DS3 Industry Forum

15 November 2018

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Agenda - Morning

Topic	Time	Speaker
Introduction and Welcome	10:00	Jonathan O'Sullivan – 10 minutes
DS3 Programme Update	10:10	Ian Connaughton – 10 minutes
DS3 Replan	10:20	Karen O 'Doherty – 20 minutes
DS3 Procurement Outcomes	10:40	Niamh Delaney – 20 minutes
Volume Capped Contract Consultation	11:00	Eoin Clifford – 45 minutes
Questions	11:45	All
Close	12:00	Ian Connaughton –15 minutes
Lunch & Networking (12.15 – 13.00)		

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Agenda - Afternoon

Topic	Time	Speaker
Introduction and Welcome	13:00	Ian Connaughton 10 min
Setting the Scene – A Vision for DSM	13:10	Jonathan O'Sullivan – 10 min
Performance Monitoring Update • **TSO** • **Group Discussion**	13:20	Mark Gormley – 20 min All – 10 Min
DSM - Industry Discussion • **Industry Presentation** • **Group Discussion**	13:50	Paddy Finn (Electricity Exchange) – 25 min All – 35 minutes
Close – Next Steps		

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DS3 Programme Status Update – November 2018

Ian Connaughton

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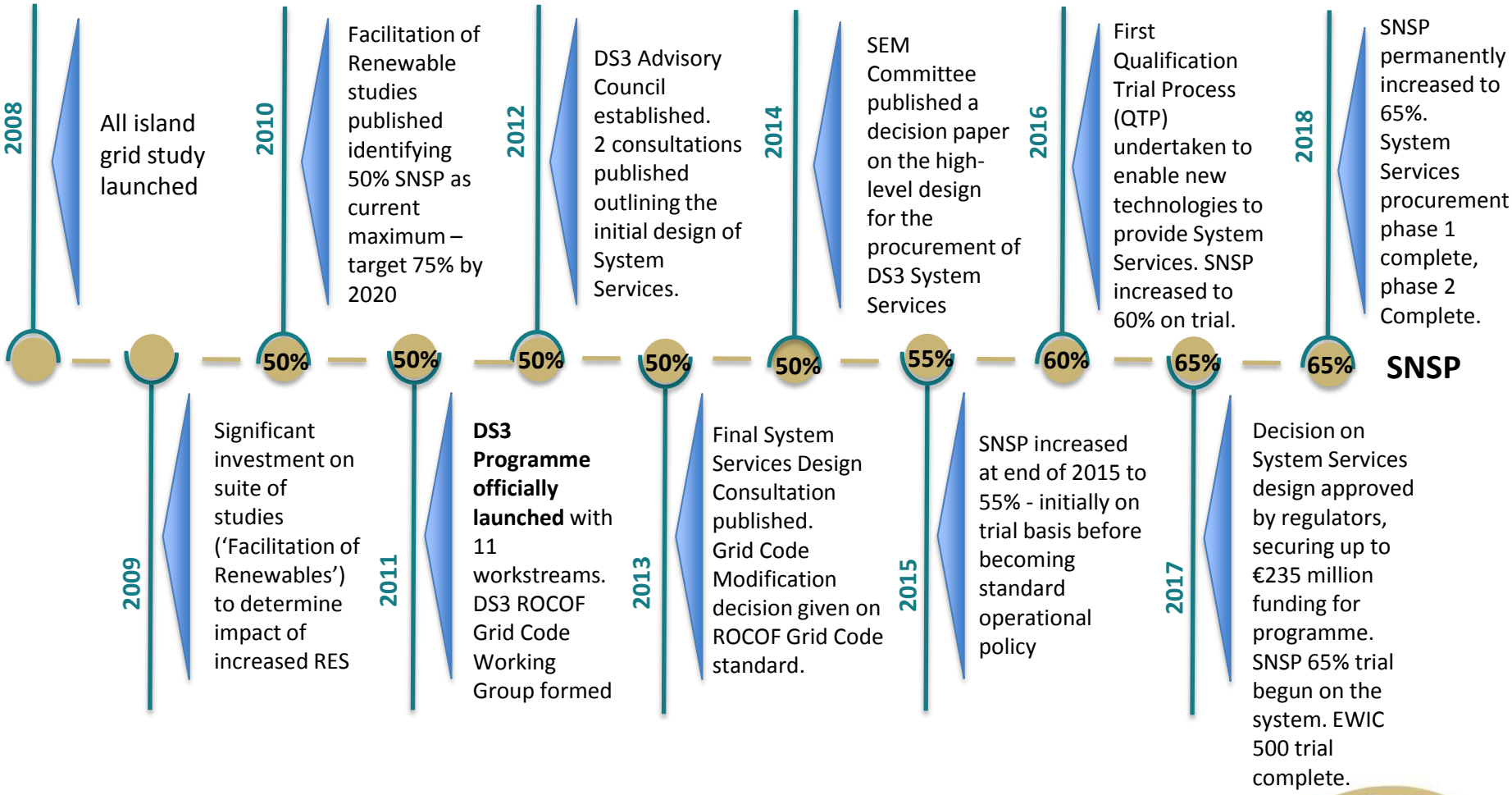
DS3 Programme



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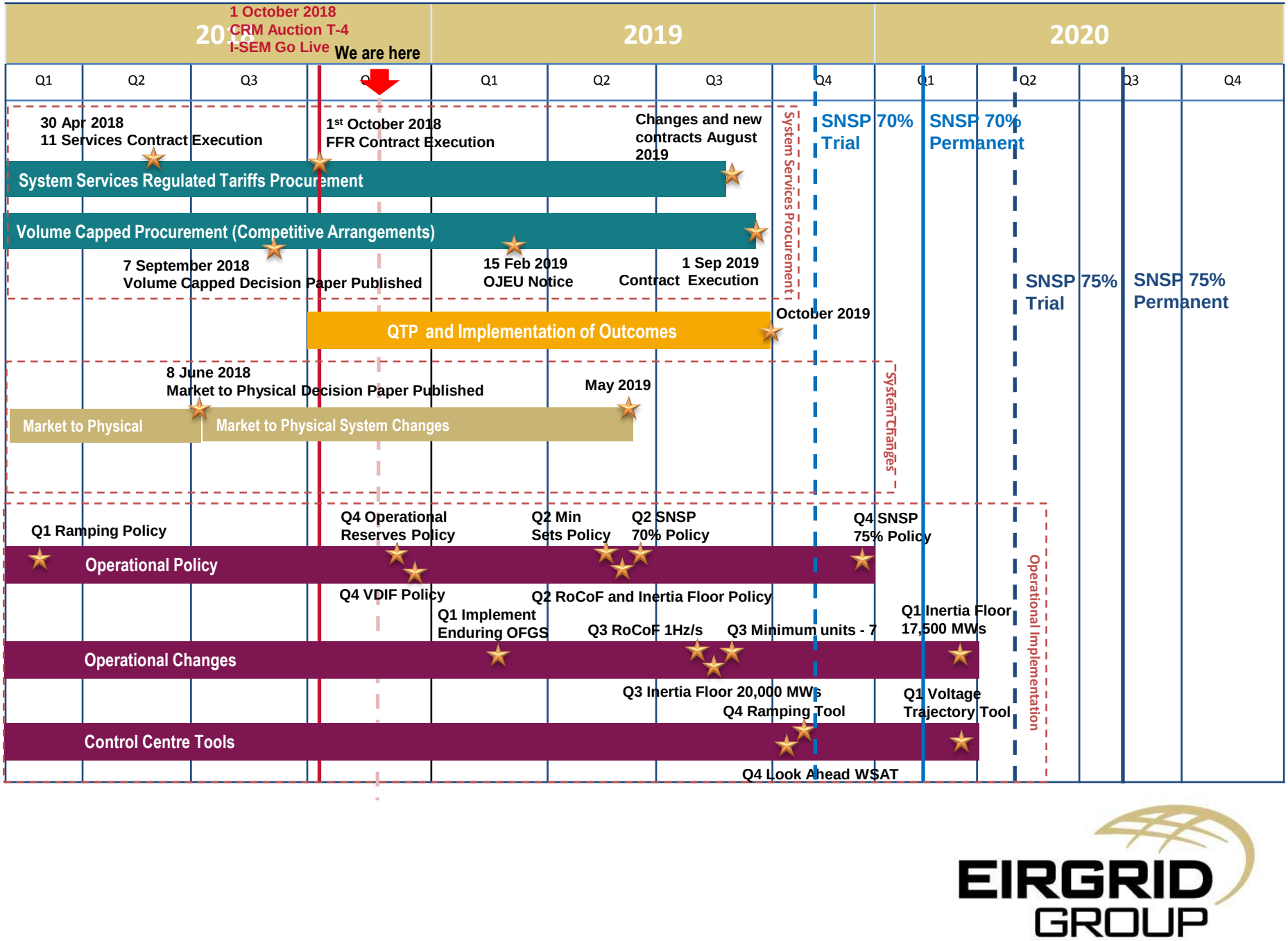
2018
1 October 2018
CRM Auction T-4
I-SEM Go Live
We are here
2019
2020
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4
30 Apr 2018
11 Services Contract Execution
1st October 2018
FFR Contract Execution
Changes and new contracts August 2019
System Services Procurement
SNSP 70% Trial
SNSP 70% Permanent
System Services Regulated Tariffs Procurement
Volume Capped Procurement (Competitive Arrangements)
7 September 2018
Volume Capped Decision Paper Published
15 Feb 2019
OJEU Notice
1 Sep 2019
Contract Execution
SNSP 75% Trial
SNSP 75% Permanent
October 2019
QTP and Implementation of Outcomes
8 June 2018
Market to Physical Decision Paper Published
May 2019
System Changes
Market to Physical
Market to Physical System Changes
Q1 Ramping Policy
Q4 Operational Reserves Policy
Q2 Min Sets Policy
Q2 SNSP 70% Policy
Q4 SNSP 75% Policy
Operational Policy
Q4 VDIF Policy
Q2 RoCoF and Inertia Floor Policy
Q1 Implement Enduring OFGS
Q3 RoCoF 1Hz/s
Q3 Minimum units - 7
Q1 Inertia Floor 17,500 MWs
Operational Changes
Q3 Inertia Floor 20,000 MWs
Q4 Ramping Tool
Q1 Voltage Trajectory Tool
Control Centre Tools
Q4 Look Ahead WSAT
Operational Implementation

