EUAA
ENERGY USERS ASSOCIATION OF AUSTRALIA

Response to the National Transmission Planner Issues Paper

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Melbourne Office
Suite 1, Level 2
19-23 Prospect Street
Box Hill VICTORIA 3125
Tel: +61 3 9898 3900

Email: euaa@euaa.com.au
Website: www.euaa.com.au

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GLOSSARY

NTP	National Transmission Planner
NTNDP	National Transmission Network Development Plan
RIT	Regulatory Investment Test
SOO	NEMMCO Statement of Opportunities

EXECUTIVE SUMMARY

This submission introduces a number of key concepts that the EUAA considers can be utilised by the National Transmission Planner (NTP) in the deployment of transmission planning functions.

One of the key concepts explored in this submission that supports the recommendations is the Value Function (VF), a concept endorsed by our expert consultants, MMA.

The VF is a set of mathematical expressions that define the net market value, or the optimal timing for the construction of a new transmission asset. The VF can be defined in terms of load, generation, or any of a number of different factors, and would be constructed from technical and economic analysis to show when the construction of a new asset – or upgrade – could be expected to be economically efficient, or otherwise meet the objectives of the Regulatory Test. Its parameters would represent the sensitivity of value or optimal timing to variations in the forecast supply/demand conditions.

Parameters that could appear in a Value Function might include:

- the capital and operating cost of the proposed asset (higher costs may result in a later optimal timing if the costs of generation or demand side resources do not also change)
- generation capacity (summer or winter)
- generation capital cost, fixed operating cost and short-run marginal cost, including emission cost
- peak demand
- maximum duration of peak demand withdrawal
- peak and off-peak energy consumption (as might affect cyclic loading of existing assets)
- local renewable energy production
- interconnection power flows
- aggregated generation output at specific locations
- reliability of embedded generation
- existence of other transmission projects (binary variable)
- capacity of alternative transmission projects (more useful to include binary options)
- transmission marginal loss factors.

A second concept introduced in this submission is that of the Planning Boundary.

The purpose of the Planning Boundary is to describe the current assessment of assets or network sections that are currently deemed to have NEM implications. The concept of the Planning Boundary is an output of the planning process, not a constraint on that process.

Further details of the Value Function and Planning Boundary concepts and the ways that these concepts may be developed and implemented are included in this submission. The EUAA considers that the development of these methodologies are likely to significantly enhance the value of the NTP's planning function, and for this reason, should be incorporated into the functions of the national transmission planner.

This submission makes a number of suggestions in relation to project assessment and consultation processes that should be incorporated into the functions of the National Transmission Planner. Specifically, this submission also proposes that the NTP adopt a staged scenario / decision-making process for new investment that firstly looks at macro variables that might influence the size, the complexity of assessment, a desktop evaluation of various options, and, ultimately, the risk of stranding or constructing ultimately stranded assets. Assessment of more micro issues – specific reliability and specific market benefits - could be assessed at later stages. This provides a cost effective approach to national planning.

Where large investment options are assessed as having significant reliability benefits but limited market benefits, the introduction of a Request for Information process could be undertaken that provides non-TNSP proponents with information about that investment, and provides them with the opportunity to feed in non-network or embedded generation solutions to the planning process, potentially deferring large-scale investment. The process outlined for this should ensure a more 'level playing field' for such competitive investment alternatives.

Above all, the NTP should have a 'stages planning horizon', stretching out to 30 years or more.

1. The period to 5 years would be expected to correspond to TNSPs' well developed plans plus any items that NTP considers have been overlooked by TNSPs.

2. The period from 5 to 10 years would develop options for transmission lines and their upgrades, and transformers needed to support the whole market economically. Timing of options would be scenario dependent.

3. The period from 10 to 20 years would consider the main transmission plan at a lesser level of detail than the 5 to 10 year period.

4. The period 20 to 30 years would focus on easements and terminal station sites based on a wide range of supply scenarios.

Rather than having the same level of detail out for a specified period of time, each planning consideration would be developed out for as long as it takes to show the longer term trends. The detail would be filled in over time as scenarios drive the planning needs.

This will help ensure a cost effective approach to the detail of planning and also ensure that planning is appropriately long term given the long-lived nature of transmission and the need to plan it over various periods. It will also allow the significant challenges likely to face transmission in future, including long term policies and important structural changes affecting transmission, such as load growth, deployment of lower emissions technologies for generation, decommissioning of existing coal plant and increased use of renewable generation to be factored into transmission planning. EUAA feels that these will be significant challenges for the future of the transmission system and for the NTP. It will be important to recognise them in the approach to national transmission planning.

