Save the Date – Battery Storage Workshop

- Proposed date **15th May 2018** – likely in Dundalk

- EirGrid & SONI hosting workshop to discuss wider battery storage considerations:
  - Grid Code
  - Network charging costs
  - Connection Assessments
  - Energy Market Interactions

- These topics will be covered at this workshop

- More details to follow over the next two weeks

EIRGRID SONI

DS3 System Services Industry Forum Volume Capped Consultation

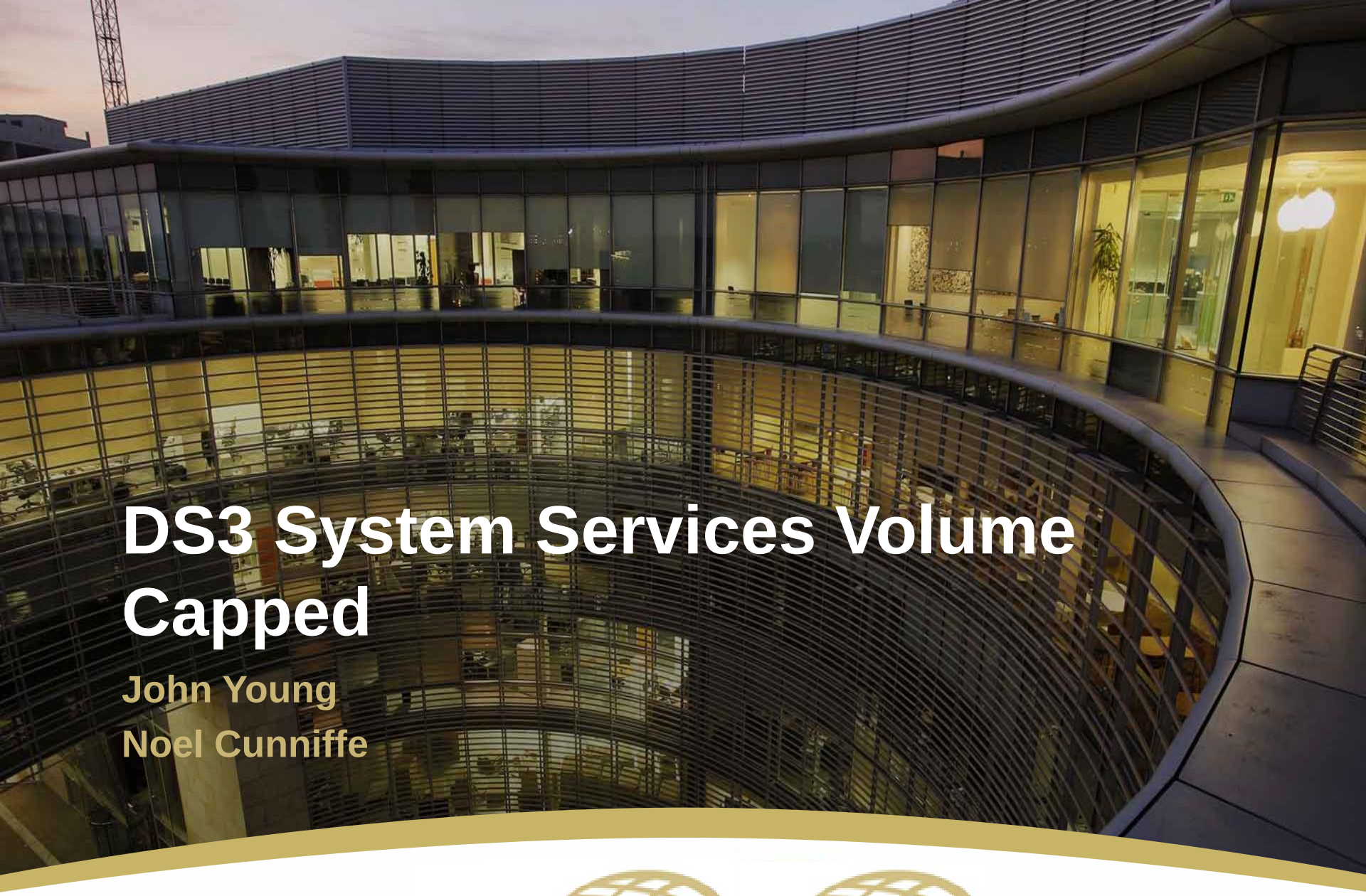
25 April 2018

EIRGRID SONI

Agenda

Topic	Time	Speaker
Registration (Tea & Coffee)	09.30	
Introduction	10.00	Ian Connaughton/ Jon O'Sullivan
Volume Capped Consultation – Part 1 Questions	10:15	John Young Noel Cunniffe
Volume Capped Consultation – Part 2 Questions	11:15	John Young
Volume Capped Consultation – Part 3 Questions	12:15	John Young
Next Steps / Session Closed	12:45	Ian Connaughton

EIRGRID SONI



DS3 System Services Volume Capped

John Young
Noel Cunniffe

EIRGRID SONI

DS3 System Services Volume Capped

1. Volume Capped Aims
2. Background & Drivers
3. Consultation Purpose
4. Timelines and Principles
5. Product Bundling
6. Product Characteristics
7. Over-Frequency
8. Availability
9. Site & Network Reqs

