

The **energy sector** is being **disrupted**, but the **drivers** form a complex mix of **innovation**, **market-dynamics**, and legacy regulatory and policy factors. The result can be a mix of **desirable** and **undesirable** impacts that introduce **change** but not *necessarily* **progress**.

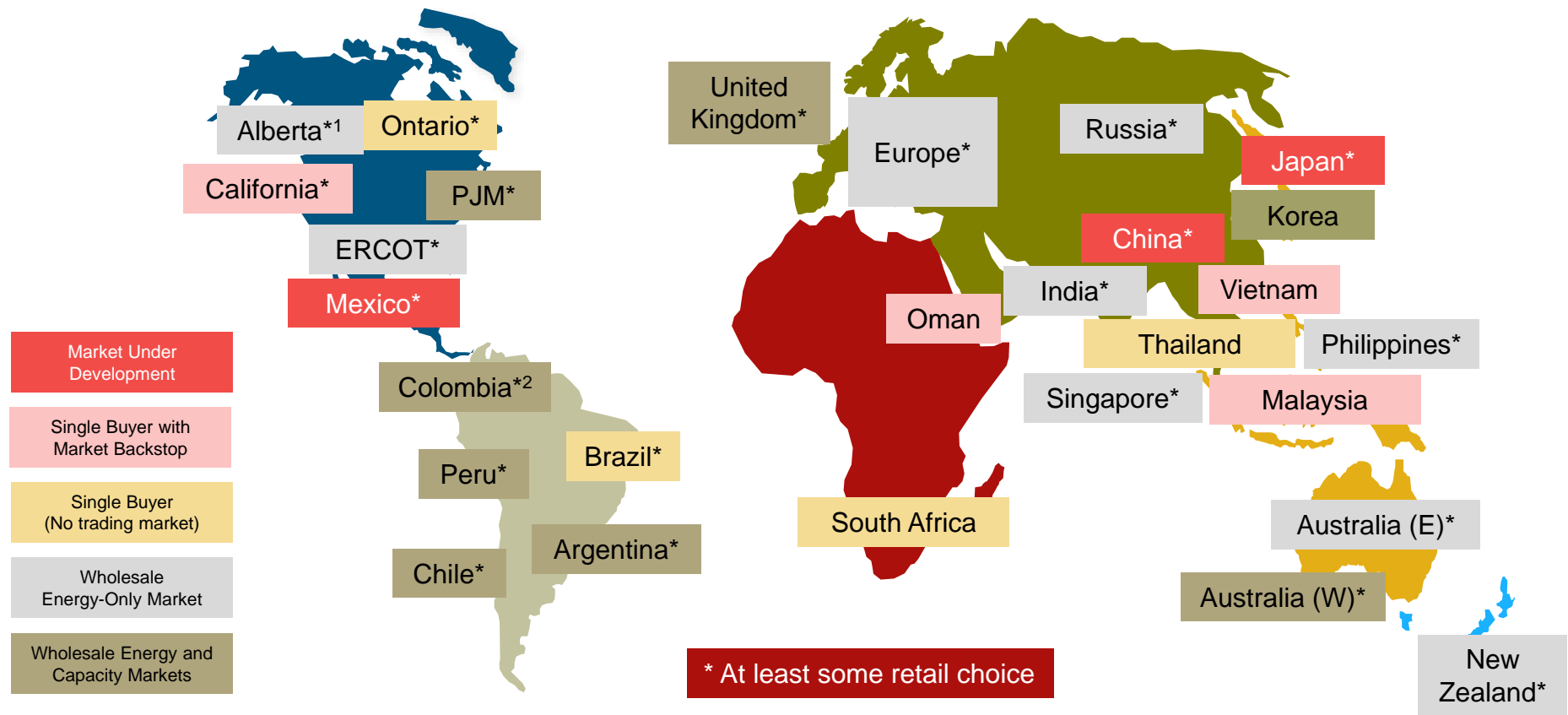
Future Opportunities & Challenges for Competitive Wholesale Electricity Markets in Asia

