System Services Industry Forum

12 October 2017

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Agenda

Topic	Time	Speaker
Registration (Tea & Coffee)	09.30	
Introduction	10.00	Ian Connaughton
Regulatory Authority Update	10.15	CRU/URegNI
Regulated Tariffs	10.30	Eoin Kennedy
Scalar Design	11.10	Joe Deegan
Regulated Arrangement Contracts & Procurement Process	11.40	Niamh Delaney
Questions Session	12.15	
Lunch & Networking (12:30 – 13:10)		
Qualification Trials Process	13.10	Jason Hannon
Testing and Compliance	13.40	Colm MacManus
Questions Session	14.10	
Next Steps / Session Closed	14:40	Ian Connaughton

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Regulated Tariffs – Recommendations

Eoin Kennedy

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TSOs' Recommendations - Context

- In this presentation, we are setting out our recommendations on various aspects of the Regulated Arrangements

- The SEM Committee's decision paper will set out the final decisions on the design to be implemented by the TSOs

- The SEM Committee's decision on certain elements of the design may differ in parts to our recommendation

Regulated Tariffs Consultation

Base Tariffs

Contract Certainty

Price Certainty

Scarcity Scalar Framework

Over-Expenditure Risk due to High Availability Technologies

Market versus Physical Dispatch Position

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DS3 System Services - Dimensions

Work within SEMC Framework

Control Expenditure

Implementable and Robust

Investment Certainty

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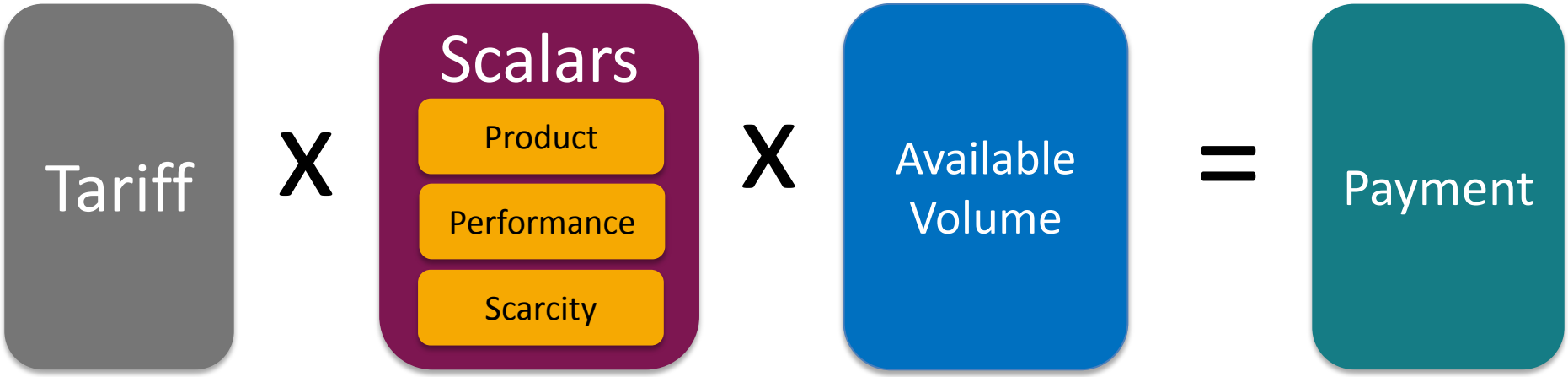
Payment Structure



Key Proposals – Payment Structure

Tariff

5% increase to “rollover contract” tariffs as a baseline

Scalars

- Product
- Performance
- Scarcity

Detailed set of product scalars to reward specific capabilities

‘Stepped’ scarcity scalar linked to SNSP levels for all services

- FFR from 50% SNSP as opposed to 60%
- Equivalent downwards adjustment to scalars

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Procurement Considerations – Expenditure Risk

High Availability Units
(availability not linked to energy dispatch)

DSUs
Batteries / Storage
Flywheels
⋮

Other Units
(availability linked to energy dispatch)

CCGT
OCGT
⋮

Key Proposals – Procurement

Tariff Arrangements

Applies to non-expenditure risk units/services only

Min 6 year term

Conditional review if over/under-expenditure

TSO right to terminate individual (or all) contracts with 1 year's notice

Competitive procurement for Expenditure-Risk Units

FFR, POR, SOR, TOR1 and TOR2 services

Min 5 year term

Different T&Cs to tariff contracts

Base Tariff Rates

Service Name	Unit of Payment	Recommend Rate €
Synchronous Inertial Response (SIR)	MWs^2h	0.0050
Primary Operating Reserve (POR)	MWh	3.24
Secondary Operating Reserve (SOR)	MWh	1.96
Tertiary Operating Reserve (TOR1)	MWh	1.55
Tertiary Operating Reserve (TOR2)	MWh	1.24
Replacement Reserve – Synchronised (RRS)	MWh	0.25
Replacement Reserve – Desynchronised (RRD)	MWh	0.56
Ramping Margin 1 (RM1)	MWh	0.12
Ramping Margin 3 (RM3)	MWh	0.18
Ramping Margin 8 (RM8)	MWh	0.16
Steady State Reactive Power (SSRP)	MVArh	0.23
Fast Frequency Response (FFR)	MWh	2.16
Fast Post Fault Active Power Recovery (FPFAPR)	MWh	0.15
Dynamic Reactive Response (DRR)	MWh	0.04

5% increase to "Rollover Contract" tariff rates

5% increase to consultation tariff rates

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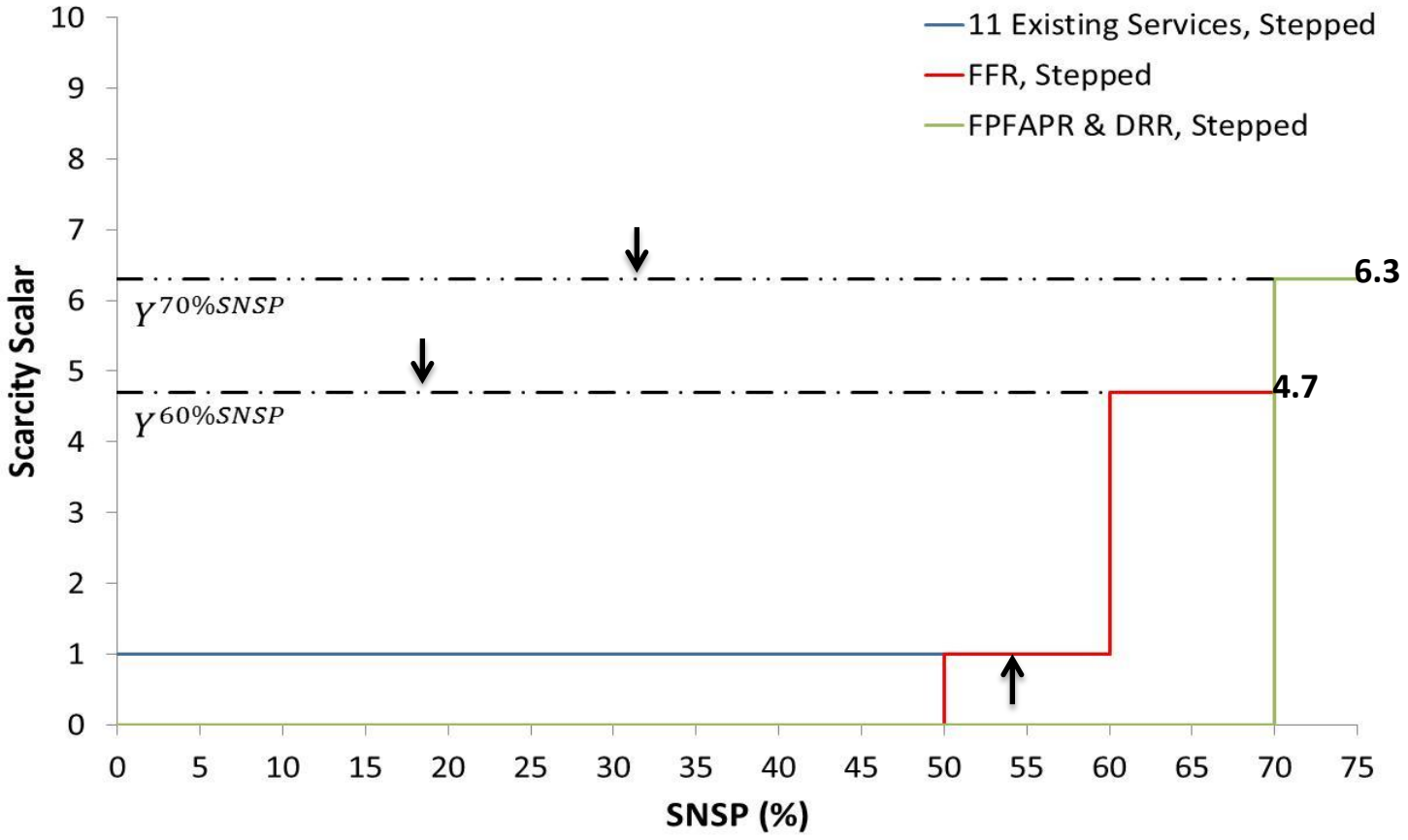
“Stepped” Scarcity Scalar Design



Note: Recommend maintaining use of “operational” SNSP

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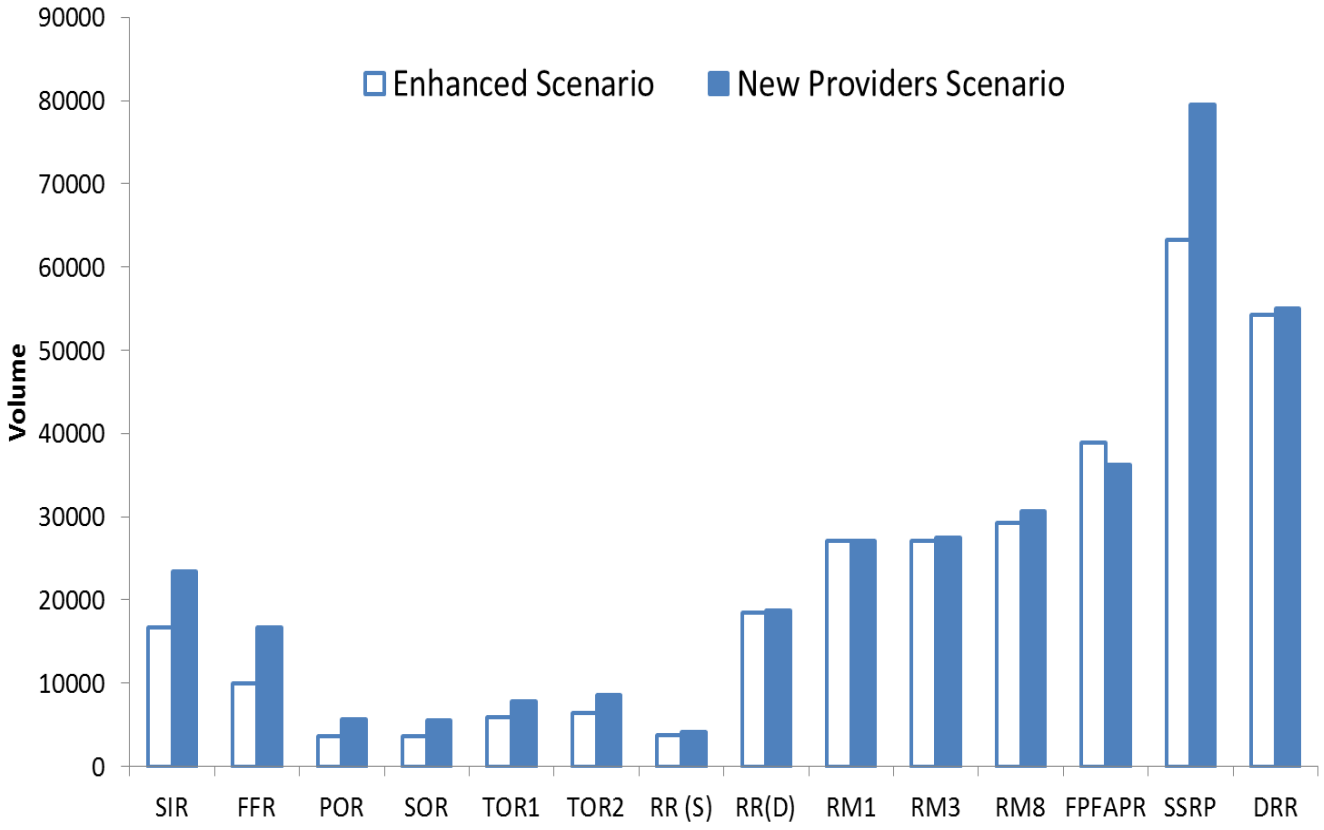
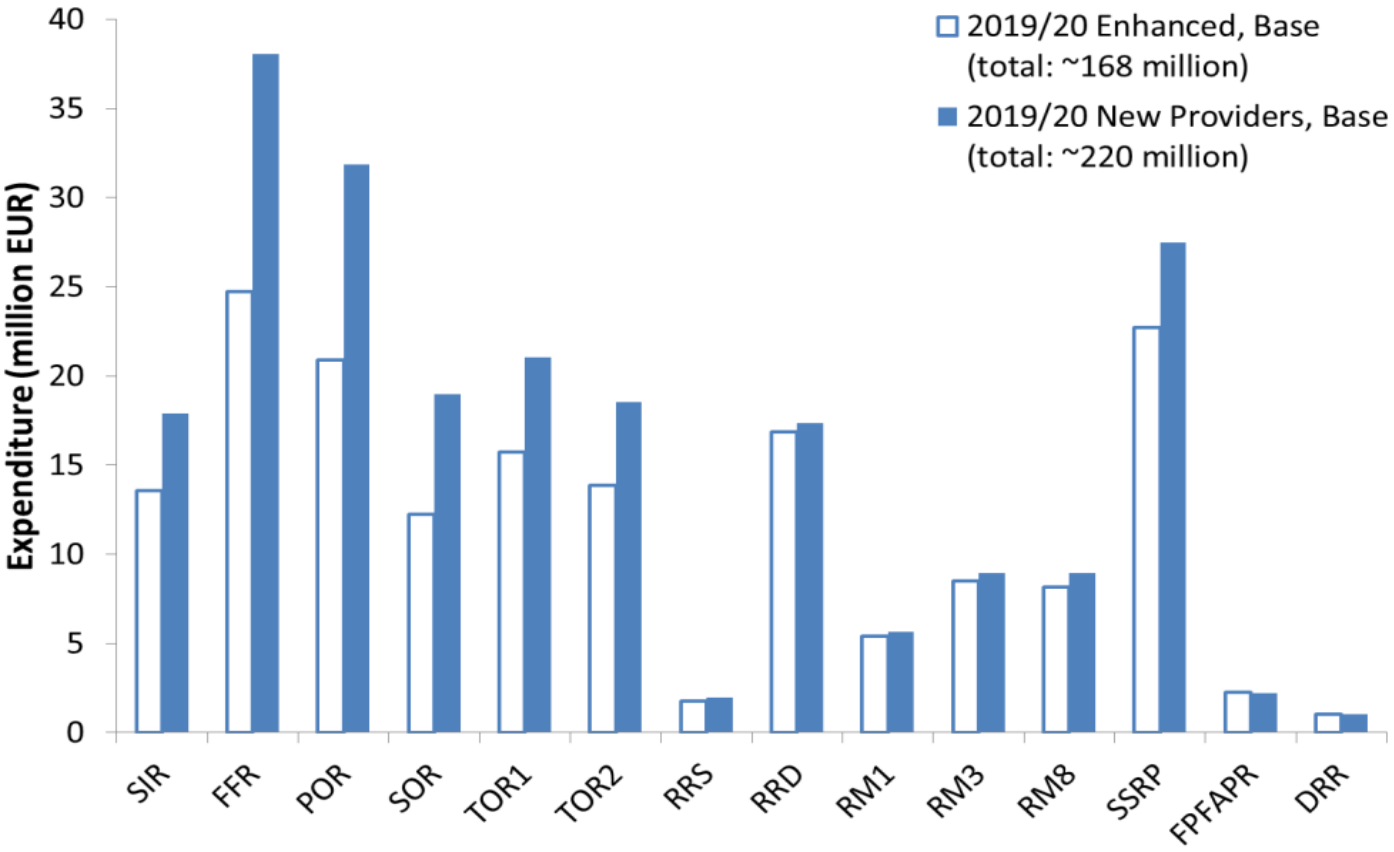
2019/20 Volumes



