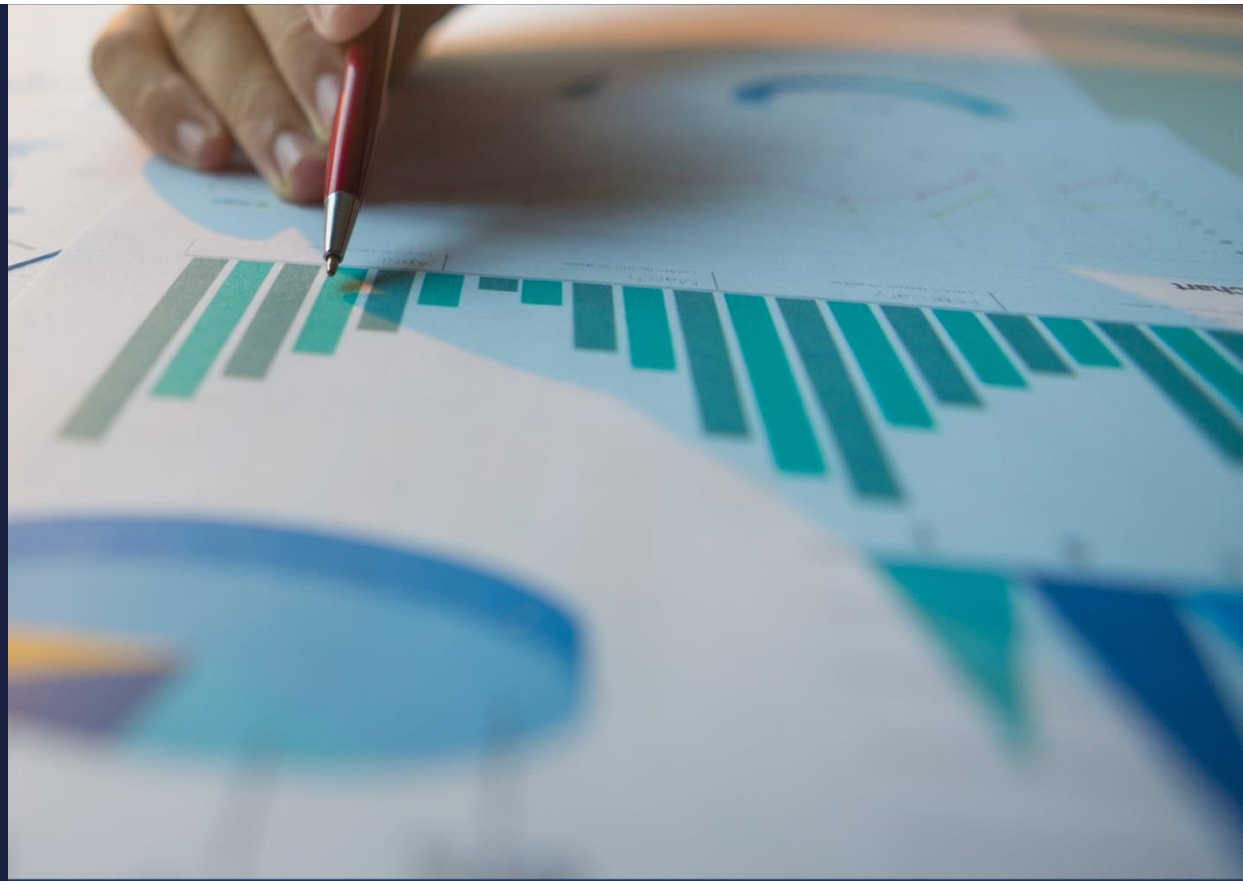
Growing Datacentres in Ireland and Possible Implications

DATE
17/05/2019

VENUE
ESRI, Dublin, Ireland

AUTHORS
Desta Fitiwi
Desta.Fitiwi@esri.ie
Muireann Lynch
John Curtis



Acknowledgments

Science Foundation Ireland sfi For what's next

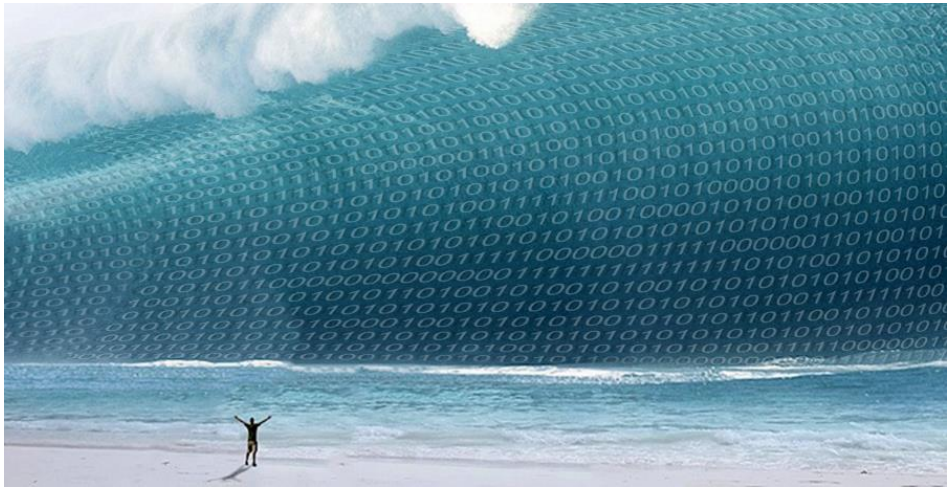
esipp Energy Systems Integration Partnership Programme

www.esipp.ie

This work has emanated from research conducted with the financial support of Science Foundation Ireland under the SFI Strategic Partnership Programme Grant Number SFI/15/SPP/E3125. The opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the Science Foundation Ireland. This work has also benefited from the valuable support of EirGrid, the Transmission System Operator in the Republic of Ireland. Hence, we would like to greatly acknowledge EirGrid's contributions in providing data and insights for this work.

