Incentivising More Efficient Generation Under Current DOE & DENR Rules

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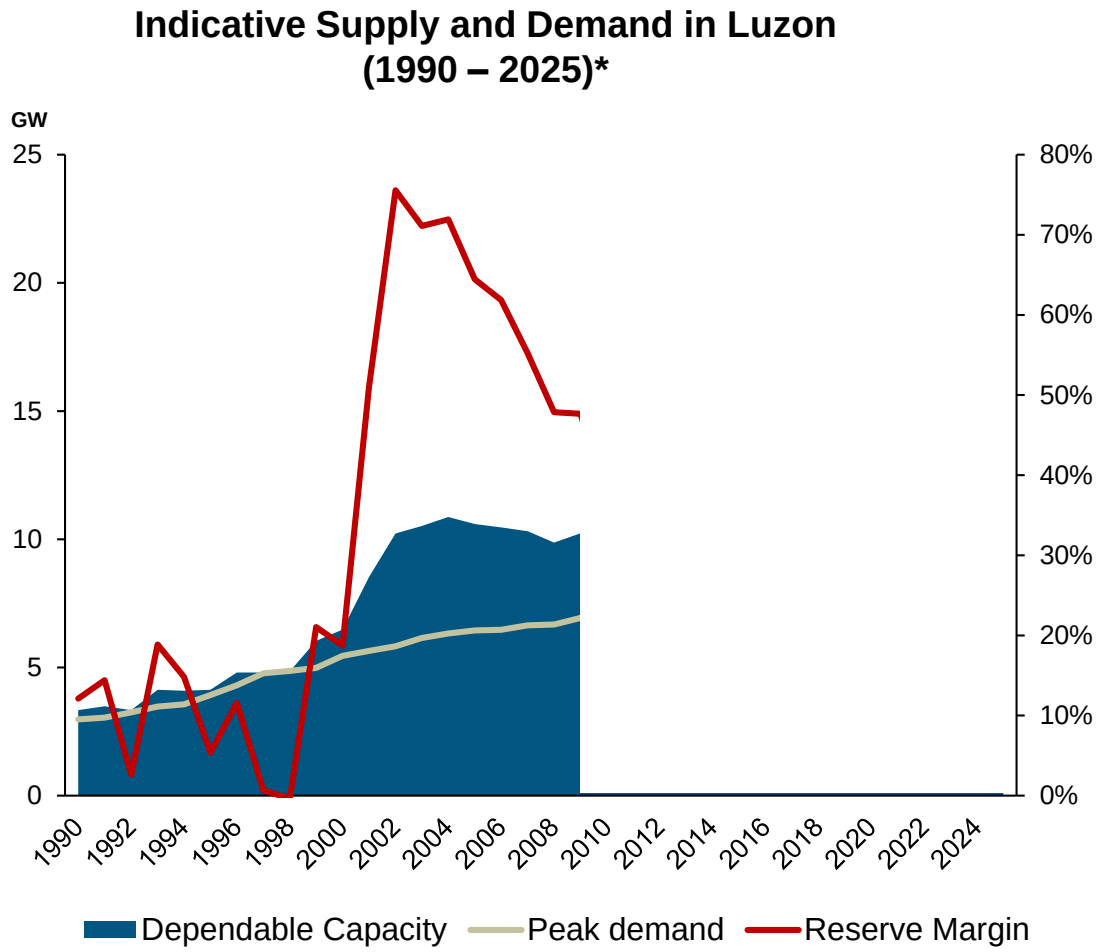
This presentation is about “incentivising efficient generation under DOE and DENR rules”….

.....But what is “efficient” generation?

- The thermal efficiency of the plants – kWh for kJ of fuel put in?
- The capital efficiency of the plants – kW out for $$$ put in?
- The economic efficiency of the plants – kWh out for $$$ put in (and including all the opportunity costs along the way)?
- The environmental efficiency of the plants – emissions out (whatever is put in)?

There are many kinds of efficiency and the focus is often different by different stakeholders

One measure often used of the efficiency of an electricity system is the reserve margin



- When I first started working in the Philippines, back in 2009, we were just coming out of the supply glut caused by the over-build of IPP's in the early 2000's
- The reserve margin was over 50%
- Coal plants were running at low load factors because there was not enough demand for them to run baseload
- Some of the gas plants were banking gas for similar reasons
- And yet still there were complaints that no capacity had been built for nearly 10 years

Source: multiple source, TLG Analysis
This assumes a flat growth rate in demand of 4% over this time frame.

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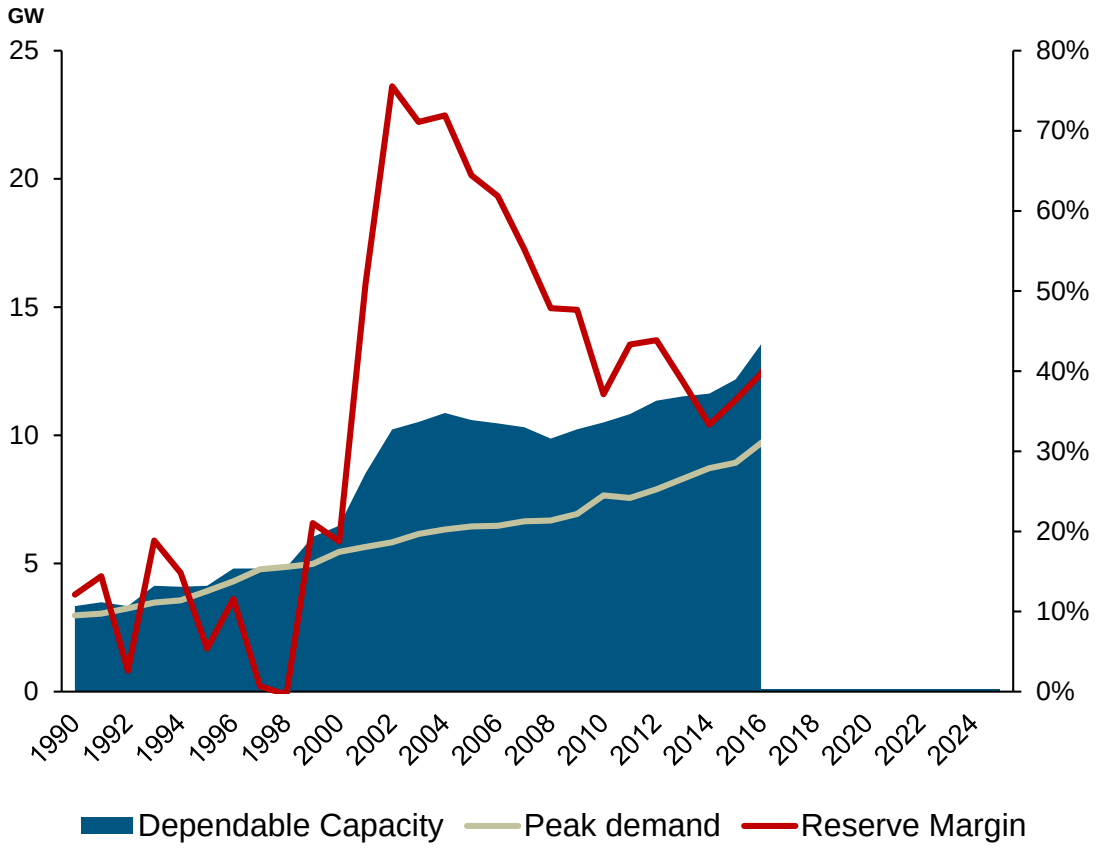
Indicative Supply and Demand in Luzon (1990 – 2025)*



