

**Market
Fundamentals**

Fuel

**Competition
& Commercial**

**Policy and
Regulation**

Disrupting the Disruptors (by Just Sticking to the Fundamentals)

Mike Thomas

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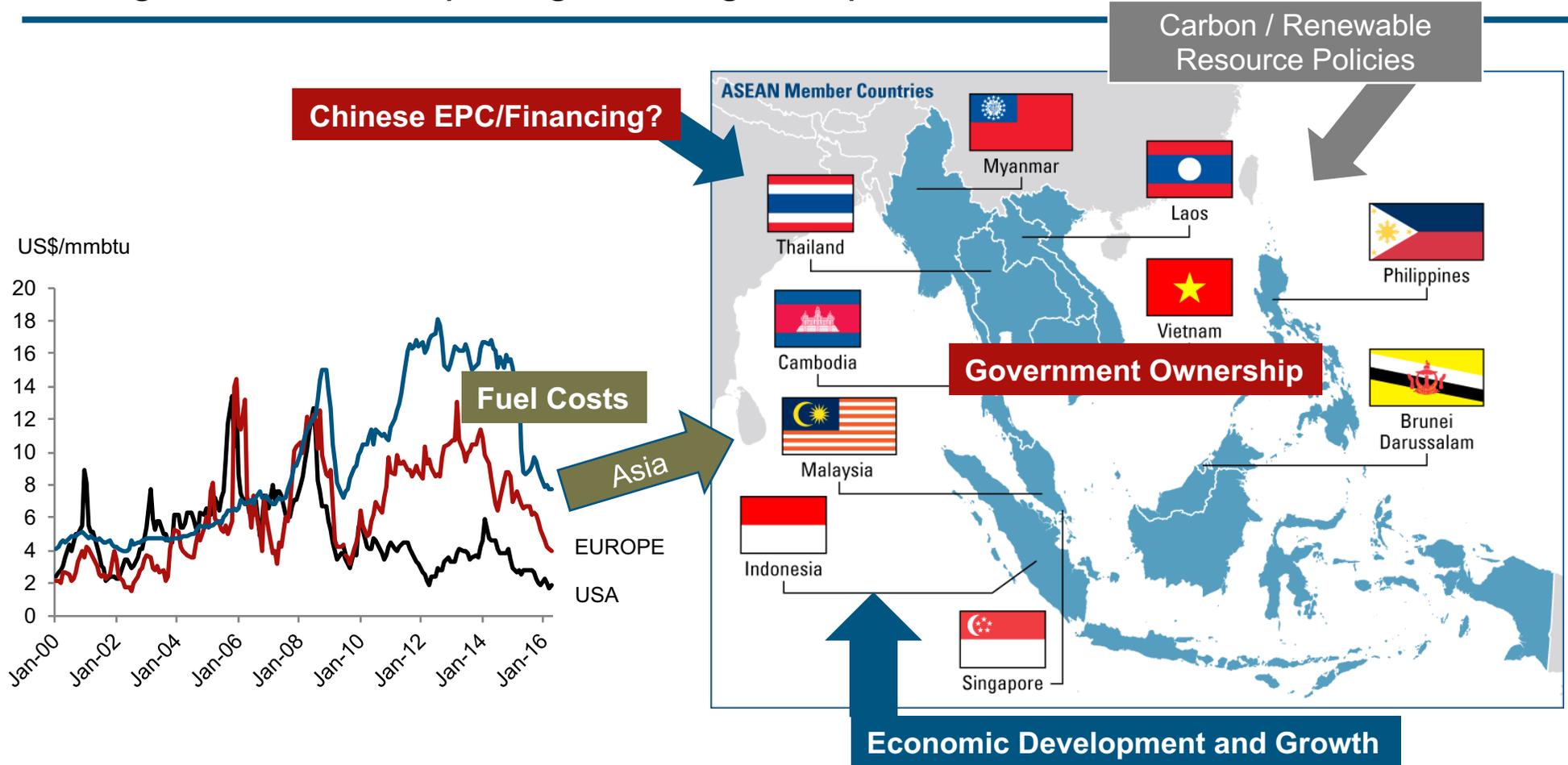
Three (quick) parts

- It's hard in the real world
- Most of what people call “disruptive” is simply “complex” and needs to be understood
- The most disruptive aspect of the power sector is policy and regulation -- which is often either unpredictable or arbitrary
- Strategy is about being flexible and opportunistic

The part where we talk about how hard it is
out there in the real world....

