

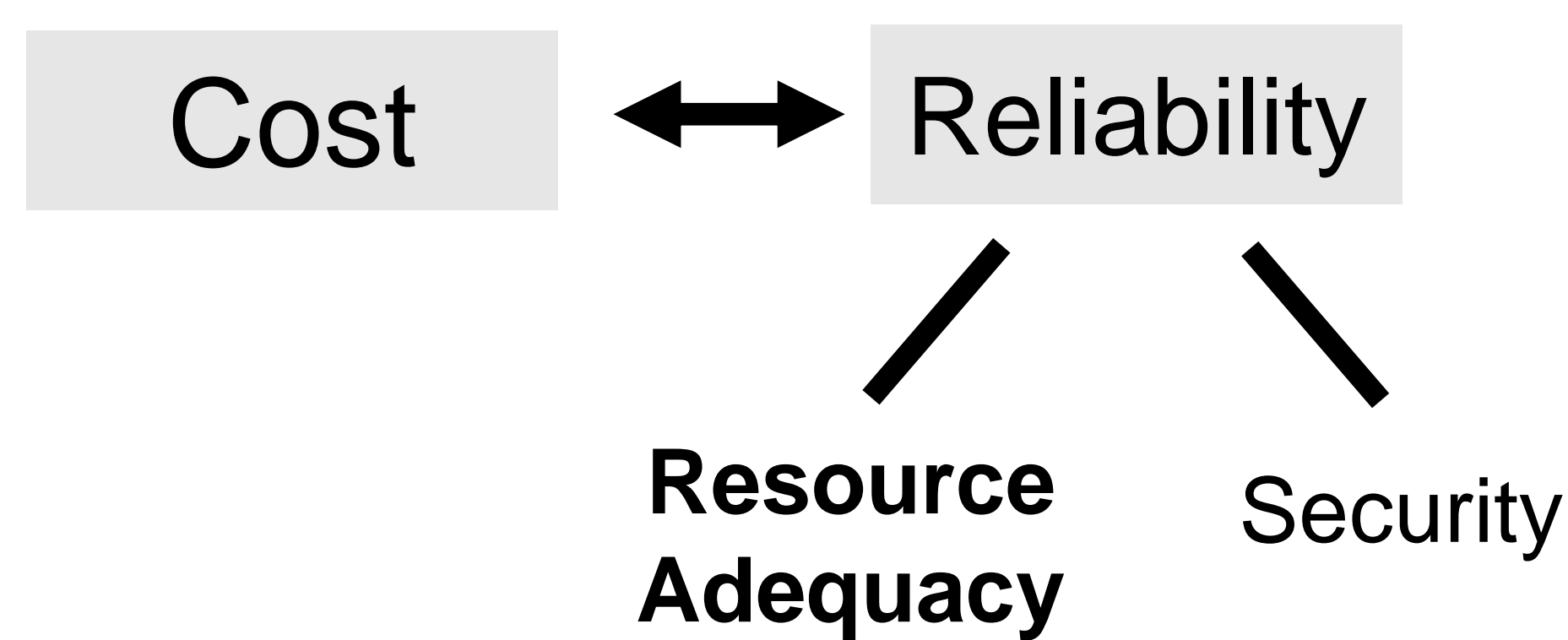


THE UNIVERSITY OF
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Resource Adequacy in Low-Carbon Energy Systems