- For the next few years, the capacity margin hovered around 40%
- Demand grew
- Some new plants were built
- It looked like the market was slowing coming back into balance

Source: multiple source, TLG Analysis
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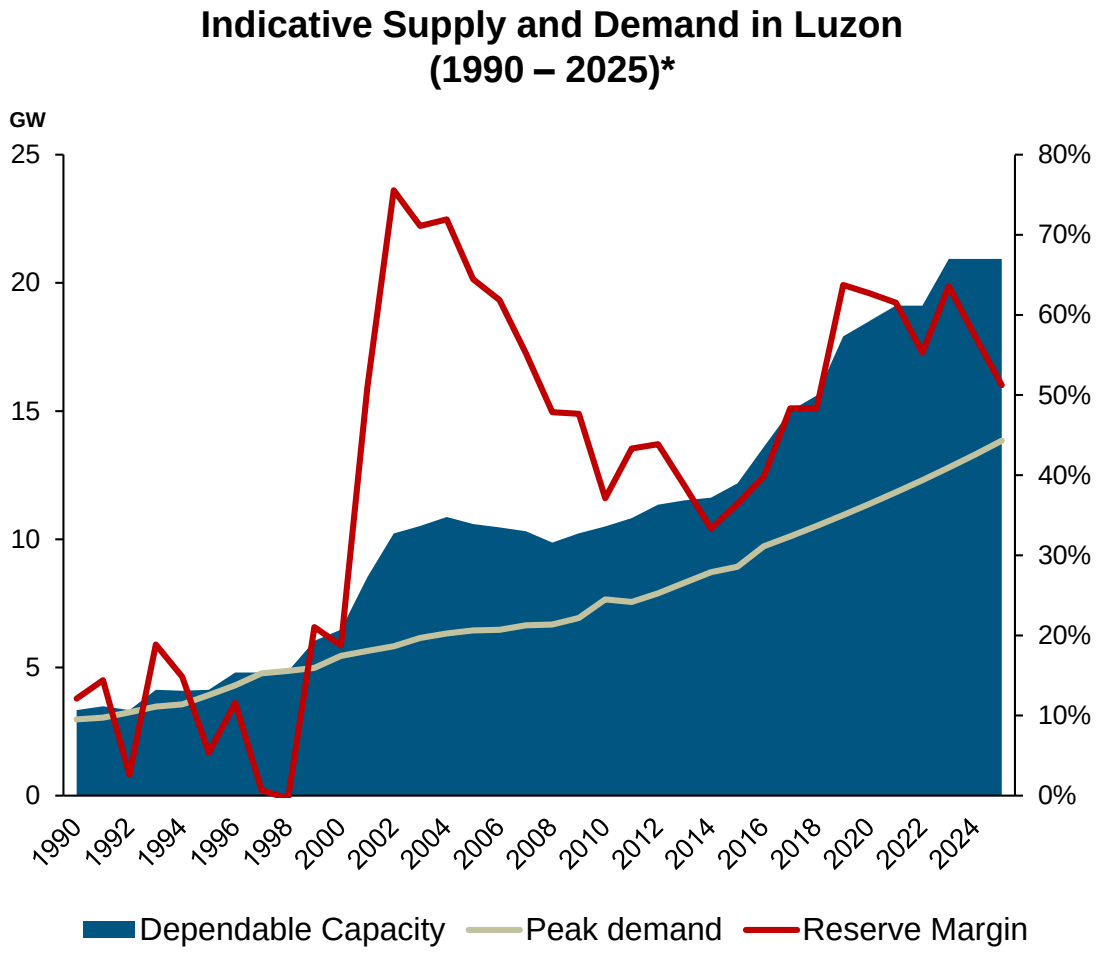

- But the new plants committed and under construction show a return to excess
- Capacity margins are already rising above 60%
- And WESM prices consequently falling

Source: multiple source, TLG Analysis
This assumes a flat growth rate in demand of 4% over this time frame.

Most of this current new capacity is coal

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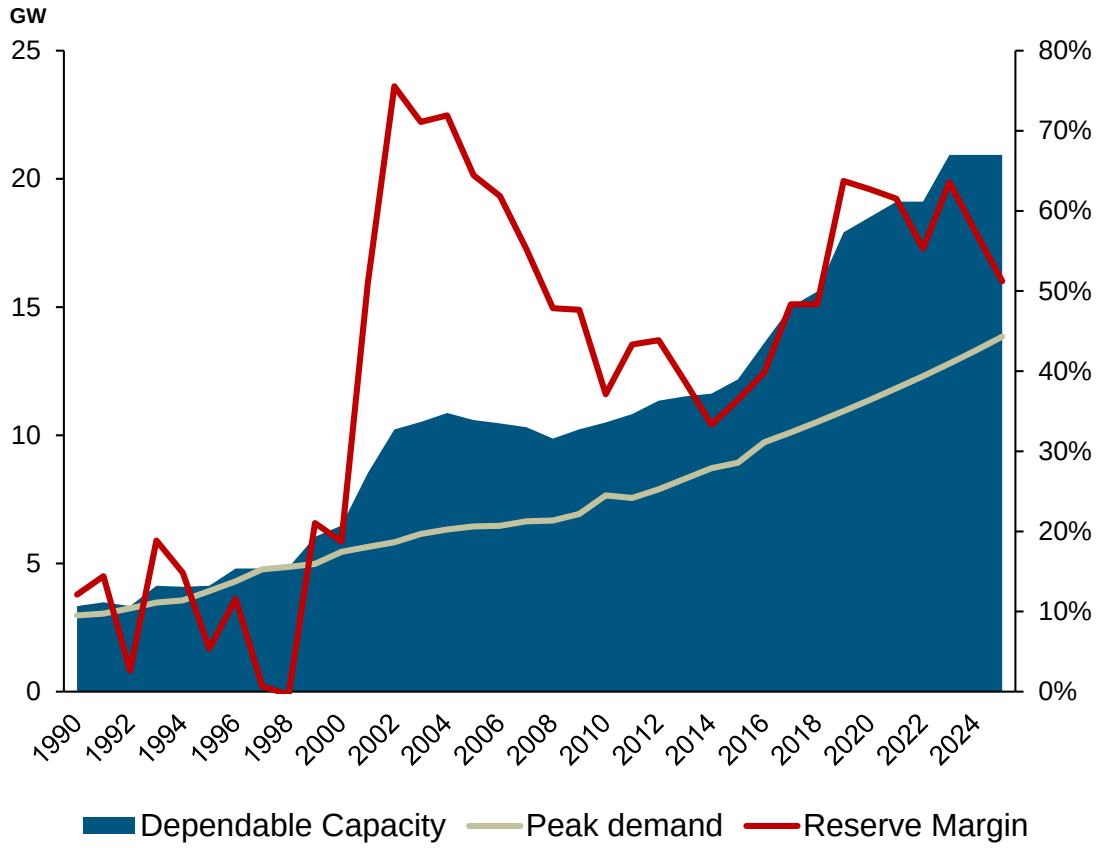

Source: multiple source, TLG Analysis
This assumes a flat growth rate in demand of 4% over this time frame.

