

A Peak Oil Overview

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Outline

- What is Peak Oil?
- What is the Problem?
- The Era of Easy Oil is Over
- The Current Global Oil Picture
- Biomass to the Rescue?
- The Path Forward

Peak Oil

- Peak oil is the point at which oil production rates begin an irreversible decline
- Peak oil is NOT a theory
- Peak oil does not mean we are running out of oil
- Peak oil dates for various countries
 - Germany – 1966
 - USA – 1970 (peaked at 9.6 million bpd; currently at 5)
 - UK - 1999
 - Norway – 2000
 - Mexico – 2004
- The global peak?
 - Maybe last year, maybe in 5 years, but without a doubt a problem that the world must soon contend with

The Threat from Peak Oil

- Oil is presently the lifeblood of the global economy
- The global transportation system – and thus global trade – is utterly dependent upon cheap oil
 - *Globalization makes it impossible for societies to collapse in isolation* – Jared Diamond
- Industrial agriculture is enabled by cheap fossil fuels
- Modern militaries can't function without oil
- Modern society – and the population explosion - that has arisen over the past 100 years has done so on the back of cheap oil
 - Oil will be exceedingly difficult to replace
 - We simply don't know if the modern world can cope with declining oil production

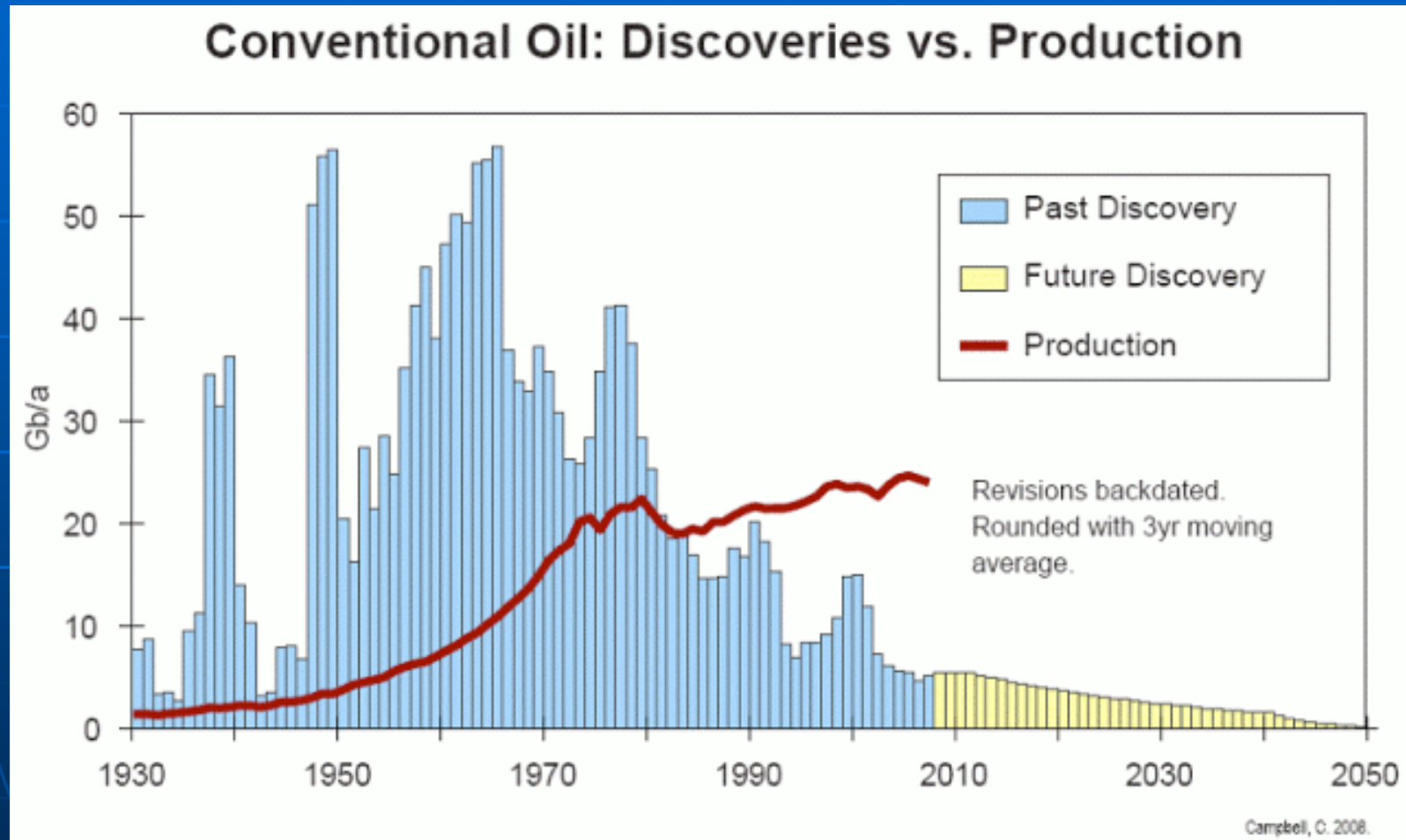
Notable Viewpoints

- Domestic demand in Saudi Arabia is forecast to rise by 250% by 2030 - *Khalid A. Al-Falih, Saudi Aramco President and CEO*
- By 2012, surplus oil production capacity could entirely disappear, and as early as 2015, the shortfall in output could reach nearly 10 million barrels per day - *US Joint Forces Command*
- Non-OPEC production peaked in 2006; global production to peak in 2014 - *Department of Petroleum Engineering, Kuwait University*

