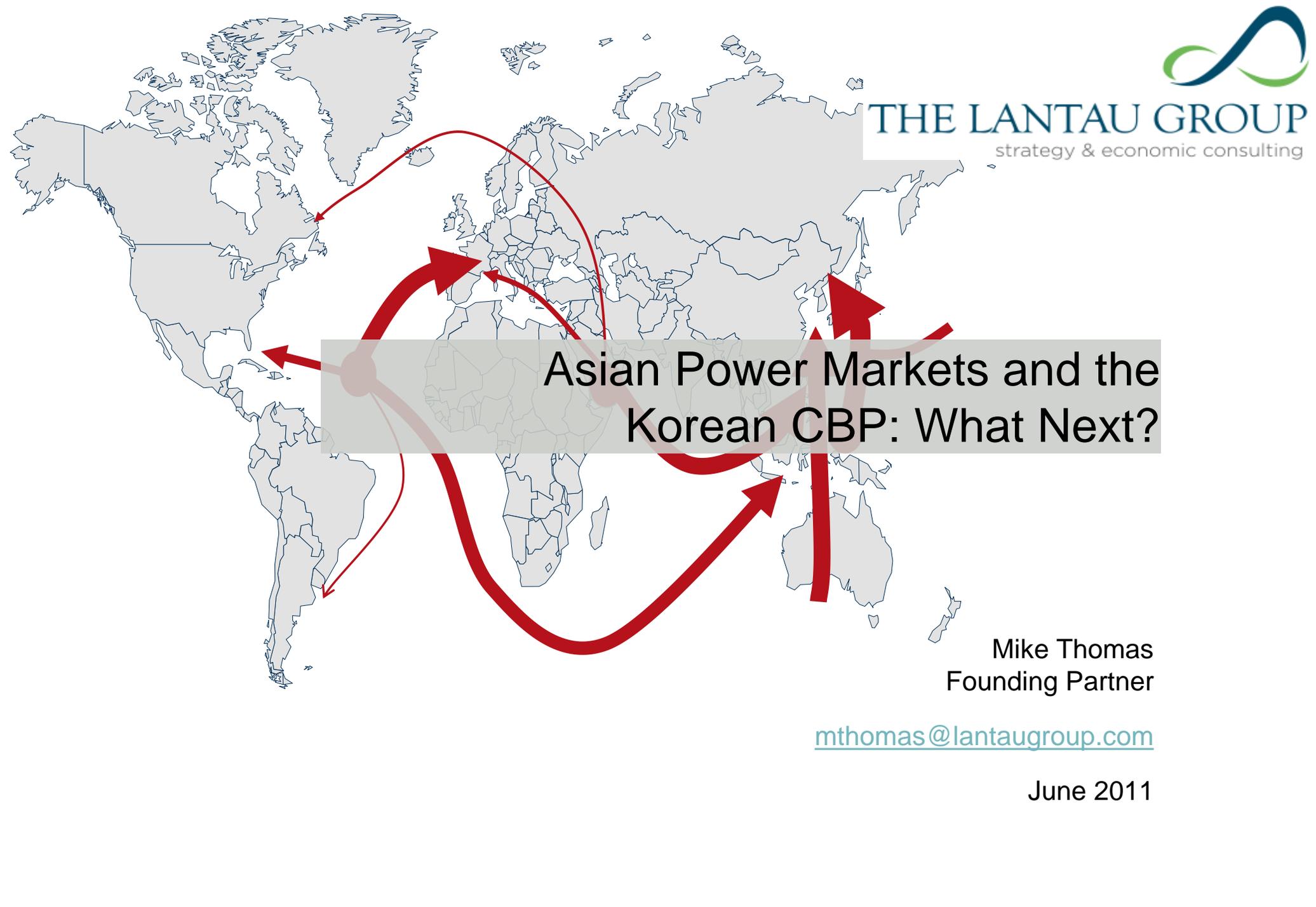




THE LANTAU GROUP  
strategy & economic consulting



## Asian Power Markets and the Korean CBP: What Next?

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## What I will be talking about

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- Changing technologies, uncertain demand, environmental pressures, rising fuel costs and globalisation are creating new challenges for the electricity sector
- Better markets for electricity and gas can help
- Korea's Cost-Based Pool is a good platform, but some issues must be addressed
- It is time for other Asian countries to implement more market-oriented reforms

# Landscape

- Asia is diverse, economically, culturally, politically and geographically
  - Developing to developed
  - Islanded to interconnected
  - Coal to Gas to Hydro to Mix
- Varying degrees of *economic* regulation
  - Politics vs. Markets
  - Uneven transparency, consistency and independence
- Prices to consumers are often regulated independently of costs and allocated risks



The power and gas sectors face rising costs, greater complexity and an increasing need for market-based reforms

# POWER EXCHANGES TODAY AND FOREVER

# Power Exchanges create value from diversity

## Different:

- Companies
- Demand patterns
- Countries
- Fuels
- Technologies
- Business models
- Opportunities

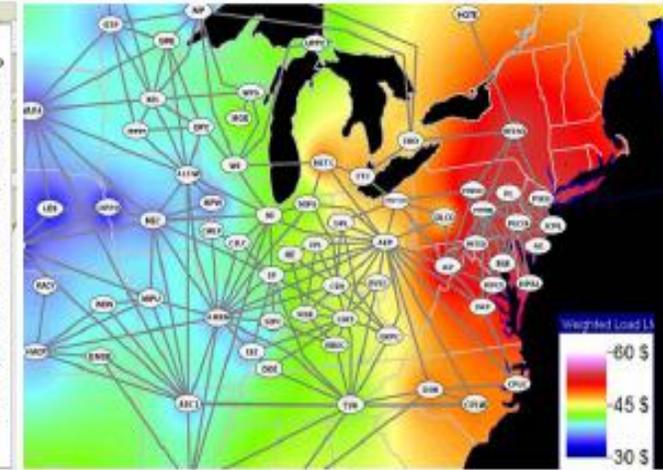
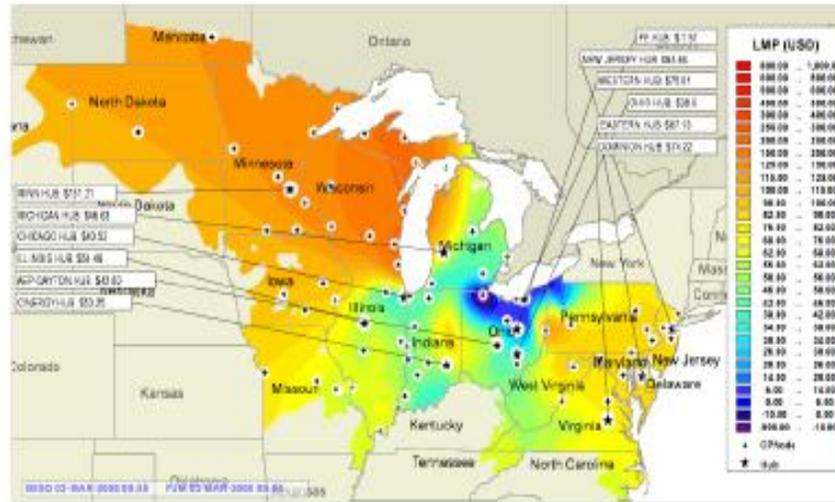


Figure 2.2-3 Contour Map of Annual Load Weighted LMP

Minnesota Hub: \$131.21/MWh. First Energy Hub: \$-1.57/MWh.

