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Supporting Submission: AER Review of RIT-T and RIT-D Application Guidelines

Marsden Jacob is pleased to provide this independent submission to Delta Electricity in relation to the review of the RIT-T and RIT-D application guidelines.

This submission is structured to address three matters:

- The first part considers the effectiveness of the current RIT-T to ensure that the long-term interest of consumers are served in an environment of rapid change including technology uptake (which is increasing risks to both system security and market operations) , emission reduction, and potentially NEM design.
- The second part considers the AEMO Integrated System Plan (ISP) and how this may be used within and influence a RIT-T application.
- The third part considers how transmission development priorities based on "strategic value" (and external to the RIT-T process) have the potential to detract from efficient transmission development as expressed by the RIT-T objective. These external factors include:
  - interconnector development undertaken for power system security reasons, such as indicated by the Energy Security Board (ESB);
  - the development of renewable energy zones (REZ) as indicated in the Finkel report, the Federal parliamentary inquiry into modernising Australia's electricity grid, and AEMO;
  - government assisted interconnector development (such as $200M support by the South Australia government for the proposed SA - NSW interconnector).

This submission has been structured to first present the conclusions from the analysis presented. Following this, this paper reviews how generation and network developments are undertaken and identifies issues with the regulatory test and related recommendations from recent reviews.

Particular issues with the RIT-T are illustrated from the 2013 RIT-T application of the Heywood interconnector upgrade.

Lastly, factors external to the RIT-T are considered and how these have the potential to influence the economic efficiency of transmission investment (and the achievement of the RIT-T objective).

Marsden Jacob is one of Australasia's leading economic consultancy firms that provides independent research and analysis on economic, financial and public policy issues. Advice provided includes high-level governance and strategy to the use of detailed econometric, economic and financial modelling. Andrew Campbell of Marsden Jacob has provided advice on the RIT-T since its inception and has undertaken a number of RIT-T applications.

Conclusions

This paper has explored the increasing complexity of future transmission development, the suitability of the RIT-T in its current form to satisfy its objective, and the potential influence of factors external to the RIT-T to efficient transmission development.

The conclusions of this paper are presented below.

RIT-T

- All transmission developments must be subject to the RIT-T. Properly applied the RIT-T is the most appropriate process for assessing transmission (and distribution) development accounting for the uncertainty associated with the transforming NEM (including issues such as non-synchronous technology influences on system security).
- The closer a RIT-T assessment represents the market benefits that would be obtained under each described scenario, the higher will be the probability of efficient transmission development. This is achieved through modelling that is designed to incorporate the theory and observations of spot market operation. Least cost modelling is far removed from this and is not recommenced as the prime modelling approach.
- The proper and fair comparison of potential projects in a RIT-T application requires that all technical and regulatory requirements are met in each scenario. This implies that security is addressed and fully represented (and costed) through a RIT-T assessment. In the past this has not been necessary as security was assumed to be met through the security limits used.
- The increasing uncertainty in the outlook of the NEM means transmission planning will require an increasingly flexible and probabilistic approach. This will require a larger spread of scenarios than previously used. Such an approach would for example provide improved insights into future risks such as how a potential large transmission project could become a stranded asset.
- The nature of transmission developments is likely to place increasing value on real options, that is developments that would provide for particular developments to occur at a later time. While the RIT-T framework provides for this it may need to be strengthened in this regard.

AEMO ISP

- The strategic planning value offered through the AEMO ISP (currently being developed) if designed to complement the RIT-T process would assist a RIT-T application. This complementarity would rely on the ISP providing a spread of scenarios that covers the conceivable range of market inputs, outcomes that could be expected in the NEM under the scenario inputs, and identifying common transmission needs across the scenarios. This would not be a fixed “strategic” long term development plan.
- Use of the AEMO ISP in a RIT-T application should complement and not exclude other scenarios and assumptions being used. A properly functioning RIT-T (when undertaken) would also complement the strategic planning service that will be provided by the AEMO ISP through the rigor and transparency provided by the cost benefit modelling and the provision of modelling assumptions and results including at a high granularity (i.e. half hourly results).
- Both the ISP and RIT-T should provide market outlooks and transmission developments that are cognisant of the needs of the market and that express the changing nature of NEM operation. As noted, while least cost modelling can be undertaken, this should not be the prime methodology used.

- A reliance on a ISP Base Case (if this were to be developed) or the mandatory use of ISP scenarios in the RIT-T application would have considerable risks. However the scenarios used in a RIT-T must be supported.

"Strategic" Developments

- Transmission developments undertaken outside of the established planning framework are not in accord with the National Electricity Rules. Such developments increases risk to the competitive market and increases the risk of stranded transmission assets.
- A proper designed cost benefit analysis (as undertaken through a RIT-T) would identify the economic and option value of developments such as REZs.
- The likely consequences of "strategic developments" is higher costs to consumers through increased risks in the competitive market and the risk of stranded transmission assets.