On the Hirsch Report

- Robert Hirsch – former director of fusion research at the U.S. Atomic Energy Commission - on his 2005 DOE-commissioned report *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*
- ***Hirsch: When the people at the DOE saw the final report, it shocked them even though they could see what was coming. Management really didn't know what to do because the Peak Oil report was so shocking and the implications were so significant.***

The Easy Oil is Gone



Graphic Source: Colin Campbell

Global Oil Picture

- Global oil production – 85.4 million bpd*
 - On a plateau since 2005
 - Some spare capacity, but...
 - Projects are being delayed – setting up price surges
 - The “incident” in the Gulf of Mexico will hasten the decline
- The good news
 - U.S. oil demand down 1.2 million bpd from 2004-2008
- The bad news
 - Largely induced by crippling prices and recession
 - Demand from China and India up by 1.9 million bpd
 - Oil at \$70-\$80/bbl the new norm
- How does the recession end if oil prices remain at recession-inducing levels?

Biomass Delusions

Biomass as a Solution?

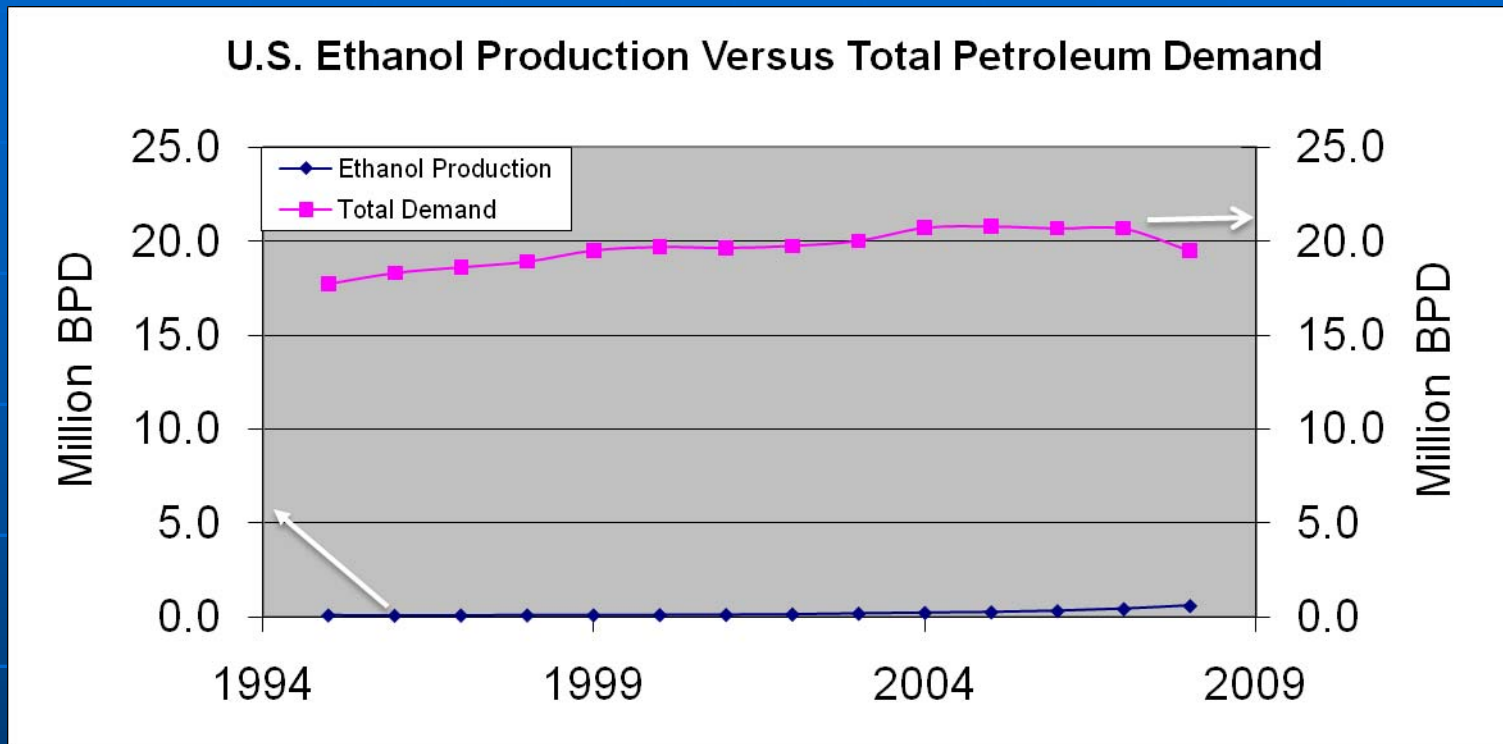
- Replacing current consumption of fossil fuels with biomass IS NOT POSSIBLE
 - Photosynthetic efficiency is too low
 - Each year we burn >400 years of ancient biomass*
 - That biomass was processed with heat and pressure courtesy of Mother Nature into fossil fuels
- “Renewable” energy is often heavily dependent on fossil fuels
 - >75% of corn ethanol’s energy is fossil fuel-based
 - Low energy density means higher energy to transport
- Two examples of presently energy intensive processes in the renewable energy world
 - Cellulosic ethanol
 - Algal biofuel

