Review of Options for Actioning the Integrated System Plan

Monash University Submission

19th October 2018

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Submission

Key points of the Submission:

- Transmission projects come in synergistic groups and cannot be treated separately
- A new process is needed for network development and regulation to augment the current incremental RIT-T process for implementation of the ISP:
    - Group 1 projects should be expedited through the RIT-T process for regulatory approval to proceed in conjunction with non-network options that enable optimal timing to be refined.
    - Group 2 and 3 projects are subject to a great deal more market uncertainty because they come later and support a higher level of decarbonisation. A different approach is needed to quantify their value in a form which could be regarded as a "conditional" or "interim" RIT-T process.
    - A full analysis of the value drivers for these Group is proposed to identify two or three critical market indices that support their viability. The supporting market conditions can be formulated as a constraint equation or a regression tree that shows the combinations of these market indices which support the value of the project.
- A new ISP and RIT-T process would build up a library of project studies that would inform the boundary of market indices where these ISP projects and Groups of projects would have sustained market value.
- Given the importance of national coordination of the network planning activities and that no one TNSP can fully appreciate the benefits and consequences of large scale projects in the NEM, we consider that AEMO needs to take the lead in formulating the choice and evaluation of ISP options.
- TNSPs would support AEMO by designing and scoping the network and main non-network options so that local circumstances and opportunities are considered in the iteration between the ISP and project planning and development.
- The Scale Efficient Network Extension framework developed by AEMC did not produce any investment in part because the risk sharing expected of generators in remote regions was impractical. It is therefore unavoidable that the risks of transmission development to provide reliable supply and lower cost energy and emission abatement will need to be borne by the community as a whole either through electricity tariffs or in some special cases through government sponsorship. Accordingly, the role of the AER in assessing and approving RIT-T submissions through the ISP may need to be strengthened.

The main contributions:

- There needs to be created a "conditional RIT-T" process that approves the ISP project Groups as the basis for further network approvals for the normal incremental RIT-T process.
- The conditional approval is defined within a constraint set for NEM indices that relate to the key uncertainties for market growth, technology costs and the deployment of distributed resources.
- A proposed method has been described that can be used to interpret the ISP studies to gain insight on the scope of market evolution that would require the project Groups to proceed and for which they would remain robust contributors to economic development of the electricity market.

The implementation of the Integrated System Plan (ISP) developed by AEMO requires a modified approach to network development and regulation. The current review by Australian Energy Market Commission (AEMC) assumes the current open access and revenue regulation market rules continue. The AEMC is seeking comment on the design of a process to implement the ISP and has set out five options for progressing the Regulatory Investment Test for Transmission (RIT-T) and four options for the development of transmission extensions to renewable energy zones (REZ).

The Monash University team developing new transmission and generation planning tools and methods is located within the Faculty of Information Technology at the Caulfield Campus and is active through the Monash Energy Materials and Systems Institute (MEMSI) and the Grid Innovation Hub (GIH). Members of this team have contributed to the preparation and review of this submission including the author Dr Ross Gawler, Senior Research Fellow, Dr Ariel Liebman, Deputy Director of MEMSI and Chloe Munro, Professorial Fellow.

The options for implementing the ISP provide a range of involvement between Australian Energy Market Operator (AEMO) and the transmission network service providers (TNSPs). We consider than these options are feasible and will need to be supported by appropriate planning and consultation resources to be effective. We support the AEMC's analysis of these options and understand that further work will be needed to refine allocation of responsibilities at each phase of the planning analysis and approval. Given the importance of national coordination of the planning activities and that no one TNSP can fully appreciate the benefits and consequences of large scale projects in the National Electricity Market (NEM), we consider that AEMO needs to take the lead in formulating the choice and evaluation of ISP options. However, the TNSPs must also be heavily involved in designing and scoping the network and main non-network options so that the local circumstances and opportunities are considered.

Transmission projects for market transformation or market expansion (as in previous eras) come in synergistic groups and cannot be effectively treated separately without reference to the broader development strategy. Therefore the current incremental RIT-T process is not well suited to evaluation of market transformation strategies or related "strategic investments" based on committed generation developments. A new process is needed where the ISP Project Groups (Groups) need to go on to some form of conditional approval status with the Australian Energy Regulator (AER) so that they can be incorporated into individual project RIT-Ts as the basis for assessment of future benefits. This is particularly important for projects that are a component of the ISP Groups 2 and 3 that may be spaced out over time.

What is missing from the AEMC Options Paper is a specific solution to the potential duplication of effort between the formulation of the ISP and the RIT-T regulatory process. In essence, the ISP is a cost-benefit analysis of the form applied for the RIT-T. For the Group 1 projects which are deemed urgent and of immediate value, the scope of uncertainties threatening their market value is minimal, and therefore the cost-benefit analysis conducted for the ISP should go straight through to the RIT-T process for regulatory approval. There might be some opportunity for refinement of design for local considerations undertaken by the TNSP which causes cost and timing variations, but the tools developed by AEMO to assess market value should be available to the TNSP to complete such refinement without having to start again. The studies might include some additional non-network solutions which may be sought to optimise the timing of the Group 1 projects, but their long-term viability should have been settled by the ISP analysis.