Luzon Major Thermal Capacity Additions Scenario**

	CoD	Capacity
SMC Limay Unit 1	2017	138
SMC Limay Unit 2	2017	138
Pabilao Expansion	2017	386
EWC	2017	650
GNPD1	2018	552
Masinloc Expansion	2019	300
SBPL	2019	455
RPE	2019	300
SRPGC	2019	700
GNPD2	2019	552
Atimonan 1	2020	600
Atimonan 2	2021	600
CLPPC	2023	552
MPGC	2023	600
GLEDC	2023	670

Source: DOE, ERC, TLG Analysis

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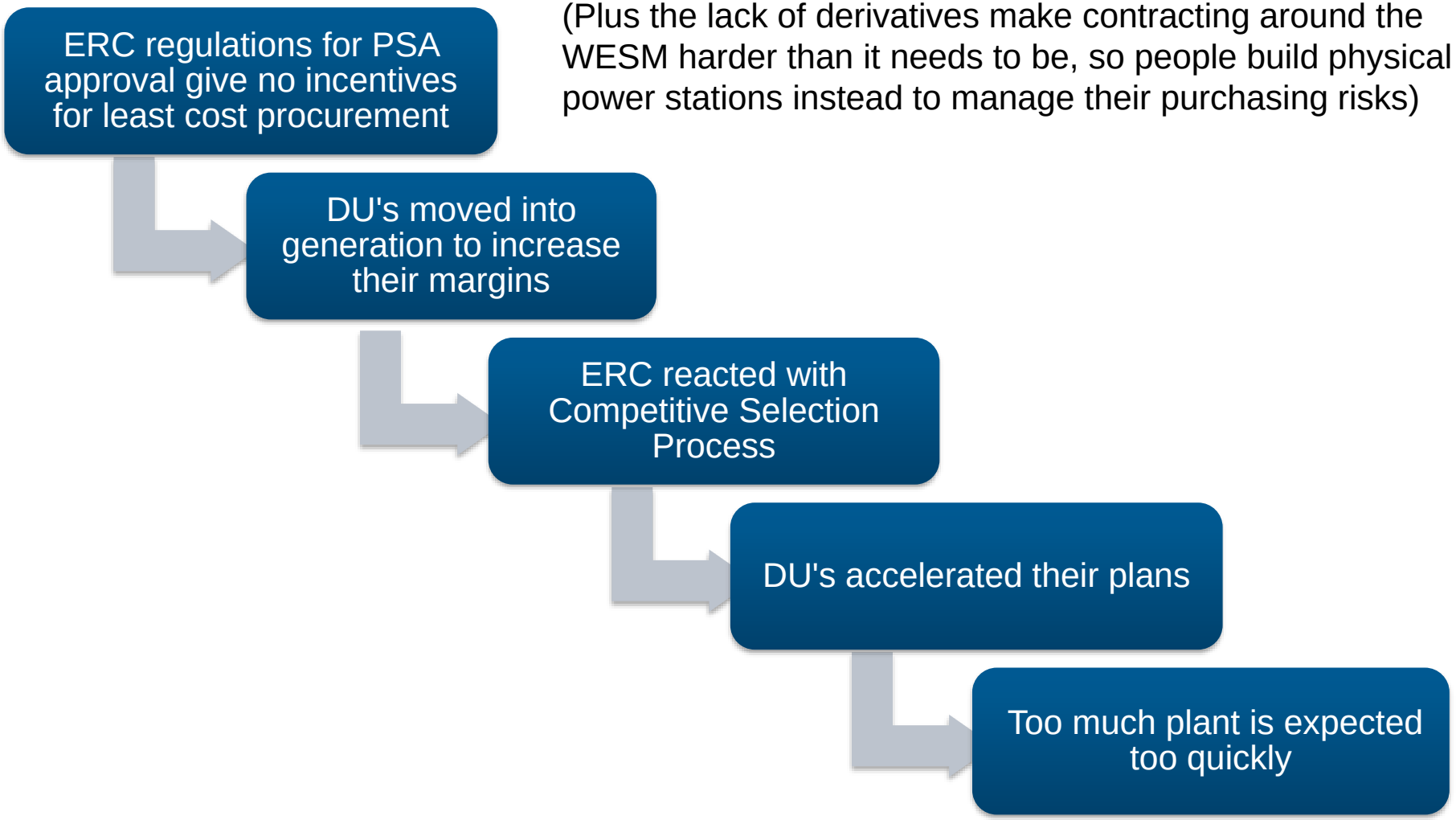
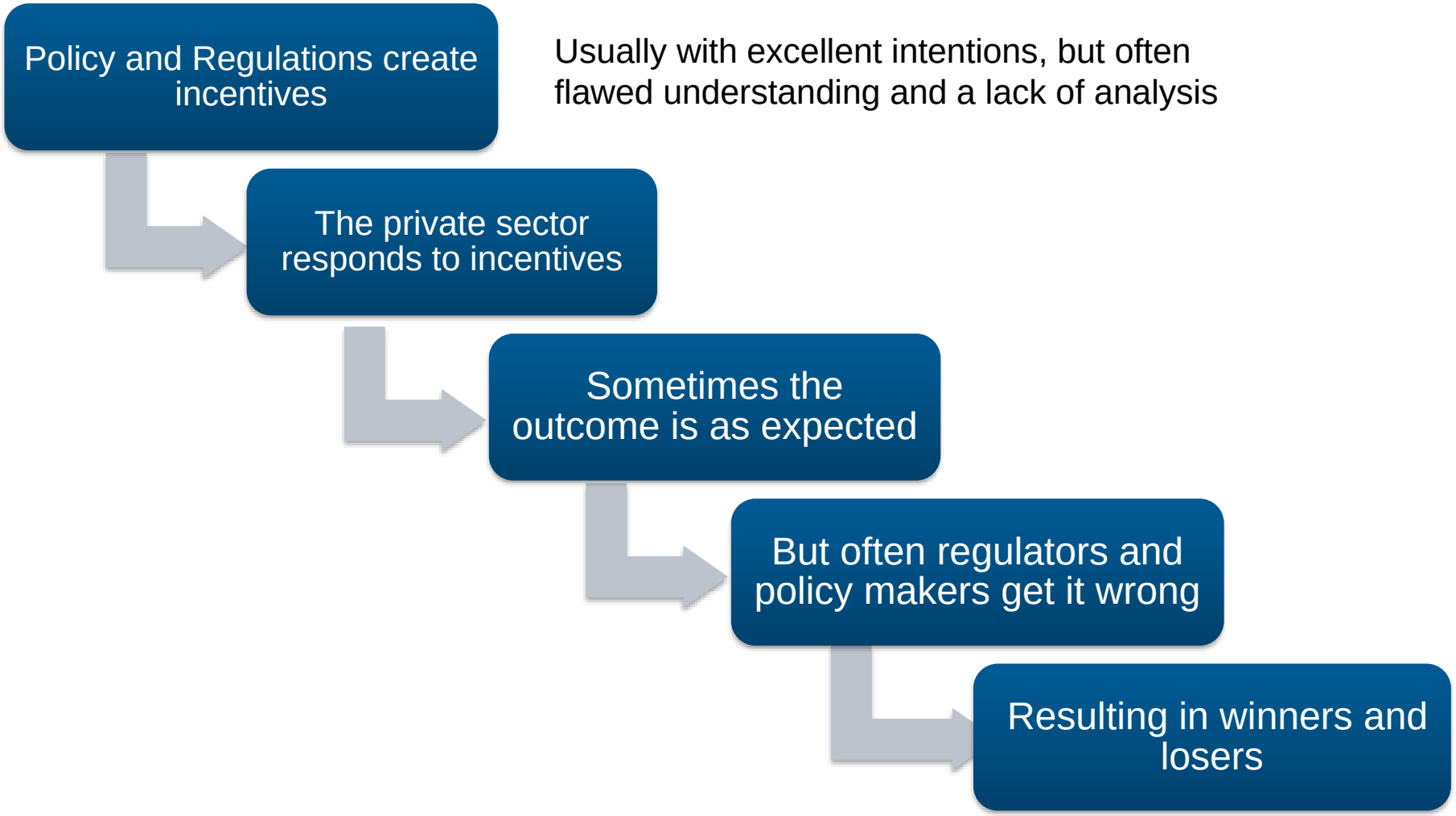
Excessive reserve margins may not be an efficient use of capital: So why has it occurred? This is one plausible explanation:



(Plus the lack of derivatives make contracting around the WESM harder than it needs to be, so people build physical power stations instead to manage their purchasing risks)

Or put another way



Usually with excellent intentions, but often flawed understanding and a lack of analysis

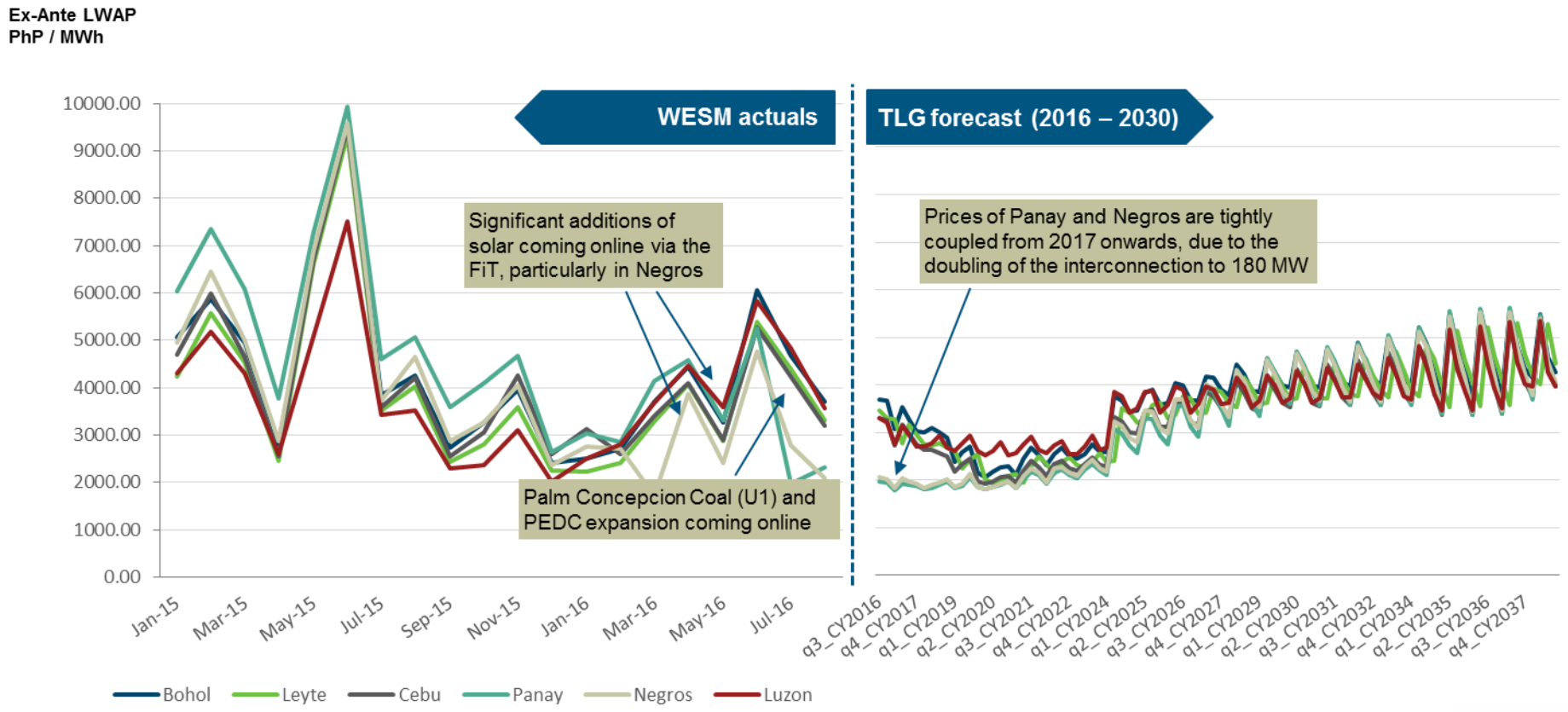
Another example: The Renewable FIT and Panay

- Back in 2009, Panay was the most expensive place to buy power in the Philippines
- Quite sensibly, a number of investors identified this price signal and planned to solve the problem with some coal plants
- Unfortunately, then came the Renewable FIT
  - Implemented as a race
  - With almost no rules
  - And no oversight as to what impact this build might have on the rest of the grid

Now Panay is the lowest priced region on the grid

- And the coal plants cannot run for periods of the day
- A risk caused by Government policy but being borne by the private sector

Price differentials between nodes in WESM sub-grids



Note: Generation price for Panay and load price for the rest of the locations

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But there is no going backwards

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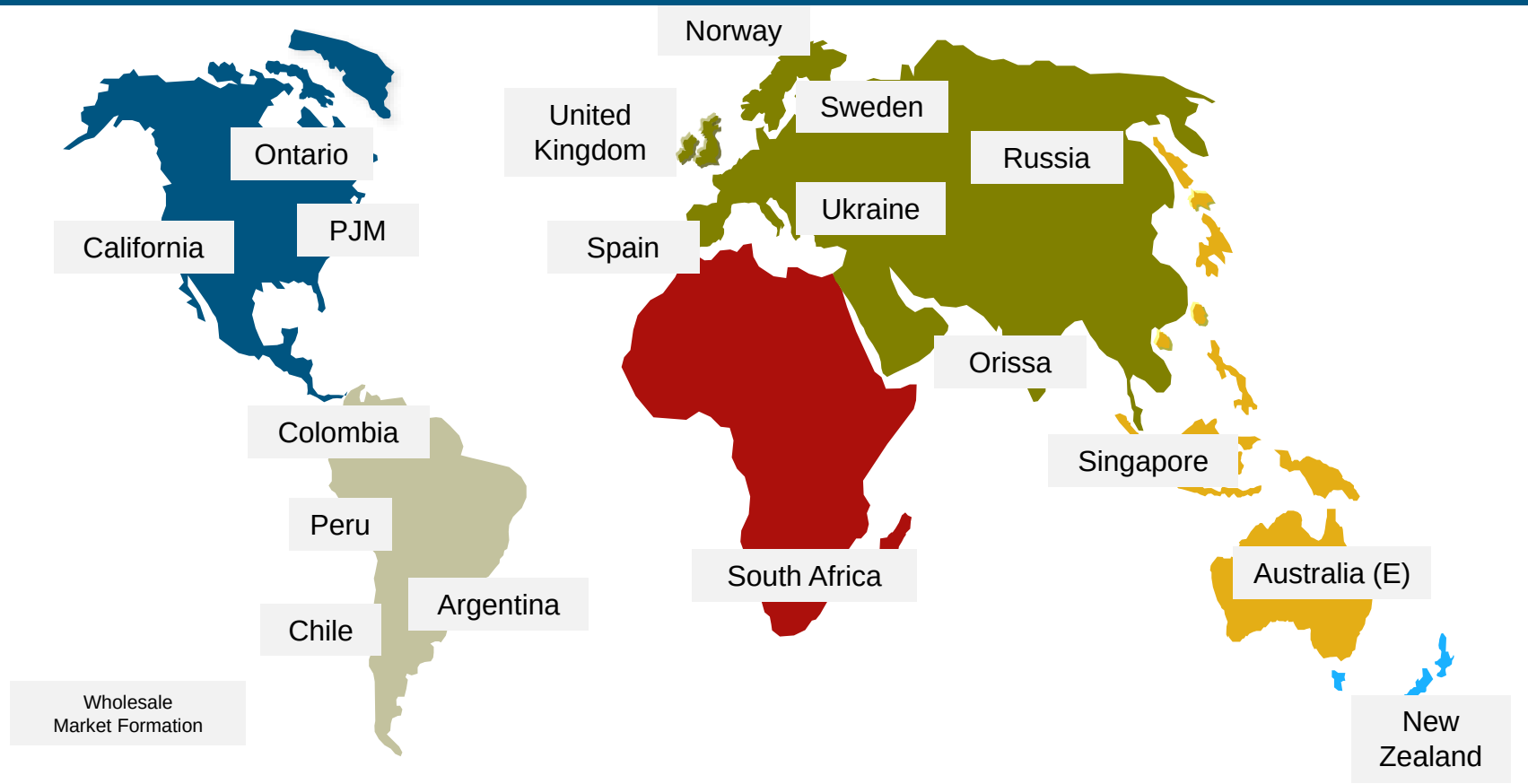
Regulatory and market models have been evolving for over 30 years

