Opportunities for reining in coal dependence in the power sector

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Background

- Discoms are reeling under huge financial stress
  - Power purchase costs constitute between 75 and 80 per cent* (on average) of the total costs of supply incurred by a discom
  - A flawed merit order is in place across thermal generation an we aren't getting cost-effective power
- Total dues payable to generators stands at INR 117,131 Crore ** at the end of May 2020

* Source: Bharadwaj, Ganesan, and Kuldeep 2017

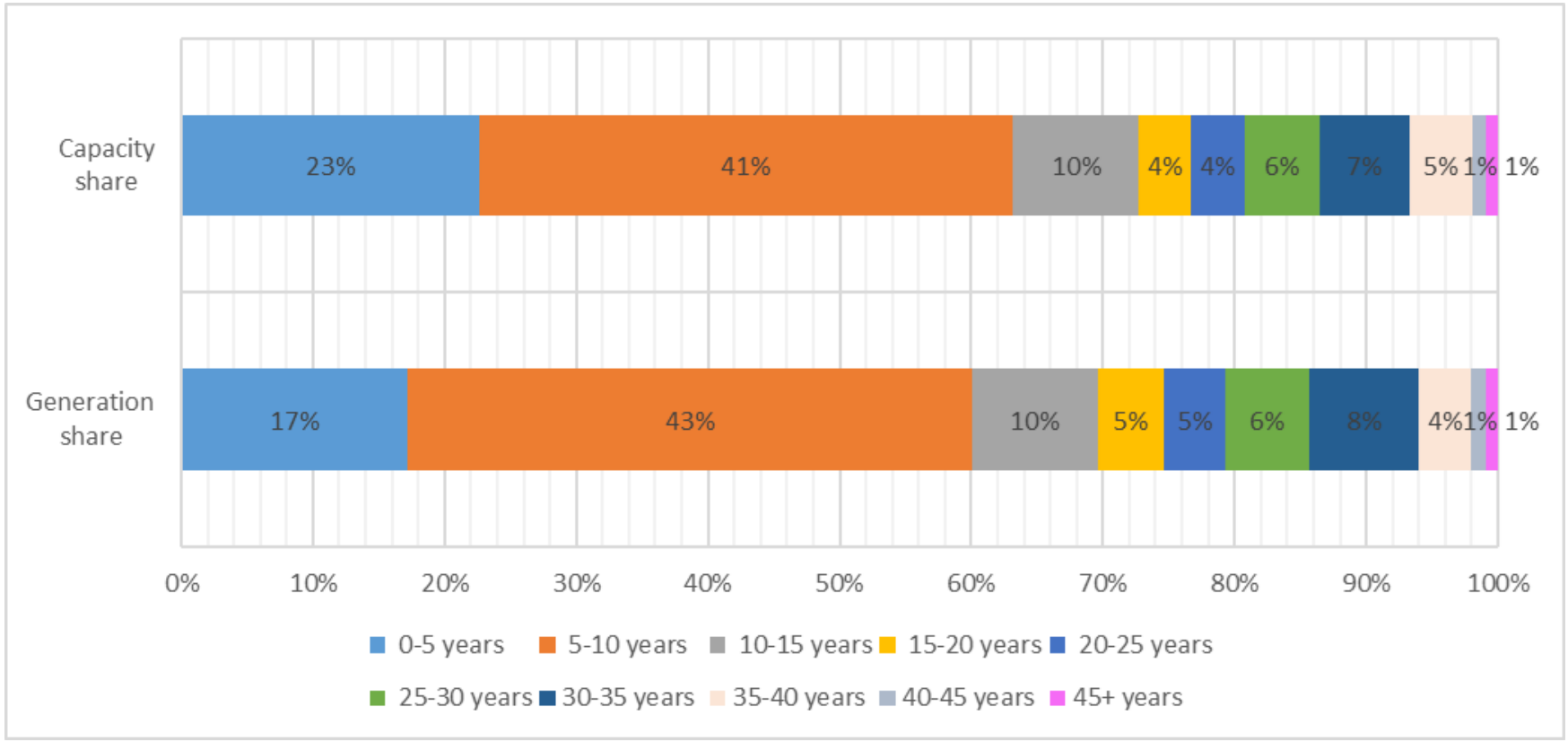
** Source: praapti.in

Objective

- To facilitate efficient transition towards market-based economic dispatch mechanism for power
- To find a path to financial solvency for the power generating assets
- To reduce the air pollution attributable to power sector

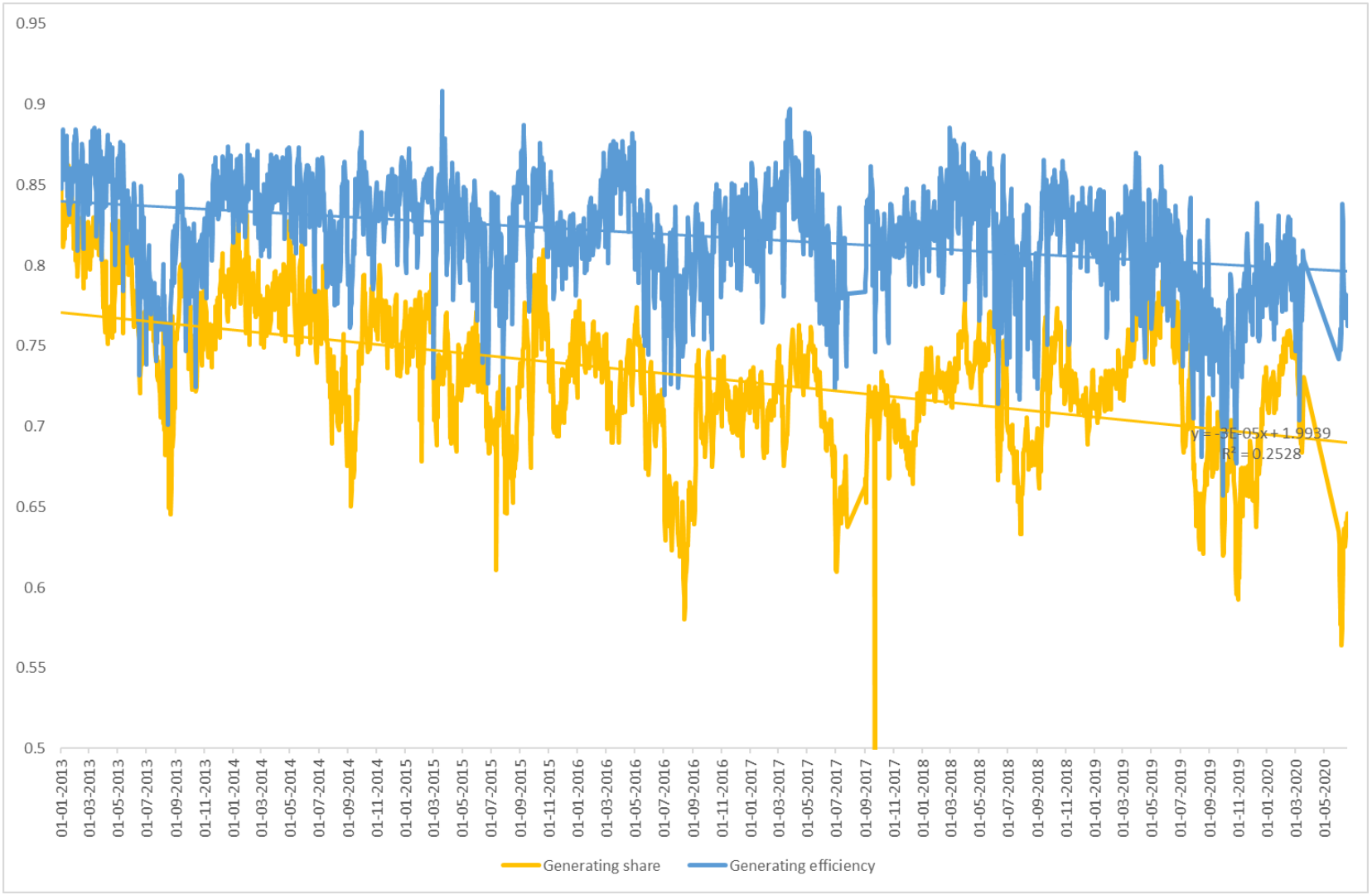
How can we do more, with less coal ?

