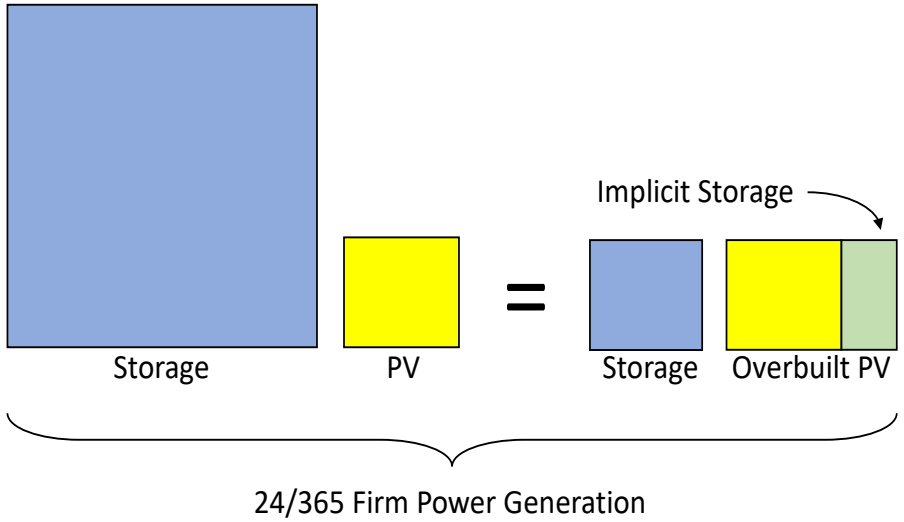
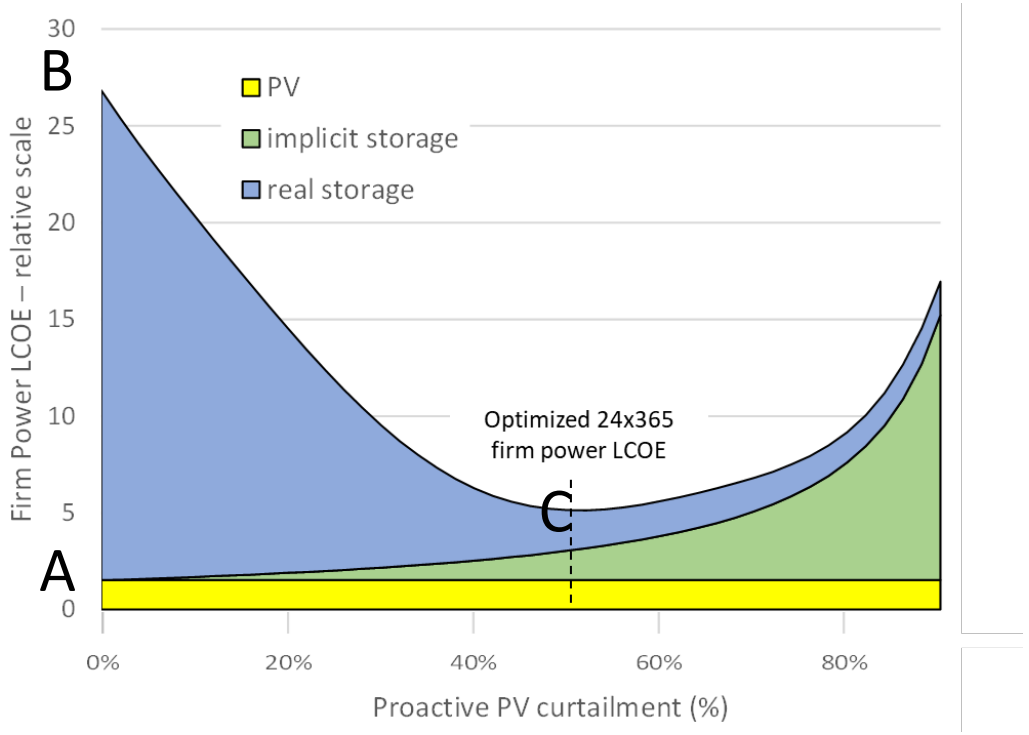
Firm Power Generation: Approach

- Assumption: VREs are relatively inexpensive compared to storage
- Optimisation of LCOE based on installation costs
- Objective: How to achieve cost optimally 100% Renewables





