



Advising Clients on Asian Energy Cost Trends

Services for, and some trends affecting, large energy users with facilities in Asia

May 2013



THE LANTAU GROUP
strategy & economic consulting

Regional Focus, Global Access

We support our Asia Pacific clients across a broad spectrum of regulatory and commercial strategy, market research and analysis, opportunity assessment and valuation and economic regulation and market development.



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In the energy management area, we partner with Pace Global, A Siemens Business, to provide support to global clients with exposure to energy costs and risks in the Asia Pacific region.



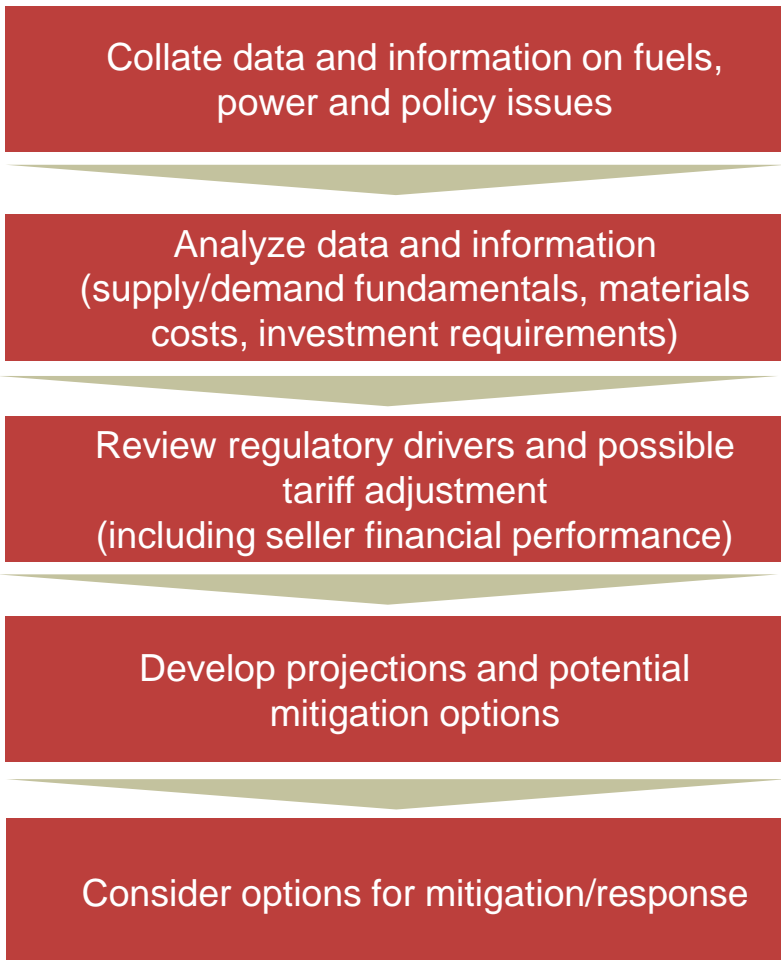
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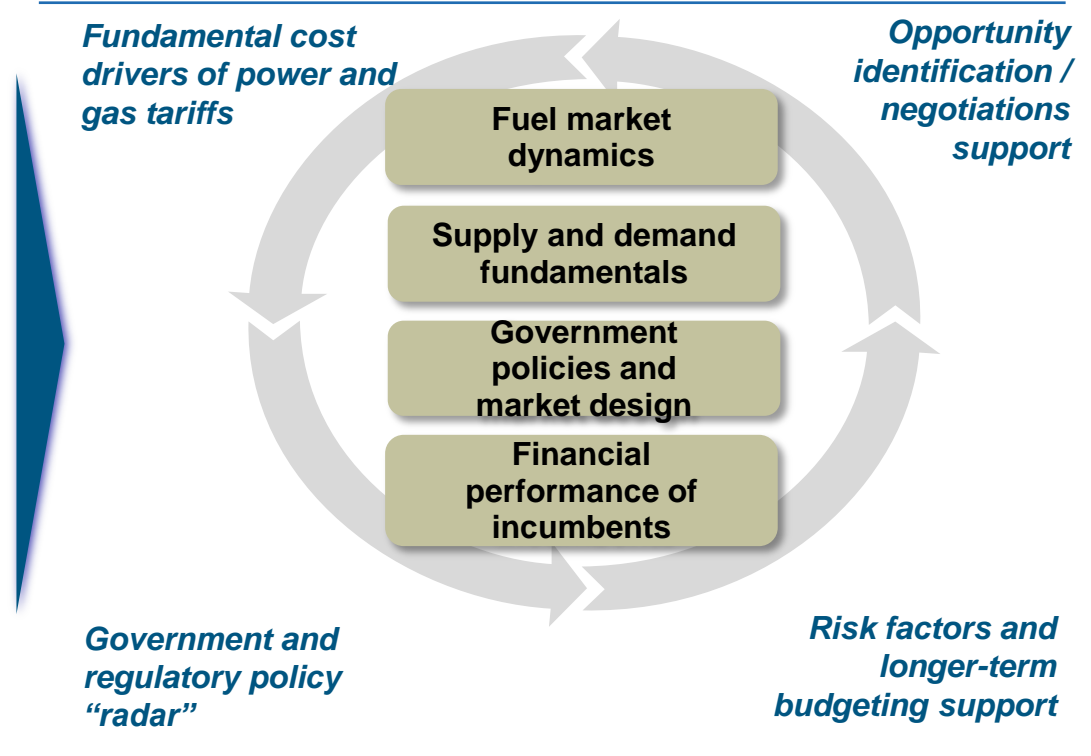
About this presentation

- This presentation is a slightly modified version of a recent webinar on Asian Energy Cost Trends for large end users with facilities in several Asian countries
- Our services for end users include
 - Projections of energy costs for planning and budgeting
 - Market updates / regulatory “radar”
 - Invoice translation / validation / tracking
 - Tariff optimisation
 - Special projects support
 - Energy contract negotiation advisory

The process of forecasting power/gas tariffs in Asia



Approach and value added



We help Asia region clients monitor their energy costs, prepare longer-term budgets, and identify or improve energy cost reduction strategies

A review of recent Asian energy market cost drivers

1 Key factors and observations

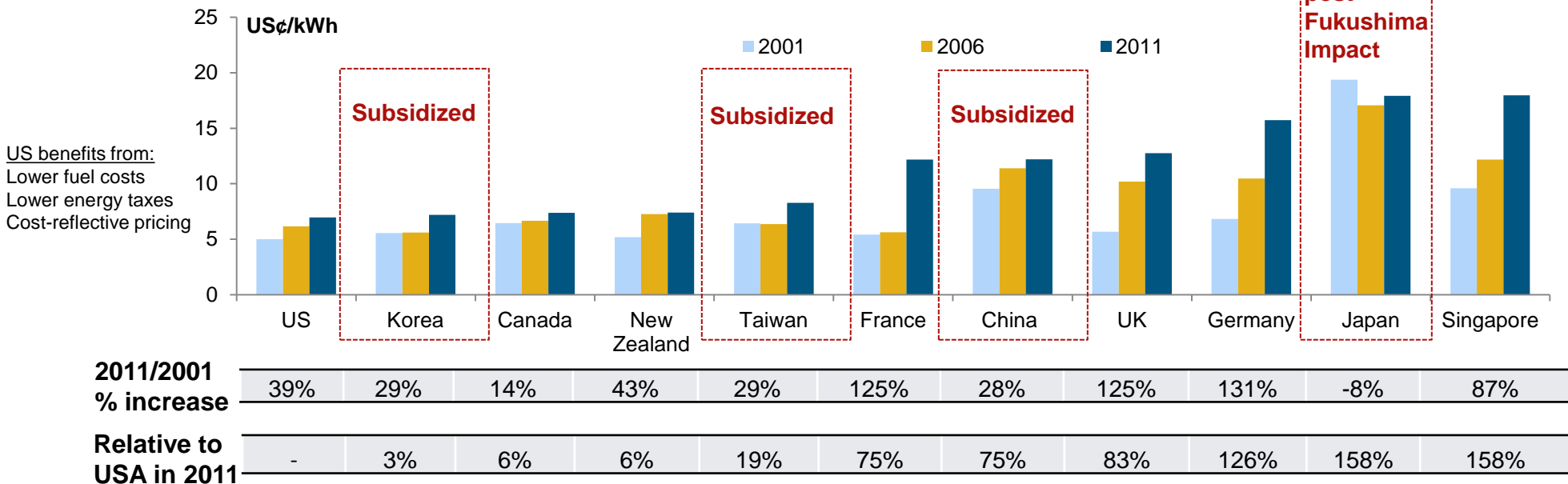
2 Deep dives

- China
- Singapore
- Philippines

3 Summary

When it is all said and done, the US has enjoyed a pretty good run of electricity prices to larger customers

Electricity prices for industry comparing 2001, 2006 and 2011



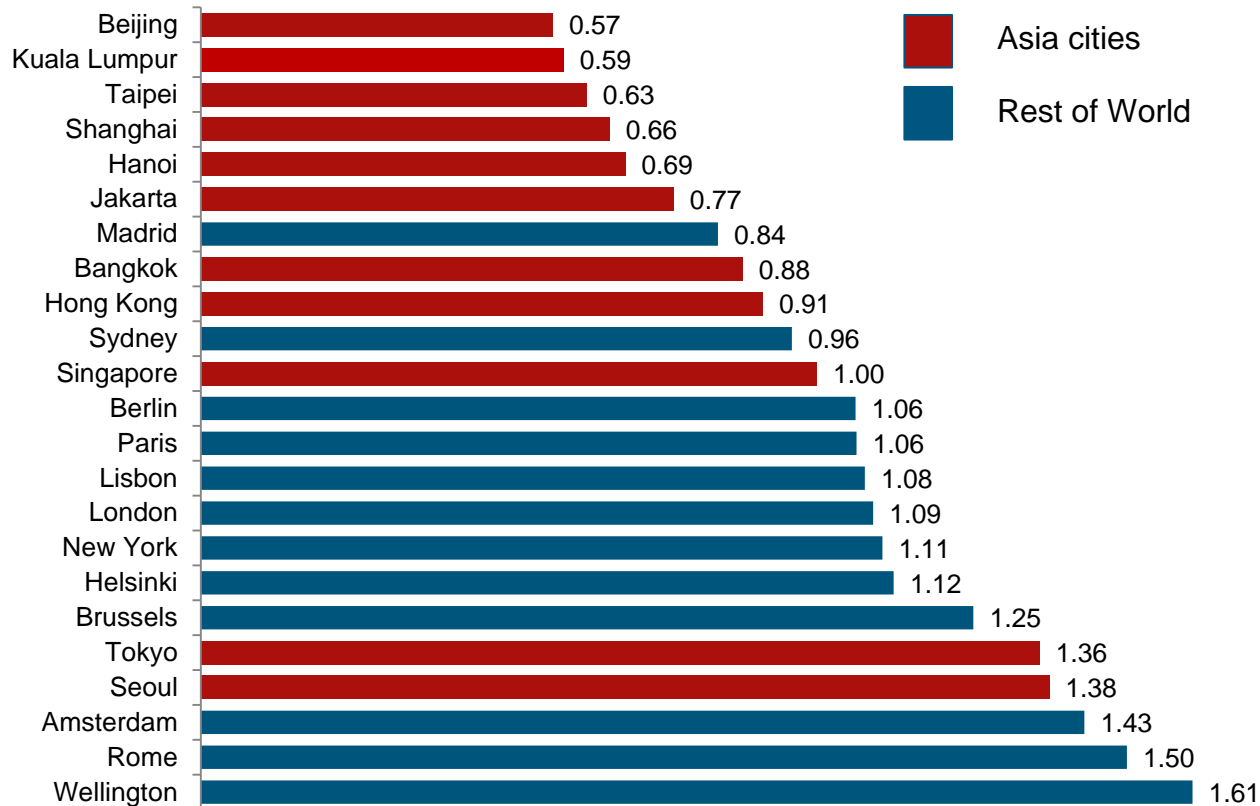
Source: IEA Energy Prices and Taxes

Asia Observations

- Most subsidies directed at smaller customers at the expense of larger customers (cross-subsidy)
- Most government-owned utilities (e.g, Korea, Malaysia, China, Taiwan, Thailand, Indonesia) have poor financial performance – problematic when fuel prices or investment needs increase
- Pressures to improve sector reliability performance increases regulatory risk and capital expenditure requirements (Korea, China)

Residential customer tariffs are strongly politicised in Asia, putting upward pressure on commercial and industrial tariffs