Independent Assessments

- Confidence and rigor in modelling undertaken for a RIT-T is essential. The prerequisite for this is a high level of transparency. This requires the provision of all assumptions, modelling details and modelling results (including the half hourly results).
- If this is not possible there is cause to require independent parties to undertake the modelling.

Part 1 The RIT-T

Generation and Transmission Development Dynamics – Observations

The development history of generation and transmission in the NEM provides valuable insights into the changing nature of generation and transmission economics and the impact this is having on the required planning and regulatory arrangements. This is presented in terms of the background to planning and development followed by outcomes and proposed solutions.

Historical background

The circumstances and manner transmission development was undertaken were as follows:

- The "traditional" paradigm of generation development (that applied in the NEM until about 2011) was new generation being developed in response to increasing demand. Modelling was based on the generation development that limited spot price increases to the Long Run Marginal Cost (LRMC) of the optimum new generator (which were typically CCGT and OCGT plant due to the availability of low cost gas). Transmission development primarily responded to new generation and demand growth.
- The reduction in demand growth post 2011 (and AEMO projections post 2015) coincided with large scale renewable generation development and the closing of a number coal power stations. Transmission development is now responding to the changing nature and location of generation.
- Actual non-renewable generator development did not develop as would have been projected (and had a low correlation with spot prices), instead being largely driven by participant needs that included vertical integration and risk management (valued at the Market Price Cap (MPC)). Renewable generation was determined by renewable generation policy and policy risk.
- Transmission development was undertaken using the various versions of the RIT over the period. The objective of the RIT throughout is stated as follows:

"to identify the investment option which addresses an identified need and which maximises the net economic benefit to all those who produce, consume and transport electricity in the NEM".

This objective aligns with ensuring that the long-term interest of consumers are served.

The RIT process involved modelling the economic benefit of an option and alternative options over a set of credible scenarios, and the option with the highest net economic benefit (economic benefit less economic cost) over most of the scenarios being selected. All scenarios were constructed and modelled on the basis of least cost and there was an implicit assumption that security was maintained (through operating the system within security limits).

A review of past RIT-T applications shows the following:

- often had a central scenario and a moderate number of sensitivity scenarios. Examples of this are as follows;
  - the Heywood 190 MW upgrade RIT-T undertaken by ElectraNet and AEMO in 2013 had scenarios labelled Central, Low, High, Revised Central (upgrade Option 1b passed the RIT-T and was developed)
  - the QNI upgrade RIT-T undertaken by Powerlink and TransGrid is 2015[1] has scenarios based on those developed by AEMO. These were labelled Planning, Fast World Recovery, Slow Rate of Change, Planning with low gas prices. Planning with northern NSW 300 MW wind generation. The planning was the central type scenario (the proposed upgrade to QNI did not pass the RIT-T and was not developed).
- project selection was based a criteria of maximum NPV[2] (consistent with the requirements to maximise Market Benefits). This meant large developments were likely preferred over smaller projects (i.e. for the same benefit to cost ratio a larger project will have a larger NPV.)
- competition benefits were small or not included
- reliability benefits were assessed through changes to unserved energy valued at the Value of Customer Reliability (VCR) and not at the Market Price Cap (MPC). The MPC is much lower than the VCR and would likely lead to less-favourable market benefits for transmission development. Generation economics for reliability is based on the MPC which means their respective incentives are misaligned
- discount rate was similar to commercial discount rates
- level of modelling and results details varied considerably between applications.

- Intraregional transmission development was mainly undertaken to satisfy TNSP planning criteria (which varied between jurisdictions). This is referred to as investment for

[1] Project Assessment Draft report, development of the Queensland – NSW Interconnector, 31 March 2014

[2] RIT-T 29June 2010:

The preferred option is the credible option that maximises the net economic benefit to all those who produce, consume and transport electricity in the market compared to all other credible options.

Where the identified need is for reliability corrective action, a preferred option may have a negative net economic benefit (that is, a net economic cost).

Net economic benefit equals the market benefit less costs.

reliability[3]. In general transmission development responded to projected flows associated with changing demand and indicated generator use / development locations.

Example: Within the constraints of the regulatory arrangements TransGrid developed their "Network Development Strategy 2014" which centred around the development of 500 kV transmission around Sydney. Individual power lines would be subject to a RIT-T test.

- In relation to interregional transmission development, the RIT was applied on most interregional connections for the purpose of upgrading or conversion.[4] The benefits arise from reduced fuel costs due to increased energy transfers and reduced new generation due to capacity (reserve) sharing. By its nature interconnection economics pre-empts what generators will be developed or will not be developed.

