Is there a market for Vietnam offshore gas?

Tom Parkinson

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THE LANTAU GROUP
strategy & economic consulting

We at The Lantau Group are experts in the economics of energy systems

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The founding partners of TLG first worked in the Asia Pacific region as part of Putnam, Hayes & Bartlett (PHB) and later with Charles River Associates

Our partners and principals have consulted for leaders throughout the region

Overview

1 **Regulatory/policy structure**

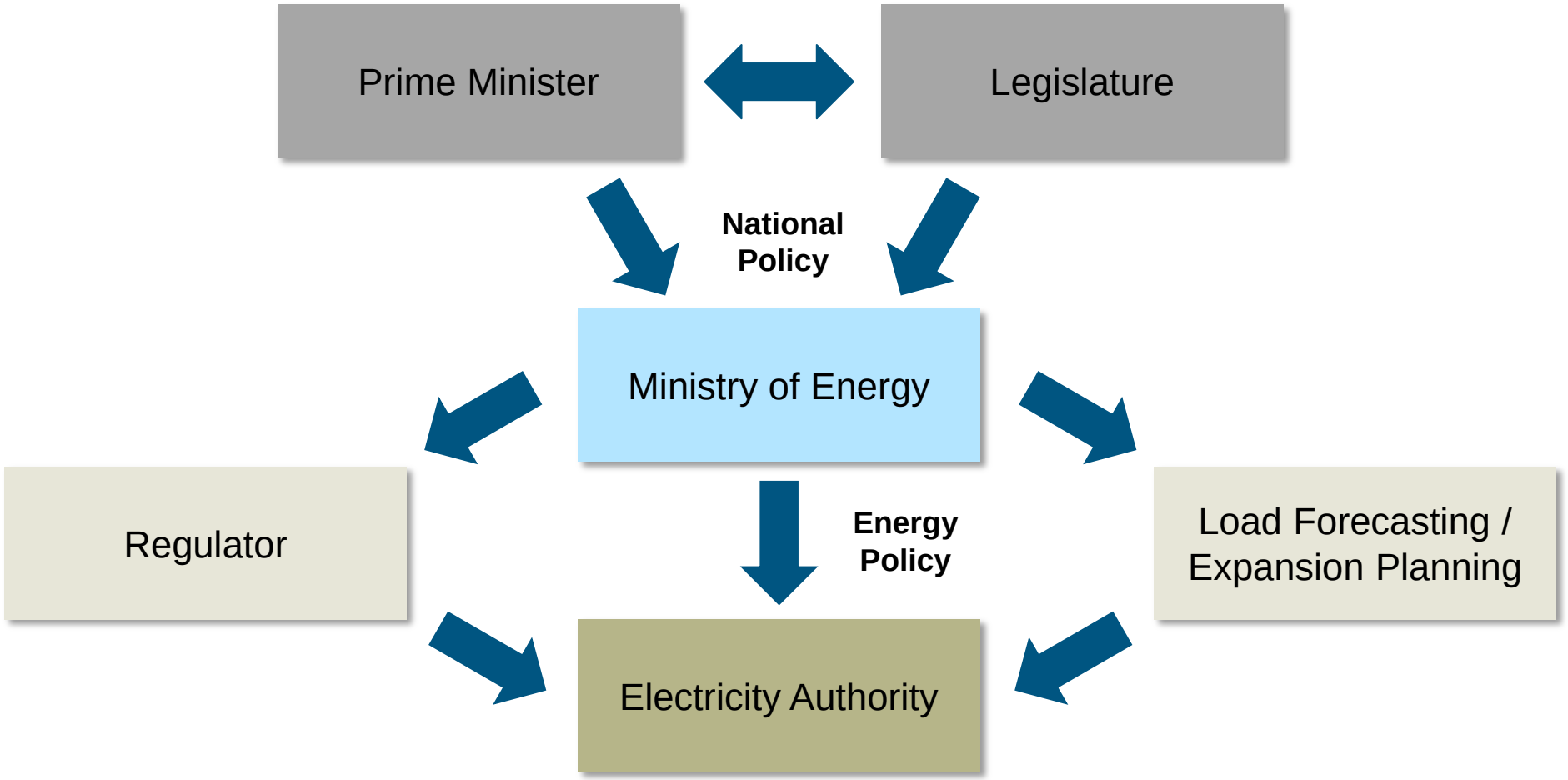
2 Power Development Plan VII

3 Critique of PDP VII assumptions

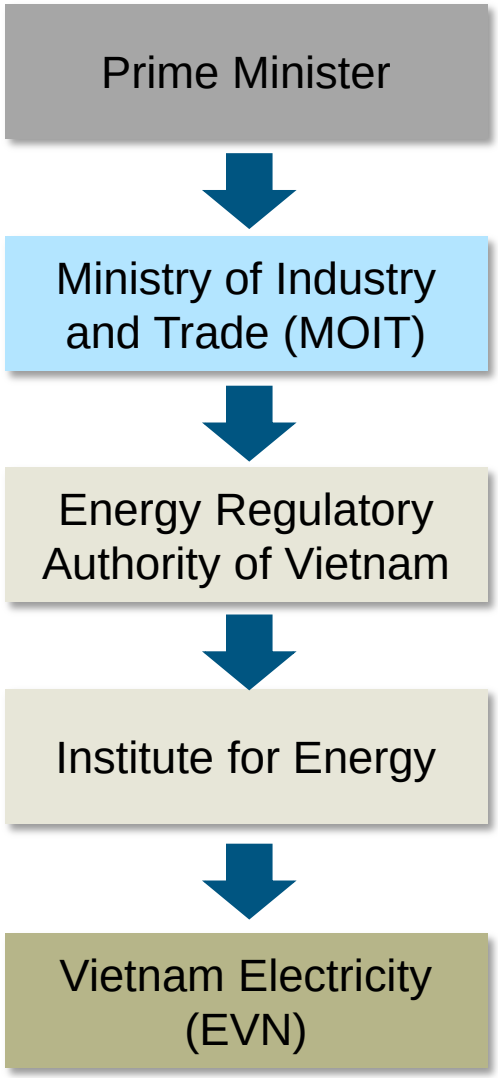
4 The Lantau Group (TLG) forecast

5 Key takeaways

Effective energy regulation/policy requires a system of checks and balances

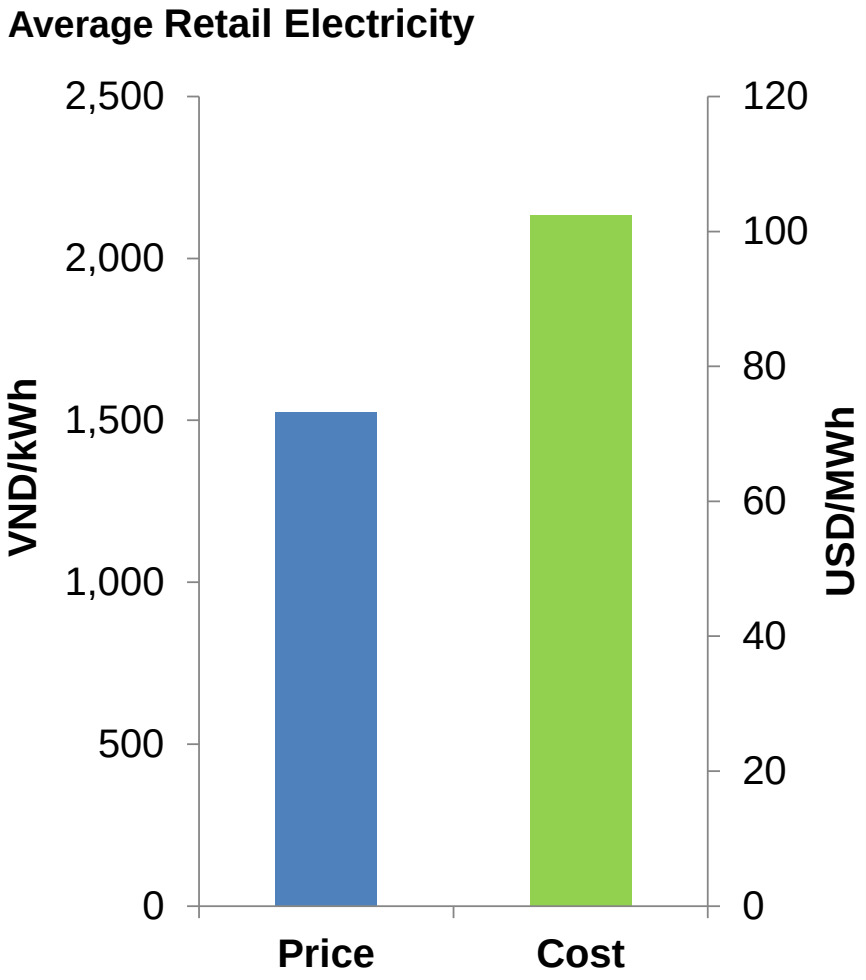


By contrast, electricity system in Vietnam has few checks and balances



- Load forecast is not an unbiased estimate of future load, but rather an aspirational statement
- Capacity expansion plan reflects developmental aspirations, rather than least-cost solution given policy constraints
- Rates reflect political necessities, rather than underlying costs

The constraints on power prices are significant and impair EVN's viability



- There is an adjustment mechanism to pass through changes in fuel costs that EVN calculates, but this is not implemented.
- Under a Prime Minister decision (24/2011QD-TTg) in April 2011, the average electricity price is supposed to be *automatically adjusted* each quarter.
- If the increase is more than 5 percent, then EVN must get approval from Ministry of Finance and Ministry of Industry and Trade
- EVN since June 2011 has been allowed to increase prices by 5 percent each quarter. But lately this has been 5 percent every six months.

