The last decade has brought significant change in global oil and gas markets, and hence influenced developments in regional energy markets, international energy trade and geopolitics.

While activity in the US has been the driver thus far, North America more generally is set to become a very different actor in global energy markets, with the potential to improve energy security and economic well-being.
Rewind to 2003 – LNG is coming to North America
Then, shale happened in the US and Canada...
we quickly realized shale resources are everywhere*  

Major North American Shale Plays (~1,930 tcf)  

European, Latin American, African and Pacific Shale Plays (~4,670 tcf)  

*Over 6,600 tcf of shale according to ARI report, 2011
The US as a Microcosm

Much success has been realized, but some constraints may become binding
North American Shale Resources

• Shale oil and gas resources are largely east of the Rockies.

Geology AND market structure yields the recipe for success... and a massive competitive advantage

- Geology is a *necessary* condition for vibrant and successful upstream activity...
- ... but it is NOT *sufficient*!
- A host of above ground factors must be aligned for commercial success to be realized.
- Once in play, commercial success builds on itself because it encourages entrepreneurial activity, and creates an environment that is attractive to capital inflows.
- Thus, a variety of regulatory and market institutions must be in place if North America is to reach its full potential in terms of energy security and economic well-being.
The *sufficient* conditions...

- Upstream firms negotiate directly with landowners for access to mineral rights.
- A market in which liquid pricing locations, or hubs, exist and are easily accessed due to liberalized transportation services being unbundled from pipeline ownership.
- A well-developed pipeline network that can accommodate new production volumes.
- A market in which interstate pipeline development is relatively seamless due to a well-established governing body – the Federal Energy Regulatory Commission (FERC) – and a comparatively straightforward regulatory approval process.
- A market in which demand pull is sufficient, and can materialize with minimal regulatory impediment thus allowing new supplies to compete for market share.
- A market where a well-developed service sector exists that can facilitate fast-paced drilling activity and provide rapid response to demands in the field.
- A competitive service sector that strives to lower costs and advance technologies in order to gain a commercial advantage.
- A rig fleet that is capable of responding to upstream demands without constraint.
- A deep set of upstream actors – the independent producer – that can behave as the “entrepreneur” thereby facilitating a flow of capital into the field toward smaller scale, riskier ventures than those typically engaged by vertically integrated majors.
Will it Last? Shale Well Performance

• Well-specific EURs can vary within a shale play substantially
  - Ultimately, profitability matters, as there is little debate about resource scale
  - Some wells are profitable at $2.65/mcf, others need $8.10... median is $4.85.
The Recent US Natural Gas Supply Surge

- The last 7 years have seen tremendous growth in US natural gas production, largely driven by shale gas resource development.

Source: EIA
Longer Term Shale Production in the US

- Strong growth of dry gas production through 2020 then stabilization.

Source: BIPP CES RWGTM
US Oil Production Surge

• The last 5 years higher price has lead to a resurgence in US oil production, from both unconventional reservoirs and old fields.

Source: EIA
US Oil Demand: A New Paradigm?

- Recent demand trends are indicative of high prices and the economy. But, there is more going on that may signal longer term demand destruction.

![Graph showing US oil demand trends](source:EIA)
Effects of Supply & Demand Trends

- Import trends shifted with demand beginning in 2006.
- Production growth since 2008 is exacerbating the trends in imports.

Source: EIA
Oil Market Developments (US)

- Resource potential is distributed widely.
  - LTO production is the driver of trends in the US. North Dakota (Bakken), Texas (Permian, Eagleford), Ohio (Utica), Pennsylvania (Marcellus), Colorado (Niobrara), Louisiana (Tuscaloosa Marine), Oklahoma (Mississippi Lime), California (Monterrey).
    - Not all shales are created equal. Each faces different geology, different environmental factors (such as water availability), and different economics.
    - Bakken and Eagleford currently accounts for most US LTO production.
    - Strong activity emerging in Permian.
    - LTO production is challenging the current legal frameworks on US oil exports.
    - Oil imports are down.
    - The US now is a net exporter of petroleum products, aided by cheap natural gas and lower domestic demand.
    - The export ban may present a demand constraint, especially with uncertainty looming on the law. Policy certainty is key.
Comment on Mexico

The potential role of energy reform is significant, but much remains to be determined for a full realization of the possible benefits... high on the list of potential impediments:

1. Security
2. Local Content Requirements
3. Contract Terms
Lack of successful upstream investment in new resources triggers decline... absent this, there is no “crisis”.

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**Oil Demand and Oil Production**

- **Y-axis (in thousands of barrels per day):** 0 to 4,500
- **X-axis:** Year from 1971 to 2012

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**Legend:**
- **Yellow line:** Oil Demand
- **Black line:** Oil Production
Projection Under the Status Quo

- Business-as-usual
  - $GDP_{gr} = 1.44\%$; $POP_{gr} = 0.44\%$; $P_{oil,2040} = $90/bl
  - Resource = 29.83 billion bls; Reserve replacement = 0.83 billion bls/y
- Mexico becomes net oil importer in 2027.
Projection Under Alternate Assumptions

- The result, however, is highly contingent on
  - Reserve replacement (+); New discoveries, such as deep water (+)
  - Domestic demand growth (-)
- Pictured: US-type reserve replacement with GoM Activity
Upstream Firm Efficiency: A Function of Operating Conditions and Regulatory Overburden

- Absent change, PEMEX is not likely to move to the frontier.
- With reform, increased PEMEX may be forced to compete with players that are active in international capital markets...
Shale in Mexico

- A potential oil and gas, as TM mapping indicates there are both oil and gas windows.
  - Assessments indicate the resource native to the Eagle Ford extends well into Northern Mexico
    - Resource endowments are highly uncertain, so drilling activity is needed to fully characterize the resource

- While access through market structure is a necessary condition to attract capital, it is not sufficient. There are other concerns that pervade the onshore and offshore.
  - These include infrastructure and safety, both of which are equally important to realization of the resource potential.
Comment on Canada

The All Important Role of Policy-related Demand Constraints
Canadian Heavy Oil

- Keystone XL: a *de facto* export control through policy external to Canada.
- But, it is only temporary.

*Source: National Wildlife Federation, [www.nwf.org](http://www.nwf.org)*
Canadian Natural Gas

- Upstream constraints are not the issue. Rather, a lack of demand outlet presents a real commercial barrier to investment.
