Welcome DS3 Advisory Council Members

- Please log in with Mic muted
- Questions can be logged using chat
- There will be 5 minutes at end of each topic to cover questions / comments

*1 Plays a description of the menu options that are available during a meeting.

*6 Mutes or unmutes your microphone

EIRGRID SONI

DS3 Advisory Council – Meeting 28

MS Teams – Virtual Meeting

30 September 2020

EIRGRID SONI

Agenda

Topic	Time	Speaker
Introduction & Welcome	11:00	Jonathan O' Sullivan, EirGrid (10 min)
Industry Discussion (TBC) o Wind Farm Dispatch Down Related Analysis	11:10	Rory Mullan, MullanGrid(20 min)
Renewable stats – historical stats for last 10 years	11:30	Jonathan O' Sullivan, EirGrid (10 min)
DS3 Programme Update o General	11:40	Jonathan O' Sullivan , EirGrid (10 min)
o RoCoF	11:50	Kenneth Conway (10 min)
o Control Centre Tools	12:00	Mary Hennessey, EirGrid (10 min)
o Procurement	12:10	Joe Deegan, EirGrid (10 min)
o FlexTech	12:20	Daniel Dixon , EirGrid (10 min)

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Agenda

Topic	Time	Speaker
REST	12:30	ALL (10 min)
Future Arrangements	12:40	Jonathan O' Sullivan, EirGrid (10 min)
DS3 Advisory Council Membership / Open positions	12:50	Jonathan O' Sullivan, EirGrid (10 min)
AOB	13:00	Jonathan O' Sullivan, EirGrid (5 min)

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Industry Discussion

30 September 2020

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Wind Farm Dispatch Down Related Analysis

DS3 Advisory Council - Sept 2020

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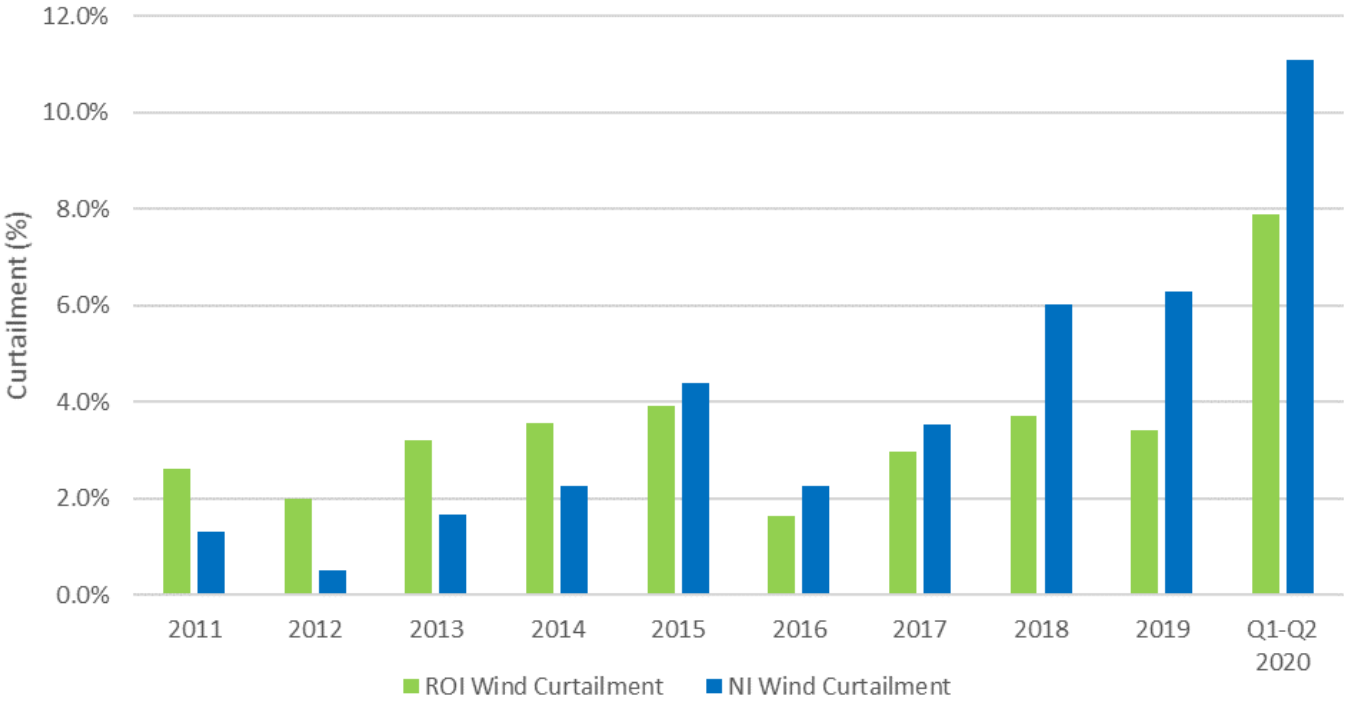
Historical Wind Curtailment



Source: EirGrid & SONI's Annual Renewable Energy Constraint and Curtailment Reports, and Wind Farm Dispatch Down Reports

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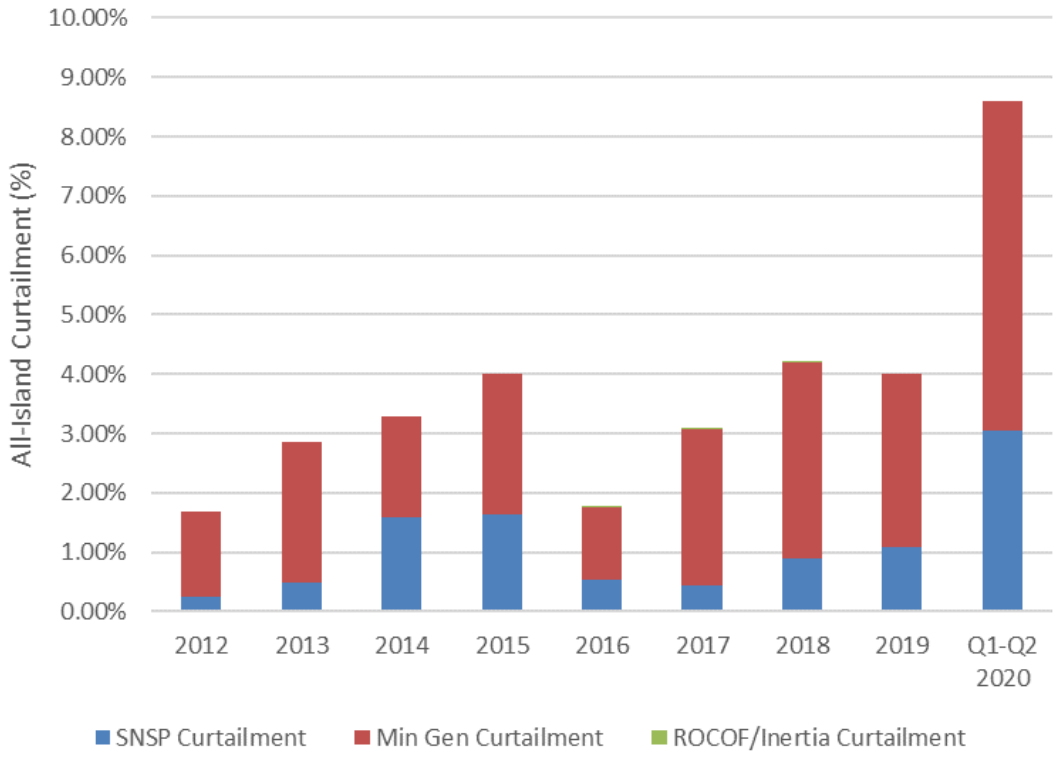
Drivers of Wind Curtailment



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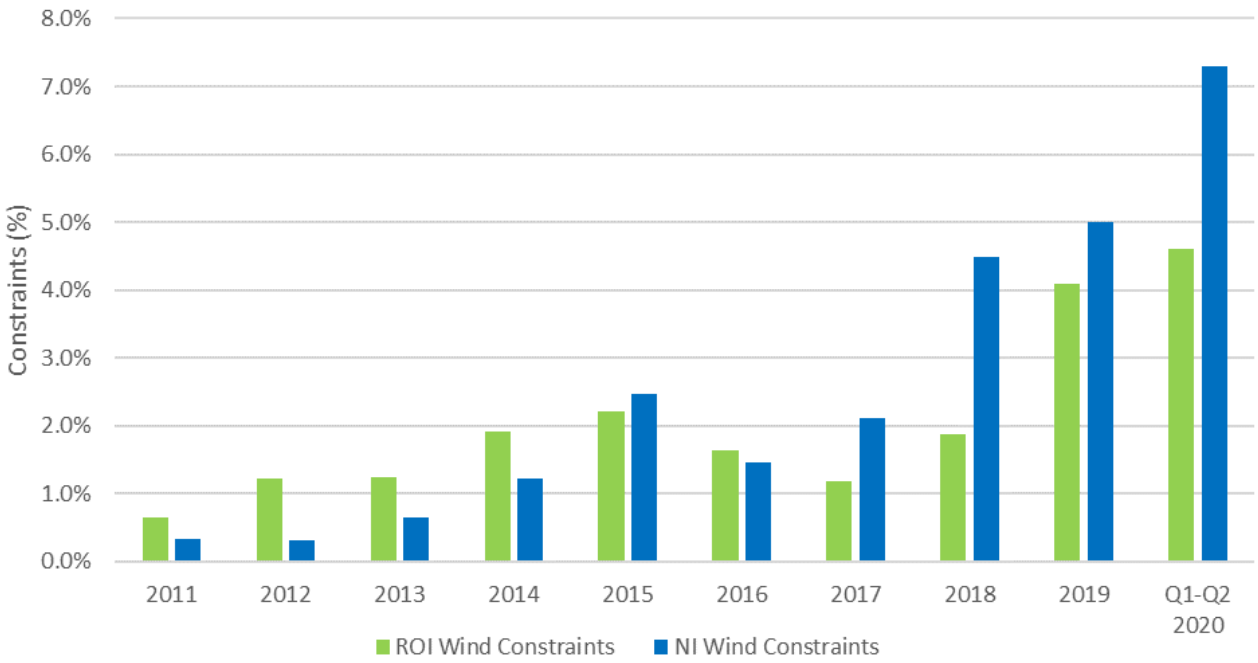
Historical Wind Constraints



Source: EirGrid & SONI's Annual Renewable Energy Constraint and Curtailment Reports, and Wind Farm Dispatch Down Reports

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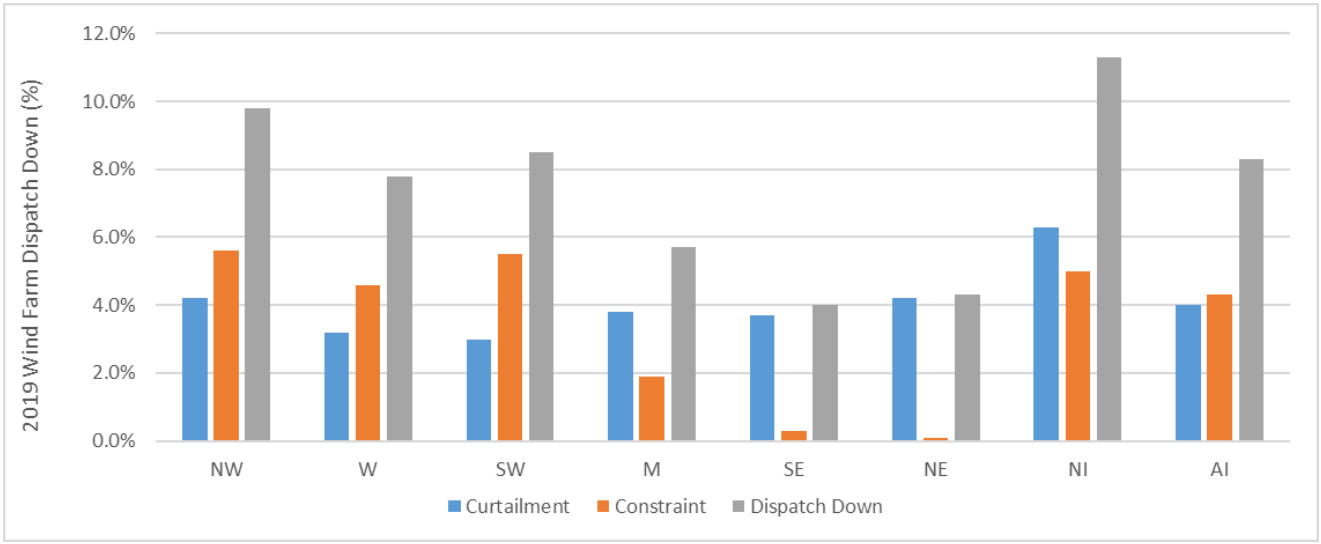
Estimation of Cost of 2019 Wind Farm Dispatch Down