Tsunami of Data

- "Always-on" digital boom.
- Data traffic doubling every 4 years (CISCO, 2018).
- A "tsunami of data" created at a pace never seen before.
  - 600 x 10^{21} bytes of data traffic by 2020 (CISCO, 2018).
  - Yet, anticipated to soon hit the Yottabyte range (10^{24}).
- Key drivers
  - Online video streaming
  - Internet-of-Things (IoTs)
  - Blockchain
  - Cloud computing
  - Artificial intelligence



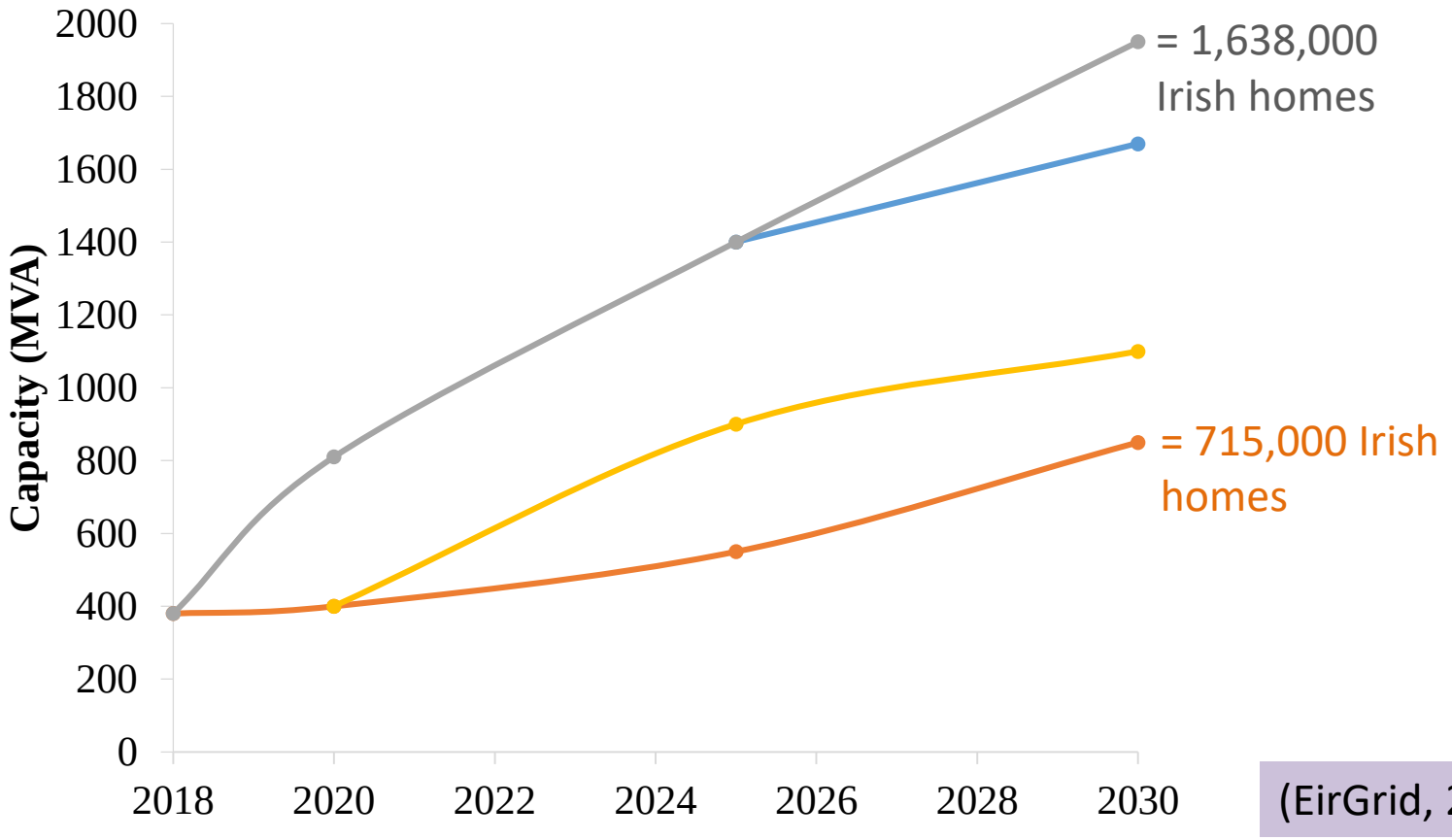
Source: https://www.forsmarthotels.com

Datacentre Investments and Hotspots

- Massive investments in datacentres required.
- Ireland one of the hotspots in the world.
  - Poised to become the datacentre capital of Europe.
  - €9 Billion investments in the coming three years (SEAI, 2017).