Ratio of residential tariff compared to commercial electricity tariff



Residential tariffs
Less than
Small Commercial tariffs

Residential tariffs
Greater than
Small Commercial tariffs

More Cost Reflective

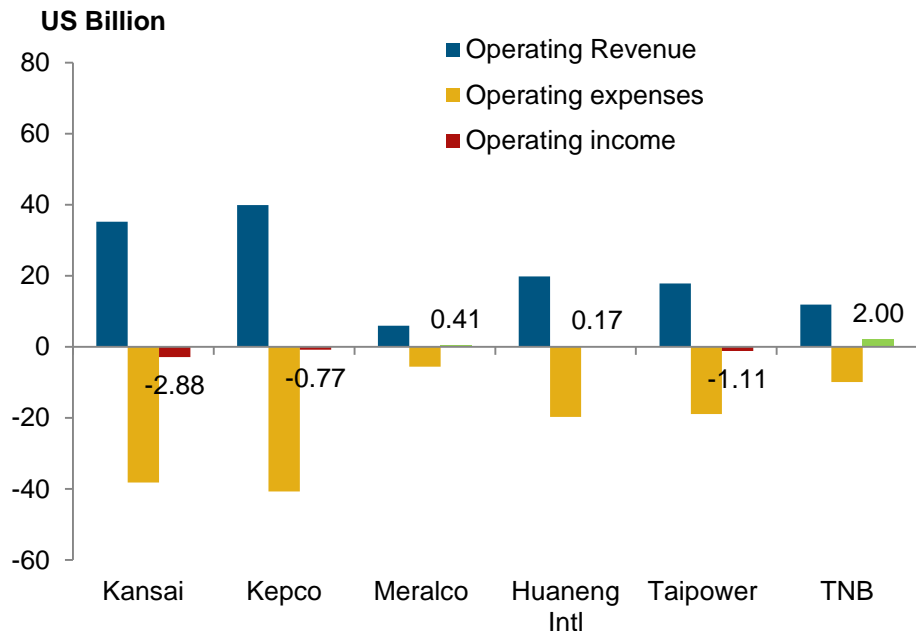


Source: TLG analysis

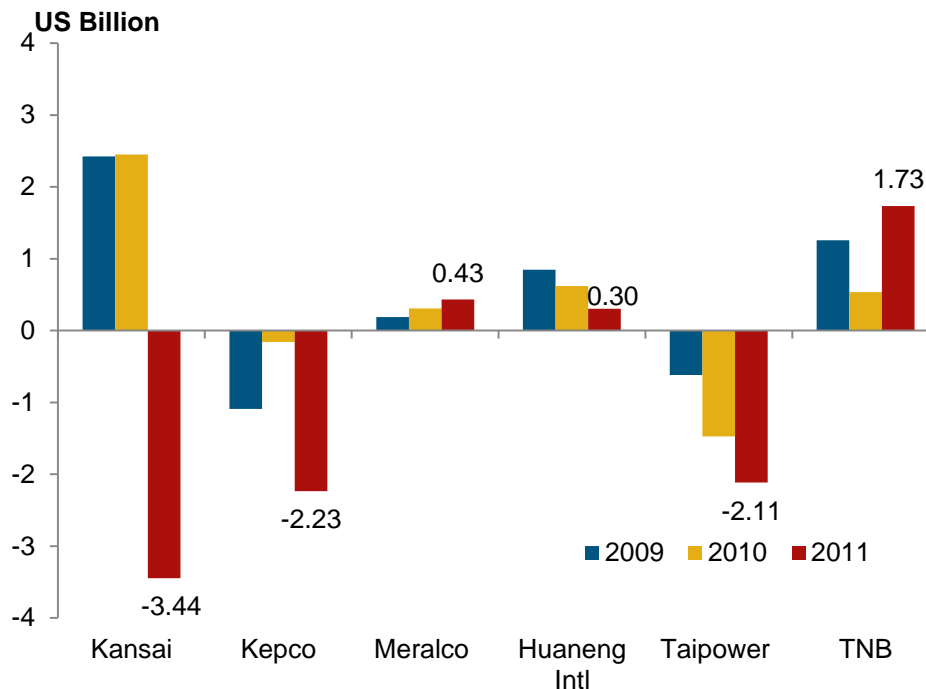
Politicized tariffs (cross-subsidies) create pressures – either larger customers pay more or the power utility earns less

Asian power tariffs do not always adjust with changes in cost – underlying financial performance is a key driver of policy driven tariffs

Operating performance of some key Asian utilities (2011)



Profit before Tax 2009-2011 of some key Asian utilities



Source: Annual reports

We track the reported performance of each major utility and correlate our findings with changes in underlying costs (fuel, non-fuel, capex)

Tariff adjustments often follow financial performance – which tracks fuel prices and policy shifts on the cost of sustaining subsidies



Updated Thursday, May 10, 2012 0:20 am TWN, CNA

Taipower publishes first 2 phases of price hike

TAIPEI—Taiwan Power Co. (Taipower) published household electricity rates for the first two phases of a three-phase price hike plan on its website yesterday.

Japan allows Tepco to raise power tariffs by 8.47%

July 19, 2012 | V. Phani Kumar

HONG KONG (MarketWatch) – The Japanese government on Friday endorsed a plan for Tokyo Electric Power Co. to raise electricity tariffs by an average 8.47%, instead of the 10.28% hike proposed by the utility, to limit the burden on consumers, Kyodo News reported. The rate hike could be implemented from Sept. 1. Tepco had proposed the double-digit tariff hike in May to meet increasing fuel costs for thermal power generation, after last year's Fukushima crisis led to a

Taipower expecting NT\$72.2bn loss

RED-FACED: The company's losses totaled NT\$117.9 billion by last year, and are forecast to rise to NT\$217 billion by next year, or more than 60 percent of the the firm's capital

Kansai Electric Seeks Tariff Increase on Rising Fuel Costs

By Tsuyoshi Inajima & Yuji Okada - Nov 26, 2012 5:12 PM GMT+0800

Kepeco contemplates rate hike after record first-half loss

OSAKA – Kansai Electric Power Co. said Monday that it might hike electricity prices after suffering a record group net loss of ¥116.785 billion in the April-September first half.

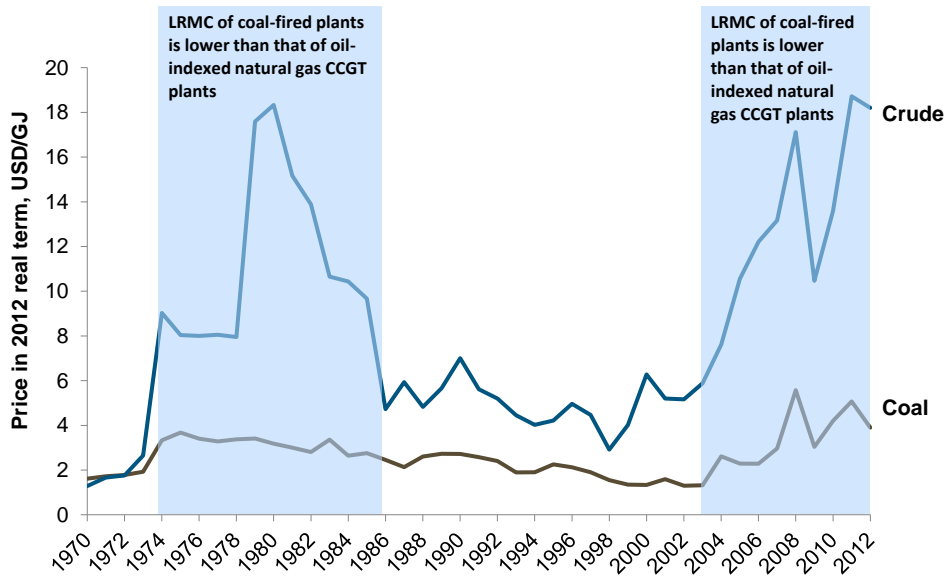
Bali: PLN electricity tariff rate increase

The Jakarta Post reports that electricity prices are increasing again from April 2013 onwards.

The state-owned electricity company, PT PLN, announced that it will apply a 4.3 percent increase to electricity rates quarterly through 2013, starting Jan 1.

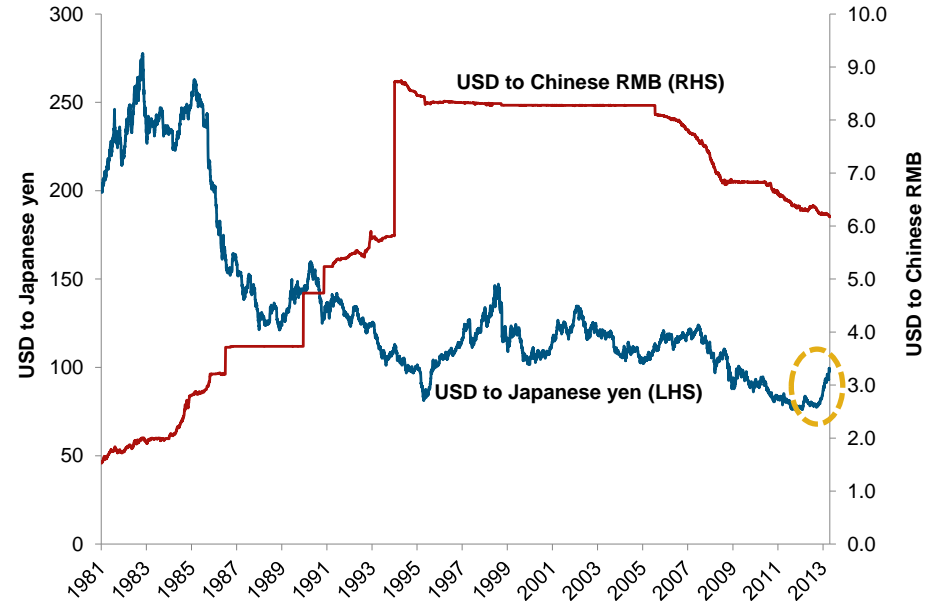
Global fuel and exchange rate factors have swung rapidly, at times

Historical coal and crude prices



Note: Crude price: 1970 - 1987: Arab Light Crude prices; 1988 - 2012: Brent price (historical Brent price only starts from May 1987)
 Coal price: 1970 - 1982: average coal prices in the US from EIA; 1983 - 2012: Newcastle FOB price

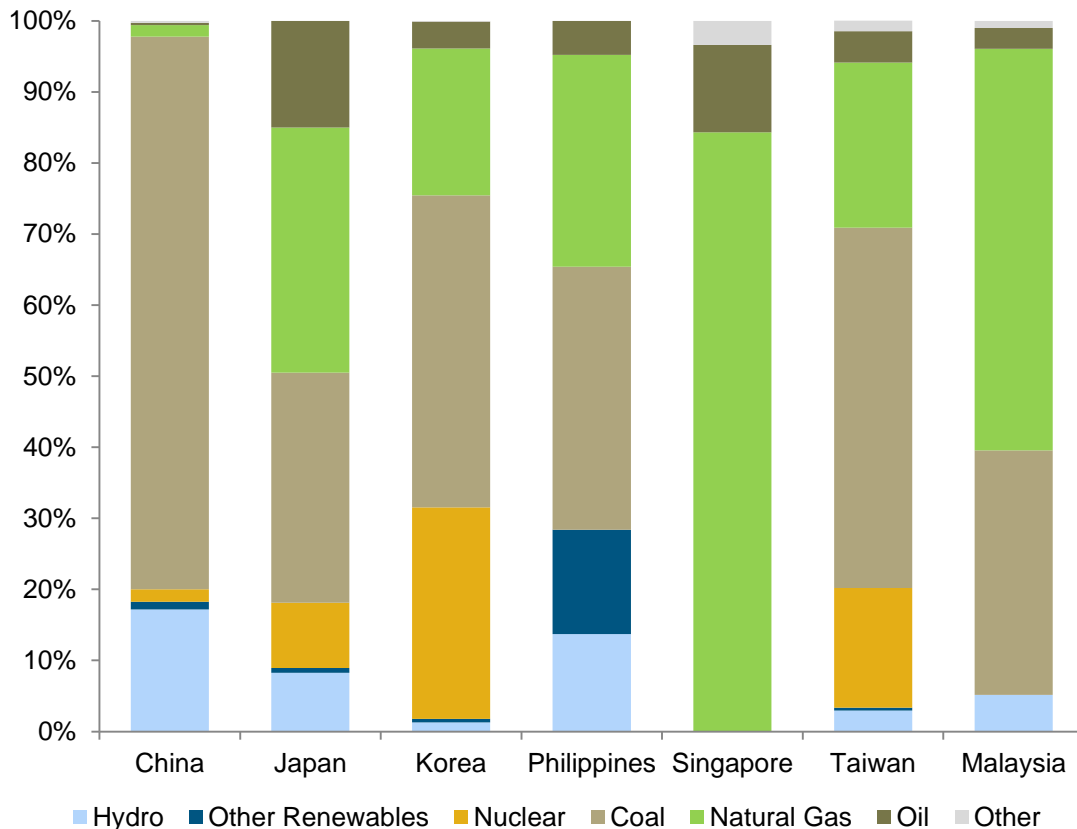
Historical exchange rate



Changes in fundamental cost drivers hit each country very differently – due to differences in technology, fuel mix, and exposure to imports

Fuel mix differences are stark – yet most countries have increasing exposure to the very same regional fuel prices (due to increased reliance on imports)

Generation fuel mix across countries in Asia in 2011



Source: IEA, Japan: FEPC, Philippines DOE

- China**
 - Domestic and imported coal (at market prices)
 - Ultra large-scale hydro
 - Growing nuclear and natural gas

- Japan**
 - Imported coal, oil and LNG
 - Post-Fukushima uncertainty re: nuclear power
 - Longer-term shift to renewables?