At the same time, it is also emphasised that short term phenomena, including political pressures with transient or narrow application, should not influence the NTP and its approach. It is critical that it remain ‘above this’ and independent, a point stressed by the Energy Reform Implementation Group (ERIG).

1 INTRODUCTION

The Energy Users' Association of Australia (EUAA) welcomes the opportunity to provide a submission on the Australian Energy Market Commission (AEMC) Issues Paper on the National Transmission Planner (NTP). This paper provides some commentary on the matters raised in the Issues Paper on the National Transmission Planner Review dated 9 November 2007. It does not purport to be a comprehensive response to the Issues Paper. It is supplementary to the EUAA submission on the Scoping Paper.

The EUAA is a non-profit organization focused entirely on energy issues. Members determine the EUAA's policy and direction; and our activities cover both national and state issues. The membership represents a wide spectrum of end users located in all states. Currently, the EUAA has more than 90 members, which are predominantly large business users of energy with activities across all states and many sectors of the economy.

The EUAA's members have a strong interest in ensuring that the development of the national gas and electricity market proceeds in an integrated fashion, and we welcome the move to scope out functions for the National Transmission Planner (NTP). One of the major recommendations to come out of the Energy Reform Implementation Group (ERIG) was the establishment of an independent, Australia-wide institution covering all aspects of energy planning and market operation. We are pleased to see that the process of defining further detail of the scope and function of the independent network planner has now begun through the NTP process. We consider that the principal benefits of the establishment of a National Transmission Planner, over time, will be:

- A better balance in national transmission planning, especially by providing greater focus on national aspects of the NEM transmission system, whilst retaining the worthwhile elements of regional transmission planning;
- increased transparency surrounding the national planning process for stakeholders;
- the facilitation of efficient investment, through the ability to challenge TNSP planning processes, and to provide clearer signals for market investment where this is required;
- a clearer focus on the long-term strategic implications of transmission, generation, load growth and demand-side management investment, and the way that these factors inter-relate; and
- a clearly-defined and holistic focus on the interrelationship of the gas and electricity markets, leading to a better integration of planning, use and development of infrastructure to meet the needs of these markets over time.

Likewise, the EUAA has a strong interest in ensuring that the national electricity and gas markets operate, to the maximum extent possible, as efficient, fully-competitive markets that are not subject to market distortions, and cannot be influenced in anti-competitive ways by players within those markets. We consider that the proposed NTP structure provides an opportunity to ensure that the NTP process also provides regulators with a fresh opportunity to assess the competition aspects of the market for gas and electricity, and to ensure that competition is enhanced, particularly across regions and through interconnecting pipelines and transmission services.

1.1 Value Function Concept

A key concept that supports the recommendations in this submission is the Value Function. The concept was proposed by MMA in their technical advice to the EUAA in relation to the EUAA's submission.

The Value Function is a set of mathematical expressions which define the net market value or the optimal timing of the proposed asset as affected by various constraints or customer needs. The Value Function is intended to show what changes in generation and load would have an impact on the optimal timing of the asset that would minimise system costs or meet a specified transmission performance standard that has been accepted as economically efficient. The Value Function structure and its parameters would be determined from technical and economic studies that show when the asset would be expected to achieve the objectives of the Regulatory Investment Test for a given supply/demand scenario. Its parameters would represent the sensitivity of value or optimal timing to variations in the forecast supply/demand conditions. Parameters that could appear in a Value Function might include:

- the capital and operating cost of the proposed asset (higher costs may result in a later optimal timing if the costs of generation or demand side resources do not also change)
- generation capacity (summer or winter)
- generation capital cost, fixed operating cost and short-run marginal cost including emission cost
- peak demand
- maximum duration of peak demand withdrawal
- peak and off-peak energy consumption (as might affect cyclic loading of existing assets)
- local renewable energy production
- interconnection power flows
- aggregated generation output at specific locations
- reliability of embedded generation
- existence of other transmission projects (binary variable)
- capacity of alternative transmission projects (more useful to include binary options)
- transmission marginal loss factors.

