STORAGE IN IRELAND- AN OVERVIEW

IWEA Autumn Conference

October 11th 2018

Bernice Doyle

Chair IWEA Storage Committee

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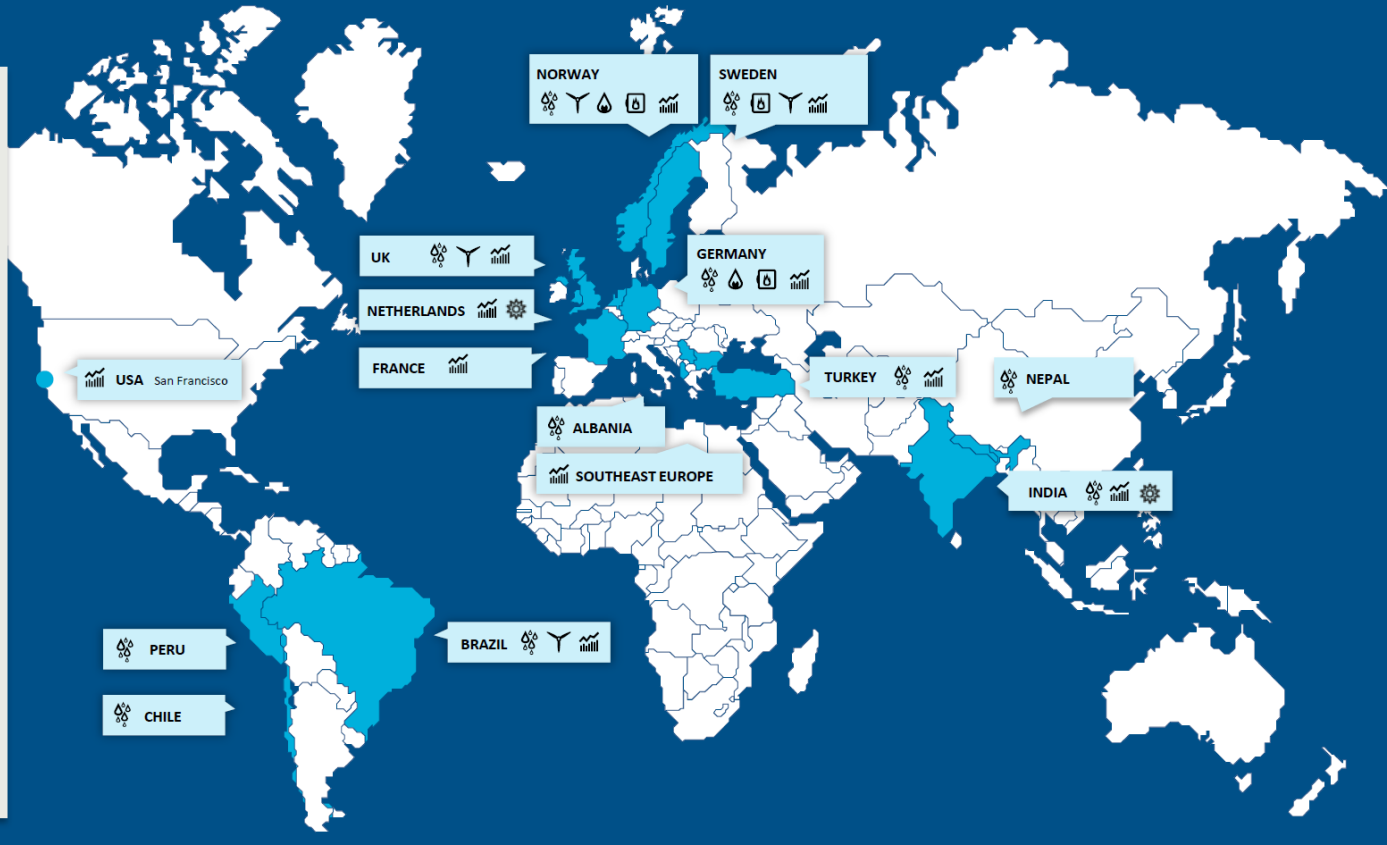
OWN CAPACITY
19 100 MW