- Korea**
 - Imported coal and LNG
 - Nuclear power

- Philippines**
 - Imported coal and oil
 - Local oil-linked natural gas supplies
 - Plans afoot to introduce LNG

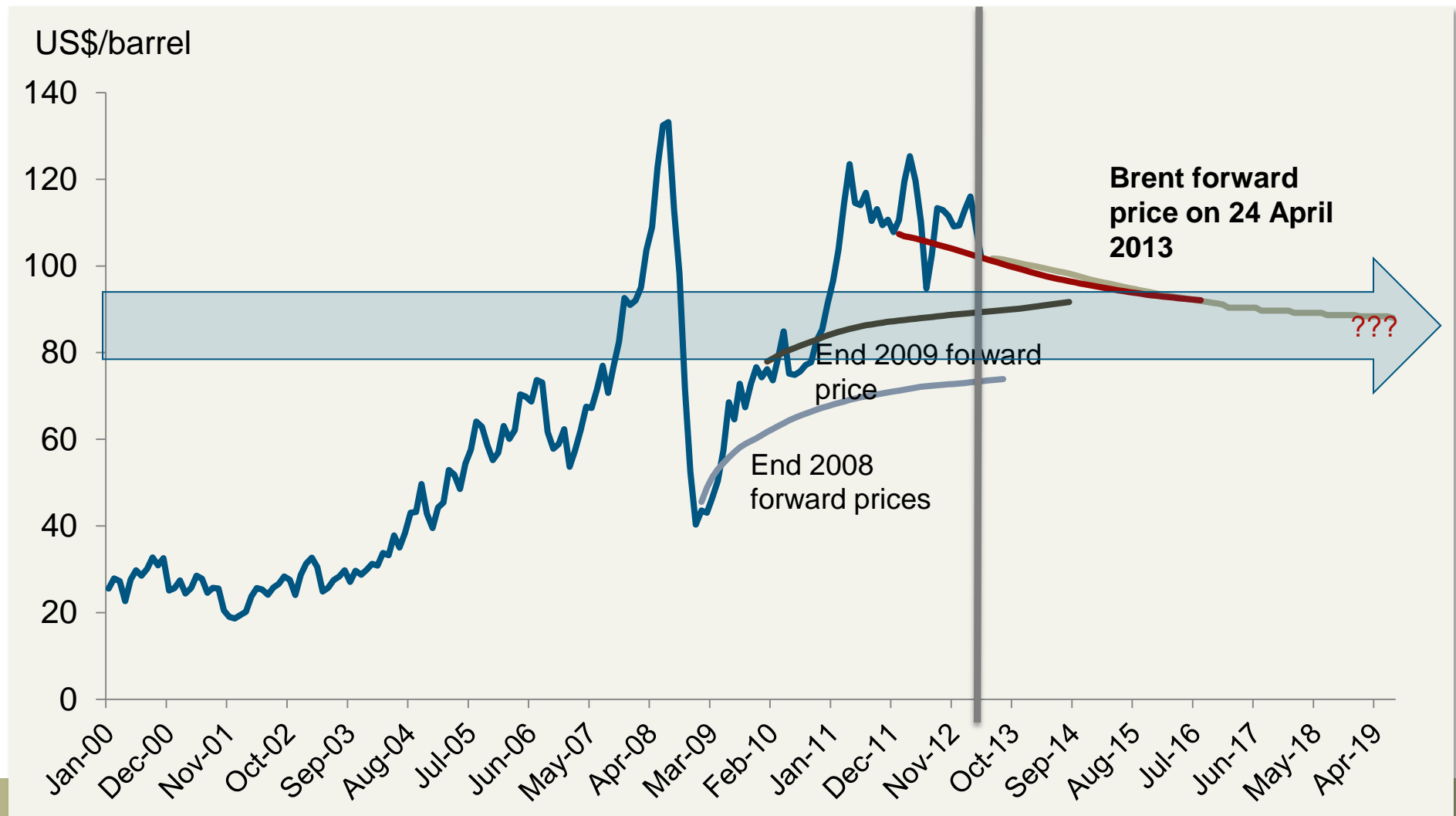
- Singapore**
 - Switching to imported LNG

- Taiwan**
 - Imported coal and LNG

- Malaysia**
 - Domestic gas supplies running out – switching more to imported coal and LNG

Growing exposure to “market-priced” (imported) coal, oil and natural gas (LNG)

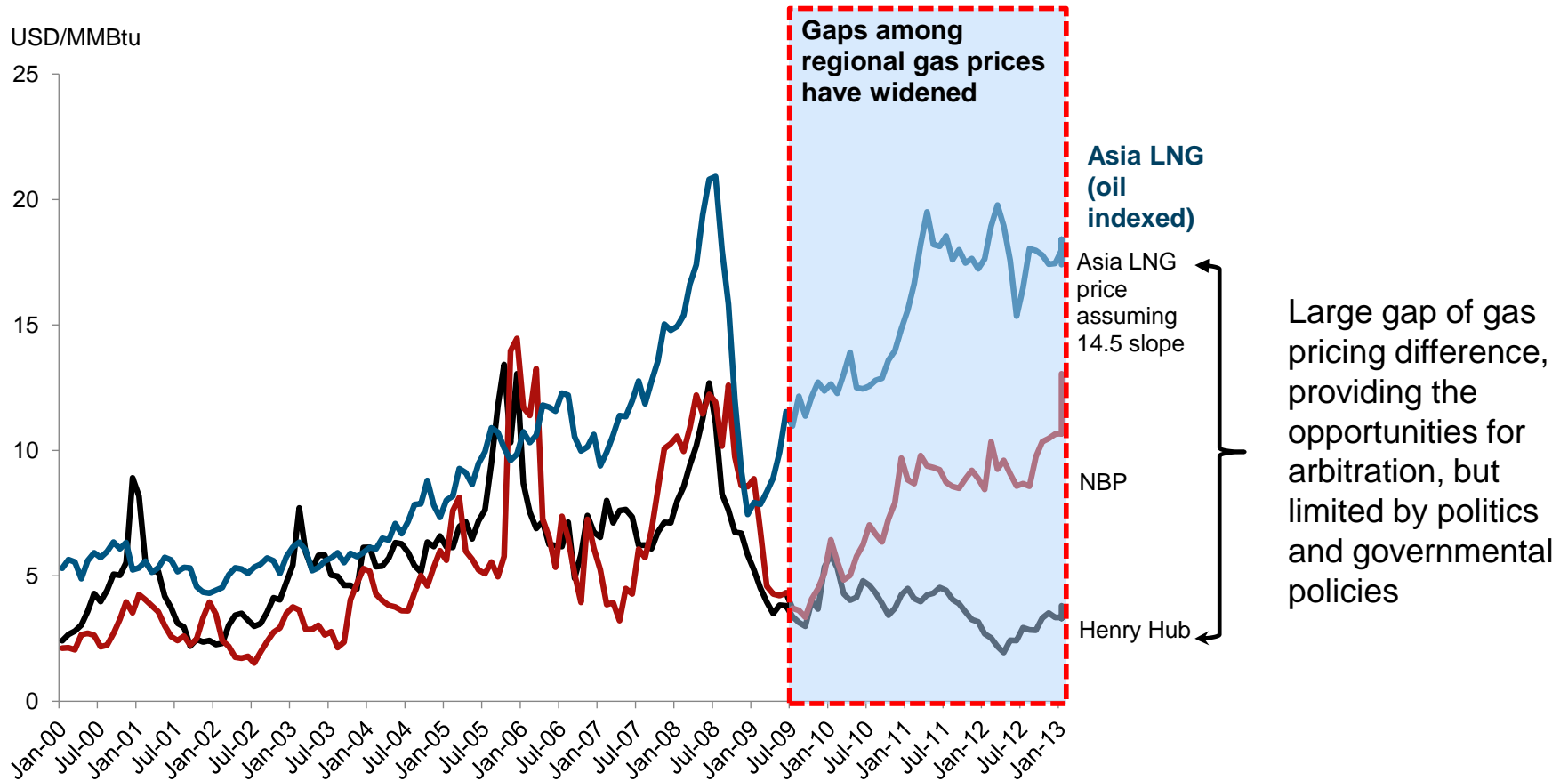
Longer term trend fuel market signals have been relatively consistent – perhaps surprisingly given the obvious volatility over the past decade



Source: ICE

Asia has been left behind in the gas revolution

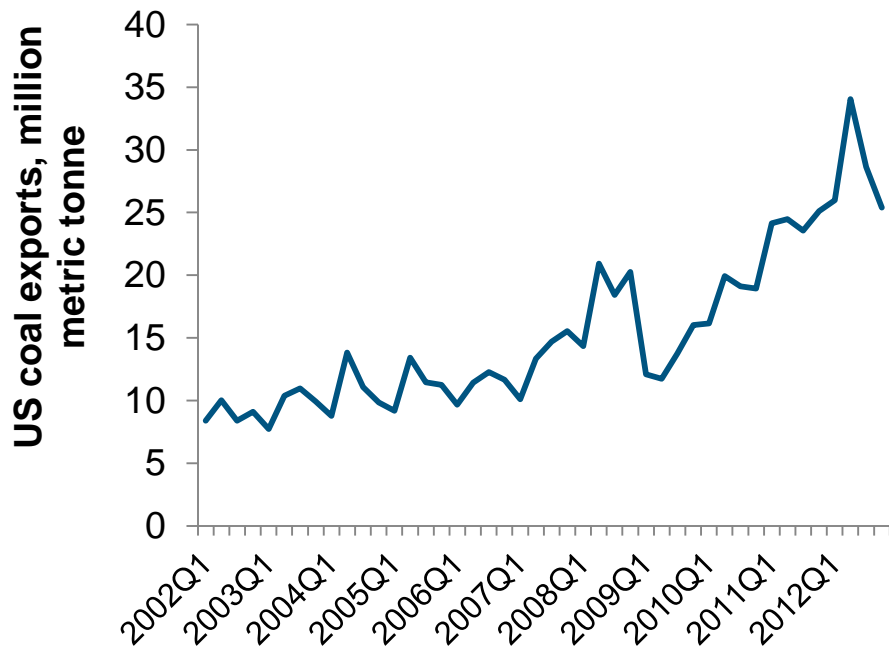
Asia LNG prices are much higher than US gas prices



Source: ICE and EIA

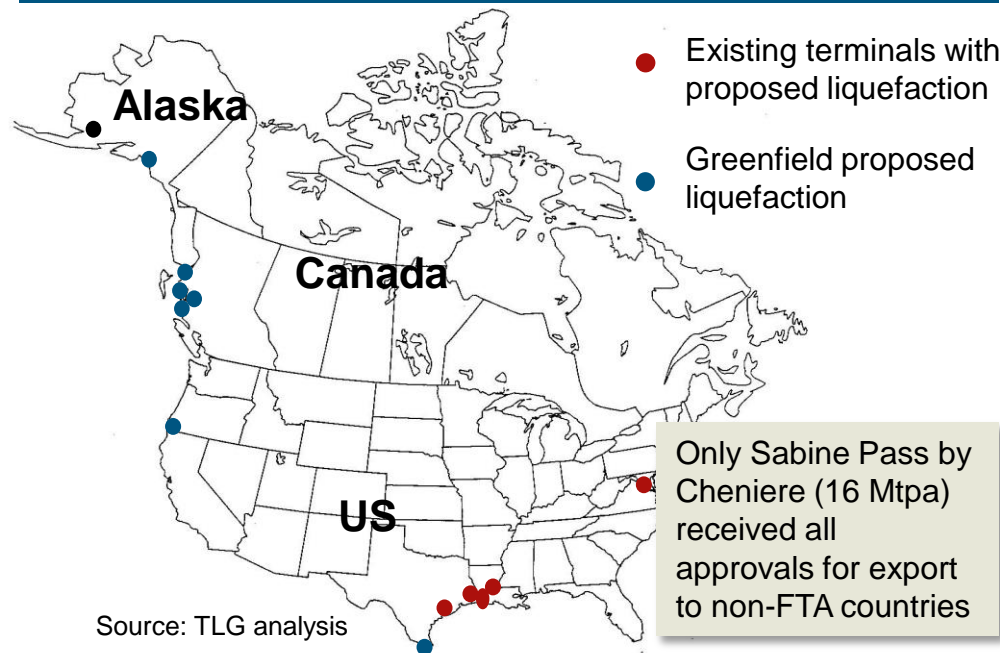
In the short-term, shale gas has caused an increase in US coal exports to Asia... In the longer-term, exports might help meet Asia's growing gas demand...

