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Optional Firm Access (OFA): The transaction cost associated with the implementation of the Firm Access Model

PART B - Transmission Network Service Providers (TNSPs)

Report to

Australian Energy Market Commission

Energy Market Consulting associates

January 2015

This report has been prepared to assist the Australian Energy Market Commission (AEMC) with its determination of the transaction costs associated with the implementation of Optional Firm Access (OFA).

This report relies on information provided to EMCa by the Transmission Network Service Providers (TNSPs) interviewed, the current policy assumptions for OFA as published by AEMC, and in its presentation provided to EMCa for briefing the TNSPs. EMCa disclaims liability for any errors or omissions, for the validity of information provided to EMCa by other parties, for the use of any information in this report by any party other than the AEMC and for the use of this report for any purpose other than the intended purpose.

In particular, this report is not intended to be used to support business cases or business investment decisions nor is this report intended to be read as an interpretation of the application of the NER or other legal instruments. EMCa's opinions in this report include considerations of materiality to the requirements of the AEMC and opinions stated or inferred in this report should be read in relation to this over-arching purpose.

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About EMCa

Energy Market Consulting associates (EMCa) is a niche firm, established in 2002 and specialising in the policy, strategy, implementation and operation of energy markets and related access and regulatory arrangements. Its Director, Paul Sell, is an energy economist and previous Partner in Ernst & Young and Vice President of Cap Gemini Ernst & Young (now Capgemini). Paul has advised on the establishment and operation of energy markets and on matters such as electricity network open access, pricing and regulation and forecasts for over 30 years.

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1 Introduction

1.1 Purpose of this report

1. AEMC requires assessment of the level of costs that are imposed on parties if the Optional Firm Access (OFA) model is to be implemented. These include both:

   - The one-off costs of implementing the OFA model, e.g. putting in place changes to IT systems to accommodate new transactions; and

   - The incremental on-going costs of implementing the OFA model, e.g. a TNSP modifying its ongoing outage management or planning processes.

2. The assignment is focused solely on an estimate of the costs associated with the OFA regime as currently specified. The AEMC, in this assignment, is not seeking to assess whether the introduction of OFA is beneficial or not. The AEMC require these costs to be estimated for two different groups of stakeholders:

   - Part 1 relates to estimating the one-off and incremental on-going costs of OFA to generators in the NEM. This is not included in the scope of EMCa's assignment.

   - Part 2 relates to estimating the one-off and incremental on-going costs of OFA to TNSPs in the NEM. This is the subject of this report to the AEMC.

3. The transaction costs only include estimates of changes to people, processes and business systems. The TNSP OFA transaction cost estimates do not include:

   - The cost of purchasing access;

   - The cost of any investment in the network that may result from the purchase of firm access by market participants;

   - Any resultant effects on revenues received from the wholesale spot market;

   - Any costs incurred by organisations prior to the final determination on the optional firm access rule change; or

- Any other indirect costs that may result from the introduction of OFA.

4. The analysis of transaction costs includes consideration of both:

   - Identification of new costs as a result of OFA implementation; and
   - Identification of transactional savings to the business that may result from investment being more market driven and which may offset transaction costs (whether in full or in part).

5. The scope of this report does not include expenses incurred by market and regulatory bodies, such as AEMC, AER or AEMO (except to the extent that AEMO has a TNSP role in Victoria).

1.2 Our review methodology

1.2.1 Background to the OFA Review

6. In February 2014, the COAG Energy Council (previously the Standing Council on Energy and Resources) directed the AEMC to develop, test and assess the OFA model that was proposed as part of the AEMC's Transmission Frameworks Review in 2013.

7. The purpose of the review is to inform the Council "on whether there are long term benefits associated with implementing the developed OFA framework and, if such benefits are identified, develop the optimal approach to implementation of the framework".[1]

8. COAG Energy Council has requested the AEMC[2] to:

   - Confirm or modify the design of the OFA model as a result of testing and evaluation;
   - Engage with industry participants and governments to build understanding of the model and the potential impacts of its implementation; and
   - Recommend whether to implement the OFA model, and if so, how it could be implemented.

9. The AEMC's work program "will assist government and industry participants to better understand the potential costs, benefits and risks of implementing OFA."[3] Implementing OFA would represent a significant change to the market.

10. The OFA concept is still in design and, as a baseline for this project, we assume that the OFA model is as specified in the AEMC's First Interim Report.[4]

[1] SCER letter to AEMC Chairman 28 February 2014, paragraph 5
[2] SCER letter to AEMC Chairman 28 February 2014, Attachment 1- Overall Objectives
[3] SCER letter to AEMC Chairman 28 February 2014, paragraph 6
[4] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014

1.2.2 Approach taken for the review

11. Our review commenced on 25th November 2014 with a kick-off meeting with the AEMC confirming the scope of work and assumptions for the assessment. AEMC, by email on 25th and 26th November 2014, provided background to the project and an introduction of EMCa to the four mainland TNSPs (ElectraNet, PowerLink, TransGrid and AusNet Services), to AEMO and to the AER.

12. Meetings with key TNSP personnel (regulatory, planning, network operations & systems/IT) were coordinated in each regional jurisdiction (SA, VIC, NSW and QLD) from 5th to 10th December 2014. We completed our assessment and documented our preliminary findings. We provided a Draft Report to the AEMC on 22nd December 2014 and this Final Report addresses feedback received from AEMC in early January 2015.

13. Interviews of TNSPs were used to assess impacts and responses to the firm access model. EMCa provided background information prior to the interview with each TNSP which included (i) an AEMC presentation "Introduction to Optional Firm Access" – describing the scope, function and intent of OFA (see Appendix A), and (ii) some EMCa notes to guide our enquiries at the interviews.

1.2.3 Data sources

14. EMCa has used an indirect resource impact approach to determine the costs, and we have not directly sought assessments of cost impacts from the TNSPs themselves.

15. Where evidence of similar works and system development are available in the past, the evidence was sought and used to support our own estimates and data sources. EMCa's team included an experienced NEM system developer to assess system costs and their allocations.

16. Confidentiality applies to all information provided, the participants interviewed, and any comparative data presented.

1.3 Structure of this report

17. The structure of this report is:

Section	Title	Content
1	Introduction	The section sets out the purpose, scope and approach of this review
2	Assessment and Observations	The section identifies the primary impact areas of OFA, observations on the issues and risk factors that may affect the implementation costs.
3	Conclusion	This section includes the financial assessment of the transaction costs for implementing OFA and

Section	Title	Content
		summarises the risk factors and base assumptions of this assessment.
	Annex A - AEMC Presentation	This provides the AEMC presentation used to brief the interview participants from each Transmission Service Provider.