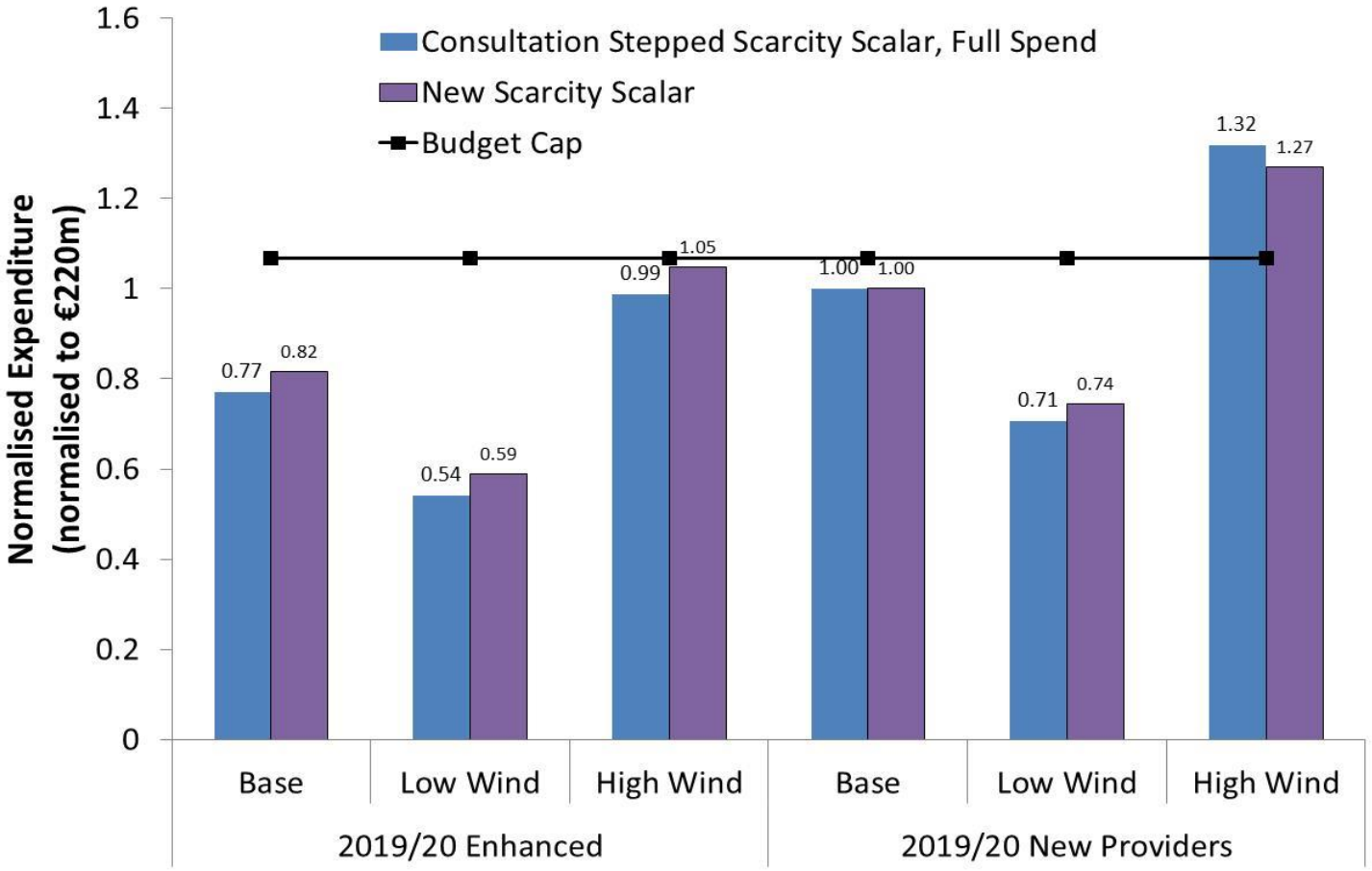
Note

- Volumes include effect of product scalars but not scarcity scalars
- SIR volumes divided by 100 for graphical purposes

2019/20 Expenditure per System Service



Expenditure: Impact of Wind Time Series



1. *Normalised with respect to the 2019/20 New Providers case*
2. *Although the budget cap is €235m, €15m is reserved to cover costs arising from the SEMC decision on market position vs. physical dispatch, and the cost of the Qualification Trial Process*

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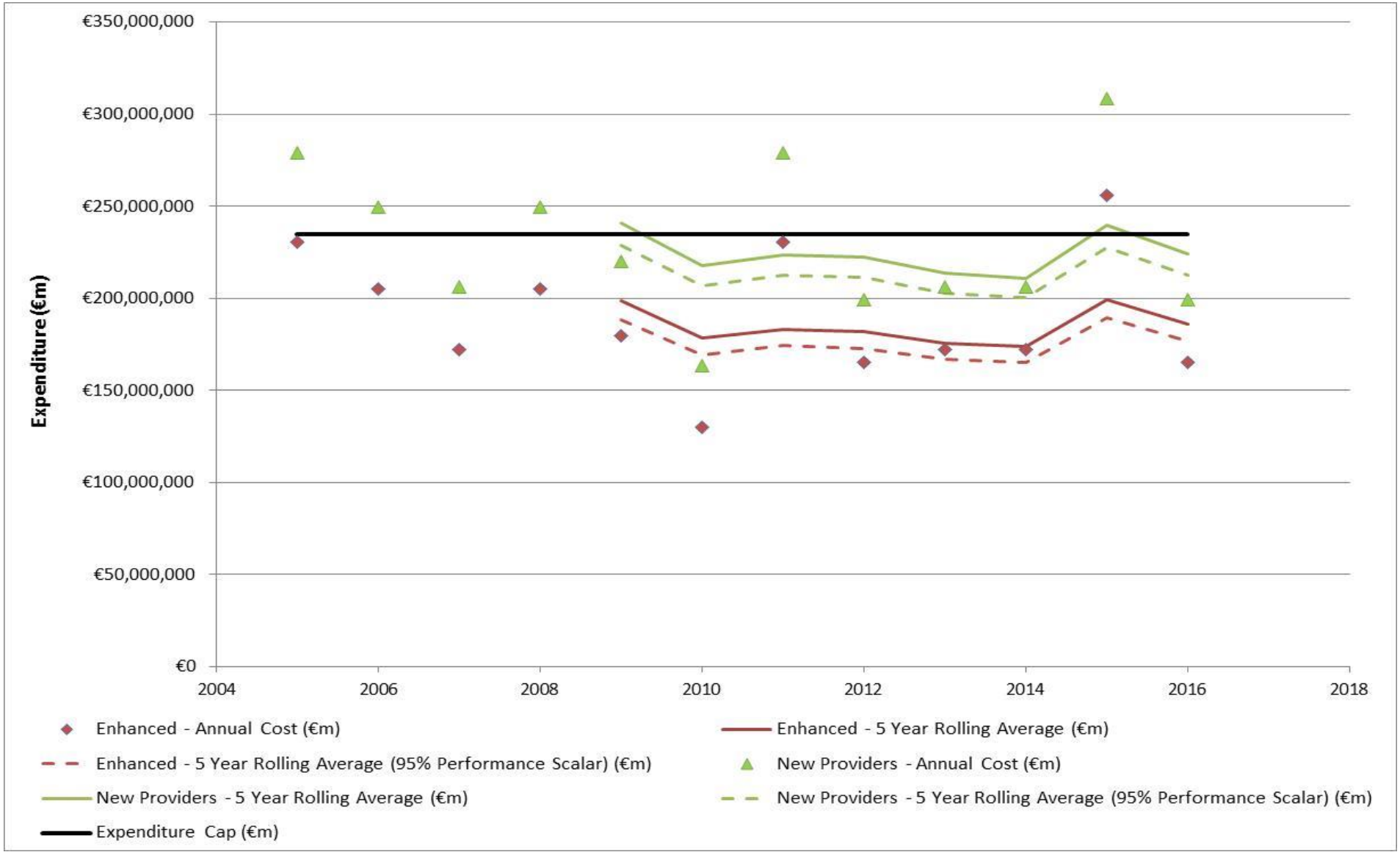
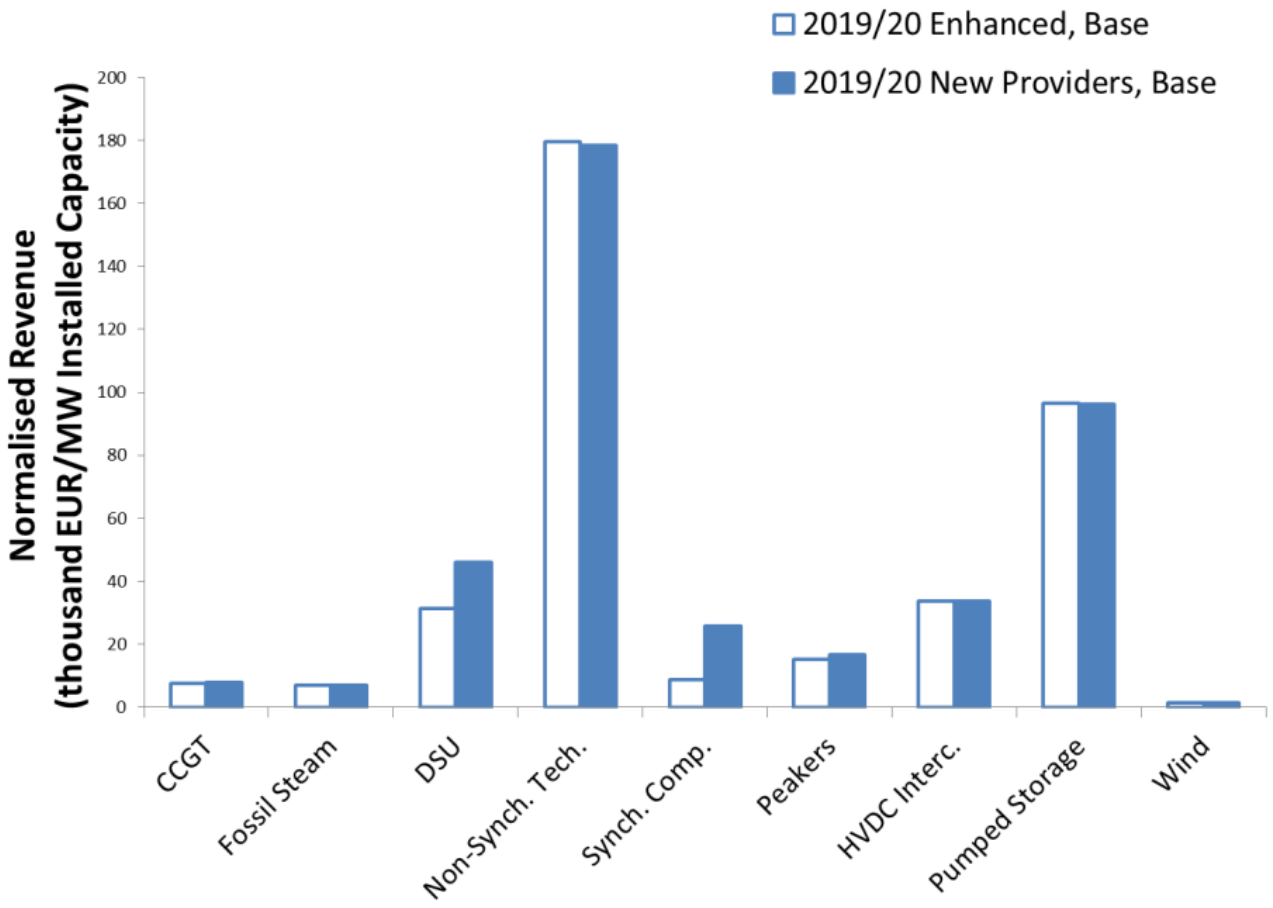
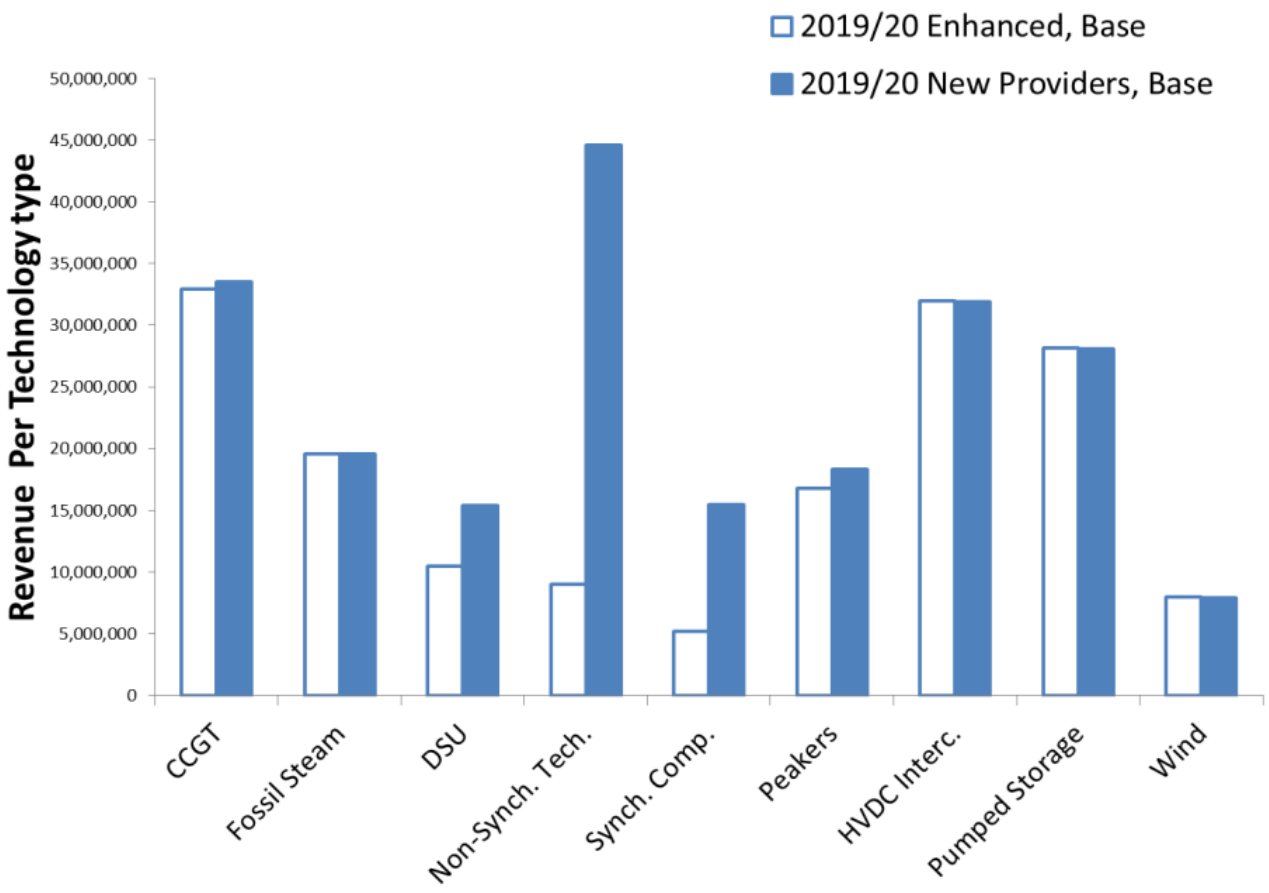
Annual Expenditure based on Historic Wind Capacity Factors