Newer plants punching well below their weight



Source: Authors' analysis from CEA daily generation reports 2019

What does the surplus mean for operations?



Source: Author's analysis based on CEA daily generation

Generation Share – the share of capacity active on any given day | Generation Efficiency – the load at which active stations run on any given day

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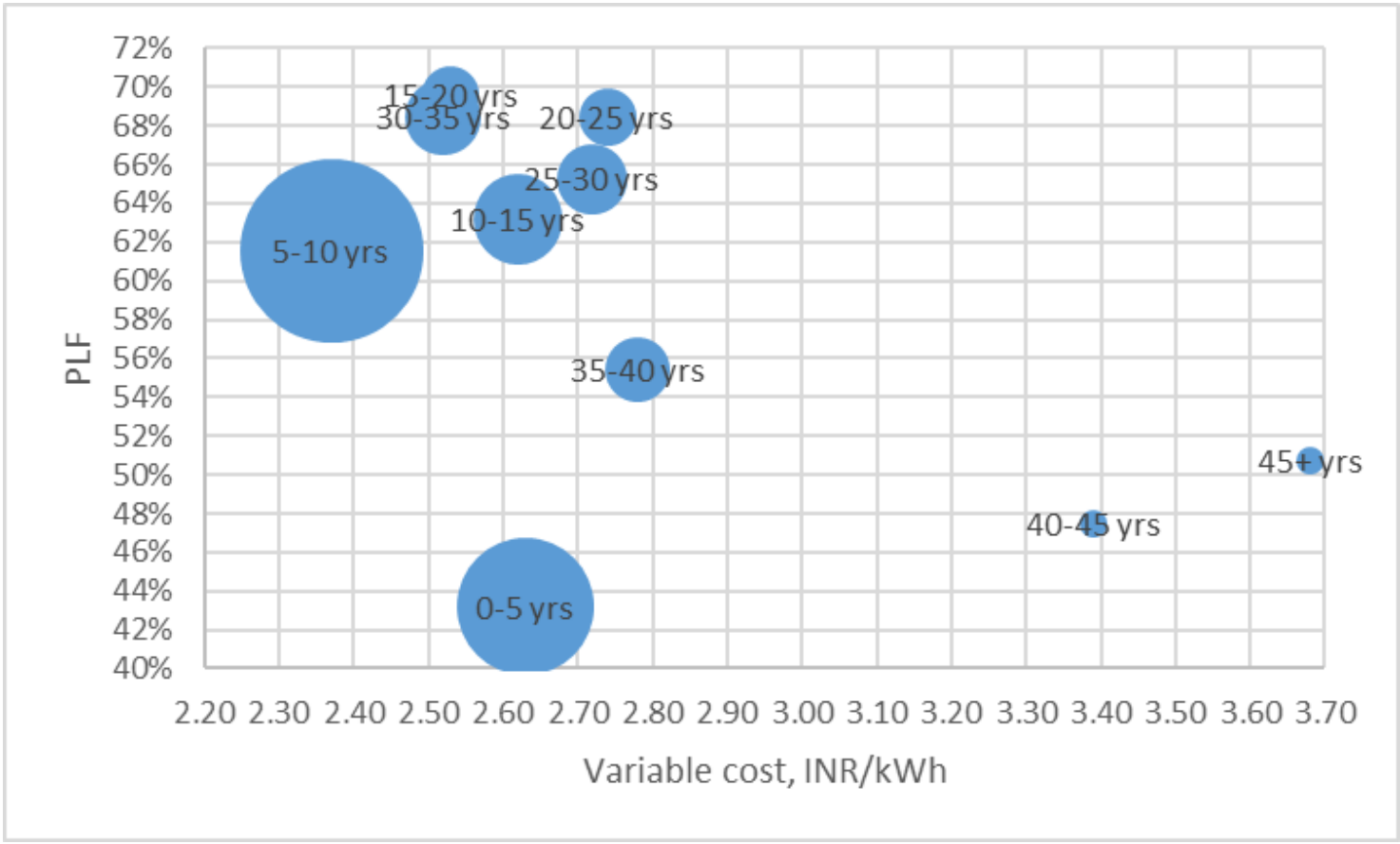
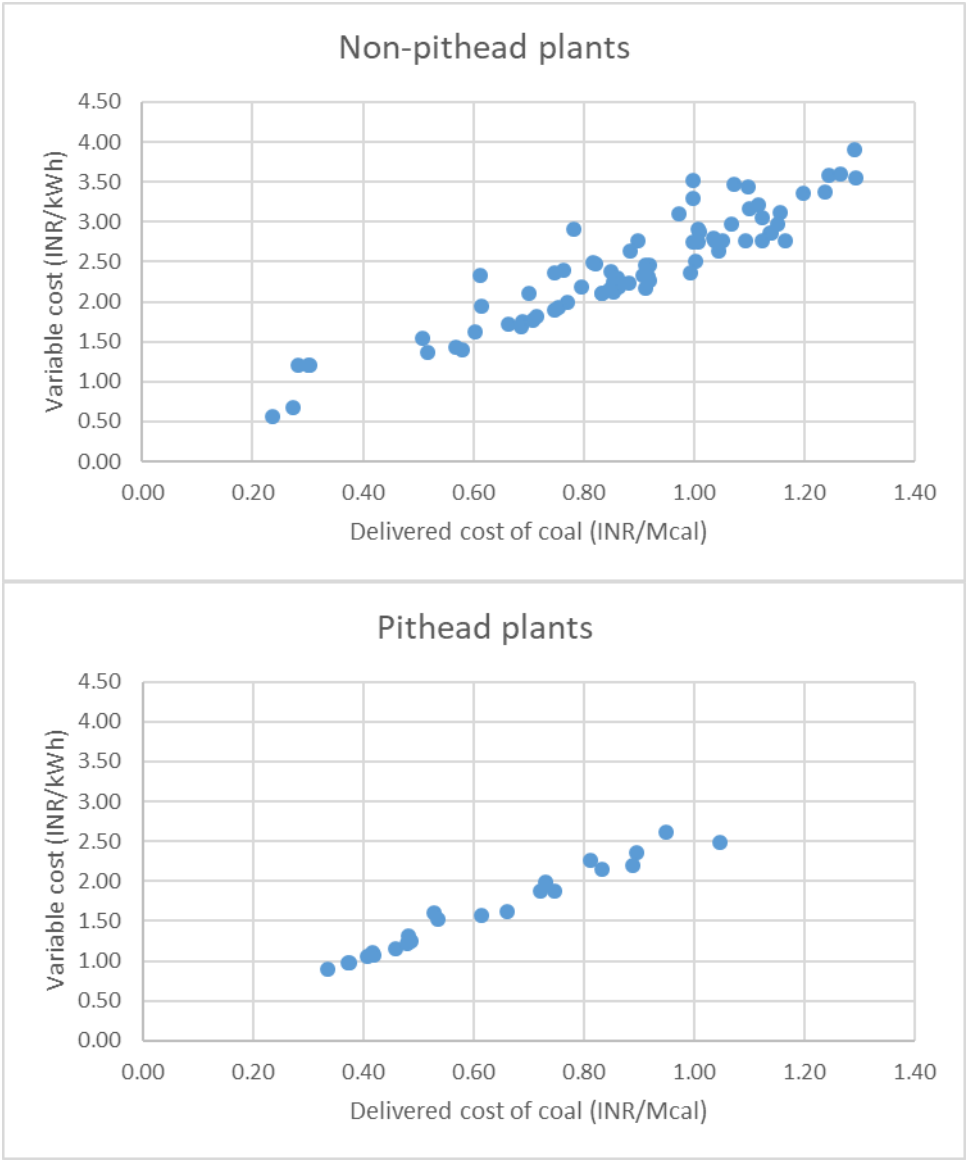
Despite having low variable cost, the PLF of 5-10 year group is low