Coal exports from US have more than tripled



Source: EIA

Many (>120 Mtpa) LNG export projects planned in the US and Canada -- probably just a drop in Asia's large bucket of growing demand



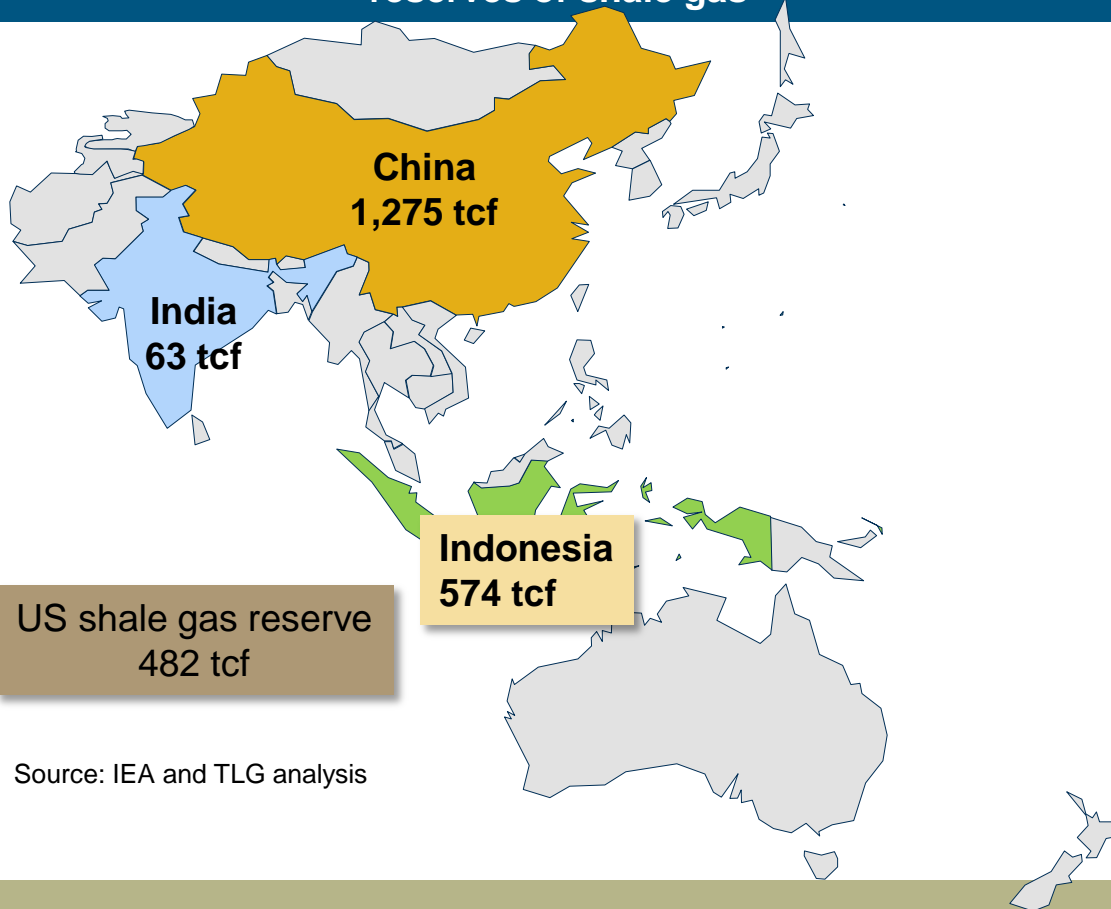
Source: TLG analysis

- China's slower growth and increased US coal exports have moderated Asian coal prices
- China's imports (270 million tonnes in 2012) are still only about 7 percent of China's domestic production

- US "resource nationalism" supported by domestic gas users
- Environmental opposition could block some terminals
- Why would prices be "discounted" to Asia?

But Asia's shale gas is not being developed very fast – doubtful North American exports alone can assuage the region's potential demand growth

China, India and Indonesia have huge technically recoverable reserves of shale gas



Source: IEA and TLG analysis

But

They do not have the ability to develop them quickly (10 years off?)

- Incomplete regulatory regime
- Limited technical know-how
- Infrastructural constraints (e.g., pipeline access)
- Environmental issues (e.g., lack of water, impacts on local residence and forced migration)
- Mis-alignment of incentives and
- Local content restriction and limits on use of foreign experts in some countries

Without a whole lot more supply hitting the Asian market, the US gas price revolution is not easily replicated

Regional summary

- Longer term fuel costs coming down a bit, but not the sort of benefit that the US has been enjoying
 - Coal markets have been relatively soft
 - LNG markets have still been relatively tight
- Broad interest in reducing subsidies and cross-subsidies, but limited political will to do so. Beneficiaries would probably be the larger industrial and commercial customers over time
- Many markets are regulated, but some, like Korea, Philippines, Singapore have market-based aspects. Philippines and Singapore are introducing some significant changes that may affect contracting strategies
- Asian power and gas prices reflect a complex mix of fundamental cost drivers and policy/regulatory risk factors, complicating projections, budgeting, and tariff optimisation

A review of recent Asian energy market cost drivers

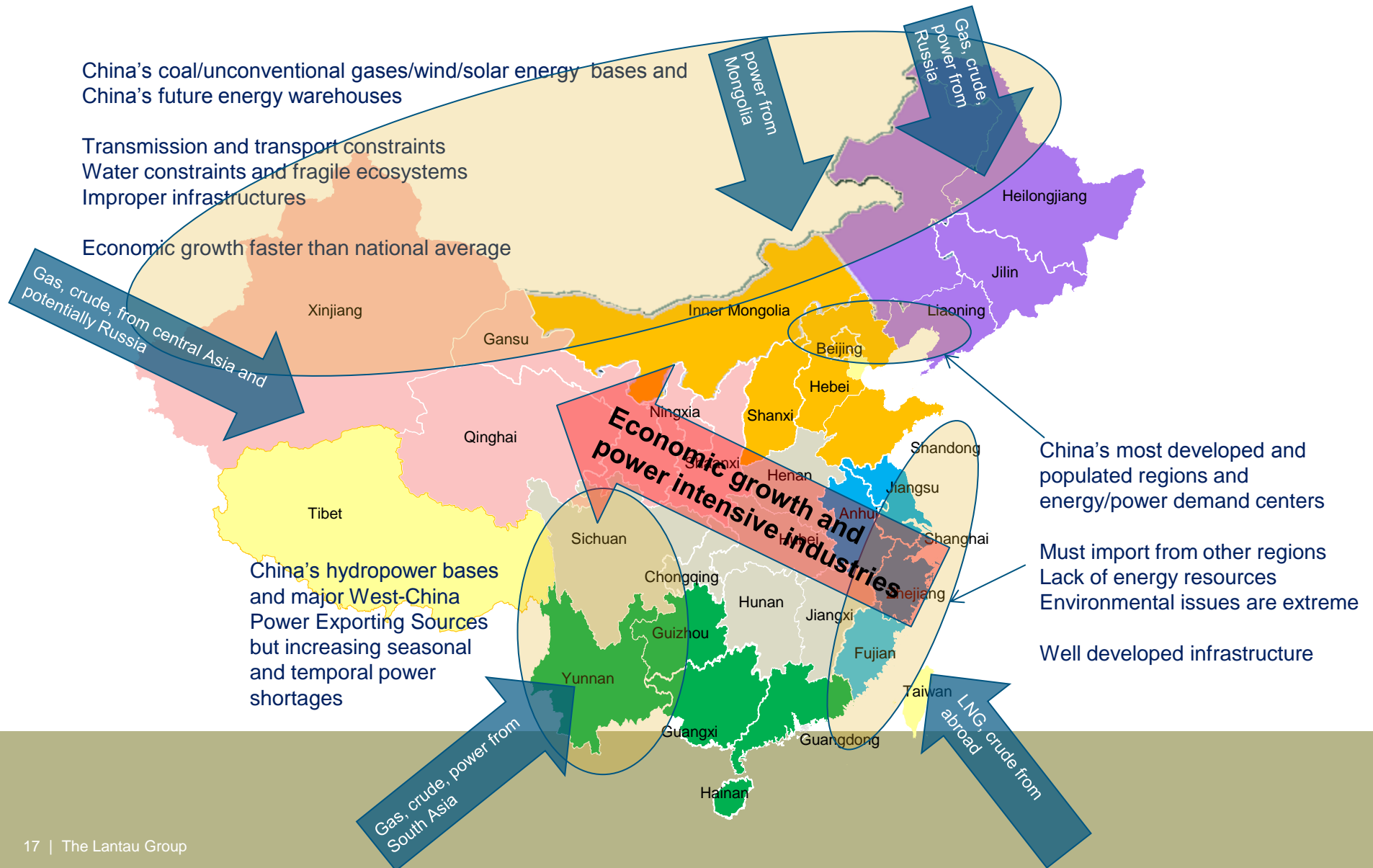
1 Key factors and observations

2 **Deep dives**

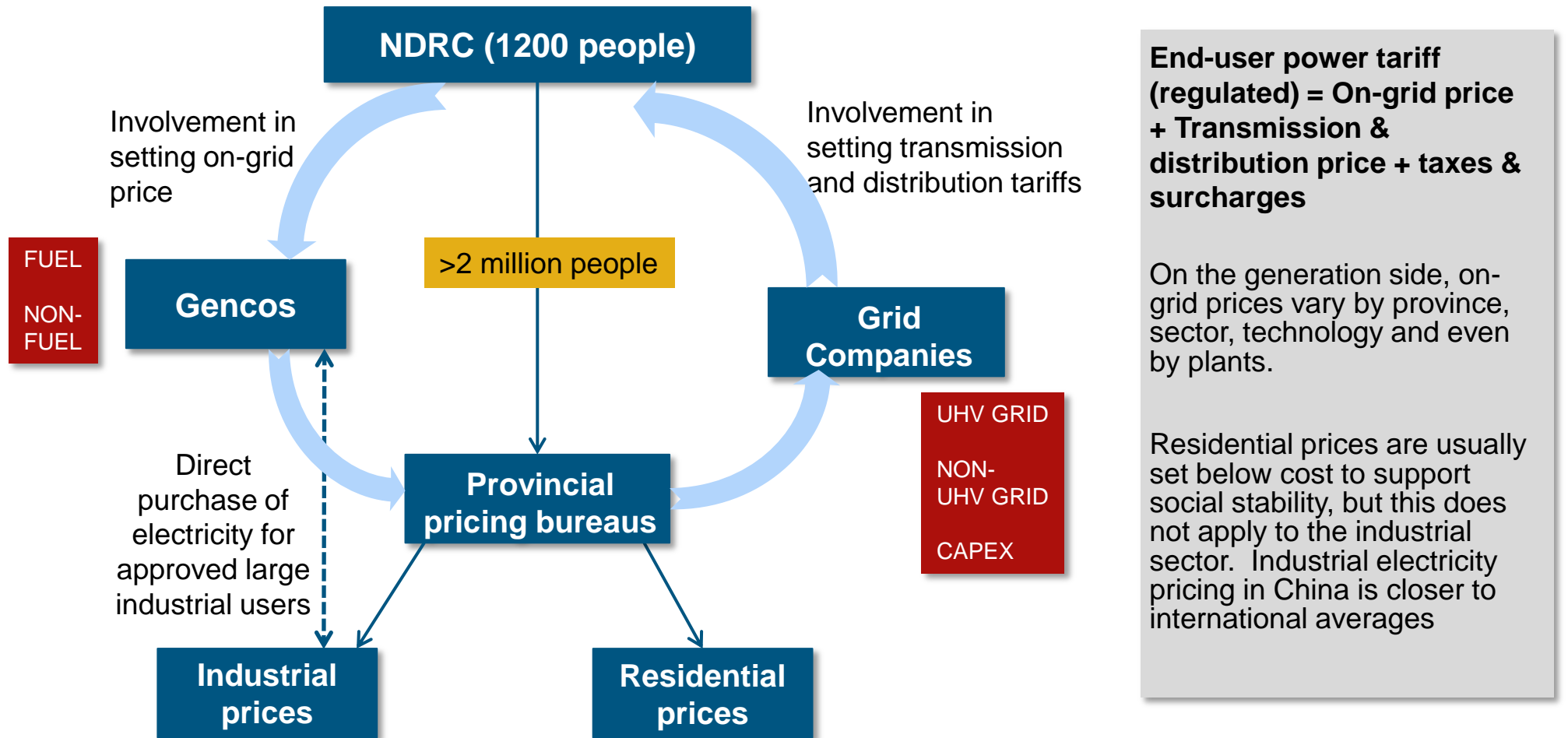
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3 Summary

We could spend days talking about China...(!)