The Group 2 and 3 phases of the ISP are subject to a great deal more market uncertainty because they come later and support a higher level of decarbonisation. We therefore consider that a different approach is needed to quantify their value in a form which could be regarded as a "conditional" or "interim" RIT-T process that provides:

1. A confirmation of economic value of each synergistic Group for the ISP planning scenarios, which is now complete
2. An analysis of the combination of market indicators for which the Groups are economic, and by implication the deviations from the ISP planning scenarios which would require a revision to the assessment of value
3. An approval by the AER that these qualifying Project Groups may be used to support the evaluation of individual projects both within and outside the Groups when they come up for the final RIT-T analysis
4. A basis for periodically reviewing the robustness of the ISP Groups without repeating the ISP analysis by testing the new forecast market conditions against the boundaries for which the Group is no longer viable. This boundary analysis should be part of the interpretation of the ISP studies as discussed below.

This approach may require some further analysis of the ISP studies to analyse the conditions under which certain Groups contribute to reducing system total costs. One possible method would be to:

1. Take the annual solutions separately from each of the four scenarios and sensitivity studies,
2. Identify which Groups and individual projects are installed in each year for each scenario based on the optimisation,
3. Extract the scenario parameters for each year for each of the key uncertainties such as
    a. Native NEM or regional energy demand
    b. Aggregate carbon emission abatement target or aggregate carbon emissions in the electricity sector
    c. Distributed solar energy resources by NEM and by region by capacity or energy
    d. Electric vehicle energy demand
    e. Energy efficiency improvement
    f. Demand side participation in peak reduction
    g. Gas cost for power generation
    h. Technology capital costs for major technologies included:
        i. Batteries
        ii. Pumped hydro
        iii. Gas turbines
        iv. Transmission lines
        v. Wind power
        vi. Utility scale solar
4. Use regression analysis and/or regression trees to identify the conditions under which the Groups become viable based on the annual solutions of optimal expansion
5. Formulate a boundary condition or combination of the above uncertainties under which each Group is not required because it does not appear in the scenarios.

Typically we would expect that each Group depends primarily on two or three critical market indices that support their viability. This can be formulated as a constraint equation or a regression tree that shows the combinations of these variables which support the value of the project.

It may be so that there is not enough independence of the uncertain variables in the ISP work to date to clearly separate out the influential variables, in which case some additional simulations may be needed.

With this information, alternative long-term scenarios can be formulated and the optimal timing of the ISP Groups could be revised based on the equations from item (5.) above. It would be possible in future to know when the ISP Groups need to be revised due to changes in the key uncertainties, and then commit to revise the ISP. Of course, if there are substantial changes in other factors not considered above, such as a new technology option appearing at unexpected lower costs, then the ISP may need revision on that basis alone. Such work might be done as part of subsequent RIT-T analysis which would then inform the next ISP. Essentially ISP and RIT-T analysis should enable building up a library of project studies that can help inform the boundaries of project value for the individual projects and their associated Groups.

We would expect the following process as shown in Table 1 on the next page for conditional and final RIT-T analysis. The ISP beyond the initial Group 1 focuses on the broader uncertainties and assessing the range of viability and perhaps net economic value against the alternatives, not just the optimum plan. The RIT-T can then focus on the central scenarios with variation to the key uncertainties to refine the cost-benefit analysis for the expected range of conditions, and use the ISP analysis to assess the broader stranding risk.

It may be beneficial to have a standard set of future scenarios that are approved through a consultative process of stakeholders and which form the basis for assessing the extent to which specific projects will provide net benefits, assessed as a probability. There should be a minimum standard to probability of net benefits, as well as an expected net benefit criterion applied to protect consumer interests.

With advanced automated analysis tools it may be feasible to take an element out of an optimal plan, rerun and then quantify its net economic benefit relative to the remaining options. This would enable value functions to be created for project value versus changes in the key uncertainties.

Monash University is researching such methods to help formulate and interpret system plan studies so that they can better inform stakeholders about the causal factors and their relative influence on transmission network commitments. It is expected that the basic viability of any particular Group may be determined by two or three critical uncertainties and it would be feasible to present such information in a visible form to help stakeholders appreciate the strength of the case for particular schemes.

