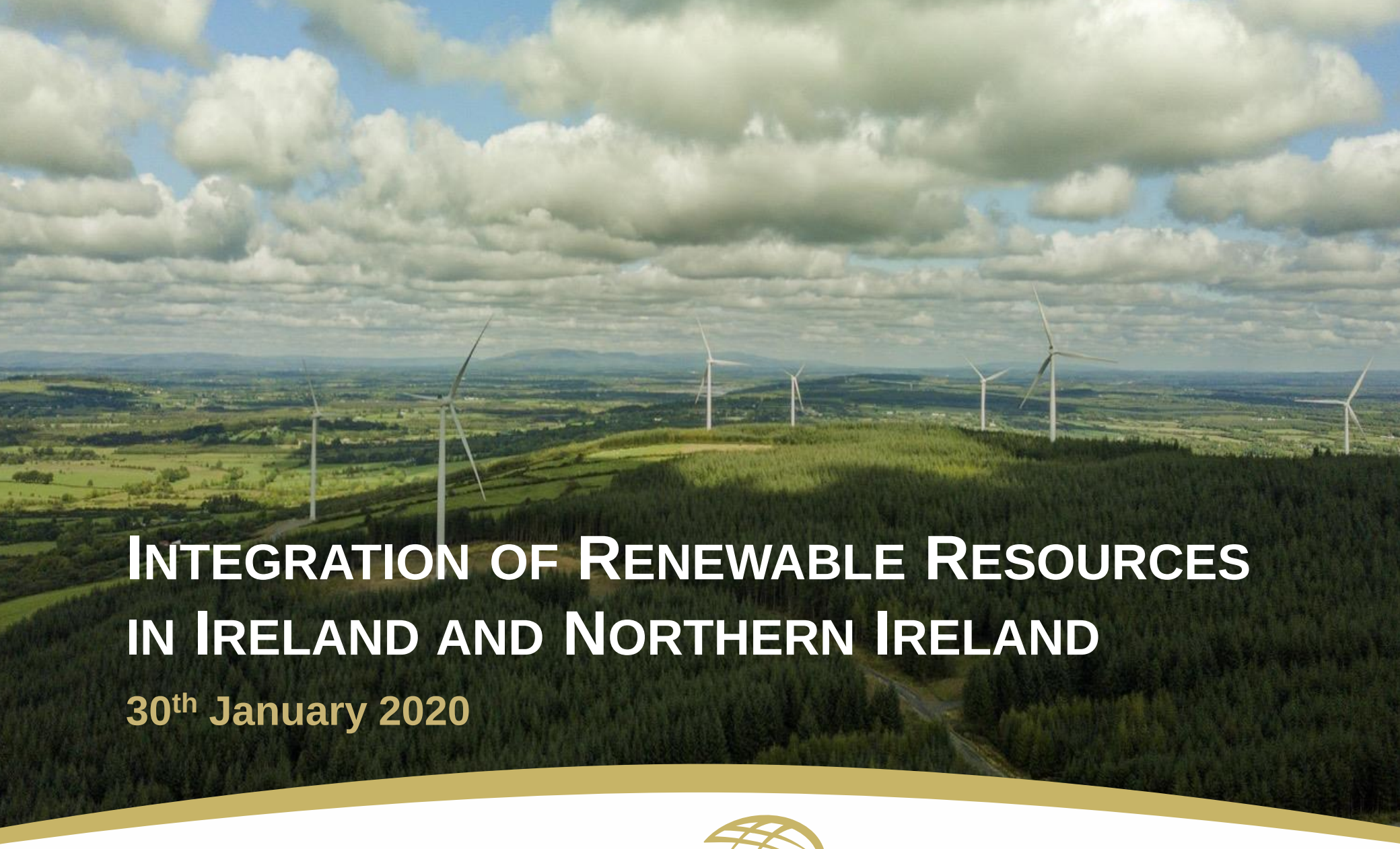

Integration of Renewable Resources in Ireland and Northern Ireland

30th January 2020

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Outline

- Background to the All Island System and 2020 Targets
- Meeting 2020 Renewable Targets in Ireland and Northern Ireland: the DS3 Programme
- Renewable Targets beyond 2020: on-going work

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Transmission System in Ireland and Northern Ireland