For example, at the simplest level, the timing of a transformer would depend on one or more localised peak demands, embedded generation capacity, reliability and perhaps maximum interconnection power flows, if the transformer is also part of an interconnection or if it's loading would be affected by interconnection power flow. A Value Function of this nature would enable market participants to identify how much they could spend on local generation and demand side response to economically defer the planned asset. This may encourage alternative projects to be developed well in advance of when the transformer would otherwise be needed.

An accurate Value Function may have the disadvantage of signalling the underlying economic value of advancement or deferral and make it less likely that an efficient cost would be offered when there is only one alternative feasible option. However, this would still create economic benefits even if not all the economic benefit is passed on to customers. In most cases, competitive options could be expected to emerge from non-TNSP proponents if the value of alternatives can be identified well before the project approval processes commences. The Value Function is a means to make the market for transmission services more transparent and to facilitate the examination of non-transmission options by parties other than TNSPs.

Given that the TNSP proponent would have the dominant role in formulating the Value Function, there is the risk of TNSPs gaming the process by omitting likely competitive sources or understating their scope for delaying investment. It will be important that the Rules and accompanying guidelines, as well as notes on individual projects outline the assumptions, approximations and limitations of the formulation of each Value Function so that independent parties can make their own assessments and challenge the basis of the analysis. This would help to create a more transparent market and more level playing field in transmission related services.

In summary, we consider that analysis of network augmentation options underpinned by Value-Function type analysis is worthwhile, and should be incorporated as part of the National Transmission Planner's function. The Value Function analysis is likely to be worthwhile in at least four ways:

- Value Function analysis is likely to provide an appropriate basis for long-term planning for the combined power (gas and electricity) networks, where previously this function has not existed;
- Value Function planning may provide benchmarks against which TNSP proposals for augmentation of electricity (and potentially, gas) networks can be assessed, and which can be utilized in the regulatory planning process; and
- Value Function planning, as the function is developed and refined, is likely to assist encourage market-based solutions to emerging constraints and opportunities within the market.

2 FUNCTIONS OF THE NATIONAL TRANSMISSION PLANNER

2.1 Planning Boundary (Section 3.1)

Creating regional networks and then restricting planning to pre-defined national flow paths between regions only reinforces the current jurisdictional focus and processes.

Instead, the starting point for the NTP role should be that it must be required to review any transmission investment or plan that can have material NEM implications. The concept of the Planning Boundary has been defined to illustrate which assets are of interest to the NTP. The purpose of the Planning Boundary is to describe the current assessment of assets or network sections that are currently deemed to have NEM implications. The concept of the Planning Boundary is an output of the planning process, not a constraint on it.

Networks outside the Planning Boundary would be radial or locally meshed networks in areas that are energy poor or have high cost energy that is not competitive under foreseeable market scenarios. Networks outside the Planning Boundary would be planned on local reliability or local market benefits with a primary focus on local supply reliability to customers. If new energy resources are found to be market competitive in a local region, then planning and development of local transmission may need to have a national focus and the Planning Boundary would be extended to cover than region.

The concept of a subset of national planning issues may be helpful if it is associated with a clear process for screening the “issues” on a regular basis. The separation of issues into national and regional would be unhelpful if it reinforces current practice without a mandate to critically review all planning decisions to see if they have material national impacts and under what kinds of energy market supply/demand scenarios. It would be best if the role of the NTP is defined by process rather than content. It is not about particular networks or flow paths, but rather about economic impacts and their uncertainty which define the scope and role of NTP. The long-term planning process would progressively enhance the detail in economic scenario analysis as lead time approaches for a project. Thus, the significance of a planned asset for the market as a whole will be estimated initially and progressively refined as the interactions between generation, demand and transmission are progressively understood and quantified.

The role of the NTP should be in the areas of scenario formulation, long-term economic impacts, and integration of planning by TNSPs, DNSPS, generators, and demand side aggregators. The NTP would assist in defining a market for transmission services through analysis and provision of information about the relative value of different transmission options under various market scenarios.

2.2 Range of Scenarios and Level of Detail (Section 3.2)

2.2.1 Scenarios

It is clear that multiple scenarios will be needed to properly analysis long-term economic uncertainty related to long-lived new transmission assets. The purpose of the National Transmission Network Development Plan (NTNDP) would be to define the uncertainty in value and timing as much as to identify a most likely requirement. Where there is significant uncertainty about the economic life of an asset arising from scenario uncertainty, the planning process would encourage market participants to propose more robust solutions.