Source: Authors' adaptation from CEA daily generation reports and MERIT state-wise daily summary data

Note: The bubble size represents the capacity share

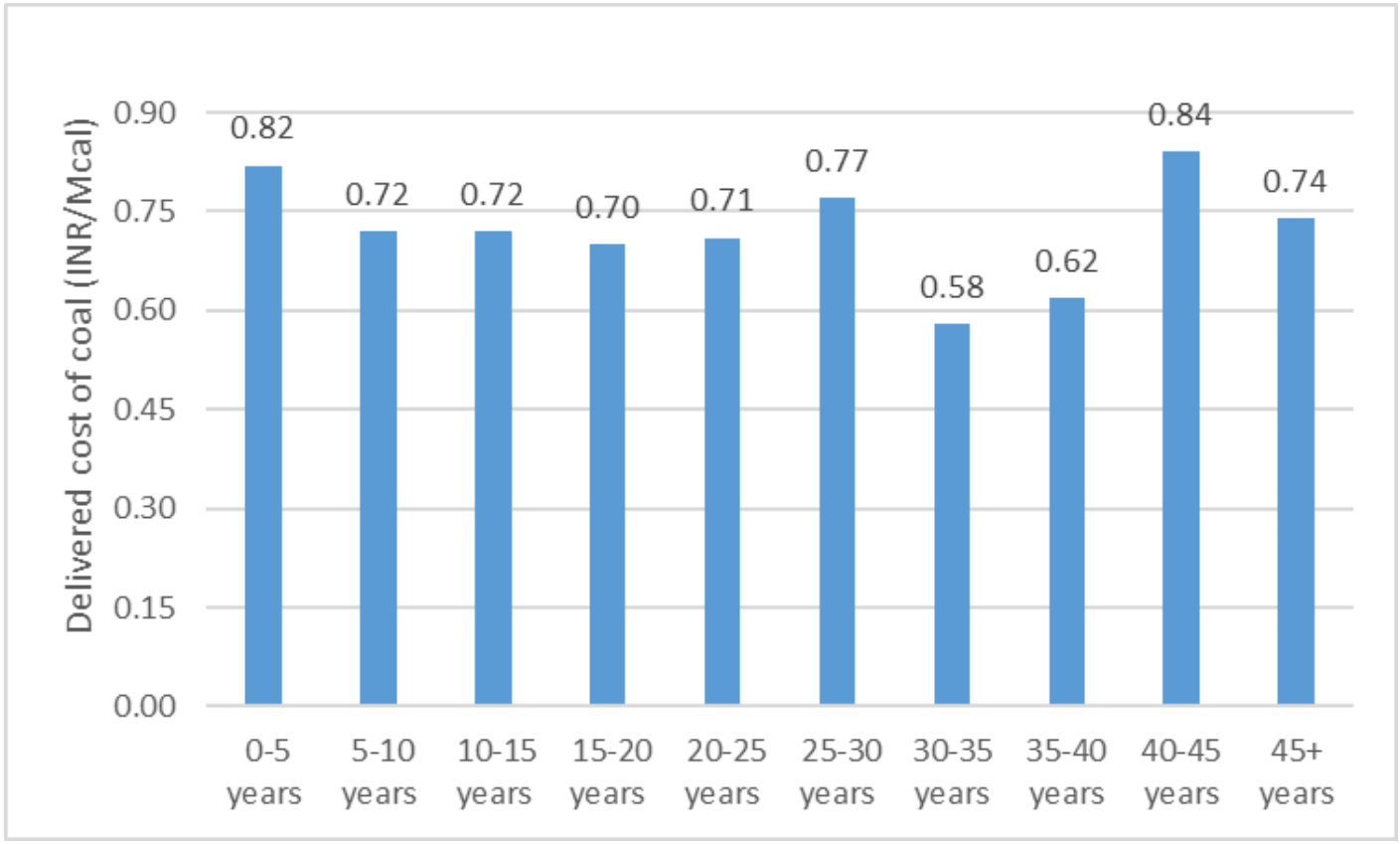
Delivered coal price overrides technical attributes in determining VC