THIRD PARTY CAPACITY
20 000 MW

GROSS REVENUES 2017
EUR 7.3 bn

NET PROFIT 2017
EUR 1.2 bn

EMPLOYEES
3 500



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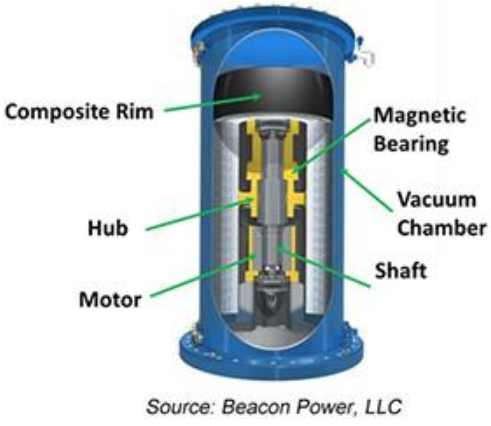
Energy Storage

“A temporal transporter of electricity through time”

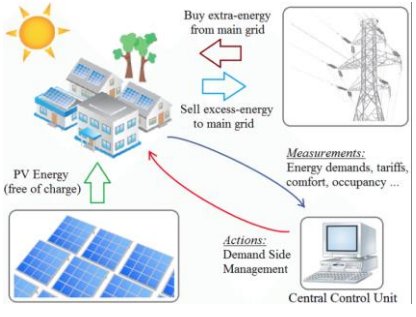
Mark Alexander, Viridian

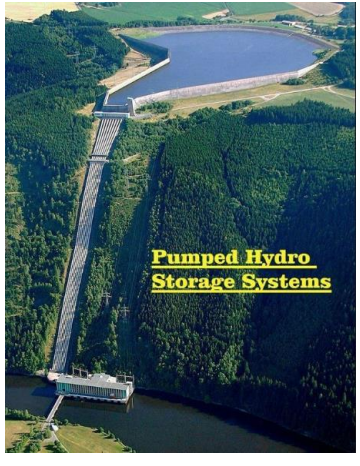
Large-scale storage technologies

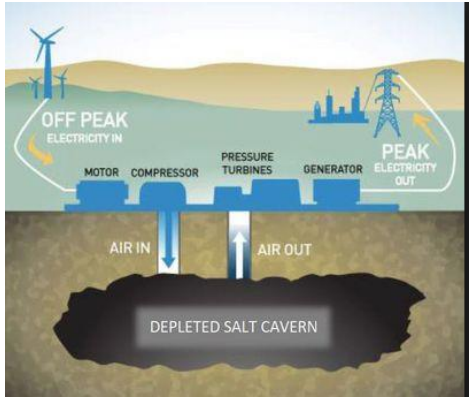
- Pumped Storage
- Compressed Air Energy Storage (CAES)
- Flywheels
- Demand Side Units (DSUs)
- Batteries



Source: Beacon Power, LLC







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Storage in Ireland

- Pumped Storage- 1974- Turlough Hill 292MW for 4.5hrs
- Utility-scale battery- Kilroot- 10MW/ 5MWh 2016