RoCoF Status – November 2018

TOTAL (approx. 11,631 MW)

7,739 MW (67%) complete

Conventional Generation (8,550MW total)

5,274 MW (62%) complete

- Progress ongoing in Ireland and Northern Ireland
- 18 out of 24 high and mid-priority units compliant

IRE: 4,524/6,723 MW complete (68%)
NI: 750/1,827MW complete (41%)

Wind (2,223 MW total)

2,175 MW (99%) complete

- Roll-out complete in Ireland and very near completion in Northern Ireland

IRE: 1,266/1,266 MW complete (100%)
NI: 942/957 MW complete (98%)

Small-scale/embedded (approx. 710 MW total)

287 MW (40%) complete

- Roll-out in Ireland progressing on target
- Roll-out in NI targeting Sept 2019 completion – letters now sent to relevant units with 12% changed

IRE: 241/330 MW complete (73%)
NI: 46 MW/380MW approx. (12%)

RoCoF 1Hz/s

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Qualification Trial Process

Daniel Dixon

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QtP 2018/19 Categories

- **Provenability Trials** – Any technology class not currently “Proven” as per a public list published on the website

- **Distribution Impacts Trials –** Focused on distribution technologies who have not qualified due to issues on the distribution network such as congestion management, protection issues or violation of operation protocols

- **Standards and Compliance Trials –** Focuses on currently proven technologies whom wish to provide the Service in a way which differs from the current standards set out in contracts. This could possibly be broken down into two sub-categories;
  - Visibility
  - Controllability

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Feed into 2018 Trial Format

1. The Qualification trials are envisioned to run up to 2020/21 with a focus on Provenability and Operational Complexities

2. Greater coordination and engagement with DSO / DNO would be beneficial (In particular for future trials)

3. Likely that future years will more bespoke / embedded but also may require innovative methods to prove technology at scale.

4. Proposed each trial will have its own time lines end to end
    1. Small up to 6 months
    2. Medium up to 12 months
    3. Large up to 18 months

5. Procurement is aimed to begin in January of 2019

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QtP 2018/19 Proposals

Provenability Trial Proposals

Lot	Category	Overview
1	Large 12-18 months	Provenability of Solar technology for the Provision of DS3 System Services.
2	Large 18 months	Residential trial focused on Services from large scale home appliances. The trial will investigate the capability to provide reserve and ramping services from immersions/storage and EV's
3	Medium 12 months	Provenability trial of new technology for the provision of DS3 System Services.
4	Small 6 months	Enhanced Technology Capability for the provision of DS3 System Services.
5	Small 6 months	Alternative communication protocol acceptable for signals/performance monitoring purposes. Move from analogue to digital.

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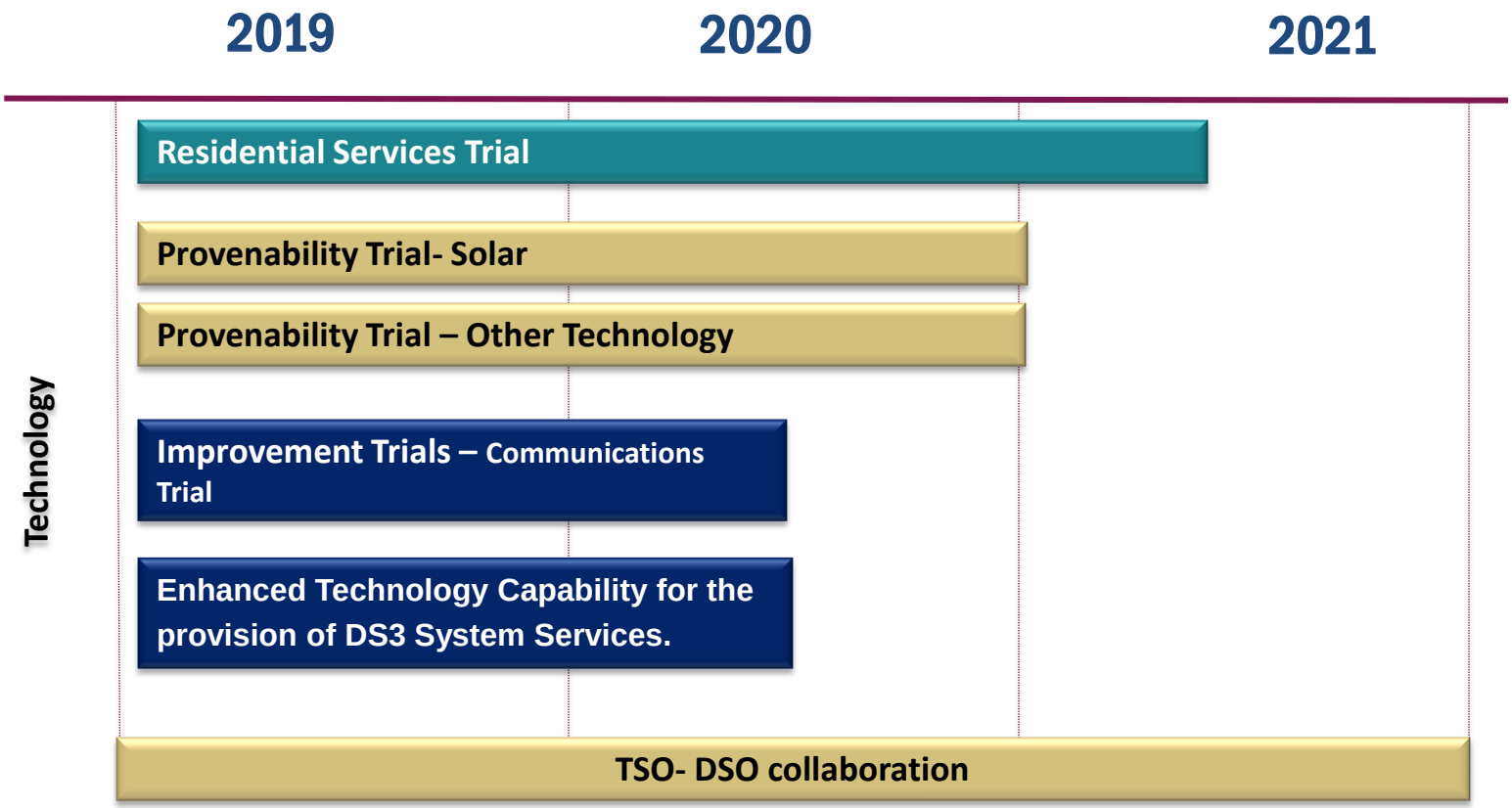
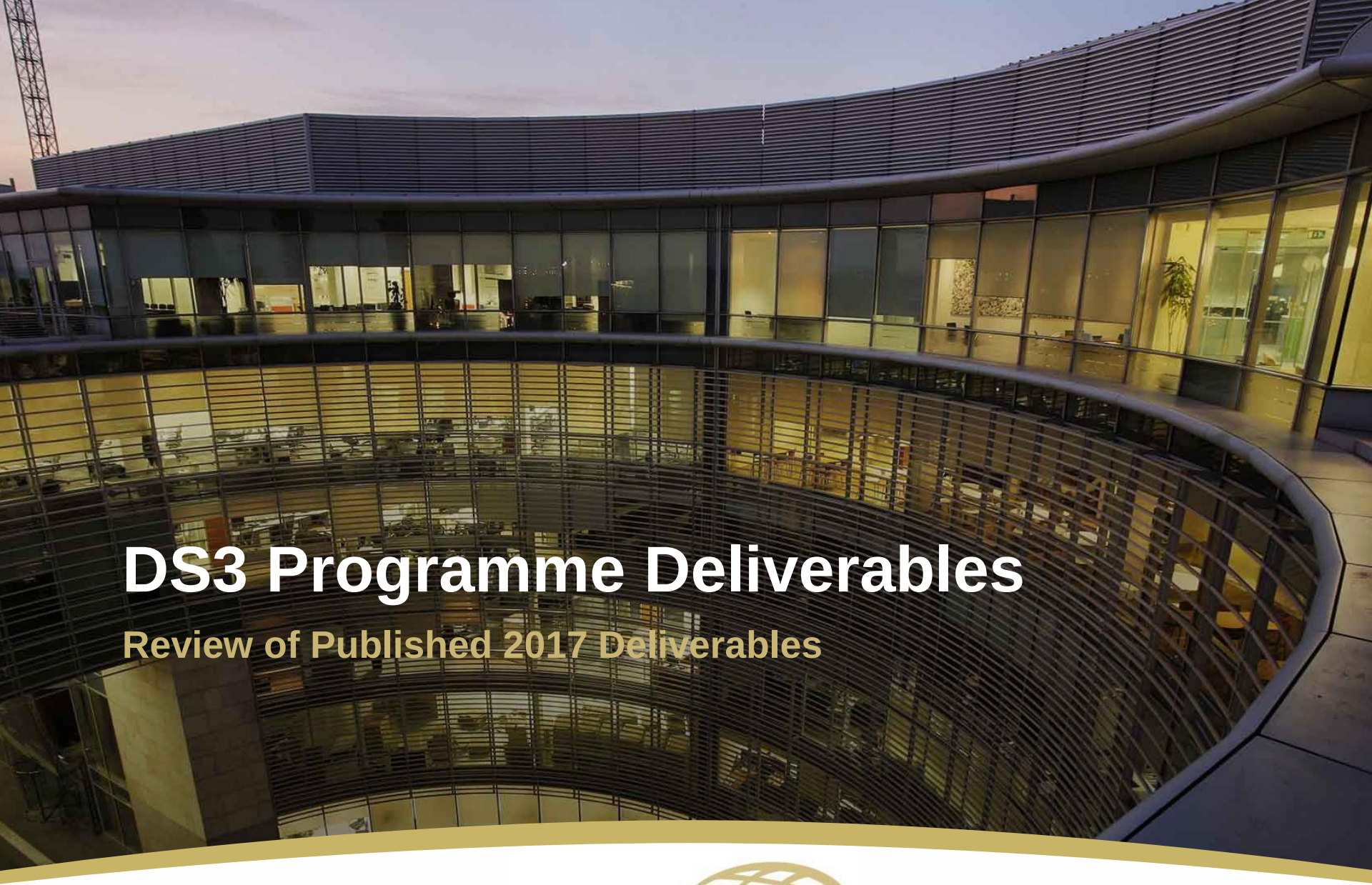
QtP trial Timeline for 2019