The Early Adopters (1980s/90s)



Accommodate **new players**, introduce **competition**, reduce **debt**, and improve **efficiency…**

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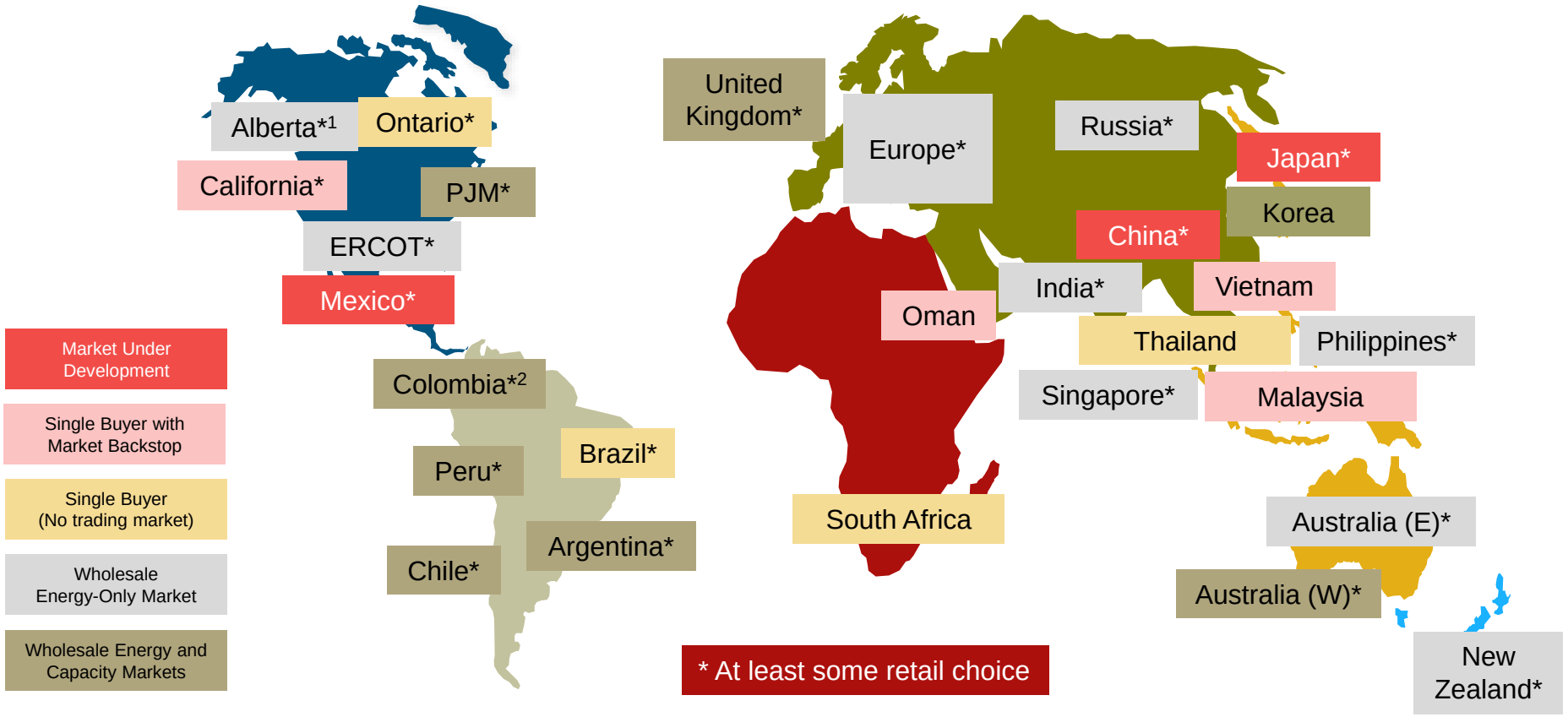
Despite a few failures, the evolution continues….

