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CHINA'S POWER UTILITIES IN HOT WATER: EXECUTIVE SUMMARY

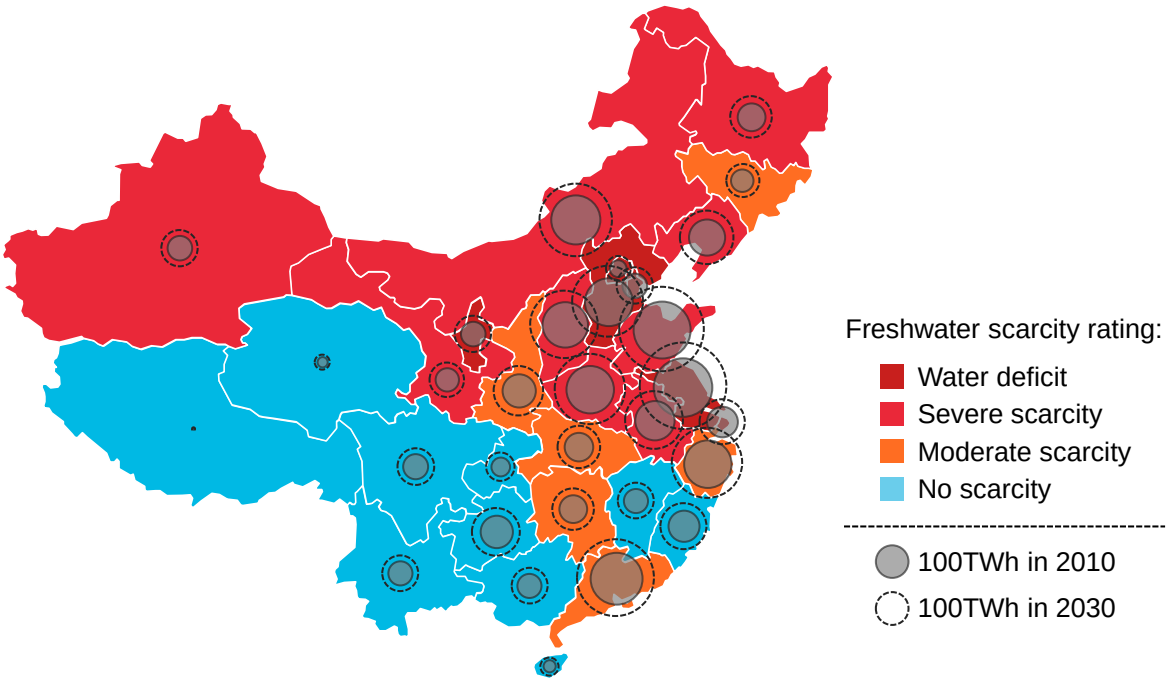
China's economic growth relies to a great extent on thermal power – a heavy water user. Yet, some of the country's waterways are already in deficit. China's "Big Five" power utilities are all highly exposed to water disruption in their **500GW** of plants. Investment to reduce risk of disruption could total **$20bn** and remove **10GW** of capacity from the electrical system.

Key findings of Bloomberg New Energy Finance's analysis on Chinese utilities' water exposure include:

- The total volume of water withdrawn by the Chinese power sector will grow from **102bn m^3** in **2010** to **124bn m^3** in **2030**, according to our ***BNEF central forecast***. This growth will be driven by a three-fold increase in water-intensive thermal power generation between now and 2030 which looks set to outweigh incremental gains in cooling cycle efficiency at 'refurbished' plants.
- In a ***Business as usual*** scenario, power sector withdrawals could reach **190bn** m^3 in **2030** and constitute more than **25%** of the national overarching cap of **700bn m^3** set by the government. Given that some regions are already in water deficit today, the projected increase in power-related water withdrawals could quickly become unsustainable.
- The fundamental problem in China is that regional demand for electricity is inversely correlated with the distribution of freshwater resources. **Northern China** is home to over **60%** of the country's **thermal power capacity,** but has just **20%** of the country's renewable **freshwater** supply.
- All of China's "Big Five" state-owned power enterprises are highly exposed to water supply disruptions across their combined **500GW** of assets. **Huaneng** and **Datang** are currently the most vulnerable, with both companies having **84%** of their **capacity** tied up in thermal power assets located **in moderately to severely water-scarce regions**. By comparison, Guodian is the least exposed member of China's 'Big Five', with 65% of its generating capacity at risk.
- Geographic and technological diversification is the best way for Chinese utilities to cope with the sector's looming water crisis. Thermal power plants built in wet regions such as **Guangxi**, **Fujian** and **Jiangxi** will be less susceptible to operational disruptions than assets in the dry North. Non-thermal power generators such as wind and solar PV do not depend on water and will therefore be an increasingly attractive option for utilities.
- New thermal plants will mainly be equipped with **closed-cycle** and **air cooling** loops, which withdraw less water than once-through systems. However, these technologies **decrease** the thermal **efficiency** of power plants by **3-10%** and result in **higher greenhouse gas emissions** per megawatt-hour.
- Water conservation and carbon emissions reductions may be conflicting objectives for China's power utilities - and meeting both goals will require a high-level, coordinated policy approach for water and energy.
- If the number of water-related power disruptions increases dramatically, the government could *force* the plants with once-through technologies to retrofit. Such retrofits would come with substantial costs: **100GW** of plants retrofitted, at a cost of **$20bn** and overall **capacity reductions** of **10GW** due to lower efficiency in retrofitted plants. China's power utilities, it seems, cannot avoid being in hot water.