Questions Panel 1

10. Staged Procurement
11. Maximum Contract Size
12. Bid Structure
13. Application of Scalars
14. Tariff Cap & Floor
15. Bid Assessment
16. Bonding

Questions Panel 2

17. Industry Frameworks
18. I-SEM Interactions
19. Question Recap
20. Next Steps

Questions Panel 3

EIRGRID SONI

1. Volume Capped Aims

Commercial frameworks appropriate for new market entrants

- Fixed contracts
- Fixed term (6 years)
- Inclusion of build period

Opportunity to incentivise effective service provision for increasing RES

- Fast response
- High Availability
- Consistent delivery

Requirement that arrangements are appropriate and cost effective

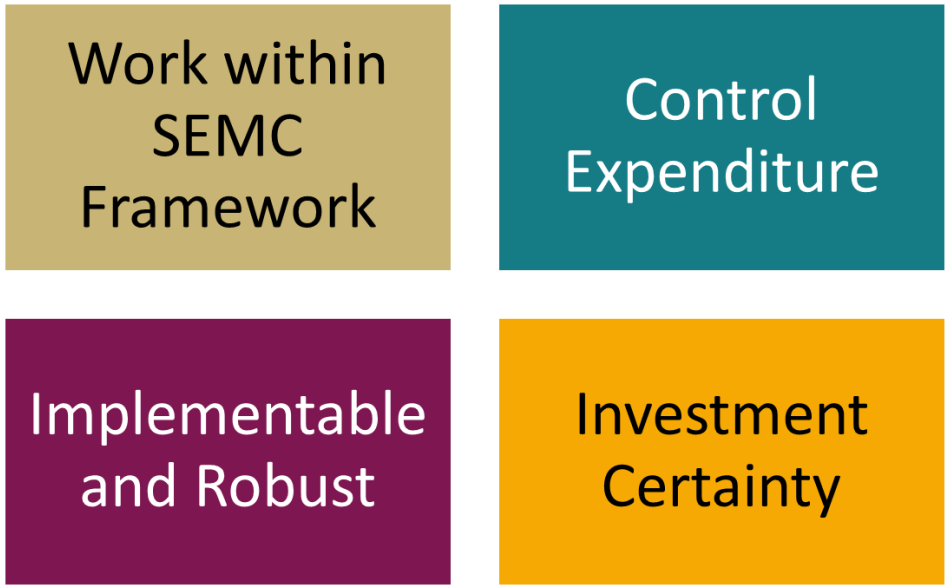
- Cost effective with respect to Regulated Arrangements
- Risk mitigation for fixed contracts
- Correct and appropriate incentives

EIRGRID SONI

2. Background & Drivers

Feedback from 2017 consultation

- Encourage applications from viable bidders
- Prevent barriers for newer entrants
- Level playing field

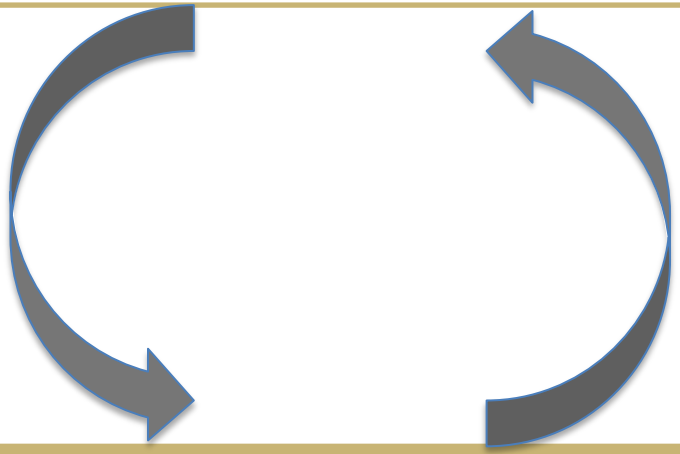


EIRGRID SONI

3. Consultation Purpose

The DS3 Volume Capped Consultation represents the first step of a new and ambitious procurement exercise

Further background, explanation and TSO thinking



Feedback, questions and stakeholder viewpoint (verbal **and** in response to consultation)

Appropriate and effective outcome for 6 year fixed term services contracts

EIRGRID SONI

4. Timelines and Principles

Indicative timelines proposed below

Consultation closes 11th May

Recommendation/Decision

Contract Consultation

EIRGRID SONI

DS3 System Services Volume Capped

1. Volume Capped Aims
2. Background & Drivers
3. Consultation Purpose
4. Timelines and Principles
5. Product Bundling
6. Product Characteristics
7. Over-Frequency
8. Availability
9. Site & Network Reqs
10. Staged Procurement
11. Maximum Contract Size
12. Bid Structure
13. Application of Scalars
14. Tariff Cap & Floor
15. Bid Assessment
16. Bonding
17. Industry Frameworks
18. I-SEM Interactions
19. Question Recap
20. Next Steps

Questions Panel 1

Questions Panel 2

Questions Panel 3

EIRGRID SONI

5. Product Bundling

Proposed in previous DS3 consultation that the Volume Capped competition would cover reserve products from FFR to TOR2

Considerations

- Stakeholder feedback
- System stability
- Consistency of volumes
- Frequency of use
- Effectiveness of contracts

