



Implications of Three Scenarios on Energy Security and Trade

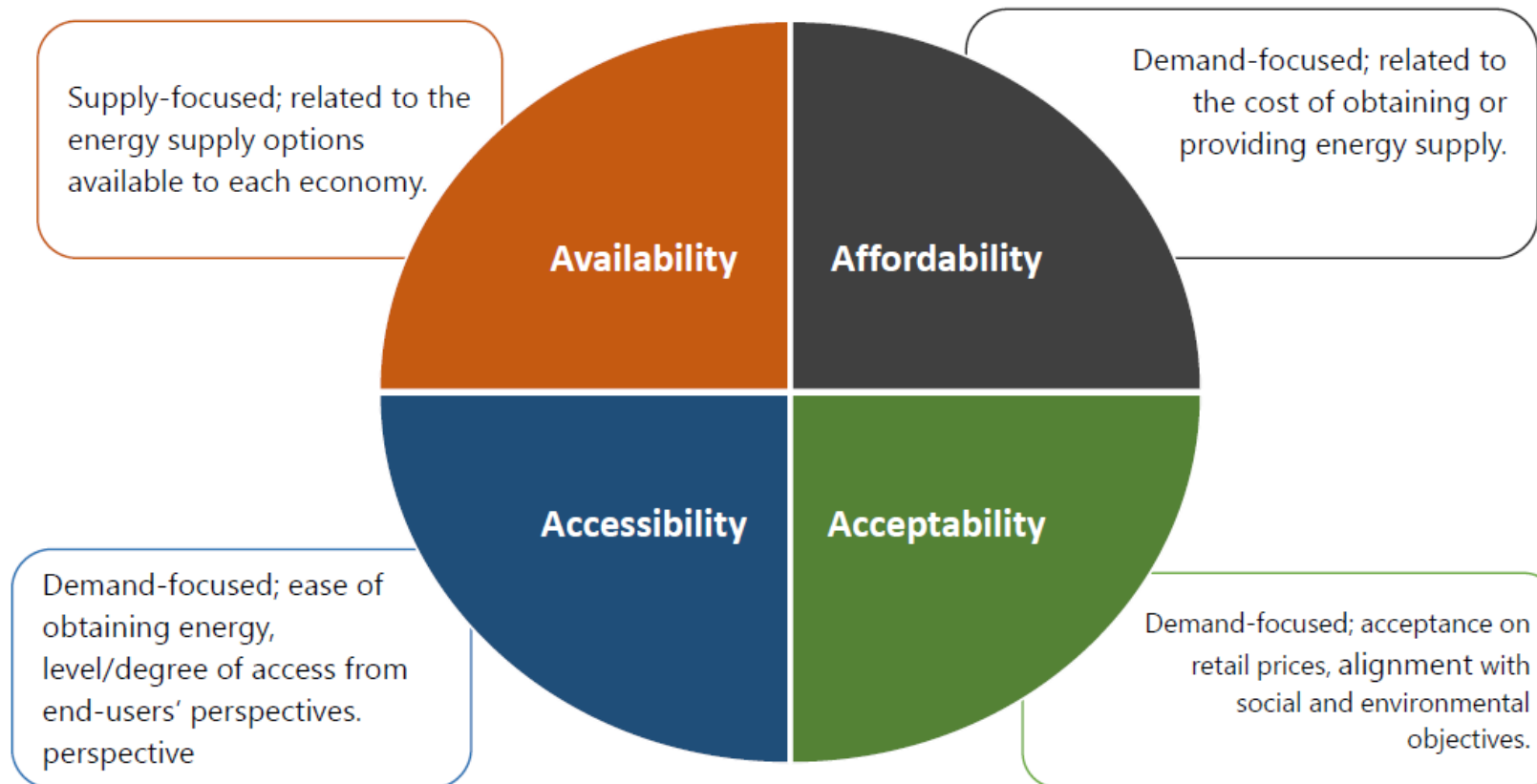
Prepared for

2018 APERC Annual Conference

Ian Twomey
30 May 2018

Energy security

IEA definition: “the uninterrupted availability of energy sources at an affordable price; long-term energy security mainly deals with timely investments to supply energy in line with economic developments and environmental needs; short-term energy security focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance.”



Source: APERC

Energy Security Trends

Availability

- Long period of reliable energy supply in most regions
- Little geopolitical disruption affecting global supply chains
- Disruption events mainly localised and related to weather/natural disaster. These put infrastructure under stress – are these sorts of events going to be more common?

Affordability

- Sharp rise in oil/gas prices 2003-2008 led to economically damaging energy costs (demand shock)
- Renewables becoming more competitive without subsidies – market in transition

Accessibility

- Technology is providing more options to consumers (locally and regionally)
- Development of flexible LNG market allows gas to fill transition role

Acceptability

- Climate change concerns making fossil fuel use 'unacceptable'
- Pollution issue forcing faster transition to clean fuels

What provides energy security?