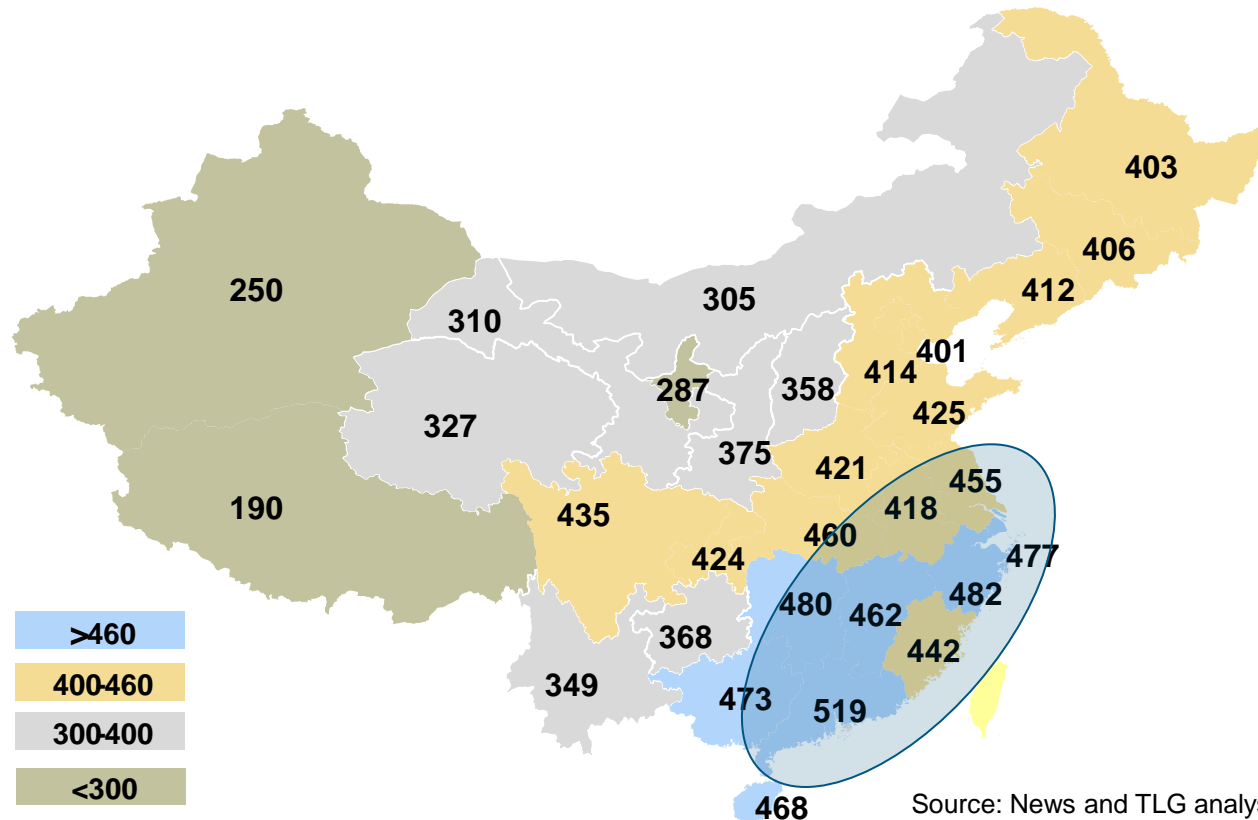
We focus on a selected number of puzzle pieces



Subsidies directed at domestic population and mitigating inflation – richer provinces and wealthier market segments pay more

China's on-grid (wholesale) power costs vary widely by location

China on-grid coal/plant tariffs after the December 2011 hike, Yuan/MWh

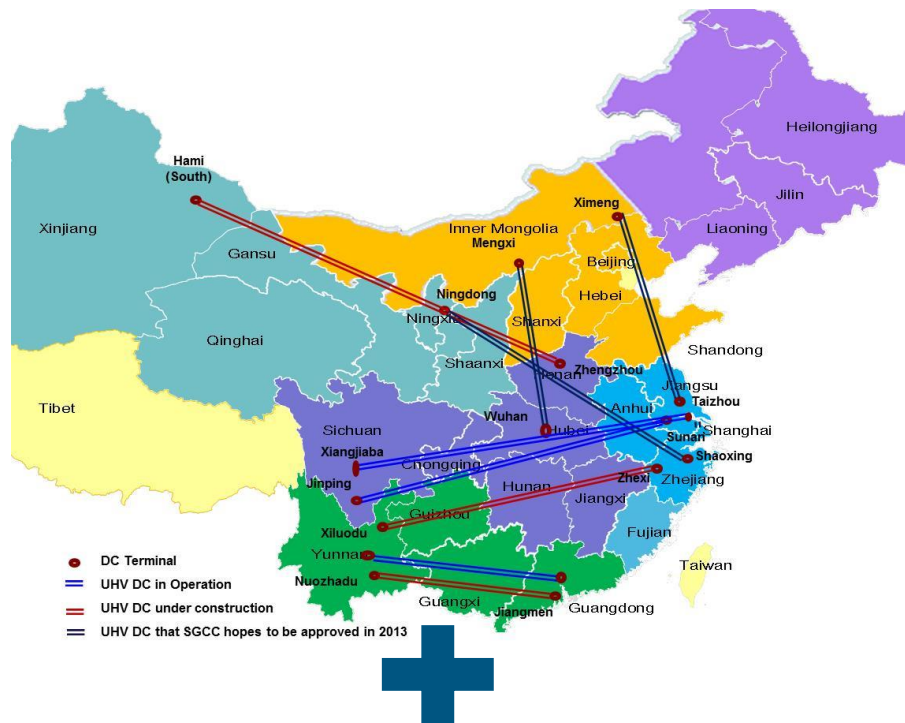


- Policy and underlying cost factors favour concentrating tariff increases in wealthier provinces
 - Broad desire to support development in inner provinces to balance China's growth

Higher wholesale power costs in wealthier provinces

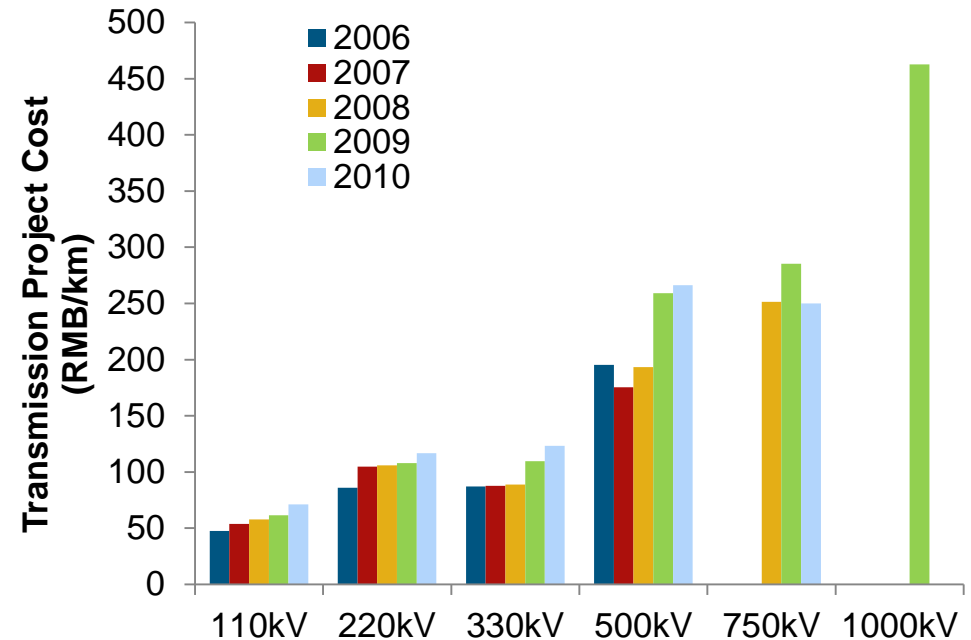
The world's most expensive grid – yet to be completed

Rapid expansion of ultra-high voltage DC Systems



State Grid also has even more ambitious plans to expand the UHV AC network to tap remote resources for eastern load centres

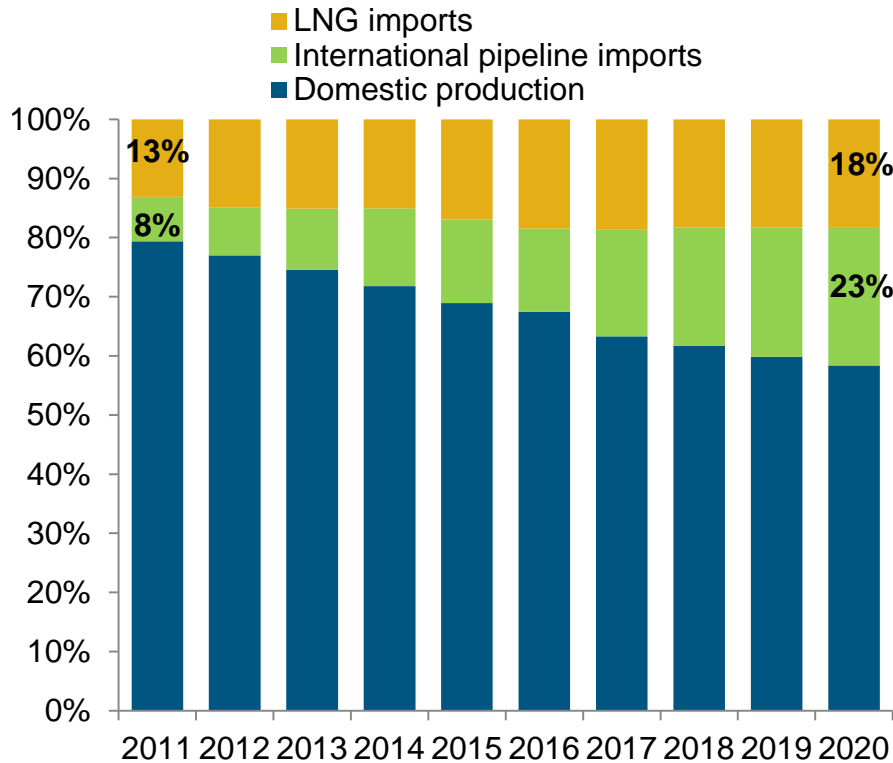
UHV project costs are much more expensive than the others



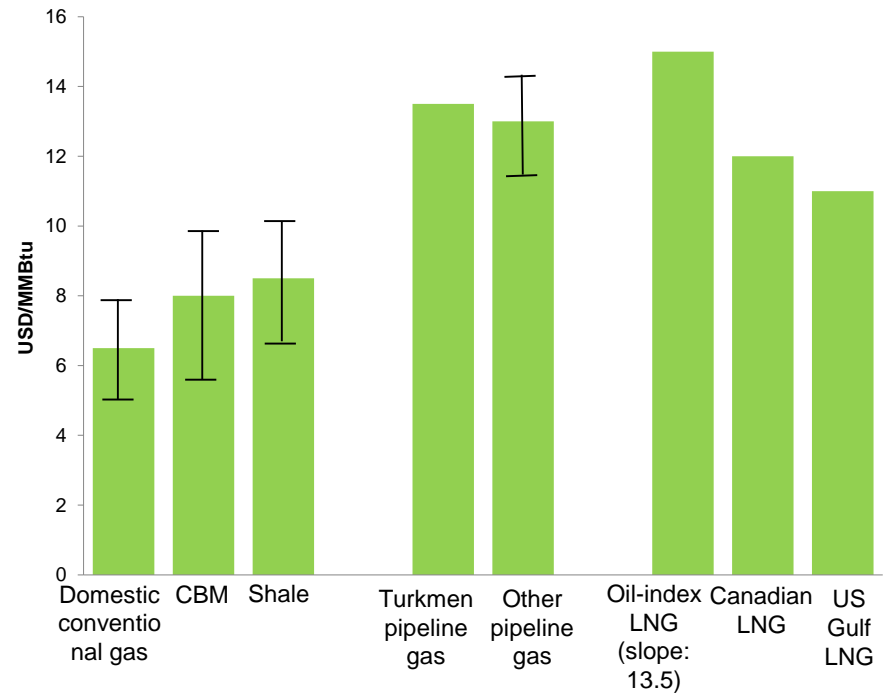
Grid development is a longer-term watching brief – it is at least three years behind original plans, and has implications for the timing and extent of natural gas (higher cost) in the eastern provinces

Environmental pressures will push up gas usage – but higher costs will have to be recovered....(this is a longer term factor)

China natural gas supply sources



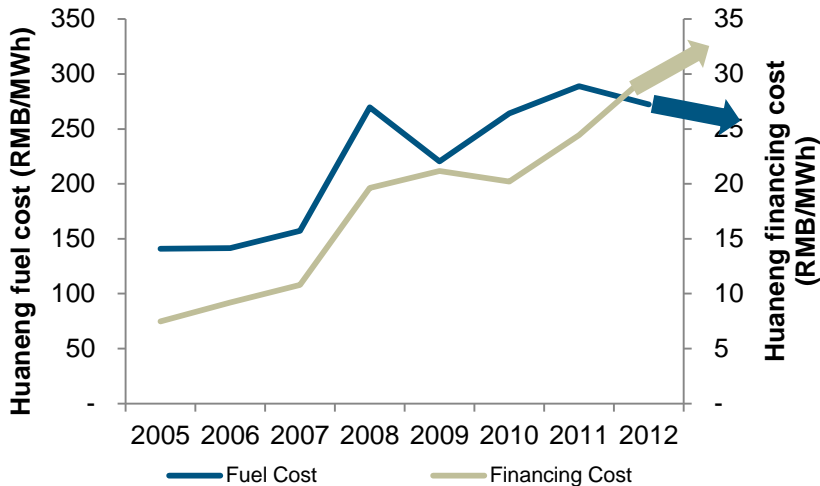
Comparative supply costs of gas into Shanghai