- Currently ~ 500 MVA of datacentre capacity in Ireland.
  - Enough to power up about 400,000 Irish homes.
- Yet, anticipated to reach 1500 MVA by 2025 (EirGrid, 2017).
- Projections for 2030 range between 350 and 1450 MVA increase (EirGrid, 2017).

Anticipated Datacentre Growth in IE

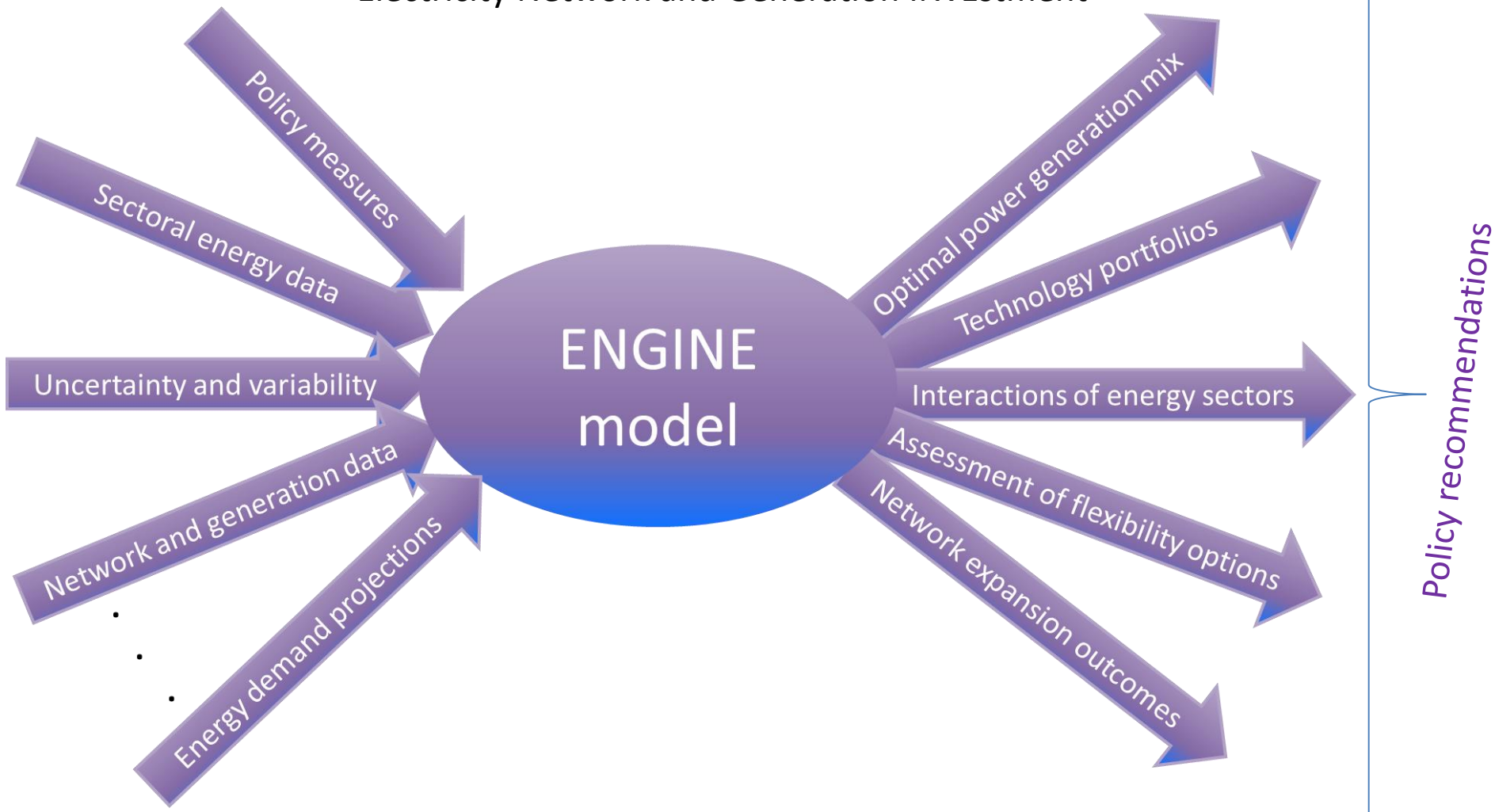


(EirGrid, 2017)

In 2016, Ireland's housing stock had 2,003,645 houses and apartments (CSO, 2016)