Wind Region	All Wind Farms								IWEA Working Group Wind Farms	
	Wind MEC (MW)	Curtailment (%)	Curtailed Energy (MWh)	Constraints (%)	Constrained Energy (MWh)	Lost Curtailed Revenue (€)	Lost Constrained Revenue (€)	Total Lost Revenue (€)	Wind MEC (MW)	Total Lost Revenue (€)
NW	443	4.2%	37437	5.6%	49917	€ 2,574,304	€ 2,879,744	€ 5,454,048	319	€ 4,490,418
W	1102	3.2%	80831	4.6%	116195	€ 5,857,043	€ 8,157,939	€ 14,014,982	896	€ 12,350,400
SW	1509	3.0%	111296	5.5%	204042	€ 8,361,517	€ 14,891,816	€ 23,253,333	1339	€ 21,892,974
M	542	3.8%	50750	1.9%	25375	€ 3,919,815	€ 1,959,907	€ 5,879,722	454	€ 5,247,610
SE	363	3.7%	28701	0.3%	2327	€ 2,063,348	€ 152,662	€ 2,216,010	275	€ 1,792,911
NE	180	4.2%	16173	0.1%	385	€ 1,251,982	€ 29,809	€ 1,281,791	138	€ 1,038,515
NI*	1108	6.3%	162597	5.0%	129046	€ 15,390,388	€ 9,549,212	€ 24,939,600	963	€ 22,177,745
AI	**5247**	**4.0%**	**487786**	**4.3%**	**527286**	**€ 39,418,396**	**€ 37,621,090**	**€ 77,039,486**	**4384**	**€ 68,990,573**
Estimated Lost Wind Energy as Percentage of 2019 All-Island Electicity Sector CO_2 Emissions**							**2.9%**			
Estimated Lost Wind Energy as Percentage of 2019 All-Island Electricity Demand***							**2.7%**			

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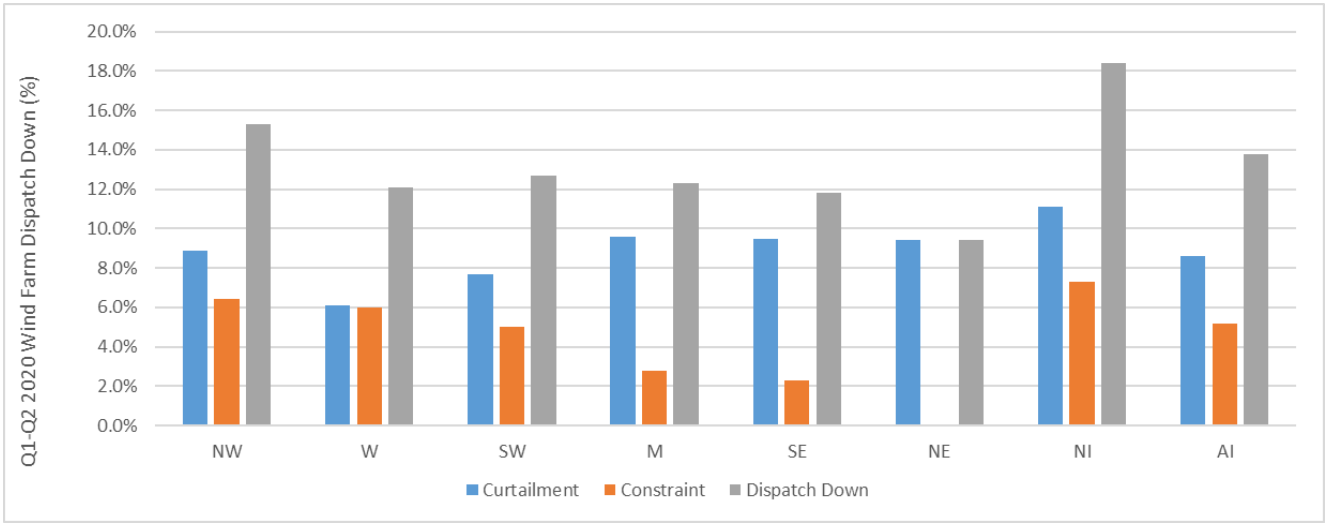
Estimation of Cost of Q1-Q2 2020 Wind Farm Dispatch Down



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NW	443	8.9%	46819	6.4%	33667	€ 2,929,166	€ 1,943,247	€ 4,872,413	319	€ 4,009,667
W	1127	6.1%	93358	6.0%	91828	€ 6,557,322	€ 6,431,114	€ 12,988,436	896	€ 11,152,301
SW	1543	7.7%	172183	5.0%	111807	€ 12,676,151	€ 8,128,519	€ 20,804,670	1368	€ 19,645,841
M	538	9.6%	75666	2.8%	22069	€ 5,846,414	€ 1,705,204	€ 7,551,618	454	€ 6,740,067
SE	363	9.5%	43491	2.3%	10529	€ 2,955,934	€ 686,668	€ 3,642,601	275	€ 2,927,916
NE	180	9.4%	21362	0.0%	0	€ 1,654,836	€ -	€ 1,654,836	138	€ 1,340,978
NI*	1108	11.1%	177492	7.3%	116729	€ 12,442,387	€ 7,127,780	€ 19,570,167	963	€ 17,338,001
AI	**5303**	**8.6%**	**630370**	**5.2%**	**386630**	**€ 45,062,209**	**€ 26,022,532**	**€ 71,084,741**	**4413**	**€ 63,154,772**
Estimated Lost Wind Energy as Percentage of Q1-Q2 2020 All-Island Electicity Sector CO_2 Emissions**								**5.8%**		
Estimated Lost Wind Energy as Percentage of Q1-Q2 2020 All-Island Electricity Demand***								**4.8%**		

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Update on Minimum Generation Levels During Curtailment Events

Generator		Fuel Type	MEC (MW)	Declared Min Gen Level (MW)	Avg Generation Level During Curtailment Events (MW)							
					Q2 2020	Q1 2020	2019	2018	2017	2016	2015	2012-14
Republic of Ireland	Must Run Plants				147	150	162	228	252	257	248	271
					143	127	147	140	151	158	176	181
					174	154	157	141	140	191	195	181
					125	120	117	124	123	129	236	242
					126	129	117	117	94	121		
					214	203	206	210	215	224	199	198
					83	84	102	119	115	121	117	121
					0	0	0	112	116	121	118	120
					0	0	107	117	121	127	120	115
					0	0	0	38	0	0	0	0
					154	148	146	197	216	207	218	206
					0	36	35	35	0	0	35	0
					38	36	36	38	0	0	0	0
					193	197	185	192	202	225	187	188
					185	188	175	193	202	255	257	0
					62	69	65	70	71	76	74	76
					62	68	65	70	73	78	75	76
	Priority Dispatch Plants				51	62	62	65	62	74	75	85
					44	60	58	62	74	76	79	75
					58	74	75	86	88	96	101	101
	Average Total ROI Min Gen During Curtailment Events (MW)				**1198**	**1222**	**1158**	**1227**	**1329**	**1403**	**1280**	**1329**
Northern Ireland	Must Run Plants				78	69	71	66	63	62	64	65
					148	155	118	114	121	106	121	110
					143	124	120	127	122	127	0	83
					96	94	104	113	113	107	117	122
					96	94	110	115	106	108	119	118
					289	285	282	289	280	283	271	264
	Average Total NI Min Gen During Curtailment Events (MW)				**416**	**395**	**405**	**419**	**467**	**488**	**470**	**411**

Plants Running >20 MW Above Declared Min Gen

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Update on Interconnector Activity During Wind Curtailment Events

		2014	2015	2016	2017	2018	2019	Q1 2020	Q2 2020	2014 to Q2 2020
Curtailment Events	Curtailment Events(nr.)	137	119	87	103	112	135	63	25	781
	EWIC Avg Net (MW)	190	-1	-64	-271	-190	-311	-326	-287	-157
	EWIC Avg Net (%)	36%	0%	-12%	-51%	-36%	-59%	-62%	-54%	-30%
	Moyle Avg Net (MW)	99	-46	-127	-186	-49	-72	-27	15	-49
	Moyle Avg Net (%)	40%	-18%	-42%	-62%	-16%	-19%	-7%	4%	-15%
All Periods	EWIC Absolute Avg (Day) (MW)	376	213	14	-18	39	-40	-157	-69	45
	EWIC Absolute Avg (Night) (MW)	78	-24	-15	-171	-154	-83	-78	-104	-69
	Moyle Absolute Avg (Day) (MW)	154	61	-11	41	145	98	59	78	78
	Moyle Absolute Avg (Night) (MW)	50	-92	-59	-76	16	67	109	-41	-3

Notes:

Moyle's permitted export capacity has varied from 250MW in 2014 and 2015, increasing to 300MW between 2016 and Q1 2019, and increasing to 380MW from Q2 2019 onwards

Positive figures represents imports, negative figures represent exports

EWIC Out of Service: 2014 = 43 days, 2015 = 14 days, 2016 = 109 days, 2017 = 53 days, 2018 = 49 days, 2019 = 12 days, 2020 = 6 days

Moyle Out of Service: 2014 = 65 days, 2015 = 2 days, 2016 = 46 days, 2019 = 9 days

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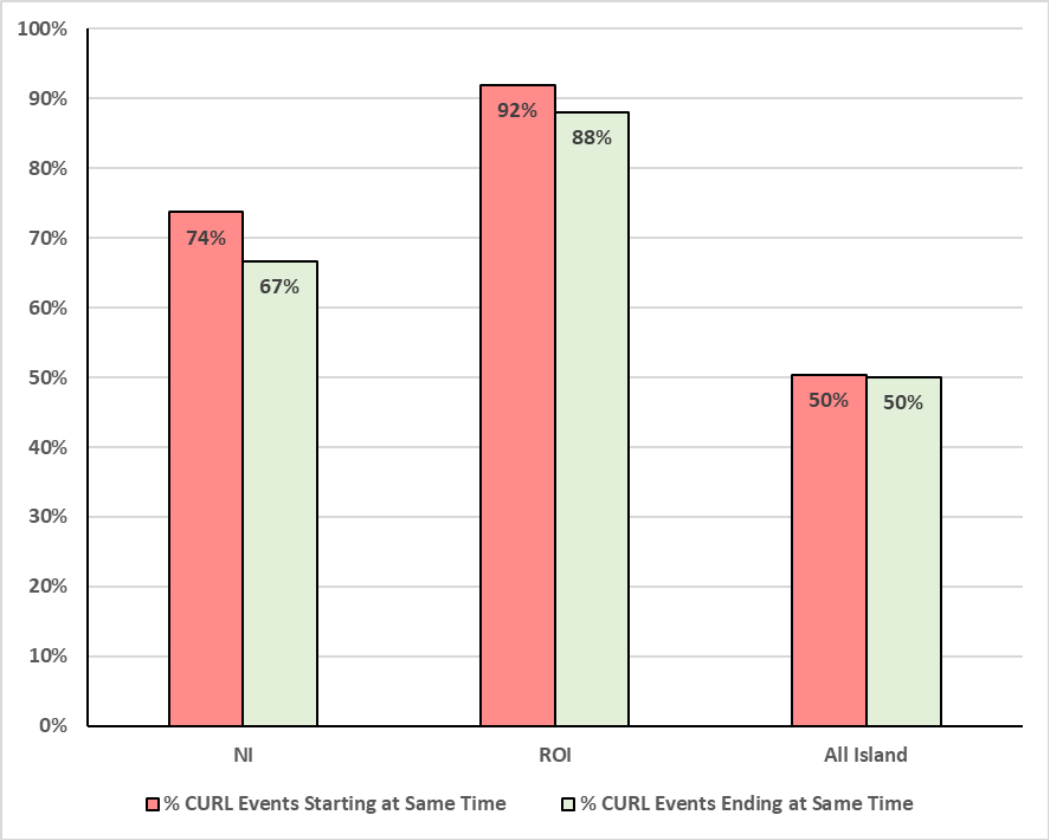
Understand if curtailment events are starting/ending at the same time 2019



