LIQUID "NATURAL" GAS

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED

Jordan Cove Energy Project, L.P. Docket No. CP13-483-000 Pacific Connector Gas Pipeline, L.P. Docket No. CP13-492-000 FERC/EIS 0256D - November 2014	LNG import / export terminal 232 mile (373 kilometer) pipeline 420 megawatt power station

PEAKED ENERGY ALTERNATIVE

"you can't export gas that only exists on paper"

Mark Robinowitz, Box 51222, Eugene, OR 97405 - mark@oilempire.us

PEAKCHOICE.ORG: COOPERATION OR COLLAPSE

An Uncensored Guide: Earth, energy and money

Peak Money: A Permanent Change
Peak Electricity was in 2007
Peak Traffic was in 2007
Peak Airplanes (domestic) was in 2007
A Dam Big Problem: the Willamette Valley tsunami

A lot of the background documentation attached to these comments shows how some of the fuel that will allegedly be exported from the United States of America through Coos Bay, Oregon does not actually exist.

Therefore, this "export" terminal is going to flip back to an import terminal as conventional natural gas declines further and the fracking boom peaks and declines due to geological limits.

I hope that there are other comments submitted for the record that discuss these physical facts, it would be good for other Oregonians to notice depletion and exaggerated estimates from energy companies.

A disclaimer about the attached articles that I did not write: I am merely including them as expert background information on this issue to provide further documentation on the assertions in my comments. These articles are not being submitted on behalf of their authors, merely for the purpose of making their writing easier to find and to be included into the formal record. If you like their writing, subscribe to their email lists, buy their books, donate to their efforts, increase awareness of their good work.

It's a cold political reality that today no candidate can win election on a platform that respects the laws of physics on a finite planet.
-- Dave Gardner, "Who Will Get This Economy Moving? No One," Nov 05, 2012
www.growthbusters.org/2012/11/who-will-get-this-economy-moving-no-one/

We are constantly being told about "a permissible amount of radiation."
Who permitted it? Who has any right to permit it?
-- Dr. Albert Schweitzer, On Nuclear War And Peace, p. 176,
www.schweitzerfellowship.org/features/about/phil/phil.aspx?id=20

NEPA REQUIRES A SUPPLEMENTAL EIS WHEN THERE ARE "NEW CIRCUMSTANCES."

CONVENTIONAL NATURAL GAS DECLINE AND THE PEAKING OF SHALE GAS FRACKING ARE NEW CIRCUMSTANCES FOR THE "EXPORT" TERMINAL, PIPELINE AND POWER STATION.

National Environmental Policy Act (not Protection Act)

The National Environmental Policy Act (NEPA) is the law that requires Environmental Impact Statements (for large projects) and Environmental Assessments (for smaller projects). The start of an EIS or EA is the drafting of a "Purpose and Need" to identify a problem, followed by "scoping" of a range of reasonable alternatives. The preferred alternative is approved in a "Record of Decision" after the Final EIS, at which time citizens can sue to block the project.

NEPA was signed by President Nixon and governs all federal actions that impact the environment, including this LNG terminal permit, pipeline route, wetland destruction permits and other federal aspects of this project. NEPA is sometimes misstated as the National Environmental *Protection* Act, but it is procedural law, not substantive -- it merely requires adequate disclosure of all decisions. NEPA does not require selecting the least destructive alternative, merely full disclosure of impacts. If an administration planned to destroy all life on Earth, NEPA would require that they analyze a range of alternatives (perhaps an option to destroy half of the Earth along with a "No Action" option). This may sound like hyperbole, but there have been many EISs prepared for nuclear weapons bases, the most omnicidal technology ever invented.

The National Environmental Policy Act (NEPA) mandates a "Supplemental" Environmental Impact Statement must be prepared if there are "new circumstances" relevant to the project. The decline of conventional natural gas and the peaking of shale gas fracking regions since the original proposal was first analyzed means that the flipping back of this project to an "import" terminal must be considered in a Supplemental EIS. The bulk of these comments contain technical details that explain why "export" is unlikely due to physical constraints and therefore full disclosure of what is really planned must be explored before a Record of Decision can be issued (preferably in support of the No Build option).

This EIS also ignores the ultrahazardous aspects of an LNG terminal next to a city and an airport runway and worse, ignores the unique dangers that the Cascadia Subduction Zone poses to operation of this terminal. A 9.0 earthquake, land subsidence and a massive tsunami might cause an enormous fireball that could destroy Coos Bay and North Bend towns, risks that are barely hinted at in the EIS. The extreme dangers of LNG tankers are why Homeland Security's Coast Guard requires large exclusion zones around these ships, an economic impact to boat traffic for Coos Bay that is not discussed in the EIS (and a reason why the proposed terminal for Humboldt Bay was withdrawn).

The Jordan Cove application is one of the larger EISs on record (5,048 pages), and violates the NEPA requirement that EISs not be excessively long. I trust that my more modest comments and attached technical information will not be overly burdensome for FERC bureaucrats and contractors to read and will be helpful for impacted land owners, other concerned citizens, environmental groups and others in the quest to understand the full scale of this project and why its cancellation is imperative. The enclosed information also describes energy reality as we pass the limits to growth on a finite planet.

> The major difference between Jordan Cove's original proposal in Docket No. CP07-444-000 and its current proposal in Docket No. CP13-483-000 is the change from an LNG import terminal to an export terminal based on changes since 2007 in the availability of domestic natural gas. The switch to LNG export rather than import resulted in some design changes at the terminal. For example, the vaporizers which were critical elements for an LNG import terminal would be unnecessary at an export terminal, and instead would be replaced by liquefaction trains, and the addition of refrigerant resupply and storage, and aerial cooling system. The natural gas liquids extraction facility for the LNG import proposal in Docket No. CP07-444-000 would not be necessary for the export proposal, and would be replaced by a pipeline natural gas processing plant.
>
> p. 1-6

Council on Environmental Quality regulations

40 CFR 1502.7 Page limits.

> The text of final environmental impact statements (e.g., paragraphs (d) through (g) of § 1502.10) shall normally be less than 150 pages and for proposals of unusual scope or complexity shall normally be less than 300 pages.

40 CFR 1502.9:

Draft, final and supplemental statements.

(c) Agencies:

> (1) Shall prepare supplements to either draft or final environmental impact statements if:
>
> > (i) The agency makes substantial changes in the proposed action that are relevant to environmental concerns; or
> >
> > (ii) **There are significant new circumstances or information** relevant to environmental concerns and bearing on the proposed action or its impacts.

A faulty idea: building an ultrahazardous LNG terminal in a severe seismic zone with catastrophic tsunamis

The risk of the Cascadia Subduction Zone earthquake and tsunami for the Jordan Cove LNG terminal should have been sufficient to cancel the project. Every other consideration and complaint is secondary in comparison.

Jordan Cove may be the most seismic location ever chosen for an LNG terminal. The nearby Cascadia Subduction Zone has generated Richter 9 earthquakes and very large tsunamis. This was not understood until the 1980s, but it is well understood now, even though the timing and precise severity of the next earthquake is impossible to predict.

The Draft EIS does not include maps of the potential liquification of soils during a CSZ earthquake and how this would impact the terminal, power station, compressor and pipeline. The Draft EIS does not include maps of the potential tsunami inundation zones even though these are public information, nor does it consider the impact of tsunami on the channel, especially if an LNG tanker were in the channel when a CSZ tsunami was generated.

The Draft EIS does not discuss the potential for sudden subsidence caused by a CSZ earthquake, which is especially egregious considering that one factor that caused the January 1700 earthquake to be discovered was a cedar forest that was dropped about 20 feet (6 meters) and submerged into salt water. Investigation of this dead cedar forest revealed that substantial parts of the Oregon coast dropped as a consequence of the quake and this needs to be considered for the Jordan Cove alleged safety analysis.

Assumptions about the size of the CSZ tsunami would be wrong if subsidence accompanied the shaking and tsunami generation. It's impossible to say that this could not happen in the Coos Bay area whenever the next CSZ earthquake happens.

The 2004 Indian Ocean tsunami and the 2011 Sendai, Japan tsunami were each more powerful than predictions of seismic risk had estimated, with devastating consequences for coastal communities. Downplaying the risk for Coos Bay and North Bend is convenient for promoters of LNG (and real estate developers in the tsunami inundation zones) but the people of these cities are held hostage to these projects.

The Fukushima Daiichi nuclear power complex was designed with an estimated wave potential of about thirty feet. The actual tsunami that inundated the facility was closer to forty five feet, shorting out the emergency core cooling system and battery backup, leading to the multiple nuclear meltdowns that continue to leak nuclear waste into the Pacific Ocean.

Assumptions of a particular size of the CSZ triggered tsunami for Coos Bay are merely estimates, since the last event was in January 1700 and precise records for the height of the wave do not exist. If the wave is bigger than predicted, or if there is unexpectedly large subsidence at this location, or the engineering of the LNG terminal is not as robust as claimed, or the tsunami damages an LNG tanker in port or the channel, then a catastrophic disaster would be extremely likely.

http://www.dailymail.co.uk/news/article-1386978/The-Japanese-mayor-laughed-building-huge-sea-wall--village-left-untouched-tsunami.html

The Japanese mayor who was laughed at for building a huge sea wall - until his village was left almost untouched by tsunami

By DAILY MAIL REPORTER

UPDATED: 20:32 EST, 13 May 2011

The huge sea wall and floodgates took 12 years to build and had been widely regarded as a £20million folly. But today one former Japanese mayor is being hailed as a saviour after the grandiose construction allowed his small town escaped the devastation wrought by the March 11 tsunami.

In the rubble of Japan's northeast coast, Fudai stands as tall as ever after. No homes were swept away. In fact, they barely got wet.

The 3,000 residents owe their lives to the late Kotaku Wamura, who lived through an earlier tsunami and made it a priority of his four-decade tenure as mayor to defend his people from the next one.

www.nola.com/politics/index.ssf/2011/05/how_one_japanese_village_defie.html

How one Japanese village defied the tsunami

by The Associated Press

on May 15, 2011 at 6:30 PM

FUDAI, Japan -- In the rubble of Japan's northeast coast, one small village stands as tall as ever after the tsunami. No homes were swept away. In fact, they barely got wet.

Fudai is the village that survived -- thanks to a huge wall once deemed a mayor's expensive folly and now vindicated as the community's salvation.

The 3,000 residents living between mountains behind a cove owe their lives to a late leader who saw the devastation of an earlier tsunami and made it the priority of his four-decade tenure to defend his people from the next one.

His 51-foot (15.5-meter) floodgate between mountainsides took a dozen years to build and meant spending more than $30 million in today's dollars.

"It cost a lot of money. But without it, Fudai would have disappeared," said seaweed fisherman Satoshi Kaneko, 55, whose business has been ruined but who is happy to have his family and home intact.

The floodgate project was criticized as wasteful in the 1970s. But the gate and an equally high seawall behind the community's adjacent fishing port protected Fudai from the waves that obliterated so many other towns on March 11. Two months after the disaster, more than 25,000 are missing or dead.

"However you look at it, the effectiveness of the floodgate and seawall was truly impressive," Fudai Mayor Hiroshi Fukawatari said.

Towns to the north and south also braced against tsunamis with concrete seawalls, breakwaters and other protective structures. But none were as tall as Fudai's.

The town of Taro believed it had the ultimate fort -- a double-layered 33-foot-tall (10-meter-tall) seawall spanning 1.6 miles (2.5 kilometers) across a bay. It proved no match for the tsunami two months ago.

In Fudai, the waves rose as high as 66 feet (20 meters), as water marks show on the floodgate's towers. So some ocean water did flow over but it caused minimal damage. The gate broke the tsunami's main thrust. And the community is lucky to have two mountainsides flanking the gate, offering a natural barrier.

The man credited with saving Fudai is the late Kotaku Wamura, a 10-term mayor whose political reign began in the ashes of World War II and ended in 1987.

Fudai, about 320 miles (510 kilometers) north of Tokyo, depends on the sea. Fishermen boast of the seaweed they harvest. A pretty, white-sand beach lures tourists every summer.

But Wamura never forgot how quickly the sea could turn. Massive earthquake-triggered tsunamis flattened Japan's northeast coast in 1933 and 1896. In Fudai, the two disasters destroyed hundreds of homes and killed 439 people.

"When I saw bodies being dug up from the piles of earth, I did not know what to say. I had no words," Wamura wrote of the 1933 tsunami in his book about Fudai, "A 40-Year Fight Against Poverty."

He vowed it would never happen again.

In 1967, the town erected a 51-foot (15.5-meter) seawall to shield homes behind the fishing port. But Wamura wasn't finished. He had a bigger project in mind for the cove up the road, where most of the community was located. That area needed a floodgate with panels that could be lifted to allow the Fudai River to empty into the cove and lowered to block tsunamis.

He insisted the structure be as tall as the seawall.

The village council initially balked.

"They weren't necessarily against the idea of floodgates, just the size," said Yuzo Mifune, head of Fudai's resident services and an unofficial floodgate historian. "But Wamura somehow persuaded them that this was the only way to protect lives."

Construction began in 1972 despite lingering concerns about its size as well as bitterness among landowners forced to sell land to the government.

Even current Mayor Fukawatari, who helped oversee construction, had his doubts.

"I did wonder whether we needed something this big," he said in an interview at his office.

The concrete structure spanning 673 feet (205 meters) was completed in 1984. The total bill of 3.56 billion yen was split between the prefecture and central government, which financed public works as part of its postwar economic strategy.

On March 11, after the 9.0 earthquake hit, workers remotely closed the floodgate's four main panels. Smaller panels on the sides jammed, and a firefighter had to rush down to shut them by hand.

The tsunami battered the white beach in the cove, leaving debris and fallen trees. But behind the floodgate, the village is virtually untouched.

Fudai Elementary School sits no more than a few minutes walk inland. It looks the same as it did on March 10. A group of boys recently ran laps around a baseball field that was clear of the junk piled up in other coastal neighborhoods.

Their coach, Sachio Kamimukai, was born and raised in Fudai. He said he never thought much about the floodgate until the tsunami.

"It was just always something that was there," said Kamimukai, 36. "But I'm very thankful now."

The floodgate works for Fudai's layout, in a narrow valley, but it wouldn't necessarily be the solution for other places, Fukawatari said.

Fudai's biggest casualty was its port, where the tsunami destroyed boats, equipment and warehouses. The village estimates losses of 3.8 billion yen ($47 million) to its fisheries industry.

One resident remains missing. He made the unlucky decision to check on his boat after the earthquake.

Wamura left office three years after the floodgate was completed. He died in 1997 at age 88. Since the tsunami, residents have been visiting his grave to pay respects.

At his retirement, Wamura stood before village employees to bid farewell: "Even if you encounter opposition, have conviction and finish what you start. In the end, people will understand."

By Tomoko A. Hosaka, Associated Press

http://articles.latimes.com/2012/mar/11/opinion/la-oe-holguin-veras-tsunami-20120311.html

Japan's 1,000-year-old warning

Op-Ed

When the tsunami struck Miyatojima island, a story passed down through generations meant residents knew what to do and kept many safe.

March 11, 2012|By José Holguín-Veras

I am an engineer and a disaster researcher; I went to Japan after the March 11, 2011, magnitude 9.0 Tohoku earthquake to try to identify lessons there that could benefit future disaster-response operations.

In late May, I was following the usual research routine of interviewing individuals involved at the various stages of the disaster response, and particularly those involved in the distribution of critical supplies as part of the relief effort.

FOR THE RECORD:

Tsunami: In a March 11 Op-Ed about a 1,000-year-old story that saved lives after the Tohoku earthquake, the last name of a Japanese engineer was misspelled. His name is Eiichi Taniguchi, not Tanaguchi. —

In a refugee center on the beautiful island of Miyatojima, at the entrance to Matsushima Bay, I stumbled on a story that, by its reach back in time, taught me something unexpected: Collective memory, as much as science and engineering, may save your life.

After a long day of field work, my colleagues and I were chatting with a community leader, Koutaro Ogata, from a fishing village called Murohama. We asked what had happened to him in the moments after the earthquake. He told us that he and his neighbors were well aware that a large earthquake would generate a large tsunami and they knew, particularly, what to do because "a thousand years ago" a massive earthquake and tsunami had all but wiped out Murohama.

This is the story he told. A millennium ago, the residents of Murohama, knowing they were going to be inundated, had sought safety on the village's closest hill. But they had entered into a deadly trap. A second wave, which had reached the interior of the island through an inlet, was speeding over the rice paddies from the opposite direction. The waves collided at the hill and killed those who had taken refuge there. To signify their grief and to advise future generations, the survivors erected a shrine.

This story might not have captured my attention if it hadn't been for a fortuitous coincidence. The day before, an engineering colleague, Eiichi Taniguchi, had told me that researchers at Tohoku University in Sendai, Japan, had found sediments indicating that a huge tsunami had hit Miyatojima about 1,000 years ago. Intrigued by the possibility of a connection between oral history and geological evidence, I asked the community leader if "a thousand years ago" was a figure of speech or an estimate of time.

To my astonishment, he indicated that it was in no way a figure of speech. Village elders had reviewed the local temple's records and found reports pinpointing a large tsunami 1,142 years ago. It was most likely the result of the massive Jogan Jishin earthquake of 869, which devastated the Sanriku coast. Thirty years before the great Mayan cities were abandoned, at the height of the Muslim and Chinese empires, when Europe was in the midst of the Early Middle Ages (and 600 years before Columbus stumbled into the Americas), a community of unknown fishermen honored their dead and successfully sent a warning to future generations.

Some 50 generations later, on March 11, 2011, the Murohama tsunami warning tower — which was supposed to sound an alarm — was silent, toppled by the temblor. Still, without the benefit of an official warning system supported by modern science, the locals relied on the lesson that had been transmitted generation to generation for 1,000 years. "We all know the story about the two tsunami waves that collided at the shrine," I was told.

Instead of taking refuge on the closest hill, the one with the shrine, they took the time to get to high ground farther away. From the safety of their vantage point they saw two tsunami waves colliding at the hill with the shrine, as they did long ago. Tragically, not everyone made the right choice; I was told of at least one person who died.

Later, I saw the shrine — a simple clearing by the side of a hillside road, with stone tablets and roughly made figures — and I heard the old story and the new one again: A community remembered what it had been told and did the right thing.

I have to admit that I have not been able to keep this story of survival out of my mind. I know that science and engineering save lives. But in this instance neither did much to help. A message sent into the future 1,000 years ago did. Reaching out from the distant past, long-gone ancestors — and a deeply embedded story — saved their children.

José Holguín-Veras is an engineering professor at Rensselaer Polytechnic Institute in New York and a member of the National Academy of Sciences' Disaster Research Roundtable. Jason Kelly contributed to this essay.

If the LNG terminal was a school or a hospital, it would be disqualified from this location due to the tsunami risk.

http://registerguard.com/rg/news/32592205-76/oregon-state-warned-on-building-in-tsunami-zone.html.csp

"Oregon State warned on building in tsunami zone"

By The Associated Press

DEC 26, 2014

NEWPORT, Ore. — Oregon's state geologist has urged Oregon State University not to put a marine studies building in the tsunami zone south of Newport's Yaquina Bay Bridge — or at least to build it to withstand waves as high as 43 feet.

Vicki McConnell says the building is designed with a capacity of 500, the maximum state law allows in a tsunami zone.

The school says that fewer than 300 would actually work and study there, and students would have quarters on higher grounds — making the risk manageable.

University officials said buying land on higher ground and pumping seawater uphill for studies would be too expensive,

The Oregonian reports another option under consideration also would add cost: "blow-through" first and second stories, with higher levels as refuge for people.

———

Information from: The Oregonian, http://www.oregonlive.com

An LNG ship and terminal has the energy potential of a small nuclear bomb

LNG is very different from liquified petroleum, usually called propane. Propane is easy to condense and is a liquid at room temperature. Natural gas, on the other hand, has to be cooled to the temperature of the planet Saturn to reach a liquid state. This is the only way that it can be transported profitably in containers. Most natural gas around the world is moved via pipelines where the expense, energy and extra danger of LNG is not required.

LNG terminals have a worst case accident potential of an explosion comparable to the smallest of nuclear weapons. That alone should prohibit any LNG facilities next to Coos Bay, North Bend and especially their airport. Would Jordan Cove be the closest LNG terminal on Earth next to an active airport? What would the risks be of an accidental or intentional crash of a plane into the LNG ship or storage tanks? This location can have severe winter windstorms which make aviation difficult.

Even the LNG import terminal in Chesapeake Bay, Maryland, which is near Calvert Cliffs nuclear power station, is several miles away from that facility.

> There are no residences within 1 mile of the proposed terminal. The Jordan Cove property is currently open land zoned for industrial development, and is large enough to accommodate all proposed facilities and the surrounding vapor hazard zone.
>
> Draft EIS, p. 3-11

The Supplemental EIS needs to include, among other concerns, potential LNG leaks from a Cascadia Subduction Zone earthquake and / or tsunami breaking the pipes of the gas facilities. It also needs to examine the risk to nearby citizens from tankers using the channel, not just the danger from the terminal location.

http://citizensagainstlng.com/wp/2014/12/23/opponents-of-jordan-cove-lng-export-pack-ferc-meetings-in-southern-oregon-dec-8th-13th-2014/
has a copy of a hazard map from a previous iteration of the EIS, it needs to be included in a Supplemental EIS to fully explore the hazards that Coos Bay / North Bend area citizens would face from LNG tanker traffic. A copy is attached below:

Jordan Cove LNG Tanker Hazard Zones (FEIS Page 4.7-3)

Zone 1 (yellow) - No one is expected to survive in this zone. Structures will self ignite just from the heat.

Zone 2 (green) - People will be at risk of receiving 2nd degree burns in 30 seconds on exposed skin in this zone.

Zone 3 (blue) - People are still at risk of burns if they don't seek shelter but exposure time is longer than in Zone 2.

Map does not include the hazard zones for the South Dunes Power Plant and the Pacific Connector Gas Pipeline.

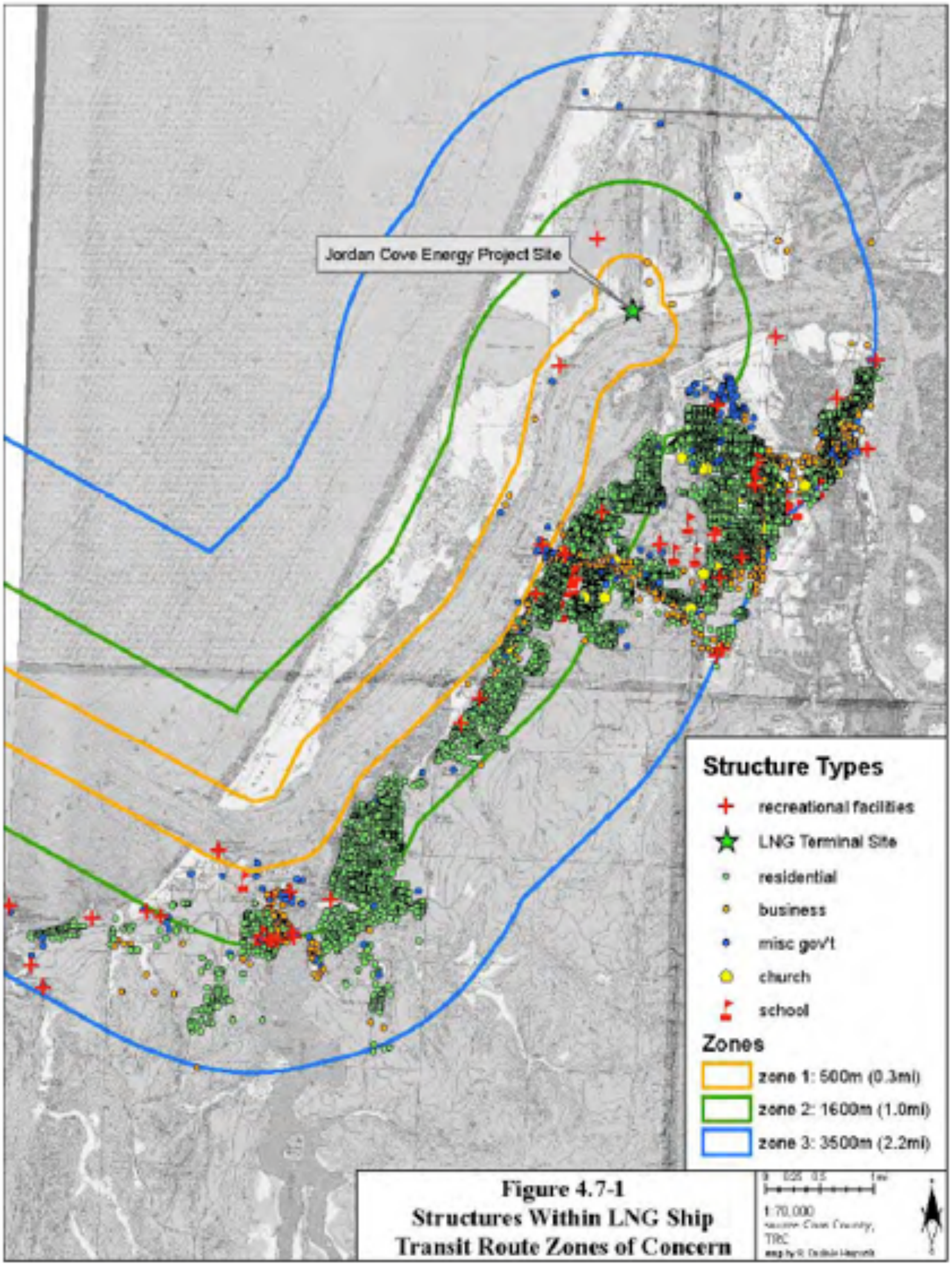


Figure 4.7-1
Structures Within LNG Ship Transit Route Zones of Concern

this Sandia Lab report is archived at
www.cryptome.org/eyeball/lng/lng-eyeball.htm

Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water, Sandia National Laboratory, December 2004.

http://www.fossil.energy.gov/programs/oilgas/storage/lng/sandia_lng_1204.pdf

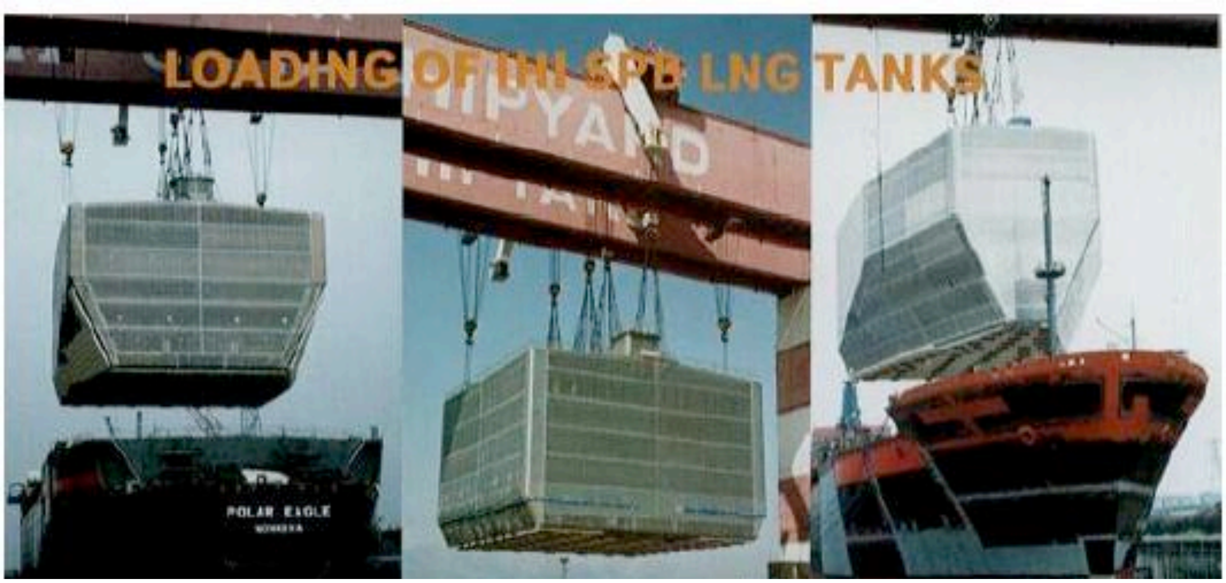
The Energy Information Administration (EIA) estimates that domestic natural gas production is expected to increase more slowly than consumption, rising to 20.5 trillion cubic feet (Tcf) in 2010 and 21.9 Tcf in 2025. Domestic gas production is relatively flat, while the marginal costs of domestic production are increasing, which has caused a fundamental shift in long-term gas prices. At the same time, gas demand is rising sharply, particularly for electric power generation. The National Petroleum Council (NPC) states in its recent report, “Balancing Natural Gas Policy – Fueling the Demands of a Growing Economy,” that “traditional North American producing areas will provide 75% of long-term U.S. gas needs, but will be unable to meet projected demand,” and that … “New, large-scale resources such as LNG and Arctic gas are available and could meet 20%-25% of demand, but are higher-cost and have long lead times.”

The combination of higher natural gas prices, rising natural gas demand, and lower liquefied natural gas (LNG) production costs, is setting the stage for increased LNG trade in the years ahead. Estimates are that worldwide LNG trade will increase 35 percent by 2020. In the United States, EIA projects that natural gas imports will more than double over the next 20 years. Nearly all the projected increase is expected to come from LNG, requiring an almost 28-fold increase in LNG imports over 2002 levels.

The United States currently has four marine LNG import terminals: Lake Charles, Louisiana; Everett, Massachusetts; Elba Island, Georgia; and Cove Point, Maryland. EIA projects that three new LNG terminals could be constructed in the U.S. in the next 4 to 5 years, and others have estimated that as many as eight could be constructed within this time frame. More than 40 new marine LNG terminal sites are under consideration and investigation. A major factor in the siting of LNG import terminals is their proximity to a market, enabling natural gas to be easily supplied to areas where there is a high demand, but limited domestic supplies. For this reason, marine LNG import terminals are being proposed or considered near major population centers on all three U.S. coasts.

LNG Transportation by Ship

Figure 1. Moss-Spherical LNG Tanker Ship



6.3 Risk Reduction Examples

Table 21 below presents selected scenarios that provide examples of potential events and several prevention and mitigation approaches that could be used to reduce risks to public safety and property. Following the table, examples are given for each category of how these prevention and mitigation strategies can be implemented individually or in combination to reduce risks and consequences for a given location.

Many of the strategies identified are already under consideration or being implemented by the Coast Guard. Other strategies identified might be considered in conjunction with existing strategies at many sites. While risks can seldom be reduced to zero, prevention of the higher consequence events can significantly reduce hazards to public safety and property and facilitate mitigation of the remaining lower consequence and lower risk events.

As discussed in Section 3, prevention and mitigation strategy implementation should key on effectiveness, costs, and operational impacts. The level of risk reduction required should be determined in conjunction with local public officials and public safety organizations such as police and fire departments, emergency response services, port authorities, the Coast Guard, and other appropriate stakeholders.

Risk reduction strategies that are effective at one site might not be effective at another site. Therefore, the examples provided in Table 21 below should be considered in the context of how a risk management approach might be customized to yield benefits to public safety and property while having limited operational impacts.

Table 21: Examples of Risk Prevention and Mitigation Strategies for Potential Threats

SCENARIO	TARGETS	MECHANISM	POTENTIAL CONSEQUENCES		RISK REDUCTION MEASURES	
			LOCAL	CASCADING	PREVENTION	MITIGATION
Ramming	Fixed targets afloat or ashore	Mechanical distortion	Fire & ship damage	Large-scale fire	▪ Control of ship ▪ Increased mobility ▪ Tug escort	▪ Absorbing barriers on fixed targets ▪ Fire-fighting capability
Triggered Explosion	Fixed targets afloat	Pre-placed, coordinated explosion	Ship damage	Large-scale fire, blockage of waterway	▪ Early interdiction and surveillance ▪ Sweeping ▪ Intelligence ▪ Control of ship	▪ Emergency response force ▪ Evacuation plans ▪ Towing option
Insider Takeover or Hijacking	Fixed targets afloat or ashore	Standoff & negotiation, or explosion	Elevated public concern or fire & ship damage	Public demands to cease operations or large-scale fire	▪ Early interdiction & searches ▪ Control of ship ▪ Employee background checks	▪ Emergency response force ▪ Evacuation plans
Terrorist	Target afloat	Vessel carrying explosives	Fire & ship damage	Large-scale fire and blockage of waterway	▪ Security zones ▪ Safety halo around ship ▪ Intelligence	▪ Emergency response force ▪ Evacuation plans ▪ Towing option

Ramming

Ramming could occur between an LNG tanker and a fixed object or between a boat and an LNG tanker. As noted in Appendix B, unless the LNG tanker speed is above 5 – 7 knots or the object is very sharp, ramming of the LNG tanker into an object will not likely penetrate both hulls and the LNG cargo tank. Likewise, if the LNG tanker is rammed by a small boat, such as a pleasure craft, the kinetic energy is insufficient to penetrate the inner hull of a double-hulled LNG ship.

Therefore, while ramming does not appear to be a major concern or present significant hazards, changes in some safety and security operations could reduce the chances of a ramming event. For example, requiring tug escorts for LNG ships in high consequence areas would reduce the potential for an insider to ram intentionally an LNG vessel into a critical infrastructure element. Another option would be to ensure that crewmembers have been properly evaluated and the ship interdicted and searched sufficiently in advance of entry into the U.S. to thwart a hijacking attempt or insider sabotage. These efforts reduce the ability of an adversary to pick the time, place, and target for a ramming event and reduce the risk from a potential ramming scenario.

Triggered Explosion

Triggered explosion events assume pre-placed explosives, either on the ship or in a fixed location. At some sites, sweeping of the waterway, harbor bottom, and terminal areas for explosives or mines might be required. This is especially true for high hazard areas, shallow waterways, or terminals where explosives might be hidden. To prevent sabotage of an LNG cargo tank through a triggered explosive on board a ship, the same type of early interdiction, searches, and control of the ship discussed in the ramming prevention scenario could be applicable.

Insider Takeover or Hijacking

A number of security measures, including armed security control aboard the ship and early interdiction and inspection of the ship prior to its entry into the U.S., could prevent many of the large breaching scenarios identified in Sections 4 and 5. This could significantly reduce hazards levels and enable spill mitigation measures available to emergency response organizations to be used effectively.

A ship hijacking should be considered credible through coordinated efforts by insiders or others. The threat could proceed with the breach and spill of an LNG cargo tank through use of planted or smuggled explosives or by overriding offloading system safety interlocks to discharge LNG intentionally onto the ship, onto unloading terminal equipment, or onto the water. While a number of operational procedures have been implemented to help prevent this type of potential scenario, control and surveillance of an LNG ship must be appropriately maintained to ensure adequate time to respond to a potential hijacking event.

External Terrorist Actions

External terrorist attacks could come from a number of avenues, including attack of the LNG ship with a wide range of munitions or bulk explosives. A U.S.S Cole-type attack is often suggested as a potential attack scenario, as well as attacks with munitions such as rocketpropelled grenades, or missiles or attacks by planes. Depending on the size of the weapon or explosive charge and the location of the attack, the potential breach and LNG spill will vary. Common approaches to prevent or mitigate these events are to make structures more resistant to attacks or to increase the standoff distance between the initiation of explosives and the ship. While security zones are presently used effectively for safety considerations at most of the LNG import locations in the U.S., a security halo for an LNG ship would have to be much smaller and effectively maintained to develop the security zones needed to prevent some of these events. Such measures could prevent a potential attacker from approaching close enough to cause severe damage to an LNG vessel. This security zone might require different escort ships and escort procedures, improved overhead and subsurface surveillance, enhanced training, or enhanced security response procedures.

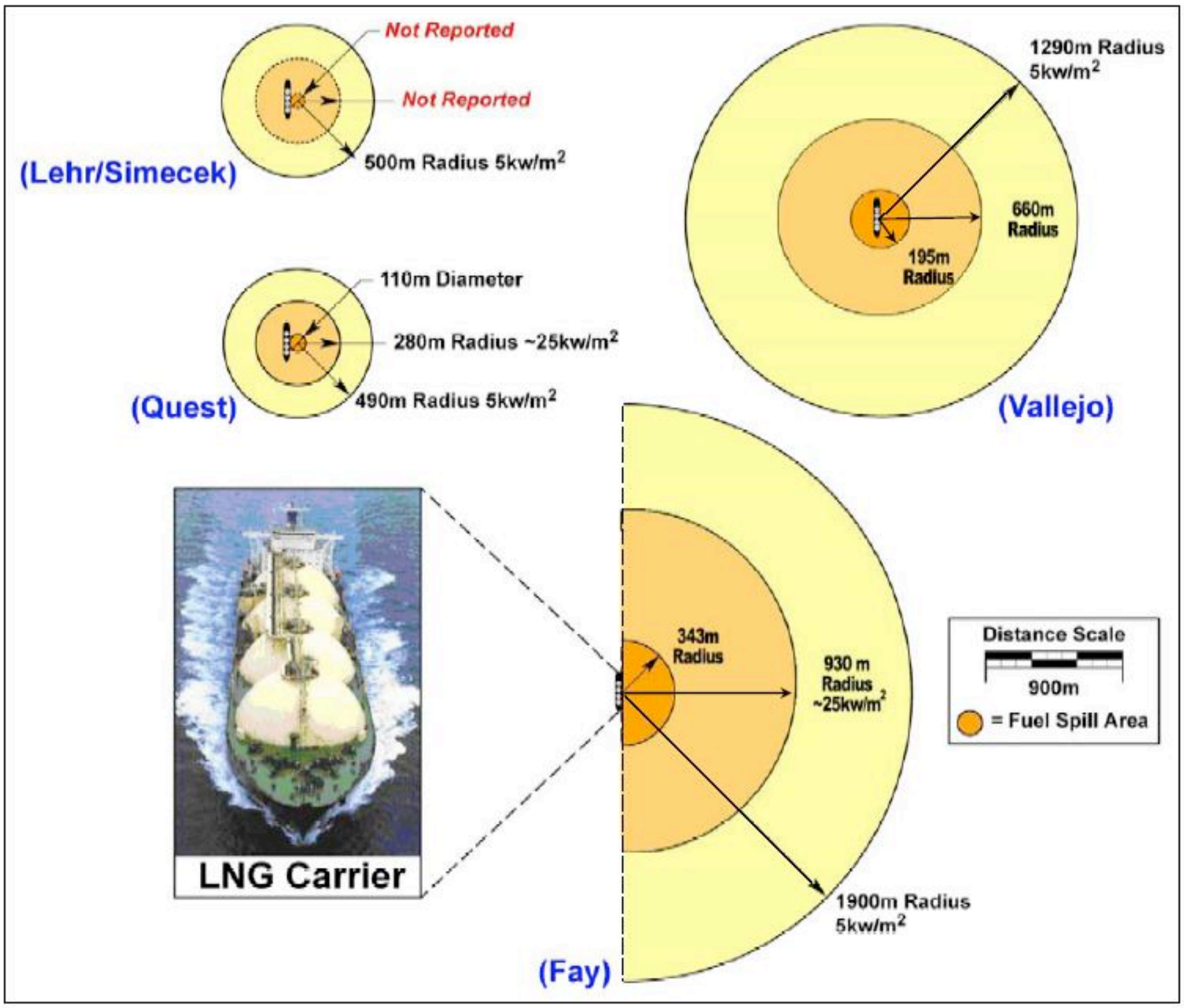


Figure 6. Graphical Summary of the Results of the *Lehr, Fay, Quest & Vallejo* Studies
(Yellow = 5kW/m^2; lt. Orange = 25 kW/m^2; dk. Orange = fuel spill radius)

4.2 Thermal Damage on Structures

The potential for damage to other vessels or structures from an LNG spill and fire needs to be considered to determine the overall risk. As noted in Appendix C, the potential for fire damage from spills can be relatively extensive. The six spills projected in Appendix B would take anywhere from 10 – 20 minutes to release up to 50% of the LNG in an individual tank for a large spill and up to one hour for a small spill, depending on the location.

The thermal radiation that will damage structures is approximately 37 kW/m2 for durations of more than 10 minutes. Damage can be expected to the vessel and nearby steel structures, because steel strengths are reduced to 60 – 75% of their room temperature values at 800º K. Further reduction in strength will result for temperatures above 800º K. Steel will melt at approximately 1800º K and is generally considered to have no strength at half the melt temperature, or 900º K. The calculations suggest that these temperatures could exist at a spill from an LNG cargo tank from 30 minutes to an hour and, therefore, potentially damage nearby steel and other structures.

Of even greater importance is the possibility that a large spill could cause a cascading set of LNG cargo tank failures. In this instance, significant long-term fire damage could result to a nearby steel structure, unloading terminal, or unloading platform. Positive operational and risk management measures can be taken to try to prevent these types of issues. This could include redundant or multiple offloading capabilities or moorings, fire protection systems, etc., as identified in Section 6.

note: a substantial section of the communities along the Coos Bay channel to the ocean would be in the zone considered at risk for heat damage from an accident as profiled in this Sandia report. This needs to be discussed in a Supplemental Draft Environmental Impact Statement.

LNG terminals stopped in California USA, import terminals built in Baja Mexico

For more than a decade, LNG companies have targeted numerous communities up and down the West Coast, trying to find the zone of least resistance to build a new terminal.

Now that LNG terminals have been canceled in Vallejo and Eureka, California, and the proposals for the mouth of the Columbia are passed (mostly), Jordan Cove seems to be “last terminal standing.”

Two sites were proposed for California. The first was in the San Francisco suburb of Vallejo, in the north bay, was the site of a proposed LNG terminal. This idea didn’t last long.

I am not familiar with the precise excuses used to cancel this concept, but I cannot imagine the Coast Guard / Homeland Security was pleased by the idea of LNG tankers passing under the Golden Gate and Richmond bridge, with the obvious danger to these structures from accidents or terrorism (or the risks posed to the San Francisco financial district). Coos Bay has a tiny percentage of the population of the San Francisco bay, much less wealth and apparently no political power to deflect this sort of abuse.

A second California site was in Humboldt Bay, near Eureka. The local fishermen complained that their access in and out of the harbor would be severely curtailed due to the exclusion zones placed around LNG tankers. This idea went up in smoke, too.

California was targeted for LNG import terminals to help provide fuel for their electricity generators, since nearly every new installation for electricity production in recent decades has been based on natural gas. The failure to find a site in California for LNG didn’t end the desire to use natural gas for electricity, it just changed which communities were supposed to host the potential hazards of LNG and the associated pipeline.

Of all the sites proposed for Oregon, Jordan Cove is closest to construction, presumably because the pipeline would be much more rural than the proposed routes from the lower Columbia through the Portland suburbs. Rural communities are often treated as sacrifice zones by big polluters, whether corporate or governmental, a blatant example of environmental injustice.

During the debates about Jordan Cove and other potential Oregon LNG terminals, new LNG import terminals opened on the west coast of Mexico, as mentioned in the Draft EIS:

> There are two existing LNG import terminals on the West Coast of Mexico. One is known as Costa Azul LNG, located about 14 miles north of Ensenada, Baja Mexico. Owned by Sempra Energy, this import terminal started operations in May 2008. It has the capacity to send out about 1 Bcf/d of natural gas, intended to supply customers in northwest Mexico.
> The other LNG import terminal on the West Coast of Mexico is farther south, at the port of Manzanillo. This terminal, jointly owned by Samsung C&T, Mitsui Trading, and Korea Gas, went into operation in 2012, and has the capacity to take in 3 million tons of LNG per year.
> We are unaware of any plans to convert the LNG import terminals on the West Coast of Mexico to export facilities. Such a conversion would require the installation of liquefaction trains. Extensive pipeline construction would be required to transport Rocky Mountain and Canadian gas to Mexico if they were converted to export LNG. Therefore, the Mexican terminals do not meet the Project objectives.
> - Draft EIS, p. 3-7

The Baja terminal is specifically aimed to help with the California, USA gas network (not only the energy use in Tijuana). Southern California does not need much heating fuel -- this gas import is in large part for electricity generation.

There is also a plan for an LNG import terminal in the Coronado Islands off the coast of Baja California. Several articles on line suggest that this proposal has been canceled, but the most current photos in Google Earth show a pair of terminal docks immediately next to the islands with tankers docked to them. This location is around 32 degrees 23.984'N, 117 degrees 14.146' W

Mexico has stronger community protection standards than Oregon for LNG siting?

The Costa Azul and Manzanillo LNG import terminals referenced in the Draft EIS have substantially larger set back from nearby communities than the Jordan Cove proposal.

The Baja (Costa Azul) terminal is almost 4 kilometers from a golf resort. There are no closer residences to the terminal, although the region's main highway passes closer than this.

The Manzanillo terminal is closer to a city, but the nearest neighborhood is still about 4 kilometers away. There are a couple isolated farmhouses closer to the northeast, but they're not immediately adjacent.

Four kilometers may not be sufficient buffer for a worst case LNG spill and explosion, but it's far more than the North Bend / Coos Bay metro area may get.

In contrast, most of North Bend is within 4 km of Jordan Cove. Some areas are very close to the terminal that the tankers would have to traverse, including the airport, schools and lots of residences. Several communities are along the channel between the terminal and the ocean and are in the high danger zone if there is an accident of any kind.

Mexico’s reputation is that it has laxer environmental and public health safety regulations than Los Estados Unidos. That is presumably why California’s new LNG import terminal was built south of the border, where Environmental Impact Statements are not required. But it seems that Oregon is treating the cities of North Bend, Coos Bay and surrounding areas with less consideration than the Mexican government, which at least ensured considerable buffer between these new terminals and its population.

Manzanillo, Mexico LNG terminal - the line represents 4 kilometers. There is a small neighborhood on the left of the photo, next to an industrial area (far left of photo). The main city of Manzanillo is on the mainland. A few isolated farms are about two kilometers from the terminal on the right side of the photo.

Baja LNG terminal. No cities are nearby. The line drawn on the map represents 4 kilometers. The golf course on the upper left of the photo has its residences (rooms to rent) about 4 kilometers away.

On Mexico's Caribbean coast, the LNG terminal at Altamira, near the city of Tampico, also has set back from residential areas. It is in the middle of a large industrial area and harbor. A nearby small town, Lomas del Real, is about 2.5 to 3.5 kilometers away. Additional residential regions are 4.5 kilometers away, to the south, and the main city of Altamira is 8 to 14 kilometers away.

The US LNG terminals in Alaska, Maryland, Georgia, Louisiana and Texas all have far more set back from nearby cities and residences than the Jordan Cove proposal.

The lone exception is the terminal in Everett, Massachusetts, which is set in the middle of the Boston metro area. After 9/11 there were lots of news articles about how the federal government had woken up to the incredible risk this posed to Bostonians but it was a bit late to mitigate the risk without shutting down the terminal.

North Bend and Coos Bay with a four kilometer radius from the Jordan Cove site.

Cumulative Impacts ignored

"Therefore, LNG vessel design and ocean transportation routes outside of the waterway close to shore will not be further analyzed in this EIS." p. 2-76

The risks of catastrophic conflagration from LNG tanker accidents are completely integrated with the danger of the import / export terminal. No LNG tankers would travel into the port without the terminal and the terminal's operation depends on the tankers. Therefore it is a connected action and the combination needs to be examined, particularly the danger of tanker accidents upon the cities of Coos Bay and North Bend.

"2.2.3 Southwest Oregon Regional Safety Center

The SORSC would occupy approximately 8 acres on the east side of Jordan Cove Road, between the Trans-Pacific Parkway and the Roseburg Forest Products property, west of the South Dunes Power Plant. The building would house the Jordan Cove Fire Company, offices for the Coos County Sherriff, Coast Guard, and the Port, and a training facility for the Southwestern Oregon Community College. Although this building does not come under the jurisdiction of the FERC, this EIS analyzes impacts resulting from its construction." p. 2-77

If the impact of a school and police substation are considered as part of a cumulative impacts analysis, then the impact of ultrahazardous tanker ships in the channel must be considered, too.

page 1-21 suggests that indirect impacts of additional drilling induced by this “export” terminal are exempt from analysis. But considering that the project is supposed to have a “25 year” authorization of supply (p. 1-13), there needs to be at least a token effort to determine where this quarter century of gas is going to come from given the ongoing decline of conventional drilling and the approaching peak of fracked gas. Plus, the gas from Canada that this project is supposed to export comes from a region far colder in the winter than Oregon, and there has been mumbling in the Canadian press for years that they need this gas to heat their cities.

EIS reports about highway expansions frequently examine the issue of “induced traffic” caused by road construction (a problem that maybe less of an issue now that traffic peaked - nationally in 2007 and in Oregon in 2002). Similarly, to authorize a massive gas export terminal without even any consideration of the physical possibility of whether the trillions of cubic feet actually exist to export or not is a dereliction of duty to disclose relevant information for informed decision making as required by NEPA.

FERC, the US Department of Energy and all of the cooperating agencies need to examine the cumulative impacts of gas production for export in a SDEIS along with reasonable estimates of how gas supplies will or will not permit the export of any natural gas as conventional wells continue to decline and the fracking boom peaks and declines. FERC cannot approve an “export” terminal that is likely to flip back to import around the time that construction is expected to be completed. Construction of the pipeline alone would cause tremendous damage to forests and residences and the public need that supposedly justifies the eminent domain has to be grounded in a reality that there is enough fuel to send from the rest of the country (and/or Canada) to Coos Bay to export. Since numerous professional experts in geology and related fields have documented that this is false, the purpose and need for the project is negated and the supposed public interest in permitting the destruction of pipeline construction is invalid.

This is not an objection to more fracking to fill this pipeline. It is instead a simple request for a SDEIS to disclose how “export” of gas could happen as North American gas supplies decline during the project’s lifetime. In the 2030s, we will be lucky to have enough to heat US cities during the winter, let alone send extra across the oceans.

reference: Council on Environmental Quality, “Considering Cumulative Impacts Under the National Environmental Policy Act,” January 1997 http://registerguard.com/rg/news/local/32573455-75/lng-site-contamination-ignored-whistleblower-says.html.csp

LNG site contamination ignored, whistleblower says

By The Associated Press

DEC 20, 2014

PORTLAND — A biologist who worked for a consultant on the liquefied natural gas plant planned for Coos Bay has told federal regulators that engineers ignored and possibly hid contaminated soils issues at the site.

The allegations came in comments filed on the project's environmental analysis, now in draft form, The Oregonian reported Friday.

The Federal Energy Regulatory Commission has concluded that there will be limited environmental impacts from the $7 billion gas-exporting complex, and they can be mitigated.

The project would be on the site of a former Weyerhaeuser paper mill. It would chill and condense natural gas piped from the interior of North America for shipment on vessels bound for Asia.

Plans call for dredging about 2.3 million cubic yards for a shipping berth and using the spoils for massive earthen berms to elevate the liquefaction plant and its accompanying power plant out of the tsunami inundation zone.

The biologist, Barbara Gimlin, said in her comments the contamination issues weren't disclosed in the analysis, nor reported to the Oregon Department of Environmental Quality until she called attention to them.

She says she supports the project but resigned in April from the consultant engineering company, SHN Engineers & Geologists, as a matter of professional integrity.

"I was stunned, just flabbergasted to find out that the DEQ hadn't been contacted at all," she told the paper. "It was inexcusable."

Gimlin said unidentified contaminated soils and sediment surfaced during excavations in an area that she had repeatedly been told was "clean fill" from previous channel dredging by the U.S. Army Corps of Engineers.

She said she learned that archeologists working on the site avoided work in one area after discovering soil they deemed contaminated, and she met resistance in her company when she asked whether environmental regulators had been informed.

Her boss at the company, Steve Donovan, said contamination issues are well understood and a plan is in place to deal with them.

Donovan acknowledged the soils were excavated and moved without notifying the Department of Environmental Quality.

"I'm not arguing with DEQ that we should have notified them, and in the future we will notify them more promptly," he said.

A hydrologist for the state agency, Bill Mason, said it sent Jordan Cove a warning letter after discovering that the contaminated soil had been pushed into a berm, covered and reseeded.

Property impacts: whether import or export

The property impacts to landowners in and near the route are inadequately described in the Draft EIS. There's no discussion of the compensation that land owners would receive for partial condemnation of their property and how this would not mitigate the full impact of their property values. (Merely measuring the percentage of property that would be confiscated does not compensate for the loss of value). There is also no discussion of the loss of property value to nearby landowners who would bear the risk of accident (and the annoyance of construction and maintenance) but are adjacent to the route and therefore not entitled to compensation for eminent domain.

If the pipeline is approved despite the hazards to Ground Zero communities, at a minimum the pipeline project needs to odorize the gas so if there is a leak neighbors will know to sound the alarm, call the fire department and run for their lives.

There's no serious discussion in the Draft EIS of the real risk of landslides to the pipeline, especially the increased risk of landslides following clearcutting of mountain slopes for the pipeline.

The pipeline company needs to post a liability bond for the potential risks to the Coos Bay - North Bend area and communities along the pipeline route. An LNG terminal accident or pipeline rupture could easily cause severe damage to property and life; therefore, adequate financial resources need to be guaranteed to ensure that potential victims could be compensated if and when there is an accident.

While it is obvious that this "export" terminal is going to flip back to an import terminal once the fracking bubble bursts, this change in the project would not be of any consolation for those unfortunate to live near the terminal and pipeline, since the dangers would be the same regardless of the direction of travel of the gas. This similar danger does not absolve FERC and the cooperating agencies from disclosing the full extent of foreseeable impacts. FERC must be aware that fracked gas is a temporary phenomenon and even if the "export" gas is to come from non-fracked sources, the fracking bubble is allegedly so large that it enables this other gas to be exported.

http://www.wunderground.com/news/natural-gas-pipeline-explosion-mississippi

Mississippi Natural Gas Pipeline Explosion Picked Up By Radar

Sean Breslin

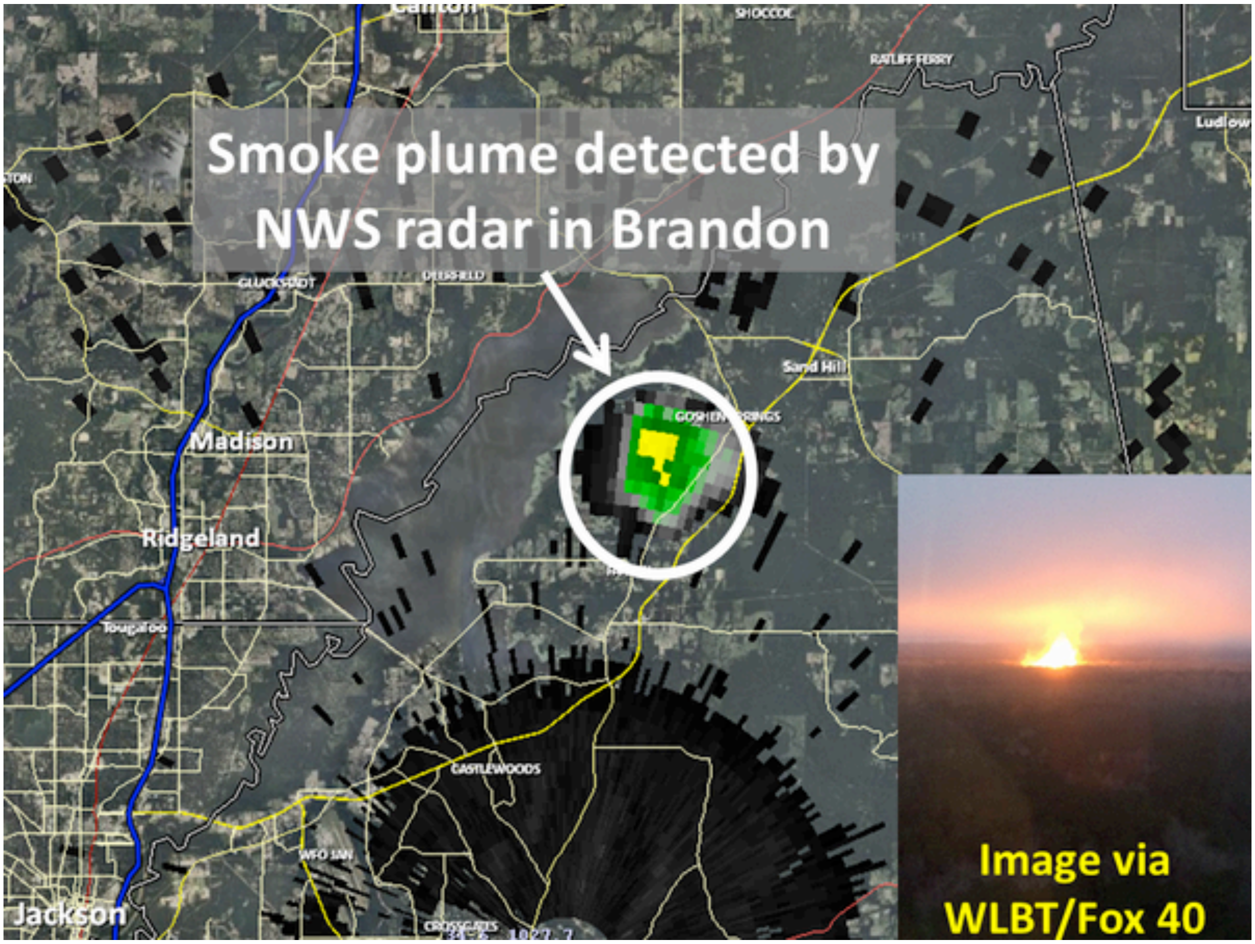
Published: January 14, 2015

Taken from Skycopter by Jessica Golden, this image shows a torched forest following the explosion of a natural gas pipeline.
(Jessica Golden/MSNewsNow.com)

A natural gas pipeline near Jackson, Mississippi, burst into flames Wednesday morning, leaving wooded areas burned and a rare image on radar.

The blast spooked nearby residents, who saw the large, orange glow in the pre-dawn sky and began to ask about its origins on social media. Gulf South Pipeline confirmed the explosion was along a natural gas line east of the Barnett Reservoir, MSNewsNow.com reported.

The National Weather Service's office in Jackson noted that the smoke plume from the fire was picked up by local radar.



Did you know precip isn't the only thing our radar can see? This morning it detected smoke from a gas line explosion.
5:39 AM - 14 Jan 2015

No injuries have been reported from the explosion, Rankin County Emergency Operations Center spokesman Bob Wedgeworth told the Clarion-Ledger.
The explosion occurred just after 6 a.m. Wednesday morning, according to WAPT.com. Residents near the fire said the explosion was so strong that it shook their houses. The fire burned for about an hour before Gulf South turned off the gas, the report added. Gulf South is investigating the cause of the blast, which is still unknown.

Conventional Natural Gas in decline

Julian Darley's 2004 book "High Noon for Natural Gas: The New Energy Crisis" documented the start of the decline of conventional natural gas. He failed to anticipate the full size of the fracking boom that unfolded a few years after the book, but on the core issue of conventional gas it was completely correct. (Darley was founder of the Post Carbon Institute, which has done some of the best documentation of how the fracking bubble will be a rapid boom and bust.)

As discussed elsewhere in this comment, the fracking boom has been a tremendous increase but it has already drilled most of the "sweet spots." Two of the three largest fracking regions for shale gas have already peaked (Barnett in Texas, Haynesville in Louisiana and Arkansas), the largest one has not yet peaked (Marcellus in Pennsylvania).

The toxic impacts of fracking have received considerable attention. The movie "Gasland," countless environmental protests, petitions, media stories, and other efforts have documented the contamination of aquifers, poisoning of nearby wells, flammable gas into neighboring wells, noise nuisance, air pollution, forest clearing and other impacts.

The other half of the story is the exaggerated estimates of what can be extracted. Industry claims of "100 years of natural gas" available through fracking are just as false as previous claims that nuclear power would be too cheap to meter. In reality, fracking is a short term boom and bust, fracked wells deplete far faster than conventional wells, fracked wells require far more energy, money and technical talent than conventional wells, and fracking is approaching its peak even while conventional gas is declinging.

Part of the gas crisis is rooted in overusing natural gas for electricity. Gas seems like a good substitute for burning coal for electricity. Its combustion is cleaner than coal (although not as clean as gas company advertisements claim). It's easy to permit under the Clean Air Act. Installing gas burners for electricity is relatively simple. It's easy to throttle the generators up and down to balance electric demand on power grids. But these attributes obscured the fact that there was not an infinite supply of gas to use for electricity -- the natural gas distribution system was only so large. It was sized for heating cities in the winter, for cooking, other residential uses, industrial applications, making synthetic fertilizer and chemicals. Adding another huge use seemed like a great idea unless one considered the actual sizes of the gas reserves.

The fact that a substantial part of US natural gas comes from offshore drilling in the Gulf of Mexico - a shift well underway before fracking - is a simple way to understand that the easiest to extract fossil fuels are now replaced by more difficult to extract energy sources. Running a major part of the electric grids on natural gas exacerbated these supply problems, which led to fracking. Fracking is not an energy renaissance, it is merely a stay of execution that has delayed rationing.

Natural gas can only be burned once. This seems self evident, yet there are plans to keep increasing applications for natural gas despite the decline of conventional drilling. One of the silliest is from oil magnate T. Boone Pickens, who wants to add transportation to the list of things that gas needs to power. There are governments, non-profits and others who echo this desire yet where additional gas is going to be found -- or how fast this additional use would deplete gas fields - is not discussed by the advocates.

Marcellus in Pennsylvania is the "Saudi Arabia" of fracked gas, but even the US Department of Energy estimates is may peak at the end of this decade. When that happens, the fracking gas bubble will clearly be burst.pickens plan - use it for transport, too - not possible (although he'll try to make money doing that)

A few suggestions for clarity in the face of finite fossil fuels:

We need to recognize depletion is a reality and plan accordingly.

Plans to export oil, coal and gas are based on false assumptions of supply and should be canceled.

We need a global cooperative, civilization wide effort for massive efficiency programs to reduce energy demand, including insulation of buildings, solar design for structures, relocalization of the global factory, relocalization of agriculture and thousands of other efforts to ensure social stability as the fossil fuels go into decline. Waiting for no fossil fuels and then shifting would be disastrous. The real crisis kicks in as we pass the limits to growth -- about now -- not when it's all gone. The oil wells are half full and half empty - we can no longer continue doing what we are doing but there's still plenty of resources to be used to mitigate descent so the future after fossil fuels will be simpler and pleasant and not a worst case scenario.

200 mile linear clearcut

The Supplemental EIS also needs to examine impact of 200 plus mile long clearcut, including through old growth forest, interior forest habitat and the climate impacts of this deforestation. Deforestation emits carbon and methane, and also disrupts the hydrologic cycle.

The impact of carcinogenic, mutagenic, teratogenic chemicals used to prevent vegetation along the pipeline route need to be examined. In addition, the ethical implications from an environmental justice perspective need to be disclosed and discussed, along with consideration of the Nuremberg Code on Human Experimentation, a federal requirement that prohibits involuntary participation in medical experiments. Citizens who do not wish to be subjected to the risks of a giant, high-pressure, non-odorized pipeline through their properties, nor the constant application of biocides to prevent vegetation regrowth should be permitted to opt out of these experiments on physical and psychological well being. The impacts of these chemicals needs to include disclosure of the synergistic impacts of these chemicals in combination plus non-cancer impacts such as hormonal disruption. The book Our Stolen Future by the late Theo Colburn would be a good reference for beginning this part of the SDEIS.

New Mexico gas crisis, 2011

On Sep 4, 2011, at 8:55 PM Sep 4, Paul wrote:

Hi Mark,
Last winter in NM, the gas pipe running north up the Santa Fe Valley was shut off to preserve adequate pressure for the city of Santa Fe, so all the towns served by that pipe, including Taos, were totally without gas for 5-7 days. The National Guard and the state police received quickie training in how to bleed lines and turn individual house gas service back on when the line was repressurized. Shelters were set up in Taos for residents who had only gas heat, but it was difficult for the Red Cross to find adequate shelter locations that didn't need gas for heat.

I was there. I stayed at a friend's who had a small wood fireplace and an electric hotplate, so we survived a very cold week.

Not only was some industry temporarily shut down, but hundreds of homes and small businesses (if not thousands) were left temporarily without gas during a period of record low temperatures.

http://www.taosnews.com/news/article_510b1732-81d1-5530-89e8-7fdc7ccced59.html

Paul

YOU CANNOT EXPORT FUEL THAT DOES NOT EXIST

The rush to export is based on the idea that there is abundant oversupply of energy resources that could be sent to Asia, but the geological reality suggests this is irrational exuberance.

Richard Heinberg's book "Blackout: Coal, Climate, and the Last Energy Crisis" is a rare look at how coal supplies are smaller than most people think. There is enough to further foul the air but not enough to continue growth of combustion, certainly not hundreds of years worth. Peak Coal is either near or here.

A 2009 report from Clean Energy Action notes that "Between 2002 and 2008, while coal costs were rising dramatically, the US Geological Survey reduced the amount of economically accessible coal in the Gillette coal field of the Powder River Basin [in Wyoming] from 23 billion tons to 10 billion tons." This makes coal export less likely.

Furthermore, to export coal from Wyoming via Coos Bay, trains would have to move past Portland, which has much better export terminals. The Eugene to Coos Bay rail route is winding, hilly and slow. Heavy coal trains are more likely to use better tracks to reach ports with greater shipping capacity. The Army Corps of Engineers is reviewing a proposal to set up a transfer station from trains to barges for the Port of Morrow, next to the Boardman coal burning power station in eastern Oregon. If this is built it would avoid congested freight rails in the Port of Portland that are already clogged with imports from Chinese factories.

The Western Power Grid stretches from Tijuana to B.C. to Denver. Half of the electricity comes from coal which is still the backbone of the grid. Obama is pushing "clean coal" which is just greenwashing more coal combustion, including new "cleaner" coal burners.

One motive for the notorious Appalachian mountaintop removal is to extract thinner coal seams that are hard to mine via conventional techniques. Parts of the Appalachians have depleted coal mines with tailings that leach sulfuric acid into river headwaters (the Potomac River headwaters is one example).

Exaggerations of coal, natural gas and oil supplies not only boost stock values of energy companies but also underlie false estimates of future economic growth, since more fossil fuels would mean more economic activity. Richard Heinberg's book "The End of Growth: Adapting to Our New Economic Reality" is a useful antidote.

In July 2010, Robert F. Kennedy, Jr. told a crowd at McDonald Theater that we could replace coal generated electricity with natural gas but political problems were the obstacles for the conversion. However, Peak Natural Gas in the US was 1973. The US imports about half of Canada's natural gas production. Replacing coal electricity with natural gas is not possible unless we stop heating homes with gas.

Shale gas "fracking" has temporarily increased US production, but claims that this could provide 100 years of supply are extreme exaggerations. The toxic impacts of fracking have finally received public scrutiny -- the documentary Gasland is an excellent summary -- but the fact that fracking wells deplete much faster than conventional drilling has not gotten as much attention.

The only reason anyone is floating the idea of exporting US coal to China is the illusion that there is so much natural gas that we can replace some of the coal with gas. The Port of Morrow proposal for transfering coal from trains to barges is supposed to become active in 2016. Geologist Art Berman, an industry insider who has examined shale gas fracking, estimates that the fracking bubble may burst around that time. When shale gas is no longer a bubble, plans to shift more coal to gas will go up in smoke and the export proposals go away, too.

In the winter of 2010 / 2011, natural gas delivery systems broke down in New Mexico during a cold snap when there wasn't enough gas to go around. Some small towns were shut off from gas supplies.

The new LNG import terminal in Baja California is providing gas for US electric generators. Supporters had tried San Francisco and Humboldt Bay before building in Mexico. As gas supplies tighten there will be more pressure for LNG imports.

In 2001, Enron partnered with Coburg Power to build a huge natural gas powered electric generator north of Eugene. It would have been at the intersection of the main electric power line for Lane County where it passes over the natural gas pipeline. After Enron pulled out (they went bankrupt for other reasons), I asked the primary promoter where the station's fuel would come from. He replied it would tap into the pipeline. I then asked where extra fuel would come from since the gas in the pipeline was already heating existing homes and businesses and he had no reply. Coburg Power never got built.

If there is any export of coal and / or natural gas through Coos Bay it is unlikely to last long since we cannot export fuel that does not exist. Will the federal government even allow fossil fuel exports as the permanent energy shock intensifies, since export would let US cities have brownouts and blackouts to provide power for Tokyo, Seoul and Beijing?

Fossil fuel depletion will force reductions in energy use. Hoping to switch from one poison to another delays the inevitable "power down." Renewable energy is great but it could power a smaller, steady state economy, not the illusion of "green growth.

The main factor that will determine how much (if any) LNG can be exported from the United States is availability of natural gas. Considering that conventional natural gas has been in sharp decline for the past decade and several gas fracking regions have peaked, it's reasonable to expect that little, if any, LNG export will be technically possible by the time the Jordan Cove project would be completed and will be even less likely over the lifespan of the terminal. FERC needs to examine this in a Supplemental EIS, including the likelihood that this alleged export terminal will become an import terminal.

The main purchasers of LNG in the world are Japan and Korea, which do not have their own indigenous supplies of fossil fuels to power their industrial economies. Japan's import of fossil fuels increased after the Fukushima meltdowns, including LNG to power new gas generators designed to offset the loss of nuclear power reactors.

What is physically possible is more important than political opinions.

What the Frack?
Scraping the bottom of the barrel is not good to the last drop

by Mark Robinowitz, PeakChoice.org

first published Energy Justice Now, energyjustice.net, September 2014

The toxic impacts of hydraulic fracturing for oil and gas have been subject to public debates, protests, lawsuits, among other tactics to stop these dangers. But the other half of the fracking story, which has had much less attention, is the exaggeration of recoverable reserves.

The fracking industry claims shale gas will fuel 100 years worth of USA consumption of "natural" gas. Massive amounts of drilling in the past several years have increased gas production above the 1973 natural gas peak. Gas has significantly increased its share of the electric power grids, lowering coal combustion and helping damper plans for new nuclear reactors.

One of fracking's dirty secrets is fracked wells decline far faster than conventional wells. Fracking a well also requires more money, technical talent and resources than conventional wells.

Two of the three top gas fracking regions in the USA have peaked. Barnett Shale near Fort Worth, Texas has peaked and plateaued. Haynesville in Louisiana and Arkansas has peaked and declined sharply. The largest fracking region -- Marcellus in Pennsylvania -- has not yet peaked and provides nearly a fifth of all USA natural gas. Nationally, about forty percent of natural gas is from fracking.

Fracking for oil has reversed the decline of USA oil extraction since the 1970 peak. The Bakken shale in North Dakota has fueled wild claims of alleged energy independence and even proposals to export oil to Asia. However, Bakken has not even offset the decline of the Alaska Pipeline, which has dropped three fourths from its 1988 peak and is approaching "low flow" shutdown. Fracking in south Texas has also raised Texan oil production but the state's peak was still back in 1972 -- a reason huge efforts have been made for offshore drilling in the Gulf of Mexico.

Post Carbon Institute has published reports documenting how fracking estimates have been exaggerated. They were vindicated in May of this year when the Department of Energy admitted plans for oil fracking in the Monterey Shale in California had been exaggerated and downsized the estimated resource by ninety-six percent (96%). Post Carbon's montereyoil.org website has details.

We are in a paradox at this time of Peak Everything and Climate Chaos. If we keep burning fossil fuels we will continue to wreck the biosphere, but if we suddenly stopped that would wreck civilization, which could accelerate ecological destruction (how many forests would be burned for electricity, for example). Fossil fuels allowed our population to zoom from under a billion to over seven billion today.