Normalised Revenue per Technology



Revenue per Technology



Recommended Procurement Framework

Existing Providers and New Investment

Non-Expenditure Risk

- Tariff Arrangements i.e. not volume capped
- Service providers whose availability is linked to energy dispatch
- 6 year tariff framework applies from 1 May 2018
- Conditional tariff review and TSO termination rights

New Investment

Expenditure Risk

- Volume-limited competitive price-based procurement
- e.g. Storage, DSUs (units whose availability not linked to energy dispatch)
- Focused on FFR – TOR2 services
- Time-limited contracts starting on a specific future start date
- Requires bonding or some other commitment
- Different T&Cs to tariff contract

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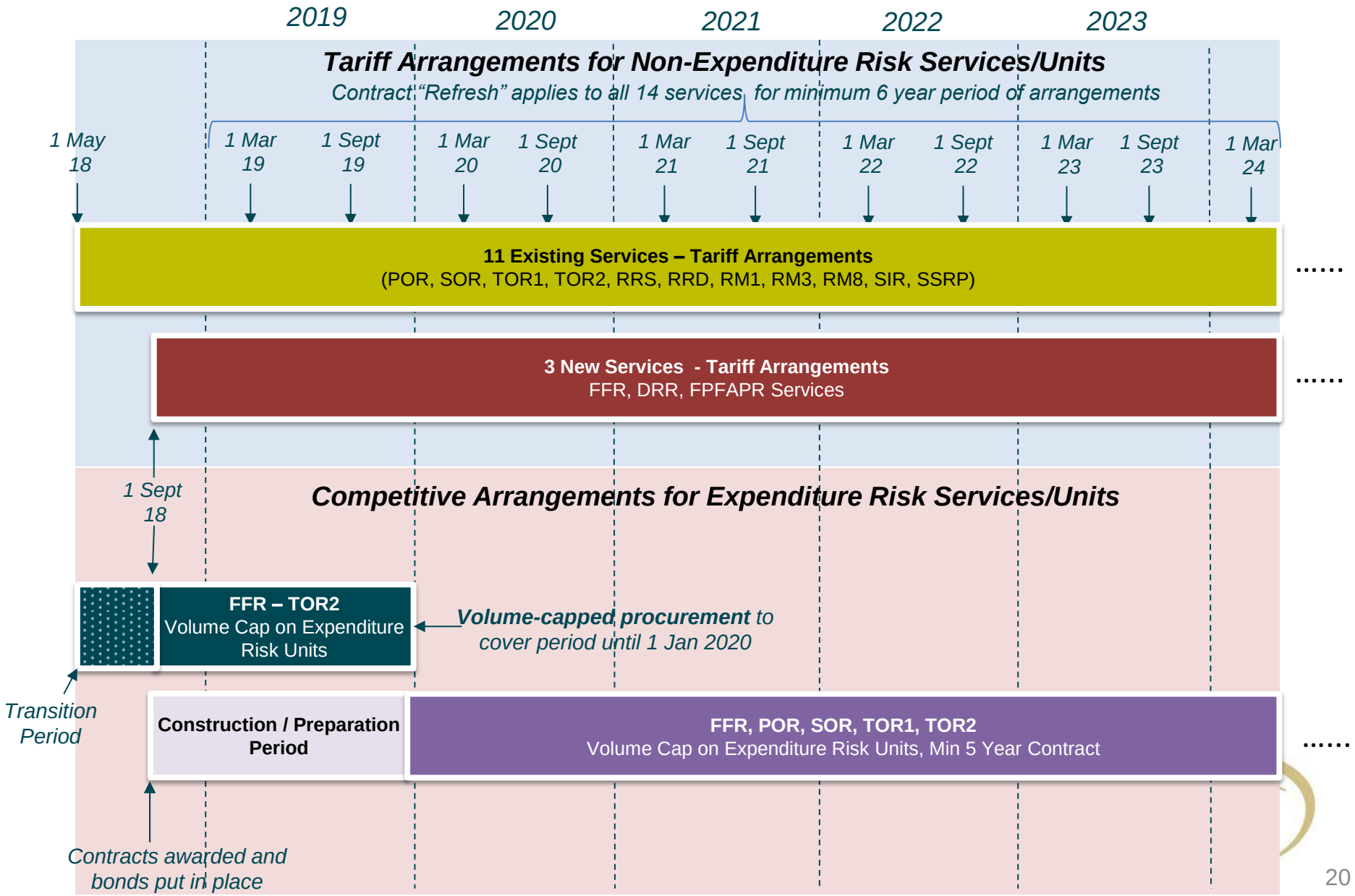
Proposed Procurement Timeline



Non-Competitively Awarded Contracts – Conditional Reviews

- Contracts that are non-competitively awarded will allow for conditional reviews if over/under-expenditure occurs
- Subject to a tolerance, TSOs would have right to adjust tariffs and/or scarcity scalar values on a quarterly basis if over-expenditure occurs for reasons other than high wind conditions subject to RA approvals
- Subject to RA approvals, TSOs would have right to adjust tariffs and/or scarcity scalar values if there is significant under-expenditure in a particular tariff year

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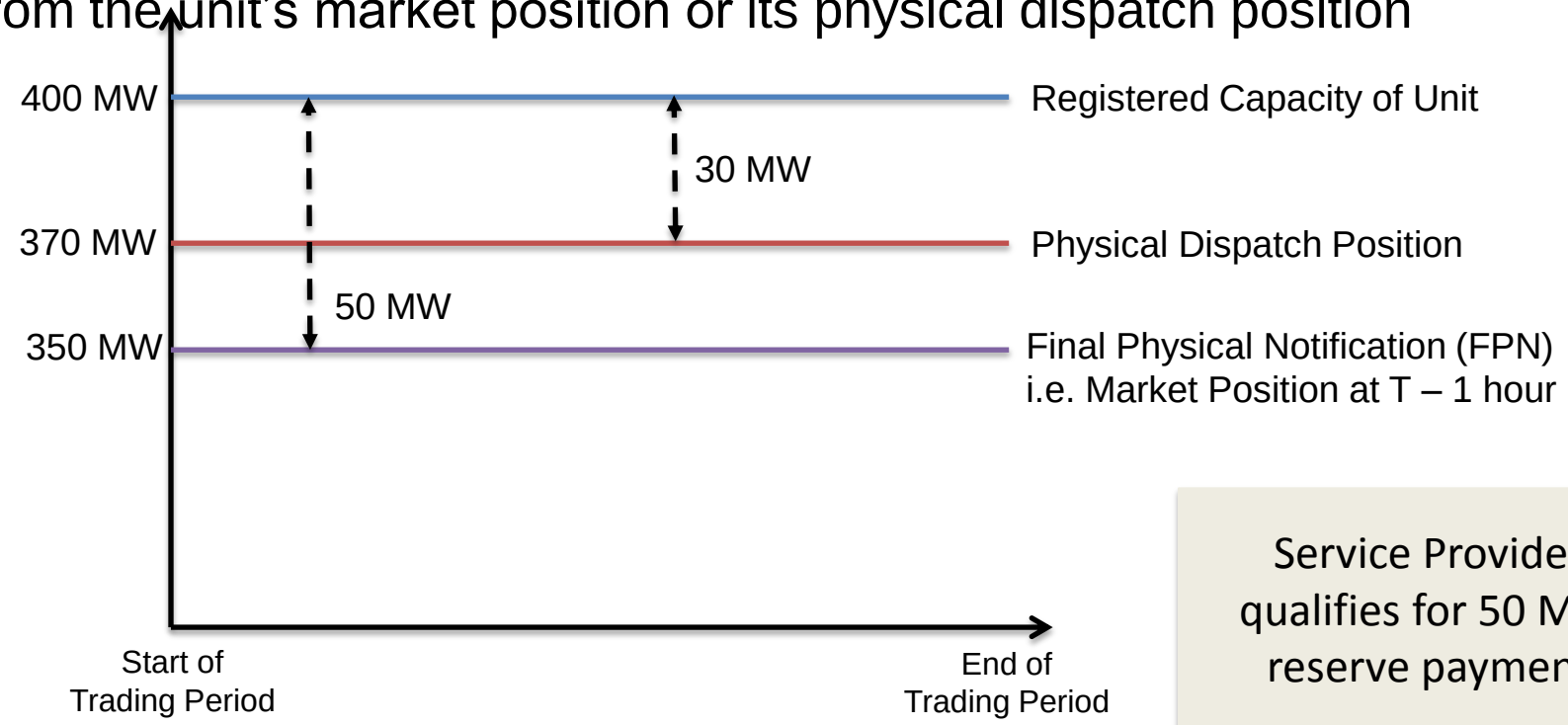
Market Position vs. Physical Dispatch

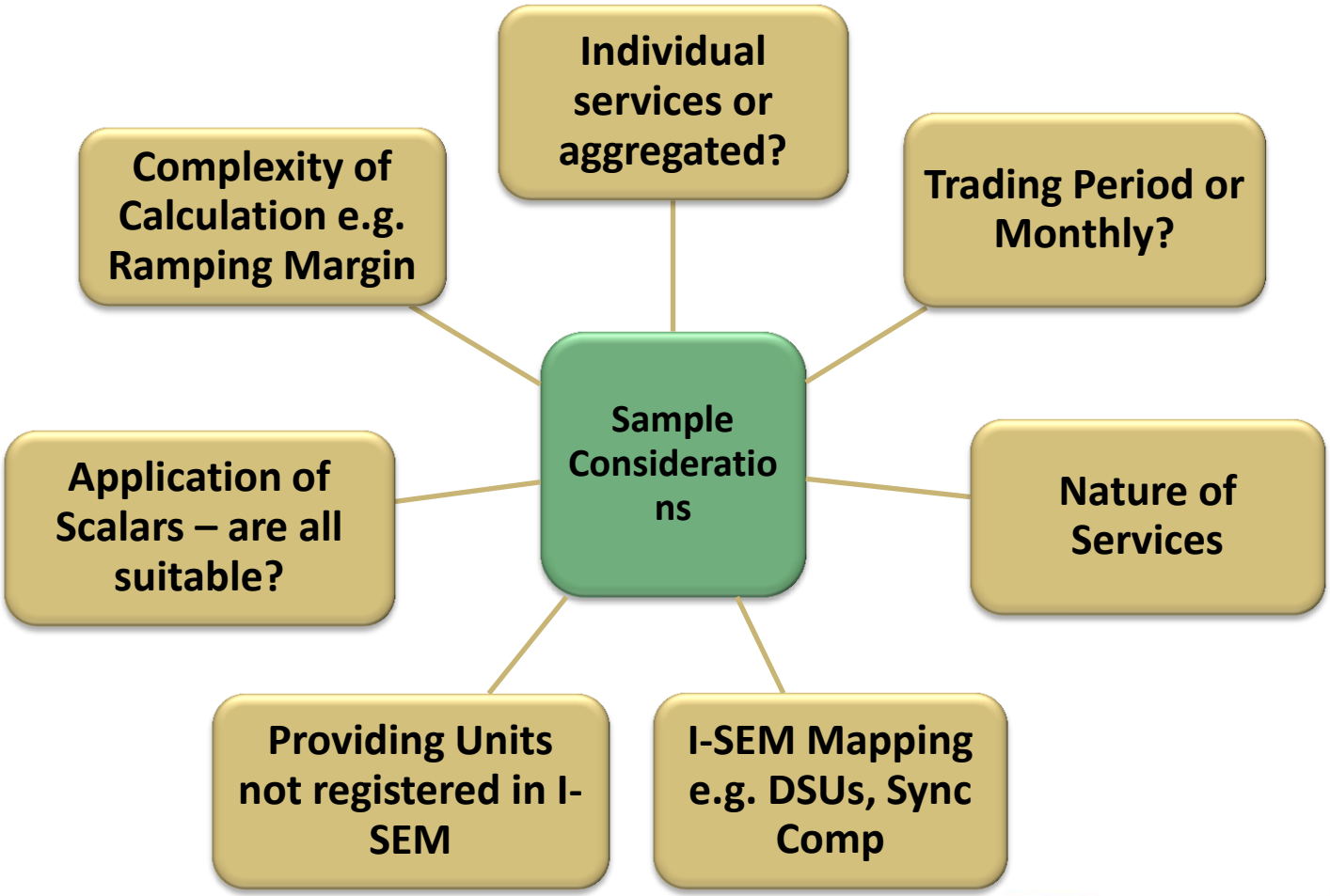
Market Position vs. Physical Dispatch

- SEMC directed that units should be paid the higher payment arising from the unit's market position or its physical dispatch position