Source: TLG analysis

China Summary

Fuel costs have risen but are now easing, but non-fuel costs are still rising



Source: Huaneng Power International annual reports

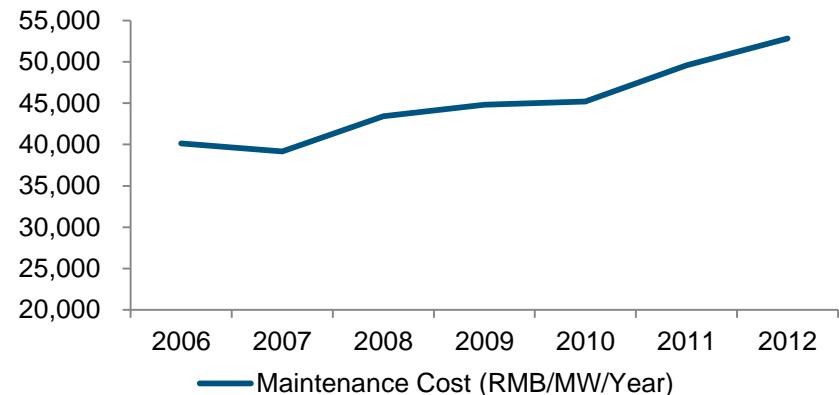
Rising renewable energy surcharge cost

- China is just starting to pay extra to increase renewable energy, but the total amount of power purchased remains very low compared to thermal and hydro generation

Increasing environmental control cost

- China has more than 817 GWs of thermal generation that fail to meet China's National Air Emissions Standards. Investment of US\$ 31 billion is required with an on-going increase in annual operational costs of US\$ 10 billion

Other costs are rising as well (Labor, equipment and material cost)



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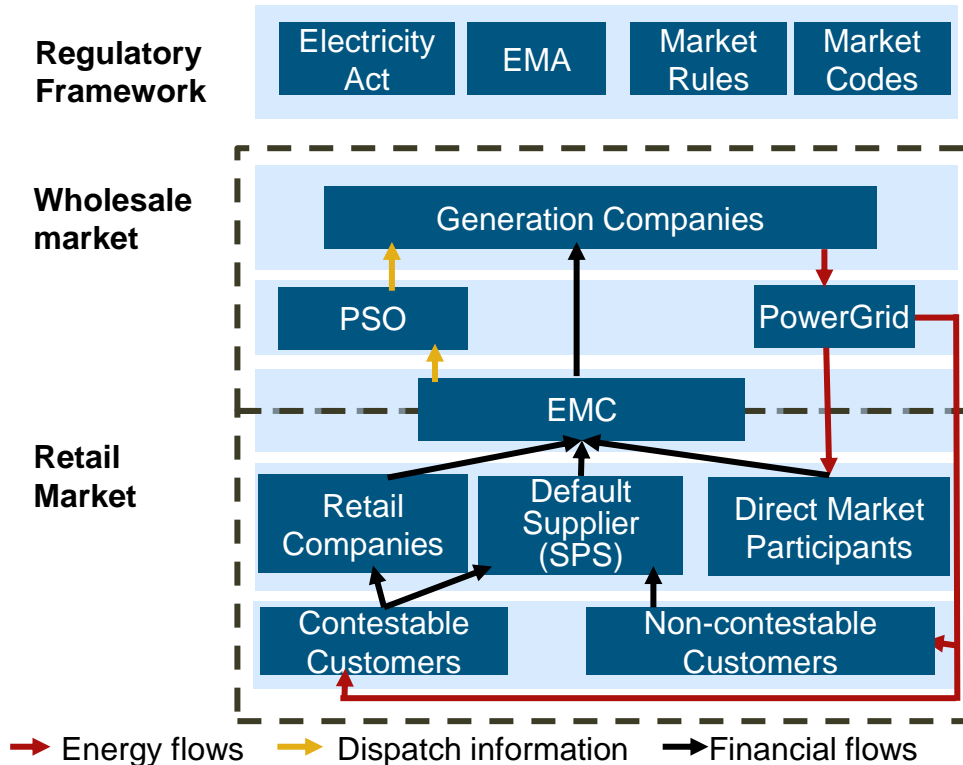
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- **Singapore**
- Philippines

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Market design of the NEMS

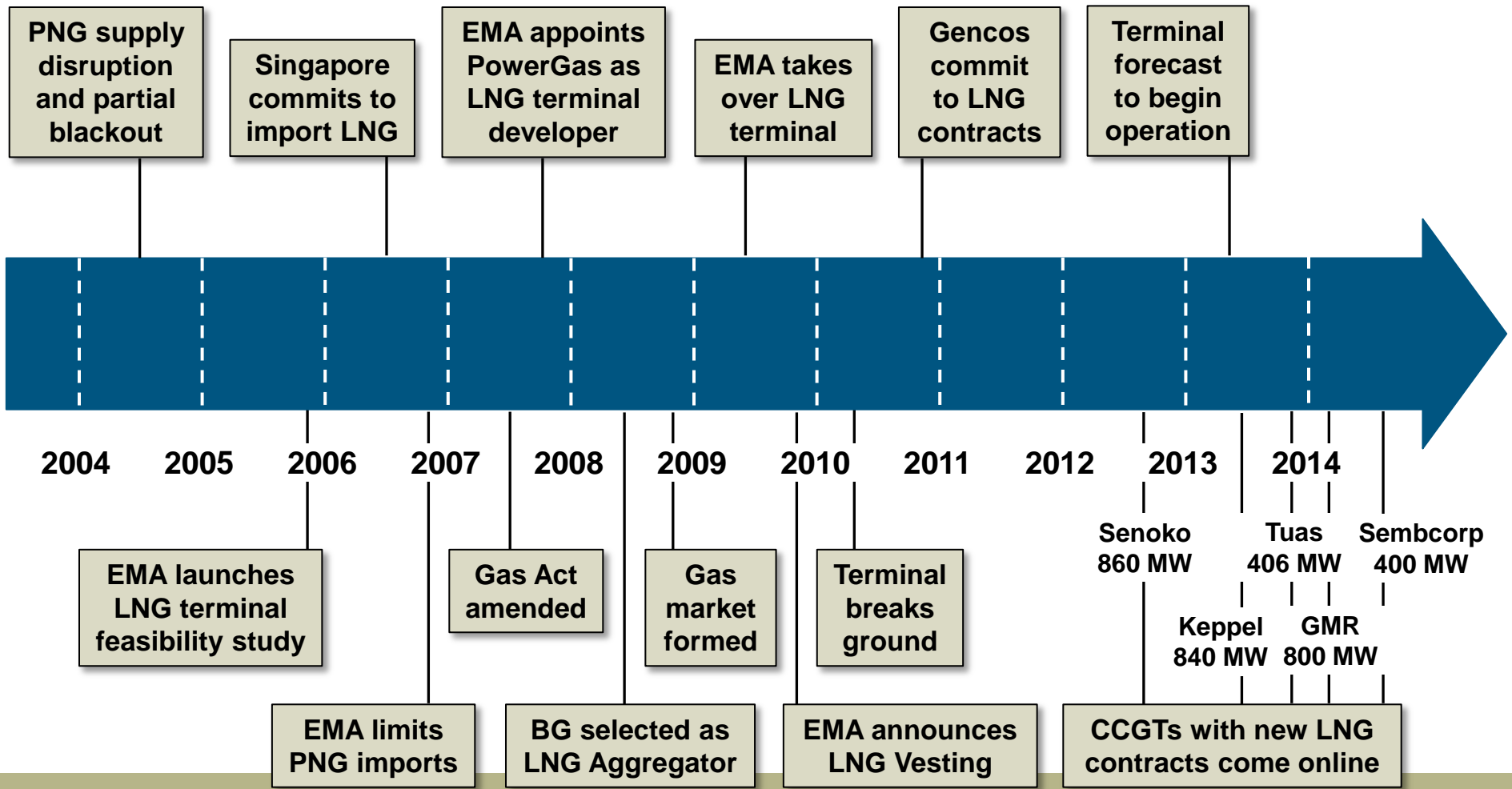
National Electricity market of Singapore (NEMS) (2003+)



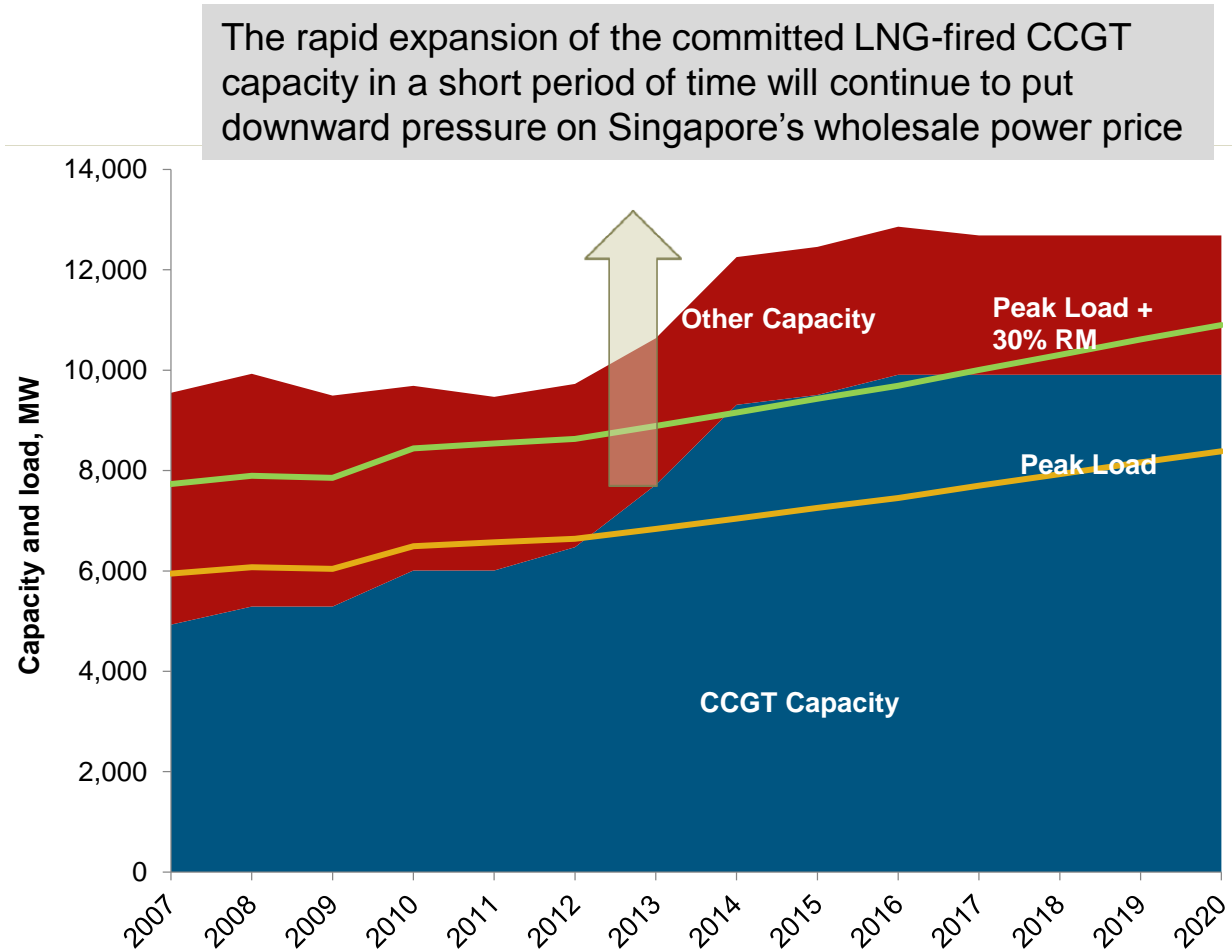
- NEMS started operating in January 2003
- NEMS is a real-time spot market for energy, regulation and three classes of reserves. The price outcomes are co-optimization between energy, reserve and regulation
- NEMS is ex ante pricing designed; it uses locational marginal (nodal) prices at 33 injection nodes and 350 off-take nodes
- Generators receive nodal spot price and customers pay Uniform Singapore Electricity Price (USEP)

The NEMS is soon to undergo a significant transformation with the introduction of LNG and the addition of new CCGT capacity

LNG development in Singapore has been a decade-long process and will have significant impact in the Singapore power market with new LNG-fired CCGTs



CCGT capacity in Singapore will grow much faster relative to peak load in the near term



Source: EMA and TLG analysis

Three key drivers will force major changes in the Singapore power price levels

Potential supply glut

- New CCGT capacity, about 4 GW from 2012-2016, will displace steam unit dispatch in virtually all hours of the year
- New CCGT capacity from new players will erode dominant gencos' ability to exercise market power