Fracking, deep water drilling in the Gulf of Mexico and tar sands extraction in Canada have delayed gasoline rationing. We are in the eye of the energy crisis hurricane, perhaps for a few more years.

The Limits to Growth study in 1972 predicted peak resources around the turn of the century, followed by peak pollution as dirtier resources were used as higher quality resources were depleted. Fracking, tar sands, mountaintop removal and other desperate destructions seek to maintain the exponential growth economy now that the easier to extract fossil fuels are in decline.

Using solar energy for two decades taught me that renewable energy could only run a smaller, steady state economy. Our exponential growth economy requires ever increasing consumption of concentrated resources (fossil fuels are more energy dense than renewables). A solar energy society would require moving beyond growth-and-debt based money.

After fossil fuel we will only have solar power, but that won't replace what we use now. We need to abandon the myth of endless growth on a round, and therefore, finite planet to have a planet on which to live.

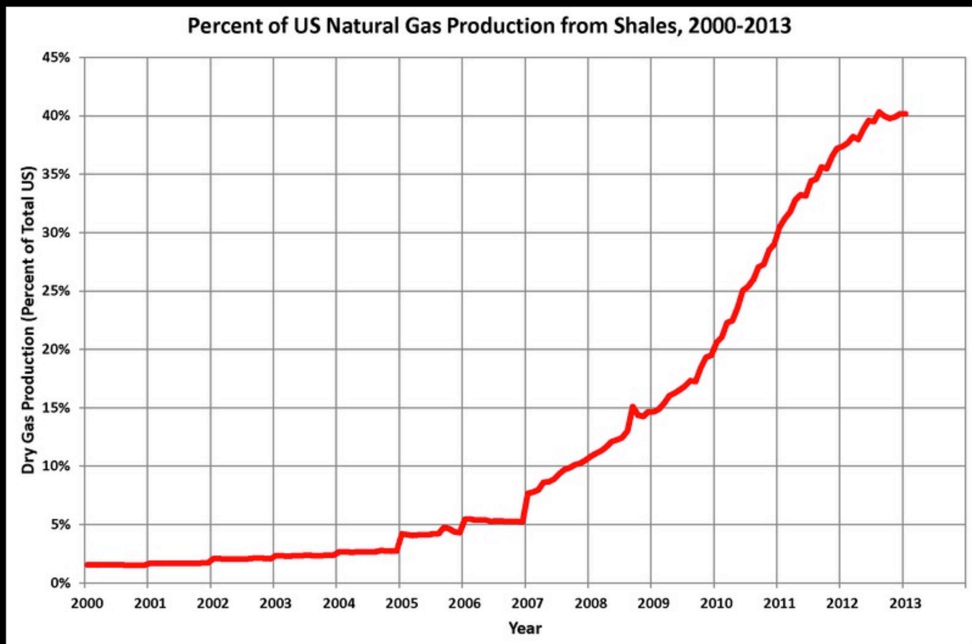
Humanity does not face the question of whether to use less fossil fuels to reduce greenhouse gases, since we have reached the limits to energy growth due to geological factors. How we use the remaining fossil fuels as they deplete determines how future generations will live after the fossil fuels are gone. Will we use the second half of the fossil fuels for bigger highways or better trains? Relocalization of food production or more globalization? Resource wars or global cooperation?

Mark Robinowitz is author of “Peak Choice: cooperation or collapse” at PeakChoice.org

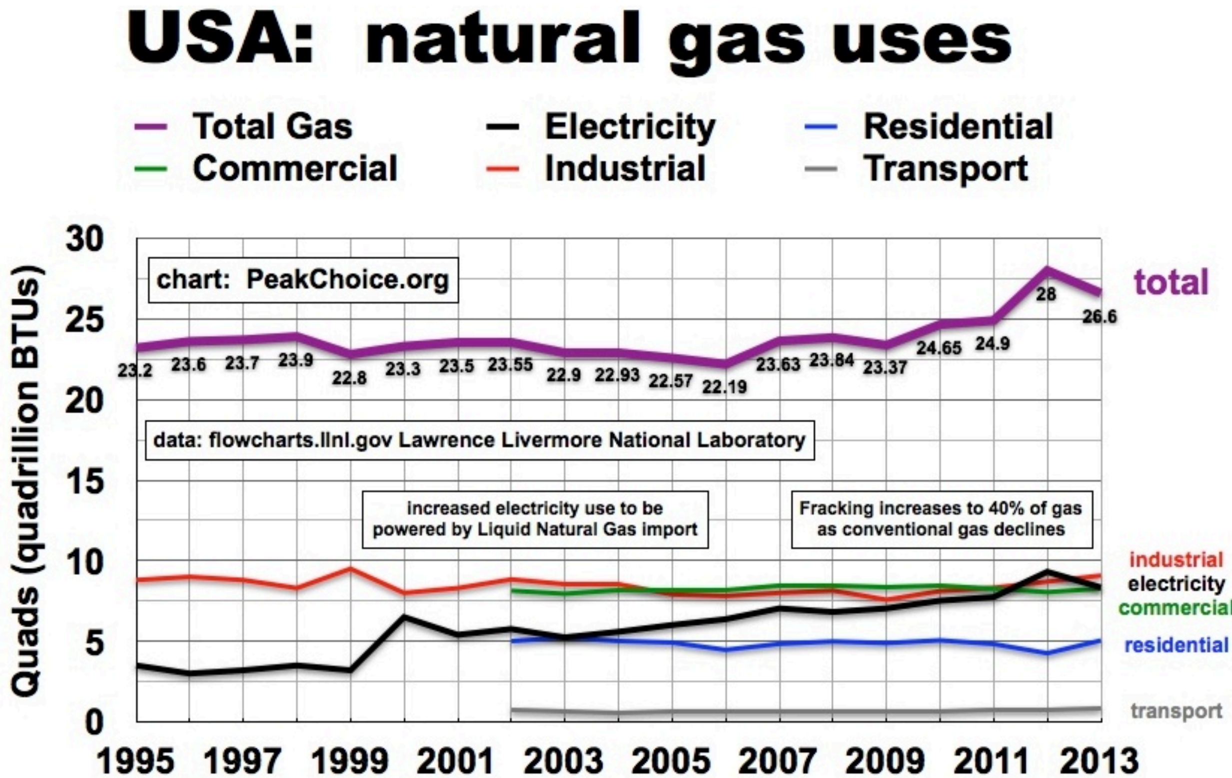
for more info:

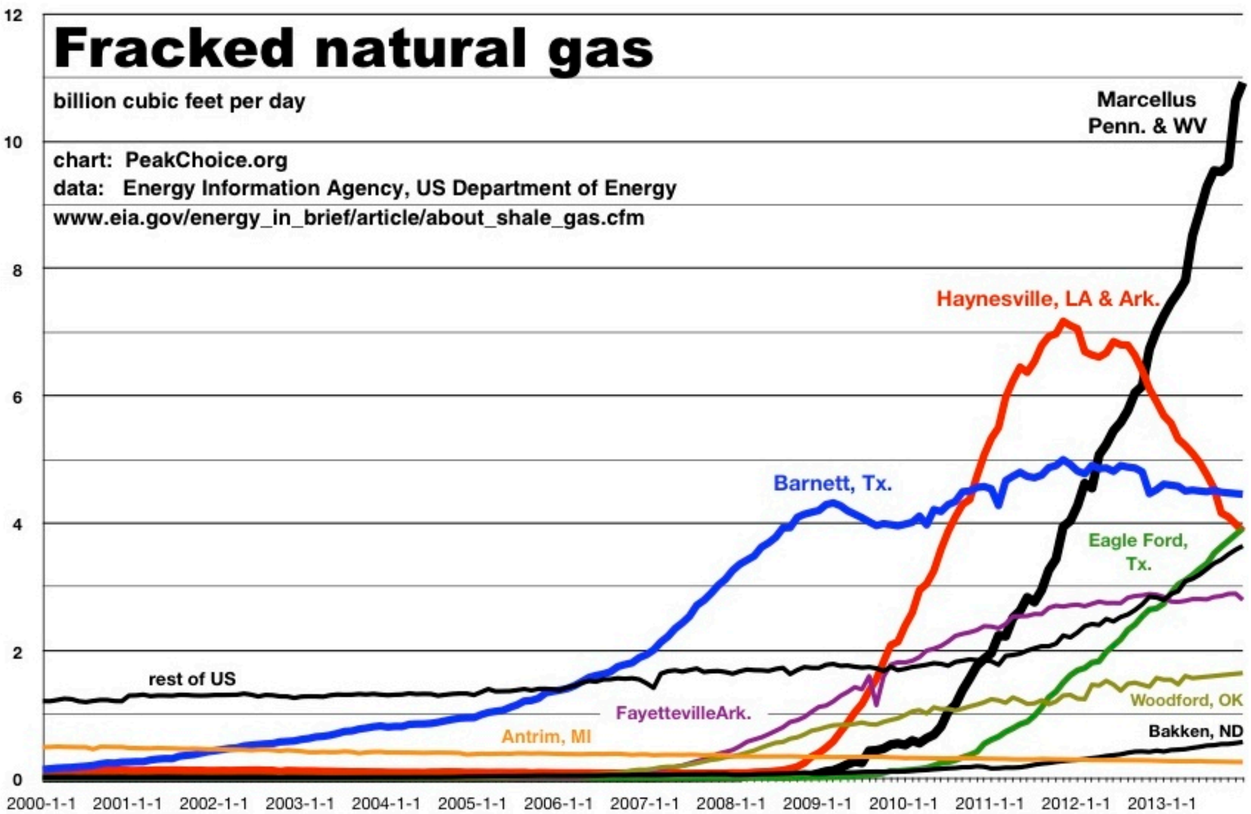
Richard Heinberg, “Snake Oil: how fracking’s false promise of plenty imperils our future,” www.PostCarbon.org www.RichardHeinberg.com

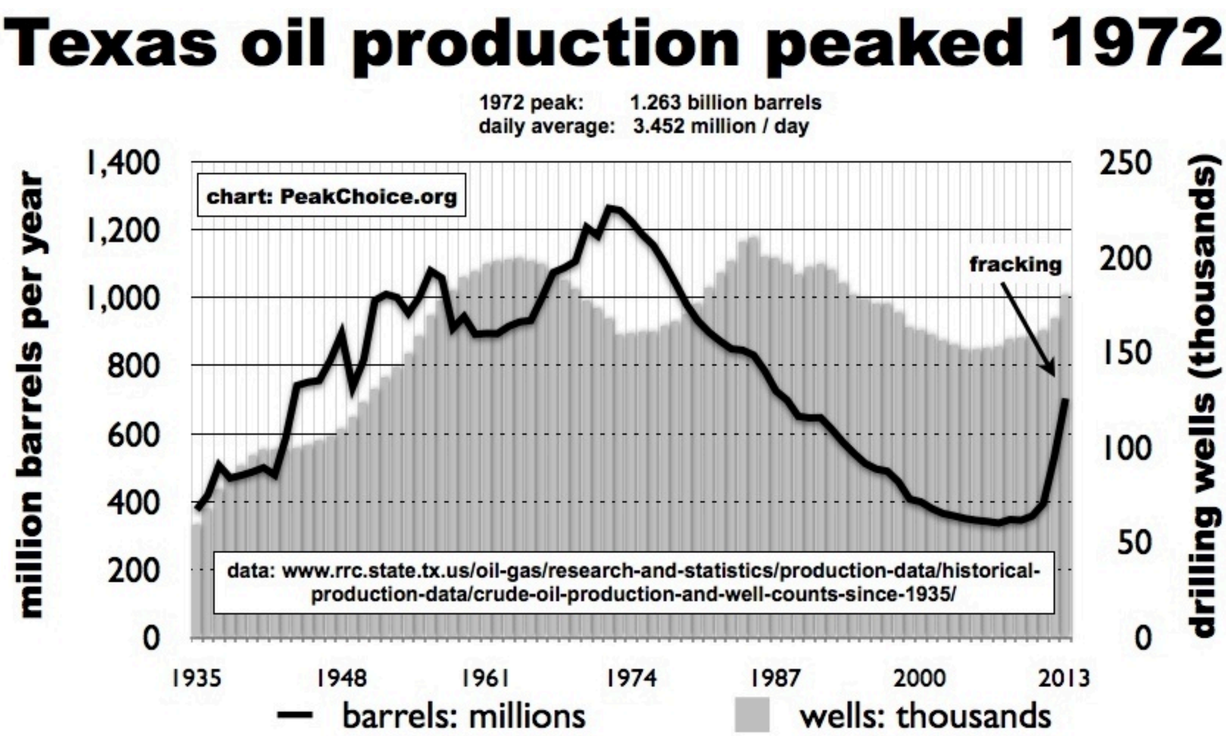
my “Peak Frack” webpage has more charts and documentation
www.PeakChoice.org/peak-frack.html

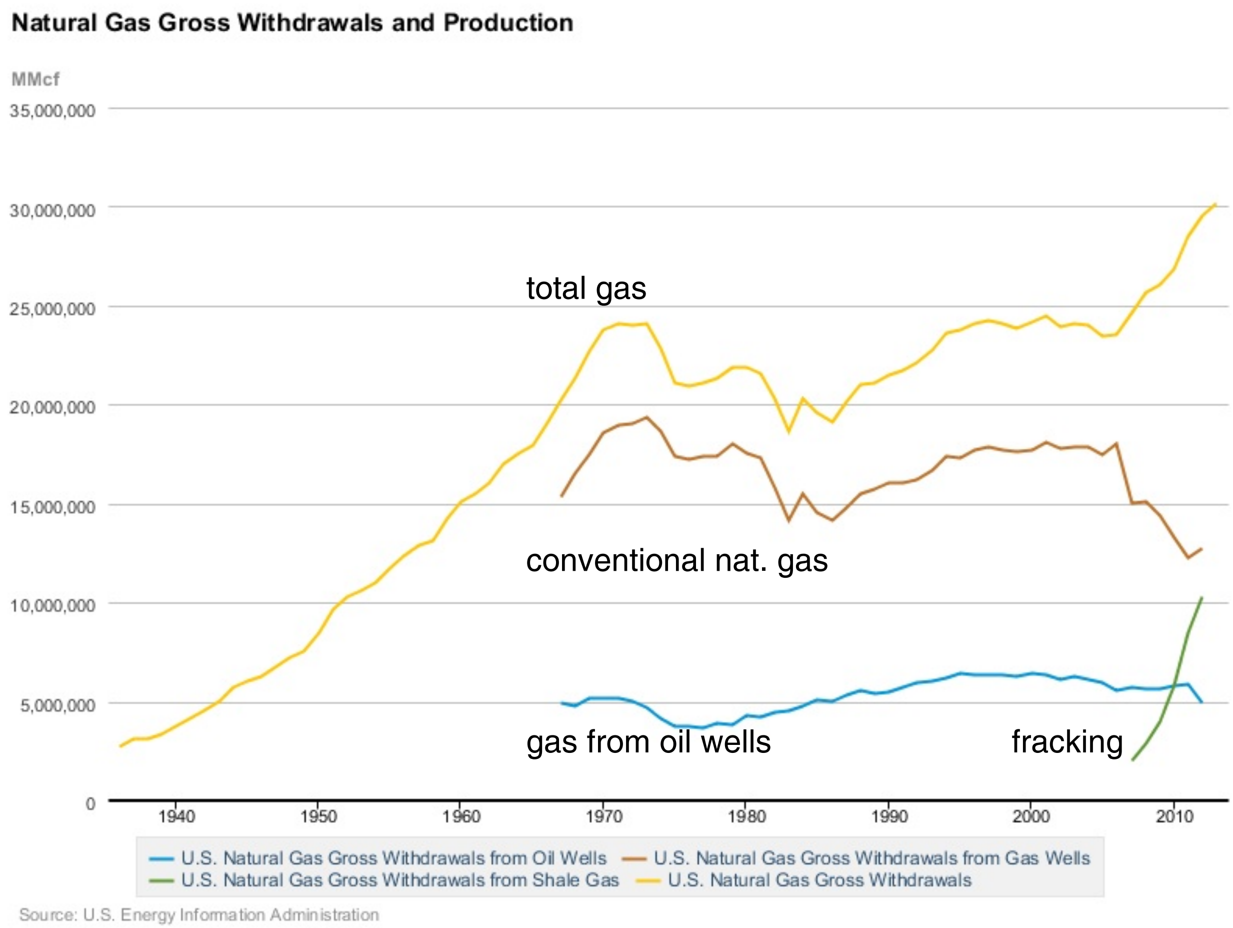


http://en.wikipedia.org/wiki/File:Pct_US_Natural_Gas_Production_from_Shales_2000-2013.png

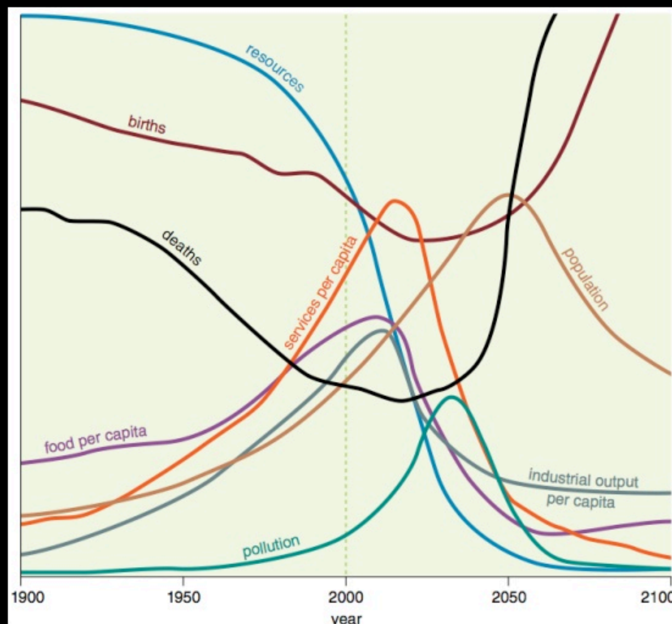

USA: natural gas uses
Total Gas
Electricity
Residential
Commercial
Industrial
Transport
Quads (quadrillion BTUs)
chart: PeakChoice.org
data: flowcharts.llnl.gov Lawrence Livermore National Laboratory
increased electricity use to be powered by Liquid Natural Gas import
Fracking increases to 40% of gas as conventional gas declines
total
industrial
electricity
commercial
residential
transport
23.2 23.6 23.7 23.9 22.8 23.3 23.5 23.55 22.9 22.93 22.57 22.19 23.63 23.84 23.37 24.65 24.9 28 26.6
1995 1997 1999 2001 2003 2005 2007 2009 2011 2013


Fracked natural gas
billion cubic feet per day
chart: PeakChoice.org
data: Energy Information Agency, US Department of Energy
www.eia.gov/energy_in_brief/article/about_shale_gas.cfm
Marcellus Penn. & WV
Haynesville, LA & Ark.
Barnett, Tx.
Eagle Ford, Tx.
rest of US
FayettevilleArk.
Antrim, MI
Woodford, OK
Bakken, ND
2000-1-1 2001-1-1 2002-1-1 2003-1-1 2004-1-1 2005-1-1 2006-1-1 2007-1-1 2008-1-1 2009-1-1 2010-1-1 2011-1-1 2012-1-1 2013-1-1

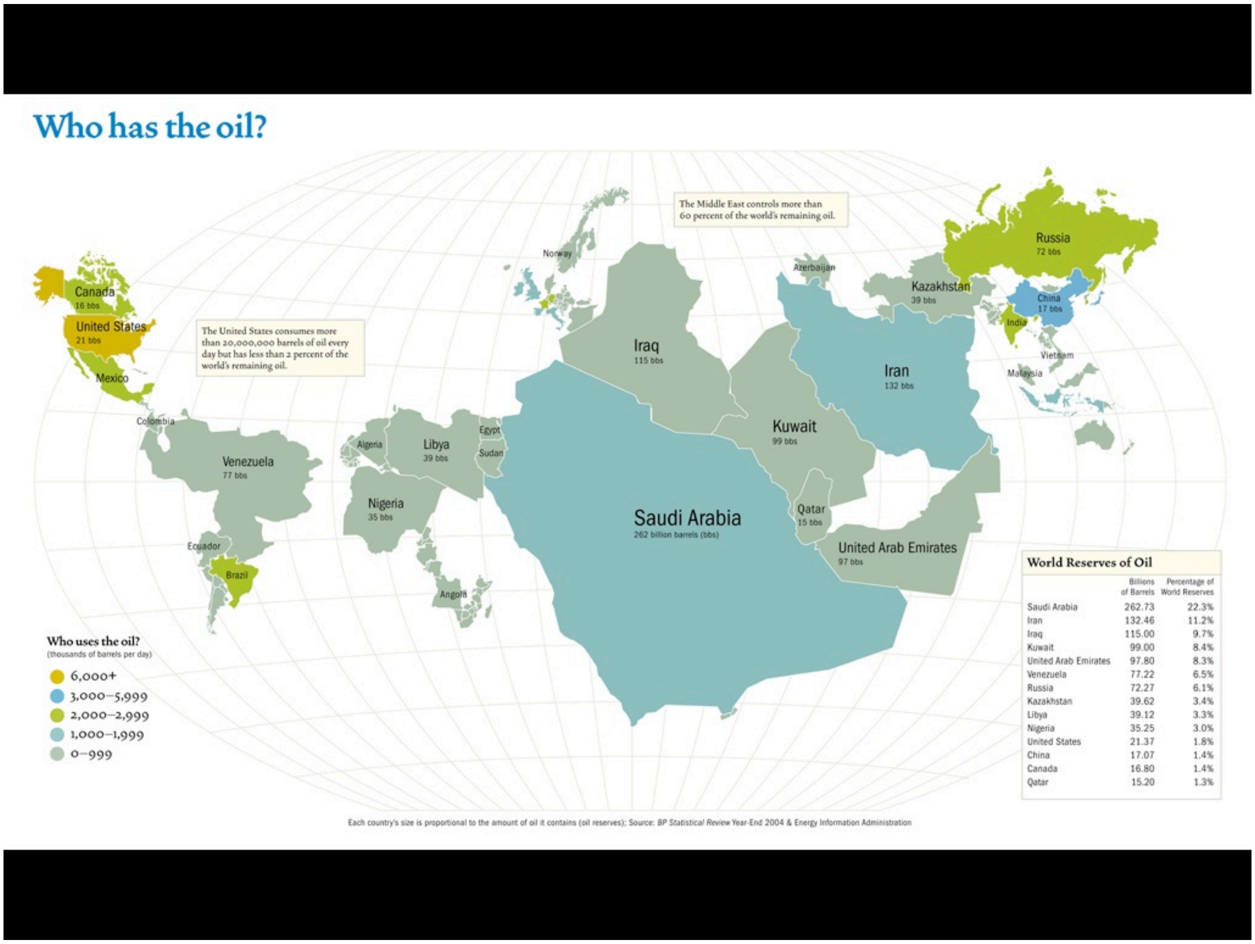

Texas oil production peaked 1972
1972 peak: 1.263 billion barrels
daily average: 3.452 million / day
chart: PeakChoice.org
fracking
data: www.rrc.state.tx.us/oil-gas/research-and-statistics/production-data/historical-production-data/crude-oil-production-and-well-counts-since-1935/
million barrels per year
drilling wells (thousands)
1,400
1,200
1,000
800
600
400
200
0
250
200
150
100
50
0
1935
1948
1961
1974
1987
2000
2013
barrels: millions
wells: thousands


Natural Gas Gross Withdrawals and Production
MMcf
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
0
total gas
conventional nat. gas
gas from oil wells
fracking
1940
1950
1960
1970
1980
1990
2000
2010
U.S. Natural Gas Gross Withdrawals from Oil Wells
U.S. Natural Gas Gross Withdrawals from Gas Wells
U.S. Natural Gas Gross Withdrawals from Shale Gas
U.S. Natural Gas Gross Withdrawals
Source: U.S. Energy Information Administration

Limits to Growth, 1972



It predicted pollution will increase on the energy downslope. Tar sands and fracking confirm this.



Fracked gas and oil delayed rationing

I'd vote for a ban of fracking anywhere, but since Pennsylvania accounts for 18% of USA nat. gas consumption, there would be massive impacts from ending this toxic practice faster than it will end on its own.

Fracked gas keeps the skyscrapers of New York and Chicago warm in the winter. It runs most of the new electric generators in the country.

Ending fracking would not merely be a symbolic statement or something simple to replace with alternatives. It would cause a major section of the economy to go up in smoke. These are necessary to protect clean water for your grandchildren but we're not ready for the difficulties this would cause.

"Conventional" nat. gas has declined sharply since 2005. Since forty percent - total - of USA nat. gas is now from fracking, it will be a huge challenge to learn to live without this energy, one that most of the anti-fracking efforts ignore.

"In my dealings with a lot of the optimists, they don't have the vaguest understanding of how complicated it is to actually drill a well."

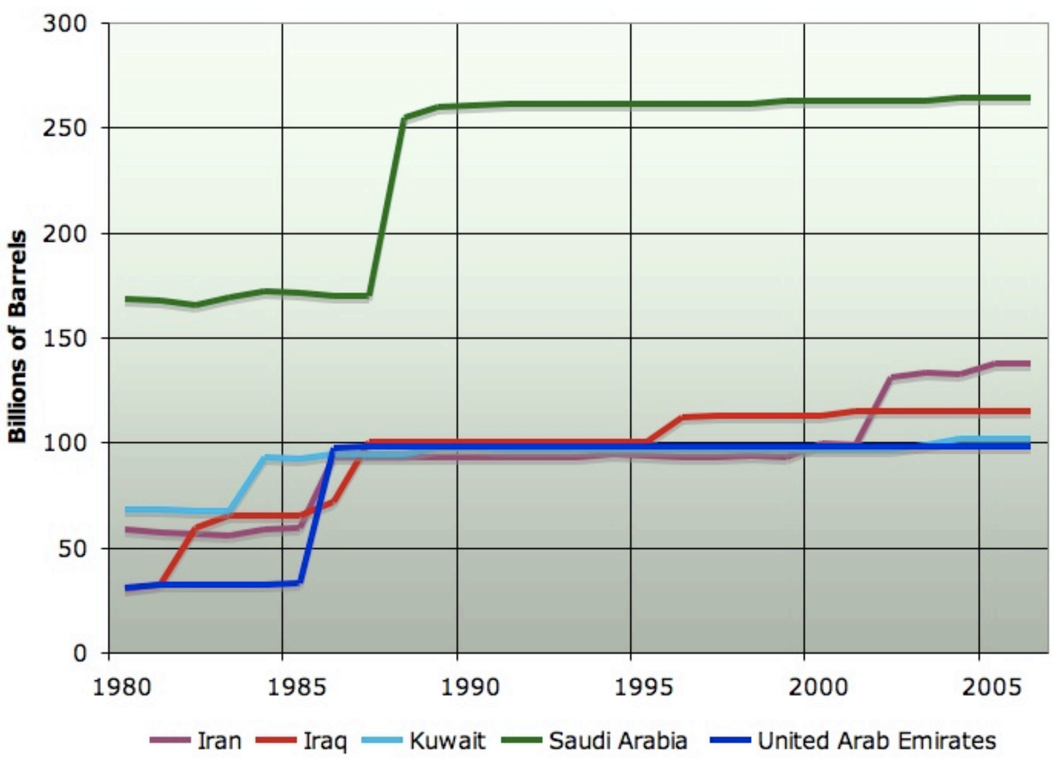
-- Matt Simmons

Paradox: protesting export plans without confronting exaggerated estimates helps the fossil fuel companies boost their share values - why we should not believe energy companies and their exaggerated estimates of reserves

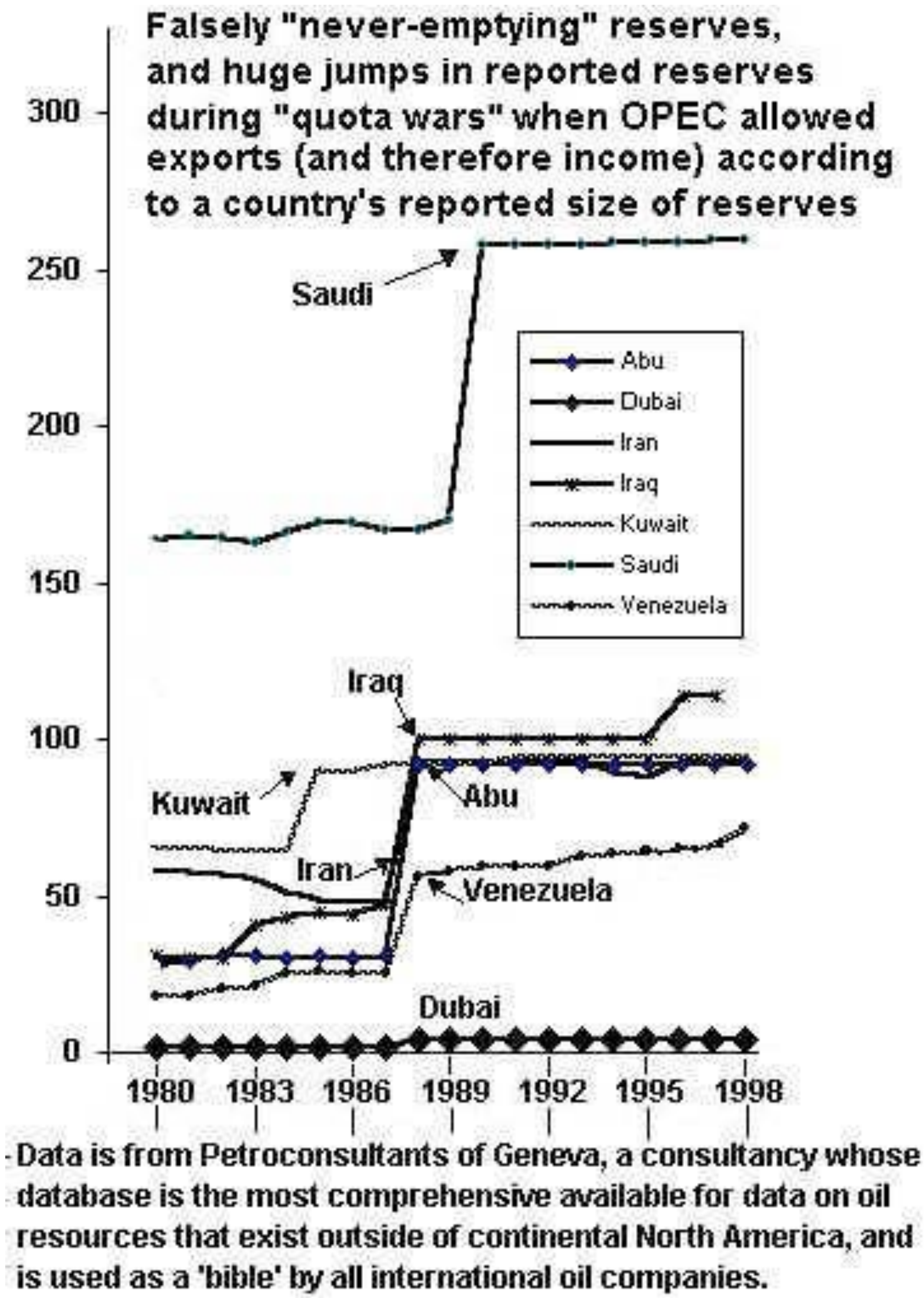
One of the many energy paradoxes is protesting plans to export fossil fuels can help energy companies. Sure, these companies would prefer pesky protestors to go away, but their protests give tacit endorsement to exaggerated estimates of reserves.

A primary factor for the value of energy company stocks is the amount of reserves they supposedly have access to. Inflating these estimates is a long cherished tradition, and stock markets go along since increased reserves means increased economic growth for the industrial economy in general (not just for energy company profits).

These exaggerations are not limited to the United States. In the 1980s, most of the OPEC countries increased their "proven reserves" of oil within a few years of each other, despite not doing much geological exploration. OPEC had a quota system among the members that determined the amount of export each member state could do based on the size of their reserves. So if a country increased their alleged reserves they could export more oil and therefor more revenue for the governments to reward their elites and buy off their restless populations.



graphic from The Oil Drum



graphic from dieoff.org

I first read about Peak Oil in 1986 via the book “Beyond Oil: the coming threat to food and fuel.” But I didn’t read about the OPEC quota war until March 1998 when Scientific American published “The End of Cheap Oil” by geologists Colin Campbell and Jean Laherrère. This, combined with reading about the “water injection” underway in Arabian oil fields -- pumping sea water underground into the oil fields to flush them out -- persuaded me that Peak was getting closer.

"The economists all think that if you show up at the cashier's cage with enough currency, God will put more oil in the ground."
-- Kenneth Deffeyes, petroleum geologist and associate of M. King Hubbert

ASPO USA: Association for the Study of Peak Oil and Gas, USA
from the ASPO-USA Peak Oil Notes, October 29, 2009www.aspousa.org
Quote of the day:
"(Steven Chu, US Secretary of Energy) was my boss. He knows all about peak oil, but he can't talk about it. If the government announced that peak oil was threatening our economy, Wall Street would crash. He just can't say anything about it."
-- David Fridley, scientist at Lawrence Berkeley National Laboratory, quoted in an article by Lionel Badal (see Peak Oil News, 10/28, item #23)

Colin Campbell, petroleum geologist, founder of ASPO, invented "Peak Oil" term
"Once you realize that this cheap, abundant, easy oil isn't there, that tells you that virtually every company quoted on the stock market is now overvalued."

www.aspo-ireland.org/contentFiles/newsletterPDFs/newsletter95_200811.pdf
"future historians will probably look back and see this as one of the great turning points for mankind. In short, debt has been premised on eternal economic growth based on flat-earth economic principles, without recognising that the growth depends on cheap energy that will no longer be available after the peak of oil production as imposed by Nature."

"as we move beyond the age of oil and beyond the economy that is driven by the age of oil, we enter an entirely new world - there really are frankly no experts anywhere who can come forward and say exactly what we do in this situation - it is entirely new to everybody's experience - there are no investors who can say this is a good investment in this situation, there are no politicians who can say this is how we should behave in this situation, even in a humble business way there is no business that can plan its future because every single aspect of its future is going to change and so we are left with a sort of vacuum"
-- Colin Campbell, founder of the Association for the Study of Peak Oil www.peakoil.net quoted in "Peak Oil: Imposed by Nature"

Environmentalists for Natural Gas

The perceived ecological advantages of "natural" gas over coal has led many of the nation's leading environmentalists to endorse burning more and more natural gas over the past quarter century as an alleged alternative to dirty coal. This is not that bad of an idea if used to build a generator or two, but the shift to running as much of the national power grids on gas as from coal has accelerated conventional gas depletion and put us all dangerously dependent on toxic, short term fracking.

Grants Pass, Oregon

Sierra Club and Chesapeake Energy gas fracking company

Perhaps the most flagrant example of collusion between the gas industry and environmental groups was the $25 million that Chesapeake Energy, a leading gas fracking company, gave to the Sierra Club for their "Beyond Coal" campaign. While Sierra has supported more gas combustion for decades, it took a special arrogance to secretly take money from Chesapeake fracking company to supposedly promote shifts to allegedly cleaner energy. The "Beyond Coal" campaign has studiously avoided discussion of the fact that coal deposits in the US are much smaller than the "centuries of coal" propaganda from the industry, that coal energy peaked in the US in 1999 (due to limits to growth, not because we suddenly adopted ecological concerns) and is promoting the industry claims that there is so much surplus coal that we can export vast amounts of it to Asia (although Sierra says they don't want this to happen, but are not willing to challenge the exaggerated estimates either).

The saddest part of the scandal of the Sierra Club taking money from Chesapeake Energy is not that Sierra Club is in bed with polluters (an old story) but that Sierra Club has zero interest in energy supply issues. If Sierra had looked at the reports from Post Carbon Institute www.postcarbon.org, the Association for the Study of Peak Oil and Gas www.aspousa.org or The Oil Drum www.theoildrum.com they would have learned that shale gas estimates are wildly exaggerated and cannot possibly replace coal even if toxic issues around shale gas fracking are solved or ignored.

If they considered the somewhat more complex interconnections of pollution, climate, energy depletion, and limits to growth, there would be much less support in mainstream environmental groups for the false idea that natural gas could be a "bridge fuel" toward a renewable energy society. Recognition that there is not enough gas, whether fracked or not, to build this bridge could lead to practical efforts to prepare for the energy downslope through relocalization and curtailment instead of trying to power the American Way Of Life through natural gas, or solar panels and wind farms.

www.corporatecrimereporter.com/chesapeake02022012.htm

CORPORATE CRIME REPORTER

Sierra Club Tells Members – We Don't Take Money from Chesapeake Energy – When in Fact They Took $25 Million

26 Corporate Crime Reporter 6, February 2, 2012

Last week, I wrote an article about how Chesapeake Energy, through its fracking activity, was destroying the rural way of life in West Virginia.

After the article ran, an insider called me with a tip – Sierra Club has taken money from Chesapeake Energy.

I called Sierra Club on Monday and asked – Are you taking money from frackers – in particular Chesapeake Energy?

Waiting for a response, I called Sierra Club activists in West Virginia to see if they know anything.

Two of them – Jim Sconyers and Beth Little – e-mailed Michael Brune, the executive director of Sierra Club, and asked him whether the Club has taken money from Chesapeake Energy.

Brune writes back to Little and Sconyers:

"We do not and will not take any money from Chesapeake or any other gas company. Hope all's well with you both."
Simultaneously, I get an e-mail from Maggie Kao, the spokesperson for the Sierra Club.
On Tuesday, Kao writes to me: "We do not and we will not take any money from any natural gas company."
I write back – I understand you do not and will not.
But have you taken money from Chesapeake?
That was Tuesday.
All day Wednesday goes by.
All day Thursday goes by.
And I can't get an answer.
Then Thursday night, Kao writes says – okay, Brune can talk to you at 7:30 pm EST.
And by the way, Kao says – check out this story just posted in Time magazine.
The headline: How the Sierra Club Took Millions from the Natural Gas Industry – and Why They Stopped.
Turns out, Sierra Club didn't want the story to break in Corporate Crime Reporter.
The millions from frackers.
And how as late as Tuesday, Sierra Club tried to mislead it's own members about the money.
According to the Time report, between 2007 and 2010 the Sierra Club accepted over $25 million in donations from the gas industry, mostly from Aubrey McClendon, CEO of Chesapeake Energy – one of the biggest gas drilling companies in the U.S. and a firm heavily involved in fracking.
Time reported that the group ended its relationship with Chesapeake in 2010 – and the Club says it turned its back on an additional $30 million in promised donations.
Waiting to speak with Brune.
And ask him what he meant by:
"We do not and will not take any money from Chesapeake or any other gas company."

David Brower, 87, ill with cancer but a rebel to the end, quit the Sierra Club board last week. "I find going to the meetings is, frankly, a total waste of time," said the great environmentalist. "They discuss practically nothing about conservation. You just get layers and layers of bureaucracy."
www.villagevoice.com/news/0021,ridgeway,15086,6.html (no longer on line)

Compromise is often necessary, but it ought not to originate with environmental leaders.
Our role is to hold fast to what we believe is right, to fight for it, to find allies, and to adduce all possible arguments for our cause. If we cannot find enough vigor in us or our friends to win, then let someone else propose the compromise, which we must then work hard to coax our way. We thus become a nucleus around which activists can build and function.
-- David Brower

The astroturf campaign to ban offshore drilling in Oregon


Governor Signs Moratorium on Offshore Drilling – Environment Oregon

http://www.environmentoregon.org/newsroom/pre

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For Immediate Release:
06/22/2007

For More Information:
Contact Jeremiah Baumann
(503) 231-1986

Governor Signs Moratorium on Offshore Drilling

Salem--Governor Kulongoski today signed into law a bill banning offshore oil and gas exploration on the Oregon Coast.

"The Coast is one of Oregonians' most treasured places," said Jeremiah Baumann of Environment Oregon. "Today the Oregon Coast is protected."

Oregon's coast was protected by a moratorium on offshore drilling for several decades in the wake oil spills due to offshore drilling off of California. Oregon's moratorium expired in the mid-1990s with a sense the threat had passed.

But in recent years, oil and gas companies have been pressing for access to coastal waters. Last summer, the U.S. House of Representatives voted to lift a moratorium protecting the East and West coasts of the United States that had been in place for decades.

This spring, President Bush announced his intent to lease federal territory off of Virginia and Alaska for drilling.

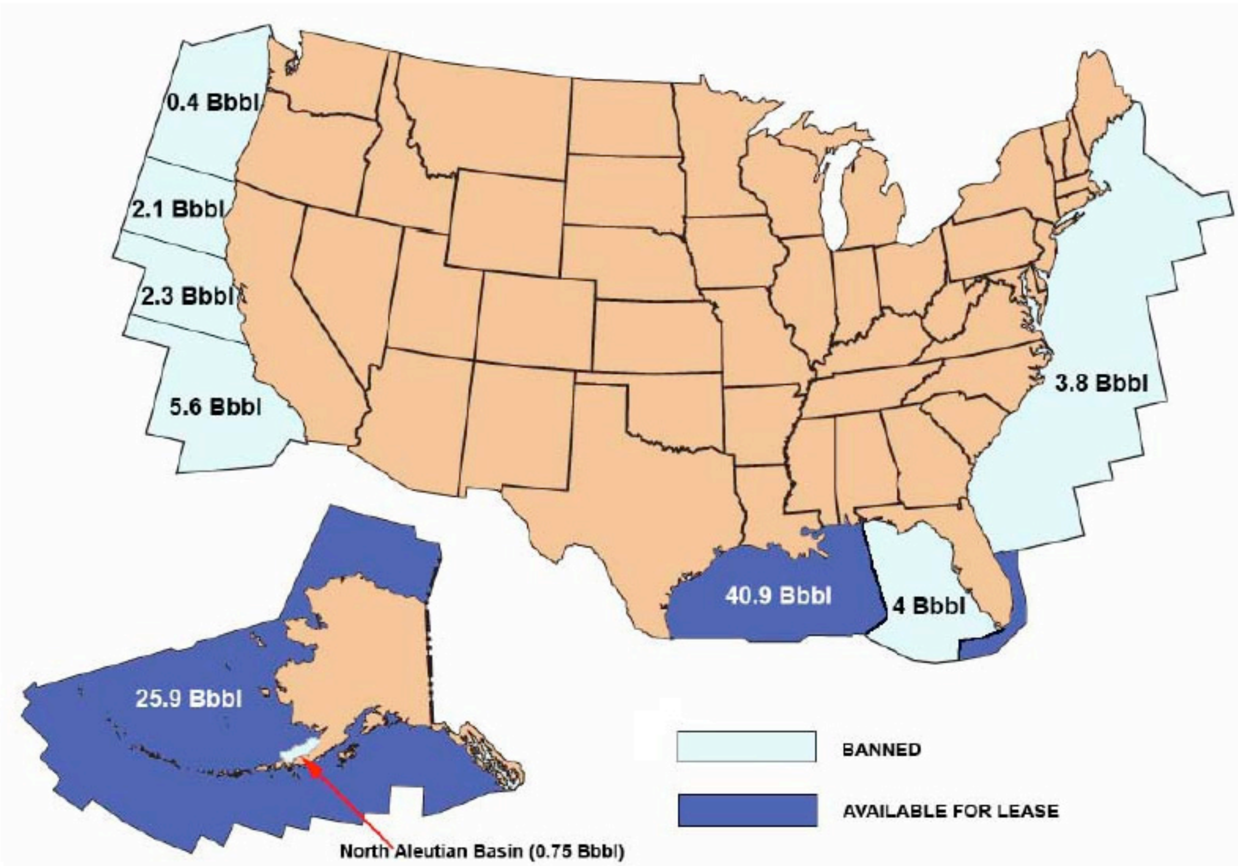
[Previous] [Next]

Protecting our air, water and open space.

Environment Oregon, an outgrowth of OSPIRG, spent years campaigning to stop offshore oil drilling on the Oregon coast. This campaign succeeded in the Governor signing a moratorium on offshore oil drilling. In 2007, the Oregon legislature extended a ban on offshore drilling on the Oregon coast -- but our coast is a subduction zone, which generates big earthquakes but not petroleum traps.

The environmentalists think they need to protect the coast from the oil companies, and the political conservatives think the environmentalists are depriving us of energy resources. This polarization would have been avoided by recognizing there isn't oil on the Oregon coast. It doesn't matter whether you protest or praise offshore drilling in Oregon, it is a distraction from depletion of the fuel sources we used to have.

US Outer Continental Shelf (OCS) Statistics



Total OCS area:	**1,760** million acres
OCS area Off-limits to Leasing and Development:	**611** million acres (**35%** of OCS area)
OCS area Open to Leasing and Development:	**1,149** million acres
OCS area currently under Lease:	**46** million acres
OCS area currently in production:	**9** million acres

Mean Estimates of Undiscovered Technically Recoverable Resources (UTRR)

UTRR in OCS Areas ***Open to Development***:

Oil :	**67.0** billion barrels of oil (Bbbl)	
Gas :	**334.1** trillion cubic feet (Tcf)	

UTRR in OCS Areas ***Subject to Moratoria***:

Oil :	**18.9** Bbbl	(**22%** of total in OCS)
Gas :	**85.8** Tcf	(**20%** of total in OCS)

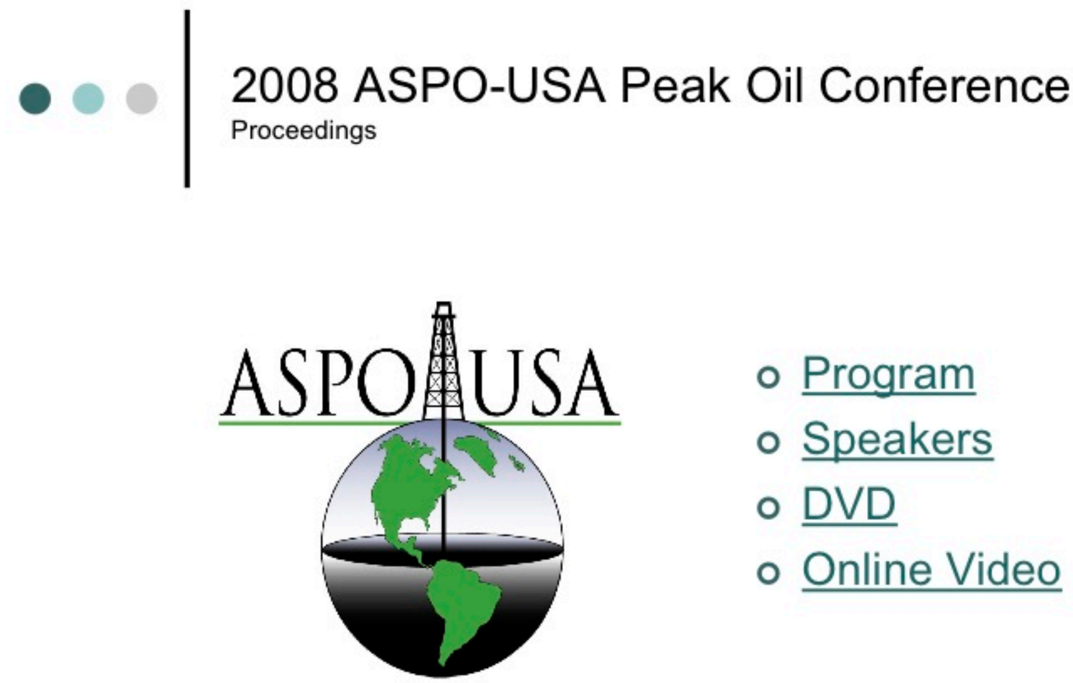
Source: Minerals Management Service, U.S. Department of the Interior

The main offshore place in the US that has oil is the western Gulf of Mexico, and drilling has been done there for decades. On the west coast, the only offshore place with significant oil is off the coast of Southern California, where there was a famous oil spill in 1969 -- the reason a moratorium was imposed. These oil fields are on both sides of the beach, since when the oil was formed millions of years ago the geology of California was very different.

Most of the “offshore” areas in the US that have oil have been drilled for the past few decades - in the Gulf of Mexico, which is about one quarter of US oil production.

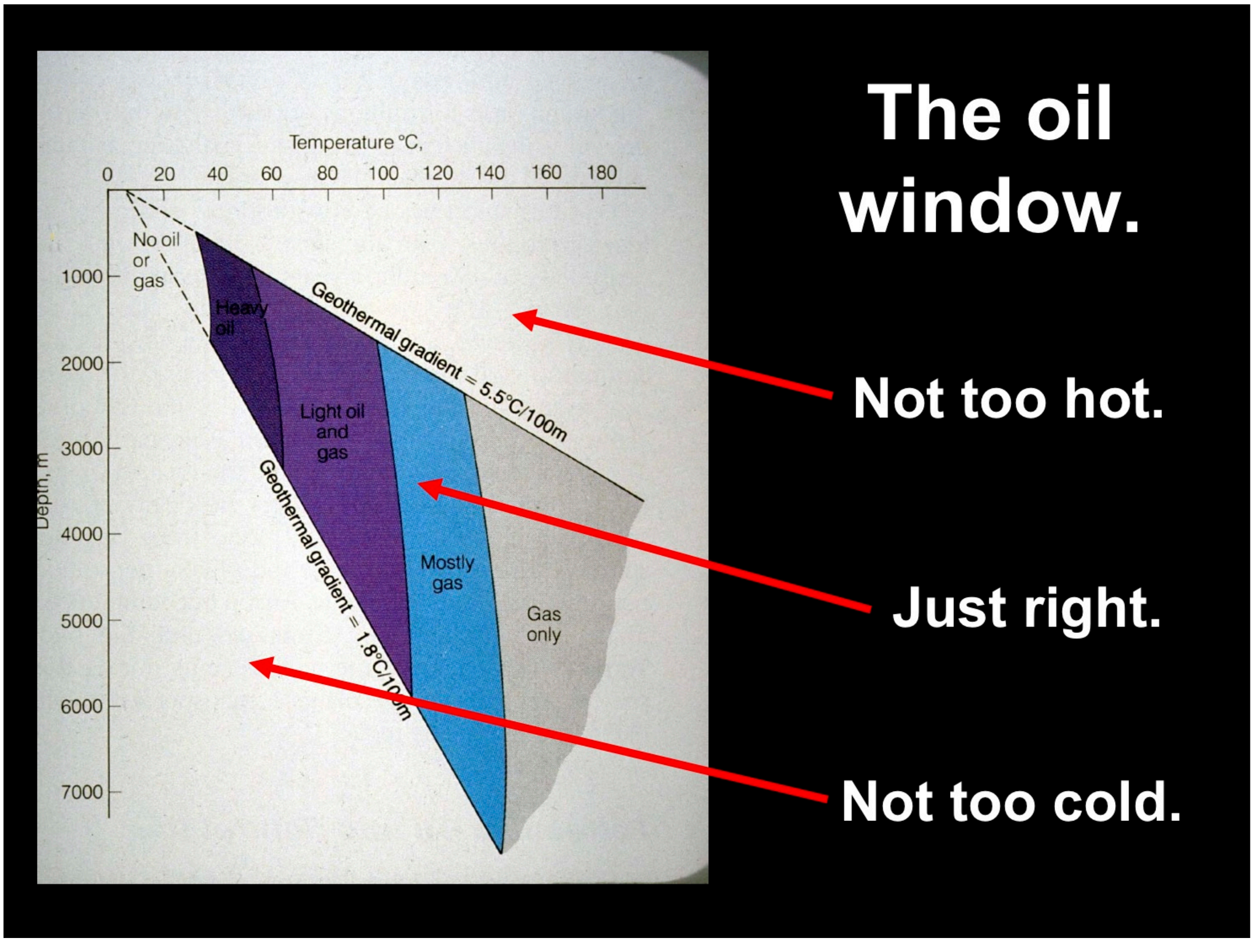
In the late 1990s, the Clinton Gore administration sought to start oil drilling off the Florida Gulf coast, which Governor Jeb Bush opposed because an oil spill there would ruin the state’s tourism industry. (Bush preferred to risk other places coasts instead of Florida’s coast.)   This is a reason why the environmental movement needs to be non-partisan and informed by facts, not polling results from focus groups.

The following 4 slides came from a presentation at the 2008 Association for the Study of Peak Oil - USA conference in Sacramento, California.

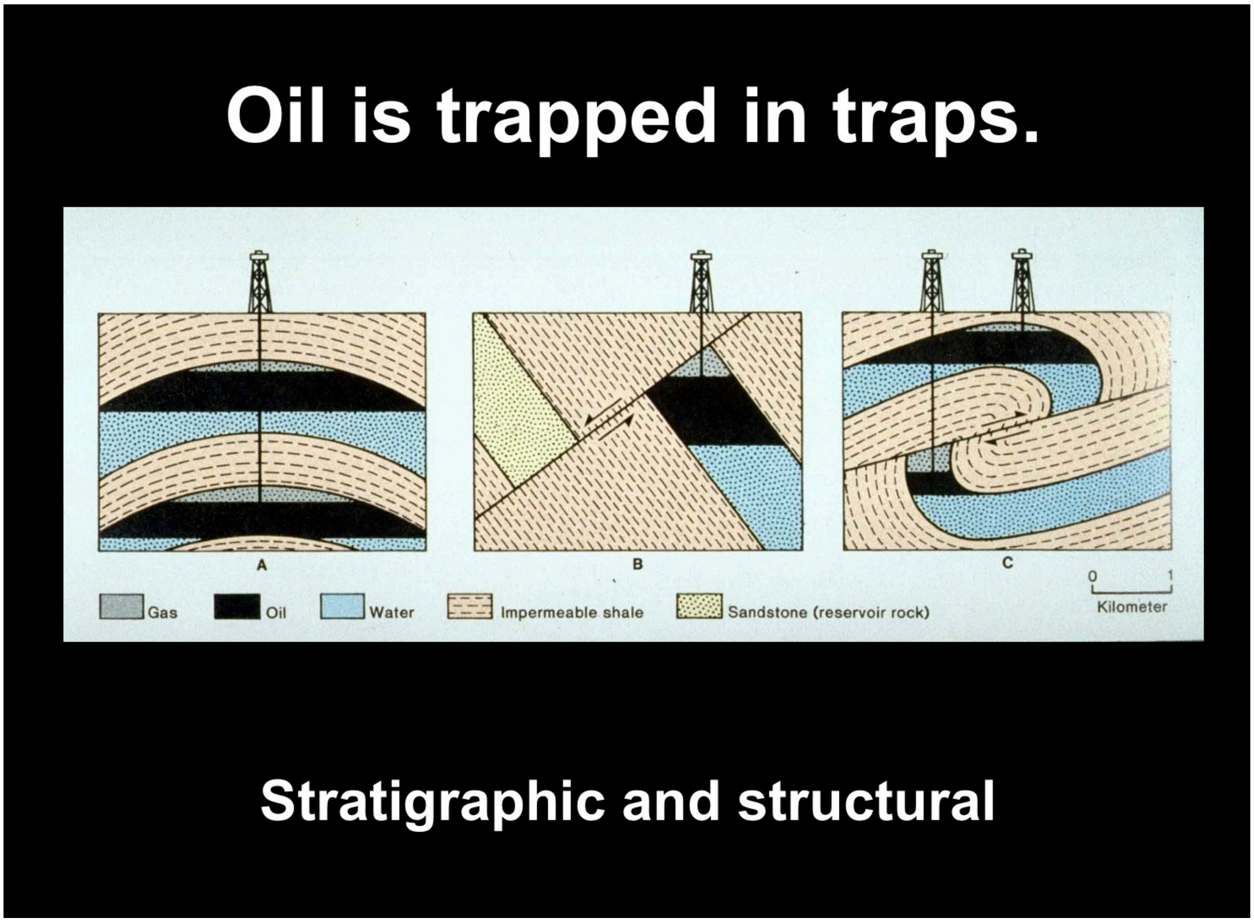


Petroleum 101

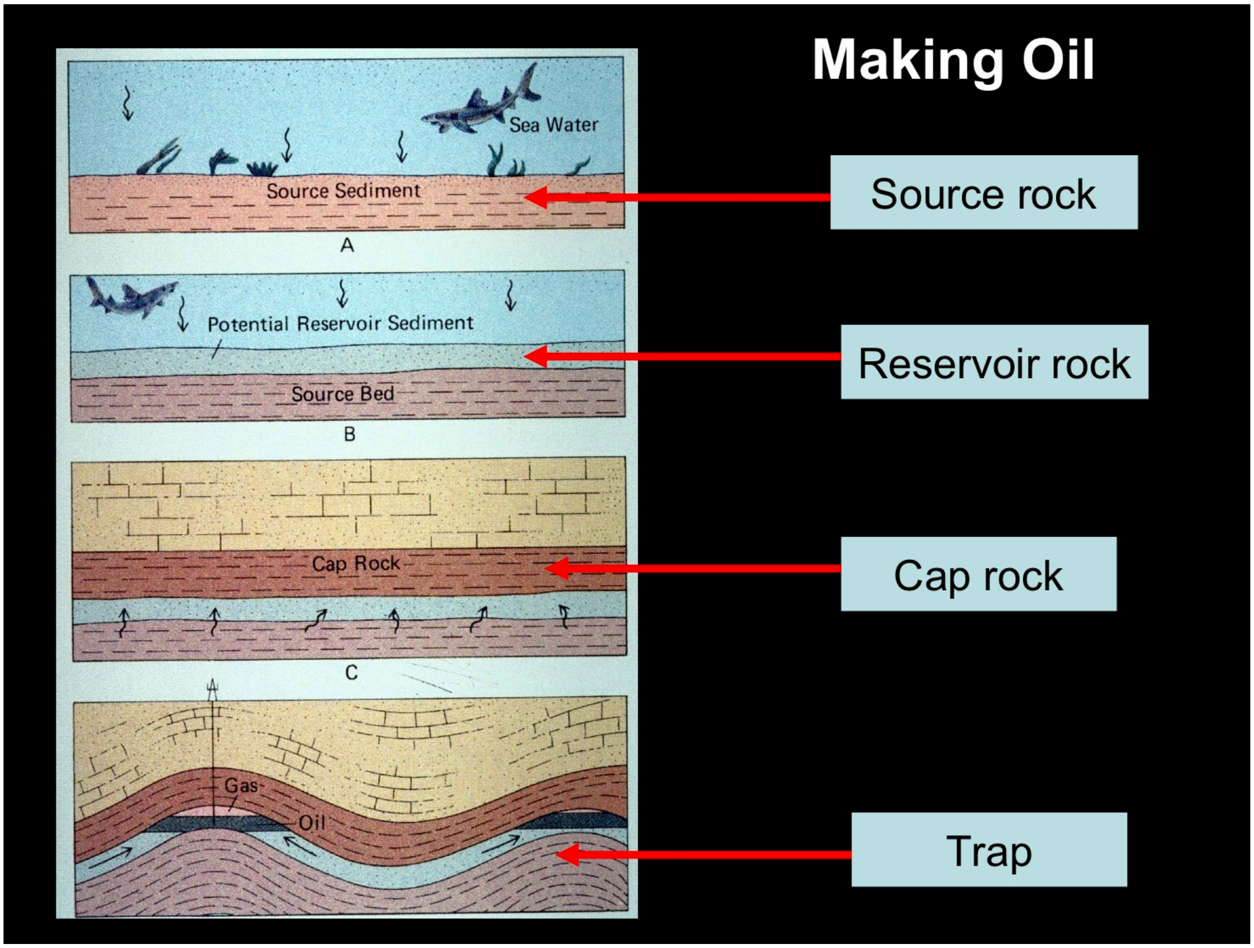
Ken Verosub
Geology Dept.
UC Davis

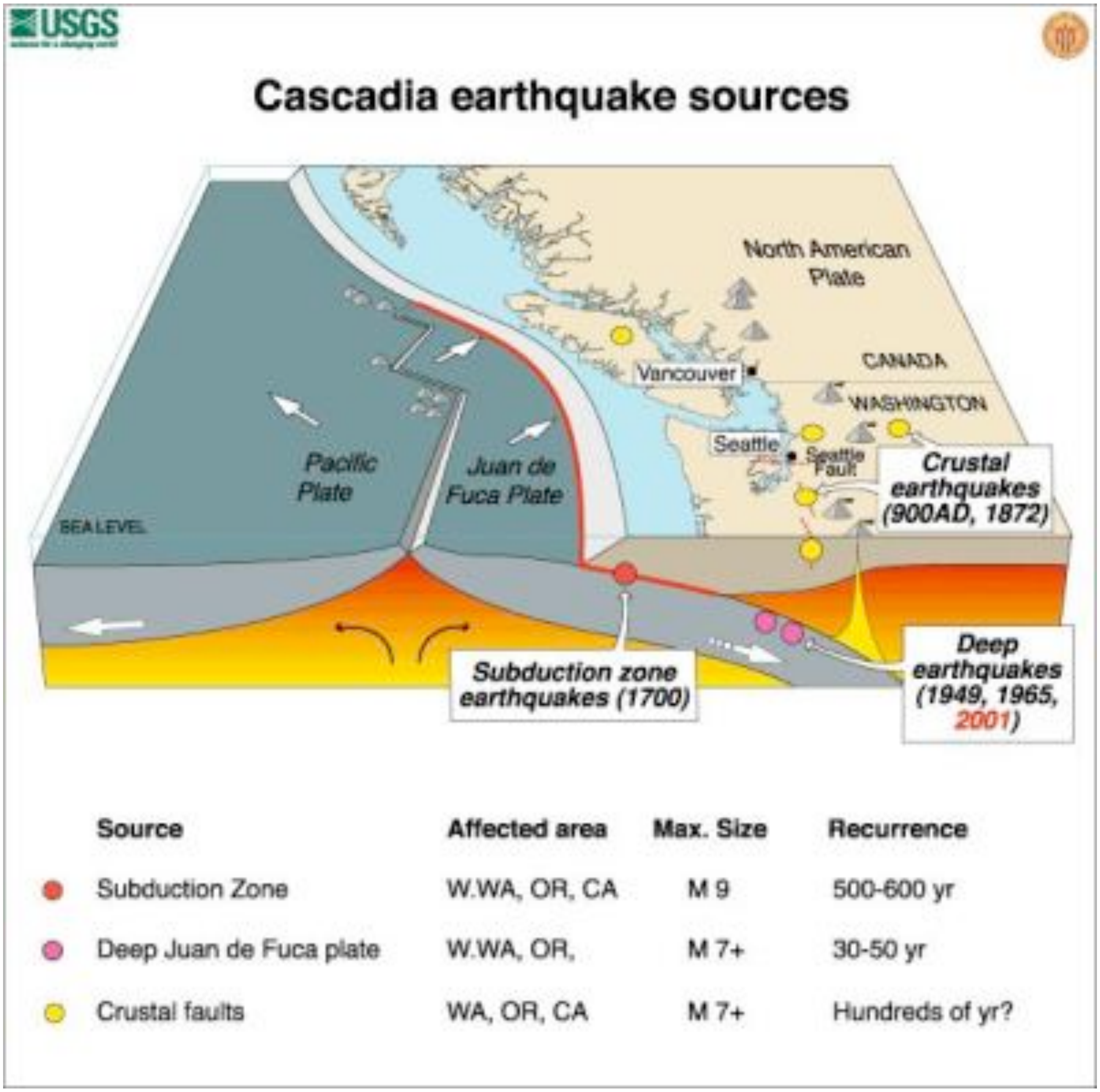


Oil and gas are formed through specific amounts of pressure and temperate in the Earth, over very long times.



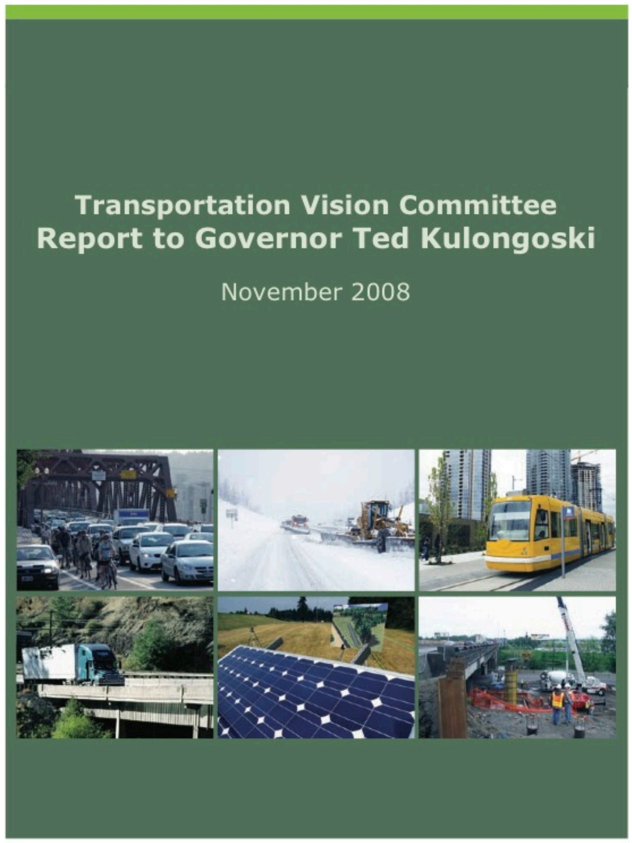
The correct geology is required to “trap” these accumulations so they can become petroleum and / or natural gas.   The volcanic subduction zone of Cascadia does not make these traps, that is why we do not have petroleum in Oregon.

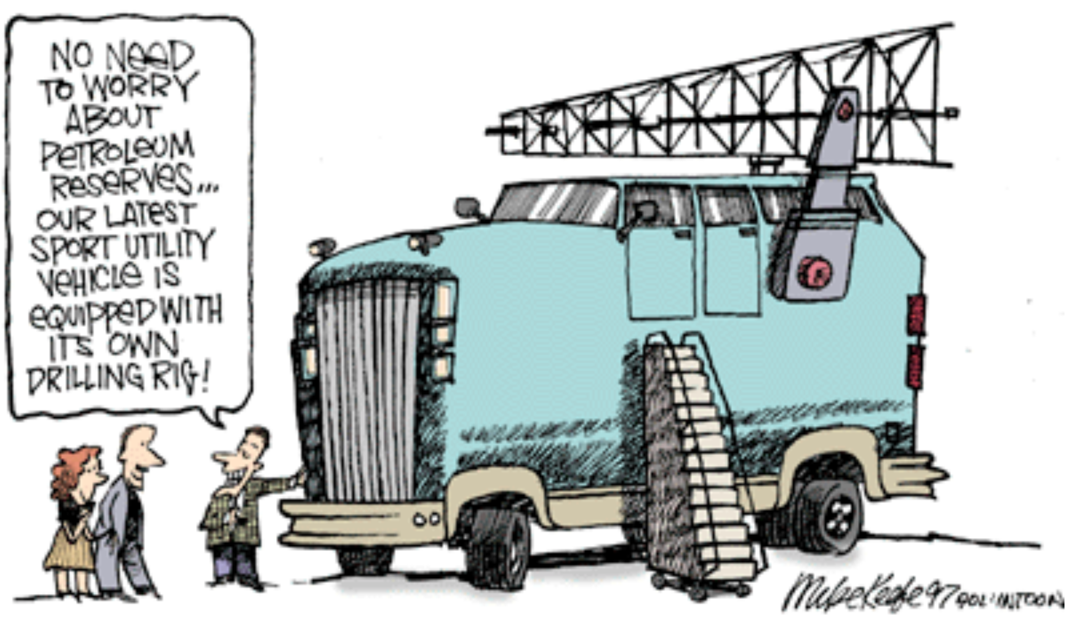

Making Oil
Sea Water
Source Sediment
A
Potential Reservoir Sediment
Source Bed
B
Cap Rock
C
Gas
Oil
Source rock
Reservoir rock
Cap rock
Trap



The Oregon coast does not have oil because is it has the wrong geology. It is a subduction zone, one plate is being pushed under the other. Any fossilized deposits that would have been there eons ago have been subducted under the North American plate - the process that made the Cascade mountain range.

Some of the groups who campaigned to "stop drilling on the coast" also were part of the Governor's "Transportation Vision Committee," which recommended $18 billion in new bypasses and highway widenings. Governor Kulongoski was praised as an environmental champion while pushing bigger highways around the state, even though traffic congestion peaked in Oregon in 2002 - a full five years before it peaked nationally. To date, I have not found any environmental groups in Oregon who dare discuss the full extent of these highway plans.





Oregon Highway Plans

www.PeakTraffic.org/oregon.html

In 2008, Governor Kulongoski's Transportation Vision Committee report called for $18 billion in new and widened state highways. An updated estimate might be about $20 billion.
1000 Friends of Oregon, Oregon Environmental Council, and Environment Oregon were part of this committee, but they were window dressing to show all points of view were supposedly considered.
If these groups had a minority report to dissent from the highway promotion, they kept it very quiet.

National highway plans include over a trillion dollars in expansions. Details at PeakTraffic.org

"Transportation Vision Report" - no longer on line
archived: www.sustaineugene.org/tvreport_final.pdf
a few highlights:

$4.2 billion: Columbia River Crossing, wider I-5, up to 16 lanes on Vancouver, WA side
approved December 2011, Oregon legislature appropriated $450 million 2013

$1 billion: Sunrise freeway, Clackamas County
approved December 2010, $130 million available to build a segment, construction started 2013

$1.3 billion: I-5 / I-84 reconstruction, Portland

$2.1 billion: I-5 to Hwy 99, Tualatin-Sherwood
part of stopped Portland Western Bypass in 1990s

$2 billion: I-5 widening south of Portland

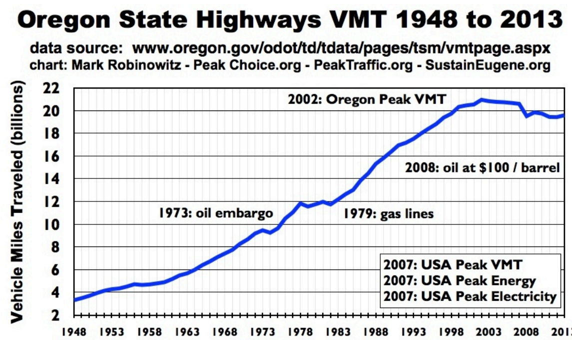
$600 million: I-5 widening, Salem to OR 34
Albany-Jefferson widening now slated at $500 m.