Table 1 Conditional RIT-T for Strategic Project Groups

	ISP Conditional RIT-T	Project Final RIT-T
Environmental Planning to ensure feasibility	Preliminary with the support of TNSPs and local and regional communities and stakeholders	Detailed following further consultation with stakeholders
Physical Design and Location	Preliminary without necessarily finalising line routes or actual specific station locations	Detailed following detailed consultation with local communities and affected stakeholders
Generator commitment	Primarily based on physical generation resources irrespective of commitment to particular projects and capacity.	Primarily based upon committed or well advanced generation projects that are materially dependent on the network upgrade for feasibility.
Cost Analysis	Planning level based on standard element costs and recent project development experience adjusted by long-term cost trends.	Cost estimated refined by consultation with contractors and equipment vendors
Scenario Analysis	Broadly defined with focus on identifying the sets of market conditions that ensure viability, as the basis for robustness. Scenarios not limited solely to current government policies, as governments can change. Opposition policies should be considered to allow for change of government and their priorities.	Focus on central scenario and confirm scope of viability based on ISP framework. Probability of variation from the central scenario used to confirm probability of stranding against the current assessment of uncertainty. ISP analysis used to assess the sphere where project and its associated Group may not be viable.
Market Analysis	Models will have reduced granularity so that they can feasibly quantify the impacts for gas supply and transmission and distributed energy resources on project selection and viability.	Models will have higher granularity to confirm economic value and its uncertainty and to take into account time dependent constraints and local conditions affecting power flow and energy dispatch and network constraints.
Economic Value	Confirm net value for defined long-term scenarios as well as defining a space where any combination of market uncertainties justifies the Group of projects. Additional sensitivity studies may be performed after the completion of the ISP to assess net economic value of each project Group by removing them and re-optimising the annual solution. This would inform future RIT-Ts about the strength of the economic value for changes in uncertainties.	Assess net economic value for the central scenario with detailed analysis, using the ISP as the context. The Group 2 and 3 projects form the context for valuation of the Group 1 projects. Probability distribution of value derived from the uncertainties of market variables and the net economic value information derived from the ISP.

The key contributions here are that:

- There needs to be created a “conditional RIT-T” process that approves the ISP project Groups as the basis for further network approvals for the normal RIT-T process
- The conditional approval is defined within a constraint set for NEM indices that relate to the key uncertainties for market growth, technology costs and the deployment of distributed resources.

- A possible method has been described that can be used to interpret the ISP studies to gain insight on the scope of market evolution that would require the project Groups to proceed and for which they would remain robust contributors to economic development of the electricity market.

Contents

Abbreviations

AEMC	Australian Energy Market Commission which makes rules to govern gas and electricity markets
AEMO	Australian Energy Market Operator which operates the two large interconnected electricity markets in Australia
AER	Australian Energy Regulator
HVAC	High Voltage Alternating Current (electric power technology)
HVDC	High Voltage Direct Current (electric power technology)
ISP	Integrated System Plan
NEM	National Electricity Market
RIT-T	Regulatory Investment Test for Transmission
SENE	Scale Efficient Network Extension
TNSP	Transmission network service provider
TUoS	Transmission use of system (network service charges)
WACC	Weighted average cost of capital for investment (applied to transmission)

Response to Questions

The following table was developed from the summary of options for ISP implementation.

Table 2 Five Options

Plan	Decide Transmission Investments	Consider ISP-identified investments in planning reports and regulatory proposals	Conduct RIT-Ts on ISP identified investment needs	Consider local conditions in project implementation	Decide Functional Specification of Assets	Project Imple-mentation
1	TNSP	TNSP	TNSP	TNSP	TNSP	TNSP
2	TNSP	AEMO	TNSP	TNSP	TNSP	TNSP
3	AEMO	AEMO	AEMO	TNSP	TNSP	TNSP
4	AEMO	AEMO	AEMO	AEMO	TNSP	TNSP
5	AEMO	AEMO	AEMO	AEMO	AEMO	TNSP

Note: assumes that existing open access arrangements are retained.

The following table is copied from Table 4.2 of the Options Paper to assist the review of the following responses.

Table 3 Options to strengthen the link between the ISP transmission investment decisions

Table 4.2: Options to strengthen the link between the ISP transmission investment decisions

	STAGE IN INVESTMENT PROCESS	RESPONSIBILITY UNDER EACH OPTION				
		1. TNSPs must consider ISP-identified needs in their TAPRs	**2. TNSPs must conduct RIT-T on ISP-identified needs and options**	**3: AEMO determines "best" option**	**4: AEMO directs TNSP to proceed with the "best" option**	**5: AEMO directs TNSP to implement the investment**
1	**Identify need**	AEMO	AEMO	AEMO	AEMO	AEMO
2	**Identify credible options that address the need**	TNSP	AEMO	AEMO	AEMO	AEMO
3	**Assess costs and benefits of credible options**	TNSP	TNSP	AEMO	AEMO	AEMO
4	**Determine "best" option**	TNSP	TNSP	AEMO	AEMO	AEMO
5	**Make decision to implement "best" option**	TNSP	TNSP	TNSP	AEMO directs TNSP to do so	AEMO
6	**Undertake detailed costing and planning for the investment**	TNSP	TNSP	TNSP	TNSP	AEMO
7	**Implement the investment**	TNSP	TNSP	TNSP	TNSP	AEMO directs TNSP to do so
TNSP control over investment		Higher degree of control				Lower degree of control

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Chapter 4 - Making the ISP an actionable strategic plan

Question 1: Questions arising from the ISP

The paper considers a number of questions about the role and regulatory implications of the ISP, including the links between the ISP and transmission investment decisions.
A) Are there any questions about the role and regulatory implications of the ISP that are not set out in the options paper?

