

Finding the Energy to Sustain Humanity

Peak Oil is no longer a hypothetical blip on the world's energy radar; peak oil is **here**.

World oil production has slowed its upward mobility, and by 2019, production will be down to 90 percent of the peak level.

While experts often argue the exact date of when global oil production peaked, the resounding consensus is that the world is currently experiencing a decline in oil production while our population increasingly demands more.

With production not expected to return to peak levels, it is becoming apparent that depleting our reserves is only part of the problem, especially in the face of continued industrialization in developing countries. As India and China continue to rapidly expand both their economies and urban populations, the world will **demand more oil** to survive. Experts estimate that by 2020, India will be importing **three times as much oil** as it did in 2005, up to 5 million barrels per day.

Can we survive in a post- peak oil world? How will China and India continue to develop if the world cannot produce enough oil to sustain their growth?

Even if we could increase production, many experts believe that we have been **overstating** the world's **oil reserves** for years. Sadad al-Huseini, former head of Saudi Aramco, announced at a 2007 Oil and Money conference in London that nearly 300 billion of the world's 1.2 trillion barrels of proven oil reserves should be recategorized as "speculative resources."

"Reserves are confused and in fact inflated. Many of the so-called reserves are in fact resources. They're not delineated, they're not accessible, they're not available for production" (Strahan).

Using current technologies, oil has been relatively easy to convert from fossil fuel into usable petroleum, using less energy to produce it than what results in the end product. But as the world's reserves continue to be consumed, extracting oil from speculative resources like tar sands is much more difficult. The future of oil production may face a **net energy** dilemma if more efficient ways of harnessing these resources cannot be found.



NEWS: Feb. 7, 2009 – Associated Press reports OPEC members are expected to cut oil production when they convene in March to try to push up prices to at least \$70 a barrel.



The Promise of Natural Gas:

"The number and geographic distribution of oil producers will decrease concurrent with another energy transition: the move to cleaner fuels. The **prized fuel** in the shorter term likely will be **natural gas**. By 2025, consumption of natural gas is expected to grow by about **60 percent**, according to DoE/Energy Information Agency projections. Although natural gas deposits are not necessarily co-located with oil, they are highly concentrated. Three countries – **Russia, Iran, and Qatar** – hold over 57 percent of the world's natural gas reserves. Considering oil and natural gas together, two countries – Russia and Iran – emerge as **energy kingpins**. Nevertheless, North America (the US, Canada, and Mexico) is expected to produce an appreciable proportion – 18 percent – of total world production by 2025" (Global Trends 2025 p.42).

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“It takes energy to get energy. Fossil fuel resources have been such an abundant source of concentrated energy that the investment of energy we make in exploration, mining, transport and processing has been relatively small. Even when we consider all the energy embodied in equipment and infrastructure, the net energy return or profit has been very high. Adding all the energy and resources needed to train and support all the engineers and other employees in the energy industries still leaves a huge net energy profit which explains why the oil industry has been such a profitable one. However, now that we have passed the peak of production of conventional oil, the net energy yield from new projects tapping the heavy, deep ocean, arctic and small remaining amounts in old oil fields, using advanced recovery methods, is less and less” (Holmgren).

To mine the **Canadian tar sands**, experts estimate that production levels in 2025 will require **1.6 – 2.3 billion cubic feet of natural gas per day**, which is equal to about one-fifth of the anticipated daily Canadian gas production. Non-thermal technologies that would not require using natural gas to extract oil from the tar sands is nowhere near viable, thus leaving Canada and the rest of the world unsure of how to proceed.

Many experts believe that the time is **now** to make the transition to **alternative fuels**, not only for use in current fossil fuel production technologies, but as a way to provide at least a portion of the energy the global population consumes. While the idea is favorable in theory, **global implementation** of such a major shift in the world’s use of energy may still be decades away.