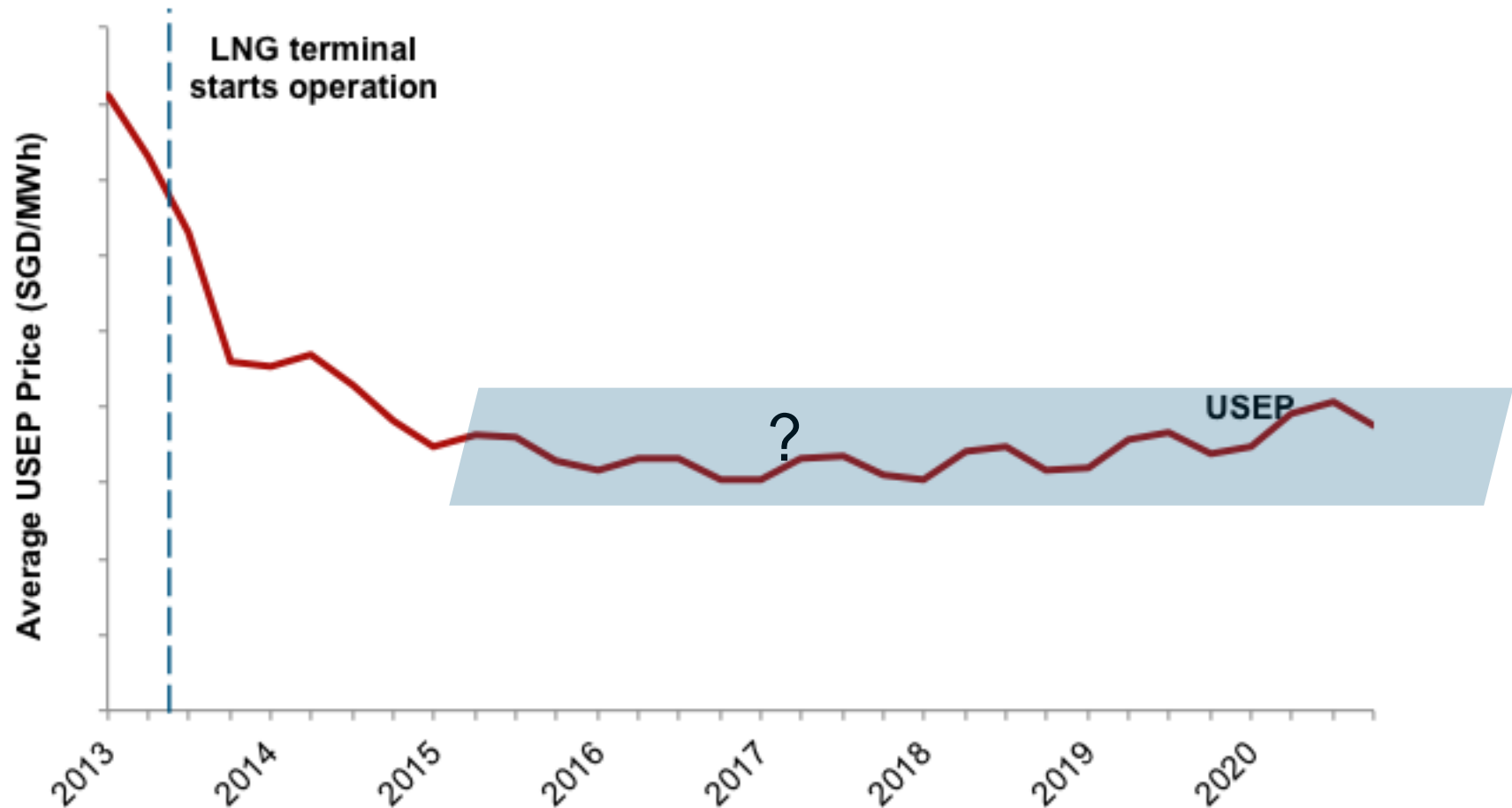
Relief of gas constraints

- The introduction of LNG in April 2013 will relieve PNG constraints that elevated bids and prices in 2011 and 2012

Future oil prices

- High sulfur fuel oil (HSFO) price drives the current underlying fuel costs for power generation as CCGTs use pipeline natural gas (PNG) that is indexed to HSFO, and the steam units use fuel oil
- Brent price will be another driver as the upcoming LNG prices are linked to Brent
- Future Brent and fuel oil prices are expected to fall slightly in the coming years

We project falling wholesale prices due to relief of gas-constraints post LNG introduction and increased competition from new entry



Source: TLG analysis (redacted) from TLG in-house power dispatched model "CEMOS" with strategic bidding features

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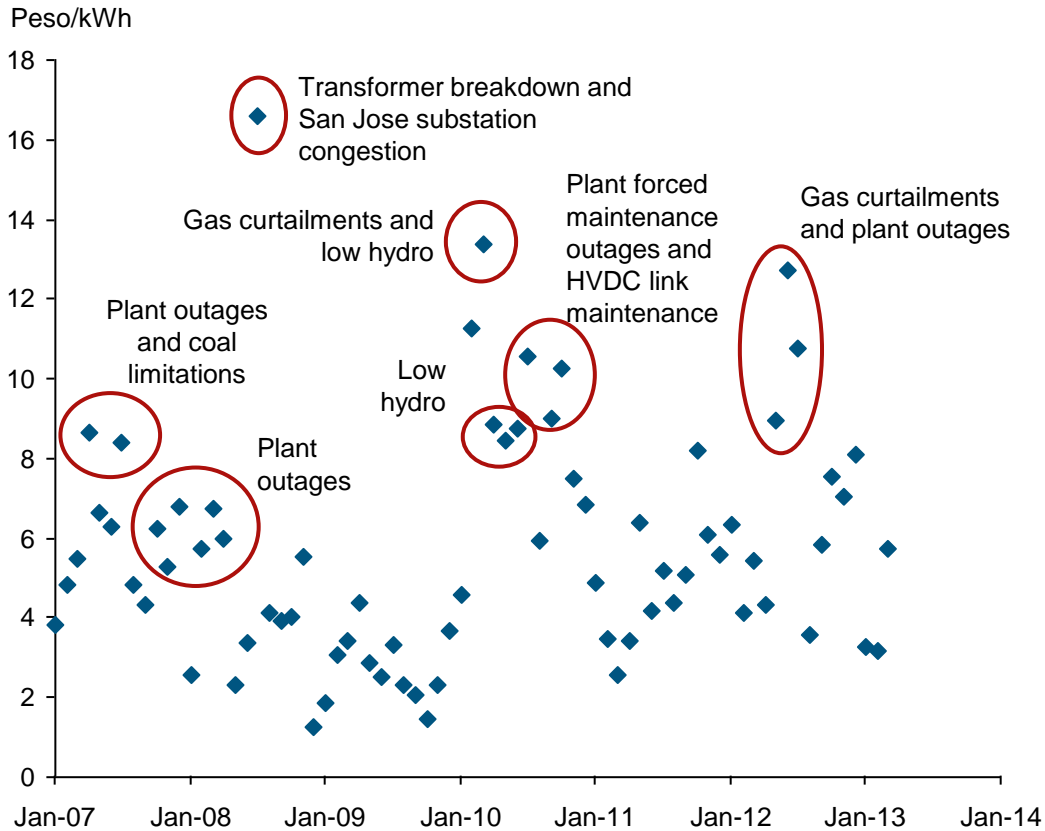
2 **Deep dives**

- China
- Singapore
- **Philippines**

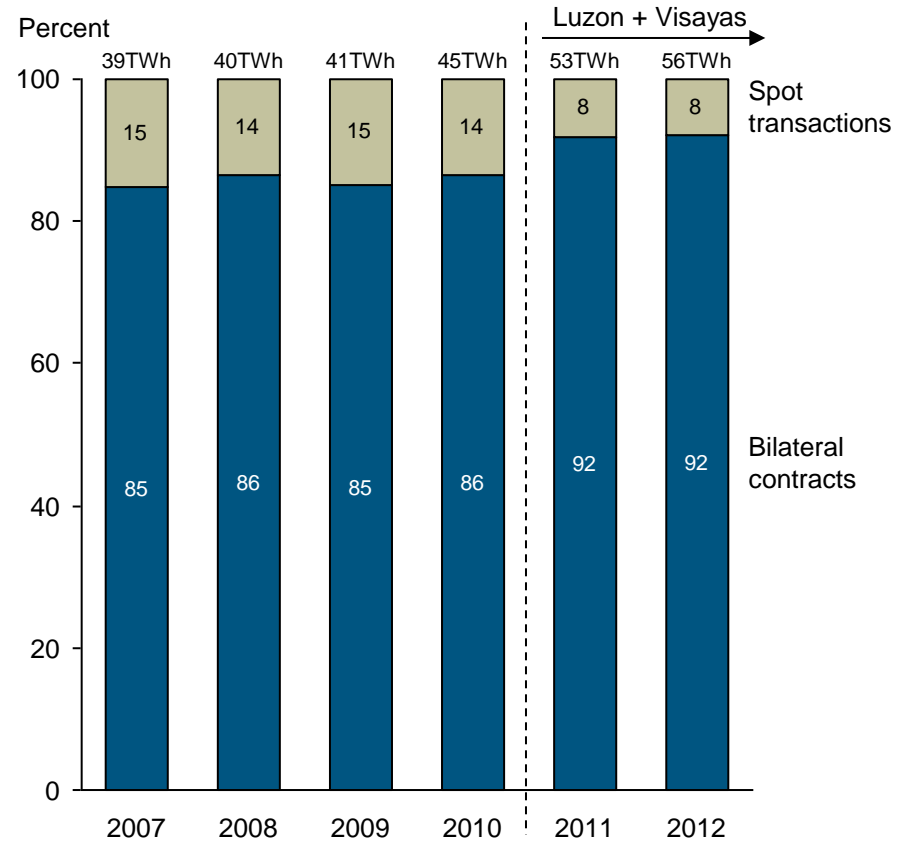
3 Summary

The Philippine Wholesale Electricity Spot Market (WESM) remains volatile and event-driven, one of the reasons why the level of contracting has increased

Average monthly WESM spot settlement price*



Mix of contracting vs. spot in WESM



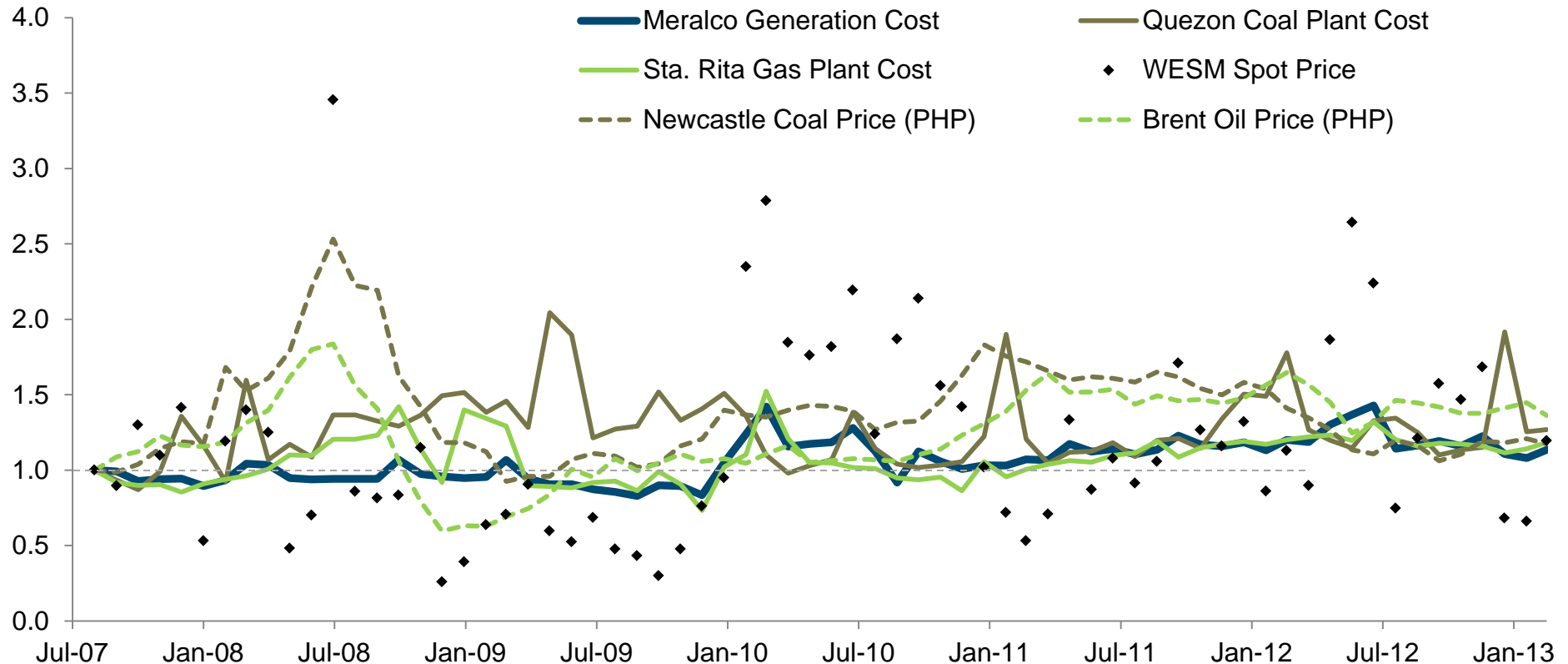
MERALCO spot (TWh)	4.4	2.6	3.8	4.6	2.4	2.3
MERALCO % spot of total purchases	15.6%	9.7%	14.3%	16.2%	8.6%	7.5%