Percentage of Events Starting/Ending At Same Time in 2019

14

Understand if curtailment events are starting/ending at the same time Jan – March 2020

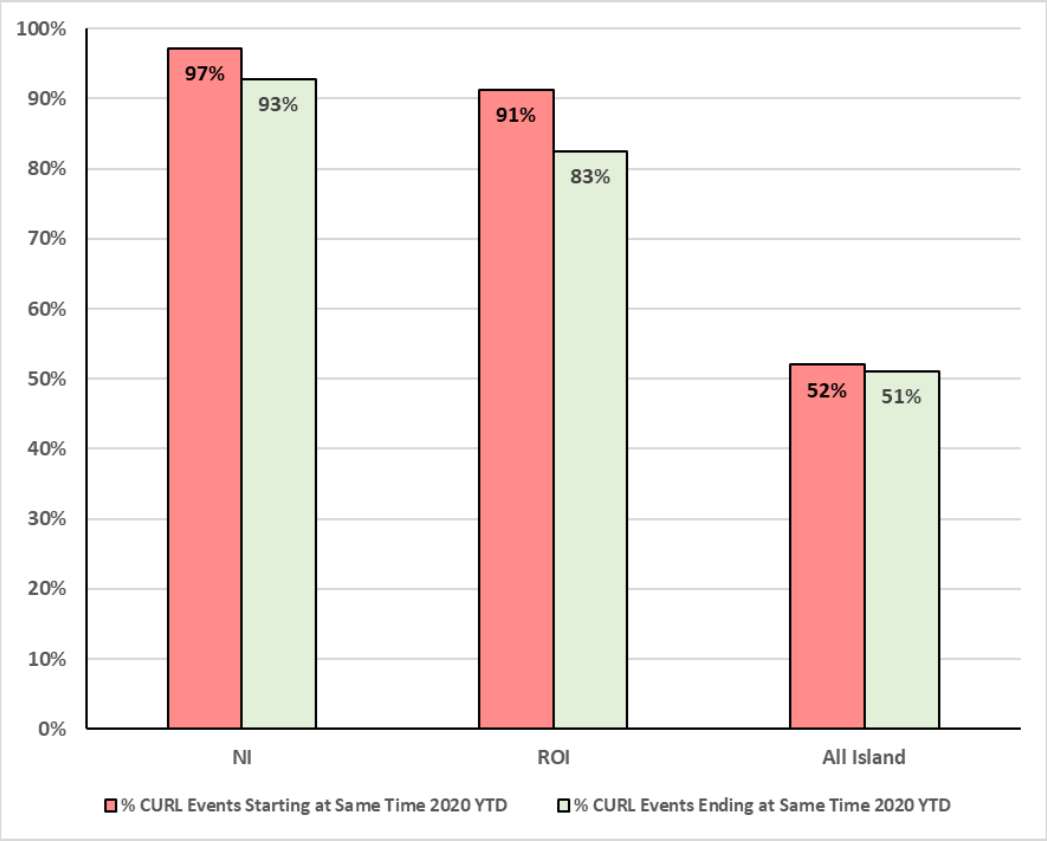


Figure 7: Percentage of Events Starting/Ending At Same Time during period Jan - March 2020

DS3 Programme Updates

2020

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Wind Generation

- In terms of renewable electricity as percentage of demand, renewable energy accounted for average of 38% in 2020.
- SNSP has been higher than 50% for 34% of the time in 2020.
- By June 2020, a total of 5,510 MW of wind capacity was installed across Ireland and Northern Ireland.

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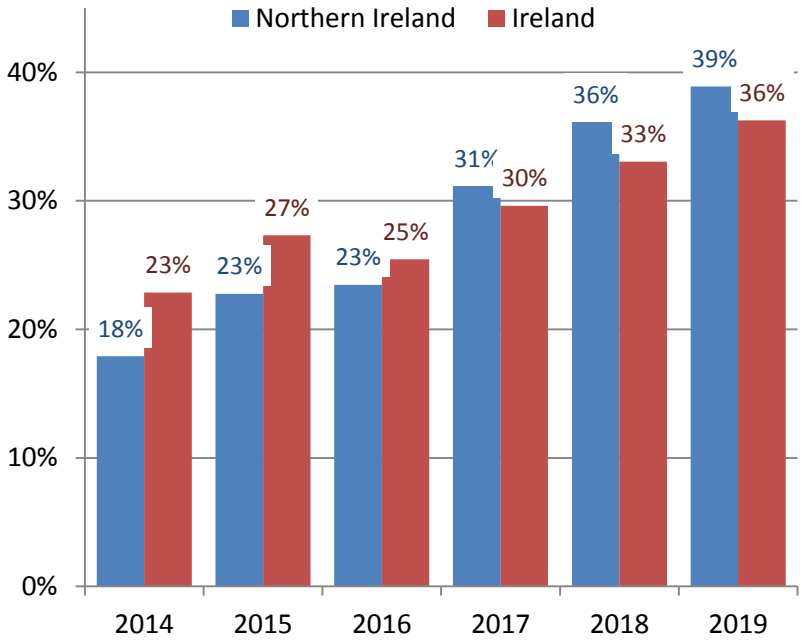
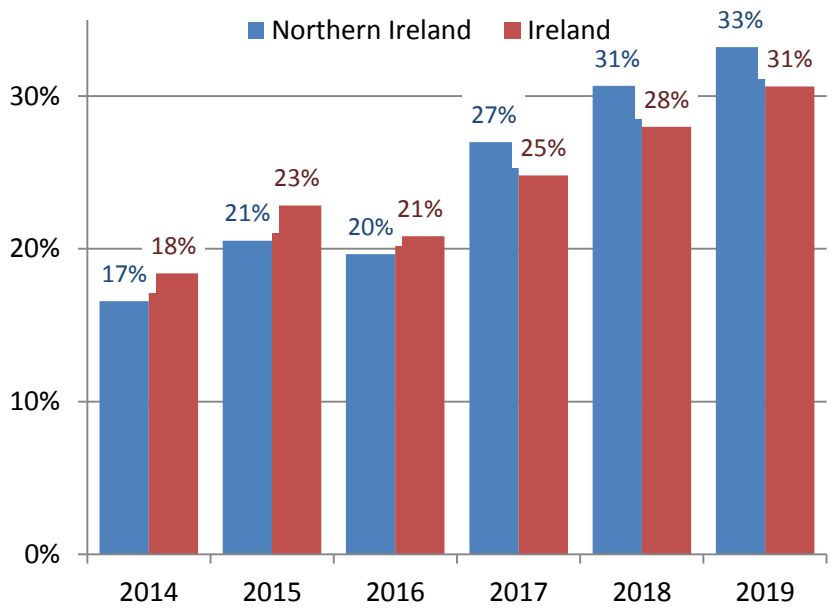
Renewable stats – historical stats
% of Demand (6 year summary)

Renewable Electricity (inc. wind)



Wind



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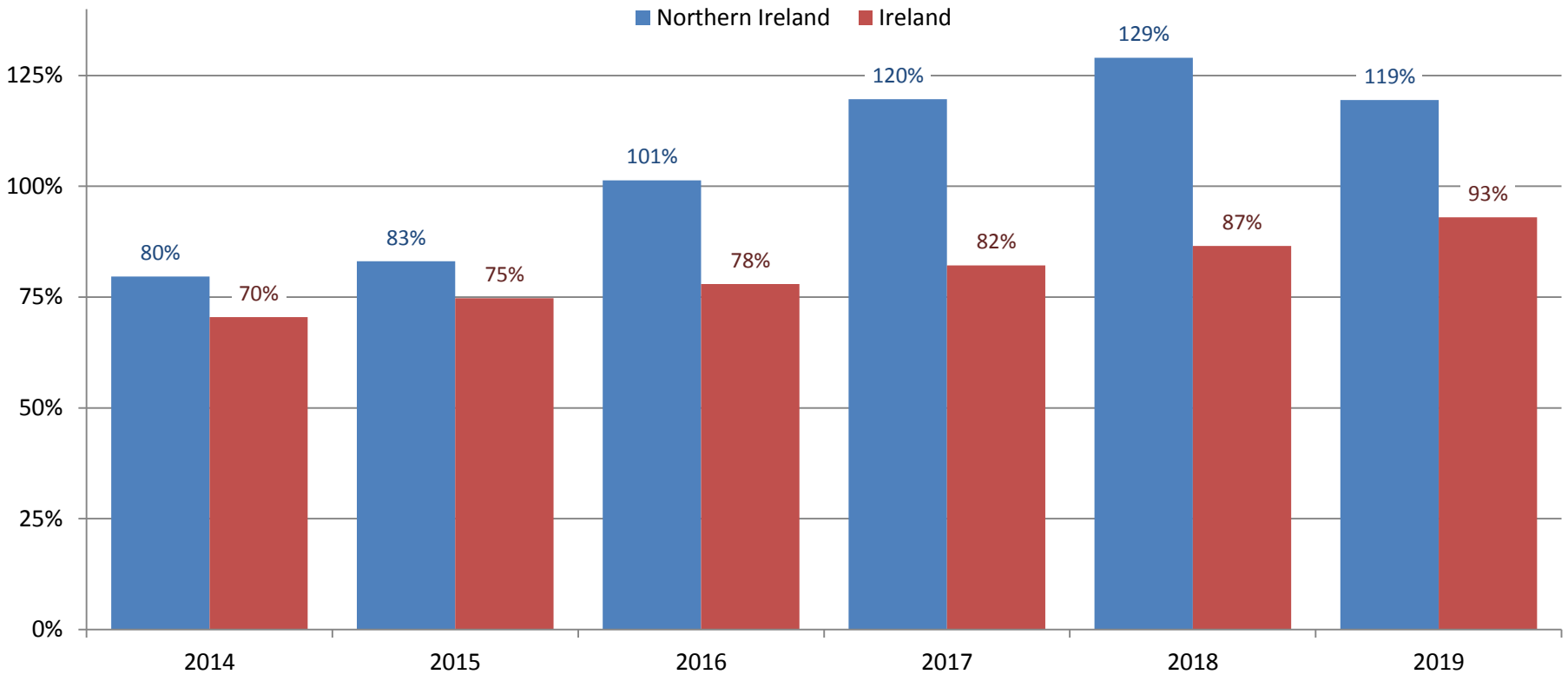
Maximum Wind Penetration as % of Demand



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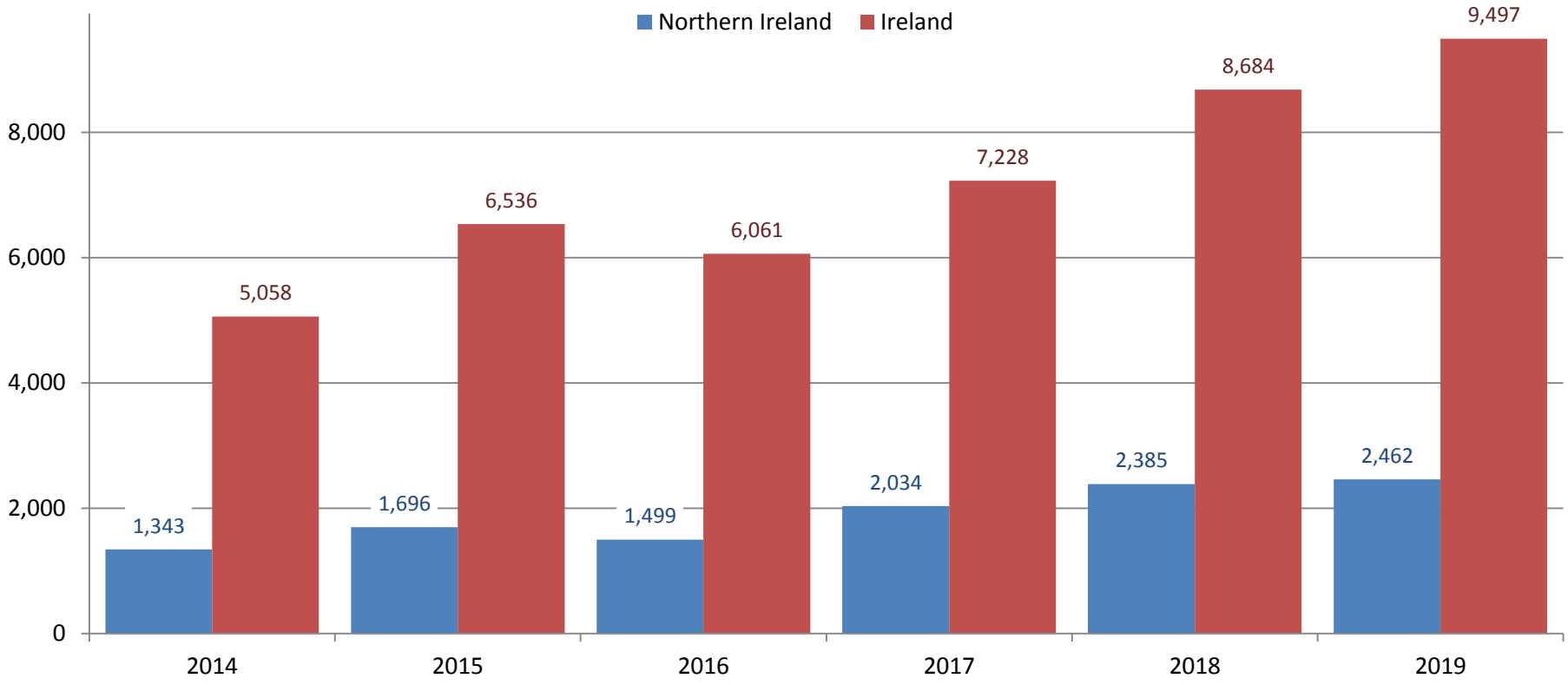
Total Wind Generation GWh