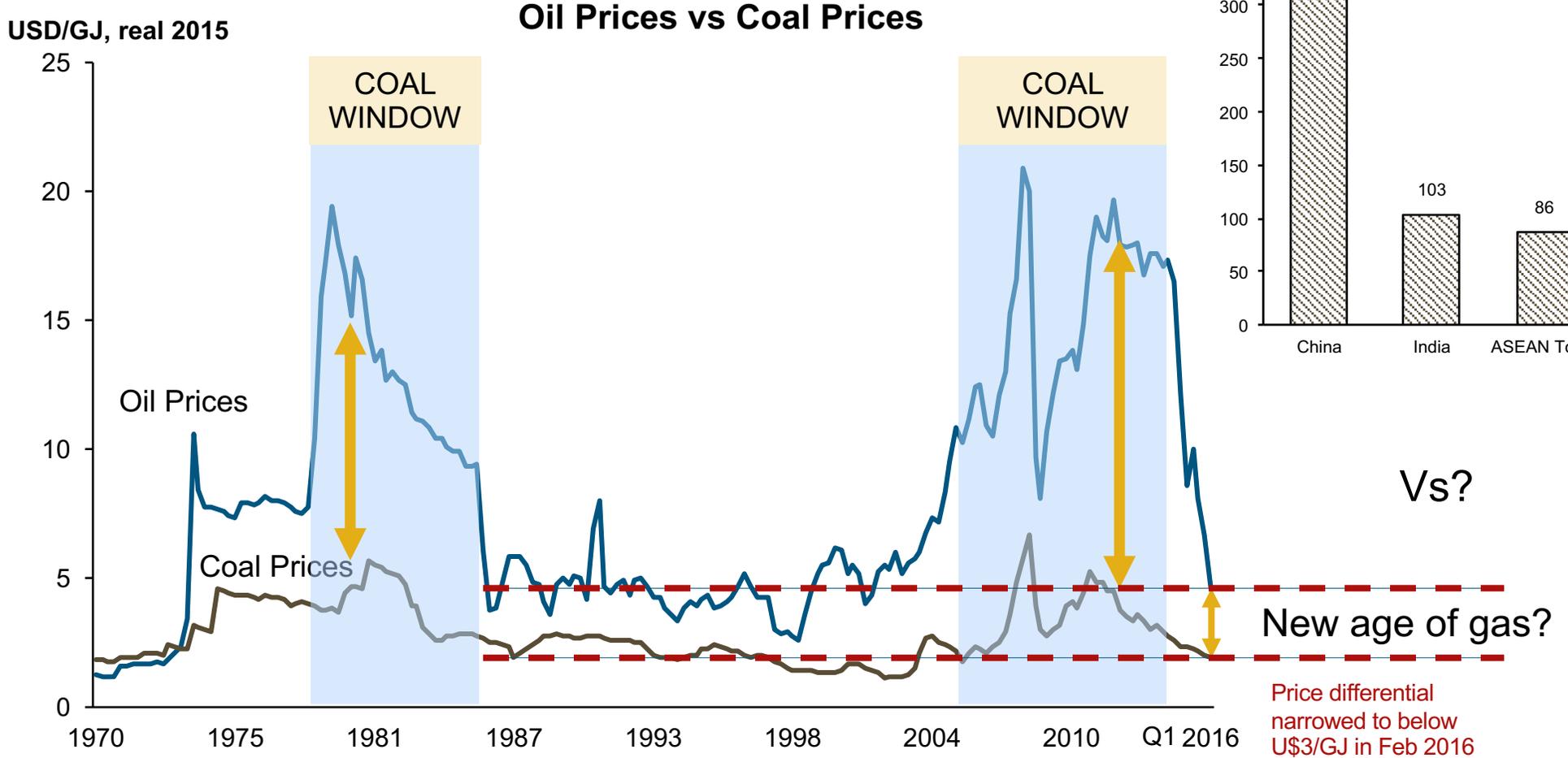
Part 1

Strong forces at work posing challenges to power sector stakeholders



Given these pressures, how would you respond?