Planning outcomes and solutions

The outcomes and proposed solutions to the changing nature of the NEM were as follows:

- The number of wind farms being developed and planned, each with lengthy and costly dedicated transmission to connect to the main grid, resulted in a policy of Scale Efficient Network Extensions (SENE). While the original proposal would have allowed the development of infrastructure prior to its use and associated cost recovery, the final decision was based on incentivising a TNSP to conduct a study into its need (i.e. transmission would follow generation development).
- Over expenditure (sometimes referred to as gold plating) of the transmission network resulted. Reasons for this included:
  - very stringent reliability criteria (under the previous reliability limb or for reliability corrective action) and TNSP planning standards
  - VCR > MPC (higher value of reliability ascribed to transmission development than market based generation development)
  - central body (AEMO, TNSP) demand forecasts – until about 2010 demand projections were higher than what out-turned
  - tendency to select large projects that maximum net market benefits.

[3] Final Decision, Regulatory Test version 3 & Application Guidelines, November 2007. This stated:

"The reliability limb relates to clause 5.6.5A(b)(2) of the NER set out above. It is to be applied to any proposed new network investment or non-network alternative option in the event that the option is necessitated to meet the service standards linked to the technical requirements of schedule 5.1 or in applicable regulatory instruments."

Regulatory investment test for transmission, June 2010. This stated:

(1) "The preferred option is the credible option that maximises the net economic benefit to all those who produce, consume and transport electricity in the market compared to all other credible options. Where the identified need is for reliability corrective action, a preferred option may have a negative net economic benefit (that is, a net economic cost)."

(2) "Where the credible option is for reliability corrective action, the quantification of the market benefits associated with changes in voluntary load curtailment and changes in involuntary load shedding must only apply in so far as the market benefit delivered by the credible option exceeds the minimum standard required for reliability corrective action. If there is no minimum standard all of the market benefits associated with changes in voluntary load curtailment and changes in involuntary load shedding for each credible option must be quantified."

[4] Direct link and Murray link were converted from a market interconnector to a regulated interconnector.

- A number of reviews have been undertaken of the suitability of the RIT. All of these reviews supported the economic cost basis of the RIT, but with minor changes being made. Changes that resulted from the review in 2010 included:[5]
  - cost benefit analysis with respect to the reliability criteria (VCR, MPC, CPT) rather than providing reliability at the lowest cost
  - amalgamated the market benefits and reliability limbs of the RIT (meaning that national benefits considered for all transmission investments)
  - new consultation requirements (which is considered most important to ensure that information and feedback form the market is being obtained).
- AEMC has had a consistent position as to the desirability of utilising commercial arrangement in markets with effective competition as the means of promoting efficient investment[6].
- The penetration of renewable generation (that is both non-synchronous and non-dispatchable) was the result of supporting energy policy (feed-in tariffs, SRES, RET, LRET, VRET, QRET). The projected continued development of solar and wind generation (due to both energy policy and economics) is impacting the requirements of transmission and distribution, and the need and economics of dispatchable generation. Response to that have included:
  - The Finkel recommendation (accepted by government) that AEMO develop the ISP for the purpose of improved coordination of generation and transmission and with increased stakeholder involvement. While the form of this report has not been released, it may influence the form of future scenarios considered in a RIT-T application.
  - Energy Project Team (EPT) noted that while it would be open to jurisdictions and/or the Energy Council bringing forward interconnector investment outside the regulated framework, due to "considerations broader" than considered by the RIT-T, the issues involved meant that this was not recommended.
  - emerging issues of security.

[5] Reference - Review of the Regulatory Investment Test for Transmission, RIT-T Review, 6 February 2017, COAG Energy council

[6] 7.1 Market-driven approach

Competitive, and hence lower cost, outcomes will generally arise where market based solutions are utilised. This means that, where feasible and practical, market participants and investors that receive the rewards and face the costs of a particular investment should be responsible for decision making. Market participants are well informed, commercially driven entities and as such are best placed to make efficient investment and operational decisions. This includes making efficient decisions on the location, type and size of generation.

Moreover, frameworks which provide scope for market-driven, commercial negotiations are generally less intrusive and administratively costly than frameworks relying on more prescriptive regulation.

The Commission considers that utilising commercial arrangements, and minimising regulatory intervention, is desirable in markets with effective competition as the means of promoting efficient investment thereby lowering expected total system costs in the long term interests of consumers.

RIT-T Application and Future Challenge to Efficient Grid Development

As per the 2017 review of the RIT-T, the RIT-T remains the prime mechanism for network investment.

The efficiency of transmission development under the RIT-T is contingent on the proper application of the test, recognising there is a proportionality issue here (i.e. the depth and complexity of issues considered should be commensurate with the size and associated expense of the project). The key factors that determine the outcome of a RIT-T application are as follows:

- The characterisation of the service provided by each of the projects being considered;
- The assumptions that underpin the development of the NEM in which the projects will be evaluated;
- The economic basis on which the NEM develops;
- The accuracy of the modelling that is used to project the impact of the project based on the above;
- The criteria used for the selection of the preferred project (which may have no project selected).