2 Assessment and observations

18. This section of the report provides our assessment and observations in regard to both the impact of implementing the OFA Model, the transaction costs and the risk factors that might influence the outcome.

2.1 General observations and areas of focus

19. At a policy level, OFA has been subject to review, modelling and testing since the Transmission Frameworks Review in April 2013. However the details of implementation and documentation of key processes such as the firm access planning standard (FAPS) and firm access operating standard (FAOS) are still in development. At officer level in each TNSP there are varying levels of understanding of Optional Firm Access.

20. The AEMC presentation and briefing on the OFA, as an introduction to the assessment, was an important part of developing a reasonable common understanding of OFA and its impacts and was an important foundation for this assessment. Nevertheless, until the details of the FAPS and FAOS are fully documented, the impact assessment by the TNSPs (and ourselves) is at best a coarse estimate.

21. Three functional areas in the TNSPs emerged as the principal areas impacted by the implementation of the OFA regime (should it proceed) and the OFA procurement process:

- Network planning;
- Generator network access and connection processes[5]; and

[5] Connection costs are not included in the OFA Model and LRIC pricing. OFA procurement is intended to be a separate regulated process from TNSP and generator negotiations of "physical" network connection. Nevertheless, OFA procurement and pricing requests from generators to TNSPs are likely to be processed by this functional area, requiring an understanding of the timing, level of activity and impact on what may be a parallel connection process.

- Network operations, including outage management and incentive scheme strategy and associated management.

2.2 Assessment process

22. EMCa discussed the three functional areas with TNSP personnel through the on-site interviews, in three stages:

    (i) Developing a common understanding of OFA, including identifying the elements of the regime that had not yet been finalised (e.g. FAPS, and FAOS);

    (ii) Identifying the resources, processes and systems currently used in the relevant functional areas; and

    (iii) Assessing the incremental transitional and ongoing impacts of introducing OFA in each functional area.

23. Where uncertainties on OFA policy emerged or implementation decisions created risk factors to the assessed impact, these were identified and/or separately assessed.

24. An early observation of the interviews was that, while the specific knowledge of OFA varied among participants, the existing market component of the STPIS provided a sound benchmark and level of appreciation of the wider application of OFA to network planning, operation and regulatory performance. Consequently the responses to the impact of implementing OFA, and the identification of the primary risk factors that emerged from each TNSP, were quite consistent.

25. The assumptions and process changes required to implement OFA are drawn from the First Interim Report: Optional Firm Access Design and Testing[6] and AEMC's presentation "Introduction to Optional Firm Access"[7]. These are referenced in text boxes throughout the report where they have guided the TNSPs' and our assessments of the impact of implementing OFA. A copy of the AEMC presentation is provided in Appendix A.

2.3 Network planning implications

2.3.1 Current resourcing, processes and systems

26. Each TNSP has different team structures. Resources ranged between around 10 and 24 FTE with total resources of around 66 people identified in this functional area.

27. The TNSPs' advised that the primary software systems utilised in network planning are PSS/e and Powerfactory for network analysis and software systems such as Prophet and Plexos for market modelling. At least one TNSP also uses Mudpack (for dynamic analysis). Commercial software of this type is subject to annual software fees and is generally maintained by the vendor at its cost. Industry contributions have been

[6] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014

[7] AEMC Presentation – "Introduction to Optional Firm Access" - see Appendix A

shared where specific market upgrades are required. The Purchaser is required to pay for any bespoke modifications.

2.3.2 How OFA impacts network planning and TNSPs' response

28. In making our assessment, we quote (in text boxes) material that defines how particular aspects of OFA are assumed to operate. This represents the key working assumptions for the purpose of the current assessment and, if changed, would require reconsideration of the impact on TNSPs.

Planning to meet capacity requirements[8,9,10]

> "TNSPs would be required to plan and operate their networks to provide the level of capacity necessary to meet the agreed quantities of firm access (i.e. the Firm Access Standard)."[8]
>
> "The Firm Access Planning Standard (FAPS) defines the amount of capacity the TNSP must plan to provide in response to requests for firm access. TNSPs would still be required to plan their networks to meet the FAPS and their jurisdictional reliability standards. Both standards would need to be met simultaneously."[9]
>
> "A TNSP's total network revenue allowance would reflect its expenditure required to meet both the firm access and reliability standards. The TNSPs total network revenue requirement = TUOS revenue (for reliability standards) + firm access revenue (for FAPS)"[10]

29. The implementation of OFA and the FAPS, for the TNSPs, represents an expanded obligation for firm access and a focus for the TNSPs. The TNSPs assumed that an independent case in regulated revenue determinations for firm access investments will be required in addition to business cases for network investments to meet jurisdictional reliability standards. The recent revision of jurisdictional reliability standards was identified as a benchmark cost for the proposed OFA changes.

30. Each TNSP concluded this will have a transitional implementation cost and an incremental ongoing cost. The TNSPs' views are consistent in that each considers that it will require around 1-2 additional FTEs over a period of 12 months to modify existing processes to meet firm access planning requirements at all times and to train staff accordingly. The TNSPs identified an incremental ongoing resource requirement of the order of 0.5 to 2.0 FTEs, related to higher levels of commitment and, in the case of at least one TNSP, potential duplication of the AEMO planning work to manage firm access risk.

[8] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 page 11
[9] AEMC Presentation – "Introduction to Optional Firm Access" – slide 17
[10] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 page 14

Transitional allocation of firm access[11]

> "Generators should receive a level of firm access that takes into account historical levels of effective access. The initially allocated transitional firm access would remain constant for a period of some years. The initially allocated access would be sculpted back over time.
>
> "The transitional process would aim to mitigate any sudden changes that might arise from the introduction of a new access model. On the other hand, transitional processes should be designed to not dilute or delay the benefits that optional firm access is intended to promote."[11]

31. We infer from this an assumption that the transitional allocation of firm access at the onset of OFA should not increase the reliability requirements of the network such that investment by the TNSPs would be required. TNSPs were concerned, and would estimate a higher transaction cost to plan additional augmentations, if generators receive a collective level of firm access above the current reliability requirements of the network. The transitional firm access allocation is therefore a risk factor if it departs from this base TNSP assumption.

32. By the same rationale, it was assumed that the auction of short term firm access should not create a collective level of firm capacity above the current reliability requirements. By definition, under OFA, the TNSPs are under no obligation to plan or invest in short term firm access, as it is a sale of spare network capacity. Consequently, the TNSPs did not propose any increase above what has been estimated for transitional implementation and incremental ongoing costs.