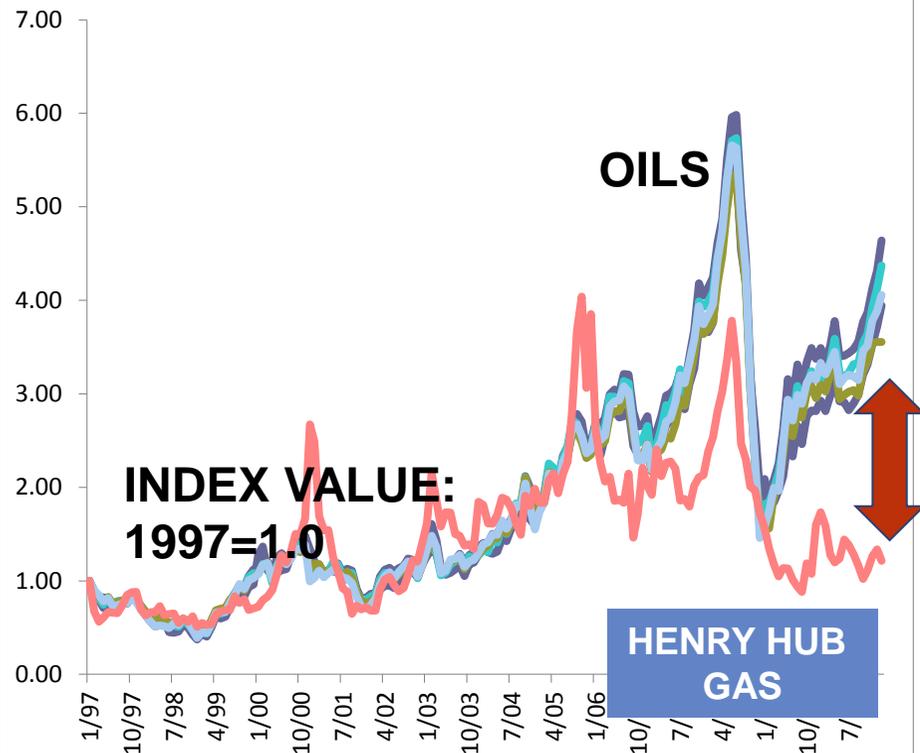
From MISO-PJM Joint and Common Market, <http://www.jointandcommon.com/> for March 3, 2008, 9:55am. Projected 2011 annual average from 2006 Midwest ISO-PJM Coordinated System Plan.

Source: Professor William Hogan

Non-discriminatory, open access and transparent pricing are key

# Markets create opportunities that lead to innovation

## THE IMPACT OF SHALE GAS IN THE USA



## A “Few” US Shale Gas Players

- **Woodford:** Chesapeake, BP, Newfield, PetroQuest, Unit Petroleum, St. Mary, Carrizo, Bankers Petroleum.
- **Barnett:** Devon, EnCana, EOG, Chesapeake, Talisman, Carrizo, Pioneer, Williams, XTO, Range, Quicksilver, Denbury, Penn Virginia, Nortex Resources, Titan Operating, Spindletop O&G, Miller Energy, ReoStar, Exterra Energy.
- **Fayetteville:** Southwestern, XTO, Chesapeake, BP, Petrohawk, Shell, Storm Cat, Energen, Maverick O&G .
- **Marcellus:** Range, Equitable, Chief Oil & Gas, Chesapeake, Talisman, Antero, Dominion, Anadarko, Southwestern, CNX, EOG, Cabot, Penn Virginia, Marathon, Exco, Unit Petroleum, Atlas Resources, Rex Energy, NFG/Seneca, J-W Operating, Trans Energy, Epsilon Energy.
- **Haynesville:** Ark-La-Tex Energy, Berry Petroleum, BEUSA, Cabot, Camterra Resources, Carrizo Oil & Gas, Chesapeake Energy, Comstock Resources, Continental Resources, Coronado, Cubic Energy, Cypress Operating, Devon, El Paso, Ellora Energy, EnCana, Encore Acquisition, EOG, Exco, Forest Oil, Fossil, Franks Operating, GMX Resources, Goodrich, Indigo Minerals, J.W. Operating, Live Oak, Long Petroleum, Mainland Resources, Matador, Nadel and Gussman, Jetta, Noble Energy, Penn Virginia, Petro-Chem, Petrohawk, Pinnacle Operating, Plains, Questar, Rising Star, Samson, Shell, Southern Star, Southwestern, St. Mary, Stroud Petroleum, TM Resources, Will-Drill, Winchester, XTO.

Shale gas did not start with a monopoly, or tightly controlled, gas sector

## Asia has too few power exchanges, but pressures are increasing....

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- **“Modern” power exchanges and market structures in place**