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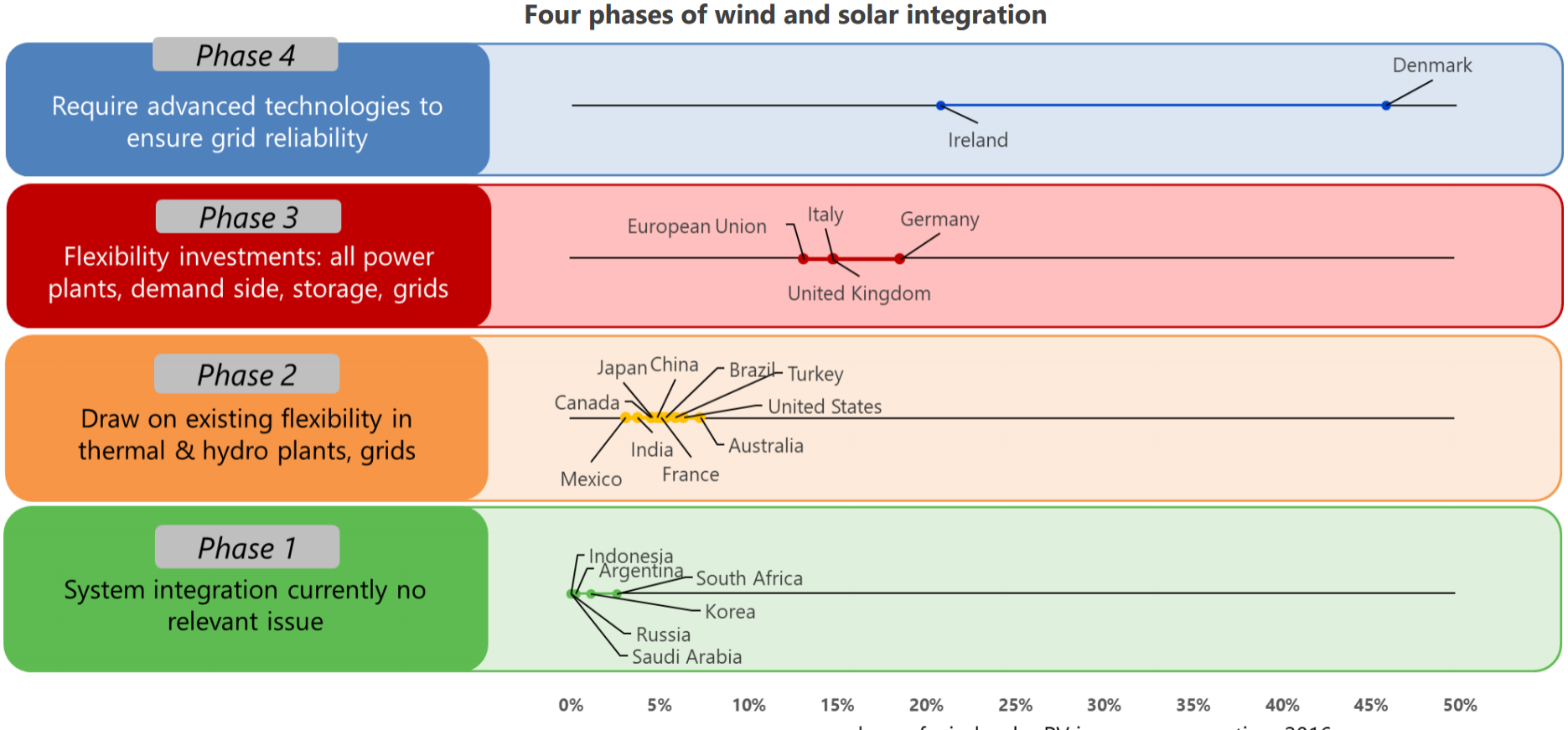