33. TNSPs noted that the level of meshedness of the network and the current contribution of generation to network constraints may impact the FAPS. Increased network complexity and higher numbers of flowgates may increase the transaction cost in one jurisdiction versus another. Nevertheless, the TNSPs had very similar assessments of the ongoing OFA resource impact.

[11] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 page 14

Specifying network conditions to meet FAPS[12]

> *"TNSPs must meet the FAPS under specified conditions."* It will be the TNSPs' role to develop the specified conditions around assumptions on Generation, Transmission and Demand. *"In terms of process for how the FAPS would be set:*
>
> - The AER would produce guidelines to guide TNSPs in setting the specified network conditions;
> - TNSPs would then develop the specified network conditions; and
> - AER would then approve the specified network conditions proposed by the TNSP to the extent they are consistent with the AER guidelines."[12]

34. It is assumed the FAPS will be assessed and reset annually. TNSPs rely on AEMO expertise to convert stability and thermal limits into the dispatch constraint equations. TNSPs expect that they will have an increased interest in the application of limits to the extent they affect TNSP performance and its regulated incentive regime "at all times". Most of the TNSPs concluded that the present level of resources would suffice if the process of review and application of limits was unchanged.

35. However, a recent AEMC OFA proposal contemplated TNSPs being responsible for deriving constraint equations for the NEMDE. This expertise primarily resides in AEMO. If this change was to eventuate, the TNSPs would be required to source and/or train constraint equation specialists for this role. This has not been factored into the TNSPs' assessments. EMCa understands there are presently seven to ten specialists in AEMO in this role.

36. The consistent view of the TNSPs is that the network planning and modelling IT systems are not likely to require modification for implementing OFA.

Annual review processes[13]

> "Key aspects of the planning process would be the same as currently, with TNSPs being required to produce both an Annual Planning Report (APR) and undertake Regulatory Investment Test for Transmission (RIT-Ts) for qualifying investments."
>
> However, there would be changes to the RIT-T analysis resulting from the implementation of OFA – benefits to generators would no longer be considered since generators would be able to directly indicate their preferred (firm) access levels".[13]

[12] AEMC Presentation – "Introduction to Optional Firm Access" – slide 11 and 12

[13] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 page 11

37. In effect the generation benefit assessment component of RIT-T is removed and replaced by regulated network investment founded on a direct contracted firm access obligation on the TNSPs.

38. There were mixed assessments of any saving the TNSPs would realise for the generation benefit component no longer being required for RIT-T. Two major interconnector assessments in the last 5 years had a material consultant input and planning resource component with around 1 to 2 FTE resources committed to these projects over the assessment period.

39. Another TNSP suggested the generator benefits assessment accounted for up to 30% of a $1m study. A third did not anticipate any further resource saving in a team that has already accounted for diminishing network augmentation and RIT-T assessments.

40. In summary, the TNSPs identified that market benefit-driven augmentations are sporadic and the TNSPs were not committed to any savings from the removal of the need to derive generator benefits as part of their market modelling to support RIT-T submissions. The RIT-T savings were not factored into their assessment on the basis of the intermittent nature of this work and declining RIT-T network augmentation.

2.3.3 EMCa view of impacts and risk factors for network planning

41. The TNSPs' and EMCa's assessments are founded on two important assumptions:

- The transitional firm access allocation (and short-term auction of "spare capacity") will not increase the level of firm access such that there is a need for network investment in a period of declining demand; and
- TNSPs will not be responsible for deriving constraint equations for the NEMDE and that TNSPs incentives and interest in reviewing limits (both stability and thermal) are adequately addressed by their present role.

42. The risk factor for TNSPs to train and acquire constraint equations specialists would appear to require at least one FTE ongoing in each TNSP to address this latter role. This recent AEMC proposal has not been factored into the TNSP assessment.

43. EMCa recognises the incremental transitional need for 1 to 2 FTE per TNSP and as a base case would suggest an allowance of 2 FTEs for the first 12 months of implementation to modify existing processes to incorporate OFA firm access requirements and to train staff.

44. The TNSPs' assessments of an ongoing requirement for an additional 1 to 2 FTEs is considered conservative and reflects their uncertainty of the full implications of the FAPS and FAOS. The implementation of OFA and the FAPS represents an expanded obligation for firm access and focus for the TNSP. This is balanced against a declining demand on the network and contraction of the augmentation planning workload.

45. The RIT-T savings have not featured in the TNSPs' assessments on the basis of the intermittent nature of this work and declining RIT-T network augmentation. The extent

to which removing the generation benefit assessment component of RIT-T contributes to this decline would require a cost benefit assessment beyond the current scope.

46. Based on the resources applied to previous RIT-T assessments (and noting the falling demand) we consider that at least one resource presently assigned to planning and RIT-T is likely to be released to manage OFA. Our assessment is that an ongoing incremental resource of 0 to 1 FTE will be required for Network Planning, with a base case of 1 FTE.

47. The network planning and market modelling systems used are not likely to require modification for implementing OFA at a material cost to the TNSP. These systems are maintained and updated by the software developer.

2.4 Optional Firm Access procurement and its impact on generator network access and connection processes

2.4.1 Current resourcing, processes and systems

48. Based on information provided by the TNSPs interviewed, teams of up to 10 FTEs manage load and generator network access and connections. This includes a commercial and engineering skill mix and access to a dedicated in-house or external lawyer. Generation network access and connection in most regions is not frequent (with one TNSP not connecting a generator within the last three years). Other TNSPs report that whilst prospective wind farms and embedded generators are making many connection enquiries on generation connection, only a small proportion of inquiries progress to a generation network access and connection agreement.

49. Network access and connection agreements typically involve complex and protracted negotiations. The definition of connection assets, pricing and negotiating terms of network access and connection can occur over a protracted period before agreement is reached. Connection IT systems relate to pricing of services, capital return assessments and contract registers. They are generally Microsoft Office-based packages and are not complex in nature.

2.4.2 How OFA procurement will impact on generator network access and connection

Setting price and terms for an OFA request[14]

> "A Generator could procure new or additional firm access, by entering an access arrangement with a TNSP in its region. The firm access agreement would be represented in a rules–based certificate issued to the firm generator by the TNSP and supported by a rules-based obligation on the TNSP to plan the network to meet the FAPS."[14]

50. OFA procurement charges will be calculated through the application of an access pricing model, which is based on a specified access pricing methodology (long run incremental cost) that would be set out in the Rules.

51. The accompanying payment deed would set out the obligations to pay the TNSP the access charge. Both the certificate and the payment deed would be a "standard form" contract. The access pricing model based on regulated input assumptions provides a single price output for a reference node. Connection costs are not included in the OFA Model or LRIC pricing and therefore would be not affect the way the firm access requirements are specified and paid for.