- Australia (NEM and WEM)
- Korea
- New Zealand
- Philippines
- Singapore



- **Limited power exchanges used for trading and support**

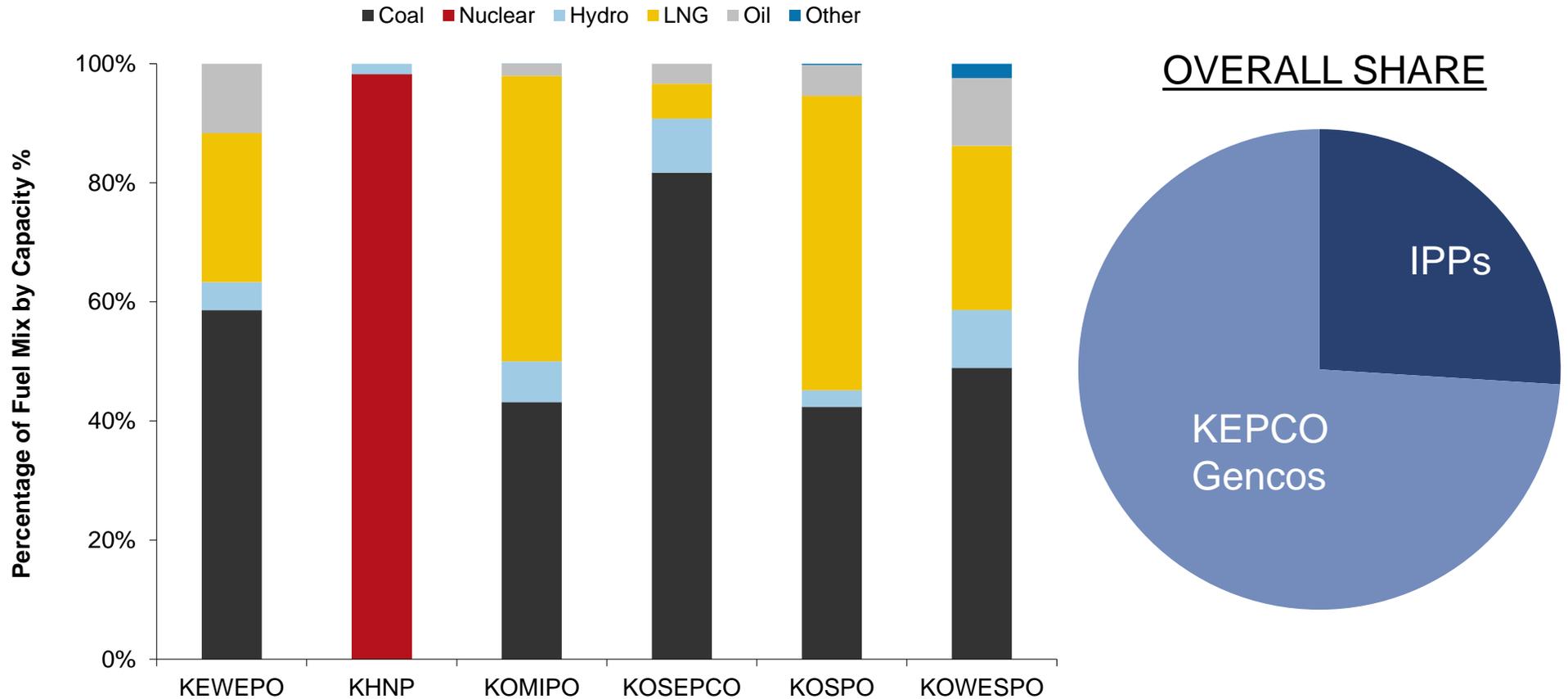
- Japan
- India

- **Power exchanges needed for trading and support**

- Malaysia
- Thailand
- “Greater Mekong Subregion”
- Indonesia
- China
- Taiwan

**AFTER 10 YEARS,  
THE KOREAN CBP  
NEEDS SOME WORK**

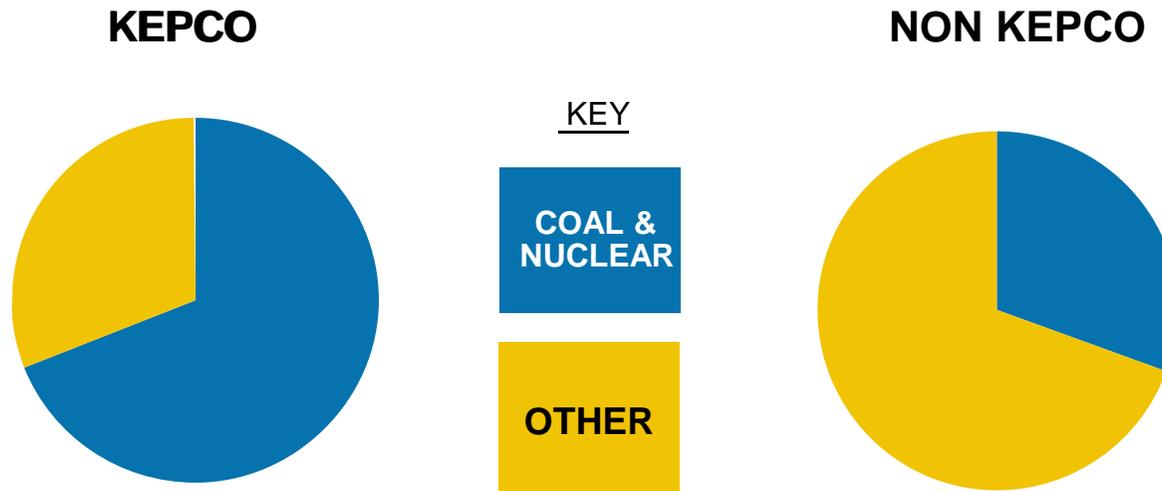
# Korea's power sector is diverse and has the potential to be highly competitive



The basic structure is in place

# Investment has been very uneven between KEPCO and NON-KEPCO

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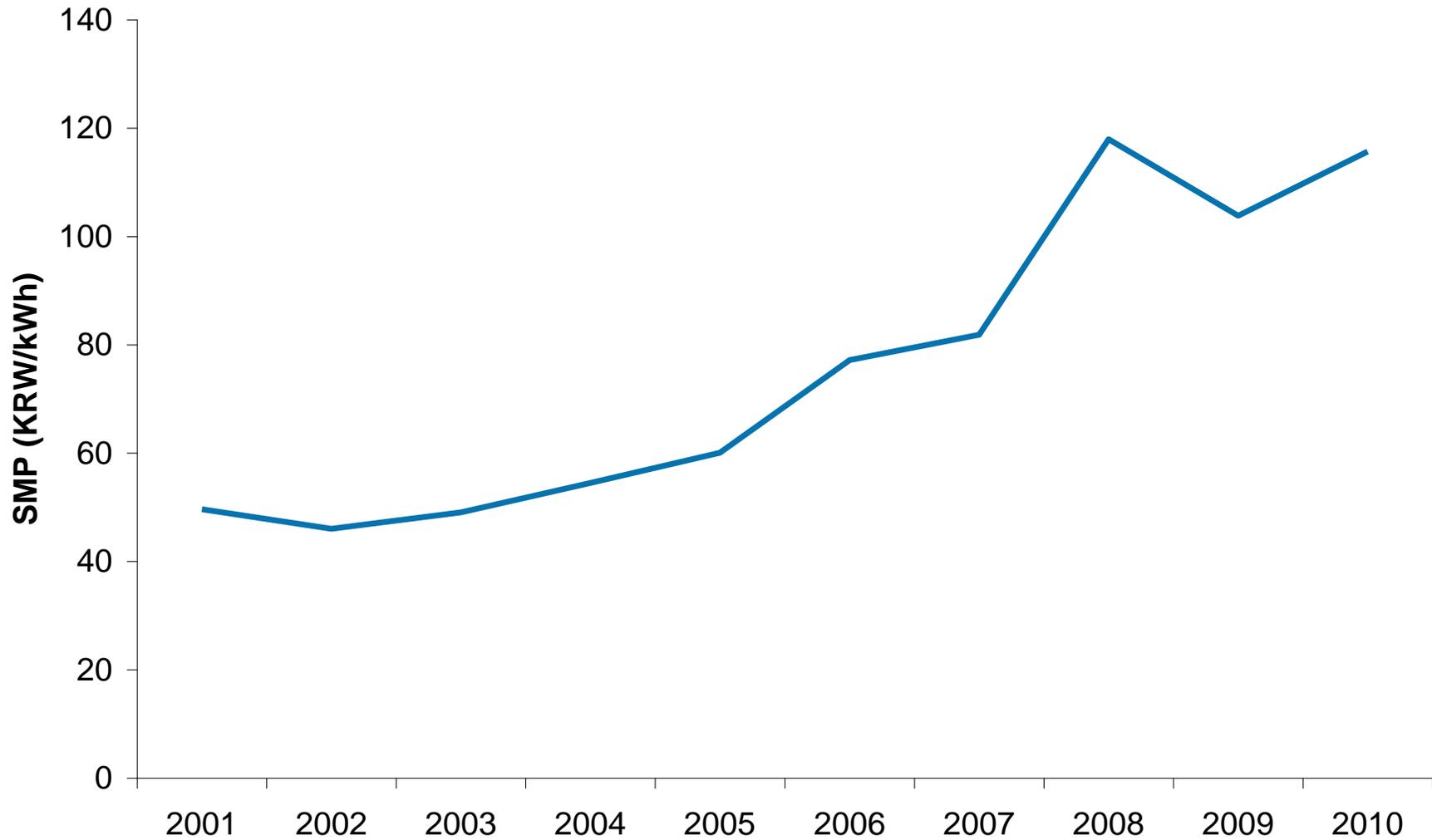


New capacity since 2001 by type and ownership

Something is not right!