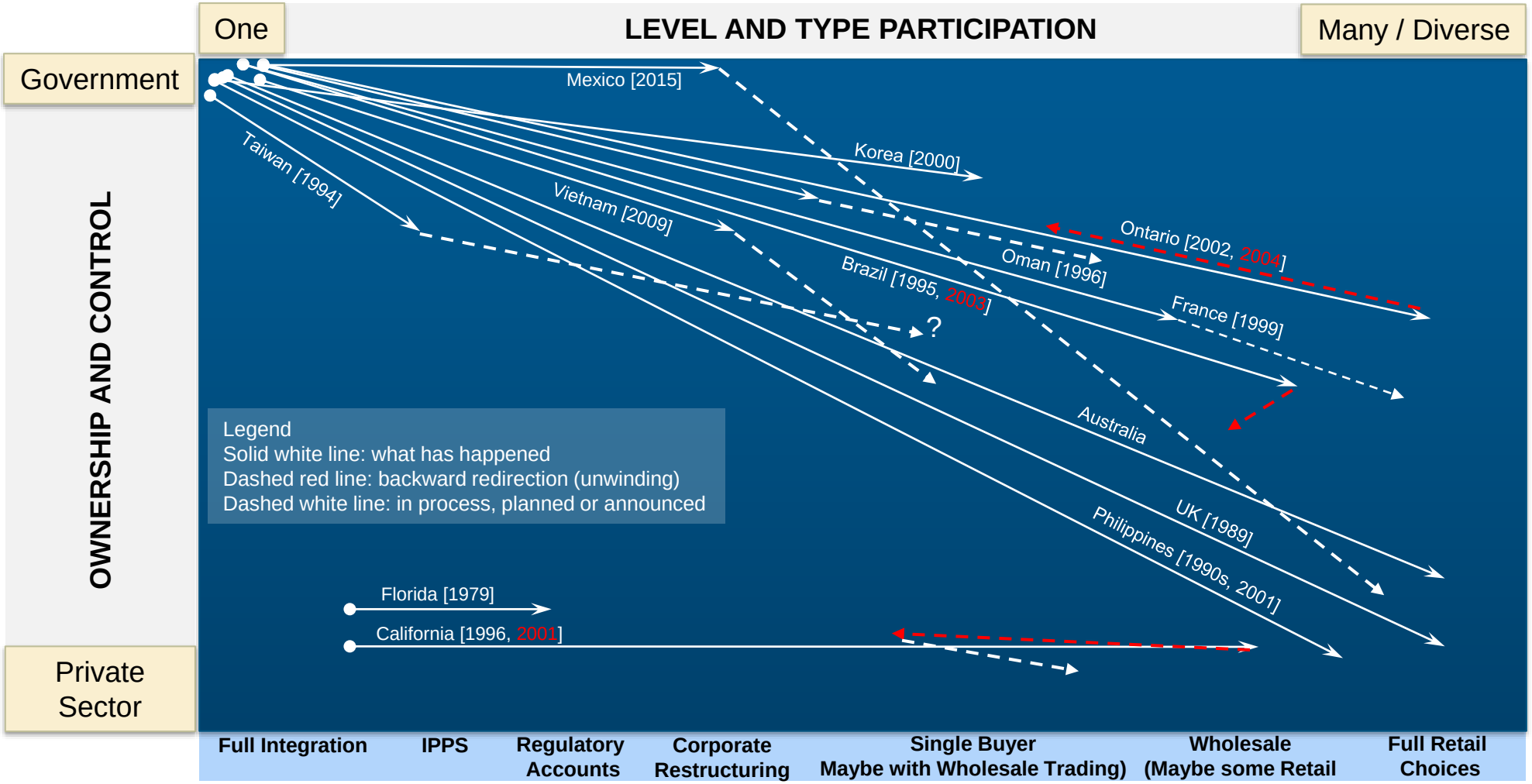
Today: More variety than ever



It has become nearly impossible to satisfy all stakeholders using a traditional monopoly utility model

1 In November 2016 Alberta recently approved AESO's recommendation to develop a capacity market
2 Colombia has a Reliability Charge scheme that replaced the capacity market in 2006

Reforms have meant more private sector participation and more competing decisions and risks…



But so have technology changes. Even if we wanted to, we cannot turn back the clock

But crucially, the electricity industry itself is changing…

More Stakeholders Want "In"

- Renewable energy developers
- Demand response providers
- IPPs

New Technologies

- Smaller scale technologies
- More technology stakeholders
- More differentiating factors
- Rapidly falling costs and performance improvement

Renewable Energy Support Policies

- Generous Feed-in-Tariffs
- Aggressive Renewable Portfolio Standards

Customers Want (or Have) "Choices"

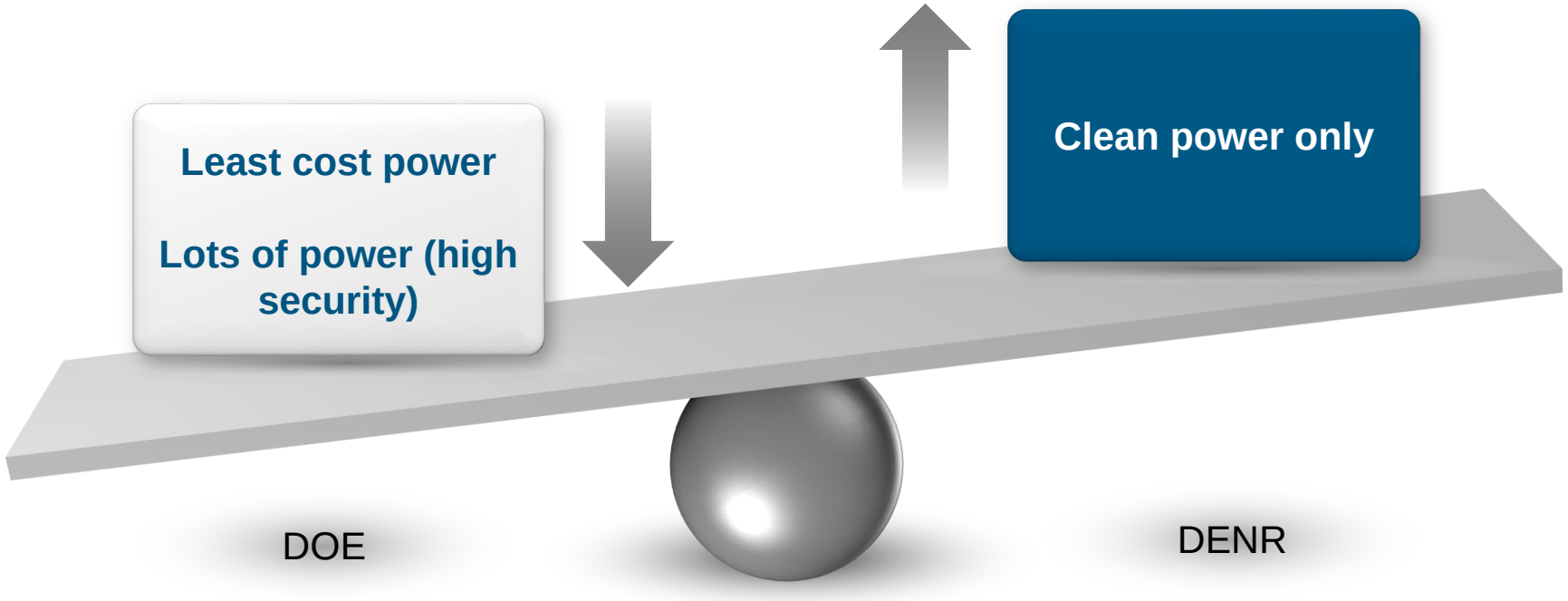
- Ability to use competition to get lower prices from exposed suppliers
- Options for "behind the meter" generation or cogeneration
- Households with options for rooftop solar or (say) Tesla batteries
- Industrials with preferences to contract for renewable energy

Ability to Exploit Poorly Designed Tariffs

- Use distributed energy resources (DERs) to avoid paying for their share of the grid
- Cherry picking of profitable customers

The question is: Are the incumbents, policy makers and regulators and customers ready for this change?

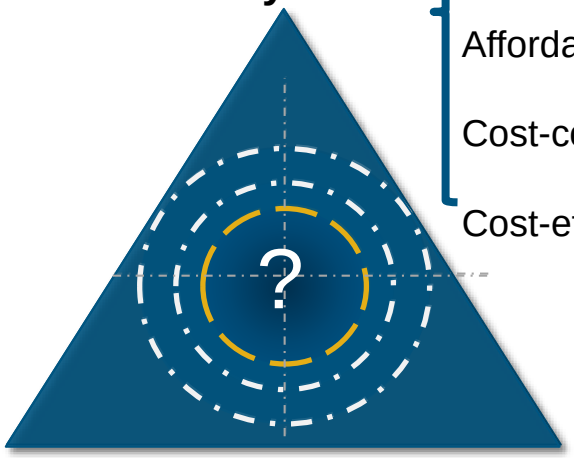
But here almost none of these complexities have entered the debate and ”the Government” position is less than clear!



And we won’t even get started on what the ERC might want…..!

There are many trade-offs – but how to make them?

The result is more complex than a dilemma, it's a trilemma!



