



Energy for
generations

Lessons for Renewable Integration Ireland's example

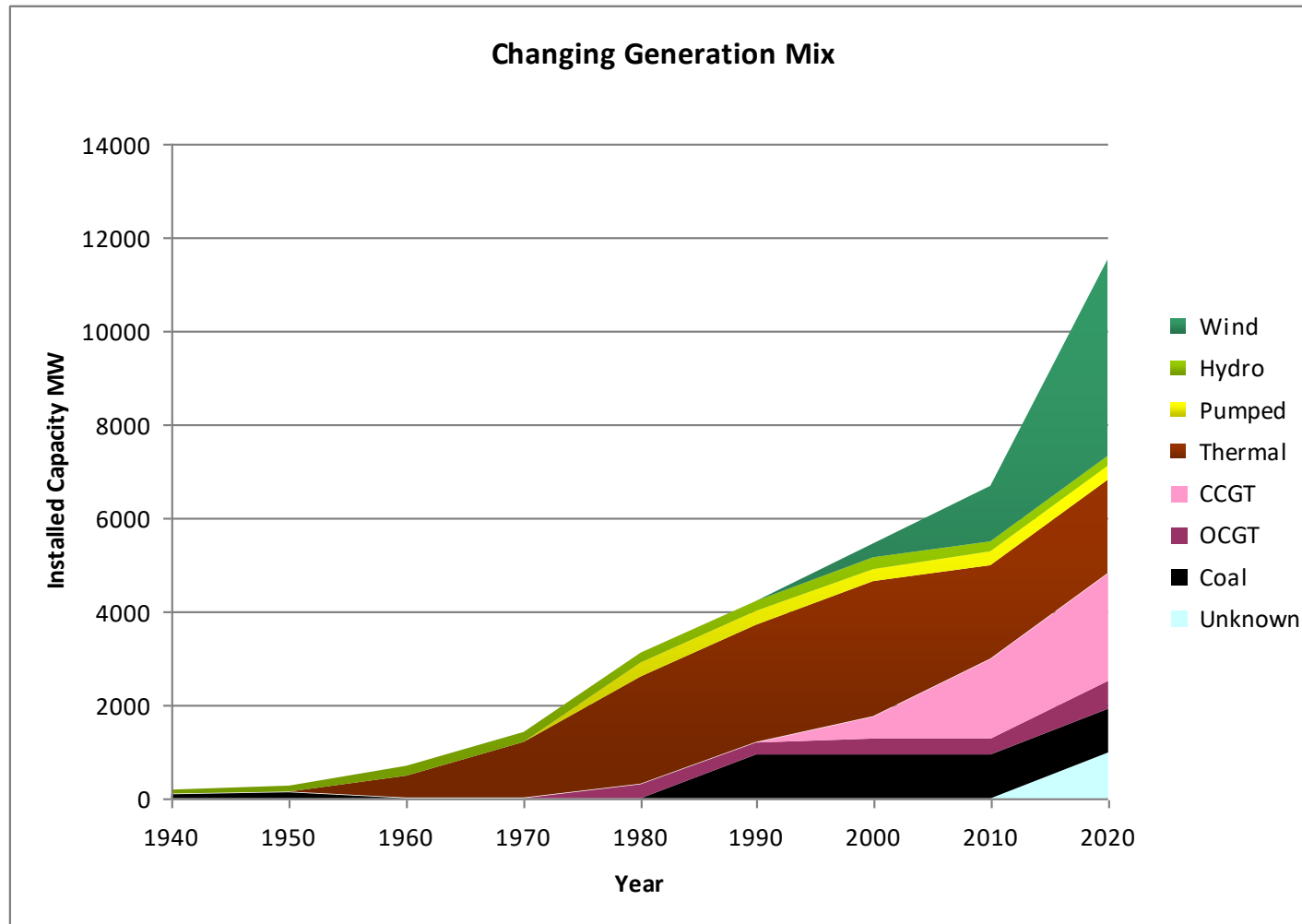
8th September 2023

Jonathan O'Sullivan

Acknowledgement

