

On the Utter Folly of Tar Sand Oil Production and the Keystone XL Pipeline
by Professor of Mathematics, John M. Bachar, Jr.
November 2014

Over a period of many years, a vast number of scientifically based articles have been written by experts about Tar Sand Oil and its production, the effect on all of society, the horrendous record of the rapacious destruction and toxic poisoning of gigantic regions of pristine wilderness and land, the huge infestation of pollutants into the atmosphere, the massively damaging effects on the environment and climate change, and the deleterious health effects on human, animal and biological life.

References, including articles and video clips, that describe the details of the above, are given below, as well as a comprehensive list of facts.

However, it is imperative to first examine the proposed Keystone XL Pipeline Project, owned by TransCanada, that, if approved by the U.S., would *ultimately* transport daily 830,000 barrels of the dirtiest, most toxic petroleum on Earth from northern Alberta to Texas refineries on the Gulf Coast. The petroleum must be infused with poisonous toxic chemicals necessary for the tar sand sludge to flow.

An overwhelming number of Americans, from top governmental decision makers to ordinary citizens, are ignorant about the benefits, if any, to U.S. daily and annual petroleum consumption needs.

Read on: the facts are mind-boggling.

The Energy Information Agency (EIA) published a table that shows the U.S. daily petroleum consumption (in millions of barrels of petroleum per day – MBD) by sectors from 1950-2013. The four sectors covered are: Residential & Commercial, Industrial, Electric and Transportation.

For the analysis that follows, note that 830,000 barrels per day, expressed in terms of millions of barrels per day, is the same as 0.83 MBD.

In 2013, the Transportation sector consumed 13.2 MBD (= 4,818 million barrels per year).

Thus, the Keystone pipeline source would supply *only* 6.29% of the daily Transportation sector consumption requirement! The number of days (resp., years) needed to accumulate enough petroleum from the pipeline source in order to meet the DAILY (resp., YEARLY) consumption usage by the Transportation sector is 15.9 days (resp., 15.9 years)!

In 2013, the total consumed by All Sectors was 18.9 MBD.(= 6,898.5 million barrels per year).

Thus, the Keystone pipeline source would supply *only* 4.39% of the daily All Sector consumption requirement! The number of days (resp., years) needed to accumulate enough

petroleum from the pipeline source in order to meet the DAILY (resp., YEARLY) consumption usage by All Sectors is 22.8 days (resp., 22.8 years)!

The rigorous analysis irrevocably proves the benefit to the U.S. is ZILCH!

This fact, combined with the devastation described in the first paragraph, dictates that the U.S. should immediately squelch this pipeline project because it is utter folly. Permitting the engorged, rapacious Big Oil vultures to disembowel our pristine environment in order to build the Keystone XL pipeline is akin to aiding and abetting dangerous criminals.

“Fool me once, shame on you. Fool me twice, shame on me.”

FACTS LIST

Excerpts from: NRDC Tar Sand Invasion, NRDC Tar Sands Crude Oil: Health Effects of a Dirty and Destructive Fuel, and Wikipedia Athabasca Sands

