"The End of Cheap Oil: Are you ready?"

Council of Supply Chain Management Professionals
Saint Louis Roundtable - Annual Seminar
February 17, 2011

Chuck Taylor
Founder and Principal of Awake! Consulting
Today’s Agenda.

- Peak Oil Explanation
- Oil Supply Outlook
- Geopolitics
- Oil Industry
- Alternatives
- Demand Outlook
- What To Expect
- Mitigation Strategies
- Peak Oil Checklist
Warning signs which people did not want to see or face.

Events catch leaders off guard, even though they had all the information necessary to anticipate them.

A pervasive failure of leadership with grave consequences for individuals, organizations, and society.

Sources: Mike Regan, Transact Technologies
“Predictable Surprises: The Disasters You Should Have Seen Coming And How To Prevent Them.’
Max H. Bazerman and Michael D. Watkins
Attributes of Predictable Surprises.

Knew a problem existed that would not solve itself.

The problem is getting worse over time.

Fixing the problem incurs significant present costs to avoid costs that are uncertain, but likely to be much larger.

Avoiding requires a decision to act to change the status quo.

Sources: Mike Regan, Transact Technologies
“Predictable Surprises: The Disasters You Should Have Seen Coming And How To Prevent Them.’
Max H. Bazerman and Michael D. Watkins
Dealing with the wolf!
Much Confusion…
...leads to many opinions.
Good Rule.

“Data always beats theories.”

Matt Simmons, President and CEO, Simmons and Co. International.
Conventional Oil is...

...a non-renewable produced in only two geological periods.

...only found if five very specific conditions are present.

...found in a few unique places – most long since explored.

...not created equal.
Conventional Oil is…(Cont.)

...found, brought to the surface, refined and moved before it is used.

...the highest energy density of any portable energy storage medium.

...the energy all other energies are ranked against in terms of utility, consistency, safety and price.

...alternatives needs to be as cheap and substitutable.
"Peak-oil theory is garbage as far as we're concerned."

“Peak Oil’ Is a Waste of Energy.”

“…the awful day of ‘peak oil’ production…is still a long way off”.

“There is too much rhetoric in the public domain about moving away from oil”.
In 1956, Dr. M. King Hubbert predicated U. S. Oil Production would peak in 1970.
I saw it happen!

**1962-1972 Texas**
Price stable, up slightly
Production +40%

**1972-1982 Texas**
Drilling exploded
Price +1000%
Production –28%
It happens in every oil field.
Timing is the only question for most.

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<tr>
<th>Peak 2005 to 2012</th>
<th>Peak 2011 to 2021</th>
<th>Peak after 2021</th>
<th>“Peak Oil is garbage”</th>
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<td>German Army</td>
<td>PFC Energy</td>
<td>CERA…….Well after 2020</td>
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<td>Oxford University</td>
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<td>Exxon Mobil……No sign</td>
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<td>Kuwait University</td>
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<td>BP…………Can’t predict</td>
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Growing Consensus.

“The actual global supply of oil is now expected to be limited to 91-92 million barrels per day …by the end of 2010/early 2011.”

“The world's oil reserves had been exaggerated by up to a third, demand may outstrip supply as early as time period of 2014-2015.”
Smith School of Enterprise and the Environment - Oxford University., March 2010.

“The analysis of 47 major oil producing countries estimates …peak in 2014…OPEC has…about 78% of the world reserves.”
College of Engineering and Petroleum at Kuwait University, March 2010.

“By 2012, surplus oil production capacity could entirely disappear, and as early as 2015, the shortfall could reach nearly 10 million barrels per day.”

“The risks to security posed by such a development cannot even be estimated.”
German Army Report, September, 2010.
A growing gap between discoveries and production.

THE GROWING GAP
Regular Conventional Oil

- Ghawar (Saudi Arabia)
- Samotlor (Siberia)
- Prudhoe (Alaska)
- Cantarell (Mexico)
- North Sea
- Kashagan (Kazakhstan)

The graph shows past discoveries (gray bars), future discoveries (yellow bars), and production (black line) over time from 1930 to 2050.
The Incredible Shrinking Forecast.

Since 2005, IEA had reduced the 2030 projected daily world oil production from 120 mbpd to 105 mbpd in 2009.

“Global oil production reaches 96 mbpd in 2035 on the back of rising output of natural gas liquids & unconventional oil, as crude oil production plateaus.”