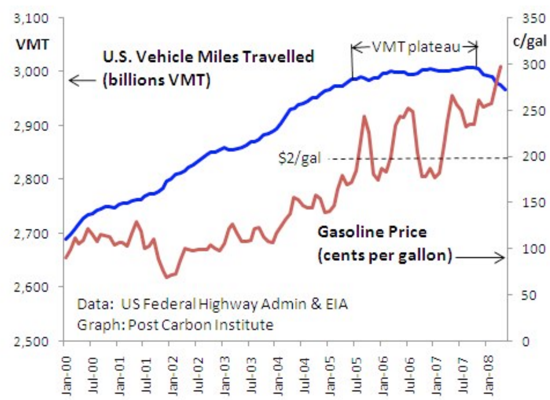
$670 million: Salem Willamette River bridge

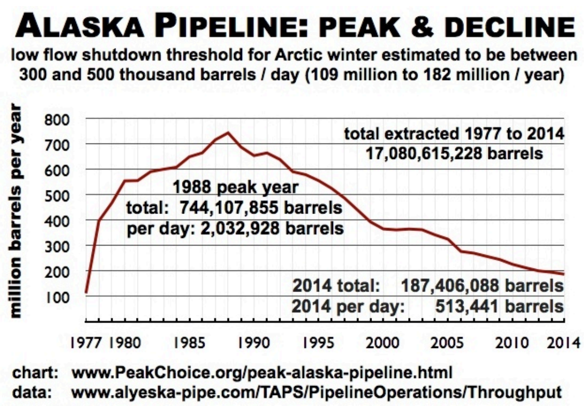
$550 million: Newberg Dundee bypass
paves farmland, approved June 2010
construction of $262 million segment started 2013

$100 million: North Corvallis Bypass
OR 34 to north Corvallis, including new river bridge

$200 million: Route 126 upgrade, Springfield
wider mainline, interchanges at 52nd & Main Street)



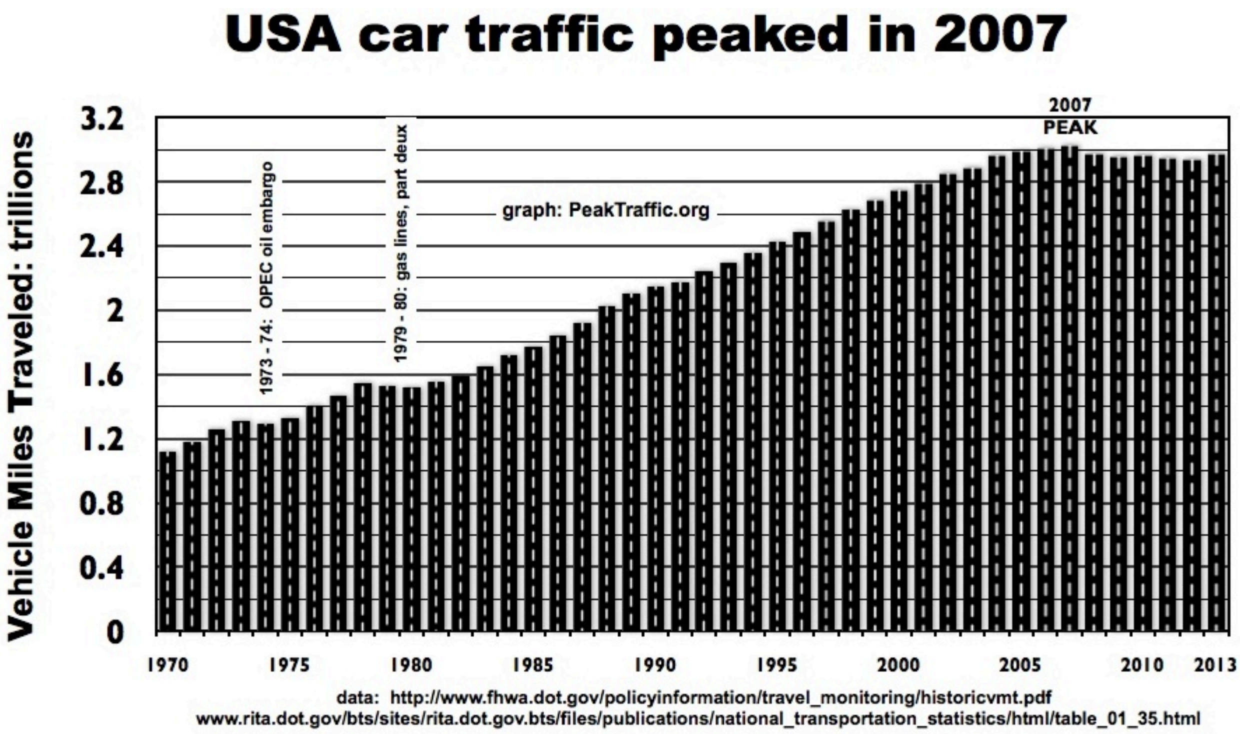




$250 million: Beltline widening, Eugene
widen Beltline to 11 lanes at the Willamette river

$375 million: Route 62 freeway bypass, Medford
approved May 2013, $450 million, only about $100 million appropriated to build a segment

$870 million: US 97 upgrades, Bend-Redmond


USA car traffic peaked in 2007
Vehicle Miles Traveled: trillions
3.2
2.8
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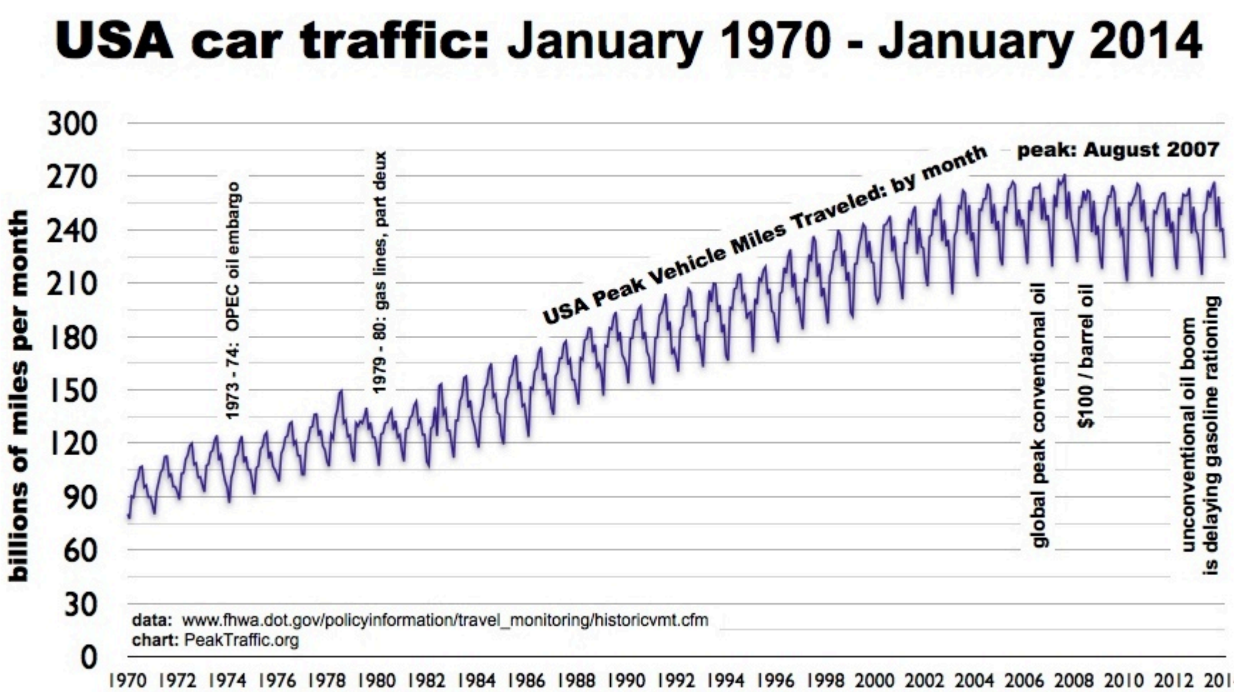
2007
PEAK
1973 - 74: OPEC oil embargo
1979 - 80: gas lines, part deux
graph: PeakTraffic.org
1970
1975
1980
1985
1990
1995
2000
2005
2010
2013
data: http://www.fhwa.dot.gov/policyinformation/travel_monitoring/historicvmt.pdf
www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_35.html


USA car traffic: January 1970 - January 2014
billions of miles per month
300
270
240
210
180
150
120
90
60
30
0
peak: August 2007
USA Peak Vehicle Miles Traveled: by month
1973 - 74: OPEC oil embargo
1979 - 80: gas lines, part deux
global peak conventional oil
$100 / barrel oil
unconventional oil boom
is delaying gasoline rationing
data: www.fhwa.dot.gov/policyinformation/travel_monitoring/historicvmt.cfm
chart: PeakTraffic.org
1970
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www.postcarbon.org/export-stupidity/

Export Stupidity by Richard Heinberg, Mar 27, 2014

Congress is holding hearings this week on the possible lifting of a US oil export ban instituted in the 1970s to promote national energy self-sufficiency and has invited a number of "experts" with dubious ties to the oil and gas industry to explain to them why it's such a good idea. Following Russia's near-annexation of Crimea, American politicians are intent on undercutting Russian president Vladimir Putin's greatest geopolitical asset—his country's oil and natural gas exports. If the US could supply Europe with large amounts of fuel, that would reduce the Continent's dependency on Russia while depriving Putin of needed revenues.

Lawmakers from both parties are also using the hearings to urge the Obama administration to speed up natural gas exports as a hedge against the threat of a conceivable Russian cutoff of gas supplies to Ukraine and other countries. Four Central European nations—Hungary, Poland, Slovakia and the Czech Republic—have already made formal requests for US exports.

There's just one tiny problem with all these fervent desires and good intentions. On a net basis, the US has no oil or gas to export.

Sure, our nation produces a lot of these fuels, and the amounts have been growing in recent years. But the United States remains a net importer of both oil and natural gas. Let me repeat and emphasize that: *the United States remains a net importer of both oil and natural gas.*

In 2013, the US produced about 7.5 million barrels of crude oil per day, but imported just about as much. While the nation's rate of domestic production is currently surging, it will likely top out at about 1.5 mb/d above current rates and then start to decline. The likely speed of the decline is a matter of some controversy: the Energy Information Administration forecasts a long plateau and slow taper, while our in-house analysis at Post Carbon Institute indicates a sharper drop-off. Either way, it is extremely unlikely that America will ever again be a net exporter of oil.

Last year the United States produced 24.28 trillion cubic feet of natural gas, an all-time record amount. However, we still imported 2.5 tcf of gas (11 percent of total consumption). The trend in US gas production rates has leveled off and (according to our in-house analysis) is likely to begin declining in just the next few years, just about the time new liquefied natural gas (LNG) export terminals will be ready for business.

To be sure, extraordinary claims have been made for America's oil and gas potential, now that the industry has unleashed fracking and horizontal drilling technologies on shale formations in Texas, North Dakota, Pennsylvania, and elsewhere. But, as I argued in my book *Snake Oil: How Fracking's False Promise of Plenty Imperils Our Future,* those claims are wildly overblown. A far more accurate assessment of the industry's prospects comes from its own premiere publication, *Oil & Gas Journal,* which reports asset write-downs approaching $35 billion among 15 of the main shale operators. The *Journal* cites ". . . recent analysis by Energy Aspects, a commodity research consultancy, showing 6 years of progressively worsening financial performance by 35 independent companies focused on shale gas and tight oil plays in the US." This worsening financial performance comes despite production growth and a general shift of drilling activity away from dry gas and toward higher-profit liquids (crude and NGLs) since 2010.

Oil & Gas Journal cites analysis by Ivan Sandrea, an OIES research associate and senior partner of Ernst & Young London, suggesting that, "Unless financial performances improve, capital markets won't support the continuous drilling needed to sustain production from unconventional resource plays." Sandrea forecasts that "Parts of the industry will have to restructure and focus more rapidly on the most commercially sustainable areas of the plays, perhaps about 40% of the current acreage and resource estimates. . . ."

So, just what are we supposed to export?

In fact, talk of oil and gas exports is being driven not by excess production capacity or geopolitical acumen, but rather by old-fashioned profit seeking. The US oil industry currently is frustrated by a mismatch between the petroleum grades increasingly being produced domestically (light crude from the Bakken and Eagle Ford plays) and the grades our refineries are tweaked to accept (heavier grades of crude, for example those from Canada's tar sands). A lifting of legal constraints on exporting US oil would help refiners and producers sort out this temporary mismatch.

Meanwhile the American natural gas industry is suffering under low domestic gas prices, a problem for which the industry has only itself to blame. During the last few years, shale gas companies over-produced in order to upgrade the value of their assets (millions of acres of drilling leases), thereby driving prices down below actual costs of production. If some US natural gas could be exported via LNG terminals now under construction, that would tend to raise domestic prices. However, this would also undercut promises of continuing low prices that the industry has repeatedly made—promises that have lured the chemicals industry to rebuild domestic production facilities and that have enticed electric utilities to switch from burning coal to natural gas—but hey, those were just words.

This is what all the oil and gas export fuss is really about. As for the notion of making Vladimir Putin quake in his boots in fear of a tsunami of American crude and natural gas—forget it. Putin is indeed probably quaking right now, from laughter.

Perhaps America should instead consider exporting stupidity. It's a commodity we seem to have in surplus.

http://registerguard.com/rg/business/32731825-63/oil-prices-raise-questions-about-coos-bay-lng-plant.html.csp

BUSINESS

Oil prices raise questions about Coos Bay LNG plant, The Associated Press FEB. 4, 2015

The Canadian company behind the project says it's confident of its long-term prospects

By The Associated Press

FEB. 4, 2015

COOS BAY — The collapse of crude oil prices and its ripple effect on natural gas exploration and production from North American shale deposits raise questions about the prospects for a liquefied natural gas export terminal at Coos Bay, but the Canadian company that proposes it says the long-term investment remains sound.

A federal government estimate says domestic gas fields will produce enough to meet American needs and supply exports through 2040 and beyond, but skeptics say it's more likely that U.S. supplies from shale formations will peak in 2020 and then drop, the World newspaper of Coos Bay reported.

"Does the U.S. have enough natural gas to even consider export?" Art Berman, a petroleum industry analyst, said. "That's the most important consideration."

The leader of Veresen Inc. of Calgary, Alberta, says he's confident about the investment of billions of dollars into the Jordan Cove project and its feeder pipeline, designed to ship superchilled, condensed gas to Asia.

"I get asked a lot nowadays if the low crude prices will have an impact on our project," said President and CEO Don Althoff. "I don't believe it will. I believe our buyers take a long-term view of the marketplace. There's a four-year construction cycle and a 20-year contract. Buyers are thinking about 25 years out, really, when they think about pricing."

Among the proposal's advantages, Althoff said, is a short route to Japan — nine days to Tokyo harbor — and supplies in Western fields that buyers won't see as so vulnerable to downturns in production as some farther east.

The Jordan Cove project was initially conceived as an import terminal, before the domestic energy boom touched off by hydraulic fracturing and shale gas. In March 2011, Japan's Fukushima Daiichi nuclear disaster left that country short of energy supplies.

Two years ago, Veresen applied for a federal permit to build an export terminal at Coos Bay. It hopes for the go-ahead from the Federal Energy Regulatory Commission later this year, followed by a slew of other permits after that.

The estimates favorable to the Jordan Cove project come from the U.S. Energy Information Administration.

A study at the Bureau of Economic Geology at the University of Texas says the federal estimate is a possible outcome. But the bureau and a report from the Post Carbon Institute suggest the nation's four major shale gas plays will peak in 2020, and then drop off.

Those fields are Texas, the Southeast and the Appalachian region. Althoff said Jordan Cove's supplies are to come from smaller fields in Colorado and Canada that natural gas buyers don't see as a huge risk.

http://resourceinsights.blogspot.com/2014/11/did-russia-and-china-just-sign-death.html
SUNDAY, NOVEMBER 16, 2014

Did Russia and China just sign a death warrant for U.S. LNG exports? by Kurt Cobb

Russia and China have signed two large natural gas deals in the last six months as Russia turns its attention eastward in reaction to sanctions and souring relations with Europe, currently Russia's largest energy export market.

But the move has implications beyond Europe. In the department of everything is connected, U.S. natural gas producers may be seeing their dream of substantial liquefied natural gas (LNG) exports suffer fatal injury because of Russian exports to the Chinese market, a market that was expected to be the largest and most profitable for LNG exporters. Petroleum geologist and consultant Art Berman--who has been consistently skeptical of the viability of U.S. LNG exports--communicated in an email that Russian supply will force the price of LNG delivered to Asia down to between $10 and $11, too low for American LNG exports to be profitable.

Now, let's back up a little. U.S. natural gas producers have been trying to sell the story of an American energy renaissance based on growing domestically produced gas supplies from deep shale deposits--now being exploited through a new form of hydraulic fracturing called high-volume slick-water hydraulic fracturing.

The problem has been that overproduction and low prices--now only a fraction of the $13 per thousand cubic feet (mcf) at the peak in 2008--have undermined the financial stability of the natural gas drillers. Here's why: Natural gas from shale, referred to as shale gas, is generally more expensive to produce than conventional natural gas and will require that natural gas prices go much higher than they are today--from around $4 per mcf almost certainly to over $6 per mcf and perhaps more to pay the costs of bringing that gas out profitably.

But at that price, U.S. LNG is no longer competitive in Europe. And now, because of the Russian-Chinese natural gas pipeline deals, it may no longer be competitive in Asia. Those are the two largest markets for LNG. Without them it is doubtful that the United States will be exporting much LNG--except perhaps at a loss.

Here's the problem: To convert U.S. natural gas to liquefied natural gas, put it on specially built tankers and ship it to Europe or Asia will cost about $6 per mcf. If the price of U.S. natural gas averages around $6 per mcf, the total landed cost of U.S. LNG will be the cost of the gas plus the cost of converting it and shipping it, that is, around $12 per mcf.

The most recent landed prices for LNG to Asia as reported by the Federal Energy Regulatory Commission were $10.10 per MMBtu* for China, $10.50 for Korea and $10.50 for Japan. For Europe the numbers are even more sobering: $9.15 for Spain, $6.60 for the United Kingdom, and $6.78 for Belgium. All amounts are U.S. dollars.

These are probably reflective of spot prices rather than long-term contracts, and they are down due to softening energy demand that may be the result of an economic slowdown in Asia and Europe.

But, they give an indication of how difficult it will be for U.S. LNG to compete on the world market. LNG prices may well improve, but buyers of LNG typically sign cost-plus contracts. In the United States that would be the cost of Henry Hub natural gas (traded on the New York

Mercantile Exchange) plus the cost of liquefaction and transportation. With no assurances--and a good deal of evidence to the contrary--that Henry Hub gas will remain at current prices (around $4) for the long term, it's difficult to see how there will be many long-term buyers of U.S. LNG.

One wonders under such circumstances just how many of the 14 proposed U.S. LNG export terminals will actually be built.

Having taken the long way around, let me return to the Russian-Chinese natural gas pipelines and their significance in this drama. Gazprom, the Russian natural gas giant that will actually deliver the gas, valued the earlier deal in May at around $10.19 per MMBtu. The latest deal has no announced value, but one analyst believes the Chinese will be asking for around $8 per MMBtu. Even if the Chinese end up accepting a price closer to the previous deal, some 17 percent of the Chinese natural gas supply will be coming from Russia when the pipelines are complete several years from now. And that will likely anchor the price of Chinese LNG imports between $10 and $11 per MMBtu, making the price too low to be reliably profitable for U.S. LNG exporters.

The implication is that today's soft prices for imported LNG to China and the rest of Asia may become the norm in a few years just as America's LNG export terminals are about to become operational. If investors fund these terminals and the Russian-Chinese pipelines get built, there is likely to be some epic capital destruction on the American side of the Pacific.

There are other reasons to be skeptical about America's future as a natural gas exporter. The rosy predictions of the industry and the U.S. Department of Energy for domestic natural gas production from shale may be overblown according to a new report from the same analyst who foresaw the massive downgrade of recoverable oil from California's Monterey Shale. Despite rising domestic natural gas production, the United States remains a net importer of natural gas. Natural gas imports accounted for about 10 percent of U.S. consumption through August of this year.

(Full disclosure: I worked as a paid consultant to help publicize the report mentioned above. But, as longtime readers know, since 2008 I've been skeptical about the wild claims of a long-term U.S. bonanza in oil and natural gas due to shale deposits. This report offers the first comprehensive analysis based on industry data and is produced independent of industry influence or money. Anyone with a stake in the industry or in U.S. energy policy should read it.)

It's possible that some U.S. LNG export projects may move forward in any case. If the buyers for this LNG sign long-term, cost-plus contracts as described above, those buyers will be in for a big surprise when U.S. natural gas prices rise. And those exports will create something of a self-reinforcing feedback loop by raising overall demand which will hoist domestic prices even higher for U.S. natural gas--even more so if there is not as much U.S. production as is currently being projected. If U.S. natural gas production remains at or below the level of domestic consumption, the United States could be faced with the rather bizarre prospect of having to import high-priced LNG from some countries to fill the gap created by LNG export shipments committed to others.

Higher U.S. natural gas prices will be a double-edged sword for those concerned about a cleaner energy future. U.S. natural gas producers and renewable energy companies will simultaneously rejoice if exports raise prices appreciably--producers because their financial fortunes will turn more positive and renewable energy companies because renewable energy will become more competitive with higher priced natural gas. Environmentalists, however, will gasp in horror as profitability rises enough in the shale gas fields to justify ever greater encroachments on the American landscape.

And, U.S. politicians who favor LNG exports may ultimately find themselves pilloried by consumers who must pay those higher prices and environmentalists who abhor the environmental costs--even as those politicians watch the campaign contributions flood in from a grateful shale gas industry.

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*MMbtu stands for 1 million British thermal units, a measure of heat content. Mcf, of course, means 1,000 cubic feet. This much natural gas contains almost 1 million Btus--975,610 to be precise. And so, the two measurements are often used interchangeably when comparing price though they are not precisely equivalent.

UPDATED: November 17, 2014 to include information on U.S. natural gas imports.

Kurt Cobb *is an* ***author***, ***speaker***, *and* ***columnist*** *focusing on energy and the environment. He is a regular contributor to the Energy Voices section of* ***The Christian Science Monitor*** *and author of the peak-oil-themed novel* ***Prelude***. *In addition, he has written columns for the Paris-based science news site* ***Scitizen***, *and his work has been featured on Energy Bulletin (now Resilience.org), The Oil Drum, OilPrice.com, Econ Matters, Peak Oil Review, 321energy, Common Dreams, Le Monde Diplomatique and many other sites. He maintains a blog called* ***Resource Insights*** *and can be contacted at* ***kurtcobb2001@yahoo.com***.

4 COMMENTS:

John said...

Another obstacle to exports: American manufacturers are pressuring the government to do what they can to keep natural gas prices low, which has supported the recent upsurge I American manufacturing.

Then, on the other hand, if you were China, how dependent on Russia would you want to become?

I'd bet some of those LNG terminals still get built.

cannuck21 said...

Excellent article. I would be interested in your opinion as to how this may effect Canadian LNG production and development?

Kurt Cobb said...

@cannuck21 Canadian dry natural gas production has been in decline since 2006. And, although Canada exports half its production (most of it to the United States), under the terms of NAFTA the proportion of its total production that is exported to the U.S. must remain the same as the average of the last 36 months. It's hard to see how given these constraints that Canada can become a serious LNG exporter.

If the terms of NAFTA are relaxed in light of growing U.S. natural gas production, then perhaps some limited LNG exports will be possible. But, the big question is, Will they be profitable? And, will investors be willing to bet that there are 30 years of dependable supply for LNG ahead?

http://www.reuters.com/article/2014/12/30/us-usa-lng-excelerate-idUSKBN0K81CP20141230?feedType=RSS&feedName=businessNews

Exclusive: Oil price crash claims first U.S. LNG project casualty

BY OLEG VUKMANOVIC

MILAN Tue Dec 30, 2014 1:21pm EST

(Reuters) - Excelerate Energy's Texan liquefied natural gas terminal plan has become the first victim of an oil price slump threatening the economics of U.S. LNG export projects.

A halving in the oil price since June has upended assumptions by developers that cheap U.S. LNG would muscle into high-value Asian energy markets, which relied on oil prices staying high to make the U.S. supply affordable.

The floating 8 million tonne per annum (mtpa) export plant moored at Lavaca Bay, Texas advanced by Houston-based Excelerate has been put on hold, according to regulatory filings obtained by Reuters.

The project was initially due to begin exports in 2018.

Excelerate's move bodes ill for thirteen other U.S. LNG projects, which have also not signed up enough international buyers, to reach a final investment decision (FID). Only Cheniere's Sabine Pass and Sempra's Cameron LNG projects have hit that milestone.

Back when LNG and crude oil prices were riding high in February, Excelerate, founded by Oklahoma billionaire George Kaiser, applied for permits to build the facility.

Eleven months on, its submission to the U.S. Federal Energy Regulatory Commission on Dec. 23 said that uncertainty generated by a steep decrease in oil prices has forced it to conduct a "strategic reconsideration of the economic value of the project" and to suspend all activities until April 1, 2015.

"Due to the recent global market conditions, the company has determined that, at this time, this project no longer meets the financial criteria necessary in order for us to move forward with the capital investment," a company spokesman told Reuters.

Stiff economic headwinds are making new developments tough going.

Prices that LNG projects can charge for long-term supply are falling from historic highs as new producers crowd the market, which is already oversupplied due to slowing demand and rising output that has seen spot Asian LNG prices halve this year.

At the same time, major consumers from Japan to South Korea and China are seeking to offload some of their long-term LNG supply commitments, contributing to the glut.

FADING DEMAND

Excelerate Energy will update the regulator on the status of Lavaca Bay in April, 2015, according to the filing.

The export plant operates under a tolling model, whereby the developer sells liquefaction capacity to LNG consumers who then must arrange for shipping to transport the fuel.

Typically companies seek to lock-in buyers for around 85 percent of a project's capacity before reaching an investment decision.

Excelerate hints in the filing that lackluster demand for capacity was behind the suspension, saying that only "renewed interest of potential counterparties" could get it moving again.

Even before the oil price slide, U.S. LNG projects were struggling to sign up the big Asian buyers needed to underpin multi-billion dollar investments, resorting finally to tapping vestiges of demand left in Europe.

Seen in the light of plus-$100 a barrel oil, projects to liquefy and export U.S. gas by ship promised major cost savings to Asian buyers reliant on costly oil-linked gas supplied by Australia and Qatar, which generated huge demand.

The advantage of U.S. export plants was that the LNG costs would reflect local benchmark Henry Hub gas prices, currently trading around $4 per million British thermal units (mmBtu), plus shipping and liquefaction costs.

"The oil price plunge makes U.S. LNG with prices linked to Henry Hub potentially uncompetitive with LNG from other sources especially those using an oil price linkage," independent consultant Andy Flower said.

Prior to the oil price crash, the U.S. discount to rival Brent-linked LNG supply from Qatar and Australia was around $8-$9 per mmBtu. Now those supplies represent a cost saving over U.S. projects.

"With U.S. LNG no longer looking to be the cheap LNG that off-takers have been seeking, finding companies prepared to commit to tolling fees for 20 years has become more challenging," Flower said.

(Editing by William Hardy)

http://www.theenergyreport.com/pub/na/14705

US Shale Gas Won't Last Ten Years: Bill Powers

Source: Peter Byrne of The Energy Report
Nov 8. 2012

Los Angeles Times, May 20 2014: US Department of Energy admits Post Carbon Institute is right about exaggerated estimates of frackable oil reserves in California, downsizes estimate for Monterrey Shale by 96%

Drilling California: A Reality...ey Shale Post Carbon Institute

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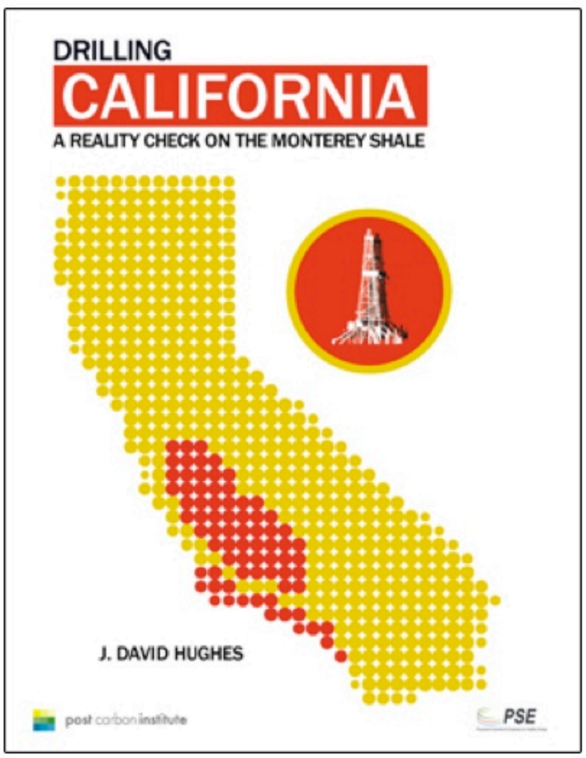


Drilling California: A Reality Check on the Monterey Shale

David Hughes

December 2, 2013

Drilling California: A Reality …rey Shale Post Carbon Institute

Drilling California: A Reality Check on the Monterey Shale

David Hughes

December 2, 2013

Written by PCI Fellow J. David Hughes and published in partnership by Post Carbon Institute and Physicians, Scientists & Engineers for Healthy Energy, this report provides the first publicly available empirical analysis of actual oil production data from the Monterey Formation, including from wells that have undergone hydraulic fracturing and acidization. It lays out some of the play's fundamental characteristics compared to other tight oil plays, including geological properties, current production, production potential, and associated environmental issues.

Unlike previous studies looking at potential production and economic impacts, this report is based on analysis of real production data (compiled in the most comprehensive oil and gas production database publicly available) and should therefore help ensure that public policy decisions on the development of the Monterey are grounded in data, not assumptions.

Visit montereyoil.org for more resources, including key maps and figures.

PROFILE 65° Los Angeles Times July 11, 2014 SECTIONS

U.S. officials cut estimate of recoverable Monterey Shale oil by 96%

BY LOUIS SAHAGUN
May 20, 2014, 9:00 p.m.

Federal energy authorities have slashed by 96% the estimated amount of recoverable oil buried in California's vast Monterey Shale deposits, deflating its potential as a national "black gold mine" of petroleum.

AL SEIB, LOS ANGELES TIMES

Aaron Kent, a wireline operator for Canary, works on a slick line at an oil rig pump jack site in the oil fields near Bakersfield. Kern County has seen a flurry of activity because of the potential for development of the Monterey Shale formation.

Just 600 million barrels of oil can be extracted with existing technology, far below the 13.7 billion barrels once thought recoverable from the jumbled layers of subterranean rock spread across much of Central California, the U.S. Energy Information Administration said.

FOR THE RECORD:
Monterey Shale: In the May 21 Section A, an article about federal energy authorities slashing by 96% the estimated amount of recoverable oil in California's Monterey Shale deposits described the rock formation as a 1,750-mile area. The Monterey Shale is a 1,750-square-mile area.

Related Content

Oil and gas industry generates thousands of jobs in California, report finds

The new estimate, expected to be released publicly next month, is a blow to the nation's oil future and to projections that an oil boom would bring as many as 2.8 million new jobs to California and boost tax revenue by $24.6 billion annually.

The Monterey Shale formation contains about two-thirds of the nation's shale oil reserves. It had been seen as an enormous bonanza, reducing the nation's need for foreign oil imports through the use of the latest in extraction techniques, including acid treatments, horizontal drilling and fracking.

The energy agency said the earlier estimate of recoverable oil, issued in 2011 by an independent firm under contract with the government, broadly assumed that deposits in the Monterey Shale formation were as easily recoverable as those found in shale formations elsewhere.

The estimate touched off a speculation boom among oil companies. The new findings seem certain to dampen that enthusiasm.

Kern County in particular has seen a flurry of oil activity since 2011, with most of the test wells drilled by independent exploratory companies. Major oil companies have expressed doubts for years about recovering much of the oil.

The problem lies with the geology of the Monterey Shale, a 1,750-mile formation running down the center of California roughly from Sacramento to the Los Angeles basin and including some coastal regions.

Unlike heavily fracked shale deposits in North Dakota and Texas, which are relatively even and layered like a cake, Monterey Shale has been folded and shattered by seismic activity, with the oil found at deeper strata.

Geologists have long known that the rich deposits existed but they were not thought recoverable until the price of oil rose and the industry developed acidization, which eats away rocks, and fracking, the process of injecting millions of gallons of water laced with sand and chemicals deep underground to crack shale formations.

The new analysis from the Energy Information Administration was based, in part, on a review of the output from wells where the new techniques were used.

"From the information we've been able to gather, we've not seen evidence that oil extraction in this area is very productive using techniques like fracking," said John Staub, a petroleum exploration and production analyst who led the energy agency's research.

"Our oil production estimates combined with a dearth of knowledge about geological differences among the oil fields led to erroneous predictions and estimates," Staub said.

Compared with oil production from the Bakken Shale in North Dakota and the Eagle Ford Shale in Texas, "the Monterey formation is stagnant," Staub said. He added that the potential for recovering the oil could rise if new technology is developed.

A spokesman for the oil industry expressed optimism that new techniques will eventually open up the Monterey formation.

"We have a lot of confidence in the intelligence and skill of our engineers and geologists to find ways to adapt," said Tupper Hull, spokesman for the Western States Petroleum Assn. "As the technologies change, the production rates could also change dramatically."

Rock Zierman, chief executive of the trade group California Independent Petroleum Assn., which represents many independent exploration companies, also sounded hopeful.

"The smart money is still investing in California oil and gas," Zierman said.

"The oil is there," Zierman said. "But this is a tough business."

Environmental organizations welcomed the news as a turning point in what had been a rush to frack for oil in the Monterey formation.

"The narrative of fracking in the Monterey Shale as necessary for energy independence just had a big hole blown in it," said Seth B. Shonkoff, executive director of the nonprofit Physicians Scientists & Engineers for Healthy Energy.

J. David Hughes, a geoscientist and spokesman for the nonprofit Post Carbon Institute, said the Monterey formation "was always mythical mother lode puffed up by the oil industry — it never existed."

Hughes wrote in a report last year that "California should consider its economic and energy future in the absence of an oil production boom from the Monterey Shale."

The 2011 estimate was done by the Virginia engineering firm Intek Inc.

Christopher Dean, senior associate at Intek, said Tuesday that the firm's work "was very broad, giving the federal government its first shot at an estimate of recoverable oil in the Monterey Shale. They got more data over time and refined the estimate."

For California, the analysis throws cold water on economic projections built upon Intek's projections.

In 2013, a USC analysis, funded in part by the Western States Petroleum Assn., predicted that the Monterey Shale formation could, by 2020, boost California's gross domestic product by 14%, add $24.6 billion per year in tax revenue and generate 2.8 million new jobs.

louis.sahagun@latimes.com

Earth, energy and money

Whether you focus on Peak Energy, Climate Chaos or what is euphemistically called the "Great Recession," each of these are aspects of reaching the limits to growth on a round, finite planet. The transition from cheap, abundant fuels to expensive, hard to get fuels is reducing the amount that people drive and damaging the economic system that requires endless growth to function. Peak Energy is starting to reduce the physical ability to grow traffic levels, regardless of economic circumstances. Burning fossil fuels pollutes the thin film of the atmosphere, with health consequences and environmental impacts, including global warming. **Ecology, energy and money are interconnected and inseparable, and each require a holistic integration with the others to address any of them.**

Energy depletion is not only about personal transportation or carbon footprints. Driving less will be uncomfortable, but eating less would be far more difficult. Most food eaten in the US crosses time zones, some travels across international borders. As fossil fuels decline we need to grow food where it is eaten. Relocalizing food production, growing food in cities, community gardens, suburban "food not lawn" efforts, and protection of farmland from asphalt and concrete are all needed to cope with oil depletion.

It's anyone's guess what energy levels will be in the 2030s, but under any physically possible scenario the flow rates of fossil fuels will be considerably less than they are today, since conventional fossil fuels have peaked globally. There will still be oil extraction in the 2030s but at levels less than current rates, and the future fuels will be the dirtier, more expensive, difficult to extract "bottom of the barrel" supplies. Hyper efficient cars, public transit, car sharing, relocalizing production of food and other goods could mitigate these impacts but not prevent them. Transportation planning needs to focus on maintaining the enormous road networks already built, not expanding them further for travel demand that will not materialize on the energy downslope.
The category of investment euphemistically called "modernization" should be dedicated toward quality train service, not super wide superhighways.

The reason we use fossil fuels is not that Dick Cheney is evil or the oil companies are greedy but that fossil fuels are more energy dense than living on our solar budget. Fossil fuels enabled us to zoom from under a billion to over seven billion today, and climbing down gracefully from peak energy will be more challenging than descending an icy Cascadian peak during a blizzard.

Connected Dots: Earth • energy • money
by Mark Robinowitz • PeakChoice.org

first printed in Heartbeat, heartwood.org, Spring 2014

We are not addicted to fossil fuels, it's much worse than that. Oil, coal, unnatural gas, mineral ores and using "renewable" resources faster than they regenerate fueled our population growth from under a billion (before fossil fuels) to seven billion today. Our industrial agriculture system is totally dependent on massive energy consumption to grow and distribute food.

We are in a paradox: burning these fuels is wrecking the biosphere, but if we stopped burning them our society would crash, which could accelerate ecological damage. There are many worthy efforts to relocalize food production and prepare for living with less fossil energy, but at the rate they are being implemented the fossil fuels will be gone before we are prepared to live without them.

Many environmental groups say we need to reduce our use of fossil fuels in the coming decades to mitigate climate chaos. However, energy use has peaked due to physical constraints, and on the energy downslope our use will continue to decline whether we plan for it or not.

In the United States, energy use from all sources peaked in 2007 at about 101 quads. A quad is a quadrillion BTUs. One BTU is roughly the energy released by a match. In 2012, energy use had dropped to about 95 quads.

2007 was also the year of Peak Electricity in the US. Since then, electricity usage has dropped about ten percent.

Traffic also peaked in the US in 2007, in terms of Vehicle Miles Traveled (VMT). The rising cost of gasoline and economic "recession" ended the increase of car traffic. Roads are still busy, but most are not getting any more congested.

Federal transportation law requires highway expansion plans to consider traffic levels two decades in the future. It's anyone's guess how much fossil energy will be available in the 2030s, but it's clear it will be considerably less than today's flow. This negates the "purpose and need" for new bypasses and highway widenings, but Peak Traffic has not yet been included in any official transportation plan anywhere in the country.

Domestic aviation also peaked in 2007, again due to rising oil prices that raised the cost of tickets. The leveling off of aviation growth is a bigger shift than the reduction after 9/11.

US oil production peaked in 1970 at about ten million barrels a day. In the past couple years, there has been a propaganda campaign to persuade the public that fracking is going to lead to energy independence. However, while fracking has received lots of scrutiny due to the toxic impacts on aquifers, the fact that fracking is a very short term activity is not as well known. Fracked wells deplete far faster than conventional wells, and the production data shows fracking cannot bring US oil extraction back to the 1970 peak, even if environmental and public health problems were ignored. Fracking and tar sands are "scraping the bottom of the barrel" and have delayed the onset of gasoline rationing.

Coal production peaked in the US in 1999, in terms of energy content. The tonnage of coal mining continues to increase, but the industry is going after lower quality coal, part of the motive for mountaintop removal. In Pennsylvania, where coal mining began, extraction peaked in 1920.

Peak Natural Gas in the US was in 1973. The recent boom in gas extraction is from fracking, but that is starting to peak, just as fracking for oil is peaking. When the fracking bubble bursts, we will have to choose whether to use the remaining natural gas to heat cities in the winter or to burn it for electricity.

Nuclear power has also peaked. Peak uranium mining in the US was 1980. The number of operating power reactors has peaked. Old, worn out reactors are being shut down faster than replacement plans for new nukes.

We are also using "renewable" resources faster than they regenerate. Forests, fish, soil, and fresh water are being depleted everywhere. Part of the needed response to our civilization's "going out of business sale" would be to implement permaculture strategies everywhere. It would be nice to see environmental initiatives focus more on "Transition Towns" than lobbying politicians. The more we can create practical responses, the more likely we will see broader adoption of ecological policies on the energy downslope.

Using solar energy for twenty years (and wind power for ten) taught me that renewable energy could only run a smaller, steady state economy. Our exponential growth economy requires ever increasing consumption of concentrated resources (fossil fuels are more energy dense than renewables). A solar energy society would require moving beyond growth-and-debt based money.

After fossil fuel we will only have solar power, but that won't replace what we use now. Living on our current solar budget could not be a seamless substitute for digging up a hundred million years of sunlight. We need to abandon the myth of endless growth on a round, and therefore, finite planet to have a planet on which to live. Will we use the remaining fossil fuels to make lots of solar panels and relocalize food production instead of waging Peak Oil Wars?

June 27th, 2012
http://www.c-realm.com/podcasts/crealm/316-peak-blame/
316: Peak Blame
KMO welcomes Mark Robinowitz of OilEmpire.us back to the C-Realm Podcast to discuss why both the mainstream political left as well as the right in the United States cannot address the demands of Peak Oil in a realistic way. Republicans have rebuked Navy Secretary Ray Mabus for attempting to ween the Navy off of fossil fuels because they see finding alternatives to petroleum as a Democratic partisan issue. Established environmental and social justice organizations are still holding onto unrealistic Green Technology and Green Capitalism paradigms and have yet to come to terms with the fact that the project of the 21st Century will be figuring out how to equitably distribute a shrinking pie. One thing unlikely to be in short supply as the realities of diminishing fossil fuel reserves make themselves unmistakable: blame. Mark hopes that we can achieve Peak Blame sooner rather than later and get on with the grown-up work of figuring out how best to deploy our remaining energy resources.

M. King Hubbert on energy and money

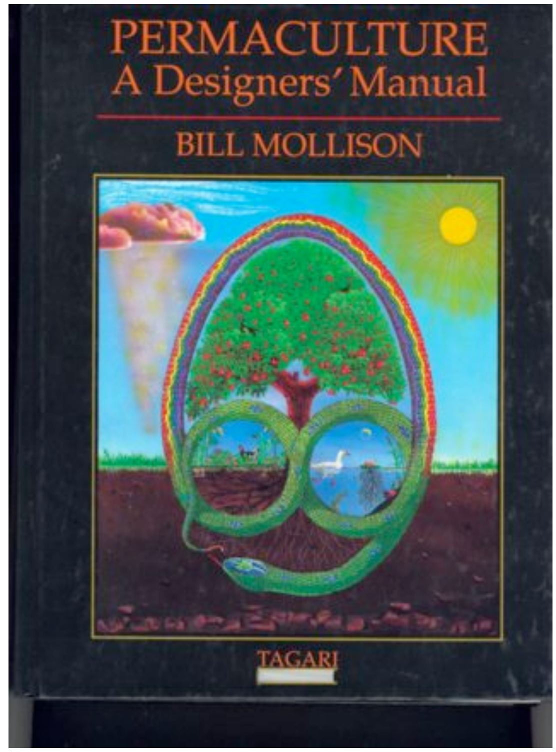
excerpt from Richard Heinberg, "The Party's Over," (New Society Books: 2003) pp. 91-92, discussing M. King Hubbert, the geologist who first figured out the math behind Peak Oil. Hubbert predicted in 1956 that the USA would peak around 1970, he was pilloried for this but the USA did peak in 1970. Hubbert later predicted that the world would peak in the mid 1990s, but then cautioned this might get pushed back a decade due to the oil shock of 1973, which is what happened. Hubbert initially thought nuclear power would be the post-fossil fuel solution but changed his mind and said solar energy was the answer, but this would require giving up exponential growth and learning to live within natural limits on a finite planet.
-- Mark

Hubbert immediately grasped the vast economic and social implications of this information [Peak Oil]. He understood the role of fossil fuels in the creation of the modern industrial world, and thus foresaw the wrenching transition that would likely occur following the peak in global extraction rates. ...

> *The world's present industrial civilization is handicapped by the coexistence of two universal, overlapping, and incompatible intellectual systems: the accumulated knowledge of the last four centuries of the properties and interrelationships of matter and energy; and the associated monetary culture which has evolved from folkways of prehistoric origin.*
> *The first of these two systems has been responsible for the spectacular rise, principally during the last two centuries, of the present industrial system and is essentially for its continuance. The second, an inheritance from the prescientific past, operates by rules of its own having little in common with those of the matter-energy system. Nevertheless, the monetary system, by means of a loose coupling, exercises a general control over the matter-energy system upon which it is superimposed.*
> *Despite their inherent incompatibilities, these two systems during the last two centuries have had one fundamental characteristic in common, namely exponential growth, which has made a reasonably stable coexistence possible. But, for various reasons, it is impossible for the matter-energy system to sustain exponential growh for more than a few tens of doublings, and this phase is by now almost over. The monetary system has no such constraints, and, according to one of its most fundamental rules, it must continue to grow by compound interest.*

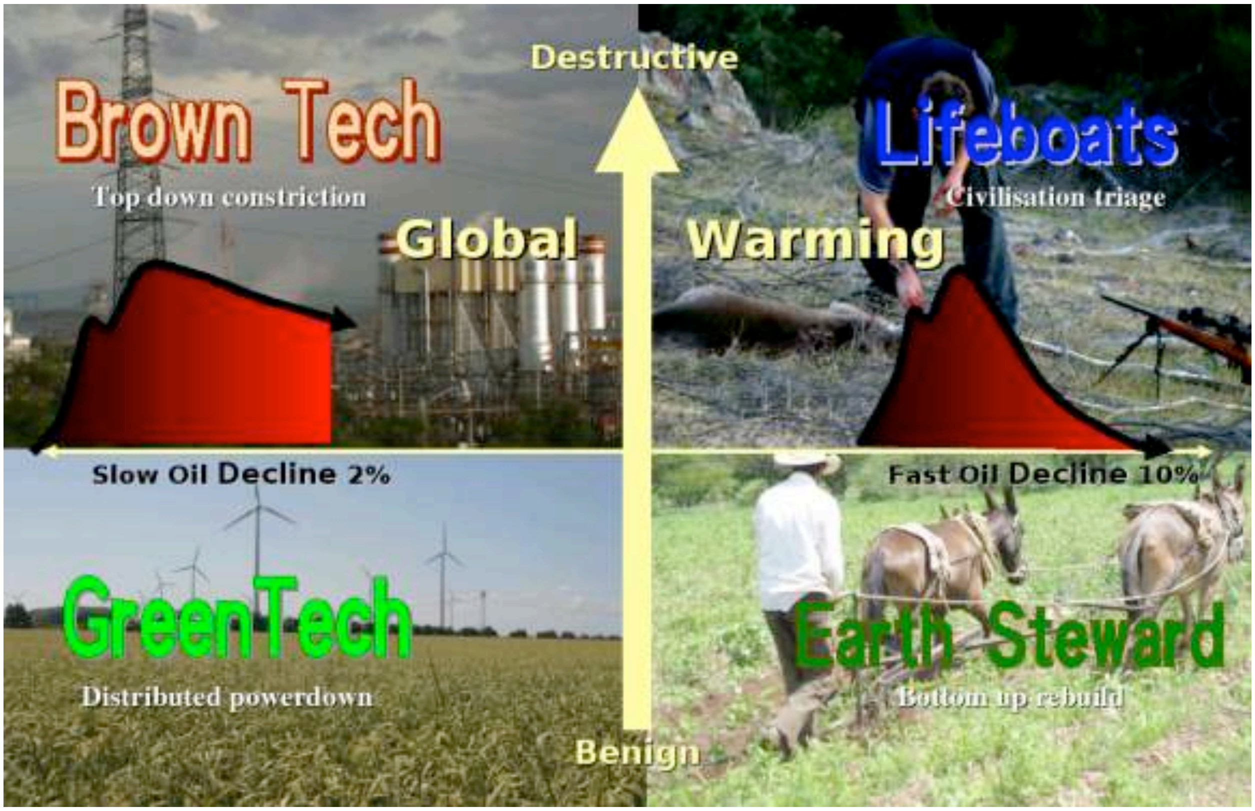
Hubbert thus believed that society, if it is to avoid chaos during the energy decline, must give up its antiquated, debt-and-interest-based monetary system and adopt a system of accounts based on matter-energy -- an inherently ecological system that would acknowledge the finite nature of essential resources.
Hubbert was quoted as saying we are in a "crisis in the evolution of human society. It's unique to both human and geologic history. It has never happened before and it can't possibly happen again. You can only use oil once. You can only use metals once. Soon all the oil is going to be burned and all the metals mined and scattered."
Statements like this one gave Hubbert the popular image of a doomsayer. Yet he was not a pessimist, indeed, on occasion he could assume the role of utopian seer. We have, he believed, the necessary know-how, all we need do is overhaul our culture and find an alternative to money. If society were to develop solar-energy technologies, reduce its population and its demands on resources, and develop a steady-state economy to replace the present one based on unending growth, our species' future could be rosy indeed. "We are not starting from zero," he emphasized. "We have an enormous amount of existing technical knowledge. It's just a matter of putting it all together. We still have great flexibility but our maneuverability will diminish with time."

David Holmgren, permaculture co-originator



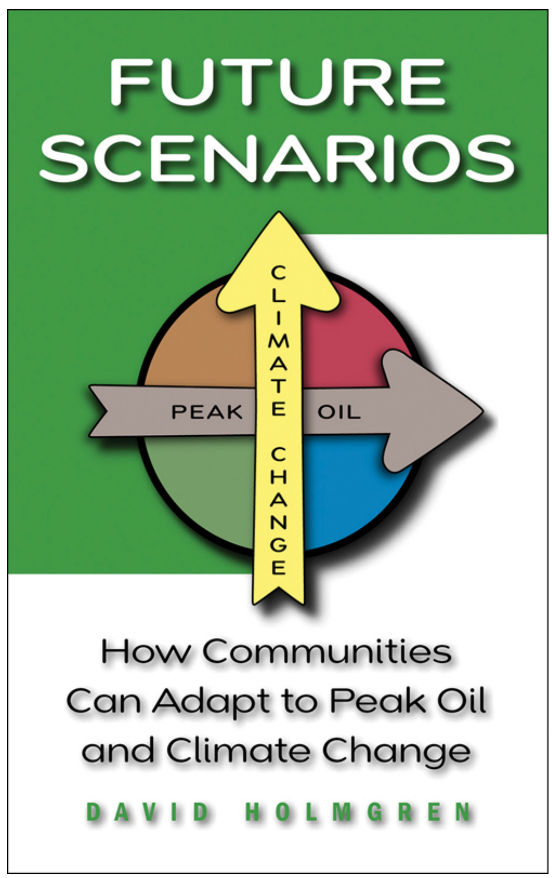
"Awareness of Climate Change by the media and general public is obviously running well ahead of awareness about Peak Oil, but there are interesting differences in this general pattern when we look more closely at those involved in the money and energy industries. Many of those involved in money and markets have begun to rally around Climate Change as an urgent problem that can be turned into another opportunity for economic growth (of a green economy). These same people have tended to resist even using the term Peak Oil, let alone acknowledging its imminent occurrence. Perhaps this denial comes from an intuitive understanding that once markets understand that future growth is not possible, then it's game over for our fiat system of debt-based money."

-- David Holmgren, co-originator of permaculture, "
Money vs. Fossil energy: the battle to control the world,"
http://www.holmgren.com.au/DLFiles/PDFs/Money_vs_Fossil_Energy.pdf

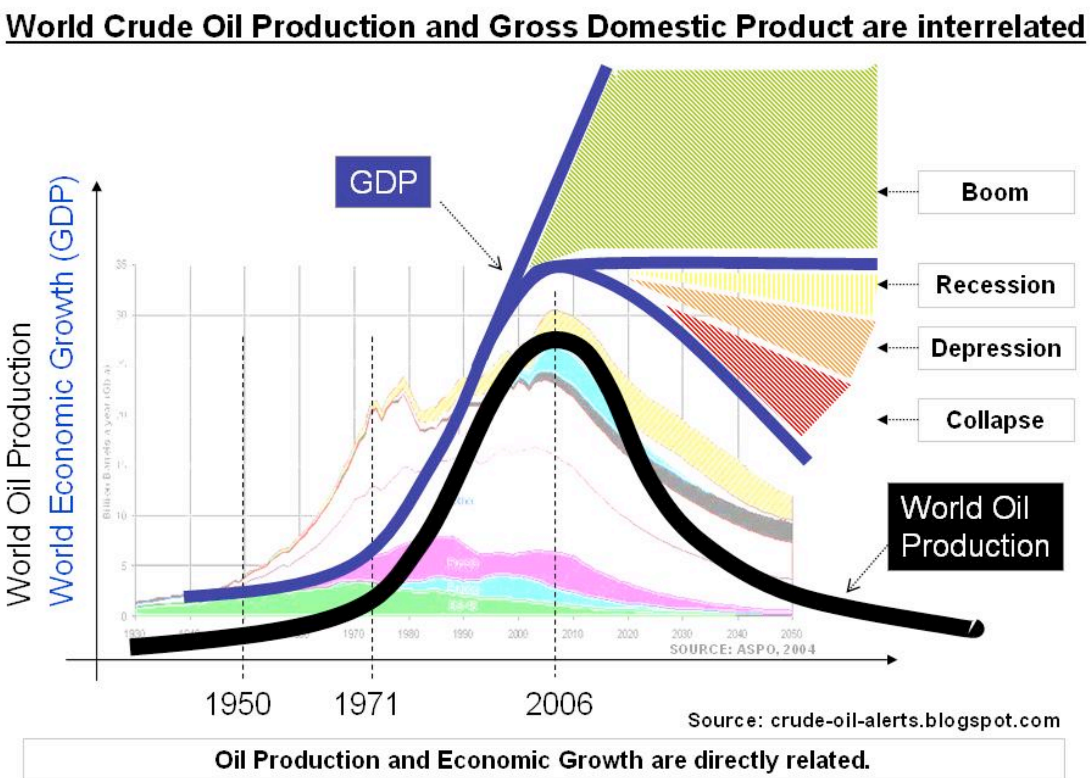


David Holmgren, the co-orginator of permaculture, is author of Future Scenarios: How Communities can adapt to Peak Oil and Climate Change. "Economic recession is the only proven mechanism for a rapid reduction of greenhouse gas emissions ... most of the proposals for mitigation from Kyoto to the feverish efforts to construct post Kyoto solutions have been framed in ignorance of Peak Oil. As Richard Heinberg has argued recently, proposals to cap carbon emissions annually, and allowing them to be traded, rely on the rights to pollute being scarce relative to the availability of the fuel. Actual scarcity of fuel may make such schemes irrelevant." -- www.futurescenarios.org

"The dip in global emissions created by the 2008 global financial crisis was ignored by the climate activist community as an inconvenient truth." "Crash on Demand: Welcome to the Brown Tech Future," by David Holmgren (co-originator of permaculture) http://holmgren.com.au/wp-content/uploads/2014/01/Crash-on-demand.pdf



podcast February 12, 2014
http://c-realm.com/podcasts/crealm/401-psycho-social-debt-jubilee/
401: Psycho-social Debt Jubilee
Podcast: Play in new window | Download
KMO welcomes permaculture co-originator David Holmgren to the C-Realm Podcast to discuss two of his essays: Money Vs Fossil Energy: the Battle for Control of the World and Crash on Demand: Welcome to the Brown Tech Future. David has been tracking the onset of climate change and peak oil for many years, but he says that in recent years, largely due to the work of Steve Keen and Nicole Foss, he has come to see financial systems as the fastest moving and most volatile element in emerging global crisis. He describes why he considers the Bush administration to have been guided by a certain energy realism lacking in too many social and climate activists. Finally, he describes why he thinks that multiple generations of mass affluence has left us saddled with a psycho-social debt that will be very difficult for us to discharge.



"I realized that one of the best use of the US Energy Policy History work may be to convince environmentalists and others that think peak oil is a scare tactic or financial manipulation, that it is in fact a real problem - not something that just popped up, it has been recognized as a problem for decades, and that access to the energy resources of other countries is the main reason that we have been able to ignore it for so long. The intention would be of course to connect the movements so that all can see the elephant for what it is."
-- David Room, Local Clean Energy Alliance

from Extraenvironmentalist.com
interview conducted at Northwest Permaculture gathering, October 2012
permaculture design, steady state economics, peak money, solar energy, limits to growth
www.peakchoice.org/audio/interview-mark-robinowitz.mp3
15 minutes, 33 megabytes

www.transitionvoice.com/2011/01/global-warming-worst-advocacy-campaign-ever/
Interesting essay that suggests the environmental movement's myopia about energy limits is part of the reason public support for climate change / global warming / greenhouse effect is in decline.

This is a good discussion of interconnections:

www.darkoptimism.org/2008/06/14/focus-on-climate-change-and-ignore-peak-oil-not-good-enough/

It is a deep pleasure for me to be again in Stockholm and to gratefully accept the Right Livelihood Award for 1986 on behalf of myself and those who have worked with me at the International Institute of Concern for Public Health. Sweden is gaining an international reputation for its extraordinary efforts on behalf of global justice and peace, and for its yearly search of the global community for creative and concerned persons and organizations which could use some encouragement and financial assistance. This is a much valued service to the forming global village. In the long run it will, I think, be more humanly productive than increased airport security, military exercises, nuclear threats, and development of crowd-control technology. This contrast between a system of encouragement and cooperation, on the one hand, and a system of threats and forceable control, on the other, lies at the centre of the global crisis. It poses a clear choice for the future, on which will depend the survival or disintegration of civilization.
-- Rosalie Bertell, THE RIGHT LIVELIHOOD AWARDS 1986
Acceptance Speech by Rosalie Bertell
December 8th, 1986
www.rightlivelihood.org/bertell_speech.html
"alternative Nobel Prize"

Most people do not enjoy having their entire worldview discredited; it sets them uncomfortably adrift. Scientists are no exception. A paradigm tends to be so greatly cherished that, as new knowledge or evidence turns up that contradicts it or calls it into question, the paradigm is embroidered with qualifications and exceptions, along with labored pseudo-explanations--anything, no matter how intellectually disreputable or craven, to avoid losing the paradigm. If a paradigm is truly obsolete, it must finally give way, discredited by the testing of the real world. But outworn paradigms ordinarily stand staunchly until somebody within the field makes a leap of insight, imagination, and courage sufficient to dislodge the obsolete paradigm and replace it.
-- Jane Jacobs, "Dark Age Ahead"

http://culturechange.org/cms/content/view/926/1/

Questionable Renewable Energy Dreams: Where Do We Go from Here by Jan Lundberg

24 November 2014

A Tale of Three Studies • Oil Grows in Instability and Danger As It Goes Away Geologically • Cars Are Renewable?

It was the summer that Al Gore had NASA's James Hansen testify in the Senate that human-caused global warming had begun: in August 1988 I founded Fossil Fuels Policy Action, a nonprofit institute, in Washington. We would be a clearing house for energy data & policy, with an eye to replacing fossil energy with renewable energy. Two all-consuming questions became our focus: why is the U.S. not conserving energy, and what can make it happen? This immediately morphed us from more passive "assessment" to more active advocacy, within our basic mission.

In a matter of months our solution became our *raison-d'être*: a Conservation Revolution. Our conclusion about the dire state of the world was seemingly affirmed by Worldwatch's 1992 initiative which followed our public announcement and publications with their very similar Environmental Revolution. It all seemed like a very big deal then, for activists and dreamers can get a bit carried away. Funding and competition for funds can come into play as well. None of us would have anticipated that nearly a quarter of a century later, now with grey hair and somewhat tired voices, we are still fighting for such a revolution or at least some meaningful, trend-altering reforms.

Prior to forming Fossil Fuels Policy Action, I had scoured the inside-the-beltway environmental establishment for a job, to put my well-known oil industry analytical skills to use for Mother Earth. It was early 1988. The only job I got was a temporary post at Renew America, formerly the Solar Lobby. What I learned from the many greenies I met around town was that they were positioning themselves for green business, in both senses of the word. Their intentions were good, but I felt somewhat repulsed by a mere industry shift. The greener establishment I glimpsed would not bring about much of a change in the nation's overall direction. Yet, I was happy enough to form a group that fit in with them, because I found some reforms exciting, and I had to create my own job under a new banner in order to participate.

Photo courtesy Truthout/Richard Brand - Flickr

My misgivings about the value and promise of a green industrial class sprang mostly from my innate, radical nature-loving. Soon after starting Fossil Fuels Policy Action, I became aware that major environmental groups were taking donations from the natural gas lobby, the American Gas Association. I had known the AGA, so I paid a visit and went out for drinks with my key contacts from my days at Lundberg Survey where I had published alternative fuels price reports for gas utilities. I left the bar knowing that Fossil Fuels Policy Action was now in line for a convenient donation: to trumpet natural gas as a "bridge fuel" for a renewable energy future. I wanted that future and was working for it, but I began to suspect it was purely utopian if the renewable energy were imagined to be on a scale to substitute for fossil fuels. I had just been sent the book *Beyond Oil: The Threat to Food and Fuel in the Coming Decades* to review, so I learned about the net-energy issues with alternative energy.

Instead of taking the AGA's money, I decided it was more fun to reject the donation publicly by publishing a newsletter on the competition between natural gas and heating oil, exposing the environmental groups' taking fossil fuel money. My corporate friend Nelson Hay of the AGA called me up after seeing our newsletter, and bellowed, "Are you on acid, Jan?!" And a prominent D.C. environmentalist chided me in a letter that said only, "It's all dirty money anyway."

Renewable energy should be the real deal, and not something to justify dependence on slightly cleaner fossil fuels. Today, the question has become, "How can renewable energy systems be seen for what they are and are not?" Where do we go from here, when the consumer economy with its cheap-oil built infrastructure has little future after conventional oil extraction peaked globally in 2005? One clue is that Fossil Fuels Policy Action eventually became Culture Change.

A Tale of Three Studies: Bursting Renewable Energy's Mental Bubble

Renewable energy is great, right? But what if it is mostly misused, and appears increasingly to be a false promise for preventing more oil spills like BP's in the Gulf of Mexico and for saving the Earth's unravelling climate? After a thorough and dispassionate look, at the end of this section we nail the "double Achilles Heel" of large-scale renewable energy: storage of energy during intermittency, and low net-energy return on energy invested.

Just as some of us question the wonders of "clean" natural gas -- increasingly derived from toxic fracking -- some go further, beyond embracing renewable energy, to promote and practice energy-consumption curtailment as the best form of conservation.

But this usually falls on deaf ears. One reason is that there is no sexy, high-tech, start-up, dollar-signs-in-the-eyes attraction to cutting back on energy use in general. Rather, "clean tech," which is often not about cutting energy consumption, is the hot buzz word for investors and careerists -- even though curtailing energy use is the fastest way to reduce greenhouse gas emissions, mercury, smog, acid rain, and nuke-energy risks.

A near spate of exposés on "renewable" energy appeared recently. We first put out the word on two of them via Facebook and emails: **What's Wrong with Renewable Energy?** by Kim Hill, drawn partly from Ozzie Zehner's book *Green Illusions*, and **Abundant Clean Renewables? Think Again!**in Truthout.org, November 16, 2014, by Almuth Ernsting of Biofuelwatch.

In these studies, as in many an article on Resilience.org (formerly EnergyBulletin.net) and CultureChange.org, the widely ignored but fatal issues involving the renewable energy technofix for peak oil and overpopulation are presented in disturbing, documented detail. The discussion is not about decentralized, small-scale energy systems for a home or farm. Passive solar and mills for grinding grain, powered with the wind or flowing water, are especially benign. Rather, the issue is large-scale systems designed to be part of the electric grid.

Ernsting asks, "Can we really put our hopes for stabilizing the climate into trying to simply replace the energy sources in a growth-focused economic and social model that was built on fossil fuels? Or do we need a far more fundamental transition towards a low-energy economy and society?" She sees the rise of wind power and solar power as serving the corporate agenda rather than human needs. She examines Germany's real energy mix, which puts solar and wind in perspective. Most "renewable" energy in Germany is from biofuels, biogas and wood pellets, none of which are innocent of causing serious environmental impacts. These three prime renewable energy supplies, and dependency on them, means that the "24,000 wind turbines and 1.4 million solar panels have scarcely made a dent in Germany's fossil fuel burning and carbon emissions."

Same for Denmark, Ernsting reports: "wind energy in Denmark accounted for just 3.8 percent of Denmark's total energy use in 2010" because electricity generation is only one aspect of energy. Again, in Denmark it is bioenergy generating far more energy than wind. Norway is a similar situation, except hydroelectric dams are the favored alternative energy. This means a set of problems for Norway that Norwegian companies are exporting, to the detriment of foreign lands.

What if the windy UK put wind turbines all over its coasts? Fifteen offshore wind turbines installed *on every kilometer of the UK coastline* would supply just 13 percent of the country's average daily energy use. "Generating that 13 percent of UK energy... would require wind turbines made of 20 million tons of steel and concrete - more than all the steel that went into U.S. shipbuilding during World War II. Steel manufacturing is heavily dependent on coal, not just as a fuel for the furnaces but because it is needed to enrich the raw material, iron ore, with carbon to make it stable. And concrete is hardly 'carbon neutral' either - cement (a key component) accounts for 5 percent of global carbon dioxide emissions."

Almuth Ernsting

Then there's solar PV panels. They are up to four times as energy- and carbon-intensive to produce as wind turbines: "Aluminum - used to mount and construct solar panels - is about as carbon and energy-intensive as steel. Silicon needs to be smelted at 2,000 degrees Celsius and materials used to replace silicon have an even higher environmental footprint. Then there's an array of highly toxic and corrosive chemicals used during manufacturing. Yet with regards to pollution, building wind and marine turbines is likely worse than making solar panels, because efficient and lasting turbine magnets rely on rare earth mining and refining. One 5-megawatt turbine requires a ton of rare earths, the mining and refining of which will leave behind 75 cubic meters of toxic acidic waste water and one ton of radioactive sludge." (Ernsting, Truthout)

Zehner gives environmentalists 10 reasons to question "renewable" energy:

(1) Solar panels and wind turbines aren't made out of nothing. They are made out of metals, plastics, chemicals. These products have been mined out of the ground, transported, processed, manufactured. Each stage leaves behind a trail of devastation...

(2) The majority of electricity that is generated by renewables is used in manufacturing, mining, and other industries that are destroying the planet. Even if the generation of electricity were harmless, the consumption certainly isn't.

(3) The aim of converting from conventional power generation to renewables is to maintain the very system that is killing the living world, killing us all, at a rate of 200 species per day. Taking carbon emissions out of the equation doesn't make it sustainable. This system needs to not be sustained, but stopped.

(4) Humans, and all living beings, get our energy from plants and animals. There is no living creature that needs electricity for survival. Only the industrial system needs electricity to survive, and food and habitat for everyone are being sacrificed to feed it.

(5) Wind turbines and solar panels generate little, if any, net energy (energy returned on energy invested). The amount of energy used in the mining, manufacturing, research and development, transport, installation, maintenance and disposal of these technologies is almost as much—or in some cases more than—they ever produce.

(6) Renewable energy subsidies take taxpayer money and give it directly to corporations. Investing in renewables is highly profitable. General Electric, BP, Samsung, and Mitsubishi all profit from renewables, and invest these profits in their other business activities.

(7) More renewables doesn't mean less conventional power, or less carbon emissions. The amount of energy being generated by renewables has been increasing, but so has the amount of energy generated by fossil fuels. No coal or gas plants have been taken off line as a result of renewables.

(8) Only 20% of energy used globally is in the form of electricity.

(9) Solar panels and wind turbines last around 20-30 years, then need to be replaced. The production process, of extracting, polluting, and exploiting, is not something that happens once, but is continuous and expanding.

(10) The emissions reductions that renewables intend to achieve could be easily accomplished by improving the efficiency of existing coal plants, at a much lower cost. This shows that the whole renewables industry is nothing but an exercise in profiteering with no benefits for anyone other than the investors.

Ernsting's and Zehner's articles are hard-hitting, short pieces and easy to read. They throw ice water on professional technofixers in the environmental movement (i.e., almost anyone getting significant funding), and dash the hopes of "progressive consumers" looking for greener ways to maintain their First World, privileged lifestyles -- if they will pay attention.

My own brief "elevator speech" on the renewable-energy technofix is that

• renewable energy systems depend on the larger fossil fuels infrastructure

• they have much lower net-energy yield than cheaply produced oil always had

• they offer electrical power only (save biofuels) and not any chemicals or materials that fossil fuels give

• renewable energy systems for replacing fossil fuels are not scalable to meet the alleged needs for energy consumption now or projected

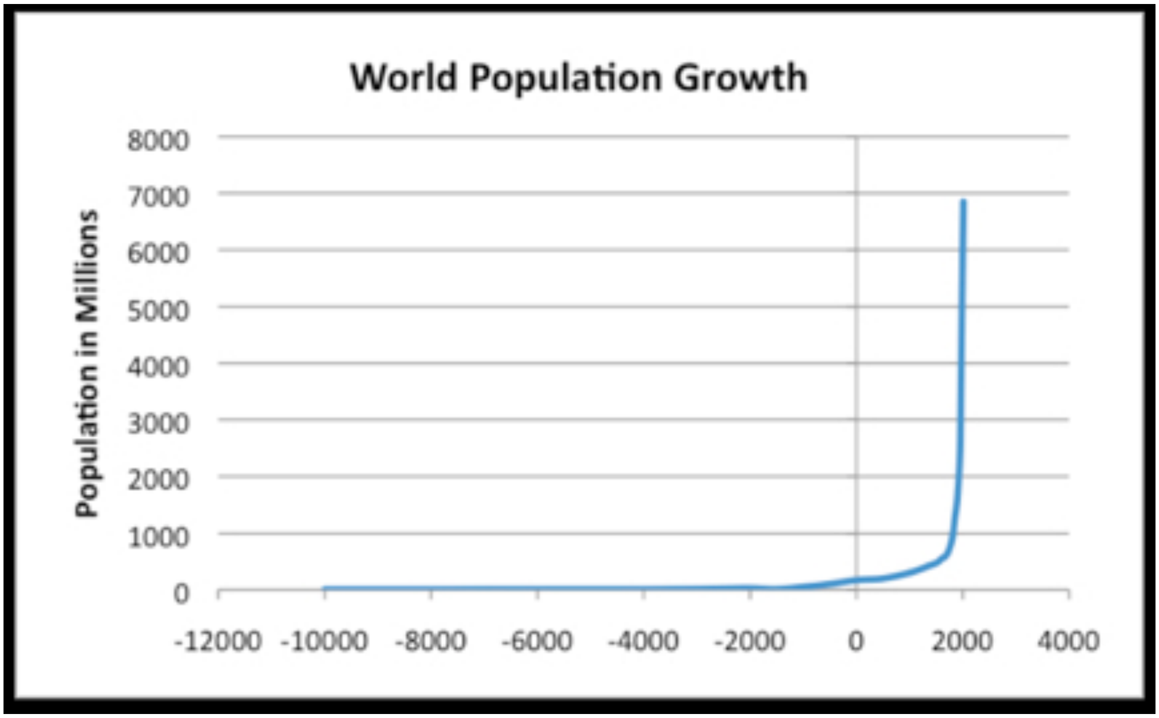
• large renewable energy systems eat up agricultural land -- as does the soil-depleting, heavily subsidized, energy-inefficient biofuels industry. Hydroelectric power poses problems too, concerning ecologically damaging dams with their siltation that shortens the lifetime of the dams' water supply for power as well as irrigation.

These concerns have been voiced by the few for many years. The facts are obscured and suppressed, as a deluded nation and entire civilization jumped on the runaway oil train to economic collapse, following the peak of cheaply extracted oil in 2005. The virtuous belief in renewable energy for a greener future justified the delusion. Collapse-denial is perhaps more pervasive than denial of anthropogenic global warming, in part because the environmental establishment and mainstream media shrink from open discussion on the shortcomings of renewable energy as a viable substitute for the volume of oil and its many products in the consumer economy.

Hence, collapse and the eventual adjusting of the population size to ecological carrying capacity -- over-shot several decades ago -- also belong off the typical enviro group's table and off the reporter's beat. Politicians refuse to touch any of this. The almost palpable silver bullet for technological avoidance of resource-limits keeps most of us going as relatively comfortable or willing players in the struggling consumer economy.

When one questions "renewable" energy, it can appear he or she is singing the praises of the petroleum industries. No; deep-green environmentalists and proponents of simple living are not shills for the oil, gas or coal industries. Yes; it is unfair that subsidies for fossil fuels are so huge, and it is a tragedy for the climate. But this does not mean that subsidies for centralized renewable-energy systems will solve the energy crisis or prevent climate collapse.