September 2017

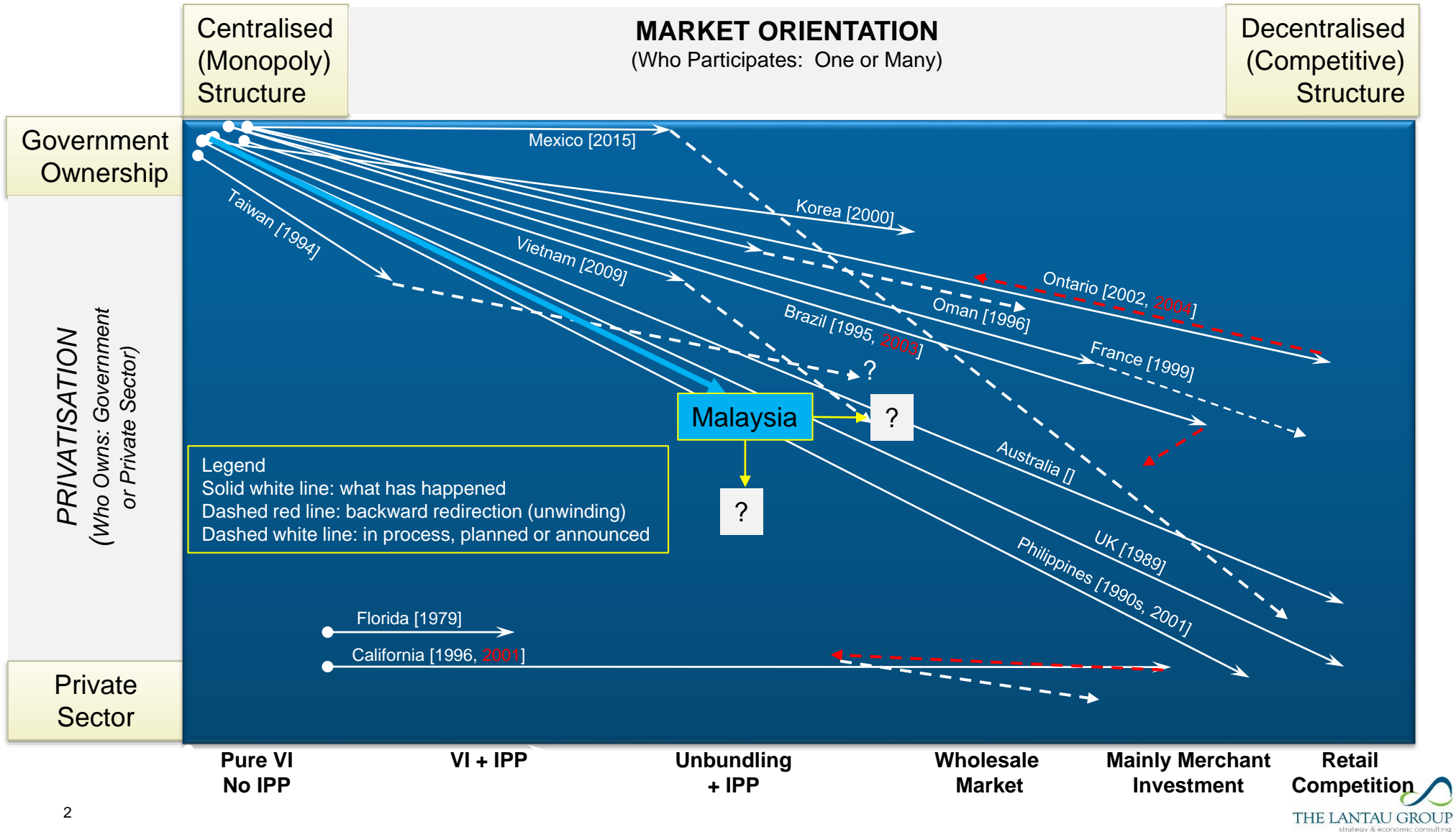
Mike Thomas



It has proven difficult (impossible?) to satisfy all stakeholders using a traditional monopoly utility model, so there is more “merchant” exposure everywhere



# Thirty years of progress: a clear direction: To the bottom (where the risk is)



# BUT

**Just when you thought it was all figured out (by now)**

(NEW)

## Holes and Ladders and Winners and Losers



# What is driving these further changes and newer risks?

## More Stakeholders

- Renewable energy developers
- Demand response providers
- New business models
- Tech

## More Technologies

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

## More Policies

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

## More “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

## Easier “Exploits”

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

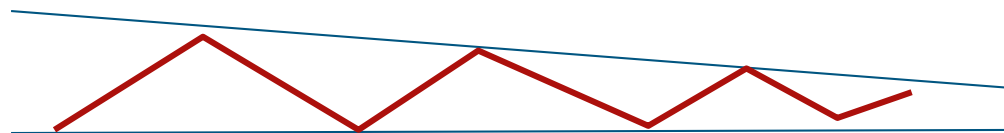
New stakeholders every day – few look like energy companies – everyone wants a slice of the pie (or two slices) or a whole new pie



# The Revenge of the Economists: winners and losers

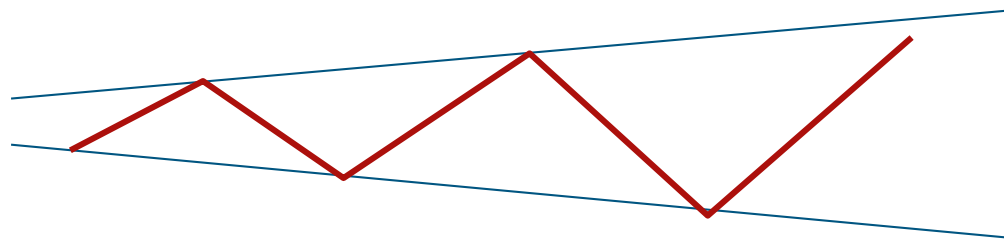
- The introduction of new technology (or the maintenance of existing technology) into the electricity sector is likely to be problematic if:
  - It is adopted (or not adopted) due to a pricing anomaly (i.e., a distorted or incomplete, or missing price signal)
  - Its adoption (or non-adoption) creates or worsens a pricing anomaly
  - Its inappropriate presence (or absence) reduces reliability or security of the system
  - It results in a material shift of costs to other stakeholders
- Usually there is some triggering of additional forces, which can either be:

**Self regulating**



Benign

**Auto-catalysing**



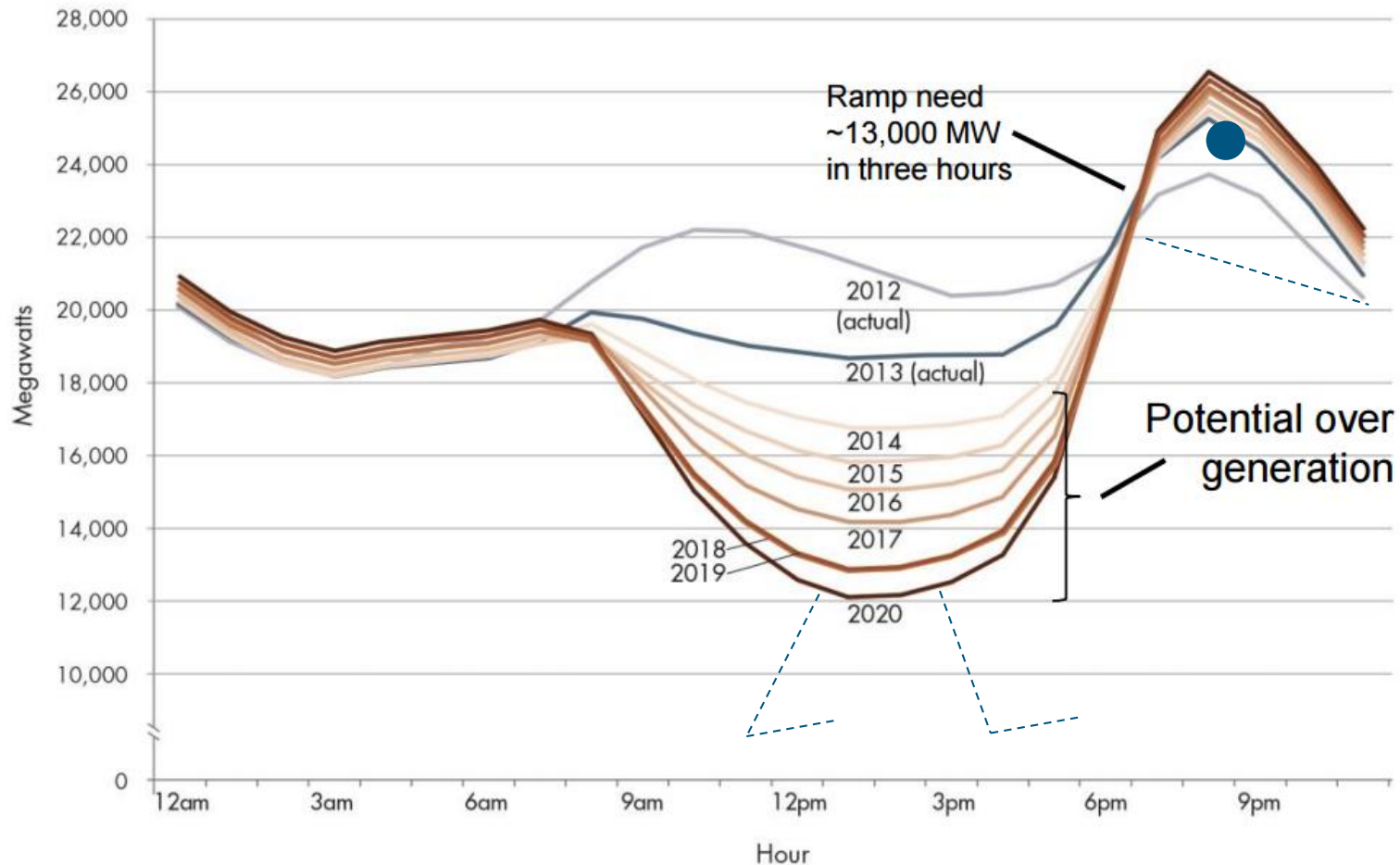
Disruptive



For Example....

## System load profiles are changing dramatically due to renewable energy

### California's "Duck Curve": Impact of Solar Output on Net Generation Requirement

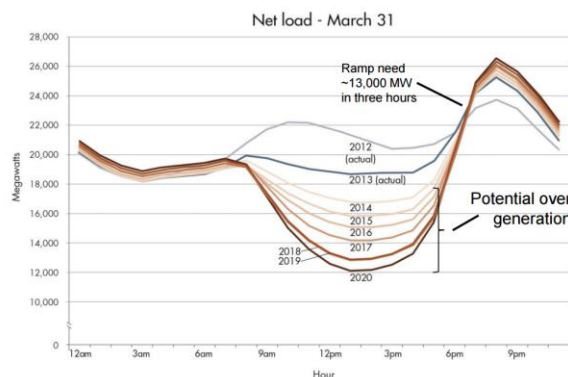


In response....

If you find yourself in a big enough hole, someone will sell you a ladder !



+



=

Excess renewable energy creates a market for energy storage solutions

## Battery storage



Disruption (for some) is an opportunity to sell a new solution

Technologies (and stakeholders) force new thinking about tariffs and incentives

## Does Nevada's Controversial Net Metering Decision Set a Precedent for the Nation?



What Nevada's decision could mean for other states

by Julia Pyper

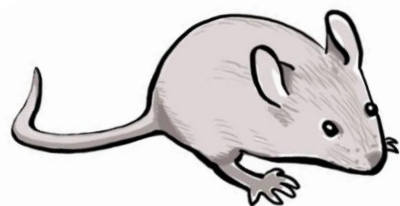
February 04, 2016

Regulators said the order was designed to make solar customers pay their fair share for use of NV Energy's grid. Solar companies warned that the changes make rooftop solar economics unworkable.

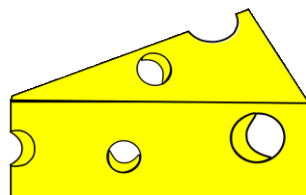
What is so problematic about net metering (other than that it can be auto-catalysing)

The problem is not so simple....

The source of “disruption” is not always something innovative and sexy...



Solar Rooftop  
Customer



Hidden Avoided Cost  
Subsidy

(Volumetric Tariff)

Disrupted!



Invoice

Other  
Customers

Solution?

CHANGE TARIFF  
DESIGN



INCREASING  
ENERGY  
POVERTY?

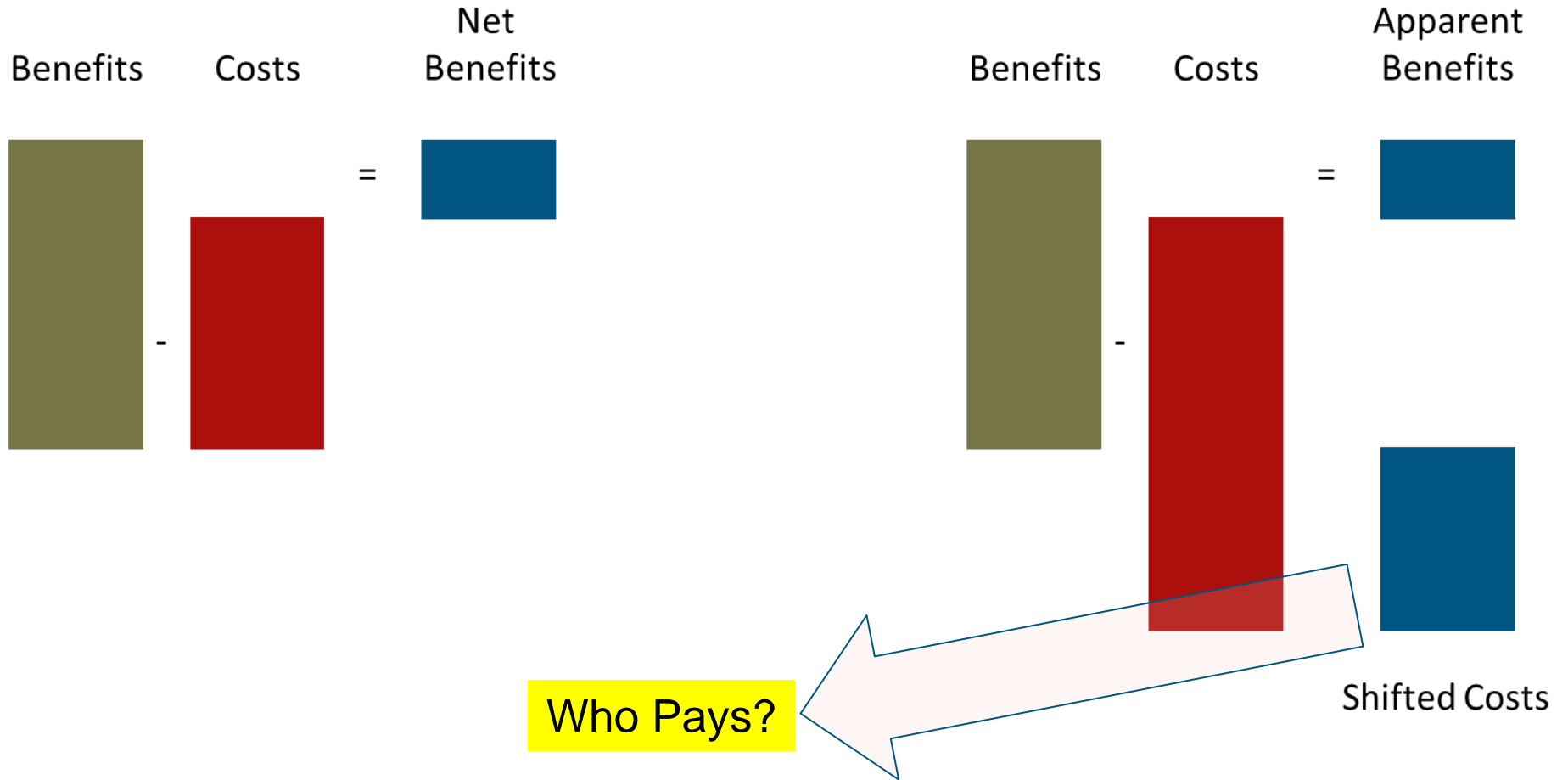


**NEED  
TO RETHINK  
LOW INCOME  
SUPPORT**

Disruption (for others) is a threat to their future

Need to look below the surface...things are not always as they seem.