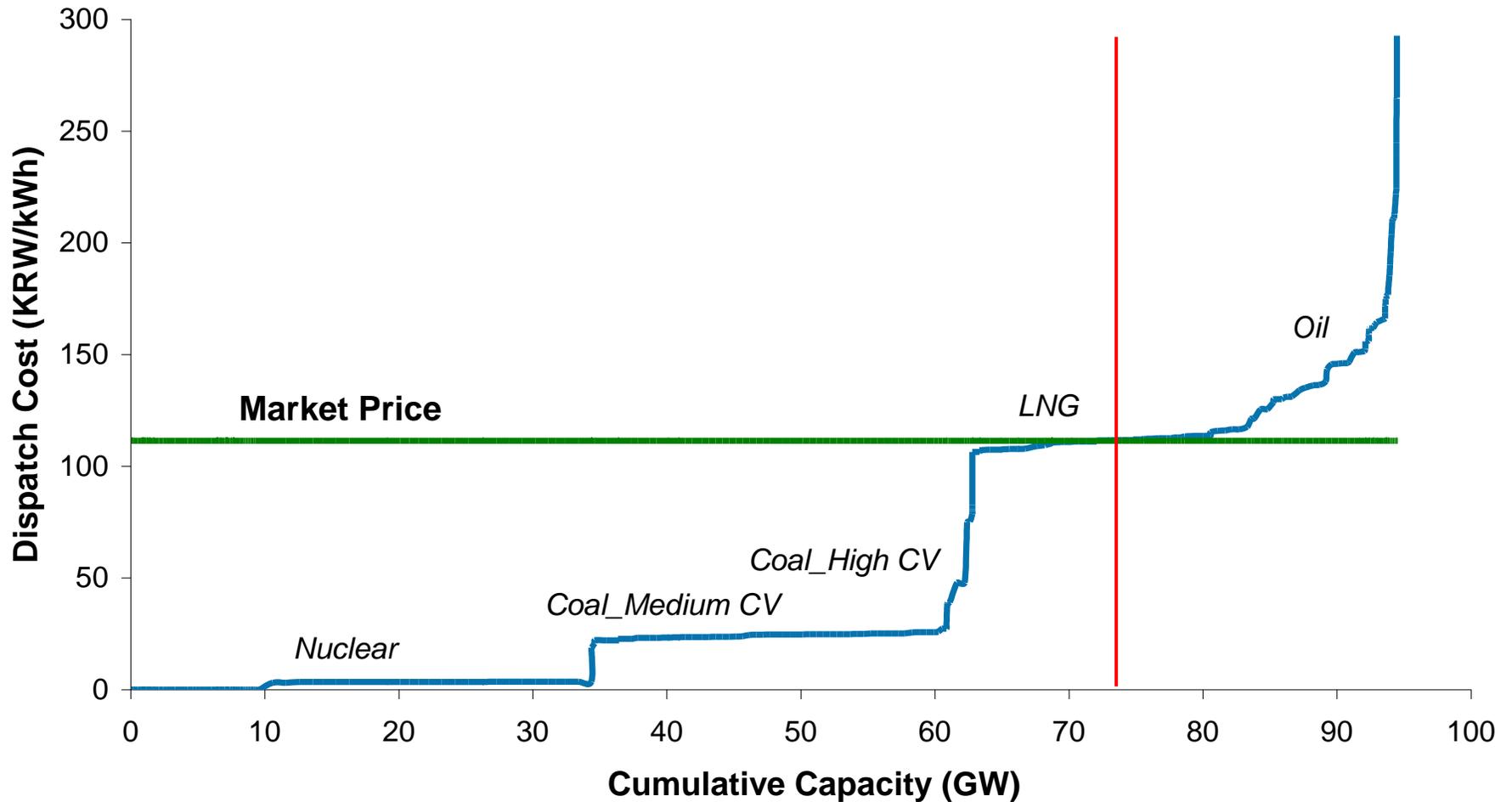
## Increasing wholesale prices in Korea

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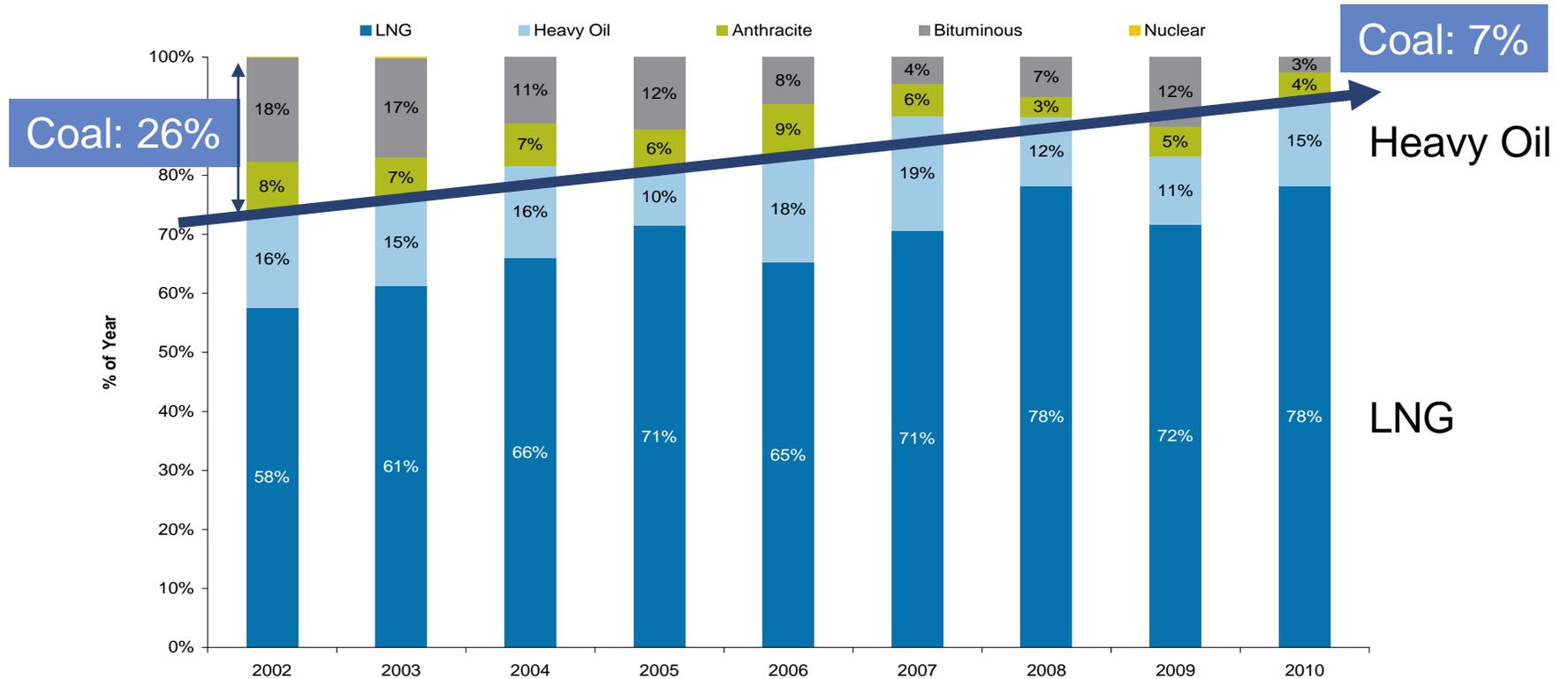
# The price in Korea is higher when LNG or Oil set the market price