Delivered cost of coal = Coal price/ Gross calorific value of coal

Source: Authors' analysis based on compilations from various generation tariff orders

Delivered coal cost of older plants makes them competitive



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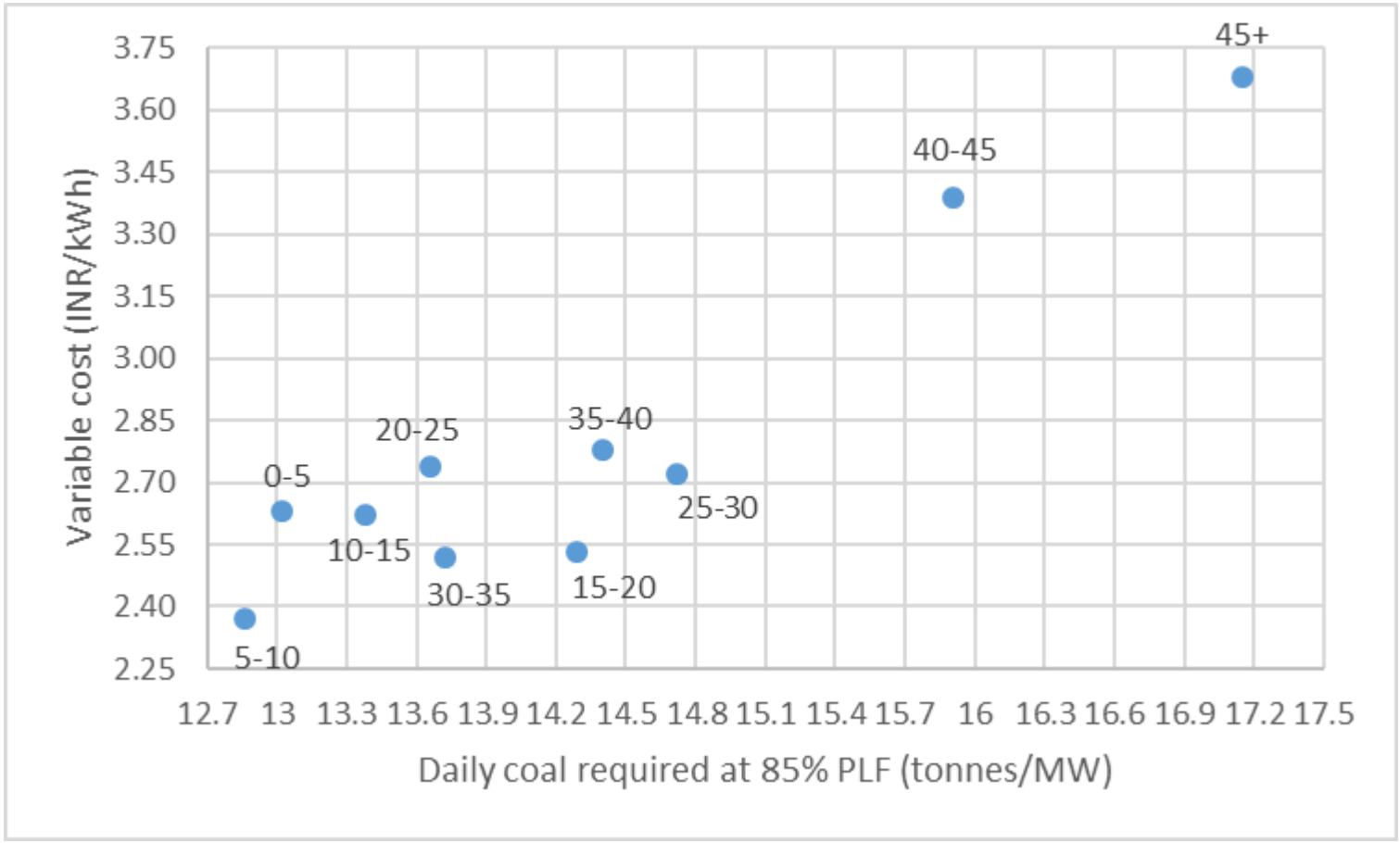
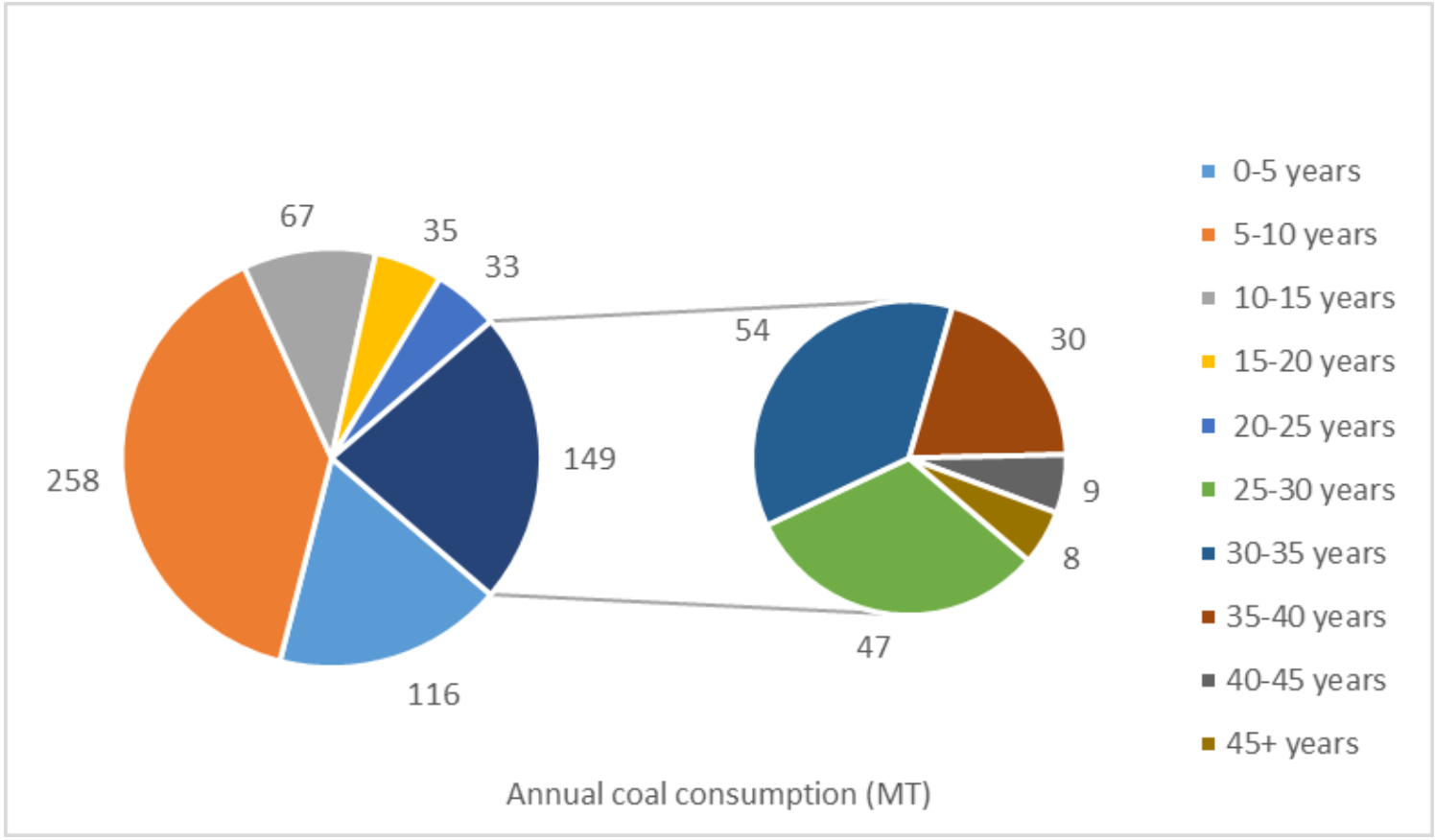
Source: Authors' analysis based on compilations from various generation tariff orders