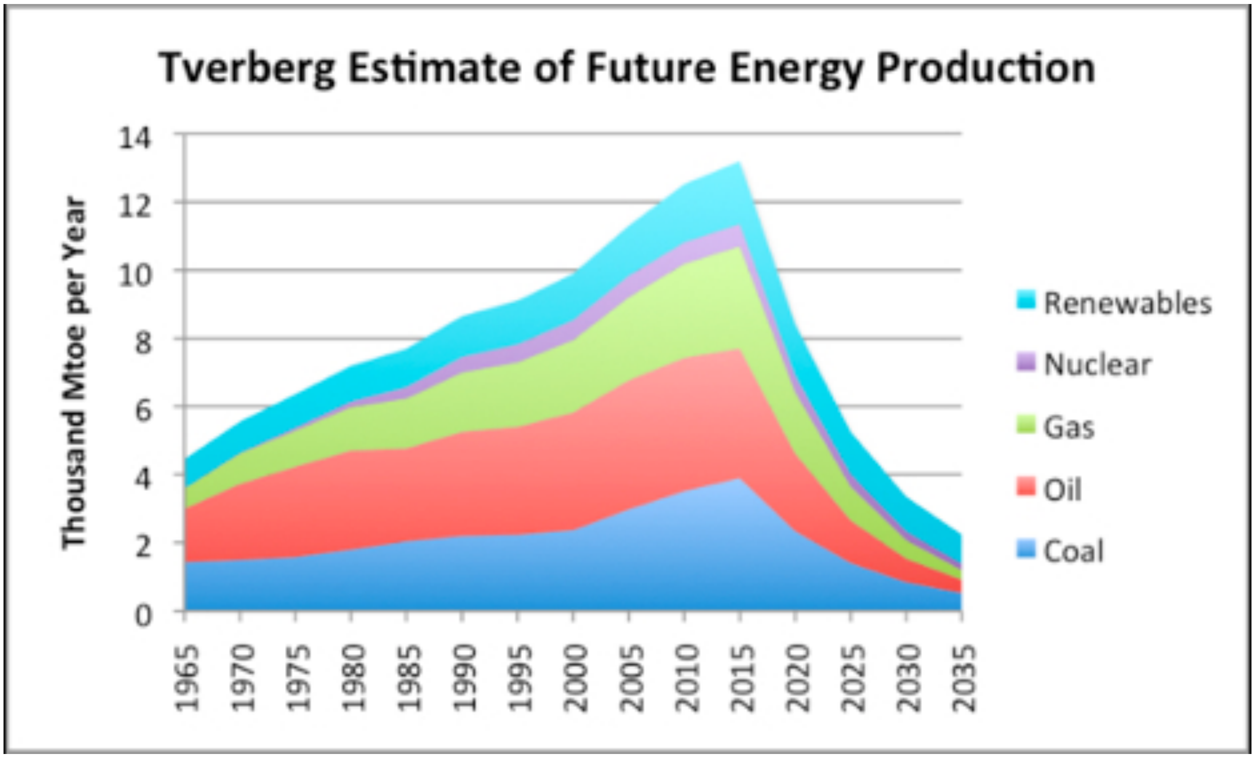
In 2005 the U.S. Department of Energy commissioned a report on peak oil. Known informally as the Hirsch Report, it found that two decades' infrastructure-transformation completion are needed before peak oil hits, to avoid major disruption to the nation. The report found, "the economic, social, and political costs will be unprecedented." Maximized renewable energy efforts cannot change this, and would have had to come on like gangbusters by 1985 along with other major shifts. [1]



based on U.S. Bureau of Census data

Make no mistake, renewable energy systems have almost entirely been put into place to perpetuate endless growth on a finite planet.

Also worthwhile reading for understanding the true and limited potential of "renewable" energy technology systems on a large scale is **Eight Pitfalls in Evaluating Green Energy Solutions** by Gail Tverberg. She gets into her subject with:
"Does the recent climate accord between US and China mean that many countries will now forge ahead with renewables and other green solutions? I think that there are more pitfalls than many realize." She concluded,



Historical based on BP 2013 Statistical Review of World Energy, IEA groupings

"Expectations for wind and solar PV need to be reduced. Solar PV and offshore wind are both likely net energy sinks because of storage and balancing needs, if they are added to the electric grid in more than very small amounts. Onshore wind is less bad, but it needs to be evaluated closely in each particular location. The need for large subsidies should be a red flag that costs are likely to be high, both short and long term. Another consideration is that wind is likely to have a short lifespan if oil supplies are interrupted, because of its frequent need for replacement parts from around the world."

Tverberg's eight pitfalls are:

(1) Green solutions tend to push us from one set of resources that are a problem today (fossil fuels) to other resources that are likely to be problems in the longer term.

(2) Green solutions that use rare minerals are likely not very scalable because of quantity limits and low recycling rates.

Gail Tverberg, photo from ExtraEnvironmentalist.com

(3) High-cost energy sources are the opposite of the "gift that keeps on giving." Instead, they often represent the "subsidy that keeps on taking."

(4) Green technology (including renewables) can only be add-ons to the fossil fuel system.

(5) We can't expect oil prices to keep rising because of affordability issues.

(6) It is often difficult to get the finances for an electrical system that uses intermittent renewables to work out well.

(7) Adding intermittent renewables to the electric grid makes the operation of the grid more complex and more difficult to manage. We run the risk of more blackouts and eventual failure of the grid.

(8) A person needs to be very careful in looking at studies that claim to show favorable performance for intermittent renewables.

Solar and wind power share a twin Achilles Heel: storage of energy during intermittency, and low net-energy return on energy invested. In **The Catch-22 of Energy Storage** by John Morgan of the Energy Collective, his research found

Several recent analyses of the inputs to our energy systems indicate that, against expectations, energy storage cannot solve the problem of intermittency of wind or solar power. Not for reasons of technical performance, cost, or storage capacity, but for something more intractable: there is not enough surplus energy left over after construction of the generators and the storage system to power our present civilization.

The problem is analysed in an important paper by Weißbach *et al* in terms of energy returned on energy invested, or EROEI – the ratio of the energy produced over the life of a power plant to the energy that was required to build it. It takes energy to make a power plant – to manufacture its components, mine the fuel, and so on. The power plant needs to make at least this much energy to break even. A break-even powerplant has an EROEI of 1. But such a plant would pointless, as there is no energy surplus to do the useful things we use energy for.

There is a minimum EROEI, greater than 1, that is required for an energy source to be able to run society. An energy system must produce a surplus large enough to sustain things like food production, hospitals, and universities to train the engineers to build the plant, transport, construction, and all the elements of the civilization in which it is embedded...

Although renewable energy doesn't live off sun alone -- it needs metals, semiconductors, ceramics and more -- Resilience.org standby Ugo Bardi's recent investigation in**Renewable energy: does it need critically rare materials?** did not find a major problem with rare-metals supply for solar or other renewable energy systems.

By now a more alert consumer of energy news can keep renewable energy developments in a big-picture perspective. We hear how Germany can be a solar success, so why can't the U.S.; we hear Denmark has built more windmills, and that renewable energy is getting cheaper and more efficient. These claims bypass or hide so much of the whole story that we miss the fact that we are witnessing a bubble created for the purpose of stoking investment and more subsidies.

An example of trumpeting solar power's slow triumph over petroleum -- despite the disparate kinds of energy involved, and total absence of discussion on the need to immediately slash energy use in general -- is Bloomberg's Oct. 29, 2014 report **While You Were Getting Worked Up Over Oil Prices, This Just Happened to Solar**, by Tom Randall:

After years of struggling against cheap natural gas prices and variable subsidies, solar electricity is on track to be as cheap or cheaper than average electricity-bill prices in 47 U.S. states -- in 2016, according to a Deutsche Bank report published this week.

That's assuming the U.S. maintains its 30 percent tax credit on system costs, which is set to expire that same year...

Yet, the report reveals the amazing expectations of major analysts: "Solar will be the world's biggest single source of electricity by 2050, according to a recent estimate by the International Energy Agency. Currently, it's responsible for*just a fraction of one percent*." [emphasis added.] It's as if petroleum's role in solar panels and the grid is negligible, or that solar panels can magically supply farm chemicals to grow the food that petroleum has been doing.

Oil Grows in Instability and Danger As It Goes Away Geologically

Falling oil prices of late, to four-year lows, are not only bad news: these are deceptively low prices. Because of direct and hidden subsidies, the real cost of oil to consumers is a few times the nominal price, i.e., a few hundred dollars per barrel. This true high price has for several years pinched off growth of the economy, and made people struggle when buying not just oil products but anything with a significant imbedded-energy cost such as food and manufactured products. Still, low oil prices are bad news for the environment, such as enabling more transport-sector pollution. If it mattered more, low oil prices that hurt renewable energy investment would be tragic. This report with its Tale of Three Studies, and further information below, puts the matter into perspective.

It is precisely because the most desirable crude oil fields are rapidly depleting and new discoveries have trended downward for decades, it is alarming that oil dependence is at its height. More accurately it is at a brief plateau, from a long-range historical perspective. Renewable energy systems and conservation have not emancipated modern society from oil, and are not on track to do so except in conditional scenarios that ignore far too much, such as population size. The dwindling supply of oil with no equivalent energy-substitution means that the rising vulnerability to oil shock and the end of plentiful supplies extends to a breaking point on the relatively near horizon. There are "Things to Know As Collapse Becomes Hip" [2]

Exuberance for continued profligate energy consumption flows not only from knee-jerk faith in technology for "renewable" energy. Claims that the U.S. has regained the role of top producer of oil worldwide obscure energy reality for the unsuspecting public, even though the U.S. is not a significant petroleum exporter and is still a gross importer of oil. To help discredit the hoopla, Matt Mushalik recently showed in Crude Oil Peak and Resilience.org that **US Oil Dependency on Middle East has Hardly Changed Since 2007**. Obviously, renewable energy did not manage to enable a different trend.

Although unconventional forms of petroleum in the Americas do not offer a ride up Consumerland Peak, they are extremely dangerous. The chart here on Fossil Fuels Emissions shows the relative potential for tar sands emissions, described as conservative by the makers of the chart.

A new Huffington Post article republished on Resilence.org is myth-busting: in **Challenging (Crude) Convention**, three researchers found that "US shale-oil production is likely to peak in 2017-18." The article warns, "It is imperative, then, that American policy makers and people recognize that the fracking-enabled spike in US crude oil production most likely represents only a temporary reprieve from the declining production levels experienced from 1970 to 2005."

The authors' findings and warnings about the very capital-intensive, short-lived U.S. oil bonanza lead us to a cautionary pronouncement on "renewable" energy as well: without the continuously greased oil infrastructure for the entire corporate global economy, "renewable" energy for the grid is similarly constrained, for the reasons explained above, as it fails to deliver the wide-eyed dreams held by many environmentalists and investors.

The article's authors Daniel Davis, David Hughes, and Mark Lewis seemed to miss that point, mentioning that "The quality and efficiency of solar power and wind turbines continues to improve and we should encourage further development." Primarily for climate concerns, the authors support those technologies to get industrial society beyond the internal combustion engine. The authors invoke the Paris UN climate conference in 2015 for the "need to accelerate investment and research into alternative means of energy creation."

This stance made the most sense decades ago when inefficiency reinged, but without the older stance of curtailing energy use for simple living, climate protection and resilience for modern society are extremely doubtful. The authors say, "it would be prudent to begin more aggressively investing in creative new means of powering the economy." But, considering what we know about energy-alternatives, would it not be more responsible (and cheaper) to anticipate oil-related collapse and pursue rapid curtailment of energy consumption? To set sails, ride more bicycles, go car-free, depave, grow food locally, and share appliances between families? Shower with a friend to save water?

The large renewable energy systems cannot be a realistic centerpiece of climate protection. Nor do they offer a way out of petrocollapse. People are happy to embrace a silver bullet to solve the energy and climate dilemmas, but changing their lifestyles is too inconvenient and psychologically threatening. What would fellow yuppie colleagues at the office say if one showed up on a bicycle and had downsized the home? This poses no social-acceptance problem in most of the world, but for the U.S. -- land of Happy

Motoring and the American Dream of the two-car garage -- consumers cling to technological progress to further insulate them from Mother Nature and her terrifying animals and storms.

Meanwhile in bike-friendly northern Europe, "the Crisis" (post 2008 meltdown) is, with hoped-for able leadership and non-austerity compassion, supposed to abate. It is fervently wished for, so that middle class consumer equality -- cars, jet vacations, restaurant bliss and the like -- can get back on track. But even without the petroleum-rich Russian Bear's being upset over Ukraine, and even without wars in the Middle East, growth as we know it is history. Stability as we know it is also history. It does not help that simple living -- closer to nature and one's local economy, brought about by energy curtailment -- is so equated with "doom and gloom."

Cars Are Renewable?

courtesy Sheerness Imports for Dealers

A key article related to addressing the notion of "clean, renewable" energy's saving the consumer lifestyle is the recent **Tesla, Leaf: Unclean at Any Speed?** by Ozzie Zehner, author of *Green Illusions*. Zehner was a car buff, an electric one at that, but he has found that "clean cars" and therefore cars in general have no long-term future.

The title harkens back to Ralph Nader's seminal consumerist study published in 1965: *Unsafe at Any Speed*: *The Designed-In Dangers of the American Automobile*. The two cars Nader gained fame for attacking were the Volkswagon Bug and General Motors' Corvair compact. The book was shocking at the time. The world had only begun to suspect the post-World War II corporate world of major fraud, thanks to the earlier book in 1960 by Vance Packard, *The Waste Makers* which introduced us to manufacturers' hidden strategy of planned obsolescence for products.

The "Tesla, Leaf" study's author, Ozzie Zehner, deflects car lovers' emotional wrath against his non-technofix position by opening with "I was once an electric car enthusiast. I even built one! But in my new IEEE cover feature, I ask, 'Are electric among the cleanest transportation options, or among the dirtiest?' Unclean at Any Speed considers the entire life cycle of electric cars, especially their manufacturing impacts..." (Zehner is a University of California at Berkeley visiting scholar.)

Additional points we frequently make to car enthusiasts who think electric or some non-petroleum propulsion will save the day:

• The approximate one million animals a day slaughtered on U.S. roads have no reason to cheer. The animals are forgotten consistently.

• In the U.S. the human death toll from crashes is 25,000 a year. Injuries are much higher, as is the death & injury toll from the sedentary lifestyle of driving.

• A car company exemplifies the opposite of local economic self-reliance because almost all the money for a new car purchase leaves the community.

• Why contribute to urban sprawl, as cars require space needed for growing food and leaving some room for wildlife? Pavement, tarmac and asphalt rooftops add to the urban heat island effect.

• Roads fragment wildlife habitat and drive away top predators. Roads allow access for clear-cutters of forests, and contribute to population growth through migration. Roads cause much erosion resulting in siltation of salmon-spawning streams.

• Ultimately the car is an entropy heap. Toxic, unsightly waste, slightly recyclable.

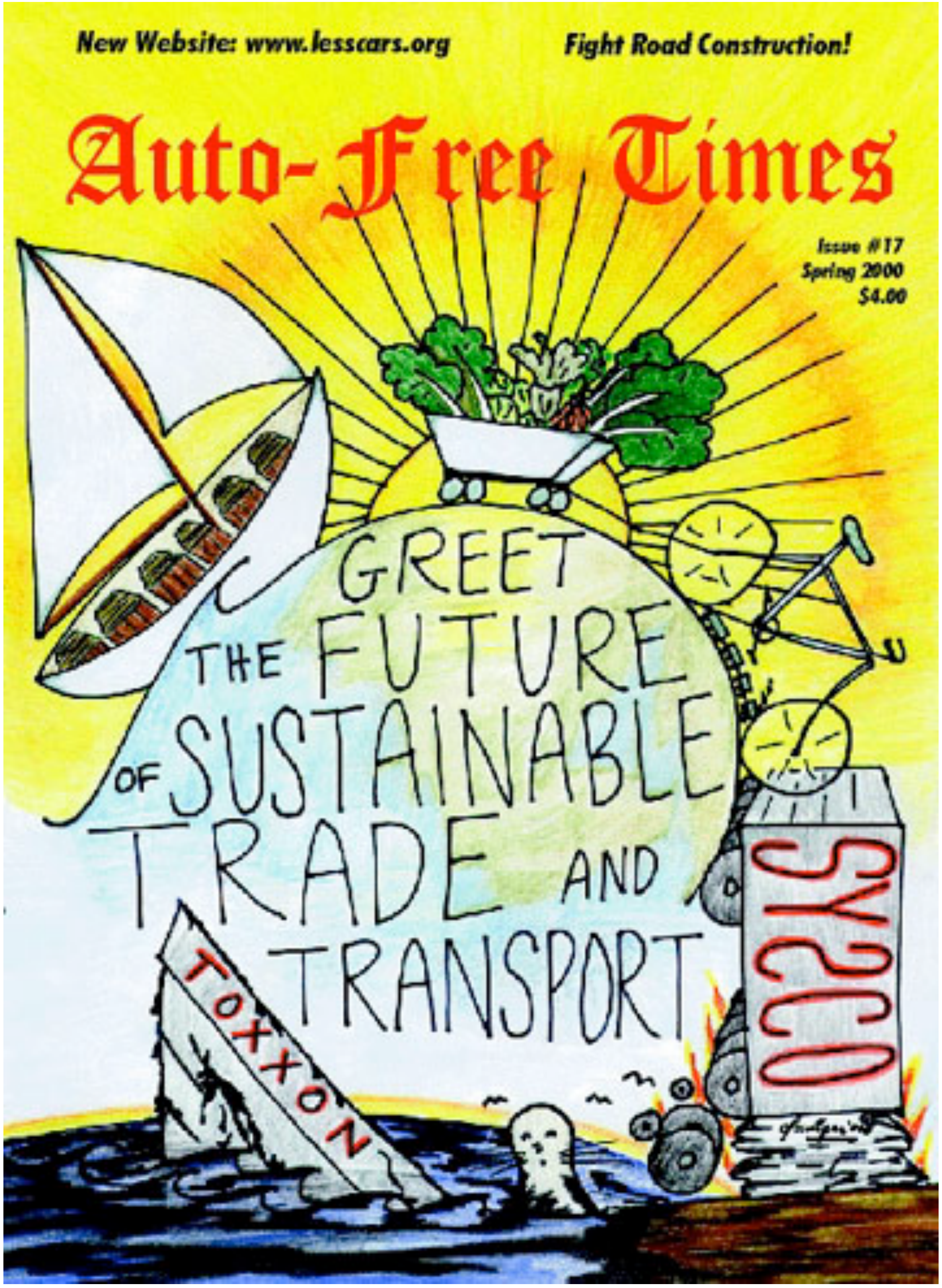
by Andy Singer

• The actual speed of the American motorist is approximately 5 (five) miles per hour, when all the time associated with the vehicle's purchase cost and upkeep is considered. (source: Ivan Illich's book *Energy and Equity*, 1974, part of his series on alternatives to industrial society)

• Think also of the billions of tires and tons of plastic from Big Oil. And are brake dust, tire dust what children and animals deserve to breathe?

• Get your exercise on a bicycle and don't threaten others with a killing machine.

Conclusion



Launch of the Sail Transport Network, reported by our organization in 2000

Apart from passive solar installations -- e.g., black-painted water tanks on roofs for warming water -- and **sail power** for truly clean transport on the water, renewable energy systems on an industrial scale for the grid have delivered neither the quantity of energy nor done so in a truly clean-source fashion to significantly cut fossil fuel consumption. Instead, renewable energy output has, in effect, been used to shore up growth of the corporate global economy's precarious petroleum infrastructure. Renewable energy systems have gotten almost nowhere without massive imbedded energy from the petroleum industry. Given the actual carbon footprint of renewable energy systems, it is not surprising there has been no decrease in overall carbon emissions with the advent of solar panels, wind turbines, and other "renewables."

Alternatives to industrial society have been in the making from Day One, when Luddites destroyed factory machines over two centuries ago in England, to protect their village way of life for their survival. The 1960s saw a rejection of Plastic Society, the War Machine, and a move to go Back to the Land. The "Appropriate Tech" movement of the 1970s followed, exemplified by The Farm in Tennessee that was the nation's biggest commune. Today there are remnants of the Back to the Land movement, along with a sail transport movement back to the sea.

Appropriate Tech has gone out of style, as renewable energy was forced to "grow up," cut the long hair, put on a suit and tie, and try to power the global corporate economy. When Appropriate Tech was twisted and betrayed to "mature" into large-scale "renewable" energy systems, it was a lot like organic food gardens and homesteads giving way to agribusiness "organic" large-scale farms that deplete topsoil and ship product very long distances with oil. But as long as there is ample oil -- subsidized so as to look affordable, during the peak-oil plateau -- little will change in the corporate global economy. This is despite renewable energy systems which have become part of business-as-usual for the totally unsustainable consumer economy.

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1. Peak oil study by Robert Hirsch, et al, for the U.S. Dept. of Energy: **Peaking of World Oil Production: Impacts, Mitigation and Risk Management**, early 2005.

2. **Things to Know as Collapse Becomes Hip** August 24, 2013, by Jan Lundberg, Truthout.org Op-Ed

In "Six Myths About Climate Change that Liberals Rarely Question," Erik Lindberg looks at renewable energy's hopeless but hoped-for role for saving the climate and the consumer economy. Scroll down to **Myth #3: Renewable Energy Can Replace Fossil Fuels**. Nov. 26, 2014

Peak Frack, Hydraulic fracturing of petroleum, in a nutshell.

Why Wind Farms Can Be Relied On For Almost Zero Power, The Energy Collective, November 17, 2014: "In every country aggregate wind farm output often goes close to zero...[so] Wind farms can reliably supply less than 1% of installed capacity"

Beyond Oil: The Threat to Food and Fuel in the Coming Decades, a 1986 book and econometric model about peak oil, reviewed by Jan Lundberg in 1988 originally for *Population and Environment* quarterly journal.

Culture Change operated the Alliance for a Paving Moratorium against new road construction from 1990-2001, publishing the **Auto-Free Times** magazine and Road Fighters' Alerts.

A conference on energy- and resource-consumption curtailment and simple living was held November 7-9, 2014, by **Community Solutions** Yellow Springs, Ohio.

***Publisher's note*:**

Although I have publicly switched my work emphasis to sail transport, I have practical reason for continuing to concern myself with industrial/consumer renewable energy systems. Apart from an abiding interest in helping people understand the workings of oil industry supply dynamics, and understand how the entire energy sector is affected, I need to be current on the realities of both "the technofix" for oil dependence and the ballyhooed oil bonanza in the U.S. oil patch, because:

When my colleagues and I are promoting sail transport as truly renewable, clean energy, this almost unique advantage is not enough for some. This is because the consumer economy gets more patience and assumed longevity with every new "optimistic" news report on petroleum or renewables. Oil-intensive consuming will thereby confidently chug along, supposedly, with no end of oil-guzzling conventional shipping. Either oil is mistakenly seen as plentiful for the foreseeable future, or renewable energy is "certainly" stepping in to allow for sustainable consuming and polluting. Yet, some of us see the inevitability of local economics and ocean protection becoming the norm, sooner than many think likely, enabled by a growing global sailing fleet for essential travel and exchange of goods. - *Jan Lundberg, independent oil industry analyst and founder,* **Sail Transport Network**

Acknowledgment: the green plug graphic is courtesy **greenretaildecisions.com** in its coverage of "EPA Launches Green Power Resource Library," or **4liberty.eu**.

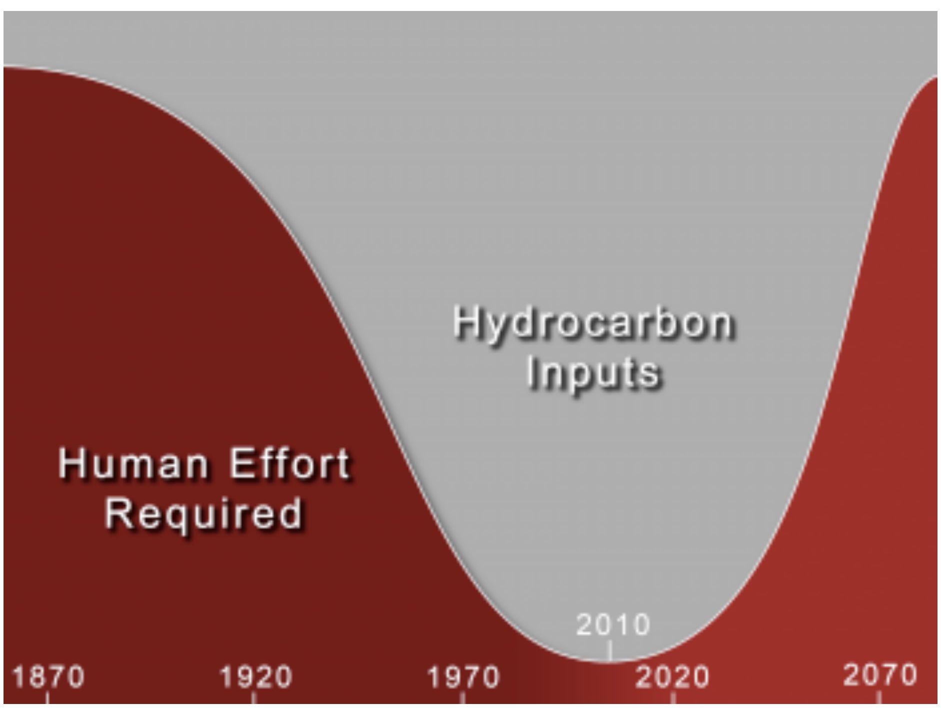
Andrew Nikiforuk's latest book, The Energy of Slaves

http://www.dmpibooks.com/book/the-energy-of-slaves

Excerpt:

Ancient civilizations routinely relied on shackled human muscle. It took the energy of slaves to plant crops, clothe emperors, and build cities. In the early nineteenth century, the slave trade became one of the most profitable enterprises on the planet, and slaveholders viewed religious critics as hostilely as oil companies now regard environmentalists. Yet when the abolition movement finally triumphed in the 1850s, it had an invisible ally: coal and oil. As the world's most portable and versatile workers, fossil fuels dramatically replenished slavery's ranks with combustion engines and other labour-saving tools. Since then, oil has transformed politics, economics, science, agriculture, gender, and even our concept of happiness. But as Andrew Nikiforuk argues in this provocative new book, we still behave like slaveholders in the way we use energy, and that urgently needs to change.

Many North Americans and Europeans today enjoy lifestyles as extravagant as those of Caribbean plantation owners. Like slaveholders, we feel entitled to surplus energy and rationalize inequality, even barbarity, to get it. But endless growth is an illusion, and now that half of the world's oil has been burned, our energy slaves are becoming more expensive by the day. What we need, Nikiforuk argues, is a radical new emancipation movement.



www.mbendi.co.za/indy/oilg/p0070.htm

geologist Colin Campbell on peak of oil production (2000)

Peak oil is a turning point for Mankind. The economic prosperity of the 20th Century was driven by cheap, oil-based energy. Everyone had the equivalent of several unpaid and unfed slaves to do his work for him, but now these slaves are getting old and won't work much longer. We have an urgent need to find how to live without them.

It is stressed that we are not facing a re-run of the Oil Shocks of the 1970s. They were like the tremors before an earthquake, although serious enough, tipping the World into recession. Now, we face the earthquake itself. This shock is very different. It is driven by resource constraints, not politics - although of course politics do enter into it. It is not a temporary interruption but the onset of a permanent new condition.

http://www.greens.org/s-r/60/60-09.html

Synthesis/Regeneration 60 (Winter 2013)

greens.org: A Critique of Jacobson and Delucchi's Proposals for a World Renewable Energy Supply

by Ted Trainer

Mark Jacobson and Mark Delucchi published a claim that all the world's energy needs in 2030, allowing for projected economic growth, can be met with wind, water and solar power. They assume that energy efficiency can reduce demand for energy by 5–15% by 2030. —Editors

Advocates of renewable energy technologies frequently refer to the many available and potential ways of reducing the effect of variability of renew able energy. However they usually do not show that these could be combined to enable constant energy delivery to the grid despite the magnitude of the shortfalls that typically occur in supply from renewable sources. Jacobson and Delucchi (2011a, 2011b) list possible strategies but do not show that these can provide the necessary quantities of energy to plug gaps in supply.

http://www.greens.org/s-r/48/48-11.html

greens.org:
Renewable Energy Cannot Sustain a Consumer Society

by Ted Trainer

Sustainable Solutions?

... a problem calls for a solution; the only question is whether a solution can be found and made to work and, once this is done, the problem is solved.
A predicament, by contrast, has no solution. Faced with a predicament, people come up with responses. Those responses may succeed, they may fail, or they may fall somewhere in between, but none of them "solves" the predicament, in the sense that none of them makes it go away.
-- John Michael Greer, "The Long Descent" thearchdruidreport.blogspot.com

http://www.postcarbon.org/why-should-we-even-bother/
Why should we even bother?
Asher Miller
December 29, 2014

Let's be honest, if you're aware — at any meaningful level — of the full nature of the human (un)sustainability crisis, you've probably asked:

Why bother? After all, the problems are so big and intractable–a climate march, Keystone XL Pipeline blockade, or Transition Town can't possibly do much. And Post Carbon Institute wants me to not only take action, but also donate money?!?!

Yes. I want you take action. We all need to take action. And, yes, donate money (even if you don't believe in the US dollar!). Because it's not hopeless.

Trust me, I get it. Given the long odds — exacerbated by the human propensity to optimism and discounting the future in favor of the present, the power and reach of entrenched interests, and the sheer inertia behind the consumer- and growth-dependent economy — it's hard to believe in solutions.

I'm going to give it to you straight: *there are no solutions*, at least not ones that will allow the society we've created to continue on its "business as usual" trajectory. (No, not even with a massive deployment of renewable energy.)

But that doesn't mean it's hopeless, that we (and you) shouldn't even bother to try. Here's our best thinking for why and how to intervene in the system — and why your role is absolutely critical.

If you're reading this, we count you among the small but growing number of innovators and early adopters who play an absolutely critical role in developing alternatives to existing policies and practices, to keep them alive and available for the moment they're needed. Here's why.

Change Strategy

In our view, the nature of the predicament we face is such that proactive efforts at mitigating its impacts — while still highly valuable — are insufficient to prevent severe crises. In fact, it will be unfolding crises in our economic, energy, ecological, and socio-political systems that create the greatest opportunity for change.

Therefore, the question before us is this: How can we anticipate these crises, build resilience to withstand them, and begin efforts that create change so that society can be ready to take decisive and appropriate action when they arise?

Our strategy responds to this question in three ways:

Support communities as they build resilience to withstand existing and coming challenges;

Help prevent the worst kinds of shocks or changes—those to which we simply cannot adapt; and

Transform cultural norms and economic, energy, food, built environment, population, and socio-political systems to help to steer humanity down a truly sustainable path.

In this effort we are guided by two theories—summarized as “Crisis = Opportunity” and “The Diffusion of Innovation.”

Crisis = Opportunity

In *The Shock Doctrine*: *The Rise of Disaster Capitalism*, Naomi Klein detailed how “free market” advocates and corporations have taken advantage of crises to further their aims. The following quote from Milton Friedman, the guru of free market economics, best outlines their strategy:

Only a crisis — actual or perceived — produces real change. When the crisis occurs, the actions that are taken depend on the ideas that are lying around. That, I believe, is our basic function: to develop alternatives to existing policies, to keep them alive and available until the politically impossible becomes politically inevitable.

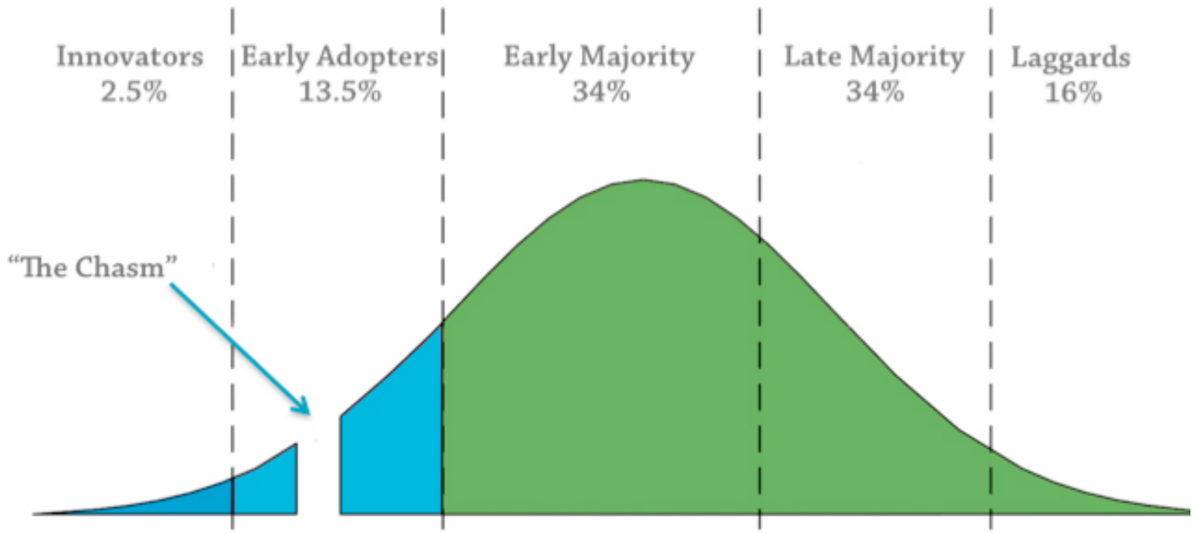
Although the philosophical views and values of the neoclassicists are in many ways antithetical to our own, this framework is very applicable to our mission. What this means in tactical terms is a change strategy focused on two main levers:

Building awareness of the true nature of the predicament at hand. Although key decision makers and society at large may not adopt the right policies and behavioral changes in advance of crises, communication and education strategies are vital in ensuring that the right ideas and models are “picked up” when the right moments arise.

Developing, replicating, and scaling the right ideas and models. Although these alternative ideas and models (which can include everything from alternative indicators of progress to replicable local food enterprises) may exist initially at the margins, current events and coming crises will present opportunities for them to be broadly adopted and quickly built out. Therefore, it is vital to use the time and resources available now to experiment and create best practices—to build alternatives that have the greatest chance of both being “picked up” and succeeding.

Diffusion of Innovations

The Diffusion of Innovations theory describes how, why, and at what rate new ideas, social innovations, and technology spread throughout our culture. Key to the theory is the identification of different types of individuals in the population, in terms of how they relate to the development and adoption of a new innovation: innovators, early adopters, early majority, late majority, and laggards.



The Innovation Adoption Lifecycle

Although they make up only a small percentage of the total population, innovators and early adopters build the foundation upon which all social innovations take place. The role of innovators is obvious. The equally critical role of early adopters is to embrace a new innovation when it is not easy to do so, and in turn spread that innovation to the early majority. Studies of hundreds of innovations (both successful and those that failed to catch on) have shown the critical role both groups play and what happens when innovations don't cross “the chasm” by failing to attract enough early adopters.

In the context of PCI's work, innovators are those developing new insights, messages, or models (e.g., a local food system enterprise) that raise understanding of one or more specific sustainability crisis and/or build resilience in response. Likewise, early adopters are those people most likely to embrace our message of limits and resilience, help spread that awareness, and take action. They may already be engaged with one specific sustainability issue (e.g., climate) or are amongst a group we call “the walking worried"—those who feel that things are amiss, but don't know what or why (and thus initiate their own process of exploration, or are exposed through their networks to innovators or early adopters).

Diffusion + Crisis

We see the greatest opportunity for significant change where diffusion and crises meet. Knowing that many crises cannot be solved or averted, Post Carbon Institute aims to develop and spread the right understanding, ideas, and responses (by supporting innovators). We also work to increase the odds that these are then embraced when these crisis hit (by increasing the number of early adopters).

We Need You. Seriously.

The focus on supporting innovators and early adopters, along with the spreading of a systemic understanding of the sustainability crisis, is why we at PCI have been so focused on building energy literacy and community resilience. Over the next year, we aim to expand these efforts by:

Exploring what kinds of societal and behavioral changes a ~100% renewable energy future will require.

Continuing to bust the hype that shale gas and oil will solve our energy woes.

Investigating with geoscientists how climate change and peak oil interact.

Developing a whole suite of new community resilience programs that provide a systemic framework for building resilience, educate and support young people for the world they've inherited, and connect and inspire thousands of community resilience groups and innovators.

This is where you come in. As a follower of PCI, we count among the small but growing number of innovators and early adopters who play an absolutely critical role in "*developing alternatives to existing policies, to keep them alive and available until the politically impossible becomes politically inevitable.*" It's **you** who PCI works so tirelessly to support. *We need you.*

When we are honest with ourselves, it seems clear that climate, energy, environmental, economic, and political crises are inevitable. What form they take we can't rightly predict. But in those moments of crisis new possibilities will emerge. On our shoulders — those of us who understand the predicament and what is required for true sustainability — lies the responsibility and privilege of ensuring that the right ideas are picked up. We sincerely believe there's tremendous potential for the "right" understanding and models to scale non-linearly, if we make the "right" efforts now.

So, we hope you'll continue to roll up your shirt sleeves by spreading knowledge and developing alternatives. And, yes, we ask that you also support PCI directly. Thank you.

http://www.theoildrum.com/node/5939

Scientific American's Path to Sustainability: Let's Think about the Details

Posted by Gail the Actuary on November 9, 2009 - 10:10am
Topic: Alternative energy
Tags: hydroelectric, scientific american, solar photovoltaic, solar power, sustainability, wind [list all tags]

Scientific American presents "A Path to Sustainable Energy by 2030" in its November issue. In many ways, it sounds good. But let's think about the details: What would the end result look like? Would it really be sustainable? What would the costs really be? Is there any way we could afford to do what is proposed?

The authors of the article, Mark Jacobson and Mark Delucchi, propose substituting wind, water, and solar (WWS) energy for all other forms of energy by 2030, not for just the US, but for the world. The types of energy sources that would be eliminated include the following:

- Petroleum (including gasoline, diesel, propane, heating oil, etc.)
- Natural gas
- Coal
- Liquid biofuels, such as ethanol
- Wood and other biomass
- Nuclear

All that would remain would be wind, wave power, tidal energy, hydroelectric, geothermal, and solar. Because of the ambitious timeframe, the only techniques that can be used are ones that work at large scale today, or are very close to working.

What would we end up with?

Essentially, we would need to change all of the world's infrastructure to use either electricity or solar or water power directly--by 2030. What might this mean?

- Airplanes. The authors propose that airplanes be powered by hydrogen powered fuel cells (with the hydrogen be made by hydrolysis using WWS energy sources). I understand that hydrogen is three times as bulky as gasoline, explodes easily, and escapes fairly quickly from its holding tanks, making it difficult to store for very long. It seems like airplanes and helicopters would need to look more like blimps, to hold the necessary fuel. Unless the explosion issue is solved, the popularity of hydrogen fuel cells would likely be pretty low.

- Ships. The authors don't tell us how ships would be powered. Clearly sailing ships would meet the criteria, but would be quite slow. Because of their slow time for passage, we would need a lot more sailing ships than the types of ships we use now, because so many would be in transit at a given time. Barges could float down rivers, and if the current isn't too strong, could perhaps be towed back in some way (boat with fuel cell?). Ships powered by hydrogen fuel cells might also work, but they would have the same issues as for airplanes. Because of their long trips, leakage would be more of an issue than on airplanes.
- Automobiles and Trucks. According to the authors, these would be powered by batteries or hydrogen powered fuel cells. There are several issues--the technology is only barely there for automobiles and trucks--for example, I don't know of anyone working on battery-powered technology for long distance trucking. Fuel cell technology is very expensive. David Strahan in The Last Oil Shock says that the current cost is about $1 million dollars per car. He quotes the chief engineer at Honda as saying it would take 10 years to get the cost down to $100,000 a car.

Minerals shortages are also likely to be a problem for converting autos and trucks to batteries or to hydrogen fuel cells. The Scientific American article mentions following materials as being in short supply: rare-earth metals for electric motors, lithium for lithium-ion batteries and platinum for fuel cells. The article mentions recycling as a partial solution. Analyses published at The Oil Drum, such as this one, indicate that we would likely run out of rare materials fairly quickly, even with recycling.

- Farm equipment; bulldozers; cement mixers; and other heavy equipment. Would need to be converted to electric. It is not clear that the technology (or rare materials needed for the technology) exist to do so.
- Heating of buildings; heating for cooking and baking; hot water heating; commercial heating; heating of grains to remove excess moisture. Would need to be converted to electric, or in some cases solar. This would be true, even where heating is now done over wood or charcoal fires, such as in Africa or China.
- Mining and manufacturing. Would need to be converted to all electric. Presumably oil and natural gas extraction would continue, but at possibly lower rates, because of their uses for non-energy uses, such as textiles, asphalt, plastics and lubrication. Drilling for oil and gas would be converted to electric as well.

What steps would be needed to build all of these things?

It seems like we would first need to figure out what the end point would look like, and then work backwards.

We are told that the authors of the Scientific American article think we would need the following:

- 3.8 million large wind turbines
- 90,000 solar electricity generating plants
- "Numerous geothermal, tidal, and rooftop photovoltaic installations"

Besides these, we would need to build all of the new airplanes, ships, cars, trucks, heavy equipment, and new appliances that would be needed under the new regime. Individual homeowners would need to get their homes rewired for the larger amount of electricity they would use--especially if they are converting to electric home heating.

One thing we need to plan for is a greatly expanded and improved electrical grid. The Scientific American article indicates that the variability in generation would be mostly smoothed out by combining electrical transmission of many different types--wind, hydroelectric, solar, geothermal, and wave--over a wide geographical area. To do this will require considerable long distance transmission, often between different countries--including some that may not be friendly with each other. The grid will also need to be upgraded to be "smart," so automobiles can draw electric power at the times of day when it is not needed elsewhere.

Once we have figured out what the new system will look like, we will need to figure out what kind of factories are needed to build all of the devices for the new system, and what raw materials the factories will need. Some of the raw materials can perhaps be obtained by recycling, and some factories can perhaps be obtained by converting other factories, but this won't always be the case. It is likely that new factories will need to be built, and new mines opened, especially for the rare minerals.

By the time we start seeing many finished good produced, it is likely that we will be at least half way through the 20 year period. In part, this is because we are still working out technology details (for example, how to efficiently build a hydrogen fuel cell powered airplane). Also, once we get those details worked out, we need to build mines for raw materials and build the factories to make the new devices. It is only when we get those steps taken care of that we can build what we really want--the airplanes, the new ships, the wind turbines, the solar PV, and all of the rest.

When sizing the factories, we will need to size them not for "normal" production levels, but for converting the economy quickly to use the new power sources. For example, under normal circumstances, if earth-moving equipment is expected to last for 40 years, we would expect to need factories to make 1/40 of the world's needed earth-moving equipment in a given year. But if we need to ramp up to replacement in 10 years, we will need 4 times as many factories. (What do we do with the excess factories at the end?)

How much would this all cost?

The authors tell us that they expect the cost of the new WWS energy generation equipment would be $100 trillion over 20 years. But that doesn't include the cost of all the new infrastructure to go with it--the new airplanes and ships and cars and trucks, or the electrical transmission lines. In total, the cost will be far higher than $100 trillion--lets guess $200 trillion--to be paid for over the next 20 years.

The Scientific American article gives the impression that the costs will be low, because it looks only at the cost the new electricity generation, and assumes that cost of generation will go down with volume and with additional research. It also implicitly assumes that debt financing over a long period, such as 40 years, will be used, so we don't have to pay for the cost of the new system before we start using it. But how realistic is that?

The cars, trucks, boats, airplanes, coal fired power plants, etc. we are currently using won't have much trade-in value once power is generated by WWS, and the new equipment will likely be fairly expensive. So we will be faced with buying new high priced equipment, with little trade-in value from what we used previously. In many cases, businesses would not normally be replacing equipment this soon. The debt that was taken on to pay for all of our current equipment won't magically go away either--it will still need to be paid.

So how will we pay for all of the new equipment? The governments of the world are pretty much maxed out for borrowing. Companies are not going to be able to take on a project of this magnitude either, especially since they already have debt to service. It seems to me that the only way a program such as the program of WWS fuels replacing other fuels can be financed is through increased taxes that would cover each year's expenditures, as they are made.

So let's think about how much this would cost. $200 trillion over 20 years amounts to $10 trillion a year, spread over world economies. The US share of this would be something around 21%, based on the ratio of US GDP to world GDP. So let's say that the US would need to fund $2.1 trillion a year. Let's compare this to current taxes. In 2008, US Federal, State, and Local taxes combined amounted to $4.1 trillion according to the US Bureau of Economic Analysis. In order to collect $2.1 trillion more, a tax increase equal to slightly more than 50% of all taxes currently paid would be required. If the additional tax were collected as a percentage of "personal income" (which includes wages, social security income, rents, dividends, etc.), it would amount to 17% of personal income. It seems unlikely that a tax of this magnitude, or even half of this magnitude, would be agreed to by tax payers.

If such a tax were passed, after a few years there would be benefits that would start offsetting its cost, and might lead to a lower tax, and after 2030, perhaps lower costs overall, because it is no longer necessary to purchase fossil fuels. The benefits that would start offsetting costs would be sales of electricity and other energy, and sales or leasing of vehicles and other goods produced. Many of the sales of goods would be going to replace automobiles that had worn out, factories beyond their useful life, and ships that no longer had value to the owners.

But there is a remaining issue. There will be a lot of assets which would still have considerable value in 2030, if it weren't for the new law. For example, a new car with an internal combustion engine that was manufactured in 2028 will still have considerable value, and a gas fired stove a homeowner owns will still have value, even though he needs to replace it with an electric one. A coal fired power plant built in 1980 is likely to still have value, apart from this law, and so will all of the tankers used for international transport of oil, and all of the natural gas pipelines. Should the owners of these assets be compensated for value of their otherwise-useful assets? There is nothing built into the tax to do so.

It would seem to me that these owners should be compensated, even if it takes a higher tax to do so. In part, this compensation could come in the form of "trade in" value, if a new automobile or electric stove or other item is purchased. But suppose the assets that lose value belong to businesses, and aren't easily traded in for corresponding asset--such as a coal fired power plant, or natural gas pipelines. I would argue that compensation for the remaining value of these is really needed as well.

The assets that will lose value because of the new law are typically owned by a company. The stocks and bonds of these companies will generally have a wide variety of owners--very often pension plans, insurance companies, endowment funds, and individuals saving for their retirements. If the otherwise-useful assets of these companies are taken without compensation, the companies are likely to default on their bonds, and the stocks of these companies will lose value. This will mean that some pension funds will not be able to pay their promised payments, and some life insurance policies will not pay as promised. If there is no compensation to these companies by a tax or some sort, the loss will flow through the system and hit others--with retirees likely hit the hardest. So there will be a loss to the system, one way or another.

How sustainable would this system be?

There are a number of weak areas in this system:

- There are not likely to be enough rare minerals (and even not-so-rare minerals), to make all of the desired high-tech end products. Recycling will help, but it is likely that the system will run into a bottleneck in not very many years.

- The system will use a huge number of electrical transmission lines. These transmission lines are subject to all kinds of disturbances--hurricane or other windstorm destruction, forest fires, land or snow slide, malicious destruction by those not happy for some reason (perhaps those unhappy by wealth disparities). Fixing lines that need repair will be challenging. We currently use helicopters and specialized equipment. These would need to be adequately adapted to a system without fossil fuels.
- If electricity is out in an area, pretty much all activity in an area will stop (except that powered by local PV), and there will be no back-up generators. Residents will not be able to recharge vehicles, so they will quickly become useless. Even vehicles coming into an area may get stranded for lack of recharge capability. Food deliveries and water may be a problem. The current system at least offers some options--back-up generators, and cars and trucks powered by petroleum that one can drive away.
- Operating the system will require a huge amount of international co-operation, because the transmission system will cross country lines. If one country becomes unable to pay its share, or fails to make repairs, it could be a problem.
- All of the high tech manufacturing will require considerable international co-operation and trade. This could be interrupted by debt defaults by major players, or by countries hoarding raw materials, or by difficulty in producing enough ships and airplanes to handle international trade.
- The system clearly can't continue forever. It could be stopped by a lack of rare minerals, or international disputes, or lack of adequate international trade. The system doesn't provide any natural transition to a truly sustainable future. For example, food production is likely to still be done using industrial agriculture, with the food that is produced shipped to consumers a long distance away. It will be difficult to transition to a system which is truly sustainable at the point the system stops working.

What would a reasonable timeframe for transition be?

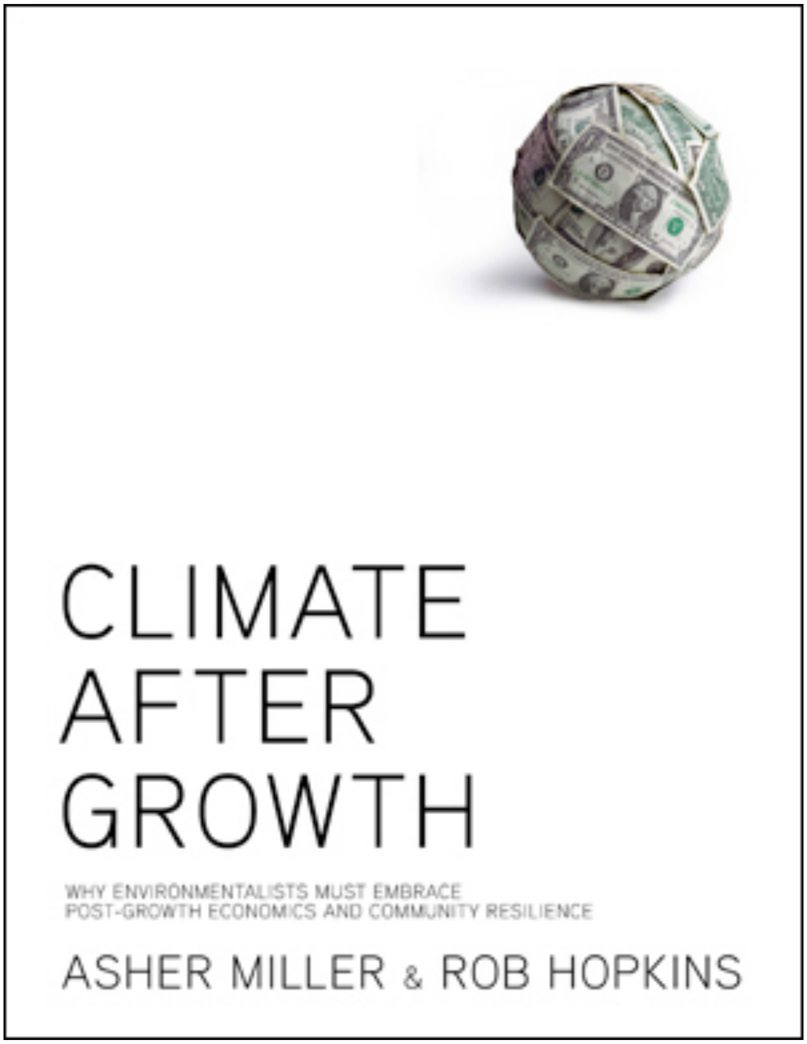
It seems to me that a reasonable timeframe for a transition such as that discussed in the Scientific American article would be 50 years, rather than 20 years suggested in the Scientific American article. With such a timeframe, there will be a little more time to fine tune technology, so as to find cost-efficient solutions that scale well. We also have more time to use the factories that are built, so that we don't have to overbuild, just to meet a deadline. Costs are likely to much easier to handle, since there will not be as much of an overlap issue. In addition, there will be much less problem of having to dispose of other-wise useful assets.

The problem is that we really don't have 50 years to make a transition. We already are on the downslope. We should have started back in the 1960s with a project like this.

It seems to me that all we can do is a very much reduced version of an approach such as the one described in the Scientific American article. Given the timing, we may not even want to do an approach such as described in the article. The approach described assumes a high level of international trade continuing long-term. This is a fairly optimistic assumption, given the difficulty of air and ship transportation without fossil fuels.

Instead of the high tech approach advocated by Scientific American, we may want to find solutions that can be done locally, with local materials. For example, we may want to encourage local agriculture. For industry, we may want to look at solutions that have worked in the past, such as wind powered factories, as discussed in this recent post. These were built with local materials, and were used to power factories directly, without conversion to electricity. With such solutions, a transition to a truly sustainable future will be much more of a possibility.

http://www.postcarbon.org/publications/climate-after-growth/



Climate After Growth: Why Environmentalists Must Embrace Post-Growth Economics and Community Resilience

Rob Hopkins, Asher Miller

September 30, 2013

In this provocative paper, PCI Executive Director Asher Miller and Transition Movement Founder (and PCI Fellow) Rob Hopkins make a convincing case for why the environmental community must embrace post-growth economics and community resilience in their efforts to address the climate crisis.

Executive Summary

The nearly ubiquitous belief of our elected officials is that addressing the climate crisis must come second to ensuring economic growth. This is wrongheaded—both because it underestimates the severity of the climate crisis, and because it presupposes that the old economic "normal" of robust growth can be revived. It can't.

In fact, we have entered an era of "new normals"—not only in our economy, but in our energy and climate systems, as well. The implications are profound:

The New Energy Normal. The era of cheap and easy fossil fuels is over, leading the industry to resort to extreme fossil fuel resources (tar sands, mountaintop removal coal mining, shale gas, tight oil, and deepwater oil) to meet demand. Unfortunately, these resources come with enormous environmental and economic costs, and in most instances provide far less net energy to the rest of society. They also require much higher prices to make production worthwhile, creating a drag effect on the economy. As a result, high energy prices and economic contraction are likely to continue a back-and-forth dance in the coming years.

The New Climate Normal. Climate stability is now a thing of the past. As extreme weather events grow in severity, communities are increasingly adopting strategies that build resilience against the effect of these and other climate shocks. At the same time, we must take dramatic steps if we hope to avoid raising global temperatures more than 2°C above pre-industrial levels. According to Kevin Anderson of the Tyndall Centre, this would require a 10% reduction in CO2 emissions per year, starting now—a rate so significant that it can only be achieved through dramatic reductions in energy use.

The New Economic Normal. We've reached the end of economic growth as we've known it in the US. Despite unprecedented interventions on the part of central banks and governments, the so-called economic recovery in the US and Europe has been anemic and has failed to benefit the majority of citizens. The debate between stimulus and austerity is a distraction, as neither can fully address the factors that spell the end of economic growth—the end of the age of cheap oil, the vast mountains of debt that we have incurred, the diminishing economic impacts of new technologies, and the snowballing costs of climate change impacts.

These fundamental changes in our energy, climate, and economic systems require unprecedented (and previously politically untenable) strategies. Yet this new reality is still largely unrecognized. As long as our leaders' predominant focus remains on getting back to the days of robust economic growth, no national or international climate policies will be enacted to do what is required: cut fossil fuel use dramatically.

Instead of focusing on achieving climate policy within the economic growth paradigm, the US environmental community must embrace strategies that are appropriate to these "new normals."

Responding to each of these new energy, climate, and economic "normals" will require one common strategy: building community resilience. Efforts that build community resilience enhance our ability to navigate the energy, climate, and economic crises of the 21st century. Done right, they can also serve as the foundation of a whole new economy—an economy comprised of people and communities that thrive within the real limits of our beautiful but finite planet.

Thankfully, innovations that build community resilience are cropping up everywhere, and in many forms: community-owned, distributed, renewable energy production; sustainable local food systems; new cooperative business models; sharing economies, re-skilling, and more. While relatively small and inherently local, these projects are spreading rapidly and creating tangible impacts.

Growing the community resilience movement to the national and global scale that's needed will require the full support and participation of the US environmental community. Specifically we need to:

build the capacity of groups—large and small—who are leading these efforts;
support the growth of a global learning network; and
enable local investments to flow into community resilience enterprises.

By making community resilience a top priority, environmentalists can offer an alternative to the "growth at all costs" story, one in which taking control of our basic needs locally has multiple benefits. Community resilience-building can create new enterprises and meaningful work, and increase well-being even as GDP inevitably falters. It can reduce greenhouse gas emissions and dependence on fossil fuels, while addressing social and economic inequities. And it can strengthen the social cohesion necessary to withstand periods of crisis.

On their own, community resilience projects can't overcome all the environmental, energy, economic, and social equity challenges facing us. That will require coordinated global, national, regional, community, business, neighborhood, household and individual efforts. But the community resilience movement can help create the conditions in which what is now "politically impossible becomes politically inevitable."

How the environmental community responds to the risks and opportunities of the new energy, climate, and economic "normals" will make an enormous difference in its success, and in the fate of humankind.

http://www.postcarbon.org/the-oil-price-crash-of-2014/

The Oil Price Crash of 2014, Richard Heinberg, December 19, 2014

Oil prices have fallen by half since late June. This is a significant development for the oil industry and for the global economy, though no one knows exactly how either the industry or the economy will respond in the long run. Since it's almost the end of the year, perhaps this is a good time to stop and ask: (1) Why is this happening? (2) Who wins and who loses over the short term?, and (3) What will be the impacts on oil production in 2015?

1. Why is this happening?

Euan Mearns does a good job of explaining the oil price crash here. Briefly, demand for oil is softening (notably in China, Japan, and Europe) because economic growth is faltering. Meanwhile, the US is importing less petroleum because domestic supplies are increasing—almost entirely due to the frantic pace of drilling in "tight" oil fields in North Dakota and Texas, using hydrofracturing and horizontal drilling technologies—while demand has leveled off.

Usually when there is a mismatch between supply and demand in the global crude market, it is up to Saudi Arabia—the world's top exporter—to ramp production up or down in order to stabilize prices. But this time the Saudis have refused to cut back on production and have instead unilaterally cut prices to customers in Asia, evidently because the Arabian royals *want* prices low. There is speculation that the Saudis wish to punish Russia and Iran for their involvement in Syria and Iraq. Low prices have the added benefit (to Riyadh) of shaking at least some high-cost tight oil, deepwater, and tar sands producers in North America out of the market, thus enhancing Saudi market share.

The media frame this situation as an oil "glut," but it's important to recall the bigger picture: world production of conventional oil (excluding natural gas liquids, tar sands, deepwater, and tight oil) stopped growing in 2005, and has actually declined a bit since then. Nearly all supply growth has come from more costly (and more environmentally ruinous) resources such as tight oil and tar sands. Consequently, oil prices have been very high during this period (with the exception of the deepest, darkest months of the Great Recession). Even at their current depressed level of $55 to $60, petroleum prices are still above the International Energy Agency's high-price scenario for this period contained in forecasts issued a decade ago.

Part of the reason has to do with the fact that costs of exploration and production within the industry have risen dramatically (early this year Steve Kopits of the energy market analytic firm Douglas-Westwood estimated that costs were rising at nearly 11 percent annually).

In short, during this past decade the oil industry has entered a new regime of steeper production costs, slower supply growth, declining resource quality, and higher prices. That all-important context is largely absent from most news stories about the price plunge, but without it recent events are unintelligible. If the current oil market can be characterized as being in a state of "glut," that simply means that at this moment, and at this price, there are more willing sellers than buyers; it shouldn't be taken as a fundamental or long-term indication of resource abundance.

2. Who wins and loses, short-term?

Gail Tverberg does a great job of teasing apart the likely consequences of the oil price slump here. For the US, there will be some tangible benefits from falling gasoline prices: motorists now have more money in their pockets to spend on Christmas gifts. However, there are also perils to the price plunge, and the longer prices remain low, the higher the risk. For the past five years, tight oil and shale gas have been significant drivers of growth in the American economy, adding $300 to 400 billion annually to GDP. States with active shale plays have seen a significant increase of jobs while the rest of the nation has merely sputtered along.

The shale boom seems to have resulted from a combination of high petroleum prices and easy financing: with the Fed keeping interest rates near zero, scores of small oil and gas companies were able to take on enormous amounts of debt so as to pay for the purchase of drilling leases, the rental of rigs, and the expensive process of fracking. This was a tenuous business even in good times, with many companies subsisting on re-sale of leases and creative financing, while failing to show a clear profit on sales of product. Now, if prices remain low, most of these companies will cut back on drilling and some will disappear altogether.

The price rout is hitting Russia quicker and harder than perhaps any other nation. That country is (in most months) the world's biggest producer, and oil and gas provide its main sources of income. As a result of the price crash and US-imposed economic sanctions, the ruble has cratered. Over the short term, Russia's oil and gas companies are somewhat cushioned from impact: they earn high-value US dollars from sales of their products while paying their expenses in rubles that have lost roughly half their value (compared to the dollar) in the past five months. But for the average Russian and for the national government, these are tough times.

There is at least a possibility that the oil price crash has important geopolitical significance. The US and Russia are engaged in what can only be called low-level warfare over Ukraine: Moscow resents what it sees as efforts to wrest that country from its orbit and to surround Russia with NATO bases; Washington, meanwhile, would like to alienate Europe from Russia, thereby heading off long-term economic integration across Eurasia (which, if it were to transpire, would undermine America's "sole superpower" status; see discussion here); Washington also sees Russia's annexation of Crimea as violating international accords. Some argue that the oil price rout resulted from Washington talking Saudi Arabia into flooding the market so as to hammer Russia's economy, thereby neutralizing Moscow's resistance to NATO encirclement (albeit at the price of short-term losses for the US tight oil industry). Russia has recently cemented closer energy and economic ties with China, perhaps partly in response; in view of this latter development, the Saudis' decision to sell oil to China at a discount could be explained as yet another attempt by Washington (via its OPEC proxy) to avert Eurasian economic integration.

Other oil exporting nations with a high-price break-even point—notably Venezuela and Iran, also on Washington's enemies list—are likewise experiencing the price crash as economic catastrophe. But the pain is widely spread: Nigeria has had to redraw its government budget for next year, and North Sea oil production is nearing a point of collapse.

Events are unfolding very quickly, and economic and geopolitical pressures are building. Historically, circumstances like these have sometimes led to major open conflicts, though all-out war between the US and Russia remains unthinkable due to the nuclear deterrents that both nations possess.

If there are indeed elements of US-led geopolitical intrigue at work here (and admittedly this is largely speculation), they carry a serious risk of economic blowback: the oil price plunge appears to be bursting the bubble in high-yield, energy-related junk bonds that, along with rising oil production, helped fuel the American economic "recovery," and it could result not just in layoffs throughout the energy industry but a contagion of fear in the banking sector. Thus the ultimate consequences of the price crash could include a global financial panic (John Michael Greer makes that case persuasively and, as always, quite entertainingly), though it is too soon to consider this as anything more than a possibility.

3. What will be the impacts for oil production?

There's actually some good news for the oil industry in all of this: costs of production will almost certainly decline during the next few months. Companies will cut expenses wherever they can (watch out, middle-level managers!). As drilling rigs are idled, rental costs for rigs will fall. Since the price of oil is an ingredient in the price of just about everything else, cheaper oil will reduce the costs of logistics and oil transport by rail and tanker. Producers will defer investments. Companies will focus only on the most productive, lowest-cost drilling locations, and this will again lower averaged industry costs. In short order, the industry will be advertising itself to investors as newly lean and mean. But the main underlying reason production costs were rising during the past decade—declining resource quality as older conventional oil reservoirs dry up—hasn't gone away. And those most productive, lowest-cost drilling locations (also known as "sweet spots") are limited in size and number.

The industry is putting on a brave face, and for good reason. Companies in the shale patch need to look profitable in order to keep the value of their bonds from evaporating. Major oil companies largely stayed clear of involvement in the tight oil boom; nevertheless, low prices will force them to cut back on upstream investment as well. Drilling will not cease; it will merely contract (the number of new US oil and gas well permits issued in November fell by 40 percent from the previous month). Many companies have no choice but to continue pursuing projects to which they are already financially committed, so we won't see substantial production declines for several months. Production from Canada's tar sands will probably continue at its current pace, but will not expand since new projects will require an oil price at or higher than the current level in order to break even.

As analysis by David Hughes of Post Carbon Institute shows, even without the price crash production in the Bakken and Eagle Ford plays would have been expected to peak and begin a sharp decline within the next two or three years. The price crash can only hasten that inevitable inflection point.

How much and how fast will world oil production fall? Euan Mearns offers three scenarios; in the most likely of these (in his opinion) world production capacity will contract by about two million barrels per day over the next two years as a result of the price collapse.

We may be witnessing one of history's little ironies: the historic commencement of an inevitable, overall, persistent decline of world liquid fuels production may be ushered in not by skyrocketing oil prices such as we saw in the 1970s or in 2008, but by a price crash that at least some pundits are spinning as the death of "peak oil." Meanwhile, the economic and geopolitical perils of the unfolding oil price rout make expectations of business-as-usual for 2015 ring rather hollow.

Strange Planet • 22 days ago
Isn't this the roller-coaster ride that some people predicted would characterise the peak of oil production? With the remaining oil supplies in the hands of the "market" instead of controlled by government as a bridge to a sustainable society, then I suppose we can expect dramatic rises and falls in price and supply right up until we

drop off the resource cliff. I have never expected that there would be a steady decline without government intervention.

Bazz12 Strange Planet • 10 days ago
Spot on Strange Planet.
This exactly what Kenneth Deffreyes predicted in his book Beyond Oil. He predicted very volatile prices going in a number of cycles, before finally sagging into collapse.
This is the second cycle.
How many cycles is the real trick, but those of a mathematical bent who can calculate integral proportional and derivative functions, if they can get the data, might be able to enlighten us all. Any control systems engineers here ?
It is all there, in the figures if your maths is good enough.

peakchoicedotorg Strange Planet • 11 days ago
The 2005 "Hirsch Report" from US Department of Energy made this prediction.
(Increasing volatility of prices at Peak Oil.)
I think Colin Campbell made similar predictions in the 1990s.

www.postcarbon.org/our-renewable-future-essay/

Our Renewable Future, Richard Heinberg

January 21, 2015

Or, What I've Learned in 12 Years Writing about Energy

(7000 words, about 25 minutes reading time)

Folks who pay attention to energy and climate issues are regularly treated to two competing depictions of society's energy options.* On one hand, the fossil fuel industry claims that its products deliver unique economic benefits, and that giving up coal, oil, and natural gas in favor of renewable energy sources like solar and wind will entail sacrifice and suffering (this gives a flavor of their argument). Saving the climate may not be worth the trouble, they say, unless we can find affordable ways to capture and sequester carbon as we continue burning fossil fuels.

On the other hand, at least some renewable energy proponents tell us there is plenty of wind and sun, the fuel is free, and the only thing standing between us and a climate-protected world of plentiful, sustainable, "green" energy, jobs, and economic growth is the political clout of the coal, oil, and gas industries (here is a taste of that line of thought).

Which message is right? Will our energy future be fueled by fossils (with or without carbon capture technology), or powered by abundant, renewable wind and sunlight? Does the truth lie somewhere between these extremes—that is, does an "all of the above" energy future await us? Or is our energy destiny located in a Terra Incognita that neither fossil fuel promoters nor renewable energy advocates talk much about? As maddening as it may be, the latter conclusion may be the one best supported by the facts.

If that uncharted land had a motto, it might be, "How we use energy is as important as how we get it."

1. Unburnable Fossils and Intermittent Electricity

Let's start with the claim that giving up coal, oil, and gas will hurl us back to the Stone Age. It's true that fossil fuels have offered extraordinary economic benefits. The cheap, concentrated, and portable energy stored in these remarkable substances opened the way, during the past couple of centuries, for industrial expansion on a scale previously inconceivable. Why not just continue burning fossil fuels, then? Over the long term that is simply not an option, for two decisive reasons.

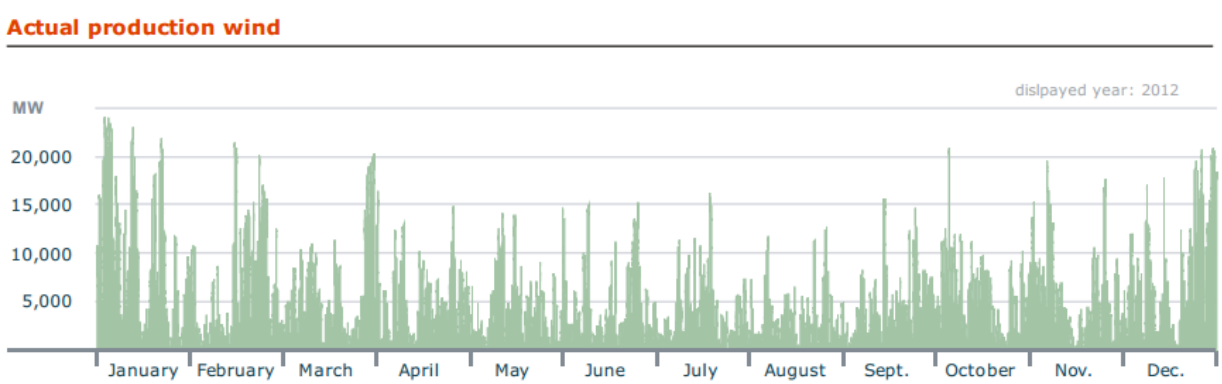
First, burning fossil fuels is changing the climate to such a degree, and at such a pace, that economic as well as ecological ruin may ensue within the lifetimes of today's schoolchildren.

The science is in: either we go cold turkey on our coal, oil, and gas addictions, or we risk raising the planet's temperature to a level incompatible with the continued existence of civilization.

Second, these are depleting, non-renewable sources of energy. We have harvested them using the low-hanging fruit principle, which means that further increments of extraction will entail rising costs (for example, the oil industry's costs for exploration and production have recently been soaring at nearly 11 percent per year) as well as worsening environmental risks. This problem has been sneaking up on us over the last ten years, as sputtering conventional oil and natural gas production set the stage for the Great Recession and the expensive (and environmentally destructive) practices of "fracking" and tar sands mining. Despite the recent plunge in oil prices the fossil fuel party is indeed over. Sooner or later the stark reality of declining fossil energy availability will rivet everyone's attention: we are overwhelmingly dependent on these fuels for nearly everything we eat, consume, use, and trade, and—as Americans started to learn in the 1970s as a result of a couple nasty oil shocks—the withdrawal symptoms are killer.

So while fossil fuel promoters are right in saying that coal, oil, and gas are essential to our current economy, what they omit mentioning is actually more crucial if we care how our world will look more than a few years into the future.

Well then, are the most enthusiastic of the solar and wind boosters correct in claiming that renewable energy sources are ready to substitute for coal, oil, and gas quickly enough and in sufficient quantity to keep the global economy growing? There's a hitch here, which critics are only too quick to point out. We've designed our energy consumption patterns to take advantage of controllable inputs. Need more power? If you're relying on coal for energy, just shovel more fuel into the boiler. But solar and wind are different: they are available on Nature's terms, not ours. Sometimes the sun is shining or the wind is blowing, sometimes not. Energy geeks have a vocabulary to describe this—they say solar and wind power are intermittent, variable, stochastic, or chaotic.



Variability of wind generation in Germany for 2012 (source: European Energy Exchange)

There are ways of buffering this variability: we can store energy from renewable sources with batteries or flywheels, or pump water uphill so as to recapture its potential energy later when it flows back downstream; or we can build a massive super-grid with robustly redundant generating capacity so that, when sun and wind aren't available in one region, another region can cover demand throughout the entire interconnected system. But these strategies cost money and energy, and add layers of complexity and vulnerability to what is already the largest machine ever built (i.e., the power grid).

