Motivations for nuclear programmes in China & Taiwan

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Why order uneconomic nuclear capacity?

Three main factors that might allow/motivate utilities/countries to order uneconomic nuclear plant

1. Lack of financial responsibility falling on the utility. Due to weak regulation in monopoly markets & insulation from the market in competitive systems
2. Availability of finance that does not reflect project risk. For example, sovereign loan guarantees, regulatory assurances that costs can be passed through
3. Military aspirations. Links to weapons or submarine programmes

China: Electricity industry structure

- 1650GW capacity (2015). 64% thermal (mostly coal), 20% hydro, 14% wind & solar, 2% nuclear. Implausible that nuclear could account for more 10% of capacity
- 5 giant utilities (105-160GW each) own 50% of capacity, much larger than nuclear vendors but can only own minority stakes in nuclear
- 3 reactor vendors, CGN, CNNC & SNPTC who also own nuclear & other generation
- Several mergers proposed involving Big 5 & reactor vendors
- Increasing influence of provincial authorities, owning generation, determining dispatch
- Demand growth in last couple of years well below rates of 7%+ typical of earlier years

China: Nuclear

- 25 reactor construction starts from 2008-2010. All now in service except 6 imported reactors (EPR, AP1000), all 4-6 years late
- Hopes that indigenising modern designs would make them affordable not fulfilled
- Since Fukushima, only 15 construction starts, none in 2017. Factors other than Fukushima important: failure of imported reactors; ban on inland sites; over-capacity in regions with nuclear; skills shortages
- China now promoting indigenous designs: Hualong One (CGN & CNNC) & CAP1400 (SNPTC) for home and export markets. Suspicions of delays & high costs for Hualong One
- Seen as part of ‘Belt & Road Initiative’, but export markets difficult to crack, only orders Pakistan
- Nuclear vendors looking to renewables as new nuclear projects are not permitted

China: Electricity price setting

- Central government sets price for ‘guaranteed’ nuclear output $6.3c/kWh
- Provincial authorities reducing guaranteed level from 7000 hours to as low as 4800 hours. Additional output sold at much lower rate to provincial markets.
- Provinces would like to reduce the guaranteed price
- Nuclear load-following & even temporary shutdown sometimes required. Significant reduction in utilisation of reactors has resulted
- Low cost finance likely to be available. Military sector well established and unlikely to need support from the civil sector

Taiwan: Electricity industry structure

- Sector dominated by state-owned, fully-integrated Taipower. No apparent independent price regulatory body
- 2016: 75% of capacity fossil fuel, 10% nuclear
- 20GW of new capacity to be built by 2026, 75% renewables, rest coal
- 5.1GW of nuclear in service ordered 1970s, 2.7GW (Lungmen) under construction, ordered 1998
- Lungmen components & fuel being sold off & government policy to close all nuclear by 2025

Taiwan: Finance & Military connections

- Operating reactors ordered when finance not an issue. Lungmen repeatedly delayed by lack of funds

- In 70s & 80s, under a dictatorship, serious concerns about weapons proliferation through Institute of Nuclear Energy Research but now fewer concerns

Conclusions: China & Taiwan

- China & Taiwan (& Saudi Arabia, Iran) have several factors in common.
- Military connections have been or are a consideration in all 4 cases
- The nuclear programmes driven by centralised authoritarian regimes, based on rapid demand growth
- Electricity sector largely owned publicly-owned, mostly by central government
- Independent & rigorous economic regulation of the electricity sector largely absent
- Most recent construction experience in China & Taiwan poor
- The Taiwan programme appears to have little future
- The Chinese programme is at crisis point & exports are proving difficult to win.