DS3 Programme Deliverables

Review of Published 2017 Deliverables

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DS3 Programme Goals

- Meet the challenges of operating the electricity system in a secure manner while achieving the 2020 renewable targets
  - Ability to operate the system at 75% instantaneous penetration of non-synchronous generation (known as SNSP)
  - Keep curtailment at a level that is acceptable to industry to facilitate growth

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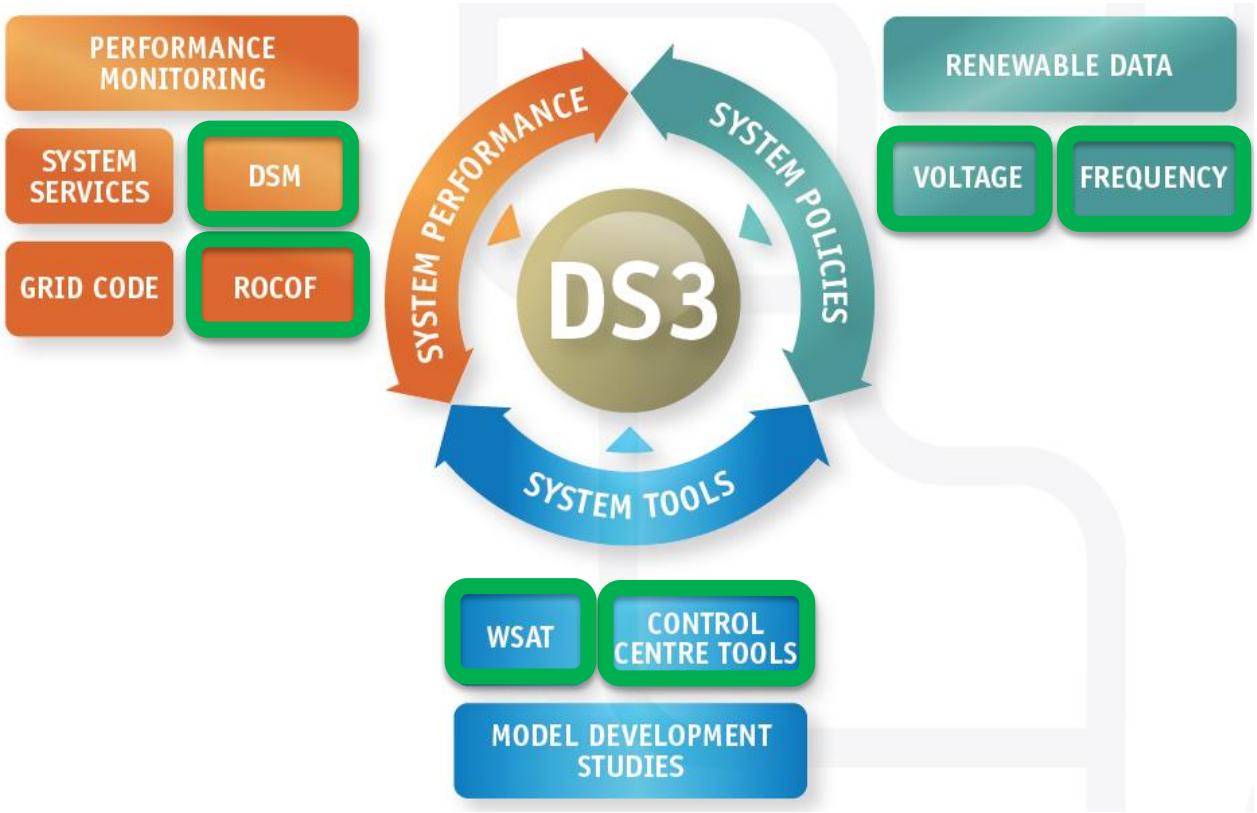
DS3 Programme Structure

Published 2017 Workstream Plans



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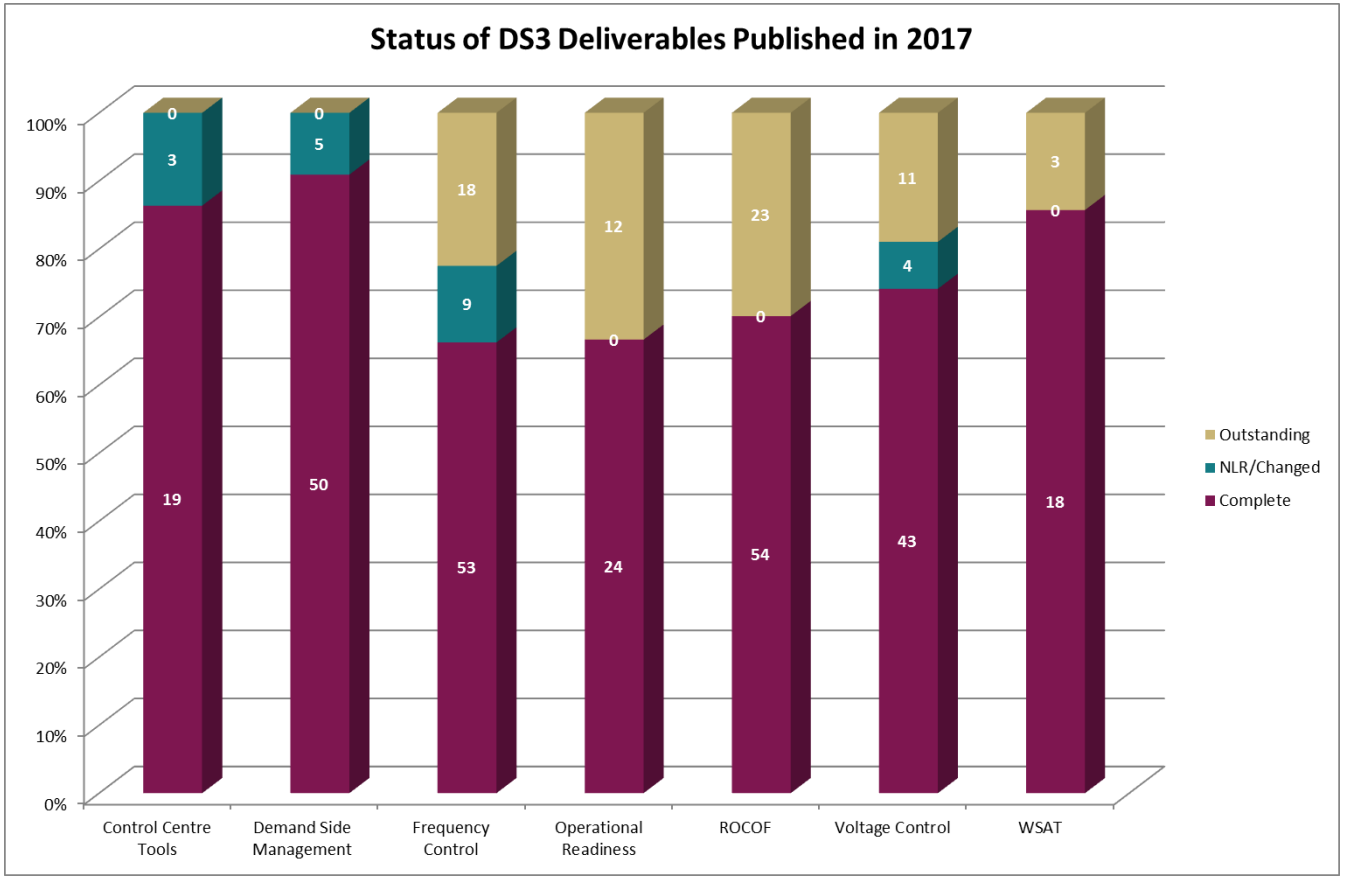
Review of 2017 Published Deliverables