Crucially, a recent study by Weissbach *et al.* compared the full-lifecycle energy economics of various types of power plants and found that once the intermittency of solar and wind energy is buffered by storage technologies, these sources become far less efficient than coal, natural gas, or nuclear plants; indeed, once storage is added, solar and wind fall "below the economical threshold" of long-term viability, regardless of the falling dollar price of panels and turbines themselves. The problem lies in the fact that the amount of energy embodied in the full generation-storage system cannot be repaid, with a substantial energy profit, by that system over its lifetime. Recent operational studies of solar PV systems in Spain and Australia have come to similar conclusions.

Another way to deal with variability is *demand management,* which can take a variety of forms (I'll be discussing some of those later in a fair amount of detail). These all, by definition, mean changing the ways we *use* energy. But for the moment let's stay with the subject of energy *supply*.

Early increments of solar and wind power are easy and cheap to integrate into the existing electricity distribution system because power from gas-fired peaking plants can quickly (literally, by the minute) be ramped up or down to accommodate these new, small, variable inputs while also matching changing overall demand levels. In this case, the price of wind and solar energy gets counted as just the immediate cost of building, installing, and maintaining turbines and panels. And, as the *New York Times* recently noted, the price of electricity from renewables (counted this way) is now often competitive with electricity from fossil fuels. On this basis, solar and wind are disruptive technologies: they're getting cheaper while fossil fuels can only grow costlier. This one clear economic advantage of renewable energy—free "fuel" in the forms of sunlight and wind—is decisive, as Germany is now seeing with falling wholesale electricity prices (though retail prices are rising due to feed-in tariffs that require the utility industry to pay above-market prices for renewable electricity).

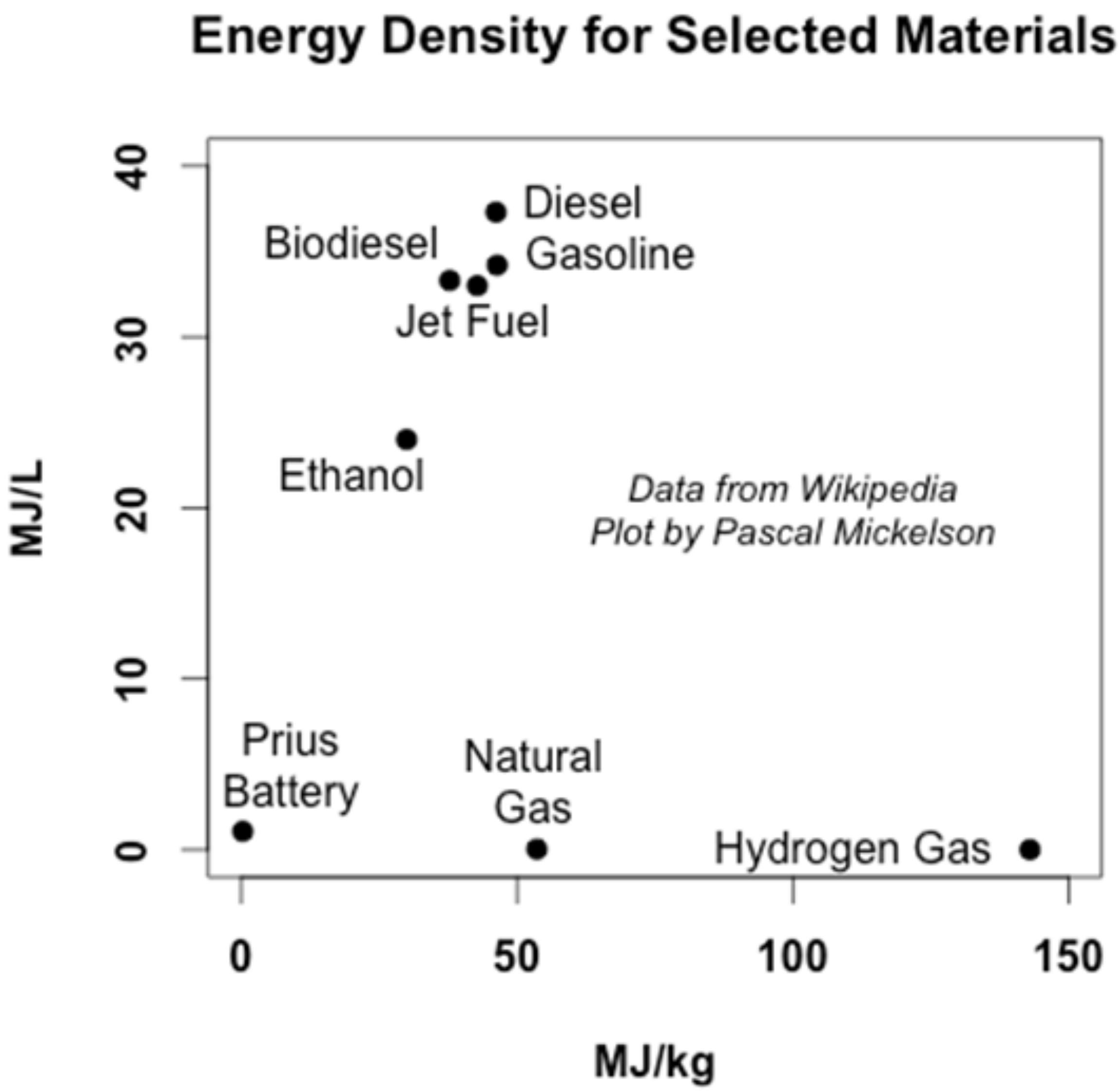
But as electricity from variable renewables makes up a larger and larger proportion of all power generated, the requirements for energy storage technologies, capacity redundancy, and grid upgrades will inevitably climb; indeed, beyond a certain point, the scale of needed investment is likely to explode. Grid managers tend to say that the inflection point arrives when solar and wind power provide about 30 percent of total electricity demand, though one computer model suggests it could be put off until 80 percent market penetration is achieved. (For two contrasting views on the question of how expensive and difficult intermittency makes the renewables transition—from renewable energy optimists Jacobson and Delucchi on one hand, and from "The Simpler Way" advocate Ted Trainer on the other—see a highly informative peer-reviewed exchange here, here, and here.) The looming need for investment in storage and grid upgrades is part of the reason some electric utility companies are starting to wage war against renewables (another part is that net metering puts utilities at a disadvantage relative to solar homeowners; still another is simply that fossil fuel interests hate competition from solar and wind on general principle). As solar panels get cheaper, more homes and businesses install them; this imposes intermittency-smoothing costs on utility companies, which then raise retail prices to ratepayers. The latter then have even more of an incentive to install self-contained, battery-backed solar and abandon the grid altogether, leading to a utility "death spiral."

Yet renewable energy technologies currently require fossil fuels for their construction and deployment, so in effect they are functioning as a parasite on the back of the older energy infrastructure. The question is, can they survive the death of their host?

2. The Liquid Fuels Substitution Quandary

So far, we've talked only about electricity. The power generation sector arguably represents the easiest phase of the overall energy transition (since alternative technologies do exist, even if they're problematic)—but only about 22 percent of global energy is consumed in the form of electrical power; in the US the figure is 33 percent. Our biggest single energy source is oil, which fuels nearly all transportation. Transport is central to trade, which in turn is the beating heart of the global market economy. Oil also fuels the agricultural sector, and eating is fairly important to most of us. Of the three main fossil fuels, oil is showing the most immediate signs of depletion, and renewable options for replacing it are fairly dismal.

It is possible to electrify much of our transportation, and electric cars are now decorating showrooms. But they have a minuscule market share and, at the current growth rate, will take many decades to oust conventional gasoline-fueled automobiles (some analysts believe that growth rate will soon increase dramatically). In any case, batteries do not do well in large, heavy vehicles. The reason has to do with energy density: an electric battery typically is able to store and deliver only about 0.1 to 0.5 megajoules of energy per kilogram; thus, compared to gasoline or diesel (at 44 to 48 MJ/kg), it is very heavy in relation to its energy output. Some breakthroughs in battery storage density and price appear to be on the horizon, but even with these improvements the problem remains: the theoretical maximum energy storage for batteries (about 5 MJ/kg) is still far below the energy density of oil. Neither long-haul trucking nor container shipping is ever likely to be electrified on any significant scale, and electric airliners are simply a non-starter.



Energy storage density by weight (horizontal axis) and volume (vertical axis) for selected media. A hypothetical ideal energy storage medium would appear in the upper right-hand corner of the graph. (Source: Pascal Mickelson)

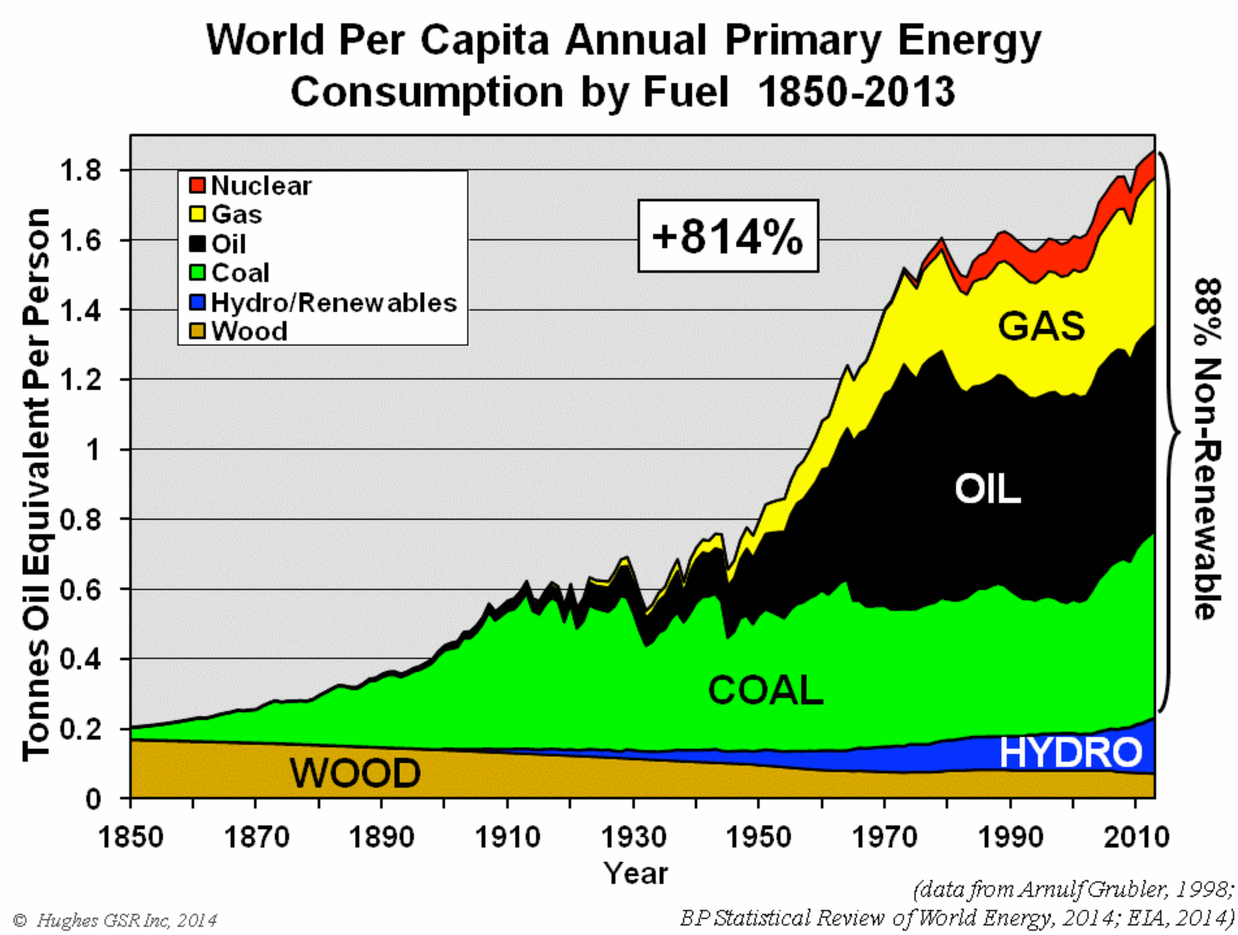
The promise of biofuels as a direct substitute for petroleum was widely touted a decade ago, but we hear much less on that score these days. It turns out that enormous subsidies are needed because the processes for producing these fuels are highly energy intensive. This goes for second-generation cellulosic ethanol and biodiesel from algae as well. Research into synthetic biology pathways to biofuel production remains in its infancy.

Hydrogen offers a medium for storing energy in a way that can be used to power vehicles (among other things), and Toyota is about to release its first commercial hydrogen-powered car. But if we produce hydrogen with renewable energy, that means making H2 from water using solar or wind-based electricity; unfortunately, this is an expensive way to go about it (most commercially produced hydrogen is currently made from natural gas, because the gas-reforming process is inherently more efficient and therefore almost always cheaper than electrolysis, regardless of the electricity source).

These problems lead some energy analysts to propose a cheaper alternative to oil: why not transition the transport fleet to burn compressed natural gas, which government and industry tell us is abundant and climate-friendly? Unfortunately this is no solution at all over the long term. Globally, natural gas may be available in quantity for several more decades, but optimistic forecasts of "100 years" of abundant US domestic gas supplies are proving to be unfounded, and methane leakage from production and transmission infrastructure may end up making gas even worse for the climate than oil.

3. How much energy will we have?

The question is inescapable: will our renewable future offer less mobility? If so, this in itself would have enormous implications for the economy and for daily life. Another question arising from all of the above: will the *quantity* of energy available in our renewable-energy future match energy demand forecasts based on consumption trends in recent decades? There are too many variables to permit a remotely accurate estimate of *how much* less energy we might have to work with (we simply don't know how quickly renewable energy technology will evolve, or how much capital investment will materialize). However, it's good to keep in mind the fact that the energy transition of the 19th and 20th centuries was additive: we just kept piling new energy sources on top of existing ones (we started with firewood, then added coal, oil, hydropower, natural gas, and nuclear); further, it was driven by economic opportunity. In contrast, the energy transition of the 21st century will entail the *replacement* of our existing primary energy sources, and it may largely be driven either by government policy or by crisis (fuel scarcity, climate-induced weather disasters, or economic decline).



The additive history of energy sources (source: David Hughes)

Even supply forecasts from renewable energy optimists who tell us that intermittency is affordably solvable typically assume we will have *less* available electrical energy, once the shift away from fossil fuels is complete, than the International Energy Agency estimates that we would otherwise want (for example, analysis by Lund and Mathieson projects energy consumption levels in 2030 in Denmark to be only 11 percent higher than 2004 demand, with no further increase between 2030 and 2050, whereas IEA forecasts assume continued demand growth through mid-century). However, if (as the Weissbach study suggests) intermittency is in fact a serious economic burden for solar and wind power over the long term, then we need to entertain the likelihood that energy supplies available at the end of the century may be smaller—maybe considerably smaller—than they are now.

At the same time, the *qualities* of our energy supply will differ from what we are used to. As explained earlier, solar and wind are intermittent, unlike fossil energy supplies. Further, while planet Earth is blessed with lots of wind and sunlight, these are diffuse energy sources that need collecting and concentrating if they're to operate heavy machinery. During the coming energy transition, we will be shifting from energy sources with a small geographic footprint (e.g., a natural gas well) toward ones with larger footprints (wind and solar farms collecting ambient sources of energy). True, we can cut the effective footprint of solar by using existing rooftops, and wind turbines can share space with food crops. Nevertheless, there will be unavoidable costs, inefficiencies, and environmental impacts resulting from the increasing geographical extent of energy collection activities.

The potency of fossil fuels derives from the fact that Nature did all the prior work of taking energy from sunlight, storing it in chemical bonds within plants, then gathering those ancient plants and transforming and concentrating their chemical energy, using enormous heat and pressure, over millions of years. Renewable energy technologies represent attempts to gather and concentrate ambient energy in present time, substituting built capital for Nature's free gifts.

Moreover, while electrical power is easily transported via the grid, this doesn't change the fact that sunlight, hydropower, biomass, and wind are more available in some places than others. Long-distance electricity transmission entails infrastructure costs and energy losses, while transporting biomass more than a hundred miles or so typically erases the crucial energy profitability of its use.

4. A Possible Outcome of Current Energy Trends

The price of renewable energy is falling while the cost of producing fossil fuels is rising. The crossover point, where fossil fuels cease to be cost competitive, could come soon—perhaps in the next decade.

What happens then? As batteries get cheaper, electric cars could become the industry standard; reduced gasoline demand would likely force the price of oil below its marginal production cost. If falling demand periodically outpaced declining supply (and vice versa), the result would be increasingly volatile petroleum prices, which would be bad for everyone. Meanwhile as more businesses and homes installed cost-competitive solar-and-battery systems, conventional utilities could go bankrupt.

The result: we would have green energy technology, but not the energy means to maintain and reproduce it over the long run (since every aspect of the renewable energy deployment process currently relies on fossil fuels —particularly oil— because of their unique energy density characteristics).

During the transition, what proportion of the world's people would be able to afford the up-front investment required for entry into the renewable energy club? It's likely that many (including poor people in rich countries) would not, especially given current trends toward increasing economic inequality; for these folks, conventional fossil-based grid power would likewise become unaffordable, or simply unavailable.

What if renewable energy optimists are right in saying that solar and wind are disruptive technologies against which fossil fuels cannot ultimately compete, but renewables critics are correct in arguing that solar and wind are inherently incapable of powering industrial societies as currently configured, absent a support infrastructure (mines, smelters, forges, ships, trucks, and so on) running on fossil fuels?

5. Googling Questions

The combined quantity and quality issues of our renewable energy future are sufficiently daunting that Google engineers who, in 2007, embarked on an ambitious, well-funded project to solve the world's climate and energy problems, effectively gave up. It seems that money, brainpower, and a willingness to think outside the box weren't enough. "We felt that with steady improvements to today's renewable energy technologies, our society could stave off catastrophic climate change," write Ross Koningstein and David Fork, key members of the RE<C project team. "We now know that to be a false hope."

The Google team defined "success" as identifying a renewable energy system that could compete economically with coal and could also be deployed fast enough to stave off the worst climate change impacts. The team concluded that renewable energy isn't up to that job. In their article, Koningstein and Fork put on a brave face, hoping that some currently unknown energy source will appear at the last minute to save the day. But putting one's faith in a currently non-existent energy source seems less realistic than working for dramatic improvements to solar and wind technologies. A completely new source would require decades for development, testing, and deployment. Realistically, our choice of replacements for fossil fuels is limited to energy sources that can be harnessed with current technology, even if they can't keep the industrial growth engine humming.

In inquiring whether renewable energy can solve the climate crisis at essentially no net economic cost, Koningstein and Fork may have been posing the wrong question. They were, in effect, asking whether renewables can support our current growth-based industrial economy while saving the environment. They might more profitably have inquired what kind of economy renewable energy *can* support. We humans got by on renewable sources of energy for millennia, achieving high levels of civilization and culture using wind, sun, water, wood, and animal power alone (though earlier civilizations often faced depletion dilemmas with regard to resources other than fossil fuels). The depletion/climate drawbacks of fossil fuels ensure that, as the century progresses, we will indeed return to a renewables-based economy of some sort, running on hydropower, solar, wind, and a suite of other, more marginal renewable sources including biomass, geothermal, wave, microhydro, and tidal power.

We always adapt our energy sources, as much as we can, to suit the ways we want to use energy. It is therefore understandable that most people would like somehow to make solar and wind act just like fossil fuels, which have shaped our current consumption patterns. But that leads us back to the problems of energy storage, capacity redundancy, grid redesign, transport electrification, and so on. Weissbach's study suggests that the costs of enabling solar and wind to act like fossil fuels are so great as to virtually cancel out these renewables' very real benefits. Reluctantly but increasingly, we may have to *adapt the ways we use energy* to suit the quantities and inherent qualities of the energy available to us.

Fossil fuels shaped our current infrastructure of mines, smelters, forges, factories, pipelines, grids, farms, highways, airports, pumps, shopping malls, suburbs, warehouses, furnaces, office buildings, houses, and more. We built the modern world with the assumption that we would always have more energy with similar characteristics to maintain, operate, and replace this staggering and still-growing array of machines, structures, and support systems. Where it is absolutely essential to maintain these systems in their current form, we will certainly make every effort to adapt our new energy sources to the job (using batteries, for example); where systems can themselves be adapted to using less energy or energy that is intermittently available, we will adapt those systems. But in many instances it may be unaffordable to adapt either the energy source or the usage system; in those cases, we will simply do without services we had become accustomed to.

This may be the renewable future that awaits us. To prepare for that likelihood, we need to build large numbers of solar panels and wind turbines while also beginning a process of industrial-economic triage.

Reconfiguring civilization to operate on less energy and on energy with different characteristics is a big job—one that, paradoxically, may itself require a substantial amount of energy. If the necessity of expending energy on a civilization rebuild coincides with a reduction in available energy, that would again mean that our renewable future will *not* be an extension of the expansive economic thrust of the 20th century. We may be headed into lean times.

Granted, there is a lot of uncertainty here. Some countries are better placed to harvest ambient natural energy sources than others. Some academic studies paint an over-optimistic picture of renewables, because they focus only on electricity and ignore or understate the costs of variability mitigation; other studies arrive at unfairly pessimistic assessments of renewables because they use obsolete price data. It's hard to portray our renewable future in a way that one analyst or another will not dispute, at least in terms of detail. Nevertheless, *most* energy experts would probably agree with the *general* outline of renewable energy's potential that I've traced here.

I consider myself a renewable energy advocate: after all, I work for an organization called Post Carbon Institute. I have no interest in discouraging the energy transition—quite the contrary. But I've concluded that many of us, like Koningstein and Fork, have been asking the wrong questions of renewables. We've been demanding that they continue to power a growth-based consumer economy that is inherently unsustainable for a variety of reasons (the most obvious one being that we live on a small planet with finite resources). The fact that renewables can't do that shouldn't actually be surprising.

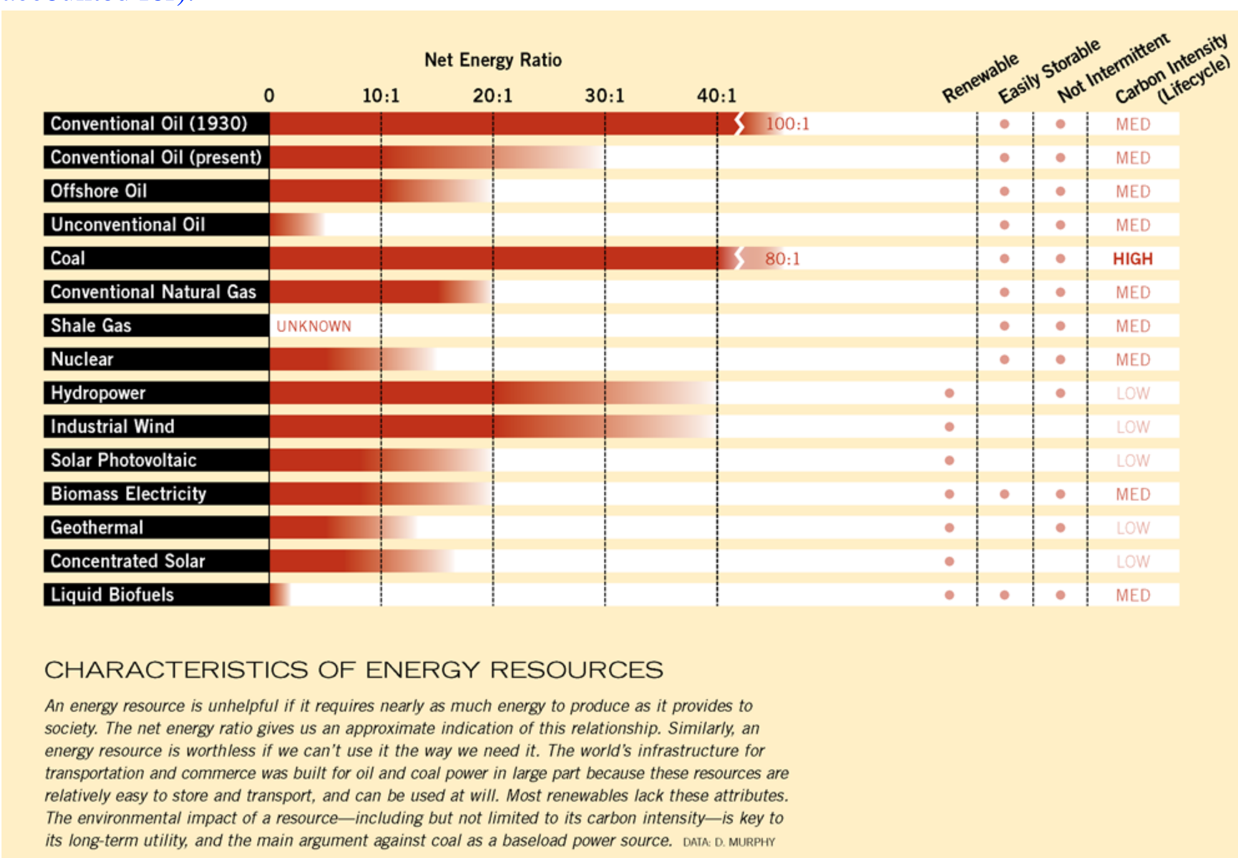
What are the right questions? The first, already noted, is: What kind of society *can* up-to-date renewable energy sources power? The second, which is just as important: How do we go about becoming that sort of society?

As we'll see, once we begin to frame the picture this way, it turns out to be anything but bleak.

6. A Couple of Key Concepts

Our degree of success in this all-encompassing transition will partly depend on our ability to master a couple of simple energy concepts. The first is *energy returned on energy invested* (EROI or EROEI). It takes energy to get energy: for example, energy is needed to drill an oil well or build a solar panel. The historic economic bonanza resulting from society's use of fossil fuels partly ensued from the fact that, in the 20th century, only trivial amounts of energy were required for drilling or mining as compared to the gush of energy yielded. High EROEI ratios (in the range of 20:1 to 50:1 or more) for society's energy-obtaining efforts meant that relatively little capital and labor were needed in order to supply all the energy that society could use. As a result, many people could be freed up from basic energy-producing activities (like farming), their labor being substituted by fuel-fed machines. Channeled into manufacturing and managerial jobs, these people found ways to use abundant, cheap energy to produce more goods and services. The middle class mushroomed, as did cities and suburbs. In the process, we discovered an unintended consequence of having an abundance of cheap "energy slaves" in the forms of tons of coal, barrels of oil, and cubic feet of natural gas: as manufacturing and other sectors of the economy became mechanized, many pre-industrial professions disappeared.

The EROEI ratios for fossil fuels are declining because the best-quality resources are being used up; meanwhile, the energy return figures of most renewable energy sources are relatively low compared to fossil fuels in their heyday (and this is especially true when buffering technologies—such as storage equipment, redundant capacity, and grid expansions—are accounted for).



Characteristics of energy resources (source: David Murphy). "Net Energy Ratio" in this chart is essentially the same as EROEI.

The practical result of *declining overall societal EROEI will be the need to devote proportionally more capital and labor to energy production processes*. This is likely to translate, for example, to the requirement for more farm labor, and to fewer opportunities in professions not centered on directly productive activities: we'll need more people making or growing things, and fewer people marketing, advertising, financing, regulating, and litigating them. For folks who think we have way too much marketing, advertising, financialization, regulation, and litigation in our current society, this may not seem like such a bad thing; prospects are likewise favorable for those who desire more control over their time, labor, and sources of sustenance (food and energy).

A second essential energy concept has to do with the difference between embodied and operational energy. When we contemplate the energy required by an automobile, for example, we are likely to think only of the gasoline in its tank. However, a substantial amount of energy was expended in the car's construction, in the mining of ores from which its metal components were made, in the making of the mining equipment, and so on. Further, enormous amounts of energy were spent in building the infrastructure that enables us to use the car—the systems of roads and highways, the networks of service stations, refineries, pipelines, and oil wells. The car's gasoline supplies operational energy, but much more energy is embodied in the car itself and its support systems. This latter energy expenditure is easily overlooked.

The energy glut of the 20th century enabled us to embody energy in a mind-numbing array of buildings, infrastructure, machines, gadgets, and packaging. Middle-class families got used to buying and discarding enormous quantities of manufactured goods representing generous portions of previously expended energy. If we have less energy available to us in our renewable future, this will impact more than the operation of our machines and the lighting and heating of our buildings. It will also translate to a shrinking flow of manufactured goods that embody past energy expenditure, and a reduced ability to construct high energy-input structures. We might find we need to purchase fewer items of clothing and furniture, and fewer electronic devices, and inhabit smaller spaces. We might also use old goods longer, and re-use and re-purpose whatever can be repaired. We might need to get used to buying more basic foods again, rather than highly processed and excessively packaged food products. Exactly how far these trends might proceed is impossible to say: we are almost surely headed toward a simpler society, but no one knows ultimately how simple. Nevertheless, it's fair to assume that this overall shift would constitute the end of consumerism (i.e., our current economic model that depends on ever-increasing consumption of consumer goods and services). Here again, there are more than a few people who believe that advanced industrial nations consume excessively, and that some simplification of rich- and middle-class lifestyles would be a good thing.

7. Transitioning Nine Sectors

When we start applying these energy principles to the systems that surround us and support our daily existence, the implications really start to get interesting. Let's take a quick tour:

Food: Fossil fuels are currently used at every stage of growing, transporting, processing, packaging, preparing, and storing food. As those inputs are removed from food systems, it will be necessary to bring growers and consumers closer together, and to replace petrochemical-based fertilizers, herbicides, and pesticides with agro-ecological farming methods that rely on crop rotation, intercropping, companion planting, mulching, composting, beneficial insects, and promotion of microbial activity in soils. As mentioned earlier, we will need many more farmers, especially ones with extensive practical, local ecological knowledge.

Water: Enormous amounts of energy are used in extracting, moving, and treating water; conversely, water is used in most energy production processes. We face converging water crises arising from aging infrastructure and climate change-related droughts and floods. All this suggests we must become far more water thrifty, find ways to reduce the energy used in water management, use intermittent energy sources for pumping water, and use water reservoirs for storing energy.

Resource extraction (mining, forestry, fishing): Currently, extractive industries rely almost entirely on petroleum-based fuels. Since, as we have seen, there are no good and comprehensive substitutes for these fuels, we will have to reduce resource extraction rates, reuse and recycle materials wherever possible, and employ more muscle power where possible in those extractive processes that must continue (such as forestry).

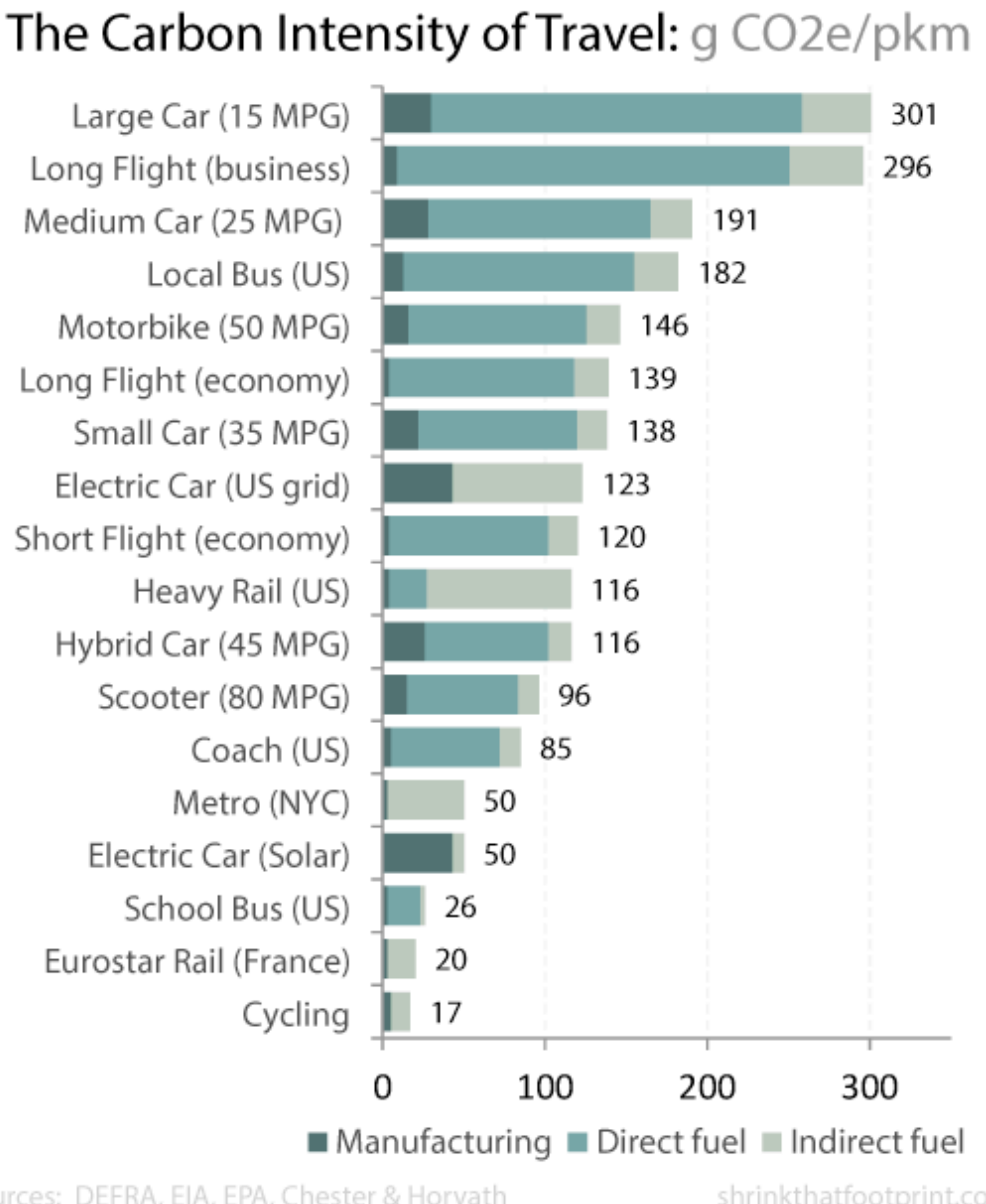
Building construction: Cement, iron, and road-building materials embody substantial amounts of energy, while large construction equipment (cranes, booms, bulldozers) requires concentrated energy for its operation. We must shift to using natural, locally available building materials, and more labor-intensive construction methods, while dramatically reducing the rate of new construction. The amount of enclosed space per person (home, work, shopping) will shrink.

Building operations: We've gotten used to actively heating, cooling, ventilating, and lighting our buildings with cheap, on-demand energy. We will need to maximize our passive capture of ambient, variable, solar energy using south-facing glazing, superinsulation, and thermal mass. Whatever active energy use is still required will employ efficient heat pumps and low-energy LED lighting, powered mostly by solar cells and wind turbines with minimal storage and redundancy (so as to maximize EROEI).

Manufacturing: Our current system is globalized (relying on oil-based transport systems); consumes natural gas, electricity, and oil in manufacturing processes; and uses materials that embody large amounts of energy and that are often made from fossil fuels (i.e., plastics). Lots of energy is used also in dealing with substantial flows of waste in the forms of packaging and discarded products. The economy has been fine-tuned to maximize consumption. We must shift to shortened supply chains, more localized manufacture of goods (shipping information, not products), materials with low embodied energy, and minimal packaging, while increasing our products' reuse and repair potential. This will be, in effect, an economy fine-tuned to minimize consumption.

Health care: The high dollar cost of modern health care is a rough indication of its energy intensity. As the energy transition gains momentum, it will be necessary to identify low-energy sanitation and care options, and prioritize prevention and local disaster response preparedness. Eventually, high-energy diagnostics and extreme end-of-life interventions may simply become unaffordable. Treatment of chronic conditions may rely increasingly on herbs and other traditional therapies (in instances where their efficacy can be verified) as the pharmaceutical industry gradually loses its capability to mobilize billions of dollars to develop new, targeted drugs.

Transportation: The energy transition will require us to prioritize transport modes according to operational and embodied energy efficiency: whereas automobile and truck traffic have been richly subsidized through road building in the last seven decades, governments should instead devote funds toward electrified rail networks for both freight and passenger travel. We must also design economic and urban systems so as to reduce the need for motorized transportation—for example, by planning communities so that most essential services are within walking distance.



Source: Shrinkthatfootprint.com (data from DEFRA, EIA, EPA, Chester & Horvath)

Finance: It would appear that comparatively little energy is needed to run financial systems, as a few taps on a computer keyboard can create millions of dollars instantly and move them around the globe. Nevertheless, the energy transition has enormous implications for finance:

heightened debt levels imply an increased ability to consume now with the requirement to pay later. In effect, a high-finance society stimulates consumption, whereas we need to reduce consumption. Transition strategies should therefore include goals such as the cancelation of much existing debt and reduction of the size and role of the financial system. Increasingly, we must direct investment capital toward projects that will tangibly benefit communities, rather than leaving capital investment primarily in the hands of profit-seeking individuals and corporations.

You may have noticed that suggestions in each of these categories are far from new. Organized efforts to reduce both operational and embodied energy consumption throughout society started in the 1970s, at the time of the first oil price shocks. Today there are many NGOs and university programs devoted to research on energy efficiency, and to life cycle analysis (which seeks to identify and quantify energy consumption and environmental impacts of products and industrial processes, from "cradle to grave"). Industrial ecology, biomimicry, "cradle-to-cradle" manufacturing, local food, voluntary simplicity, permaculture, and green building are just a few of the strategies have emerged in the last few decades to guide us toward a more energy-thrifty future. Most major cities now have bicycle advocacy groups, farmers markets, and energy efficiency programs. These all represent steps in the right direction.

Yet what is being done so far barely scratches the surface of what's needed. There could be only one meaningful indication of success in all these efforts, and that would be a decline in society's overall energy use. So far, we have seen energy declines primarily in times of severe economic recession—hardly ever purely as a result efficiency programs. What we need is not just to trim energy use here and there so as to save money, but to reconfigure entire systems to dramatically slash consumption while making much of the remaining energy consumption amenable to intermittent inputs.

Another insight that comes from scanning energy reduction strategies in various societal sectors is that efforts already underway along these lines often have side benefits. There are tangible psychological, social, and cultural payoffs associated with local food and voluntary simplicity programs, and health improvements can follow from natural, energy-efficient dwellings, walking, bicycling, and gardening. A successful energy transition will require that we find ways to maximize and celebrate these benefits, while honestly acknowledging the full human and environmental costs of our decades-long, fossil-fueled joyride.

In the march toward our energy future, the PR war between the fossil fuel industry and renewables advocates gets much of the attention. But it will be our effectiveness in the hard work of dramatically reducing and reconfiguring energy consumption—sector by sector, farm by farm, building by building, household by household, community by community—that will largely determine our overall success in what is likely to be history's most difficult and crucially important economic shift.

8. Neither Utopia Nor Extinction

This is all politically charged. Some renewable energy advocates (particularly in the US) soft-pedal the "use less" message because we still inhabit an economy in which jobs and profits depend on stoking consumption, not cutting it. "Less" also implies "fewer": if the amount of energy available contracts but human population continues growing, that will translate to an even sharper *per capita* hit. This suggests we need to start reducing population, and doing so quickly—but economists hate population decline because it compromises GDP and results in smaller generational cohorts of young workers supporting larger cohorts of retirees. Here is yet another message that just doesn't sell. A contraction of energy, population, and the economy has only two things going for it: necessity and inevitability.

From a political standpoint, some solar and wind advocates apparently believe it makes good strategic sense to claim that a renewable future will deliver comfort, convenience, jobs, and growth—an extension of the oil-fueled 20th century, but now energized by wind and solar electrons. Regardless of whether it's true, it is a message that appeals to a broad swath of the public. Yet most serious renewable energy scientists and analysts acknowledge that the energy transition will require changes throughout society. This latter attitude is especially prevalent in Europe, which now has practical experience integrating larger percentages of solar and wind power into electricity markets. Here in the US, though, it is common to find passionate but poorly informed climate activists who loudly proclaim that the transition can be easily and fully accomplished at no net cost. Again, this may be an effective message for rallying troops, but it ends up denying oxygen to energy conservation efforts, which are just as important.

I have good friends in the renewable energy industry who say that emphasizing the intermittency challenges of solar and wind amounts to giving more ammunition to the fossil fuel lobby. Barry Goldwater famously proclaimed that "Extremism in the defense of liberty is no vice"; in a similar spirit, some solar and wind boosters might say that a little exaggeration of renewable energy's potential, uttered in defense of the Earth, is no sin. After all, fossil fuel interests are not bound by the need for strict veracity: they continually make absurd claims that the world has centuries' worth of coal and gas, and decades of oil. It's not a fair or equal fight: the size and resources of the fossil fuel industry vastly outweigh those of the renewables camp. And there could hardly be more at stake: this is war for the survival of our current civilization-supporting climate regime. Nevertheless, we will ultimately have to deal with the reality of what solar and wind can actually provide, and we will do so far more successfully if we plan and prepare ahead of time.

There are a lot of smart, dedicated people working hard to solve the problems with renewables—that is, to make it cheaper and easier for these energy sources to mimic the 24/7 reliability of fossil fuels through improvements in energy storage and related technologies. None of what I have said in this essay is meant to discourage them from that important work. The more progress they make, the better for all of us. But they'll have more chance of success in the long run if society starts investing significant effort into adapting its energy usage to lower consumption levels, more variable sources, and more localized, distributed inputs.

The problem is, the gap between our current way of life and one that can be sustained with future energy supplies is likely to be significant. If energy declines, so will economic activity, and that will create severe political and geopolitical strains; arguably some of those are already becoming apparent. We may be headed into a crucial bottleneck; if so, our decisions now will have enormous repercussions. We therefore need an honest view of the constraints and opportunities ahead.

At this point I must address a few words to "collapsitarians" or "doomers," who say that only utter ruin, perhaps extinction, awaits us, and that renewables won't work at all. They may be correct in thinking that the trajectory of society this century will be comparable to the collapse of historic civilizations. However, even if that is the case, there is still a wide range of possible futures. The prospects for humanity, and the fates of many other species, hang on our actions.

What's needed now is neither fatalism nor utopianism, but a suite of practical pathways for families and communities that lead to a real and sustainable renewable future—parachutes that will get us from a 17,000-watt society to a 2,000-watt society. We need public messages that emphasize the personal and community benefits of energy conservation, and visions of an attractive future where human needs are met with a fraction of the operational and embodied energy that industrial nations currently use. We need detailed transition plans for each major sector of the economy. We need inspiring examples, engaging stories, and opportunities for learning in depth. The transition to our real renewable future deserves a prominent, persistent place at the center of public conversation.

The Transition Network, The Arthur Morgan Institute for Community Solutions, The Simplicity Institute, and many other organizations have already begun pioneering this work, and deserve support and attention. However, more framing and analysis of the issues, along the lines of this essay but in much greater depth, could also help. My organization, Post Carbon Institute, is embarking on a collaborative project to provide this. If you don't hear much from me for a while, it's because I'm working on it. Stay tuned.

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*For the sake of simplicity, I have omitted discussion of nuclear power from this essay. There are those who say that nuclear power will, or should, play a prominent role in our energy future. I disagree with this view. Globally, nuclear power—unlike solar and wind—is contracting, not growing (China provides one of only a few exceptions to this observation). Nations are turning away from nuclear power due to the high levels of required investment—which, in virtually every case, must be underwritten by government. They are doing so also because of the high perceived risk of accidents—especially since the commencement of the ongoing catastrophe at the Fukushima nuclear facility in Japan. Nuclear boosters advocate new fuels (thorium) or technologies (fast breeder reactors) to address these concerns. But many years of trials will be needed before these alternatives are ready to be deployed at scale; and it is unclear, even then, whether they will live up to claims and expectations.

www.postcarbon.org/the-purposely-confusing-world-of-energy-politics/

The Purposely Confusing World of Energy Politics, by Richard Heinberg

Posted Feb 11, 2014

Life often presents us with paradoxes, but seldom so blatant or consequential as the following. Read this sentence slowly: Today it is especially difficult for most people to understand our perilous global energy situation, precisely *because* it has never been more important to do so. Got that? No? Okay, let me explain. I must begin by briefly retracing developments in a seemingly unrelated field—climate science.

Once upon a time, the idea that Earth's climate could be changing due to human-caused carbon dioxide emissions was just a lonely, unpopular scientific hypothesis. Through years that stretched to decades, researchers patiently gathered troves of evidence to test that hypothesis. The great majority of evidence collected tended to confirm the notion that rising atmospheric carbon dioxide (and other greenhouse gas) levels raise average global temperatures and provoke an increase in extreme weather events. Nearly all climate scientists were gradually persuaded of the correctness of the global warming hypothesis.

But a funny thing happened along the way. Clearly, if the climate is changing rapidly and dramatically as a result of human action, and if climate change (of the scale and speed that's anticipated) is likely to undermine ecosystems and economies, then it stands to reason that humans should stop emitting so much CO2. In practical effect, this would mean dramatically reducing our burning of fossil fuels—the main drivers of economic growth since the beginning of the Industrial Revolution.

Some business-friendly folks with political connections soon became alarmed at both the policy implications of—and the likely short-term economic fallout from—the way climate science was developing, and decided to do everything they could to question, denigrate, and deny the climate change hypothesis. Their effort succeeded: belief in climate change now aligns fairly closely with political affiliation. Most Democratic elected officials agree that the issue is real and important, and most of their Republican counterparts are skeptical. Lacking bipartisan support, legislative climate policy languished.

From a policy standpoint, climate change is effectively an energy issue, since reducing carbon emissions will require a nearly complete revamping of our energy systems. Energy is, by definition, humanity's most basic source of power, and since politics is a contest over power (albeit *social* power), it should not be surprising that energy is politically contested. A politician's most basic tools are power and persuasion, and the ability to frame issues. And the tactics of political argument inevitably range well beyond logic and critical thinking. Therefore politicians can and often do make it harder for people to understand energy issues than would be the case if accurate, unbiased information were freely available.

So here is the reason for the paradox stated in the first paragraph: As energy issues become more critically important to society's economic and ecological survival, they become more politically contested; and as a result, they tend to become obscured by a fog of exaggeration, half-truth, omission, and outright prevarication.

How does one cut through this fog to gain a more accurate view of what's happening in our society's vital energy supply-and-support systems? It's helpful to start by understanding the positions and motives of the political actors. For the sake of argument, I will caricature two political positions. Let's personify them as Politician A and Politician B.

Politician A has for many years sided with big business, and specifically with the fossil fuel industry in all energy disputes. She sees coal, oil, and natural gas as gifts of nature to be used by humanity to produce as much wealth as possible, as quickly as possible. She asserts there are sufficient supplies of these fuels to meet the needs of future generations, even if we use them at rapidly increasing rates. When coal, oil, and gas do eventually start to run out, Politician A says we can always turn to nuclear energy. In her view, the harvesting and burning of fossil fuels can be accomplished with few incidental environmental problems, and fossil fuel companies can be trusted to use the safest methods available. And if Earth's climate is indeed changing, she says, this is not due to the burning of fossil fuels; therefore, policies meant to cut fossil fuel consumption are unnecessary and economically damaging. Finally, she says renewable energy sources should not be subsidized by government, but should stand or fall according to their own economic merits.

Politician B regards oil, coal, and natural gas as polluting substances, and society's addiction to them is shameful. He thinks oil prices are high because petroleum companies gouge their customers; nuclear energy is too dangerous to contemplate; and renewable energy sources are benign (with supplies of sunlight and wind vastly exceeding our energy needs). To hear him tell it, the only reason solar and wind still supply such a small percentage of our total energy is that fossil fuel companies are politically powerful, benefiting from generous, often hidden, government subsidies. Government should cut those subsidies and support renewable energy instead. He believes climate change is a serious problem, and to mitigate it we should put a price on carbon emissions. If we do, Politician B says, renewable energy industries will grow rapidly, creating jobs and boosting the economy.

Who is right? Well, this should be easy to determine. Just ignore the foaming rhetoric and focus on research findings. But in reality that's not easy at all, because research is itself often politicized. Studies can be designed from the outset to give results that are friendly to the preconceptions and prejudices of one partisan group or another.

For example, there are studies that appear to show that the oil and natural gas production technique known as hydrofracturing (or "fracking") is safe for the environment. With research in hand, industry representatives calmly inform us that there have been *no* confirmed instances of fracking fluids contaminating water tables. The implication: environmentalists who complain about the dangers of fracking simply don't know what they're talking about. However, there are indeed many documented instances of water pollution associated with fracking, though technically most of these have resulted from the improper disposal of wastewater produced once fracking *per se* is finished, rather than from the hydrofracturing process itself. Further, industry-funded studies of fracking typically focus on sites where best practices are in place and equipment is working as designed—the ideal scenario. In the messy real world, well casings sometimes fail, operators cut corners, and equipment occasionally malfunctions.

For their part, environmentalists point to peer-reviewed studies showing air, water, and human health problems associated with actual (far from ideal) fracking operations.

So, depending on your prior beliefs, you can often choose research findings to support them—even if the studies you are citing are actually highly misleading.

Renewable energy is just as contentious. Mark Jacobson, professor of environmental engineering at Stanford University, has co-authored a series of reports and scientific papers arguing that solar, wind, and hydropower could provide 100 percent of world energy by 2030. Clearly, Jacobson's work supports Politician B's political narrative by showing that the climate problem can be solved with little or no economic sacrifice. If Jacobson is right, then it is only the fossil fuel companies and their supporters that stand in the way of a solution to our environmental (and economic) problems. The Sierra Club and prominent Hollywood stars have latched onto Jacobson's work and promote it enthusiastically.

However, Jacobson's publications have provoked thoughtful criticism, some of it from supporters of renewable energy, who argue that his "100 percent renewables by 2030" scenario ignores hidden costs, land use and environmental problems, and grid limits (see here, here, and here. Jacobson has replied to his critics, well, energetically (here and here).

At the other end of the opinion spectrum on renewable energy is Gail Tverberg, an actuary by training and profession (and no shill for the fossil fuel industry), whose analysis suggests that the more solar and wind generating capacity we build, the worse off we are from an economic point of view. Her conclusion flatly contradicts that of this report, which aims to show that the more renewables we build, the more money we'll save. Ecologist Charles Hall has determined that the ratio of energy returned to energy invested in capturing solar energy with photovoltaic (PV) panels is too low to support an industrial economy. Meanwhile the solar industry claims that PV can provide *all* of society's power needs. Global wind capacity may have been seriously over-estimated. But then again, maybe not.

In sum, if you're looking for quick and simple answers to questions about how much renewables can do for us, at what price, and over what time frame, forget it! These questions are far from being settled.

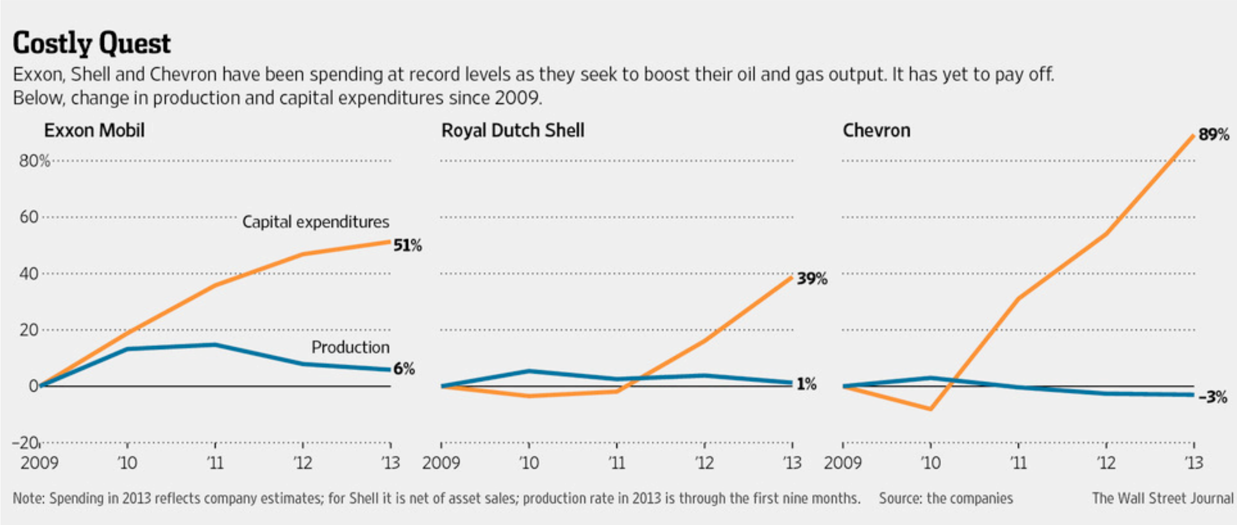
There's a saying: For every Ph.D., there is an equal and opposite Ph.D. Does this mean science is useless, and objective reality is whatever you want it to be? Of course not. However, politics and cultural bias can and do muddy the process and results of scientific research.

All of this is inevitable; it's human nature. We'll sort through the confusion, given time and the hard knocks that inevitably come when preconceptions veer too far from the facts. However, if the more worrisome implications of climate science are right, we may not have a lot of time for sorting, and our knocks may be very hard indeed.

* * *

Here's a corollary to my thesis: *Political prejudices tend to blind us to facts that fail to fit any conventional political agendas.* All political narratives need a villain and a (potential) happy ending. While Politicians B and A might point to different villains (oil companies on one hand, government bureaucrats and regulators on the other), they both envision the same happy ending: economic growth, though it is to be achieved by contrasting means. If a fact doesn't fit one of these two narratives, the offended politician tends to ignore it (or attempt to deny it). If it doesn't fit either narrative, nearly everyone ignores it.

Here's a fact that apparently fails to comfortably fit into either political narrative: *The energy and financial returns on fossil fuel extraction are declining—fast.* The top five oil majors (ExxonMobil, BP, Shell, Chevron, and Total) have seen their aggregate production fall by over 25 percent over the past 12 years—but it's not for lack of effort. Drilling rates have doubled. Rates of capital investment in exploration and production have likewise doubled. Oil prices have quadrupled. Yet actual global rates of production for regular crude oil have flattened, and all new production has come from expensive unconventional sources such as tar sands, tight oil, and deepwater oil. The fossil fuel industry hates to admit to facts that investors find scary—especially now, as the industry needs investors to pony up ever-larger bets to pay for ever-more-extreme production projects.



In the past few years, high oil prices have provided the incentive for small, highly leveraged, and risk-friendly companies to go after some of the last, worst oil and gas production prospects in North America—formations known to geologists as "source rocks," which require operators to use horizontal drilling and fracking technology to free up trapped hydrocarbons. The energy returned on energy invested in producing shale gas and tight oil from these formations is minimal. While US oil and gas production rates have temporarily spiked, all signs indicate that this will be a brief boom that will not change the overall situation significantly: society is reaching the point of diminishing returns with regard to the economic benefits of fossil fuel extraction.

And what about our imaginary politicians? Politician A wouldn't want to talk about any of this for fairly obvious reasons. But, strangely, Politician B likely would avoid the subject too: while he might portray the petroleum industry as an ogre, his narrative requires it to be a powerful one. Also, he probably doesn't like to think that gasoline prices might be high due to oil depletion rather than simply the greed of the petroleum barons. Motives can be complicated; perhaps both feel the patriotic urge to cheer domestic energy production, regardless of its source and in spite of evidence of declining returns on investment. Perhaps both understand that declining energy returns imply really bad news for the economy, regardless which party is in power. In any case, mum's the word.

Some facts seem to fit one narrative or the other but, when combined, point to a reality that undermines both narratives. *What if climate change is an even worse problem than most of us assume, and there is no realistic way to deal seriously with it and still have economic growth?*

In the real world of US politics, many Democrats would agree with the first part of the sentence, many Republicans with the second. Yet both parties would flee from endorsing the statement as a whole. Nevertheless, this seems to be where the data are driving us. Actual climate impacts have consistently outpaced the worst-case forecasts that the UN's International Panel on Climate Change (IPCC) has issued during the past two decades. That means curbing carbon emissions is even more urgent than almost anyone previously thought. The math has changed. At this point, the rate of reduction in fossil fuel consumption required in order to avert catastrophic climate change may be higher, possibly much higher, than the realistically possible rate of replacement with energy from alternative sources. Climatologist Kevin Anderson of the UK-based Tyndall Centre figures that industrial nations need to cut carbon emissions by up to 10 percent per year to avert catastrophe, and that such a rapid reduction would be "incompatible with economic growth." What if Anderson is right?

The problem of transitioning quickly away from fossil fuels while maintaining economic growth is exacerbated by the unique characteristics of different energy sources.

Here's just one example of the difficulty of replacing oil while maintaining economic growth. Oil just happens to be the perfect transport fuel: it stores a lot of energy per unit of weight and volume. Electric batteries can't match its performance. Plug-in cars exist, of course (less than one percent of new cars sold this year in the US will be plug-in electrics), but batteries cannot propel airliners or long-haul, 18-wheel truck rigs. Yet the trucking and airline industries just happen to be significant components of our economy; can we abandon or significantly downsize them and grow the economy as we do so?

What about non-transport replacements for fossil fuels? Well, both nuclear power stations and renewable energy systems have high up-front investment costs. If you factor in *all* the financial and energy costs (something the solar, wind, and nuclear industries are reluctant to do), their payback time is often measured in decades. Thus there seems to be no realistic way to bootstrap the energy transition (for example, by using the power from solar panels to build more solar panels) while continuing to provide enough energy to keep the rest of the economy expanding. In effect, to maintain growth, the energy transition would have to be subsidized by fossil fuels—which would largely defeat the purpose of the exercise.

Business-friendly politicians seem to intuitively get much of this, and this knowledge helps fuel their continued infatuation with oil, coal, and natural gas—despite the increasing *economic* problems (even if we disregard the environmental problems) with these fuels. But these folks' way of dealing with this conundrum is simply to deny that climate change is a real issue. That strategy may work for their supporters in the fossil fuel industries, but it does nothing to avert the worsening real-world crises of extreme temperature events, droughts, floods, and storms—and their knock-on impacts on agriculture, economies, and governments.

So those on the left may be correct in saying that climate change is the equivalent of a civilization-killing asteroid, while those on the right may be correct in thinking that policies designed to shrink carbon emissions will shrink the economy as well. Everybody gets to be correct—but nobody gets a happy ending (at least as currently envisioned).

That's because nearly every politician wants growth, or at least recognizes the need to clamor for growth in order to be electable. Because growth, after all, is how we currently define our collective, national happy ending. So whenever facts lead toward the conclusion that more growth may not be possible *even if our party gets its way*, those facts quickly get swept under the nearest carpet.

Masking reality with political rhetoric leads to delays in doing what is necessary– making the best of the choices actually available to us. We and our political "leaders" continue to deny and pretend, walking blindly toward environmental and economic peril.

* * *

We humans are political animals—always have been, always will be. Our interests inevitably diverge in countless ways. Further, much of the emotional drive fueling politics comes from ethical impulses: perhaps for genetic reasons, different people assign different ethical principles a higher priority. Thus one politician's concern for fairness and another's passion for national loyalty can glide right past each other without ever shaking hands. Religion can also play a role in partisanship, along with the legacies of economic and social exclusion, historic rivalries, disputes, and atrocities. None of this can be dispelled with the wave of a magic wand.

Moreover, political engagement often leads to welcome outcomes. When people organize themselves to effect change, the result can be expansions of civil rights, women's suffrage, and environmental protection. On the other hand, when people fail to speak up, social power tends to become monopolized by a small minority–and that never ends well. So, let's not withdraw from politics.

But how to work effectively in a politically polarized environment? Hyper-partisanship is a problem in approving judicial appointees and passing budgets, and failure to do these things can have serious consequences. But when it comes to energy and climate, the scale of what is at stake runs straight off the charts. The decisions that need to be made, and soon (ideally 20 years ago!), on energy and climate may well determine whether civilization survives. The absence of decisive action will imperil literally everything we care about.

Energy is complicated, and there can be legitimate disagreements about our options and how vigorously to pursue them. But the status quo is not working.

I've struggled to find a hopeful takeaway message with which to end this essay.

Should I appeal to colleagues who write about energy, pleading with them to frame discussions in ways that aren't merely feeding red meat to their already far too polarized audiences, encouraging them to tell readers uncomfortable truths that don't fit partisan narratives? I could, but how many energy writers will actually read this essay, and how many of those are willing to examine their preconceptions?

Perhaps the best I can do is point out the existence of a small but enthusiastic subculture that actually understands these issues. This subculture is exemplified by Transition Initiatives promoting "small-scale local responses to the global challenges of climate change, economic hardship, and shrinking supplies of cheap energy" and the premise that life can be better without fossil fuels. For better or worse, this subculture is practically invisible to political elites and the mainstream media (except perhaps in parts of the UK).

Perhaps it's fitting that this essay leaves both author and readers unsettled and uncomfortable. Discomfort can sometimes be conducive to creativity and action. There may be no solutions to the political problems I've outlined. But even in the absence of solutions there can still be better adaptive behaviors, and judo-like strategies that achieve desired outcomes—ones that could conceivably turn the tide on intractable global problems such as climate change—without directly confronting existing societal power structures. These behaviors and strategies can be undertaken even at the household scale, but we're likely to achieve much more if we collaborate, doing what we can locally while using global communications to compare notes and share our successes and challenges.

Originally published as Richard Heinberg's February 2014 Museletter.

www.postcarbon.org/new-site-files/Reports/Searching_for_a_Miracle_web10nov09.pdf

SEARCHING FOR A MIRACLE: Net Energy Limits and the Fate of Industrial Society, by Richard Heinberg

Foreword by Jerry Mander
A Joint Project of the International Forum on Globalization and the Post Carbon Institute. [False Solution Series #4]
September 2009

www.resilience.org/stories/2012-10-22/gas-bubble-leaking-about-to-burst

Gas Bubble Leaking, About to Burst, by Richard Heinberg, Post Carbon Institute, October 22, 2012

For the past three or four years media sources in the U.S. trumpeted the "game-changing" new stream of natural gas coming from tight shale deposits produced with the technologies of horizontal drilling and hydrofracturing. So much gas surged from wells in Texas, Oklahoma, Louisiana, Arkansas, and Pennsylvania that the U.S. Department of Energy, presidential candidates, and the companies working in these plays all agreed: America can look forward to a hundred years of cheap, abundant gas!

Some environmental organizations declared this means utilities can now stop using polluting coal—and indeed coal consumption has plummeted as power plants switch to cheaper gas. Energy pundits even promised that Americans will soon be running their cars and trucks on natural gas, and the U.S. will be exporting the fuel to Europe via LNG tankers.

Early on in the fracking boom, oil and gas geologist Art Berman began sounding an alarm (see example). Soon geologist David Hughes joined him, authoring an extensive critical report for Post Carbon Institute ("Will Natural Gas Fuel America in the 21st Century?"), whose Foreword I was happy to contribute.

Here, one more time, is the contrarian story Berman and Hughes have been telling: The glut of recent gas production was initially driven not by new technologies or discoveries, but by high prices. In the years from 2005 through 2008, as conventional gas supplies dried up due to depletion, prices for natural gas soared to $13 per million BTU (prices had been in $2 range during the 1990s). It was these high prices that provided an incentive for using expensive technology to drill problematic reservoirs. Companies flocked to the Haynesville shale formation in Texas, bought up mineral rights, and drilled thousands of wells in short order. High per-well decline rates and high production costs were hidden behind a torrent of production—and hype. With new supplies coming on line quickly, gas prices fell below $3 MBTU, less than the actual cost of production in most cases. From this point on, gas producers had to attract ever more investment capital in order to maintain their cash flow. It was, in effect, a Ponzi scheme.

In those early days almost no one wanted to hear about problems with the shale gas boom—the need for enormous amounts of water for fracking, the high climate impacts from fugitive methane, the threats to groundwater from bad well casings or leaking containment ponds, as well as the unrealistic supply and price forecasts being issued by the industry. I recall attempting to describe the situation at the 2010 Aspen Environment Forum, in a session on the future of natural gas. I might as well have been claiming that Martians speak to me via my tooth fillings. After all, the Authorities were all in agreement: The game has changed! Natural gas will be cheap and abundant from now on! Gas is better than coal! End of story!

These truisms were echoed in numberless press articles—none more emblematic than Clifford Krauss's New York Times piece, "There Will Be Fuel," published November 16, 2010.

Now Krauss and the Times are singing a somewhat different tune. "After the Boom in Natural Gas," co-authored with Eric Lipton and published October 21, notes that ". . . the gas rush has . . . been a money loser so far for many of the gas exploration companies and their tens of thousands of investors." Krauss and Lipton go on to quote Rex Tillerson, CEO of ExxonMobil: "We are all losing our shirts today. . . . We're making no money. It's all in the red." It seems gas producers drilled too many wells too quickly, causing gas prices to fall below the actual cost of production. Sound familiar?

The obvious implication is that one way or another the market will balance itself out. Drilling and production will decline (drilling rates have already started doing so) and prices will rise until production is once again profitable. So we will have less gas than we currently do, and gas will be more expensive. Gosh, whoda thunk?

The current Times article doesn't drill very far into the data that make Berman and Hughes pessimistic about future unconventional gas production prospects—the high per-well decline rates, and the tendency of the drillers to go after "sweet spots" first so that future production will come from ever-lower quality sites. For recent analysis that does look beyond the cash flow problems of Chesapeake and the other frackers, see "Gas Boom Goes Bust" by Jonathan Callahan, and Gail Tverberg's latest essay, "Why Natural Gas isn't Likely to be the World's Energy Savior".

David Hughes is working on a follow-up report, due to be published in January 2013, which looks at unconventional oil and gas of all types in North America. As part of this effort, he has undertaken an exhaustive analysis of 30 different shale gas plays and 21 shale/tight oil plays—over 65,000 wells altogether. It appears that the pattern of rapid declines and the over-stated ability of shale to radically grow production is true across the U.S., for both gas and oil. In the effort to maintain and grow oil and gas supply, Americans will effectively be chained to drilling rigs to offset production declines and meet demand growth, and will have to endure collateral environmental impacts of escalating drilling and fracking.

No, shale gas won't entirely go away anytime soon. But expectations of continuing low prices (which drive business plans in the power generation industry and climate strategies in mainstream environmental organizations) are about to be dashed. And notions that the U.S. will become a major gas exporter, or that we will convert millions of cars and trucks to run on gas, now ring hollow.

One matter remains unclear: what's the energy return on the energy invested (EROEI) in producing "fracked" shale gas? There's still no reliable study. If the figure turns out to be anything like that of tight "fracked" oil from the North Dakota Bakken (6:1 or less, according to one estimate), then shale gas production will continue only as long as it can be subsidized by higher-EROEI conventional gas and oil.

In any case, it's already plain that the "resource pessimists" have once again gotten the big picture just about right. And once again we suffer the curse of Cassandra—though we're correct, no one listens. I keep hoping that if we're right often enough the curse will lift. We'll see.

www.postcarbon.org/person/36208-david-hughes
www.postcarbon.org/reports/PCI-report-nat-gas-future.pdf
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Post Carbon Institute: Will Natural Gas Fuel America in the 21st Century?

David Hughes
Published May 29, 2011
In this groundbreaking report, David Hughes shatters the myth (advanced by industry, government, and many environmental organizations) that domestic natural gas can be a "bridge fuel" from high-carbon sources of energy like coal and oil to a renewable energy future.

“Snake Oil: how fracking’s false promise of plenty imperils our future” by Richard Heinberg

Snake Oil: how fracking's false promise of plenty imperils our future – Reviews – The Ecologist

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Snake Oil: how fracking's false promise of plenty imperils our future

Paul Mobbs

20th March 2014

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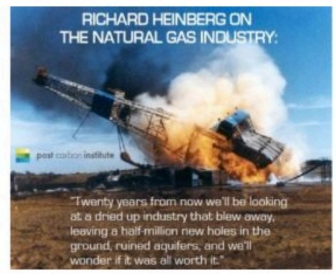
Fracking is just another step on the fossil fuel treadmill, according to 'Snake Oil' by Richard Heinberg. High costs, diminishing returns and growing pollution will ultimately nail its future. Paul Mobbs urges readers - give a copy to your MP before it's too late!



Twenty years from now we'll be looking at a dried up industry that blew away, leaving half a million new holes in the ground, ruined aquifers, and we'll wonder if it was all worth it. Image: Post Carbon Institute.

> “Unlike the USA, where the damage to states such as Texas and Pennsylvania is largely done, we in the UK still have the time to stop this mad policy before it's too late.”

For those who thought the 'fracking' issue was just about water pollution and earthquakes, Richard Heinberg's *Snake Oil* might be a little perplexing.

You don't get to the parts about environmental pollution until about two thirds of the way through the book. But it's for that very same reason that those who are unaware of these larger dimensions to the shale gas issue will get the greatest benefit from reading the book.

Like myself, Richard Heinberg began to look at the issue of energy and the environment in the early 2000s, and in particular the growing geophysical restrictions on conventional oil and gas supplies.

As 'conventional' resources reach their physical limits of production - the point known as 'peak oil' and 'peak gas' - the energy industry has looked to other 'unconventional' energy sources to keep their business models working.

The many faces of a single problem

In Canada that's been tar sands; in Australia it's coal seam gas; in Russian that's drilling in the Arctic Circle; in the USA, and perhaps soon Britain, that's shale gas and oil.

The first two thirds of 'Snake Oil' described the history of how this transition has taken place:

- how Western oil companies and their home economies have become challenged by high energy prices;
- how energy agencies and companies have selectively quoted and managed the statistics on energy supply to downplay any talk of a crisis;
- and as a result, how shale gas was promoted as an energy solution when in fact it was, in that greatest of American traditions, a 'Snake Oil' remedy - a toxic cocktail that tricks the unsuspecting consumer into buying it, and which often makes the underlying problems worse.

The book outlines how interest groups have used partial data to talk-up the promise of shale gas in order to gain political support and financial investment; and then how they used that political and financial capital to relax environmental controls and buy publicity for their technology.

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Snake Oil: how fracking's false promise of plenty imperils our future – Reviews – The Ecologist

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It's just another treadmill

It reveals how the drilling boom sparked by this large-scale investment has been used to promote the economic benefits of shale gas - whilst at the same time hiding the fact that it's the poor production and fast depletion rates of shale gas well which force this continuous 'treadmill' of drilling.

And it uses the oil and gas industry's own proprietary data sources to demonstrate how, like the resource booms of American history, the current boom of US shale gas is likely to go bust very soon - as investment dries up and the available sites are quickly worked out.

And yes, there's a chapter on pollution too!

'Snake Oil' is an American book, largely based on American data. However, from that wealth of experience we can draw parallels with how the industry has been manipulating public opinion in Britain and Europe, to buy political influence and talk-up their false solution.

In advance of the widespread damage seen in the USA, we can hopefully learn the lessons and stop that same corrupt process happening over here.

Stop this mad policy while we still can!

And unlike the USA, where the damage to states such as Texas and Pennsylvania is largely done, we in the UK still have the time to stop this mad policy before it's too late.

'Snake Oil' shouldn't just be a book for anti-fracking activists. It has value to the general public, and I would hope that many journalists and policy-makers would read it too.

To that end we should all consider buying a copy and sending it to our pro-fracking Members of Parliament and Council leaders - and demanding that they respond to the information the book contains in order to justify their support to develop this technology in Britain.

The book: *Snake Oil: How Fracking's False Promise of Plenty Imperils Our Future* is written by Richard Heinberg and published by Clairview Books, February 2014. ISBN 9781 9055 7072 0. £10.99.