Note: * Buying price (with 100% surplus)
Source: PEMC; MERALCO; TLG analysis

Short-term supply-demand events have masked the links between energy prices and fuel costs, but they are reasonably aligned in the long-term

Energy and fuel price trends

Index (Aug-07 = 1.0)

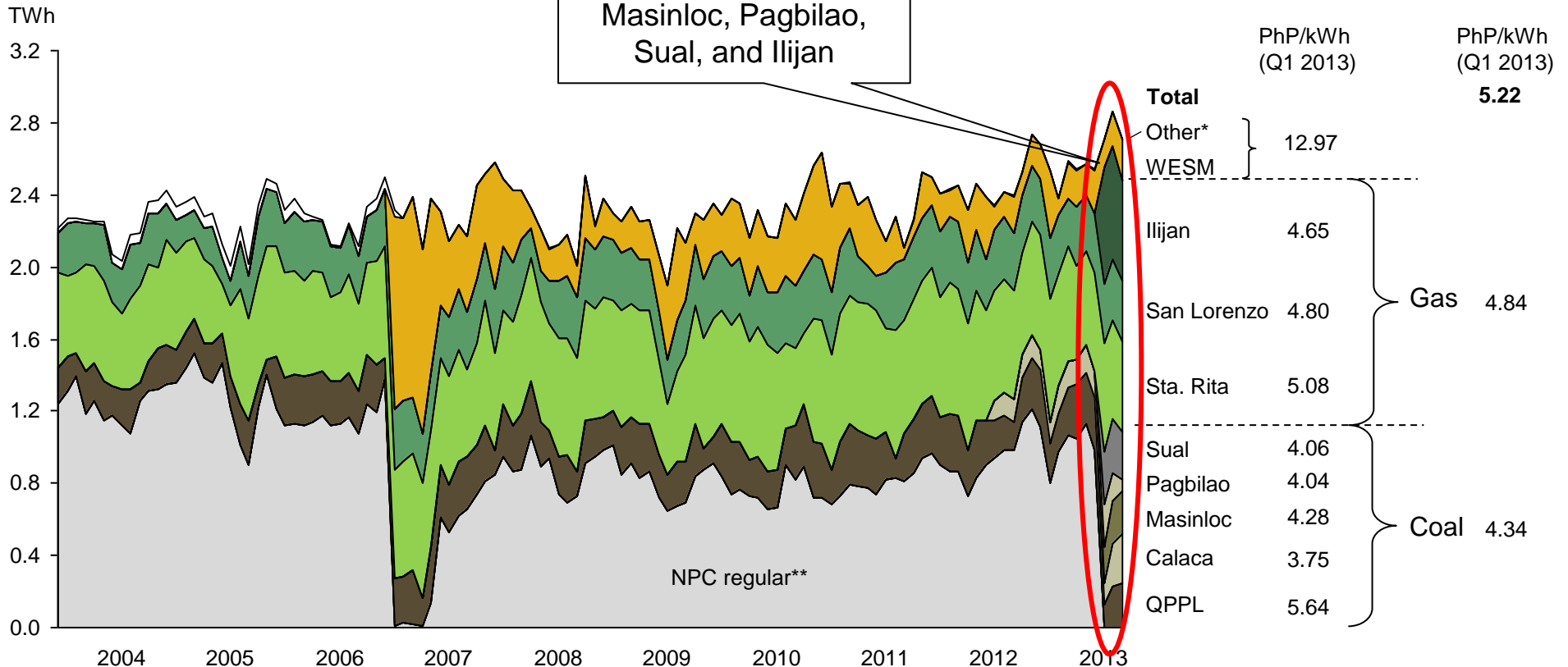


Note: Meralco, Sta. Rita and Quezon costs shown for month purchased, not billing month

Source: Meralco; World Bank; BSP; PEMC; TLG analysis

Twelve years after the EPIRA reforms, Meralco has finally been weaned off its transition contracts with state-owned NPC, but its reliance on gas continues

Power purchased by Meralco



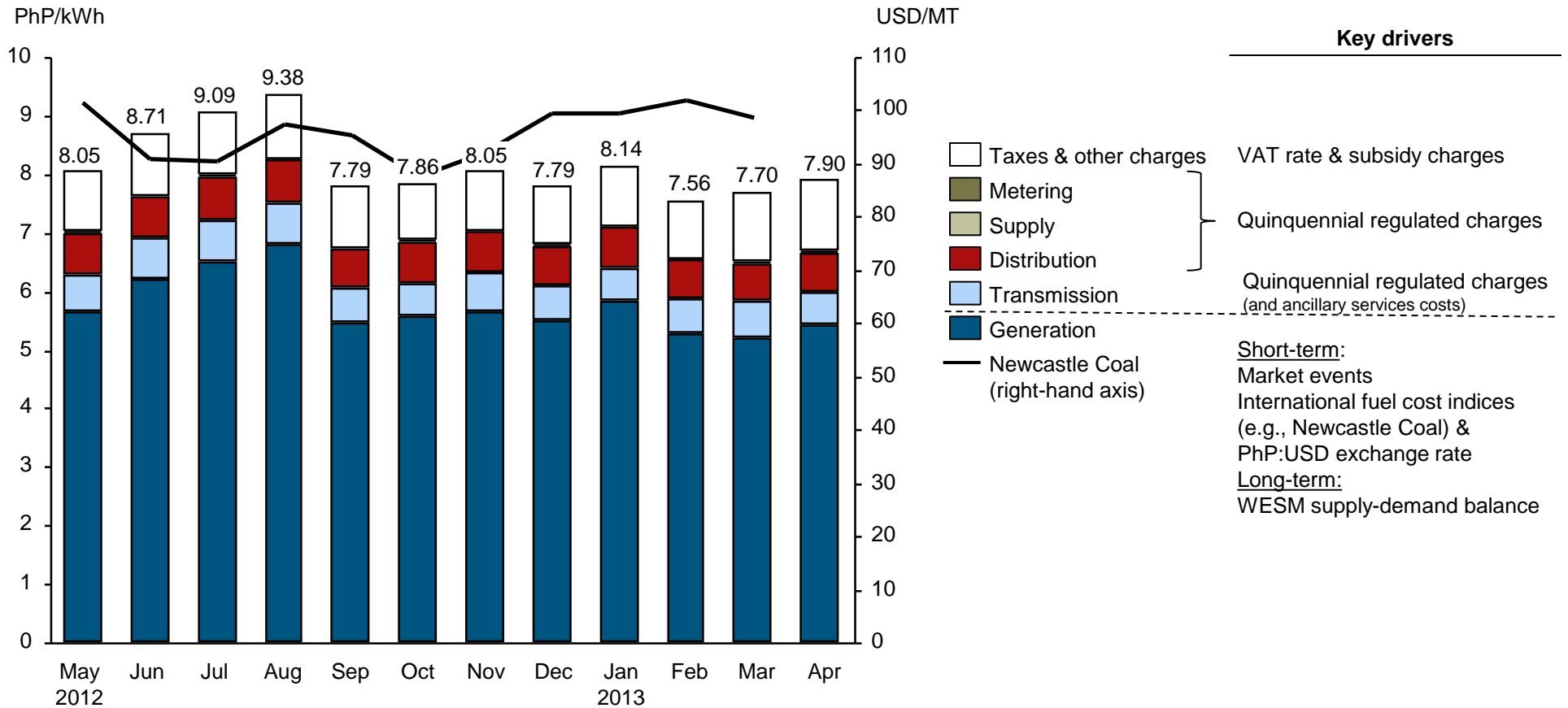
Note: * Duracom (until Jul-06), Republic Cement (until Dec-05), Philpodeco, MMPC and Bacavalley (from Mar-2011), quantity estimated in 2013;

** Does not include NPC for Special Programs (CPP and Ecozone)

Source: Meralco (ERC case no. 2011-010CF/generation charge breakdown); TLG analysis

Energy costs are passed directly through to consumers month-by-month, so tariffs respond quickly to changes in fuel and currency markets

Meralco Large customer 34.5kV tariff* & Newcastle Coal Price Index



Note: * Assumes (438MWh pm consumption, i.e., 80% load factor at 750kW); Large customer tariff applies for 200 – 750kW peak demand
Source: Meralco; TLG analysis

Challenges in the Philippines power market create uncertainties in the future power tariff direction

Regulation

- The energy regulator (ERC) appears to be under-resourced, struggling to interpret a complex market and under pressure to reduce electricity prices for consumers.
- The ERC implements a “cost plus” regulatory model that is inconsistent with the market and even more inconsistent with retail competition.
- Delays on approving contracts and frequent refusals to allow costs to pass through create very high levels of uncertainty for new build – causing failure of bidding processes and financing problems for some players.
- Small retailers have no spare cash to either fund prudential arrangements (so cannot join the market) nor create credit support for contracts (and thus underwrite new build). Worse, there are no incentives for mergers or cost savings.

Issues with New Build

- Many think that Meralco represents the only credit-worthy counterparty to underpin new build but it currently operates only in Luzon and appears to be very highly contracted given demand growth expectations.
- Other counterparties are seen to have credit risks that can cause project financing issues unless other forms of support can be found.
- Although potentially the most economic option, coal may be harder to finance than gas or renewables as the World Bank and ADB refuse to help out.

Retail Competition Uncertainties

- Retail Competition & Open Access (RCOA) has been planned for many years but has only recently been declared, with commercial transactions for the largest customers planned to start in June 2013.
- A delay from December 2011 to July 2013 appears to be the last –but only time will tell how well it is implemented in practice
- The systems for customer switching appear unfinished; practical operation may be compromised
- Impending open access means that few utilities want to sign long term contracts – but without these financing necessary new build is challenging

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3 **Summary**

Summary

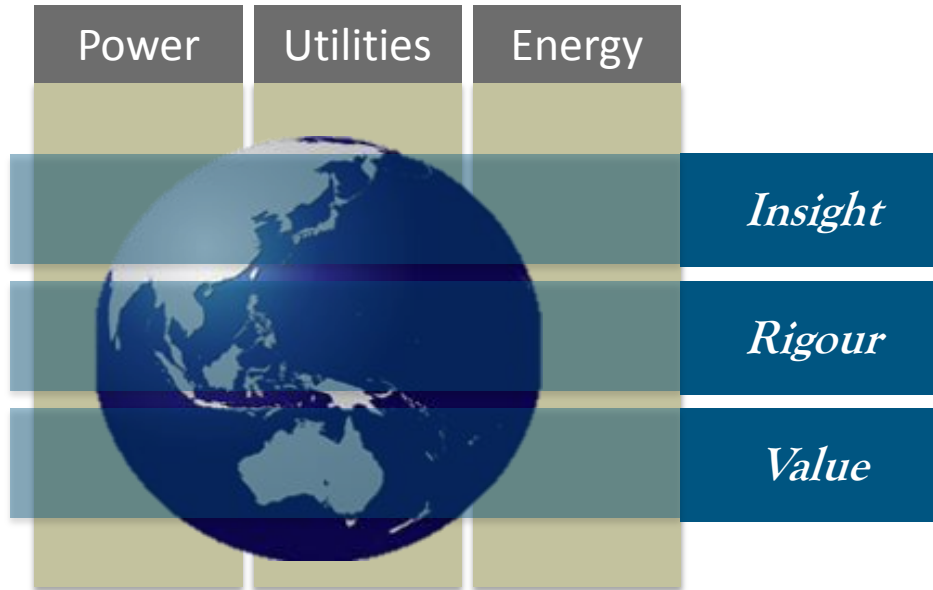
Summary of the trends

- Most Asian countries are increasingly facing the very same fuel cost trends
 - Imported coal
 - Imported LNG
 - Therefore: their power production costs are a function of their fuel mix exposure
- Environmental factors, while not formal in many countries, are driving up China's costs in the longer-term due to NOx control costs and a desired shift to natural gas
- Poor incumbent financial performance has been a key predictor of politicized tariff changes

Options going forward

- With rising cost pressures (except Singapore) and more complex cost drivers
 - Tariff offerings are likely to increase
 - Cross-subsidies will become more politicized, possibly requiring more active industry lobbying
 - Demand response and energy efficiency investments are likely to become more valuable
 - Regulatory and policy developments pertaining to subsidies and industry reform are wild-cards
 - An increasing range of options and risks are emerging in markets like Philippines and Singapore (competitive power markets)

For more information on our services for end-users....



Why we are called The Lantau Group

Lantau Peak, on Lantau Island in Hong Kong, is also known as Chinese Phoenix Mountain, aptly reflecting the importance of reinventing the energy sector to meet the tough new challenges of rising costs, environmental sustainability, energy security, technology, competition and globalisation.

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