52. A base assumption of this regulated process is there is no negotiation of the firm access procurement price; however the TNSPs will be required to reach commercial agreement on the payment period and payment terms, including credit security undertakings. The additional resources required to manage OFA procurement requests in addition to the network access and connection contract process are founded on this assumption.

Expansion planning and LRIC model update following changes to firm access obligations[15,16]

> "The stylised expansion plans on which access prices are predicated are not the actual plans the TNSP would follow in developing the network." There would not be a one-to-one mapping between an access request and a transmission expansion project."[15]
>
> "TNSPs would have to provide input/data to this model"[16]

53. The long run incremental cost-based price (LRIC) by definition is not equivalent nor a benchmark to the actual cost of firm access network augmentation. TNSPs will not be reliant on the LRIC OFA model price for firm access network investment. The assumption is that the firm access price (derived from the LRIC model) will be used to offset TUOS revenue (in a similar arrangement to how SRA revenue is a TUOS offset). TNSPs' revenue will be derived from FAPS regulated network planning assessments.

[14] AEMC Presentation – "Introduction to Optional Firm Access" – slide 19
[15] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 page 12
[16] AEMC Presentation – "Introduction to Optional Firm Access" – slide 20

54. The LRIC model will have to be updated with any firm access contracts executed and the TNSP will contribute to periodic review and reset of the Model's network data and cost assumptions. This is likely to be an annual review and reset. It was generally agreed the network data was already available in the TNSP. However, independent validation and regulatory oversight of this data, and management of the model itself, is assumed to be a regulatory process to be managed by the AER.

55. The TNSPs' views are that at least one staff member will have to be familiar with the LRIC pricing model but it is generally agreed that a dedicated additional resource is not required.

56. The TNSPs considered that a prototype LRIC pricing model, and indeed a commercial version that may be developed, would not require a protracted level of training or specific expertise to operate that was not already available in current resources.

57. There is a consistent view from the TNSPs that the introduction of OFA may create an initial interest and potential influx of early requests for firm access. The concern for TNSPs was the level of enquiry and request for firm access that may arise when OFA is implemented. The resources and expertise required to process a firm access enquiry, manage pricing and implement a firm access contract are central to this assessment.

58. The majority of TNSPs anticipated a transitional increase in resourcing to manage enquiries and requests for firm access. While this may not progress to firm access agreements, it was considered that a transitional 1 to 2.5 FTE resource (per TNSP) will be required to manage these requests for the first six to twelve months.

59. TNSPs have assumed if a regulated time is applied to processing a firm access request it will not impact or add materially to the resource and transaction cost risk of the network access and connection process.

Short term OFA procurement[17]

> "Short term access would be obtained through an auction, which participants would bid into. As well as TNSPs offering short-term access in such an auction, other generators could offer in some long term access to be sold in the short term".[17]

60. The short term auction process is yet to be fully documented. The TNSPs assumed that it will be managed by AEMO in the same manner as SRA's and that processing of short term access "certificates" is also likely to be managed (and exchanged) by AEMO. TNSPs will therefore merely inherit the short term access obligations.

61. However there is a risk that this could require additional resourcing, if more sophisticated definitions of 'short term available capacity' are required, particularly given the incentive/penalty regime that will be linked to the FAOS.

[17] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 page 13

2.4.3 EMCa view of impacts and risk factors for provision of generator access and connection

62. The TNSPs' and EMCa's assessments are founded on four important assumptions:

- No negotiation of the firm access price produced by the OFA model;
- The LRIC pricing model would not require a protracted level of training or specific expertise to operate;
- While TNSPs will provide input data, the independent validation and regulatory oversight of this data is assumed to be part of a regulatory process managed by the AER;
- Connection costs are not included in the OFA Model and LRIC pricing and therefore would be affect the way the firm access requirements are specified and paid for.

63. The consistent view of the TNSPs is that there is no ongoing resource requirement for this aspect of OFA. However there is also a consistent view that the introduction of OFA may create an initial interest and potential influx of early requests for firm access. The additional resources required to manage an influx of firm access requests will test the assumption that there is no negotiation on the firm access price. Consequently, the TNSPs' assessment of transitional resources of 1 to 2.5 FTE is founded on the likely interest, the time requirements, and resources time to process these enquiries.

64. In our view, with experience in using the OFA LRIC model, and growing TNSP confidence in the standard form of contract and non-negotiability of pricing, a lower transitional cost than proposed by the TNSPs is likely to be realised. Based on these same assumptions, we consider that there is no ongoing resource requirement for OFA and that for the first 6 to 12 months 0.5 to 1 FTE transitional resources would be sufficient to address any initial influx of enquiries.

65. It is a reasonable assumption that there is independent validation and regulatory oversight of the LRIC model data. The AEMC will have recent experience of this requirement and estimates of its cost.

66. We suggest that if time constraints are placed on the firm offer request, it should be consistent with normal 'good practice' and not impact or add materially to the resource and transaction cost risk of the network access and connection process.

2.5 Network operations, operations strategy and TNSP performance incentives

2.5.1 Current resourcing, processes and systems

67. It would appear that network operations, strategy and performance management tend to have two planning and coordination functional areas being outage planning and coordination; and longer term operational planning / outage planning studies. In the NEM, there is currently a market-based performance incentive mechanism (MITC),

which largely relates to outage management. Operations planning appears to utilise between 7 and 18 FTE in each TNSP.

68. Indications are that the (approximately) 50 total TNSP network operations personnel (of the four TNSPs we interviewed) are allocated broadly on a 45%:55% basis between the outage management and operational planning functions.

69. A third functional area of the network operations group is operations control. This group tends to have around three real time operation control room personnel (two system operators and one network control manager). The shift roster arrangements tend to require around 20 FTEs to achieve this in each TNSP.

70. The primary modelling IT systems utilised by network operations are PSS/e, Outage Management and Planning System (OMAPS), MITC in-house management software, and EZ2View. Commercial software of this type is subject to annual software fees. They are generally maintained by the vendor at the vendor's cost.

71. However products like EZ2View are adapted to the user and industry. Industry contributions have been shared where specific market upgrades are required. The Purchaser is required to pay for any proprietary modifications. Modification to EZ2View to address the market (MITC) component of STPIS was a $60k cost to one TNSP. We were advised that the in-house MITC software cost $50k to $100k to develop.

2.5.2 How OFA will impact on network operations

Firm Access Operating Standard (FAOS)[18]

> "The Firm Access Operating Standard (FAOS) would require TNSPs to efficiently operate the network assets that have been developed pursuant to the FAPS. Accompanying this standard is the TNSP operational incentive scheme.
>
> This scheme would apply at all times – and would replace the market component of the current STPIS"[18]

72. While the market component of STPIS applies during outages, the FAOS and its incentive scheme will apply at all times. The TNSPs have no obligation to provide non-firm access, however, they must meet both the FAOS and the jurisdictional reliability standards.