Feature	Description
Diversity	a range of supply sources with flexibility to respond to market dynamic
Options	being able to change energy sources; consumer choice
Buffers/ spare capacity	stocks – buy time when managing disruption; strategic stocks provide insurance. Spare/back up capacity needed for electricity networks
Confidence	that markets will continue to function in the future (e.g. payment will be made for cargo being loaded; new investment will generate a return)
Information	Open transparent markets with good flow of information (e.g. forecasts) so that supply can adjust to demand changes in sufficient time

Concerns

- Anything that stops or slows the trade energy markets rely on (e.g. loss of confidence financial crisis, trade barriers)
- Loss of investor confidence that leads to lack of investment for the future

How will scenarios impact energy security and trade?

Energies that don't supply consumers with the 4 A's won't develop.

- If they are too expensive customers will not use/transition
- If they are unreliable, customers will look to reliable alternatives
- If they do not align with social and environmental objectives, move to other energies

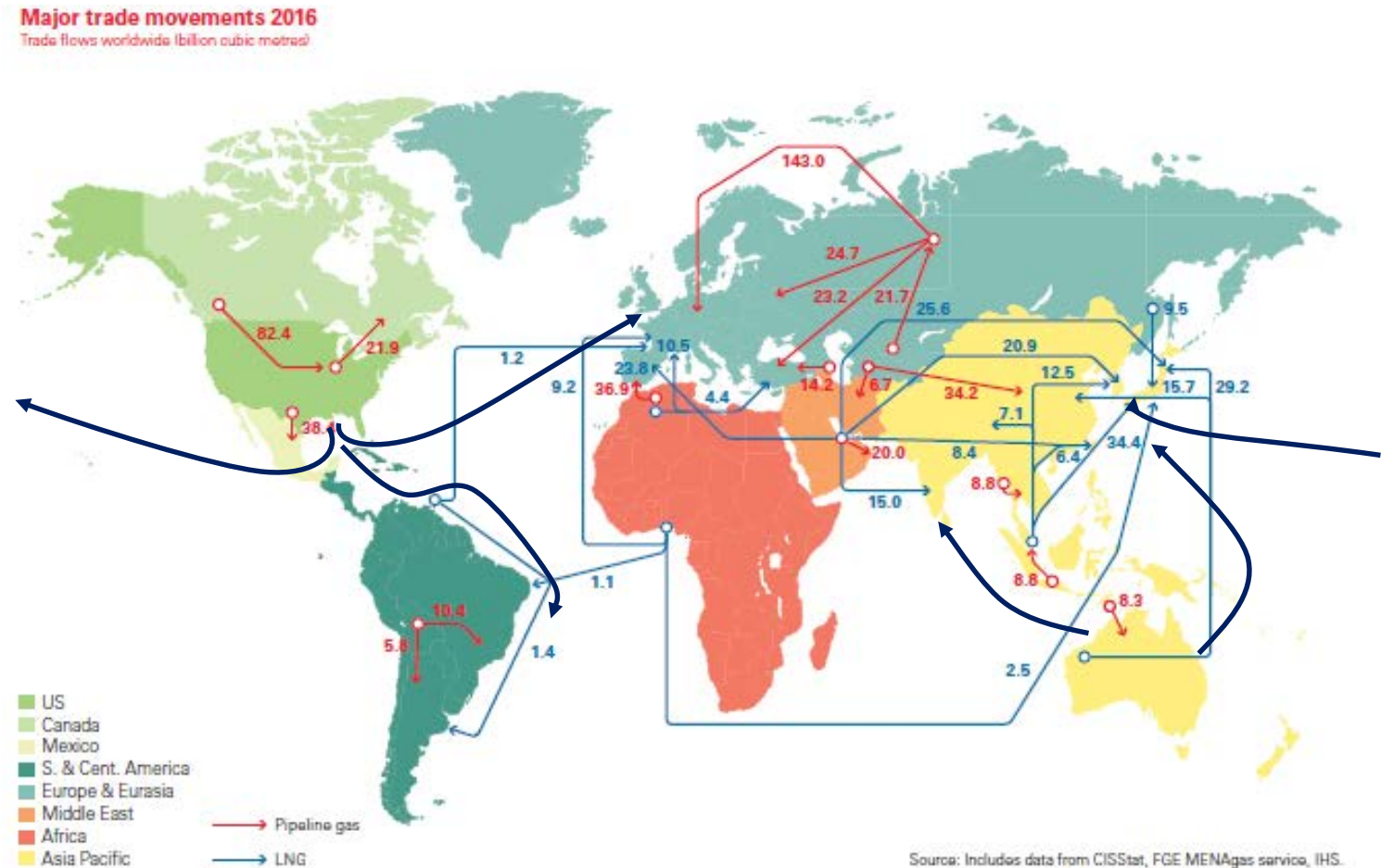
Examples

- Renewables growth – forecast for some time but only now happening once they are cost competitive and reliable
- Nuclear power unacceptable in many countries despite low emissions
- Fossil fuels (particularly coal/oil) becoming less acceptable