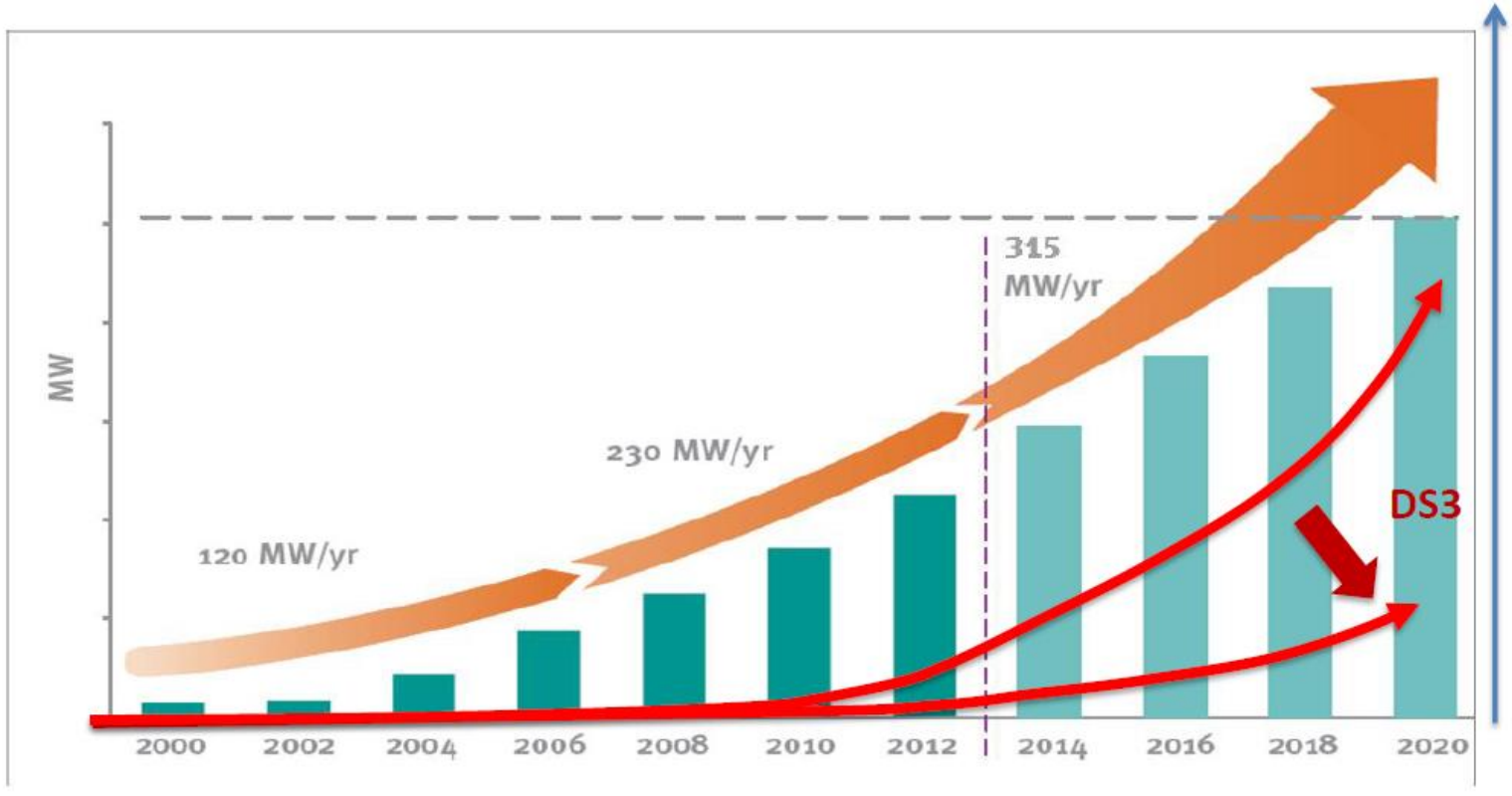
1. Why Storage and why now in Ireland?
2. Which storage technologies?
3. Why batteries?