Modelling Approach

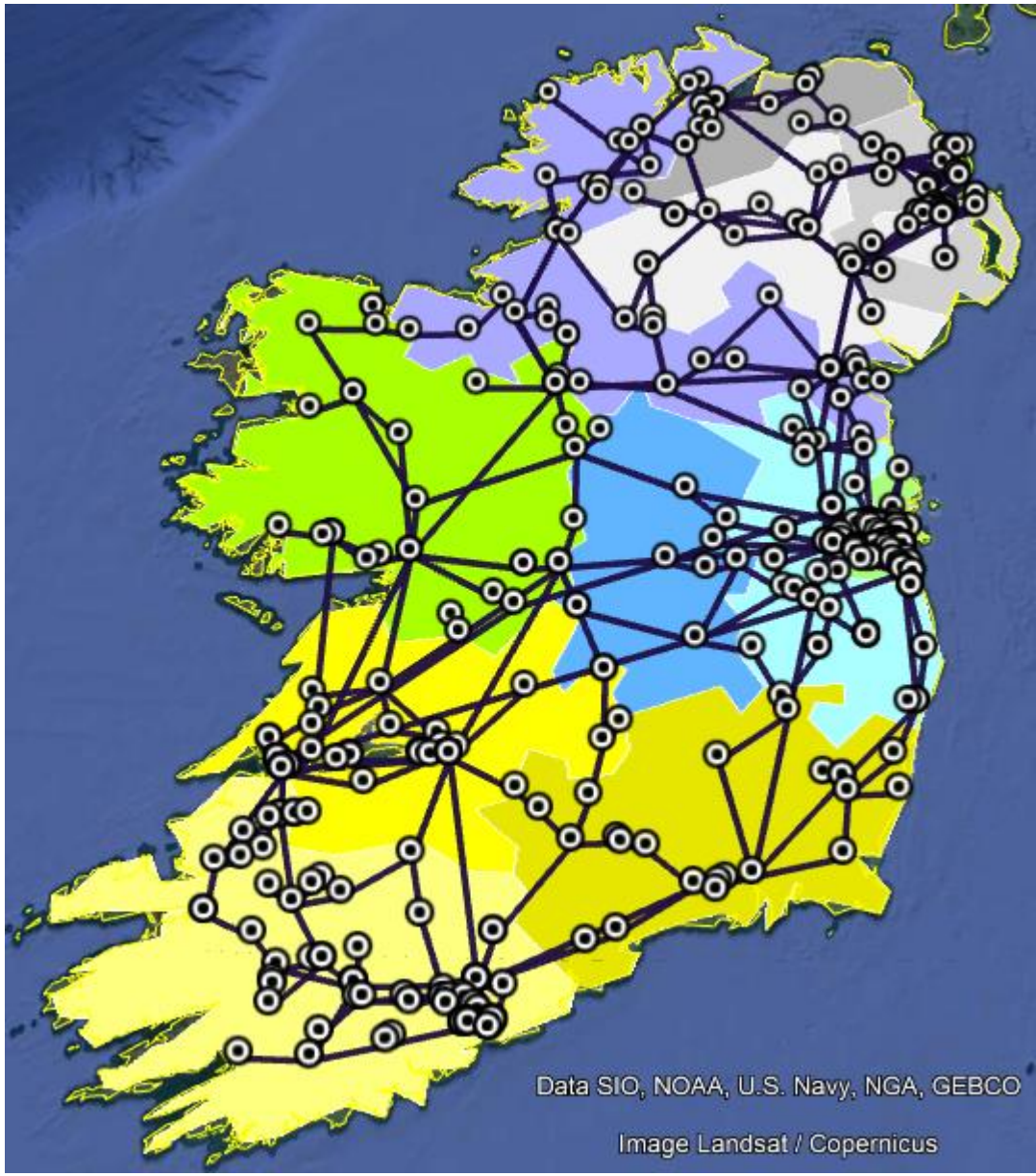
Electricity Network and Generation INvEstment