Do you build coal or gas or both or neither?



Note: Crude price 1970-1979 Saudi Arabian Light, 1979-present Brent; Coal price Newcastle
 Source: World Bank; TLG analysis

Do you spend the money / propose cleaner technologies, or do you go for absolute least cost based on lower standards found in many Asian countries?

- **CHINA:** has some of the most stringent emission standards for coal plants in the world, and is routinely achieving them (or better) using latest technology

SO ₂ (mg/m ³)	NO _x (mg/m ³)	Particulate matter (mg/m ³)
<=35	<=50	<=10

Source: Ministry of Environmental Protection of the People's Republic of China

But few other countries are pushing as hard

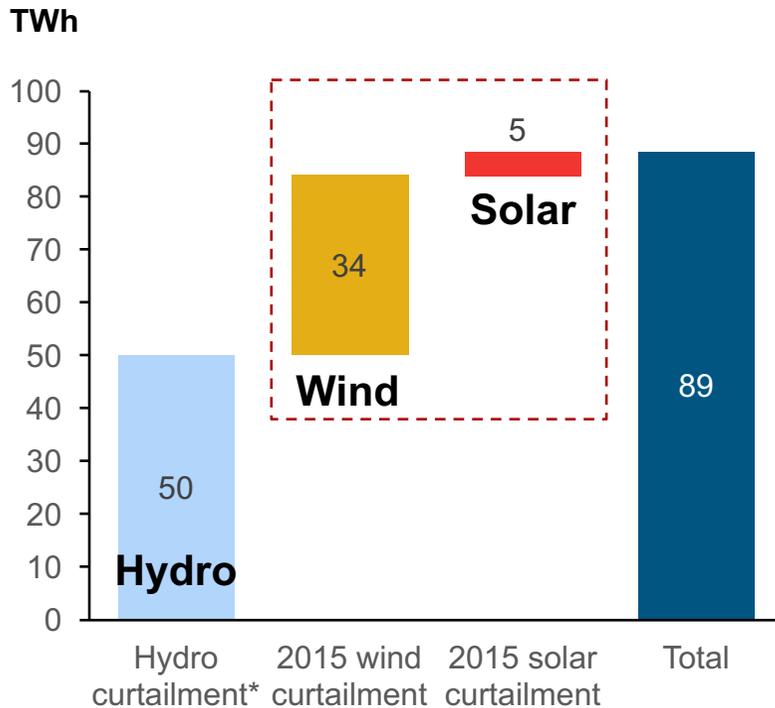
- **PHILIPPINES** (for example), set emission standards in the Clean Air Act of 1999 and hasn't made any adjustment to date.

SO ₂ (mg/m ³)	NO _x (mg/m ³)	Particulate matter (mg/m ³)
Existing plants		
1,500	1,500	150
New plants		
700	1,000	150

Source: Department of Environment and Natural Resources

If you build it, will it operate as expected? (Example: Curtailment in China)

RE Curtailed TWhs in China



Powering Down: Chinese Electricity Demand Stalls Amid Slowing Growth

China Electricity Demand Slows, Coal Consumption Drops, Hits Australia Hard

China wind energy groups cry foul over grid curbs

Total curtailment amount in 2015 is equivalent to **2x Singapore's power consumption**

China RE investors have no contractual protection from curtailment or dispatch below expectation

Are you able to respond to your customers? Or will someone else?