Paul Mobbs *is an independent environmental consultant, researcher and author.*

He is also the creator and editor of the Free Range Activism Website.

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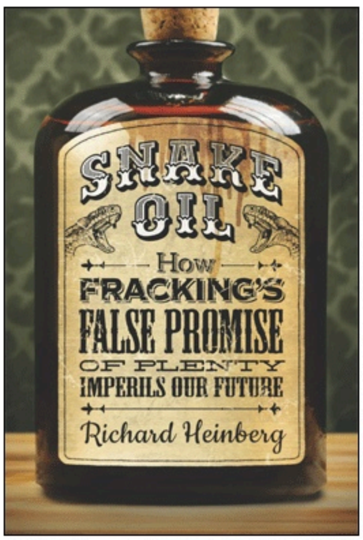

Snake Oil: How Fracking's False Promise of Plenty Imperils Our Future

Richard Heinberg

July 25, 2013

The rapid spread of hydraulic fracturing ("fracking") has temporarily boosted US natural gas and oil production… and sparked a massive environmental backlash in communities across the country. The fossil fuel industry is trying to sell fracking as the biggest energy development of the century, with slick promises of American energy independence and benefits to local economies.

Snake Oil casts a critical eye on the oil-industry hype that has hijacked America's energy conversation. This is the first book to look at fracking from both economic and environmental perspectives, informed by the most thorough analysis of shale gas and oil drilling data ever undertaken. Is fracking the miracle cure-all to our energy ills, or a costly distraction from the necessary work of reducing our fossil fuel dependence?

Published by Post Carbon Institute. Distributed by Chelsea Green Publishing. 2013. 162 pages. ISBN 9780976751090.

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Gas Bubble Leaking, About to Burst

by Richard Heinberg, originally published by Post Carbon Institute | OCT 22, 2012

For the past three or four years media sources in the U.S. trumpeted the "game-changing" new stream of natural gas coming from tight shale deposits produced with the technologies of horizontal drilling and hydrofracturing. So much gas surged from wells in Texas, Oklahoma, Louisiana, Arkansas, and Pennsylvania that the U.S. Department of Energy, presidential candidates, and the companies working in these plays all agreed: America can look forward to a hundred years of cheap, abundant gas!

Some environmental organizations declared this means utilities can now stop using polluting coal—and indeed coal consumption has plummeted as power plants switch to cheaper gas. Energy pundits even promised that Americans will soon be running their cars and trucks on natural gas, and the U.S. will be exporting the fuel to Europe via LNG tankers.

Early on in the fracking boom, oil and gas geologist Art Berman began sounding an alarm (see example). Soon geologist David Hughes joined him, authoring an extensive critical report for Post Carbon Institute ("Will Natural Gas Fuel America in the 21st Century?"), whose Foreword I was happy to contribute.

Here, one more time, is the contrarian story Berman and Hughes have been telling: The glut of recent gas production was initially driven not by new technologies or discoveries, but by high prices. In the years from 2005 through 2008, as conventional gas supplies dried up due to depletion, prices for natural gas soared to $13 per million BTU (prices had been in $2 range during the 1990s). It was these high prices that provided an incentive for using expensive technology to drill problematic reservoirs. Companies flocked to the Haynesville shale formation in Texas, bought up mineral rights, and drilled thousands of wells in short order. High per-well decline rates and high production costs were hidden behind a torrent of production—and hype. With new supplies coming on line quickly, gas prices fell below $3 MBTU, less than the actual cost of production in most cases. From this point on, gas producers had to attract ever more investment capital in order to maintain their cash flow. It was, in effect, a Ponzi scheme.

In those early days almost no one wanted to hear about problems with the shale gas boom—the need for enormous amounts of water for fracking, the high climate impacts from fugitive methane, the threats to groundwater from bad well casings or leaking containment ponds, as well as the unrealistic supply and price forecasts being issued by the industry. I recall attempting to describe the situation at the 2010 Aspen Environment Forum, in a session on the future of natural gas. I might as well have been claiming that Martians speak to me via my tooth fillings. After all, the Authorities were all in agreement: The game has changed! Natural gas will be cheap and abundant from now on! Gas is better than coal! End of story!

These truisms were echoed in numberless press articles—none more emblematic than Clifford Krauss's *New York Times* piece, "There Will Be Fuel," published November 16, 2010.

Now Krauss and the *Times* are singing a somewhat different tune. "After the Boom in Natural Gas," co-authored with Eric Lipton and published October 21, notes that ". . . the gas rush has . . . been a money loser so far for many of the gas exploration companies and their tens of thousands of investors." Krauss and Lipton go on to quote Rex Tillerson, CEO of

ExxonMobil: “We are all losing our shirts today. . . . We’re making no money. It’s all in the red.” It seems gas producers drilled too many wells too quickly, causing gas prices to fall below the actual cost of production. Sound familiar?

The obvious implication is that one way or another the market will balance itself out. Drilling and production will decline (drilling rates have already started doing so) and prices will rise until production is once again profitable. So we will have *less* gas than we currently do, and gas will be *more expensive.* Gosh, whoda thunk?

The current *Times* article doesn’t drill very far into the data that make Berman and Hughes pessimistic about future unconventional gas production prospects—the high per-well decline rates, and the tendency of the drillers to go after “sweet spots” first so that future production will come from ever-lower quality sites. For recent analysis that does look beyond the cash flow problems of Chesapeake and the other frackers, see “Gas Boom Goes Bust” by Jonathan Callahan, and Gail Tverberg’s latest essay, “Why Natural Gas isn’t Likely to be the World’s Energy Savior”.

David Hughes is working on a follow-up report, due to be published in January 2013, which looks at unconventional oil and gas of all types in North America. As part of this effort, he has undertaken an exhaustive analysis of 30 different shale gas plays and 21 shale/tight oil plays—over 65,000 wells altogether. It appears that the pattern of rapid declines and the over-stated ability of shale to radically grow production is true across the U.S., for both gas and oil. In the effort to maintain and grow oil and gas supply, Americans will effectively be chained to drilling rigs to offset production declines and meet demand growth, and will have to endure collateral environmental impacts of escalating drilling and fracking.

No, shale gas won’t entirely go away anytime soon. But expectations of continuing low prices (which drive business plans in the power generation industry and climate strategies in mainstream environmental organizations) are about to be dashed. And notions that the U.S. will become a major gas exporter, or that we will convert millions of cars and trucks to run on gas, now ring hollow.

One matter remains unclear: what’s the energy return on the energy invested (EROEI) in producing “fracked” shale gas? There’s still no reliable study. If the figure turns out to be anything like that of tight “fracked” oil from the North Dakota Bakken (6:1 or less, according to one estimate), then shale gas production will continue only as long as it can be subsidized by higher-EROEI conventional gas and oil.

In any case, it’s already plain that the “resource pessimists” have once again gotten the big picture just about right. And once again we suffer the curse of Cassandra—though we’re correct, no one listens. I keep hoping that if we’re right often enough the curse will lift. We’ll see.

www.resilience.org/stories/2014-12-24/fracking-fracas-the-trouble-with-optimistic-shale-gas-projections-by-the-u-s-department-of-energy

Fracking Fracas: The Trouble with Optimistic Shale Gas Projections by the U.S. Department of Energy, David Hughes

December 23, 2014

On December 3, 2014, *Nature* published "Natural Gas: The Fracking Fallacy", which suggested that the forecasts of the Energy Information Administration (EIA) for four major U.S. shale gas plays were wildly optimistic, based on a comparison to forecasts for the same plays by the University of Texas Bureau of Economic Geology (UT/BEG). This was followed by a formal denunciation of the article both by the EIA and UT/BEG, despite the fact that the substance of the article was correct. Arthur Berman provided an excellent overview of the merits—or in this case the lack thereof—of the attack by both of these agencies on what is essentially the reality behind the shale revolution.

The *Nature* piece steered clear of any discussion of my recent *Drilling Deeper* report (published by Post Carbon Institute), which looked at twelve major shale gas and tight oil plays accounting for most of U.S. shale production, and which also came to the conclusion that the EIA's projections were extremely optimistic. *Nature* focused instead on the four plays described in two published and two unpublished studies by UT/BEG. The *Nature* article sparked a lot of media attention, which prompted the EIA and UT/BEG to issue rebuttals.

The argument of the EIA and UT/BEG that their projections of shale gas production from the plays mentioned in the *Nature* article are fundamentally similar is untrue, given the publicly available data. The implications of the EIA being wrong on its projections of cheap and abundant gas for decades are considerable, given that investment decisions are now being made based on these projections— including construction of infrastructure for LNG exports, gas-fired generation and even crude oil exports. Hence it is worthwhile to examine the EIA's optimistic projections in more detail in light of the projections available from UT/BEG and the *Drilling Deeper* report (DD).

www.postcarbon.org/the-shocking-data-behind-shale-oil/

The Shocking Data Behind Shale Oil, Chris Martenson, David Hughes, December 16, 2014

Hooray, oil is suddenly much cheaper than it used to be. That's great news, right?

Not so fast. For certain it's not good news for those counting on a continued rise in US oil production from the "shale miracle". Many drillers were challenged to operate profitably when oil was above $70 per barrel. Very few will remain solvent with oil in the $50s (as it is as of this writing).

So, expect US oil production to suffer from these lower prices if they persist. But even if oil prices rise and rise soon, there's new data that indicates the total amount of extractable oil from America's shale plays is less –*much* less — than what we're being told (or better put, "sold").

On today's podcast, Chris Martenson talks with oil analyst David Hughes, who has analyzed the major shale plays utilizing a massive database of well production results from America's shale basins. The data show that declines tend to be hyperbolic in all shale fields. The average first-year decline is 70%; down to 85% by year three. And we're drilling the best parts of these plays first: meaning that future wells will yield less even under the best results.

We're pinning our hopes of "oil independence" on faulty assumptions. Worse, we're using it to dismiss the Peak Oil theme at exactly the time we should be using this extra oil to construct the infrastructure for our next energy age (whatever that may look like), while we still have the net energy available to us:

> *Let's just take a play like the Bakken.: 45% annual field decline, sweet spots are getting to be drilled out. We know that they need to drill 1,500 wells a year just to keep production flat. But as you go into lower quality rock, the well quality in most of the play's extent is only about half of what it is in the sweet spot. If you have to rely on the lower quality part of the play you need 3,000 wells per year instead of 1,500 to offset the field decline. But the wells aren't any cheaper. They cost the same amount to drill. To be profitable for producers, it's going to take a lot higher prices in order to make that happen. And you can go through play after play and see the same thing. We are drilling the best parts of the plays now and it is just going to get worse down the road. We are going to need higher and higher prices.*
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> *The EIA has not only made what I consider really optimistic estimates on production, they have also made optimistic estimates on price. A lot of the infrastructure that is being built today is based on the assumption of cheap prices for the foreseeable future. That is not in the cards. With these recent cheap prices we are going to see production go down a lot faster than my estimates. My estimates are best case: I assume that the capital will always be there to drill the wells and that there will be no environmental concerns that restrict access to drilling locations. So in that way I am the best case. But even if you take my best case, the medium and long-term supply picture from shale is disturbing.*
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> *Sadly, corporations tend to think about the next couple of quarters. Politicians may think about the next election, but an energy sustainability plan has to have a vision of decades we certainly don't see that in all the hype read every day. If you look at the mainstream media, I don't think there is a lot of original research that is done there. I think people tend to repeat what other people said and it kind of takes on a momentum of its own, which is why I was so*

interested in trying to lay out as much of the basic data on these shale plays as I could. It's dangerous.
I mean, if you look at the infrastructure going forward in an era of declining oil and gas the number one way to promote energy sustainability in my view is figuring out ways to use less. And some of the infrastructure that needs to be built in order to give people an alternative to high energy throughput lifestyles takes a lot of oil and gas to build. And you know, this short term bounty that we are looking at should in fact be used to do that not to maintain business as usual to the bitter end and then face the consequences.

TRANSCRIPT

Chris Martenson: Welcome to this Peak Prosperity podcast. I am your host Chris Martenson. Today there really is no more important story than what is happening to the price of oil. Now just like in 2008 oil has been plummeting catching everyone including this analyst by surprise. West Texas intermediate crude, the WTIC blend I am looking at right now at $58 and a few pennies here. Right here on the 12th of December. And the airwaves are packed with commentary. And the print media are churning out copy to explain all of this to us. Mostly with the spin that the price plunge is due to US shale oil flooding the world markets. And most are going out of their way to even find Wall Street analysts who make the claim that shale oil is profitable at $70, no $60, no $50. In fact, I even read last week one analyst claim that $25 a barrel was profitable in the shale plays.
Now why does all of this matter so much? Isn't lower oil prices, aren't those good for consumers and should we see all of this maybe as a gift? Well, yes for now. But unfortunately not in the sense that in the near term a lot of shale oil and shale gas companies are going to go out of business because they were not profitable when oil was 40% higher. And they are therefore even more unprofitable today. And over the longer term we see oil projects getting pulled left and right today. Deep water plans have been shelved. Capital cut backs have happened in the oil sands and this means that future production will be lower than if oil prices had remained elevated. So a little consumer happiness today potentially followed by damaging oil shortfalls in the future.

The shale story, however, is weighing on this and it is not a simple story as the media likes to portray. It is more than plucky American can-do ingenuity turning straw into gold. To really understand the shale oil future we need to understand that not all shale plays are created equally. And that within each play some regions are sweet spots and others are relative duds. We need to know that these wells deplete horribly quickly. And that the very process of drilling these wells creates all sorts of above ground troubles, including road and bridge damage and airborne fracking aerosols that drift about harming humans and animals alike.

Now possibly, worst of all, is that the nation if not the world has latched onto the shale story as if it were some permanent savior from the unpleasant task of facing up to the idea that oil is a finite substance. To help us understand all of this we could not have a better guess today than David Hughes, a geo-scientist who has studied the energy resources of Canada for nearly four decades including 32 years with The Geological Survey of Canada as a scientist and research manager. Now it is his work with The Post Carbon Institute that has really caught my eye. That includes "Drill Baby Drill," a 2013 report. Probably the most comprehensive, publicly available analysis to date of the prospects for shale gas and tight oil, as shale oil is usually called in the United States. "Drilling California," which was the first, first publicly available empirical analysis of actual oil production data from California's much promoted Monterey formation and the subject of today's discussion, "Drilling Deeper," which is a reality check on the Department of Energy's expectation of long-term domestic oil and natural gas abundance. Welcome, David.

David Hughes: My pleasure, Chris.

Chris Martenson: Well, David I want to – really, I am very excited to have this conversation with you. And I want to help our listeners understand what is truly possibly in the shale plays. Obviously there is oil there. There is gas there. We are getting both out of the ground, that's true. But I need to cut through the marketing copy and even outright industry propaganda that has muddied the waters so that our listeners can make some informed decisions. Now let's focus on "Drilling Deeper," your most recent study. Tell us about this study. I want to know what it included, how it was conducted and for example, what sorts of data did you use to perform the analysis? What can you tell us about how you put this report together?

David Hughes: Well, we had access for the first time really to the EIA's play by play forecast which was published in the "Annual Energy Outlook 2014." And what I wanted to do is look at those forecasts and basically do a reality check on them. So what we did is we looked at the top 12 shale plays that basically account for 88% of shale gas production. In the EIA's forecast 82% of tight oil production. We went through that play by play. The data source was Drilling Info, which is a commercial database out of Austin, Texas, that is used by the EIA and it is also used by most multinationals. And it contains basically all of the well production data on a play by play basis. So one can take it apart at the play level and one can also take it apart at the county level within plays. So I was interested in looking at the – as you referred to, all plays are not created equal. And even within plays all counties are not created equal. So we wanted to do things like you know, characterize well quality, what is the average productivity by county, by play. What are the decline rates? Both well decline rates which are very steep if you look at a tight oil play like the Bakken for example. The average three year decline is about 85% in production. The average first year decline is about 70%. Declines tend to be hyperbolic in all shale fields. The first year is the greatest, the second year is a bit less. Third year a bit less. So if you look at the decline of the field, which is really a combination of new wells declining quickly and older wells declining slowly, you can compute a field decline.

And so for a field like the Bakken the decline is about 45% per year, which means that 45% of production has to be replaced by more drilling in order to keep production flat. So if you know the average rate of production for the first year of wells in a play it is quite easy to calculate the number of wells you need to drill in order to keep production flat. And for a play like the Bakken that is about 1500 wells per year are needed just to keep production flat. So in round numbers at $10 million a well you need to put in about $15 billion a year to keep production flat on the Bakken. Production is growing in the Bakken and that is because they are drilling 2,000 wells a year. They are 500 wells to the good in terms of growing production. However, the higher production grows the larger the chunk that 45% drill decline takes. So you need more and more wells in order to offset decline. So basically, what we did for each of those plays is put all of that information into a spreadsheet. So we know what the well quality is in the sweet spots and we know what the well quality is in all the rest of the play. And typically sweet spots may be 15 to maybe 20% at the outside of the total play area.

So we know that fundamental law of oil and gas companies is they drill their best locations first. So the wells are going into the sweet spots today, but as drilling locations are used up in sweet spots they are going to have to go more and more into lower quality rocks. We can put all of that into a spreadsheet and come up with production forecasts going forward.

Chris Martenson: So this spreadsheet then, this is at the individual well level? So like well has a code that is associated, some alpha numeric code and says this is well XJ55 or whatever and you had each of those in a spreadsheet so they were sorted I guess by time so that you would have – I mean there are thousands and thousands of wells drilled in the Bakken and some of them get started to be drilled in what 2007? And then there is a vintage in 2008, 9, 10 so did you have all that data available?

David Hughes: Yes. So for a play like the Bakken we had all of the producing wells up until about July of 2014. "Drilling Deeper" was published in late October. We tried to keep it current to mid 2014. So we had every well that was drilled from year 0 in all of those different plays.

In terms of making the forecast, basically we used the average production over the first year which allowed us to determine the number of wells that you need to offset that 45% decline. And you know, in the spreadsheet you start off assuming—in the case of the Bakken you know, engineering companies are telling us that well technology is getting better and we are making those wells more productive. I actually was doing a check on that for every play. I looked at the average productivity by year from 2009 until 2013. So you can see if in fact, it is going up or if it is not going up.

Chris Martenson: This is per well productivity, right? So that is what we really care about is productivity of the wells and just at this point I need to interject. I think that the EIA has muddied the water to turning to what they call "per rig" productivity and saying people have thrown this at me a lot lately "oh 300% productivity improvement." No, no, no that is a process improvement because what they have done is they managed to figure out ways to drill multiple wells off a single pad. And they have these things called walking rigs which allows each rig to spend less time in transit and more time drilling. So we are drilling more wells, but what you are talking about is the per well productivity, which is what we really should care about, right? Because if we are getting more oil out of each well then yes, there is more oil coming out of the play. But if we are drilling more wells faster that is not the same thing. So you are talking about per well productivity, right?

David Hughes: Absolutely.

Chris Martenson: So what do you see there?

David Hughes: You know, the other thing is how many wells could you drill in a play? That was another fundamental parameter that we looked at for every play. If you look at investor's presentations there is a lot of talk about down spacing. How close can you space these wells before you get interference. There is a – what I thought was a really good paper published by an engineer at Drilling Info who looked at the Bakken in terms of down spacing. In essence if you drill two wells 300 feet apart, initially the productivity will likely be very high. It would likely be comparable between the two wells. But if you look at it over 12 months or 24 months you can start to measure the interference so one well is cannibalizing another well's oil. And the drilling info paper basically said below about 2,000 feet spacing you are starting to see interference if you look at a 12 to 24 month timeframe.

We made assumptions about how many wells you can drill in a play. For a play like the Bakken we assumed when the play is said and done you can drill about 32,000 wells. There is

8,500 producing wells right now. We felt you could drill four times as many wells as are there right now. That is a key fundamental parameter in making the forecast. So if rigs are more productive, sure you can drill those locations out quicker, but you don't necessarily get any more oil at the end of the day. It is per well productivity that counts at the end of the day.

Chris Martenson: Let me talk about that per well productivity then. This is a central part to the story that is out there. So I want to make sure we get this right. So a typical Bakken well they drill down whatever 10,000 feet, slant it sideways. And then they go sideways in this big horizontal stage and I guess how much we get out of a well is going to be a function of a number of things. One, the underlying geology that is just true for that rock. Two, how long of that lateral we drilled? Is it 5,000 feet? Is it 10,000 feet? That makes a big difference in the collection area. Then I guess are we doing a five stage frack or a 30 stage frack? So how much we shatter that rock up. All of that sort of plays in and I assume that are playing with all of those parameters over time. But you have got data that showed these wells by year. And if we really were — I don't know how you would factor out the longer drilling and the more fracking, but how much additional oil are we seeing coming out of the wells because we have made improvements to the drilling techniques and the fracking techniques? How much is that?

David Hughes: Well, it depends on the play. And it depends on the region within the play. So if you look at the Bakken the average well that was drilled in the Bakken went up about 7% from 2011 to 2013. That is a combination of better technology, as you say longer horizontal laterals, more frack stages, higher water volumes, more propping and it is also a function of people drilling in the sweet spots. It is hard to differentiate the two. I think it is a combination of both; better technology and drilling in the sweet spots.

So for a play like the Bakken we say okay, we are looking at a slight improvement in well productivity. So I'm going to assume that is going to continue for another year or two before people start to have to drill in lower quality parts of the reservoir. And from peak well productivity, well productivity will decline as you go into the lower quality rock. The technology is never going to make up for bad reservoir rock. The Bakken is still quite a young play. As I said, they have only drilled about 25% of the total potential locations. So there are still locations in the sweet spots. Well, those are running out fairly quickly.

If you look at an older play like the Barnett which is a shale gas play in Texas and that is where fracking really got its start. Well quality peaked in 2011. So they drilled about 20,000 wells in the Barnett now. 4,000 of those are no longer productive. Well quality peaked in 2011 and it is now down 17% from peak. So if you look at the top counties in the Barnett they are finished .There is already eight wells per square mile and drilling has to move into lower quality rock. Production of the Barnett is now down 18%. In a mature play like the Barnett you are really seeing the fact that geology wins out every time against technology, despite what Halliburton and some of these companies will tell you.

Chris Martenson: Now one quick thing on the Barnett. Somebody said to me once, "well that's because natural gas prices are at say $3 to $4.00 per NCF. But if natural gas prices went back up to $10 or $12.00 from its current $3 to $4 that people would start punching more holes into the Barnett." That is the slow down in the drill program accounts for that decline, but they could ramp it back up again if prices were higher. We know price is always a function in this story that is lurking out there. How much do you think the Barnett would be sensitive to additional price improvements and people drilling more, and how much do you think it is past its prime, it is already done?

David Hughes: Well, I looked at that. And that is true to a certain extent – the drilling rate in the Barnett is down. It is only about 400 wells per year right now. So in every play drilling rate is the key parameter. How fast you drill determines what the production profile looks like. So in every play I get at least three and sometimes four different scenarios of drilling rate. And the Barnett I – my low scenario is we just keep drilling 400 wells per year. What does that look like in terms of future production? My most likely scenario is the price of gas is going to go up a bit and drilling will be bumped from 400 to 600 wells per year. And then it will gradually decline to 500 wells per year to move into the lower quality parts of the play, which they are already moving into.

But I also did another study, another projection that said okay what if quintuple drilling rates in the Barnett? If we go from 400 to 2,000, which is what it was at its max back in about 2008. And if you do that you can certainly stop the decline and reverse it to a new peak. That new peak would happen in about 2016. You know, if we instantaneously increased the drilling rate by five times. However, when you look at the total production out to 2040, it doesn't change the cumulative production that much. All you do, if you drill faster, you get it quicker. So if you look out through say 2020-2025 in that quintuple drilling rate scenario, all of a sudden production falls below what you would have got if you follow my most likely scenario. So there is no free lunch. You can drill fast and get it quick and then suffer the consequences later. Or you can drill at what I consider the most likely rate.

I went through that scenario for all the plays and then stacked them all up and compared my most likely scenario to what the EIA projected.

Chris Martenson: Okay. I am going to assume given the current prices that we are going to fall below your most likely scenario for a while just because prices aren't supportive of a real robust drilling program right now.

To get back to drilling deeper—among the major conclusions of your report were that shale oil would peak in output before 2020. I think the EIA is roughly in agreement with that. But where you disagree with the Energy Information Agency, the EIA, is that you feel they have overstated the amount of oil that the US would produce by 2040 by a really very wide margin. I want to understand those conclusions. So let's break them down.

First, talk about the peak in shale oil happening before 2020. How did you arrive at that conclusion? I understand that you've modeled this. You have ran a variety of scenarios. When I say "shale oil peaks before 2020," I assume that is under your most likely scenario. Let's talk about that scenario and what the implications of that are. So do you still see a peak before 2020?

David Hughes: Yeah. The actual peak before 2020 was for the two top plays, which are the Bakken and the Eagle Ford. The Bakken and Eagle Ford make up 62% of current tight oil production. So those are really the two biggies. I also went through Permian Basin plays. But the Permian Basin is unlike the Bakken and Eagle Ford; the Permian Basin is really a very old place. They have been around for 40 to 60 years. Other plays like the Niobrara and the *Austin* Chalk would fall into that category too. So these are really old plays that we have known about for a long time and they are redeveloping them with better technology. With fracking.

The Bakken and Eagle Ford are unique in that they kind of rose from nothing. They're true tight oil shale oil plays. I was able to do forecasts for those two for tight oil and for the Permian basically I just looked at all of the historical data. I didn't actually make projections. But if you look at the Bakken and Eagle Ford, the two most important tight oil plays in the US, I went through those and did the same scenario based on drilling rate and looked at the most likely scenario. So for example, for the Bakken, not withstanding the current low oil prices, I assume that the drilling will continue at 2,000 wells per year and then gradually fall to 1,000 wells per year as they move into the outlying, low quality parts of the play.

And if you do that, Bakken production rises to about 1.2 barrels a day. In or around 2015, 2016 you get a peak followed by a long decline. Same thing for the Eagle Ford. The Eagle Ford is actually the number one tight oil play in the US right now. They are plowing 3,500 wells per year into Eagle Ford. Yeah, its just incredible, it's 10 wells per day. And I assumed that drilling was going to continue at that rate and gradually decline to about 2,000 wells per year as they move into the outlying parts of the play. If you do that, it peaks considerably higher. I am just trying to think right off hand… I think my most likely scenario was around 1.4 to 1.5 million barrels a day and that will happen around 2016, 2017. If they ramped up drilling in Eagle Ford they could go much higher. They can probably top out at 1.8 million barrels a day. Also the Eagle Ford produces a lot of associated gas. So there is a lot of value in those wells. You look at the trajectory, peaking in 2016, 2017 and declining. When you add up the production in 2040 in the Bakken and the Eagle Ford compared to the EIA forecast for the Bakken and Eagle Ford, mine are less than a tenth of the production in 2040.

Chris Martenson: Less than a tenth.

David Hughes: Less than a tenth. The other interesting thing is the EIA seems to have underestimated short term production. So my projections are actually for higher production early on and a higher peak than the EIA. But you know, much worse scenario down the road. Much lower productivity by the time you get to 2040.

Chris Martenson: This is interesting. I assume you have read or heard of the University of Texas at Austin study on shale gas that concluded that US government estimates of the amount of natural gas that can be extracted by fracking are far too optimistic and that shale gas production will peak in 2020, I think they put it, and decline rapidly. As I understood it what they did is they didn't look at county level resolution. They broke down all the plays into square mile resolution, which some counties are thousands of square miles. So this resolution is much higher and that helps them identify sweet spots or not sweet spots more accurately, I assume. So I am wondering, did you read that? And how did their study conclusions differ from yours or do your conclusions match? Then given your answer to that, what is the EIA doing wrong, or what should they consider amending in their approach to be more realistic. So first on the study – did you see it and how do your conclusions match?

David Hughes: Oh yeah, I've got a detailed comparison in "Drilling Deeper" between my work and UT's work and they are very comparable. You know, if you look at the section by a square mile by square mile resolution, you can do that but in fact the critical parameters — one of the key parameters you get for every well is IP, right? That is the highest one month production or the highest six month production of every well, which I mapped, which gives you a pretty good idea of where the sweet spots are. There is a lot of other parameters you can look at for shale gas, thermal maturity, organic matter content, porosity, natural fracture density, things like that, but those parameters are not measured at a square mile resolution. They are measured generally at a much broader scale. So I think that you can do a pretty good job at the county level, which is the level that I took it — and parts of counties. When I looked at the total play area, I looked at the boundaries between productive wells and non productive wells so we could put a limit. I only used that portion of the county that was productive in determining the productive play area. When I did the comparison I talked to Scott Tinker at UT. Basically their base case and my most likely case are very close. There are only two studies that they published so far – the Barnet and the Fayetteville — so I did a detailed comparison. In fact, they may be a little more pessimistic than me in some cases. But you know, we are in broad agreement that the EIA is wildly optimistic.

Chris Martenson: What would the EIA need to do to become more realistic? Where are they – we know that the – so I mean we know the EIA in the case of the Monterey shale they turned to a private firm and just did some back of the envelope calculations and then had to downgrade the Monterey estimates of what that reserve was going to be at by 96%. Something that you had come to a conclusion a long time before. Obviously the EIA had some methodological issues or they relied on the wrong parties in the case of the Monterey. But more generally, what is the EIA doing that is giving them these inflated estimates do you think?

David Hughes: I scratch my head about that. If you go through "Drilling Deeper," — it's a free download for your guests or audience — I've done a comparison. The Barnett, my most likely case, compared to the EIA; it is really kind of bizarre. The EIA agrees that the Barnett peaked in 2012 and it is going to decline but then they have a ramp up to nearly the equivalent of the 2012 peak in 2040. So it doesn't fit with the fundamentals of the play. The only thing I can think of is they have a phenomenal faith in technology. That somehow someone is going to pull a technological rabbit out of his hat. Same thing if you go through play by play I have done the comparison. One of them I think the Bone Spring in the Permian I think the EIA is too conservative, but every other one they are way too optimistic.

Chris Martenson: Well this is really important because as I look at it I see chemical companies and power utilities, all of them investing tens, hundreds of billions of dollars in new property, plant, and equipment. Investments with 40, 50 year life cycle horizons. Because they are taking advantage of, I am quoting here, "100 years of cheap, natural gas," mostly from the shale plays. If you were going to advise these companies, what would you – would you tell them that you think the EIA's assessments are not the ones they should be using?

David Hughes: Absolutely. And that is one of the reasons I was so interested in doing "Drilling Deeper." And I have laid out, if you go through it, there is 20 pages a play and a lot of the basic fundamental data that has never been available is there in charts and graphs. Let's just take a play like the Bakken. 45% field decline, sweet spots are getting to be drilled out. We know that they need to drill 1,500 wells a year just to keep production flat. But as you go into lower quality rock and the well quality in most of the plays is only about half of what it is in the sweet spot. If you have to rely on the lower quality price of the play you need 3,000 wells per year instead of 1,500 to offset the field decline. But the wells aren't any cheaper. They cost the same amount to drill. Obviously you need a lot higher prices in order to make that happen. And you can go through play after play and see the same thing. We are drilling the best parts of the plays now and it is just going to get worse down the road. We are going to need higher and higher prices.

The EIA has not only made what I consider really optimistic estimates on production, they have also made optimistic estimates on price. A lot of the infrastructure that is being built as you say is based on the assumption of cheap prices for the foreseeable future. That is not in the cards. With cheap prices, we are going to see production go down a lot faster than my estimates. My estimates are best case, so I assume that the capital will always be there to drill the wells and that there will be no environmental concerns that restrict access to drilling locations. So in that way I am best case. Even if you look at my best case, that will be rather disturbing to me if I was a petro chemical company or somebody that was investing a lot in gas fired generation.

Chris Martenson: Alright. Let me test one of the assumptions then. There are a couple of key assumptions that are really driving the overall scenario then. First is going to be the decline rates of each wells and that leads you to say here is why we need to replace 1,500 wells. Let's start there with that decline rate. I was reading this Bloomberg article yesterday and I am quoting here, "Shale production will keep growing because the rate of decline from wells has been overstated, Ed Morris, head of commodities research at Citigroup said." So I am already reading things where they are tossing out that decline rates have been over estimated, but when I read your report what I saw is that you didn't estimate these decline rates; you measured them, right? So what is the difference between these? Did you estimate them? It looked to me like a measurement. Like you just said "let's sum up all of these wells by vintage and see how fast they decline." That's not an estimate. That is more of a measurement. What do you think the disagreement here is?

David Hughes: Well, if you want an optimist, Ed Morris makes the EIA look like the most conservative organization on the planet. He has always been wildly optimistic. If you look at his latest forecast for tight oil, we're going up to 7 million barrels a day and it is just going to stay there forever. I am not sure what Ed uses to make those kind of statements, but what I used is every well. My decline curve for the play in every play is all the wells in the play. I looked at the most current five years worth of drilling. I also looked at well decline curves in every county. You know, all of the top counties at any rate in every place. That is data. It is just nothing imaginary about that.

Chris Martenson: Alright. So you feel like the well decline rate is something we have a handle on, we can model that. We have enough data out of the big plays, the Barnetts, the Fayettevilles, the Eagle Fords, Permian, Bakken — we've got enough. Maybe even Marsalis. We have enough data now to say, "Hey this is kind of how this plays out." Is this a fair statement?

David Hughes: That is a very fair statement.

Chris Martenson: Cool alright. So second big piece – the second big factor I have some confusion around is how much oil is ultimately going to flow from a well, which goes by the acronym EUR, the ultimate recoverable amount of oil. I've got to tell you David, the typical EURs that I am still reading in the newspapers from the Bakken wells, they just toss around this 500,000 barrel amount; it is a lot of oil. And looking in "Drilling Deeper" I found a table you had your EURs that averaged 378,000 barrels a well. That is a big discrepancy. How do you explain that one?

David Hughes: I think if you look at — was it the Bakken you are looking at?

Chris Martenson: Yeah.

David Hughes: I think if you look at counties like Montrail and McKenzie they are higher than that. And if you look at the outlying counties like Divide and Richland they are much lower than that. I can't recall — I think the Montrail and the McKenzie are about 400 and the Richland and Divide and some of those are down sort of in the low 200s. So overall they may average 378 like you say.

Chris Martenson: Yeah. That was your total. So how did you derive your EURs? Was that by taking the decline rates and extrapolating them out and coming up with some idea of how long these wells will persist?

David Hughes: Yeah. The bottom line is nobody knows how much oil is going to come out of those wells until the last barrel gets pumped. So it is an assumption, right? You fit a curve – most companies fit a hyperbolic curve or some combination of hyperbolic/exponential. What I did is I used the actual data for the first four years. So the decline curve for the first four years in a play like the Bakken is pretty solid, you know, it is not much doubt about that. So I took the data for the first four years — how much oil is that cumulatively? And then I fit a 13% exponential decline after that, assuming the well would live to be 30 years old, which is a totally unproven assumption. But for the sake of comparison so I could at least compare the EUR between counties. I used a 13% exponential decline. That number is certainly arguable. If you look at the decline in year four in the Bakken it is probably about 20%. So using 13% as a terminal decline is maybe optimistic. The other thing that if you look at those EUR diagrams in "Drilling Deeper," you will see I have denoted the amount of oil that is produced in the first four years versus the next 26 years, and typically 50 to 60% or more of a well's total oil will be produced in the first four years. So you know, if you are in a sweet spot you can make your money back pretty quickly. That is one of the beauties for oil companies about shale wells. The downer is we don't know if it will only last for 12 years, and that assumption of total EUR is just that, an assumption. I looked at the Barnet and 4,000 wells are no longer producing and their maximum life is only about 10 years. Their average life is something like four years. So you know, anybody that tells you a well is going to produce this much oil is really kidding you. It is only an assumption at this point in time.

Chris Martenson: The Barnett is mostly, it is all gas right? So maybe the gas plays will be different, but this is astonishing to me, David, the astonishing thing is that the Barnett really started getting drilled hard in what, 2007-ish maybe, 2008?

David Hughes: Or the Bakken, you meant?

Chris Martenson: No, I was thinking of the Barnet. When did that start getting drilled?

David Hughes: Oh okay. It really got started in the late '90s for the Barnet. I mean it really ramped up after about 2003, 2004.

Chris Martenson: Right, but that's just like 10 years ago that is when the ramp up started and the peak happened on that gas play within a 10 year window, let's just say, and so obviously the Bakken is going to be different because there is still what 24,000 well sites that can be drilled. That will just take time. At 2,000 wells a year we still got 12 years of drilling. So it is going to take some time for that to really — there is plenty of room to continue that drill program, but it is not forever. And so this is the part I really want to get to is this idea that somewhere before or around 2020 even these shale plays now are in decline from a total production standpoint. And as far as I'm concerned, because I am 52 now, that is like tomorrow. Time seems to go faster as I get older. So this is really soon as far as I am concerned and my concern in trying to publicize all this is we got the data, you have done this incredible work, there it is. There is really nothing to argue about with decline rates. We can quibble a little about the EURs. We can talk about how close the wells might be spaced, but really we are sort of wiggling a little. We are not going to get 100 years of gas. We are not going to get 100 years of increasing oil production out of this whole thing, Ed Morris' weird graphs not withstanding. So my concern is that this is really, really important because so many decisions are being built in this country around this idea that we have solved this energy crisis and it is now in the rear view mirror, but it is really not is it?

David Hughes: Absolutely not. I have been on that same theme there Chris for many years. Corporations tend to think about the next couple of quarters. Politicians may think about the next election, but this is an energy plan, an energy sustainability plan has to have a vision of decades and we certainly don't see that in all the hype we read every day.

Chris Martenson: If I had my magic policy wand I would say "great, we can pretty much add up how many trillions of cubic feet of gas we think we are very likely to get at a certain price and here is how many billions of barrels of oil are left and these are two finite numbers." And then we would take those and we would go "where would we like to be when those finally run out" — or nothing every fully runs out, but we are going to have a blob of energy that we get to use over this next period of time, let's call it 10 or 20 years, and then it is largely gone at that point in time. Dregs remaining. That is what I would love to have a conversation. Where do we want to be in 10 or 20 years? Because business as usual will get us to a place where we have a lot of infrastructure that can't be supported any longer because we don't have the goods for it. This is the part where I get in arguments all the time, people go "oh but we are so swamped with natural gas that look it drove prices down. It just proves that technology will always find a way." My response to that is: "Did you know that we still in the United States are a net importer of natural gas?" And most people don't know that part because they hear we are making LNG terminal decisions because we have so much that we better just export it. It is just astonishing to me that the data that you have and the public perception it is still pretty far apart.

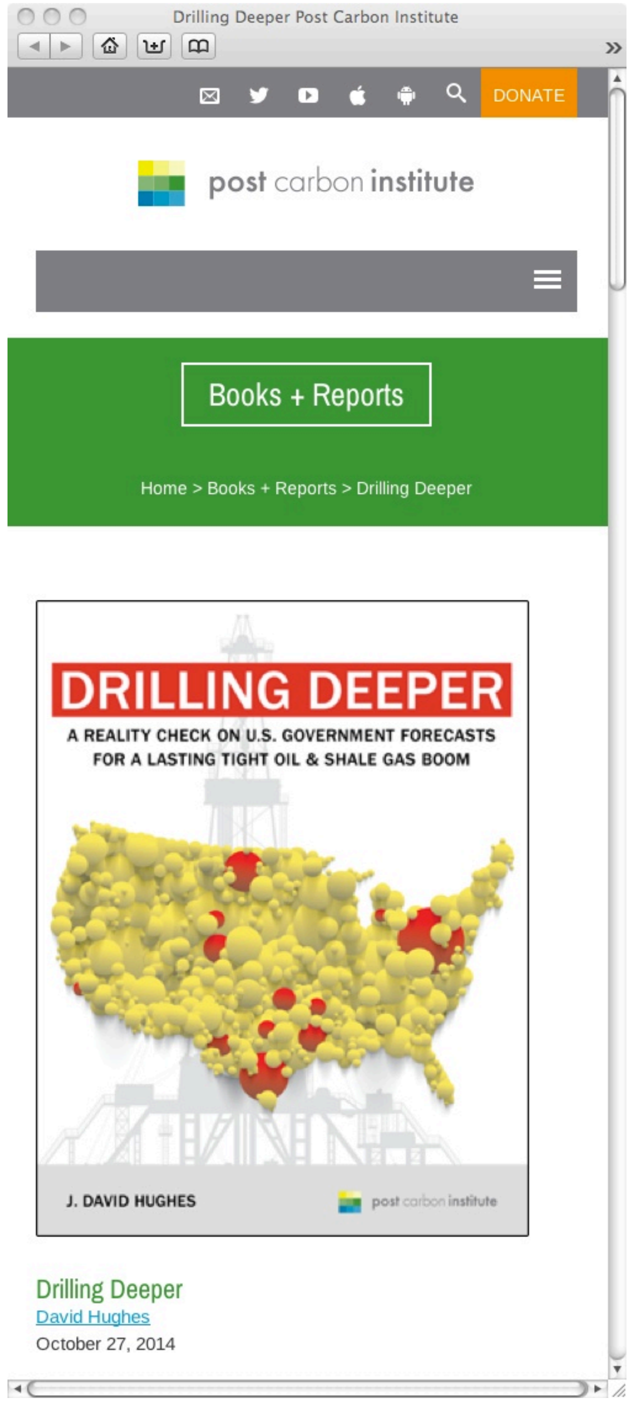
David Hughes: Yeah, it is. You know, I think that if you look at the mainstream media, I don't think there is a lot of original research that is done there. I think people tend to repeat what other people have said and it kind of takes on a momentum of its own. Which is why I was so interested in trying to lay out as much of that data as I could. It is dangerous. I mean if you look at the infrastructure going forward in an era of declining oil and gas, the number one way to promote energy sustainability in my view is figuring out ways to use less. And some of the infrastructure that needs to be built in order to give people an alternative to high energy throughput lifestyles takes a lot of oil and gas to build. And you know, this short term bounty that we are looking at should in fact be used to do that, not to maintain business as usual to the bitter end and then face the consequences.

Chris Martenson: I agree. I agree. Final question – and thank you for your time, so generous. Final question is: What is the reception to the report? Has the EIA reached out? Have any government people talked to you? Is industry wanting to know more? Tell me about how it has been received so far.

David Hughes: Well, I sent a copy of the report the day it was published to John Staub at the EIA who is the head of the oil and gas team and I didn't hear anything back. I sent it to Scott Tinker at UT and he was pretty enthused and sent it around to his team. So they are certainly looking at it. In terms of the mainstream media, they really didn't have a lot of major coverage of it unfortunately. In terms of the industry, if you look at the industry lobby group, Energy in Depth is a lobby arm of the Independent Petroleum Association of America. They took special pains to write an attack article on it. They didn't really criticize any of the data in it. They sort of had to resort to ad homonym adjectives that apply to me, which wasn't appreciated. I think if you look at the second tier of media, we did get an awful lot of coverage and none of it really negative that I can see. I think the data that is in Drilling Info is data that is not available anywhere else. This is data that industry uses, but it has not been widely made available. I am hoping that "Drilling Deeper" will have a long shelf life and people will be able to refer back to it again and again. Hopefully it will promote a bit of saner thinking in terms of our energy future going forward.

Chris Martenson: At a minimum I would hope that the good people who are running the state of North Dakota would take a look and plot a strategy based on the likely arc of their industry because it is completely calculable. As long as they have a long-term view of that and understand where they are going I think that would be great. Listen, thank you so much for your excellent and data driven work and for your time today. I will note that we will have a link to "Drilling Deeper" at the bottom of this podcast. People if you look at the bottom of this page you will see it right there and that will take you over to the Post Carbon website and a download. And you should read it. You should check it out. If you like your data and you love it done well and analyzed well and with good writing around it, this is an absolutely essential report because everything depends on the energy story as we go forward and boy the disinformation out there is just magnificent right now and "Drilling Deeper" and other work by David Hughes is state of the art. It is great stuff. So please everybody take a look at that and David thank you so much for your time today.

David Hughes: It's been my pleasure, Chris.



Links

Drilling Deeper report

Drilling California report

This interview was originally published at Peak Prosperity.org

Drilling Deeper Post Carbon Institute

Drilling Deeper

David Hughes

October 27, 2014

Abstract

Drilling Deeper reviews the twelve shale plays that account for 82% of the tight oil production and 88% of the shale gas production in the U.S. Department of Energy's Energy Information Administration (EIA) reference case forecasts through 2040. It utilizes all available production data for the plays analyzed, and assesses historical production, well- and field-decline rates, available drilling locations, and well-quality trends for each play, as well as counties within plays. Projections of future production rates are then made based on forecast drilling rates (and, by implication, capital expenditures). Tight oil (shale oil) and shale gas production is found to be unsustainable in the medium- and longer-term at the rates forecast by the EIA, which are extremely optimistic.

This report finds that tight oil production from major plays will peak before 2020. Barring major new discoveries on the scale of the Bakken or Eagle Ford, production will be far below the EIA's forecast by 2040. Tight oil production from the two top plays, the Bakken and Eagle Ford, will underperform the EIA's reference case oil recovery by 28% from 2013 to 2040, and more of this production will be front-loaded than the EIA estimates. By 2040, production rates from the Bakken and Eagle Ford will be less than a tenth of that projected by the EIA. Tight oil production forecast by the EIA from plays other than the Bakken and Eagle Ford is in most cases highly optimistic and unlikely to be realized at the medium- and long-term rates projected.

Shale gas production from the top seven plays will also likely peak before 2020. Barring major new discoveries on the scale of the Marcellus, production will be far below the EIA's forecast by 2040. Shale gas production from the top seven plays will underperform the EIA's reference case forecast by 39% from 2014 to 2040, and more of this production will be front-loaded than the EIA estimates. By 2040, production rates from these plays will be about one-third that of the EIA forecast. Production from shale gas plays other than the top seven will need to be four times that estimated by the EIA in order to meet its reference case forecast.

Over the short term, U.S. production of both shale gas and tight oil is projected to be robust-but a thorough review of production data from the major plays indicates that this will not be sustainable in the long term. These findings have clear implications for medium and long term supply, and hence current domestic and foreign policy discussions, which generally assume decades of U.S. oil and gas abundance.

Drill, Baby, Drill: Can Unconventional Fuels Usher in a New Era of Energy Abundance? Post Carbon Institute

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Drill, Baby, Drill: Can Unconventional Fuels Usher in a New Era of Energy Abundance?

David Hughes

February 19, 2013

In this landmark report, PCI Fossil Fuel Fellow David Hughes takes a far-ranging and painstakingly researched look at the prospects for various unconventional fuels to provide energy abundance for the United States in the 21st Century. While the report examines a range of energy sources, the centerpiece of "Drill, Baby, Drill" is a critical analysis of shale gas and shale oil (tight oil) and the potential of a shale "revolution."

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Abstract

It's now assumed that recent advances in fossil fuel production – particularly for shale gas and shale oil – herald a new age of energy abundance, even "energy independence," for the United States. Nevertheless, the most thorough public analysis to date of the production history and the economic, environmental, and geological constraints of these resources in North America shows that they will inevitably fall short of such expectations, for two main reasons: First, shale gas and shale oil wells have proven to deplete quickly, the best fields have already been tapped, and no major new field discoveries are expected; thus with average per-well productivity declining and ever-more wells (and fields) required simply to maintain production, an "exploration treadmill" limits the long-term potential of shale resources. Second, although tar sands, deepwater oil, oil shales, coalbed methane, and other non-conventional fossil fuel resources exist in vast deposits, their exploitation continues to require such enormous expenditures of resources and logistical effort that rapid scaling up of production to market-transforming levels is all but impossible; the big "tanks" of these resources are inherently constrained by small "taps."

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Interview with Art Berman - Part 1 - July 19, 2010

Art Berman is a geological consultant whose specialties are subsurface petroleum geology, seismic interpretation, and database design and management. He is currently consulting with a wide range of industry clients such as PetroChina, Total, and Schlumberger. Mr. Berman has an MS in geology from the Colorado School of Mines and is active with the American Assoc. of Petroleum Geologists. Art spoke with us last Thursday after a presentation in Canada at the CIBC Technical Conference.

POR: Can you give us your latest updated perspective on the shale gas story?Art Berman is a geological consultant whose specialties are subsurface petroleum geology, seismic interpretation, and database design and management. He is currently consulting with a wide range of industry clients such as PetroChina, Total, and Schlumberger. Mr. Berman has an MS in geology from the Colorado School of Mines and is active with the American Assoc. of Petroleum Geologists. Art spoke with us last Thursday after a presentation in Canada at the CIBC Technical Conference.

Art Berman: You have to acknowledge that shale gas is a relatively new and significant contribution to North American supply. But I don't believe it's anywhere near the magnitude that is commonly discussed and cited in the press. There are a couple of key points here. First the reserves have been substantially overstated. In fact I think the resource number has been overstated.

If you investigate the origin of this supposed 100-year supply of natural gas…where does this come from? If you go back to the Potential Gas Committee's [PGC] report, which is where I believe it comes from, and if you look at the magnitude of the technically recoverable resource they describe and you divide it by annual US consumption, you come up with 90 years, not 100. Some would say that's splitting hairs, yet 10% is 10%. But if you go on and you actually read the report, they say that the probable number-I think they call it the P-2 number-is closer to 450 Tcf as opposed to roughly 1800 Tcf. What they're saying is that if you pin this thing down where there have actually been some wells drilled that have actually produced some gas, the technically recoverable resource is closer to 450. And if you divide that by three, which is the component that is shale gas, you get about 150 Tcf and that's about 7 year's worth of US supply from shale. I happen to think that that's a pretty darn realistic estimate. And remember that that's a resource number, not a reserve number; it has nothing to do with commercial extractability. So the gross resource from shale is probably about 7 years worth of supply.

For a project that a colleague and I did for a client, I actually went in and looked at all the shale plays and assigned some kind of a resource number to them. I also used some work that was done by Wendell Medlock at Rice University's Baker Institute. He did an absolutely brilliant job of independently determining what the size of the resource plays in Canada and the US might be.

The resource hasn't been misrepresented but the probable component has not been properly explained as a much smaller component of the total resource; I guess they just didn't read the PGC's report carefully enough. If you take the proved reserves plus the report's probable technically recoverable number, we have something like 25 years of natural gas supply in North America, which is quite a bit. It's a lot. I don't say any of this to give shale gas a bad name.

The other interesting thing about the PGC's report that nobody seems to pay attention is this: they said there is something like 650 Tcf of potential shale gas. Well, there's 1000 Tcf of something else. What's the something else? It's conventional reservoirs plus non-shale/non-coalbed-methane unconventional reservoirs. So there's 70 percent more resource in better quality rocks than shale. It just astonishes me that nobody has paid any attention to that.

So that's the simple view. And then the other thing that we see empirically is that if you look at any of these individual shale-gas plays-whether it's the Haynesville or the Barnett or the Fayetteville-they all contract to a core area that has the potential to be commercial that is on the order of 10 to 20 percent of the geographic area that was originally represented as all being the same. So if you take the resource size that's advertized-say for the Haynesville shale, something like 250 Tcf-and you look at the area that's emerging as the core area, it's less than 10 percent of the total. So is 25 Tcf a reasonable number for the Haynesville shale? Yeah, it probably is. And it's a huge number. But the number sure is not 250 Tcf, and that's the way all of these plays seem to be going. They remain significant. It hasn't been proved to me yet that any of it is commercial, but they're drilling it like mad, there's no doubt about it.

Those are sort of the basic conclusions. And when you look at it probabilistically, which I think is the only intelligent way to look at anything which you have any uncertainty about, what you realize is that the numbers that are being represented by all of these companies as "truth" are probably like the P-5 case, having a 5 percent probability of being true. So they say, "well, our average well in the Haynesville is going to be 7 Bcf," and I say there will certainly will be wells that make 7 Bcf but there's no way that the average is that high. My take is that there will probably be 5 percent of wells that will make 7 Bcf.

I just think everybody is caught up in this. I have a slide where I say, you guys need to get over the love affair and get on with the relationship. You keep talking about how big it is and how great it is, but at some point you have to live together and that's hard work. You have to be honest with yourself and with each other and you have to do some work. I just don't think we've moved past the love affair.

One other important thing is the Barnett shale. We keep coming back to it because it's the only play that has much more than 24 months worth of history. I recently grouped all the Barnett wells by their year of first production. Then I asked, of all the wells that were drilled in each one of those years, how many of them are already at or below their economic limit? It was a stunning exercise because what it showed is that 25-35% of wells drilled during 2004-2006-wells drilled during the early rush and that are on average 5 years old-are already sub-commercial. So if you take the position that we're going to get all these great reserves because these wells are going to last 40-plus years, then you need to explain why one-third of wells drilled 4 and 5 and 6 years ago are already dead.

POR: When you say one-third of the wells are already sub-commercial, do you mean they have been shut in, or that they are part of a large pool where no one has sharpened the pencil?

Berman: Some of them never produced to begin with. No one talks about dry holes in shale plays, but there are bona fide dry holes-maybe 5 or 6 or 7 percent that are operational failures for some reason. So that's included. There are wells that, let's just call them inactive; they produced, and now they're inactive, which means they are no longer producing to sales. They are effectively either shut-in or plugged. Combined, that's probably less than 10 percent of the total wells. But then there are all the wells that are producing a preposterously low amount of gas; my cut-off is 1 million cubic feet a month, which is only 30,000 cubic feet per day. Yet those volumes, at today's gas prices, don't even cover your lease/operating expenses. I say that from personal experience. I work in a little tiny company that has nowhere near the overhead of Chesapeake Energy or a Devon Energy. I do all the geology and all the geophysics and there's four or five other people, and if we've got a well that's making a million a month, we're going to plug it because we're losing money; it's costing us more to run it than we're getting in revenue.

So why do they keep producing these things? Well, that's part of the whole syndrome. It's all about production numbers. They call these things asset plays or resource plays; that reflects where many are coming from, because they're not profit plays. The interest is more in how big are the reserves, how much are we growing production, and that's what the market rewards. If you're growing production, that's good-the market likes that. The fact that you're growing production and creating a monstrous surplus that's causing the price of gas to go through the floor, which makes everybody effectively lose money….apparently the market doesn't care about that. So that's the goal: to show that they have this huge level of production, and that production is growing.

But are you making any money? The answer to that is…no. Most of these companies are operating at 200 to 300 to 400 percent of cash flow; capital expenditures are significantly higher than their cash flows. So they're not making money. Why the market supports those kinds of activities…we can have all sorts of philosophical discussions about it but we know that's the way it works sometimes. And if you look at the shareholder value in some of these companies, there is either very little, none, or negative. If you take the companies' asset values and you subtract their huge debts, many companies have negative shareholder value. So that's the bottom line on my story. I'm not wishing that shale plays go away, I'm not against them, I'm not disputing their importance. I'm just saying that they haven't demonstrated any sustainable value yet.

Commentary: Interview with Art Berman—Part 2

By the Peak Oil Review team

(Note: Commentaries do not necessarily represent the ASPO-USA position.)

Art Berman is a geological consultant whose specialties are subsurface petroleum geology, seismic interpretation, and database design and management. He is currently consulting with a wide range of industry clients such as PetroChina, Total, and Schlumberger. Mr. Berman has an MS in geology from the Colorado School of Mines and is active with the American Assoc. of Petroleum Geologists. He spoke with us about 10 days ago, after a presentation in Canada at the CIBC Technical Conference. (Part 1 appeared last week, in the July 19th issue of the POR.)

POR: How have analysts and investors responded to your studies and your viewpoints?

Berman: My biggest clients, for this kind of talk and work, are investment bankers and investment advisory companies. I gave two talks in Calgary over the last week—one to CIBC and the other to Middlefield Capital. I've given multiple talks to energy investment companies. They're the peoplewho are really paying attention to this. The answer is that a significant portion of the investment banking sector takes what I'm saying quite seriously, but what they do with that I can't tell you.

POR: How has the gas-producing industry responded to your studies and views?

Berman: The U.S. companies have pretty much chosen to ignore me. Or they've made public statements that I'm a kook or I don't understand or I'm hopelessly wrong. Some them—especially the Canadian companies for some reason—want me to advise them even though my message is not a message that they prefer.

It's a fascinating process. My sense of it is that the level of interest, and whatever notoriety I have, has only increased. I credit the ASPO 2009 peak oil conference in Denver with really kicking that off. That presentation was a tipping point in awareness about the truth of shale gas reserves and economics. After my presentation, I had almost five hours of discussions with analysts that had attended the talk. Associated Press reporter Judith Kohler published an article — Analyst: Gas shale may be next bubble to burst that was distributed to hundreds of outlets in the national press and that brought this topic into the mainstream. U.S. E&P executives responded with a series of ad hominem opinion editorials and earnings meeting statements that minimized the fact-based positions that were presented at the ASPO 2009 meeting.

Before that, I spent months making presentations to professional societies of geologists, geophysicists and engineers throughout the Gulf Coast. These are colleagues who do the work of the petroleum industry that gave me what amounted to a peer review. I know that there were silent people in those audiences who disagreed with me, but the overall response was supportive and enthusiastic. I also got hundreds of e-mails responding to my World Oil articles that included testimonials about companies' experience with shale gas wells in the real world.

E&P executives don't have any such base, nor do they know about this experience. In all of my presentations, I acknowledge people that include some of the most respected E&P CEOs, opinion leaders, and experts on oil and gas price formation, reservoir engineering, economic evaluation and risk analysis. In addition, there are also many industry analysts in research companies, financial advisory and fund management firms, and reporters in the energy press that consult and publish opinions about my position on shale gas.

The point is that I am not alone. I have a large community of supporters with impeccable credentials. I am a cautious and somewhat conservative person in my professional work because I advise clients on high-risk and very large bets on wells and investments. My reputation and future income depends on the credibility of my evaluations and the quality of my research. I do not believe that the same can be said for the CEOs of the U.S. public companies that dispute my findings.

I'm a fairly busy guy, and a lot of people want to hear the story; I talk to Bloomberg and Platts and others all the time. If anything, I feel as if I'm sort of slipping into the mainstream, in a weird way. It's a scary thought. I'm now asked to participate in august panel discussions, albeit representing the radical fringe; but a year ago nobody even wanted to talk to me.

I don't know where it's going. It seems inevitable to me that it is sort of a bubble phenomenon; but bubbles can go on for 25 years or so, even though everyone knows that's what's happening. As long a capital markets continue to fund these things it's going to keep on going. I'm not saying that's even a bad thing, though I wouldn't put any money in it, that's for darned sure.

POR: Back in the 1960's the phrase "too cheap to meter" was introduced, by some promoters, as being the future of nuclear energy. Over time, the reality obviously didn't match the hype. It feels to us that there could be a parallel with the recent 100-year-supply statement...

Art Berman: It could be a big denial issue....

POR: Like that early era for atomic power, the shale gas story still seems so new that there are a lot of uncertainties about the shale gas bucking bronco, if you will. How will the industry respond to the uncertainties? How are they responding to the current tough price signals?

Berman: Not at all right now. I had a whole series of talks that I gave last spring called, ―North American Natural Gas: Acknowledging the Uncertainty.‖ That's all I want people to do. Not that they shouldn't drill for it or that I'm right; all I'm saying is acknowledge the uncertainty.

POR: How do you think the Macondo well fiasco will impact US gas and oil production? We're particularly thinking in the mid- to long-term scenarios.

Berman: Just what's happened already has had a pretty negative effect on the US economy. The moratorium has caused some rigs to move to other countries. So it seems to me that the inevitable outcome, at some point, is that we'll have even more dependence on imported crude oil. I just don't see any other way around it. The intangible piece of that really is how it will affect the planning of companies that want to continue exploring in the Gulf of Mexico. Do they immediately de- emphasize all of that because we just don't know what the government is going to do to them? And I think the answer to that, despite what they say, is —yah, sure.

The deepwater Gulf of Mexico is really it. That's the only substantial source of new reserves of crude oil that the United States has. For now, the whole area has a big question mark on it.

POR: How about the impact on offshore oil and gas production elsewhere in the world? There is already talk of modifying standards and rules in some other offshore basins.

Berman: That's another unknown. It can't be good for the energy industry. There are some countries that's couldn't care less; they're just happy to have the rigs come into their waters. But there are certainly countries—like Canada and the UK and Norway—that will certainly put more regulations on it. It will likely have the net effect of slowing offshore operations down and making things cost more. I'm not here to say that that's wrong.

I personally think the current administration is milking this thing for all the political capital they can. Nobody who's handling this for them really knows much about the oil and gas business. You have a theoretical physicist running the Department of Energy and I'm sure he's a very intelligent and high- integrity guy but he didn't really know anything about drilling or petroleum and I don't think Salazar is particularly schooled in it. President Obama doesn't know anything about it. So you have a bunch of amateurs dealing with something that needs a bunch of professionals. Even on the networks and cable news shows, I haven't seen anybody they've brought on who knows anything about it. A lot of interesting people get in front of the cameras and talk: college professors and oceanographers and image analysis specialists and the director of a center for biodiversity—he seems like a real smart guy—but they don't know anything about drilling operations or petroleum. I don't say that hyper- critically; it's just a fact.

POR: Switching over to oil...A number of oil industry CEOs—Christophe de Margerie, James Mulva, etc.—have said world oil production is likely to top out in the

90-95 million barrels/day level, probably during this decade. Where do you see world oil production going in the future?

Berman: That's not an area where I've done a lot of current research. I'm really just answering from the standpoint of what I've read others say. I agree with the comments of the CEOs that you named. It just seems like such a stretch to me that we could ever get to the kinds of levels of production that some groups like CERA [Cambridge Energy Research Associates] say we can. It just makes huge sense to me that the big oil exporting countries will continue using more and more of their own petroleum for their own internal uses. How does anybody think that they are going to actually increase the amount of exported oil to get to 95 million or 100 million barrels a day or whatever the forecast number is? From what I read, it looks like the odds are stacked against getting production much higher than it is right now. And we're in kind of a good place now because demand is way down. US demand has been down nearly 2 million barrels a day below what it was in 2008; that's huge. How long will that last? We don't know, but assuming we're in a recovery— and it kind of looks that way from a natural gas consumption perspective—if and when oil demand ramps up I think we're going to know the answer very quickly. And the answer's going to be, we'll struggle to maintain...that's my belief.

http://kunstler.com/blog/2010/11/sixty-lame-minutes.html

Sixty Lame Minutes by James Howard Kunstler

on November 15, 2010 9:13 AM

So, last night CBS hauled Aubrey McClendon, CEO of Chesapeake Energy, on board their flagship Sunday infotainment vehicle, 60 Minutes, to blow a mighty wind up America's ass (as they say in professional PR circles). America is lately addicted to lying to itself, and 60 Minutes has become the "go-to" patsy for funneling disinformation into an already hopelessly confused, wishful, delusional, US public.

McClendon told the credulous Leslie Stahl and the huge viewing audience that America "has two Saudi Arabia's of gas." Now, you know immediately that at least half the viewers misconstrued this statement to mean that we have two Saudi Arabia's of gasoline. Translation: don't worry none about driving anywhere you like, or having to get some tiny little pansy-ass hybrid whatchamacallit car to do it in, and especially don't pay no attention to them "green" sumbitches on the sidelines trying to sell you some kind of peak oil story.... It also prepared the public to support whatever Mr. McClendon's company wants to do, because he says his company will free America from its slavery to OPEC. By the way, CBS never clarified these parts of the story by the end of the show.

First of all, they are talking about methane gas, not liquid gasoline or oil. There are large deposits of methane gas locked into shale deposits roughly following the Appalachian mountain chain from New York State through Pennsylvania, West Virginia, into Ohio, but also hot spots out west. It's hard to get at. You have to basically blow up the shale rock deep underground with high pressure water that is loaded up with chemicals and sand particles to keep the rock fragments separated once they are blown apart. Chesapeake Energy specializes in this rock fracturing (or "fracking") method for drilling. You can get gas out of the ground this way. The question is how much, over what time period, at what cost.

At the present time, with America anxious about any kind of future energy, shale gas sounds like a dream-come-true. Mostly what the public saw on 60 Minutes last night was a sell-job for Chesapeake Energy to boost its stock price. Here are some facts:

Over a 50 year period ahead, all the shale gas drilling of the Marcellus fields in New York State will produce the equivalent of three years US consumption at 2008 levels.

A price of $8 per unit is required to make shale gas fracking economically viable in theory even for a short time. Gas is currently around $4. Expect to pay at least twice as much for gas.

Even at higher costs, shale gas fracking is arguably uneconomical. It requires huge numbers of rigs, generally 8 wells per "pad," meaning very high capital investments. The wells produce nicely for a year, average, and then deplete very steeply - meaning you get a lot of money up front and very soon all that capital investment is a wash. Translation: Chesapeake can make a lot quick money over the next few years of intense drilling and they don't care what happens after that.

Chesapeake itself estimates that 5.5 million gallons of fresh water are needed per well, often delivered in trucks, which require fuel.

It takes three years, average to prepare a drilling "pad" and the up to 12 wells on it, working 24/7 in rural areas with significant noise and electric lighting

The fracking fluid is a secret proprietary cocktail formula amounting to 5 percent of the liquid injected into the earth. It's composed of: sand; a jelling agent to suspend the sand because water is not "thick" enough; biocides to kill bacteria that thrive in jelling agent; "breakers" to thin out jell-thickened water after fracking to get the fluid out of the way of released gas and improve "flowback;" fluid-loss additives to decrease "leak-off" of fracking fluid into rock; anti-corrosives to protect metal in wells; and friction reducers to promote high pressures and high flow rates. Of the 5.5 million gallons of fluid injected into each well, 27,500 gallons is the chemical cocktail.

Mr. McClendon said on 60 Minutes that it couldn't possibly harm the public's water supply because they were drilling so far below the 1000-foot-deep maximum of most water wells. He left out the fact that they have to drill through those drinking water layers to get down to the shale gas, and pump the fracking fluid through it, and then get the gas up through it. He also left out the fact that the concrete casings of drill holes sometimes crack and leak at any depth.

The fracking fluid cannot be re-used. You have to mix new cocktail fluid for each injection.

"Flowback" fluid inevitably comes back up with the gas, sometimes spilling over the ground. In any case, the stuff that does come back up is stored on the surface in lagoons. Often it contains heavy metals, salts, and radioactive material from drilling through strata of radon-bearing granite and other layers. Liners of flowback fluid lagoons have been known to fail.

Gas well failures in Pennsylvania, where production was ramped up quickest in recent years, have ended up polluting well water to the degree that residents can no longer use their wells.

Little is known about the migration of fracking fluids underground.

It seems to me that the chief mass delusion associated with this touted "bonanza" is that Americans would supposedly be able to shift to driving cars that run on natural gas. I believe they will be hugely disappointed. Between the cost of fracking production (and its poor economics), gearing up the manufacture of a new type universal car engine, and installing the infrastructure for methane gas fill-ups - not to mention the supply operation by either new pipelines or trucks carrying liquefied methane gas, we will discover that a.) America lacks the capital, and b.) that households will be too broke to change out the entire US car fleet.

What this disgusting episode really shows is how eager the USA is to mount a campaign to sustain the unsustainable at all costs, including massive collective self-deception. The lying starts at the very top, not just in Aubrey McClendon's office at Chespeake, but in every executive suite throughout the land - including the Oval Office - where any lie is automatically swallowed and then upchucked for public consumption in the interest of keeping a nation based on addictive rackets stumbling on without having to change our behavior.

note from Mark: CBS is the most honest television network, if you want to “see BS” http://kunstler.com/blog/2012/11/epic-disappointment.html

Epic Disappointment

by James Howard Kunstler

November 19, 2012

Those inhabiting the economic wish-space got a case of the vapors last week when the Paris-based International Energy Agency (IEA) published an annual report stating that the USA would overtake Saudi Arabia as the world's leading oil producer and reach the long-touted nirvana of "energy independence." The news was greeted in this country with jubilation. Thus, peak credulity meets peak bullshit.

It's been clear for a while that authorities in many realms of endeavor - politics, economics, business, media - are very eager to sustain the illusion that we can keep our way of life chugging along. But under the management of these elites, the divorce between truth and reality is nearly complete. The financial system now runs entirely on accounting fraud. Government runs on the fumes of statistical fraud. The business of oil and gas runs on public relations fraud. And the media runs on the understandable wish of the masses to believe that all the foregoing illusions still work to maintain the familiar comforts of modern life (minus Hostess Ho-Hos and Twinkies, alas).

And so the story has developed that the shale oil plays of North Dakota and Texas, which started ramping up around 2005 - the same year the world hit the wall of peak conventional oil - and the shale gas plays in Texas, Louisiana, Pennsylvania, New York, and Ohio would enable American "consumers" to drive to WalMart effectively forever.

Now, it happens that the particulars of oil and gas production are so abstruse that the editors of The New York Times, The Bloomberg News Service, CNN, and a score of other mass media giants swallowed the IEA report whole, with fanfares and fireworks, and a nation afflicted with doubt about its future swooned into the first week of the holidays in celebration mode - we're soon to be number 1 again, and the future is secure! Have a nice Thanksgiving and Christmas and prepare to sober up in 2013. When the truth finally emerges from this morass of dissimulation, the disappointment will be epic.

Here's why the shale oil story is not the "game changer" that the wishful claim it is: the price required to get it out of the ground (between $80-90 a barrel) will crush the US economy. Since prices are already in that range, the economy is already being crushed. The result is an economy in more-or-less permanent contraction. As demand for oil falls with declining economic activity the price of oil falls - below the level that makes it worthwhile to conduct expensive shale oil drilling and fracking operations.

Meanwhile, in the background, as economies contract and economic "growth" of the type our system requires no longer happens, the problems in finance and banking get a lot worse. This is largely because interest on borrowed money can no longer be paid back. Loans are defaulted on. As this happens, banks become insolvent. Governments play games with public money - including "money" they "create" out of thin air - to prop up the banks. None of it alters the sad fact that there is not enough real money in the system. The result of all these desperate monkeyshines is the impairment of capital formation. That is, the failure to accumulate new wealth. The lack of new wealth, along with declining prospects for the repayment of loans, leads to a shortage of credit, especially to businesses that require large supplies of it to keep gigantic complex operations like shale oil and gas going

Shale oil (and shale gas) share some problematical properties. The cost of drilling each well is a big number, $6-8 million. The wells deplete very rapidly, over 40 percent after one year in the Bakken formation of North Dakota. The oil is not distributed equally over the whole play but exists in "sweet spots." The sweetest sweet spots were drilled the earliest and the quality of the remaining potential drill sites is already in decline. The current trend shows declining first-year productivity in new wells drilled since 2010 running at 25 percent.

There are over 4300 shale oil wells in the Bakken formation of North Dakota producing about 610,000 barrels a day. In order to keep production up, the number of wells will have to continue increasing at a faster rate than previously. This is referred to as "the Red Queen syndrome" which alludes to the character in Alice in Wonderland who famously declared that she had to run faster and faster just to stay where she is. The catch to all this is that the impairments of capital formation are working insidiously in the background to guarantee that the money will not be there to set up the necessary wells to keep production at current levels. In other words, shale oil (and shale gas) are Ponzi schemes. The story in the Eagle Ford play in Texas is very similar.

I haven't even mentioned the concerns about fracking and its effect on ground water, and won't go into it here, except to acknowledge that it presents an additional range of concerns.