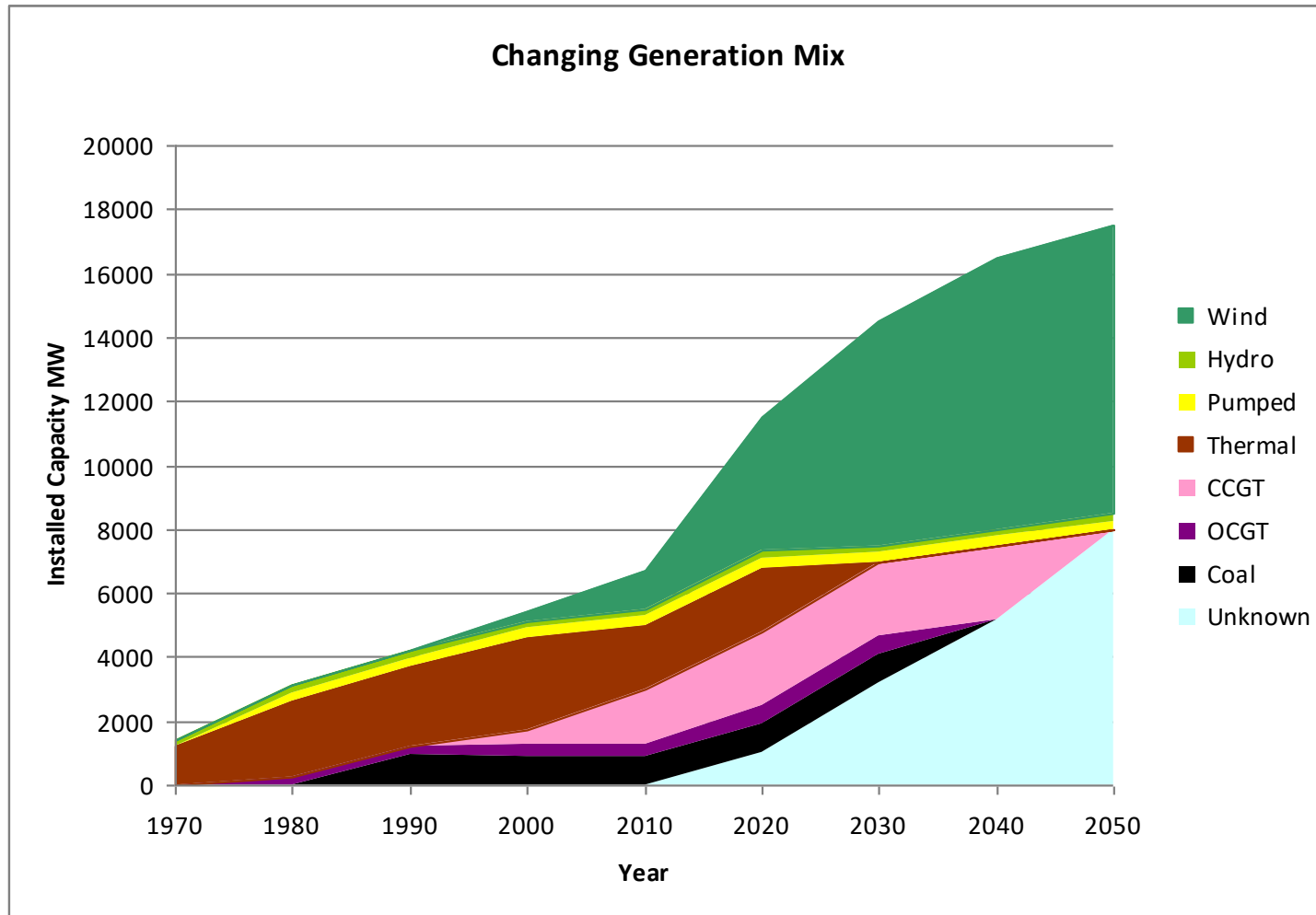
Presentation is based on author's previous work in the public domain from ESB National Grid 1996-2006, EirGrid 2006-2022 and his own views.