1. Oil sand is either loose sand or partially consolidated sandstone containing a naturally occurring mixture of sand, clay, and water, saturated with a dense and extremely viscous form of petroleum technically referred to as bitumen (or colloquially tar due to its similar appearance, odor and color). Natural bitumen deposits are reported in many countries, but in particular are found in extremely large quantities in Canada. Other large reserves are located in Kazakhstan and Russia. The estimated worldwide deposits of oil are more than 2 trillion barrels; the estimates include deposits that have NOT yet been discovered. Proven reserves of bitumen contain approximately 100 billion barrels, and total natural bitumen reserves (including undiscovered deposits) are estimated at 249.67 trillion globally, of which 176.8 trillion barrels, or 70.8%, are in Canada.
2. The Athabasca Oil Sands, the Cold Lake Oil Sands and the Peace River Oil Sands contain initial oil-in-place reserves of 1.6 trillion barrels, an amount comparable to the total world reserves of conventional oil. The World Energy Council reported (2007) that the three Alberta oil sands areas contain at least two-thirds of the world's discovered bitumen in place. These three major oil sands areas, all in Alberta, have reserves that dwarf those of the conventional oil fields. By 2007 the Alberta natural bitumen deposits were the source of over one third of the crude oil produced in Canada.
3. In Alberta, Canada, the hydrocarbon bitumen is found under the largest remaining ecosystem: the Boreal Forest. The oil industry strip mines and drills pristine forests and wetlands to get at the bitumen, which lies under the trees and is mixed with sand and clay. The industry then separates the bitumen, thins it down and pipes it out for refining into gasoline and diesel. In the process, giant swaths of forest and bird habitat are lost forever. The 55,000 square mile area of northern Alberta (the Athabasca, Cold Lake and Peace River regions), an area the size of Florida (and larger than each of the Amazon Rainforest Basin and England) will become a wasteland if tar sands growth goes unchecked; most of this land has already been leased for development. These areas are within traditional First Nations' territories.
4. Approximately 1.0–1.25 trillion joules (= 94.7817120 - 118.4771400 million btus) of energy is needed to extract a barrel of bitumen and upgrade it to synthetic crude. As of 2006, most of

this is produced by burning natural gas. Since a barrel of oil equivalent (= the unit of energy based on the approximate energy released by burning one barrel [42 U.S. gallons] of crude oil) is about 6.117 trillion joules (= 579.7797723 million btus), its EROEI (= the ratio of the amount of usable energy acquired from a particular energy resource to the amount of energy expended to obtain that energy resource) is 5–6. That means this extracts about 5 or 6 times as much energy as is consumed. Energy efficiency is expected to improve to average of 900 cubic feet of natural gas or 0.945 trillion joules (= 89.56871784 million btus) of energy per barrel by 2015, giving an EROEI of about 6.5. A joule is a unit of energy: 1 J = 0.00094781712 BTU.

In physics, **energy** is the capacity for doing work. It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms. There are, moreover, heat and work—i.e., energy in the process of transfer from one body to another. After it has been transferred, energy is always designated according to its nature. Hence, heat transferred may become thermal energy, while work done may manifest itself in the form of mechanical energy.

All forms of energy are associated with motion. For example, any given body has kinetic energy if it is in motion. A tensioned device such as a bow or spring, though at rest, has the potential for creating motion; it contains potential energy because of its configuration. Similarly, nuclear energy is potential energy because it results from the configuration of subatomic particles in the nucleus of an atom.

Energy can be converted from one form to another in various ways. Usable mechanical or electrical energy is, for instance, produced by many kinds of devices, including fuel-burning heat engines, generators, batteries, fuel cells, and magneto-hydrodynamic systems.

Energy is treated in a number of articles. For the development of the concept of energy and the principle of energy conservation, see physical science, principles of; mechanics; thermodynamics. For the major sources of energy and the mechanisms by which the transition of energy from one form to another occurs, see coal; nuclear fission; oil shale; petroleum; electromagnetism; energy conversion.

Also click on:

http://en.wikipedia.org/wiki/Forms_of_energy

<http://en.wikipedia.org/wiki/Erg>

<http://physics.info/energy/>

<http://en.wikipedia.org/wiki/Joule>

5. Tar sands operations release large volumes of pollutants into the air. These emissions include nitrogen oxides, sulfur dioxide, volatile organic compounds and particulate matter. These chemicals pollute the air and are known to impact human and wildlife health. For example, sulfur dioxide and nitrogen oxides are major contributors to smog and acid rain.

6. Tar sands mining requires about four gallons of water for every gallon of crude oil produced. This water comes from the Athabasca River, which flows nearly 930 miles, past tar sands mines, and on to the Peace-Athabasca Delta. This delta is the largest boreal delta in the world, and one

of the most important nesting and staging grounds for North American waterfowl. As of 2009, the Alberta government had granted permits allowing oil companies to divert a billion cubic feet of water each year for their operations, an amount that is about six times what is needed by a city of one million people for one year. These water withdrawals threaten the sustainability of fish populations and waterfowl nesting grounds.