73. The assumption is that the incentive scheme would apply at all times and would replace the market component of the current STPIS regime (the market initiated transmission constraint ("MITC") scheme). The MITC applies whenever an outage causes a market initiated transmission constraint that leads to a market impact greater than $10/MWh.

74. The MITC only applies to network constraints arising from outages and does not differentiate the impact on a MITC incentive if the market price is greater than $10/MWh. The assumption is OFA will apply at all times and will have regard to the full

[18] AEMC Presentation – "Introduction to Optional Firm Access" – slide 14

MITC price impact subject to the caps imposed in the incentive scheme. That is, the TNSPs will have a higher degree of market price exposure the greater the price separation arising from that constraint (i.e. the firm access "shortfall cost").

75. It would appear that the commercial software packages (PSS/e, Powerfactory and OMAPS) are unlikely to require bespoke modification (at a cost to the TNSP).

76. The TNSPs assume their investments in MITC systems are likely to require modification to address constraint management at all times. There was no real concern with the access to live AEMO data; however TNSPs envisage a scenario that may require the MITC systems to be replaced or materially modified. The MITC bespoke software appears to represent an investment of the order of $100k-$200k. A similar level of investment was assumed if it needs to be replaced.

77. The commercial software package, EZ2View, has been adapted for the individual requirements of TNSPs. The transition to OFA will require similar bespoke modification for TNSPs. A previous $60k modification to EZ2View was paid to address the market (MTIC) component of STPIS.

Level of incentive / penalty[19]

> The scheme would specify an annual dollar target of shortfall cost for the TNSP to meet. The target would be set at the expected annual aggregate of capped shortfall penalties for the benchmark TNSP – with this set on an ex-ante basis"[19]

78. The market (MITC) component of STPIS is presently 2.0% of TNSP regulated revenue. It is assumed in discussions with AER and AEMC that the OFA incentive component would replace the market component of STPIS at an equivalent portion of TNSP regulated revenue.

79. The MITC is a bonus scheme only. The OFA incentive arrangement will reward a TNSP if the annual firm access shortfall cost is less than the benchmark target cap and penalise the TNSP if the annual firm access shortfall cost exceeds the benchmark target cap. Nested caps would apply, limiting a TNSP's exposure to extreme shortfall costs in "abnormal" operating conditions.

80. The increased market exposure and application of the FAOS at all times would support and incentivise an increased resource commitment. The TNSPs identified a need for 1 to 2 FTEs to manage in the first year the transition of systems, processes and training to implement OFA. This included modifying operations manuals and reporting to address constraint management at all times. There were no resource requirements for operations control.

81. The majority of TNSPs identified no ongoing incremental resource requirement with one TNSP suggesting 1 FTE in the longer term. In all cases this was focused on the MITC outage planning group.

[19] AEMC Presentation – "Introduction to Optional Firm Access" – slide 15

Provision of spare capacity[20]

> "Generators could also purchase short-term firm access (firm access up to 3 years out). Short-term access would comprise any spare capacity on the network, as well as any capacity created through the TNSP undertaking activities to release more capacity."[20]

82. TNSPs assume the release of additional spare capacity would be a network operational planning decision consistent with current planning coordination activities and MITC optimisation and performance.

Provision for secondary trading[21]

> "Short term access may also be supplied by generators engaging in secondary trading".
>
> Bilateral agreements between generators may be subject to approval by the relevant TNSP. Mechanisms would need to be designed to protect the TNSP from an increase in its obligations without corresponding compensation."[21]

83. For TNSPs, secondary trading in short term access is a largely undeveloped policy area. This area was not assessed in the current scope.

2.5.3 EMCa view of impacts and risk factors for network operations

84. The TNSPs' and EMCa's assessment of Network operations is founded on the assumptions:

- The market (MITC) component of STPIS is presently 2.0% of TNSP regulated revenue. It was assumed that the OFA incentive component would replace the market component of STPIS at an equivalent portion of TNSP regulated revenue.
- The active participation of TNSPs in short term markets and secondary markets is a policy area largely undeveloped and not assessed in the current scope.

85. The existing market component of the STPIS provides a sound benchmark and key assumption for the TNSPs' appreciation of the wider application of OFA to network planning. Their understanding and experience implementing and operating under the present incentive regime converted to a clear perspective on what areas are impacted. Consequently the attention was on the transition, modifying operations manuals and reporting to address constraint management at all times.

86. Where other transition work is likely to extend over a 12 month period, the network operation transition work is likely to be a shorter exercise. Our base assumption is that 1 to 2 FTEs are required over a 6 month period.

[20] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 page 10
[21] First Interim Report – Optional Firm Access, Design and Testing, AEMC 24 July 2014 - Note 16 page 13

87. Outage management software and bespoke commercial systems are likely to require modification and possible replacement. A previous $60k modification to EZ2View paid to address the market (MTIC) component of STPIS by a TNSP provides a reasonable benchmark for this work. The proprietary MITC system may cost between $50k and $100k to modify or replace. EMCa's assessment is that $60k to $160K is a reasonable estimate with a base case assessment of $150k for system modification.

2.6 Summary of the OFA impact for resources and systems

2.6.1 TNSP views on impact for resourcing

88. Table 1 summarises the TNSPs' views of the assessed transition and ongoing resource impact for Network Planning, Connection and Network Operations. The OFA procurement impact for access and connection has a transitional component founded on the concern that a high level of enquiry and request for pricing may arise in the first year of its implementation. There was no ongoing resource requirement identified for access and connection activities.

Table 1: Resource (FTE) impact on network planning, connection and operations

TNSP - Resource Impact (FTE)		A	B	C	D	Total
Network Planning	Transition	1-2	1-2	1-2	1-2	4-8
	Ongoing	1-2	0.5-1.5	1-2	1-2	3.5-7.5
Connection	Transition	1-2	0-0	1-2	2.5-2.5	4.5-6.5
	Ongoing	0-0	0-0	0-0	0-0	0-0
Network Operations	Transition	1-2	1-2	1-2	1-2	4-8
	Ongoing	0-0	0-0	0-0	1-1	1-1

2.6.2 TNSP views on impact for relevant IT systems

89. Table 2 summarises the variety of systems that the TNSPs use for network planning, connection and operations. The majority are commercial packages maintained by third party developers. TNSPs were consistent in assessing that any changes arising from OFA on the planning, market modelling and outage management software are likely to be covered by updates from the vendors and will not be at a direct cost to the TNSPs.