## Korean merit order bid stack projected for 2015



# LNG and oil are setting the wholesale price more frequently

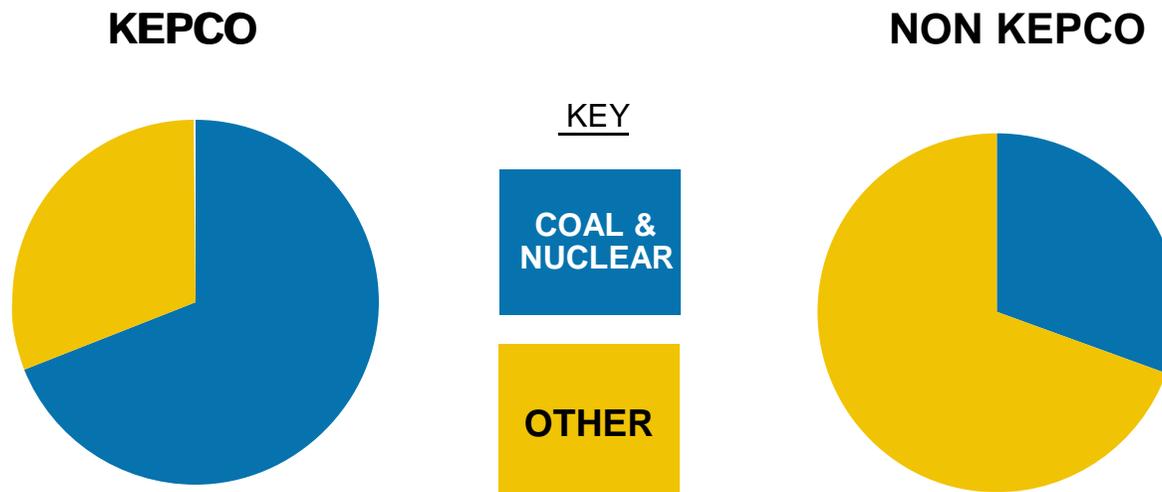
## What fuel sets the SMP?



Not all investment decisions in the CBP reflect market signals—the increasing SMP reflects the addition of too little baseload capacity

# The uneven investment mix is not due to the CBP

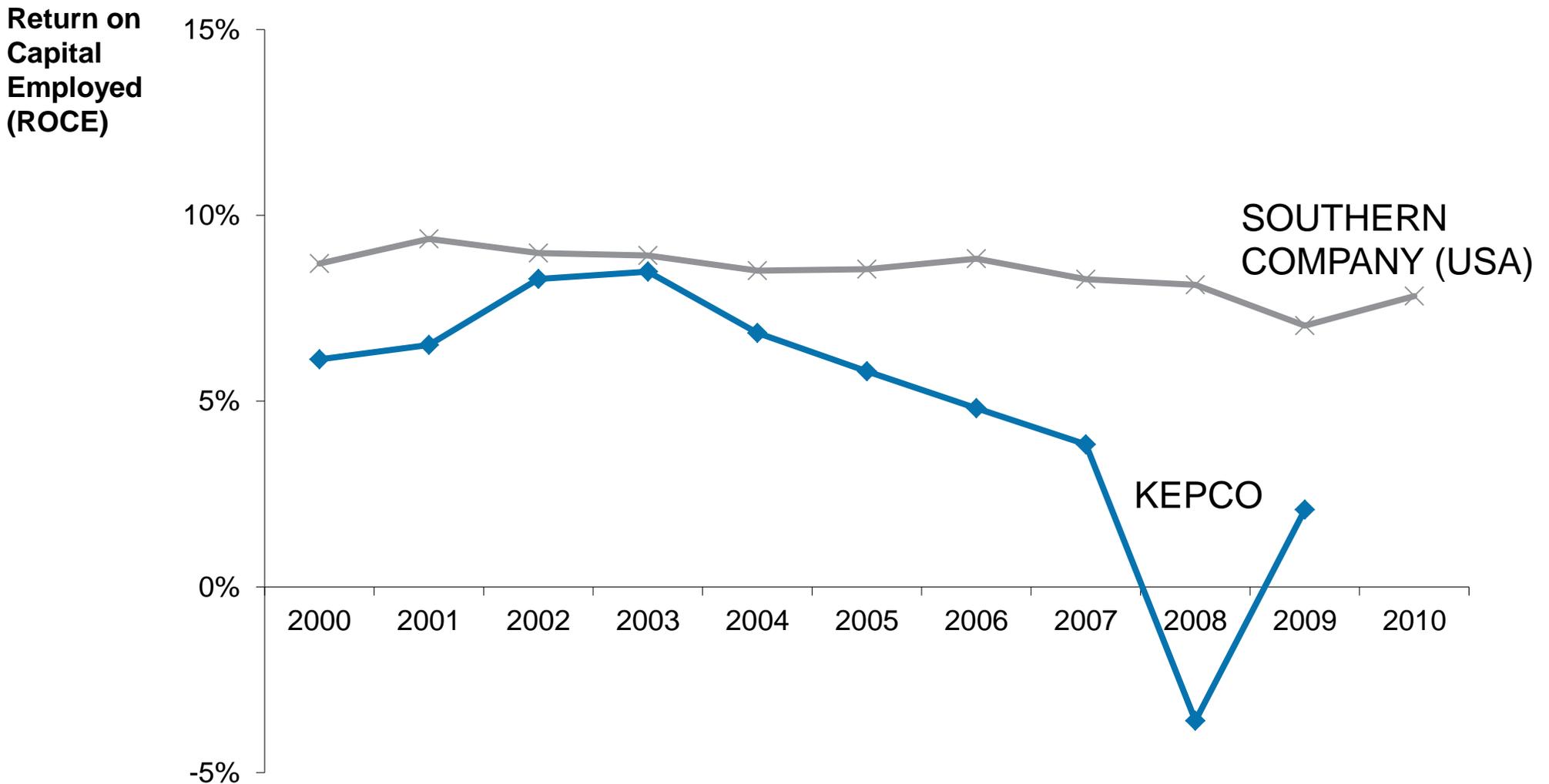
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New capacity since 2001 by type and ownership

The approvals process for new capacity, restrictions on siting and an apparent preference for IPP development are driving the plant mix away from optimal levels

## As generation costs increase, KEPCO's financial return has been falling



Also outside of the CBP:

Bojung Geysoo (correction factors) limit KEPCO genco revenues

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- The CBP produces an SMP, but it is not the basis for compensating KEPCO gencos.
  - Instead, each KEPCO genco receives a “corrected” energy payment

$$\text{Genco Energy Price} = \text{Fuel Cost} + (\text{SMP} - \text{fuel cost}) \times \text{Correction Factor}$$