The Challenge: The Rest of the Portfolio



Source: O'Riordan and the Government white paper with assumptions on load factor and hydro contribution

The Next Frontier: Beyond 2020



Source: O’Riordan, Government White paper and assumptions on plant life length

ESB— Delivering our Net-Zero Ambition



>30GW Renewables



>10GW Backup Dispatchable
Zero-Carbon Power & Flexibility



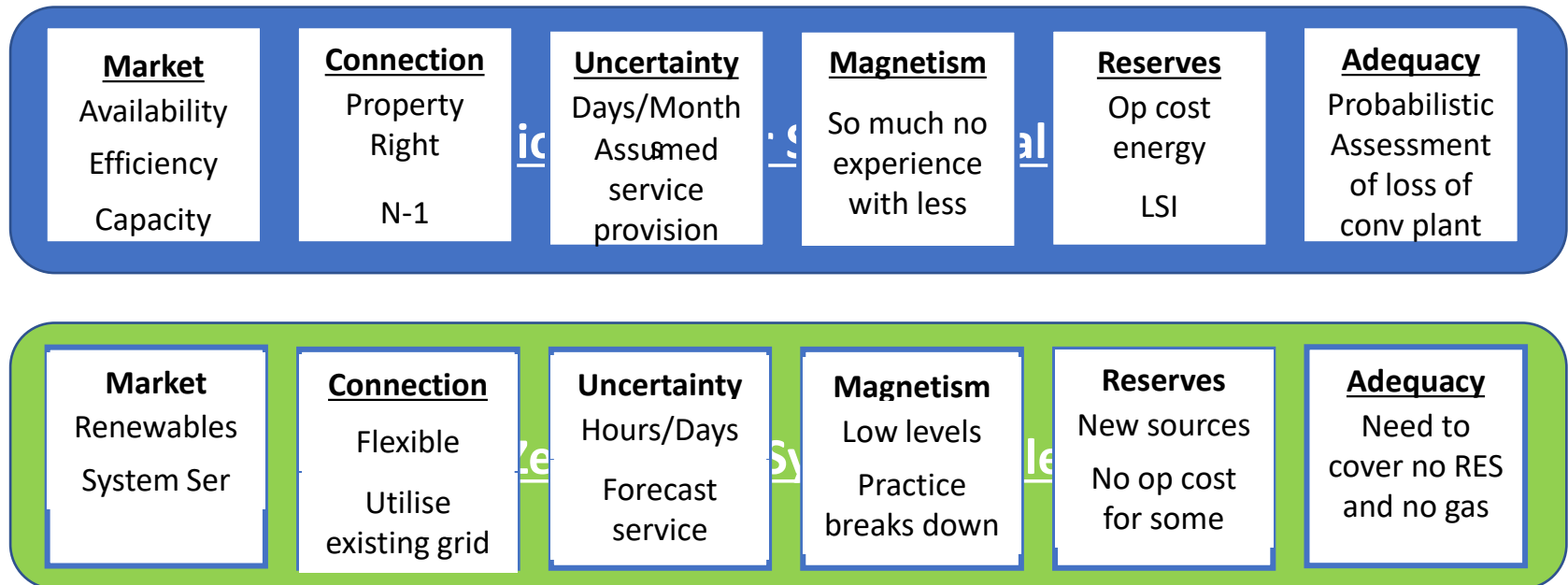
>10GW Hydrogen Production



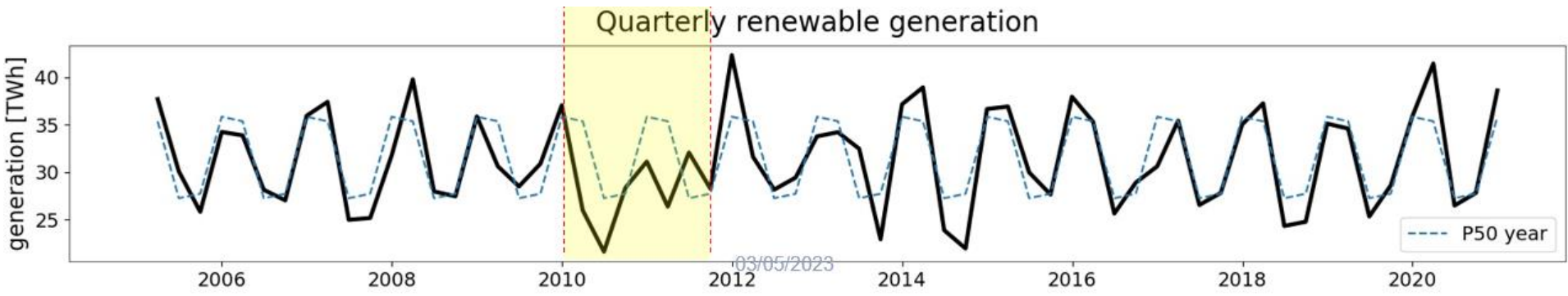
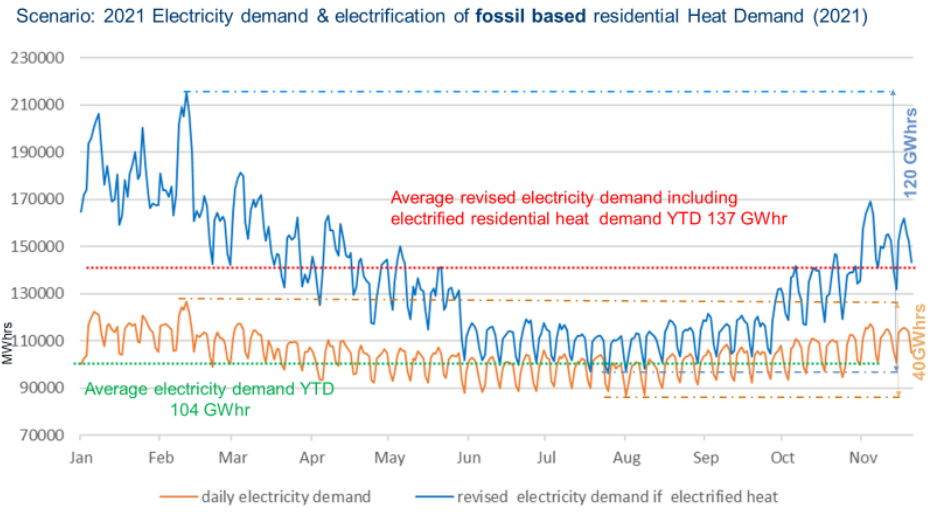
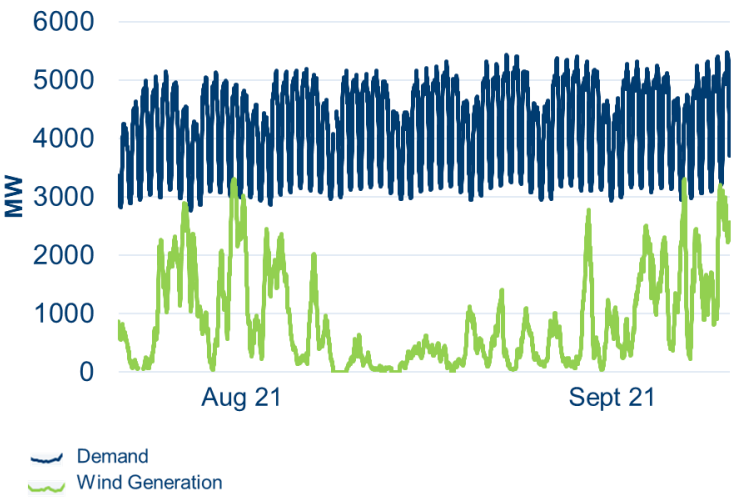
5 – 10TWh Storage

ESB is actively investing in all elements of the Energy Transition to Deliver Net Zero