## Cost shifting is a real problem for customers and investors and taxpayers



New policies can cause incredible value shifting....

In the worst cases, market changes have been extremely bad for investors

### Investor exposure to renewable energy in Germany

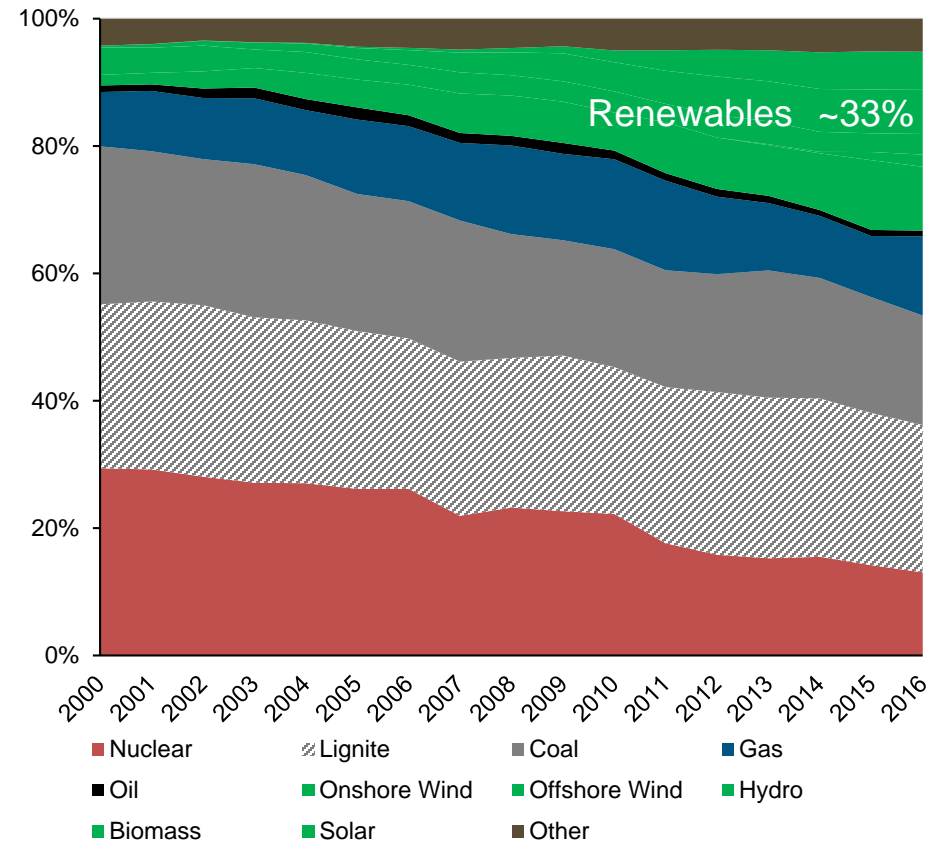
#### E.ON Market Capitalization



#### RWE Market Capitalization



#### Share of Energy Generation



Fear of change is always a factor, because the value implications are enormous!

Or they can work within the existing regulatory framework....

But not always....

- California has even more renewable energy than Germany, **and investors are happy**



**PG&E Corporation**  
FOURTH QUARTER EARNINGS CALL  
February 16, 2017

## Continued Progress in 2016



### Safety and Operational Performance

- Second best electric reliability year in company's history
- Continued investments to strengthen gas system
- Industry-leading gas and electric emergency response times
- Improved customer satisfaction

### Regulatory and Legal

- Final Phase 2 decision in Gas Transmission and Storage rate case
- All-party settlement in 2017 General Rate Case
- Cost of Capital settlement
- Criminal case decision

### Clean Energy Economy

- Delivered nearly 70% GHG-free energy in 2016, including ~33% RPS eligible resources
- Leading the nation in electric vehicle and private rooftop solar installations
- Enabling transportation electrification

## Well-positioned to Deliver Strong Returns



### A Strengthened Company

- Significant safety, reliability and operational improvements
- Improved customer satisfaction

### Key Advantages

- One of the greenest utilities in the country
- Constructive regulatory and policy environment
- Multiple infrastructure investment drivers

### Robust Growth Profile

- State policies support strong cap ex and ratebase growth
- Resumed dividend growth