Review of 2017 Published Deliverables

- Realign deliverables to DS3 Goal
- Can be misleading – wording of deliverable means it is achieved, however work is ongoing and critical to DS3 Programme success i.e. Control Centre Tools
- Large number of outstanding actions to be completed may be outside the TSOs control i.e. ROCOF
- Deliverables cross several workstreams and are being double counted i.e. ROCOF and Nodal Controller

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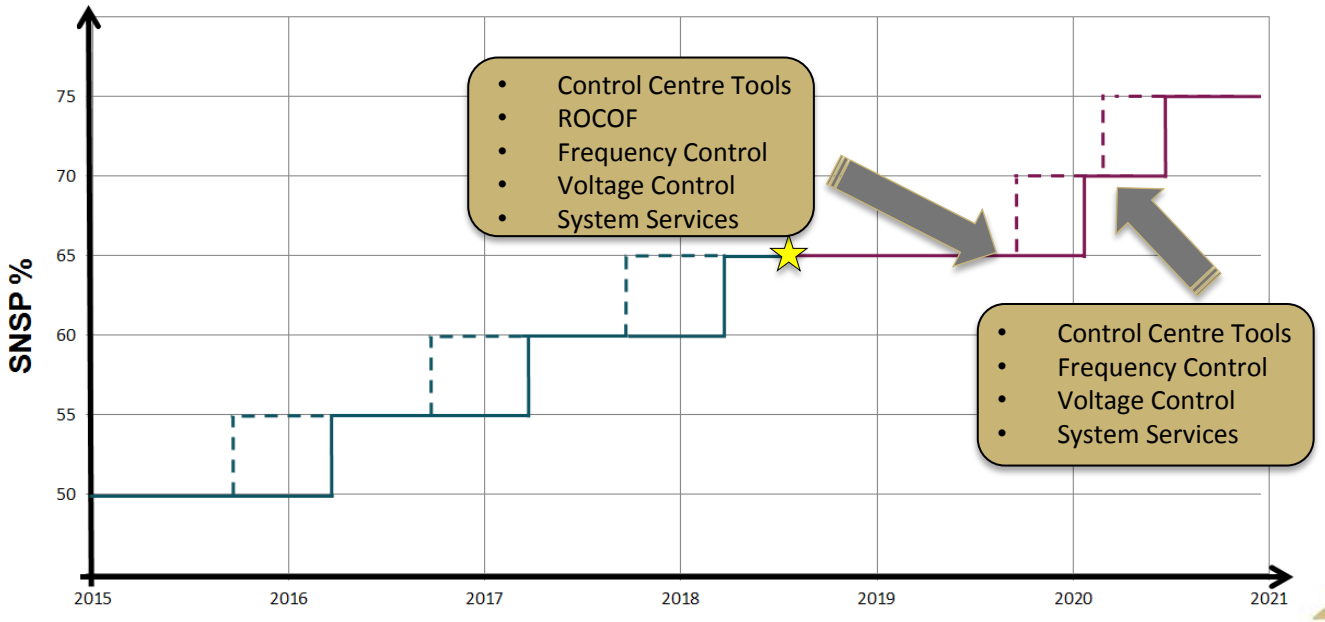
Restructure

- Remove workstream structure
- Link deliverables to programme milestones
- Clarity around responsibility for deliverable



Dashed line represents an SNSP trial

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Proposed Restructure

Workstream closeout statements to be issued:

- Performance Monitoring
- DSM
- Grid Code
- Renewable Data
- WSAT
- Model Development Studies

Workstreams to transition into new plan:

- ROCOF
- Voltage
- Frequency
- Control Centre Tools

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Work Stream 1 – 65% to 70% SNSP

Operational Change	*Expected Delivery*	*Status*
RoCoF transition to 1Hz/s	Q3 2019	
Inertia Floor – 20,000 MWs	Q3 2019	
Operational Policy		
Ramping Policy	Q1 2018	**Complete**
SNSP 70% Policy	Q2 2019	
Operational Reserves Policy	Q4 2018	
RoCoF & Inertia Floor Policy	Q2 2019	
Control Centre Tools		
Ramping Tool	Q4 2019	
Look Ahead WSAT	Q4 2019	
System Services		
11 existing services + FFR	Q3 2018	**Complete**

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Work Stream 2 – 70% to 75% SNSP

Operational Change	*Expected Delivery*	*Status*
Implement OFGS enduring	Q4 2019	
Inertia Floor – 17,500 MWs	Q1 2020	
Minimum Units Online – 7	Q3 2019	
Operational Policy		
Min Sets Policy (Voltage & Inertia)	Q2 2019	
SNSP 75% Policy	Q4 2019	
VDIF Policy	Q4 2018	
Control Centre Tools		
Voltage Trajectory Tool	Q1 2020	
System Services		
11 existing services + FFR + DRR + DPFAPR	Q3 2019	

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Next Steps

- Draft plan and close out statements with RAs for review
- Plan and close out statements to be finalised and published
- Update to be communicated with wider industry

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System Services Procurement

Niamh Delaney

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Overview

- Phase 1 Procurement Outcomes
- Procurement Challenges and Future Improvements
- Protocol Consultation
- Qualification System Refresh

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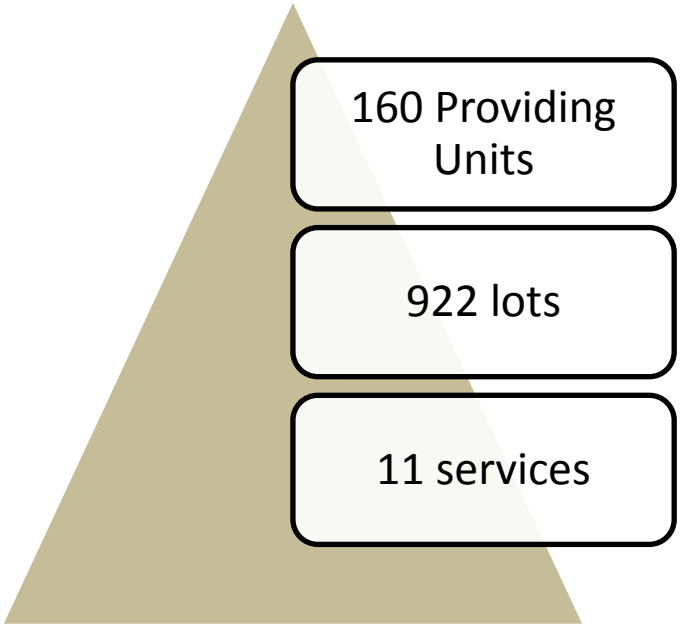
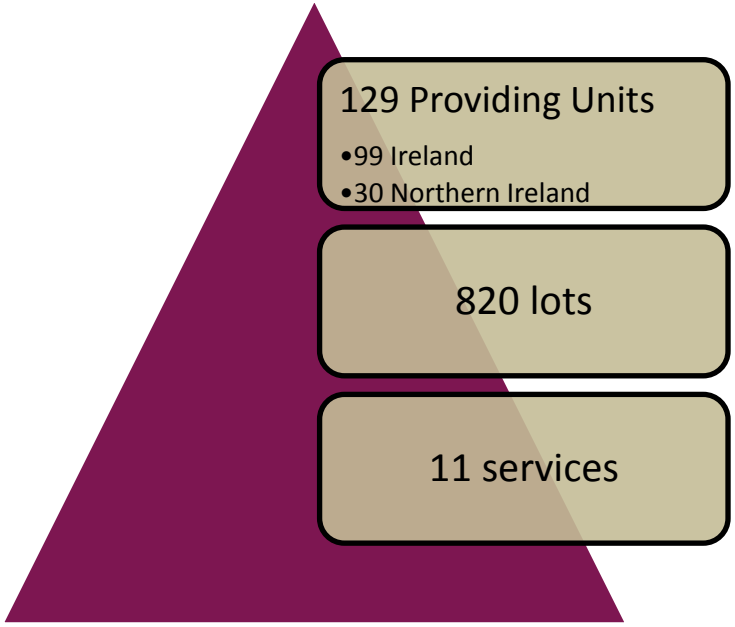
Procurement Overview – Phase 1