2010 World Energy Outlook
Need a new Saudi Arabia every 2 years.

**The Challenge.**

Current Production: 87

Million Barrels Per Day

Depletion: 5.0%: 4.4

Demand: 1.5%: 1.3

Total Needed Annually: 5.7

Saudi Production: 11.0

(including spare capacity)
Energy Returned on Energy Invested. (EROEI)

Oil Production
1930’s - 100 : 1
1970’s - 30 : 1

Canadian tar sands – 5/3 : 1.

Deep Water – 8 : 1

Oil Production
Today -19 / 10 : 1

Biofuels
Brazil 10 : 1
US 1:1

Shale - na

Oil Production
1930’s - 100 : 1
1970’s - 30 : 1

Biofuels
Brazil 10 : 1
US 1:1

Shale - na

These keep the lights on.

Coal - 80/50 :1

Natural Gas - 10:1

Nuclear - 15/5 : 1

These keep the fleets moving.

Hydro – 100 : 1

Wind - 18 : 1

Solar - 10/3 : 1

These keep the lights on.

These keep the fleets moving.
No present alternatives for oil for transportation.
Think about it!

One barrel of oil has the energy of up to 25,000 hours of human labor.

Even at $100 a barrel, oil is remarkably cheap compared with human labor.

VS. 

1 Cup = $1.18

1 Cup = $0.33
World Gasoline Prices and Taxes.
The 12 OPEC countries, six in the Middle East, four in Africa, and two in South America, have 70% of proven oil reserves.

Iran, Iraq, Russia, Venezuela and Nigeria have 36% of proven oil reserves.
Suez Canal 4.5 MBD
Bab-el-Mandeb 3.3 MBD
Straits of Hormuz 17 MBD
Straits of Malacca 15 MBD
Panama Canal .5 MBD
Turkish Straits 2.4 MBD

The World’s Oil Flows Through 6 Critical Choke Points

Oil Choke Points:
Source: Department of Defense
It all about the Middle East!

The Golden Triangle of Oil.
25% of daily world production of oil.

56% of world proven oil reserves.
World’s Oil Gauge is Broken.

250 of world’s fields provide 80%+ of total production.

95% of world’s “proven reserves” are unaudited.

Current numbers not accurate.

Many analyst agree with WikiLeaks - ME reserves overstated.

Few know true condition of reservoirs.
Supposed excess capacity is in Saudi Arabia.

Source: Jeffery Brown, The Oil Drum
Five old super giant fields have produced 90% of SA’s oil. All face serious water maintenance and corrosion problems.

35 years of intense exploration found little new oil. Drilling cost up 7 times since 2004.

“The West is deluded to rely on Saudi oil.”
Dr. Sadad Ali-Husseini, former Executive Vice President of Aramco), 2004.

“OPEC oil reserves are overstated by more than one-third….we have already reached maximum sustainable production.”
Dr. Al-Husseini, 2009.
“Saudis Put Oil Capacity Rise On Hold.”
Financial Times April 21, 2008.

“Saudis Face Hurdle In New Oil Drilling.”

“I told them that I have ordered a halt to all oil explorations so part of this wealth is left for our sons and successors God willing.”
Saudi King Abdullah, Zawya Dow Jones, July 4, 2010.

“Without reducing the rate of energy consumption growth, the kingdom could see oil available for export drop some 3 mbpd to less than 7 mbpd in 2028.”
Khalid al-Falih, CEO Saudi Aramco, Reuters, Feb 12, 2011.
Egypt – Canary in the coal mind.

Egyptian oil production peaked in 1995.

Production declined at an average rate of 1.6% for 14 years.

Internal consumption increased at an average rate of 3% for 14 years.

Production declines plus consumption increases resulted in a 95% decline in net exports.

Thirty-three (33) net oil exporters comprise 99%+ of global net oil exports.

The Consumption/Production ratio for global net oil exporters went from 26.1% in 2005 to 29.1% in 2009.
Price crashes in 80’s, 90’s, 00’s and ‘08.
IEA estimates $12.4 Trillion investment needed through 2030.
Global exploration and production spending declined 15% in 2009.
The overwhelming amount of oil left is in the hands of state-run oil companies.
During booms, shortages of people, drilling rigs, yard space, equipment, raw materials and transportation.