One of the risks of the national planning process is its exposure to short-term political objectives and policies. It must not be constrained by current Government policies on renewable energy, nuclear power or emission abatement, for example. Governments come and go but transmission systems last much longer than most governments. Therefore scenario formulation must not be constrained by current policies. Scenarios that include changes of policies by future governments may need to be included to encompass the full range of uncertainty.

2.2.2 Planning resources

The discussion under Section 3.2 of the Issues Paper highlights the need for NTP to be able to critique the TNSPs' analyses and that some analytical skills will be needed by NTP.

Disputes may arise where NTP considers that TNSP analysis has been inadequate and TNSP disagrees in the context of its own planning mandate. It will be important for the design of the planning process to define the respective responsibilities of NTP and TNSPs so that co-operative working relationships can be facilitated. However, it is recognised that NTP may need to call upon independent experts and resources to resolve more difficult planning issues. Effective planning and consultation processes rely on the scope and limitations of market analysis to be communicated and understood by stakeholders. Sufficient information about scenarios and assumptions should be made available so that studies can be replicated and validated by stakeholders.

2.2.2.1 Internal Resources

NTP will need the internal expertise to understand the network planning and system design process. NTP may out-source supplementary analysis as it may not be practical to keep the necessary skills within the organisation unless it has access to AEMO resources with sufficient priority to do its work in a timely manner. The primary role of NTP would be to co-ordinate and critique planning analysis by TNSPs rather than to duplicate effort. Where new methodologies are being developed, some comparative analysis may be warranted to validate the results provided by TNSPs.

2.2.3 Value Functions

The assessment of the value of assets identified in the NTNDP would be greatly enhanced if Value Functions were defined as part of the planning process (Refer section 1.1). A Value Function would be defined as a mathematical expression that describes either:

- possible sets of market conditions under which a transmission asset becomes economic. Relevant factors would be load growth, local generation capacity and energy, carbon prices, renewable energy targets, value of unserved energy, load shedding priorities, amounts of specific load types at risk; or
- optimal timing of assets in terms of patterns of load growth, demand side response and generation development in defined locations.

Essentially the two formulations are derived from equations where the right hand side is a fixed value and the operator is an inequality. The fixed value would represent some measure of network flow or capacity and would be required to be alleviated. There may be multiple Value Functions associated with a proposed new asset, each one relating to a significant constraint affected by the new asset.

The second form of Value Function would include the time dependencies of the input variables according to the growth scenario and project timing where appropriate. The analysis would set the two sides of the mathematical expressions to equality and solve for the optimal timing as a set of expressions. The required timing might be a minimum of a set of equations that represent the constraints that would be alleviated by the proposed new asset.

For example a transformer may be required when a peak load offset by local firm demand side response exceeds a critical level. Supplementary parameters might relate to energy production limits or demand side maximum duration because they impact the expected unserved energy. If the asset has market benefits, then other factors would be expected to appear in the Value Function terms such as interconnection peak power or energy flows.

Together with the stated cost of the project in capital and O&M terms, such Value Functions would enable market participants to identify alternative resources that would be of lower cost than the planned assets well before the regulatory approval process commences. Value Functions would be the means to co-ordinate planning for other energy resources and to be able to quickly formulate an aggregate approximate plan for a new scenario without repeating all the detailed analysis. The Value Function essentially represents the key sensitivities related to one or more scenarios. The Value Function may differ among quite different scenarios if the primary value divers are different. Normally we would expect that one adequately defined Value Function could express the requirement for most or all the defined scenarios.

Value Functions would also serve the purpose of testing the credibility of the planning analysis. The sensitivity to growth and energy supply factors as presented would provide a useful guide as to which factors have been considered in what ranges and which factors have been deemed to be immaterial. If any of this fails the 'sanity test', then the NTP would critique the analysis in more detail. The Value Functions would also imply the scope of the planning analysis and make it more transparent.

Whilst the development of Value Functions would add cost to the planning process, in most cases the analysis would have been conducted and it would involve presenting that analysis in a different way to make clear the work that has been completed. In most cases, sensitivities may be approximated with linear functions which can be derived from regression analysis of features of the technical and economic analysis.

Value Functions may well start out as very simplified because they represent preliminary capacity analysis without detailed market benefits included. Partial equations are better than none and will serve to make clear the quality of the analysis to date. The accuracy of the Value Functions could also be estimated to show the uncertainty in the analysis at that stage.