- The ISP provides a strategic plan that identified prospectively beneficial investments over a limited range of uncertainty. It thereby provides a context for developing RIT-T proposals that are consistent with that plan and therefore more likely to gain industry and consumer acceptance.
- The underlying risk of the Group 1 ISP investments has not been quantified as yet, other than general statements that these options are supportive of the nominated development scenarios and sensitivities provided for the ISP.
- The benefits of the Group 1 projects will depend on the evolution of the market scenarios, changes in Government policies and global trends in emission abatement, economic growth and technological development. Will they be evaluated as stand-alone elements or must it be assumed that Group 2 and Group 3 projects will follow with efficient timing for each scenario evaluated?
- The additional question is:
    - When future RIT-T proposals are presented, will the regulatory framework require that the ISP proposals are the subsequent developments, retimed as necessary, to meet the updated outlook?

B) Is our approach to making the ISP actionable (i.e. strengthening the link between the ISP and investment decisions) appropriate?

- It represents the first step in working out how to reformulate the RIT-T process to speed up analysis and reduce duplication.
- AEMO will have a key role but need not do everything.
- The key to success will be to coordinate AEMO and TNSP activities with standardised and efficient evaluation tools and a progressive process of quantifying value and investment risk.

Question 2: Interaction between the ISP and government policies

A) *The ISP will necessarily have to take into account government environmental and industry policies in modelling ISP scenarios. Do stakeholders consider it would be helpful for the COAG Energy Council to provide formal advice to AEMO as to what government policies or scenarios should be modelled in the ISP?*

- COAG should certainly advise AEMO as to the relevant government policies for energy and environmental management are in effect and to be developed so that the impacts on investment in the electricity market can be assessed as this directly affects total costs and the means to minimise costs
- However the government should not limit the scope of scenario formulation because there is no sign of bipartisan approach to these matters and therefore policy changes are likely over the transmission investment horizon. The range of decarbonisation over the period to 2050 and the customer contribution to distributed energy generation, energy storage and adoption of electric transportation are three key areas of great uncertainty, among others that should not be constrained by current government policy.
- Exposing the ISP to a broad range of plausible scenario variation is essential to
    - understanding the conditions under which particular elements will no longer be viable,
    - understanding the potential government policy changes that would make them essential or redundant, and

- Identifying a method for developing options that have economic value minimally affected by changes in assumptions when taking into account the known uncertainties. That is, a robust-optimisation to develop least-regret based plans.

B) *Are there other ways in which government policies that impact on the NEM could be incorporated as modelled scenarios in the ISP?*

- Most definitely:
  - Aggregate emission abatement in the electricity sector is a key constraint and it has been included in the first ISP, together with a higher rate of emission abatement, as well as the Victorian and Queensland targets
  - That changes of government in Victoria and Queensland could result in the state-based schemes to be abandoned also needs to be considered as part of quantifying the factors that could undermine the value of the Group 1 investments
  - Given that Group 1 investments would normally proceed as soon as possible, the ISP ought to identify if the project economic viability could be undermined by a change in government energy and environmental policies. This would serve to inform the government and the electorate of the importance and costs and benefits associated with their policies.
  - The analysis of the results of the ISP analysis should identify the critical factors which support or could undermine each key scheme, including government policies.
  - The ISP analysis should determine the degree to which government policies affect Project Group timing rather than just the final manifestation of the considered options. In the cases where change in policy mostly results in delay (or advancement) of projects there should be a stronger case to invest and a mechanism to share the value timing risk.

Question 3: "Strategic, national" investments and regional investments

A) *It is proposed that the ISP only focusses on "strategic, national" investments. Do stakeholders consider this is appropriate?*

- The arguments for the level of detail in the ISP are sound as it would not be practical with current analytical methods to consider all of the intra-regional implications of major upgrades of interconnectors and formation of new interconnectors. This can be considered through further iteration of the studies as intra-regional implications become apparent and through subsequent RIT-T analysis on component projects for each Group.
- A much higher level of automation and systems integration of the analytical process would be required to fully integrate inter- and intra-regional transmission developments.
- Monash University considers that research and software development is needed to bring transmission planning tools up to speed with foreseeable requirements, especially in view of the considerable uncertainty in future market conditions. The current approach may produce a robust solution but it does not inform stakeholders of the conditions under which proposals would need to be accelerated or abandoned. The modelling work should seek to identify the boundaries within or below where the key uncertainties drive value of the project Groups. This would enable subsequent assessment of when the ISP needs revision.
- AEMO will need to support TNSPs in their role of assessing the intra-regional implications of ISP proposals so that future iterations of the ISP can take these effects into account. This would involve formulating the changes in the intra-regional constraint equations arising from the intra-regional assessments. This would help to refine the analysis and ensure that consequential costs and benefits can be included in future reviews.