Money Costs

- Project investment and operating costs
- System costs
- Affordability
- Cost-competitiveness
- Cost-effectiveness

Environmental Constraints

- Air Emissions
- Water emissions
- Ground emissions
- Other environmental issues

Security of supply

- Risk of losing load
- Price risks

Within this framework, we need to include all the implications – for example land

- A 1000MW coal fired power station would need around 400 hectares of land
- A solar equivalent would need around 4800MW of solar cells plus batteries to achieve the same energy output and reliability as a 1000MW coal power station – needing more than 10x the land area
- Shown approximately to scale on the map

Someone has to pay for it

Least cost generation at the current point in time points to coal for baseload with gas or solar for peaking

- Investments in coal in the Philippines are currently strong despite various pressures against new development

But what is least cost is not a static concept

- Falling gas prices are making gas increasingly competitive even close to baseload
- Falling solar and battery costs look likely to threaten conventional fuels within a reasonable time frame

Clean generator has always meant more expensive

- Polluting is “cheap” – until you price in the externalities of health costs
- Clean coal technology can remove all emissions except carbon but is more expensive than conventional coal and there are no rules in Philippines to incentivise it
- Renewables are increasingly cost effective – but not available all the time

Secure generation now means more than just having enough capacity

- Increasing solar and wind penetration into grids is highlighting the lack of asynchonous support they provide to the system (even with batteries)
- Being dispersed fuels, they require significant investment in transmission
- Gas and coal plant are subject to fuel price fluctuations, so economic security is also important

Finding the path to optimal efficiency is hard

- Traditional energy is not on a par with “new energy”
- The tools we have to compare options are out of date
  - Models that rely on Short Run Marginal Cost frameworks
  - Regulations that ignore the security and environmental implications of different options
- The risks facing proponents is changing
  - Networks and retailers face demand risk from “behind the meter” installations
  - Even newly built solar faces risks from cheaper solar in a few years
- Yet some risks remain the same
  - Fuel prices remain volatile

What constitutes more “efficiency” in this context of competing objectives…..?

Can we keep up with the changes?

- The speed of change is faster than the regulatory cycles and incumbent decision making lifecycles
  - It's already causing disruption, as we saw in the Panay example
  - Can a new thermal plant being planned today be certain they will dispatch in 15 years with the potential for very cheap solar and batteries?

A lot of the competition for the “future” is not actually happening in the energy market….but everywhere else…

- An increasingly involved public - the “prosumer”
  - With access to alternative technologies (some of which are only economic because of pricing distortions)
  - Which needs focus to ensure the (currently reasonably robust) pricing policies do not incentivise rooftop solar when it would be more economic to have utility scale solar
- Just as UBER has changed our transport experiences in Manila, so there are innovations that may change the face of the energy market
  - Peer-to-peer sharing of solar
  - Electric vehicles
  - Consumer “plug and play” batteries

Old models need to adapt; and they need to adapt quickly

Poor policy or technological disruption creates new stakeholders

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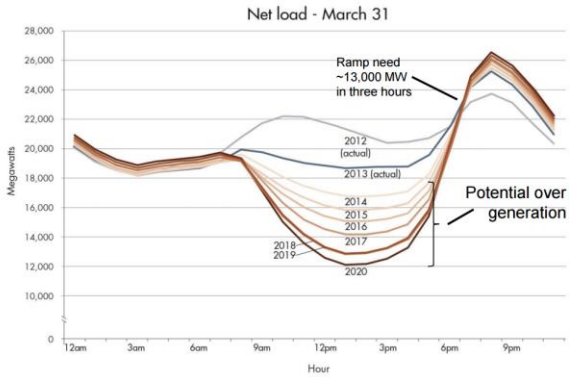

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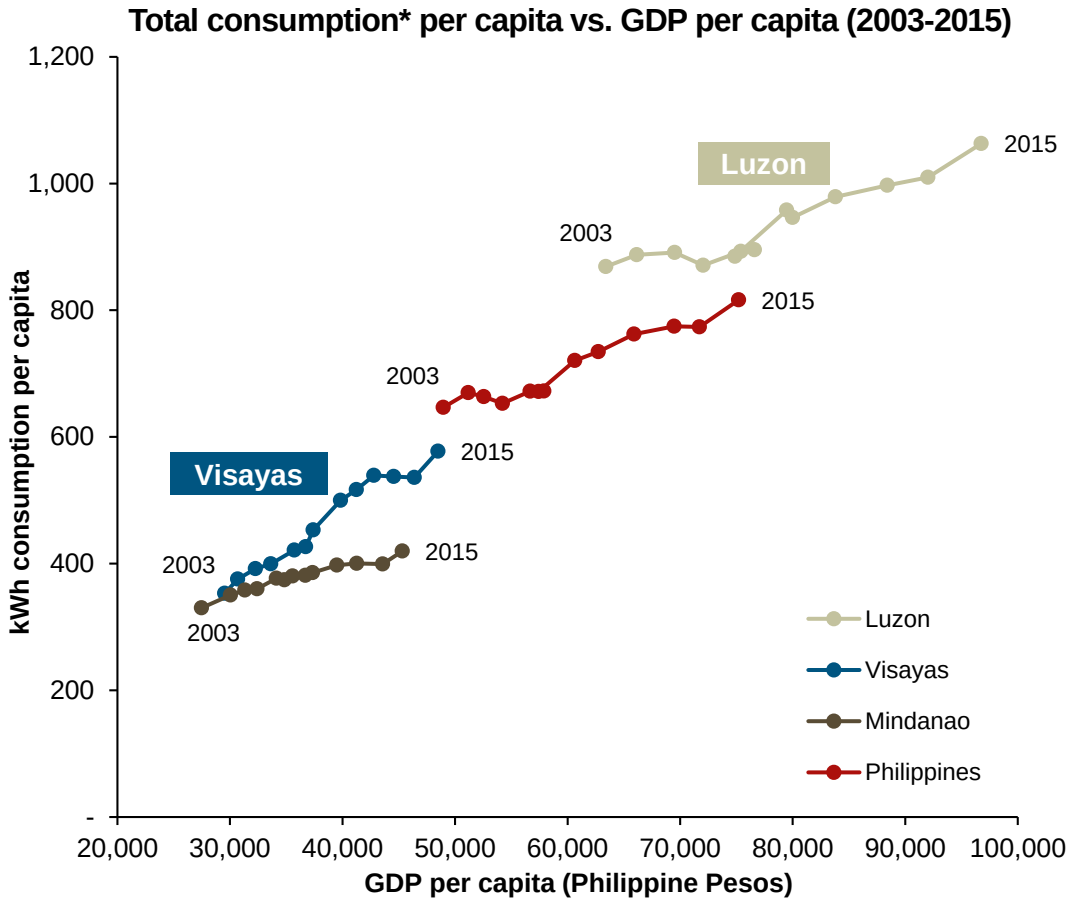
Battery storage

Excess renewable energy creates a market for energy storage solutions

If you dig yourself a big enough hole, someone will develop a ladder !

Its not too late

- Unlike many developed markets, Philippines is still growing and still predicted to grow for a number of years
- Why is this important?
- Because with strong growth, you can “grow out” of mistakes quite quickly



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As long as you do not repeat them!