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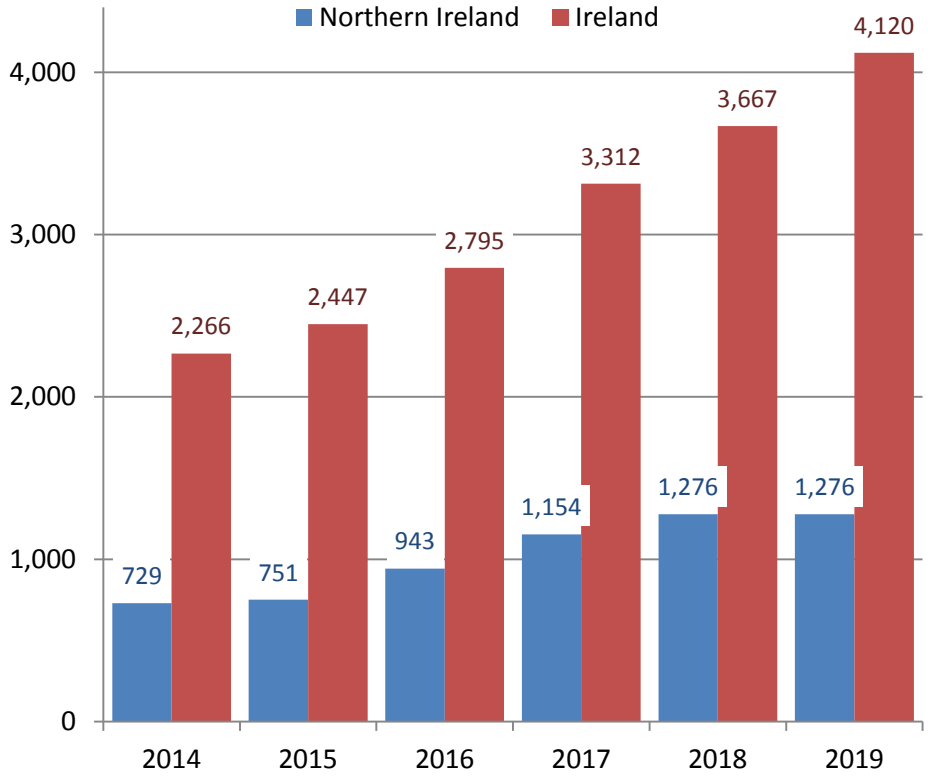
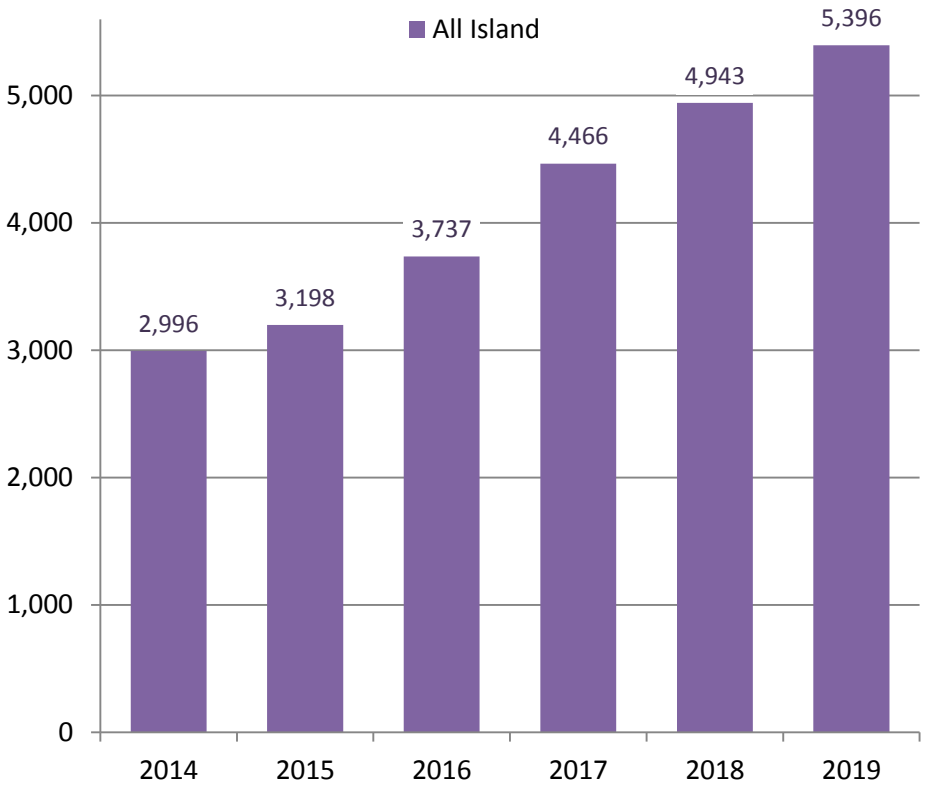
Installed Wind Capacity MW





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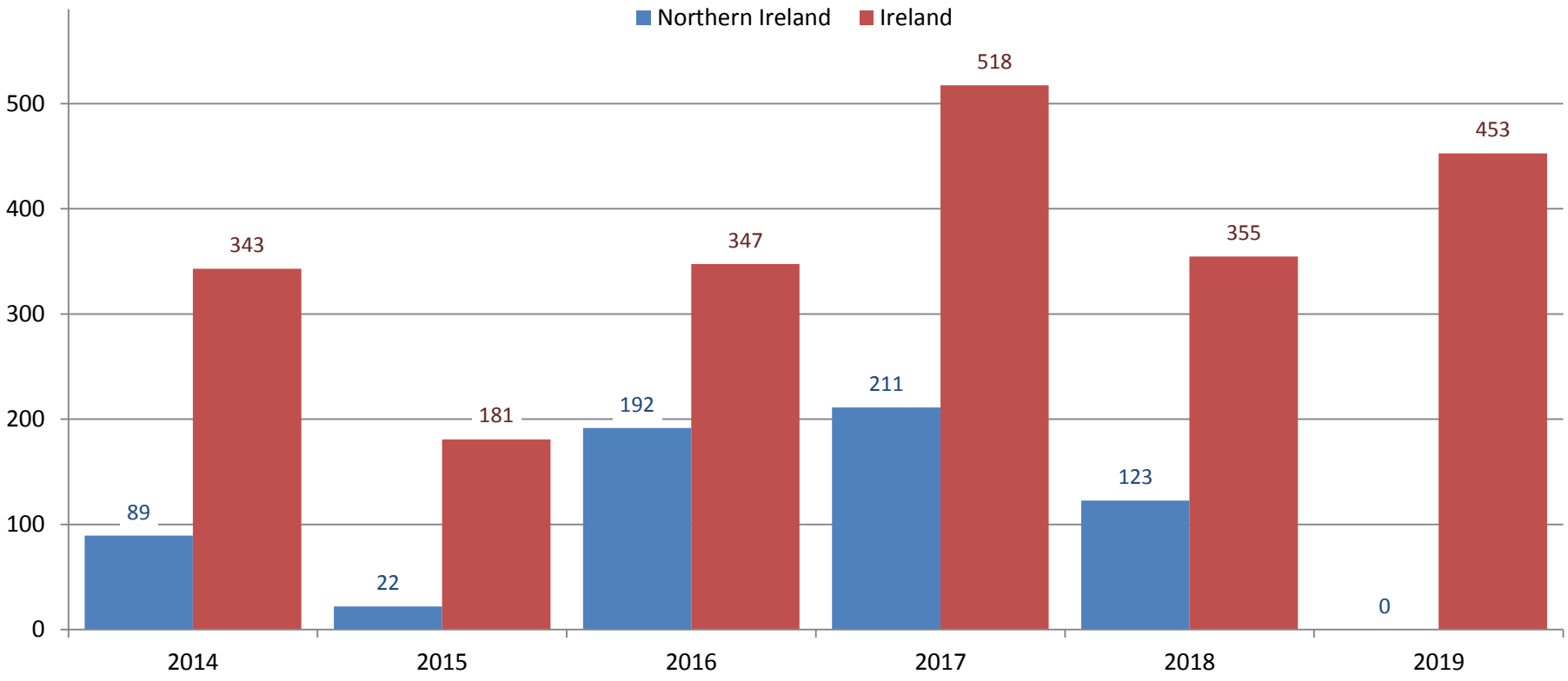
Wind Installed During Year MW



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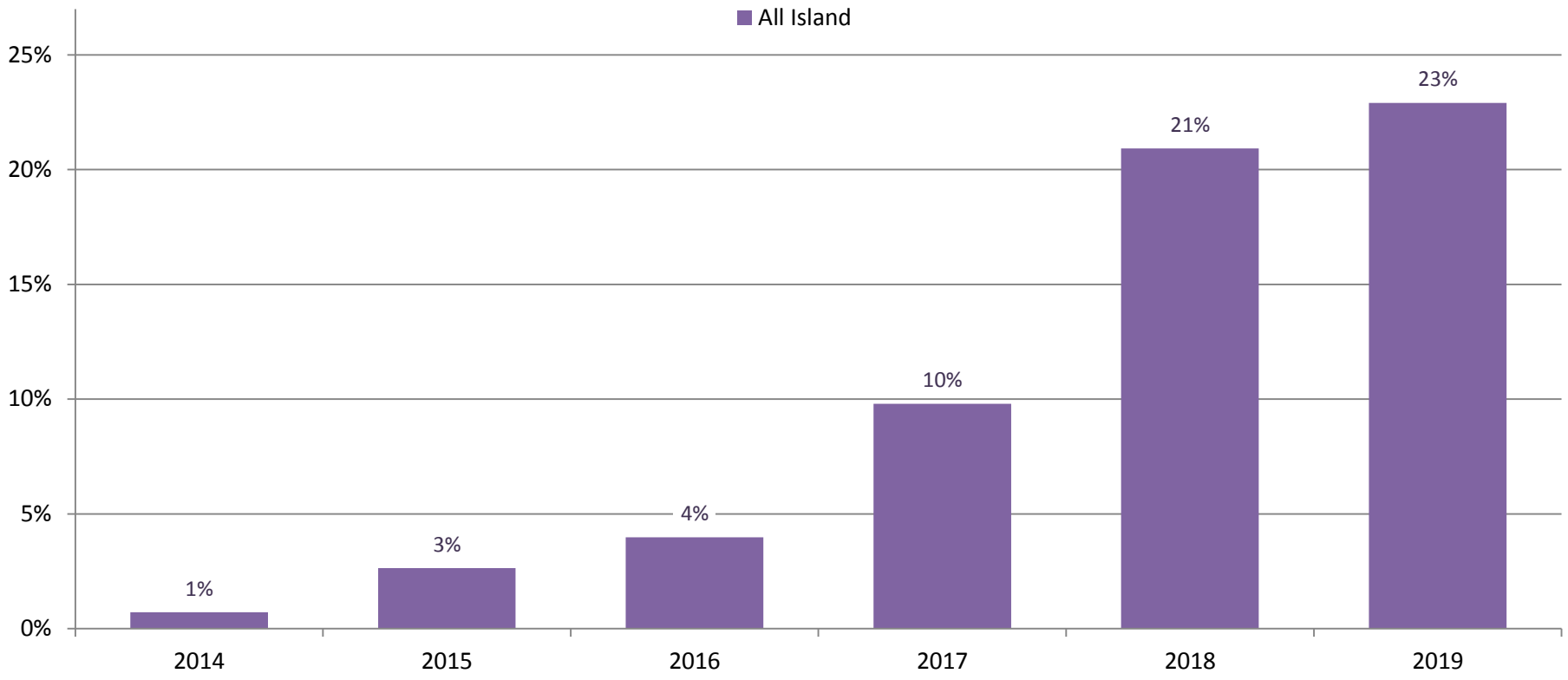
Percentage of Year with SNSP at 50% or Higher