Older plants are inefficient and firing more coal per MW



Source: Authors' analysis based on CEA monthly coal data and MERIT state-wise daily summary data

Partial loading of power plants also increases coal requirement



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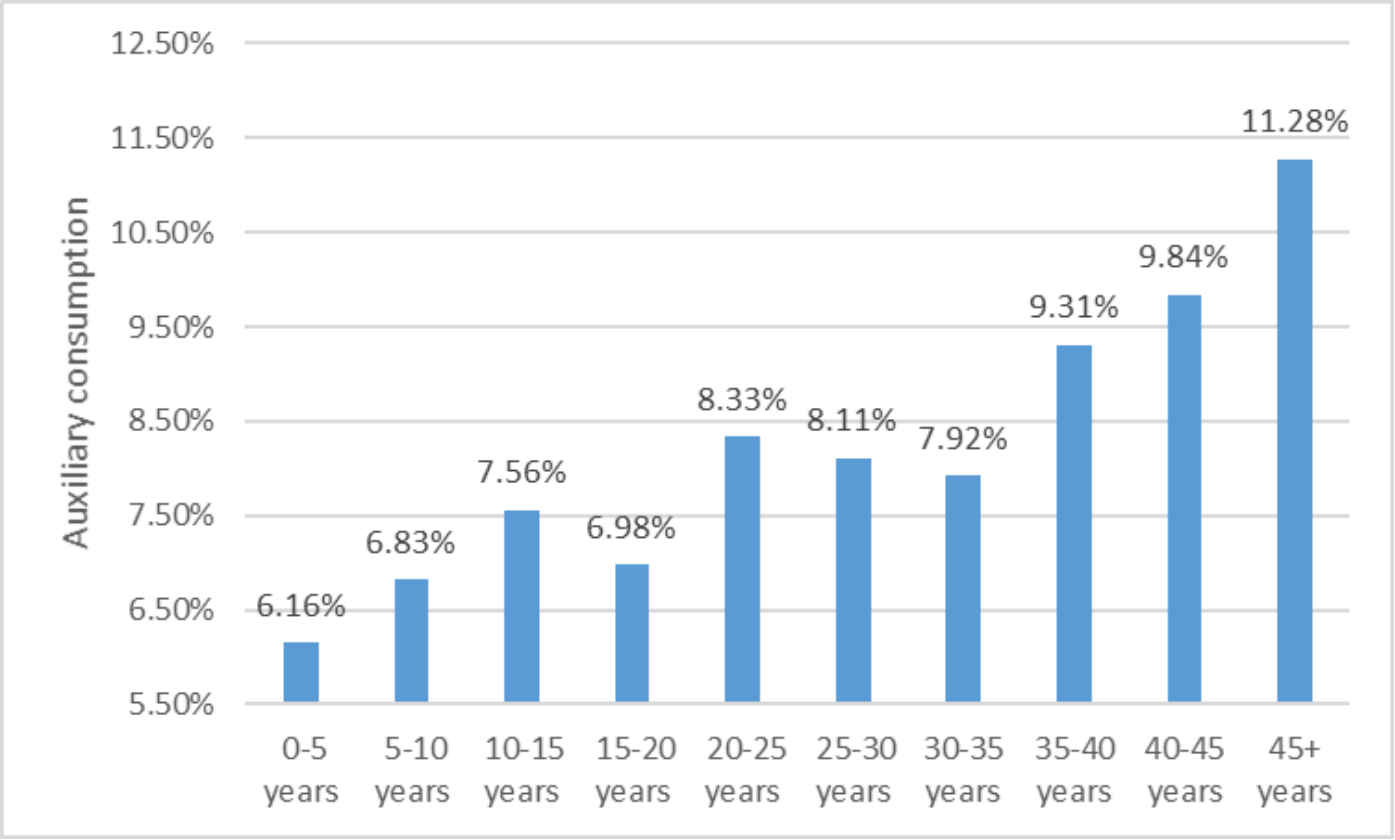
Source: Authors' analysis based on CEA monthly coal and generation reports

Older plants have higher self-consumption and leave less to be sold



Source: Authors' analysis based on compilations from various generation tariff orders

A reallocation scenario

- We do a greedy reallocation of generation where efficient plants are dispatched first
  - VC is distorted and hence the choice of efficiency

- Saturation PLFs are fixed based on the respective age groups of the plants
  - Newer plants have higher operational limits and older progressively lesser
  - Also allows for flexing capabilities to be utilized from older plants

Note: The scenario is run to meet the daily demand of 2825 MU. The number is arrived at based on the average daily generation of thermal plants in India between Sep 2017 – Feb 2020.