Hello, this is Big Sexy Technology Leader Customer, we would like to speak with someone about green energy

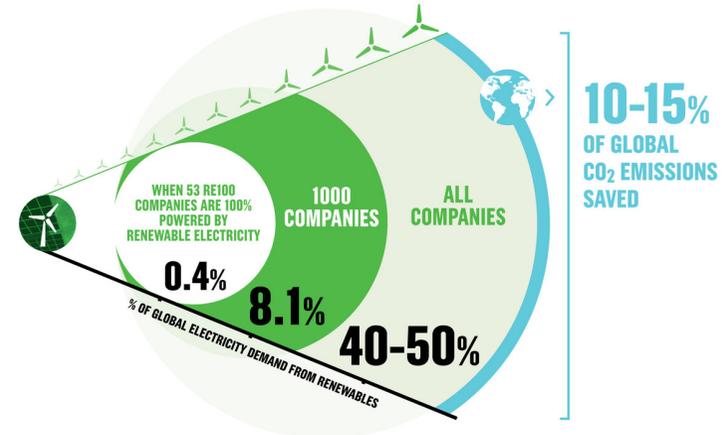
We don't have a tariff for green energy

Some end-users are seeking change to fit their global branding

I don't understand. We want to buy green energy and we are happy to pay for it.

We do generate some electricity from green sources like solar, wind, hydro, and geothermal, but we don't sell it or contract it out.

RE 100 | HOW BUSINESSES ARE POWERING A LOW CARBON ECONOMY



We would like you to build a wind farm to supply our facility buy some

Sorry we have never done a special deal with a customer like that, we'll have to get back to you. We're

Ok, we'll call you tomorrow

But it will take us a year to decide what to do....

#RE100

*Not to scale

Find out more at TheRE100.org

RE 100

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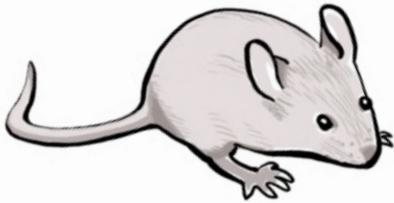
What risks exist in ever-changing government and regulatory policies?

- Singapore's underutilised LNG terminal and the associated inducements to develop generation capacity to use the terminal
- Western Australia's highly remunerative (badly designed) capacity mechanism
- European experience with feed-in tariffs and the associated massive loss of shareholder value
- China's massive over-capacity as if growth has not slowed down
- Eastern Australia's massive renewable energy build-out and associated impact on the wholesale market
- California's "duck curve"
- The inequitable distortions arising when combining net metering with pure volumetric tariffs
- Cross subsidised tariffs that enable "cherry picking" by new entrants
- Government fascination with fuel mix targets

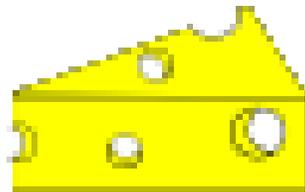
Such risks arguably increase when growth slows or supply is in excess
(a clear need for power tends to support more robust commercial arrangements)

Are you exposed to risks associated with tariff structures and net metering?

- What if the reduction in costs enjoyed by a customer who installs rooftop solar panels or behind-the-meter generation (DERs) exceeds the reduction in costs experienced by the power system overall?
- **Someone has to make up the difference!**
- Tariff design matters



Net Metering
Customer



Hidden Net Metering
Subsidy

Invoice

Other
Customers

Few (if any) of these challenges disrupt the *industry* -- but all affect the players in the industry

	Opportunity	Response
Traditional	Growing	Developing new projects to meet growth
	Operating	Operating power stations or networks
	Privatising	Selling off formerly government-controlled assets
	Financing	Making the deal possible
Newer	Displacing	Responding to fuel market shifts
	Improving	Refurbishing or repowering existing assets
	Swapping	Buying / selling stakes in assets to build or adjust portfolios
	Cleaning	Seeking opportunities in emission reduction or RE development
	Connecting	Providing network support or investment in network components
	Trimming	Helping customers manage energy usage
	Balancing	Providing ancillary services

These challenges are real – but why aren't they “disruptive”

If everything is “disruptive” then disruption means nothing – drawing a distinction between disruptive and challenging

What is Disruption?

- “Disruption” describes a process whereby a **smaller company with fewer resources is able to successfully challenge established incumbent businesses.**
- Specifically, as incumbents focus on improving their products and services for their most demanding (and usually most profitable) customers, they exceed the needs of some segments and ignore the needs of others.
- Entrants that prove disruptive begin by successfully targeting those overlooked segments, gaining a foothold by delivering more-suitable functionality—frequently at a lower price. Incumbents, chasing higher profitability in more-demanding segments, tend not to respond vigorously.
- Entrants then move upmarket, delivering the performance that incumbents’ mainstream customers require, while preserving the advantages that drove their early success. When mainstream customers start adopting the entrants’ offerings in volume, disruption has occurred.”