Service Provider qualifies for 50 MW reserve payment

Market Position vs. Physical Dispatch
Sample Considerations



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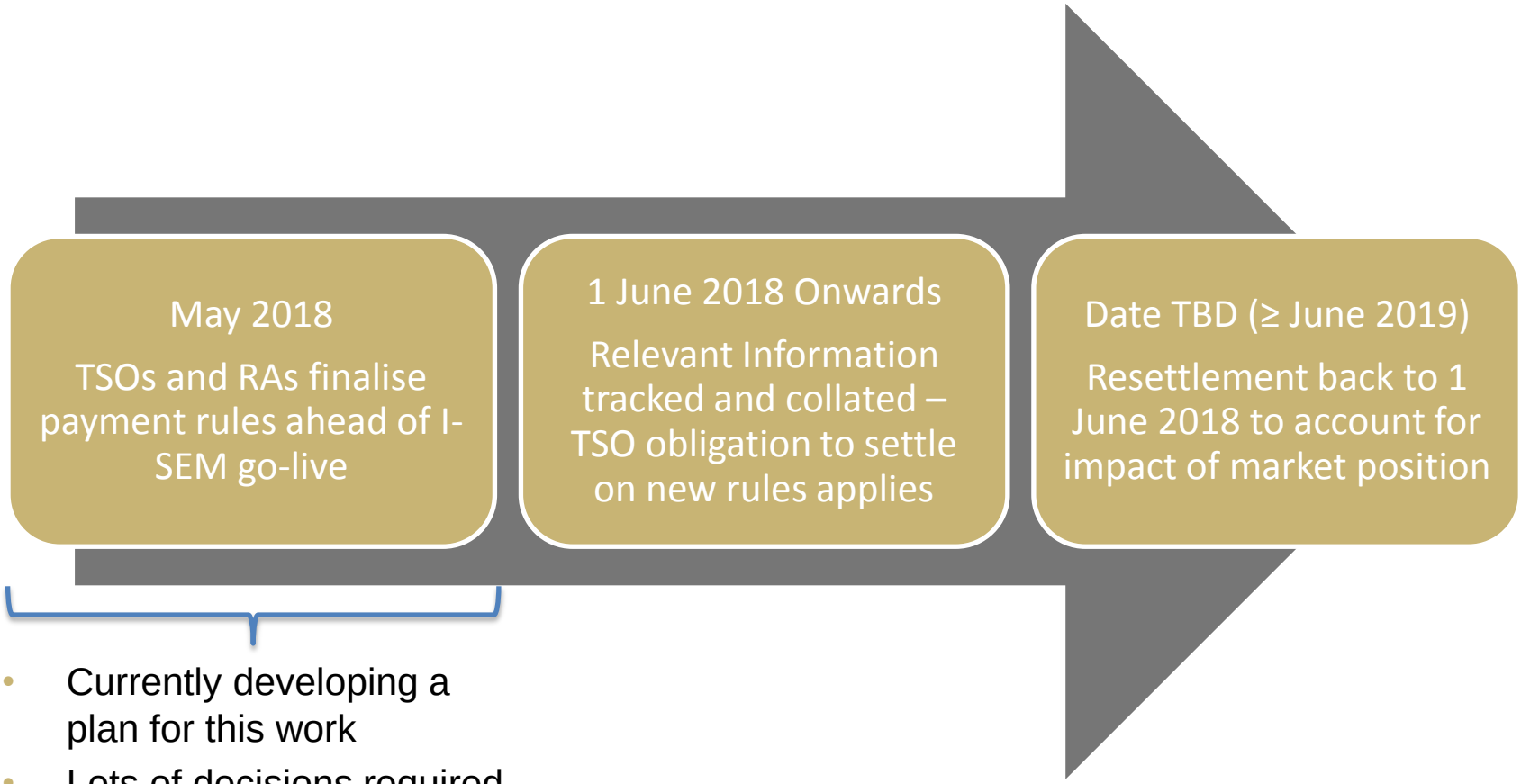
Market Position vs. Physical Dispatch



- Currently developing a plan for this work
- Lots of decisions required by TSOs and RAs
- Significant stakeholder engagement needed

Regulated Tariffs – Next Steps

Regulated Tariffs - Next Steps
(Dependent on SEMC Decision)

Assess final SEMC decision and develop an implementation plan

Translate SEMC decisions into contracts for non-volume capped tariff arrangements

Consult on contracts for volume-capped competitive arrangements

Market versus Physical Dispatch Position Development

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Scalar Design – Recommendations

Joe Deegan

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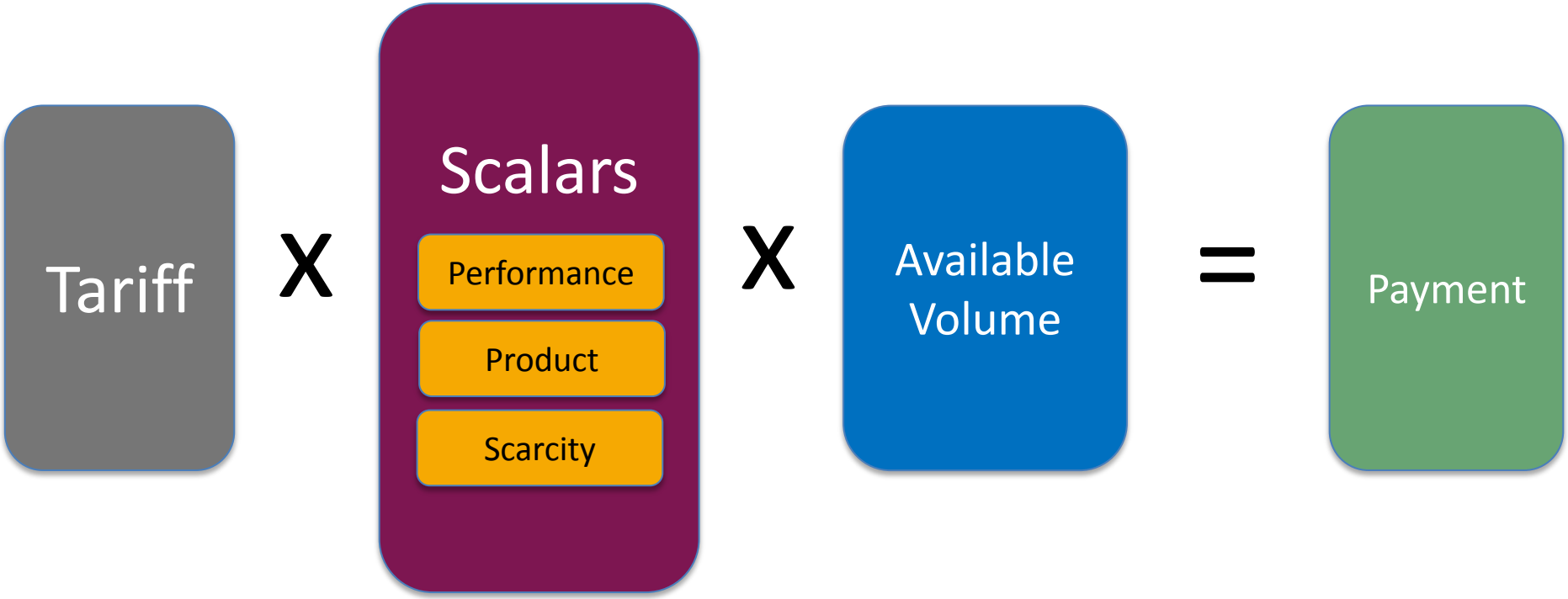
Scalars – Holistic Design



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Recommended Scalars - Context

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Recommended Scalars

Scalar Type	Purpose of Scalar
Performance Scalar	Incentivise Reliable Performance
Product Scalar	Faster Response of FFR
Product Scalar	Enhanced Delivery of FFR, POR, SOR, TOR1
Product Scalar	Continuous Provision of Reserve from FFR to TOR1
Product Scalar	Delivery of SSRP with an AVR
Product Scalar	Delivery of SSRP with Watt-less VArs
Scarcity Scalar	Locational Variation of All System Services
Scarcity Scalar	Temporal Variation of FFR
Scarcity Scalar	Temporal Variation of DRR and FPFAPR
Scarcity Scalar	Temporal Variation of 11 Existing System Services

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Performance Scalar

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Performance Scalar Definition - Recommendation

- The specification of the performance scalar and its related performance assessment methodologies is to continue to be described in the Protocol document accompanying the contractual agreement
- Existing practice in place for Interim Arrangements
- Rationale is to allow for continuing development of methodologies throughout the duration of Regulated Arrangements

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Performance Scalar Composition - Proposal

- Proposed that the performance scalar is to include an evaluation of a unit's forecast of availability
- Expanded proposal in Consultation on DS3 System Services Contracts for Regulated Arrangements (3.39)
- TSOs propose not to apply performance scaling to forecasts for the 1st twelve months of Regulated Arrangements

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Performance Scalar Composition - Proposal

- It is proposed that the performance scalar is to consist of two components:
  - Availability Discount Factor (PA)
  - Event Response Factor (PE)

- The overall Performance Scalar is then to be calculated as:

  $P = PA * PE$

- Additional information relating to PE is included in the Consultation on DS3 System Services Contracts

Product Scalar for the Faster Response of FFR

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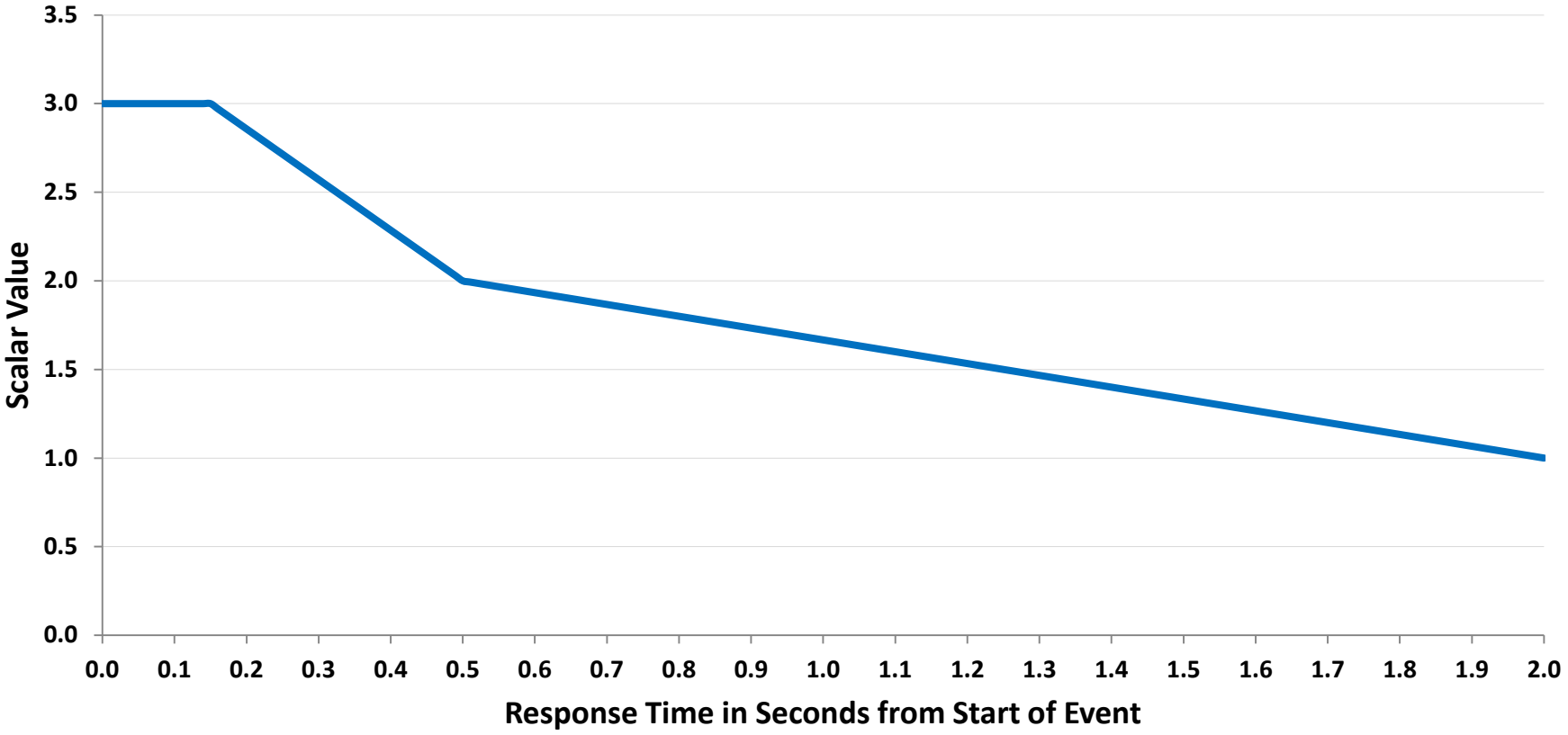
Faster Response of FFR - Recommendation



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Faster Response of FFR

- No change to the consultation proposal
- Industry feedback to proposal was generally favourable
- TSOs had addressed previous feedback advocating incentivisation of response time faster than 500ms
- TSO studies support the recommendation

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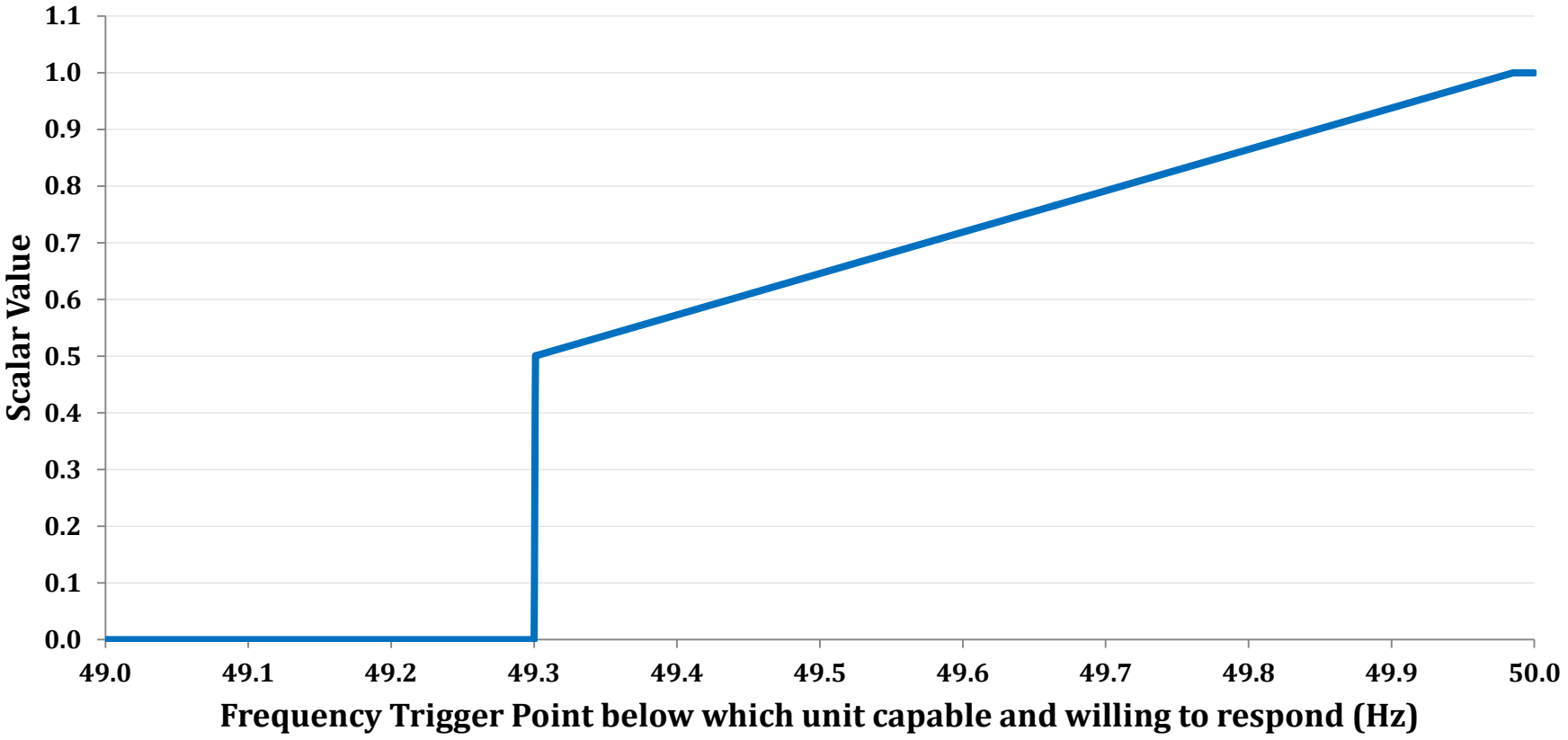
Product Scalar for the Enhanced Delivery of POR, SOR and TOR1