- “Correction factors” are changed seemingly randomly each year

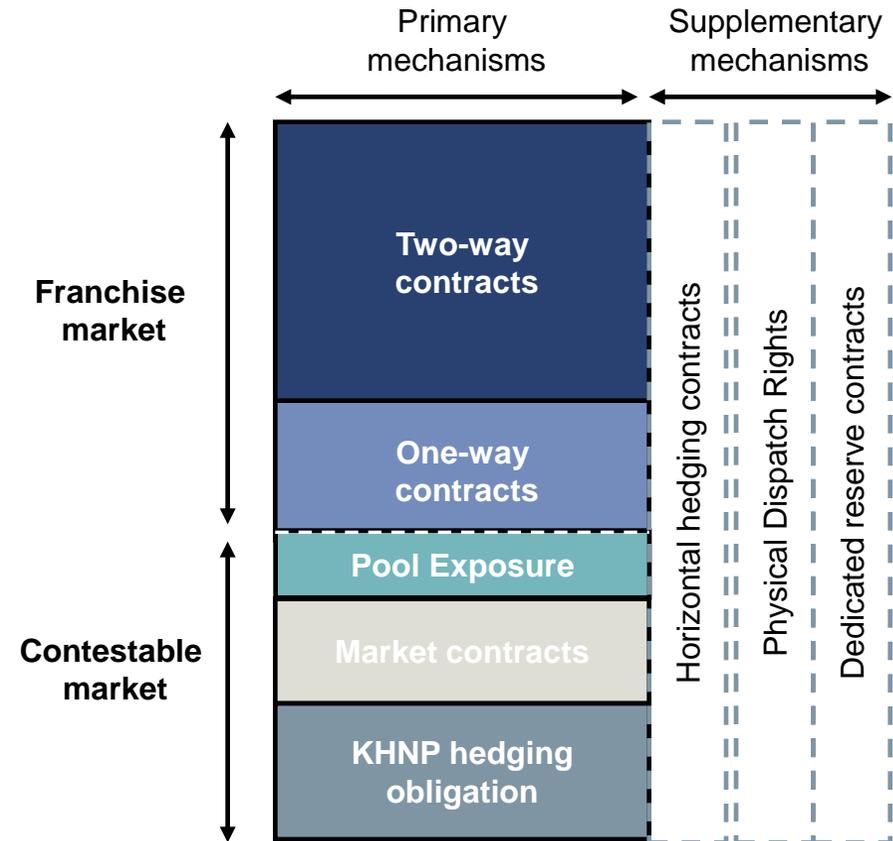
Time	Nuclear	Coal	LNG	Anthracite
Aug 2008	0.2184	0.0894	0.0894	0.75
Aug 2009	0.3052	0.1865	0.327	0.75
Aug 2010	0.1913	0.1315	0.320	0.50

Bojung Geysoo results in different prices for the same thing (electricity) depending on who and what produces it

In modern electricity markets contracts, not correction factors, are used to manage financial risk related to volatility of inputs and market conditions

- Protect financial viability
  - Two way contracts
- Prevent price shocks
  - One way contracts (caps)
  - Maintain financial viability of the industry
- Mitigate market power
  - Limited spot market exposure
- Protect customers during transition
  - Contract profile over time
- Manage availability risks
  - Horizontal hedging contracts

### Original TWPB “Vesting Contract” Structure



The CBP needs a system of contracts and a robust contracting environment

# The Korean CBP supports one of the largest power sectors in developed Asia

## Pros

- Very similar in *design* to the most advanced power markets in the world
  - System marginal price
  - Capacity payment
- Professionally managed by KPX
- International fuel prices
- Markets are a strong platform for innovation and “smart grid”

## Cons

- Retail tariffs below cost
  - KEPCO losses
- Uneconomic capacity mix
  - Too little base load capacity?
- No robust value management mechanism (such as contracts)
  - Bojung Geysoo (correction factors) are ad hoc, not transparent and always changing
- Need to re-align the SMP and capacity payment with economic principles
  - Fix methodological shortcomings

It is time to review and re-invigorate the CBP to make it work better as a platform for efficient power sector development and growth

**NEW POWER MARKETS  
WILL DEVELOP IN ASIA OVER  
THE NEXT DECADE**

Korea is not alone:

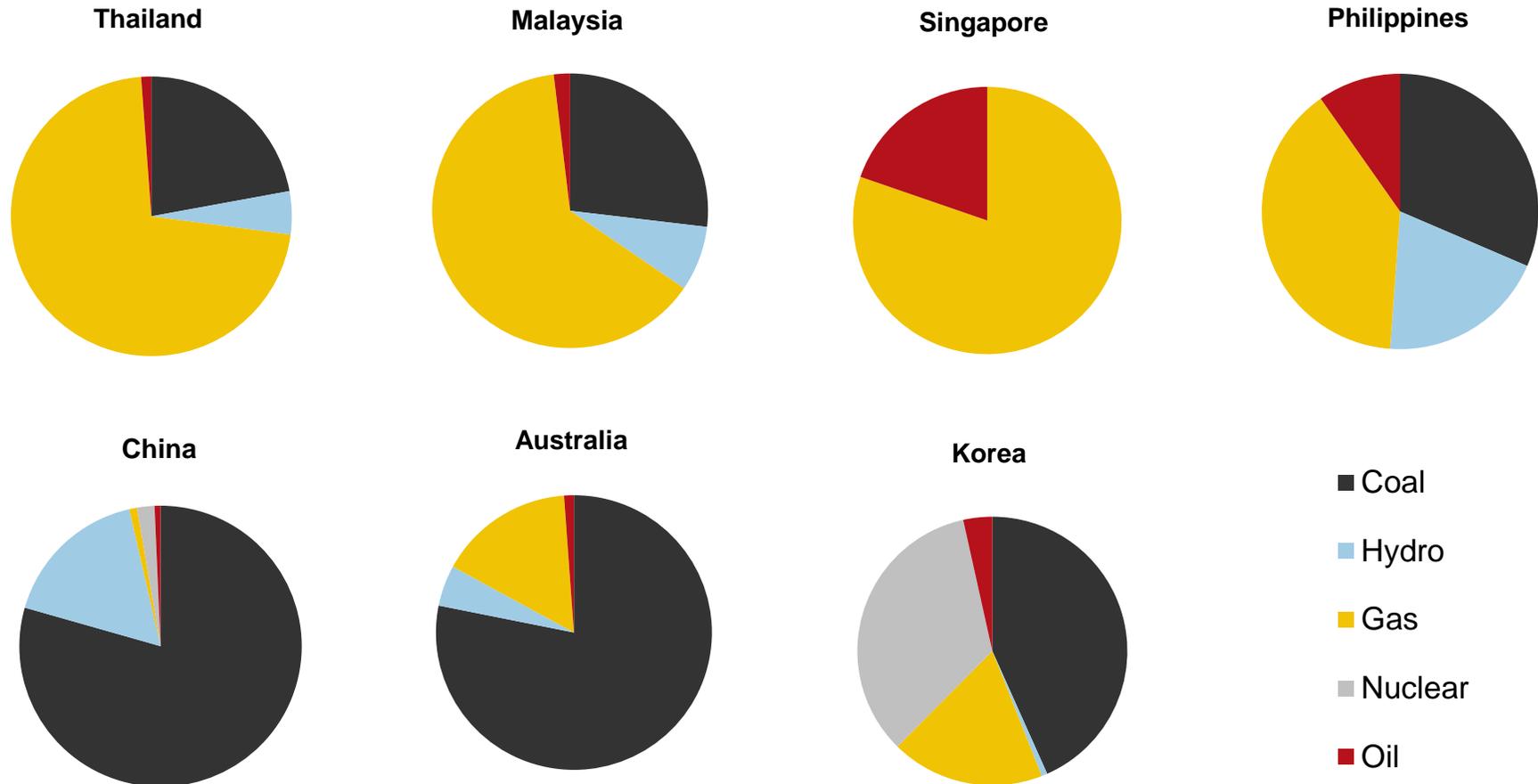
Elsewhere in Asia, market stresses are increasing at a rapid rate