Tenders Received



Contracts Awarded

102 pre-tender clarifications

137 post-tender clarifications

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Procurement Overview

Number of Contracts Awarded in each Service

Lot	Lot 1IE	Lot 2IE	Lot 3IE	Lot 4IE	Lot 5IE	Lot 6IE	Lot 7IE	Lot 8IE	Lot 9IE	Lot 10IE	Lot 11IE
Service	POR	SOR	TOR1	TOR2	RRD	RRS	SSRP	SIR	RM1	RM3	RM8
No. of contracts	57	60	64	58	47	48	78	31	63	55	55

Ireland Contracts awarded per Service

Lot	Lot 1NI	Lot 2NI	Lot 3NI	Lot 4NI	Lot 5NI	Lot 6NI	Lot 7NI	Lot 8NI	Lot 9NI	Lot 10NI	Lot 11NI
Service	POR	SOR	TOR1	TOR2	RRD	RRS	SSRP	SIR	RMI	RM3	RM8
No. of contracts	24	24	20	20	15	15	16	13	21	18	18

Northern Ireland Contracts awarded per Service

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Summary of Phase 1 Procurement Outcome

Contracted volumes – Ireland Agreements

IRELAND	LOT1(IE) POR	LOT2(IE) SOR	LOT3(IE) TOR1	LOT4(IE) TOR2	LOT5(IE) RRD	LOT6(IE) RRS	LOT7(IE) SSRP	LOT8(IE) SIR	LOT9(IE) RM1	LOT10(IE) RM3	LOT11(IE) RM8
Total contracted volume	714 MW	1090 MW	1315 MW	1605 MW	1915 MW	3391 MW	6388 MVar	521806 MWs^2	5253 MW	6627 MW	7206 MW
Forecast expenditure (€m)	10.4	10.4	9.6	8.8	6.6	2.4	16.8	10.7	2.3	2.9	3.3

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Summary of Phase 1 Procurement Outcome

Contracted volumes – Northern Ireland Agreements

NORTHERN IRELAND	LOT1(NI) POR	LOT2(NI) SOR	LOT3(NI) TOR1	LOT4(NI) TOR2	LOT5(NI) RRD	LOT6(NI) RRS	LOT7(NI) SSRP	LOT8(NI) SIR	LOT9(NI) RM1	LOT10(NI) RM3	LOT11(NI) RM8
Total contracted volume	448 MW	492 MW	496 MW	735 MW	714 MW	1381 MW	1379 MVar	113480 MWs^2	1662 MW	2047 MW	2198 MW
Forecast expenditure (£m)	4.9	3.2	2.5	3.4	1.8	0.5	2.1	2.0	0.8	1.2	1.0

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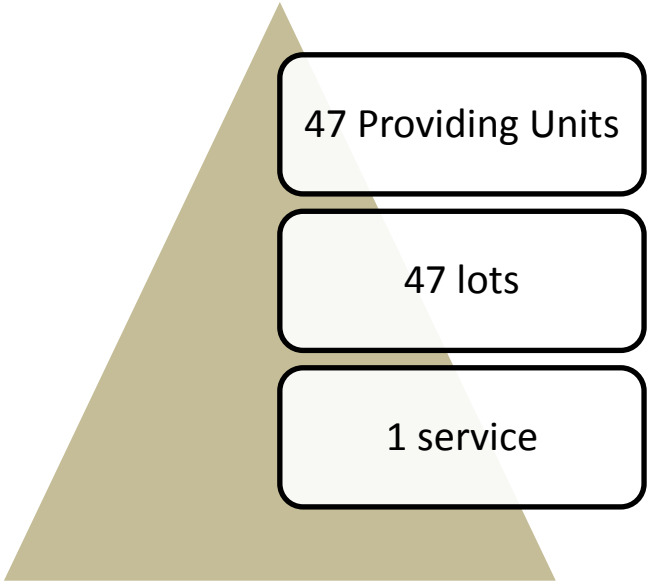
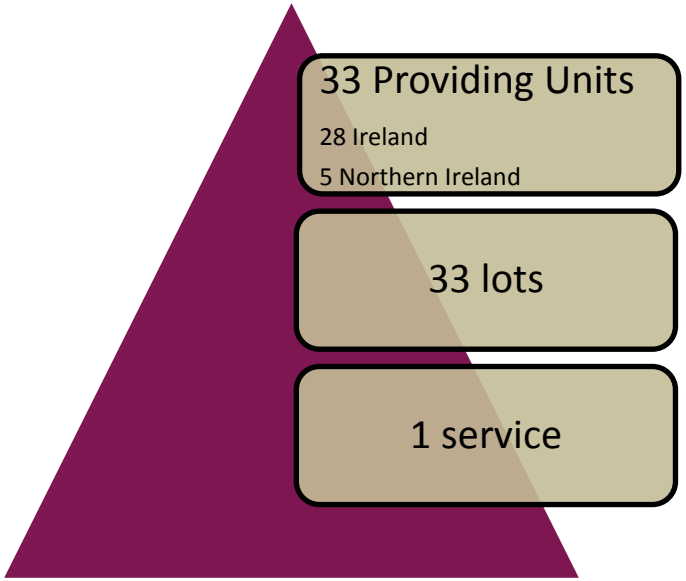
Procurement Overview – Phase 2



Tenders Received



Contracts Awarded

47 pre-tender clarifications

33 post-tender clarifications

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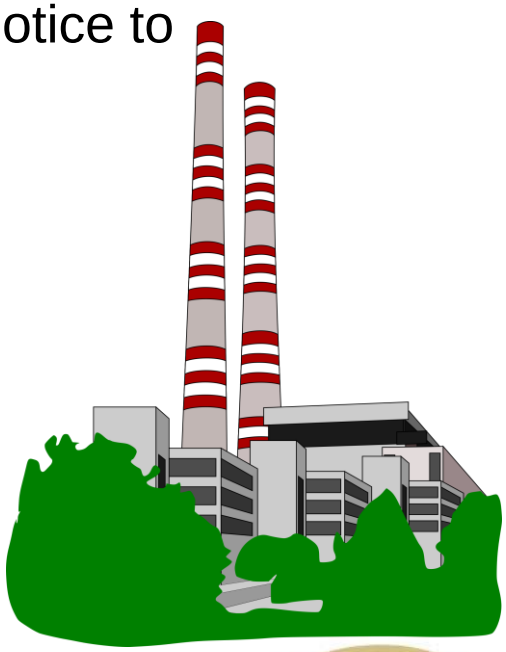
Operational Impacts of System Services

Conventional Units

- 11 units changed TOD – improving start up times, notice to synchronisation, load up rates, minimum loads
- 8 units reduced minimum load for SIR,

  providing net benefit of 330MW to the system
- 12 units now providing FFR (211MW)



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Operational Impacts of System Services

Wind Units

- 39 WFPS contracted for System Services:

POR	SOR	TOR1	FFR	SSRP
51MW	43MW	33MW	39MW	1024MVar

- 2 WFPS providing POR and one providing FFR using Emulated Inertia (4MW)
- Signal works completed for 7 WFPS within 3 months

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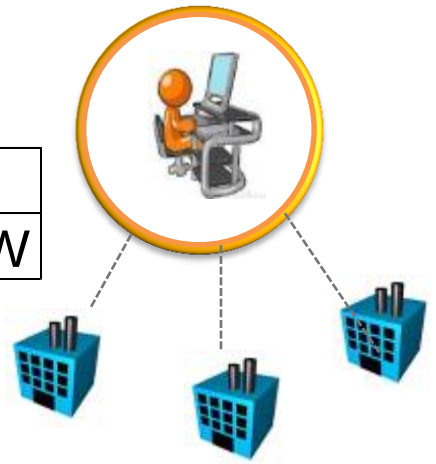
Operational Impacts of System Services

Demand Side Units

- 21 DSUs providing System Services
- 6 New DSUs providing FFR – TOR2
- 17 DSUs providing RRD

POR	SOR	TOR1	TOR2	FFR	RRD
60MW	58MW	74MW	54MW	60MW	179MW



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Procurement – Challenges and Future Improvements

Areas for Improvement

- Definition of Services
- Testing and Compliance
- Performance Monitoring
- Technical Questionnaire
- Communication/Timelines

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Procurement – Challenges and Future Improvements

Definition of Services

- 11 services generally well understood
  - However clarity sought on **Frequency Event** wording
    - change proposed to Protocol (forthcoming consultation)

- FFR
  - Queries surrounding definitions of:
  - FFR Response Time
  - Hysteresis
  - Static/Dynamic response

Procurement – Challenges and Future Improvements

Testing and Compliance

- Testing Report process was an improvement on Interim Arrangements
  - However some tenderers initially submitted Grid Code reports instead of System Services reports
  - Queries from tenderers regarding testing standards applied and their applicability to different technologies
    - request feedback from tenderers in this regard for further consideration
- Signaling Requirements
  - Generally well understood by tenderers, but some confusion with regard to Wiring Cert reference in Technical Questionnaire

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Procurement – Challenges and Future Improvements

Testing and Compliance

- Future testing may be decoupled from the procurement gate and be a pre-requisite for tendering
  - this would remove the concentrated test window/reduce the possibility of delays due to weather conditions etc.
  - could accommodate units such as DSUs where the constituent sites change by having testing slots in advance of but close to procurement gate

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Procurement – Challenges and Future Improvements

Performance Monitoring

- Queries received regarding
  - Standards for performance monitoring equipment
  - Obligations of IDSs within a DSU