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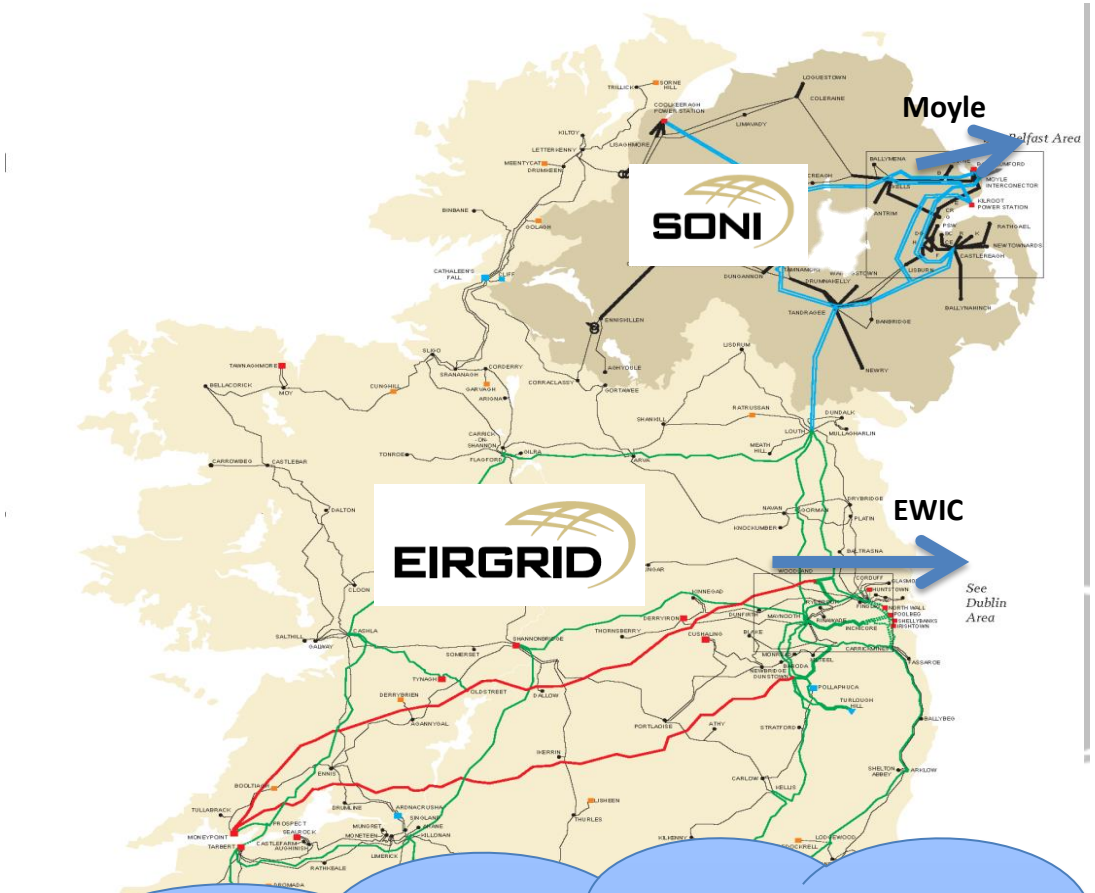
The All-Island System (RG IE/NI)

- Synchronously isolated
- HVDC Interconnection: 1000 MW
  - NI & GB: Moyle LCC (500 MW)
  - IE & GB: EWIC VSC (500 MW)
- 9 GW of conventional plant
  - Relatively large units (several > 400 MW)
- 5,5 GW of Wind/PV
- Peak Demand of ~6.5 GW
- Valley Demand of ~2.5 GW



Key Targets for 2020:

IE: 40% RES-E

NI: 40% RES-E

Meeting 2020 targets

DS3 Programme

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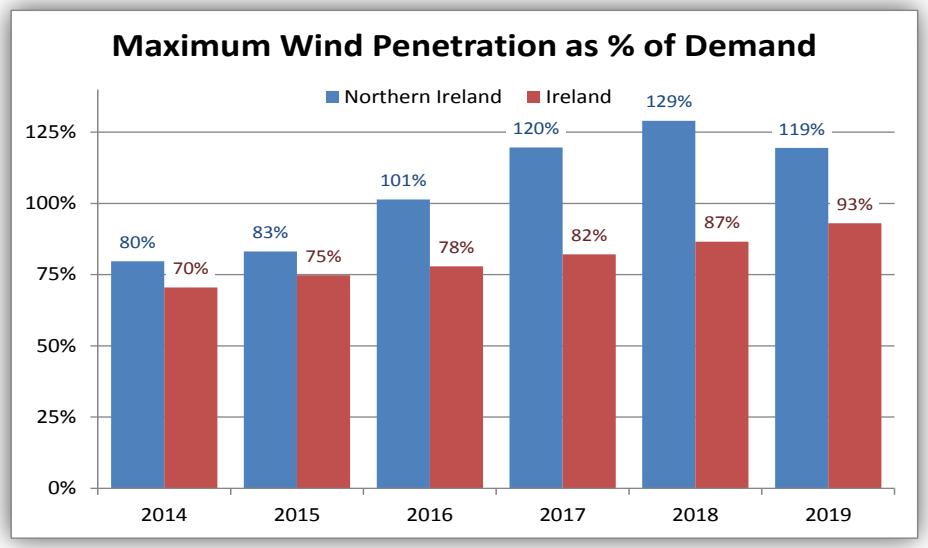
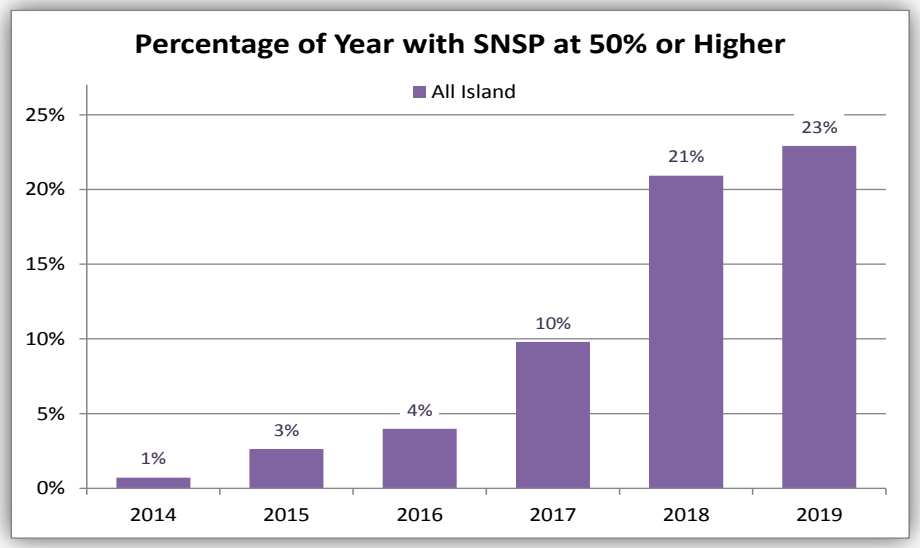
Performance in 2019

- Northern Ireland achieved 40% of electricity from renewables
- Ireland met 36% of electricity from renewables





- Instantaneous wind penetration (% of demand) approaching or exceeding 100%

- Operating the system at 65% SNSP
- Goal to move to 75% SNSP in 2021

$$\text{SNSP} = \frac{\text{Wind + HVDC Imports}}{\text{Demand + HVDC Exports}}$$

Enablers

Detailed Technical Analysis

2008 - All Island Grid Study
2010 - Facilitation of Renewables
2011 - Ensuring a Secure Sustainable System

Delivering a Secure Sustainable System

- 2011 – Programme established
- Meeting the RES Policy Objectives efficiently while maintaining system security
- Holistically considering technical, commercial and regulatory needs of the system
- Engaging with all industry stakeholders

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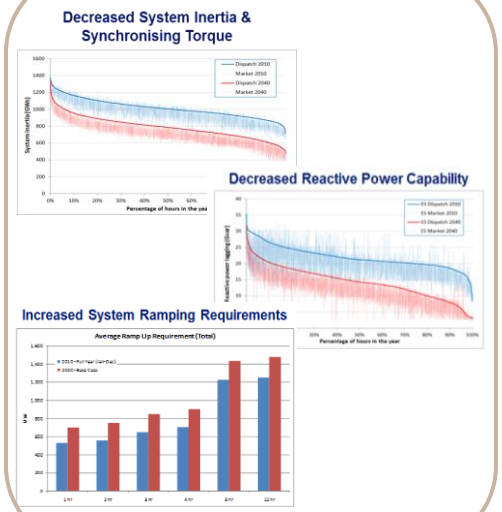
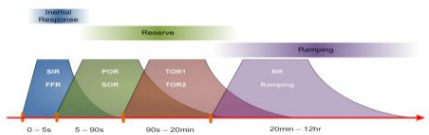
What does the system need and how to get it?