Input | Tools and Methods | Output

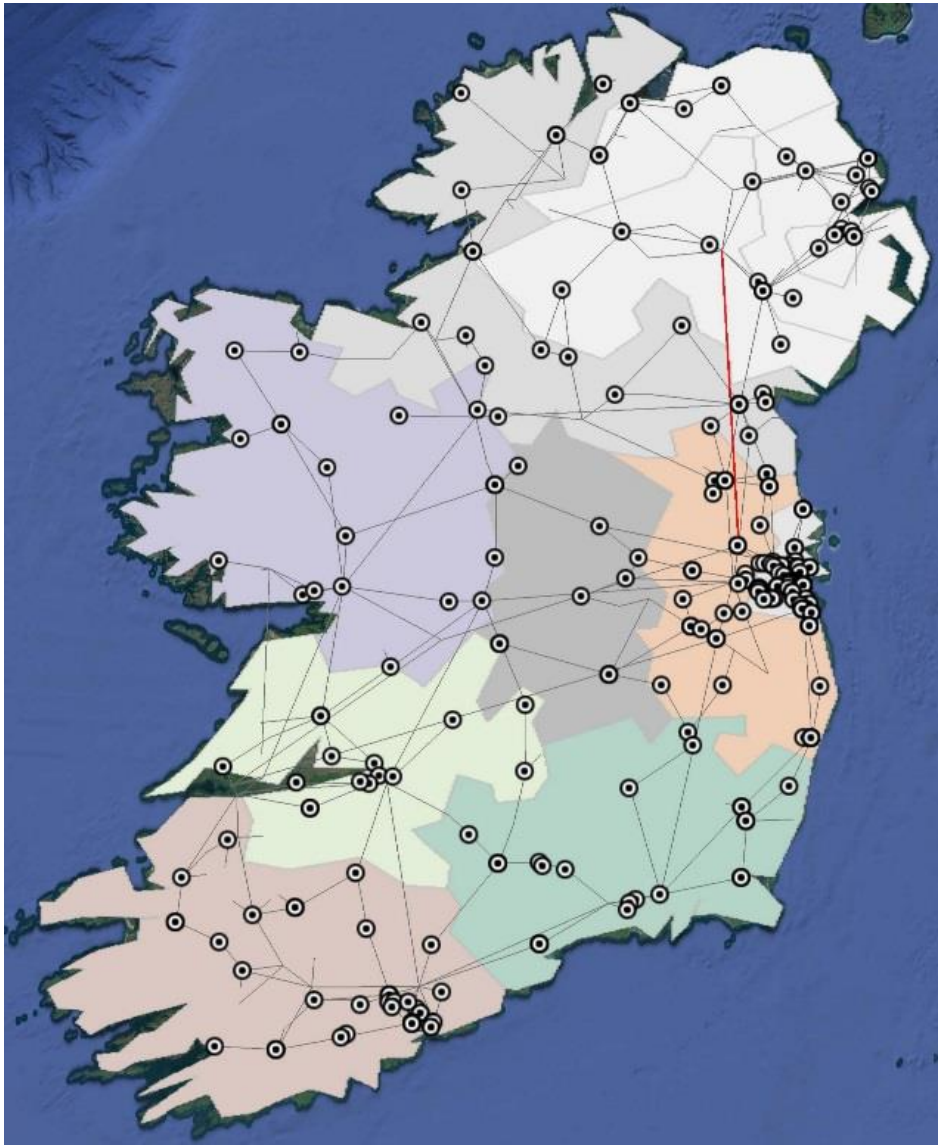
Data

- Irish transmission system data, provided by EirGrid.
- ≥ 110 kV voltage level (plus generator nodes).
- 676 transmission nodes
- 900 transmission lines and transformers,
- 174 generators, …

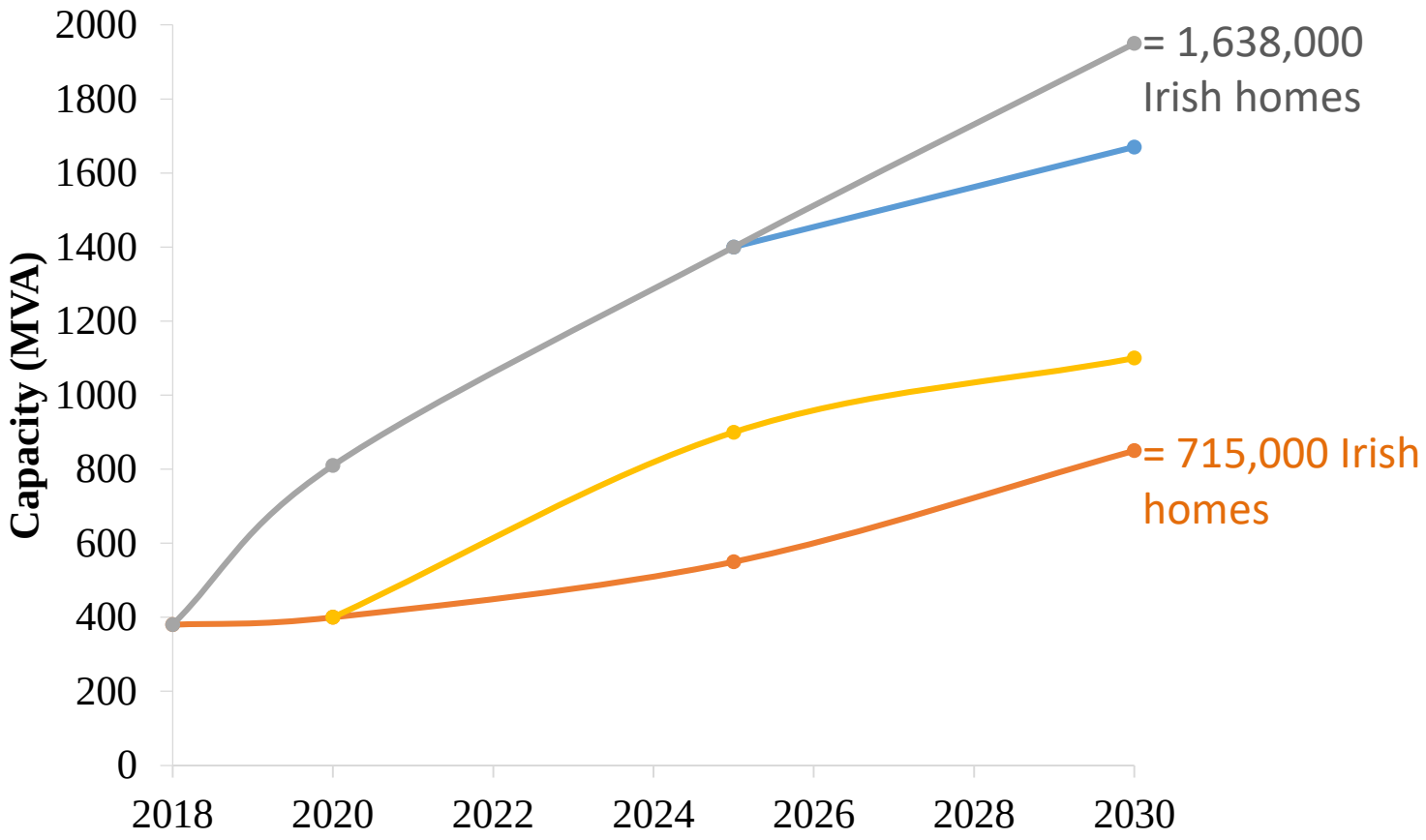


Key Assumptions (1/2)