Europe leads the way in system integration of variable renewables





Illustrative SNSP curves

SNSP- System Non Synchronous Penetration

The proportion of power being provided by non-synchronous sources- wind/ solar/ IC

DS3 System Services

- EirGrid DS3 System Services the most ambitious increase in ancillary services of any TSO worldwide

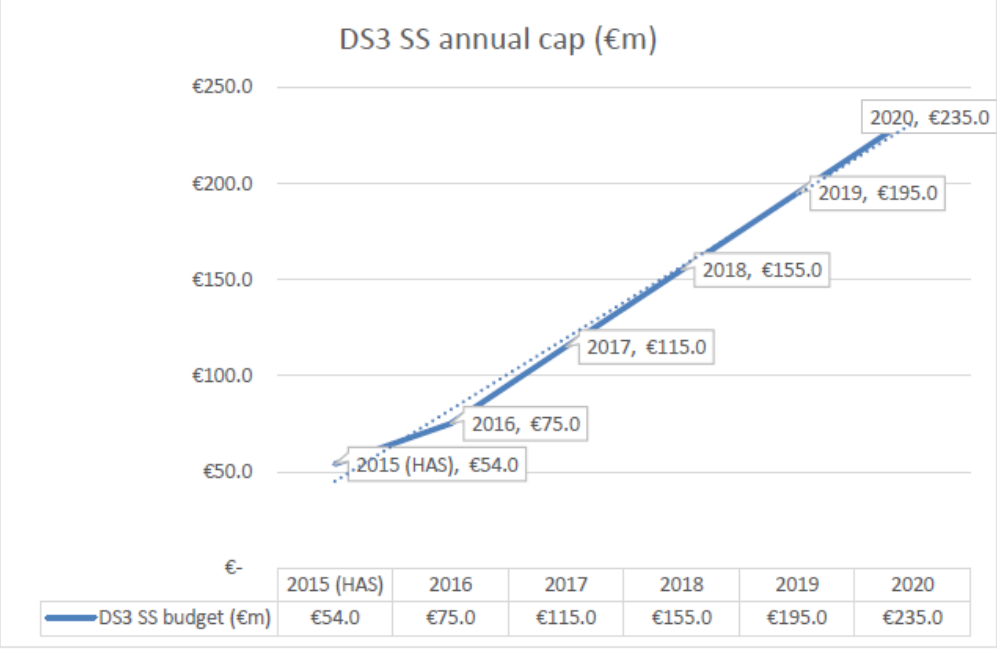


Figure 3: DS3 System Services Glide-Path

DS3 System Services- Reserves

Volume- Capped services subset- Batteries/ DSU/ ICs can provide all 5

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% within 250 ms of voltage >90%
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

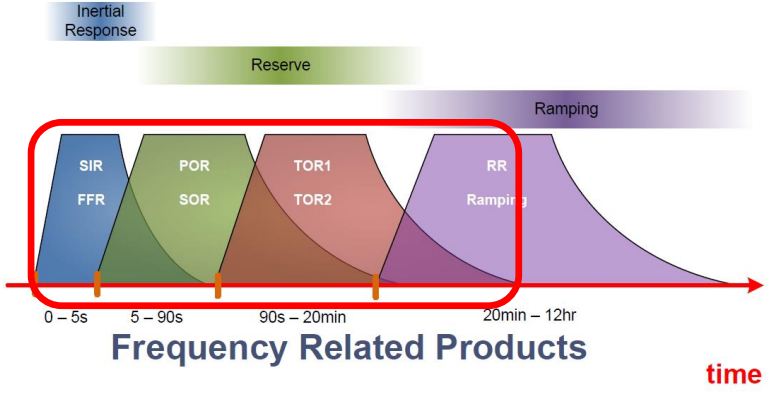
Wind Turbines- up to 10% MEC

Conventionals- ~5% MEC

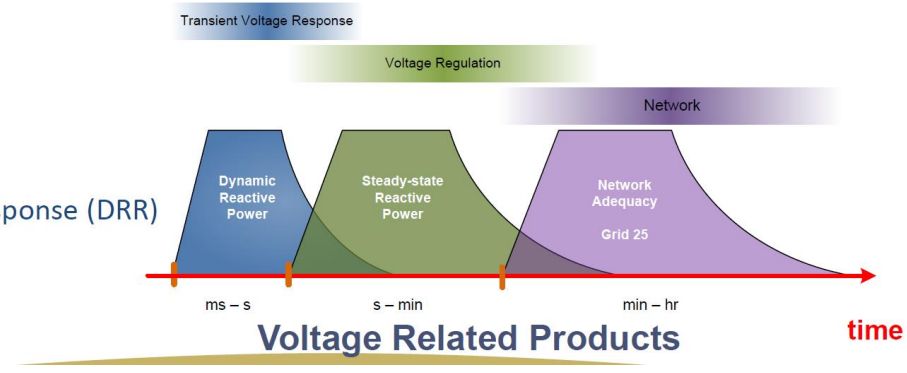
- EirGrid DS3 System Service Contracts for Regulated Arrangements Recommendations Paper- 12/12/2017

Reserve Products

NEW
- Fast Frequency Response (FFR)
- Fast Post-Fault Active Power Recovery (FPFAPR)