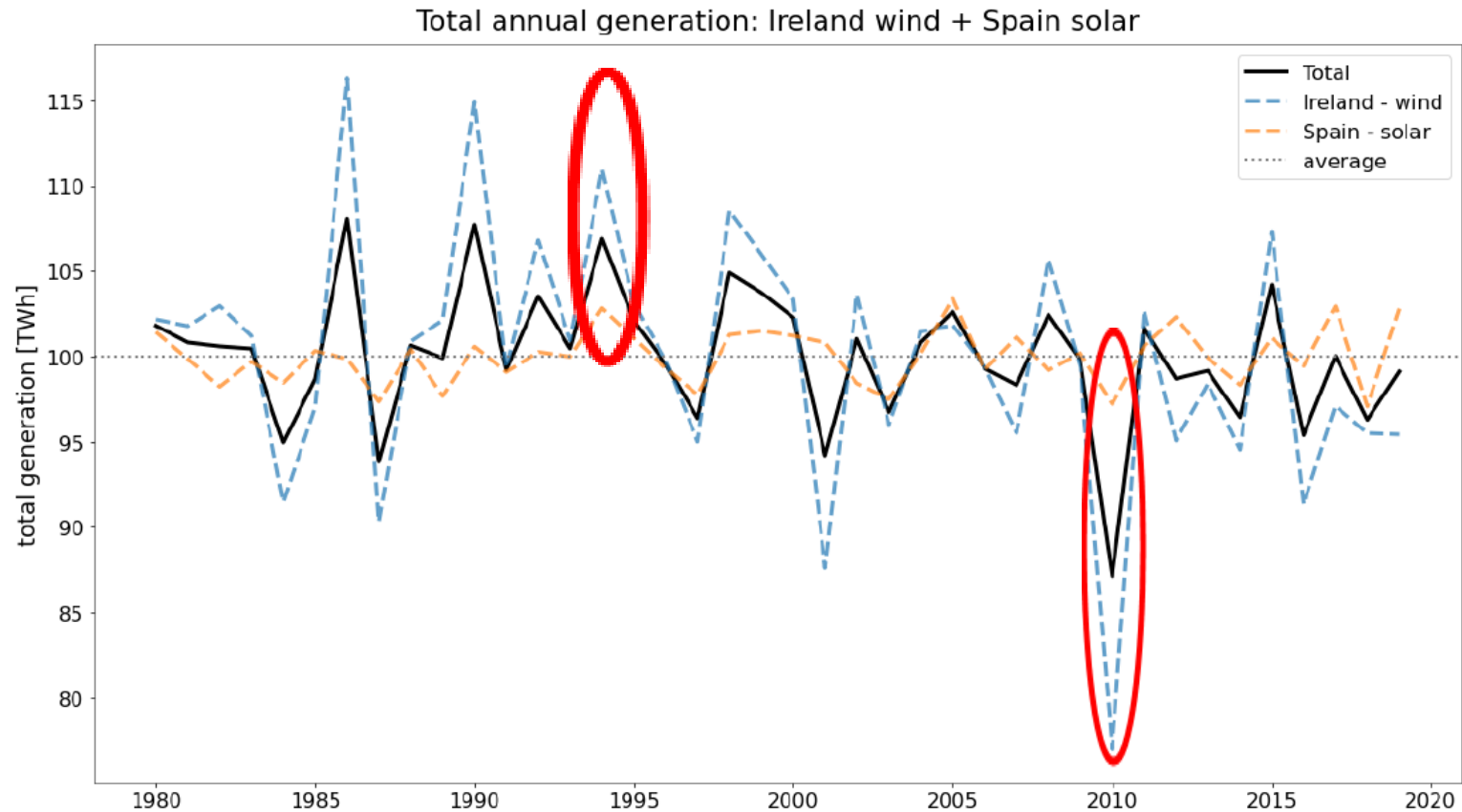
Changing Challenges



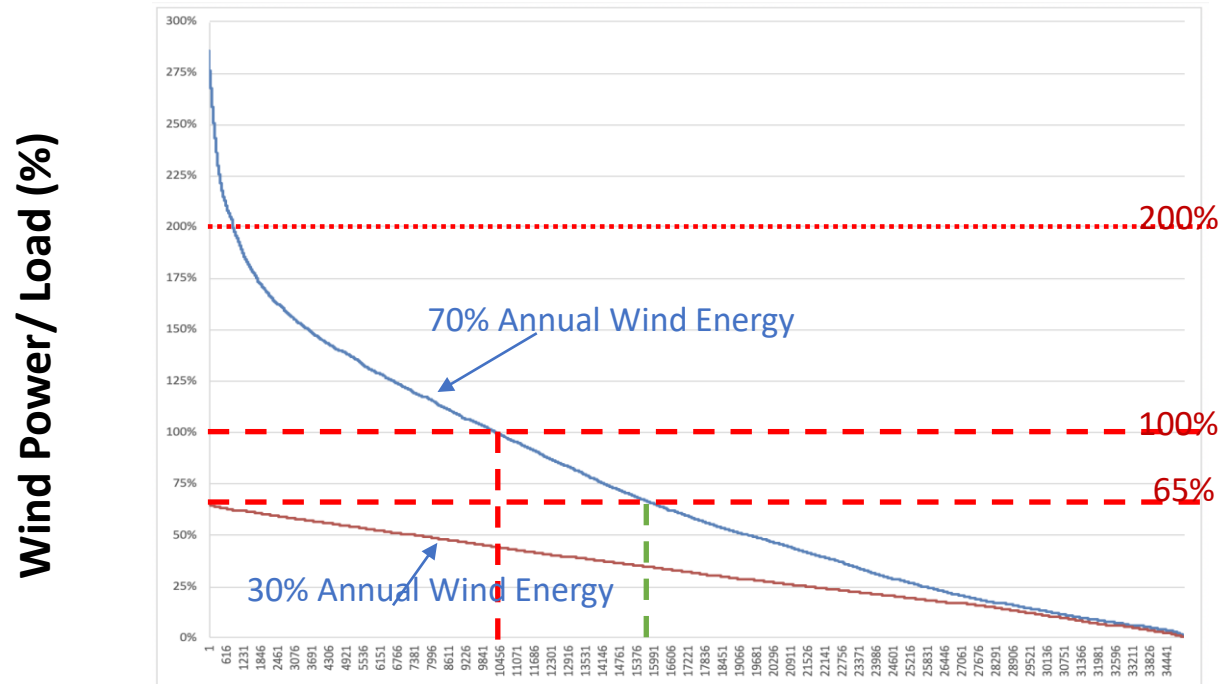
Seasonal quantities Zero CO2 Energy storage-critical



Seasonal quantities even for Europe

