Using ML training computations for grid stability in 2050

Scott Evans*

Tapan Shah*

*: GE Vernova Research

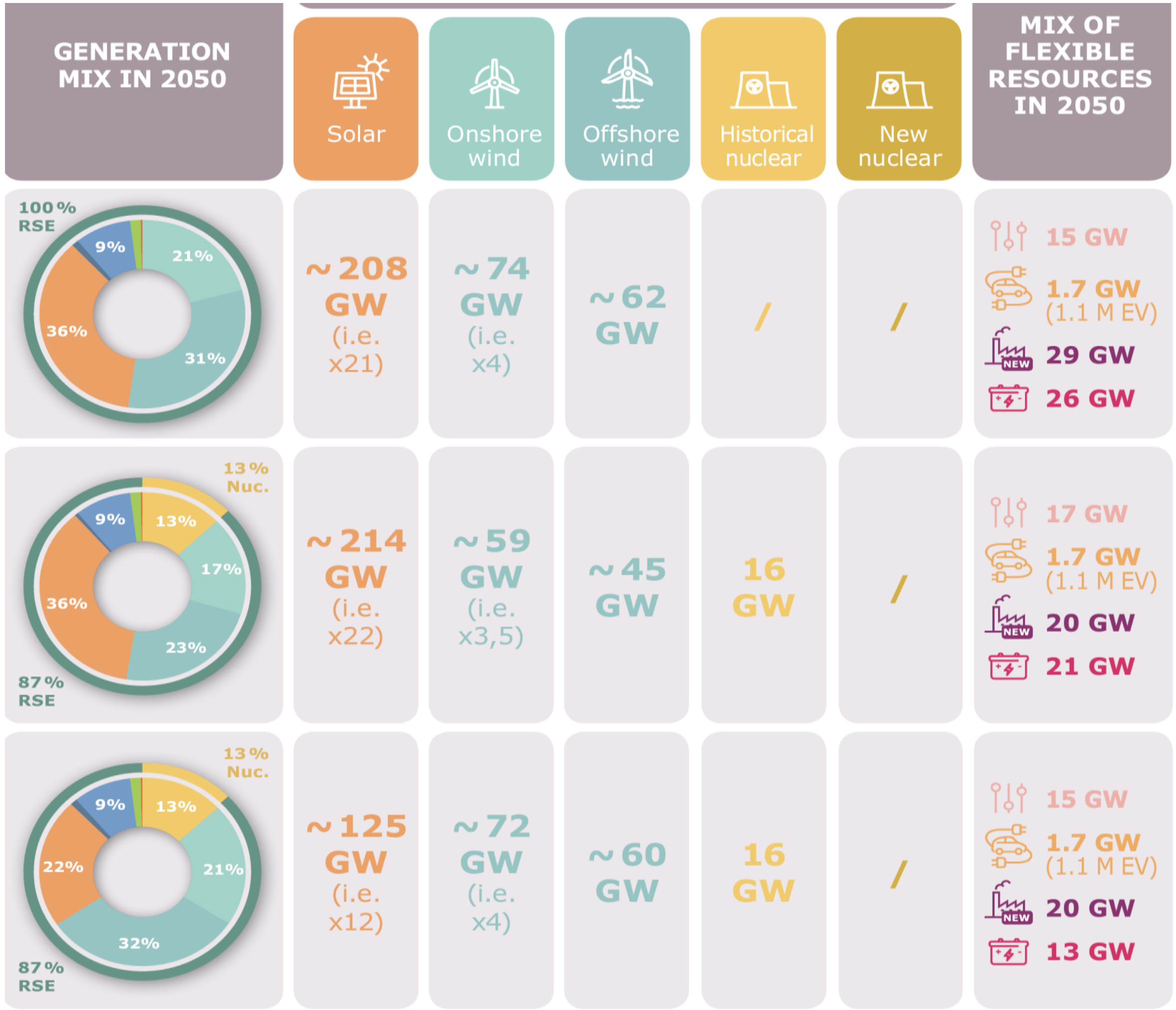
IEEE SusTech 2023

GE VERNOVA

Our portfolio of energy businesses

Motivation

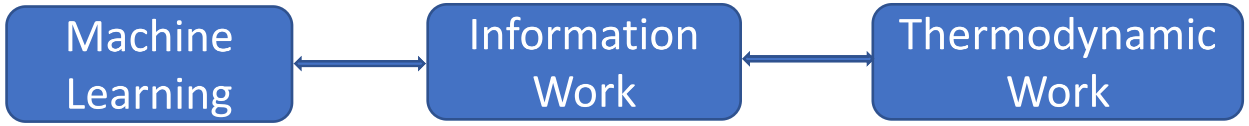
- Zero-carbon regime in 2050--> high renewable mixes
- Increase vulnerability of power grids to black outs
- Solar/Wind are prone to under/over-utilization
- Push for Controllable loads
  - Battery storage
  - Hydrogen
  - Vehicle-to-grid etc.