Enhanced Delivery POR, SOR, TOR1 - Recommendation

Scalar Range	Scalar Components and Weighting	
0 – 1	Trigger Scalar	÷ 2
	+	
0.5 or 1	Type Scalar	

Enhanced Delivery POR, SOR, TOR1 - Trigger Scalar Recommendation



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Enhanced Delivery POR, SOR, TOR1 - Type Scalar Recommendation

Scalar Value	Frequency Response Capability
1	Dynamic
0.5	Static

Enhanced Delivery POR, SOR, TOR1 - Recommendation

- No change to consultation proposal

- Industry feedback:
  - General agreement on principle of scalar design
  - Linear nature of trigger scalar does not reflect importance and cost of responding at 49.985Hz
  - Type scalar does not reflect importance / cost of dynamic capability
  - Max value of 1 not aligned with SEM-14-108 definition

Enhanced Delivery POR, SOR, TOR1 - Recommendation

- Rationale:
  - Complexity in identifying proportionate value of various frequency set points
  - TSOs consider that type scalar definitions remain suitable for non-FFR provision
  - Holistic approach applied to the overall volumes and tariffs considerations

Product Scalar for the Enhanced Delivery of FFR

Enhanced Delivery FFR - Proposal

- Provision of FFR is to be defined through parametrisable Frequency Response Curves
  - Dynamic
  - Static

- Expanded proposal in Consultation on DS3 System Services Contracts for Regulated Arrangements (3.27):
  - Proposed criteria for application of dynamic and static curves
  - Proposed components and design for product scalar

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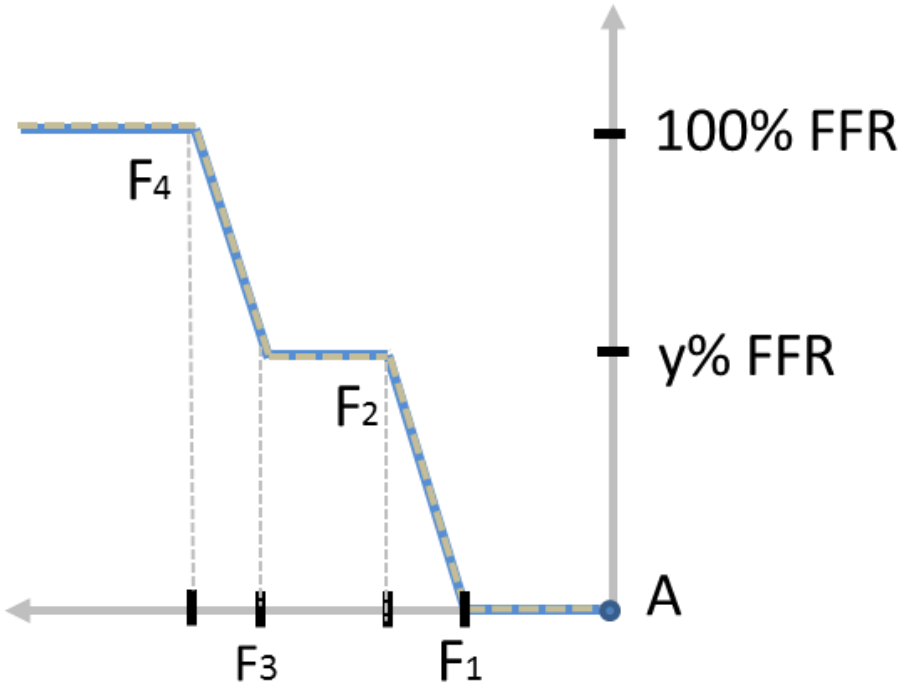
Enhanced Delivery FFR - Dynamic Capability Proposal



X axis	System Frequency (Hz)
Y axis	FFR Magnitude (%)
A	50Hz, 0% FFR
F_1	Frequency set point 1
F_2	Frequency set point 2
F_3	Frequency set point 3
F_4	Frequency set point 4

Frequency falling

Frequency recovering

Enhanced Delivery FFR - Dynamic Capability Proposal

- Criteria for dynamic capability:
  - ability to track frequency changes dynamically
  - capability to provide at least 10 steps, with no step > 5MW
  - frequency trigger setpoint is to be at least 49.8Hz
  - unit must be able to provide a droop of at least 4%
  - unit must be able to operate without recovering its resource until frequency recovered to within 5% of pre-event frequency for 5 mins
  - unit's provision of POR, SOR and TOR1 should mirror its FFR response characteristics

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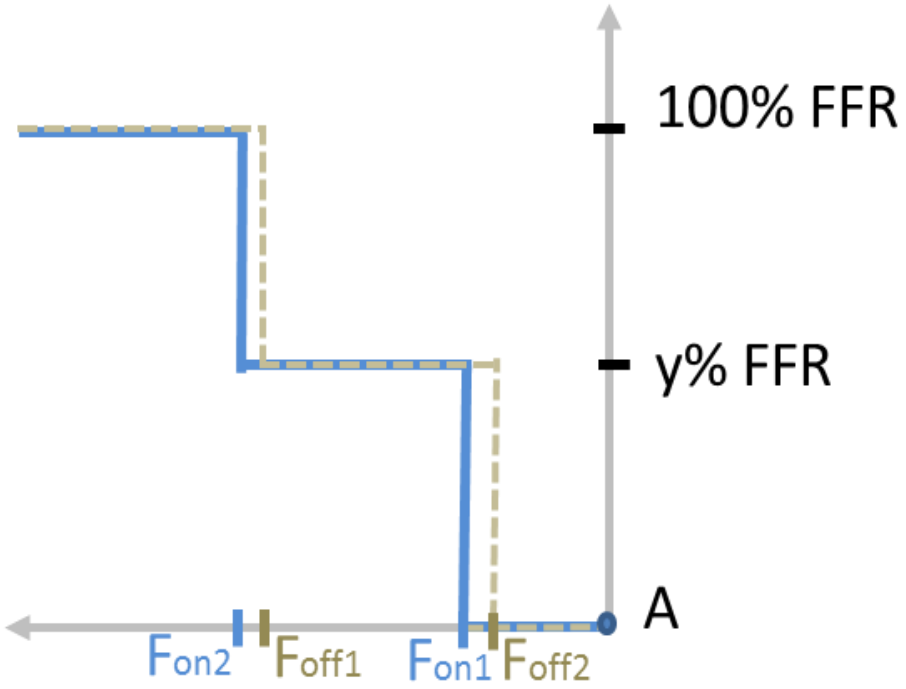
Enhanced Delivery FFR - Dynamic Capability Proposal

Scalar Range	Dynamic Scalar Components and Weighting	
0.7 – 1	Dynamic Trigger Scalar	60%
0.2 – 1	Droop Scalar	30%
0.5 or 1	Response Scalar	10%

Enhanced Delivery FFR - Static Capability Proposal



X axis	System Frequency (Hz)
Y axis	FFR Magnitude (%)
A	50Hz, 0% FFR
Fon1	Response Step1
Fon2	Response Step 2
Foff1	Recovery Step 1
Foff2	Recovery Step 2

Frequency falling

Frequency recovering

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Enhanced Delivery FFR - Static Capability Proposal

- Criteria for static capability:
  - capability to provide discrete steps ≤ 10MW; TSOs must have the ability to choose to use the entire static response at one frequency trigger point
  - frequency trigger setpoint is to be at least 49.3Hz
  - basic recovery of FFR product applies
  - unit's provision of POR, SOR and TOR1 should mirror its FFR response characteristics

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Enhanced Delivery FFR - Static Capability Proposal

Scalar Range	Static Scalar Components and Weighting	
0.1 – 0.6	Static Trigger Scalar	60%
0.5 or 1	Hysteresis Scalar	20%
0.1 – 1	Step Scalar	20%

Product Scalar for the Continuous Provision of Reserve from FFR to TOR1

Continuous Provision FFR to TOR1 - Recommendation

Scalar Value	Criteria Applicable to FFR Provider
1.5	Provides all of FFR, POR, SOR and TOR1
1	Otherwise

Continuous Provision FFR to TOR1

- The scalar is only to apply to the FFR Service
- No change to the consultation proposal
- Industry feedback to consultation:
  - generally favourable
  - suggested TSOs reward provision of POR and SOR also
- TSO studies support the recommendation

Product Scalar for the Enhanced Delivery of SSRP with an AVR

Enhanced SSRP with AVR - Recommendation

Scalar Value	Criteria Applicable to SSRP Provider
2	AVR installed, turned on and fully operational
1	Otherwise

Enhanced SSRP with AVR

- No change to consultation proposal
- Industry feedback in agreement on the proposal
- Definition of AVR for Interim Arrangements to remain
- SEM Committee DS3 System Services Technical Definitions Decision Paper (SEM-13-098) directed that HAS arrangements be maintained

Product Scalar for SSRP with Watt-less VArs

SSRP with Watt-less VArs - Recommendation

Scalar Value	Criteria Applicable to SSRP Provider
2	Unit capable of providing SSRP at 0MW and instructed to do so by TSOs
1	Otherwise

SSRP with Watt-less VArs

- No change to consultation proposal
- Industry feedback to consultation:
  - majority of respondents in agreement in principle
  - concerns about the energy costs relating to the provision of SSRP at 0MW
- TSOs will work to resolve this issues in terms of I-SEM deliverables and the type of operational support contracts that may be required

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Locational Scarcity Scalar for All System Services

Locational Scarcity All System Services - Recommendation

Scalar Value	Criteria to Apply to Any / All System Services
1	Duration of Regulated Arrangements
>1	May apply to the provision of any System Service from to-be-determined geographical locations

Locational Scarcity All Systems Services

- No change to consultation proposal
- SEM Committee Request: Paper SEM-17-017
- Industry feedback focussed on transparency of any decision
- Scalar >1:
  - dependent on strong locational requirement
  - subject to approval by the Regulatory Authorities

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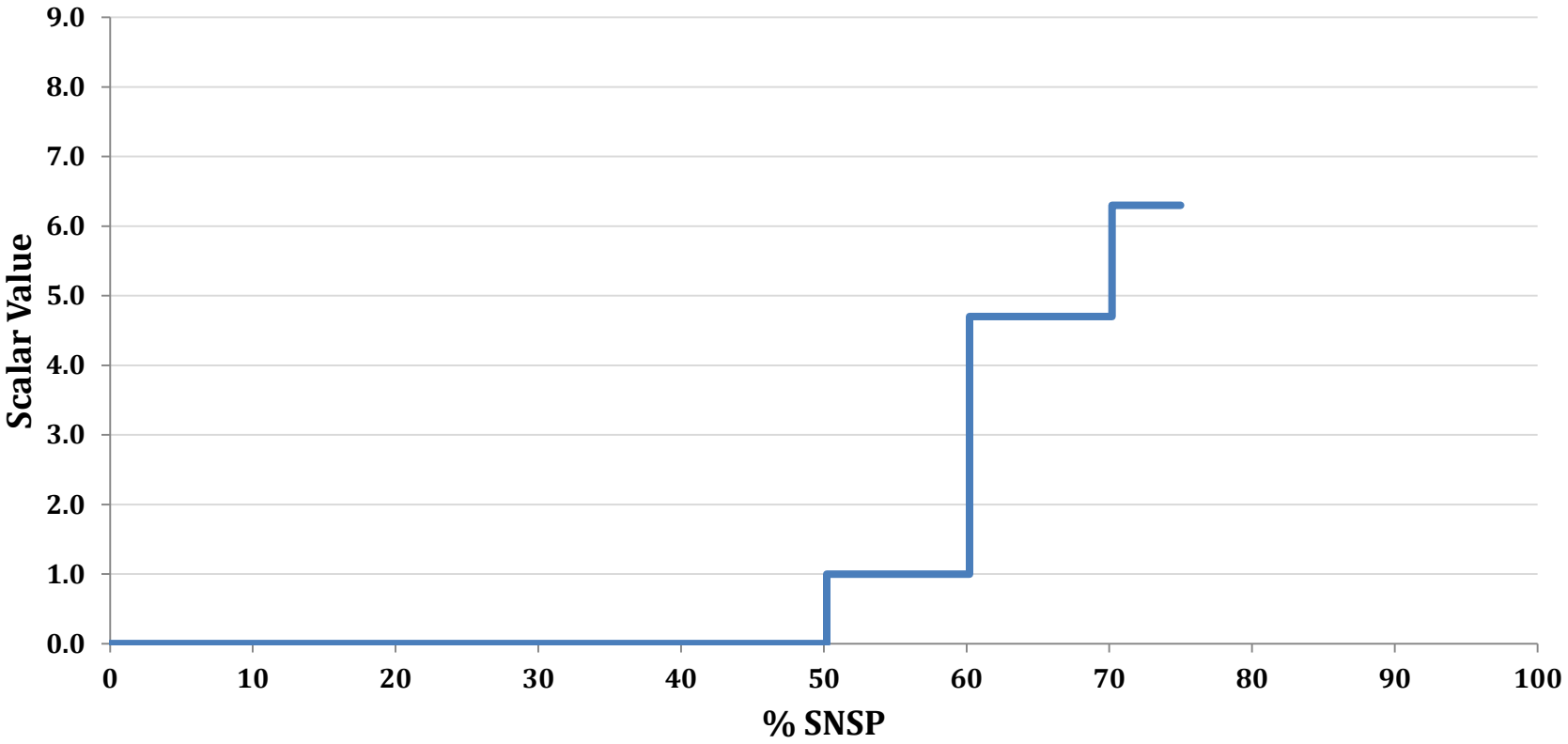
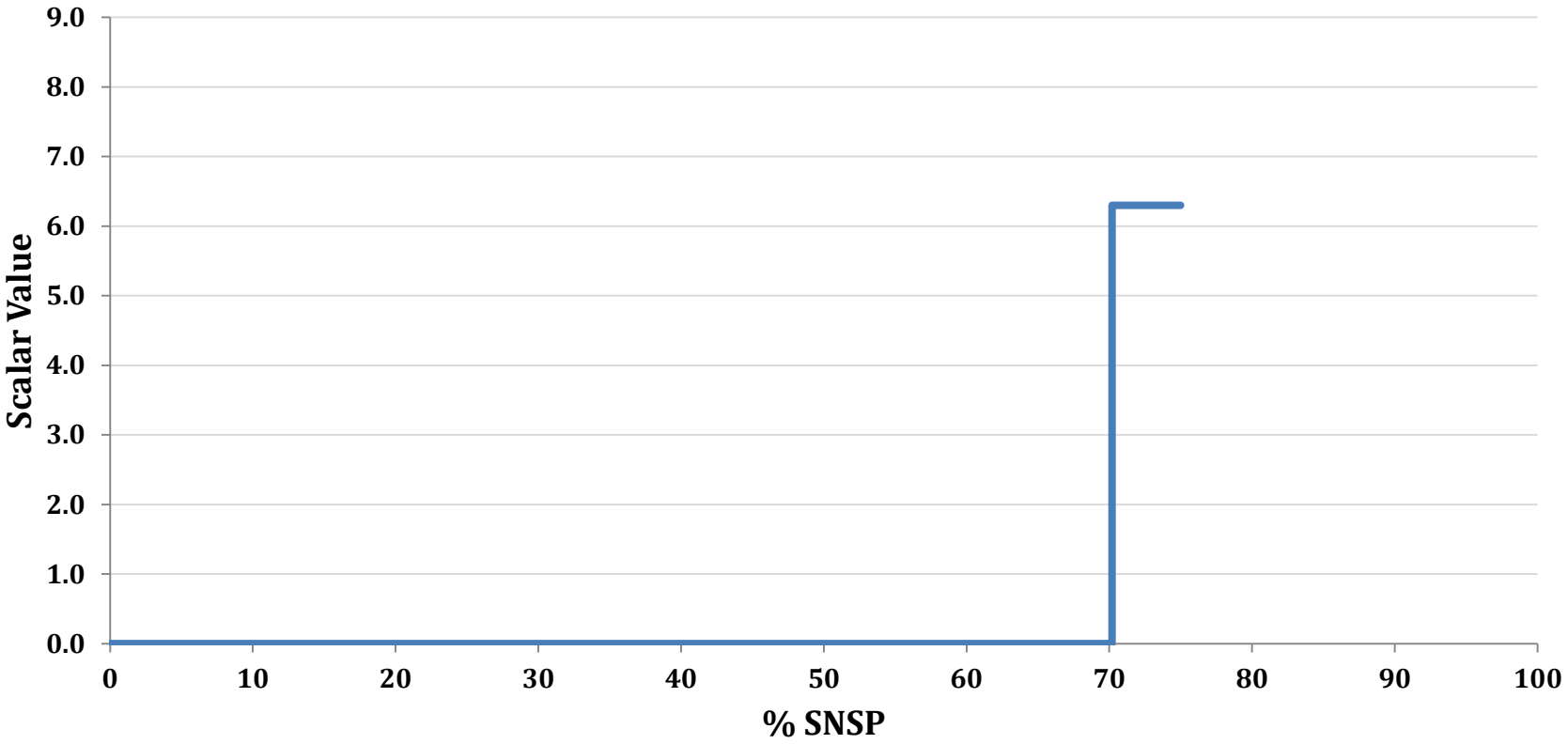
Temporal Scarcity Scalar for FFR