Need for flexibility in dispatch

Service Name	Abb.	Short Description
Fast Frequency Response	FFR	MW delivered between 2 and 10 seconds
Primary Operating Reserve	POR	MW delivered between 5 and 15 seconds
Secondary Operating Reserve	SOR	MW delivered between 15 to 90 seconds
Tertiary Operating Reserve 1	TOR1	MW delivered between 90 seconds to 5 minutes
Tertiary Operating Reserve 2	TOR2	MW delivered between 5 minutes to 20 minutes

Options

1: FFR – TOR1 Bundle

2: FFR – TOR2 Bundle

TSO Proposal: FFR-TOR2 required to the same contracted volume level

EIRGRID SONI

5. Product Bundling

Need for flexibility in dispatch

Dispatchable TOR1 and TOR2

- Events where frequency falls below trigger and remains at this level into TOR1 and TOR2 timescales will be infrequent (but significant when they do occur)
- Added flexibility and usability of services needed to ensure effective and worthwhile contracts

Early Feedback

Preconditions for dispatch?

Under consideration

- For TSO, the more flexible the better
- Recognise the need to understand frequency of discharge

Question

Question 1: Do you have any comments on the two options for service bundling proposed and the TSO's preferred option?

EIRGRID SONI

6. Product Characteristics

How should the bundled service proposed be delivered?

Considerations*

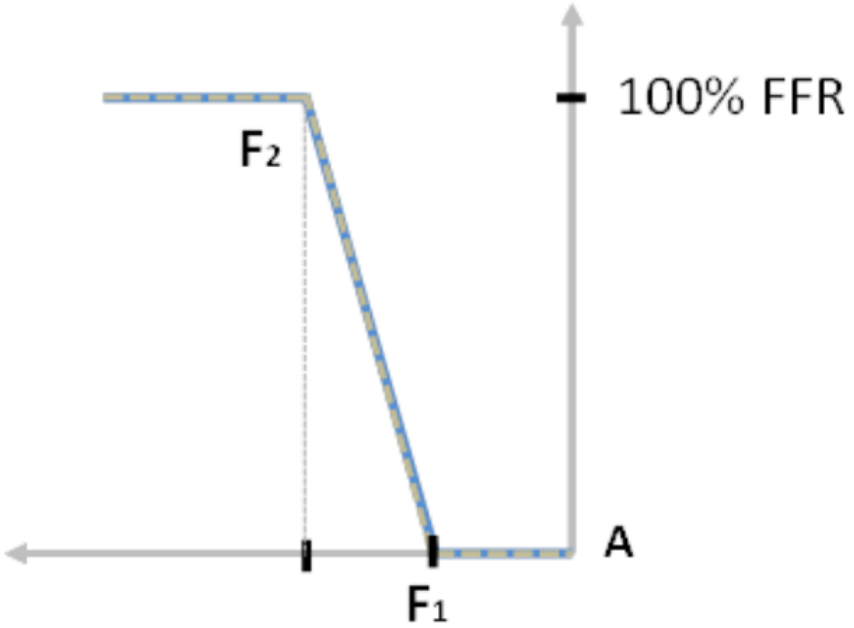
- Impact on and benefit to system stability
- Usability and effectiveness
- Ability of providers and impact on design
- Existing frequency curves set out in regulated arrangements

*Consideration of scalar application will be covered later in the presentation

Characteristic	Requirements
Type of response	Dynamic capability in response to a Reserve Trigger
Reserve trigger capability	49.8 Hz
Minimum speed of response	150-300ms
Trajectory	0.3Hz
Recharge limitations	Trickle recharge allowed post-event provided frequency has returned to within ±0.05Hz of 50Hz and remained there for 5 minutes