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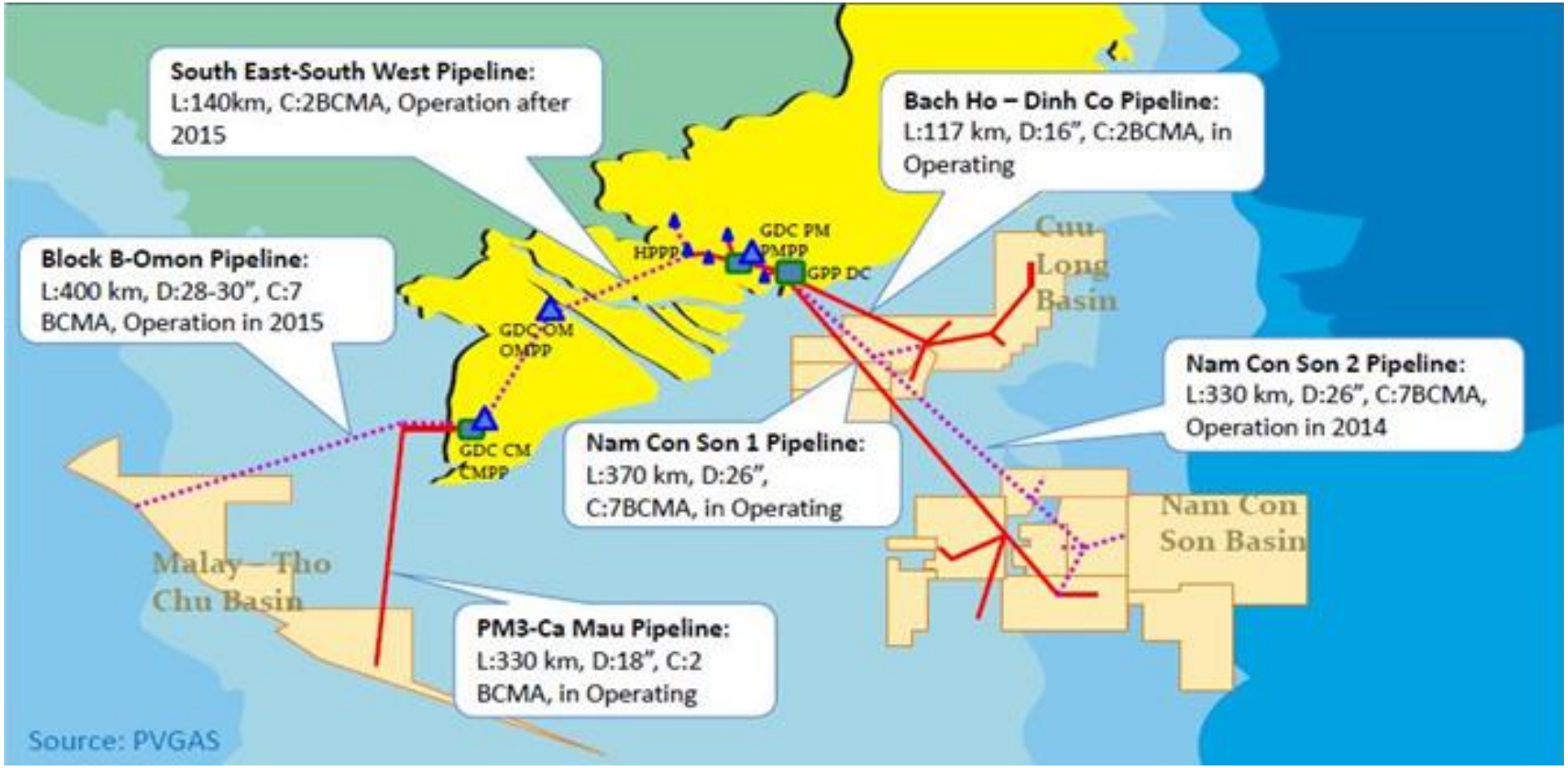
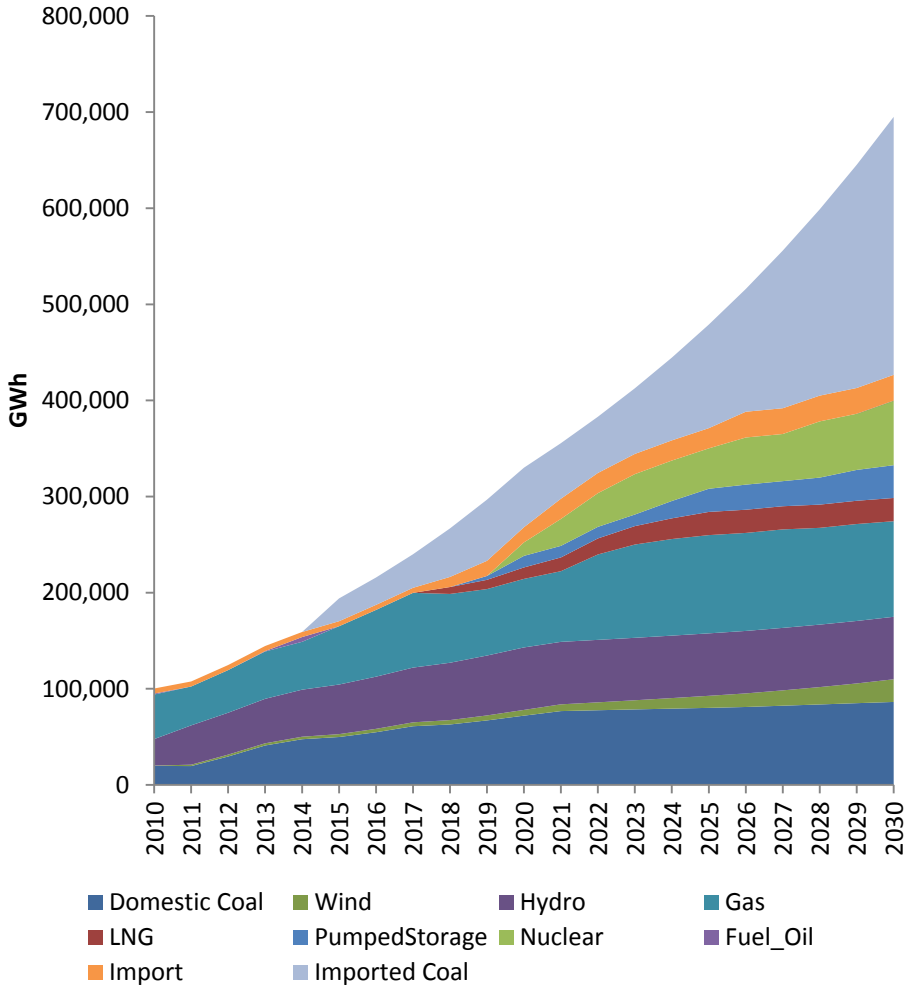
The key near-term gas supply basins and pipeline networks are in the south



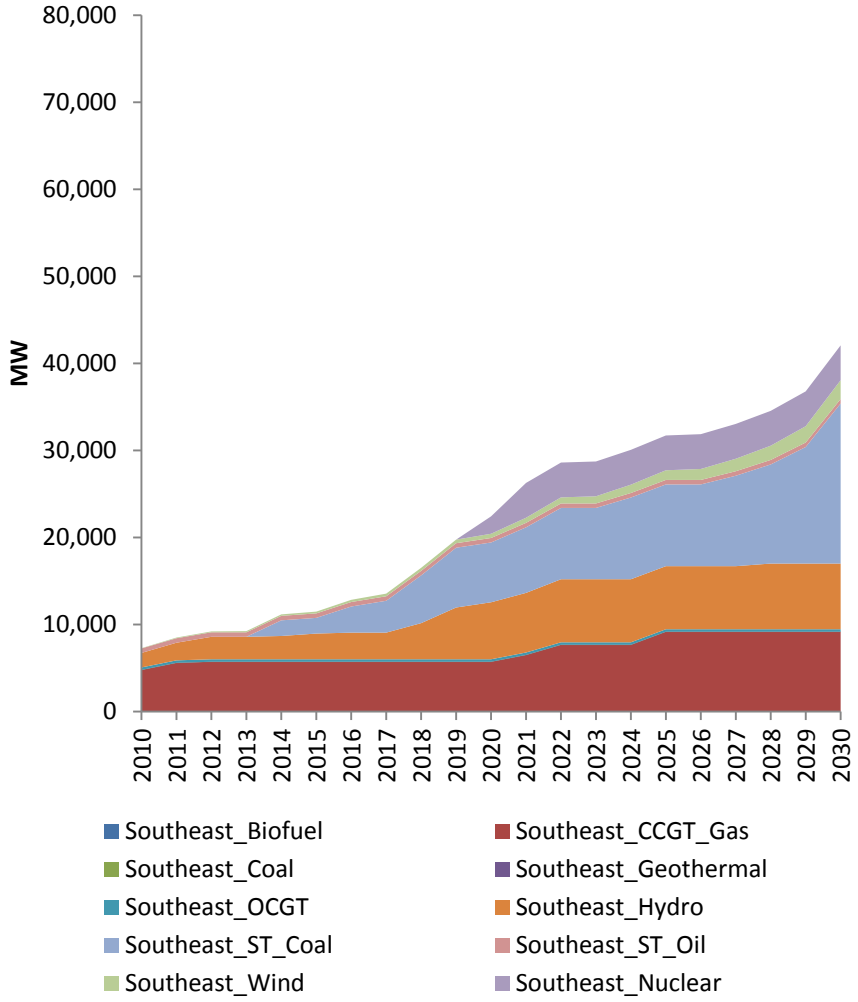
In order to replicate the PDP results, we had to “force-build” units



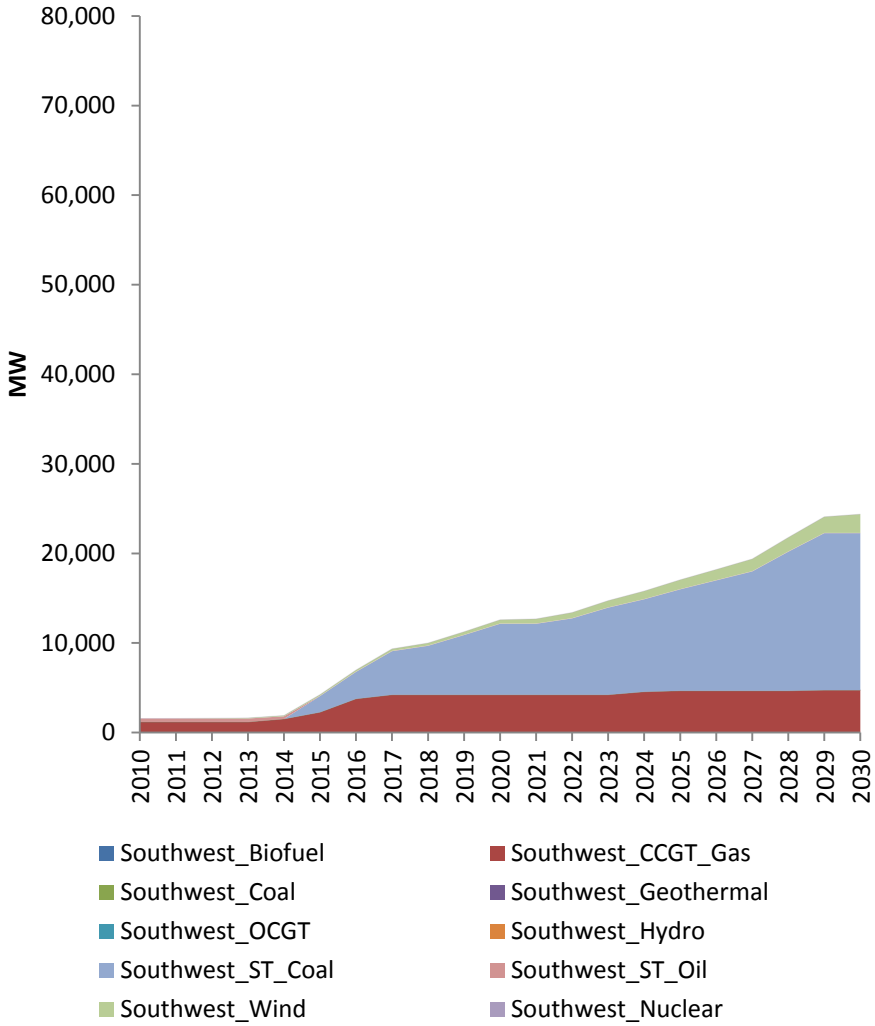
- Overall demand reaches 695 TWh in 2030 (versus 442TWh in our projection)
- Domestic coal levels out after 2020.
- Wind makes a growing presence (50 percent higher than in TLG forecast)
- Hydro and pumped storage (similar to hydro in TLG forecast)
- Nuclear contributes 10 percent of generation by 2030 (whereas we have no nuclear in our projections)
- Imported coal accounts for most of the baseload growth – a third of the generation in PDP (versus a sixth in our forecast).
- Competition from other types of generation and assumed LNG use results in lower demand for domestic gas (relative to the TLG forecast).