Technical Scarcities



New Services and Technologies



Proof of Service Provision

Control Centre Changes

Safe and Secure Operation

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Why New DS3 System Services?

- Paying for what the system needs
- Energy market reflects the value of energy
- System services reflects the value of reliably and securely getting that energy where it needs to be
- Each service covers a system need and is designed to:
  - Deliver the performance we require
  - Incentivise enhanced performance or change in behaviour
- Revenue from system services becomes a key part of the basis on which developers invest

Budget for services increases from €55m in 2016 to €235m in 2020

The 14 System Services

- Frequency and Voltage services
- Range from 0.15 seconds to eight hours

Service Name	Abbreviation	Unit of Payment	Short Description
Synchronous Inertial Response	SIR	MWs^2h	(Stored kinetic energy)*(SIR Factor – 15)
Fast Frequency Response	FFR	MWh	MW delivered between 2 and 10 seconds
Primary Operating Reserve	POR	MWh	MW delivered between 5 and 15 seconds
Secondary Operating Reserve	SOR	MWh	MW delivered between 15 to 90 seconds
Tertiary Operating Reserve 1	TOR1	MWh	MW delivered between 90 seconds to 5 minutes
Tertiary Operating Reserve 2	TOR2	MWh	MW delivered between 5 minutes to 20 minutes
Replacement Reserve – Synchronised	RRS	MWh	MW delivered between 20 minutes to 1 hour
Replacement Reserve – Desynchronised	RRD	MWh	MW delivered between 20 minutes to 1 hour
Ramping Margin 1	RM1	MWh	The increased MW output that can be delivered with a good degree of certainty for the given time horizon.
Ramping Margin 3	RM3	MWh	
Ramping Margin 8	RM8	MWh	
Fast Post Fault Active Power Recovery	FPFAPR	MWh	Active power (MW) >90% of pre-disturbance output within 250ms of voltage >90% of nominal voltage
Steady State Reactive Power	SSRP	Mvarh	(Mvar capability)*(% of capacity that Mvar capability is achievable)
Dynamic Reactive Response	DRR	MWh	Mvar capability during large (>30%) voltage dips

Yet to be procured

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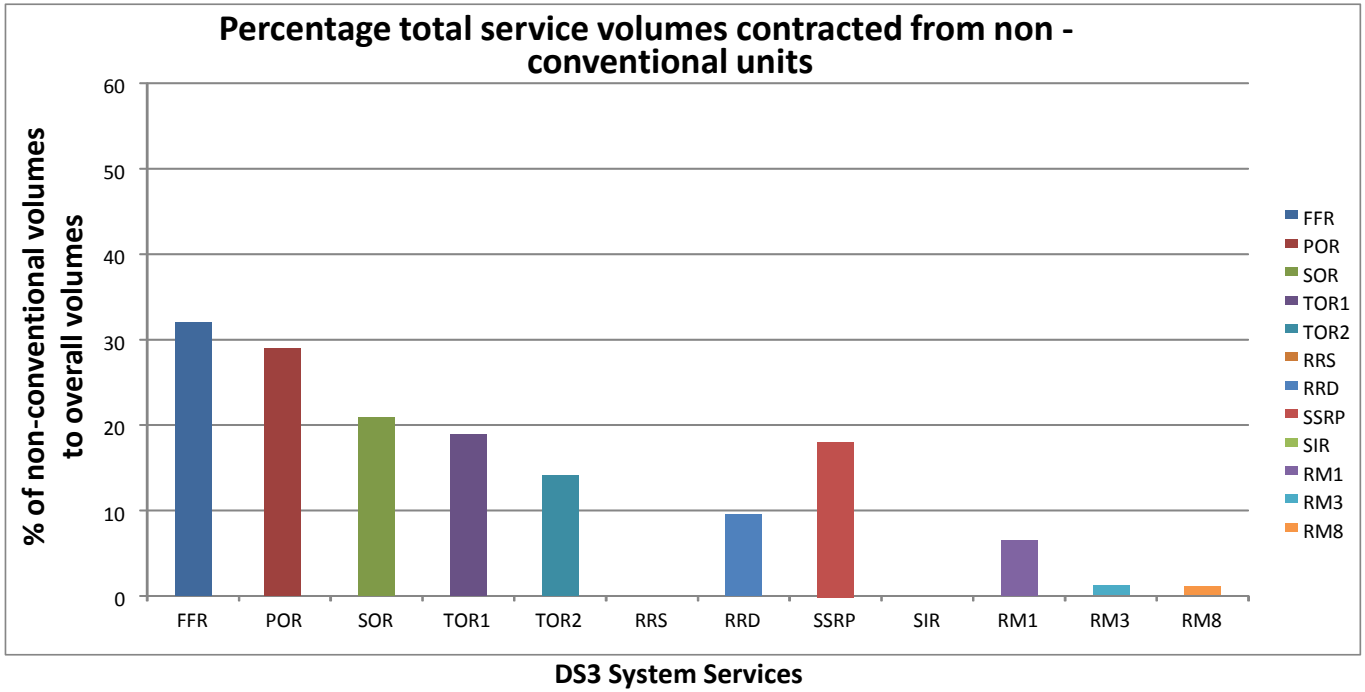
Services from Non-Conventionals