*Dukes, J.S. 2003. Burning buried sunshine: human consumption of ancient solar energy. *Climatic Change*, 61(1-2): 31-44.

Pseudo-Renewable Energy

- Is the “renewable” fuel renewable?
 - Are you using fossil fuel to produce the renewable fuel?
 - Is a fuel that is dependent upon fossil fuel and grown from a crop that depletes topsoil renewable?
 - How many BTUs to transport renewable energy (1/3rd of the energy density of oil)
- If production costs are high because energy inputs are high, you have a receding horizon problem
 - Cost position may worsen as oil prices increase
- The problem of receding horizons
 - “Oil Shale Development Imminent” – headline circa 1900
 - When oil was \$20/bbl, oil shale needed \$40/bbl
 - At \$80/bbl, oil shale still not economical

Understanding Scale



- While the U.S. has been successful at rapidly ramping up corn ethanol, it barely registers on the scale of our petroleum demand

Evaluating Sustainability

- Is the process enabled by fossil fuels?
- Does the process impact food supplies?
- Can the process operate without straining water supplies?
- Does the process lower the soil quality?
- Does the process impact local biodiversity?
- What are the emissions from the process?

Deal with reality or reality will
deal with you

Mitigation

- Educate
 - The person you educate may be capable of changing policy
- Trade off fossil fuel taxes for income taxes
 - Rebate income taxes to make it revenue neutral
 - Encourages energy conservation
 - Encourages alternatives
 - Encourages mass transit
- Encourage behaviors that reduce energy consumption
 - Rebates for solar water heaters, fuel efficient cars

Conclusions

- The world is collectively asleep at the wheel
- The future will arrive regardless of whether you plan for it
- None of us expect our houses to burn down
 - But if it does, the consequences are great
 - Thus, we carry insurance
- The consequences of peak oil are far greater, yet we have no insurance policy
- The good news is there is enough solar energy falling on the earth to sustain a good quality of life – if we ever resolve technical challenges of efficiently storing and later using the energy

We all love Mother Nature, but never forget that she can solve problems in a very cruel manner.

Recommended Reading

- Crude World by Peter Maass – to help put into perspective the price of our oil dependency
- The Long Emergency by Jim Kunstler – to scare you into action
- Life After the Oil Crash - <http://www.lifeaftertheoilcrash.net/> - if you want to consider the really bleak point of view
- The Hirsch Report by Robert Hirsch – to convince you that delaying action will be far more problematic than facing the problem now
- The Oil Depletion Protocol by Richard Heinberg – to see one possible course of action

Thank You