EIRGRID SONI

6. Product Characteristics



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

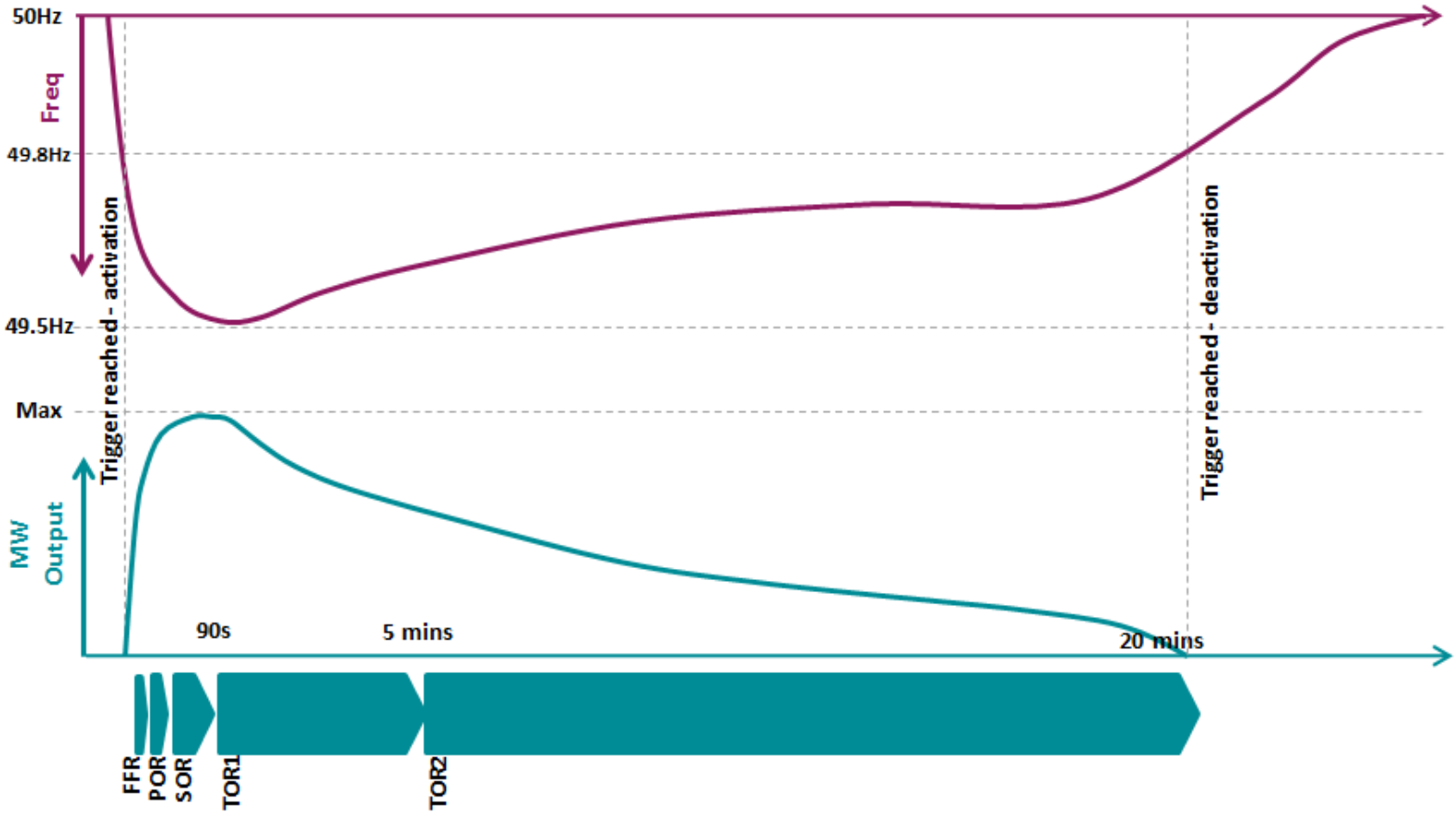
Frequency falling
Frequency recovering

TSO Proposal:

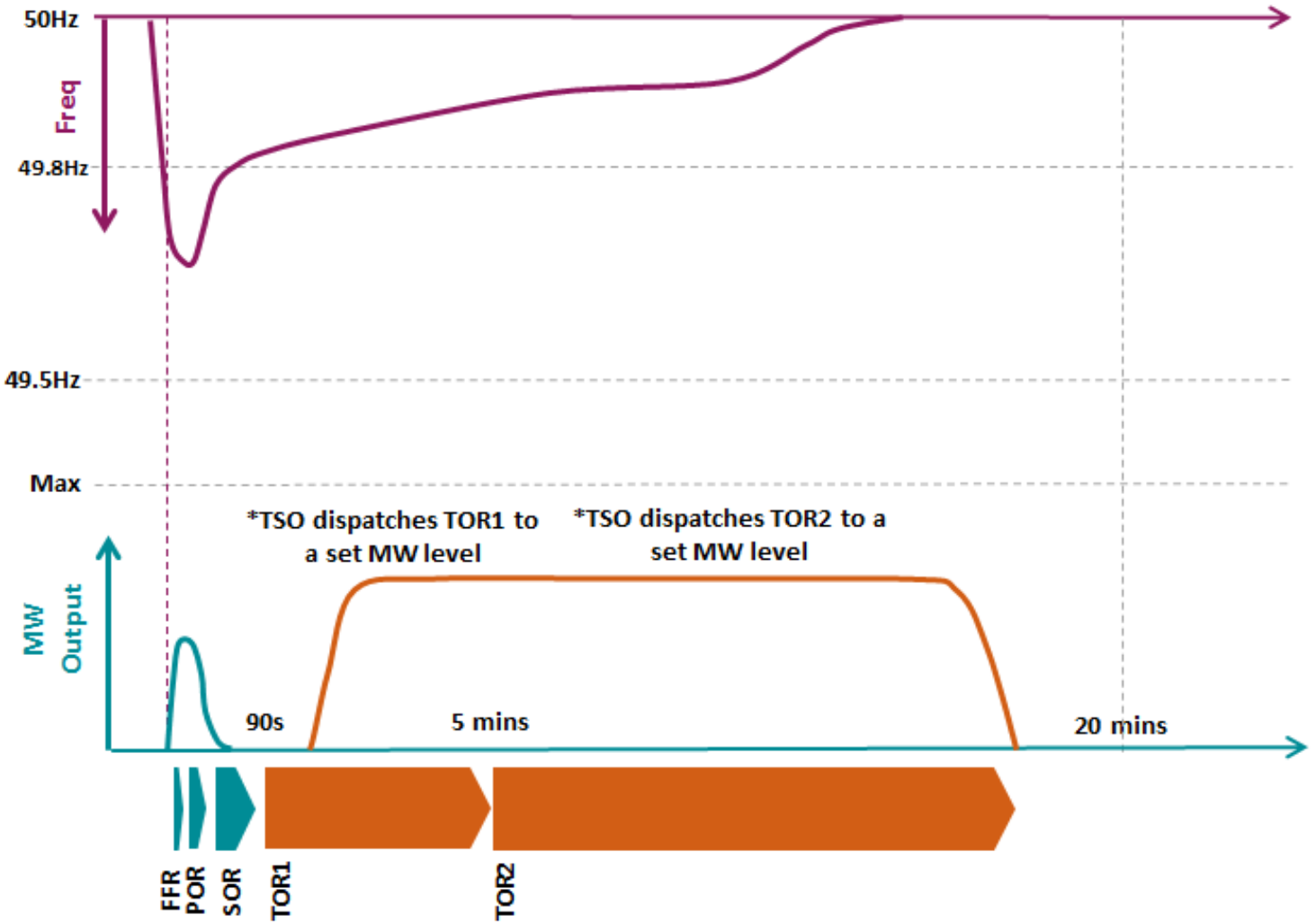
- Output following FFR Dynamic Capability – Frequency Response Curve
- **F1 = 49.8Hz** and **F2 = 49.5Hz**
- Provision of POR-TOR2 must continue with FFR response characteristics during the required timescales