PDP capacity forecast southeast and southwest

Southeast

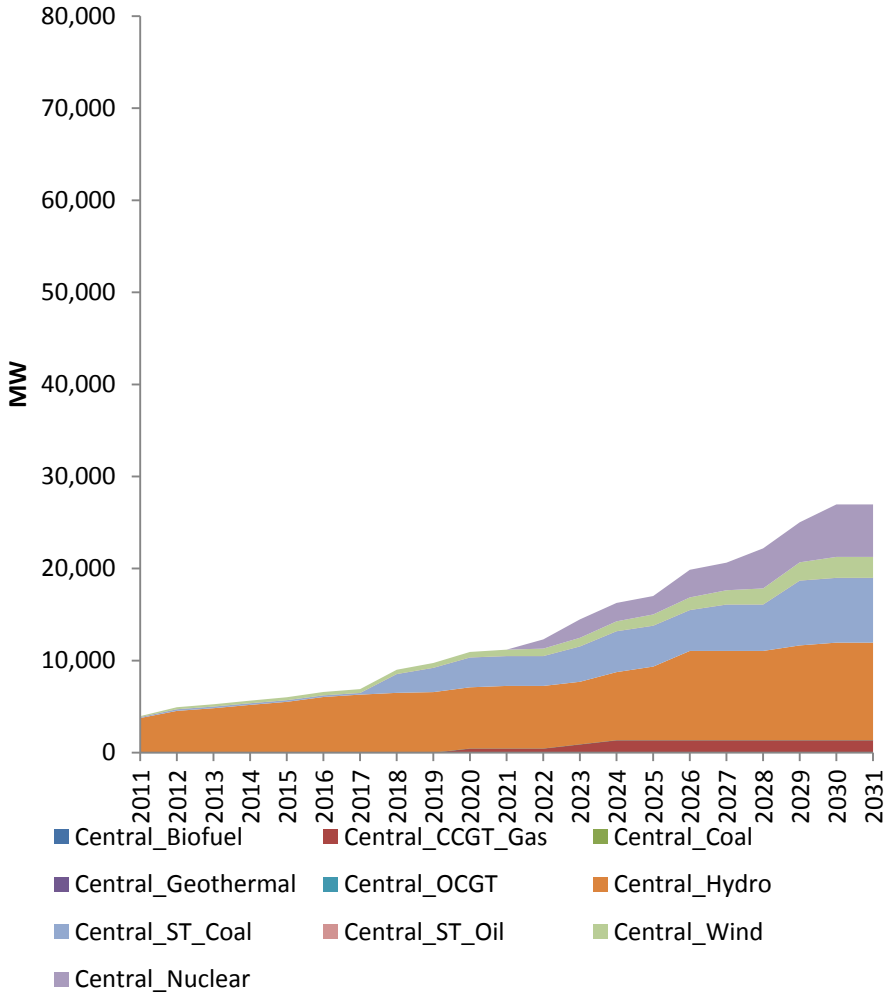


Southwest

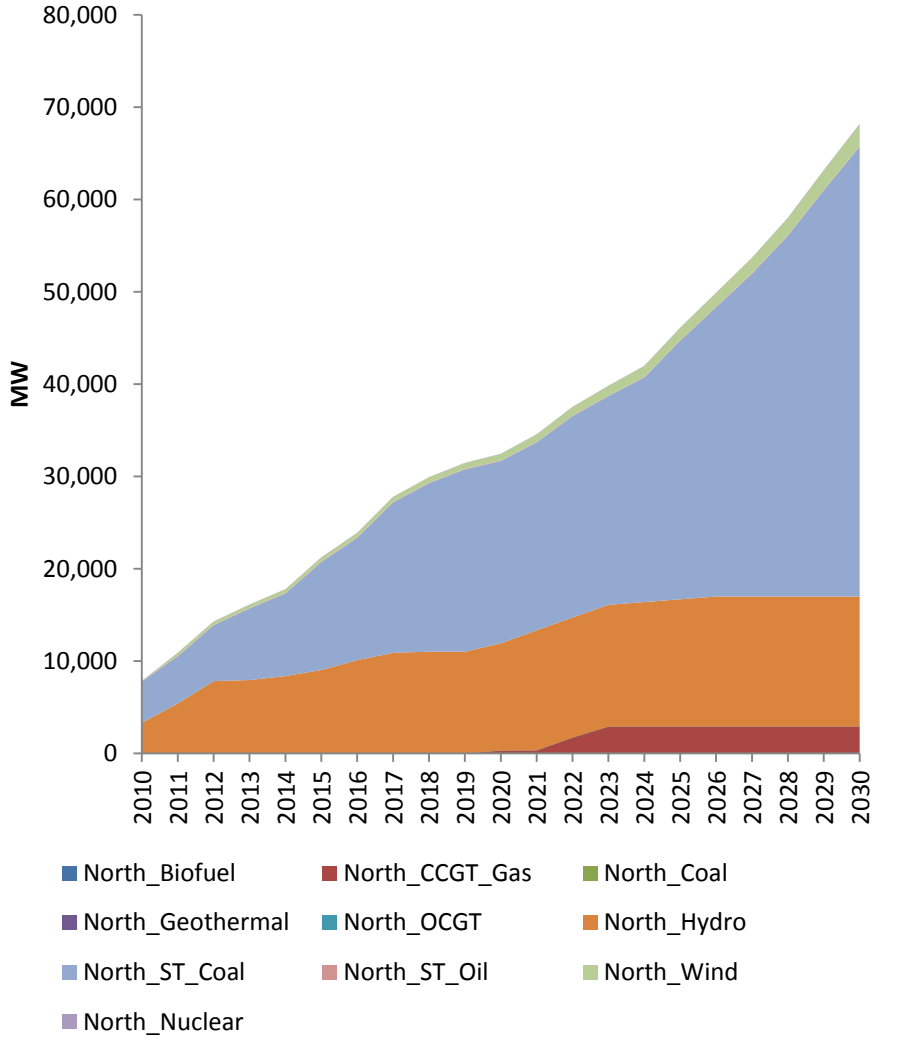


PDP capacity forecast central and north

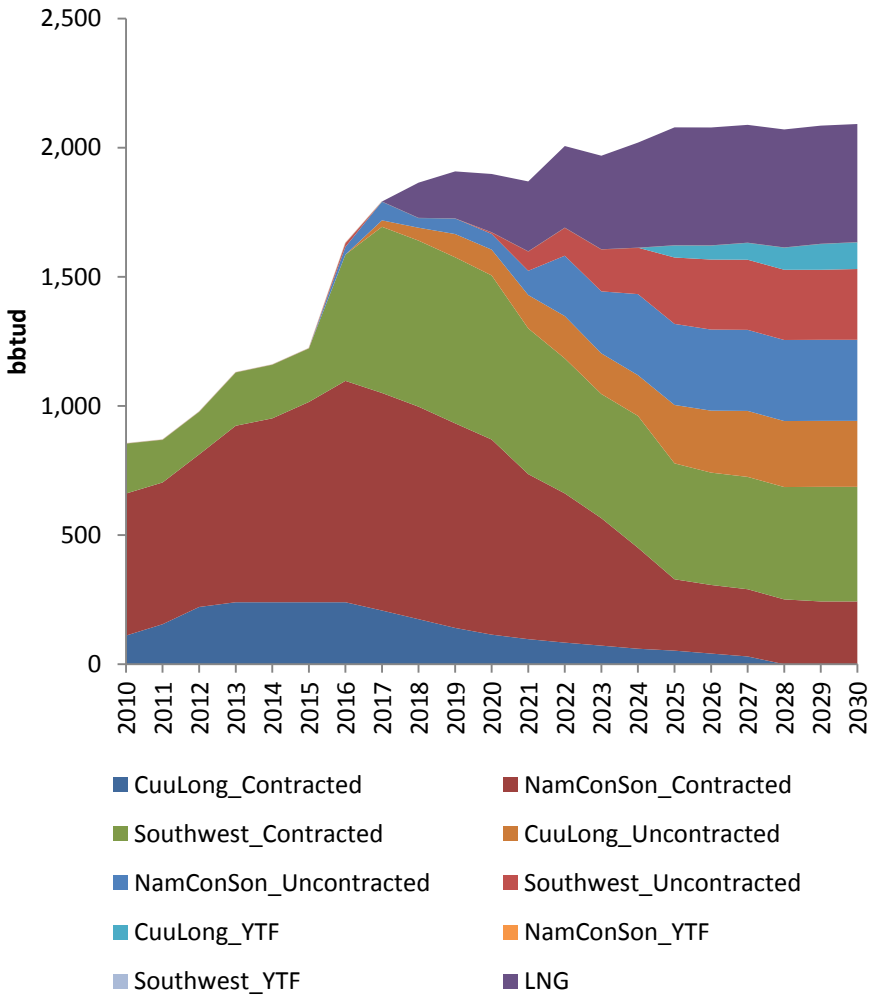
Central



North



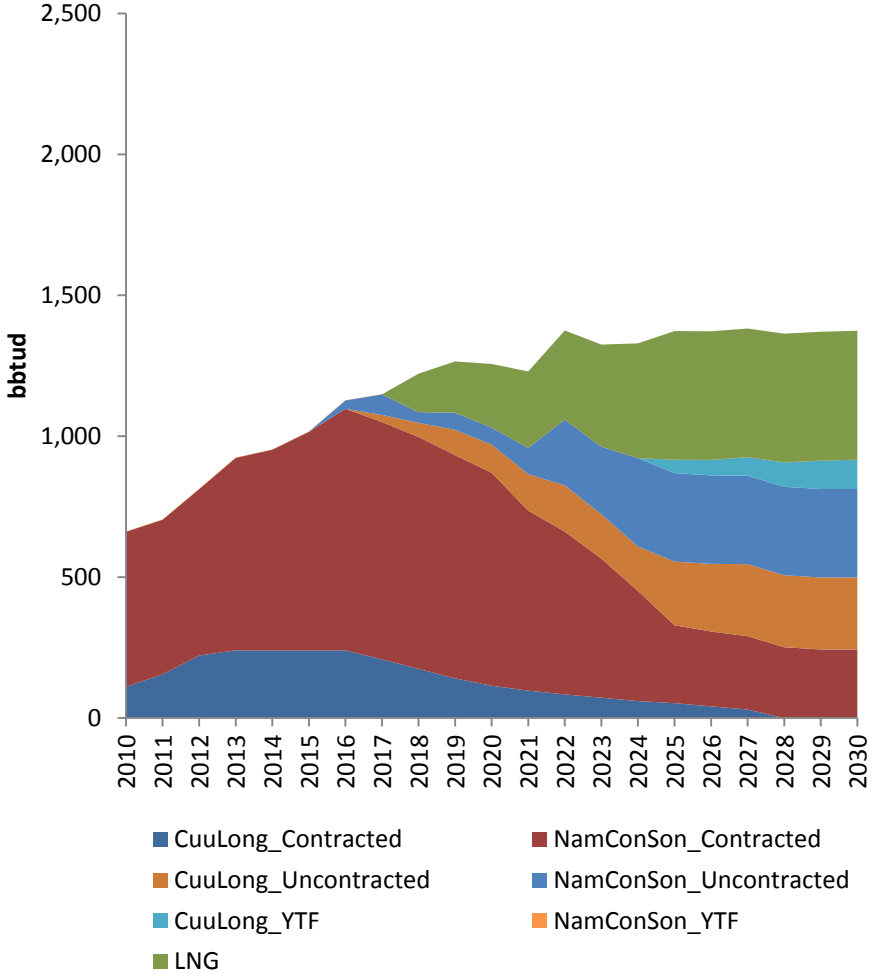
PDP South Vietnam gas demand forecast



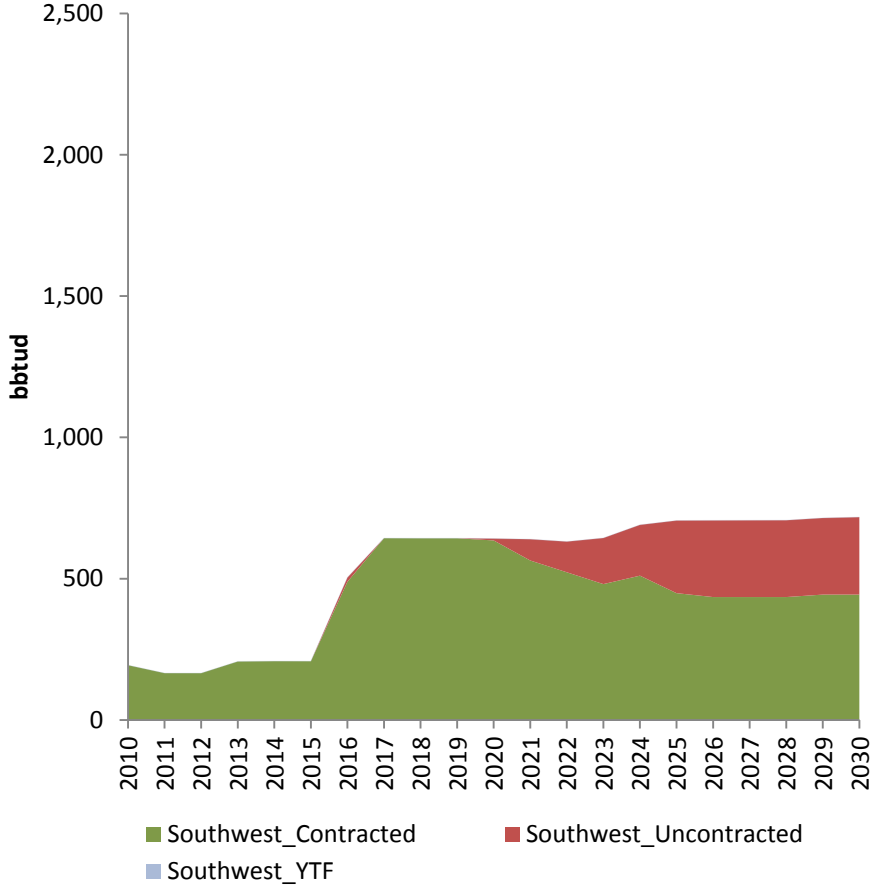
- Demand for piped gas peaks at 1,800 bbtud and then declines as it is displaced by other fuel sources
- This lowers NamConSon2 pipeline to between 300 mmcfd to a low of 50 mmcfd and would undermine the economics of the pipeline (whereas the TLG forecast supports development)
- LNG comes in by 2018 at 135 bbtud and rises to 450 bbtud by 2030.