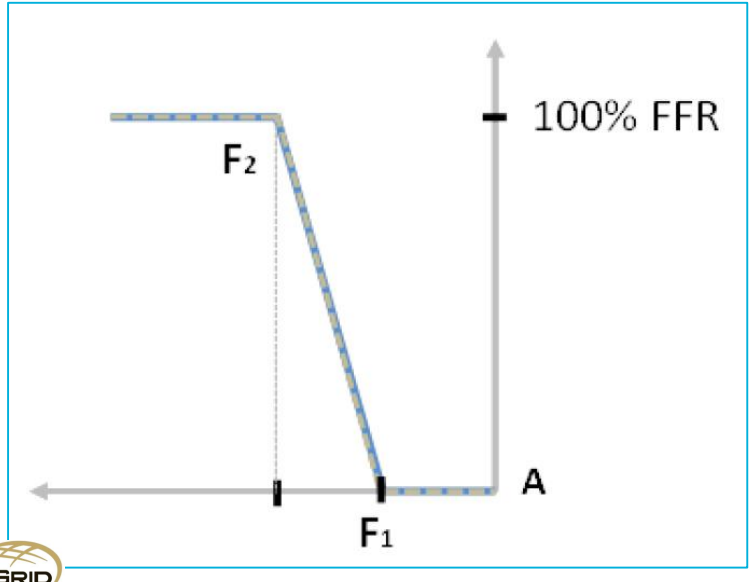


NEW
- Dynamic Reactive Response (DRR)

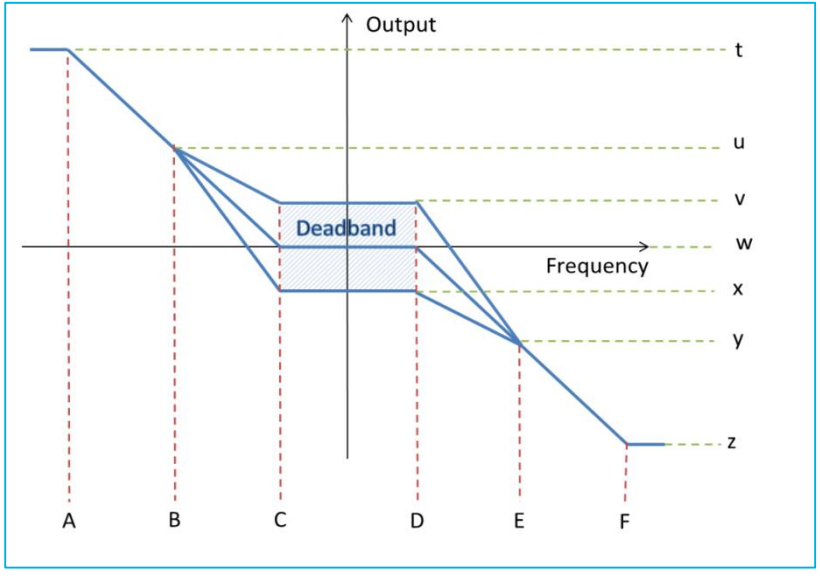


Fast Frequency Response- Ireland vs. GB

- Ireland Fast Frequency Response (FFR)
  - Non-symmetric, mainly low-frequency response, low-utilisation



- GB Enhanced Frequency Response (EFR)
  - Symmetric, regulating, high utilisation



…and then there's GB FFR (Firm Frequency Response)…. confused yet?

Procurement

1st Contracts May 2018

Suits existing conventional, DSUs, ICs and Wind
Little capital investment needed

Volume Uncapped

- Tariff-based payment- subject to various scalars
- Any unit can participate
- No limit on volume
- 6-monthly procurement gates
- All tariff-based contracts due to end April 2023
- 1-year unilateral termination for SO
- Ability to revise tariffs if risk of over-spend
- No build-time

1st Auction Q1 2019

Suits batteries requiring large capital investment- will DSUs/ ICs participate?

Volume Capped

- Pay-as-bid auction- limited operational scalars
- High Availability Requirements- 97%
- Volume-capped- 90-140MW in 2019
- Annual auctions?
- 6-year fixed contract
- No unilateral termination
- No revision of payments
- 2-year build time

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Why battery technology?

- Capable of very fast response
- Quick and easy to deploy
- Relatively established
- Low rate of self-discharge
- High Charging efficiency
- High Energy Density

Battery Projects in Ireland

- Planning- relatively straight-forward- >400MW with planning
- Grid- ECP-1 is processing 371MW DS3 grid- 5 times over-subscribed
- Grid Code requirements for storage units- PPM modification
- Noise- one to watch out for
- Fire Regulations- key risk to manage
- Network Charges- BESS charged as demand and generation
- Market Charges- PSO Levy inappropriate for BESS
- Rates- uncertainty re evaluation method