<https://hbr.org/2015/12/what-is-disruptive-innovation>

This definition of “disruption” does not fit most of the (new) challenges facing the utility industry

Other types of disruption

- Things that are together that do not need to be together – and thus may someday be separated
 - Generation vs Networks
 - The sale of electricity vs the sale of “green electricity”
 - Electricity tariffs and social policy regarding energy poverty and industry support
- Common standards that do not necessarily need to be common
 - Uniform price across a disparate region
 - Uniform price despite materially different usage characteristics
 - Uniform (minimum) level of reliability that exceeds customers willingness to pay
- Things that are not always integrated but really should be integrated
 - Energy market supply and demand and pricing incentives vs renewable energy support policies
 - Fuel markets and energy markets

The possible separating of things that do not need to be combined, and the combining of things that should be integrated are constant sources of regulatory and policy tension

Most “new” technologies create ways to solve problems better or faster – giving industry players more tools to master and manage

- Creating capability to recover from policy-exacerbated “duck” curves
 - New opportunities for storage and flexibility
 - Monitoring, predicting, influencing demand / Enabling and supporting faster response supply
- Enabling demand response that reduce the cost of “missing money” problems
 - by supporting more diverse array of resource availability that can be developed and put to use much more quickly than a new power stations or network components can be built
- Improving forecasting and awareness to improve integration of intermittent resources
 - Forecasts closer to real time that can be acted on, are inherently more accurate
- Enhancing the robustness of demand forecasts
 - Would you want to invest on a demand forecast that had huge hidden demand response or energy efficiency conversion potential underneath it?

Whether utilities or IPPs or networks do these things depends a lot of regulation and policy

Hundreds of new players are carving new niches in the market, but they enhance, not disrupt, the core utility business and the end-user experience

Energy optimization

Customer Bill savings



Operations improvement



Energy Efficiency



Again – more tools and information and resources and expertise to integrate into the traditional production and distribution paradigms

Big Data is also about making practical use of information previously not available or not able to be processed and interpreted within a useful time frame

It needs to be fit for purpose

Veracity



Volume

Many sources, Collected frequently



4 Vs of Big Data

(IBM 2014)

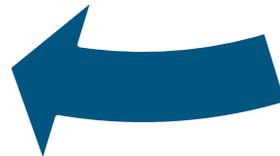


Variety

We can now mash up Data from different sources to create (even) richer information

Velocity

We want to speed up the process of gaining insight or informing decisions



Some new technologies have disruptive potential, but mainly through the interaction of renewable energy and carbon policy due to much higher cost...

- Solar today is similar in cost to oil-based peaking in Asia – and so it is “economic” when that is the competition
 - Solar + batteries are (often) on the order of three to four times more expensive than a least cost combination of coal plus natural gas in Asia for “full load profile and reliability equivalence”
 - Four times is a lot of bananas.
- So – disruption from solar + batteries is only possible to the extent that a grid-connected customer is willing to sacrifice substantial reliability
 - Or to the extent the customer free-rides on network support....
- If customers truly are willing to reduce their reliability and alter their usage materially, then solar+batteries will be more disruptive, (or more disruptive more quickly)
 - But most adopters remain attached to the central grid – potentially free-riding on a substantial backup insurance policy

Most of the smartest benefits come from smarter pricing – which may require regulatory or policy approval (or market-based systems)

- Enabling active or passive response
 - A way to transmit a condition or state to someone or something that can respond to it
- More granular pricing of energy and ancillary services
 - More frequent prices / time of use
 - Co-optimisation of ancillary services / causer pays
 - Prices for valuable attributes or services
 - Payments to capabilities that are scarce (and thus cannot be taken for granted)
- More fixed pricing of network access
 - Less avoidability and value–shifting
 - More customisation based on services required
- More refined contracting and trading

- Information creates value if it can answer questions
 - What is happening?
 - What actions can I / should I take?
 - Why did something happen?
 - What could happen that I should prepare for?