Table 2: Impact on network planning, connection and network operations IT systems

Systems	Developer	Function	Modification	$/TNSP
PSS/E	Siemens	Network Planning	nil	0
Powerfactory	DiGSilent	Network Planning	nil	0
Prophet	IES	Market Modelling	nil	0
Plexos	Energy Exemplar	Market Modelling	nil	0
OMAPS	Schneider	Outage Management	nil	0
MITC	In-house	Operations Performance	modify/replace	50-100k
EZ2View	Global ROAM	Operations Performance	modify	60k

2.6.3 EMCa assessment

90. Table 3 summarises EMCa's assessment of the transitional and ongoing resource impacts of introducing OFA on Network Planning, Connection and Operations.

Table 3: EMCa assessed impact on network planning, connection and assessment

EMCa - Resource Impact (FTE)		A	B	C	D	Total	BASE
Network Planning	Transition	1-2	1-2	1-2	1-2	4-8	8
	Ongoing	0-1	0-1	0-1	0-1	0-4	4
Connection	Transition	0.5-1	0.5-1	0.5-1	0.5-1	2-4	2
	Ongoing	0-0	0-0	0-0	0-0	0-0	0
Network Operations	Transition	1-2	1-2	1-2	1-2	4-8	4
	Ongoing	0-0	0-0	0-0	0-0	0-0	0
IT $k	Transition	60-160	60-160	60-160	60-160	360-640	600k

91. Based on our experience with reviewing and using the OFA LRIC Model we have reduced the transitional component of connection for each TNSP. Assuming there is no negotiation of the model's OFA price at each node, we are confident that the TNSPs' anticipated increase in enquiries at the introduction of OFA will be mitigated by generators' ability to access and use the same model, the standard nature of the OFA contract, and the limited number of enquiries that would progress to a firm access transaction.

92. We have adjusted base case ongoing network planning resources cost to 4 FTEs (i.e. 1 FTE per TNSP) on the assumption that the transitional firm access allocation and short term trading (by definition of spare capacity) will not increase the level of firm access such that additional network investment is required.

93. The TNSPs' estimate of ongoing network planning is considered conservative and reflects an uncertainty of the full implications of the FAPS and FAOS. The implementation of OFA and the FAPS, for the TNSPs, represents an expanded obligation for firm access and focus for the TNSP.

94. Also, savings from a reduced effort required for RIT-T preparation have not been accounted for in the TNSPs' assessment on the basis of the intermittent nature of this work and the changing demand for RIT-T network augmentation. The extent to which removing the generation benefit assessment component of RIT-T contributes to a reduced effort for RIT-T preparation is unclear. However, based on the resources applied to previous RIT-T assessments we consider that at least one resource presently assigned to planning and RIT-T is likely to be released to manage OFA.

95. We have adjusted the base case transitional network Operations transition resources to 4 FTEs total on the basis that the transition project will be completed over a 6 month period (i.e. from 2 FTEs/year to 2 FTEs/6months).

96. The calculation of the IT cost is on the basis that the MITC is replaced (with cost efficiencies being an amended specification of existing facilities) or the EZ2View and existing MITC systems are modified. A base cost of $150k is estimated to apply to each TNSP.

3 Conclusion

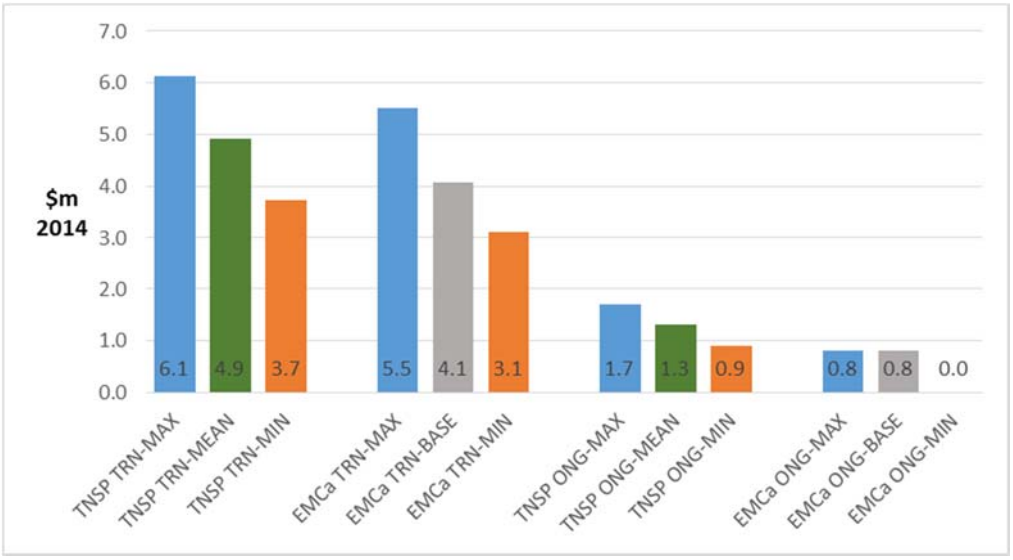
3.1 Financial assessment of OFA implementation transaction cost

97. The financial assessment of the OFA implementation transaction cost has been undertaken based on the following assumptions:

- Transitional costs will apply only to the first year of OFA.
- An assumption of $200k/FTE is made for labour impacts. The aggregated maximum impact on the TNSPs is used as a benchmark cost. This provides a high confidence that the total transaction cost has not been under-estimated.
- A project specification, project management, implementation and contingency budget of 20% are applied to all transitional resource and IT project allocations.
- All costs are expressed in $2014.

98. Based on the above assumptions, the transaction cost impact is presented for Year 1 in Figure 1. A breakdown of transition (labour and IT) and ongoing (labour) OFA transaction costs is shown for the maximum, mean, base and minimum costs scenarios.