EIRGRID SONI

6. Product Characteristics

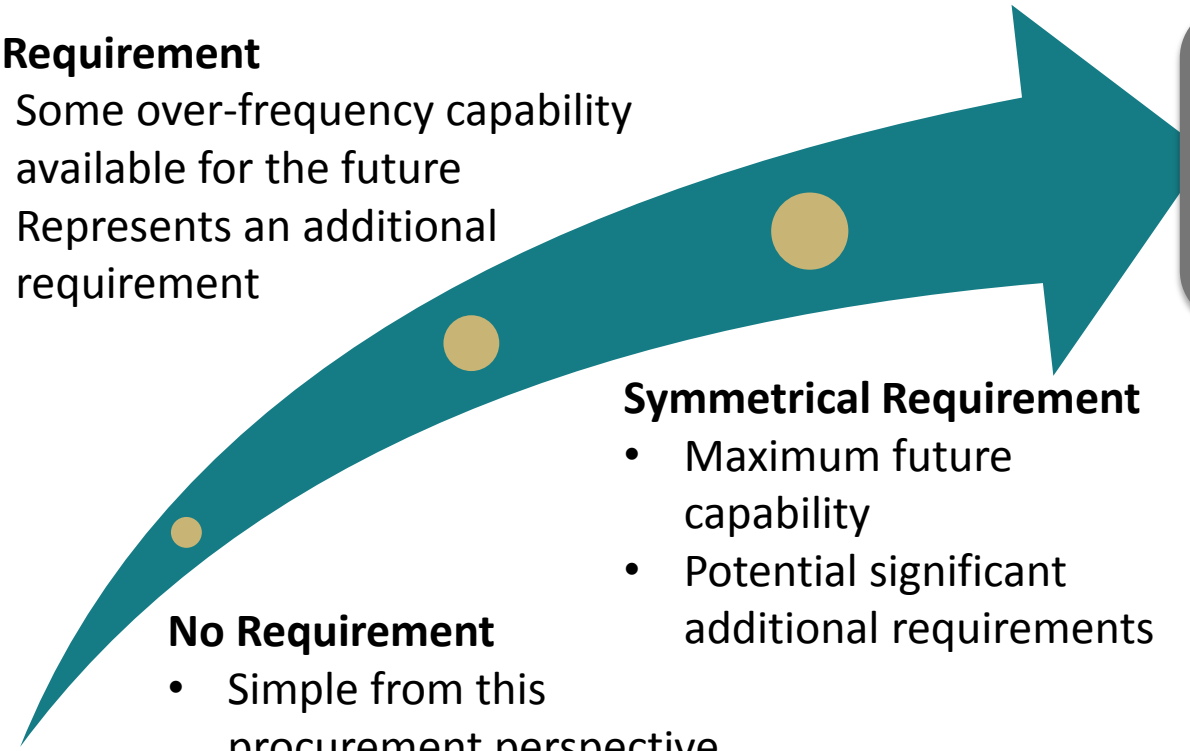


6. Product Characteristics



7. Over-Frequency

No current over-frequency service – but need will increase out to 2027. What is the correct requirement for this procurement?



% Requirement

- Some over-frequency capability available for the future
- Represents an additional requirement

Symmetrical Requirement

- Maximum future capability
- Potential significant additional requirements

No Requirement

- Simple from this procurement perspective
- Missed opportunity to deliver future system need

TSO Proposal: Technical ability to provide over-frequency response is required

Question 2: Do you have any view on the technical requirements proposed?

EIRGRID SONI

8. Availability

What are the appropriate availability obligations for providers?

Purpose of contracts i.e. high availability

Need for some periods of unavailability

Considerations

- Need for certainty – can be managed for planned maintenance
- Appropriate timescales – alignment with scalar assessment frequency
- Incentive for prompt recharge

TSO Proposal: 97% availability (exclude planned periods of maintenance)

Availability	Performance Scalar
<60%	0%
≥60% <70%	25%
≥70% <80%	50%
≥80% <90%	70%
≥90% <95%	85%
≥95% <97%	95%
≥97%	100%

TSO Proposal: Performance scalar will apply as per table above

Question 3: Do you have any comments on the availability obligation proposed?