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<th>Drilling Rig Fleet.</th>
<th>25 Years Old.</th>
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<tr>
<td>Global Pipeline System.</td>
<td>40 - 60 Years Old.</td>
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<td>Tank Farms.</td>
<td>40 – 70 Years Old.</td>
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<tr>
<td>Refineries.</td>
<td>40 – 100 Years Old.</td>
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<tr>
<td>Oil Tankers.</td>
<td>17 Years Old</td>
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GOM Blowout – Lessons and Fallout.

The "easy" oil is gone especially for major western oil companies.

At the limits of human capability to keep the oil supply flowing.

Moratorium will hasten and worsen the coming oil supply crunch.

Shortages vs. coastlands - coastlands win until shortages cause real pain.

No deepwater drilling equals more imports.
When production does return it will be much more expensive.

The world still needs offshore deep-water energy development.

Accidents will continue to happen, but GOM spill may improve responses.

Beginning of a serious discussion about the end of the oil age?
The reasons demand won’t slow down.
Oil Shock Coming Soon?

88 mbod
Previous
All Time
High
No magic bullets – A deep, intractable problem of energy transition.
What to expect!

Peak oil is here or close enough.

Peak oil is a liquid fuels problem.

Peak oil could be rapid and severe.

Peak oil is not temporary. It will continue until energy bridges are built.

Transition will require Brown and Green solutions, time and money.

Mitigation of oil shortages will trump other priorities.
What to expect! (cont.)

The U.S. will move (slowly but surely) towards modifying our lifestyles to use less energy.

Governments will intervene to maintain critical levels of oil supply and protect national security.

Expect rationing, demand restraints and non-market based oil pricing.

Just-in-time supply chains dependent on worldwide long-distance transportation will be impacted first.

We must learn to live with much higher oil prices. Adequate supply will the highest priority.
An urgent need to do reasonable things!

Tell the truth.

Make efficiency a “real” national priority.

Develop a Liquid Fuel Emergency strategy.

Increase fuel taxes. Use money to provide tax breaks for efficiency and moving off oil.

Speed vehicle fuel efficiency standards.

Develop technology to continue offshore drilling.
An urgent need to do reasonable things!

Maximize use of alternative fuels (LNG, Hybrid, Electric).

Reduce speed limits.

Increase truck size and weight limits.

Limit operating hours in congested areas.

Halt non-essential road and airport construction.

Begin a serious effort to replace air, car, and truck transport with rail/water.

Remove bio import tariff.
Peak Oil Checklist (Short Version)

Does senior management understand that the Petroleum Age is coming to an end?

Does the planning process consider Peak Oil?

What would be your company’s greatest vulnerabilities in a petroleum-/energy-short world?

Is there a Liquid Fuel Emergency Plan in place?

Are there efforts to monitor and influence public policy?

Does the culture reward those who rethink, reduce, recycle, reuse, conserve, and cooperate?
Peak Oil Checklist (Short Version)

Is fact-based information available?

How is your business impacted at various fuel-price points - $5, $6, $7, $10 etc. per gallon?

Do sales/marketing/manufacturing/supply chain policies fit an energy-constrained world?

What can be done to remove complexity from the supply chain?

How can the network be made more flexible and changed to eliminate movement and transportation?
Peak Oil Checklist (Short Version)

Do sourcing strategies consider Peak Oil?

Where are opportunities for on-shoring and in-sourcing?

Will your carriers and third parties add value in an energy-constrained future?

Can a cheaper mode be used?

Where can the system slow down?
Peak Oil Checklist (Short Version)

What are the plans to take miles out, improve miles per gallon and take advantage of new fuels and technologies?

Is “emergency” transportation really an “emergency”?

Do you rely on air freight?

How much non value adding “dead air’ is shipped (filler materials, packaging layers, shapes and volume)?

Are transportation and fuel/energy purchasing centralized?
Summary and Conclusions.

World oil production growth will eventually stop and production will peak.

The world has never faced a problem like the decline in world oil production.

This is an uncharted, unpredictable bridging period.

Government will intervene when crisis hits.

Expect confusion/chaos.
Summary and Conclusions.

Begin change today.
Take a fresh look.
Rethink, reduce, recycle, reuse and reward.
Get Lean.
Conserve and cooperate.
Stay flexible and seriously consider your personal circumstances.
Have a safe journey!
Charles L. (Chuck) Taylor
Head Coach

Awake!

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