### Healthy 3-year growth profile

- ~6.5-7% ratebase growth
- Above average dividend growth

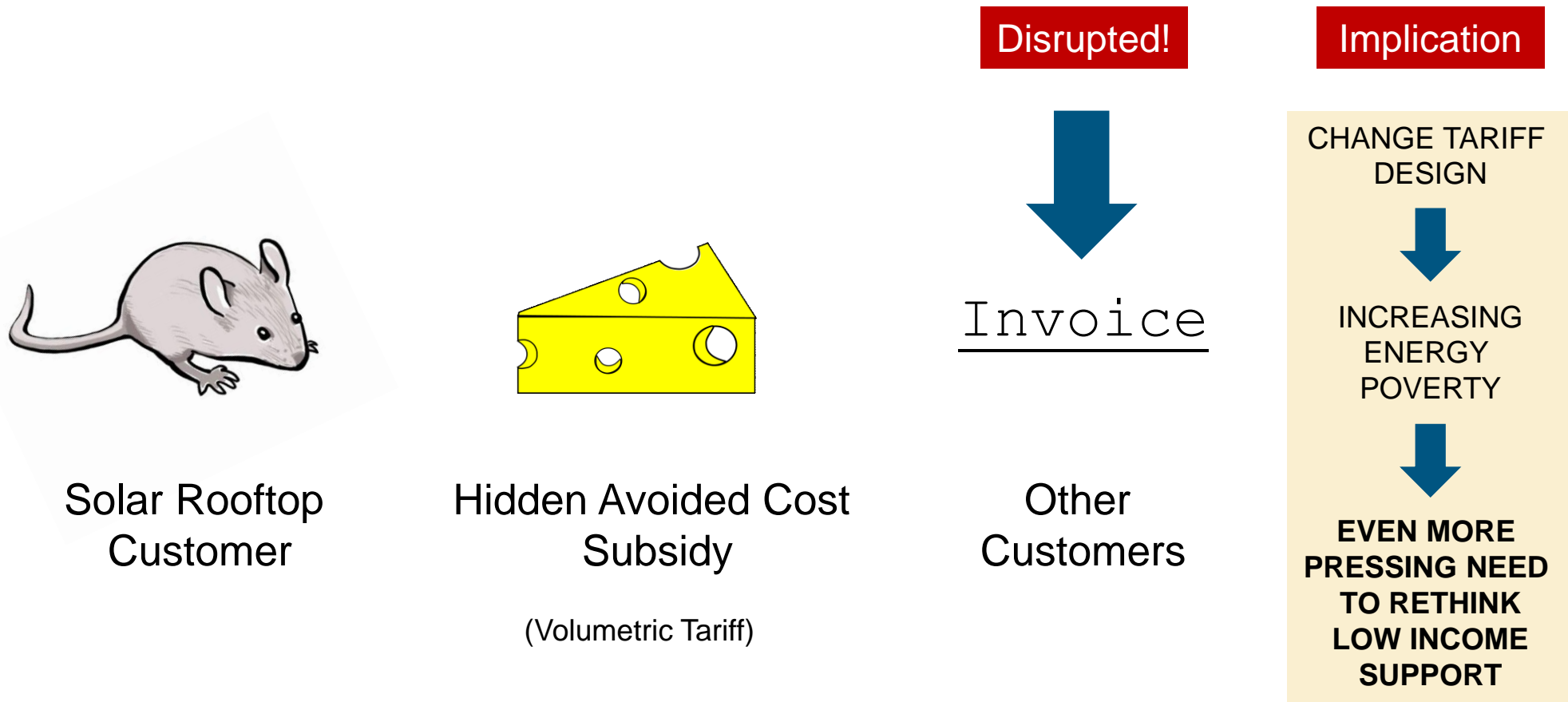
Warning: Statements for factors that could cause actual results to differ materially from the guidance presented and underlying assumptions.

After the crisis, California developed a hybrid regulatory/market model with strong investor protection



No matter what, though, someone has to pay....

## But California has an increasing energy poverty problem



Tariff structure matters, but changing tariff structures is difficult and slow, but new technologies and new stakeholders move much faster....



# Observations

---

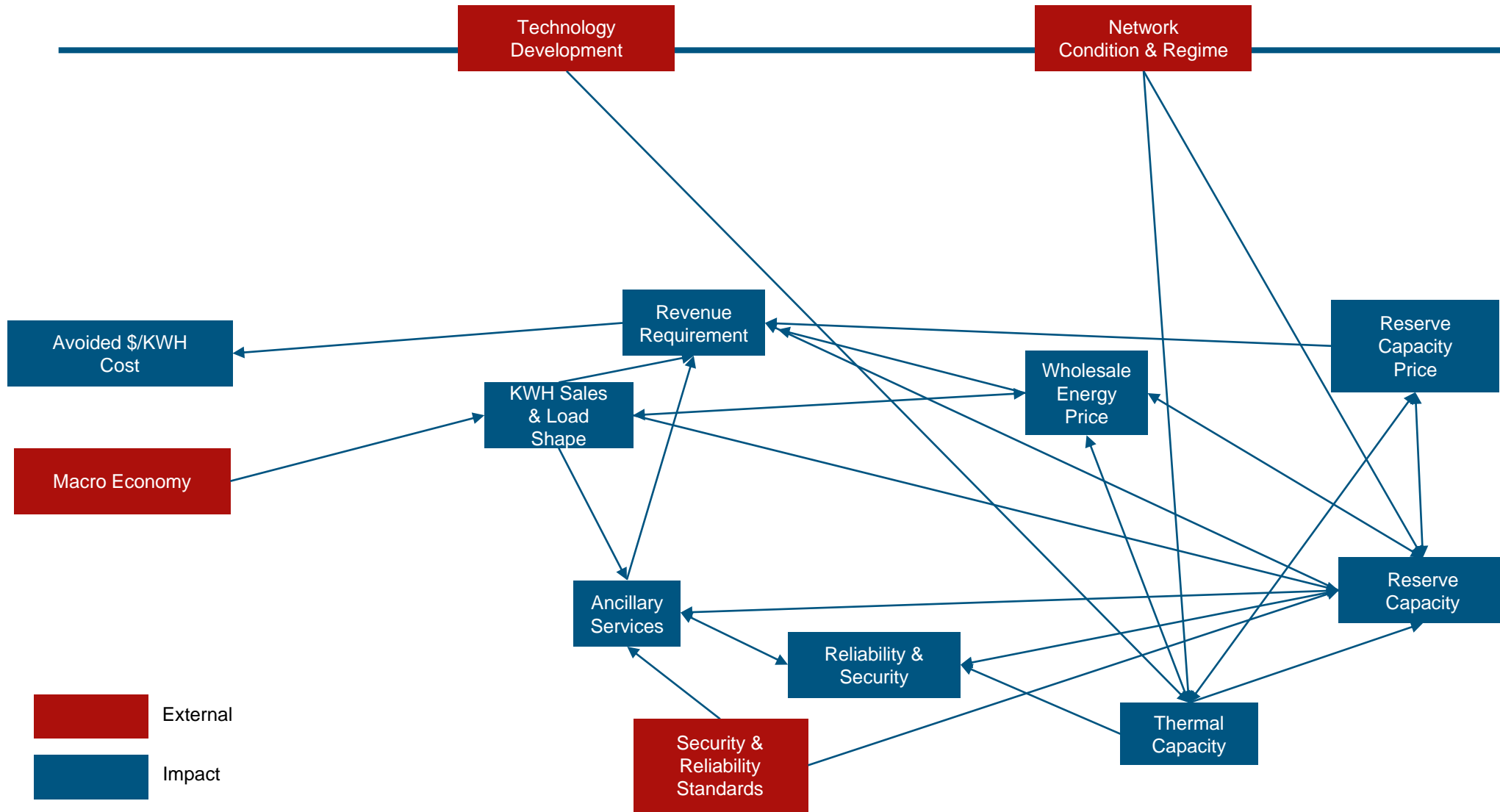
- The energy market and the environmental and technology agenda have long been out of sync
  - Higher financial risk to shareholders
  - Greater risk of blackouts
- Few fully understand these trends and their implications
  - Too many conflicting messages from competing stakeholders
  - Tariffs are too political and do not respond to changing conditions or risks
  - Policies may be developed without a realistic view as to what they will cost or what impact they will have

Which way is (really) forward?