PDP southeast and southwest gas demand forecast

Southeast

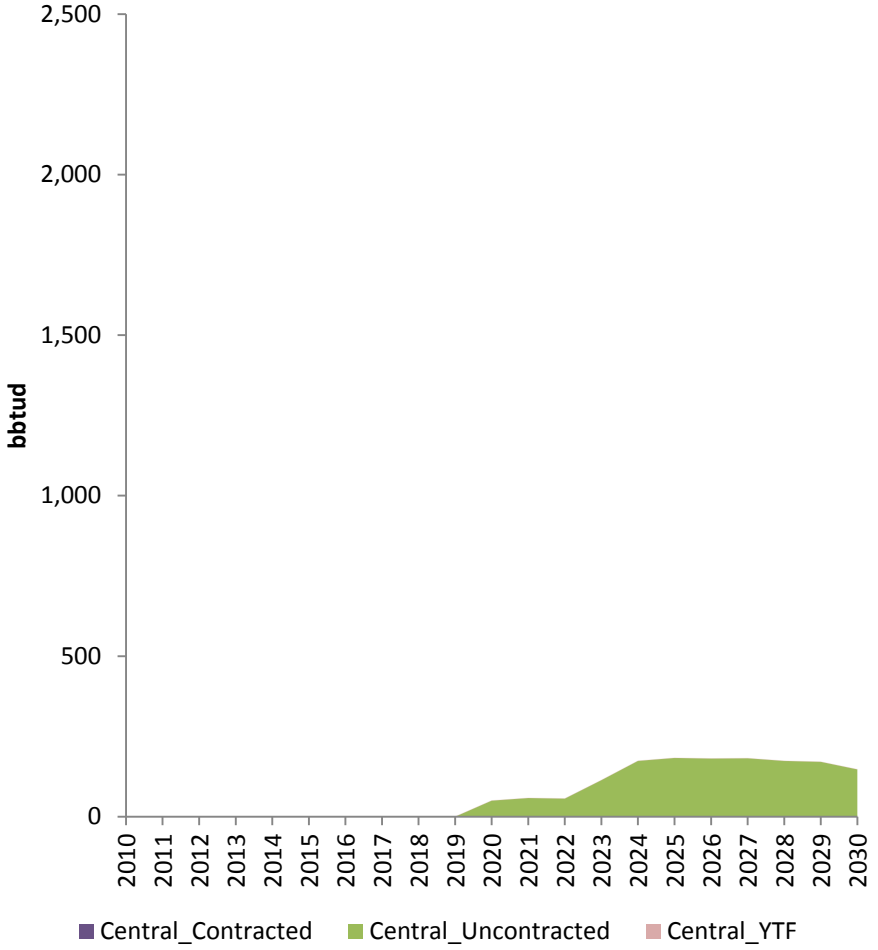


Southwest

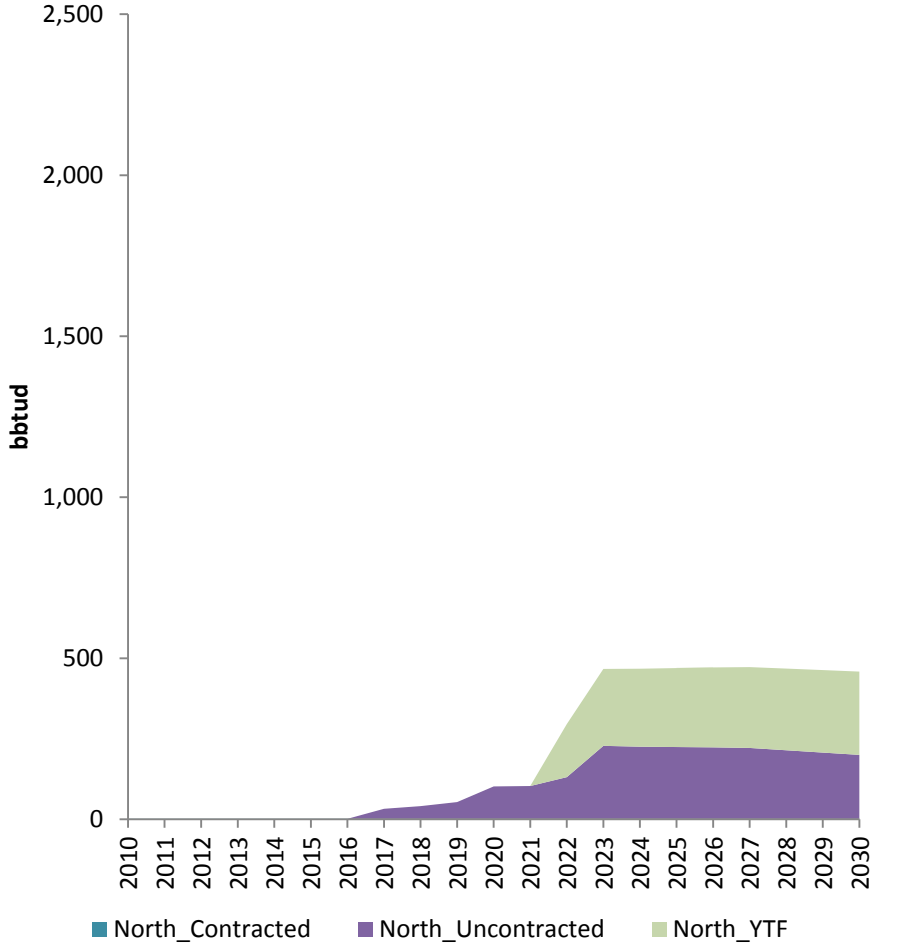


PDP central and north gas demand forecast

Central



North



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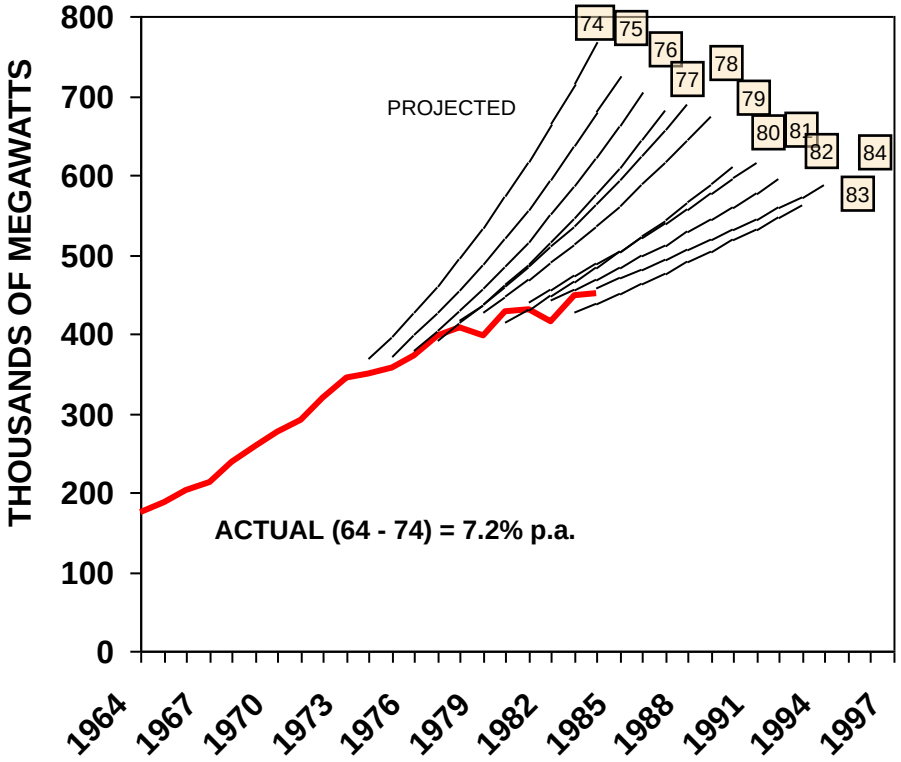
6 Conclusions

We see three fundamental flaws in the PDP

- The load growth forecast is wildly optimistic
- Capacity expansion plan (at least implicitly) uses LNG to meet incremental load growth – but LNG is not economic relative to alternative resources (and also assumes nuclear development starting in 2020)
- Ability to pass on LNG costs to consumers appears dubious – and certainly does not justify use of LNG for baseload power

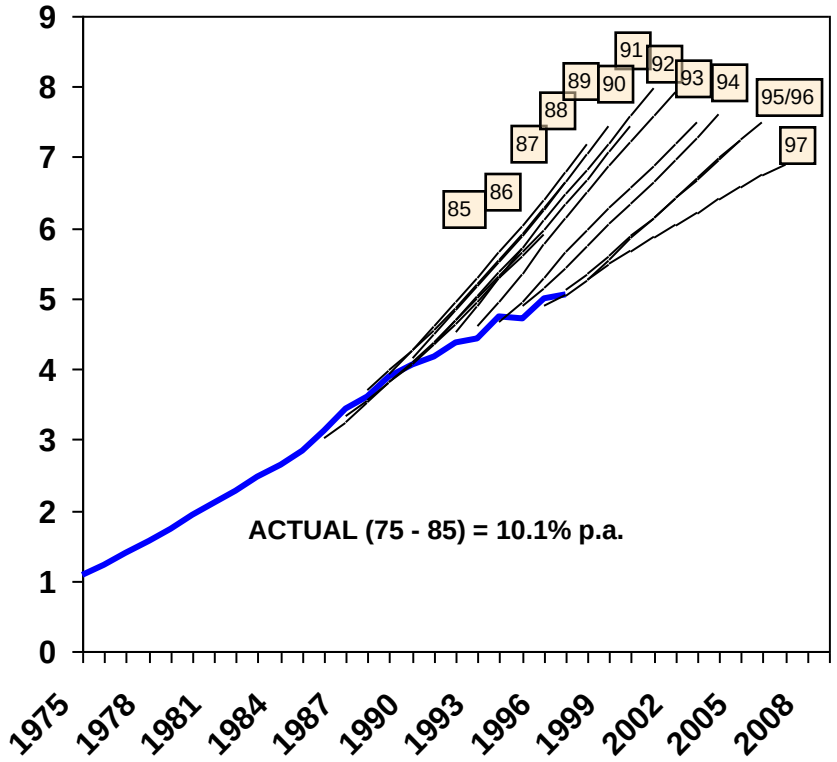
Optimistic load growth forecasts are endemic to the electricity industry

United States



Source: North American Electric Reliability Council
Electric Power Supply & Demand 1984, p.5