B) *If so, how could this threshold be defined, or what criteria could be used to define it?*

- The ISP needs to consider impacts for;
  - The existing interconnectors
  - New interconnectors (eg SA-NSW, Marinus Link)
  - The highest voltage meshed network back-bone in each region of the NEM (500 kV and 330kV in Victoria and NSW, 500 kV and 275 kV in Queensland, 275 kV in South Australia, 220 kV in Tasmania)
  - Extensions to new renewable energy zones (REZ) (eg Eyre Peninsula, western areas of NSW and Queensland) to capture additional renewable energy
- Ultimately the state highest voltage networks may need to be upgraded to capture the resources in the REZ and this cannot be optimised separately from interconnection evaluation.
- Major build-outs of pump-hydro or other large scale storage should be considered as options as these can change both inter- and intra-regional transmission investment quite dramatically.

Question 4: Risk allocation

A) *The paper canvasses a number of options for making the ISP actionable. How may the existing risk allocation for consumers, TNSPs and generators change under the proposed options?*

- It is plausible that only AEMO has the capability to identify the best option, and that TNSPs are best placed to implement the plan and adapt to local conditions. This would seem to produce the lowest risks to consumers.
- That TNSPs face lower financial risks if AEMO dominates the process would seem to depend on the AER's involvement in the approval process and asset base recognition. If TNSPs are held less accountable by AER because AEMO made the decision, then the risks of overinvestment may be transferred to customers. The risks of under-investment are primarily with customers who experience power supply disruption. To a lesser extent, under-investment leads to lower returns for TNSPs, but such risks are asymmetric to the disadvantage of customers.
- There is an important role for the AER to assess the risks of long-term investments where the capacity provided is progressively used up over time as generation is transferred from thermal to renewable energy resources. Thus a key function of the ISP is not just to define an efficient scheme with appropriate sequencing and staging, but also to identify the conditions under which generators, consumers and TNSPs would not receive value for their contribution.

B) What other regulatory changes may be required in order to mitigate against changes in the risk allocation?

- The Scale Efficient Network Extension framework developed by AEMC did not produce any investment in part because the risk sharing expected of generators in remote regions was impractical. It is therefore unavoidable that the risks of transmission development to provide reliable supply and lower cost energy and emission abatement will need to be borne by the community as a whole either through electricity tariffs or in some special cases through government sponsorship. Accordingly, the role of the AER in assessing and approving RIT-T submissions through the ISP may need to be strengthened.
- It may also be beneficial to have a standard set of future scenarios that are approved through a consultative process of stakeholders and which form the basis for assessing the extent to which specific projects will provide net benefits, assessed as a probability. There should be a minimum standard to probability of net benefits, as well as an expected net benefit criterion applied to protect consumer interests.

Question 5: Level of consultation required under each of the options for how the ISP could be made actionable

A) What do stakeholders think about the level of consultation that would be required under each of the options considered for how to make the ISP an actionable strategic plan?

- A high level of consultation is essential for the credibility of the decisions made for all options. It doesn't matter whether TNSPs or AEMO drives the process, as long as both are able to contribute to the process and both facilitate the involvement of market participants and consumer advocates.

B) Should there be more consultation for options that fall to the right-hand side of the table?

- No. it shouldn't make any difference to scope of consultation. The environmental planning and economic evaluation should involve all who are interested or can contribute relevant insights. The amount and process of consultation should not be determined by which organisation is running the process.

Questions 6-10. The Commission has articulated five possible options for how the ISP could be made actionable, and incorporated into the existing regulatory framework. For each option, the Commission asks:

A) *What are stakeholder views on each of the options proposed for how to make the ISP an actionable strategic plan?*

1) Option 1 assessment is agreed
2) Option 2: AEMO could identify conceptual non-network solutions such as distributed embedded generation and demand side management where they would potentially enable deferment or avoidance of the ISP project. If the ISP scenarios include regional contributions from distributed resources, then that component of non-network solutions is already included. What might be missing is the detail of local resources where there are intra-regional impacts. The TNSPs may be able to provide sufficient information to confirm project viability. However, refinement of project timing would require specific commercial proposals for non-network solutions to finalise the planning process at the final RIT-T stage.
3) Option 3 description and assessment is agreed. This option provides a satisfactory mix of national and local focus.
4) Option 4 description and general assessment is agreed. However, it does put a great deal of responsibility on AEMO and AER and these organisations would have to scale up their planning and development resources for their respective roles. There may be a risk of reduced local influence on the assessment process and greater risk of disputes between AEMO and TNSPs depending on the strength of the consultation processes.
5) Option 5 description and assessment is agreed.