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Procurement – Challenges and Future Improvements

Technical Questionnaire – Areas for Improvement

- SSRP tenders received from Type B and C distribution-connected units
  - TSOs should include in RFP/Technical Questionnaire
- DSU IDS submission
  - Submission to DNO/DSO on behalf of tenderers improved from Interim
  - Submission of IDS information amended in Phase 2
- FFR Response time to be included in Section C

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Procurement – Challenges and Future Improvements

Technical Questionnaire – Issues Encountered

- Reserve Characteristics not completed correctly in a number of cases
- Volume requests different to Interim with no indication that a change was being sought and/or no test report or test date submitted
- Section C not completed correctly in a number of cases
- Grid Code test reports submitted with no indication of requested change

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Procurement – Challenges and Future Improvements

Communication/Timelines

- Timelines for process (4.5 months) caused issues with regard to getting everything done
  - Procurement timeframe guideline is 6 months for non-complex tenders to allow sufficient time/necessary clarifications on both sides
    - Level of change (contracted volumes) always underestimated
  - Backdating contracts confusing for tenderers/ additional work for TSOs
- Internal TSO processes to be improved
  - e.g. change of EDIL declarations aligning with change in contracted volumes

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Protocol Consultation

Changes for Upcoming Consultation

- Clarification of the definition of a Frequency Event
- Clarification of when a Frequency Event is deemed to be a Performance Assessment Event
- FFR Performance Monitoring updated
- Inclusion of fixed contract (Volume Capped) arrangements
- General housekeeping

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DRR and FPFAPR Services

Future Procurement

- Both services will only be remunerated when operational SNSP >70%
- Do not envisage procuring DRR and FPFAPR at next refresh gate
- Requirements development nearing completion
  - Target to publish in Q1 2019

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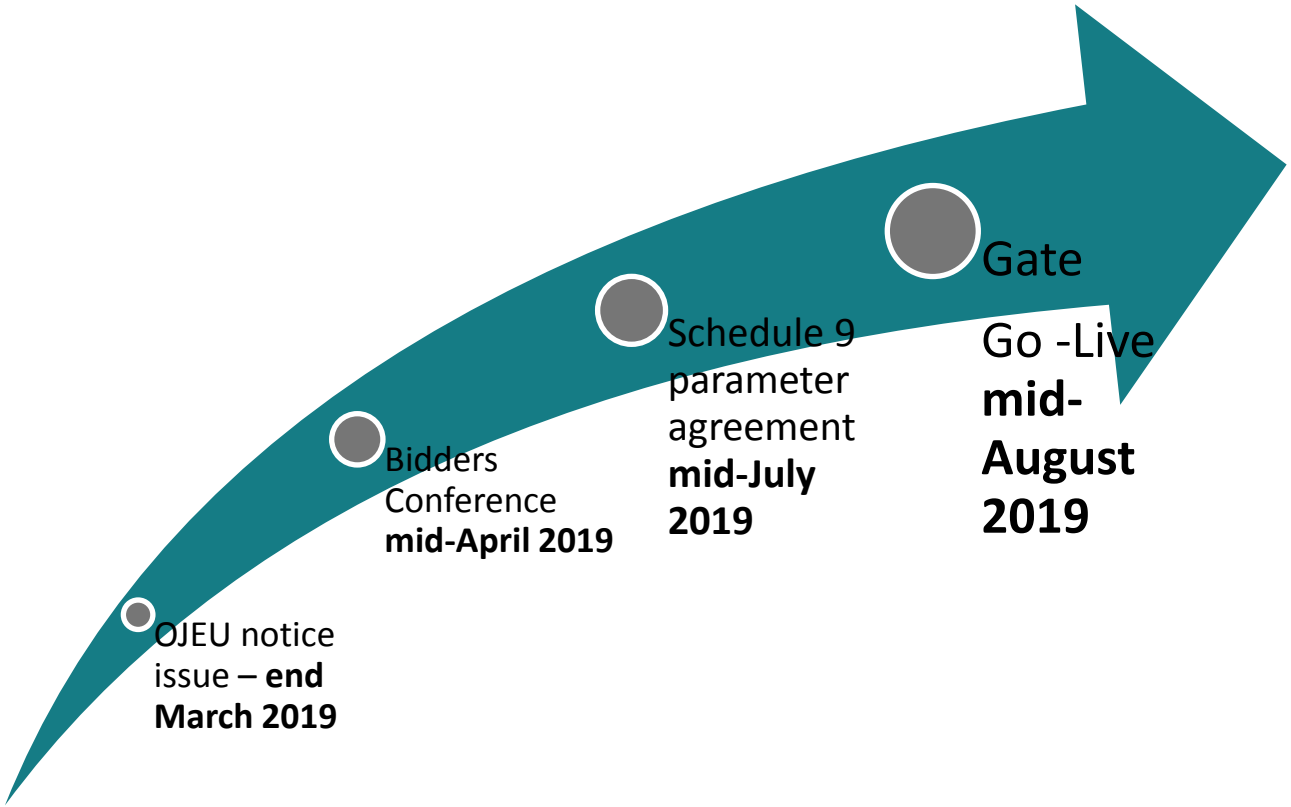
Qualification System First Refresh Gate

Proposed Timetable



System Services: Fixed Contracts (Volume Capped) consultation

Eoin Clifford

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Outline

Review of previous consultation and decision

Current Consultation: Non-contract

- Protocol Document
- Availabilty Performance
- Recharging
- Connection arrangements
- Temporal Scarcity Scalar
- TOR Dispatch
- Auction Design

Q&A part I

Current Consultation: Contract

- Bonding
- Reserves
- Operational Details
- Other Contract Details
- Indicative Timelines

Q&A part II

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Design Consultation

Recommendation Paper and Decision Paper published

- 24 responses to consultation with extensive stakeholder engagement undertaken
- Decision Paper published 7th September

Product Bundling	• FFR –TOR2 with 90 s of over-frequency requirement @15% of under-frequency capability
Product Characteristics	• Frequency threshold 49.8 Hz with dynamic delivery (50.2 Hz for OFR)
Availability	• 97% availability expectation, incentivised using scalar
Maximum Contract Size	• 50 MW per connection agreement, 91 – 140 MW total
Typo	• 0.15 is the fastest response time for FFR (**not** 0.1 s)

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Contract Consultation

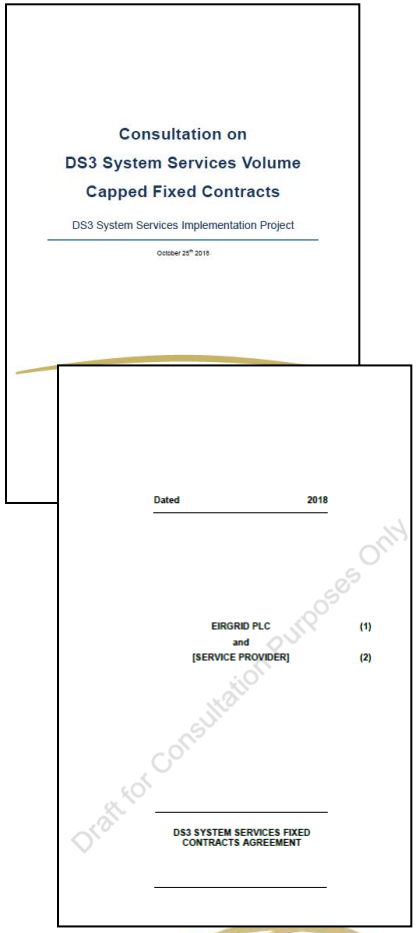
Closes 6th December

Consultation Paper

- Contract Overview
- Protocol Changes (Availability Performance Scalar)
- Connection criteria
- Temporal Scarcity Scalar
- TOR 1 & 2 dispatch
- Tie-Break

Contracts

- Similar to Regulated Tariff arrangements
- Separate for each jurisdiction but identical T&Cs



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Protocol Document

Technical document

- Outlines certain technical requirements as well as some scalar details
- Can be changed with consultation

Protocol Consultation

- Full consultation planned before end of year
- Clarifications regarding frequency event, FFR testing
- Changes for Fixed Contracts Arrangements shown in this paper

Availability Performance Monitoring

- Calculation details for Total Availability Factor
- Details Monthly Weighting
- (Event Performance Scalar is renamed to avoid ambiguity)