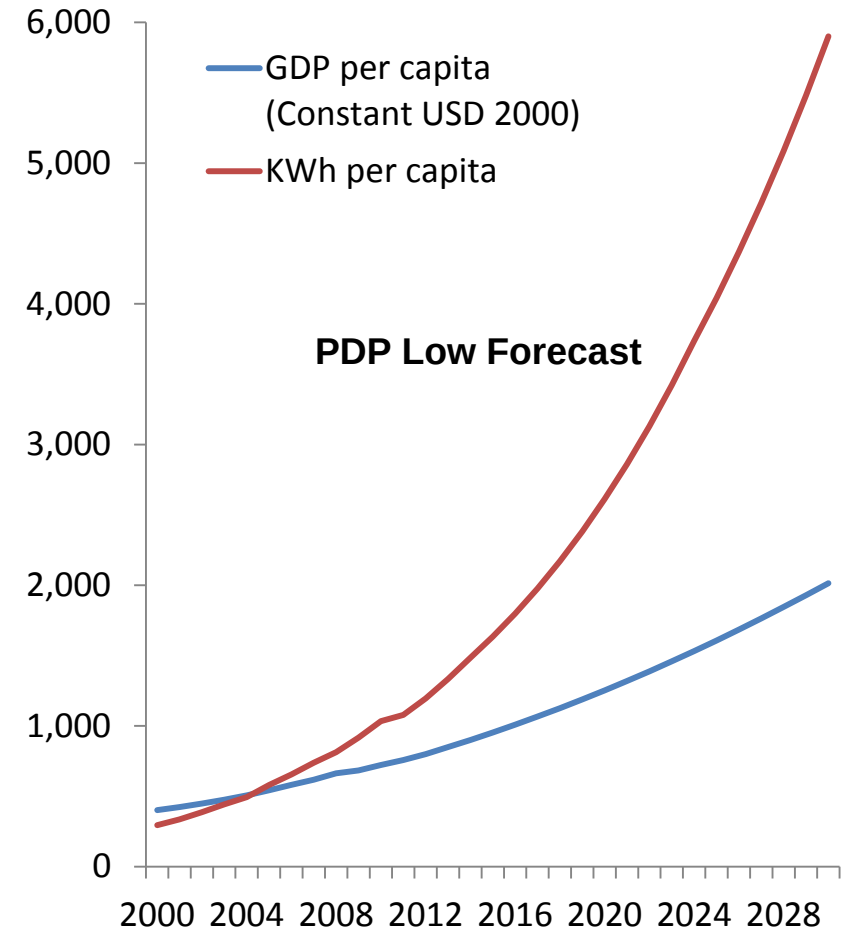
Asian Country



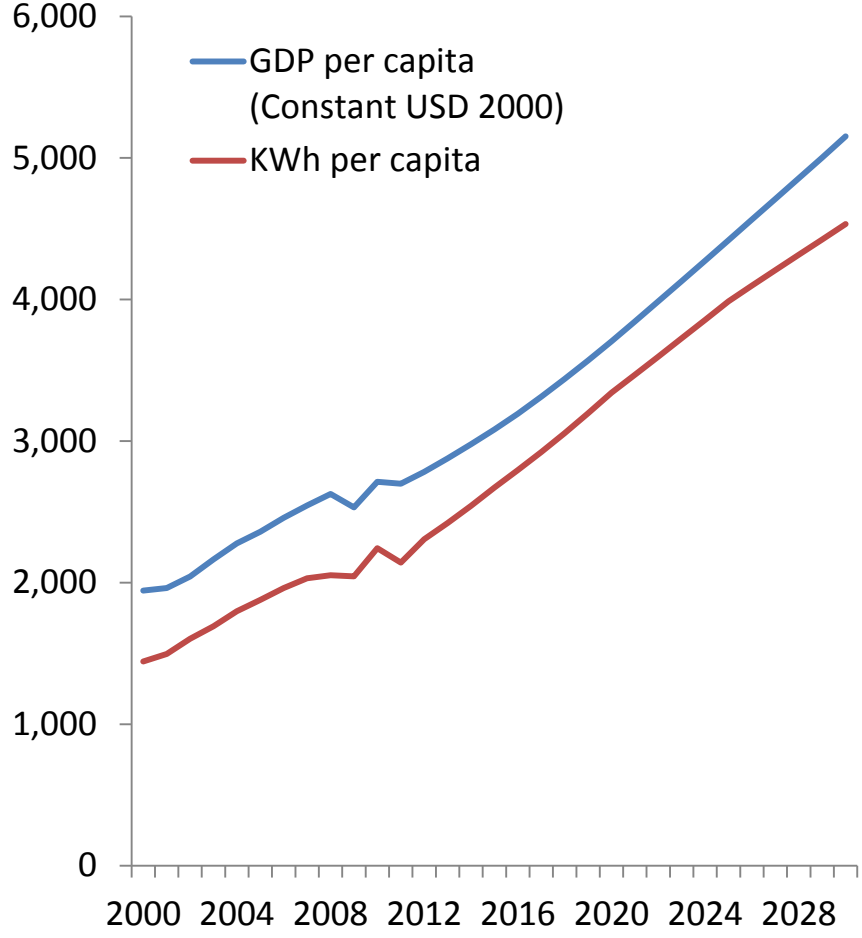
Source: Client Confidential

Vietnam projects much higher load than Thailand, despite much lower GDP

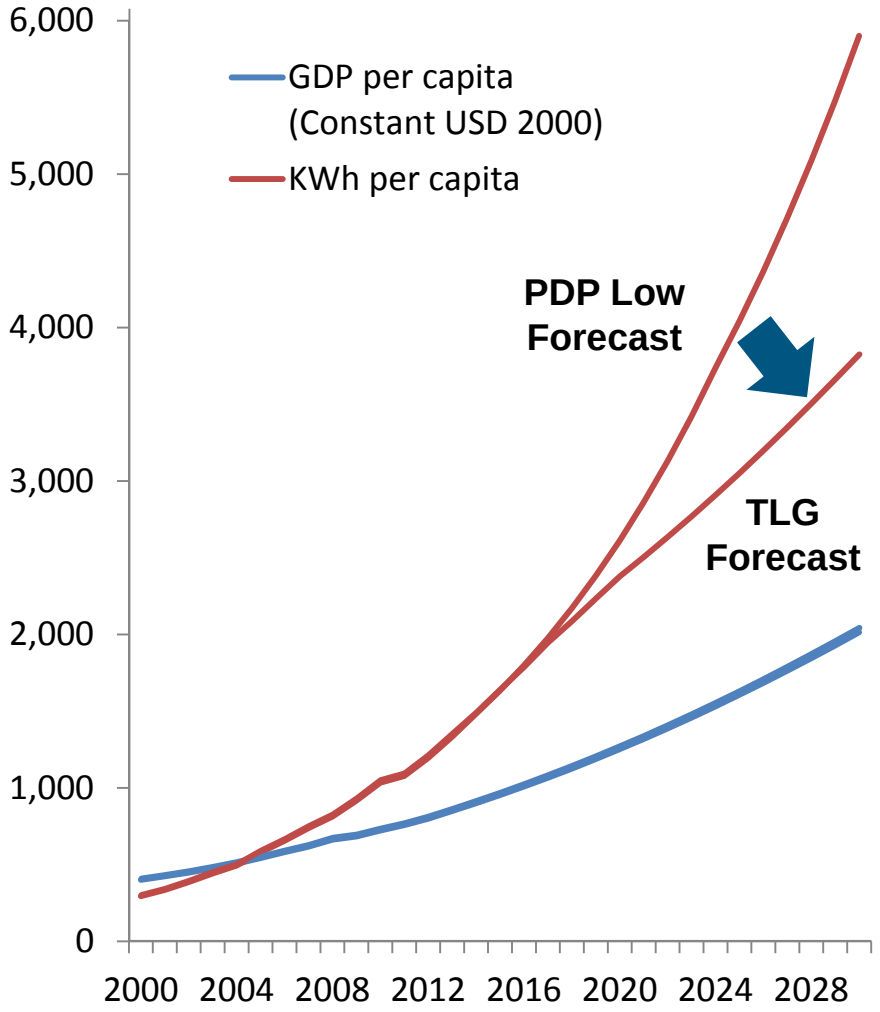
Vietnam



Thailand



Our TLG forecast reduces the load growth rate substantially



- The low PDP generation forecast looks way over-ambitious compared to economic growth
- We have assumed the same underlying GDP growth rate (6.5% average annual expansion the economy to 2030) as assumed for the low PDP forecast
- We have assumed an average elasticity of power generation growth to economic growth of 1.2 times through to 2030 (versus an average of 1.6 times for the low PDP forecast) – and we feel even this assumption is aggressive.

Gas prices will be limited by the competition between coal and gas economics

Plant Type	Gas CCGT	Coal Greenfield State of Art Indonesian Sub-bituminous
Plant Details and Capital Cost		
Generic USD/kW	900	1,600
Economic Life (years)	25	30
Capacity Factor (%)	**85**	**85**
Fixed Cost		
Capex (USD/MWh)	17	32
Fixed O&M per MWh	2	3
Fixed (USD/MWh)	**19**	**36**
Fuel Costs	**Gas**	**Coal**
Gross Fuel Cost (HHV) (USD/mmbtu)	9.1	4.8
Heat Rate (mmbtu/MWh)	6.9	9.0
Variable Costs		
Variable O&M per MWh	2	4
Fuel per MWh	64	45
Variable (USD/MWh)	**66**	**49**
LRMC (USD/MWh)	**85**	**85**

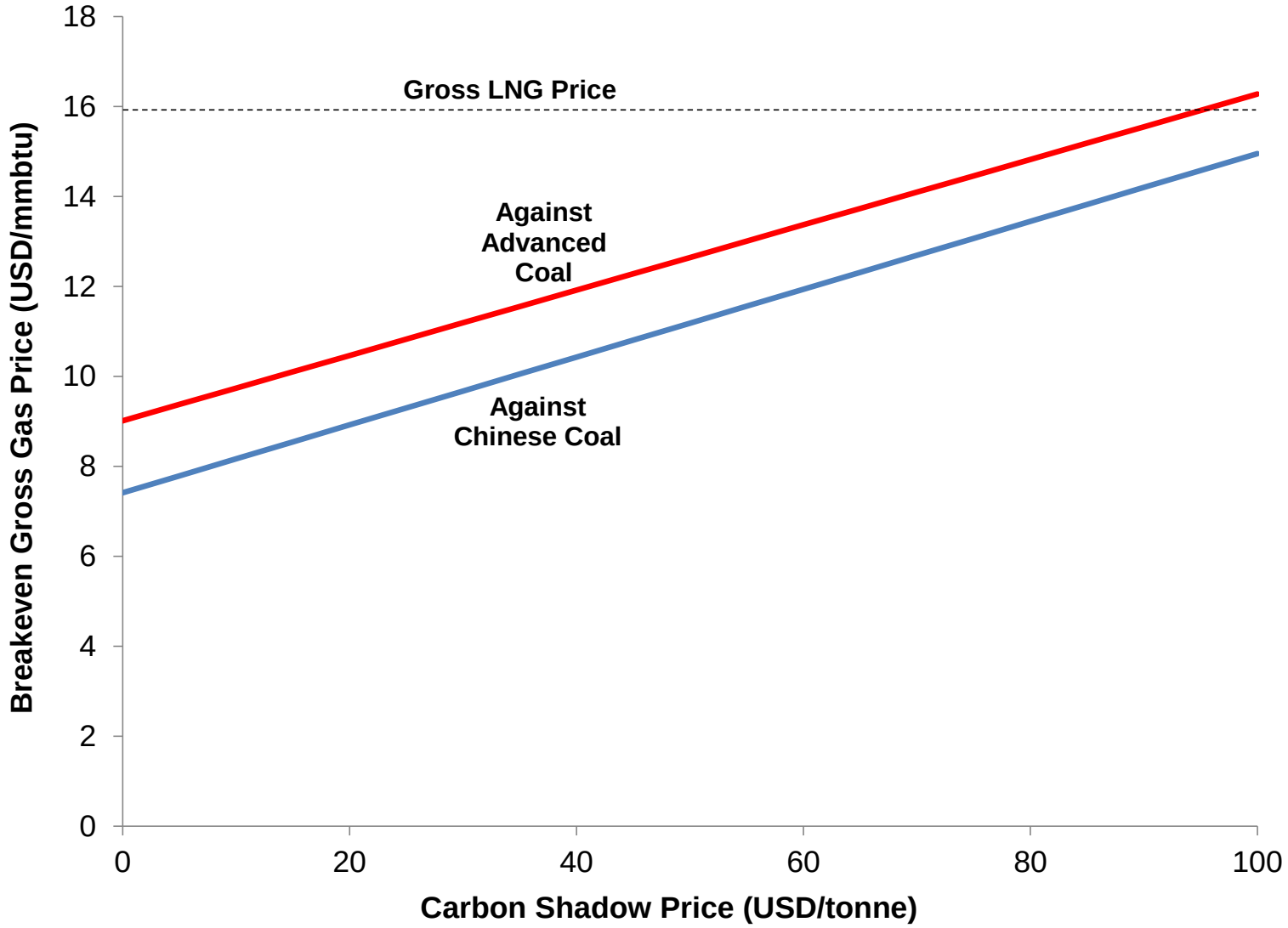
- State-of-the-art technology and Indonesia sub-bituminous coal
- Plant competing for base load with average capacity factor of 85 percent
- Use the economics of the new build coal plant to determine the competing price for delivered gas
- This would be gas delivered to a new build combined cycle gas turbine
- Should be willing to pay up to USD 9.10/ mmbtu delivered for gas.
- This indicates a range of USD 8.10 to 7.85/ mmbtu upstream.

The use of Chinese technology would force the breakeven gas price even lower

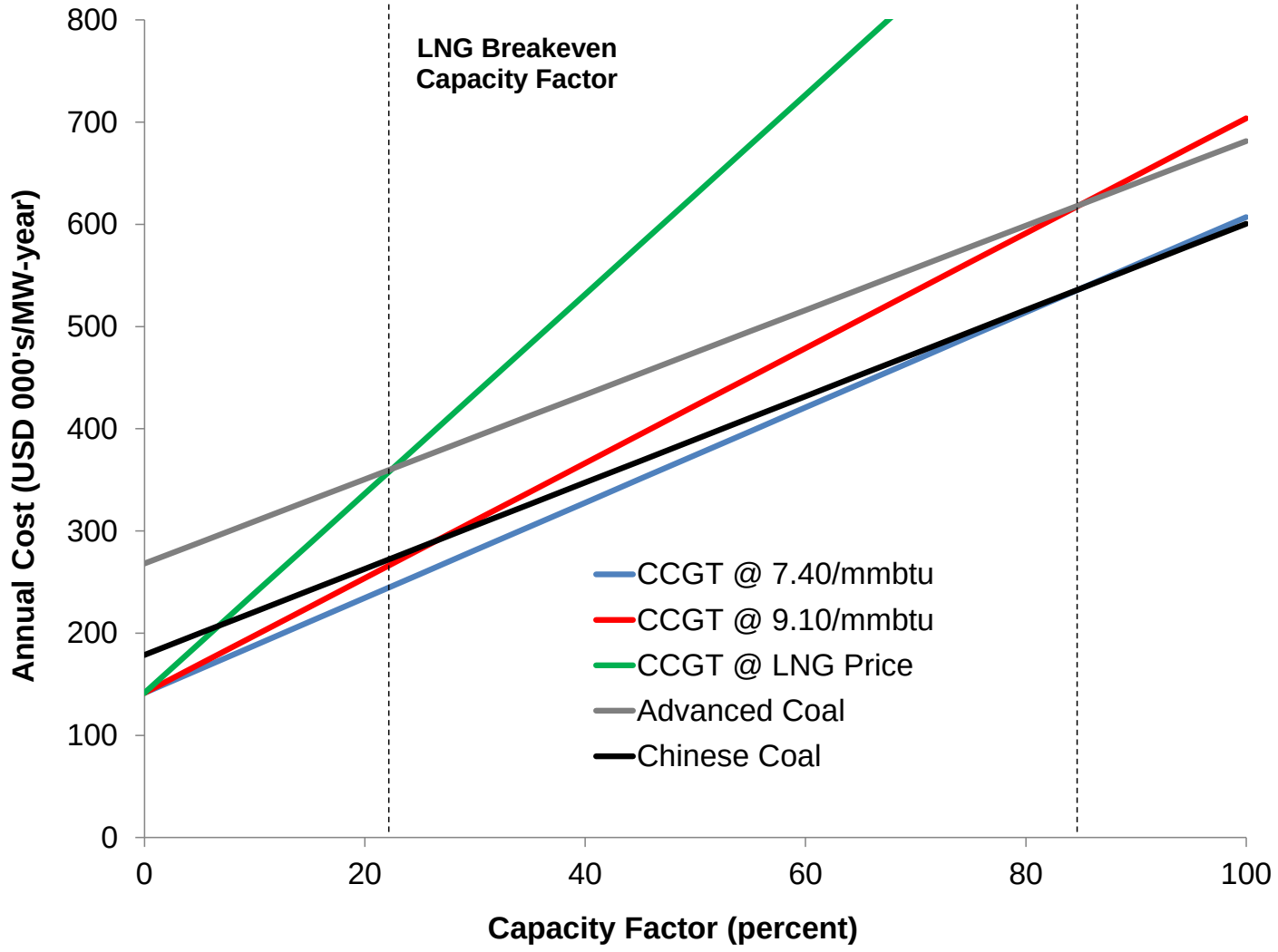
Plant Type	Gas CCGT	Coal Greenfield China Technology Indonesian Low Ranked
Plant Details and Capital Cost		
Generic USD/kW	900	1,000
Economic Life (years)	25	30
Capacity Factor (%)	**85**	**85**
Fixed Cost		
Capex (USD/MWh)	17	20
Fixed O&M per MWh	2	3
Fixed (USD/MWh)	**19**	**24**
Fuel Costs	**Gas**	**Coal**
Gross Fuel Cost (HHV) (USD/mmbtu)	7.4	4.8
Heat Rate (mmbtu/MWh)	6.9	9.2
Variable Costs		
Variable O&M per MWh	2	4
Fuel per MWh	52	46
Variable (USD/MWh)	**54**	**49**
LRMC (USD/MWh)	**73**	**73**