These are discussed in turn below. This is followed by a review of the application of the RIT-T to the Heywood interconnector undertaken in 2013.

Project Characterisation

The service provided by the project and alternative projects assessed in a RIT-T application must be correctly characterised and represented as such in the modelling. This is what is being purchased. The complexity of the transmission system and security constraints can mean this may not be easily done.

This can be particularly important for interconnectors where the capacity can be determined by system conditions (such as generators in service) and security constraints.

Scenarios

The scenarios selected have a significant bearing on the assessed economics of the project and alternative projects. The RIT-T specifies that these be "credible scenarios". With the increasing uncertainty in relation to technology penetration and future energy policy, the spread of credible scenarios has increased and this potential uncertainty needs to be recognised.

This strongly suggests that the concept of a central most likely scenario, as used in the past, is no longer valid.

Scenarios should be internally consistent and satisfy all technical and regulatory requirements. This includes power system reliability and security (accounted for in system operating limits). This may require additional security constraints be incorporate and associated system costs than has been the practice in previous modelling for RIT-T applications.

NEM development dynamics

As important as the scenario assumptions (such as gas cost and technology costs) is the assumed dynamics governing generation (and entrepreneurial transmission) investment and dispatch. The RIT-T specifies that this be on the basis of least cost, and that scenarios using market based development be included if required.

The preference to use least cost development is problematic for three reasons:

- Firstly as a review of the investments and daily operation in the NEM shows, the NEM does not function on the basis of least cost. Investment and operation are determined by factors that include vertical integration, risk management, and spot price opportunities.
- Secondly, least cost modelling results can be very sensitive to assumptions and the formulation of all the constraints involved[7], that on the surface would appear quite similar. This also makes understanding the differences between different models very challenging.
- Thirdly, the level of future uncertainty (associated with the transforming NEM) further removes the manner the NEM will develop from that given by least cost. In the context used in the RIT-T least cost assumes perfect foresight in relation to the assumptions used, and does not recognise the influence of risk management by the individual participants. This can be particularly important when considering the value of developments that provide an option to respond to later market developments.

Modelling accuracy

Getting all the above right is wasted if the market model that takes as inputs the project specification, scenario assumptions and NEM development dynamics, for the purpose of calculating the net market benefit, does not do this correctly (or with insufficient rigor).

This is a difficult issue that has never been properly addressed. It involves very technical issues and different modelling companies espousing the virtues of their "own" model.

The complexity of the issues means that it cannot be resolved through technical audits, but only through verification (demonstration) on how the drivers of outcomes are incorporated. The solution to this does not concern who undertakes the modelling (i.e. the proponent or the AER), but ensuring that the modelling that is undertaken is reported with sufficient transparency such that independent parties can determine what the basis of the modelling was and the reasons for differences in other modelling that may be undertaken.

Economic Assessment Criteria

It has been argued that a criteria that maximises market benefits gives preference to large projects over smaller projects with higher benefit/cost ratios. This is likely to be the case unless the projects considered address this issue.

Who undertakes the Modelling

The complexity of the issues involved and modelling means that particular selections of assumptions, technical details, and modelling methodology can significantly impact the level of market benefits that are output from modelling.

There are two issues associated with having confidence in the results obtained from modelling. Foremost is that the modelling must be transparent. This requires the provision of all assumptions, modelling details and modelling results (including the half hourly results). This should be sufficient for other parties to verify / understand the modelling. Assumptions provision etc. could be done under certain limitations specified by a confidentiality agreement.

If the above is done then the matter of proponents undertaking their own modelling is resolved. If not, then there is a potential issue with "who did the modelling", meaning that there could be cause to require an independent party to undertake the modelling.

[7] Least cost modelling involves optimising an objective function (in this case the net present value of market benefits) subject to many hundreds or thousands of constraints. These constraints include the network, generation, environmental etc.

Example RIT-T Application – 2013 Heywood Interconnector Upgrade

The most recent example of a RIT-T application for an interconnector is the RIT-T for the Heywood Upgrade Contingent Project[8] undertaken in 2013 by ElectraNet and AEMO[9]. The RIT-T application resulted in Option 1b (a 3rd Heywood transformer + series compensation + 132 kV works at an estimated capital costs of $107.7M) that provided an increase of 190 MW in both directions passing the test and being developed.

We first note the complexity of the issues involved and that the Project Assessment Conclusions Report addressed many matters.

Fundamental to the conclusions reached in that report were the scenarios used, the modelling methodology used, and the transparency of the results. These matters are addressed in turn below.

Scenarios

The scenarios used in the RIT-T, which were considered the most probable at the time (and which confirmed to policy at the time), illustrate the difficulty in having a central scenario that can be considered the most likely. This also illustrates how matters can change. The main assumptions of that study which turned out not be representative of what actually occurred are as follows:

- All scenarios had a carbon price;
- Gas supply did not foresee the price increases that would occur;
- Playford Power Station was assumed converted to gas;
- Hazelwood Power Station was assumed retired much later than occurred.

