

# DISCUSSION OF GREEN DEVELOPMENT

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# RESEARCH QUESTION

**Starting point:** RES are less geographically concentrated than fossil fuels  
AND more costly to trade

→ How does this change the geographic nature of competitive advantage?

# KEY MODELING CHOICES

- **Static** decision problems by households and firms:
  - Households choose consumption of goods and energy, location
  - Firms choose land, energy, production labor and innovation labor
- RES endowments need to be converted into energy production & fossil fuel depletion
- Elasticity of substitution between energy types is constant and common across locations, CES weights location-specific
- Sector-specific productivity evolves over time with climate, local innovation, and nearby past innovation

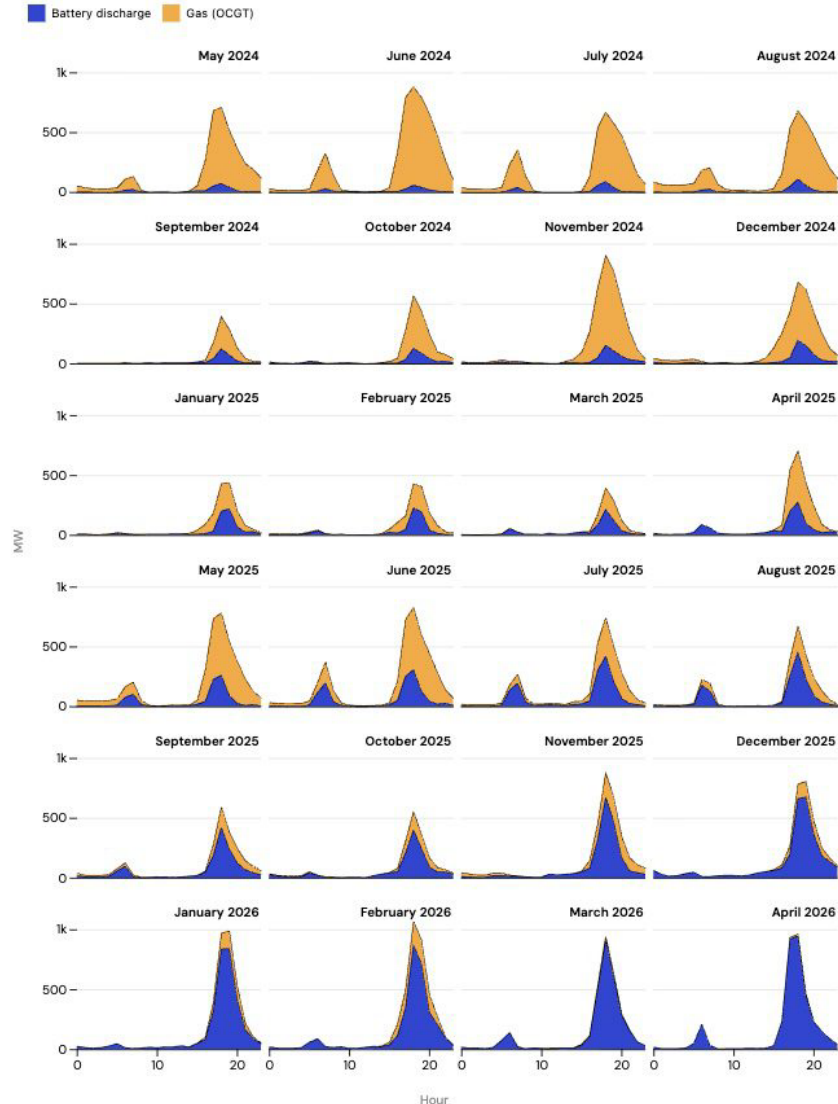
# WHY DOES SPACE MATTER IN THE MODEL?

1. Energy endowments: fossil fuel and RES
2. Energy type-specific trade costs
3. (Energy type-specific) local productivity growth depends on local employment density and local innovation spending
4. Migration
5. Climate damages are location-specific

# THE CASE OF AUSTRALIA: THE BATTERY REVOLUTION

## Batteries are eating into Queensland's gas peaking role

Queensland battery and OCGT dispatch by time of day: monthly average daily profiles, MW.



Source: Open Electricity

Batteries replaced gas to serve the peak – in less than 2 years

Driven by the economics, not policy:

- Subsidy cuts for solar
- Expansion of coal for export

Sources: <https://reneweconomy.com.au/big-batteries-took-a-bite-out-of-gas-generators-evening-peak-party-then-they-ate-the-whole-dinner/> and <https://www.theguardian.com/environment/ng-interactive/2026/may/31/cheaper-energy-bills-battery-revolution-climate-crisis>

# WHY IS THE MODEL MISSING AUSTRALIA'S GREEN MOMENT?

## Parameter choices:

IEA has historically overestimated growth in fossil fuels and underestimated growth in RES