The current price situation in shale gas is different than shale oil. The drilling frenzy in shale gas produced a glut, which drove down prices from a $13 a unit (thousand cubic feet or mcf) to around $2 at its low point earlier this year. That's way below the price that is economically rational to drill and frack for it. The price collapse has played havoc among the companies engaged in shale gas, though it has been a boon to customers. A lot of the drilling equipment has moved to the North Dakota oil fields. There will be less shale gas in the period ahead and the price will go up. It has got to go above about $8 a unit or there will be no reason for any company to be in the shale gas business. But as is always the case in such a correction, the price will surely overshoot $8, at which point it will become unaffordable to its customers. The volatility alone will make the business of shale gas drilling impossible to maintain. Forget about the USA becoming a major gas exporter.

You probably get the point by now, so I will only add a couple of out-of-the-box considerations vis-à-vis the prospect of the USA becoming energy independent.

-- Production is getting so low in the Prudhoe Bay fields of Alaska that the famous pipeline may not be able to operate. If the flow of oil reaches a certain low volume, it takes longer to make the long journey. The oil cools down and gets sludgy and some of the water that travels with it will freeze. This could destroy the pipeline. The capital is not there to retrofit the pipeline for a depleting oil field in a region that is difficult and expensive to work in.

-- Exporting countries (the ones that send us oil) are depleting their reserves and using more of their own oil, resulting in annually declining export rates. China, India, and other still-modernizing nations compete for a growing share of that declining export flow.

-- I have barely hinted at the geopolitical forces roiling behind the sheer business dynamics. But here's an interesting one: the time will come when the US will invoke the Monroe Doctrine to prevent Canada from sending its oil and tar-sand byproducts to nations other than ourselves. Just wait.

Finally, I have one flat-out prediction, one I have made before but deserves repeating: Japan will be the first society to consciously opt out of being an advanced industrial economy. They have no other apparent choice really, having next-to-zero oil, gas, or coal reserves of their own, and having lost faith in nuclear power. They will be the first country to enter a world made by hand. They were very good at it before about 1850 and had a pre-industrial culture of high artistry and grace - though, granted, all the defects of human psychology.

I don't think the US can make that transition in an orderly way. We're too stricken with techno-narcissism and grandiosity. What troubles me is how we will greet the epic disappointment that waits for us when we discover that the journey to WalMart is over. My guess is that being predisposed to superstition and religious fanaticism, the American public will violently reject science and rationality and retreat into a world of shadows. We're already well on our way. The IEA report will just accelerate things.

from ASPO USA's Peak Oil Review, January 3, 2010
Association for the Study of Peak Oil and Gas - USA
www.aspo-usa.org

Shale Gas: Panacea or Chimera?

The hype surrounding shale gas continued to build during 2010 with many saying that the gas will prove to be so plentiful that it will be the solution to our energy problems for many decades ahead. It has become conventional wisdom in many circles that the US has 100 years' worth of shale gas ready for exploitation. The hysteria reached its zenith in March at the Cambridge Energy Research Associates annual conference where speaker after speaker spoke ecstatically about the prospects for the natural-gas industry. In Pennsylvania over 1000 shale gas wells have now been drilled. Even India, China, the French and Shell have started investing in the US shale gas bonanza as have the major US oil companies.

During the past year the prices for natural gas fell from $6 per million cubic feet to less than $4 as the quantity of gas in storage continued to build. Outside analysts continue to say that at these prices the industry is losing money and that it will require at least $6 or $7 gas to pay for the drilling and hydraulic fracturing of the expensive horizontal wells.

Concerns over contamination of groundwater by the fracking process continue to grow. Over strident industry objections, the state of New York has put a temporary hold on new shale-gas drilling permits until the EPA can investigate the dangers to groundwater supplies more carefully.

As was the case last year, skeptics point out that while shale-gas wells can initially be very productive they quickly fall to below economic levels. The 100 years' worth figure comes from the most optimistic possible reading of the Potential Gas Committee report; in reality the amount of gas available at modest prices may ultimately be only a fraction of the touted amount. When one factors in the talk about moving a substantial portion of US electricity generation to natural gas or perhaps replacing the diesels in long-haul trucking with natural gas engines, exponential growth kicks in so that natural gas reserves would be drawn-down much more quickly than imagined.

While large quantities of shale gas are likely to be produced over the next few decades, behind-the- scenes evidence that the resource is not a long-term solution to our energy problems and certainly not to our liquid-fuels problem continues to mount.

getting a little closer to the truth ... but still says gas exports will increase into the 2020s

www.bloomberg.com/news/2012-01-23/u-s-reduces-marcellus-shale-gas-reserve-estimate-by-66-on-revised-data.html

Bloomberg: U.S. Cuts Estimate for Marcellus Shale Gas Reserves by 66%

by Christine Buurma - Jan 23, 2012 9:04 AM PT

The U.S. Energy Department cut its estimate for natural gas reserves in the Marcellus shale formation by 66 percent, citing improved data on drilling and production.

About 141 trillion cubic feet of gas can be recovered from the Marcellus shale using current technology, down from the previous estimate of 410 trillion, the department said today in its Annual Energy Outlook. About 482 trillion cubic feet can be produced from shale basins across the U.S., down 42 percent from 827 trillion in last year's outlook.

"Drilling in the Marcellus accelerated rapidly in 2010 and 2011, so that there is far more information available today than a year ago," the department said. The estimates represent unproved technically recoverable gas. The daily rate of Marcellus production doubled during 2011.

The estimated Marcellus reserves would meet U.S. gas demand for about six years, using 2010 consumption data, according to the Energy Department, down from 17 years in the previous outlook.

The Marcellus Shale is a rock formation stretching across the U.S. Northeast, including Pennsylvania and New York. Shale producers use a technique known as hydraulic fracturing, which involves pumping water, sand and chemicals underground to extract gas embedded in the rock.

Geological Data

The U.S. Geological Survey said in August that it would reduce its estimate of undiscovered Marcellus Shale natural gas by as much as 80 percent after an updated assessment by government geologists.

Shale gas will probably account for 49 percent of total U.S. dry gas production in 2035, up from 23 percent in 2010, the Energy Department said today.

Gas's share of electric power generation will increase to 27 percent in 2035 from 24 percent in 2010, the report showed.

The department also said the U.S. may become a net exporter of liquefied natural gas in 2016 and a net exporter of natural gas in 2021. U.S. LNG exports may start with a capacity of 1.1 billion cubic feet a day in 2016 and increase by an additional 1.1 billion cubic feet per day in 2019, the department said.

http://energyskeptic.com/2014/methane-hydrate-not-gonna-happen/

Why we aren't mining methane hydrates now. Or ever. Peak Energy & Resources, Climate Change, and the Preservation of Knowledge by Alice Friedemann

Methane hydrates are methane gas and water that exist where pressures are high or temperatures low enough.

The United States Geological Survey estimates the total energy content of natural gas in methane hydrates is greater than all of the known oil, coal, and gas deposits in the world.

But that's a wild ass guess since we can't measure this resource, for reasons such as coring equipment that can't handle the expansion of the gas hydrate as it's brought to the surface. And if you do work around this problem, there's tremendous variability within the same area (Riedel). Since less than 1% of is potentially extractable, there's no point in throwing around large numbers and getting the energy illiterate excited.

According to petroleum engineer Jean Laherrère, no way do methane hydrates dwarf fossil fuels. "Most hydrates are located in the first 600 meters of recent oceanic sediments at an average water depth of 500 meters or more, which represents just a few million years. Fossil fuel sediments were formed over a billion years and are much thicker — typically over 6,000 meters (Laherrère).

So here it is 2014, with no commercially produced gas hydrate, despite 30 years of research at hundreds of universities, government agencies, and energy companies in the United States, Japan, Brazil, Canada, Germany, India, Norway, South Korea, China, and Russia.

Japan alone has spent about $700 million on methane-hydrate R&D over the past decade (Mann) and gotten $16,000 worth of natural gas out of it (Nelder). I think this reflects the likely EROI of methane hydrates — .0000228 (16000/700,000,000, and yes, I know money and EROI aren't the same). But EROI doesn't capture the insanity as understandably as money does. Basically, **for every $43,750 you spend, you get $1 back** ($700,000,000 / $16,000).

Of course, it's all ***theoretical***. Maybe you get $500 or $5,000 back. Who knows? There is no commercial production now or in the foreseeable future. And we've tried all kinds of thermal techniques to unleash it — hot brine injection, steam injection, cyclic steam, fire flooding, and electromagnetic heating — all of them too inefficient and expensive to scale up to a commercial project (DOE 2009).

1) Gas hydrates are cotton candy crystals mainly found in dispersed, deeply buried impermeable marine shale.

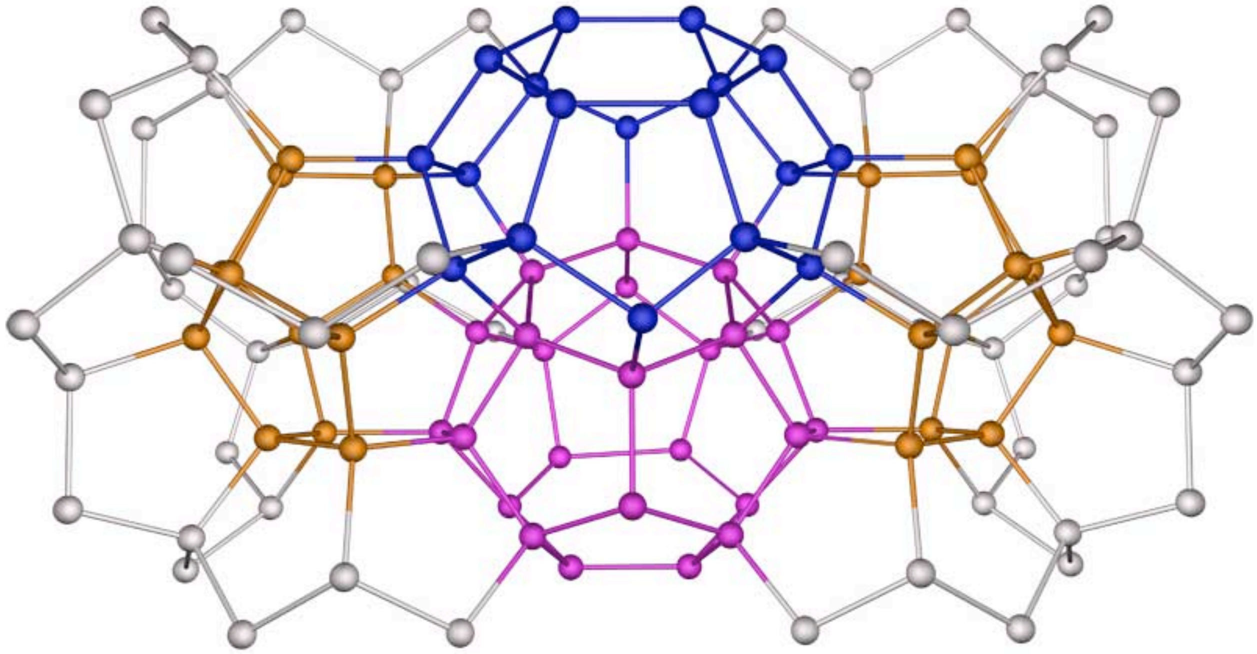
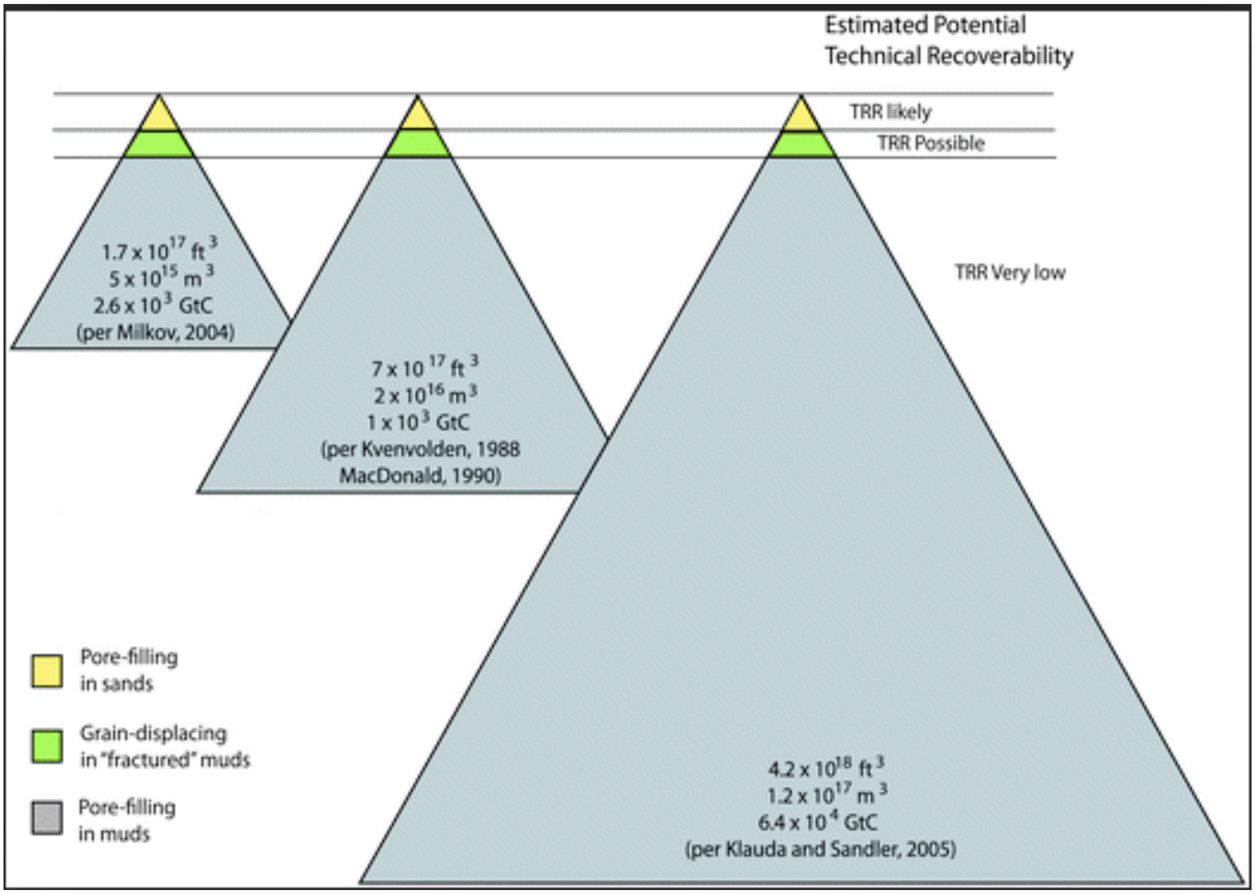


Figure 1. methane hydrate crystals form from dodecahedral clusters of water which create a cage around a single methane molecule. Source: Ken Jordan. 2005. Water Water Everywhere. Projects in Scientific computing.

In Figure 2 below, methane hydrates (yellow) in porous sands are the only resource with any chance of being exploited — a very small fraction of the overall methane hydrate resource. Most methane hydrates are locked up in marine shales (gray) where they'll probably remain forever because:

- The average concentrations are extremely low, about .9 to 1.5% by volume, even in the less than 1% of highly porous sediments where there's any chance of extracting them
- Marine shales are impermeable, very deep, widely dispersed, with very low concentrations of methane hydrate (Moridis et al., 2008).
- Clathrates are far from oil and gas infrastructure, which you must use to get the methane hydrates stored and delivered
- The infrastructure, technology, and equipment to extract gas hydrates hasn't been invented yet
- The energy required to get the methane hydrate out has negative Energy Returned on Energy Invested (EROEI). It takes too much energy to heat them in order to release them plus break the bonds between the hydrates' water molecules.
- Inhibitor injection requires significant quantities of fairly expensive chemicals



Source: Boswell, Ray, et al. 14 Sep 2010. Current perspectives on gas hydrate resources. Energy Environ. Sci., 2011,4, 1206-1215

2) Methane Hydrates are Explosive Cotton Candy

Because as temperature rises or pressure goes down when you bring these ice cubes to the surface, the gas hydrates expand to 164 times their original size. Though most are the size of sugar grains mixed in with other sediments.

Methane hydrates bubbling up to the surface

3) How do you store and get these giant gas bubbles to market?

If you could keep the gas hydrates small, crystalline, and pacified, there would still be that niggling worry you might offend them into their 164-fold fury. So it's best to let that happen — but now where are you going to store all this gas and how will you deliver it?

You'd have to use oil and gas infrastructure in the Arctic and other questionable places where ownership isn't settled and potentially create geopolitical tensions.

And imagine how Exxon will feel about that! Their oil rigs are already dodging icebergs. Oil companies avoid drilling through methane hydrates because they can fracture and disrupt bottom sediments, wrecking the wellbore, pipelines, rig supports, and potentially take out a billion dollar offshore platform as well as other oil and gas production equipment and undersea communication cables.

4) The Mining of Gas Hydrates can cause Landslides…

Eastman states that normally, the pressure of hundreds of meters of water above keeps the frozen methane stable. But heat flowing from oil drilling and pipelines has the potential to slowly destabilize it, with possibly disastrous results: melting hydrate might trigger underwater landslides as it decomposes and the substrate becomes lubricated…

5) Which can Trigger Tsunamis

Landslides can create tsunamis that migh result in fatalities, long term health effects, and destruction of property and infrastructure.

6) Methane Hydrates are a greenhouse gas 23 times more potent than carbon dioxide

Climate scientists like James E. Hansen worry that methane hydrates in permafrost may be released due to global warming, unleashing powerful feedback loops that could cause uncontrollable runaway climate change.

Scientists believe that sudden, massive releases of methane hydrates may have led to mass extinction events in the past.

Considering that the amount of methane onshore and offshore could be 3,000 times as much as in the atmosphere, it ought to be studied a bit more before proceeding, don't you think? (Whiteman 2013, Kvenvolden 1999).

7) Ecological Destruction

They're dispersed across vast areas at considerable depths, which makes them very ecologically destructive to mine, since you have to sift through millions of cubic yards of silt to get a few chunks of hydrate.

8) Toxic Waste

The current state of technology uses existing oil drilling techniques, which generate wastes including produced formation water (PFW), drilling fluid chemicals, oil and water-based drilling muds and cuttings, crude oil from extraction processes and fuel/ diesel from ships and equipment (Holdway 2002).

9) EROI

There are only two studies on EROI, both by Callarotti, and he looks ***only*** at the heat energy used to free the clathrates up, and it's published in a journal called Sustainability that would better be named Gullibility when it comes to the topic of energy which is not their specialty. He comes up with an EROI of 4/3 to 5/3 using just that ***one*** parameter. Callarotti knows this is a dishonest figure because he says "If one were to consider the energy required for the construction of the heaters, the pipes, and the pipe and the installation process, the total EROI would be even less."

Is he kidding? What about the energy used to mine and crush the ore to get the metals to build the pipelines, drilling, dredging and sifting through the sediment equipment, methane hydrate processing plant, the vessel and the diesel burned to get to the remote (arctic) location, and so on.

Conclusion

You don't have to be a scientist to see how difficult the problem is:

- Somehow you've got to capture the energy in thousands of square miles of exploding grains of sugar that erupt into a gas 164 times their size.
- There are huge deposits of natural gas that are easier to get at and far more valuable that aren't being exploited because they're stranded (not near pipeline infrastructure), so who's going to invest in a resource of much lower quality at the bottom of the pyramid with such dismal prospects?
- We can't even drill for oil in most of the Arctic (Patzek) which is where a lot of the methane hydrates are, and that infrastructure has to be there to even think of trying to get at the methane hydrates.
- Most of the hydrates are in a thin film on the deep ocean floor. Are you going to build a thousand square mile blanket to trap the bubbles like a school of fish? Or use expensive fracking & coalbed methane techniques?
- Permafrost gas hydrate is so shallow there's not enough pressure to get it to flow fast enough to be worth mining

Despite all the happy talk that says we can meet these challenges by 2025 if only there were more funding, we're out of time.

It's highly unlikely that Methane Hydrates will ever fuel the diesel engines that do the actual work of civilization, all of them screaming "Feed Me!" as oil declines in the future.

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a link to the BBC documentary referenced above:
http://www.youtube.com/watch?v=wn62AjIpWMw

BBC: "The Day the Earth Nearly Died" about Permian mass extinction 252 million years ago caused by methane

These EIS comments have stressed Peak Energy more than Climate, mostly because energy limits impact the potential for an "export" terminal far more than concerns about pollution. However, I think the popular focus on climate is actually understated, the crisis is not only worse than official predictions from the Intergovernmental Panel on Climate Change, it is worse than the environmental groups suggest.

The Permian mass extinction is a way to consider the risk that is posed to all life. This extinction is thought to be the worst of the five big mass extinction in Earth's history, worse than the impact that wiped out the dinosaurs 65 million years ago. It is thought that volcanism warmed the world and then this warming caused the melting of frozen methane in the oceans to further heat the planet.

Some who warn about climate suggest that we've used most of our "carbon budget" for keeping the Earth's temperature increase below 2 degrees C, and only could use a little more before reaching these limits, and therefore most of what remains has to be left in the ground. However, if current theories about the Permian extinction are correct, then we would have to leave ALL of the remaining fossil fuels in the ground, since the warming we have already set in motion could accelerate thawing of permafrost and frozen methane in the sea floor.

www.crudeoilpeak.info/peak-affordable-oil

Peak Affordable Oil

BY MATT – FEBRUARY 2, 2015

POSTED IN: CRUDE OIL ANALYSIS, GLOBAL

It is quite obvious that high oil prices in the last 3-4 years

Fig 1: WTI spot prices to 23/1/2015

http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=rwtc&f=w

have reduced demand for oil, as shown in this IEA graph for OECD countries:

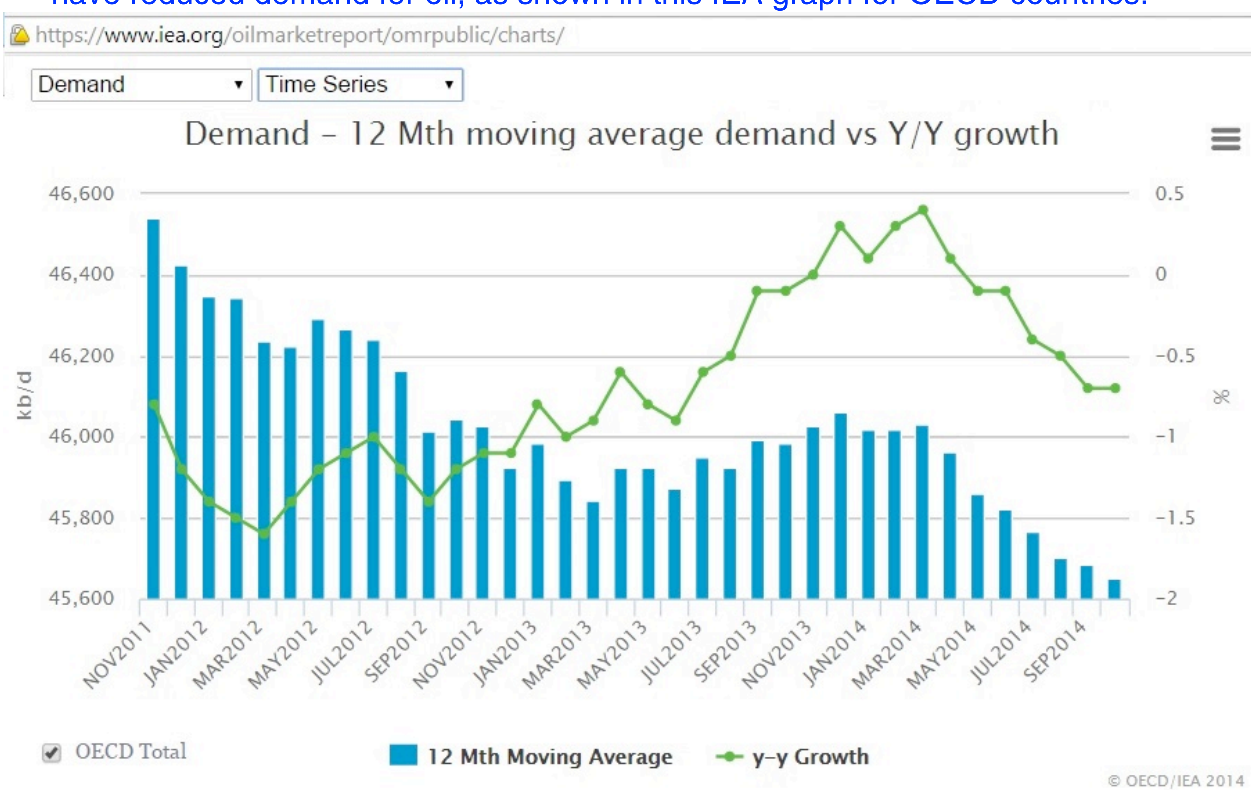


Fig 2: Oil demand in OECD countries Oct 2011 – Sep 2014
https://www.iea.org/oilmarketreport/omrpublic/charts/

So which oil is affordable? Let’s use a graph of the Monetary Policy Report (January 2015) of the Bank of Canada (which would be favourable to Canadian tar sands)

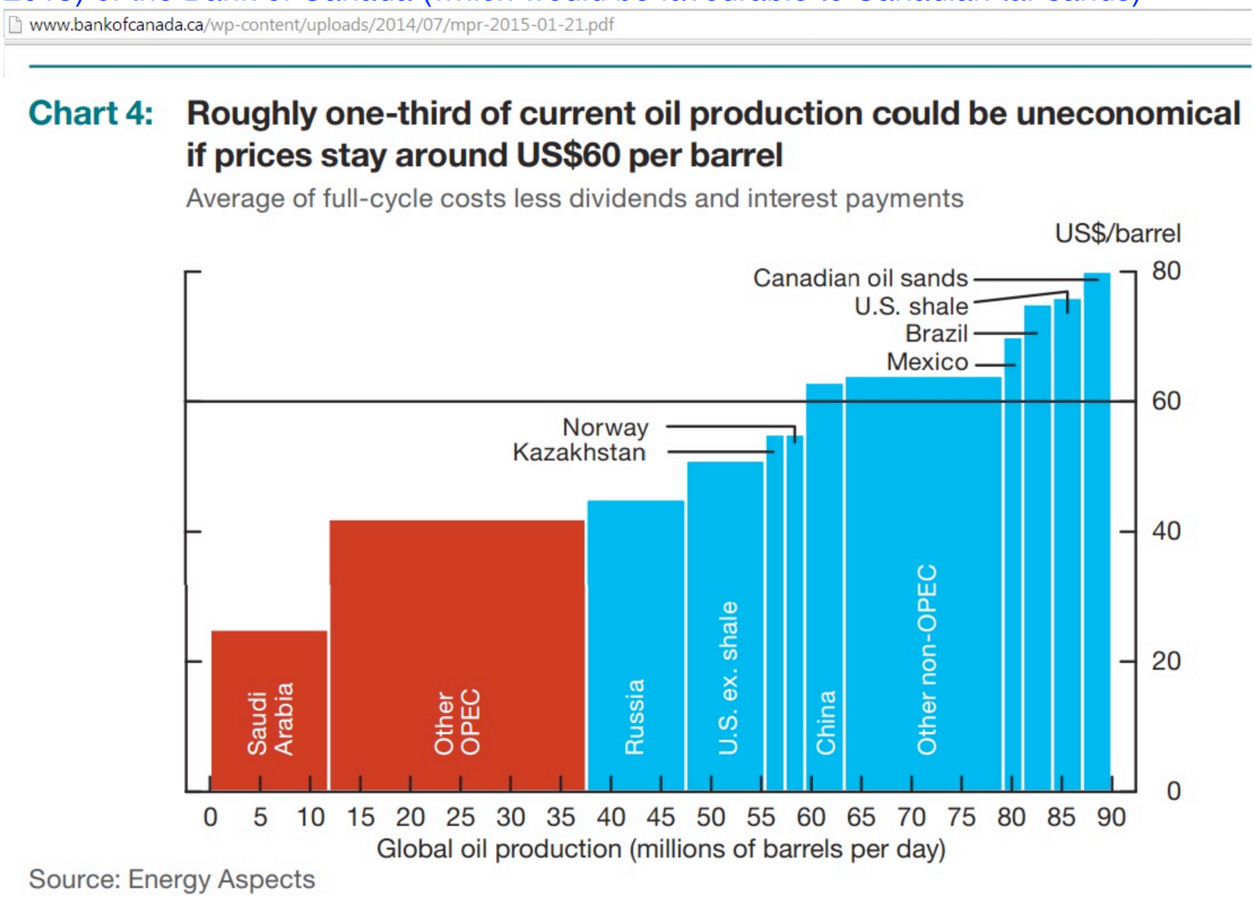


Fig 3: Oil production by area and full-cycle costs

The Bank of Canada report reads: “Based on recent estimates of production costs, roughly one-third of current production could be uneconomical if prices stay around US $60, notably high-cost production in the United States, Canada, Brazil and Mexico (Chart 4). More than two-thirds of the expected increase in the world oil supply would similarly be uneconomical. A decline in private and public investment in high-cost projects could significantly reduce future growth in the oil supply, and the members of the Organization of the Petroleum Exporting Countries (OPEC) would have limited spare capacity to replace a significant decrease in the non-OPEC supply.”
http://www.bankofcanada.ca/wp-content/uploads/2014/07/mpr-2015-01-21.pdf
Let’s put these costs into oil production graphs:

(1) Total Oil Supply

Fig 3 refers to 90 mb/d (x-axis) which was the world's total oil supply for 2013, according to EIA's stats available here: http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=53&aid=1

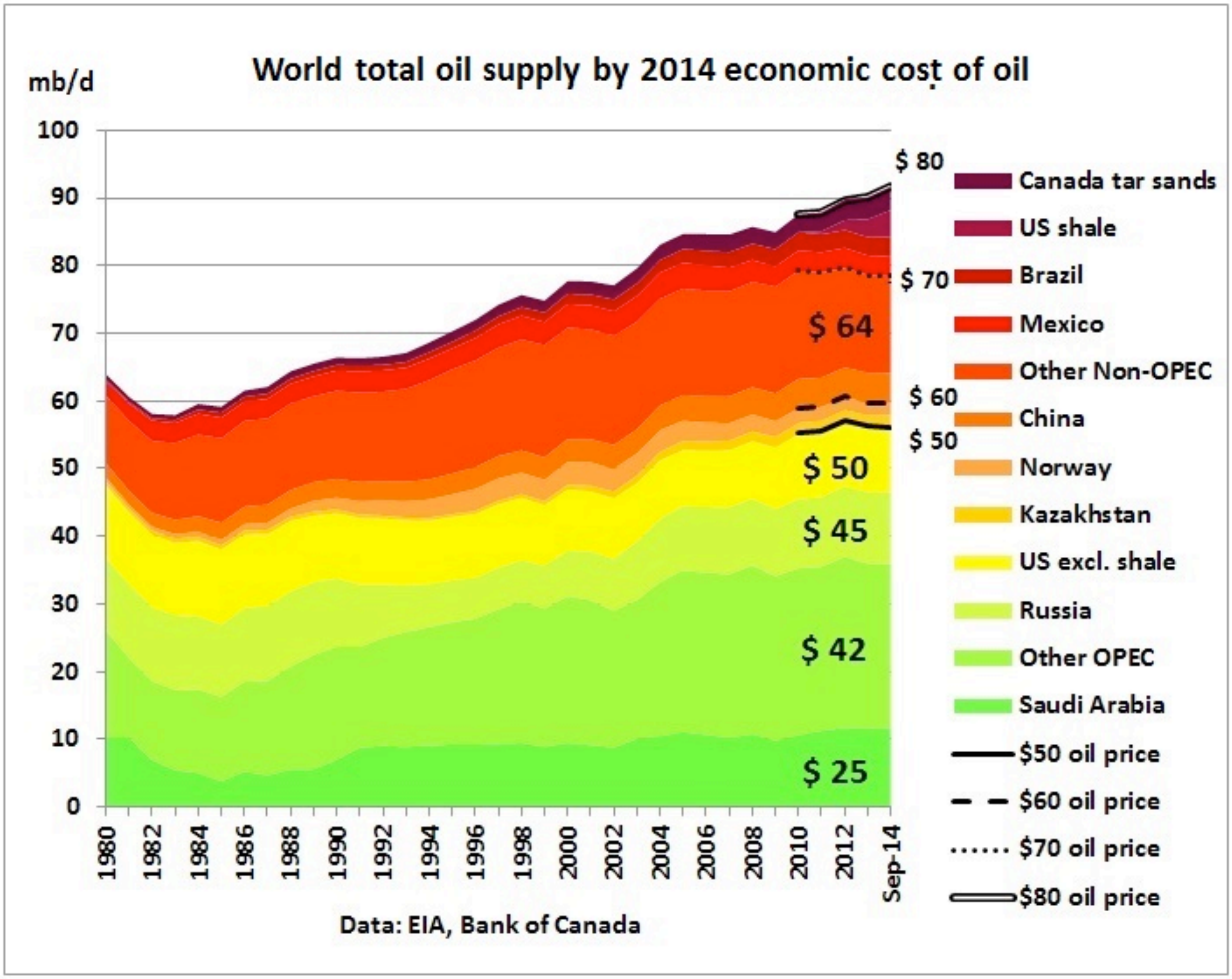


Fig 4: Oil supply by country/area and economic cost of oil

In Fig 4, oil supplies are stacked by 2014 economic cost of oil, starting with Saudi Arabia ($25/barrel, green) and going up to Canadian tar sands ($80/barrel, dark red). The colors have been extended over the whole period to 1980 so that the production history can be seen. Lines in various styles show 4 different cost levels, whereby their lengths are indicative only to show corresponding production levels for the last years.

It seems that oil supplies up to around $75 have peaked (all countries up to Brazil). In other words, if the world is willing (or able) to pay only $75 a barrel, corresponding oil production declined since 2012 – at around 1.6% over 2 years. $50 oil was up and down, but at only 56 mb/d or 60% of current demand. What is important here is that affordable oil does not appear to increase in volume. That has serious implications for economic and transport planning

In Fig 4, oil supply includes: crude oil, natural gas plant liquids, refinery processing gains and other liquids (including bio fuels). The EIA definitions are here: http://www.eia.gov/cfapps/ipdbproject/docs/IPMNotes.html#p1

Let's check how that graph would look like if we used just crude oil and condensate.

(2) Crude oil and condensate

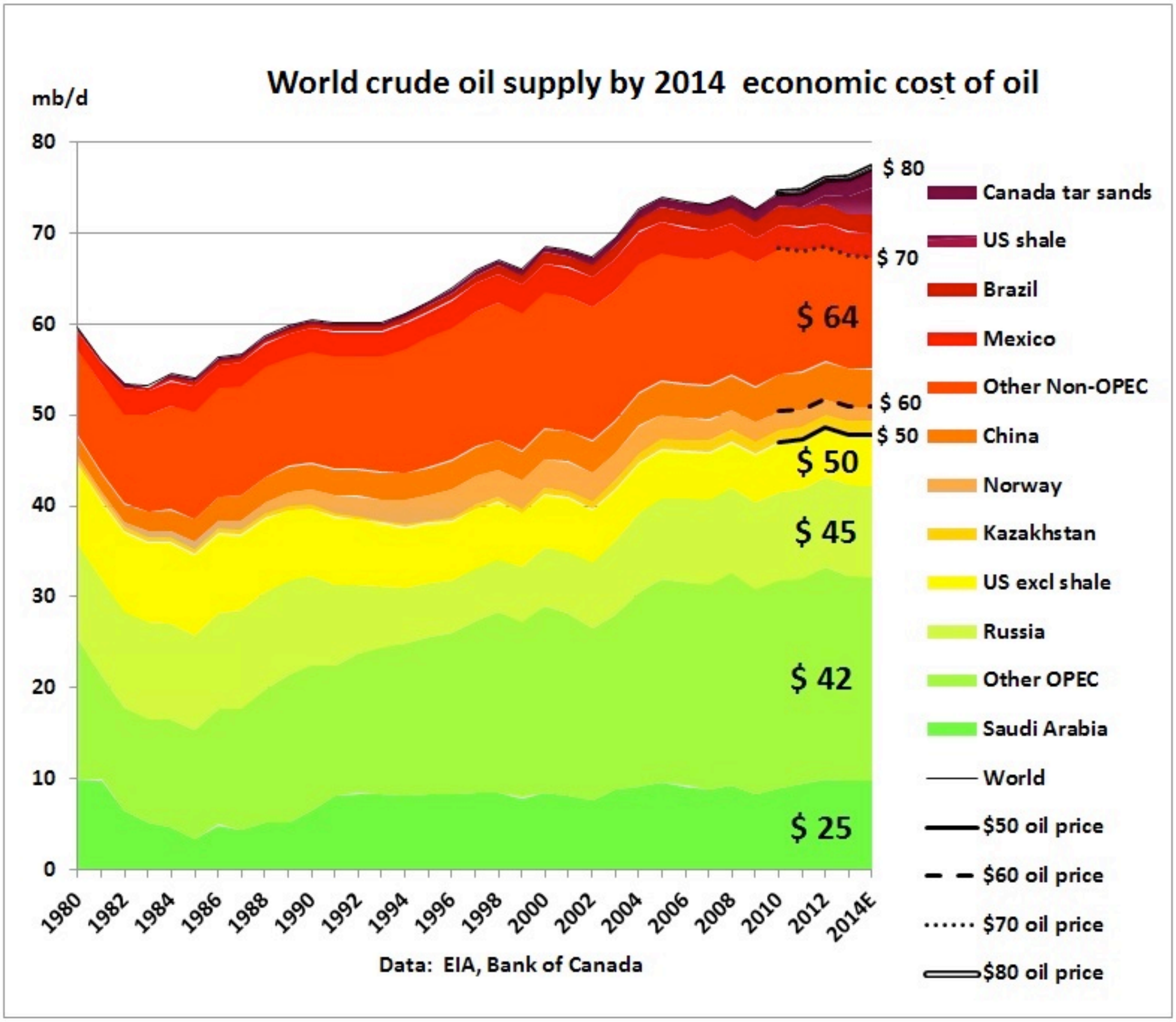


Fig 5: Same as Fig 4, but for crude oil only

All crude oil up to $75 is basically flat since 2005. Expensive unconventional oil has covered up this indisputable trend.

(3) Canadian tar sand costs

So how did the Bank of Canada arrive at $90 for tar sands? The following table is from a July 2014 report of the Canadian Energy Research Institute (http://ceri.ca/) CANADIAN OIL SANDS SUPPLY COSTS AND DEVELOPMENT PROJECTS (2014-2048)

ceri.ca/images/stories/2014-07-17_CERI_Study_141_Oil_Sands_Supply_Cost_Update_2014-2048.pdf

Table 3.4: Supply Costs Summary

Project	SC at Field Gate (C$2013/bbl)	WTI Equivalent SC (US$2013/bbl)
SAGD	**50.89**	**84.99**
Stand-Alone Mine	**71.81**	**105.54**
Integrated Mining and Upgrading	**107.57**	**109.50**
Standalone Upgrader	**40.82**	**44.13**

Source: CERI

Fig 6: Cost of Canadian tar sands

SAGD stands for steam assisted gravity drainage for in-situ tar sand projects as described here: http://www.connacheroil.com/index.php?page=great_divide_oil_sands

So the Bank of Canada has taken $90 as a WTI equivalent average. The above prices assume a light/heavy differential of $18 a barrel between West Texas Intermediate and West Canadian Select, even after the reversal of the Seaway pipeline and the construction of the southern leg of the Keystone XL in 2013 to connect Cushing to the Gulf of Mexico. This increased WTI, thereby narrowing the differential to Brent, but not to historical levels of $2-5/barrel "potentially indicating two things: either the two markets are no longer correlated and prices are representative of regional markets only or the market to market connectivity is not sufficient to increase WTI prices to Brent levels (sans transportation costs) or a combination of both….. Over time as more blended bitumen and SCO (syncrude oil) continue to penetrate the existing markets as well as new markets, such as the US Gulf Coast and markets outside of North America, the light heavy differential might narrow in the future."
http://ceri.ca/images/stories/2014-07-17_CERI_Study_141_Oil_Sands_Supply_Cost_Update_2014-2048.pdf

Conclusion:

Using the assessment of the Bank of Canada, production of affordable oil at price levels up to $75 has peaked or is at peak since the turning point of 2005. This means that the global economy cannot grow "normally" again.

wolfstreet.com/2014/05/29/why-the-promise-of-american-lng-exports-is-gassy-hype-2/

Why The Promise Of American LNG Exports Is Gassy Hype

by Wolf Richter • May 29, 2014

Natural gas production has been on a tear in the US. The fracking boom caused coal use to go into remission, broadsided the solar-panel industry, and motivated energy-intensive industries or those that use natural gas as feedstock to build new plants in the US. It has changed the energy equation. It created tens of thousands of good jobs. It created a whole industry of lobbyists and activists, battling each other and greasing politicians along the way.

And it caused earthquakes, not just in Oklahoma, but also in the minds of speculators, hype artists, and Wall Street hope mongers, funded by a tsunami of nearly free money that was drilled into the ground for years while the price of natural gas remained stubbornly below the cost of production.

That money is gone for good. And the price? After some tumultuous gyrations earlier this year, it's up 140% from the April 2012 low. But it's *still* below the cost of production, and the industry has shown no eagerness whatsoever to drill for dry natural gas. Wells that also produce enough oil and natural gas liquids, which fetch a much higher price, are better deals.

So production last year rose a scant 1% to a new record of 24.3 trillion cubic feet, not nearly enough to meet demand. In 2013, gas in underground storage was drawn down by 700 billion cubic feet and ended the year 20% below where it had started the year. After some additional nasty winter weather, natural gas in storage is now at 1,266 Bcf. That's 786 Bcf, or 38%, below where it had been at this time last year, and last year's storage levels were already running below average, which caused the price gyrations this winter.

And current levels are 1,478 Bcf, or 54%, below those of the same period in 2012. In other words, demand has exceeded supply for two years in a row by over 700 Bcf each. But now there isn't enough gas in storage to keep the system operational if a similar drawdown occurs again.

Questions are percolating if the US is going to have enough natural gas in storage by end of October to last through the winter. People are crunching all sorts of numbers to get a handle on it. But the Energy Department's EIA remains sanguine. Its predictions concerning natural gas are almost always far off target, and its predictions of a super-low price over the last two years have become – with hindsight – a silly joke.

Much depends on the weather. A cool summer and a warm winter will get us through it. But if a long heat spell hits densely populated areas and AC units are maxed out for weeks at a time, and if major cold waves roll over the land in the winter, the US would have to import Liquefied Natural Gas from the international markets, in competition with Korea and Japan which pay nearly four times the current price at the Henry Hub. It's going to be mayhem.

While all these questions are being kicked around and visions of shortages hover over every calculation, billions of dollars are thrown at LNG export terminals and deals are made to ship US LNG to other parts of the world. The idea is to take this dirt-cheap natural gas that would be produced in the US in maniacal bouts of over-drilling and arbitrage the price differential. And when Russia annexed the Crimea, voices clamored for the US to start selling LNG to Europe to lessen Europe's dependence on Gazprom and save it from Russia.

But where the heck is all this natural gas supposed to come from?

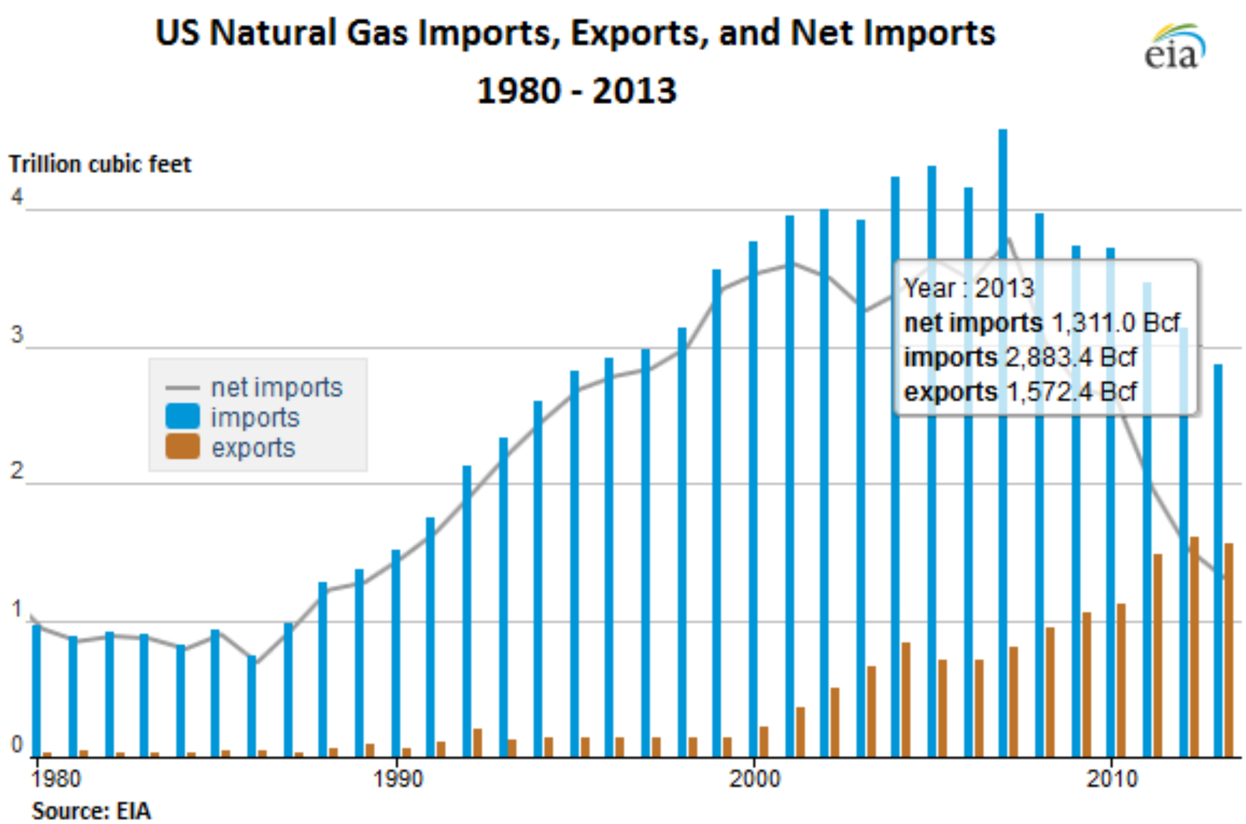
The US is a net importer of natural gas. OK, exports via pipeline to Mexico and Canada have steadily risen over the last ten years, except in 2013 when they edged down 1% as the US was running a little short. And imports, which ballooned from the mid-1980s to max out when the fracking boom kicked off in earnest in 2007, have since dropped every year. Last year, imports – mostly by pipeline from Canada and some LNG – were down 8%. The difference – net imports – dropped to 1,311 Bcf, the lowest since 1989.

If these trends were to continue, the US *could possibly* reach natural-gas independence over the next four or five years and might become a net exporter after that. But consumption has exceeded production over the last 24 months – largely due to the damage the persistent low price has done to the drilling industry. Demand has been met by drawing storage levels down 54%! But that resource has now been used up.

For the US to perform the super-feat of becoming a major net-exporter of natural gas, a new mega-drilling boom for dry gas would have to burst on the scene, *like right now*, and resources, equipment, and people would have to be moved from drilling for oil to drilling for dry natural gas. But that isn't going to happen with high oil prices and still dirt-cheap natural gas prices. Production goes where the profits are – and they aren't in natural gas. Not yet. Not at the current price.

And so the promise that American LNG could relieve Japan's thirst for natural gas and lower its dependence on the price gougers in the Middle East, and that the *very same* LNG could also calm Europe's angst about Russia's reliability as a supplier, the promise that easy billions could be made exporting that LNG has turned out to be just gassy hype.

The US has its hands full dealing with its own demand – at least until a dizzying increase in the price of natural gas triggers another drilling boom. Then all bets are off. *But wait* … once the price spikes enough to trigger that drilling boom, the promise of big profits from exporting cheap natural gas as high-priced LNG would turn into even more gassy hype.



PEAK COAL AND PEAK OIL: DECLINING PROSPECTS

Coal Export through Oregon and Washington?
coal peaked in USA in 1999, in Pennsylvania in 1920

www.peakchoice.org/peak-coal.html

link and comment courtesy of RiceFarmer.blogspot.com
www.platts.com/latest-news/coal/washington/power-river-basin-producers-finding-it-more-costly-21402408
Powder River Basin producers finding it more costly to get to coal reserves

"'There's very little low ratio coal out there anymore,' said Al Elser, BLM's assistant district manager for solid minerals in Casper, Wyoming."

Powder River Basin coal is some of the cheapest in the world. But as this article shows, the "easy coal" is pretty much gone. That of course means rising prices, and declining net energy. As with oil, coal is not going to literally "run out," but price increases will create an increasing drag on the economy. It's all downhill from here.

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www.cleanenergyaction.org
COAL: Cheap and Abundant: Or Is It?
Version 1.1. Released February 2009
Comments and Questions to Leslie Glustrom lglustrom at gmail.com

ABSTRACT
Coal-fired power plants provide approximately 50% of the electricity in the United States. It has often been stated that coal is "cheap and abundant" and it is assumed that it will stay that way for at least the next century. A careful analysis of existing information on coal supplies suggests that United States coal supplies are much more constrained than is widely understood. Indeed, it appears that with existing mines playing out over the next 10-20 years and future mine expansions highly uncertain, the planning horizon for building alternative power production infrastructure is likely to be much shorter than previously thought.

A careful review of existing information on U.S. coal supplies demonstrates that:

1) The U.S. Energy Information Administration has repeatedly published data on coal "reserves" as though they include an assessment of economic recoverability when in actuality they did not. As a result, the often touted "200 year supply of U.S. coal" is not based on a realistic assessment of how much coal will actually be accessible.

2) The United States Geological Survey has developed a tool for assessing economic recoverability and published a series of reports showing that the amount of economically recoverable coal is a small fraction (e.g. less than 20%) of the original resource. The most recent USGS assessment of coal in the Gillette coal field of the Powder River Basin of Wyoming, the source of about 40% of U.S. coal, found that only 6% of the coal was economically accessible under the economic conditions at the time.

Between 2002 and 2008, while coal costs were rising dramatically, the USGS reduced the amount of economically accessible coal in the Gillette coal field of the Powder River Basin from 23 billion tons to 10 billion tons.

3) The major mines in the Powder River Basin of Wyoming (e.g. the "Fort Knox" of U.S. coal) have less than a 20 year life span, and coal mines in other parts of the United States are also likely to be playing out in the next 20 years. Future coal mine expansions are highly uncertain as these expansions will face very serious geologic, economic, legal and transportation constraints. Importantly, the federal government owns essentially all of the coal in the western United States, and future coal mineexpansions in western states will have to comply with a host of federal laws.

IN CONCLUSION,

It appears that rather than having a "200 year supply of coal," the United States has a much shorter planning horizon for moving beyond coalfired power plants. Depending on the resolution of geologic, economic, legal and transportation constraints facing future coal mine expansion, the planning horizon for moving beyond coal could be as short as 20-30 years.
http://cleanenergyaction.files.wordpress.com/2011/10/
coal_supply_constraints_cea_0212091.pdf

"We can’t print coal the way we’ve been printing money so we need to take a very sober look at long-term coal supplies and begin to plan accordingly."
-- "Coal Supply Constraints: Long-Term American Coal Supplies Questioned," Leslie Glustrom, Boulder, CO, February 12, 2009
www.cleanenergyaction.org/documents/press/our%20news/coal_supply_constraints_021209.html

"Geology and Markets, not EPA, Waging War on Coal"
http://cleanenergyaction.org/2014/06/04/geology-and-markets-not-epa-waging-war-on-coal/
Clean Energy Action shows that it's the peaking of coal production, not Obama policies, causing coal's decline by driving up the cost of extracting coal (June 2014)

The EPA is not waging a war on coal. This isn’t to say that a war on coal would be a bad idea, but rather that it’s mostly unnecessary. Coal in the US is dying off on its own, and at most what we’re doing is equivalent to taking it off life support. Our task is to manage the graceful transition to a much lower carbon energy system.

The proposed EPA carbon regulations are just the first baby steps we need to take down the path of avoiding catastrophic warming. The EPA, the state legislatures and regulatory bodies, and (someday) the US Congress are all going to have do do a whole lot more work in the years to come, working together to transform our energy system much faster and much more profoundly than these regulations alone can.

Because there’s so much more work to do, it is important that we do not allow the EPA and the Obama administration to be made into scapegoats for the decline of the coal industry. We must not allow this kind of work to remain politically poisonous, or we’ll never build the kind of momentum we need to finish the job.

"Warning: Faulty Reporting on U.S. Coal Reserves"
http://cleanenergyaction.org/research-reports/faulty-reporting-us-coal-reserves/
2013 Clean Energy Action report on peaking of coal reserves

www.scitizen.com/future-energies/global-coal-supplies-it-might-be-worse-than-anyone-thinks_a-14-3558.html

Global Coal Supplies: It Might Be Worse Than Anyone Thinks
by Kurt Cobb
10 Aug, 2010
A new study on global coal supplies suggests a worldwide peak in production from existing fields in 2011.

Claims that the world has 200 to 400 years of coal left at current rates of consumption have blinded policymakers and the public. The claims are based on two questionable notions: 1) That official coal reserve estimates are accurate and 2) that the world will experience no growth in the rate of consumption of coal over the period cited.

In a new study published in the international journal Energy researchers Tadeusz W. Patzek and Gregory D. Croft suggest that actual historical coal production is a better indicator of the future trend of worldwide coal output than stated reserves which are notoriously unreliable. They note, for example, that the state of Illinois, despite its rank as second in reserves in the United States, has seen its production decline by half over the last 20 years. In the meantime Illinois' estimated recoverable reserves have actually increased from 32 billion tons to 34 billion tons between 1987 and 2006.

They mention the work of David Rutledge at the California Institute of Technology who has detailed the sharp downward revisions in the official reserve estimates in recent decades and who believes ultimate production will fall far short of the current reserve estimates. The trajectory for reserves, Rutledge shows, has largely been down as planners include constraints both technical and practical such as coal in seams too thin to mine economically or the presence of a large city over a shallow coalfield. Rutledge also applies Hubbert Linearization to the production data to obtain a truly startling picture of ultimate future recoveries: 50 percent less than current forecasts.

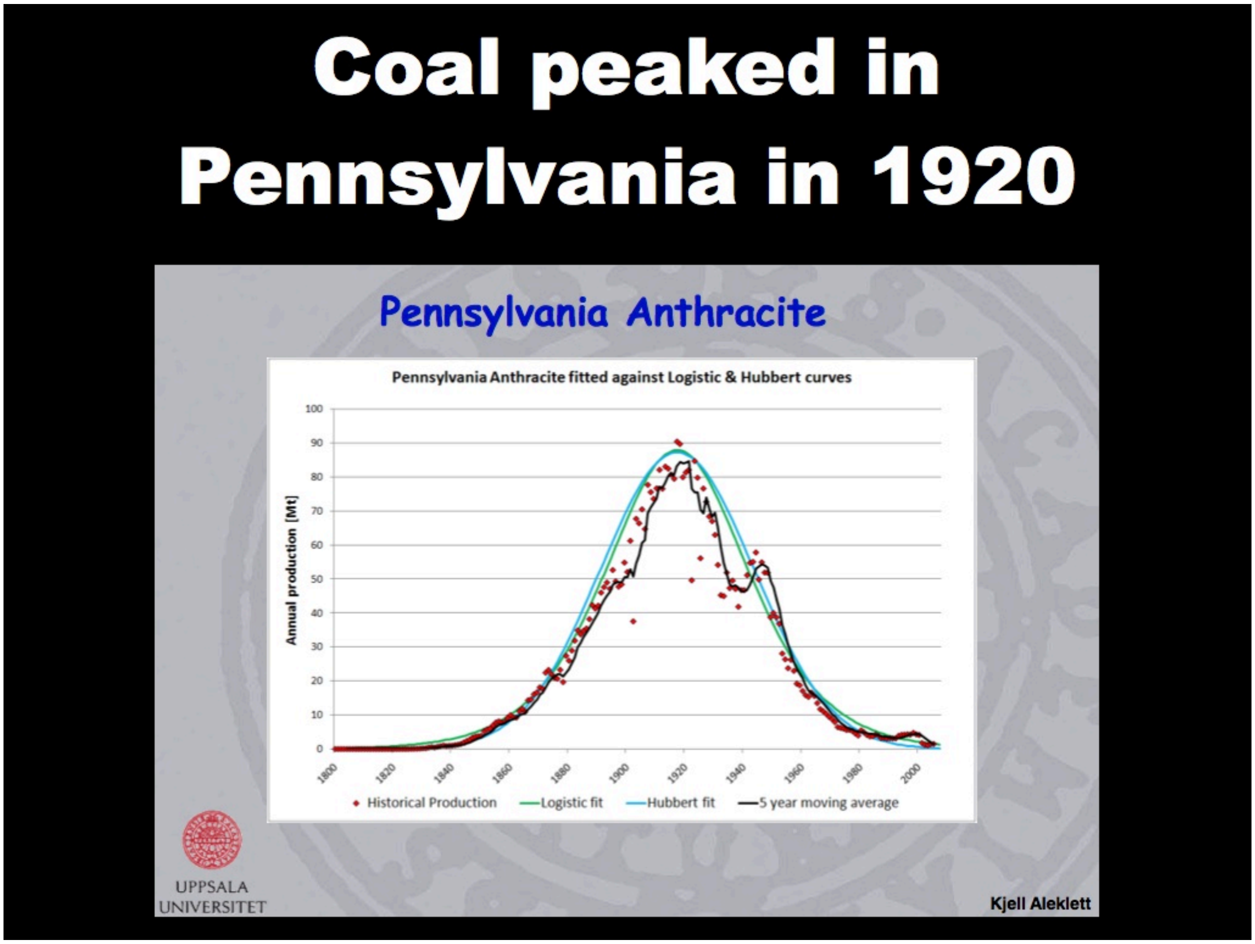
As for the second assumption, the idea that coal demand would stay the same even as the population and the world economy presumably grow is an absurd notion without any historical basis. So even if stated reserves are correct, exponentially rising rates of production would quickly whittle the supply down to perhaps 75 years with a peak coming much sooner than that.

But the authors believe such a path of growth is out of the question because of the near term production peak they expect in coal and oil as well. They calculate a peak in worldwide coal production from existing coalfields in 2011. They argue that nearly all of the world's major coalfields have been known for a long time, and that only one major field has been discovered in the last 50 years. They recognize major untapped sources in Alaska and Siberia, but believe that the difficulties and long lead times involved in developing them will mean that the date of peak production will not be affected. Rather these areas might lessen somewhat the pace of decline. Perhaps the most shocking projection in the report is that coal production from existing coalfields is expected to fall by 50 percent over the next 40 years.

www.george-orwell.org/Down_The_Mine/0.html
George Orwell
Down The Mine

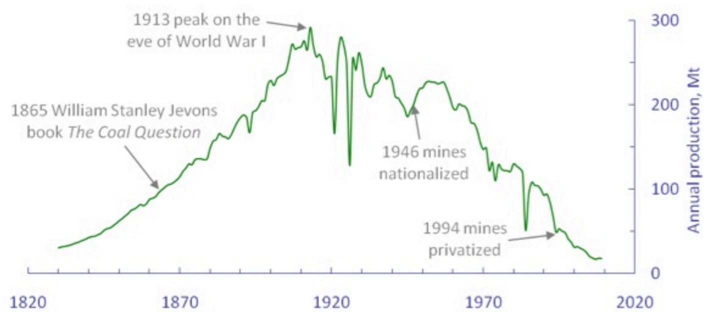
Our civilization, pace Chesterton, is founded on coal, more completely than one realizes until one stops to think about it. The machines that keep us alive, and the machines that make machines, are all directly or indirectly dependent upon coal. In the metabolism of the Western world the coal-miner is second in importance only to the man who ploughs the soil. He is a sort of caryatid upon whose shoulders nearly everything that is not grimy is supported. For this reason the actual process by which coal is extracted is well worth watching, if you get the chance and are willing to take the trouble. ....

But-most of the time, of course, we should prefer to forget that they were doing it. It is so with all types of manual work; it keeps us alive, and we are oblivious of its existence. More than anyone else, perhaps, the miner can stand as the type of the manual worker, not only because his work is so exaggeratedly awful, but also because it is so vitally necessary and yet so remote from our experience, so invisible, as it were, that we are capable of forgetting it as we forget the blood in our veins. In a way it is even humiliating to watch coal-miners working. It raises in you a momentary doubt about your own status as an 'intellectual' and a superior person generally. For it is brought home to you, at least while you are watching, that it is only because miners sweat their guts out that superior persons can remain superior. You and I and the editor of the Times Lit. Supp., and the poets and the Archbishop of Canterbury and Comrade X, author of Marxism for Infants--all of us really owe the comparative decency of our lives to poor drudges underground, blackened to the eyes, with their throats full of coal dust, driving their shovels forward with arms and belly muscles of steel.


Coal peaked in Pennsylvania in 1920
Pennsylvania Anthracite
Pennsylvania Anthracite fitted against Logistic & Hubbert curves
Annual production [Mt]
Historical Production
Logistic fit
Hubbert fit
5 year moving average
UPPSALA UNIVERSITET
Kjell Aleklett

Coal, Climate Change, and Peak Oil
David Rutledge, Caltech
ASPO USA 2010 conference

UK Coal Production



- Mt = millions of metric tons
- Production is now 16 times less than the peak — the last time the production was this low, Napoleon was alive
- In 1913, Britain exported 31% of its production, now it imports 74% of the coal it burns

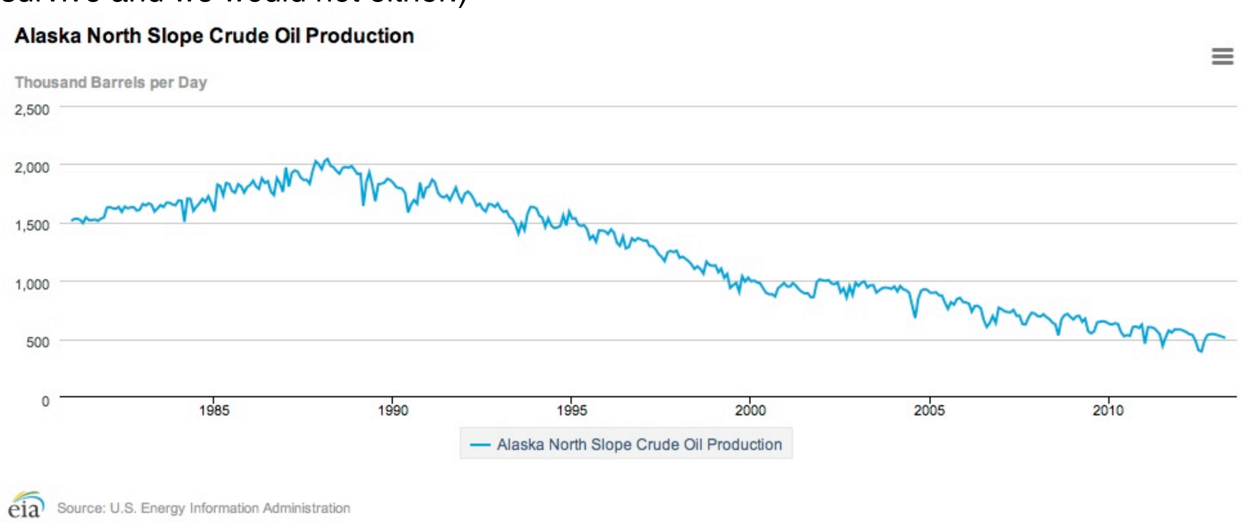
Oil Export versus Peaked Oil: Oil trains to replace Alaska Pipeline depletion, not to export to Asia

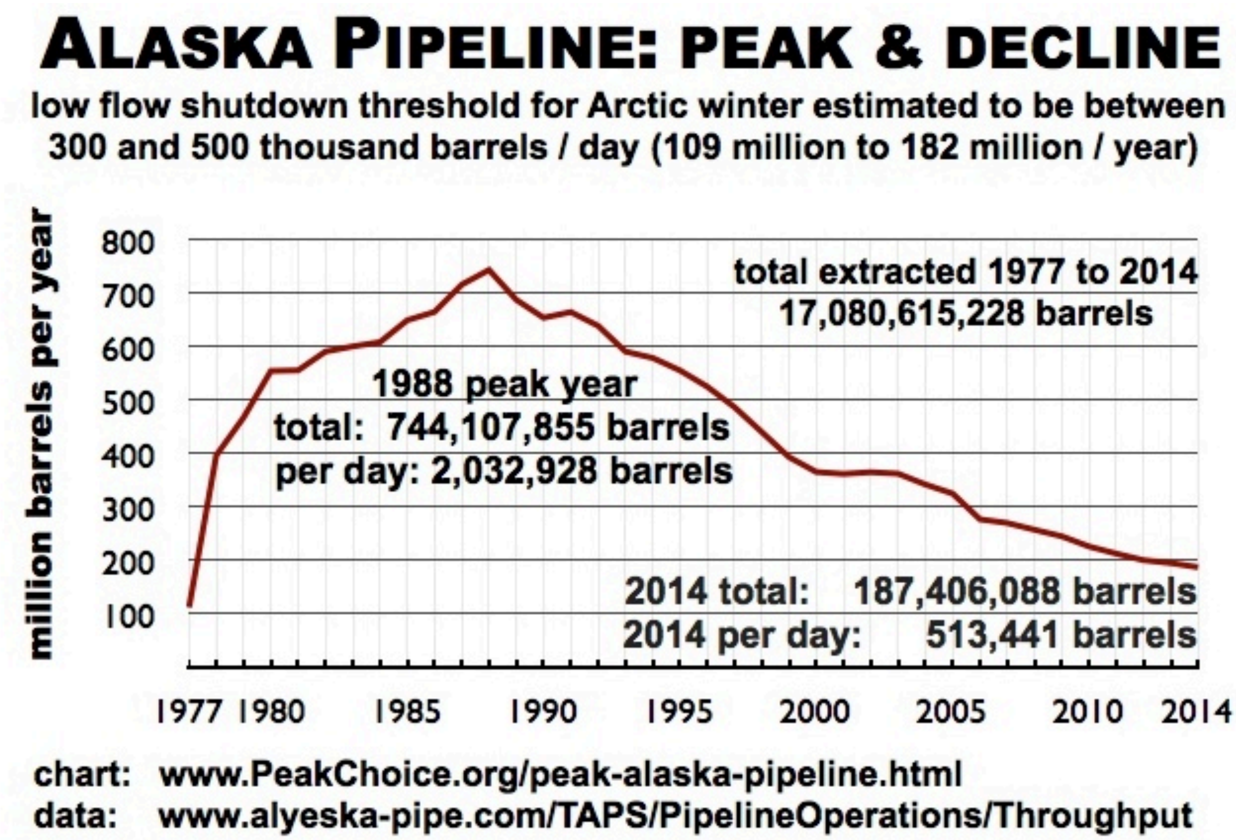
Proposals to export oil through Oregon to Asia ignore these facts: the US is an oil importer, fracking has not surpassed the peak of domestic oil production in 1970, conventional oil continues to decline and the main oil source for the Northwest is dwindling toward low flow shutdown. Oil trains flowing into the region are more likely to replace Alaskan oil for Oregon and Washington motors, not to export to China. Perhaps a couple boatloads of oil will be shipped - to prove a point, perhaps to make more profit than can be made domestically - but it's a short term distraction.

In 1998, the Clinton Gore administration opened up the Naval petroleum reserve in northwest Alaska (west of Prudhoe Bay). It was originally thought to have ten billion barrels, current estimates are about 800 million. The Arctic National Wildlife Refuge to the east of Prudhoe also has oil, estimates range from a billion to several billion. Whatever the exact amounts, it's clear that Alaskan oil is winding down, even if "ANWR" is drilled. These last fields would only extend the pipeline's lifetime a few more years.

There have been proposals for drilling in the Arctic Ocean, but so far these have not been successes. Details: Randy Udall and Steve Andrews, "The offshore? Good luck, bad luck and mukluk," ASPO-USA, September 11, 2008 - archived at www.resilience.org/stories/2008-09-11/offshore-good-luck-bad-luck-and-mukluk

Even if global warming results in an ice free Arctic Ocean in the summer, causing new climate feedback loops (ice reflects more sunlight than open water), it will still freeze in the winter, even if the freeze time is shorter, and ice floes are destructive to offshore drilling rigs. (If the Arctic warms enough so it doesn't freeze in the winter, oil extraction would be the least of our concerns -- our agricultural systems would not survive and we would not either.)





http://alyeska-pipe.com/NewsCenter/HeadlineStories
"Cold oil a hot topic during winter"

As oil throughput declines, TAPS faces new and complicated challenges. One of the most complex is maintaining crude oil temperature in the pipeline at around 40 degrees during the winter. This provides a safe operating buffer above 31 degrees, at which point trace amounts of water in the oil can begin to freeze. Heat input along TAPS is critical during cold weather; the hotter the oil, the lesser the chance of ice formation during extreme cold weather events or unplanned pipeline shutdowns. Ice in the pipeline can pose risks to mainline check valves, instruments, mainline pumps and maintenance pigs.

Each winter between October and March, Alyeska's Operations Engineering and the Operations Control Center constantly analyze temperatures along the pipeline and look at weather forecasts to optimize heat input.

"The effort requires a mix of science and intuition to maintain the target temperatures for the pipeline system," explained Mike Malvick, Flow Assurance Advisor with the Flow Assurance Team. "And it's a system that has a lot of thermal mass and a transit time that exceeds two weeks."

TAPS oil temperature is a function of pipeline throughput and the time the oil spends in the pipeline. At its peak in 1988, TAPS throughput was more than 2 million barrels a day. At that rate, oil traveled from Pump Station 1 to Valdez in 4.5 days and was as hot as 120 degrees. Freezing water and wax accumulation weren't concerns.

Oil now leaves Pump Station 1 at approximately 110 degrees and experiences a significant drop in temperature almost immediately upon departing, then continues cooling as it travels to Valdez. Today's throughput is around 530,000 barrels a day, taking 18 days to travel to Valdez. On Monday, January 26, oil departed Pump Station 1 at 106 degrees with an ambient temperature of 17 below zero. By the time the oil traveled 100 miles south to Pump Station 3, the environment had drawn 51 degrees from its natural temperature. Near the Yukon River, temperatures were around 50 below zero. In Fairbanks, temperatures hovered around 40 below. Without heating assistance, the oil would eventually cool below 31 degrees before reaching Valdez.

During current normal winter operations, oil temperature is increased using mainline pumps and station recycle loops to add heat through friction at Pump Stations 3, 4, 7 and 9. At Pump Station 3, approximately 13 degrees of heat is added to the crude by running it through recycle loops at 25,000 barrels per hour. The same process is repeated at Pump Stations 4 and 9. The heat added at Pump Station 7 comes from a different source, one that involves recycling but through the use of a legacy mainline pump – one of the last on the line. On January 26, the ambient temperature at Pump 7 was 21 below zero, with crude arriving at 40 degrees and leaving at 53.

Heating with the existing equipment increases system-wide equipment maintenance costs and is especially expensive south of Atigun Pass. There, the heat is generated by burning turbine fuel trucked to Pump Station 7 and by consuming electricity from Golden Valley Electrical Association at Pump Station 9.