The issue is not that assumptions can be incorrect, but that a spread of scenarios should cover the potential future. Clearly the spread of assumptions used in the Heywood study did not encompass the potential ”book ends” resulting in what actually out-turned (just 4 years on) being outside of the scenario range.

Least cost development and operation

Extracts from ElectraNet/AEMO report (RIT-T: Project Assessment Draft Report, Sept 2012) are as follows:

> Section 5.3.1 Generation expansion plans: modelled projects: “Consequently, these modelled projects were developed on a least-cost basis, consistent with the requirement of the RIT-T.”
>
> Section 5.3.2 Market dispatch model: “ The Prophet model has been run using load and wind traces from 2009/10 and based on an assumption of SRMC bidding behaviour of generators.”
>
> Section 4.1.7 ElectraNet and AEMO note that the changes in USE are very low and are represented by the reliability benefits reported in the RIT-T results

Frontier Economics also undertook modelling (on behalf of Macquarie Generation) to repeat the modelling undertaken by ElectraNet/AEMO (to determine the market benefits of the

[8] Contingent projects are significant network augmentation projects that may arise during the regulatory period but are not yet committed and are not provided for in a capital expenditure forecast. Contingent projects are linked to unique investment drivers, which and are defined by a unique 'trigger events' that are set by the AER when it determines to accept a proposed contingent project in a revenue proposal.

[9] South Australia – Victoria (Heywood) Interconnector Upgrade, RIT-T Project Assessment Draft report, September 2012, AEMO and ElectraNet. South Australia – Victoria (Heywood) Interconnector Upgrade, RIT-T Project Assessment Conclusions Report, January 2014, AEMO and ElectraNet.

proposed Heywood upgrade). In their report on this modelling Frontier[10] note in Section 5.1 titled "Summary of Frontier's findings":

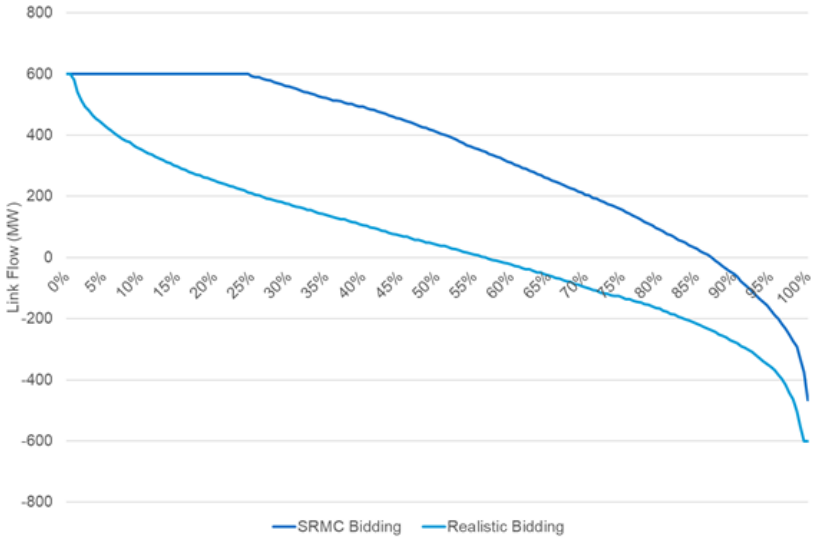
> "We have relied where possible on the same primary source for input assumptions as ElectraNet and AEMO has used. These assumptions include fuel prices, plant technical and operating parameters, plant capacities, demand growth, carbon prices and the LRET target."
>
> "Based on the above approach, we have quantified the gross market benefit of Option 1b as $24.23m ($2011/12, present value as at 2011/12). This compares to ElectraNet and AEMO"s estimate (on a comparable basis) of $284m."
>
> "One major point of departure between our analysis and ElectraNet and AEMO"s is the consideration of intra-regional transmission constraints. Frontier"s approach models inter-regional flow using discrete constraints that limit power transfers between regions to notional import and export regions. ElectraNet and AEMO"s approach considers the impact that intra-regional constraints can have on constraining flow between regions to levels below notional transfer limits."
>
> "it would appear that the treatment of intra-regional constraints under ElectraNet/AEMO"s approach is a large driver of this overall difference."

The experience of Marsden Jacob in undertaking similar least cost modelling is that this is not a surprise. This is because least cost formulations and solutions are extremely complex and are influenced by many factors, and the change of 190 MW (in this case) associated with the Heywood upgrade is a relatively small change in the total NEM.

This is also evidenced by the understanding of Marsden Jacob that participants or investors in the NEM do not use least cost modelling for the projection of generation dispatch, generator economics, or future investments.

Figure 2 illustrates the magnitude of the flow differences on the Heywood (SA-Victoria) interconnector that can result from assuming generators bid SRMC corresponding to least cost operation) compared to bidding consistent with observed behaviour (labelled realistic bidding).