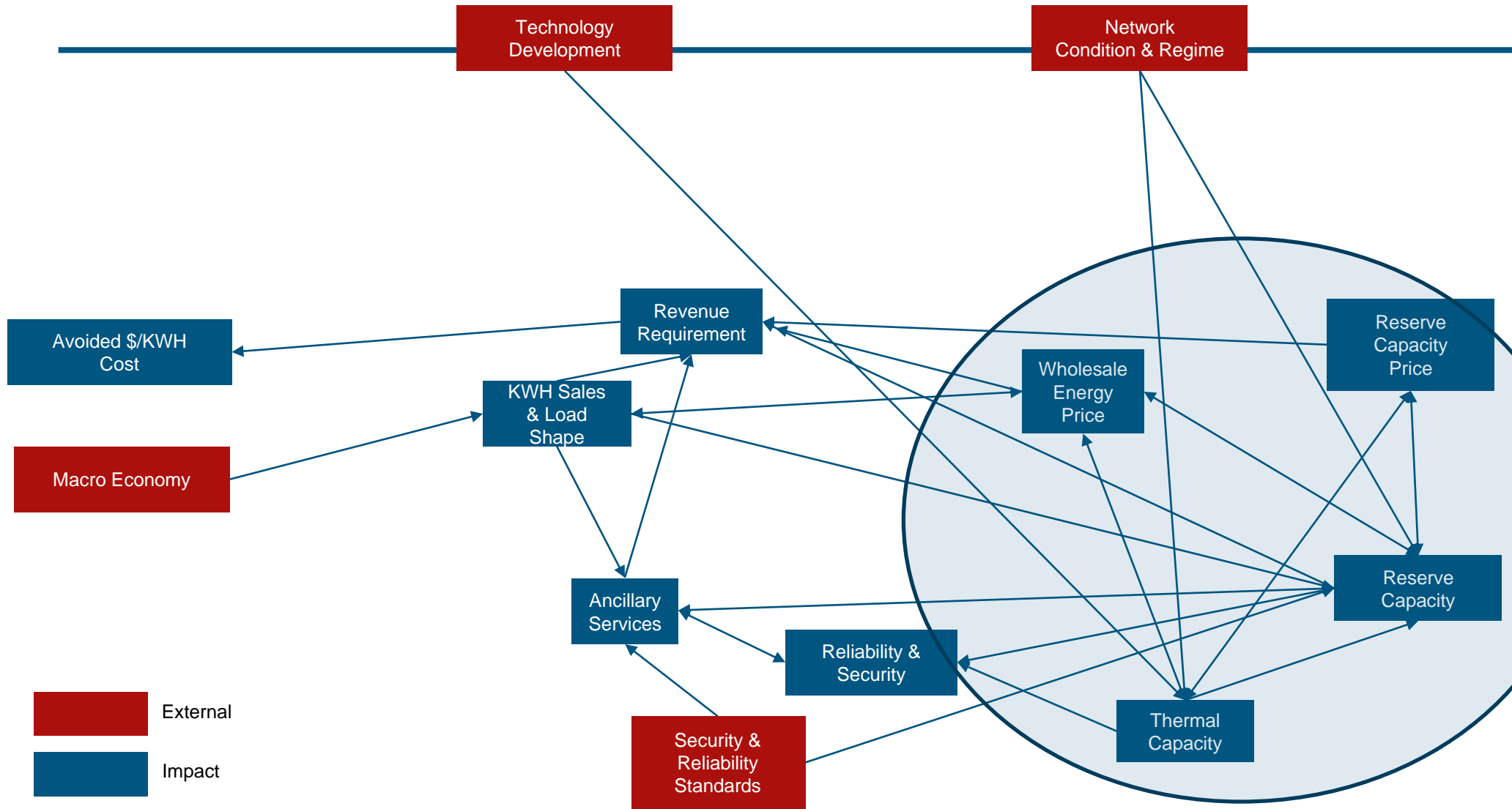
...the future looks (even more)  
different to the past



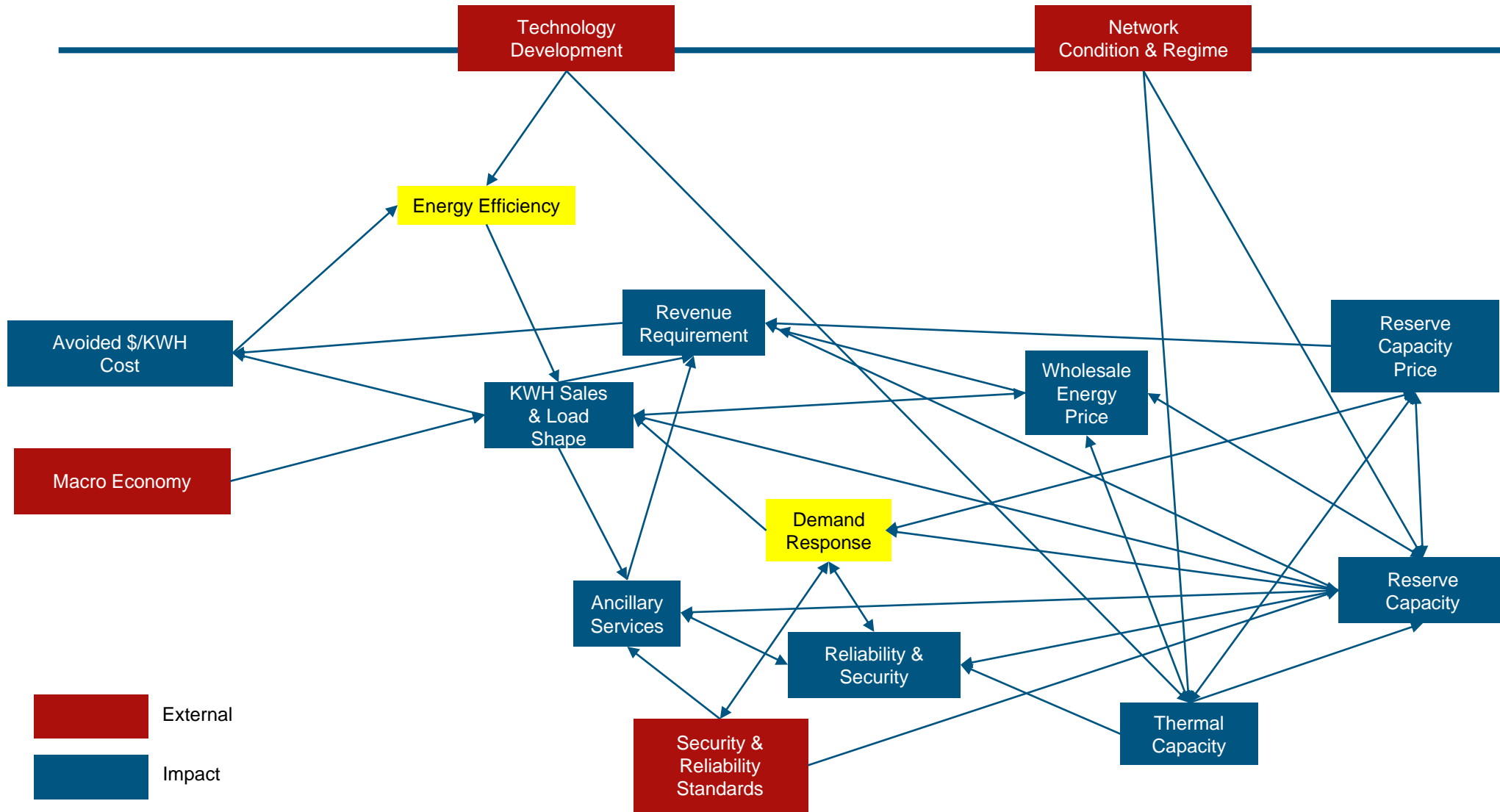
We used to live in a simpler time (that seemed complex enough then...)