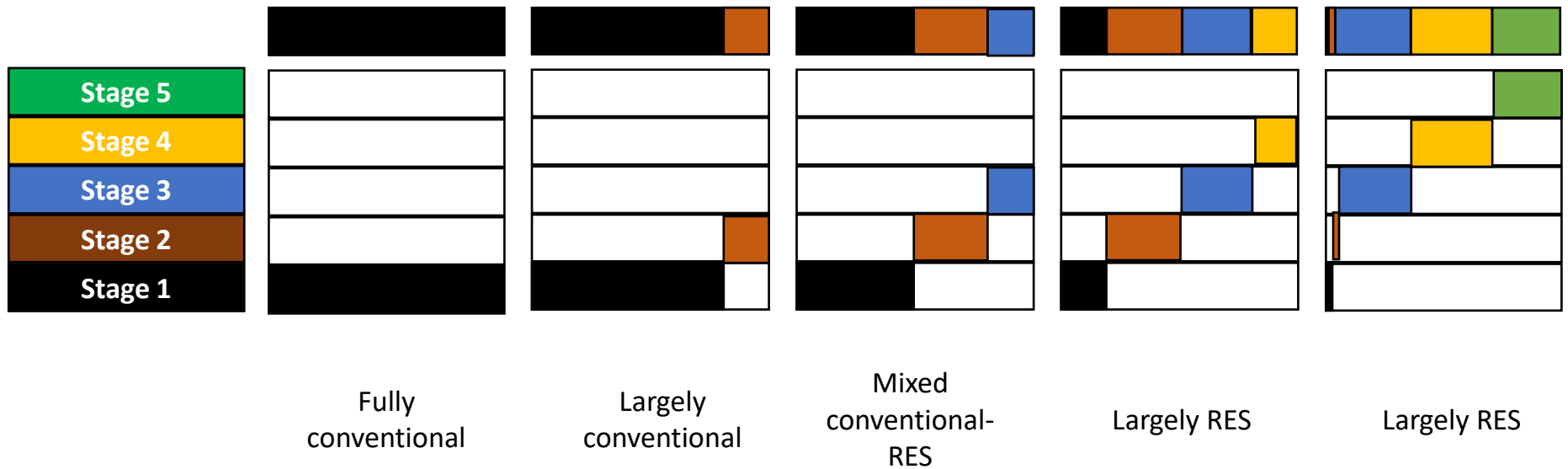


All-Island Wind Penetration Duration



2030 wind was estimated by multiplying 2018 wind availability by 2.1612 to achieve an energy balance of 70% wind.


