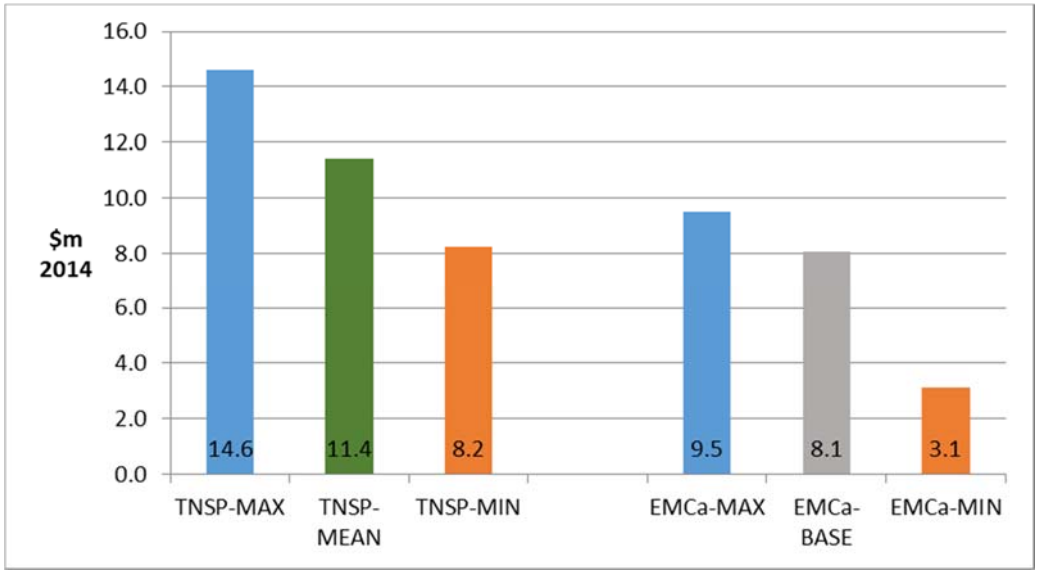
Figure 1: Comparison of EMCa and TNSP assessed OFA Transition (TRN) and Annual Ongoing (ONG) costs



3.2 Initial period cost estimate

99. The above costs provide a base estimate for further cost and benefit assessment of OFA implementation. An estimate is provided in Figure 2 below based on one year transition and 5 years of ongoing costs. The estimate is for comparison only as no discount rate or cost escalation have been applied.

Figure 2: Comparison of EMCa and TNSP assessed total costs (6 years)



100. The mean of the TNSPs' aggregate assessment of the OFA transitional (year 1) cost is $4.9m (i.e. around $1.25m per TNSP). The mean of their estimate of the OFA ongoing (including the first year) cost is $6.5m. Assuming a 50% probability on the discreet values of the high and low estimates in the range given to us by each TNSP,

then at an 80% confidence level[22] the expected mean aggregate transition cost would be less than $5.5m and the ongoing cost would be less than $7.4m (i.e. $12.9m total over the 6 years).

101. The EMCa base aggregate transaction cost assessment is $4.1m for the transitional period (year 1) and $4.0m in aggregate for ongoing years 2 to 6 (i.e. $8.1m total over 6 years). The summary of results is provided in Table 4.

Table 4: Comparison of EMCa and TNSP assessed OFA transition (TRN) and 5-year ongoing (ONG) costs

TNSP/EMCA	TNSP MAX	TNSP - MEAN	TNSP - MIN	EMCa - MAX	EMCa - BASE	EMCa - MIN
Transition (Labour & IT)	6.1	4.9	3.7	5.5	4.1	3.1
5 Years Ongoing (Labour)	8.5	6.5	4.5	4.0	4.0	0.0
TOTAL	14.6	11.4	8.2	9.5	8.1	3.1

3.3 Summary of assumptions and risk factors

102. The following assumptions are relevant to the cost assessment and could materially affect the TNSPs' transaction costs if modified:

- The transitional allocation of firm access should not, at the onset of OFA, increase the reliability requirements of the network such that investment by the TNSPs would be required. A higher transaction cost may arise if Generators receive a collective level of firm access above the current reliability requirements of the network. This is because TNSPs would need to undertake specific planning studies to determine the need for augmentation against the new FAPS and to plan those augmentations (though the larger cost would be the cost of the network augmentations themselves).
- TNSPs rely on AEMO expertise to convert stability and thermal limits, which they provide, into the dispatch constraint equations. A recent AEMC proposal contemplated TNSPs being responsible for deriving constraint equations for the NEMDE. This revealed a gap in TNSP expertise which currently (but not exclusively) exists in AEMO. If this change was to eventuate the TNSPs would be required to source and/or train constraint equation specialists for this role and this role may be more onerous under OFA given the significance to TNSPs of any constraints on generation. This development has not been factored into the TNSP assessment.
- The active participation of TNSPs in short term markets and secondary trading is a policy area largely undeveloped and not assessed in the current scope. It is noted in the FIR that "Mechanisms would need to be designed to protect the TNSP from an increase in its obligations without corresponding compensation."
- It is assumed that the OFA incentive component would replace the market component of STPIS at an equivalent portion of TNSP regulated revenue. The TNSPs' understanding and experience implementing and operating under the present incentive regime resulted in a clear perspective on what areas are impacted. A markedly different value would likely alter the resource that would be warranted by each TNSP in seeking opportunities and managing its risk.

[22] This applies a conservative 0.84 times ($z_{0.20}$) the standard deviation of the assessed cost.

- We have assumed that there is to be no negotiation on the firm access price produced by the OFA LRIC pricing Model. Relaxation of this assumption or a requirement for 'bespoke' re-configuration of the LRIC model for each firm access request, could significantly affect TNSPs' transactions costs.
- It is assumed (based on the current prototype model) that the OFA LRIC pricing model would not require a protracted level of training or specific expertise to operate.
- While TNSPs will provide input data, the independent validation and regulatory oversight of this data is assumed to be a regulatory process managed by the AER.
- Connection costs are not included in the OFA Model and LRIC pricing and therefore would not affect the way these firm access requirements are specified and paid for. If regulated time constraints are placed on the firm offer request, it should be consistent with normal 'good practice' and not materially impact or add to the resource and transaction cost risk of the network access and connection process.

Appendices

Annex A: AEMC Presentation

Introduction to Optional Firm Access

AUSTRALIAN ENERGY MARKET COMMISSION

Outline

- What is optional firm access
- Firm access planning standard
- Firm access operating standard and incentive scheme
- Transmission planning
- Acquiring access rights

What is optional firm access?

Background

- The AEMC's Transmission Frameworks Review looked at whether existing transmission frameworks produce efficient outcomes
- The final report of this review was published April 2013
- The report observed that differences in the approach to generation and transmission investment processes may not operate to minimise overall system costs for consumers
- It proposed the optional firm access model which gives generators the ability to buy firm financial access to the transmission network

How would optional firm access work? (1)

- Currently, when there is network congestion, generators may not be able to dispatch some of their capacity and therefore not be paid for "constrained off" dispatch
- Under optional firm access, generators would have the option of buying firm (financial) access to the regional reference price
- Generators could still choose to be non-firm and still not pay for use of the transmission network
- The effect for firm generators is that if they are constrained below their contracted level of access because of a constraint they will receive compensation for lost margin above bid price

How would optional firm access work? (2)