*“All current technologies are inadequate for replacing traditional energy architectures on the scale needed, and new energy technologies probably will not be commercially viable and widespread by 2025. The present generation of biofuels is too expensive to grow, would further boost food prices, and their manufacture consumes essentially the same amount of energy they produce ... An Argonne National Laboratory study found that **hydrogen**, from well to tank, is likely to be at least **twice as costly as gasoline**. Even with the favorable policy and funding environment that would be needed for biofuels, clean coal, or hydrogen, major technologies historically have had an ‘adoption lag.’*

Learning About the **Canadian Tar Sands**



WHERE are the Canadian Tar Sands? “The Canadian Tar Sands are an extensive deposit of oil-rich bitumen (another word for tar) located in northern Alberta, Canada, with some extensions into adjacent Saskatchewan.”

WHAT are the Canadian Tar Sands? “These sands consist of a mixture of crude bitumen, which is a semisolid form of crude oil (aka tar, because the hydrocarbons are more carbon and less hydrogen) that impregnates rocks that are composed primarily of sand and clay. The bitumen is almost entirely immobile within the rock matrix and does not flow into a well bore like conventional crude oil.”

HOW DO WE GET OIL from the Canadian Tar Sands? “Strip mines are associated with massive handling and processing systems that mine the rock with giant earthmoving equipment and hauling trucks the size of a McMansion. The mined rock is hauled to a massive facility that upgrades the material and converts the otherwise almost unusable bitumen into synthetic crude oil for shipment to refineries in Canada and the United States.”

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A recent study found that in the energy sector, it takes an average of 25 years for a new production technology to become widely adopted. A major reason for this lag is the need for new infrastructure to handle major innovation” (Global Trends 2025, p.44).

Can we wait **25 years** for alternative energy technologies to enter into the global energy picture? How can we **invest** in the **infrastructure** effectively to ensure that future populations have the energy to sustain themselves?

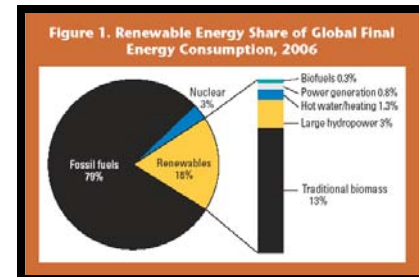
Creating a global shift away from fossil fuel consumption will take both innovation and funding. Our most promising alternatives may prove to be **renewable generation sources**, such as photovoltaic technology and wind power. Currently, renewable energy accounts for 18 percent of the world’s final energy consumption, including traditional biomass, large hydropower, and “new” renewables (small hydro, modern biomass, wind, solar, geothermal, and biofuels).

“Renewable energy offers our planet a chance to reduce carbon emissions, clean the air, and put our civilization on a more sustainable footing. It also offers countries around the world the chance to improve their energy security and spur economic development. So much has happened in the renewable energy sector during the past five years that our perceptions lag far behind the reality of where the industry is today” (Renewables 2007 Global Status Report p.2).

Could we be closer to a **renewable energy transition** than we think?

Researchers at MIT have been working with a new technology that may allow our **built environments** to become generators of renewable energy. MIT graduates have developed a system of floor blocks that create energy by rubbing against each other when people walk on them. Coined “**the crowd farm**,” it’s estimated that a crowd of 30,000 people could create enough power to run a small electrical system or bring a subway train safely to a platform in the event of a blackout.

How will you apply **forward-thinking innovation** to the built environment of the future?