The market will respond to the opportunities expected and that includes ensuring a reliable and cost efficient supply. All scenarios show increased use of gas. We review the market response to this opportunity in the development of a flexible LNG market, enabling gas to be a transition fuel.

LNG/gas – Market transitioning for the future

- Market responding to opportunities shown in scenarios
- LNG market moving from a previous rigid market to flexible future
- Gas critical transition fuel (lower carbon) and backup for renewables
- Technology (e.g. floating regasification) increasing reach
- In the space of 2-3 years the LNG flows are looking very different

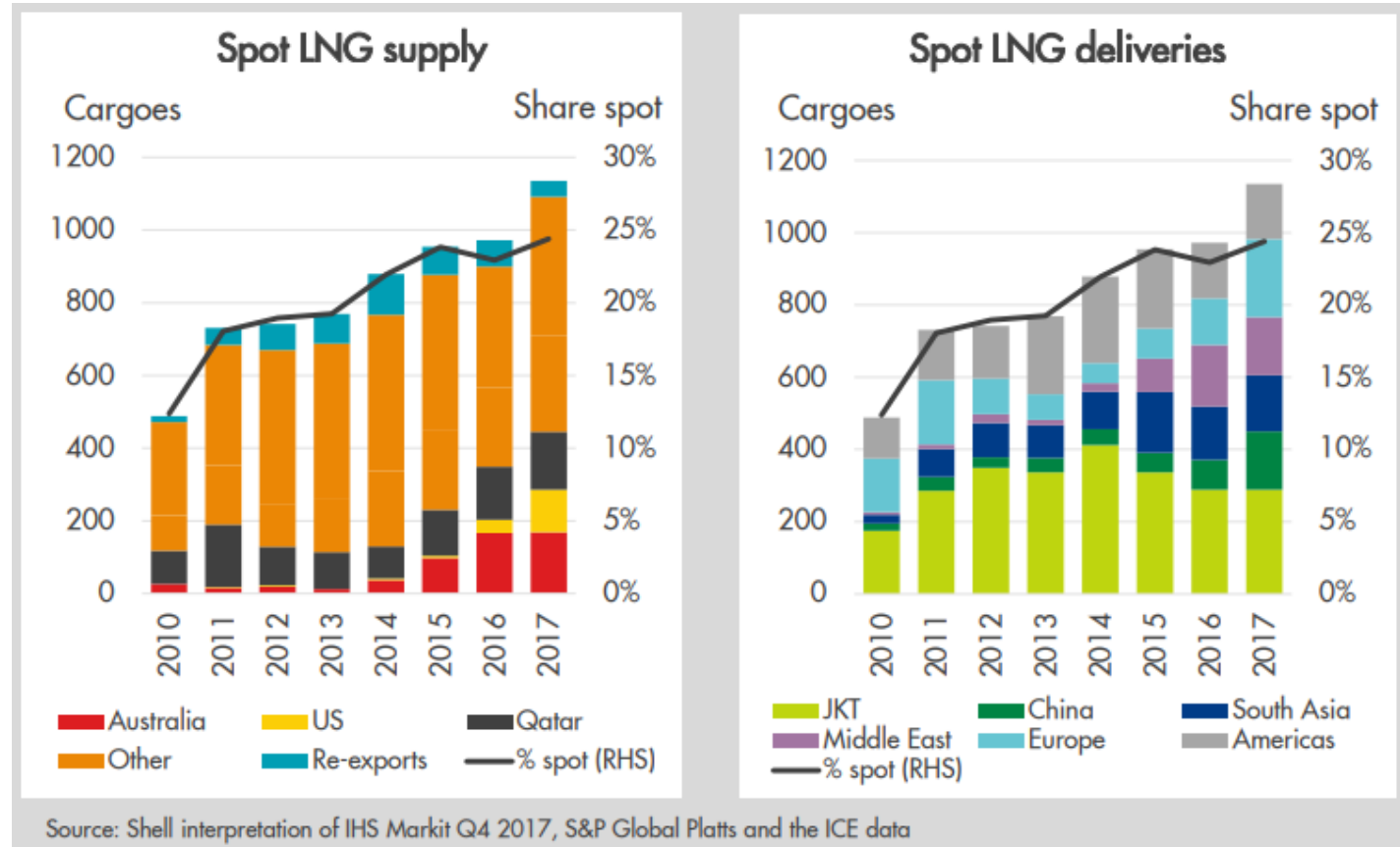


BP Statistical Review of World Energy June 2017, H&T

LNG/gas – Market transitioning for the future

What does this mean for security

- Gas market becoming more like oil – flexible, diverse, responsive and therefore resilient
- Learning to deal with greater demand price elasticity
- Customers finding ways to provide security other than long term agreements
- Suppliers finding ways to invest without long term purchase commitments
- Flexible responsive market provides security in similar way to oil has for last 40 years