B) *Would the effective delivery of the different options have an impact on the speed with which "strategic, national" investments are made?*

1) Option 1 would require changes to the RIT-T process to ensure that the ISP scenarios and data are used as the basis for RIT-T analysis to assist the integration of project development and support stakeholder's understanding of the process and credibility of the results.
2) Option 2 would speed up the process as AEMO would already have the tools at hand to identify the credible options which would have been developed at the ISP stage.
3) Option 3 would speed up the process by reducing the impact of jurisdictional boundaries on the assessment process, although it remains possible that efficient projects are not taken up by risk averse TNSPs.

4) Option 4: If the decision process was not credible to the TNSP, there may be disputes and delays in implementation with this option.
5) Option 5: If development is tendered to willing TNSPs on a competitive basis, then disputes may be reduced as compared to Option 4. However, if the tendered cost varies substantially from the estimated cost, then the value proposition may be invalidated and other options may need to be reconsidered.

C) *Are there any regulatory or other implications that are not raised in the discussion of these options?*

1) Option 1: There may need to be a requirement that RIT-T analysis of projects assumes that the Group 2 and 3 schemes provide the context for subsequent developments, if only to help inform future reviews of the ISP and to refine the Group 2 and 3 proposals before they are taken through the RIT-T process.
2) Option 2: No
3) Option3: The process may make the ISP work take a lot longer than the current approach due to the amount of extra detail that is required. There may be some advantage in keeping the ISP fairly generic and simplified, and leaving the TNSPs to do the detailed work and feedback that information back to AEMO for subsequent ISP reviews, as per Option (2)
4) Option 4: The efficiency and effectiveness of the consultation by AEMO would be critical to avoid post-decision disputes with TNSPs.
5) Option 5: Where the net benefit of network options is small compared to the planning cost estimates, then the assessment process may need to be reconsidered or the timing of projects re-optimised. This is more relevant in the current environment of many more sources of uncertainty than was considered in previous eras of network development.

Question 11: Other options and considerations

A) *Are there other options to strengthen the link between the ISP and individual TNSP investments that are not raised here?*

- None identified

B) *Are there any other matters that should be taken into account when considering options to strengthen the link between the ISP and TNSPs' individual investments?*

- How uncertainty in the choice and timing of ISP options may change during the assessment process and whether institutional rigidity could affect the progress toward finding an optimal solution and managing the uncertainties leading up to financial close for transmission or non-network solutions. This will require strong working relationships between AER, AEMO and TNSPs for these strategic investments which can have long-term benefits but where firm net economic benefit may be small compared to the up-front cost (i.e. internal rate of return very close to WACC).
- Where projects may have a high level of optionality value (such as the network development associated with Snowy 2.0), means to portray and confirm that value will need to be developed and communicated to stakeholders to ensure credibility of these processes irrespective of which process is adopted.
- The linkages between transmission development and the associated commitment to REZs has not been addressed in this review. If an ISP project is intended to open up REZs, how is that commitment going to be tied to generator commitments and how is that risk to consumers going to be managed under these options? Will a minimum commitment to associated generation projects be required before network commitment? How will AEMO or the TNSP direct a decision if the lead time for network development is much longer than the lead time for associated generation development?
- There may be a need to assign rights to prospective generator developments that are required to make a network investment viable. So that some form of financial benefit is assigned to the generators if they

proceed by a certain time after the network capacity is provided. This would mitigate the risk to consumers of a stranded network investment, help manage the risk for the prospective generator developments, and provided incentives for low cost generation to respond to the new network capacity for new REZs.

- On the other hand, whilst selling transmission rights to generators for new capacity might provide a potential revenue for the transmission project, it may not help the new generation to proceed if they are burdened with having to fund those rights well before production begins.

Chapter 5 - the regulatory investment test for transmission

Question 12: RIT-T benefits

A) *Are there any additional benefit categories that should be considered in the RIT-T?*

- No

B) Why have no network businesses sought approval from the AER for additional benefits to be considered in RIT-T assessments as allowed for under the current NER?

- Not known

Question 13: Potential concerns with the RIT-T process

A) *What are stakeholder views on current limitations with the RIT-T process?*

- The current RIT-T framework is incremental and assumes that we are adding to an existing system without reviewing the system paradigm of HVAC technology with the current maximum network system voltages supported by HVDC links between regions. Therefore the RIT-T cannot readily accommodate the formulation and approval of a long-term strategy in its current form.
- The ISP was a way of meeting the need for a broader and longer-term perspective. Long term questions cannot be readily established by this approach - such as for:
  - Maximum system voltage (330 kV, 500 kV, 750 kV, 1100 kV etc) for a region cannot be resolved on a project by project basis because most of the benefits of such a decision depend on other subsequent decisions. Doing so on the basis of wholesale demand growth is no longer practical.
  - Acquisition of new easements for future network elements in potentially congested areas. At the moment, an easement would not be approved until the associated project is approved which may be too late for the least cost result.
  - Location of future terminal stations for new cities and regional development depends on benefits that may be speculative.
- These matters require the valuation of a strategic plan much like the ISP but also require an understanding of when the initially approved plans are no longer suitable for implementation of their component stages and projects, and a new strategic plan is needed.
- The current RIT-T process is workable as long as there is a whole of system or regional system plan for which the justification of particular elements such as new easements and stations is clear and consistent with that plan.
- One possible solution may be to create the concept of an “conditional scheme approval” for these strategic plans which reveal the following elements:
  - The economic value of the scheme as a whole (for example Riverlink) as a function of the key uncertainties of DER, economic growth, energy efficiency, fuel and capital technology costs so that the space of economic validity is indicated. This is different from comparison against a set of credible scenarios; it looks wider than just three or four limited scenarios
  - The projected optimal timing for the key stages of a scheme as a function of the top two or three main value drivers. These may be system wide parameters such as wholesale energy or regional peak demand, or may be dependent on regional power station capacity such as for new solar and wind power stations in REZs.
  - Some indicative market conditions under which the scheme may no longer be viable, such as emission abatement remains below a defined level, or distributed energy provides more than a