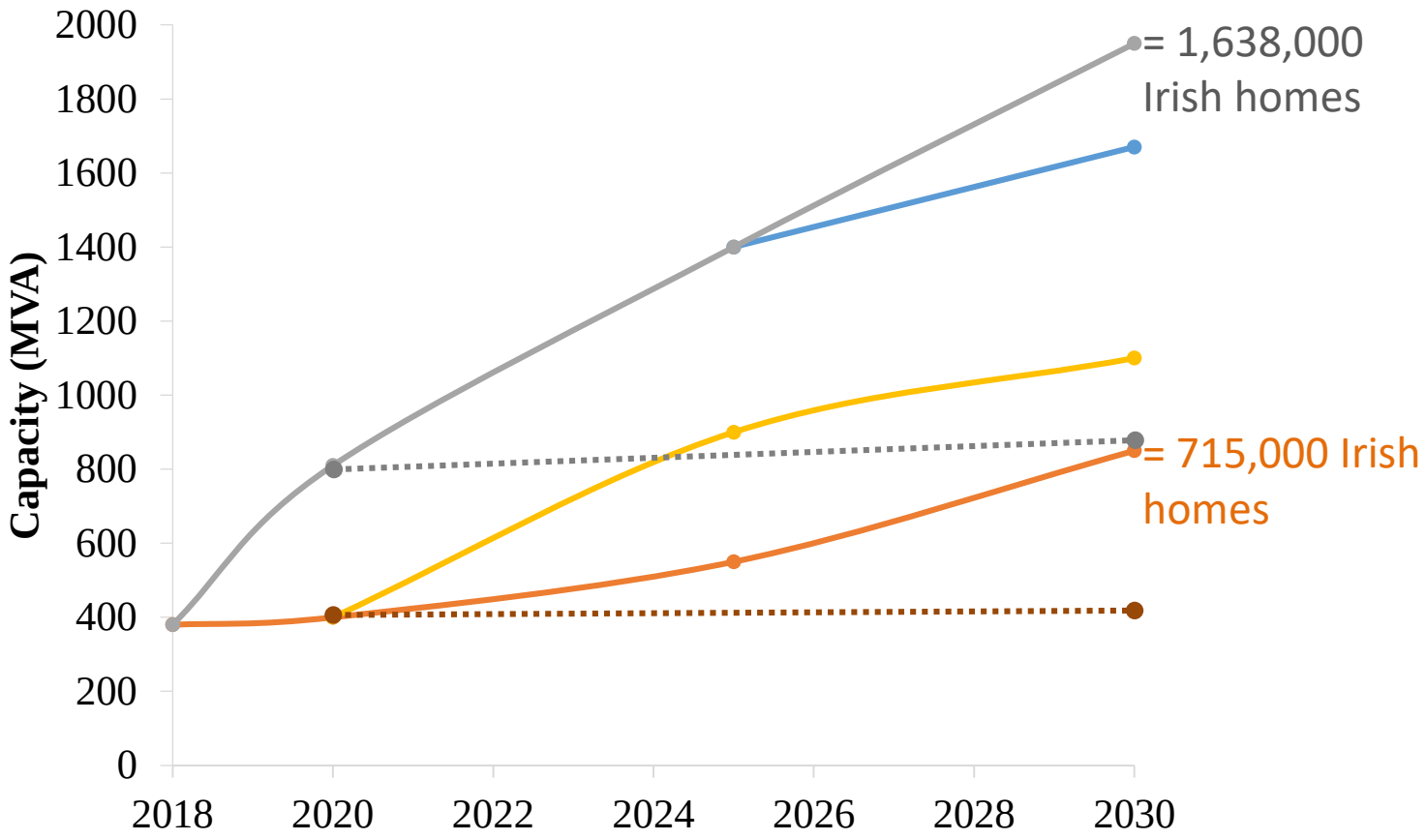
- Decentralized RES development portfolio
  - 211 possible connection nodes
- New thermal power plants in brown fields.
  - Replacing existing older power generation units with more efficient CCGTs.
  - Or, with carbon capture and storage as an option.
- 55% vRES integration target by 2030.
- System Non-Synchronous Penetration (SNSP) set to 75%.