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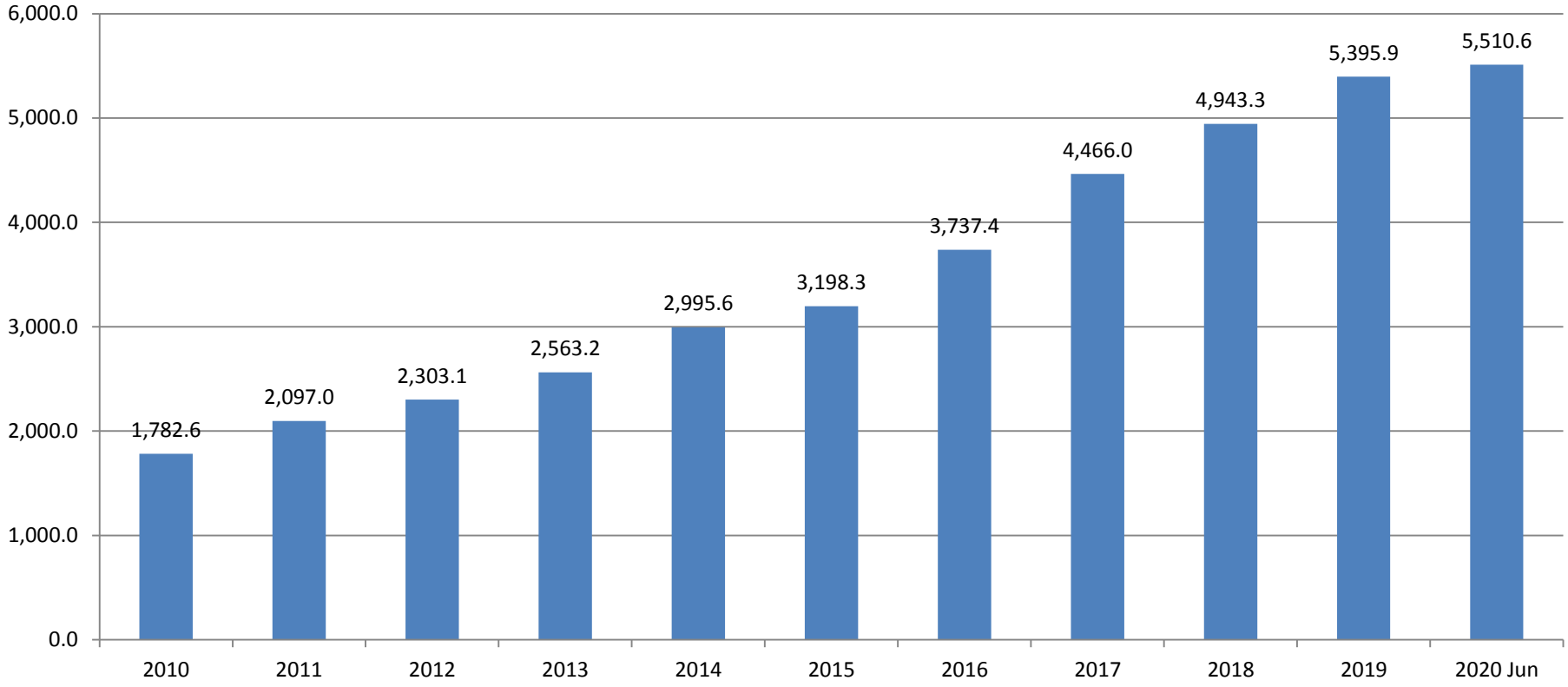
Wind Installed Capacities (MW)
All Island – 10 years



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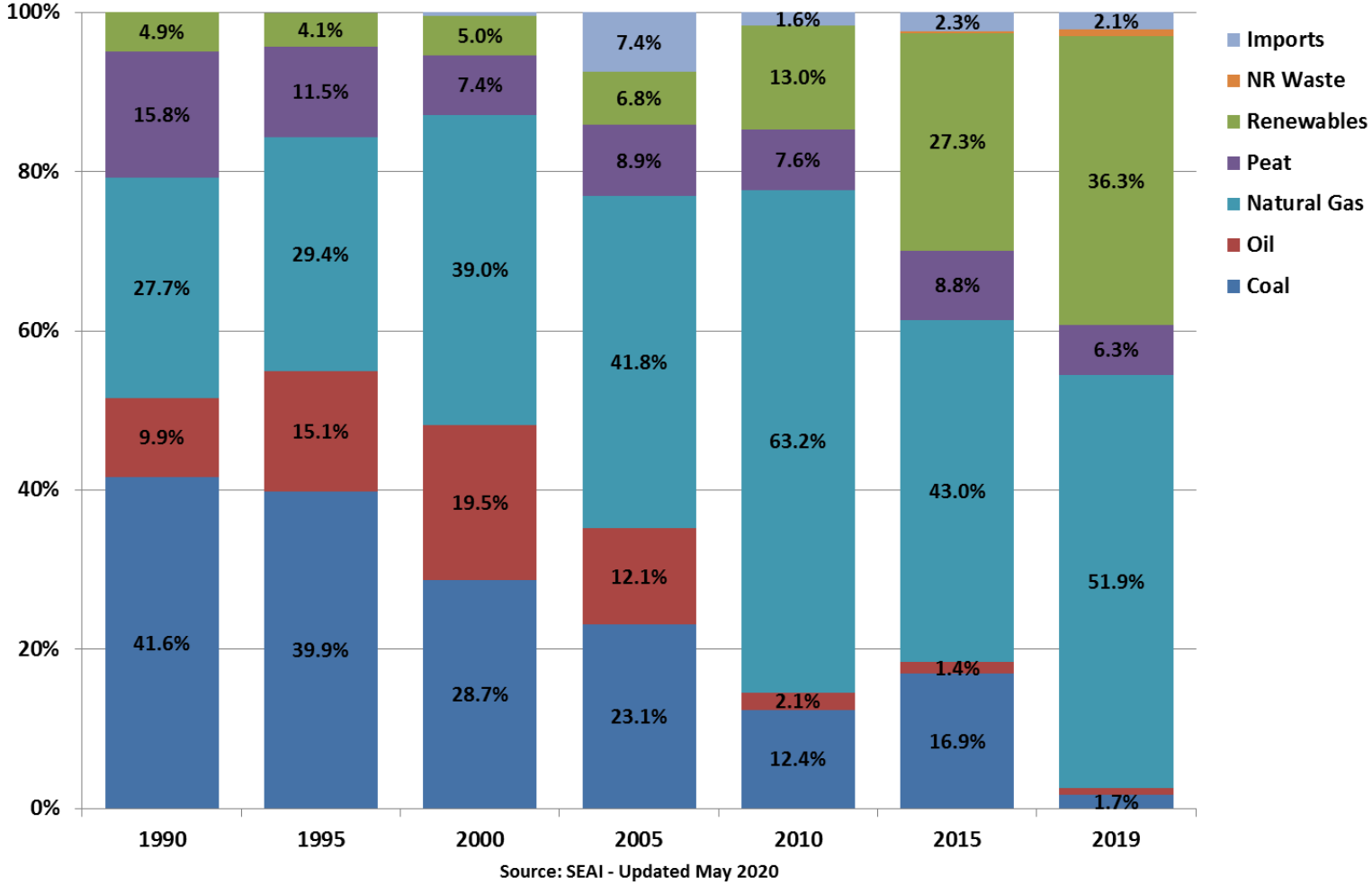
Ireland Electricity Fuel Mix



Source: SEAI - Updated May 2020

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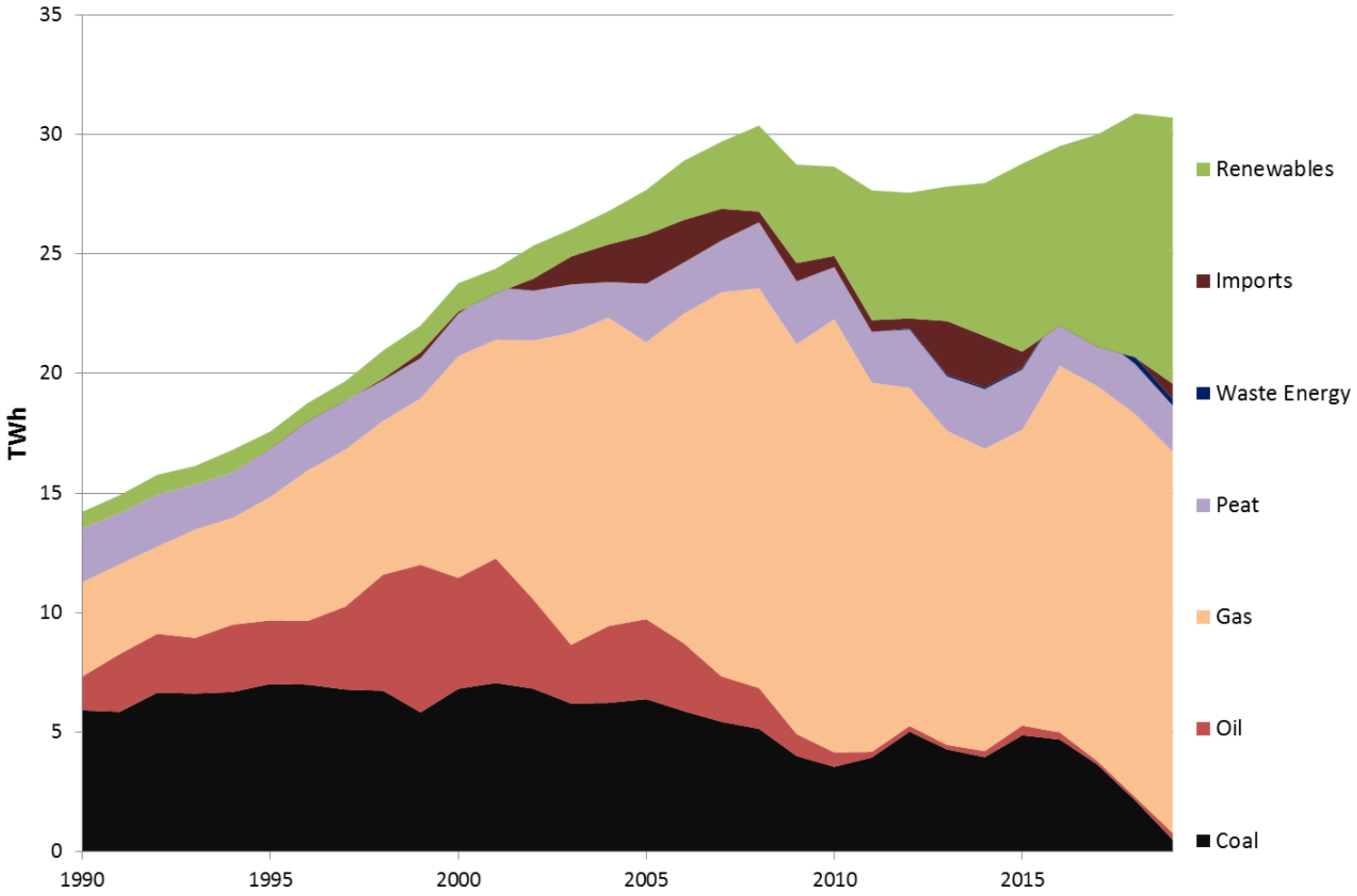
Ireland Historical Electricity Production by Fuel Type