Future Volumes- 2030

IWEA 70 by 30 Report

- 1200MW large-scale storage by 2030

EirGrid Tomorrow's Energy Scenario Report

- 1200MW large-scale storage by 2030 in low carbon living scenario

Future Volumes- 2020

2016- Volume Calculation Methodology and Portfolio Scenarios DECISION PAPER

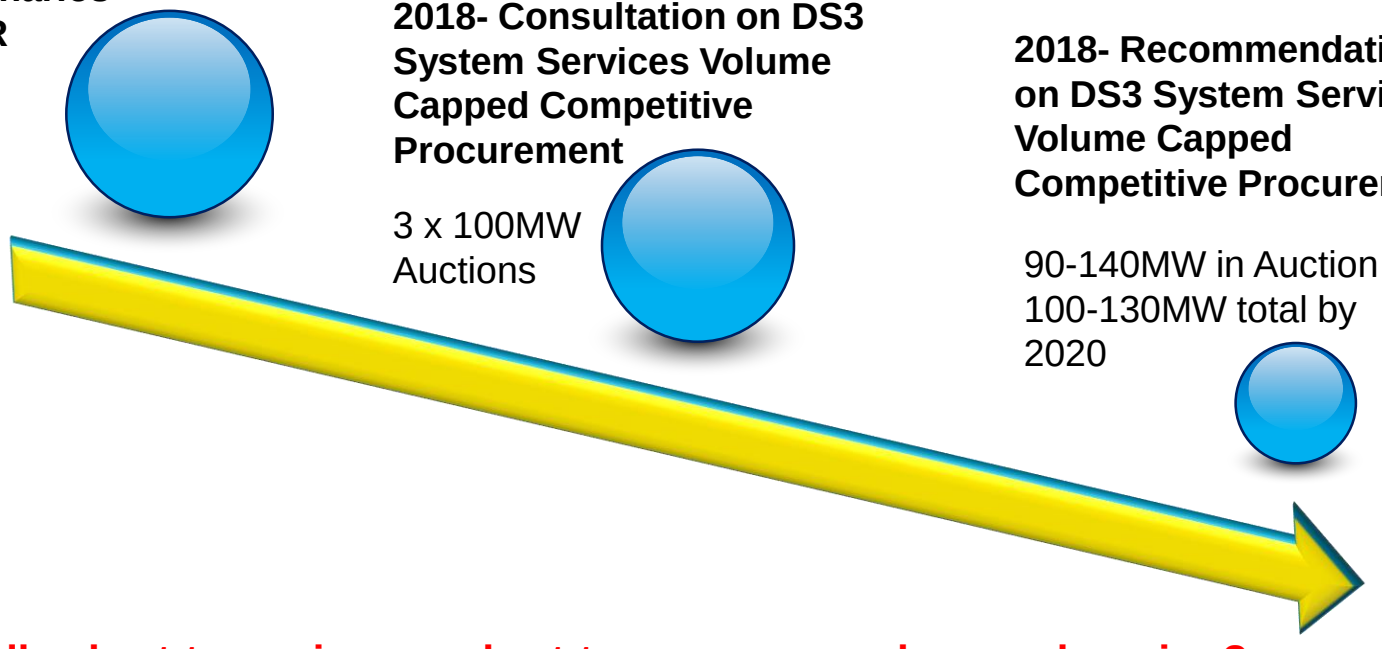
DSU/ IC / Storage FFR provision 582-707MW

2018- Consultation on DS3 System Services Volume Capped Competitive Procurement

3 x 100MW Auctions

2018- Recommendation on DS3 System Services Volume Capped Competitive Procurement

90-140MW in Auction 1
100-130MW total by 2020



Why is EirGrid's short-term view on short-term reserve volumes changing?