Temporal Scarcity FFR - Recommendation



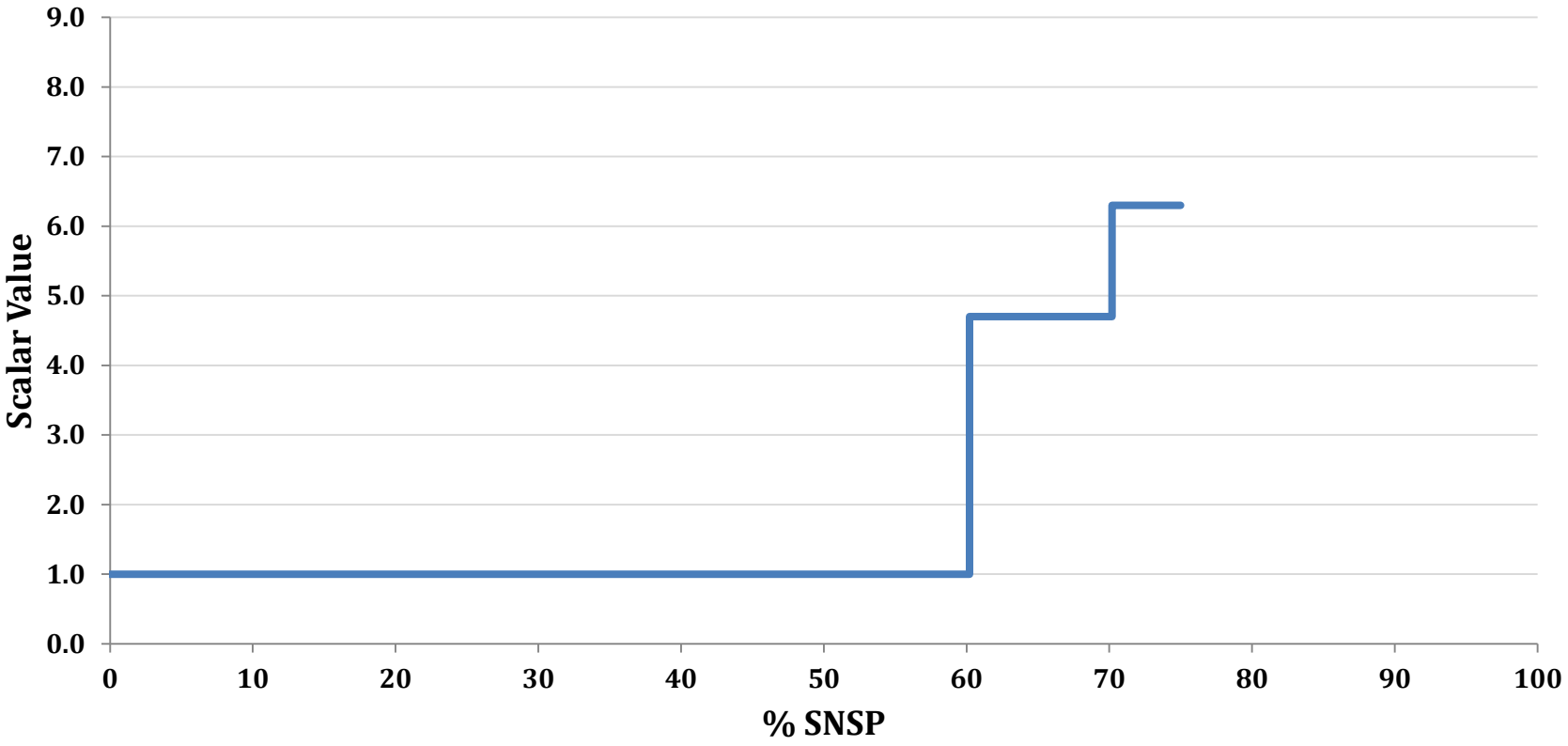
Temporal Scarcity Scalar for FPFAPR and DRR

Temporal Scarcity DRR & FPFAPR - Recommendation



Temporal Scarcity Scalar for 11 Existing System Services

Temporal Scarcity 11 Existing Services - Recommendation



Scalars – Not Recommended

Scalar Type	Purpose of Scalar
Product Scalar	Enhanced Delivery of DRR with More Reactive Current
Product Scalar	Enhanced Delivery of SSRP with a PSS
Product Scalar	Delivery of SIR with Reserve
Product Scalar	Faster Response of FPFAPR
Scarcity Scalar	Temporal Variation of Reserve Products
Scarcity Scalar	Temporal Variation of SIR
Scarcity Scalar	Locational Variation of SSRP
Volume Scalar	Protect customers from overpayment and allow the TSOs to manage the overall scale of payments

Contracts and Procurement

Niamh Delaney

EIRGRID SONI

Regulated Arrangements Contracts Consultation

- Published **26 September 2017**
- Responses due back to DS3@eirgrid.com or DS3@soni.ltd.uk by **17 October 2017**

Interaction with Outstanding Consultations

- At the time of issue of the Contracts consultation, decisions are outstanding on the consultation on **DS3 System Services Enduring Tariffs** and **DS3 System Services Enduring Scalar Design**

- Both forthcoming decisions will impact a number of the areas noted in this consultation paper (e.g. proposed term of contract and scalar values)

Changes to contractual arrangements relative to Interim Arrangements

DS3 System Services Contract

- Standard contractual provisions
- Term
- Schedules for 14 DS3 System Services
- Product Scalar details
- Scarcity/Locational Scalar details

Protocol Document

- Compliance Requirements – additional detail for new and existing technologies
- Performance Scalar Details
- Performance Monitoring Methods and infrastructure requirements
- Operational Requirements
- Governance

Statement of Payments

- DS3 System Service Payment rates

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Proposed Contract Structure

DS3 System Services Contract

- Standard Legal
- Schedule 1 – Definitions
- Schedule 2 – Operating Reserves
- Schedule 3 – SSRP
- Schedule 4 – SIR, FFR, FPFAPR, RM, DRR
- Schedule 5 – Billing and Payment
- Schedule 6 – Dispute Resolution Procedure
- Schedule 7 – Address Details and Billing Address
- Schedule 8 – Banking Details of the Service Provider
- Schedule 9 – Operating Parameters + frequency response curves

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Changes to contractual arrangements relative to Interim Arrangements

- All references to **Framework Agreements** have been removed
  - Will use **Qualification System** and **Contracts**
- Proposed **Term** of arrangements has been altered
- Requirement for a Service Provider to be registered as the Participant (as defined in the TSC) for the Providing Unit under the **TSC** will alter
- **Termination** clauses amended
- **Liability Cap** may alter
- New **Definitions** provided for

Changes to contractual arrangements relative to Interim Arrangements

- **Scalar** details (as proposed in Scalar consultation)
- **Replacement Reserve** definition amended
- **Market versus Physical Dispatch Position** decision will be reflected
- **Conditional Review** clauses will be added (**Qualification System** and **Contracts**)
- **Governance of Protocol document**
- **Performance Monitoring**

Replacement Reserve Definition

Definitions of RRD and RRS have been amended

- Historically higher payments for RR have been made to units that could provide the service from an off-line desynchronised state (paid RRD rate) than units that needed to be synchronised to the system (paid RRS rate)
- Providing Units that do not need to be exporting active power at the time of service provision do not take up ‘headroom’ on the system that could be used to integrate renewables
- Proposed change:
  - DSUs will be eligible to provide the RRD service rather than the RRS service
  - Energy Storage Units will be eligible to provide the RRD service when providing Replacement Reserve from a 0 MW position or when importing.
  - When exporting, Energy Storage Units will be eligible to provide the RRS service

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Governance of Protocol Document

- Proposal to change the Governance of the Protocol document
- Changes allowed a maximum of once every 3 months
- Calendar for change no longer tied to specific months
- Protocol will still be subject to consultation and RA approval for a material change.
- Will increase the flexibility to change the Protocol document periodically if necessary

Managing Expenditure Risk

- Expenditure risk if lots of **high availability Providing Units** whose availability is not linked to energy dispatch (e.g. DSU, batteries, flywheels) are contracted to provide a subset of system services

- Also propose provisions for **conditional reviews of tariffs/scarcity scalars**

Manage Scale of New Entrants – Mitigation Options presented in Enduring Tariffs paper

Option 1: Volume Scalar

- Introduce a Volume Scalar by trading period

Option 2: "Availability" Definition

- Should overinvestment become evident, the definition of "availability" could be reviewed for new entrants

Option 3: Procurement

- Limit volume of services provided by New Technologies through procurement

TSOs' proposal

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Managing Expenditure Risk

Procurement Process (for Volume Capped)

- Manage scale of new high availability units receiving contracts for high value FFR – TOR2 services through competitive procurement
- This will also provide for greater investment certainty

Contracts (for Volume Uncapped)

- Manage expenditure risk in non-competitively awarded contracts
  - Conditional reviews of tariffs/scarcity scalars
  - TSO termination rights

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Key Proposals – Procurement

Tariff Arrangements (Volume Uncapped)

Applies to non-expenditure risk units/services only

Min 6 year term

Conditional review if over/under-expenditure

TSOs right to terminate individual (or all) contracts with 1 year's notice

Competitive procurement for Expenditure-Risk Units (Volume Capped)

FFR, POR, SOR, TOR1 and TOR2 services

Min 5 year term

Different T&Cs to tariff contracts

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Volume Uncapped and Volume Capped

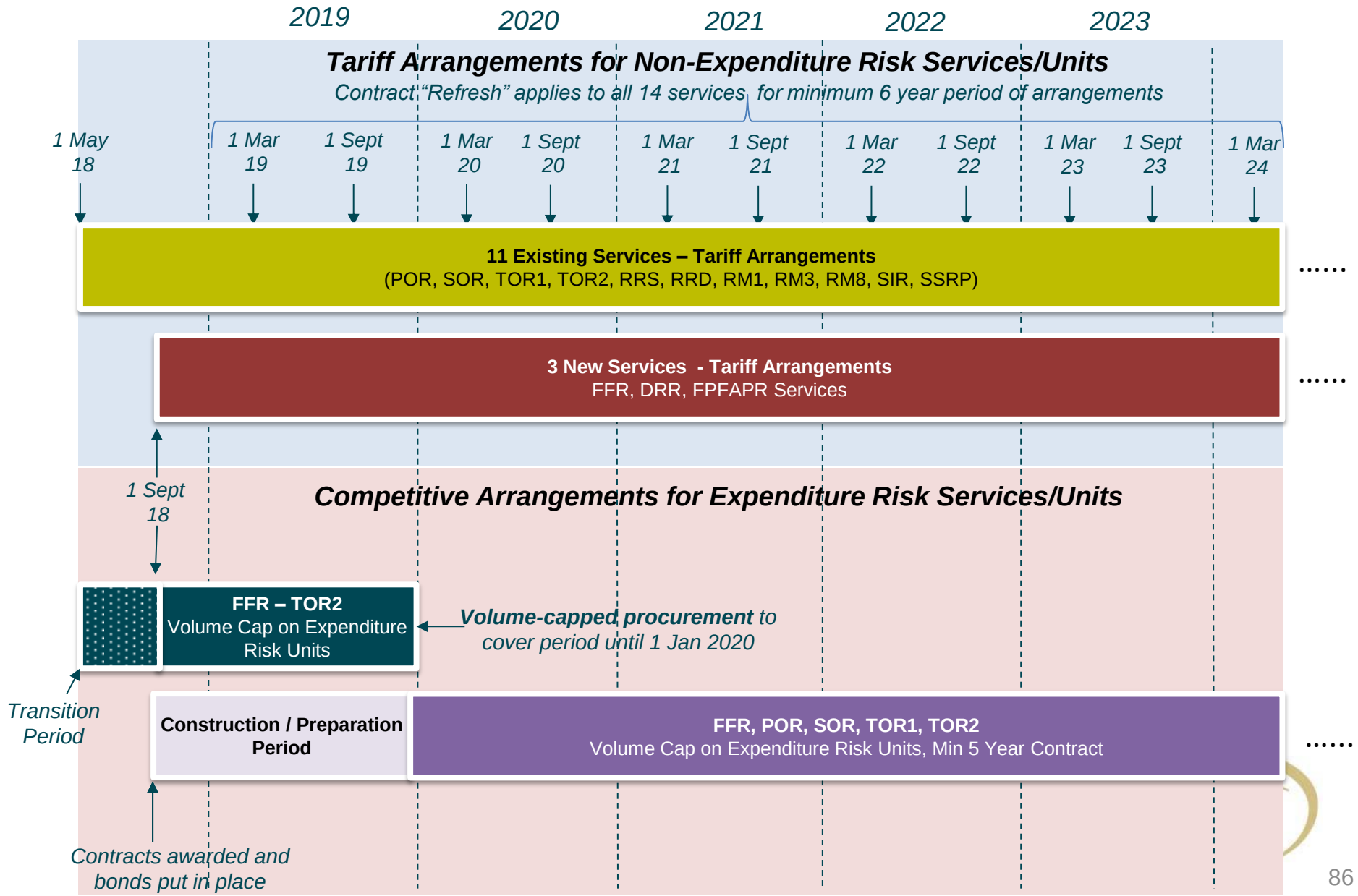
Volume Uncapped Procurement

- Refers to procurement which does not volume limit any of the system services being procured and to which regulated tariffs will apply