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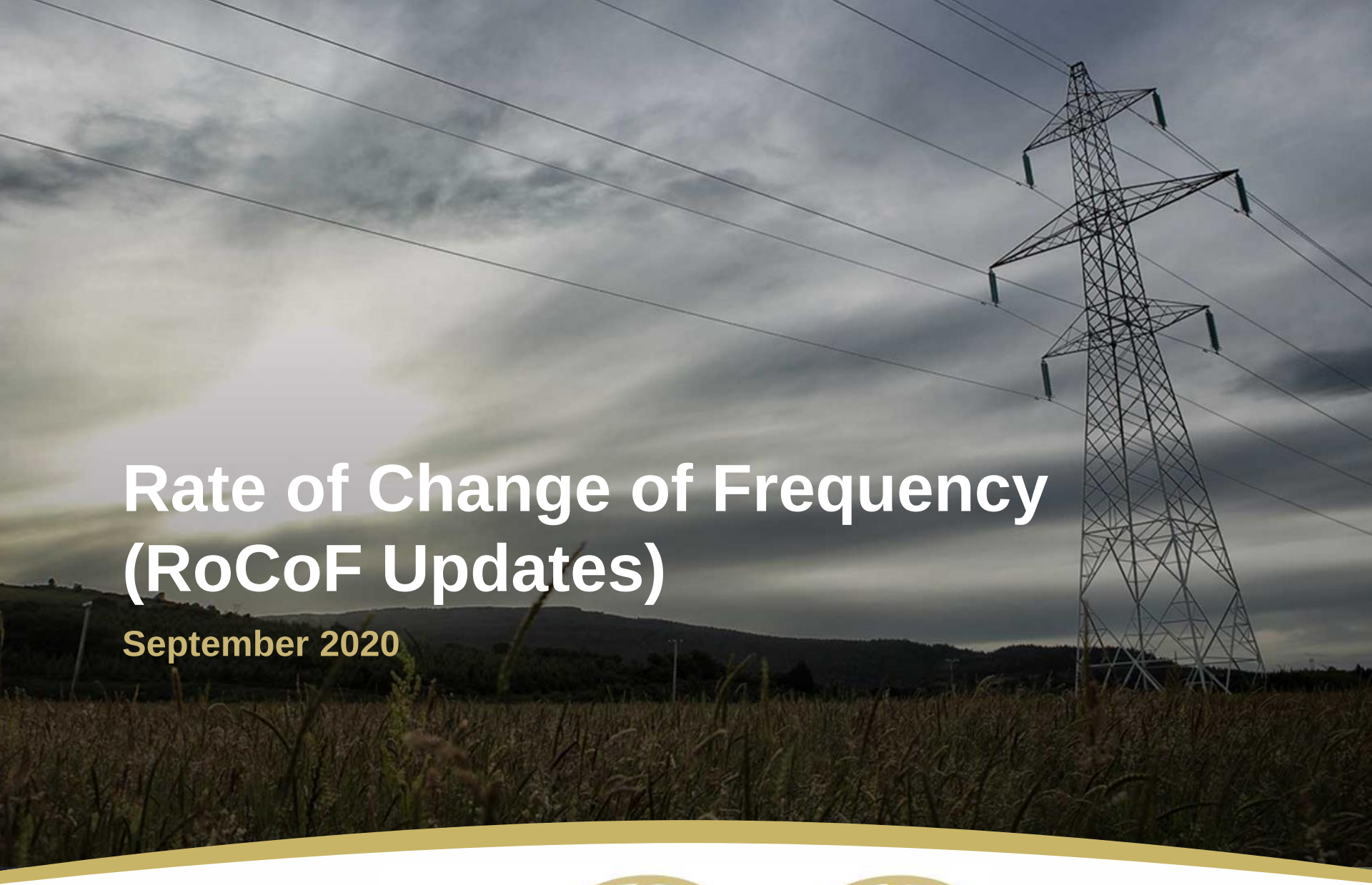

Rate of Change of Frequency (RoCoF Updates)

September 2020

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RoCoF Overview

- $RoCoF = \frac{f * \Delta P}{2(Ksys - Klost)}$
- Increasing RoCoF removes a limitation on the Inertia Floor
- Increasing RoCoF facilitates increased levels of renewable generation

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RoCoF Trial Progress

- Phases:
  - RoCoF 1Hz/s Trial Phase 1a (Overnight): 16/06 - 01/07
  - RoCoF 1Hz/s Trial Phase 1b (24/7): 01/07 – present

- RoCoF Trial Paused:
  - Amber Alert – 05/08
  - Amber Alert – 15/09
  - Louth Tandragee 2 275kV Outage – 06/08 - 26/08

- No issues in Control Centres during the Trial

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Control Centre Tools Update

Mary Hennessy, EirGrid

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Control Centre Tools - Status Update

Look-ahead Security Assessment Tool:

- Project delivery phase commenced in Nov 2019.
- Development and Acceptance testing completed in Sept 2020.
- Go Live in both control centres complete in Sept 2020.

Ramping Margin Tool - Interim:

- Project delivery is complete with rollout in both control centres in August 2020.

Ramping Margin Tool - Enduring:

- Design for Ramping Margin Tool has been validated by third party in Dec 2019.
- Procurement completed in Sept 2020.
- Project to be initiated and go live in control centres is due in Q2 2021.

Voltage Trajectory Tool:

- Procurement is in final stage and go live in control centres is due in Q2 2021.

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Procurement Update

Joe Deegan, EirGrid

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Volume Uncapped Gate 3

- Gate 3 tender is nearing completion.
- Signing of new agreements and amendments to existing contracts is in progress.
- Expected that total number of Providing Units in Framework will increase by approximately 10% following this Gate.
- Gate 3 outcome will be published in October after contracts have been executed on 01/10/2020.

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Volume Uncapped Consultation

- Consultation on procurement gates for 2021 published on 01/09/2020.
- Obtain industry view on impact of COVID-19 in ability of units to tender for System Services at previously planned for gates.
- 3 mitigating options proposed – additional gate in 2021, allow for exceptional testing at gates, reschedule 2021 gates.
- Consultation closes on 25/09/2020.
- Any TSO decision will be informed by broad industry impact and feasibility of implementation.

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Volume Uncapped Expenditure

- Expenditure note published on 16/09/2020 on the EirGrid and SONI websites.
- TSOs recognise the potential for an increase in the costs of System Services – risk of breaching expenditure cap.
- Due to: high wind outputs in winter, new participants (with fast acting services capability) due to provide services in 2021, and the impact of lower demand resulting from COVID-19.
- TSOs will continue to monitor the situation – any necessary interventions will be carried out in line with our regulatory obligations.
- No actions at this time – further note to be published in April 2021.

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FlexTech

September 2020

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FlexTech Update

- FlexTech response to consultation published on **14/7/2020**
- Consultation outline priority area for the short, medium and long term of the five working group
- Multiple Legal Entities consultation published on the 03/09/2020, response open until the **12/10/2020**
- Further Industry engagement planned for the end of this year.

DS3 Milestone plan

EirGrid

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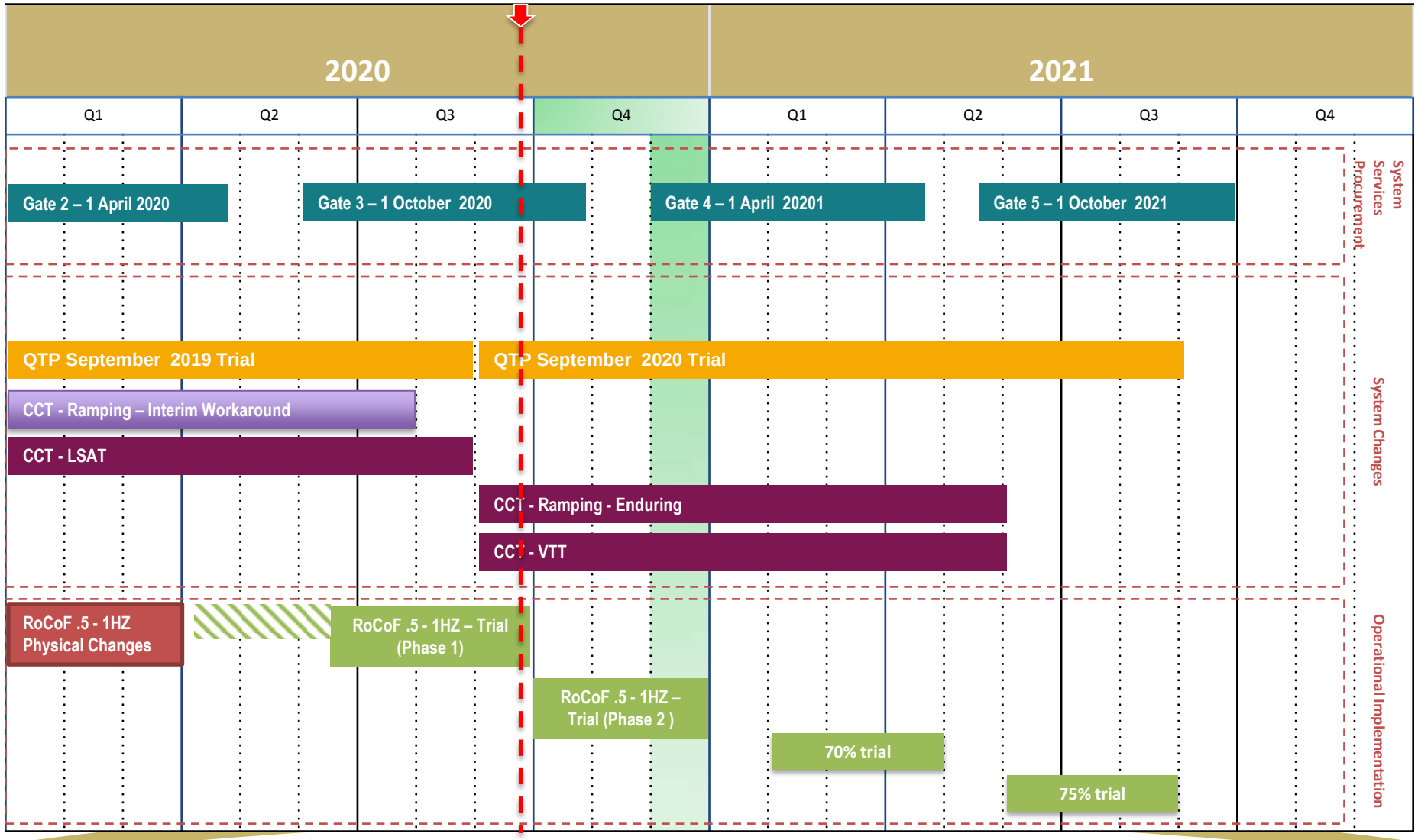
DS3 Revised Plan September 2020



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QTP Update

- QTP 2019 trials are continuing, with some delays due to Covid19.

- QTP 2020 due for publication in October

Trial 1	**Hybrid Unit/Site**
Trial 2	**Open Strand for providers**
Trial 3	**Grid Forming Technology**

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Future Arrangements

Jonathan O Sullivan, EirGrid

EIRGRID SONI

SEMC System Services Future Arrangements Scoping Paper

SEMC Workshop held August 26th 2020

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Introduction

- Consultation paper context is developing a future arrangements solution that will:
  - comply with European legislative requirements
  - align with the Irish and UK governments' policies of transitioning to energy systems which are predominantly supplied by low carbon sources of electricity
- TSOs' view is that addressing future technical scarcities with appropriate services is central to delivering government policy
- Services will need to be procured using arrangements that
  - are transparent and have the necessary characteristics for investment
  - align with operational practice
  - are an evolution of System Services work to date

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So why change DS3 System Services..?