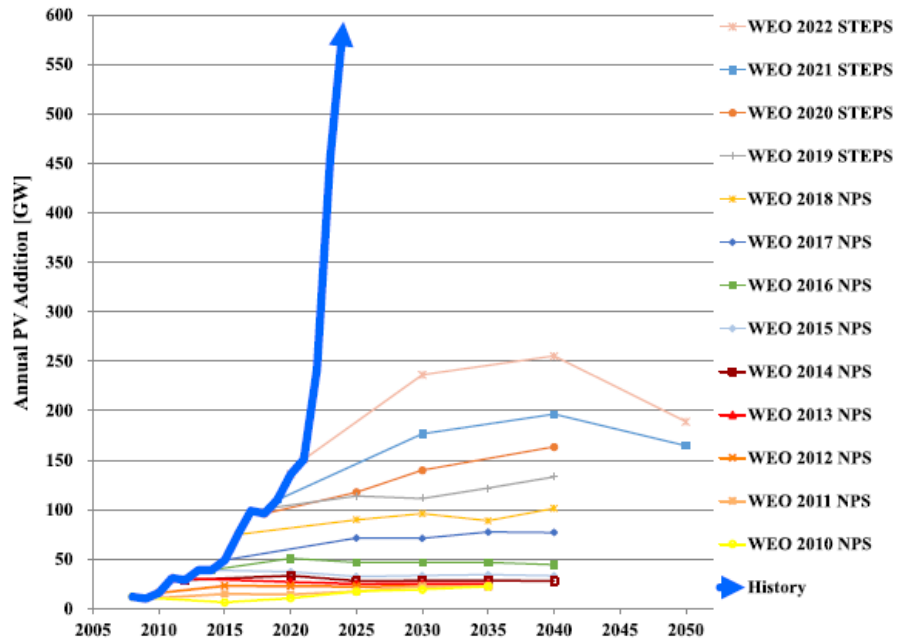
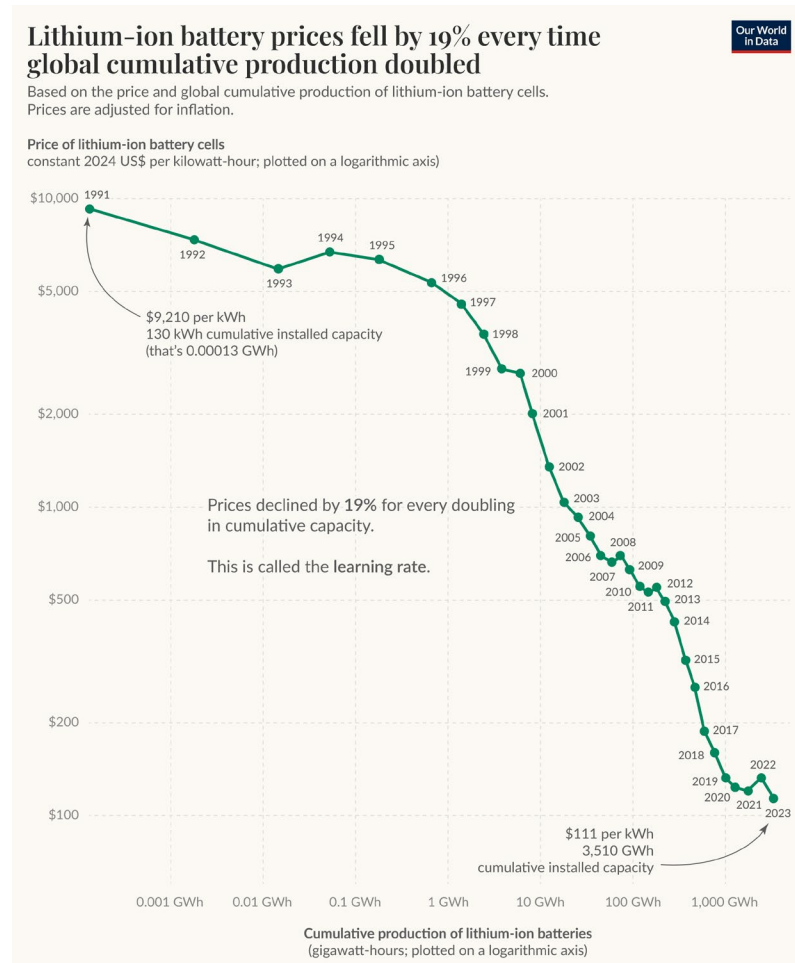


Fig. 29. Annual solar PV additions by WEO outlook scenarios compared to historical developments. 2022 historical data taken from Ref. [41]. A more detailed view is available in the Supplementary Material.

Source: Lopez et (2025)

## Economics of electrification and batteries:

Global (not local) innovation spillovers, radical innovation (makes fossil obsolete)



# OTHER CONSIDERATIONS

- Could technological leapfrogging reverse the conclusion for sub-Saharan Africa?
- Energy as a CES consumption good in households' utility function vs. derived demand
  - Forces them to be imperfect substitutes + no role for energy efficiency
- With batteries, RES endowment may even be less geographically concentrated → no longer the main geographical differentiator for competitive advantage ?
- More philosophical for framing: resource endowment  $\nRightarrow$  growth / development because of resource ownership.
  - Also applies to critical minerals (green colonialism)
- Is climate a distraction ?