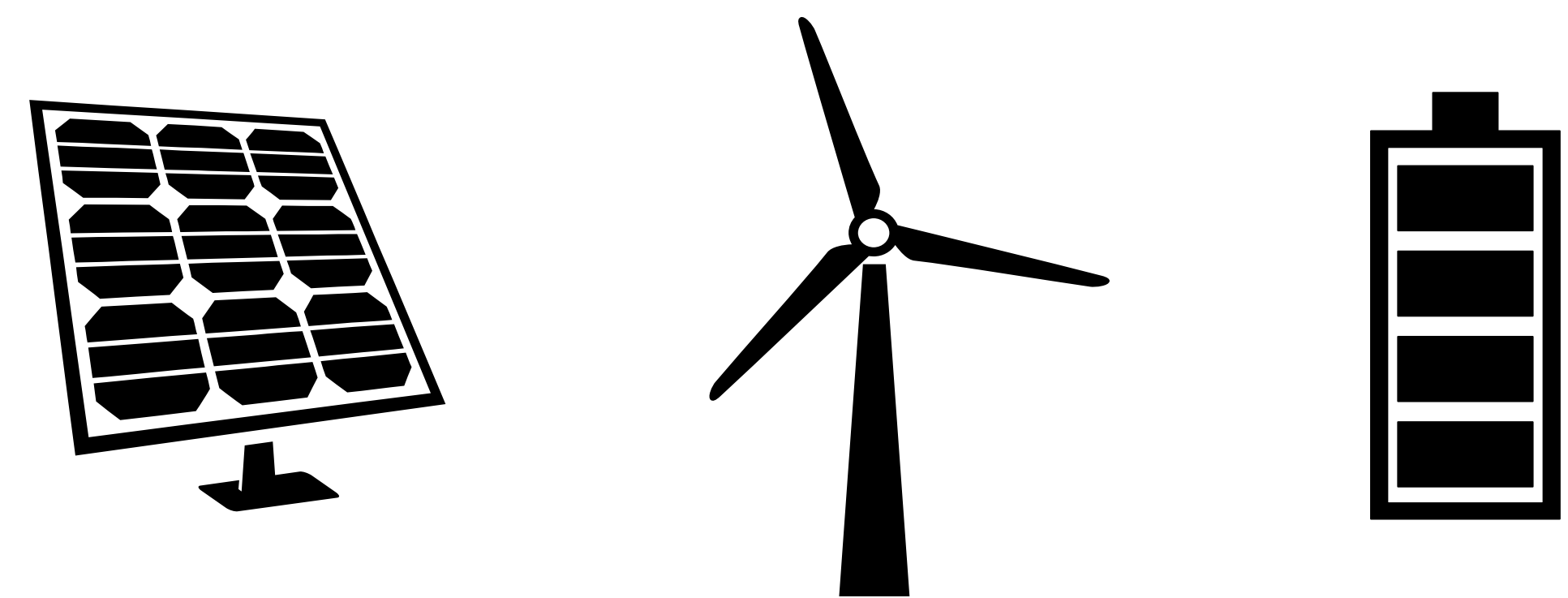
Resource Adequacy (RA)

Planning generation and transmission to meet reliability standards of the future energy system.