9. Site & Network Requirements

- Area where encouraging viable applicants, whilst facilitating new market entrants, needs careful consideration
- Network constraints and financial risk considered

Early Feedback

Clarification of Interactions with Connection Policy/ECP-1 in Ireland requested

Connection Requirements

Network Limitations

Questions

Question 4: Do you have any comments on pre-requisites with respect to **Connection Offers**?

Question 5: Do you have a view on the two options provided with respect to managing **network limitations**?

EIRGRID SONI

9. Site & Network Requirements

Connection Requirements

1. On Hold
Application for connection received but not progressing at present

2. Processing
Application for connection is deemed complete and is being processed

3. Live Connection Offer
Connection offer has been made to a customer - with them for acceptance.

4. Contracted
Customer and the TSO/DSO have entered into a legally binding connection agreement/offer.

Considerations

- Certainty of project go-live
- Risk of speculative bidding
- Facilitating competition
- Interactions with ECP-1 dates

Options

1: 'Contracted phase' only
2: 'Contracted phase' and 'Live Connection Offer phase'
3: 'Contracted phase', 'Live Connection Offer phase' and 'Processing phase'

TSO Proposal: Option 2

EIRGRID SONI

9. Site & Network Requirements

Network Limitations

With whom should the risk of service unavailability due to network limitations sit?

Considerations

- Risk of non-delivery over 6 year contract
- Potential revenue uncertainty for aspiring market entrants
- Incentivise appropriate network location

1. With the TSOs
Unavailability due to network limitations will not negatively impact on remuneration

2. With Providers
Unavailability due to network limitations will be reflected in remuneration

Options

1: With the TSOs - Providers would need to submit confirmation from the TSO/DSO that network limitations will not prohibit service availability

2: **With Providers** - will not be remunerated in the event of unavailability due to network limitations

EIRGRID SONI

DS3 System Services Volume Capped

1. Volume Capped Air
2. Background & Drivers
3. Consultation Purpose
4. Timelines and Principles
5. Product Bundling
6. Product Characteristics
7. Over-Frequency
8. Availability
9. Site & Network Reqs

Questions Panel 1

10. Staged Procurement
11. Maximum Contract Size
12. Bid Structure
13. Application of Scalars
14. Tariff Cap & Floor
15. Bid Assessment
16. Bonding

Questions Panel 2

17. Industry Frameworks
18. I-SEM Interactions
19. Question Recap
20. Next Steps

Questions Panel 3

EIRGRID SONI

10. Staged Procurement

The DS3 Volume Capped process and the awarding of fixed contracts represents a significant commitment that will be undertaken by all stakeholders

Up to 300MW* to be procured via process

Options

Procure in single exercise, or
Procure over multiple stages

Considerations

- Risk mitigation
- Potential cost and competition benefits
- Appropriate amount if using staged approach

TSO Proposal: staged approach will be undertaken with 100MW procured in the first stage

Points to note

- *300MW represents maximum – may be less
- Second 100MW stage envisaged

Question 6: Do you have a view on the staged approach proposed?

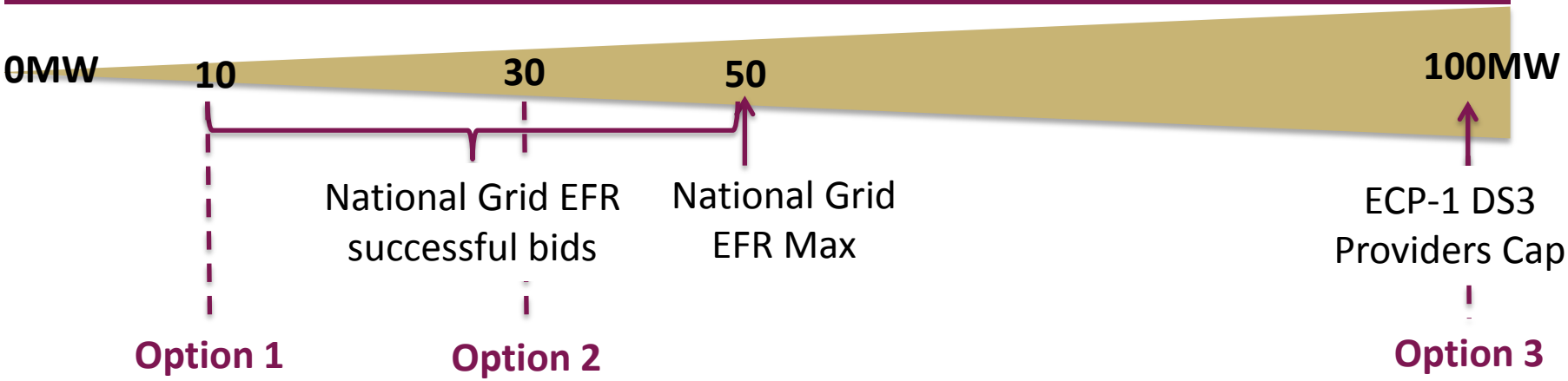
EIRGRID SONI

11. Maximum Contract Size

What is the appropriate maximum MW size for these contracts?