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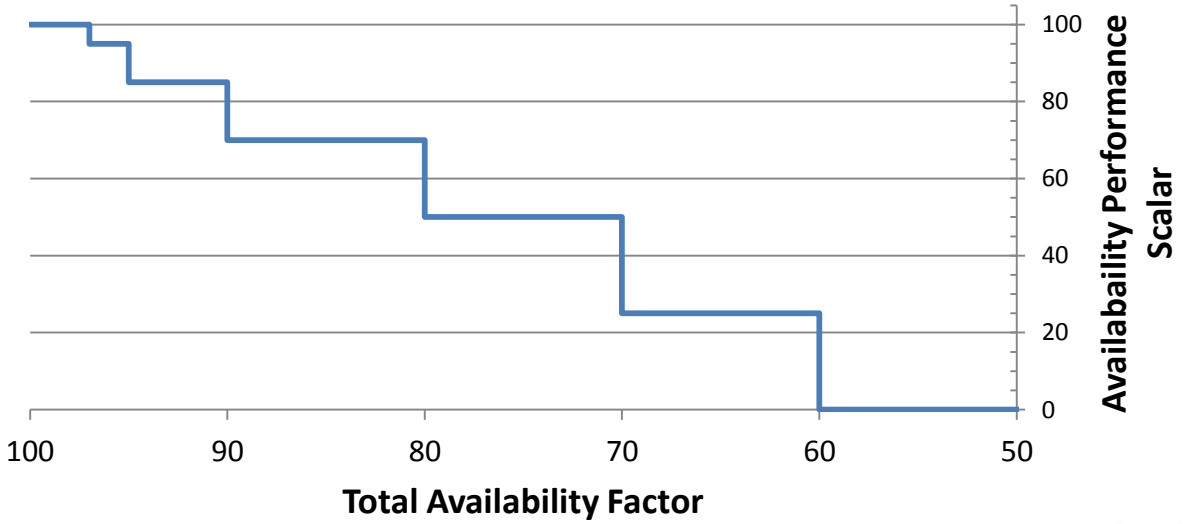
Availability Performance

Availability Performance Scalar

- High availability expected- penalised if below 97%
- Consistent low availability could be considered breach of contract
- 3 consecutive months with an Availability Performance Scalar value of 0 (section 9.2.17)
- Calculated using Total Availability Factor (Schedule 2)



Availability Performance

Total Availability Factor

- Measured across all services (including OFR)
- Defined in Protocol Document

Formula

- Get Available Volume /Contracted Volume for each month
- Apply Weighting Factor
- Sum for previous 12 months
- Assume value of 100% for months prior to go-live

M – (Months preceding Scalar Assessment Month)	Monthly Weighting
1	0.120
2	0.120
3	0.112
4	0.104
5	0.096
6	0.088
7	0.080
8	0.072
9	0.064
10	0.056
11	0.048
12	0.040

$$\sum_{M=1}^{12} \left(\frac{(\text{Total Availability Volume})_M}{(\text{Total Contracted Volume})_M} * \text{Monthly Weighting}_M \right) * 100\%$$

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Availability Performance: Example 1

Unit Unavailable for all services for half of January

		February Settlement		June Settlement		November Settlement	
M – (Months preceding Scalar Assessment Month)	Monthly Weighting	Monthly Availability Factor	Weighted Monthly Availabilty Factor	Monthly Availability Factor	Weighted Monthly Availabilty Factor	Monthly Availability Factor	Weighted Monthly Availabilty Factor
1	0.120	0.50	0.060	1.00	0.120	1.00	0.120
2	0.120	1.00	0.120	1.00	0.120	1.00	0.120
3	0.112	1.00	0.112	1.00	0.112	1.00	0.112
4	0.104	1.00	0.104	1.00	0.104	1.00	0.104
5	0.096	1.00	0.096	0.50	0.048	1.00	0.096
6	0.088	1.00	0.088	1.00	0.088	1.00	0.088
7	0.080	1.00	0.080	1.00	0.080	1.00	0.080
8	0.072	1.00	0.072	1.00	0.072	1.00	0.072
9	0.064	1.00	0.064	1.00	0.064	1.00	0.064
10	0.056	1.00	0.056	1.00	0.056	0.50	0.028
11	0.048	1.00	0.048	1.00	0.048	1.00	0.048
12	0.040	1.00	0.040	1.00	0.040	1.00	0.040
		Total Availability Factor	0.940	Total Availability Factor	0.952	Total Availability Factor	0.972
		Availability Performance Scalar	**0.85**	**Availability Performance Scalar**	**0.95**	**Availability Performance Scalar**	**1**

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Availability Performance: Example 2

Unit with 30 MW contract does not provide Over-frequency from Jan-April

- Demonstration purposes only – in reality consistent lack of provision could be considered breach of contract

Service	Contracted Volume (MW)	Actual Provision (MW)
FFR	30	30
POR	30	30
SOR	30	30
TOR1	30	30
TOR2	30	30
OFR FFR	4.5	0
OFR POR	4.5	0
OFR SOR	4.5	0
Total Volume	163.5	150
Availability Factor		**91.7%**

		May Settlement	
Months preceding Scalar Assessment Month	Monthly Weighting	Monthly Availability Factor	Weighted Monthly Availabilty Factor
1	0.120	0.917	0.110
2	0.120	0.917	0.110
3	0.112	0.917	0.103
4	0.104	0.917	0.095
5	0.096	1.000	0.096
6	0.088	1.000	0.088
7	0.080	1.000	0.080
8	0.072	1.000	0.072
9	0.064	1.000	0.064
10	0.056	1.000	0.056
11	0.048	1.000	0.048
12	0.040	1.000	0.040
		Total Availability Factor	0.962
		Availability Performance Scalar	**0.95**

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Availability Performance

During Event

- Trading period in which unit responds to event is not considered in availability monitoring

Recharging of Storage units

- Unit has period to recharge which is not counted against them
- Duration up until end of trading period 90 minutes after event is not considered
- Should allow recharge through Intra-Day Market
- Won’t be penalised if non-energy action in Balancing Market prevents recharge
- Automating this through settlement systems may prove challenging

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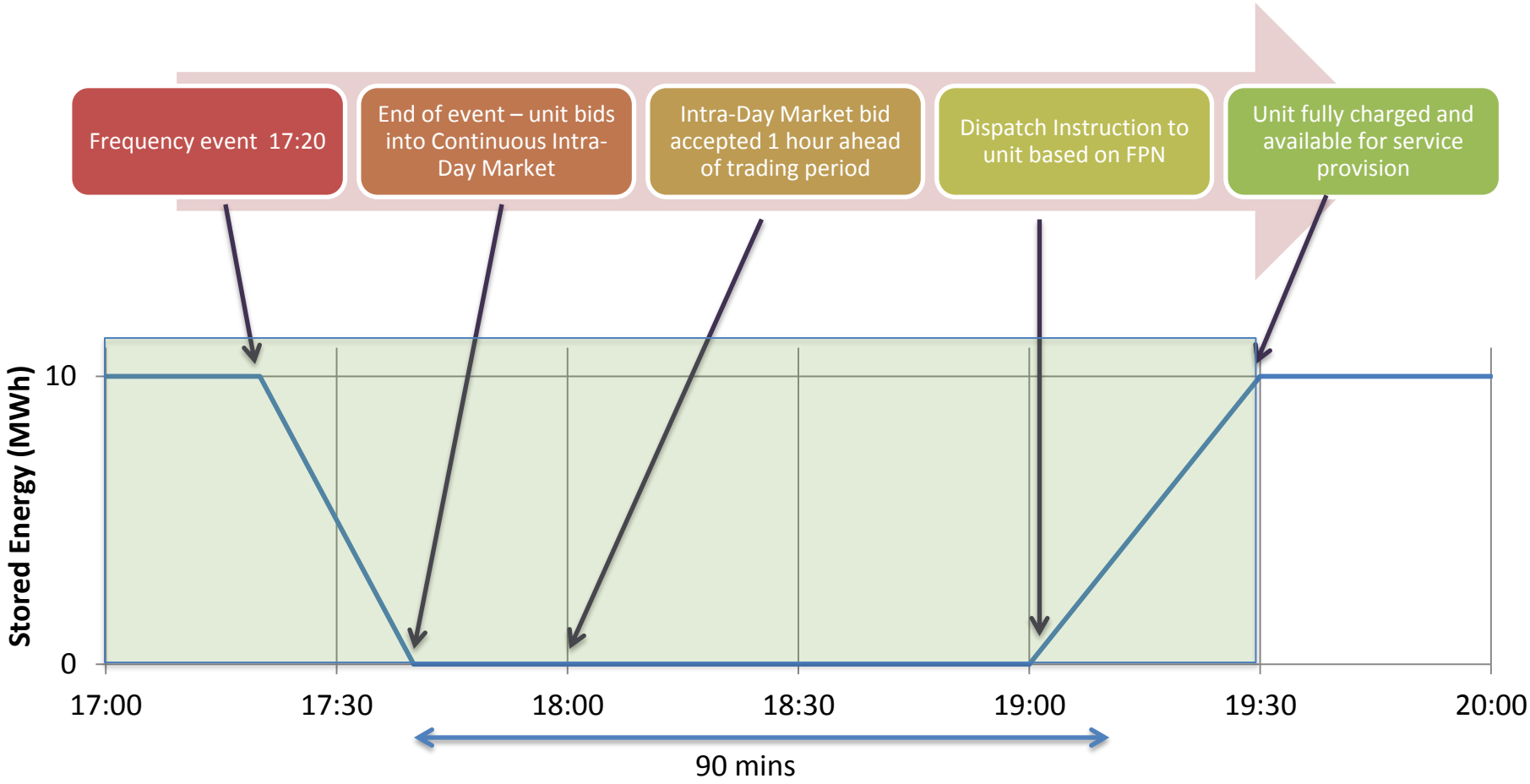
Recharging Example



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Connection arrangements

Electrically Contiguous

- Single Point of Failure
- No two contracted units should be put out of action by the loss of a single piece of equipment

Other Conditions

- One unit per connection agreement
- Service provider must be party to connection offer
- 50 MW max contract size

Regulated Tariff arrangements

- Either/or – unit cannot provide same services in both Capped and Uncapped arrangements
- SEM-17-094

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Temporal Scarcity Scalar

Fixed value

- Same value for each trading period for duration of contract
- Two values: one for FFR and one for other services
- Values will be published in advance of tender

SNSP forecasting model

- Use Plexos model to create full hourly dispatch for future tariff year
- Based on 'Average' wind year – year with capacity factor closest to 5 year average
- From this, determine hourly levels of SNSP
- Convert these to hourly TSS values
- Take average (time weighted)

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TOR 1 & 2

Dispatch Conditions

- Where frequency is below trigger (≤ 49.8 Hz)
- Where frequency goes below trigger and recovers
- TSO instruction due to system requirements

System Requirements

- Thermal Overloads
- Frequency events outside of trigger
- Voltage issues
- Etc
- Limited to 10 such calls per year
- 90 minute rule for recharge still applies for storage units

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Auction Design

Price Based

- Bid will be a discount on bundle price
- Bundle price will be based on existing tariffs
- Details will be published in advance of tendering process

Volume procured

- Between 91 and 140 MW
- First unit to bring volume over 90 MW ends auction
- Bids in whole MW (rounded down)

Tie-break

- Currently considering options
- Over-Frequency response capability?
- Drawing of lots?