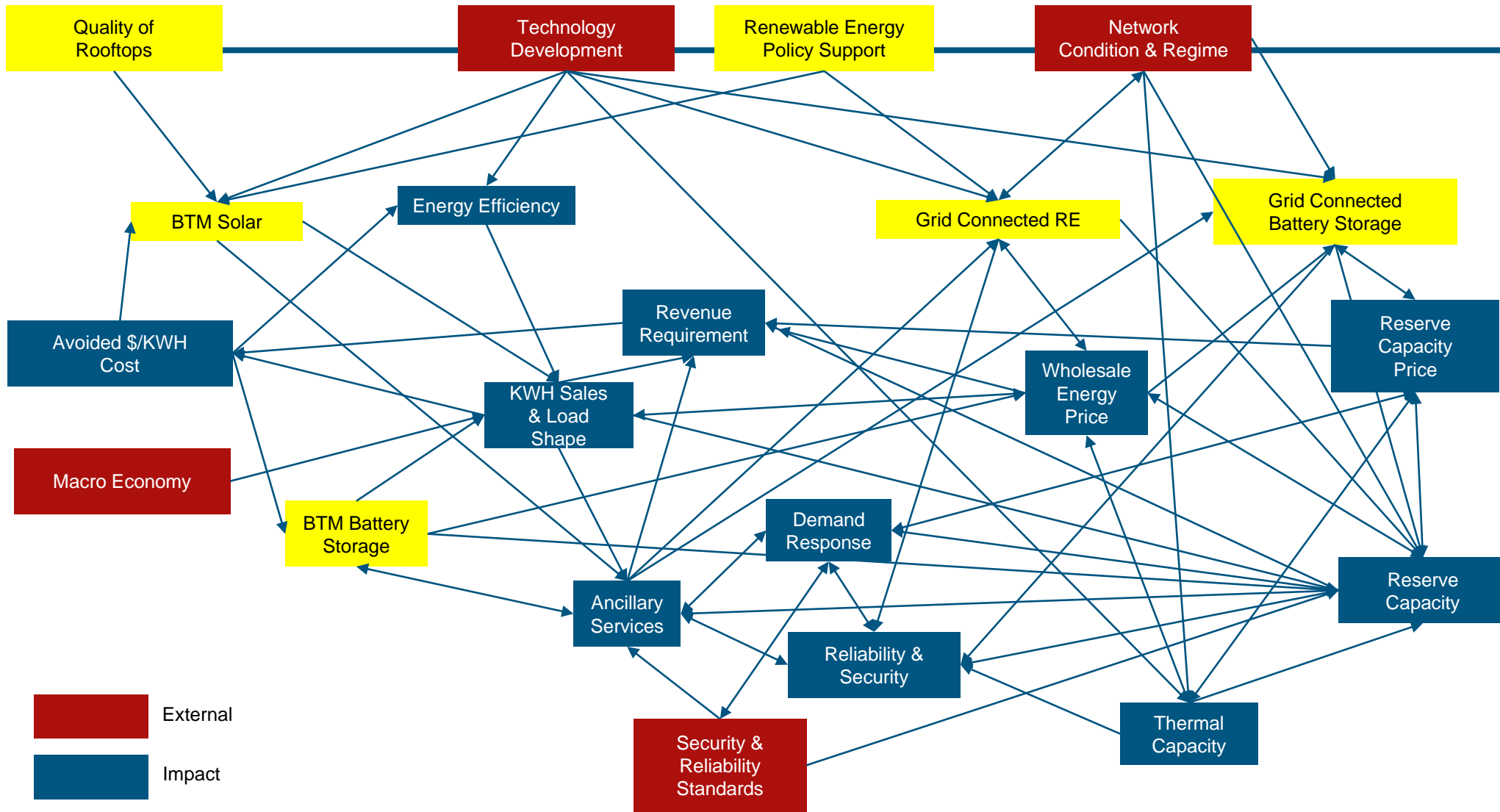
The focus was just on how to generate electricity at least cost...