Considerations

- Risk of non-delivery – both in build and operational timescales
- Incentive to providers and economies of scale
- Experiences in other jurisdictions and applicability to Ireland and Northern Ireland



TSO Proposal: maximum contract volume of 30 MW proposed per separate grid connection

Question 8: Do you agree with the proposed maximum contract volume per separate grid connection?

11. Maximum Contract Size

ECP-1 interaction

Early Feedback

Why are the 30MW maximum proposed and the 100MW ECP-1 cap different?

Clarification note published 16th April

ECP-1 Cap: Regulatory process with maximum cap decided in order to promote greater competitive pressures

Volume Capped Maximum proposal: Maximum contract size proposed in consideration of specific benefits and risks associated with volume capped

Early questions

- Can a unit larger than Volume Capped max bid in?
- Can a successful unit contract additional MW in the Uncapped arrangements?
- Can a successful unit bid additional MW in the subsequent rounds of the volume capped arrangements?

EIRGRID SONI

12. Bid Structure

Service being procured is a bundle – should applicants submit a price for the overall bundle or a price per service?

Considerations

- Ease of submission and assessment
- Need for prices to be under current tariffs (i.e. price cap)
- Need for application of scalars

Price per service viewed as necessary

TSO Proposal: Prices should be submitted per service to enable the relevant scalars to be applied and to ensure the proposed tariff limits are respected

Service Name	Unit of Payment	Rate €
Fast Frequency Response (FFR)	MWh	2.16
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

EIRGRID SONI

13. Application of Scalars

Tariff rates were calculated in the Volume Uncapped arrangements on the basis that scalars would apply – should these scalars therefore apply in the Volume Capped?

Performance Scalar | Locational Scalar | Product Scalars | Temporal Scarcity Scalar

TSO Proposal: Locational will not be utilised in this initial stage

Considerations

- Need for suitable incentive
- Measurement timescales
- Exclusion of planned maintenance
- Inclusion of recharge periods
- Event performance included

TSO Proposal: Performance scalar will be applied as per table excluding periods of planned maintenance

Availability	Performance Scalar
<60%	0%
≥60% <70%	25%
≥70% <80%	50%
≥80% <90%	70%
≥90% <95%	85%
≥95% <97%	95%
≥97%	100%

13. Application of Scalars

Temporal Scarcity Scalar

- Purpose to incentivise service availability during periods of high SNSP
- Volume Capped proposed availability requirement is very high
- Significantly impacts remuneration for FFR in particular

Assuming Scarcity Scalar is applied, will need to be included in assessment of bids – likely to be based on 'typical' wind year

Early Feedback

More info on 'typical' wind year please

Options

1: Assess and remunerate based on typical wind year

2. Assess only using typical wind year, remunerate based on real SNSP conditions

Considerations

- Alignment with aims of scalar and SEM-C decisions
- Certainty and risk for both TSO and provider
- Need for cap and floor for Option 2

TSO Proposal: Use typical wind year for temporal scarcity scalar in both assessment and remuneration

EIRGRID SONI

13. Application of Scalars

Product Scalars

Enhanced Delivery
- Scalar starts at 1 and decreases
- Requirement for frequency trigger are set – therefore no need for incentive

Continuous provision
- Provides incentive to supply MW response through services
- Requirement of the bundle – therefore no need for incentive

Scalar for the Faster Response of FFR
- Purpose to incentivise the faster provision of FFR up to an upper threshold of 0.15s
- Requirements for FFR speed between 150ms and 300ms is set
- This would provide a Product Scalar of 2.57 for 300ms, rising to 3 for 150ms

Considerations
- Effect on remuneration
- If applied as part of bid assessment, may not incentivise fastest response
- Alternative mechanisms via which this could be applied or considered?

EIRGRID SONI

13. Application of Scalars

Product Scalars – Faster Response FFR

Options

1: Scalar applied as part of bid assessment and remuneration

2: Scalar applied on remuneration only – during bid assessment scalar applied equally to all applicants regardless of speed of FFR

3. Applicants are sorted on speed of response – providers which are faster than 200ms prioritised over those which are slower

Scalar Summary

Locational	Performance	Scarcity	Product
TSO proposal – do not apply	TSO proposal – apply as per table	Options – TSO proposal to use typical wind year	Enhanced delivery – TSO proposal, do not apply
			Continuous Response – TSO proposal, do not apply
			Speed of response - options

Question 9: Do you have a view on the proposed application of performance, scarcity, product and locational scalars?

EIRGRID SONI

14. Tariff Cap & Floor

SEM Committee Decision that price cap for bids, as well as revenue cap and floor* should apply

Price Cap

Decision that the bid price cap set by the relevant service tariff for the individual service

Service Name	Unit of Payment	Rate €
FFR	MWh	2.16
POR	MWh	3.24
SOR	MWh	1.96
TOR1	MWh	1.55
TOR2	MWh	1.24

Revenue Cap and Floor

- Needed to mitigate risk of high /low wind years
- As such is ***not required if using Option 1 for application of temporal scarcity scalar**

High and low wind years set out in previous DS3 work in determination of tariffs

Low wind year: 24% capacity factor
High wind year: 33% capacity factor

EIRGRID SONI

15. Bid Assessment

How will the price for successful providers be determined? What will the TSO do in the circumstance where successful bids do not exactly match the required volume?

Pay as bid or pay as clear?