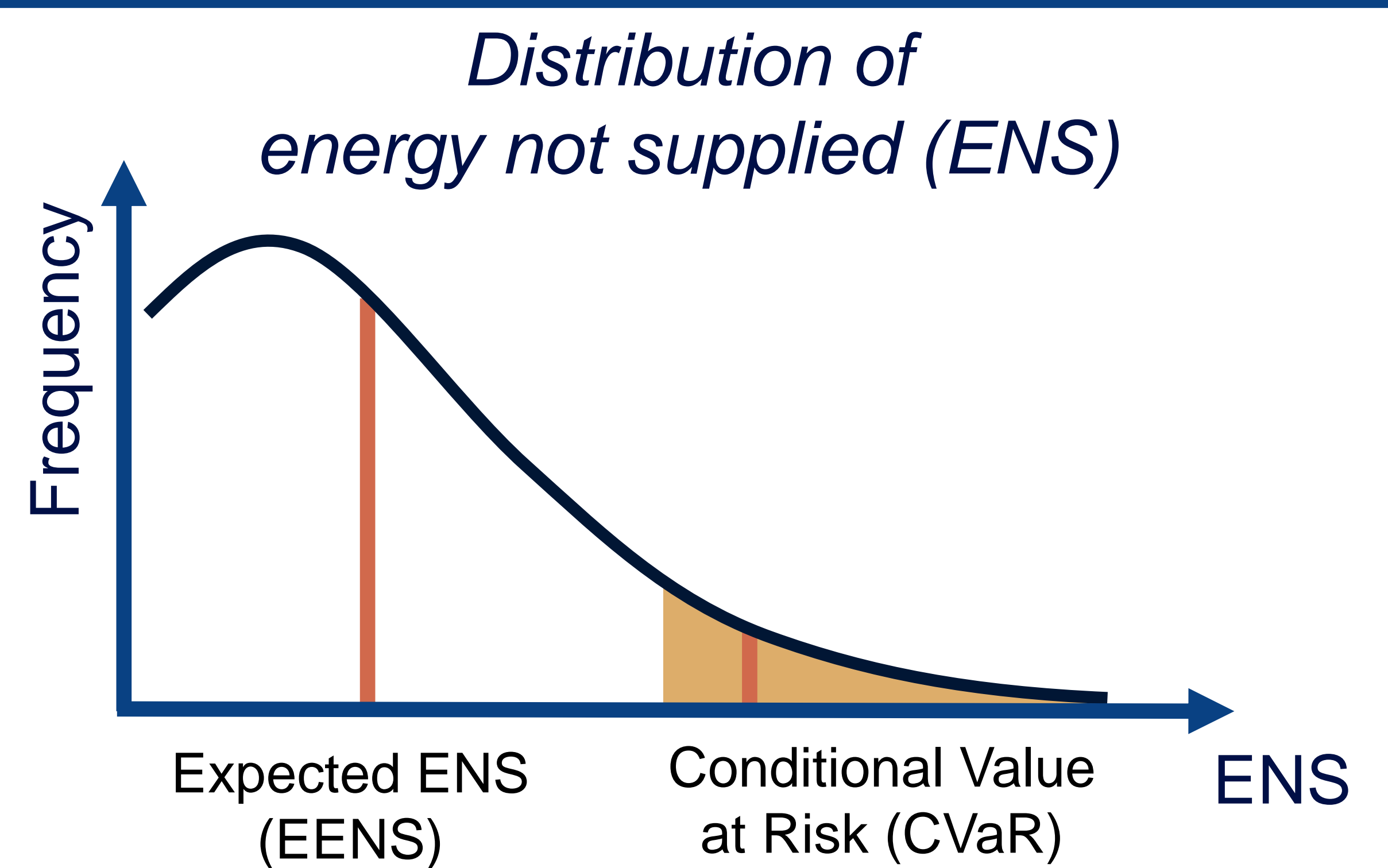
Research Question

How to *optimally* ensure resource adequacy considering the changing generation mix?