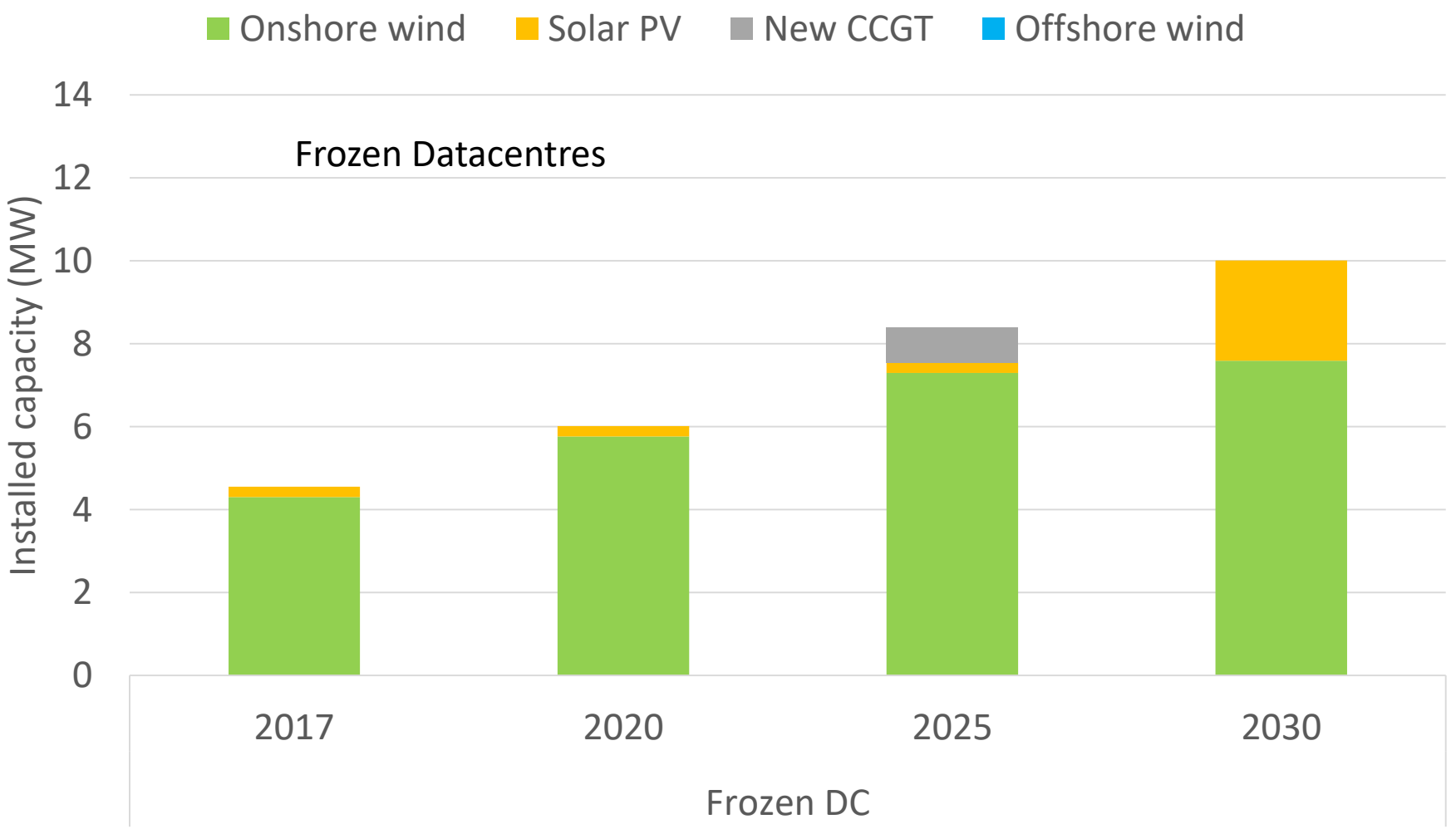
Key Assumptions (2/2)



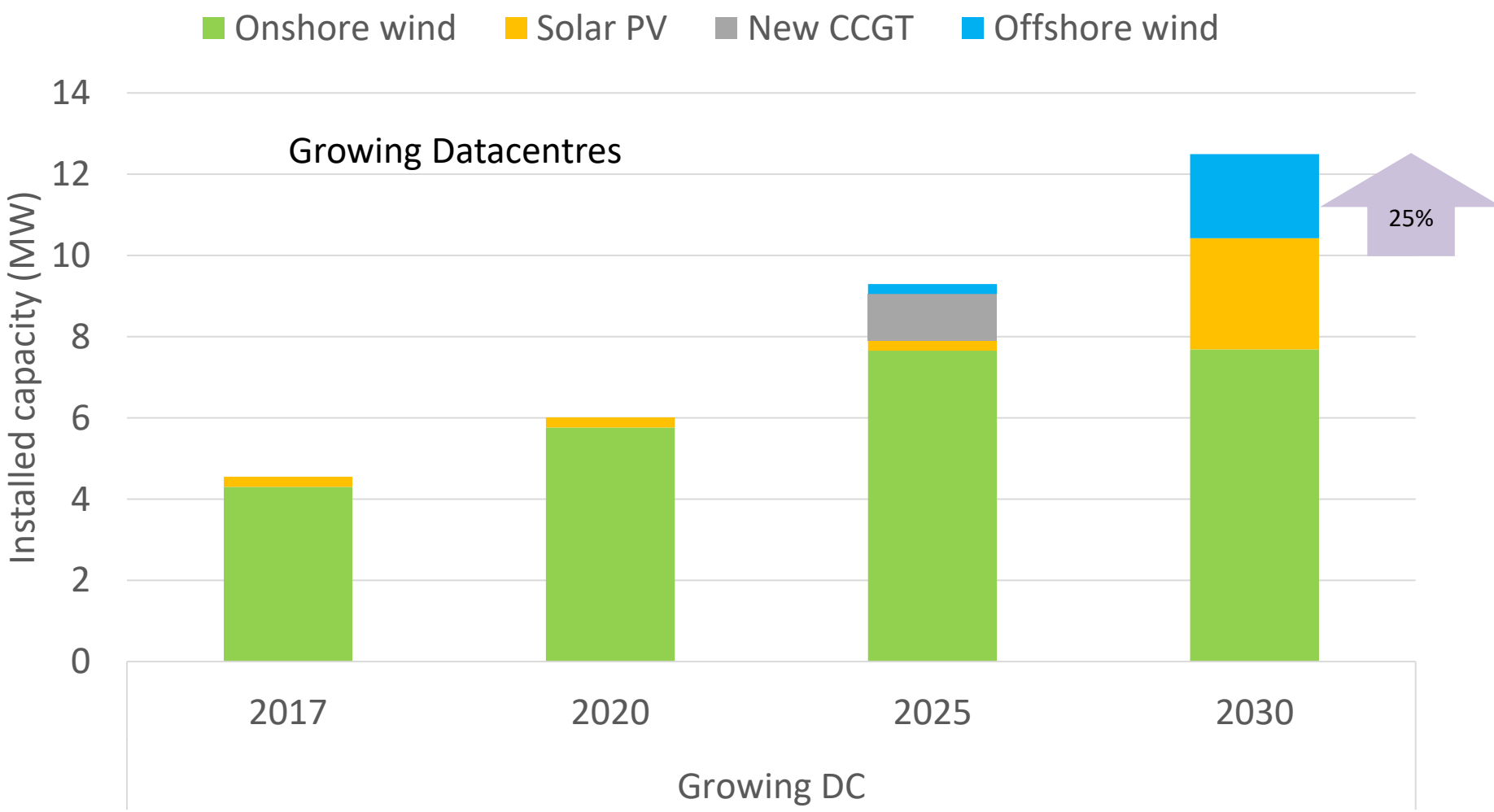
Key Assumptions (2/2)