- Unlocked potential services from Non-Conventionals
- Prove these services are effective and available



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Who Does What?

Wind

FFR
POR
SOR
TOR1
SSRP

Storage

FFR
POR
SOR
TOR1

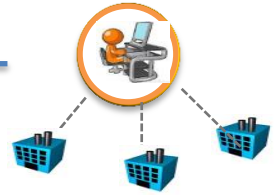
FFR
POR
SOR
TOR1
TOR2
SSRP

HVDC

FFR
POR
SOR
TOR1
TOR2
RRS
RRD
SIR
SSRP
RM1
RM3
RM8

Thermal

FFR
POR
SOR
TOR1
TOR2
RRD
RM1



Demand Side

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Moving Beyond 2020

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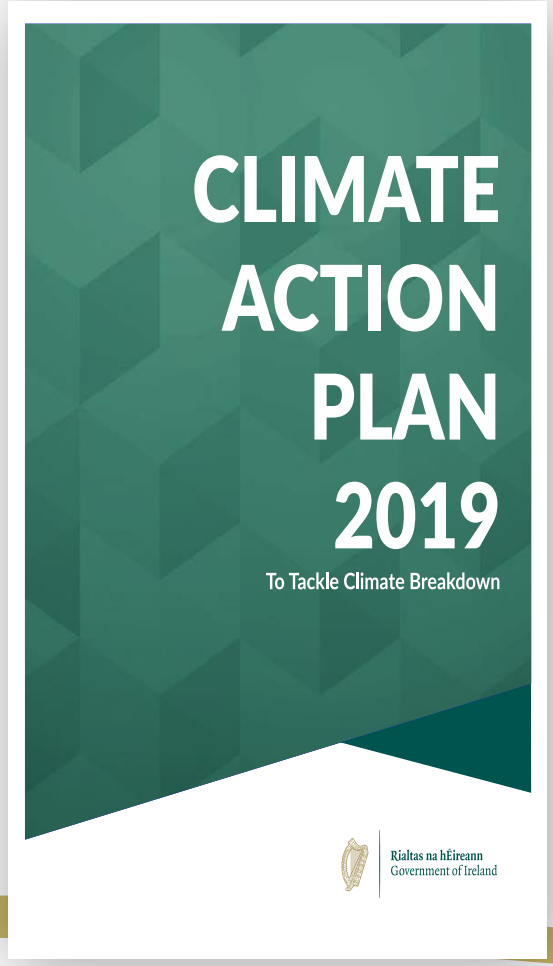
UK and Irish Government plans