Approaches in the Literature

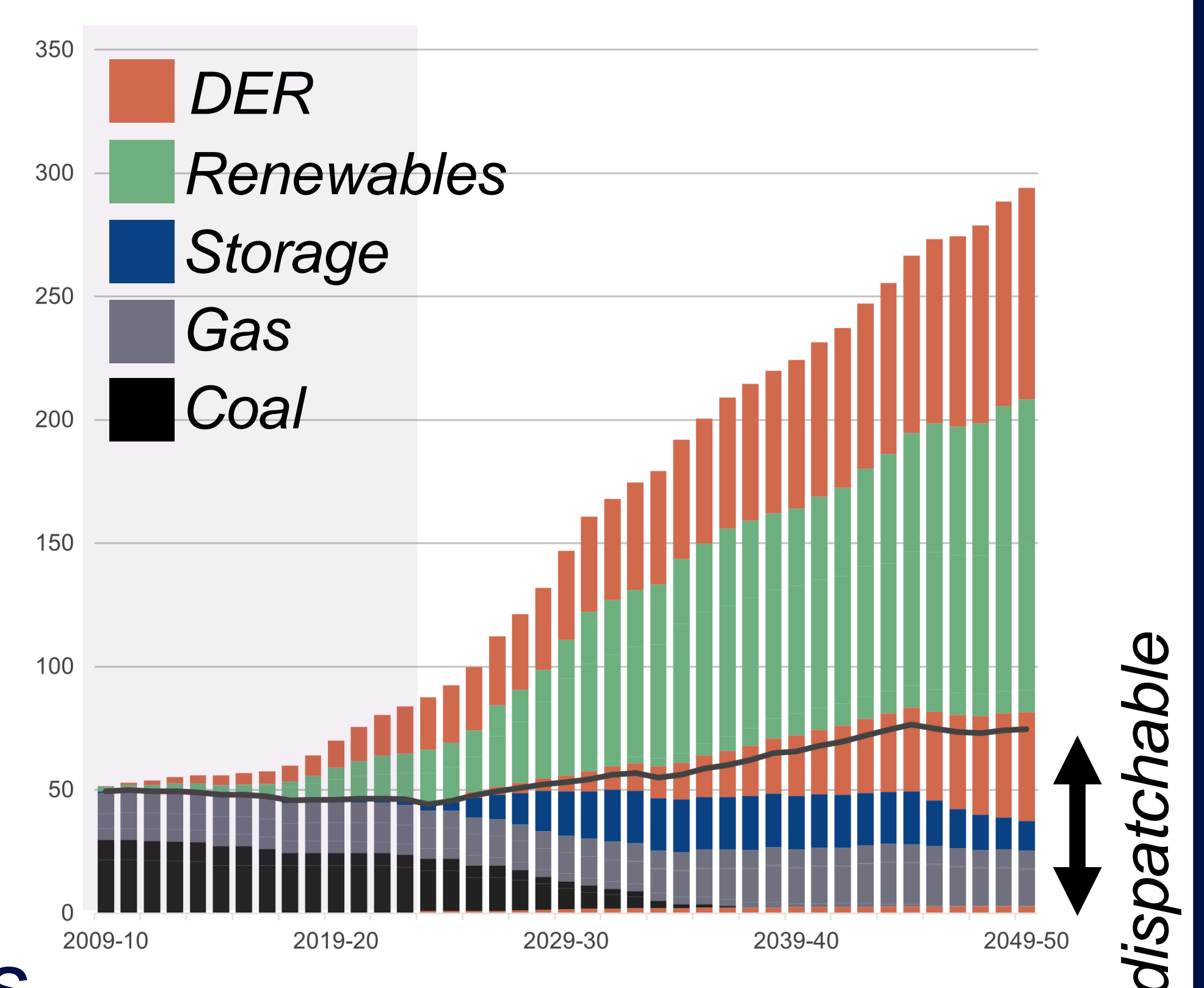
- Consider the changing risk profile [1]
- Evaluate contribution to reliability: *Capacity credits* [2]
- Use updated metrics for RA planning: *EENS* and *CVaR* [3]
- Diverse weather assessments are important [1, 4]



Australian Context

- **National Electricity Market (NEM):**
88 GW capacity / 33.3 GW peak demand [5]
- Reliability standard based on normalised energy not supplied (EENS < 0.002%)
- Coal retires in 2037
- High uptake of **renewables**, super high increase of **distributed energy resources (DER)**, along with strong growth in **storage**
- Energy-only market with capacity investment schemes

Projected capacity until 2050 [6]



[1] ESIG: *Redefining Resource Adequacy for Modern Power Systems*, 2021, <https://www.esig.energy/resource-adequacy-for-modern-power-systems/>

[2] Zhou et al.: *Framework for capacity credit assessment of electrical energy storage and demand response*, 2016, <https://doi.org/10.1049/iet-gtd.2015.0458>

[3] ESIG: *New Resource Adequacy Criteria for the Energy Transition: Modernizing Reliability Requirements*, 2024, <https://www.esig.energy/new-resource-adequacy-criteria>

[4] Levin et al.: *Planning and Operations in Electricity Markets Under System Transformation: Key Findings: U.S. Department of Energy (DOE), Grid Modernization Laboratory Consortium (GMLC)*. <https://doi.org/10.2172/2439139>

[5] AEMO: *NEM Fact Sheet*, 2024, <https://aemo.com.au/-/media/Files/Electricity/NEM/National-Electricity-Market-Fact-Sheet.pdf>

[6] AEMO: *Integrated System Plan (ISP)*, 2024, <https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2024-integrated-system-plan-isp>