Plant loading impacts coal use and VC

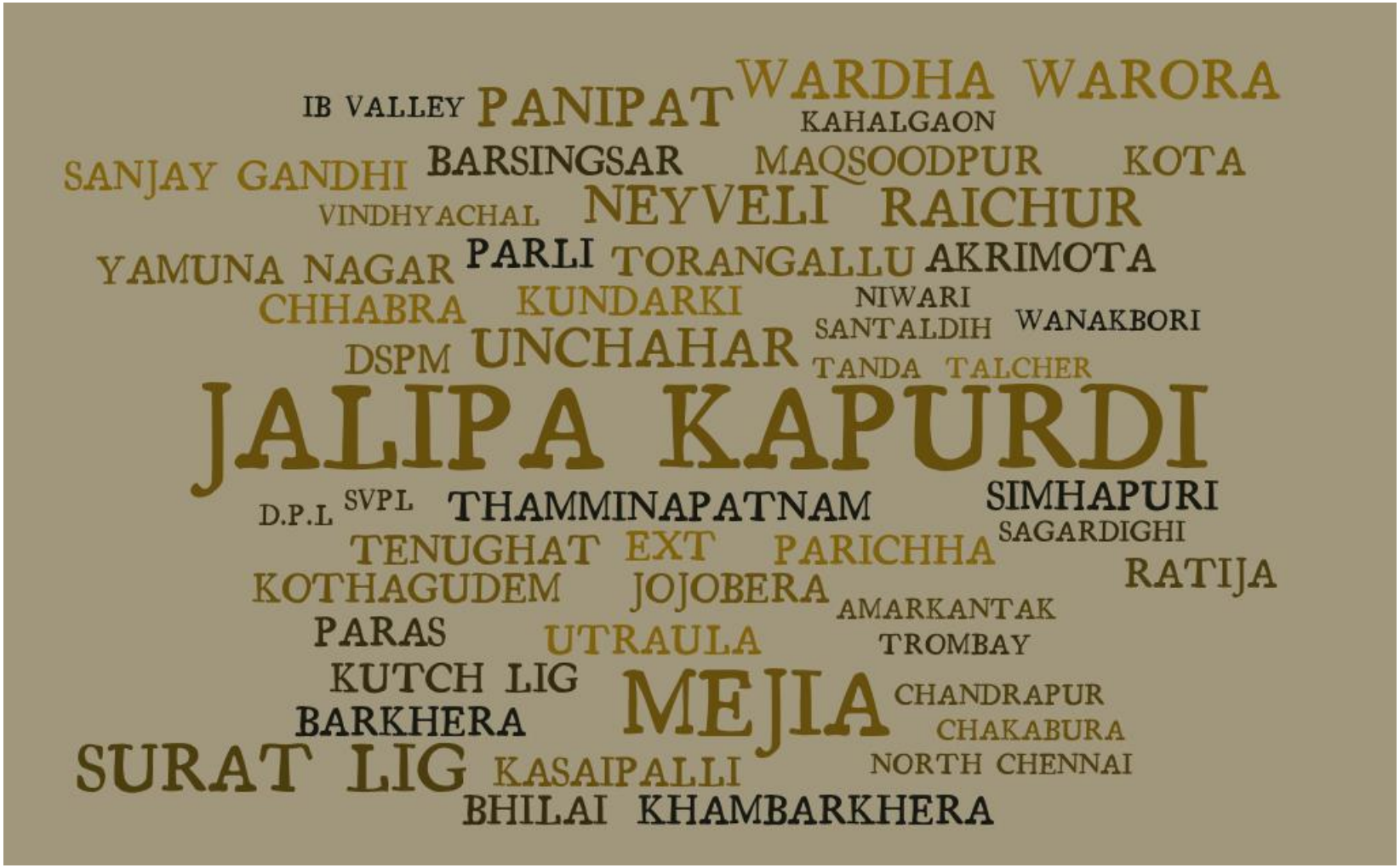
- 10 years older and you are penalised 0.5 T/MW/day *
- An 800 MW unit can benefit by 1.2 T/MW/day **
- A 20% increase in PLF implies a benefit of 0.5 T/ MW/day and 10 paise / kWh reduction in VC

Source: Author's Analysis * on a baseline value of 13.5 T/MW/Day ** as compared with a 250 MW unit

Long serving plants that don't meet efficiency metrics any more

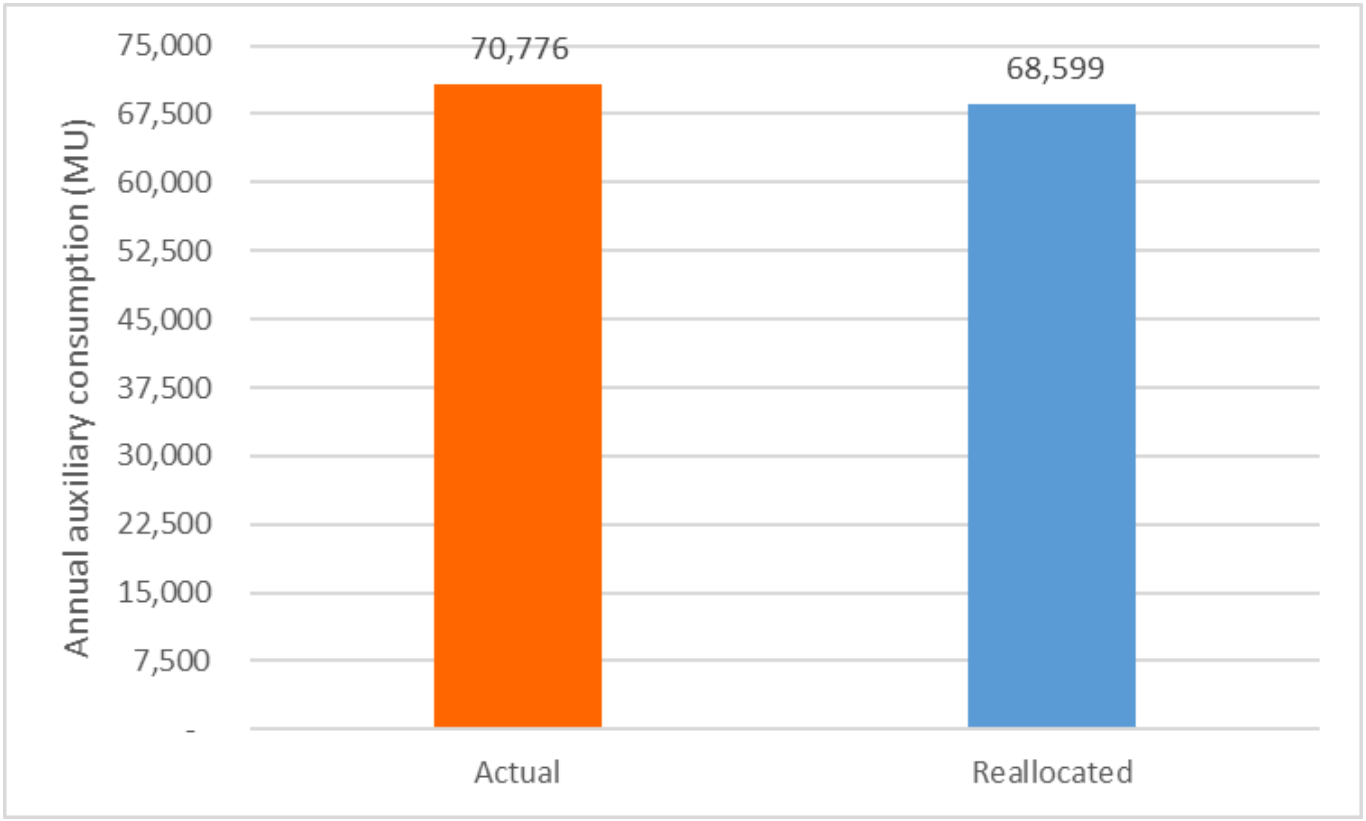
Source: Author's analysis based on reallocation exercise described earlier