- 12 System Services have been procured to date
  - 1073 individual services have been contracted from 179 service providers (136 in Ireland and 43 in Northern Ireland)
  - 64% of the currently contracted service providers are non-conventional units.
  - 53% of the FFR and 42% of POR service volumes are contracted from new technologies
- SNSP has gradually been increased initially to 55%, to 60% in March 2017 and since April 2018 to 65%

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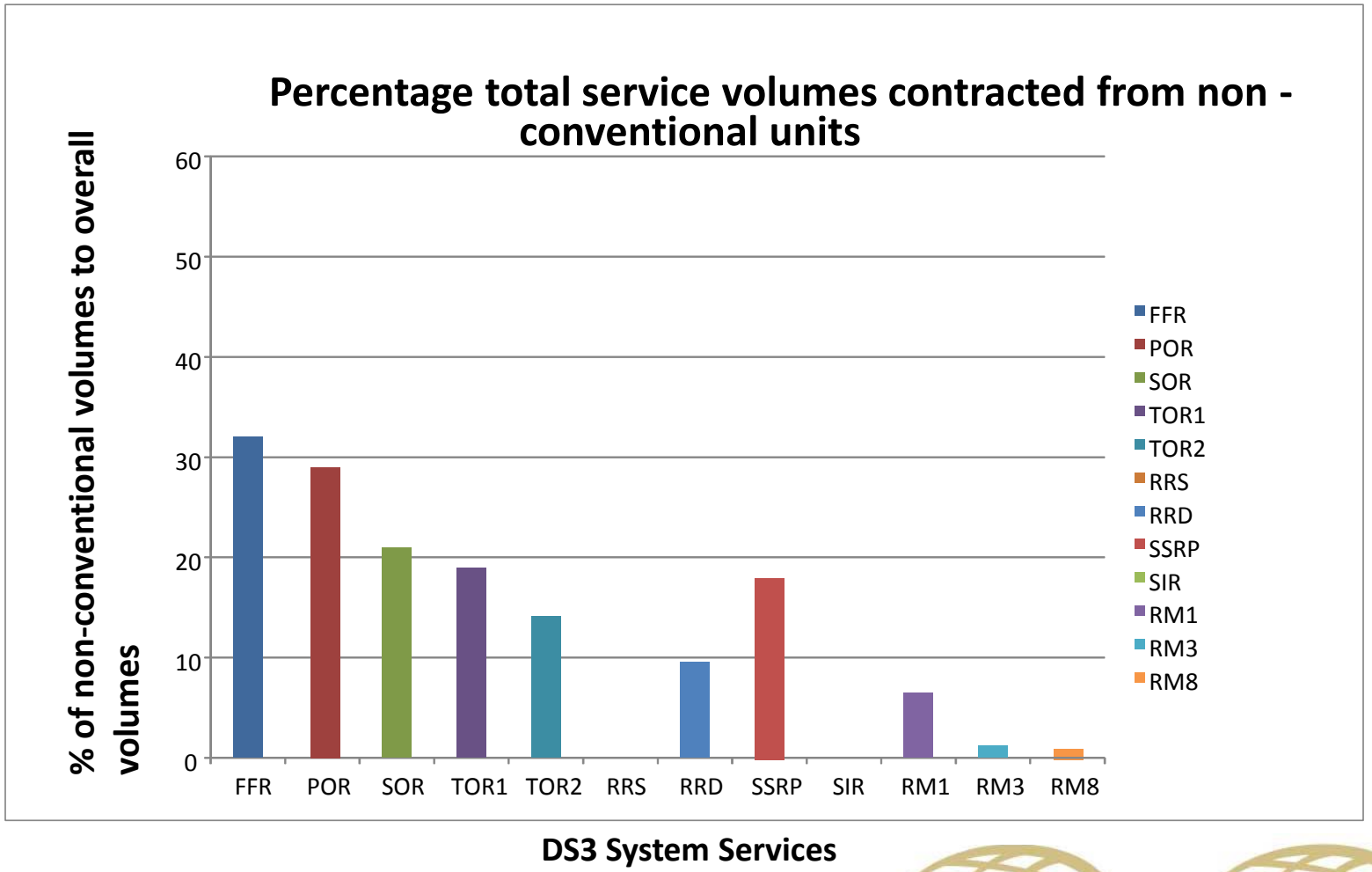
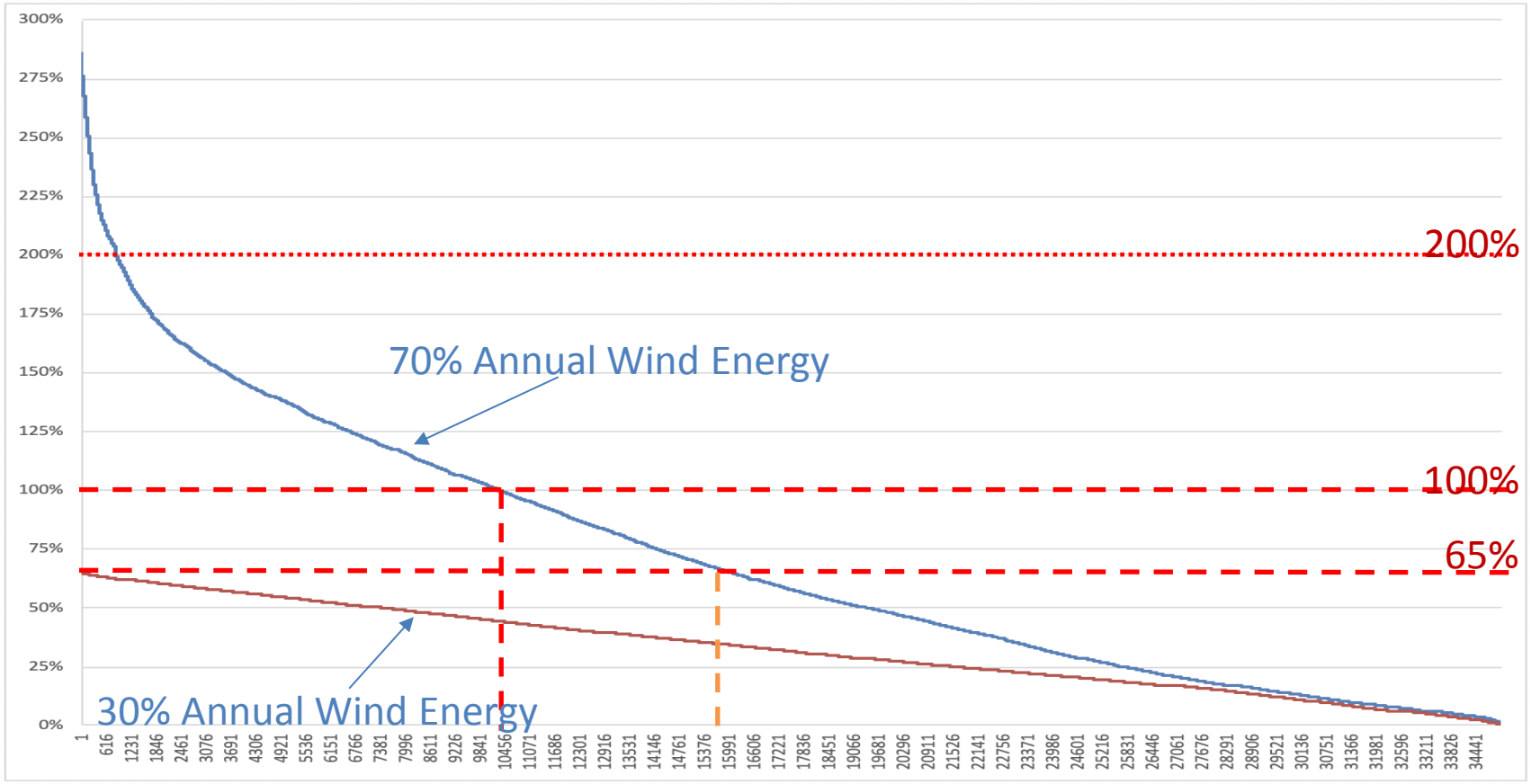
When we are getting the investment….!



But the scale of challenge to 2030 is big!!



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

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Which creates old and new challenges

Market	Connection	Uncertainty	Magnetism	Reserve
• Availability • Efficiency • Capacity	• Property Right • N-1	• Week/Month • Assumed service provision	• So much no experience with less	• Op Cost Energy • LSI

Market	Connection	Uncertainty	Magnetism	Reserve
• Renewables • System Services	• Flexible • Utilise existing grid	• Hours/Days • Forecast Service	• Low Levels • Practice breaks down	• New Sources • No op cost for some

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And we are leading in seeing these issues…

No Scarcity	Evolving Characteristic	Concern	Scarcity

	Continental Europe	Ireland & Northern Ireland	Nordic System
RoCoF (dimensioning incident)	Localised concern	Inertia scarcity	Evolving characteristic
RoCoF (system split)	Global concern	N/A	Not analysed
Frequency containment (dimensioning incident)	Evolving characteristic	Evolving characteristic	Evolving characteristic
Frequency containment (system split)	Global concern	N/A	Not analysed
Steady State Voltage Regulation	SS reactive power scarcity	SS reactive power scarcity	
Fault Level	No scarcity	Dynamic reactive injection scarcity	
Dynamic Voltage Regulation	No scarcity	Dynamic reactive injection scarcity	
Critical Clearing Times	Evolving characteristic	Evolving characteristic	
Rotor Angle Margin	Not analysed	Localised concern	
Oscillation Damping	Damping scarcity	Damping scarcity	
System Congestion	Global concern	Transmission capacity scarcity	
System Restoration	Not analysed	Evolving characteristic	

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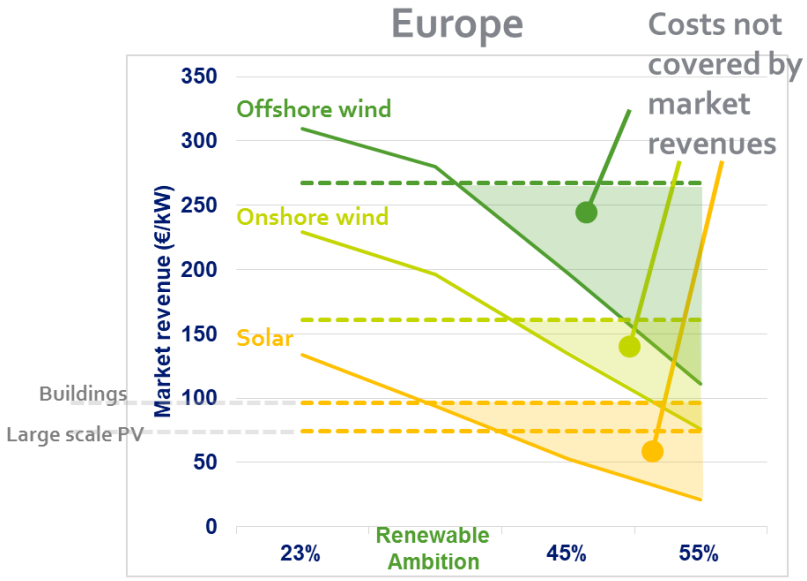
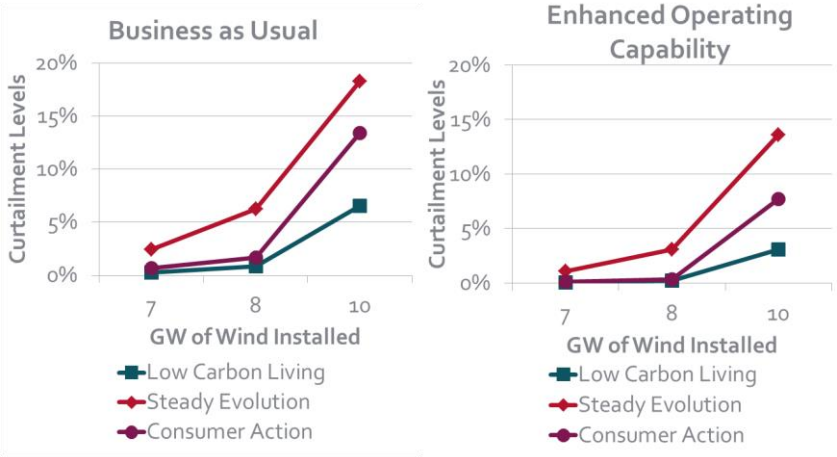
.. And the value of the right services is significant



- **Power system is transformed by the large-scale deployment of RES**
- **Energy only market will not provide sufficient revenue**



Scenario	Financial Gap (millions)	Value (millions)
Steady Evolution	€297 - €594	€300 +
Low Carbon Living	€285 - €1000	€740 +
Consumer Action	€170 - €419	€600 +

- **System services could be one of a range of mechanisms to support mitigation of the technical and financial challenges**

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But this includes the whole system - DSO and DNO critical to Future Arrangements