Figure 2 Modelled Heywood Interconnector Flows – SRMC bidding and Realistic Bidding



[10] Frontier Economics - Market benefits of Heywood upgrade – Final report. A report prepared for Macquarie Generation, May 2013

This shows the power flows for a year (2017) presented as a flow duration curve[11] . The differences are very significant and would significantly impact any assessment of economics (particularly when project economics is highly influenced by changes in fuel use).

System Security Issues

Subsequent to the RIT-T on the Heywood interconnector upgrade being developed, constraints have been introduced into SA that requires minimum amounts of synchronous generation to be operating. These constraints relate to:

- System strength that requires that certain combinations of gas generator units are operating in SA when wind generation in SA exceeds certain levels[12];
- Rate of change constraint[13] which requires in SA having sufficient ancillary service capability to address the unforeseen outage of the Heywood interconnector[14].

The consequences of the requirement to have minimum amounts of gas generation operating in SA and minimum amount of frequency control capability in SA is that the benefits from the Heywood upgrade are less than they would have been otherwise.

This paper has not undertaken an assessment of the impact to the market benefits that are now provided by the Heywood upgrade, only to note that this is an example of issue of assumed technical characterisation that can significantly impact benefits.

Conclusion - Suitability of the RIT-T

The RIT-T remains the most suitable approach determining the economic value of transmission in ensuring the long-term interest of consumers are served.

Efficient transmission development requires that the respective market benefits of competing development options represent that which would be obtained across a set a scenarios representing the possible future.

RIT-T modelling should be based on how the spot market would operate – this needs to account for participant investment and operation drivers and power system security requirements. This represents a change to current practice.

Modelling requires a level of transparency sufficient for other parties to detail the basis for the results obtained. Without sufficient transparency the modelling would be required to be undertaken by an independent party.

[11] A flow duration curve haver the half hourly flow for a year ordered from highest to lowest.

[12] Source: http://aemo.com.au/Market-Notices?searchString=60252

[13] National Electricity Amendment (Managing the rate of change of power system frequency) Rule 2017 No.9

[14] On 19 September 2017, the AEMC published a final rule to place an obligation on Transmission Network Service Providers (TNSPs) to procure minimum required levels of inertia or alternative frequency control services to meet these minimum levels.

Part 2 AEMO Integrated System Plan[15]

As the ISP is still being developed its precise form is not known. However AEMO have indicated that:

- The approach will utilise combined gas and transmission development scenario / plan based on least cost development;
- Will include a number of scenarios with associated transmission development options;
- Renewable energy zone (REZ) will be an important component.

About the AEMO Integrated System Plan

Recommendation 5.1 from the Finkel Review stated:

> "By mid-2018, the Australian Energy Market Operator, supported by transmission network service providers and relevant stakeholders, should develop an integrated grid plan to facilitate the efficient development and connection of renewable energy zones across the National Electricity Market".

AEMO have stated that:[16]

> The first ISP in June 2018 will deliver a strategic infrastructure development plan, based on sound engineering and economics, which can facilitate an orderly energy system transition under a range of scenarios. This ISP will particularly consider:
>
> - What makes a successful renewable energy zone (REZ) and, if REZs are identified, how to develop them.
> - Transmission development options.

ISP and the RIT-T

There is an issue of whether the proposed strategic planning value offered through the ISP is in conflict with what is often expressed as the incremental development model associated with the RIT-T. However the nature of the changing market should require these to work together:

- The increasing uncertainty in the market is meaning transmission planning will require an increasingly flexible and probabilistic approach. This is assisted with an ISP that is designed to consider the spread of what can happen, the grid developments that would be required across these scenarios, what these scenarios have in common, and indicators of particular ways forward. This is not a fixed "strategic" long term development plan.

[15] AEMO website (https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan)

AEMO is calling this an Integrated System Plan (ISP), rather than an integrated grid plan, to reflect that over time, the ISP will by necessity consider a wide spectrum of interconnected infrastructure and energy developments including transmission, generation, gas pipelines, and distributed energy resources. The June 2018 ISP is not the end of the process, but rather the first of many steps, with updates in future years to reflect the dynamically changing nature of the power system and the need to continually innovate and evolve strategies for the future.

The first ISP in June 2018 will deliver a strategic infrastructure development plan, based on sound engineering and economics, which can facilitate an orderly energy system transition under a range of scenarios. This ISP will particularly consider:

[16] https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan

- The nature of transmission developments is likely to place increasing value on real options, that is developments that would provide for particular developments to occur at a later time.
- The final decisions for development will continue to be best undertaken through a cost benefit framework as provided by the RIT-T. However the RIT-T may need to be strengthened to provide for greater recognition to option value and to require modelling that better reflects actual investment and operating dynamics.