Implications of Growing Datacentre (1/5)



Implications of Growing Datacentre (2/5)



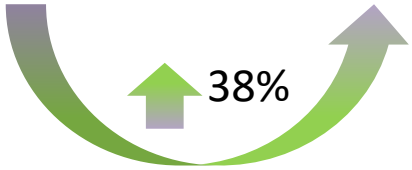
Implications of Growing Datacentre (3/5)

	Frozen DCs	Growing DCs
Number of transmission lines	19	23
Number of transformers	4	6
Total length of new lines (km)	145	200

- Datacentres => Massive grid investment needs

Implications of Growing Datacentre (3/5)

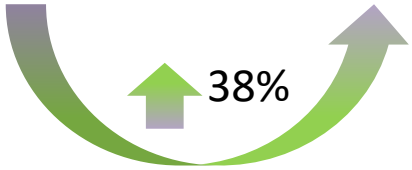
	Frozen DCs	Growing DCs
Number of transmission lines	19	23
Number of transformers	4	6
Total length of new lines (km)	145	200



- Datacentres => Massive grid investment needs

Implications of Growing Datacentre (4/5)

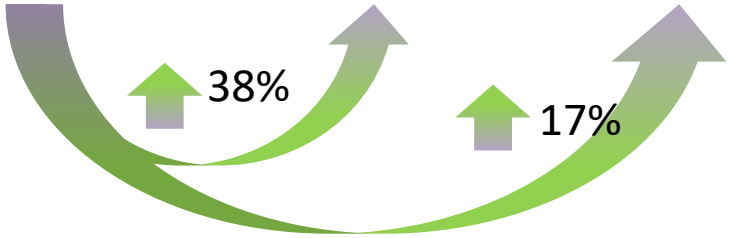
	Frozen DCs	Growing DCs	Distributed DCs
Number of transmission lines	19	23	23
Number of transformers	4	6	6
Total length of new lines (km)	145	200	170



- Datacentres => Massive grid investment needs
- But optimally allocating some new DCs along the fibre optics corridor and adopting a decentralized renewable development.
  - Substantially reduce network reinforcement needs.

Implications of Growing Datacentre (4/5)

	Frozen DCs	Growing DCs	Distributed DCs
Number of transmission lines	19	23	23
Number of transformers	4	6	6
Total length of new lines (km)	145	200	170



- Datacentres => Massive grid investment needs
- But optimally allocating some new DCs along the fibre optics corridor and adopting a decentralized renewable development.
  - Substantially reduce network reinforcement needs.

Implications of Growing Datacentre (5/5)

- ~ 24% increase in the system-wide NPV cost.
- ~ 14% increase in expected carbon emissions.
- ~ 18% increase in expected energy not served.

Summary

- The anticipated growth of datacentres by 2030 could lead to:
  - Significant infrastructural challenges (supply and grid perspectives)
  - Considerable increase in costs, average GHG emissions, involuntary load shedding, and grid expansion needs
- But these impacts can be alleviated by:
  - Encouraging investments in onsite power generation and storage technologies.
  - Adopting energy efficiency measures.
  - Optimally allocating some datacentres in regional places (other than in and around Dublin)

Thank you for your attention!

www.esipp.ie

This work has emanated from research conducted with the financial support of Science Foundation Ireland under the SFI Strategic Partnership Programme Grant Number SFI/15/SPP/E3125. The opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the Science Foundation Ireland. This work has also benefited from the valuable support of EirGrid, the Transmission System Operator in the Republic of Ireland. Hence, we would like to greatly acknowledge EirGrid's contributions in providing data and insights for this work.