- The compensation is generally funded by non-firm generators if they are dispatched in preference to firm generators
  - When the network is constrained, non-firm generators receive a local price rather than the regional price
  - The difference between the local price and the regional price is used to compensate constrained-off firm generators
  - The local price should not be less than non-firm generators' offer price
- TNSPs would have an obligation to meet a firm access planning standard (FAPS) under specified conditions, which will be based on the sum of access that has been purchased
- Regulatory provisions will incentivise TNSPs to meet the generator access standard – through the firm access operating standard (FAOS) and an associated incentive scheme

How would optional firm access work? (3)

- Dispatch processes are unaffected by OFA
  - Physical and financial access remain delinked
  - Dispatch patterns may change because of changed incentives
- Generator enters into an access agreement with the local TNSP
- There would be parallel changes to inter-regional mechanisms in the package

Firm access planning standard

Firm access planning standard (1)

- The Firm Access Planning Standard (FAPS) describes the amount of capacity the TNSP must plan to provide in response to requests for firm access
- It would be set on the basis of certain specified network conditions, with the conditions likely to reflect the time access is of most value to generators
- TNSPs must meet the FAPS under these *specified conditions* (which, we have assumed to be peak demand for our assessment)
- The FAPS would need to specify assumptions around:
  - Generation – expected output and commitment from scheduled, semi-scheduled and non-scheduled
  - Transmission – assets being in system normal
  - Demand – assumptions around scheduled and non-scheduled demand

Firm access planning standard (2)

- In terms of process for how the FAPS would be set:
  - The AER would produce guidelines to guide TNSPs in setting the specified network conditions
  - TNSPs would then develop the specified network conditions
  - The AER would then approve the specified network conditions proposed by the TNSP to the extent they are consistent with the AER guidelines
- The specified network conditions would be set at each regulatory reset (although there may provision for revision midway through a regulatory period, if conditions changed substantially)

Firm access operating standard and incentive scheme

Firm access operating standard and incentive scheme (1)

- The Firm Access Operating Standard (FAOS) would require TNSPs to efficiently operate the assets that have been developed pursuant to the FAPS, so as to optimise the "firmness" of the firm access service
- It is difficult to know whether the TNSP is actually operating efficiently, and so accompanying this standard is a TNSP operational incentive scheme
- This scheme would apply at *all times* – and would replace the market impact component of the current STPIS
- The incentive scheme operates by levying penalties on the TNSP when access to firm generators falls short of the agreed amount
  - TNSPs could earn upside (see next slide)
- The magnitude of the penalty would be based on the shortfall cost: the cost to firm generators of receiving reduced access
  - The shortfall cost is defined as the capacity shortfall multiplied by the flowgate price (representing the estimated market impact of the constraint)

Firm access operating standard and incentive scheme (2)

- The scheme would specify an annual dollar target of shortfall costs for the TNSP to meet
- The target would be set at the expected annual aggregate of capped shortfall penalties for a benchmark TNSP – with this set on an ex ante basis
- For example, if the target was $15m, and the actual shortfall is $18m, then the penalty that the TNSP must pay firm generators is $3m. Or, if the actual amount of shortfall is $12m, the TNSP would receive a reward (funded by firm generators) equal to the difference, ie, $3m
- Nested caps would apply, limiting a TNSP's exposure to extreme shortfall costs in "abnormal" operating conditions
- The TNSP payments/rewards would be calculated ex post at the end of the year, and settled with firm generators over the following year

TNSP planning

TNSP planning

- TNSPs would be required to plan their networks to meet the FAPS and their jurisdictional reliability standards
  - Both standards would need to be met simultaneously
- Key aspects of the planning process would be the same as currently – TNSPs would be required to produce APRs and RIT-Ts
  - However, only benefits that accrue to parties *other* than generators would be required to be considered under the RIT-T

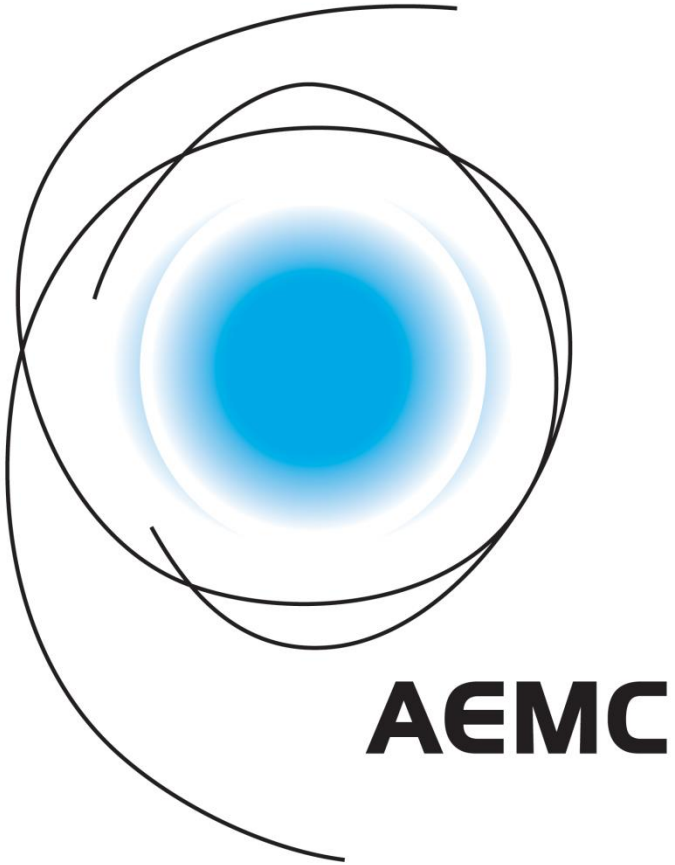
Acquiring access rights

Generator requests for access & TNSP obligations (1)

- Through a procurement process, a generator could procure new or additional firm access, by entering into an access arrangement with a TNSP in its region
  - Generators can request a firm access amount, location and duration
- The procurement process would typically be iterative with the generator submitting a request, the request being priced by the TNSP, and the generator amending its request in response
- The firm access agreement would be represented in a Rules-based certificated issued to the firm generator by the TNSP, and supported by a Rules-based obligation on TNSPs to plan their network to meet the firm access planning standard
- There would be an accompanying payment deed, which the set out the generators' obligations to pay the TNSP the access charge
- Both the certificate and the payment deed would likely be "standard form contracts" – with the framework for this set out in the Rules

Generator requests for access & TNSP obligations (2)

- Access charges are calculated through the application of an access price model, which is based on a specified access pricing methodology (long run incremental cost) that likely would be set out in the Rules
  - TNSPs would have access to this model, and could use the model
  - TNSPs would also have to provide input/data to this model
- A TNSP's revenue allowance would reflect its expenditure required to meet both the firm access and reliability standards
  - A TNSP's total network revenue requirement = TUOS revenue (for reliability standards) + firm access revenue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