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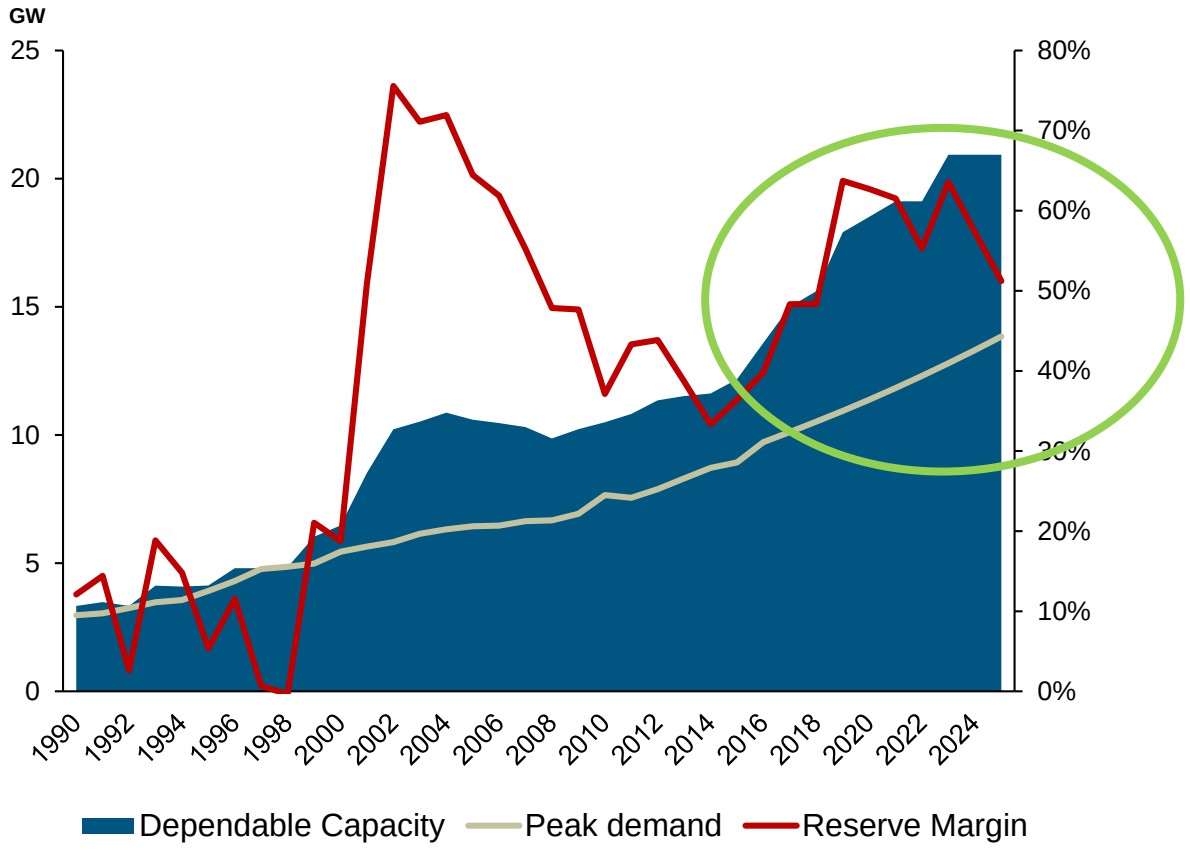


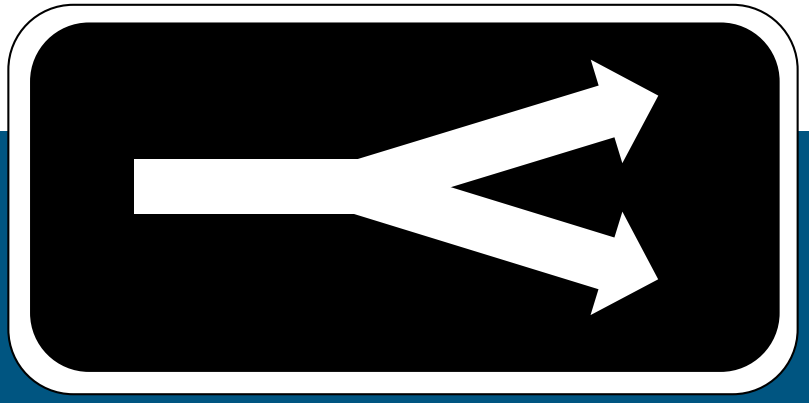
New market; old mistakes!

Source: multiple source, TLG Analysis
This assumes a flat growth rate in demand of 4% over this time frame.

But the implication may be a less “efficient” system

- Excessive renewables too fast lead to duck curves – which result in:
  - Ramping constraints may increase fuel burn and hence fuel costs
  - Additional ancillary services needed to keep the system stable
- Poor tariff policies can lead to excessive rooftop solar and personal storage:
  - Which increase the overall costs of the system compared to utility scale solar and storage
  - (Or flexible gas options in the short term)
- Unclear environmental standards lead to small, inefficient coal plants
  - Which are more expensive, have lower thermal efficiency as well as being dirtier than larger supercritical and clean coal plants
- Lack of focus on economic costs and ”cost based” PSA approvals lead to too much baseload development
  - Which is more expensive than a balanced mix
  - And undermines the case for cleaner, flexible gas

Inefficient outcomes are rarely caused by one thing, but are a combination of many seemingly innocuous regulations and policies



The real challenge is regulation

Regulation can either incentivise an efficient growth in the industry – or hamper it

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The driver of investor success / failure is the **regulatory and policy regime**

Not so Smart

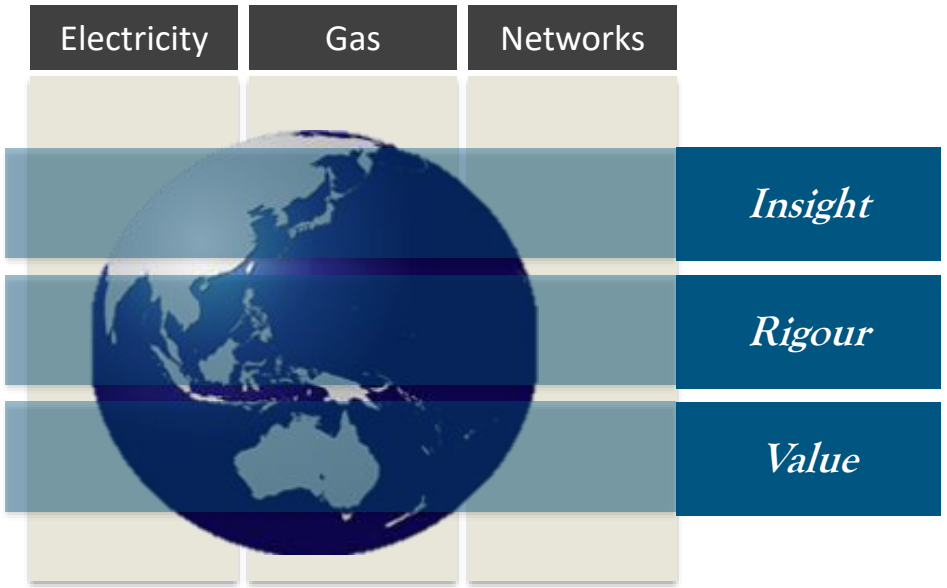
- MY solar panel is partly paid by YOUR increased tariff
- Country's renewable energy policy seems affordable because it is paid for by shareholder losses
- Investor retires unprofitable capacity and a blackout occurs

Smart

- Use markets for information and trading to optimise use of fuels and infrastructure
- Use price signals to enhance efficiency of use and operations
- Use data and technology to reduce forecast error where possible
- Use flexible emissions caps to reduce cost for same environmental impact
- Use enhanced situational awareness for faster / better response
- Promote broad understanding of options, costs, and implications
- Prudently incurred costs are paid for by consumers

The Smart Grid requires Smart Regulators, Smart Markets, and Smart Customers

Thank you



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