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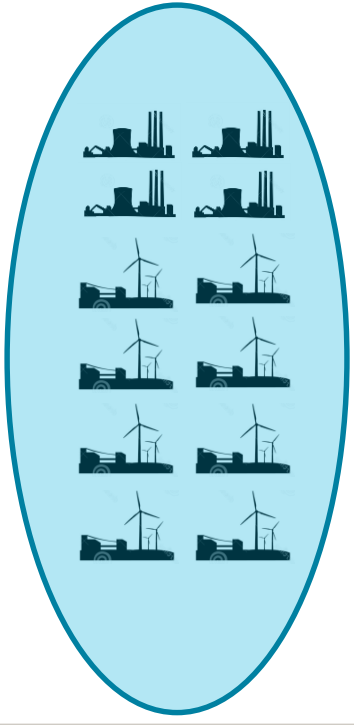
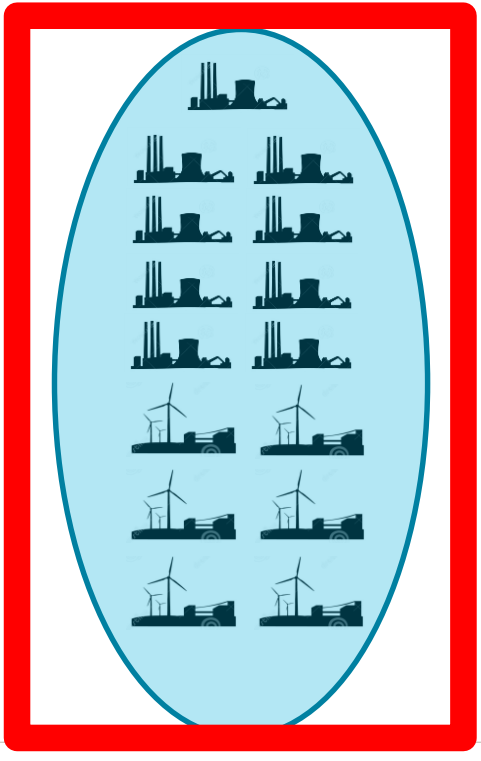
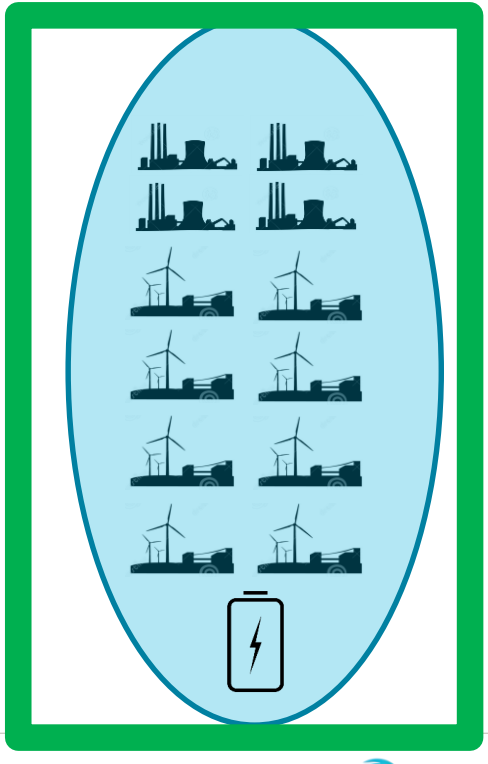
Unconstrained Run
4 conventional units dispatched
1600MW conventional
3000MW wind
200MW Reserves



Constrained Run- no batteries
9 conventional units
1600MW + 500MW*=
2100MW conventional
2500MW wind
400MW Reserves
125 tonnes additional CO_2



Constrained Run- With 400MW Battery
4 conventional units
1600MW conventional
3000MW wind
400MW Batteries
400MW Reserves
0 additional CO_2



Consider constrained dispatch options for 1 ½-hour trading period…

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IWEA Storage Committee

- Representing the interests of the Storage industry in Ireland
- Wind and storage are complementary, especially at the very high penetration levels anticipated by 2030
- 20+ member organisations represented

Objectives

- Addressing key policy and regulatory issues facing storage projects
- Monitoring delivery of DS3 programme to 2020
- Work on 2030 scenarios and understand the implications for System Service requirements
- Development of System Services regime to maximise the opportunity for storage technology to meet the needs of a high SNSP system

Conclusion

- Industry has ramped up quickly in Ireland due to relatively low barriers to entry
- ECP-1 DS3 grid heavily over-subscribed
- Auctions will be highly competitive
- Industry needs to understand EirGrid volume forecast for services
- Batteries will be the most cost-competitive source of fast reserves in foreseeable future
- Batteries are a key technology to 70% RES in 2030

THANK YOU

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