Net zero carbon emissions by 2050



70% RES-E in 2030

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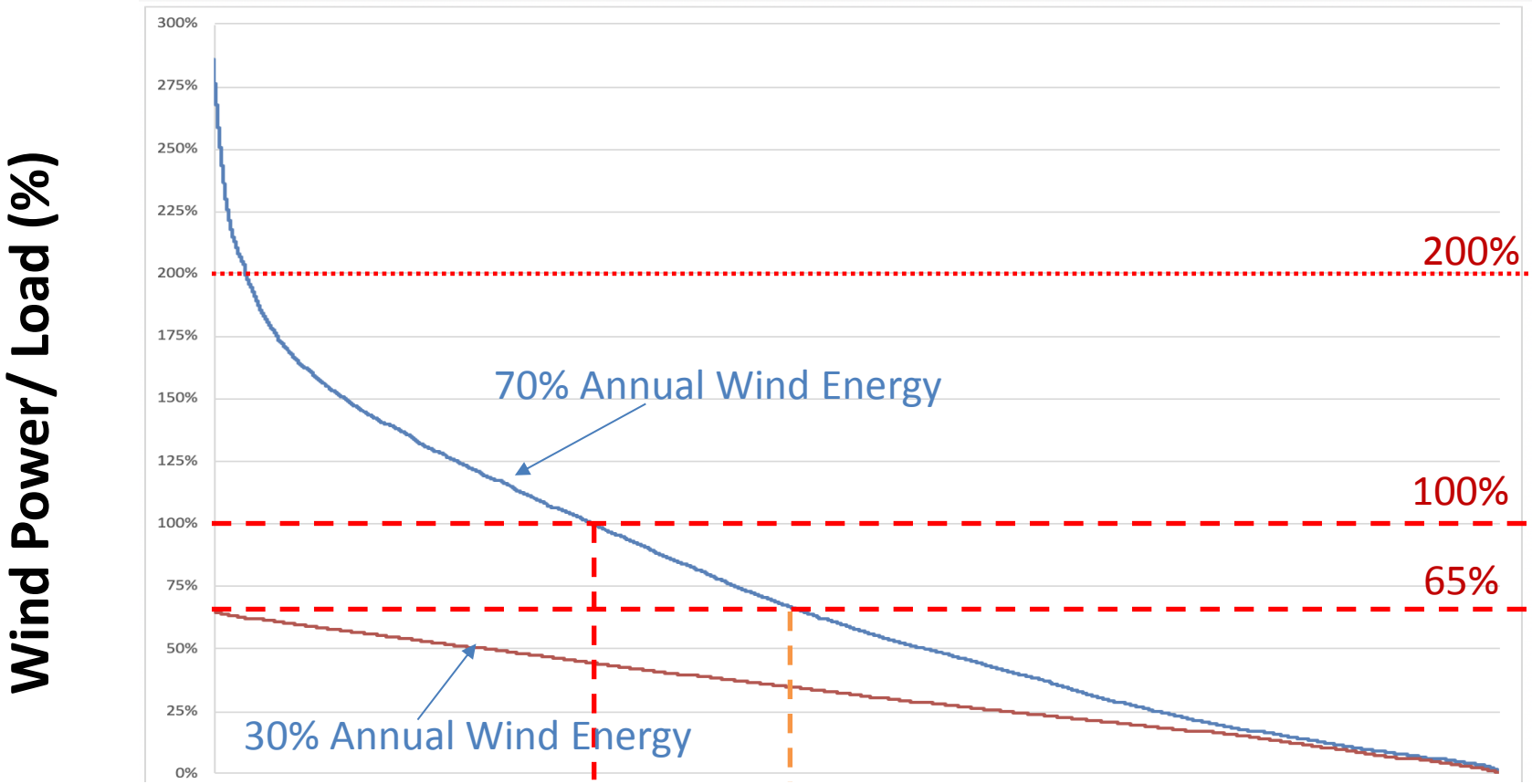
All-Island Wind Penetration Duration



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

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How to meet 2030 targets

- **Requirements:**
  - Connect 10 GW of renewables ……. more than we have done to date
  - Operate with 95% SNSP
- **Programme plan currently under development**
- **Main focus areas**:
  - Augmented System Services
  - Interconnection
  - Congestion management
  - Policy and Tools
  - New technologies
  - Market evolution

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Identifying and Addressing Future Needs

- **Identify:**
  - emerging technical scarcities
  - limitations on RMS modelling
  - stability limits of current Wind/PV technologies (grid following)
  - where the limit is for reduced electromagnetism
- **Address:**
  - Unlock full potential of residential demand side response
  - Understand and manage increasing uncertainty and variability
  - Manage congestion, new assets likely to be limited
  - Managing new connections
  - TSO-DSO interaction
  - Enhanced system services

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Work with Partners for Positive Change

- Participation in H2020 MIGRATE project

- Host Wind Integration Workshop, October 2019

- Lead H2020 SysFlex project

- FlexTech Initiative: A transparent and collaborative platform for engagement with industry with the objective of removing barriers to renewable integration.

Thanks for your attention

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