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Consultation Questions I

Question 7:	• Do you have any comments on the proposed inclusion to the Protocol document?
Question 8:	• What is your view in relation to the proposed maximum contract volume restrictions and conditions regarding connection to the power system?
Question 9:	• What is your view on the proposed mechanism for determining the values of the Temporal Scarcity Scalar to be applied?
Question 10:	• Do you have any comments in relation to the proposed system conditions for TOR1 and TOR2 dispatch?
Question 11:	• Do you have any suggestions in relation to the application of non-price criteria in a tie-break scenario?

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Contract: Overview

Duration

- Max 6 years or up until end of Aug 2027

Termination Clauses

- Section 9
- By agreement with 3 months notice
- Non-compliance with I-SEM TSC, Grid Code
- Termination of Grid Connection or Use of System agreements
- Inability or failure to provide Services – Availability Performance Scalar of zero for 3 consecutive months

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Contract: Bonding

Bond

- €12,000 per MW (or equivalent in GBP)

Milestones

- Must be met
- Clauses for Force Majeure and TSO cause

Details

- Section 4
- Schedule 4
- Schedule 11

Performance Milestone:	Completion Condition:
Connection Agreement Effective Date	- The Company has received and countersigned two (2) copies of the Connection Agreement signed by the Customer; - The Conditions Precedent in Clause 2.1 and 2.2 of the Connection Agreement have been fulfilled.
Consents Issue Date	Both the Company and the Customer have obtained the Consents relating to the Connection Works and the Facility
Connection works Completion Date	The Company is satisfied that the Connection Works have been completed to the extent necessary to allow all Commissioning Tests to be performed
Energisation Date	Active power and reactive power is transferred to and from the Facility through the Customer's Plant and Apparatus
Operational Date	The Grid Code and applicable Capacity Tests for every part of the Customer's Equipment have been properly and satisfactorily completed and all monies payable have been paid to the Company
Go-Live Date	On Declaration & Provision of Contracted Services

Contract: Reserves

Schedule 2

- Rules on operational reserves
- Payment formulae
- Event Performance assessment
- Availability Performance assessment

TOR1 Trading Period Payment = TOR1 Available Volume × TOR1 Payment Rate × TOR1 Scaling Factor × Trading Period Duration

= TOR1 Available Volume × €1.55 × (1-bundle discount) x Availability Performance Scalar x Event Performance Scalar × TSS × half-hour

For a 30 MW unit with a 20% discount bid and perfect performance, and a TSS of 1.5:

TOR1 Trading Period Payment = 30 × €1.55 × 0.8 × 1.5 × 0.5

= €27.90

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Contract: Operational Details

Schedule 8

Operational Requirements

- Declaration, Signalling, Monitoring requirements
- Must be market registered
- Flat provision across 5 under-frequency services

Response

- FFR fastest response between 150 ms and 300 ms
- OFR fastest response between 150 ms and 300 ms
- OFR duration up to 90 s
- Dynamic Frequency Tracking
- Frequency triggers: ≤ 49.8 Hz & ≥ 50.2 Hz

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Other Contract Details

Schedule 3

- Billing & Payment
- Monthly Basis (Charging period = 1 calendar month)

Schedule 5

- Dispute Resolution

Schedule 9

- Specific Technical characteristics
- Completed after testing

Schedule 10

- GDPR

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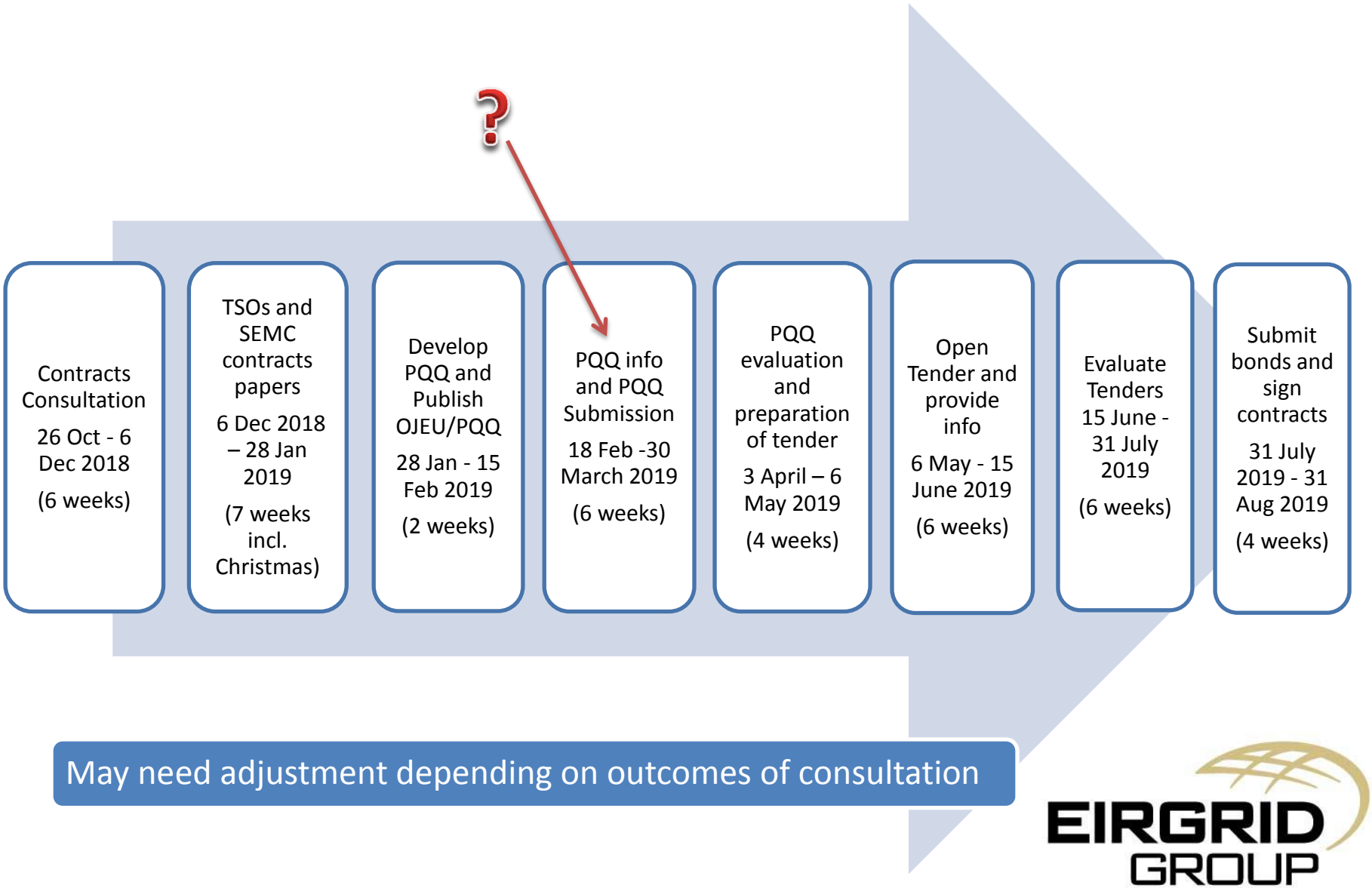
Draft Timelines



May need adjustment depending on outcomes of consultation

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Consultation Questions II

Question 1	• What is your view in relation to the proposed Fixed Contracts contract?
Question 2	• Do you have any comments with respect to the definitions outlined in Schedule 1 of the Fixed Contracts contract?
Question 3	• Do you have any comments with respect to Schedule 2 (Operating Reserves) in the Fixed Contracts contract?
Question 4	• Do you have any comments with respect to the Bonding requirements and the Performance Bond milestones proposed?
Question 5	• Do you have any comments with respect to the Operational Requirements and Parameters proposed in Schedule 8 and 9?
Question 6	• Do you have any comments with respect to the remaining content of the contract Schedules?

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Thank you

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