7. Tar sands mining operations produce huge amounts of toxic waste, called “tailings.” This waste consists of water, sand, silt, clay, contaminants and hydrocarbons. Contaminants in the tailings include naphthenic acids, polycyclic aromatic hydrocarbons, phenolic compounds, ammonia, mercury and other trace metals. These toxic tailings ponds cover nearly 50 square miles, and are increasing in volume at the rate of about 80 Olympic sized swimming pools each day. These dumps are an environmental threat because they leak into the groundwater, with estimates suggesting that as much as four billion liters of tailings leak each year. The tailings ponds also are a threat to migratory birds. For example, in the spring of 2008, 1,600 migrating ducks were killed when they landed on one of Syncrudes tailings ponds. Independent scientists have estimated that the actual number of waterfowl deaths is far higher.

8. Producing a barrel of synthetic crude oil from tar sands admits at least three times the global warming pollution as producing a barrel of conventional oil, causing the tar sands to be the fastest growing source of global warming pollution in Canada.

9. Today, people who live near tar sands strip-mining, drilling, and processing operations in Canada face health risks from additional air and water pollution, and there are reports of an increasing incidence of cancer. Transporting tar sands on rail and through pipelines pose other threats to public health, as do tar sands oil spills and the refining process. Not only does refining of tar sands increase hazardous air pollution, it also produces an especially dirty, carbon-intensive byproduct known as petroleum coke, which is often burned in a way similar to coal. Taken together, the myriad health threats from tar sands development, transportation and processing are far more significant than policymakers and governments have acknowledged to date.

BOREAL FOREST BEFORE BEING STRIP-MINED INTO OBLIVION



AFTER OBLIVION







References

1. **1. Natural Resources Defense Council (NRDC)**

<http://www.nrdc.org/search.asp?cof=FORID%3A11&ie=UTF-8&q=tar+sands+invasion&cx=001024953138106184952%3Alevppvfplwy&hq=-inurl%3Ahttps&t=iframe&sa.x=20&sa.y=9>

[Tar Sands Invasion](#)

[Tar Sands Invasion: How Dirty and Expensive Oil from](#)

https://www.google.com/url?q=http://www.nrdc.org/energy/dirtyfuels_tar.asp&sa=U&ei=6216VNC6HfLGsQTk4ILoCg&ved=0CAkQFjAD&client=internal-uds-cse&usg=AFQjCNEWFbc8hV6epKOMb0zWe9YeMdT_yw

[NRDC: Press Release - Pipeline Problems: New Tar Sands Oil ...](#)

[A River of Tar Sands Crude Floods an Arkansas Town | Rocky ...](#)

[Take 60 seconds to read 6 reasons why America needs to say](#)

[Mounting evidence of health concerns near tar sands](#)

[Canada's First Nations are paying a high price for our dirty tar](#)

[Tar sands operations tainting local foods according to study ...](#)

[Kalamazoo one year later: Anatomy of a tar sands spill |](#)

2. Athabasca Oil Sands Wikipedia

http://en.wikipedia.org/wiki/Athabasca_oil_sands

3, Oil Sands Wikipedia

http://en.wikipedia.org/wiki/Oil_sands

4. Peace River oil sands Wikipedia

http://en.wikipedia.org/wiki/Peace_River_oil_sands

5. Cold Lake Oil Sands Wikipedia

http://en.wikipedia.org/wiki/Cold_Lake_oil_sands

6. List of Articles about Canadian Tar Sands

http://en.wikipedia.org/wiki/List_of_articles_about_Canadian_tar_sands

7. Moyers It's Not Just Keystone — Five Dirty Pipelines You've Never Heard Of

<http://billmoyers.com/2014/03/26/its-not-just-keystone-five-dirty-pipelines-youve-never-heard-of/>