IBM (2014)

**Smart Means:
Value Creation Not
Value Transfer**

**The changes in regulation and policy
needed to support smarter pricing
can be very disruptive**

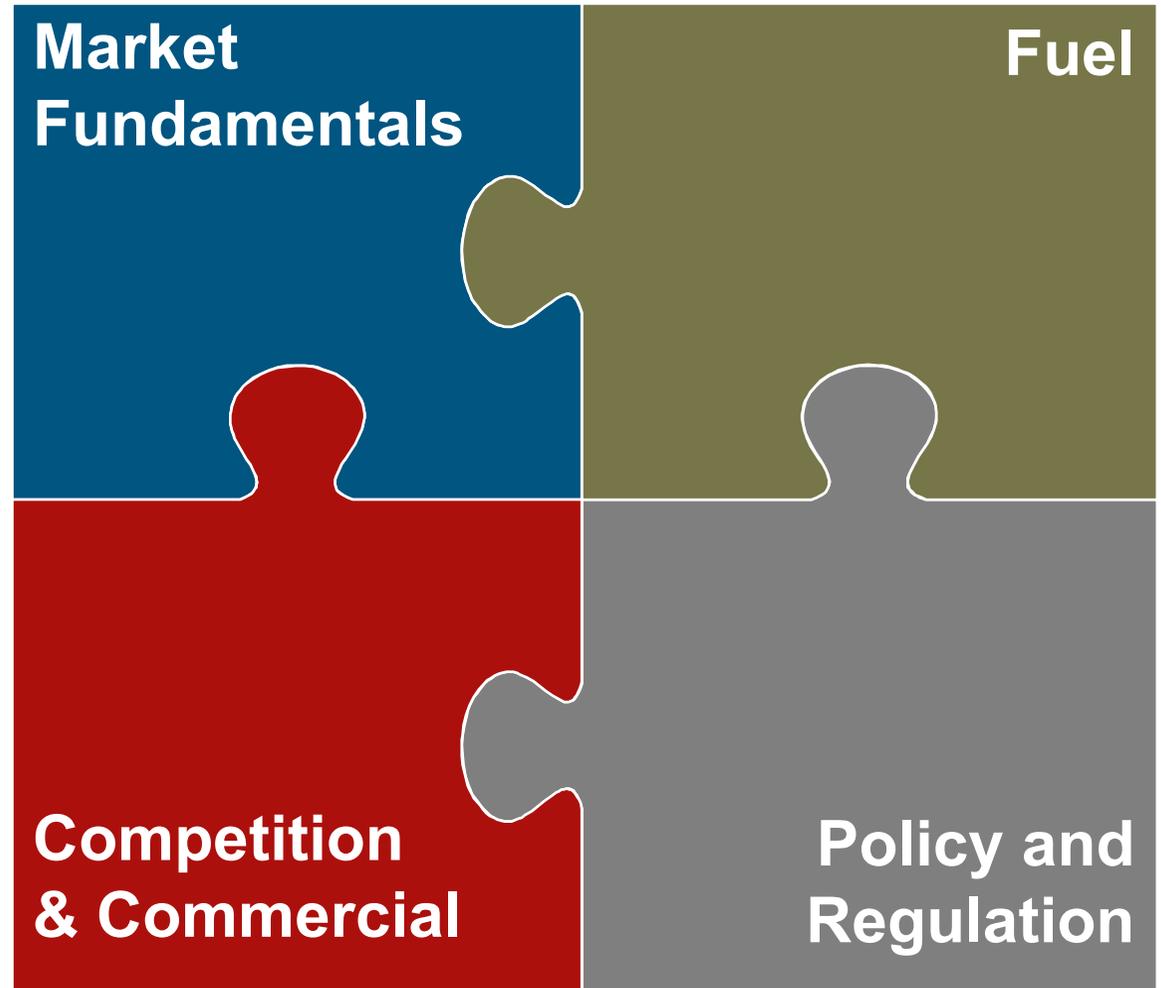
Where are we (at risk of) getting smart benefits wrong -- thus causing future problems...