High RES system require stage 4-5 operation



Operating Policy – Volumes for IRE-NI system

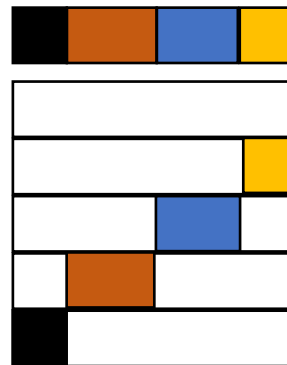
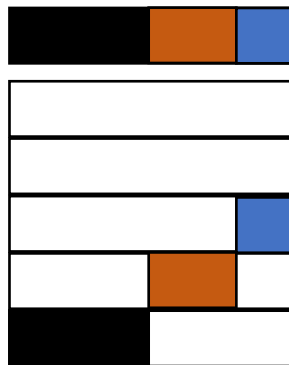
Operating Stage	Reserves	Ramping	Electro-magnetism	Adequacy
Stage 1	500 MW (75% LSI)	None	8 -1000, Sys 20000 MWs	Probability of loss of con plant
Stage 2	500 MW(75% LSI)	None	8 -1000, Sys 20000 MWs	Probability of loss of con plant
Stage 3	500 MW (200 MW FFR) (75% LSI)	1-3-8	8 -1000, Sys 20000 MWs	Probability of loss of con plant
Stage 4	500 MW (200 MW FFR) (75% LSI)	1-3-8-12	8 -1000, Sys 20000 MWs	No wind
Stage 5	500 MW (200 MW FFR) (75% LSI)	12	8 -1000, Sys 20000 MWs	No wind

What tech can we plan, dispatch and schedule...?

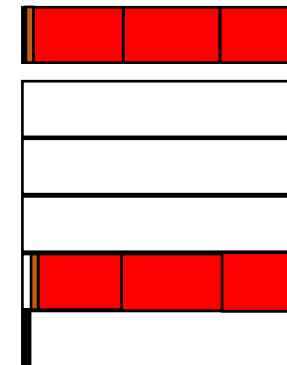
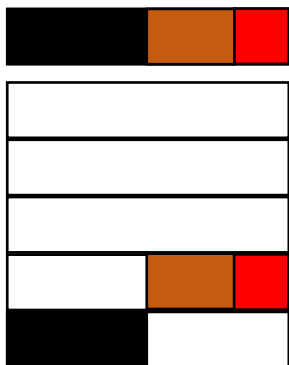
	Energy	Capacity	Trad Services	New Slow Services	New Fast Services	New Ultra high RES services	New Congestion
Conventional							
Wind							
Solar							
Storage							
DSM – Ind							
DSM – Res							
Data Centres							
HVDC Interconns							

What if high RES market schedule inoperable?

Market
Schedule



Operation
Schedule



Guiding principle of investments

- In large scale investments the best outcomes are when those who are best able to manage the risk are responsible for the risk.
- There are 3 risks outside of the control of investors in electricity
 - **oversupply, constraints, curtailment**
- If the markets do not explicitly deal with these risks and place the risk with the right actors at the right time the outcome is a false economy

Energy Market

Price Transparency
Competition
Cross Border trade – across EU
Long Term downward pressure on Energy
Price

Missing Energy – what
happens if probability cannot
meet load – aka reliability
standard

Missing Money – top up
energy money to make
investment case for marginal
needed plant

Upside
equity
investor

Dimensioned
trad system

Ancillary
Services

Capacity Market

Energy Market

System Services

Renewable
Support

Ancillary
Services

Capacity Market