Options

1. Pay as clear
2. Pay as bid

Considerations

- Both viable models
- Additional complexity in pay as clear

TSO Proposal: Pay as bid

Acceptance of last tenderer?

Options/Considerations

- Whole bids only preferred
- Mitigation of risk
- Significant complications with using partial bids – not preferred

TSO Proposal: Whole bids only up to and not exceeding maximum amount

Question 7: Do you have a view on the proposed bid pricing requirements and the mechanism for assessing bids, determining price and remunerating providers?

EIRGRID SONI

16. Bonding

It is proposed that performance bonds will be used in the volume capped procurement process

The performance bond may be called up by the procuring party:

- in whole, where a successful applicant abandons a development,
- in whole, where a successful applicant substantially fails to meet Performance Milestones or the Go-Live Date, or
- in part, where a successful applicant fails to meet Performance Milestones by the due dates

Performance milestones will be included in an implementation agreement – typical milestones within consultation

Considerations

- Experience in other jurisdictions
- Need for appropriate security whilst not precluding newer/smaller entrants
- Dependency on requirements for connection offer

TSO Proposal: Performance bond will be required, at proposed value of €12,000/MW

EIRGRID SONI

DS3 System Services Volume Capped

1. Volume Capped Aims
2. Background & Drivers
3. Consultation Purpose
4. Timelines and Principles
5. Product Bundling
6. Product Characteristics
7. Over-Frequency
8. Availability
9. Site & Network Reqs

Questions Panel 1

10. Staged Procurement
11. Maximum Contract Size
12. Bid Structure
13. Application of Scalars
14. Tariff Cap & Floor
15. Bid Assessment
16. Bonding

Questions Panel 2

17. Industry Frameworks
18. I-SEM Interactions
19. Question Recap
20. Next Steps

Questions Panel 3

EIRGRID SONI

17. Industry Frameworks

For certain technologies code and charging obligations may evolve over time – such changes sit outside the scope of this procurement exercise

Grid Code/Distribution Code

Considerations

- Differences exist between Grid Code obligations and service requirements
- Code obligations cover more aspects
- Need for ability to operate in System Services mode and Grid Code mode

TSO Proposal: Service providers must satisfy the applicable Grid Code or Distribution Code requirements

Network Charging

Considerations

- Include payments for the respective Maximum Export Capacity (MEC) and Maximum Import Capacity (MIC)
- Interactions with over-frequency

TSO Proposal: Service providers will be subject to the network charges applicable to their connection

EIRGRID SONI

18. I-SEM Interactions

Balancing	• Balancing obligation versus availability requirements • BMCOP requirements • Non-energy dispatch (e.g. constraints)	**TSO Proposal:** For providers to manage fulfillment of availability
Recharge	• Utilisation of trickle charge ability • Positioning in Energy Market to recharge • Impact on Performance Scalar	**TSO Proposal:** Providers manage their own recharge via market and trickle charge
Capacity Market	• Obligation for I-SEM registered units to participate • Service providers must ensure they can fulfill availability obligations	**TSO Proposal:** For providers to manage fulfillment of availability

Question 10: Do you have a view on the market interactions outlined here and the proposed mechanism for mitigating?

EIRGRID SONI

19. Question Recap

Question 1: Do you have any comments on the two options for service bundling proposed and the TSO's preferred option?

Question 2: Do you have any view on the technical requirements proposed?

Question 3: Do you have any comments on the availability obligation proposed?

Question 4: Do you have any comments on pre-requisites with respect to Connection Offers?

Question 5: Do you have a view on the two options provided with respect to managing network limitations?

Question 6: Do you have a view on the staged approach proposed?

EIRGRID SONI

19. Question Recap

Question 7: Do you have a view on the proposed bid pricing requirements and the mechanism for assessing bids, determining price and remunerating providers?

Question 8: Do you agree with the proposed maximum contract volume per separate grid connection?

Question 9: Do you have a view on the proposed application of performance, scarcity, product and locational scalars?

Question 10: Do you have a view on the market interactions outlined here and the proposed mechanism for mitigating?

Question 11: Do you agree with the proposed mechanism for assessing applications?

EIRGRID SONI

20. Next Steps

Consultation is open until 11th May 2018

http://www.eirgridgroup.com/site-files/library/EirGrid/Consultation-on-DS3-System-Services-Volume-Capped-Competitive-Procurement.pdf

Clarification Note is available here

http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-Volume-Capped-Consultation-Clarification-Document.pdf

Any questions please do not hesitate to contact DS3@EirGrid.com or DS3@SONI.ltd.uk

Thank you for your time

EIRGRID SONI

DS3 System Services Volume Capped

1. Volume Capped Aims
2. Background & Drivers
3. Consultation Purpose
4. Timelines and Principles
5. Product Bundling
6. Product Characteristics
7. Over-Frequency
8. Availability
9. Site & Network Reqs

Questions Panel 1

10. Staged Procurement
11. Maximum Contract Size
12. Bid Structure
13. Application of Scalars
14. Tariff Cap & Floo
15. Bid Assessment
16. Bonding

Questions Panel 2

17. Industry Frameworks
18. I-SEM Interactions
19. Question Recap
20. Next Steps

Questions Panel 3

EIRGRID SONI

Thank You

EIRGRID SONI