Market submissions

A review of the submission on the ISP shows that the concept of AEMO undertaking an ISP is supported by most industry participants, be it with some cautionary conditions. Most participants also support that new transmission should continue to be subject to the regulatory test.

The reasoning for this majority view is understood to be an acceptance of the increased need for nationally coordinated planning as the NEM transitions to increased renewable generation. There is also an expectation that the strategic outlook / plan will be cognisant of the needs of the market and how it will economically develop. Particular issues noted were:

- The need for transparency in the modelling and importantly high granularity in the results provided;
- Scenarios that cover a wide range of potential and credible market outcomes;
- Incorporation of demand side and distributed networks.

This has the ISP as a resource to assist the market in better appreciating how it may evolve but with decision making as before – generation through the market and regulated transmission through the RIT-T.

Scenario development requires a framework that recognises the market drivers, which may not involve co-optimised gas and electricity assets.

AEMO versus Market Perspectives

While the ISP can provide value to the development of the NEM and this is widely supported, there are also issues and associated risks involved that need to be understood. These relate to the manner the scenarios are developed and the results (or development plans) produced through the least cost methodology being proposed. Here the following are noted:

- While the ISP is a combined transmission / generation optimised plant, in the actual market transmission is regulated and generation is market driven;
- Least-cost development very different than market development based on realistic market behaviour. This may have these scenario plans that are ”not credible”
- The objectives of AEMO (who will develop the scenarios and associated develop plan) and the market may not align. This may potentially have the modelling not accounting for full value to owner/trader of generation and transmission assets - energy cost, capacity, hedging and risk;
- The breadth of scenarios may be limited but excluding potential outcomes not consistent with current policy or policy outcomes.

This means that:

- Consultation with industry will be vital;
- Scenarios need to be fully described;

- Scenarios should to the extent possible be consistent with observed market needs and dynamics;
- All modelling results down to the finest granularity will need to be provided, and any issues noted and explained;
- RIT-T applications should not be bound to be constrained or limited to utilising scenarios developed as part of the ISP.

Part 3 Strategic Transmission Developments

The economic efficiency of the NEM requires that both the competitive and regulatory sides of the market function properly. Particular issues for the competitive side are the reliability settings and confidence that transmission will be developed in accordance with the National Electricity Rules[17] (NER) in response to current and foreshadowed transmission needs.

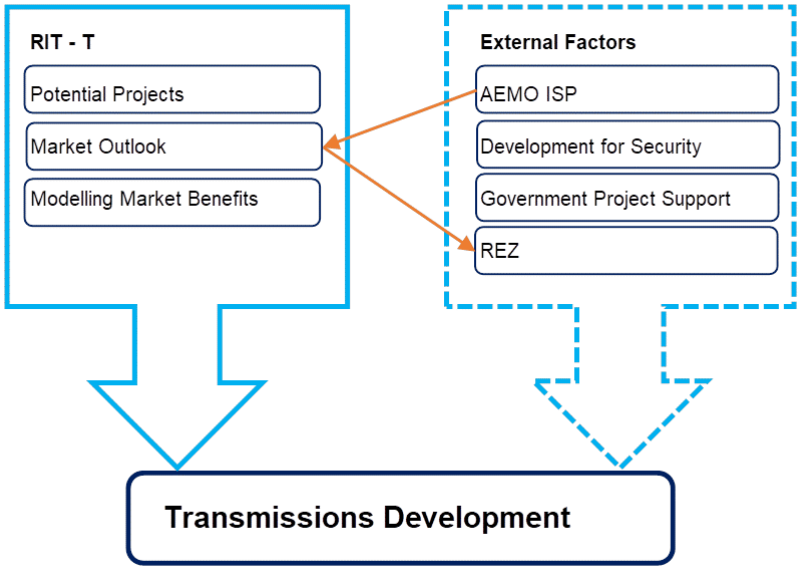
Developments undertaken outside of the established framework (that provides the basis to assess what developments might occur) increases risk to the competitive market and increases the risk of stranded transmission assets.

In recent times there have been suggestions that there are transmission developments needed for "strategic" reasons. These include:

- Interconnection for Power System Security;
- Renewable Energy Zones;
- Government sponsored developments;

A diagrammatic view of the potential relationship between the RIT-T and potential strategic developments external to the RIT-T is shown in Figure 1. This shows the key components of the RIT-T, the ISP as a potential input to the RIT-T, and how these "strategic" developments could be used to bypass the rigor of the RIT-T cost-benefit assessment.

Figure 1 Diagrammatic View of the RIT-T and External Influencing Factors



[17] The transmission planning framework specified by the NERs includes the processes to be followed.

Noting the basis of transmission development articulated in the NERs, issues with these development types are considered in turn below.

Interconnection for Power System Security

As described above, the proper costing and benefit assessment of the options considered in a RIT-T application require that all technical and regulatory matters are addressed. Not to do so would distort the comparative economics of the options being considered.