INVESTING in RENEWABLES Key Facts and Figures

- Renewable electricity generation capacity reached an estimated 240 gigawatts (GW) worldwide in 2007, an increase of 50 percent over 2004. Renewables represent **5 percent of global power capacity** and 3.4 percent of global power generation.
- The **largest component of renewables** generation capacity is **wind power**, which grew by 28 percent worldwide in 2007 to reach an estimated 95 GW.
- The **fastest growing energy technology** in the world is **grid-connected solar photovoltaics (PV)** ... 1.5 million homes [have] rooftop solar PV feeding into the grid worldwide.
- Renewable energy, especially small hydropower, biomass, and solar PV, provides electricity, heat, motive power, and water pumping for **tens of millions of people in rural areas of developing countries**. Twenty-five million households cook and light their homes with biogas, and 2.5 million households use solar lighting systems.
- **Developing countries** as a group have more than **40 percent of existing renewable power capacity**, more than 70 percent of existing solar hot water capacity, and 45 percent of biofuels production.

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While many governments across the globe support a transition to alternative energy, there are world leaders and special interest groups who will work diligently to ensure this transition never occurs. Some of the most powerful forces in the fight against alternative energy are “**petrodicatorships**,” described as “the Putins, the Chavezes, the Ahmadinejads, regimes that depend on oil for their power and influence in the world today.” With their interest in keeping oil at the top of the world’s must-haves list, these petrodictators have the real potential to further squeeze the oil market and inflate prices. Thomas Friedman, author of *Hot, Flat, and Crowded*, highlights an interesting correlation between the price of oil and the freedoms enjoyed by petrolist countries’ populations.

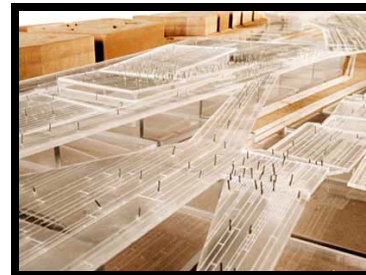
“In oil-rich petrolist states, the price of oil and the pace of freedom tend to move in opposite directions. That is, the higher the average global crude oil price rises, the more that free speech, free press, free and fair elections, freedom of assembly, government transparency, judicial independence, rule of law, and the formation of independent political parties and nongovernmental organizations are eroded. All these negative trends are also reinforced by the fact that the higher the price goes, the less petrolist leaders care about what the world thinks or says about them. They have more disposable income to build up domestic security forces, bribe opponents, buy votes or public support, and resist international norms” (Friedman p.96).

How can we develop alternative energy infrastructure without causing extremist backlash? Can we become allies instead of adversaries in the energy transition?

It may appear as though there are many **obstacles** to overcome in assuring that our future generations have enough energy to not only sustain humanity, but to continue to advance as a global society. For stewards of the built environment, it may feel as though this is someone else’s problem to solve. But energy is an issue that touches everyone every second of every day. We use energy to light our workstations, drive our cars, send our emails, cook our dinner, and lull ourselves to sleep.

We should all **commit** ourselves to investing in the global energy transition and aim to see the forest of progress through the trees of cost.

Learning About the **Crowd Farm**



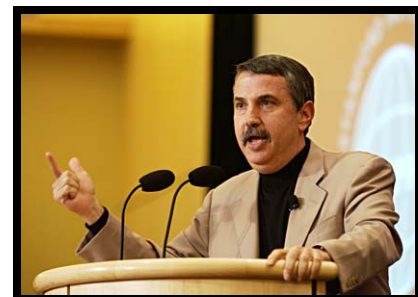
WHAT is the Crowd Farm?

“The so-called ‘Crowd Farm,’ as envisioned by James Graham and Thaddeus Jusczyk, both M.Arch candidates, would turn the mechanical energy of people walking or jumping into a source of electricity.”

HOW would the Crowd Farm work?

“A responsive sub-flooring system made up of blocks that depress slightly under the force of human steps would be installed beneath [Boston’s South Station railway terminal’s] main lobby. The slippage of the blocks against one another as people walked would generate power through the principle of the dynamo, a device that converts the energy of motion into that of an electric current.”

WATCH: Why We Need a Green Revolution



From **FORA.tv**: “Friedman warns about the impacts of petrodicatorships and the inverse correlation between the price of oil and the expansion of freedom.