Using ML training computations for grid stability in 2050

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Our portfolio of energy businesses

Motivation

GENERATION

MIX IN 2050

100%

RSE

87 % RSE

87 % RSE 뗼

~208

GW

(i.e.

x21)

~214

GW (i.e.

x22)

~125

GW

(i.e.

x12)

Nuc.

 ~ 74

GW

x4)

~59

GW

x3,5)

~72

GW

x4)

~62

GW

~45

GW

~60

GW

16

16

- 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

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MIX OF

FLEXIBLE

RESOURCES

IN 2050

ໃໄງ **15 GW**

🖳 29 GW

7 26 GW

រ៉ៃ **17 GW**

14 20 GW

🔁 21 GW

ໃໄ**ງິ 15 GW**

🐨 13 GW

Luy.

1.7 GW

20 GW

1.7 GW

1.7 GW

Proposed Approach



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

AlphaGoZero •

Neural Architecture Search

TI7 Dota 1v1

Neural Machine Translation

DeepSpeech2

ResNets

2016

VGG

Seq2Seq

2015

Xception

2017

AlphaZero

2018

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



Comparison with Battery and Hydrogen



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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.

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