- An increasing number of service providers are, and will in future be, distribution connected
  - Currently 35% of service providers in Ireland and 60% of service providers in Northern Ireland are distribution connected
  - On average providers are contracted for 4 services (mainly reserves)
- Services will be required both on transmission and distribution levels to address future scarcities on both networks
  - Congestion management may be a particular concern
- Development of mitigation approaches should be aligned
  - CEP Article 31 highlights the need for this alignment
- Network usability will be a key issue

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So how do Future Arrangements look

- Essential Elements
  - **Alignment** of pioneering operational practice with market outcomes (PD paper)
  - TSO make **Commitment** to change operational practice in line with public policy objectives
  - Create **Confidence** in arrangements to drive investment

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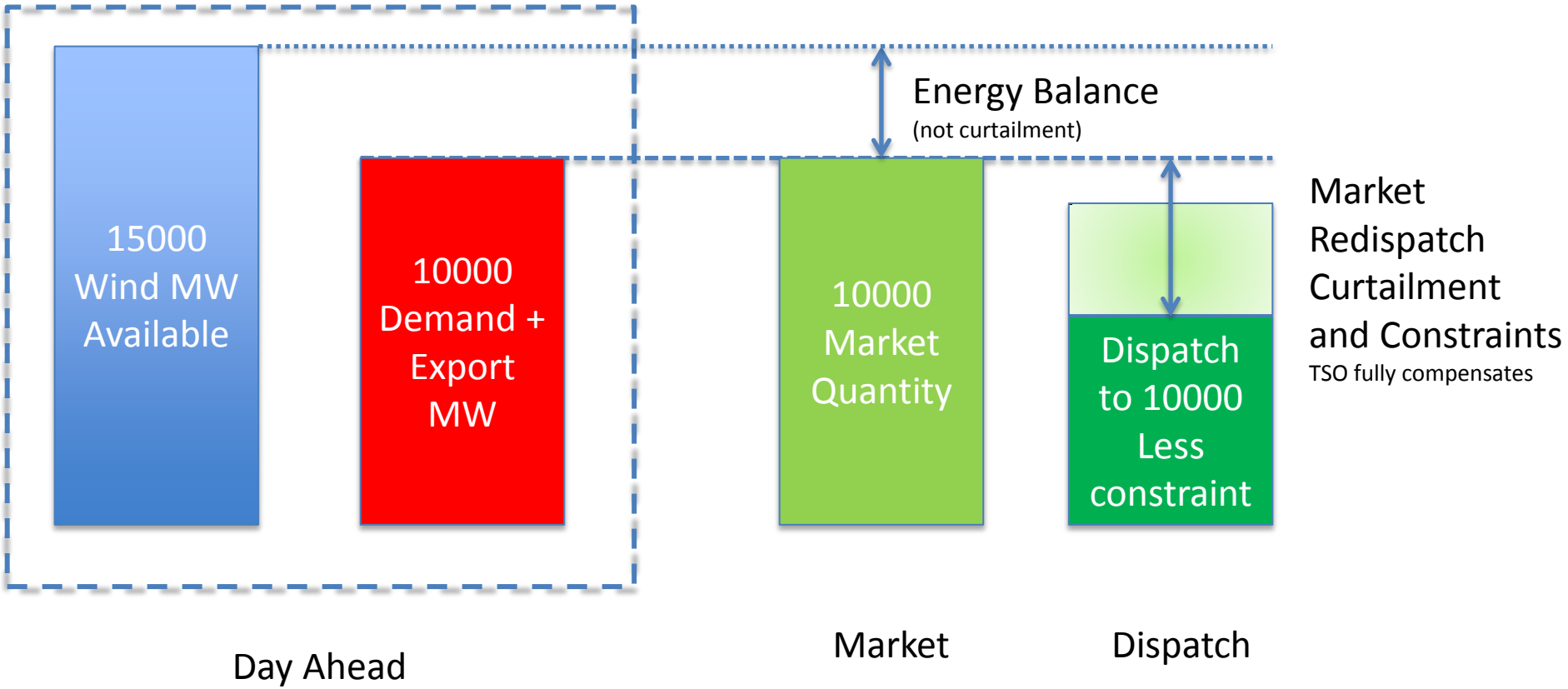
Alignment of markets to operational limits



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Commitment to change operational practice

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Operational Policy Commitment

- **Long Term Policy** for Scarcity Valuation and Product Design
- **Medium Term Policy** to demonstrate benefit of new investment
- **Short Term Policy** for Daily Auction Volumes

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Building Confidence for 3rd party investment

- Transparency of arrangements
- Length of time that the arrangements are in place
- Design of Auction
- Governance

Governance

- Paper suggests possibility of governance via a “Ruleset or Code document”

- The TSOs have a specific **responsibility for the procurement of ancillary services to ensure operational security** as noted in **DIRECTIVE (EU) 2019/944 Article 40 *Tasks of transmission system operators***. Any governance arrangements must consider the context of this. Fulfilling this responsibility requires the TSOs to have a significant governance role.

- The funding for system services is not the same as for the energy or capacity market. If the TSOs are to manage a budget with an upper limit, they must be able to exercise funding controls within the governance structure.

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Alignment with EU legislation

- CEP and EGBL requirements for current products are listed in the paper
  - Need for existing and new services indicated from technical studies
  - DSO/DNO may also have need for new products

Additional relevant areas of EU legislation

- Need to maintain an awareness of the progression of MARI and TERRE
- EBGL stipulates characteristics of a standard product bid with which balancing capacity products must comply
- further work will be required to examine the application of balancing capacity requirements in light of the proposed future arrangements
- Article 15 of EBGL referring to the DSO restricting the provisions of services from distribution connected units for system reasons is relevant
- System Operator Guideline (SOGL, EU 2017/1485) Article 182 is also relevant with regard to other aspects of TSO/DSO co-operation in facilitating reserve provision from distribution-connected units

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TSO Future Arrangement Foundations

- Should adhere to volume-based auctions for services where suitable
- Having the widest range of products in the auction provides the largest choice to participants. This is critical for success
- Segmentation of the market and removing products from a daily auction to separate "tender" competitions needs careful consideration. This restricts choice and if not well understood may lead to poor outcomes for the consumer.
- However complications in auction design for some products could lead to difficulties in implementation. These could undermine appropriate investor certainty.
- Locational aspects to some services further complicate these issues:
  - Possible Tender for locational rates rather than running a separate competition.
- Energy and System Services should not be combined into the one tender
  - If there is a need this indicates some market failure or barrier(s) that need to be removed

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General Options TSO considering

1. Hold an auction which co-optimises energy and system services within the cost objective
   - Energy and system service bids submitted
   - Objective minimises the cost of the aggregate of energy and system services

2. Run an auction which co-optimises energy and reserves.
   - Energy bids only subject to BCOP. Services position derived from the Long Term Schedule run including Transmission Constraint Groups (TCG)

3. Use the Ex-Ante energy market as starting point and sequentially auction the services with distinct daily bidding by providers
   - Leverage existing Ex-Ante market (capped for PD)
   - Facilitate post ex-ante bidding clearing auctions to determine the service providers to be paid each day

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Possible Daily Auction Outcomes

- **Right Volume for now not for the future** (e.g. reserves 200 MW but 400 MW needed for 2030)
  - Use future volume and show scarcity (regulated bid price); OR
  - Let auction results stand but send medium term expectations with new service capability;
- **Right volume for now and the future but wrong technology** (e.g. right reserves for future but all from conventional)
  - Run auction with limit on service from existing technology; OR
  - Let auction results stand but send medium term expectations with new tech investment;
- **Right volume for now and the future and right technology**
  - Auction results stand

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..and if we dispatch differently…?

- But we have a central dispatch model and we often dispatch away from the position (**Alignment** will significantly reduce the need to do this)
  - Pay Dispatched on Minimum (Price Cap, Bid price) for dispatch on Pay for additional useable needed services above Market Position (but not all);
  - Pay Dispatched down Market position revenue; AND
  - Pay for additional useable needed services at Physical Position (but not all);

Market Power and Price Caps

- Market Power needs market abuse
  - Caution that market power in energy is simpler than services
  - Having market power is not a problem; abuse of it is
- Bigger challenge is the interactions and needs of system
  - System Services Non-linear, inter temporal and Interactions lead to inadvertent outcomes
- Best approach is price caps informed by Value for all services
  - Apply similar exercise as we did for DS3 System Services
  - Where risk lies may need to increase these to acknowledged RISK profile

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Miscellaneous but important issues

- Barriers to new technology need to be addressed
  - Qualifier Trailing Barrier Breaker – DS3+ FlexTech
  - No load motoring energy contracts
- Useable Service provision
  - Pay for what is useable
  - If not useable need to clarify risk
    - E.g. Network Firm / Non firm – long term flexible network..?
- Performance Scalers
  - Apply to daily revenues for providers
  - Use as Auction and Schedule prohibition

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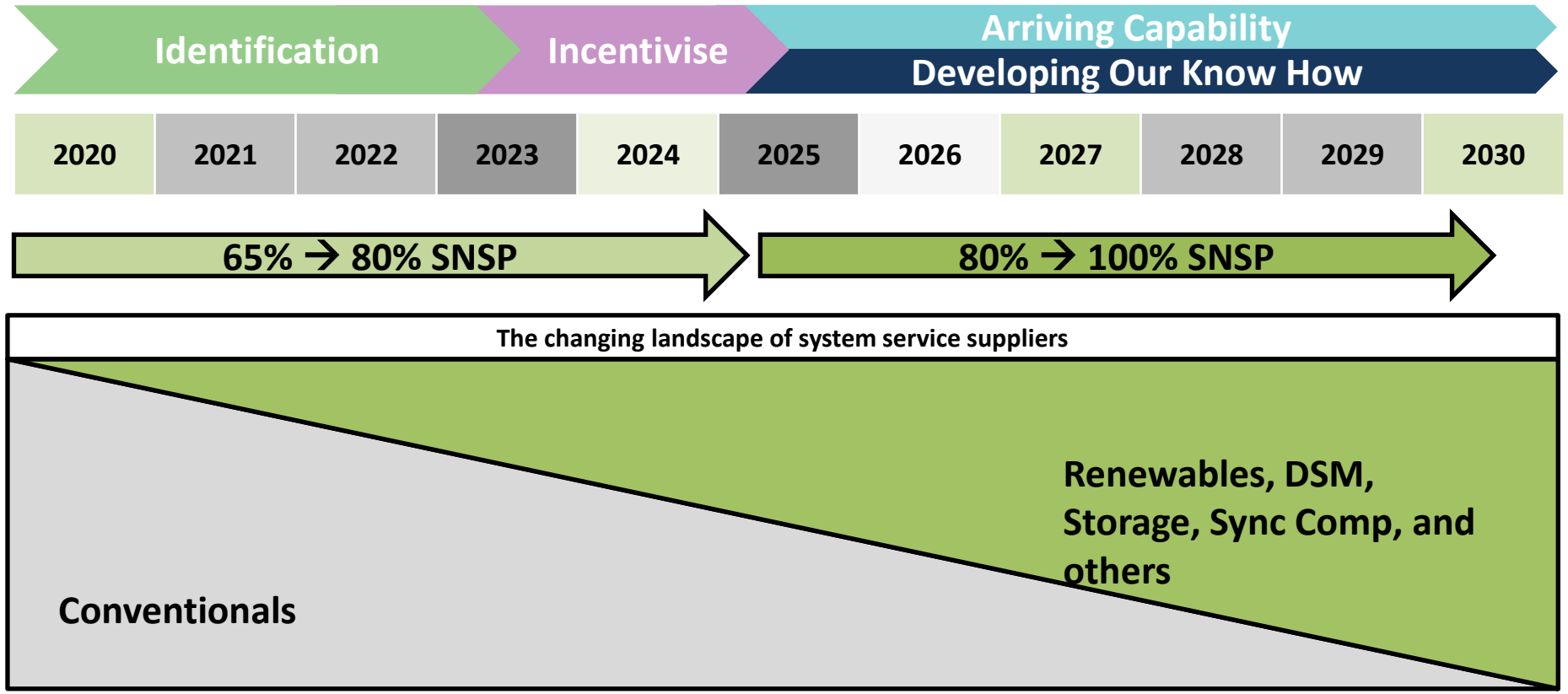
The Journey for the next decade



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DS3 Advisory Council Membership / Open positions

Jonathan O Sullivan, EirGrid

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AOB

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DS3 Advisory Council meeting dates 2020/2021	
Q1	26 February 2020
Q2	20 May 2020
Q3	30 September 2020
Q4	20 January 2021
Dates may be subject to change	

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