<http://www.worldwatch.org/node/5287>

<http://www.nytimes.com/2012/05/10/opinion/game-over-for-the-climate.html? r=1&>

<http://insideclimatenews.org/topic/dilbit-disaster-series-2012>

<http://www.enbridge.com/MediaCentre/News.aspx?yearTab=en2014&id=1814235>

<http://www.transcanada.com/energy-east-pipeline.html>

<http://environmentaldefence.ca/reports/transcanada%E2%80%99s-energy-east-export-pipeline-not-domestic-gain>

<http://environmentaldefence.ca/reports/transcanada%E2%80%99s-energy-east-export-pipeline-not-domestic-gain>

<http://350.org/>

<http://billmovers.com/2014/02/19/kentucky%E2%80%99s-keystone-xl-the-bluegrass-pipeline/>

Videos on the Destruction Wrought from Tar Sands Oil Production

<http://onerivernews.ca/a-tail-of-two-ponds-what-bc-can-learn-from-albertas-own-tailings-spill/>

<http://www.commondreams.org/news/2014/08/05/massive-environmental-disaster-canada-toxic-tailing-pond-floods-waterways>

http://us.yhs4.search.yahoo.com/yhs/search?hspart=ironsource&hsimp=yhs-fullyhosted_003&type=ast_wnzp01_14_40_ie¶m1=1¶m2=cd%3D2XzuyEtN2Y1L1QzutDtDtC0BtByEyEtByE0B0AzztAtDtD0CtN0D0Tzu0StCtDtDzytN1L2XzutAtFtBtFtCtFyDtN1L1CzutCyEtBzytDyD1V1TtN1L1G1B1V1N2Y1L1Qzu2SyD0DyByByEzytB0CtGtD0C0E0FtG0DyD0ByEtG0EyD0E0AtGtBzz0CzyyCtAtB0AtBzz0DtB2QtN1M1F1B2Z1V1N2Y1L1Qzu2SzytBtDtB0AtAtDtBtG0Dzz0DzytGyEtDtC0AtG0ByE0BzztGyB0CzytBtCyC0DyEtAtBtB0D2Q%26cr%3D1171463029%26ir%3D142905_a%26elng%3Den%26elcl%3Dus%26a%3Dast_wnzp01_14_40_ie%26f%3D7%26cat%3Dweb%26ulng%3Den-US%252Cen%253Bq%253D0.8%26sid%3D2b7c9ab972246df5df948f5d7044b3be%26stype%3Dast_wnzp01_14_40_ie%26sesid%3Dc95a492a39829b3137999b4522c4540f%26csr%3D0%26ipblock%3D0%26b%3DChrome%26bv%3D39.0.2171.65%26os%3DWindows%2BVista%26cc%3Dus%26ip%3D104.1.54.157%26p%3Dastromenda&p=Videos+on+Tar+Sand+destruction

http://www.ted.com/talks/garth_lenz_images_of_beauty_and_devastation

<http://www.youtube.com/watch?v=Sjia7BsP4Bw>

<http://www.sofreshandsogreen.com/2012/03/01/video-kalamazoo-river-tar-sands-oil-pipeline-spill-and-the-destruction-it-caused/>

<http://climatecrocks.com/2013/01/29/video-stop-the-keystone-pipeline-stop-tar-sands-development/>

<http://rabble.ca/rabbletv/program-guide/2014/07/best-net/video-tar-sands-healing-walk-2014>

<http://2012spiritinaction.wordpress.com/2013/04/25/tar-sands-oil-extraction-the-dirty-truth-youtube/>

http://www.youtube.com/watch?feature=player_embedded&v=HUMhsB8eG2I

<http://www.viddler.com/v/61c01896>

<http://www.nationofchange.org/exxonmobil-tar-sands-oil-pipeline-ruptures-arkansas-obama-ponders-fate-keystone-xl-1364830352>

<http://forgottennavajopeople.org/2011/07/14/nrdc-stop-tar-sands-mining-in-canadas-boreal-forest/>

<http://vimeo.com/6597349>

<http://www.wilderutopia.com/environment/energy/tar-sands-documentary-white-water-black-gold/>

<http://h2oildoc.com/home/about-the-film>

PETROPOLIS:

<http://www.greenpeace.org/canada/en/Blog/neil-young-and-petropolis/blog/47889/>