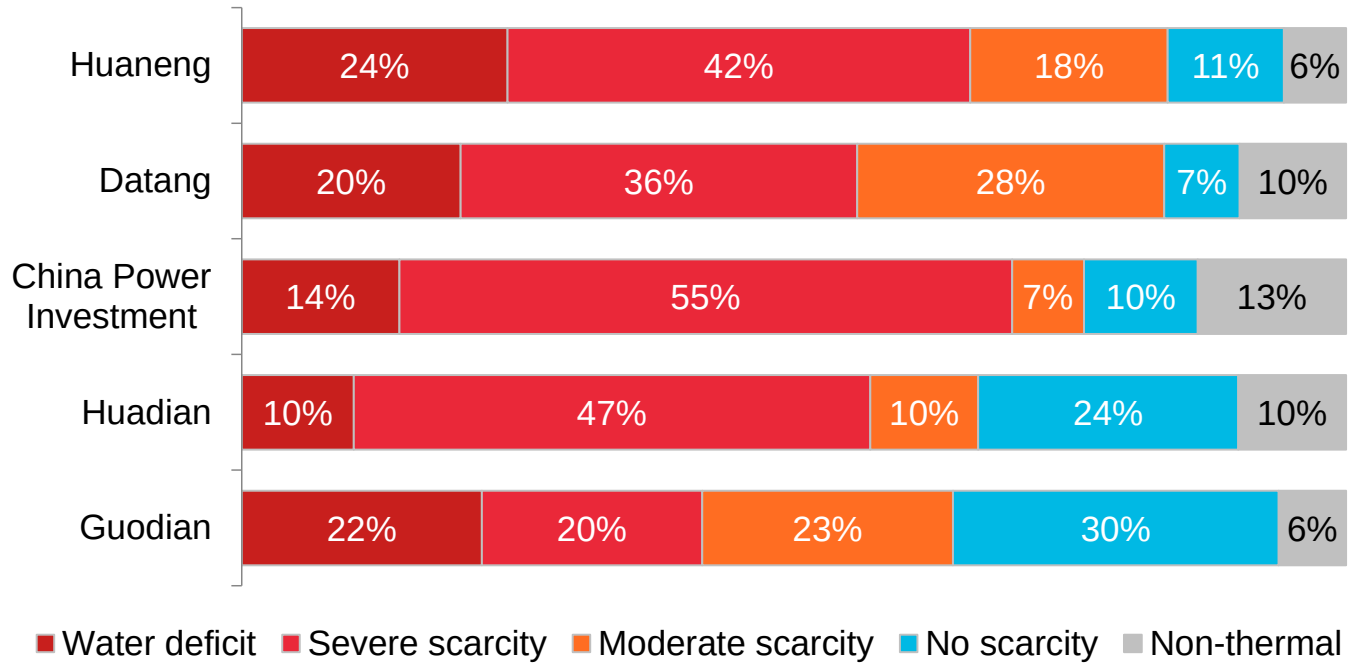
Nathaniel Bullard
+852 2977 4827
nbullard@bloomberg.net

Thermal power generation versus water scarcity by province in China, 2010 and 2030



Source: *Bloomberg New Energy Finance, National Bureau of Statistics of China.* ***Note:*** *We define 'water scarcity' using a criticality ratio. A region is water-scarce if annual freshwater withdrawals amount to 20-40% of the renewable resource, and severely water-scarce if they surpass 40%. If annual withdrawals exceed the renewable supply, the region is said to be in water deficit. Annual freshwater withdrawals by province were calculated using 2011 data. The average renewable water resource reflects the mean annual renewable freshwater supply in the period 2004-11.*

Thermal power capacity in water scarce regions by utility (% of total generation capacity)



Source: *Bloomberg New Energy Finance, National Bureau of Statistics of China, Platts.* ***Note:*** *Regional freshwater withdrawals were calculated using 2011 data, while the mean renewable water resource in each province was determined as the average of annual renewable supplies in the period 2004-11. Generation capacities were summed over all power assets in commercial operation in 2008, including those using saline water for cooling.*

ABOUT US

SUBSCRIPTION DETAILS

WATER INSIGHT **sales.bnef@bloomberg.net**

CONTACT DETAILS

Nathaniel Bullard, Director of Content	nbullard@bloomberg.net	+852 2977 4827
Maxime Serrano Bardisa, Analyst, Water Insight	mserranobar1@bloomberg.net	
Alasdair Wilson, Analyst, Water Insight	awilson100@bloomberg.net	

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