### Challenges throughout the region

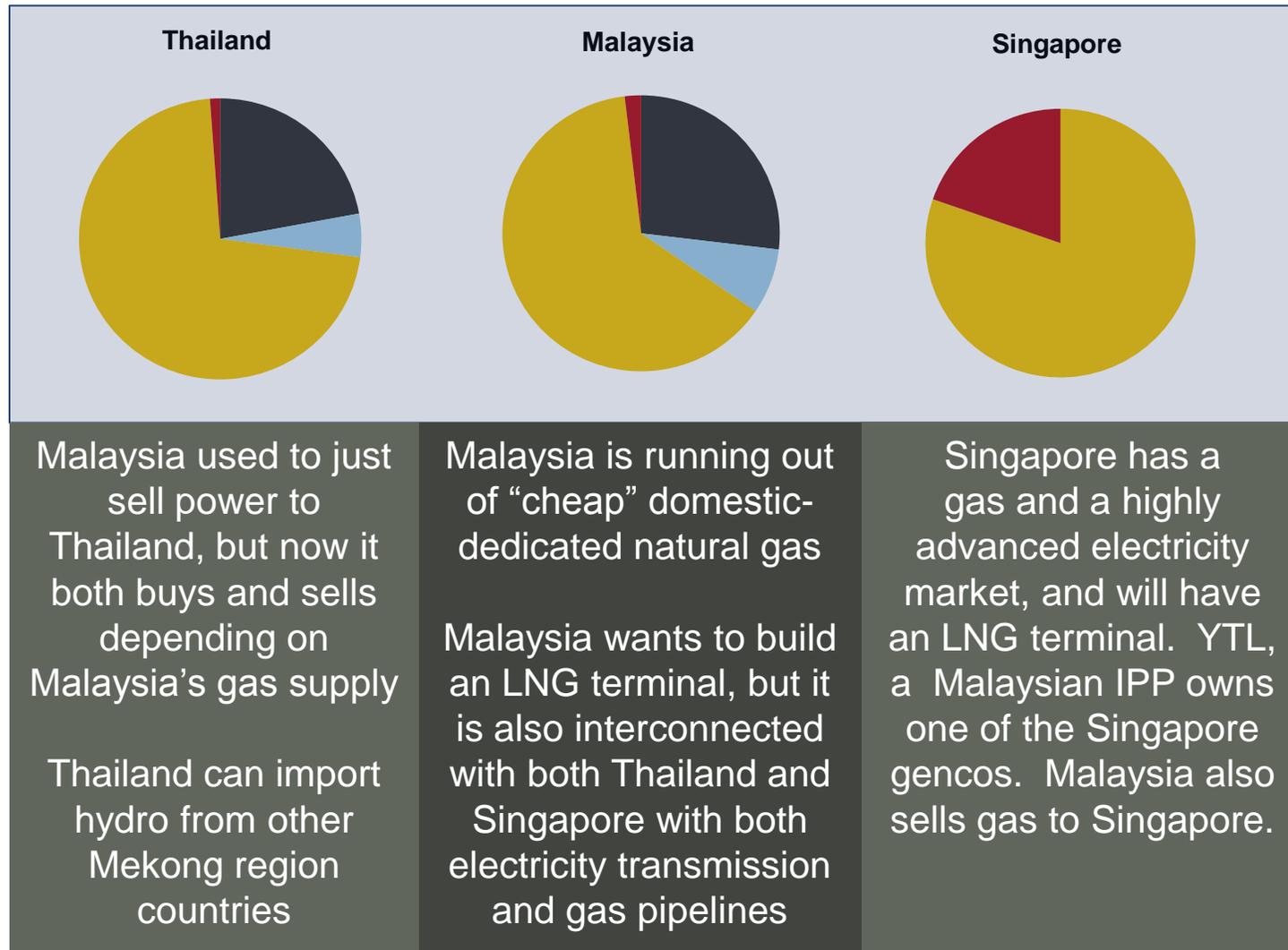


1. Privatisation
2. Commercial use of ASEAN grid/gas
3. Exposure to global LNG pricing
4. Increased interest in competitive tendering
5. Expiry of existing PPAs
6. Tariff that are out of line with costs
7. Issues with market parameters and settings that need to be addressed
8. Greenhouse gas policy / renewables integration challenges

# Fuel market and environmental (carbon) issues will affect each Asian country differently – increasing investor risk and increasing pressures for change



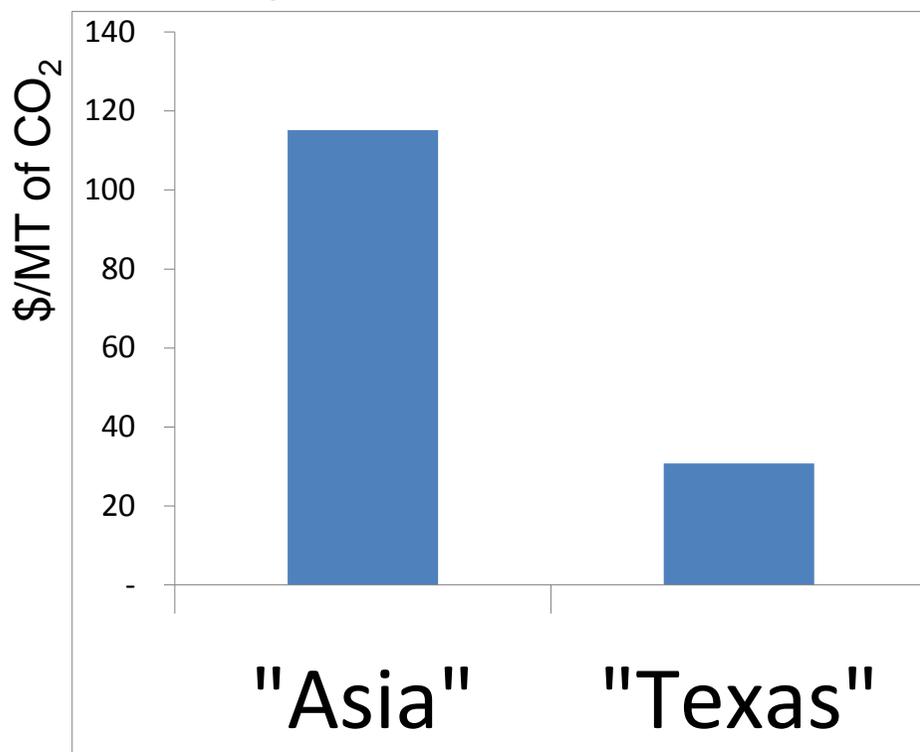
# Three interconnected countries undergoing a mega-shift in gas-related costs—will a power market come to the rescue or will consumers pay too much?