(A) LCOE of uncurtailed PV

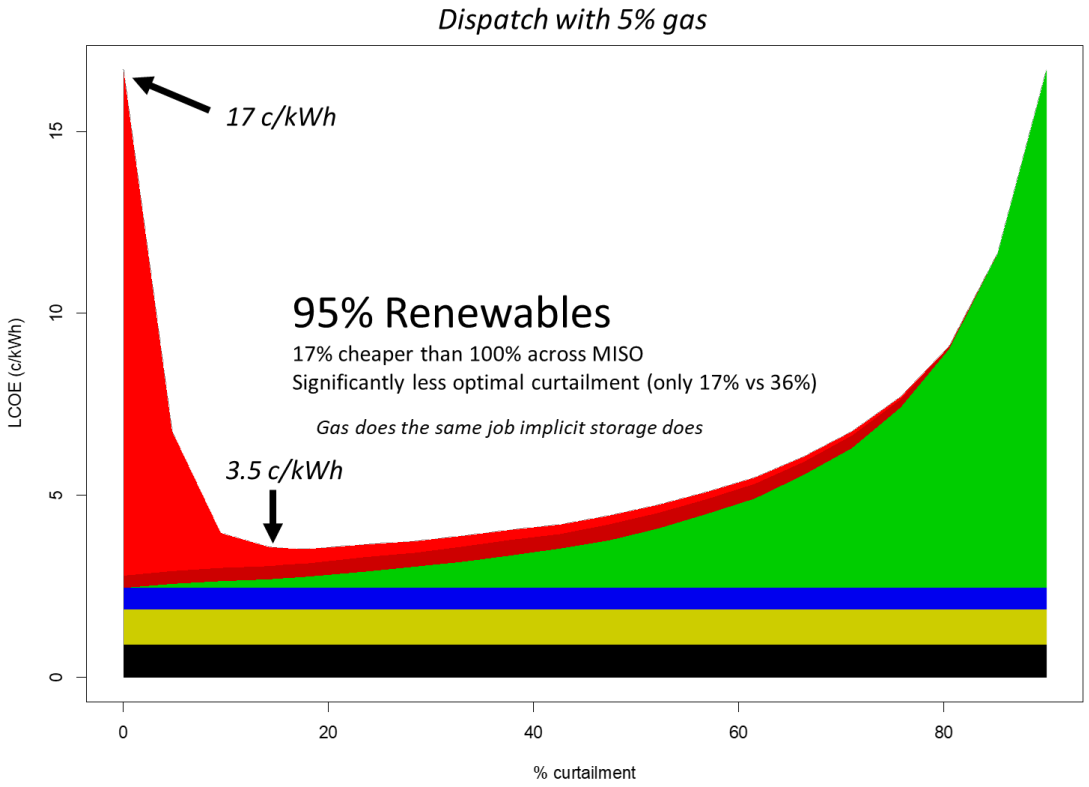
(B) LCOE without any curtailment (all is stored)

(C) Sweet spot

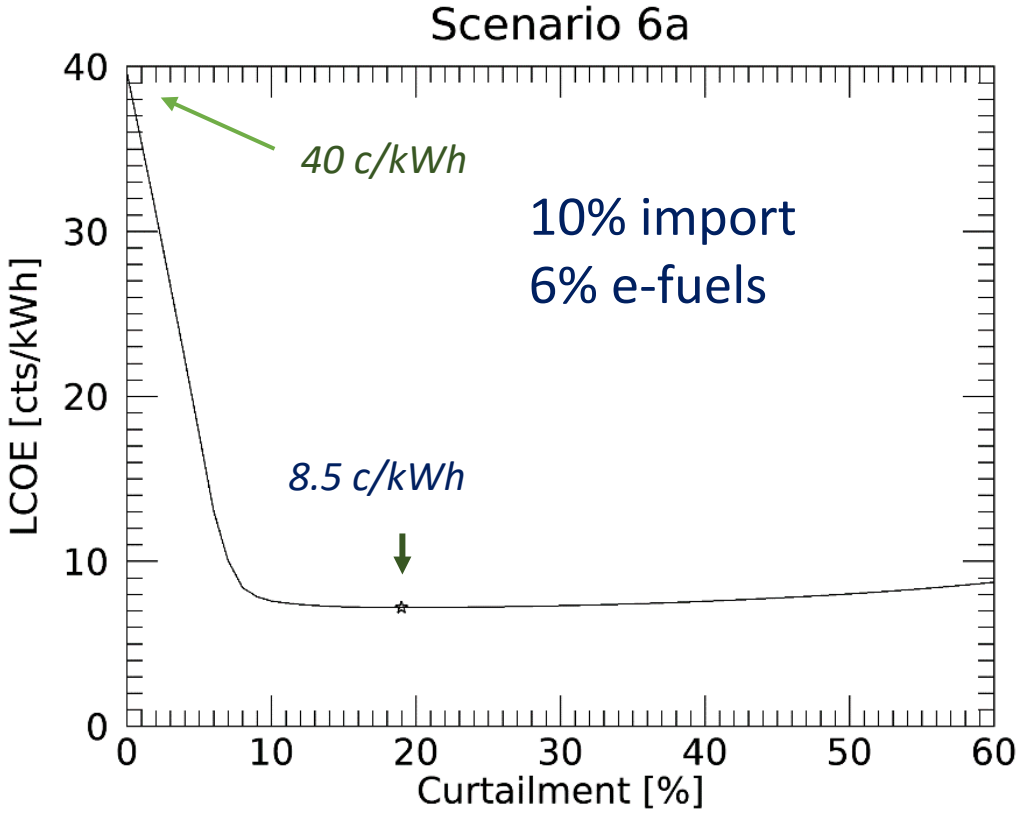
PVPS

Firm Power Generation: Results

US Midcontinent (MISO) System



Switzerland



Curtailment & Overbuilding lowers average LCOE significantly.

Description of “High VRE penetration” (firm power) studies: Switzerland, USA, Europe, Italy and “Entry-level studies” (firm predictions): USA and Italy.

Editors: Richard Perez, SUNY, USA and Jan Remund, Meteotest, CHE

PVPS

Firm Power Generation: Key Takeaways

- 100% VRE power grids with full renewable resource adequacy guaranteeing 24x365 firm availability are not only possible but would also be economically sound, insofar as supply and demand are concerned.
- VRE overbuilding and operational curtailment (i.e., implicit storage) are key to achieving economically acceptable firm power solutions.
- It is essential that optimal implicit storage configurations be enabled by appropriate market rules and remuneration vehicles favoring firm power.