- If the coal plant uses less expensive China technology, then the capital expenditure comes down.
- This also brings down the price at which gas would compete to displace the new build coal plant.
- USD 7.40/mmbtu delivered for gas means an upstream price in the range of USD 6.40 to 6.15/mmbtu.

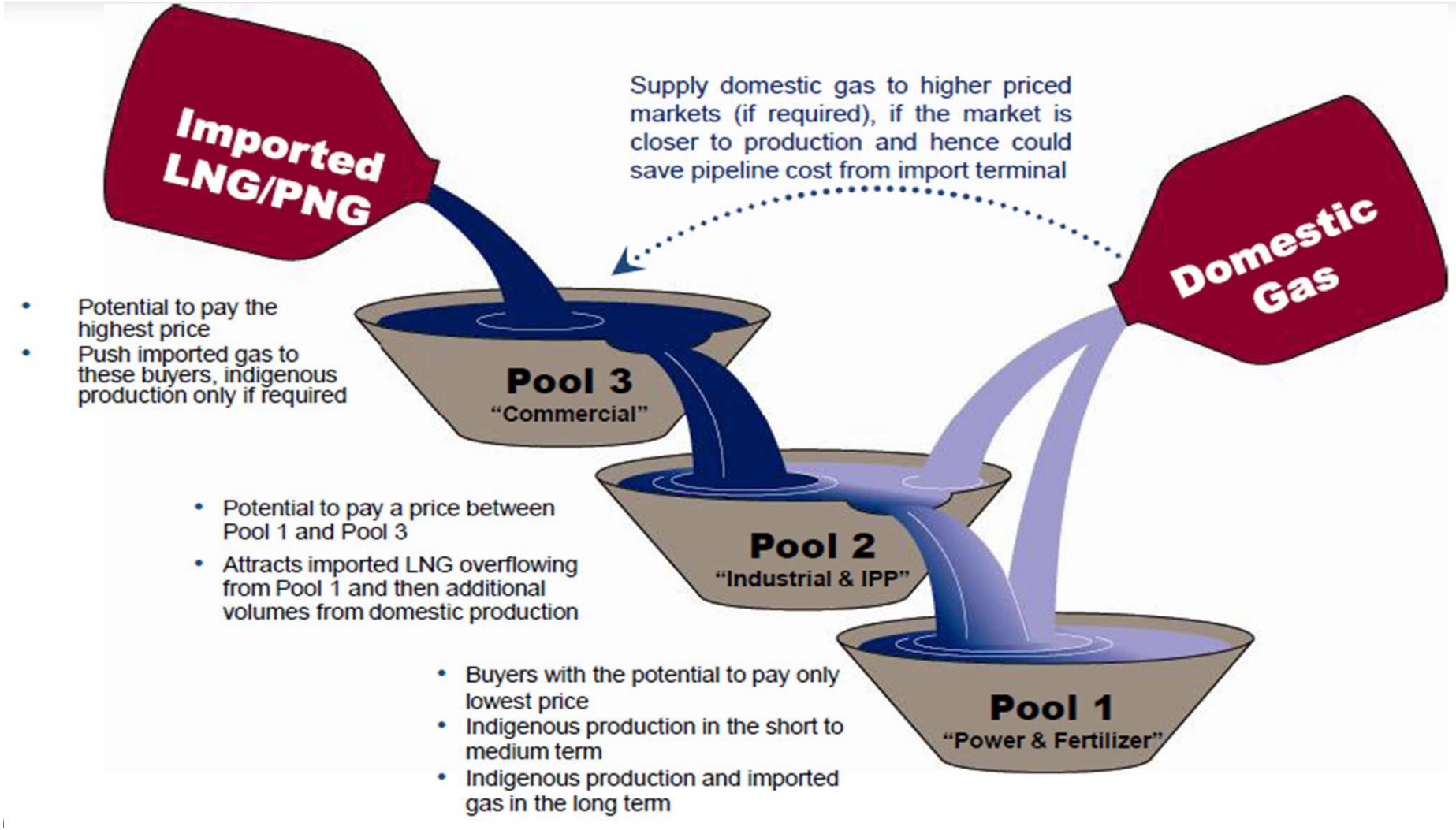
Including a carbon value would raise the breakeven price of baseload gas



CCGTs burning LNG would only be economic at very low capacity factors



PVN's plan is to create WACOG pools so as to direct subsides to specific users



Source: PetroVietnam Gas, *Challenges for Balancing Gas Supply and Demand*, 4 July 2012

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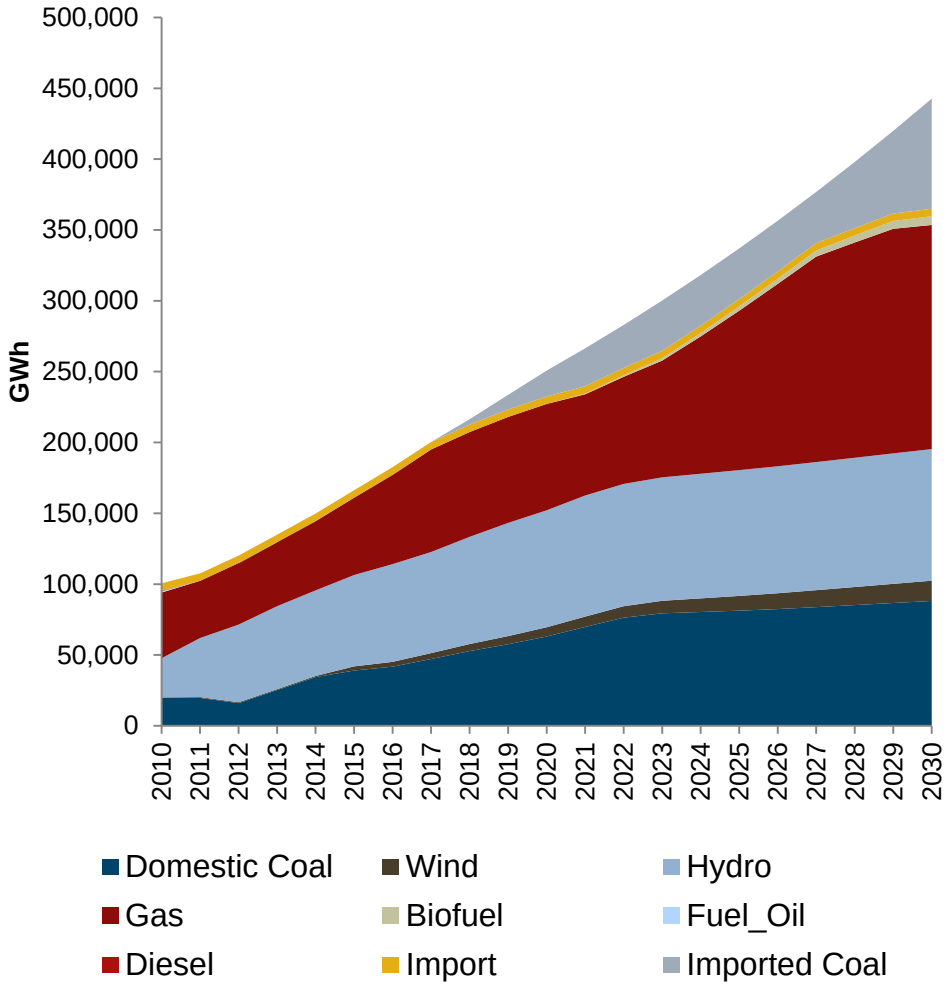
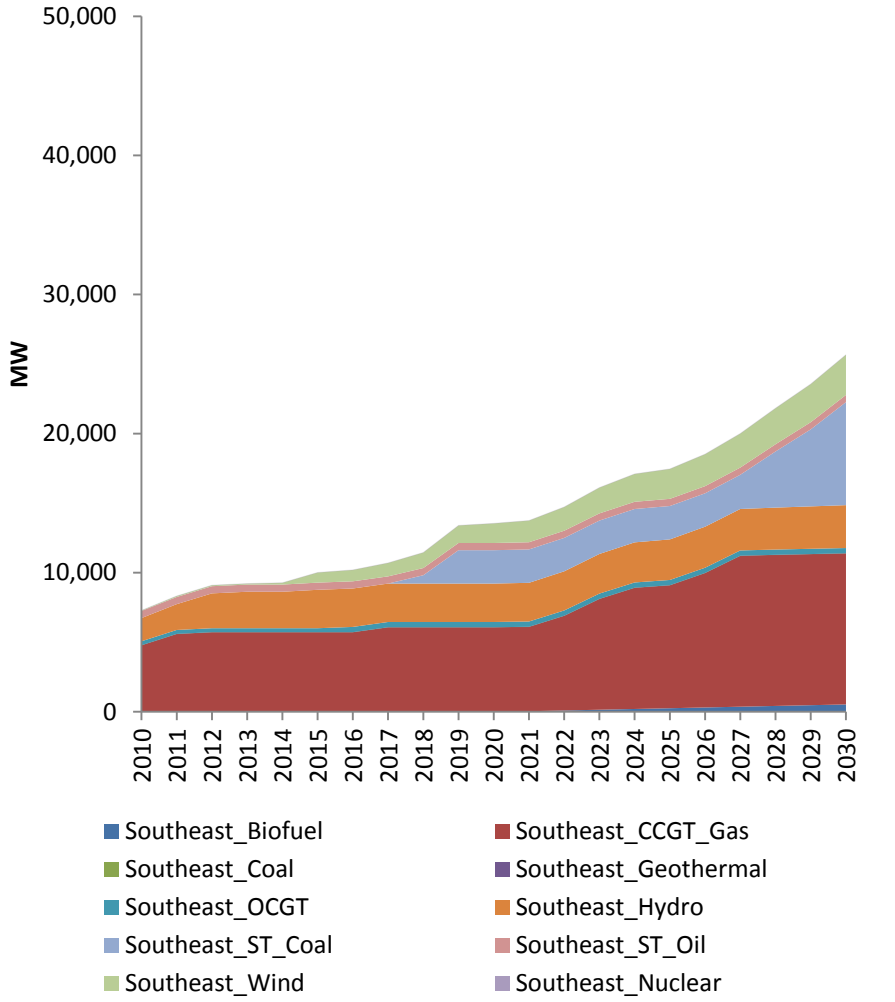
Imported coal is the “swing resource” in the generation mix