Many younger plants that can be mothballed in the interim



Source –Author's analysis based on reallocation exercise described earlier

We can avoid as much as one day's worth of generation just from auxiliary consumption reduction



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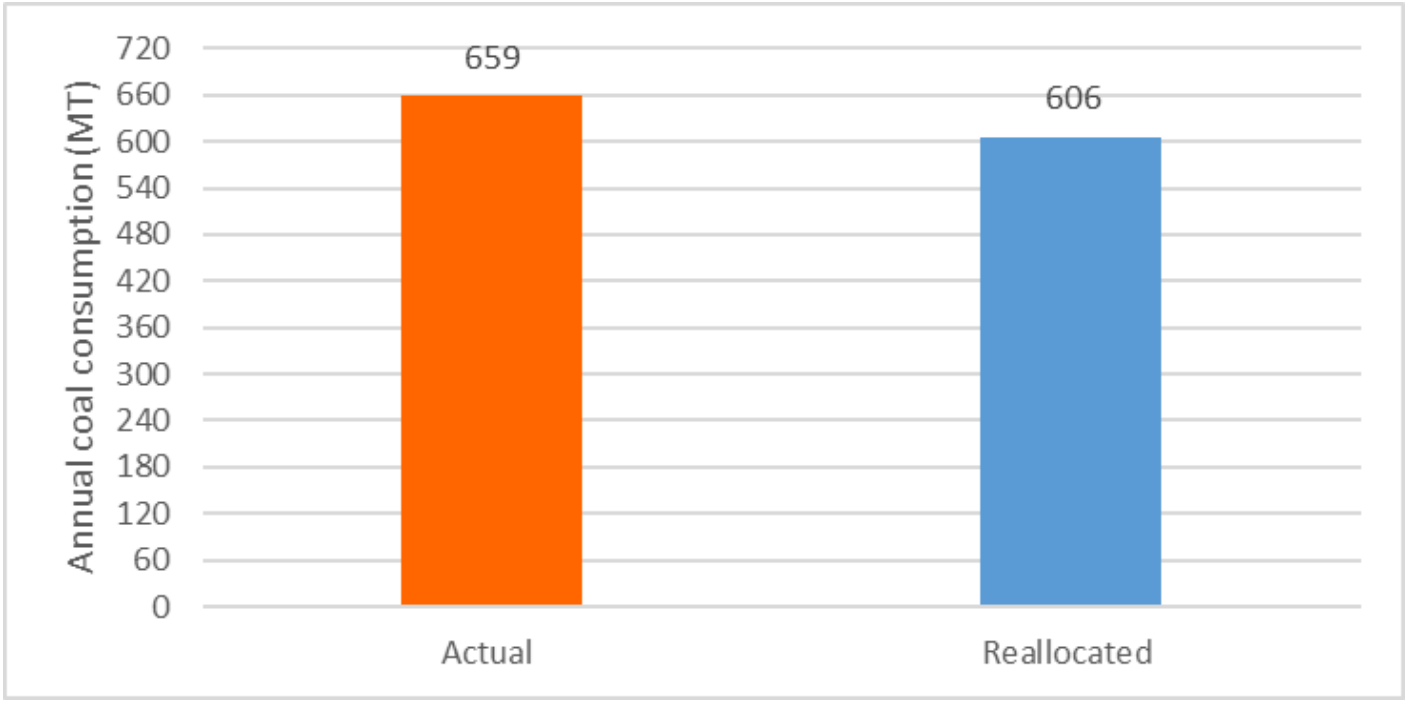
Source: Authors' analysis

Prioritizing efficient plants would save 53 MT of coal annually



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Source: Authors' analysis

What does it leave on the table ?

Variable	Annual savings (INR crore)
Auxiliary consumption	544
Coal consumption	19,234
Variable cost outlay	5,749
Total	**25,527**

Possibly enough to pay the dues to relegated plants ?

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Source: Authors' analysis

What do we lose out when we chase efficiency ?