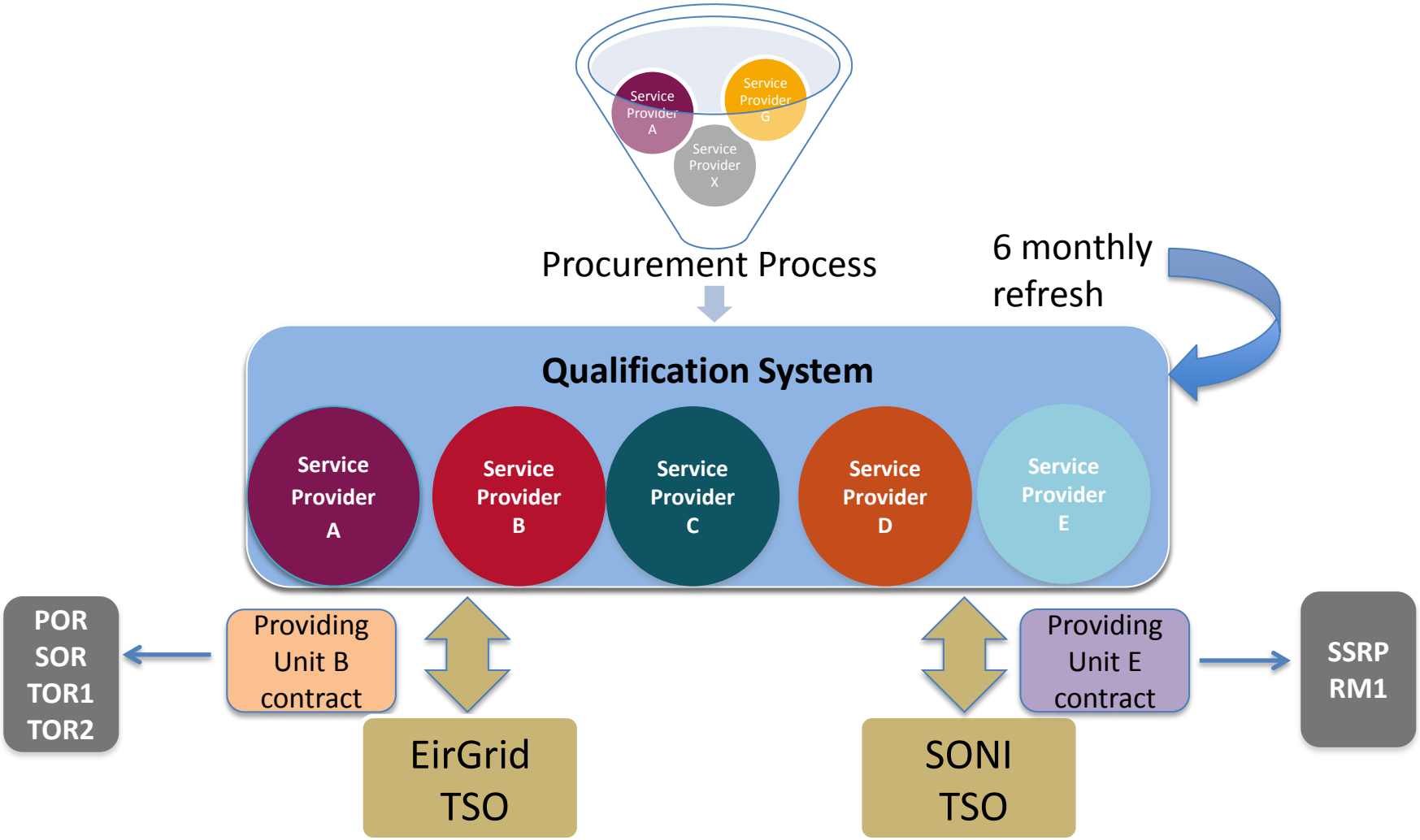
Volume Capped Procurement

- Refers to procurement for which an upper limit will be applied to the volume of relevant system services being procured and for which prospective service providers will offer a competitive price as part of their tender (proposed to apply to high availability Providing Units)

Proposed Procurement Timeline



Volume Uncapped Procurement (Tariff–based)



Volume Capped Procurement (Competitive)

- Principles of solution
  - Volume cap for Providing Units with high availability whose availability is not linked to energy market dispatch for a subset of system services (FFR, POR,SOR,TOR1 and TOR2)
  - Criteria to select between Providing Units where demand exceeds volume cap
  - Propose two separate volume-capped procurement processes be undertaken for the FFR, POR, SOR, TOR1 and TOR2 services
  - **Category 1 procurement** and **Category 2 procurement**
  - In both cases the price paid for a given DS3 System Service would be capped at the associated regulated tariff rate

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Volume Capped Procurement

Category 1 (1 Sept 2018 – 1 Jan 2020)

- Successful service providers would need to provide the 5 services for the entire duration of this period

Category 2 (1 Jan 2020 – 31 Dec 2025)

- Propose contracts awarded by 1 September 2018 for delivery of the 5 services at a future date (e.g. 1 September 2020).
  - provides a period of time for construction / preparation before service provision commences
  - helps to facilitate new investment which requires certainty of contract award before construction

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Volume Capped Terms and Conditions

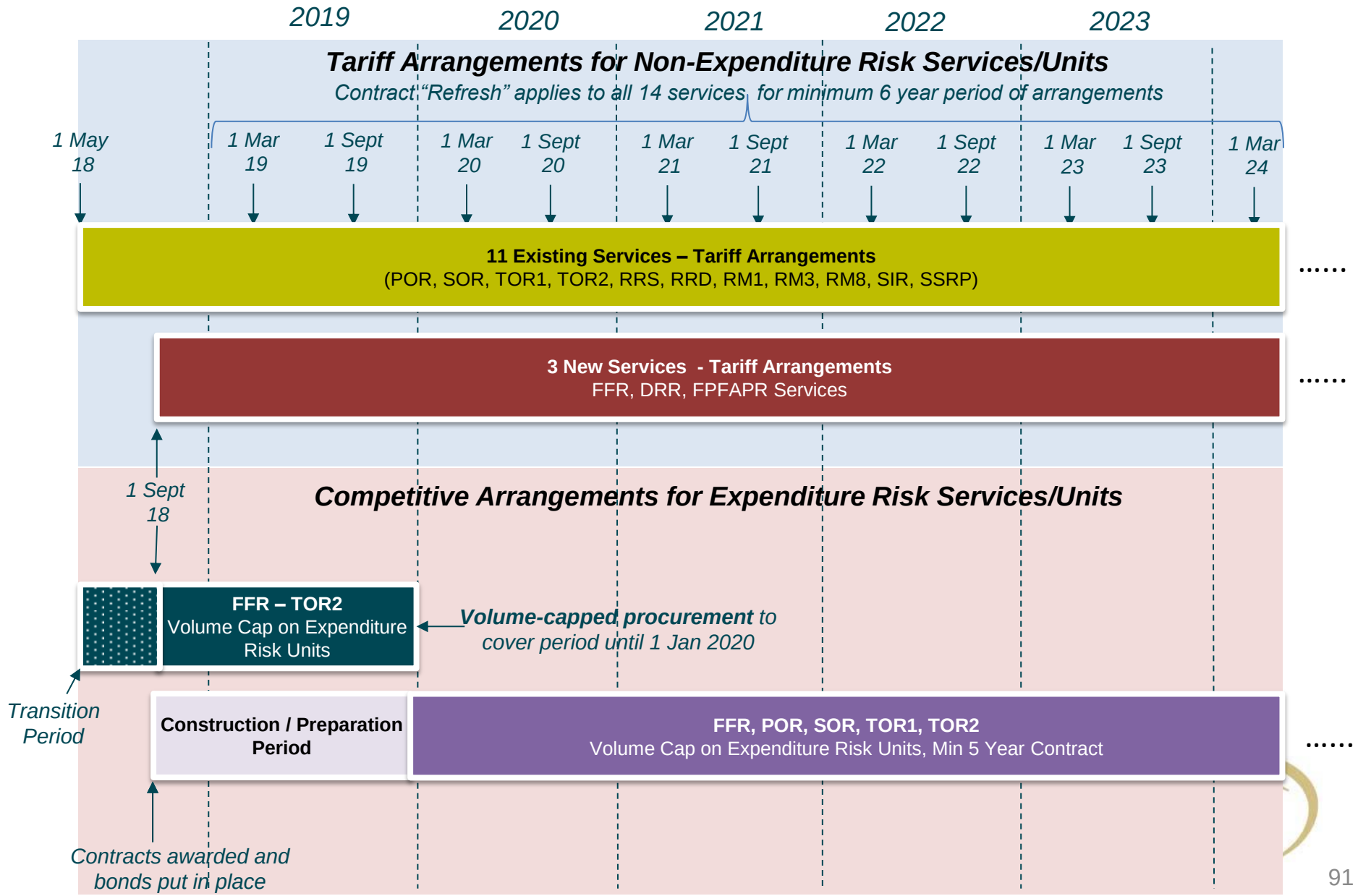
Volume Capped Contract Terms and Conditions

May include

- Mandatory availability levels of service provision
- Bonding / level of commitment required to ensure future date delivery
- Stage Checks – regular checks against delivery plan

- **Further consultation will be required on the terms and conditions of these contracts**

Transition Period



Transition Period (1 May – 30 Aug 2018)

- Procurement solution is being examined to manage expenditure during this transition period (1 May - 30 Aug 2018)

Possible options for the transition period

1. Limit the number of services for which new high availability units can contract

2. Allow unrestricted entry of new high availability units for all services but provide for conditional adjustment of tariff rates in procurement for all service providers

- Another alternative would be to move the proposed procurement dates

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Provisional Timelines for Tender Submission and Contract Award

2017/2018 DS3 SS Central Procurement Timetable (provisional)	Issue of OJEU notice of tender	Tenders Receipt	Letters to tenderers informing them of outcome	Final date for contract signature
Phase 1 Volume Uncapped (11 Services)	30/11/2017	18/01/2018	02/04/2018	30/04/2018
Phase 2 Volume Uncapped (3 Services)	30/03/2018	18/05/2018	02/08/2018	31/08/2018
Volume Capped Category 1 (5 Services)	30/03/2018	18/05/2018	02/08/2018	31/08/2018
Volume Capped Category 2 (5 Services)	30/03/2018	18/05/2018	02/08/2018	31/08/2018

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Qualification Trials 2016 - 2017

12 October 2017

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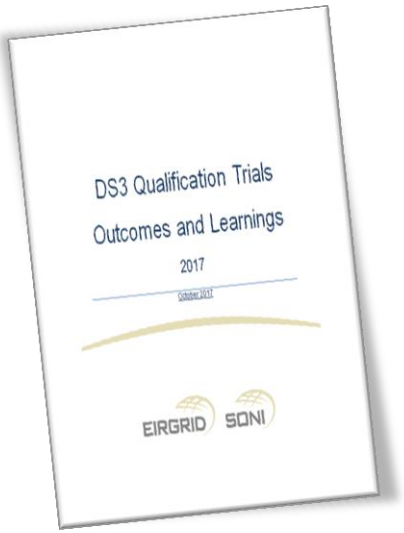
DS3 Qualification Trials Update

- Trials finished operationally on 01 September
- Analysis and recommendations now completed
- Outcomes report awaiting publication
- 27 Recommendations in total



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Trials Categories Overview

Provenability			Measurability		
DS3 System Service[2]	Technology Category[1]	Number of Trialists	**DS3 System Service[2]**	Technology Category[1]	Number of Trialists
POR	Wind	2	**FFR**	CDGU	1
POR	Wind (with Emulated Inertia)	3	**FFR**	Wind	1
POR	DSM	2	**FFR**	DSM	1
POR	Sync Comp (Energy Storage Unit)	1	**FFR**	HVDC Interconnector	2
			FPFAPR/DRR	CDGU	1
			FPFAPR/DRR	Wind	1

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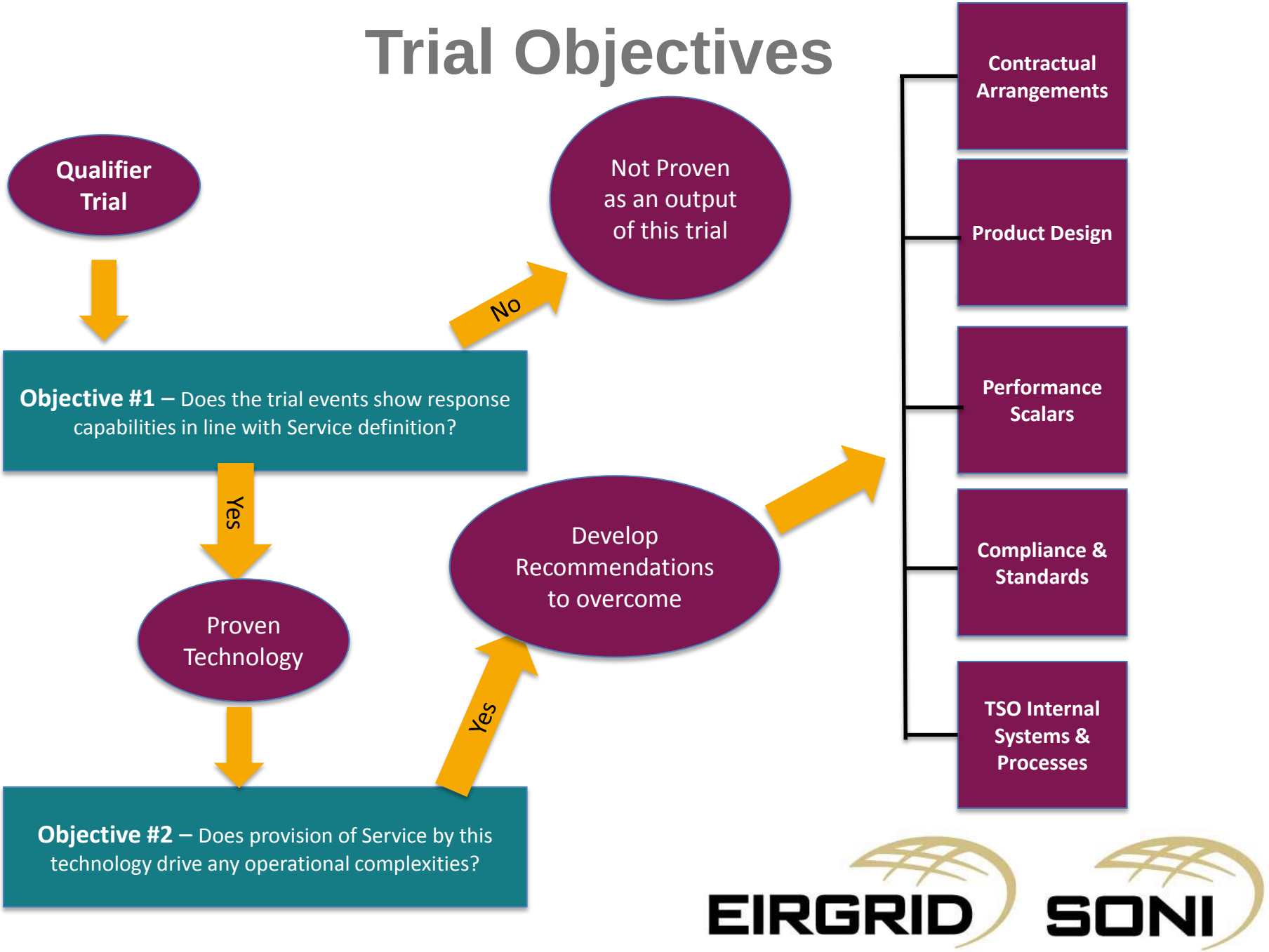
Trial Objectives