- Technology incentivisation is a sensitive area – difficult to get right
 - Network tariff avoidance – is that really the prudent way to support technology development?
 - Efficiency benefits of really large new advanced power stations that (elsewhere) impose ancillary services costs on the system which are paid for by other stakeholders
- Environmental regulation (particularly fuel mix targets and RE policies)
 - Fuel supply constraints or fuel diversification policies to shift to renewables or natural gas at prices that are much higher than the underlying emissions related opportunity costs
 - Net metering with volumetric (fully avoidable tariffs)
- Reliability of supply
 - Is it worth it to networks to continue providing equivalent reliability to all customers even when the customers are not paying for it?
- Generation / Network boundary
 - What options are available to deal with network constraints and are these efficient

Conclusions

At the end of the day, we fall back on TLG’s “Four Lenses” to monitor each market for fundamentals, risks, and emerging shift factors

- **Market fundamentals**
 - Supply and demand balance
 - Economic and electricity sector growth rate and drivers
- **Fuel**
 - Generation economics by fuel type
 - Fuel availability and pricing issues
- **Policy & Regulation**
 - Policy and regulatory context
 - Reform or other regulatory issues
- **Competition & Commercial**
 - Nature of commercial environment
 - Degree of competition
 - Financing issues / insights

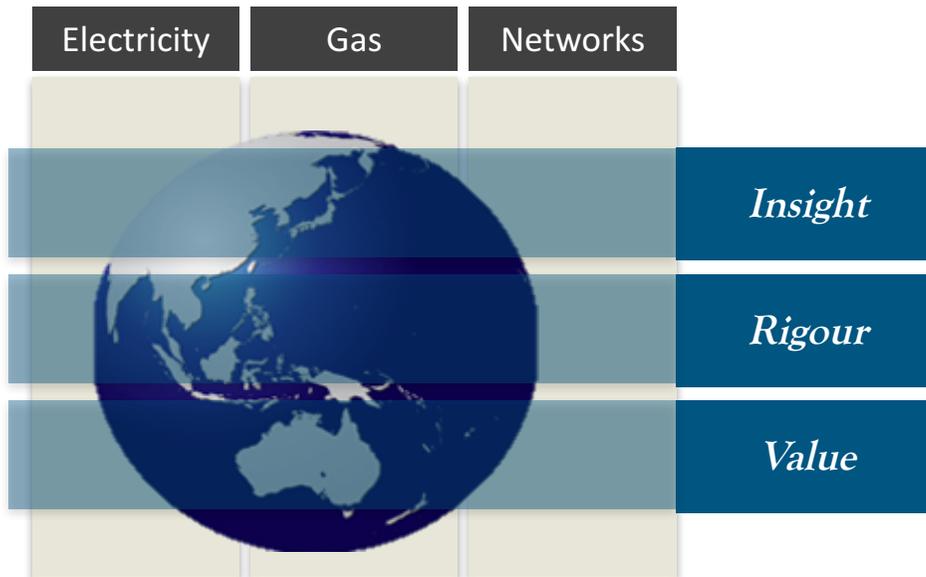


Opportunity is....opportunistic

- If the risk is broadly unpredictable, then diversification or avoidance are the only strategies
- If the risk can be identified but not mitigated directly, then regulatory and policy engagement are crucial
- If the risk is associated with pricing or tariffs that is not based on fundamentals, then be wary of regulatory risk, as the foundation is built on sand.
- If the risk is related to lack of awareness of what customers value and what they will pay for, then a transformation is likely required or someone else will figure it out.
- If the timing of the risk is unpredictable but the direction or nature is clear, then identify markers and thresholds or triggers to watch for, and be flexible

The best strategies focus on flexibility and responsiveness and keep a close eye on fundamentals

Thank you



For more information please contact us:

Mike THOMAS, Partner
mthomas@lantaugroup.com

By phone
+852 9226 2513 (office)

By mail
4602-4606 Tower 1, Metroplaza
223 Hing Fong Road,
Kwai Fong, Hong Kong

Online
www.lantaugroup.com