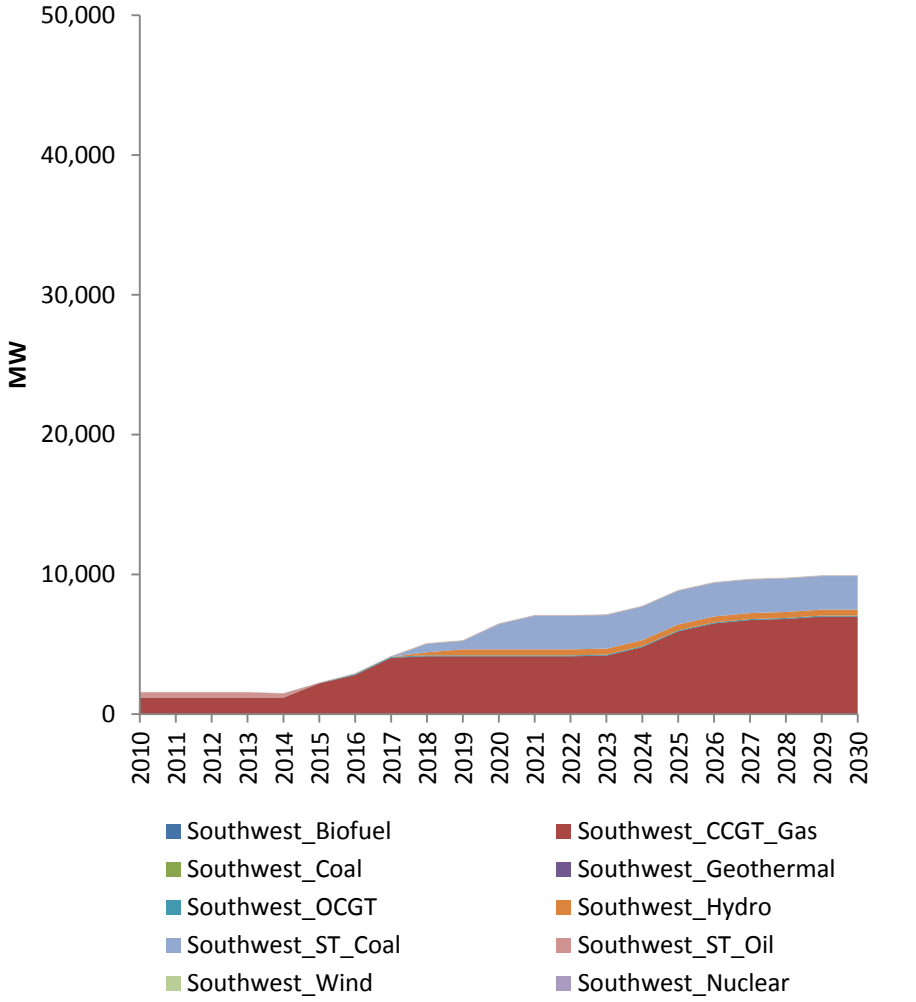
- Domestic coal supply into power levels off around 2020 – and this allows for reduced exports and also some degree of underground mining.
- Southeast Vietnam has some of the best wind potential in Southeast Asia, but incentives will be needed.
- Hydro (including imported hydro) expands to 2020 then the rate of growth declines.
- Domestic gas shows relatively good growth but some committed southern coal plants hamper gas sales through to 2020
- Beyond 2020 we let the economics of the simulation take over; gas competes with coal in the south, but in the north the sheer level of power demand requires substantial coal build – there is limited supply of gas in the north.

TLG capacity forecast in southeast and southwest

Southeast



Southwest



TLG capacity forecast in central and north

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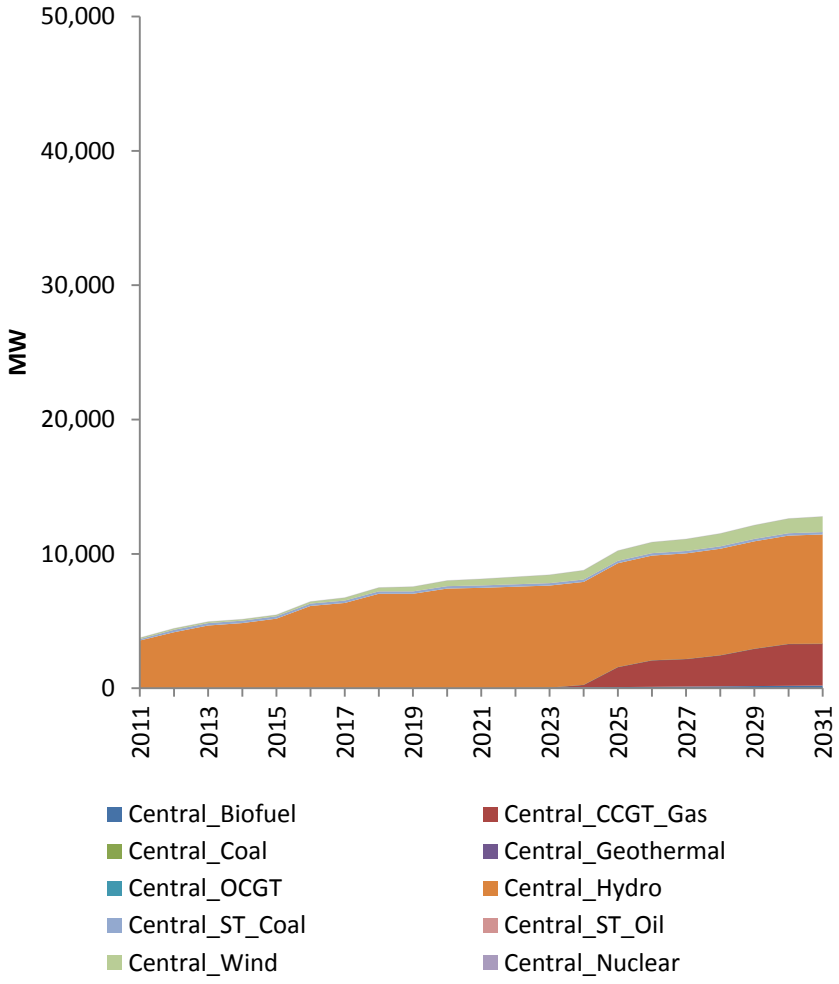
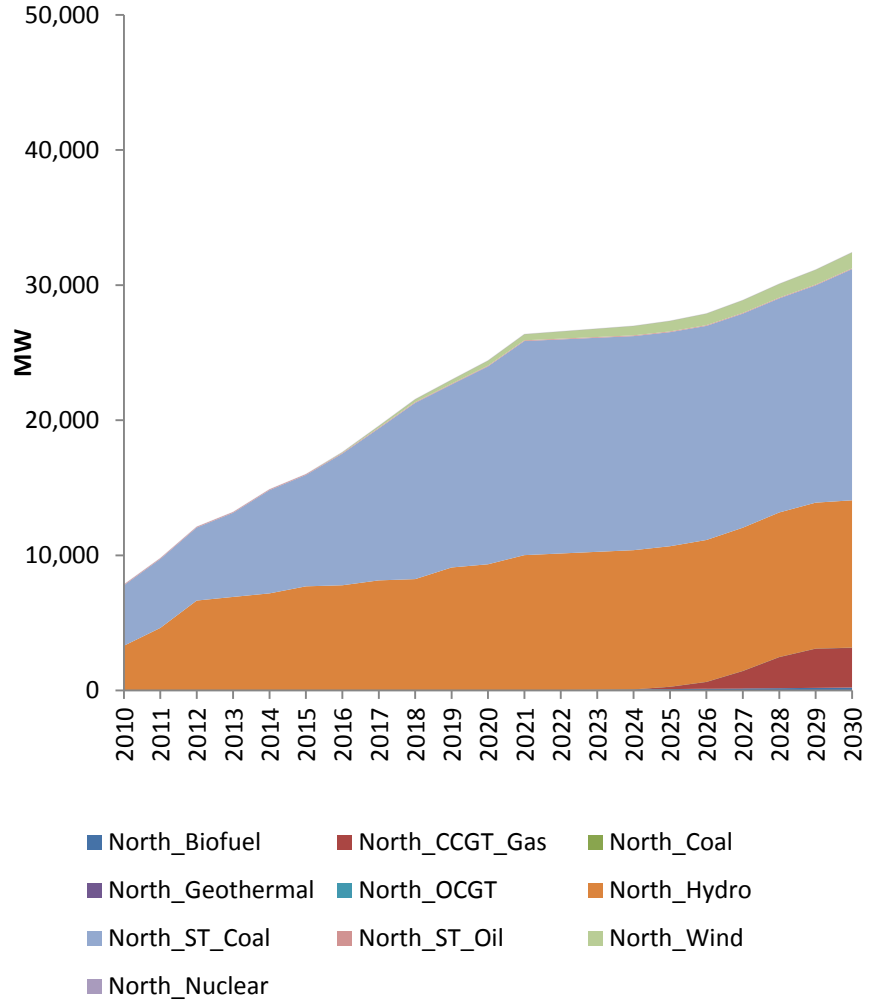
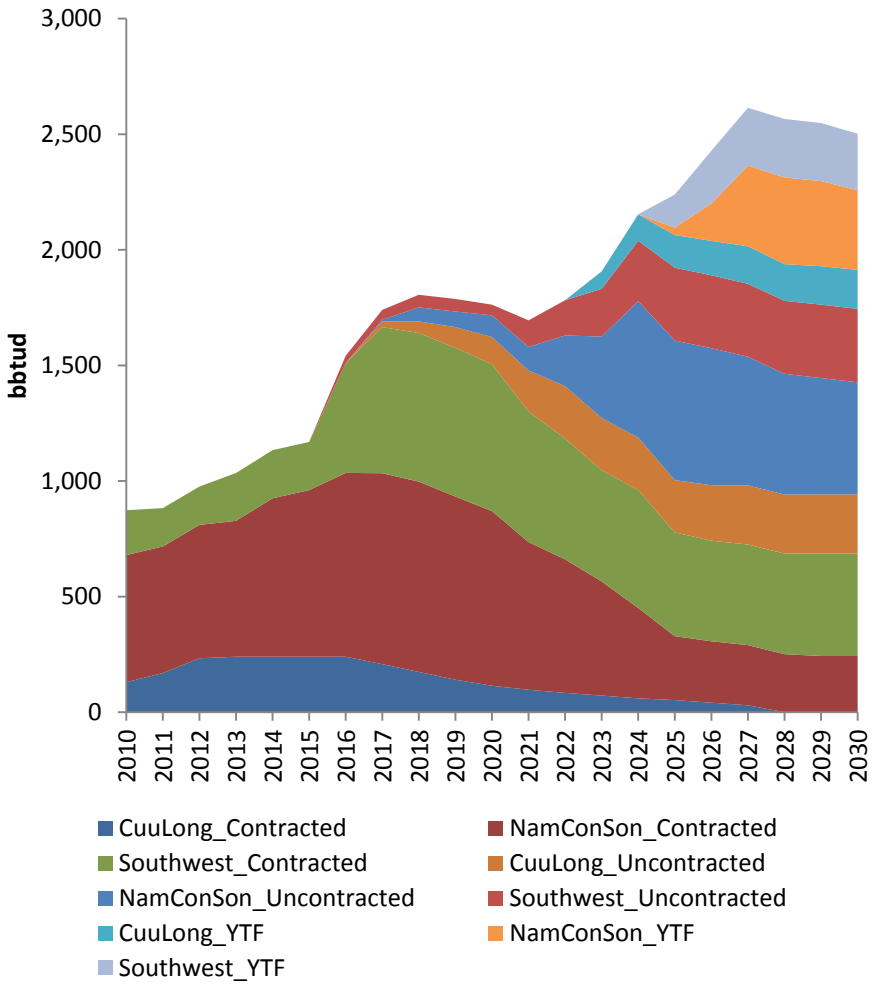