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Trial Objective #1 Outputs

Technology Class / Sub Class[1]	Services Applicable[2]
Wind - Wind Farm Control	FFR, POR, SOR,TOR1
Wind – Emulated Inertia	FFR,POR
Demand Side Management (DSM)	FFR,POR,SOR,TOR1
Synchronous Compensator and Flywheel Hybrid	FFR, POR,SOR,TOR1
Centrally Dispatched Generating Unit (CDGU)	FFR
HVDC Interconnectors	FFR

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Trial Objective #2 Outputs

- 27 Recommendations identified in response to operational complexities identified

- Next steps are to feed these into;
  - DS3 Procurement documentation
  - DS3 Contractual arrangements
  - DS3 Compliance and Testing procedures
  - DS3 Performance Monitoring processes
  - TSO Internal Systems

- Hence, although a technology class may be “Proven” they must still adhere to standards and requirements identified by the TSOs

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Some Recommendations…

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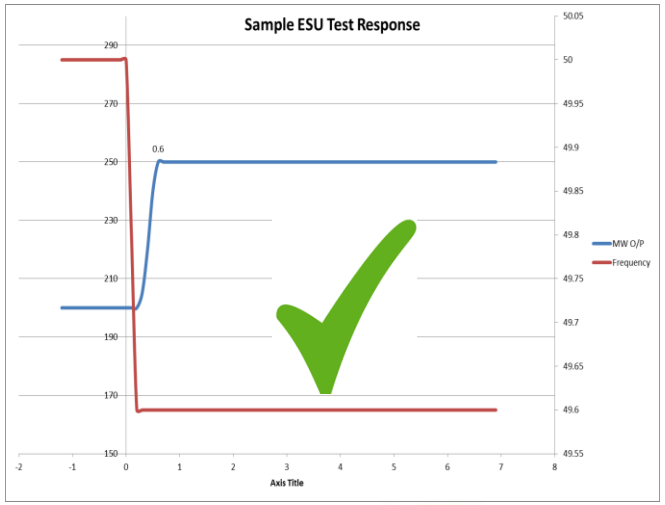
Recommendation 1 – Calculation of the Sub-Two Second Product Scalar for FFR

The application of an enhanced product scalar for a sub-two second response for FFR should only be applied to units that can provide 90% of their maximum recorded provision identified during the testing process over the FFR timeframe .

The overall volume contracted for FFR in such cases should remain based over the minimum provision identified during testing over the FFR window (two to ten seconds)

In respect to aggregators of services, the same principle should apply based on the aggregate response of the DSU as a whole achieving within 90%.



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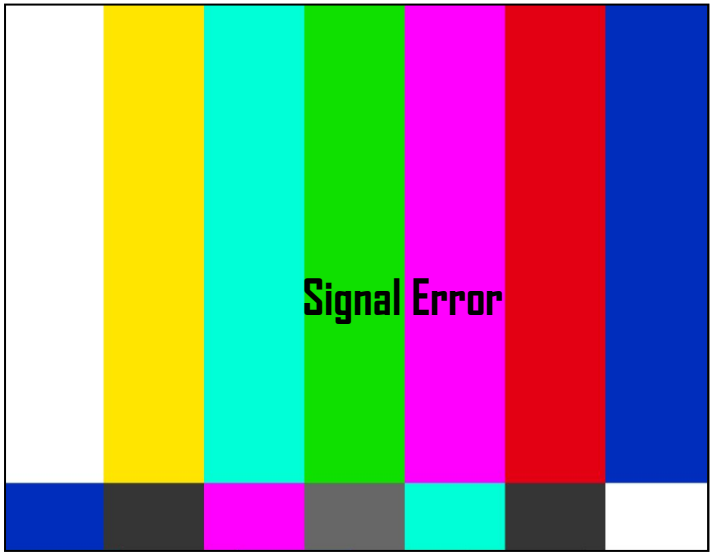
Recommendation 3 – Available Active Power Error Factor

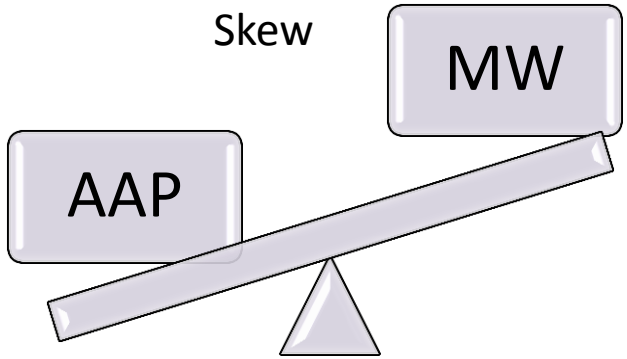
An error factor for WFPS providing reserve services should be calculated. This error factor should feed into assumptions of when the unit is available to provide the service and performance monitoring of the services.

$$\text{AAP Error Factor} = 95^{th} \text{ Percentile Error (MW)} \times \frac{\text{Skew (\%)}}{100} \times 2$$

The error factor should be calculated quarterly based on the most up to date information.

Skew (%) refers to, on average, how often the error is biased such that AAP is greater than AMW.





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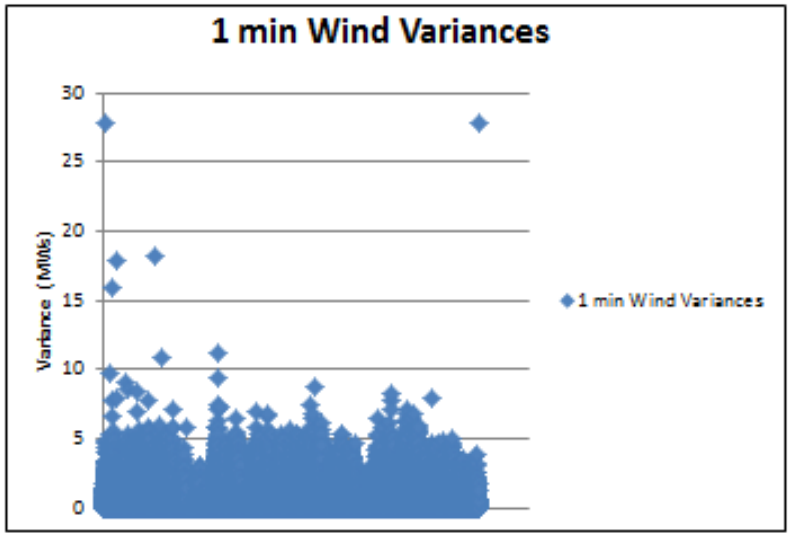
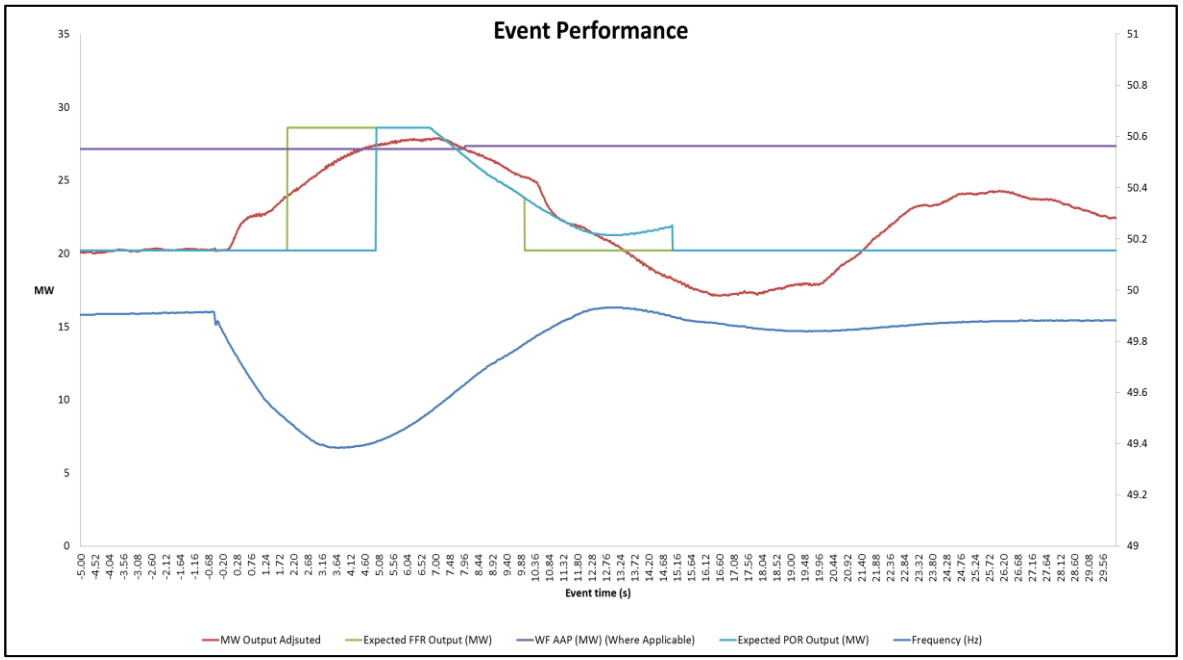
Recommendation 4 – Wind Resource Variance Factor

To account for potential short term variances in availability it is proposed that a WFPS should only be considered available to provide FFR, POR and SOR when its calculated headroom is greater than 5% of the unit's Registered Capacity. For TOR1 this value should be increased to 10% to account for the longer time frame.



Recommendation 9 – Units contracting for Emulated Inertia can only contract for WFC up to the same horizon window

As Emulated Inertia response effectively results in a unit entering a recovery mode, a unit providing services in this manner cannot contract for WFC for subsequent horizon windows.



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Recommendation 13 – New Signals required to manage service provision of new technologies should form part of the minimum requirements to receive a contract

The installation of new signals required to manage system service provision should be considered as part of the minimum compliance standards within the DS3 System Services Contractual Arrangements. Specifics of the additional signals required for each Service Provider will depend on its technology class / sub – class and the services it wishes to provide.

High level descriptions of the new signals required for each new technology class is described within each technology's section of this report.

1. On / Off Control of Service Category
2. Availability Declaration
3. Misc. Other signals depending on Technology (e.g. Energy Charge Remaining for ESUs

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Recommendation 15 – Energy Limited Devices without control of their recharging should be classified as Static Providers

Energy limited devices can only provide a response when there remains enough energy left in the device to respond. This has impacts on the dynamic provision of services when an under frequency event is still occurring.

In addition to this, Energy limited devices that must recharge their resource immediately following their response can cause a reduction in the overall volume of services available in further horizon windows as these devices will be recharging during these times. As a result, these types of units that not only cannot sustain dynamic provision of service and also cannot control their recharge following this should be considered as static providers of operating reserve services.

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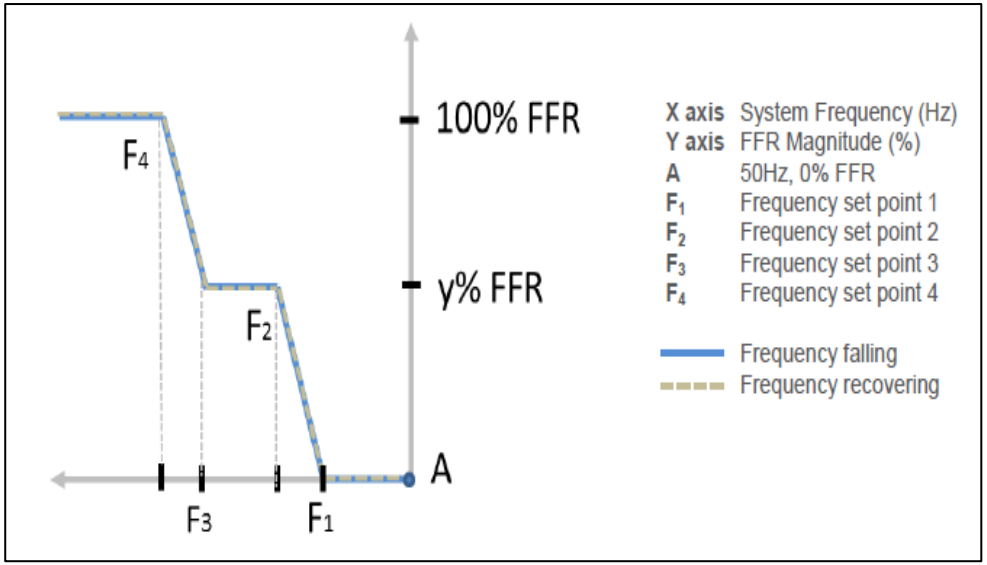
Recommendation 25 – Parameterisable Droop Response Curves should only be applied to units with sub-1 second response times



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Key Learnings from 2017 Trials

1. 2017 trial selection process was time consuming
2. Time between selection process and trial commencement was challenging
3. Applying standard time lines and format to all trials impacted on learnings
4. Greater coordination and engagement with DSO / DNO may be beneficial for future trials
5. Units required to be operational to trial

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Feed into Future Trials

1. The Qualification trials are envisioned to run up to 2020/21
2. Likely that future years will more smaller scale / embedded but may also be more difficult to prove…
3. Volume of trials likely to be less but more detailed end to end trials
4. Focus on;
    1. Provenability
    2. Measurability and Standards

System Services – Capability Management

Colm MacManus

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Topics

- Scope
- Guidance Document
- Demonstrating Provision of Services
  - Reports
  - Procedures
- Signal Lists
- Webpage

Scope

- Focus on Proven Technologies
  - Operating Reserve
    - FFR, POR, SOR, TOR1
  - Ramping
    - TOR2, RM1, RM3, RM8
  - Steady State Reactive Power
    - SSRP
  - Fast Acting
    - FPFAPR, DRR
  - Synchronous Inertial Response
    - SIR

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Guidance Document

- Assist units in planning and coordinating changes to capability.
  - Services available for technology types
  - Expected timelines for demonstration
    - *E.g.* demonstrating quantity of service provision through testing process
  - Impact of changes
    - Interaction with Grid Code
    - Tests required

Demonstrating Provision of Service

- Test Report Templates
  - What data is required?
  - How to analyse that data
- Test Procedure Templates
  - Steps to gather required data
  - Overlap / Subset of Grid Code Compliance Testing

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Signal Lists

- Update published templates
  - Conventional
  - Wind Farm
  - Demand Side Unit
- Opt-In approach for signals

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Webpage

- www.eirgridgroup.com
- Online 30 November
- Single location for the relevant documents
  - Guidance Document
  - Reports & Procedures
  - Signal Lists
- Developed for industry use
  - feedback welcome