

# SAN FRANCISCO PEAK OIL PREPAREDNESS TASK FORCE REPORT

## II) INTRODUCTION

A) **WHAT IS PEAK OIL?** Oil is a finite resource. It is the linchpin of all modern economies. In addition to serving as the fuel for 95% of all transportation, tractors, and other heavy equipment, it is used as a feedstock for plastics, chemicals, fabrics, cosmetics, and pesticides. Like most commodities, its price is determined by market forces of supply and demand. Demand for oil has been rising sharply, as developing economies of China and India grow. Supply of oil is the central topic of "Peak Oil".

We are not yet "running out of oil". There are still vast reserves of oil in the ground. What matters to the world's economy, however, is not the oil in the ground, but rather the flow of oil, or oil production. This is conventionally measured in millions of barrels per day. Today, worldwide production of petroleum liquids is about 86 million barrels per day.<sup>1</sup> The production of oil is limited by both geological limits of physically how fast it can be pumped out of the ground, and by human constraints, such as political decisions or wars.

Many analysts believe that the world is at or approaching the physical limit to how fast oil can be produced. Any given oil field produces oil at a flow rate that roughly follows a bell-shaped curve over time. When you add up all those bell curves, total production forms something like a bell curve.

Though not all production curves are exactly bell-shaped, certain key features are present in the production curve for an oil reservoir: Production increases over time, reaches a peak when approximately half the available oil has been pumped, and begins a steady and inexorable decline thereafter. Worldwide, the oil industry is at or near the beginning of this decline.

As the world approaches peak oil production, oil exports will fall faster than total production. Why? Because oil producing nations gradually use more oil domestically, thus leaving less for export, even if their production is unchanged. They may also withhold production, believing that prices will be higher later on, or planning to ensure their own future supply of oil. For example, Russia has stated that it will not be increasing exports as it keeps more oil and gas for its own use. This is called "resource nationalism" and it means that oil exports will decrease faster than overall oil production. The volume of total oil exports is actually more important to the US than total production, as we bid against China and other importing nations for a shrinking pool of oil available for export. Worldwide, net oil exports reached a maximum in late 2005, and have been trending downward since then. Exports are currently 1.3% below their peak, as shown below.

{to add - graph of oil exports over time}

Our oil future is a classic case of what happens when too much demand chases too little supply - rising prices. The price of a barrel of oil today is % higher than it was when our task force was

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formed just 14 months ago. And this is only the beginning. Production from existing oil wells is falling about 5% per year. That means we need to put more than 4 million barrels per day into production *each year* just to stay even. To put this in context, the Canadian tar sands are currently producing 1 million barrels per day and hoping to reach 3 million per day within 5 years.

And let's not forget price. As the peak of production approaches, we are not running out of oil, but we *are* running out of oil that is easy to get at. Every time you hear of oil from "deep water" or "tar sands", just substitute the word "expensive".

**B) PEAK NATURAL GAS:** Historically, the United States has supplied its own natural gas, or purchased it from Canada. However, natural gas production in North America is also close to peak. Conventional production of natural gas is already in decline. Unconventional natural gas production has surged. No one knows how long this will last, but remember that "unconventional" is another synonym for "expensive".

The United States was hoping to make up for declining gas production with imports of liquified natural gas (LNG). This strategy has been unsuccessful thus far because the world price of LNG is higher than the north american price. Over the past twenty years, natural gas prices have been 86% correlated with oil prices.<sup>30</sup> We expect this connection to continue, since energy is somewhat fungible.

{graph of natural gas prices}

Electricity prices will follow the price of natural gas, especially in California, where most power plants are fueled by natural gas. In June, 2008, PG&E asked for a 6.5% increase in electric rates, specifically citing the rise in natural gas prices.

Looking ahead, many Americans expect that we will move to an all-electric society, whether that electricity will be coal or nuclear based, or wind and solar based. Because of the magnitude of the energy source which must be replaced, that will not be possible. Because petroleum-based vehicle fuels make up 50% of the energy used in San Francisco, and electricity only 20%, replacing a 4% annual drop in petroleum supplies would require an increase in electricity supply and grid capacity of 10%. And that's just the first year, and assumes that we will have vehicles that can run on electricity. Freight transport and heavy equipment used in construction and agriculture are particularly intractable problems.

Ethanol and biodiesel are also not solutions. In addition to competing with food production, they are nowhere near reaching the capacity to make up for declining petroleum availability. Many other technologies are said to be in the pipeline, but none are in a position to scale up in the near future.

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In short, the exact outlook for oil and natural gas is not totally clear, but we can conclude a few things about our energy future:

Energy will continue to get more costly. Until recently, energy has been extraordinarily cheap, cheap enough that we have been able to use it wastefully. That is changing before our eyes, and we need to change our attitude to match the new reality. We will see gasoline at \$20 a gallon; that's a *when*, not an *if*.

Declining oil and gas production will impact many areas not traditionally associated with hydrocarbons. Food production in particular will be impacted both through rising costs of oil and gas based fertilizers and pesticides, and the fuel costs of equipment and transporting to market.

Rising oil and gas prices will have a strongly negative effect on the economy. A study by the Federal Reserve Bank of Philadelphia estimates that a 10% spike in oil prices results in a 2% drop in US GDP -- a year later -- even if the price of oil recedes to its previous level. Not all sectors will suffer equally. Of particular impact on San Francisco will be the probable drop in travel.

Shortages and supply interruptions are likely. The supply chains for oil and gas are long and complex. As demand outstrips supply, the possibility of disruptions becomes ever greater. In the 1970s, we saw the havoc that can be wreaked by even brief interruptions. And the American south experienced shortages and long queues after some refineries were temporarily closed by Hurricane Ike.

There is no solution to the coming crisis, but there are mitigations. The sooner we take action, the better.

### **GOAL OF THE PEAK OIL PREPAREDNESS TASK FORCE:**

San Francisco cannot solve the problem of peak oil on its own. Mitigation strategies must be pursued at every level: regional, state, national, and worldwide. Still, there are policies which the city can enact to prepare for the above eventualities.

This is a great opportunity for San Francisco to take the lead in moving to a low-carbon future. Aggressive action here can point the way for California and the United States. San Francisco is uniquely suited to move ahead, by its aware and active residents, and by its progressive tradition in government.

Moreover, with a challenge like peak oil and gas, requiring a major social and economic paradigm shift and long-term thinking, strictly market-based coping cannot be counted upon to arrive at the best course of action. The city must step forward to set priorities and plan how to move toward the best resolution for all its citizens. It is the mission of the task force to assist the city in making a such a plan.