North



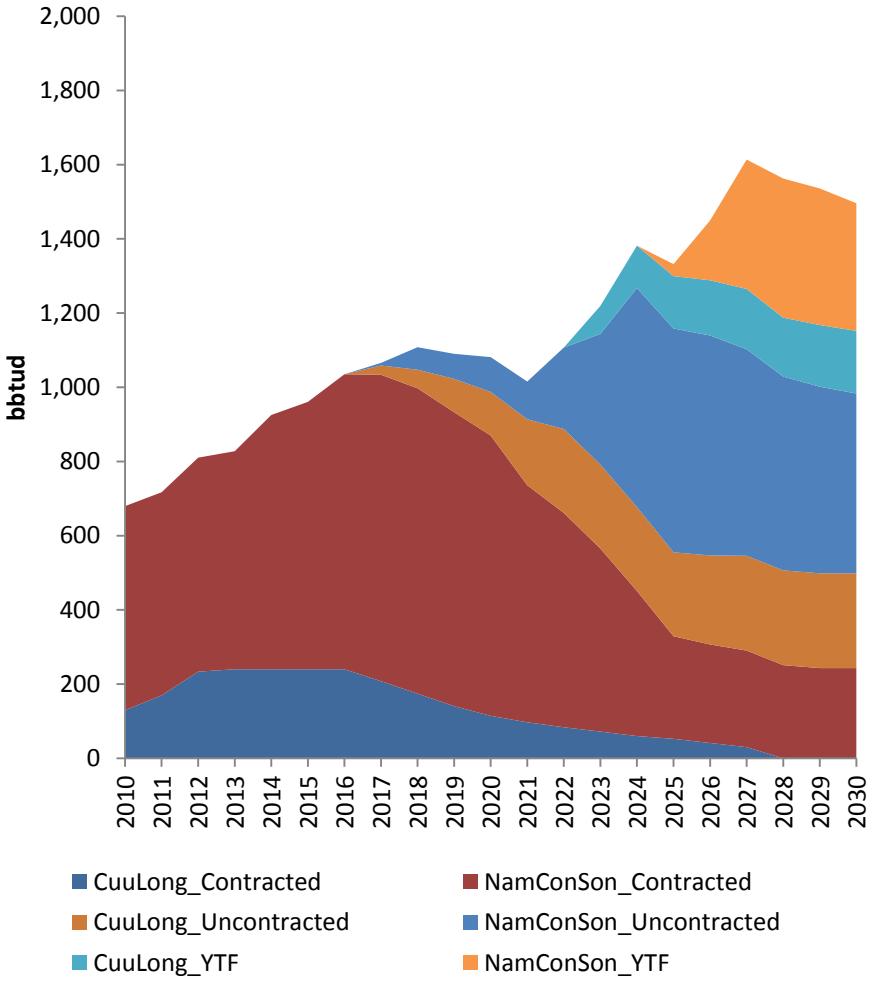
TLG South Vietnam gas balance



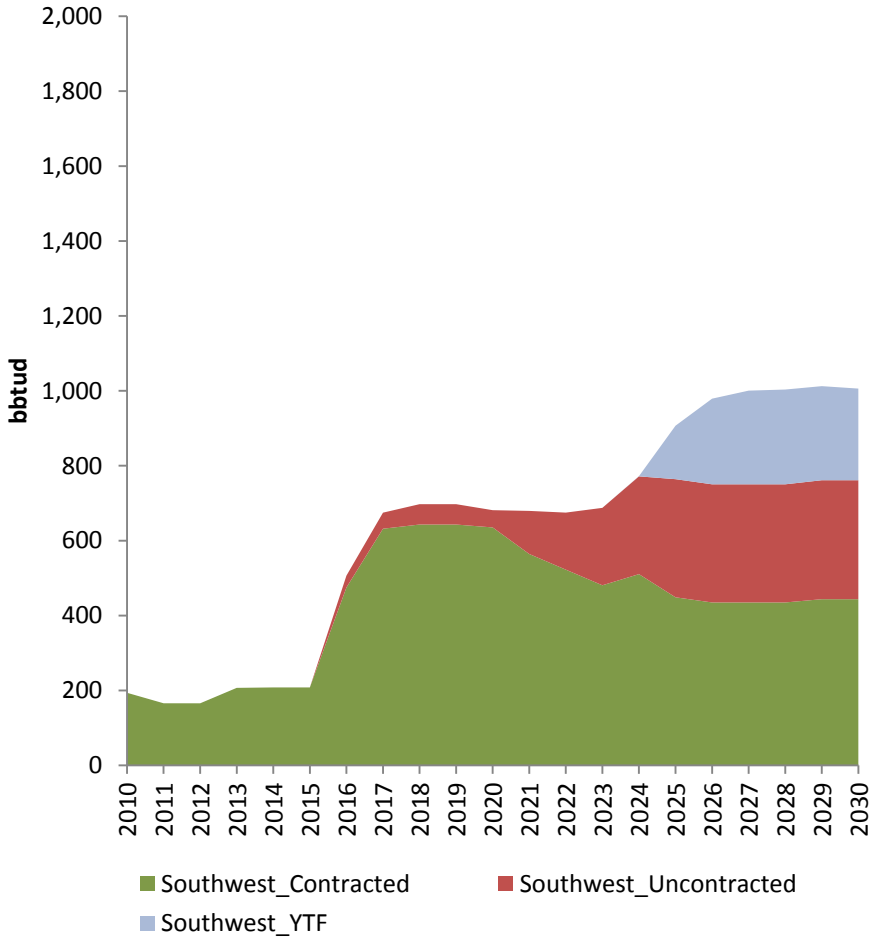
- Some coal build dents demand between 2017 to 2021.
- But there is enough gas through to 2027 before supplies dip.
- Transmission of large amounts of “gas by wire” say from central is not really possible due to limited power transmission.
- Therefore, it is not until 2027 that we foresee the window would open for LNG *on an economic basis* for the power sector in the south.

TLG gas demand forecast in southeast and southwest

Southeast

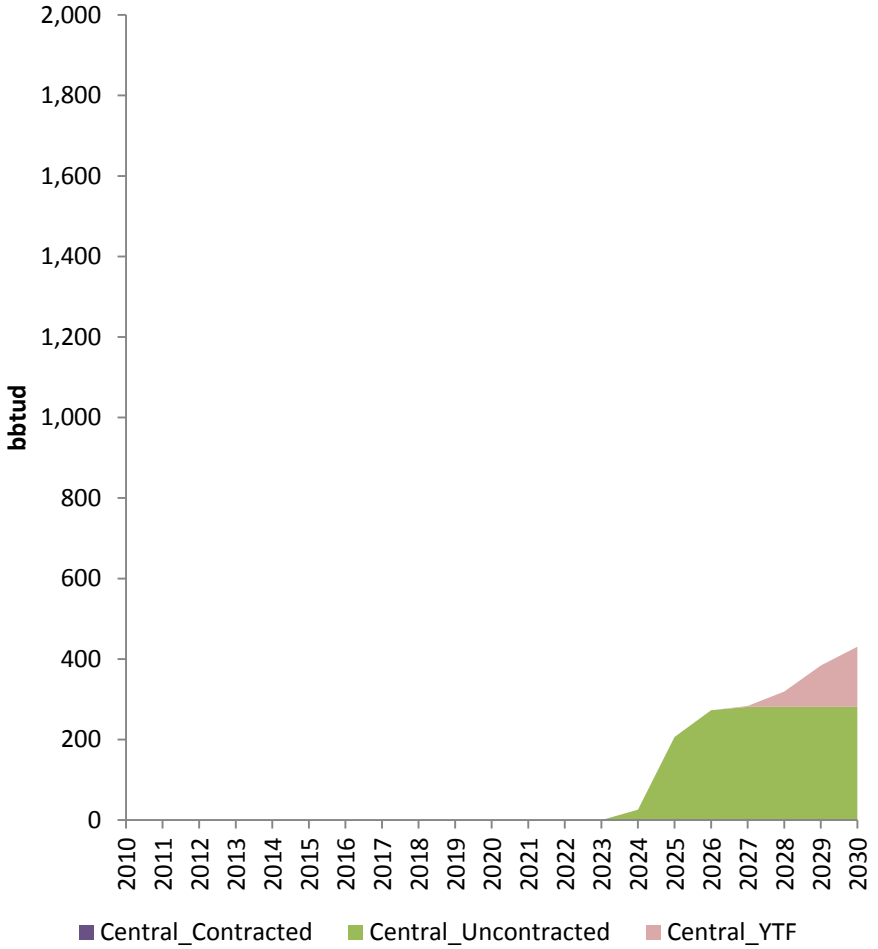


Southwest

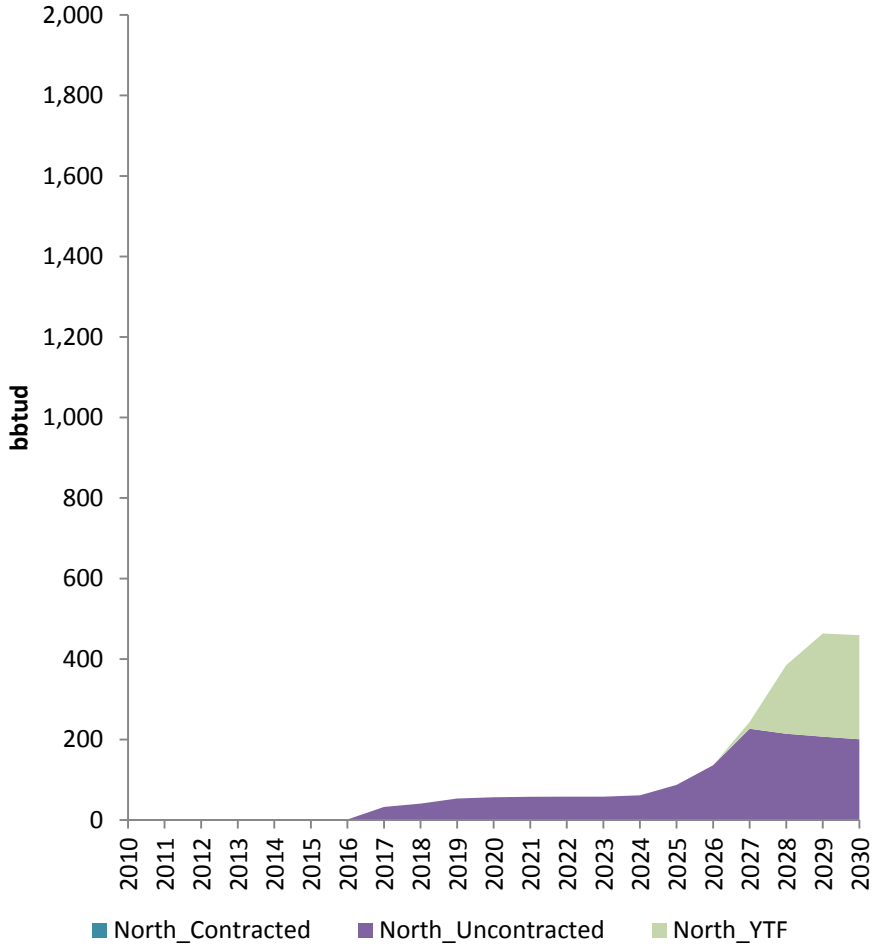


TLG gas demand forecast in north and central

Central



North



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- Power Development Plan VII appears wildly optimistic
  - Load forecast – even the low case! – is simply not credible
  - Capacity expansion plan appears to force development of resources – particularly baseload CCGTs burning LNG – that are not economic relative to alternatives
  - Rationale to use LNG appears to rest on a price-discrimination scheme that may enable PVN to cover the cost of LNG, but hardly justifies its use for baseload power
- Realistic capacity expansion makes full use of domestic gas and pushes off need for LNG – at least for baseload power – until about 2027
- Competition between baseload gas and coal will set “ceiling prices” for upstream domestic offshore gas:
  - Against Chinese coal technology, ceiling prices would be in the range of USD 6.15-6.40/mmbtu
  - Against advanced coal technology, ceiling prices rise to USD 7.85-8.10/mmbtu
  - If carbon is valued explicitly, breakeven prices rise USD 0.74/mmbtu for every USD 10/tonne increase in the carbon price
  - Without a carbon value, CCGTs burning LNG would only be economic as peaking units; moreover, for any foreseeable carbon value, they would not be economic as baseload units.

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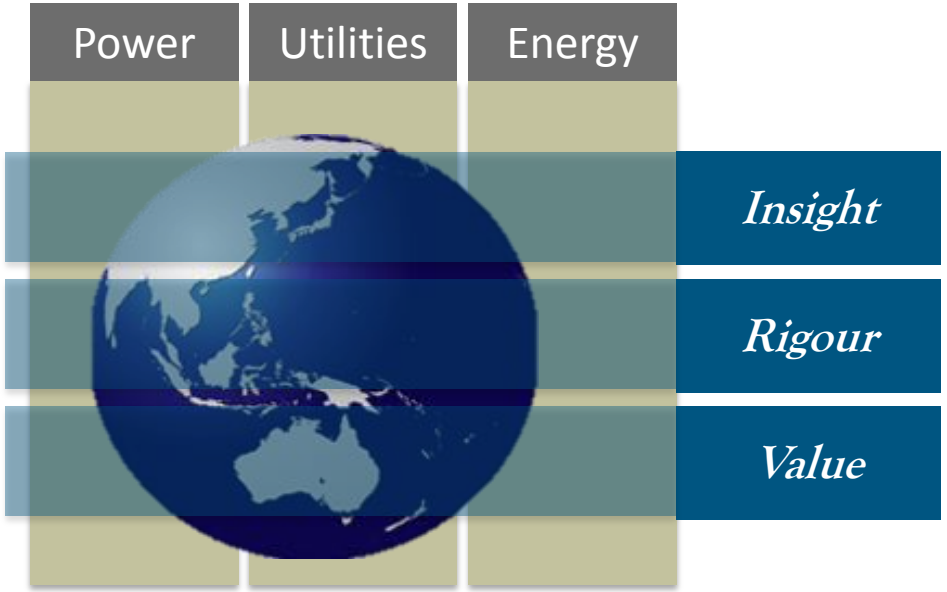

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