It is recognised that in the past there has been sufficient inertia (and other technical matters such a system strength[18]) to provide a level of margin to the minimum amount required. This has meant that a precise quantification of security issues has not been required in modelling undertaken in RIT-T applications.

As additional solar and wind generation enters this may now be required.

However to undertake the development of interconnection for reasons of improved security, without a robust comparison to other options, carries the following risks:

- That the security envelope has not been properly articulated in the options considered (otherwise no specific reason for interconnection). If security is included in the options (through power system limits and requirements) then security value will naturally be included in the normal RIT-T process.
- Requiring additional transmission for security that cannot be properly specified will have the high risk that more will be provided than is needed (i.e. over expenditure).

The resulting outcome of the above would be similar to what has occurred in the past. This is developments undertaken that are not needed resulting in additional and unnecessary cost to consumers.

Renewable Energy Zones

AEMO have stated that the ISP will include "what makes a successful renewable energy zone (REZ) and, if REZs are identified, how to develop them."

In the AEMO ISP Consultation paper[19], Table 4 presents a list of potential barriers raised by stakeholders to REZ development. This list is as follows:

- Climate and energy policy uncertainty;
- Obtaining project approvals in the face of uncertainty;
- Social license and community acceptance;
- Lead times to plan and build;
- Communicating the value of REZs;
- Impact of Distributed Energy Resources (DER) uptake;
- Asset stranding risk;
- Risk sharing in a forward looking framework;
- Cost allocation between regions;
- State versus national priorities.

[18] System strength refers to the level of current that flows during a fault condition. Fault current needs to be of a certain level to enable power system protection to operate. This is important to system security.

[19] Integrated System Plan Consultation, December 17, For the National Electricity Market

This illustrates that there are substantial and perceived risks associated with assigning exceptional value beyond net economic benefit: of 'strategic' projects such as "Renewable energy zones".

A properly applied RIT-T supported by information from an ISP of potential market outcomes, can incorporate a consideration of REZ on a level playing field with other developments.

Similarities to Scale Efficient Network Extensions

We make the observation that REZs are similar to Scale Efficient Network Extensions (SENE) that were proposed in 2011.

In the AEMC Rule Determination on SENE[20] in 2011 the AEMC stated the following (executive Summary):

> In making its final determination, the Commission considered what mechanisms are likely to contribute to minimising expected total system costs over time. The Commission considers that this will occur where an appropriate trade-off is made between: (1) building spare capacity in anticipation of future generation so as to capture the scale economies associated with transmission investment; and (2) the risk that the expected additional generation investment does not occur, thereby stranding that spare capacity. This decision is best made by market participants or investors with the appropriate information, ability and incentive to manage the asset stranding risk

Section 5.1 of that report noted the views of stakeholders. This was that approximately half the stakeholders who responded to the Options Paper considered that a case has not been made for change or that existing frameworks are sufficient to promote efficient outcomes. In particular, these stakeholders considered:

- There are no barriers to developing cost sharing arrangements that would allow generators to coordinate their connections, facilitated if necessary by a Network Service Provider;
- The RIT-T and the National Transmission Planner (NTP) are new initiatives that could support efficient connections in the absence of a new framework and should be given the opportunity to work; and
- Modelling undertaken by ROAM Consulting suggests that "...highly concentrated wind development with substantial transmission development...does not appear to be the lowest cost way of meeting the RET."

AGL concluded in their submission on SENE to the AEMC[21]

> AGL considers that, given the dynamic nature of the energy market, the competitive market will develop solutions to capture the economies of scale available in connection and extension assets if the savings are significant. AGL sees no reason why the competitive market will not drive efficient outcomes. The distortionary impacts of a regulated approach with the potential for asset stranding must be avoided. As such, AGL strongly supports the AEMC's Draft Rule with its emphasis on information provision.

Government Sponsored Development

The final matter addressed is government influence through policy or financially supporting a particular transmission or generation project. A recent example of this is the South Australian government's development of a 200 MW gas plant.

[20] AEMC, RULE DETERMINATION, National Electricity Amendment (Scale Efficient Network Extensions) Rule 2011, 30 June 2011

21 file:///C:/Andrew%20-%202/5%20MJA%20Clients%20Active%206/Delta/1%20RIT%20Submission%20Mar18/2%20Papers/Scale%20efficient%20extensions/AGL-Submission-to-AEMC-Scale-Efficient-Network-Extensions-FINAL.pdf

The risk associated with this sort of "market intervention" are well known and demonstrated.

These are such that developments can either:

- Displace what the market may have developed;
- Commit the development path of the market to one that is less optimal than normal market processes would have determined.

Conclusions – Strategic Transmission Developments

Transmission developments that bypass the economic assessment of the RIT-T have two associated and significant risks:

- Increased risk to the competitive market through increased uncertainty;
- Increased risk of transmission asset stranding through assumptions of economic value that were not properly tested.