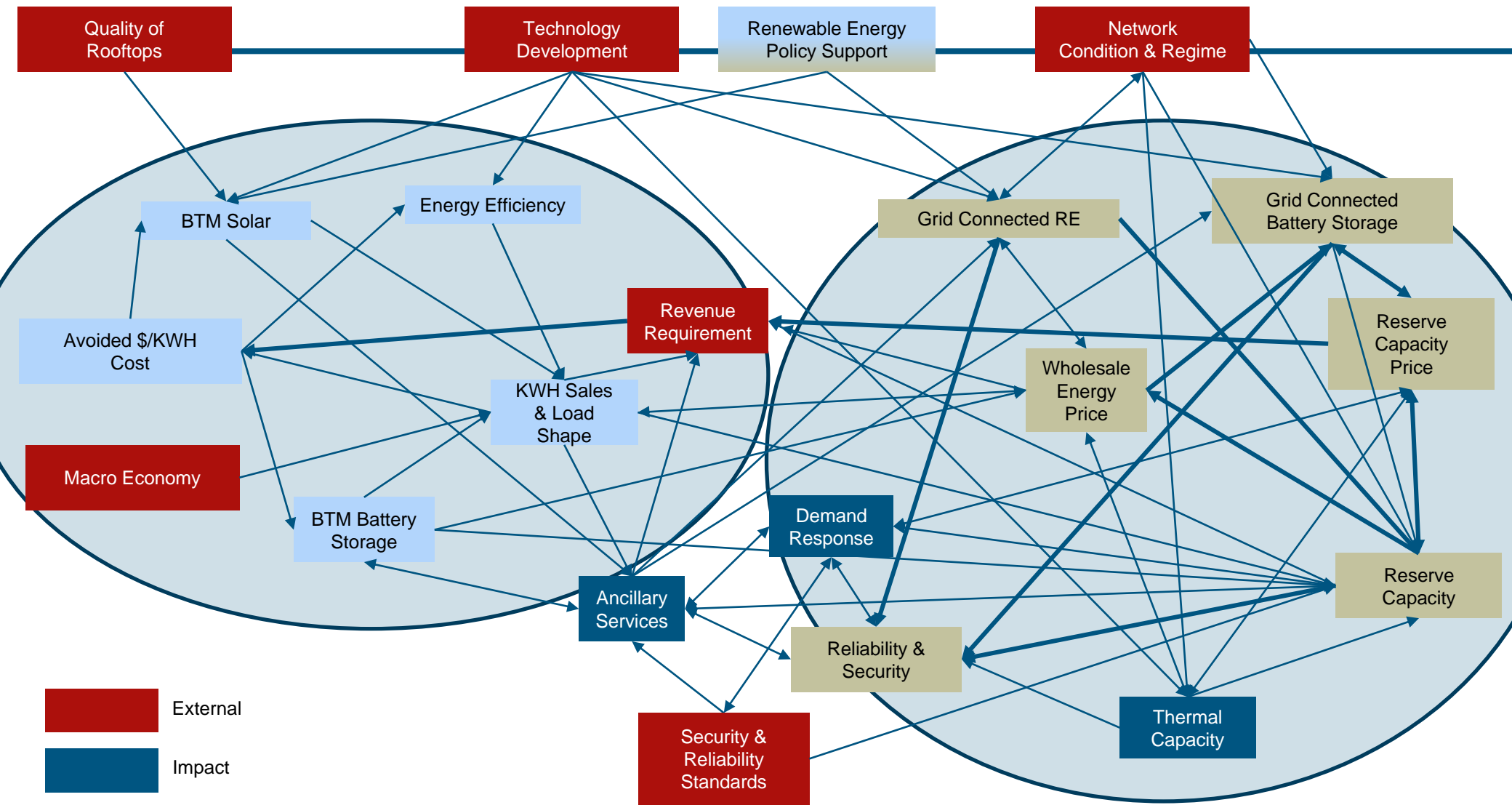
We then started seeing some “customer-side” responses (or tried to encourage them)



And then new technologies emerged on both sides of the “meter” ....



Does something become magically better or different just because it is on one side of a meter or another?



# The homework we need to do to prepare for the future....

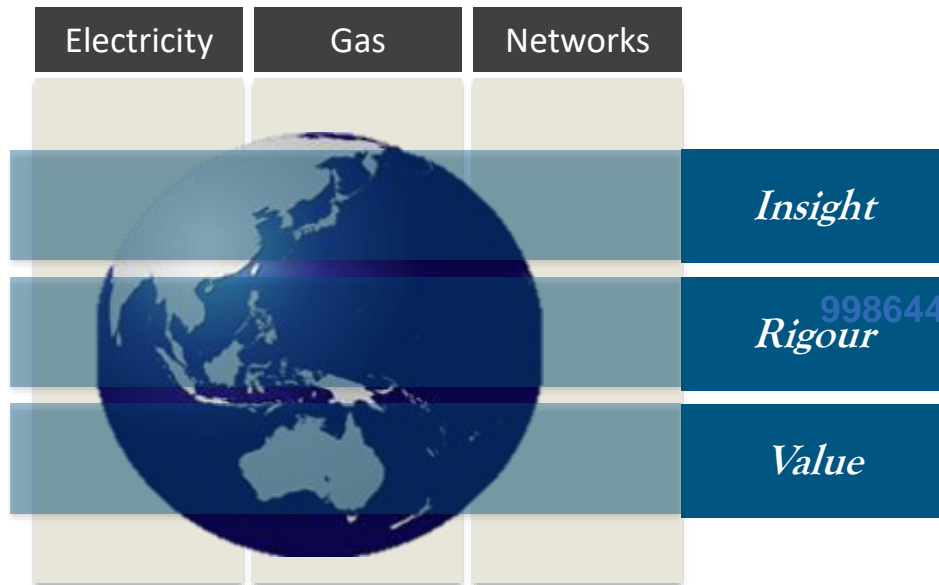
---

- Getting signals right for ancillary services (and promoting them from being merely “ancillary”!)
- Tariff design / regulation
  - What is the right charging and cost recovery structure, especially for networks?
- Ensuring a regime that gets price and performance signals right for storage (not just batteries)
  - Ensure appropriate access to ancillary service value as well as energy arbitrage
  - Recognise that storage can accelerate / amplify feedback between BTM and Grid Connected Options
  - Cost-shifting can worsen, more quickly → tariff design and responsiveness
- Signaling for the right type of capacity in the right locations will get harder
  - Integrating transmission and generation and demand planning
  - Avoiding wasteful curtailment due to poor location decisions for renewable energy
- Recognise that socialised energy pricing can trigger challenging feed-back loops that ultimately make it even harder to address energy poverty – need mechanisms outside the energy sector



# Thank you

---



For more information please contact us:

Mike Thomas, Partner  
[mthomas@lantaugroup.com](mailto:mthomas@lantaugroup.com)

**By phone**  
+852 9226 2513 (Thomas Mobile)

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

**Online**  
[www.lantaugroup.com](http://www.lantaugroup.com)

# About The Lantau Group

## Consultants to the Energy Sector

Competition, Markets, Regulation, Policy

Decisions Support Analysis

Disputes

Market Analysis

Asset Valuation

Strategy and Advanced Analytics

### Offerings:

- Strategic, commercial, and regulatory support
- Ability to connect the dots between fuel markets
- Analysis-based recommendations
- Highly relevant international experience
- Accessible experts focussed on the region
- Pricing, trends, drivers, risks



All of our work is related to the profound commercial, regulatory, and policy factors shaping the energy sector