2018 Shell LNG Outlook

How will scenarios impact energy security and trade?

BAU

- The expected – working in an environment of known risks with moderate change
- Gas market stays relatively balanced (supply/demand) within APEC region

TGT

- A transition but relatively orderly; gas very important
- Reduces net APEC energy imports to lowest level

2DS

- Sharp drop in demand for fossil fuels particularly coal and oil
- Rapid transition which leads to more uncertainty
- Despite lower oil consumption, more reliance on non-APEC sources
- Gas has significant surplus in region

How will scenarios impact energy security and trade?

Particularly for the 2DS scenario, rapid transition could significantly impact energy security

Availability

- Fossil fuel investments are long term; loss of confidence in future demand could impact investment
- Lack of investment in infrastructure could lead to more disruption (less resilience)

Affordability

- Prices may become higher and more volatile despite lower demand

Accessibility

- While the future can be seen, rapid change causes accessibility issues in the transition

Acceptability

- Fossil fuel use becomes 'unacceptable'
- Gas is impacted as gas and oil generally produced together

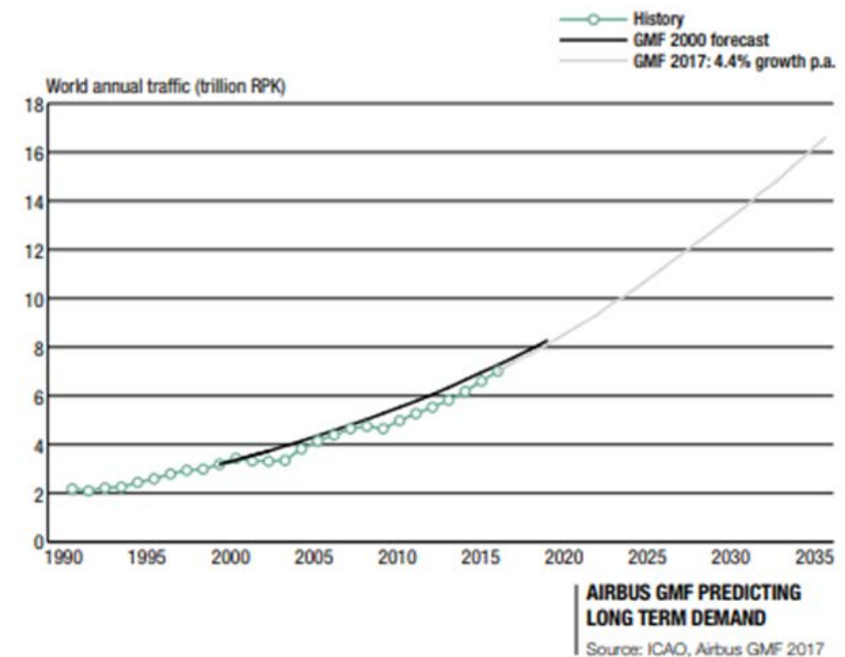
Energy supply mix impact energy security and trade

We have covered key role gas will play in allowing the transition

- Market already responding with flexibility in contracts and more supply options
- Floating regasification makes infrastructure investment flexible and expands markets
- Market will provide supply security to cover expected disruption. Should governments require more supply security than market delivers, additional measures will be needed

Concern over future mix of petroleum product demand for transport

- Can see transition pathways for land/sea transport but not air travel (yet)
- Air travel industry still forecasting substantial growth
- Crude oil refining can't only produce jet fuel – is this going to work?



Future outlook

Investment – concern is not so much investment to sustain supply but what is the industry going to look like if it can't invest with confidence knowing those assets will have value in 10 or 20 years time

Oil product mix – Crude oil and the refining process creates a range of products. If some decline rapidly and other grow, supply chains will be under stress

Trade – Open global energy supply chains support efficient, flexible and resilient energy markets. It allows efficient response to changing demand (e.g. LNG developments). Open information exchanges will support this flow.

Time – Supply change happens quickly to meet TGT/2DS scenarios. Window for change is next five to ten years with any delay making the energy transition more challenging