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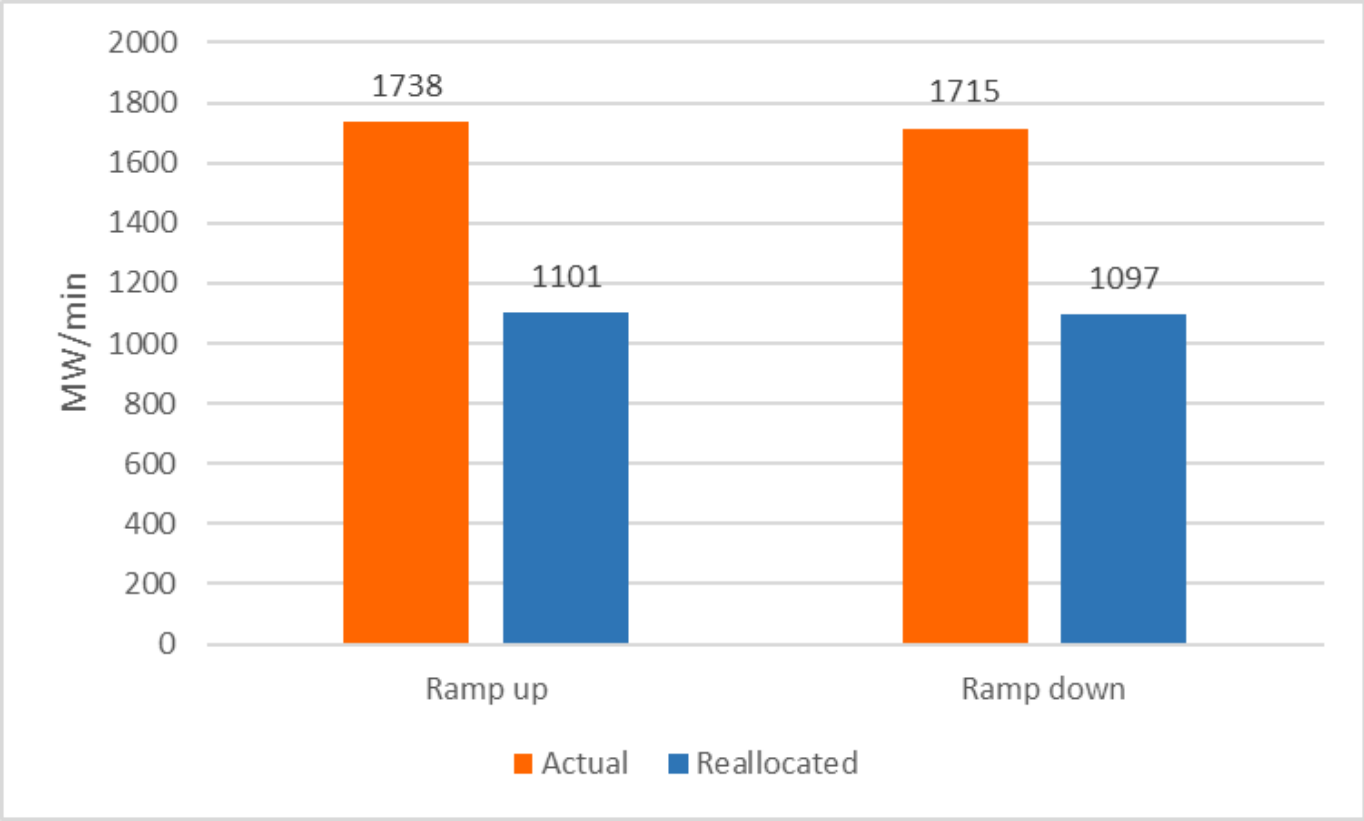
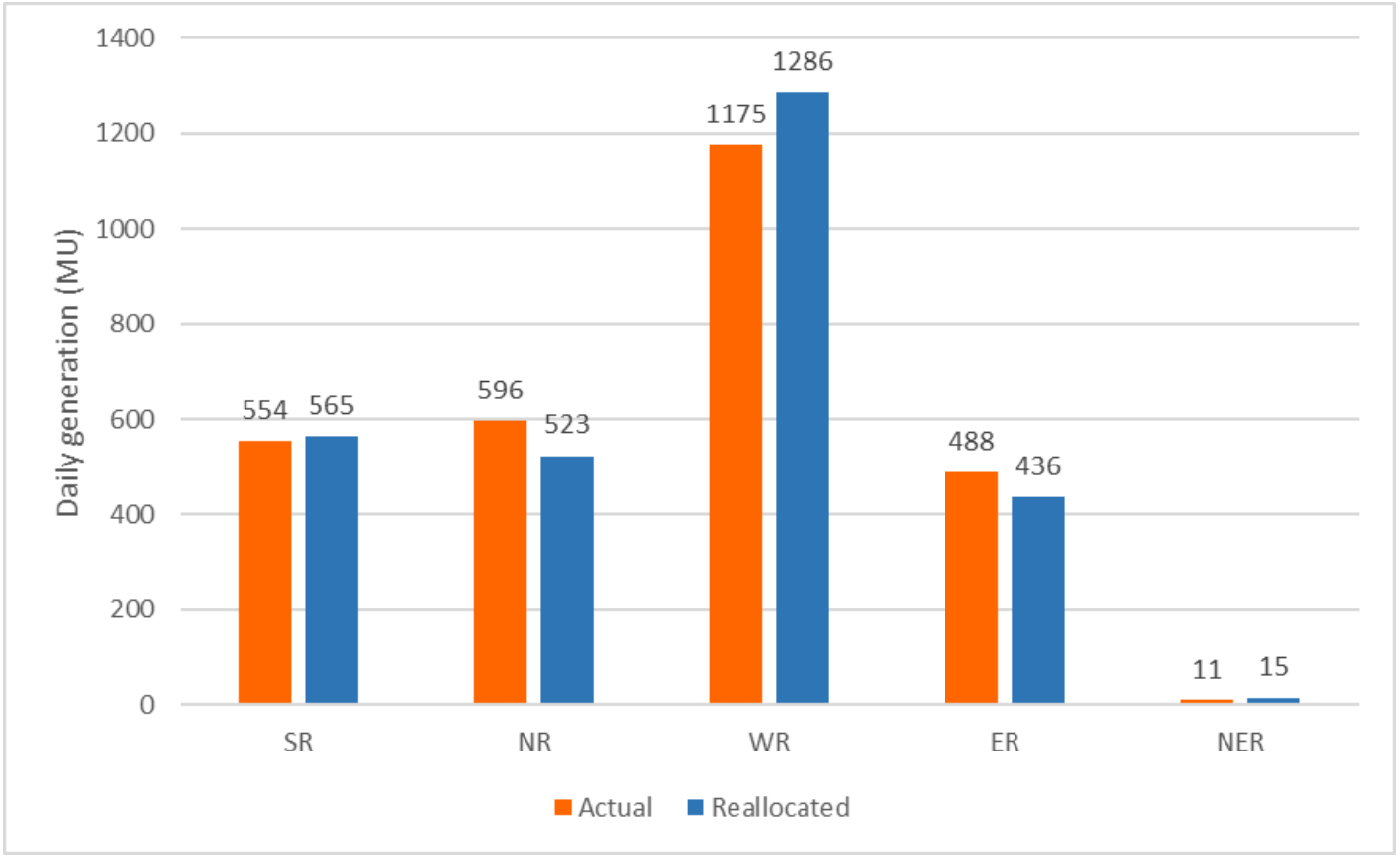
The system becomes less flexible without some of the older assets



Source: POSOCO

Regional balance in generation changes, but not much



Source: Authors' analysis

States affected by generation reallocation

State	% diff
West Bengal	-53%
Jharkhand	-42%
Delhi	-27%
Rajasthan	-27%
Bihar	-11%
Tamil Nadu	9%
Chhattisgarh	9%
Punjab	12%
Haryana	14%
Karnataka	41%

Source: Authors' analysis

Retrofitting for pollution control or not ?

- Is there an economic case for installing PCTs in older plants?
  - In theory : Remaining 'economic' life of the plant is less and installing PCTs would significantly increase tariff (even if passed through)
  - In practice: 39 GW capacity , older than 25 years, was generating in 2019
- If life extension is the norm, retrofitting must be mandated but much ambiguity remains
- Retrofitting the plants that are relegated under the reallocated scenario and aged above 25 years would require a capex of ***INR 10,871 crore****
- If these plants are not retrofitted, the capex shall be spent in scale of **INR 0.09/kWh** of electricity purchased between FY 21 to FY 27

PCT – Pollution control technologies

* Source: Garg et al., 2019

Takeaways

- There is an economic opportunity to **accelerate** the phase out of ‘inefficient’ plants
- Making the system leaner, results in significant gains
  - Lower Coal use and lower variable costs
- We will be left with enough surplus to pay for assets that had to be forced out
  - Between 55% and 60% of our 2027 needs can be satisfied just with the plants we keep
- Pollution retrofits must take priority and for this reason we must take a strategic call on what to keep and what to drop

Thank you

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