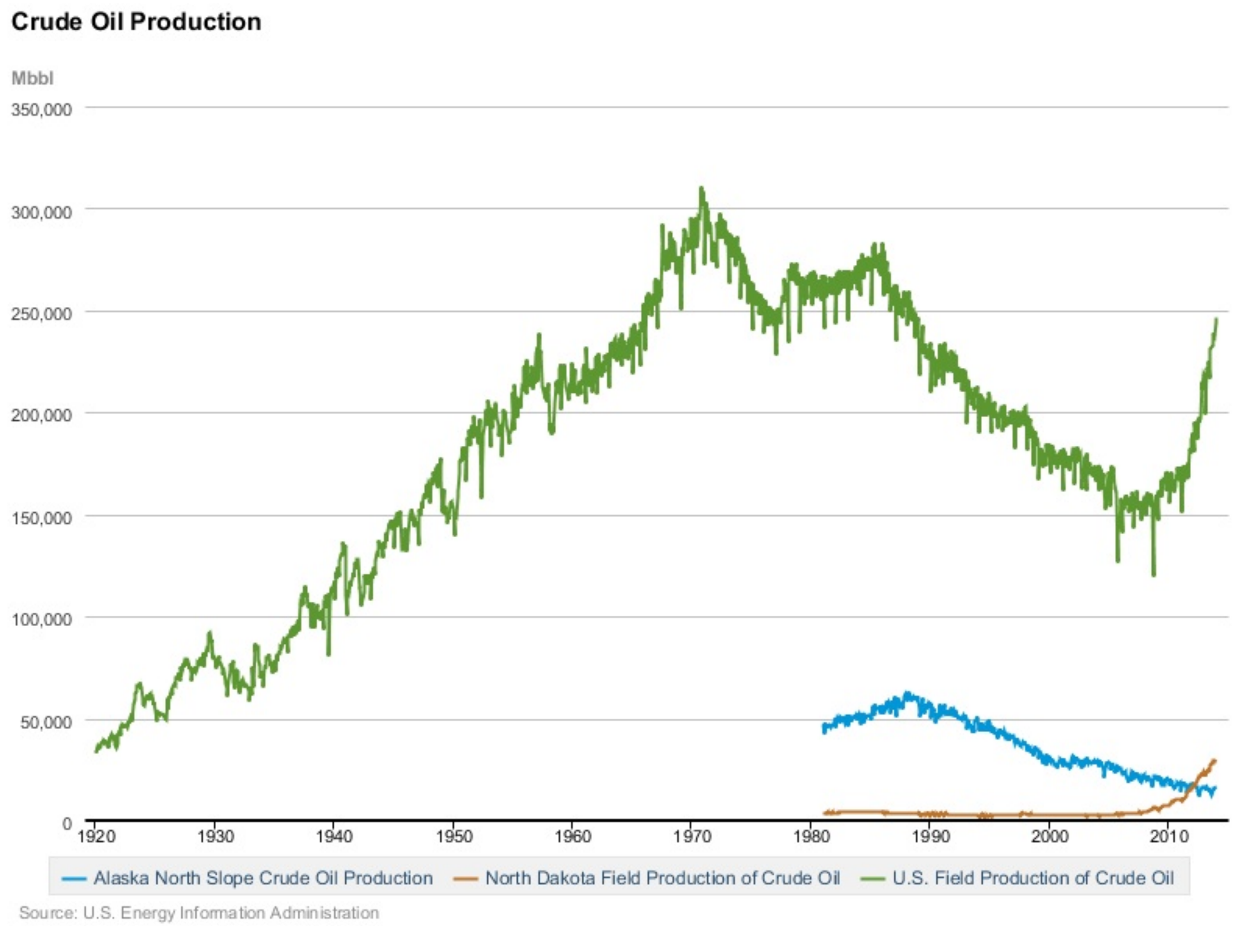
"Without considering literally dozens of data points and responding to weather or throughput changes several days into the future, it is easy to either put more heat into the system than necessary and incur unnecessary fuel and electricity expense," added Malvick, "or to not anticipate a cold snap, watch pipeline temperatures drop below targeted values, and then play catch-up with maximum heat input for several days or weeks."

Malvick and other TAPS staff are developing additional initiatives to warm the oil as it travels the line.

One heating solution is the new Remote Gate Valve 65 (RGV-65) point-source heating skid, located 17 pipeline miles north of Pump Station 7. The portable diesel-fired slipstream heating/reinjection skid was brought online January 7 with the potential to increase oil temperatures by 2 degrees.

"The skid is a relatively efficient system for adding heat and serving as a contingency to mitigate the risk of ice accumulation at Pump Station 7," said John Baldridge, Senior Director, Pipeline Operations.

RGV-65 will be used as weather dictates. Engineers will validate RGV-65's effectiveness and reliability this winter; if successful, Alyeska will consider setting up similar skids along the line.



US oil production peaked in 1970, fracking is a secondary, smaller peak.
Alaskan oil production peaked in 1988 and has declined three fourths in the flow rate.
North Dakota oil is almost entirely now from fracking but it's nowhere near the peak flow from Alaska.

The real exports: raw logs and wood chips

Coos Bay used to export vast volumes of old growth timber. But since there was not an infinite supply, and the trees were cut much faster than they can grow back, this flood of forest products has ebbed and now the exports are smaller logs (often unmilled) and wood chips.

In 1998 I took a picture of the former mill on the Coos Bay waterfront, it had a sign stating "Products for Japan." The mill, by then, was empty of equipment and the building was just a shell. Down the road, another site was transformed into a casino to fleece those who did not do well in math in school. Now, wood chips - a very low grade product - are exported from Coos Bay.

Exporting raw lots without milling them here in Oregon is a form of exporting jobs and money. It's a "third world" approach to natural resources -- send the raw ingredients elsewhere to be turned into useful products.

The Oregon Coast Range was one of the most productive and amazing forests on the planet. A century of industrial deforestation has converted this region into a giant monoculture tree farm. Maybe one percent of the original forest remains and much of that is in the small "wilderness" areas. The timber companies have liquidated nearly all of their holdings and now that they only have second and third growth trees the financial value of these forestlands are much less.

If we really wanted to mitigate climate change, we would let these tree plantations grow back into old forests.

If we were concerned about a forest economy, raw log exports would be banned and we would think about value added products from milled logs (and non-timber products from forests) instead of treating the landscape as a raw material for a globalized market. (Oregon's annual sales of furniture is less than the cost of a highway interchange.) Selective forestry can make more board feet in the long run than short rotation clearcuts, but this conflicts with corporate requirements for maximum short term profit.

If we wanted to mitigate unemployment, we could recreate the New Deal era Civilian Conservation Corps to restore clearcuts and tree farms into forests.

If we were concerned about cancer and birth defects, we would prohibit timber companies from spraying poison from helicopters that drifts downwind for miles and increases up the food chain.

And if we wanted to protect biodiversity, carbon storage, air and water quality, scenic vistas, recreation and the hydrologic cycle, we would convert Oregon's National Forests, BLM Oregon and California lands, and State Forests into protected parks for future generations of all species. Cascadia National Park!

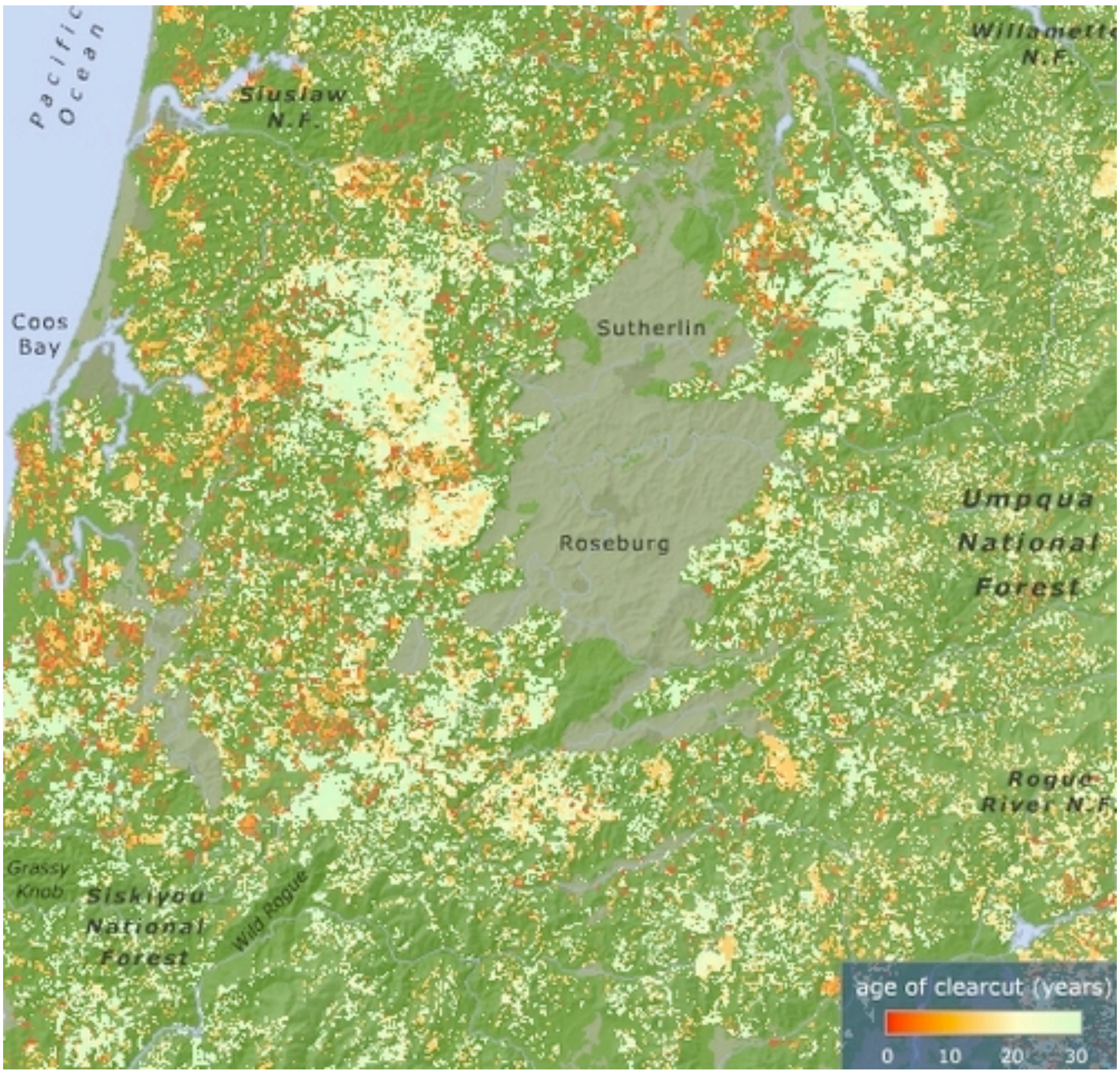
Some regional efforts focused on preventing the abuses of industrial “forestry” on corporate timberlands

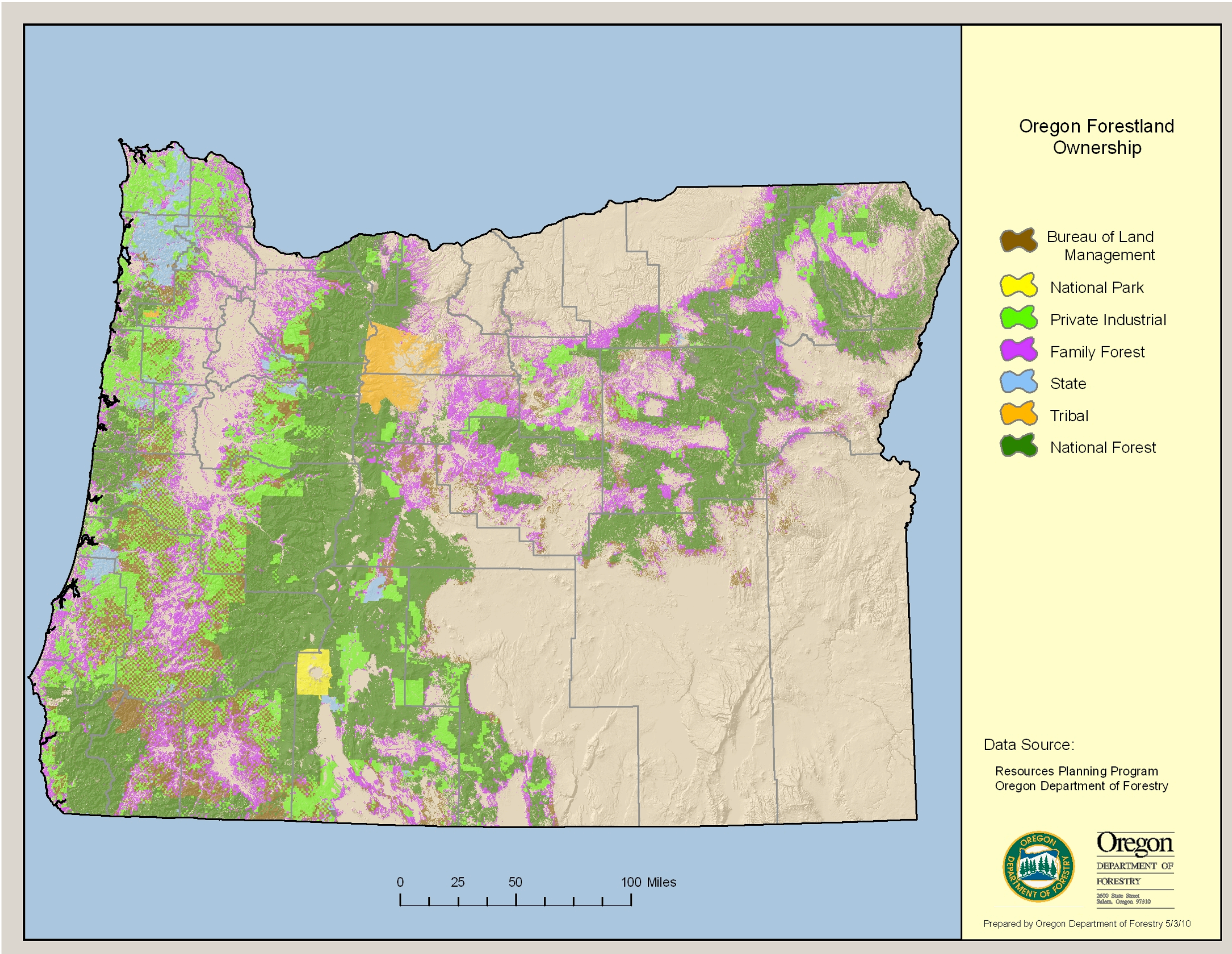
forestclimate.org - video from the Clearcutting the Climate conference

eco-advocates.org - EcoAdvocates Northwest

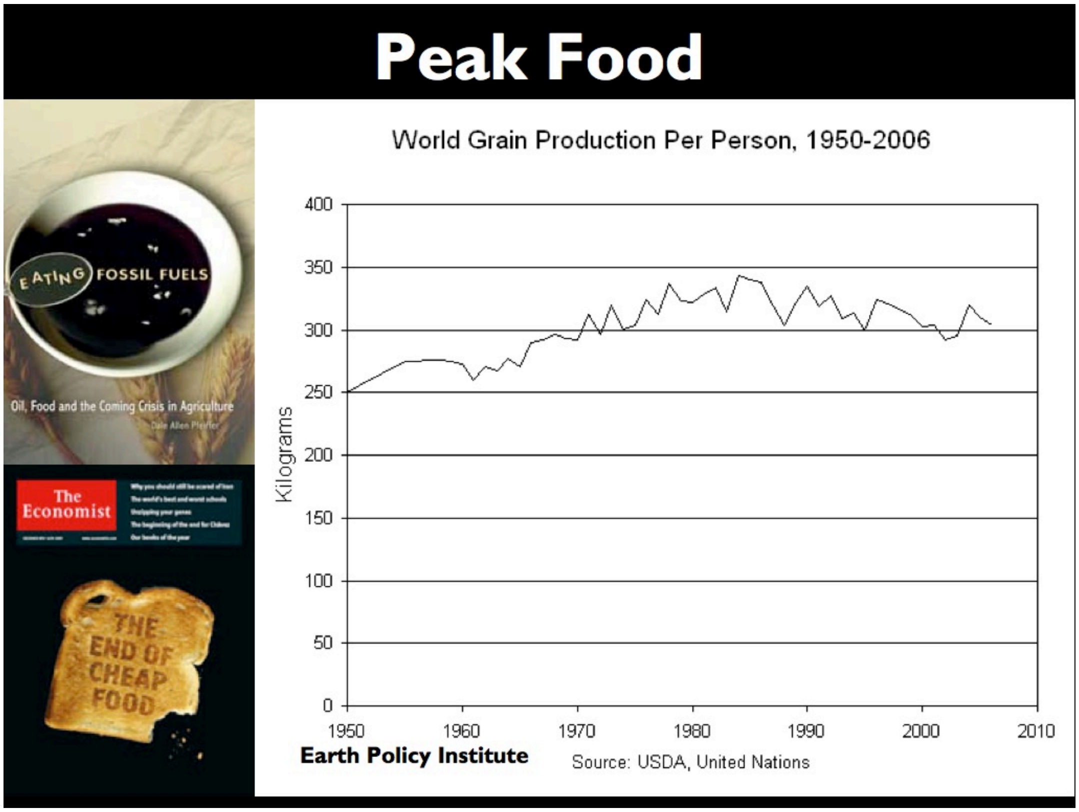
ourforestsforever.org - Our Forests Forever (good discussion of log exports)

coastrange.org - Coast Range Association

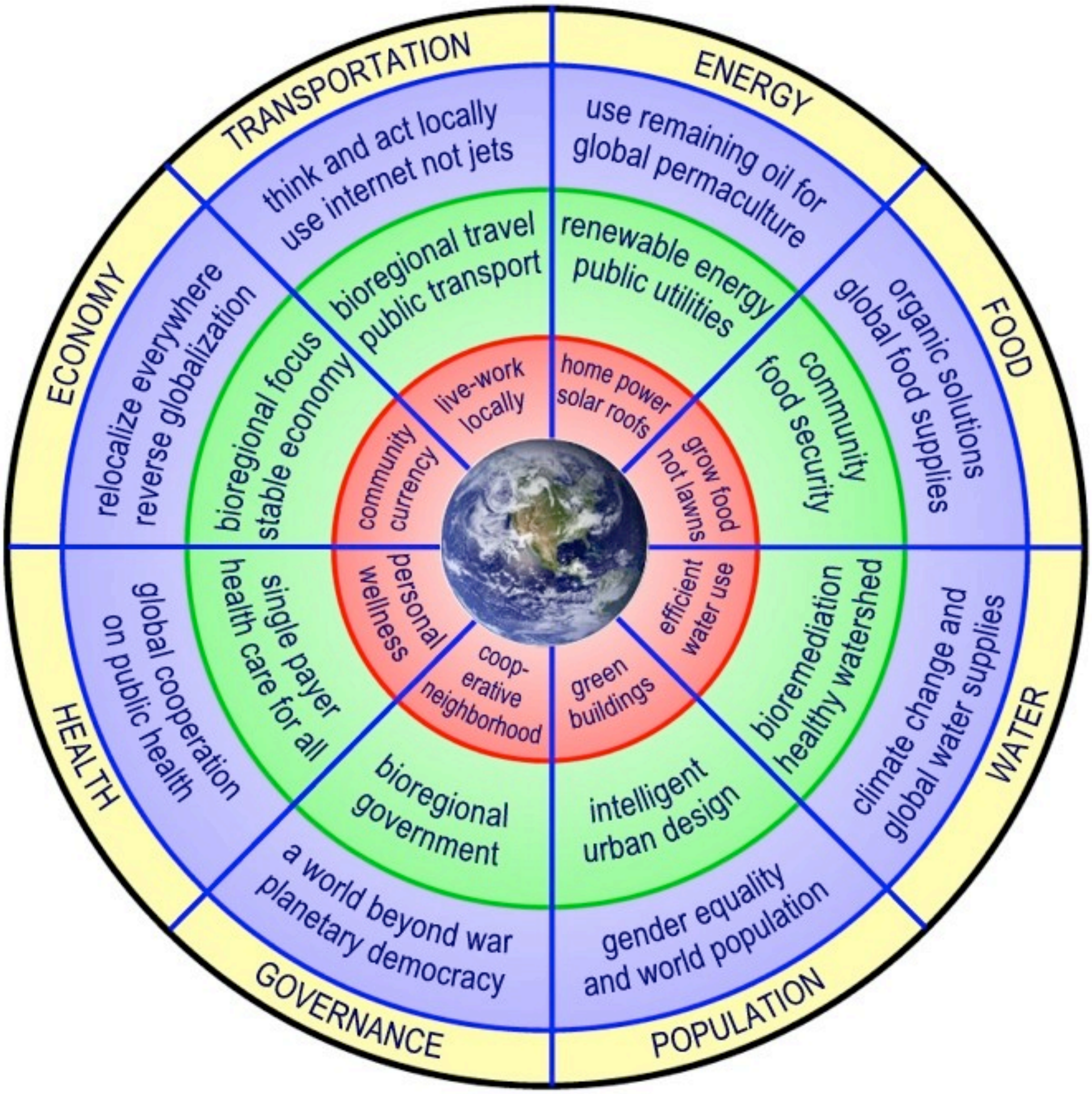




Oregon Forestland Ownership
Bureau of Land Management
National Park
Private Industrial
Family Forest
State
Tribal
National Forest
0
25
50
100 Miles
Data Source:
Resources Planning Program
Oregon Department of Forestry
Oregon
DEPARTMENT OF
FORESTRY
Prepared by Oregon Department of Forestry 5/3/10



Peak Food is the real energy crisis. Not driving as much will cause hardships for many but not eating as much will be even more chaotic. Relocalizing food production is probably the most important response to energy decline. There are lots of good efforts underway for community gardens, teaching how to convert backyards (and front yards) to vegetable gardens, more farmers markets, farm to school programs, converting grass seed farms to growing food and many other programs. But at the rate these are going the oil and natural gas will be mostly gone by the time we relocalize a majority of our calories.



www.PeakChoice.org/levels.html

local - bioregion - global

fractal permaculture

BBC News - China: Power plant burns banknotes instead of coal

http://www.bbc.com/news/blo

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10 December 2014 Last updated at 10:17 ET

China: Power plant burns banknotes instead of coal

News from Elsewhere...

...media reports from around the world, found by BBC Monitoring

A company in one Chinese city has money to burn, and is using it to make electricity, it's reported.

The power plant in Luoyang, central Henan Province, is burning old and damaged banknotes instead of coal - the first time this has been done in China, **the official Xinhua news agency reports**. The plant says one tonne of notes can generate more than 600 kWh of electricity, and is better for the environment than burning coal. The country's central bank, the People's Bank of China, has given permission for the notes to be burned, and says it's an efficient way to make electricity. With the province's unused paper money the company "can help generate 1.32 million kWh of electricity annually, which is equal to burning 4,000 tonnes of coal", a member of staff at the bank tells Xinhua.

Banknotes which are withdrawn from circulation in China after being worn out by handling or other damage are most commonly used to make paper products, **according to the Dahe Daily news website**. The idea of setting fire to the city's cash has amused Chinese social media users. "Burning money? Luoyang is such a rich city!" says one Weibo user, while **another person writes**: "I'm willing to go a year without electricity, please give me a pile of cash!" But one user has a craftier suggestion: "Hire me as an employee, I promise I won't take any money."

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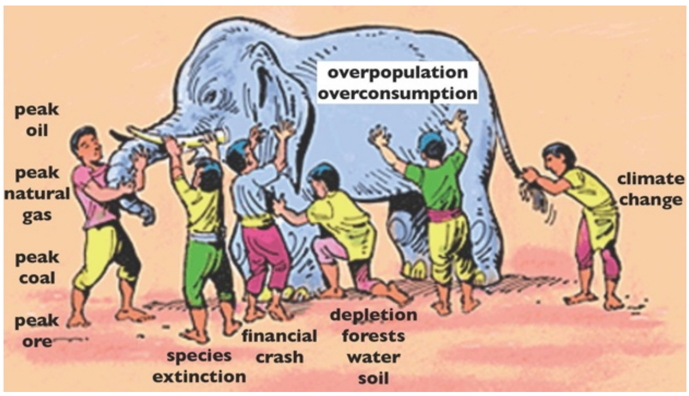
- Stray cat enjoys $1,000 fish feast
- Reward doubled over spud sabotage
- Donkey protest in central Nairobi

Peaked Energy and Climate Chaos

The most important question facing the human race is how we respond to the interconnected crises of Peaked Energy, Climate Chaos, overpopulation, and resource conflicts. These crises resemble the parable of the blind men touching an elephant. Each observer is correctly describing what a part of the elephant is, but none have a holistic understanding. **Peaked Energy and Climate Change are two facets of ecological overshoot, and neither can be mitigated without the other.**



The global crises of the end of cheap fossil fuels and the start of climate change require global levels of solutions -- we need to relocalize everywhere. We are not merely at peak energy, we are at peak technology, peak money, peak communication, and peak everything else. Real solutions would require us to redirect the energy, talents, resources of global capitalism, the military industrial complex, universities, media and other pillars of our society.

We have enough resources and talent to shift civilization to create a peaceful world that might be able to gracefully cope with the end of concentrated fossil fuels, or to create a global police state to control populations as the resources decline. The "War on Terror" is actually a long planned World War to control finite fossil fuels that power civilization.

Understanding why civilization did not respond to the warnings of resource depletion decades ago is needed if a shift toward sanity is still possible at this late date. This is a simple question that has a complicated answer - since these decisions were not made democratically. Addressing Peak and Climate would require world peace instead of Peak Oil Wars.

We are not "addicted" to oil -- the modern world is completely dependent upon fossil fuels for industrial agriculture systems, transportation networks, and the growth based monetary system. Addictions are things you can give up -- but oil runs our civilization.

Peak and Climate are interconnected

Focusing on energy shortage while ignoring ecology led to the false solutions of tar sands, shale gas, offshore drilling, liquid natural gas, biomass electricity, mountaintop removal, and nuclear power.

Focusing only on "carbon" while ignoring energy limits is one of the reasons for the political backlash against climate change awareness. Environmental groups frame these concerns as we should reduce energy consumption instead of we will reduce use because we cannot burn fuel that does not exist.

Framing the question as how we will use the remaining oil could bypass the problem of climate change denial. We will reduce our "carbon footprint" whether we want to or not. How many governments or corporations will still exist in 2050 when our footprints are supposed to be smaller? How much oil, coal and unnatural gas will be left in 2050 to extract?

Our exponential growth economy has hit the end of growth of resource consumption, imposed by nature as well as politics. Building lots of wind turbines, railroads and relocalizing agriculture would require reallocating resources used for endless warfare and wasteful consumerism. After Peak Everything there will be fewer resources available for "transition." We need triage on a planetary scale to wisely use the remaining fossil fuels and minerals.

David Holmgren, co-originator of permaculture, is author of *Future Scenarios: How Communities can adapt to Peak Oil and Climate Change*. www.futurescenarios.org

> *"Economic recession is the only proven mechanism for a rapid reduction of greenhouse gas emissions ... most of the proposals for mitigation from Kyoto to the feverish efforts to construct post Kyoto solutions have been framed in ignorance of Peak Oil. As Richard Heinberg has argued recently, proposals to cap carbon emissions annually, and allowing them to be traded, rely on the rights to pollute being scarce relative to the availability of the fuel. Actual scarcity of fuel may make such schemes irrelevant."*

Living on our current solar budget would power a smaller, steady state economy. We will live on our solar budget as the oil, unnatural gas and coal go away. Future generations need us to choose wisely and use remaining fossil fuels for relocalization and power down. We are past the limits to growth on our round, finite planet.

PEAK MONEY: a permanent change

we are past limits to growth, this is not a cyclical recession

Some of the media, government elites, and the financial world knew the financial crash was imminent but feigned surprise in public while planning their exit strategies and wargaming how to manage and manipulate the crisis to protect their power (not just more profits). The financial meltdown is not a cyclical recession, it is a permanent economic shift. The End of Growth transcends ideologies and partisan politics.

Now that we are at Peak Everything we need to move beyond Peak Denial and Peak Blame to equitably share the shrinking economic pie.

Even if transnational corporations were converted into democratic, locally owned cooperatives, we have still overshot Earth's carrying capacity.

"This is not so much financial bad weather as financial climate change" — James Howard Kunstler

"Communism forgets that life is individual. Capitalism forgets that life is social, and the kingdom of brotherhood is found neither in the thesis of communism nor the antithesis of capitalism but in a higher synthesis that combines the truths of both. Now, when I say question the whole society, it means ultimately coming to see that the problems of racism, the problem of economic exploitation, and the problem of war are all tied together."
— Martin Luther King, “Where do we go from here?” August 16, 1967

energy and money

- “the recession that will not end in our lifetime” www.PeakChoice.org/peak-money.html
- Richard Heinberg, Post Carbon Institute “The End of Growth” www.postcarbon.org
- Chris Martsenson, "The Crash Course" www.peakprosperity.com/crashcourse
- Center for the Advancement of the Steady State Economy www.steadystate.org
- Gail Tverberg, OurFiniteWorld.com

steady state economics for an ecological society

The dominant paradigm teaches money is the most important value, energy conservation and ecological sanity are nice if we can afford them.

Most of the environmental movement has embraced the concept of the Triple Bottom Line, which suggests that the economy needs to consider ecology and social justice issues. While it is good to factor these into economic decisions, the deeper truth is the environment makes the economy possible. Energy creates money, not the other way around. No jobs on a dead planet.

It is probably not a coincidence that many of the political voices calling attention to the problems of fiat currency, the Federal Reserve and other structural problems rarely mention the underlying ecological limits - and worse, some of them seem fixated on Jewish bankers who allegedly run the world.

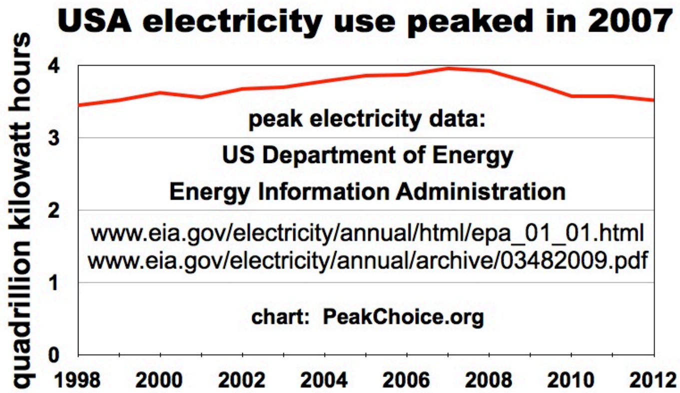
We need to weave together social justice advocates with understanding of how fiat money is created and that we have reached the limits to infinite growth on a finite planet.

"Awareness of Climate Change by the media and general public is obviously running well ahead of awareness about Peak Oil, but there are interesting differences in this general pattern when we look more closely at those involved in the money and energy industries. Many of those involved in money and markets have begun to rally around Climate Change as an urgent problem that can be turned into another opportunity for economic growth (of a green economy). These same people have tended to resist even using the term Peak Oil, let alone acknowledging its imminent occurrence. Perhaps this denial comes from an intuitive understanding that **once markets understand that future growth is not possible, then it’s game over for our fiat system of debt-based money**."
— David Holmgren, co-originator of permaculture "Money vs. Fossil energy: the battle to control the world" www.holmgren.com.au

PEAKED ELECTRICITY

by Mark Robinowitz - www.PeakChoice.org

Oil is not the only critical resource that is "peaking." The amount of electricity is also approaching a peak of production due to finite supplies of the fuels used to make electricity (coal, uranium, natural gas). Renewable energies are ideal generation sources, but they are a small amount of the electric grid and cannot be expanded fast enough to maintain current levels.



Coal: Dirtiest and Biggest (but finite)

Half of the electricity in the US comes from burning coal to spin steam turbines. Coal is the dirtiest type of fossil fuel in terms of mining damage and greenhouse gas production. Estimates of the amount of remaining coal have been exaggerated and "peak coal" globally is likely in the next decade or two. There's not enough coal to fuel endless growth projections, but there is enough to further foul our air.

Coal peaked in the US in 1999, in terms of energy content. In Pennsylvania, where coal mining started, it peaked in 1920. In Britain, coal peaked in 1913 and Germany had Peak Coal during World War II.
For more info: www.oilempire.us/peak-coal.html
the best book: Richard Heinberg "Blackout: Coal, Climate and the Last Energy Crisis."

Nukes: Just a Fancy Way to Boil Water

The richest uranium deposits in the US were in the Colorado plateau, the best were extracted decades ago (with severe health and ecological impacts). Globally, uranium deposits are mostly in a few countries and are nearing their peak.

As of 2010, about half of the nuclear fuel in US power reactors comes from the "Megatons to Megawatts" program, which has diverted uranium from dismantled Russian nuclear bombs to civilian fuel production. Using weapons materials for power generation reduces weapons stockpiles, but still creates more high level nuclear wastes. This program will run out in 2013.

Some nuclear boosters want to revive plans for "reprocessing" of irradiated fuel rods, the most toxic technology ever invented. Reprocessing dissolves extremely radioactive "spent" nuclear fuel rods into acids, and uses solvents to extract the unfissioned uranium for reuse. The byproducts include the myriad "fission products" left over from the reactor's operation ("high level waste"), dissolved into a nasty mix of toxic solvents and acids. It is thermally hot, lethally radioactive and extremely difficult to contain.

In 1975, the Nuclear Regulatory Commission published "The Impact of Intensified Nuclear Safeguards on Civil Liberties," also known as the "Barton Report." It predicted that an economy based on nuclear reprocessing would require the suspension of civil liberties to safeguard the nuclear fuel since it would create commerce in nuclear weapons ingredients. Reprocessing also separates out plutonium from irradiated fuel rods. President Ford blocked US plans for reprocessing since it would fuel nuclear proliferation by commercializing weapons materials.

Unnatural Gas: Overcommitted, In Decline

Natural gas is the cleanest burning fossil fuel and it is also the most versatile, which has led to increased variety of uses of it. In recent years, its role in the electric grid has increased and now powers about one sixth of US electrical demand.

US natural gas production peaked in 1973 and has been on a bumpy plateau ever since. About a quarter of US oil and gas production is from offshore wells in the Gulf of Mexico (since most on shore fields are in terminal decline).

Natural gas is the most difficult fossil fuel to transport, requiring pipelines between the well head and the ultimate user.

Since 9/11, US imports of Liquid Natural Gas via special ships have doubled (from one to two percent of US gas usage). LNG cools natural gas to about 260 degrees below zero (F) to compress it for transoceanic transit. LNG boats and terminals have the energy potential of a small nuclear bomb if they explode.

A new technology called fracking has created a surge of US gas production. Fracking blasts underground rock with toxic solvents to liberate embedded natural gas. Industry groups claim shale gas is a "100 year" supply but wells in the Barnett shale gas field near Dallas, Texas have sharp decline rates. Shale gas will probably be a short term boom followed by sharp bust. A good summary is Richard Heinberg's book "Snake Oil: How Fracking's False Promise of Plenty Imperils Our Future" – postcarbon.org and shalebubble.org

Dams Damn Rivers

Hydropower was one of the earliest forms of large scale electrical production and is the easiest to operate. The fuel is essentially free and renewable (once the dam is built). It is easy to vary the flow rates up and down to match shifts in the load demand. But in the US, most sites with hydroelectric potential have already been dammed, so even if society ignored the ecological impacts on rivers and fish habitat, there are few places left in North America for more dams.

Grid Stability and Baseload

The electric grid requires balancing generation with load demands to keep it stable. Solar and wind power are reliable yet intermittent, it's not always sunny or windy. Running more than a small portion of the grid with renewables would require major changes to the way the grid runs since it's hard to store solar and wind power.

The Department of Homeland Security has run planning exercises on how to power "critical infrastructure" if the national grids break down and result in "islands" of fragmented grid sections. It will be harder to keep everything powered all of the time as fossil fuels decline, the economy contracts and components age.

Solar Power: Good for Billions of Years

Passive solar heating of buildings, solar hot water, and solar electricity are ultimately the best way to power our society. But there is a huge gap between where we are and where we would like to be. Current solar electric technology requires a global electronics infrastructure, rare mineral ores, copper and other materials that are energy intensive to process. Most solar technologies are ways to use fossil fuels, not substitutes for them.

Solar thermal energy — to heat water and buildings — is much simpler and cheaper than photovoltaic panels. Solar thermal can also make utility scale electricity that stores heat for the evening. It is better for grid baseload than PV.

The Answer is Blowing in the Wind

Wind turbines are also a way to use solar power, since sunlight creates wind. Commercial wind turbines require rare earth mineral ores for the magnets, which are mostly found in China. While there has been a big boom in wind farms, they cannot be built fast enough to replace depleting natural gas or the need to stop mining coal due to its ecological devastation.

Renewables for a Steady State Economy

Using solar power for two decades (and wind power for one) taught me that renewable energy could only run a smaller, steady state economy. Our exponential growth economy needs ever increasing consumption of concentrated resources (fossil fuels are more energy dense than renewables). A solar energy society would require moving beyond growth-and-debt based money

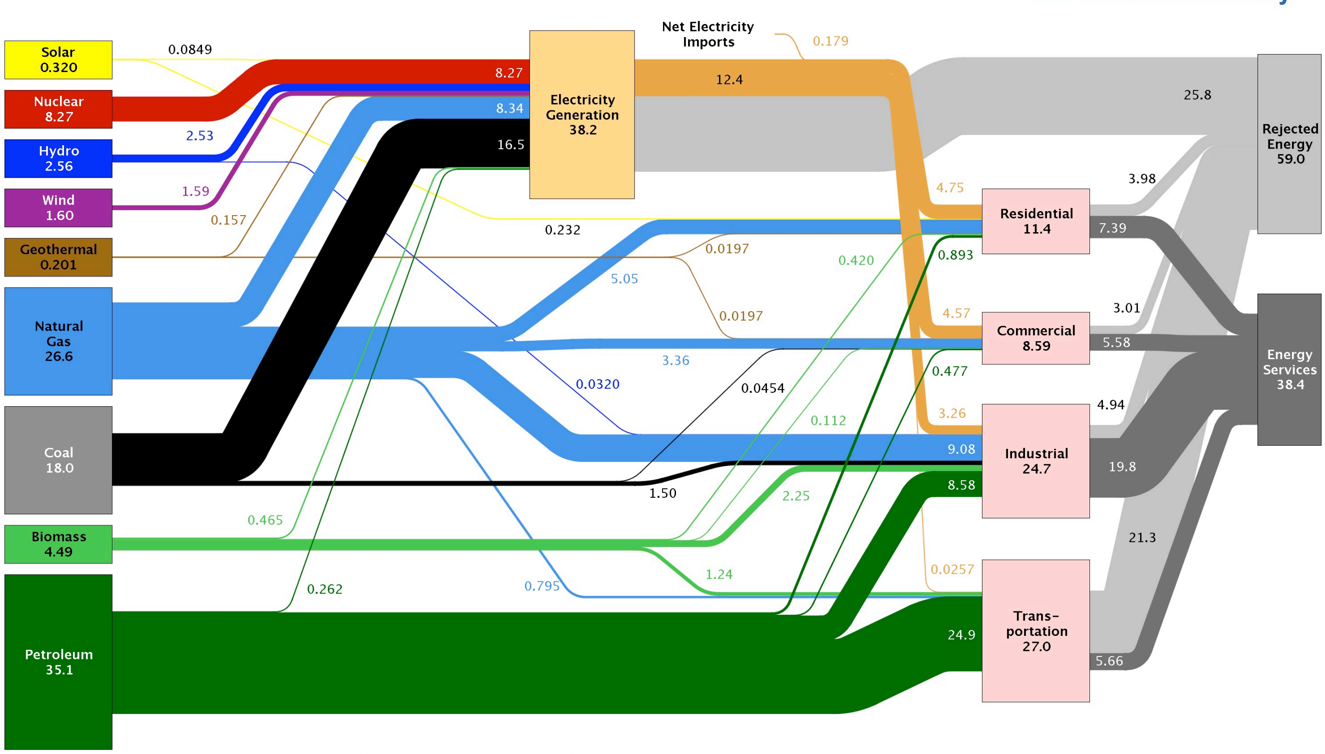
After fossil fuel we will only have solar power, but that won't replace what we use now. We need to abandon the myth of endless growth on a round, and therefore, finite planet to have a planet on which to live. Will we use the remaining fossil fuels to make lots of solar panels and relocalize food production instead of waging Peak Oil Wars?

additional resources on energy descent

Searching for a Miracle: Net Energy Limits and the Fate of Industrial Society
by Richard Heinberg
www.postcarbon.org/new-site-files/Reports/Searching_for_a_Miracle_web10nov09.pdf

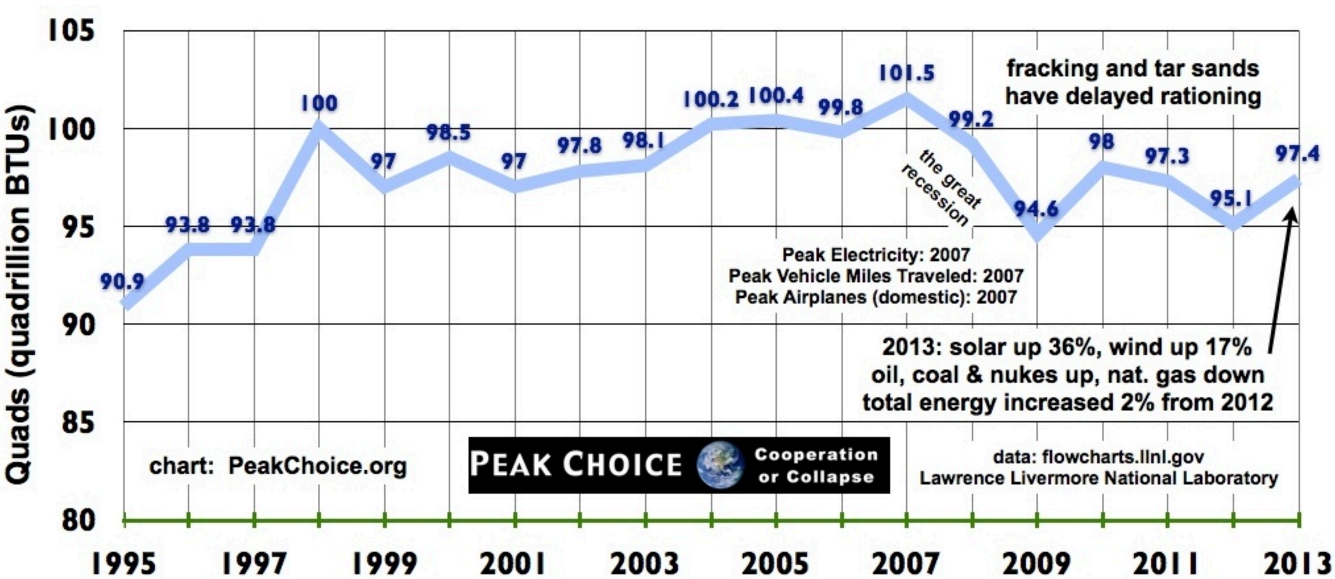
Future Scenarios: How Communities can adapt to Peak Oil and Climate Change
by David Holmgren (co-originator of permaculture) www.futurescenarios.org

Estimated U.S. Energy Use in 2013: ~97.4 Quads

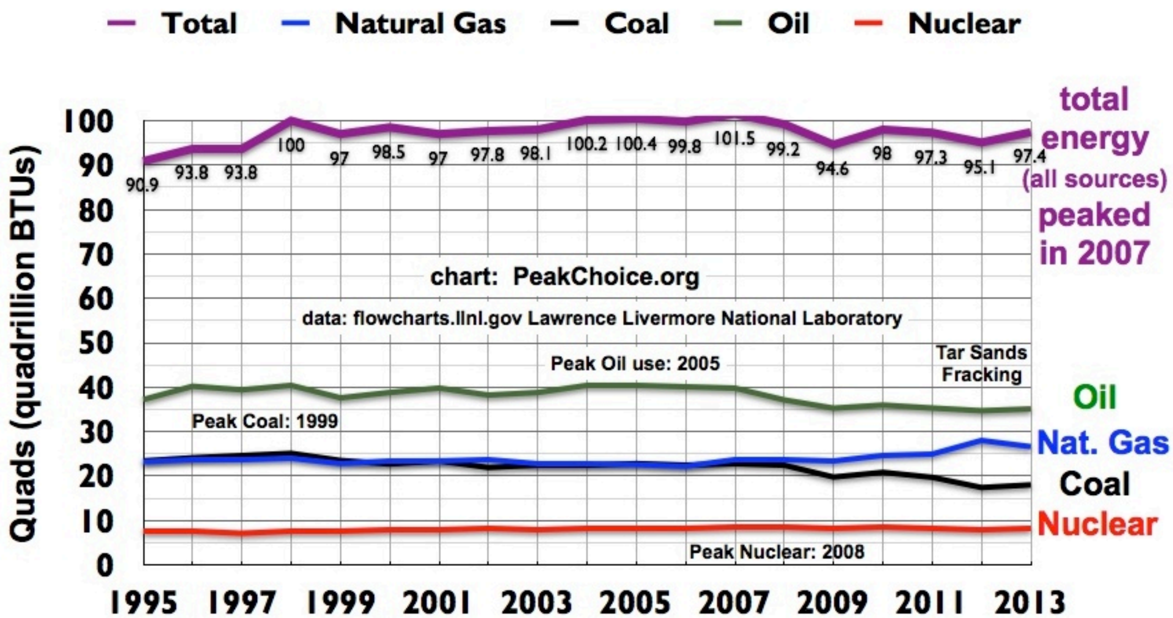


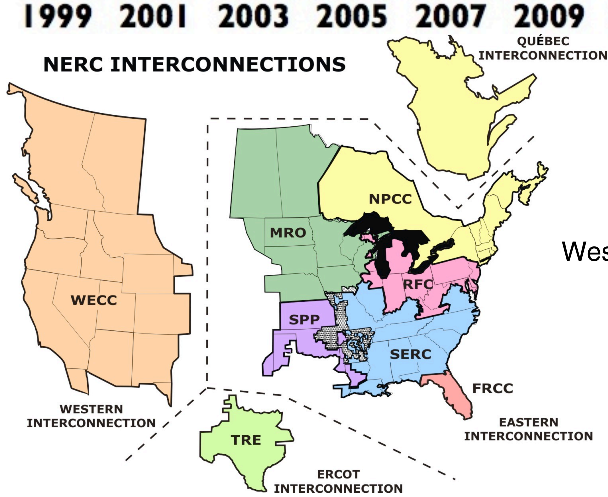
Source: LLNL 2014. Data is based on DOE/EIA-0035(2014-03), March, 2014. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential and commercial sectors 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

USA: all energy use peaked in 2007



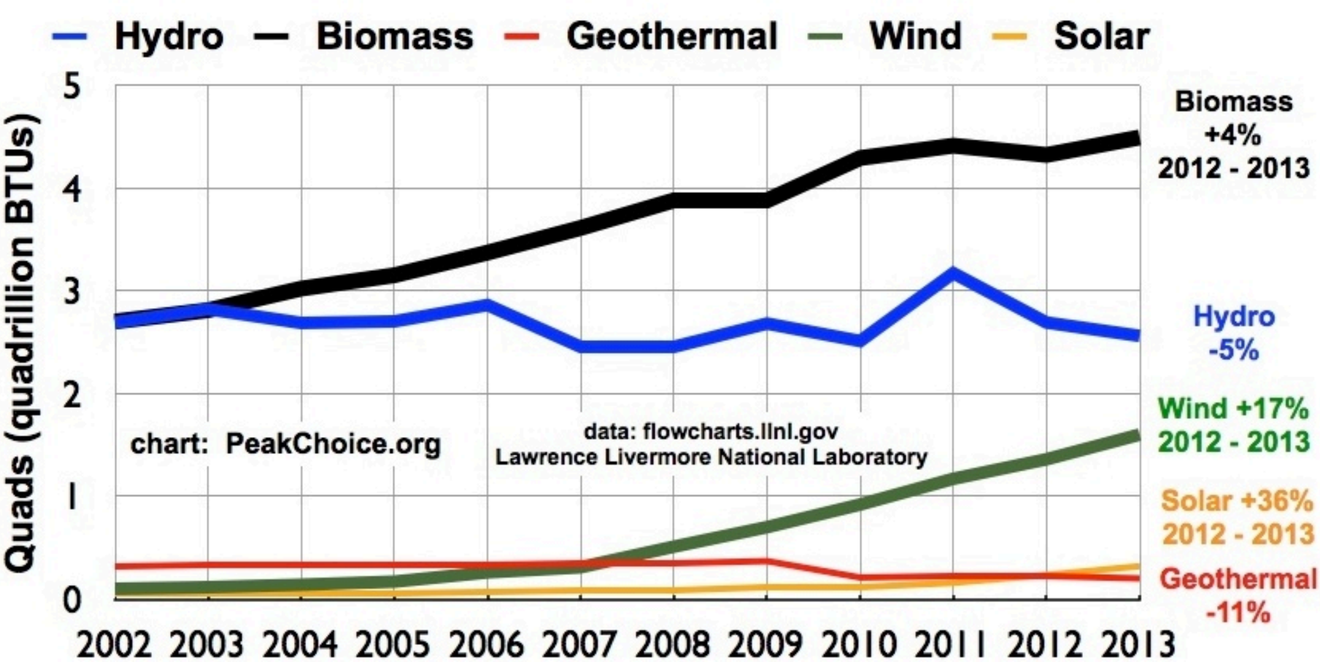
USA: fossil fuels and nuclear





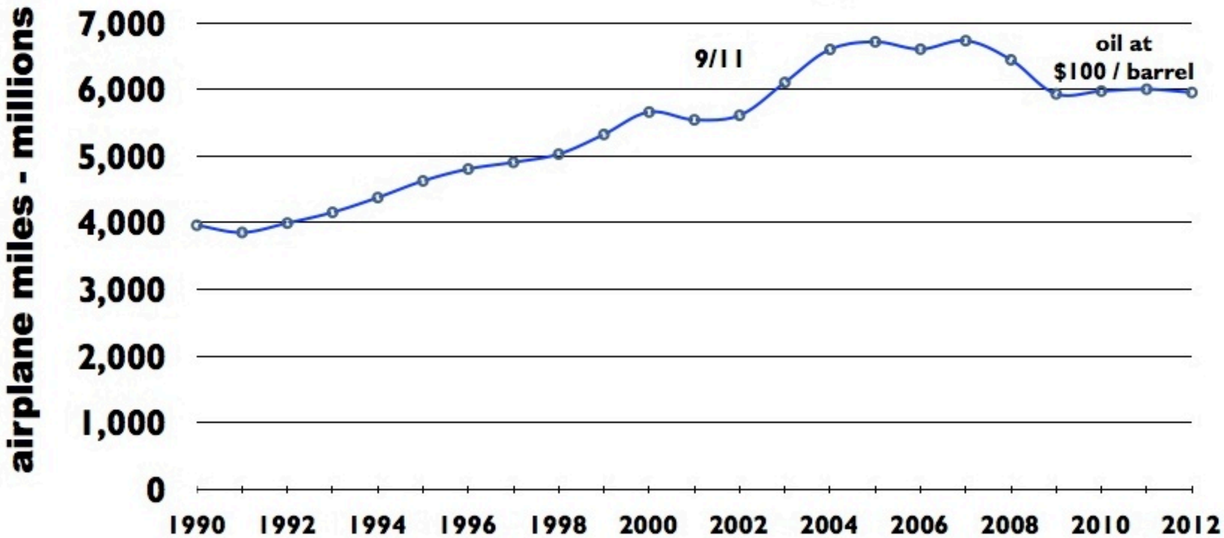
power grids:
West, Texas, East, Quebec

USA: "renewables"



USA domestic aviation peaked in 2007

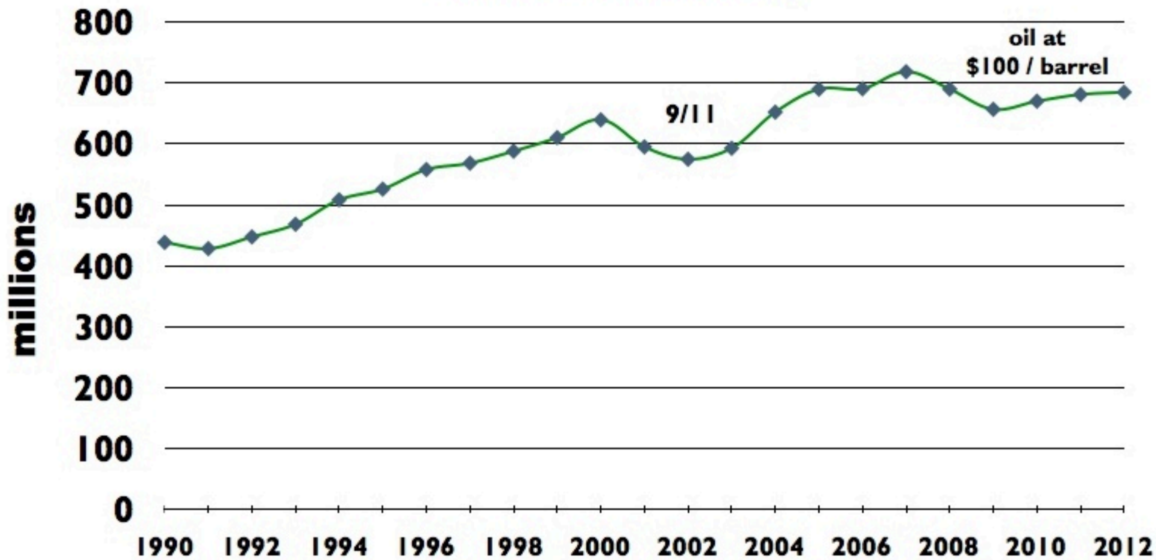
chart: PeakTraffic.org



data: www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_35.html

USA commercial airline passengers peaked in 2007

chart: PeakTraffic.org



data: www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_37.html

Green Fascism: wind power for Guantanamo and NSA

U.S. DEPARTMENT OF DEFENSE

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Guantanamo Harnessing Wind to Create Power, Cut Emissions

By Kathleen T. Rhem
American Forces Press Service

NAVAL STATION GUANTANAMO BAY, Cuba, March 29, 2005 – Public works officials here are combining ancient and modern technologies to build cost savings into the base's energy program.

Two of the wind turbines at Naval Station Guantanamo Bay, Cuba, are seen from the base of the highest of the four new structures. Photo by Kathleen T. Rhem
(Click photo for screen-resolution image);high-resolution image available.

Since earlier this year, four huge, white wind turbines have been standing guard over Guantanamo Bay from John Paul Jones Hill, the base's highest point, named for the Revolutionary War naval hero.

"This is the world's most ancient philosophy, combined with state-of-the-art technology," said Navy Cmdr. Jeffrey M. Johnston, the base's public works officer. "Harnessing the wind is arguably the first technical thing man ever did."

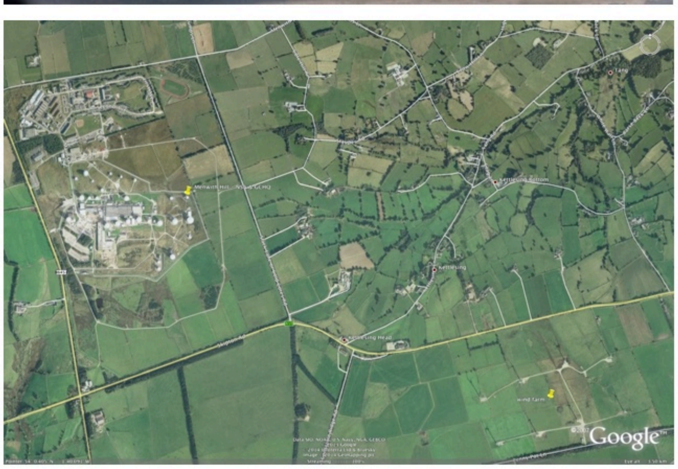
At 80 meters (262 feet) high, the four three-blade turbines are among the base's most noticeable features. But they're there for much more than just to improve the scenery. Base officials estimate the four turbines will provide as much as a quarter of the base's power generation during the high-wind months of late summer and fall.

Guantanamo Bay is unique in that the base is completely self-sustaining. Most U.S. military bases in the United States and overseas get their power and water from municipal sources. But Guantanamo Bay takes no power or water from Fidel Castro's Cuba.

"This is the last of the great independent military installations," Johnston said. "That's not to say that all installations should go back to 'independent steaming.' It makes a lot of sense to use tax dollars to regionalize. ... It just doesn't work here."

Menwith Hill

Yorkshire, England main NSA (and GCHQ) listening post in Europe



the wind farm will power the spies as British electrical grids cope with the end of North Sea natural gas

the "golf balls" are covers for very large satellite dishes

JFK called off Cold War

September 20, 1963 • United Nations

convert Moon race to global cooperation

Finally, in a field where the United States and the Soviet Union have a special capacity — in the field of space — there is room for new cooperation, for further joint efforts in the regulation and exploration of space. **I include among these possibilities a joint expedition to the Moon.** Space offers no problems of sovereignty; by resolution of this Assembly, the members of the United Nations have foresworn any claim to territorial rights in outer space or on celestial bodies, and declared that international law and the United Nations Charter will apply. **Why, therefore, should man's first flight to the Moon be a matter of national competition?** Why should the United States and the Soviet Union, in preparing for such expeditions, become involved in immense duplications of research, construction, and expenditure? Surely we should explore whether the scientists and astronauts of our two countries — indeed of all the world — cannot work together in the conquest of space, sending someday in this decade to the moon not the representatives of a single nation, but the representatives of all of our countries. ....

Never before has man had such capacity to control his own environment, to end thirst and hunger, to conquer poverty and disease, to banish illiteracy and massive human misery. We have the power to make this the best generation of mankind in the history of the world — or to make it the last.

— President John F. Kennedy, September 20, 1963 speech to the United Nations called for an end to the Cold War and offered to convert the Moon race into an international cooperative effort, two months and two days before he was removed from office by the National Security State.

excerpt: full speech at www.JFKMOON.org/un.html

Wayne Morse meeting with JFK November 12, 1963

from ***JFK and the Unspeakable: Why he died and why it matters***
by James Douglass
reviews: www.jfkmoon.org/unspeakable.html

Senator Wayne Morse came to the White House to see the president about his education bills. Kennedy wanted to talk instead about Vietnam -- to his most vehement war critic. Morse had been making two to five speeches a week in the Senate against Kennedy on Vietnam. JFK took Morse out into the White House Rose Garden to avoid being overheard or bugged by the CIA.

The president startled Morse by saying: "Wayne, I want you to know you're absolutely right in your criticism of my Vietnam policy. Keep this in mind. I'm in the midst of an intensive study which substantiates your position on Vietnam. When I'm finished, I want you to give me half a day and come over and analyze it point by point."

Taken aback, Morse asked the president if he understood his objections.

Kennedy said, "If I don't understand your objections by now, I never will."

JFK made sure Morse understood what he was saying. He added, "Wayne, I've decided to get out. Definitely!"

Yet a mind needs hands to carry out its intentions. A president's hands are his staff and extended government bureaucracy. As Kennedy knew, when it came down to the nitty-gritty of carrying out his decision to end the Vietnam War, his administrative hands were resistant to doing what he wanted them to do, especially his Pentagon hands. He also knew that to withdraw from Vietnam "after I win the election" in the fall of 1964, he now had to inspire his aides to continue moving the machinery for withdrawal that he activated on October 11 with National Security Action Memorandum 263.

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note: *JFK called for the first thousand to be out by the end of 1963 and the rest by 1965. NSAM 263 was reversed by LBJ immediately after he became President.*

Kennedy's October 11, 1963 Viet Nam withdrawal order

National Security Action Memorandum No. 263
Washington, October 11, 1963.

TO
Secretary of State
Secretary of Defense
Chairman of the Joint Chiefs of Staff
SUBJECT
South Vietnam

At a meeting on October 5, 1963, the President considered the recommendations contained in the report of Secretary McNamara and General Taylor on their mission to South Vietnam.

The President approved the military recommendations contained in Section I B (1-3) of the report, but directed that no formal announcement be made of the implementation of plans to withdraw 1,000 U.S. military personnel by the end of 1963.

After discussion of the remaining recommendations of the report, the President approved an instruction to Ambassador Lodge which is set forth in State Department telegram No. 534 to Saigon.
McGeorge Bundy

JFK's final press conference November 14, 1963

www.jfklibrary.org/Research/Ready-Reference/Press-Conferences/News-Conference-64.aspx

QUESTION: Mr. President, in view of the changed situation in South Viet Nam, do you still expect to bring back 1,000 troops before the end of the year, or has that figure been raised or lowered?
THE PRESIDENT: No, we are going to bring back several hundred before the end of the year, but I think on the question of the exact number I thought we would wait until the meeting of November 20th.

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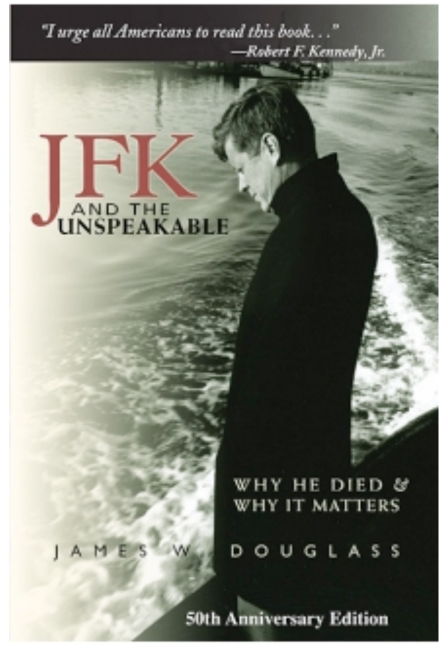
details:
www.jfklancer.com/NSAM263.html
www.jfklancer.com/NSAM273.html

www.jfkmoon.org/vietnam.html

www.maryferrell.org/wiki/index.php/1963_Vietnam_Withdrawal_Plans

Robert F. Kennedy, Jr. "I urge all Americans to read this book"
JFK AND THE UNSPEAKABLE: WHY HE DIED AND WHY IT MATTERS
by James Douglass



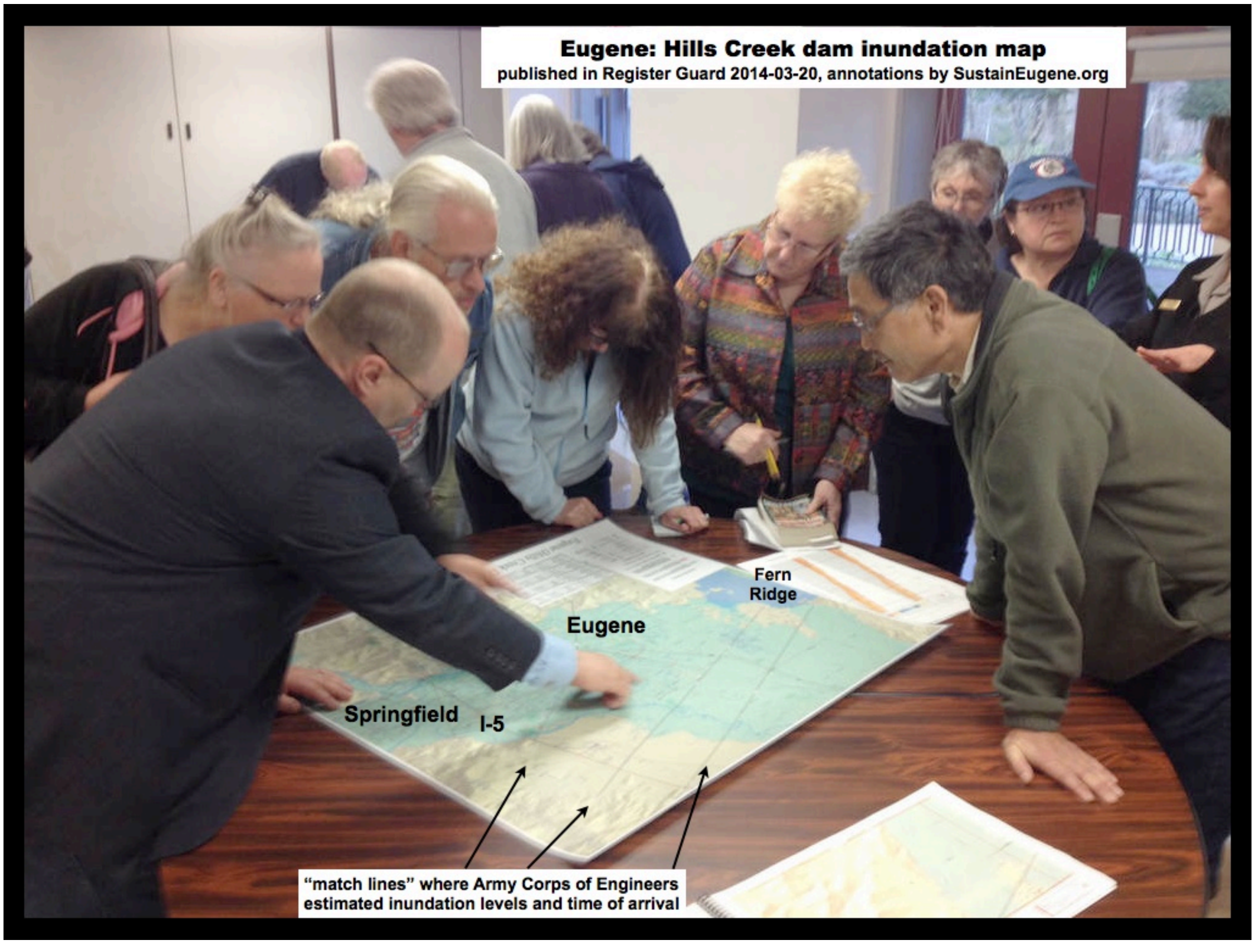
www.orbisbooks.com/jfk-and-the-unspeakable.html

"In JFK and the Unspeakable Jim Douglass has distilled all the best available research into a very well-documented and convincing portrait of President Kennedy's transforming turn to peace, at the cost of his life. Personally, it has made a very big impact on me. After reading it in Dallas, I was moved for the first time to visit Dealey Plaza. I URGE ALL AMERICANS TO READ THIS BOOK and come to their own conclusions about why he died and why — after fifty years — it still matters."
— Robert F. Kennedy, Jr.

www.orbisbooks.com/a-monthly-letter-from-orbis-books-editor-robert-ellsberg.html

"This statement is itself historic: **the first time any member of the Kennedy family has publicly endorsed a book that attributes President Kennedy's assassination to a conspiracy involving the military-intelligence establishment of the U.S. government.** But what sets Douglass's book apart from the many treatments of Kennedy's assassination is his methodical case for the reasons behind it: to thwart the President's extraordinary turn toward peace, especially his back-channel negotiations with Nikita Khrushchev to dismantle the Cold War. So, elements of his own government viewed the President as a dangerous traitor, one to be eliminated.

"Only by remembering this story can we take up the challenge that Kennedy left unfinished — the challenge to make peace our legacy for generations yet unborn."



A Dam Big Problem: the Willamette Valley tsunami

by Mark Robinowitz **www.SustainEugene.org/dam.html**

I went to the Army Corps of Engineers presentation of the dam inundation maps on Tuesday, March 18, 2014 in West Fir. Other meetings were held in Eugene, Springfield and Cottage Grove, all downstream from aging federal dams built without seismic considerations.

If Hills Creek dam, upstream of Oak Ridge, collapsed, it could wreck Lookout Point and Dexter (along highway 58), and almost all of Eugene and Springfield (and Junction City) would be underwater. North Eugene and River Road would be in worse shape than South Eugene since there are fewer refuges (and in River Road, no refuge at all, unless Beltline Highway overpasses were high enough, something not indicated on the maps).

If you're north of 18th Street in Eugene, you'd have to flee to Hendricks Park, College Hill or Skinners Butte. You might have seven hours from the Hills Creek break before the water arrived, enough time to grab the kids and the pets and your most precious family heirlooms, assuming an earthquake hadn't wrecked roads or trapped people in ruined buildings.

In Springfield, everything would be underwater except the small hill near I-5 and Thurston.

Downtown Eugene might be under 20 to 30 feet of water. If you want to envision what that would look like, there's lots of videos on You Tube from the tsunami in Japan three years ago. Most of the towns washed away had waves of this magnitude.

I didn't get to look at all of the maps due to time constraints, but I did see two places with potential risks for much greater inundation. If Cougar dam collapsed, the wall of water in Blue River could be closer to 100 feet high. Similarly, if Fall Creek dam collapsed a similar size wave would swamp "downtown" Fall Creek (at the general store).

These locations would have very short response times, unlike the Cities of Springfield and Eugene.

The maps are extremely detailed and impressive, the cross section maps are especially important as they show estimated inundation depths at each location downstream.

They modeled the impact of Hills Creek having a "domino" effect on Lookout Point and Dexter, but did not model all of the dams going under in a big flood or big earthquake.

They also did not examine the EWEB dams, federal dams outside Lane County (there are some big dams in Linn and Marion counties) or dam failures on multiple tributaries at the same time (ie. dams on McKenzie and Middle Fork breaking due to a Cascadia Subduction Zone earthquake or an exceptional flood event).

They did reassure that the very large earthquakes in Japan and Chile in the past few years had minimal impacts on those dams, and the fact that our local dams are further away from the coast than the valley might mitigate the amount of shaking they will experience (although that's not the case for Fern Ridge). Meanwhile, Wanapum Dam in central Washington, on the Columbia, has had its reservoir drawn down as engineers try to figure out how to fix the crack and bowing of the dam. How we will cope with dam maintenance after fossil fuels is unknown.

The water level near the I-5 crossing of Willamette River could reach about 450 feet above sea level in a Hills Creek dam collapse scenario. One of the nearby locations could see a peak of 454.1 feet. A couple feet of fast moving water is sufficient to sweep someone away, twenty to thirty feet of moving water would be a "Willamette Valley tsunami" (not literally a tsunami but the impact would be the same).

As a mere citizen, you do not have the right to have a copy of the Army Corps reports, although if pre-screened (for an event like the West Fir and other meetings) you can see the maps but not take a picture or a copy home with you to share with your family, friends, neighbors, co-workers, etc.

However, the Corps is willing to provide individuals excerpts that show how far underwater your location would be and I recommend everyone, especially those on the valley floor, to request a copy.

If you believe in writing politicians urge them all (from local government to the feds) to make this material public, since if there's ever an emergency we would all need to know what to do, how far to run, etc.

The excuse that bad guys would use this information to cause havoc is BS, the real people kept in the dark are all of us. Plus, even if a "bad guy" did commit a violent act, those downstream would "need to know" how to respond to minimize the chaos and loss of life.

Direct your respectful requests for your individual location information to:

Scott Clemans
Public Affairs Specialist
Portland District, U.S. Army Corps of Engineers
Office: (503) 808-4513
www.nwp.usace.army.mil
Scott.F.Clemans@usace.army.mil

"in 1987 the Oregon Emergency Management Division estimated that a completely catastrophic failure of the Hills Creek Dam, an extremely unlikely event, could require the evacuation of over 250,000 people with damages in excess of $10 billion. Adjusting these 1987 estimates for inflation and for population growth suggests that damages could easily exceed $20 billion. Detailed casualty estimates have not been made for catastrophic dam failures affecting Lane County. However, given the large inundation areas, high water depths, and the logistical difficulties in evacuating 250,000 people to safe ground, it is not difficult to imagine that a truly catastrophic dam failure could potentially result in 1,000 or more deaths. "
-- City of Eugene's Multi-Hazard Mitigation Plan