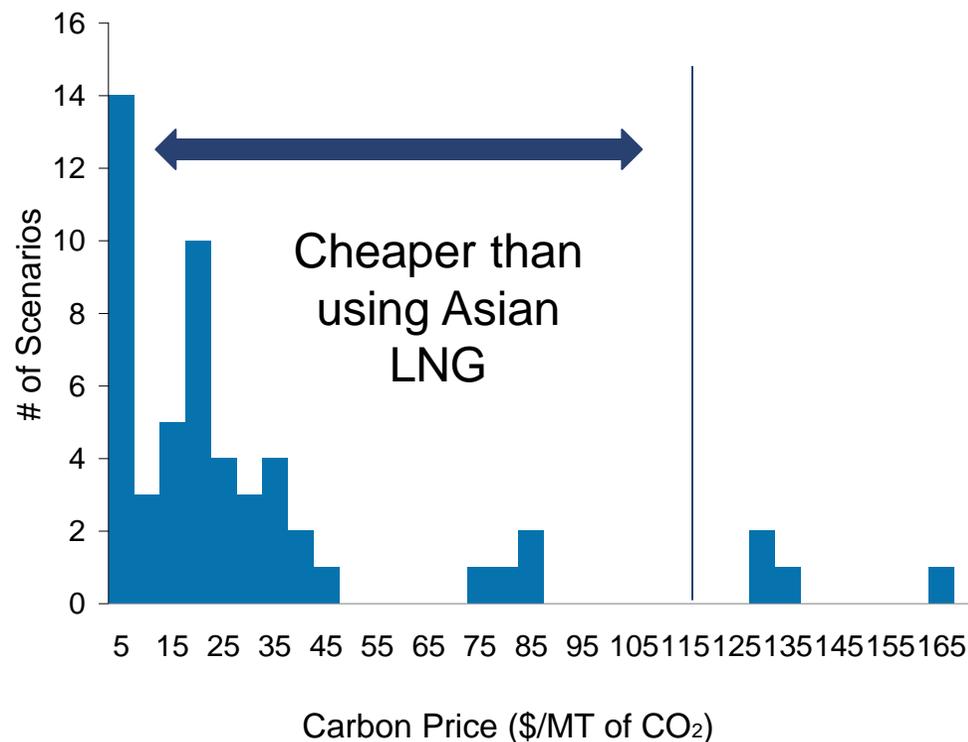
# Market-based thinking could also reduce Asian reliance on LNG while still contributing to the environment...

The relative short-run cost of using natural gas to back down coal in Asia compared to Texas

### Cost per Tonne of CO<sub>2</sub> Removed



### Carbon Price Forecast for 2025



Sources: TLG estimates and from "A Literature Review of Mid-to Long-Term Carbon Price Forecasts" by Eco Securities

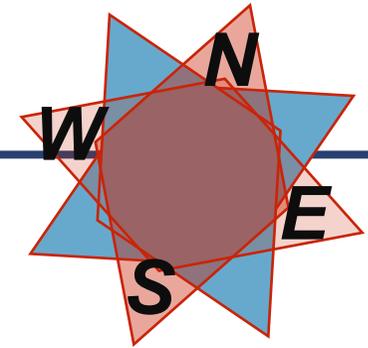
# THE ROAD AHEAD

## The cost of producing electricity appears to be increasing throughout Asia

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- Rising electricity costs will be difficult politically and for companies like KEPCO
- Ultimately, consumers must know the real cost of the electricity they use
- Markets can help, if they are allowed to work
- Clearer rules and more robust arrangements are needed

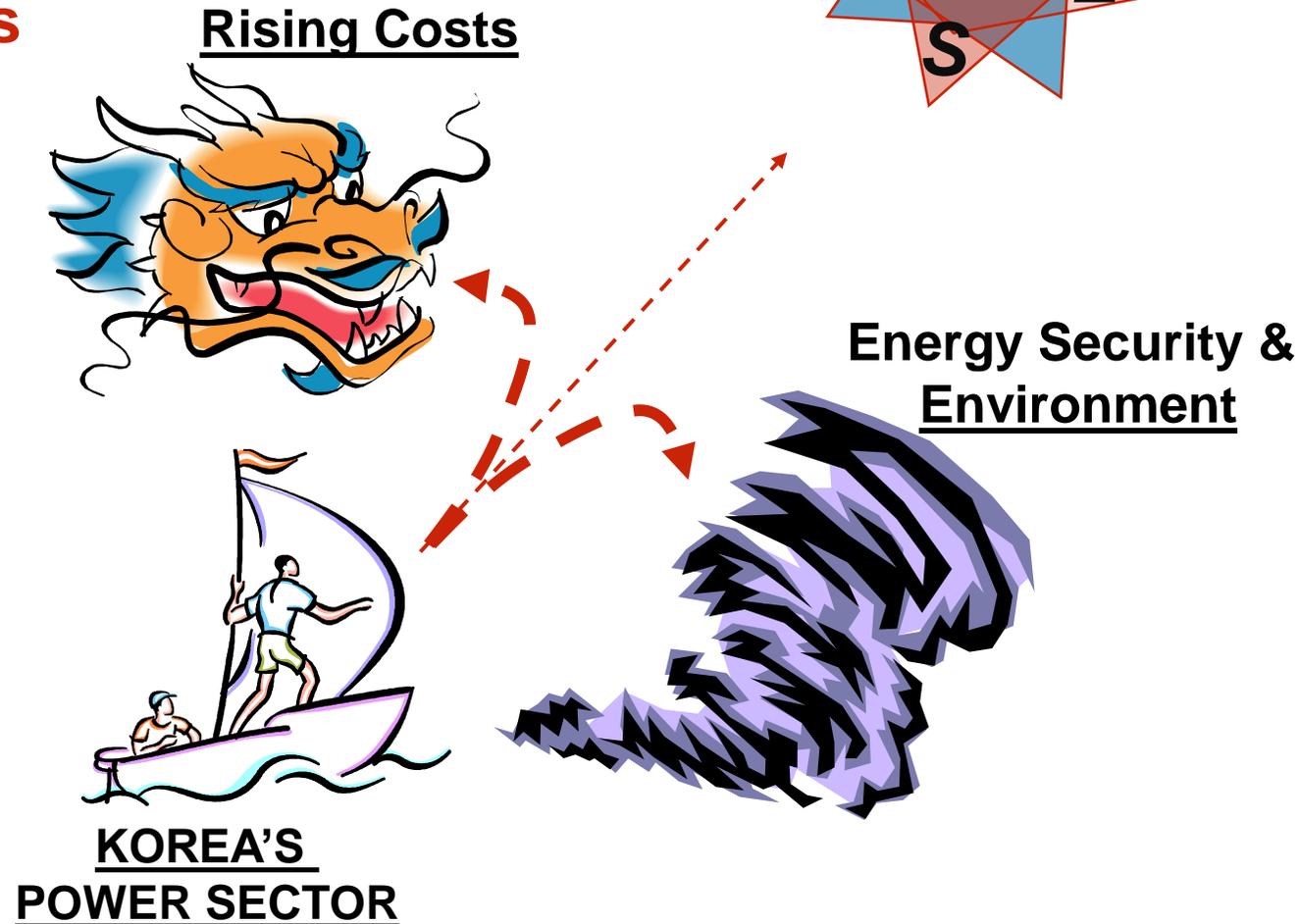
Customers will need the information and tools with which to understand and manage their energy consumption



- **Scylla and Charybdis**

- Two monsters from Greek mythology
- Most died trying to pass between them
- **Ulysses** succeeded, but still lost six men

- A difficult journey for which skills and focus are crucial



# Thank you

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