defined proportion of total demand. Refer Table 1 above which shows differences between the ISP analysis and the final project RIT-T analysis.

- Providing the strategic plan's required conditions remain consistent with future scenarios, the RIT-T for particular projects can proceed using the strategic plan as the basis for long-term network development and its economic assessment. New easements could be valued against the approved strategic plan and AER could approve their acquisition when their option value exceeds their acquisition cost.
- By this means there is a five stage process:
  - Identify long term needs (such as for decarbonisation)
  - Develop a preferred system-wide scheme based on a range of future uncertainty within which credible scenarios may be formulated
  - Approve the system-wide scheme through a conditional RIT-T which also quantifies its scope of validity
  - Approve project RIT-Ts within the context of the system-wide scheme, updated as necessary for changed conditions (e.g. change of timing and sequencing of developments)
  - Periodically review the system-wide scheme when the future uncertainty moves outside the previously defined field of validity or the previous underlying assumptions about technology and costs are no longer applicable.

B) *Setting aside the ISP and how to make it more "actionable," what other issues warrant attention when considering the objective of the RIT-T?*

- There may need to be some criteria about minimum commitment of related generation capacity within a region to ensure that the economies of scale can be realised. Whilst small projects may proceed based solely on committed or well advanced generation capacity, larger schemes for major interconnection upgrades may need to carry some risk that their full value may not be achieved in the long-run. AER and AEMC may need to set some parameters to guide investors as to what level of confidence is needed that the internal rate of return of a project will exceed the WACC.

C) *What changes may make the existing RIT-T process "faster"?*

- Having pre-approved the system-wide scheme on a conditional basis as defined above. This would provide an analytical setting for the system wide benefits with the quantitative framework captured in the published system models (using PLEXOS for example).
- The improvement to the RIT-T process of this nature is recommended by ElectraNet as quoted on page 81 of the Options paper.

D) What is the role of a dispute process in the RIT-T? How could spurious disputes be minimised?

- Having the conditional scheme approval process to follow the ISP would initiate planning and environmental approval for the primary scheme elements so that communities and stakeholders have had the opportunity to refine and approve the concepts well before projects need to be initiated. This would help to reduce the lead time to commitment except for the Group 1 projects which may already be overdue.
- Projects tend to be more successful when the local community has an opportunity to participate in the decisions around route, design and environmental treatment. This takes time. It works better when participants do not feel pressured with a sense of urgency or that the decision has already been made and they have no real influence. If implacable opposition is well established at the ISP conditional RIT-T stage, then the scheme may be able to be redesigned to circumvent such limitations well before implementation is required.
- Quantifying the net economic value of an option against its next nearest competitors can also help to support a compelling project with high value and can also encourage proponents to abandon an unpopular marginal project where alternatives are available at only slightly higher total cost. It's useful

not only to declare that a plan is optimal for least cost and reliability requirements, but also to be able to say how much better it is than its alternatives.

Chapter 6 - Renewable Energy Zones

Questions 14-18. The Commission discusses five potential options for developing REZs. For each option, the Commission asks:

A) *Do stakeholders agree with our conclusions for how REZs can occur under current regulatory arrangements?*

- Option1: They can occur under current regulatory arrangements but not easily where the economies of scale would require higher transmission voltages than existing. This is because there is no party that could bear the stranding risk, either a group of competing generators or the incumbent TNSP. This is partly why the Scale Efficient Network Extension Policy has not opened up high value new areas, even though such areas were identified in 2009, such as the Eyre Peninsula.
- Option 1: Incremental and close connections can be made, but there is a risk of too many independent radial connections to the existing grid rather than co-ordinated development of loops and hubs at higher voltages which provide capacity commensurate with the ultimate REZ potential.
- Option2: Agree that this option is impractical under current market frameworks and investment drivers. The value of accessing remote regions is not large enough to cover the risks of generators trying to coordinate their investment activities to share a new network extension. The market remains highly competitive and individual generators cannot normally accept such risks. Generator coordination can occur under current arrangements but it does not happen because the risks are too great to be manageable by individual investors.
- Option 3: Transmission bonds could be a useful mechanism to encourage efficient network extensions. Provision for a higher rate of return to reflect the higher risk profile would be necessary to encourage such investments.
- Option 4: This option could be workable in situations where the energy value is compelling and technology is available to capture the available energy resources at efficient scale. There would need to be some additional margin in the value proposition for consumers to justify the risk pf offering prescribed services model. It is agreed that this may not be universally appropriate for all REZs.
- Clustering: Clustering of generation projects to a transmission extension could occur under current arrangements but has its difficulties in ensuring efficient solutions.