Some prior work in using compute-centers as controllable loads

https://rte-futursenergetiques2050.com/

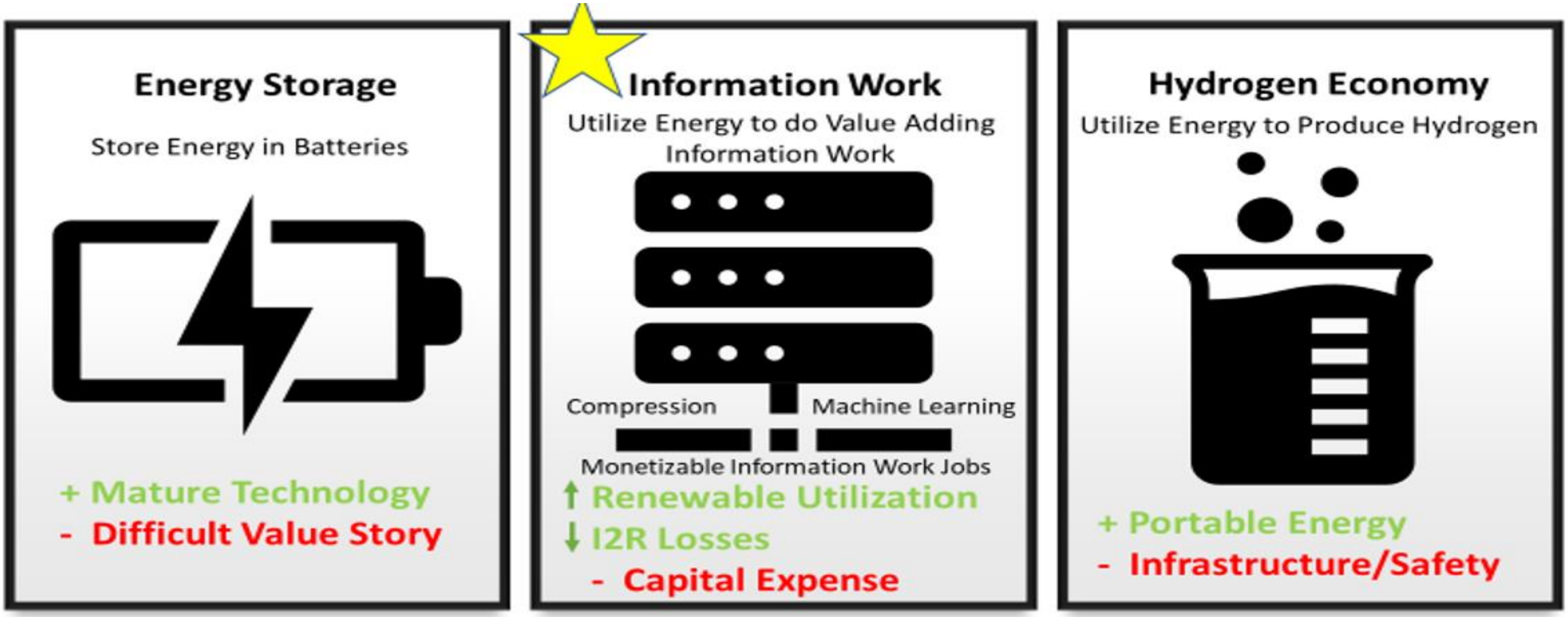
Proposed Approach



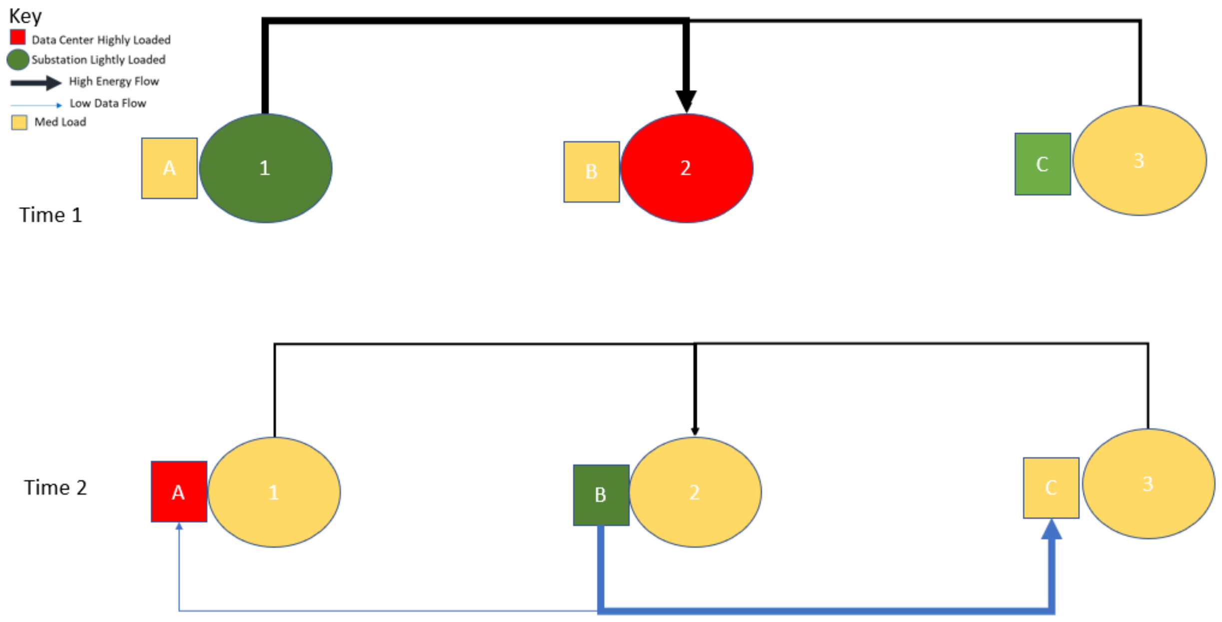
https://openai.com/research/ai-and-compute

Explore Machine Learning (information work) as a controllable loads against battery storage and hydrogen conversion

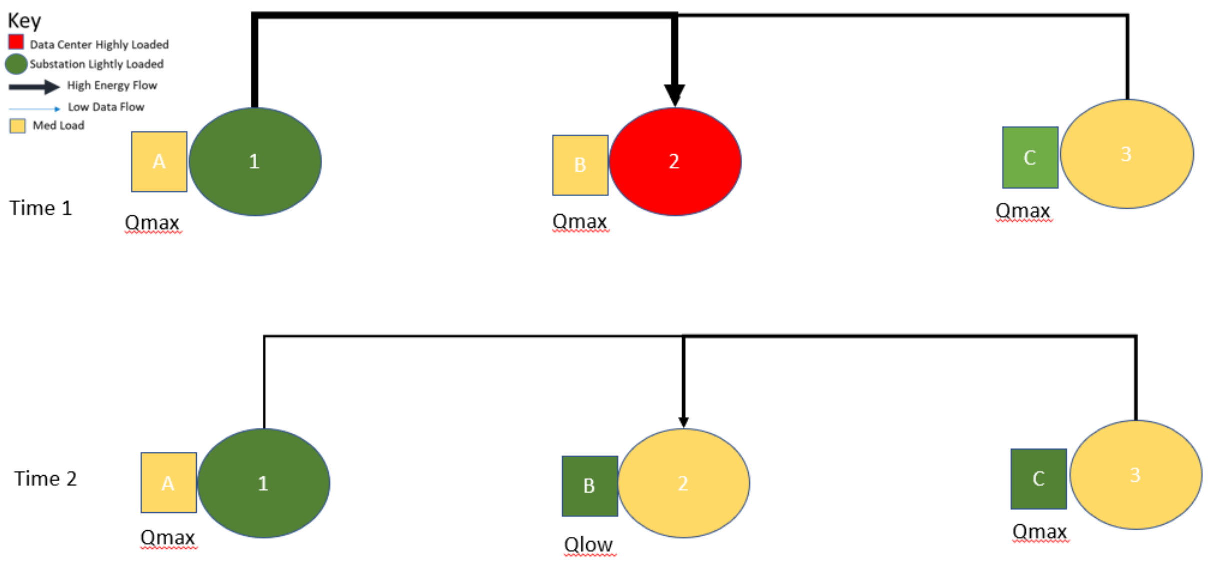
Comparison with Battery and Hydrogen



Scenario Evaluation



Scneario 1: Grid stabilization by moving jobs



Scenario 2: Grid stabilization by modulating quality

Conclusion and next steps

- Preliminary research at concept stage
  - Transferring bits more efficient than transferring electricity to achieve grid stability.
  - Machine Learning as computational load has multiple tunable knobs eg. number of epochs, desired accuracy, training locations etc.
  - Batteries suffer from charge leakage, ML models once built can be used repetitively until re-train required.
- Layout theoretical analysis to compute and compare energy efficiency and stability
- Work with grid operator to modulate suitable ML loads to stabilize grid.