B) *Do stakeholders agree with our assessment of whether potential REZ models are consistent with the options discussed for making the ISP actionable? What other considerations should be taken into account?*

- Option 1: The ISP provides information on the more prospective REZs by implication. It does not show the additional cost of pursuing other REZs as the analytical problem was too great for the allotted time and resources. It is not clear in the ISP what volume of generator connections is needed to make the Group schemes viable.
- Option 2: The ISP can support generator coordination under current arrangements but some form of conditional network development approval is required for the networks to start making investments. Some mechanism to shift costs and risks between customers and generators is needed if a connection assets becomes a shared asset or vice versa in the future after power plant retirements.
- Option 2: Some form of government underwriting of network extensions may also be helpful if the market does not adequately support the decarbonisation target. This would be a way of placing some risks on taxpayers in recognition that the electricity sector will need to take the greatest share of decarbonisation because it is the easiest pathway, as compared to agriculture, and commercial and industrial sectors.
- Option 3: Transmission bonds would provide a mechanism to realise the ISP elements.

- Option 4: This model could deliver the ISP elements but the risk of building excess network capacity throughout the NEM is higher than for the other models. REZs could be evaluated for their estimated economic value and ranked accordingly. Those that meet a higher than average threshold could be considered for prescribed services, especially if other market mechanisms are seen to be failing to deliver the required level of decarbonisation.
- Clustering: It is could be made to work effectively, it could deliver some of the larger investments in the ISP if the economic and financial business proposition is compelling for investors.

Question 19. REZs and access

Do stakeholders agree with our conclusion about the types of REZ models that are feasible under the current transmission access framework?

- It is agreed that access to a zone may have limited value to a generator if other generators could constrain the zone from outside its local reach. For example, if Riverlink proceeds and a large number of generators connect to it, then it may be a regional energy source still not adequately linked to the major city load centres in Melbourne and Sydney. Thus the ISP will need to advise on the connection limits in a zone that are indicated by a particular stage of the ISP Group development.

Chapter 7 - Congestion and access

Question 20: Conclusion on need to consider access issues

Do stakeholders agree with the Commission's conclusion in this Chapter that access and congestion management issues are likely to need to be addressed in the near term, once the role of the ISP has been addressed?

- Efficient transmission development, taking into account the costs of generators and networks would lead to an efficient level of congestion assuming that the level of congestion can be accurately predicted by all investors. If the level of congestion cannot be anticipated, then inefficient decisions may occur. Once the regulatory path from the ISP to the individual project approval has been confirmed, then the quality of decisions may be monitored by competition and regulatory authorities and any deficiencies in the resulting level of congestion addressed.
    - Congestion can be more accurately forecast with more accurate data on the renewable energy resource and the conversion technology, as well as native demand and the behaviour of distributed resources. These factors can best be monitored by AEMO as the system forecaster and operator, and therefore guidance from AEMO on the economic level of investment with respect to network capacity and exposure to congestion is likely to help avoid inefficient congestion.

Chapter 8 - treatment of storage

Question 21: Storage and TUOS

Do stakeholders agree with the way the Commission has framed the issue of whether or not storage should pay transmission use of system charges?

- The framing of the question is appropriate.

Question 22: Storage and TUOS - current arrangements

Do stakeholders have any comments on the Commission's initial views on storage and transmission charges? Are there any other arguments that are not discussed?

- The key issues relating to network reliability and the causality between storage charging and network constraints and investment needs have been identified.
- TUoS charges might discourage storage, but that may then drive relocation of storage to more favourable locations where TUoS charges can be offset by network support services. Furthermore, if the TUoS charges can be made efficient with sufficient granularity and dynamic response to system conditions, then the storage may then operate without incurring significant TUoS charges and network

costs. Such improved TUoS would also stimulate more efficient demand side response to system conditions.

- Essentially, if storage demand operates within transmission constraints and does not contribute to reliability indices, then it should not pay full TUoS charges. Having a separate category of participant would facilitate an efficient TUoS charging regime for storage. There may be some common charges that could be reasonably allocated to storage devices to support their charging operation. These costs would be recovered from energy trading, FCAS and network support services.

Question 23: Storage and TUOS - considering changing existing arrangements

Are there any matters the Commission hasn't discussed that should be addressed if a change to the existing arrangements for transmission charging for storage is considered?

- None identified

Question 24: Storage and TUOS - additional considerations

When considering the approach to the recovery of transmission charges, are there any additional factors worthy of consideration that the Commission has not list

- None identified