2.3 Scope of the National Plan (Section 3.3)

The scope of the NTNDP can be limited to the transmission assets in principle. However the value drivers are in the generation, load and gas transport areas in most cases. It would be unrealistic for the NTNDP to cover all of these other factors, such as specific plans for gas transmission. However, the interactions need to be recognised in both the analysis and the presentation of the NTNDP. If a specific transmission development plan assumes that a gas pipeline is built, then that should be clearly stated in the scenario definition. If there is doubt about the viability of the pipeline, then sensitivity should be included without the pipeline and the relative value revealed to the extent feasible, with qualification as necessary.

Therefore:

- scenarios must recognise the drivers for the development of gas pipelines and gas supplies
- scenarios would make assumptions for the development of embedded generation resources and demand side response but the NTNDP would include the sensitivity of timing to these assumptions where they are material to timing and economic value
- the optimal timing of transmission assets does require an integrated design analysis to ensure that transmission developments minimise total energy supply costs which would include gas transport in cases where gas fired generation is a low cost supply option
- the proposed Value Functions would provide the mechanism for showing the value drivers and enabling other parties to co-ordinate their planning activities.

Therefore, provided the economic assumptions are stated and the sensitivity of planning outcomes to assumptions about generation, demand side and gas supply are incorporated into the process, there is no need for the scope to be extended beyond the planning of transmission assets. Certainly the application of the NTNDP would be wider than just the electricity transmission system alone.

It would be unwise to specify a threshold value for the NTP's activities unless it were set to a low level of say $1M asset value. The NTP should work on matters of principle where it gets involved in reviewing assets plans, where market value is a significant part of valuation (say at least 10% of asset value).

If this causes NTP to get involved in classes of multiple small assets which individually have market value which is critical to valuation of the overall NTNDP, then it would sufficient to establish standardised procedures for their planning justification rather than treat each asset on a case by case basis. As the generation in the electricity system becomes more distributed, planning methods will need to change to be able to forecast impacts on the transmission system. It would be unwise to be specific on where the boundaries should be drawn. That should be an outcome of the planning process, not a prescriptive input.

2.4 Other Issues (Section 3.4)

2.4.1 Time horizon

The time horizon in considering augmentations and upgrades to the network, and the elements that drive the need for those changes does need to be longer than 10 years. Other submissions supported a longer time horizon. This is necessary for decisions on terminal station locations, higher voltage level and easement acquisition. Remote generation from geothermal and solar energy will require longer time horizons for easement and voltage level decisions.

2.4.2 Credible forecasts

It is not the purpose of the NTP to produce a 'single' credible forecast for each examined region, except in so far that they are credible for a given scenario. The accuracy of the forecast as an actual outcome is not nearly as important as the assessment of the uncertainty and the optionality in a given investment. The matter of accuracy is more important at the regulatory approval stage when the focus is on the accuracy of timing. By the approval stage, it would have already been established through the long-term planning process that the proposed transmission asset should have significant value. That the asset has long-term value and optionality should have been confirmed by the previous annual planning reviews, including the relative stability of the Value Function and its underlying independent variables (value drivers) over several reviews.

2.4.3 Relationship among documents

The SOO should provide the overall framework for demand growth and short to medium term generation resources. The NTP should primarily cover the 5 – 30 year period with the Annual Planning Statements focusing on the 5 year horizon. Combining the APR into the NTNDP would have the danger of distracting the NTP from focusing on the longer term issues and the overall planning framework. The structure of the roles of these documents is illustrated in Table 2-1. The blue shaded areas correspond to the main NTP activities. A gas SOO and transmission plan would certainly assist the co-ordination of gas and electricity planning and should be developed on similar principles.

Table 2-1 Relationship of Documents

<table>
<tr><th></th><th>Gas</th><th>Generation</th><th>Transmission</th><th>Demand</th></tr>
<tr><td>0 – 5 years</td><td rowspan="2">A gas SOO would enhance the planning linkages between gas and electricity</td><td>The SOO shows committed plant</td><td>The SOO shows committed interconnectors. The APR shows the timing of assets by region.</td><td rowspan="2">The SOO shows the range of demand growth</td></tr>
<tr><td>5 – 10 years</td><td>The SOO shows the potential supply gap.</td><td>The ANTS shows potential for augmentation of major flow paths. NTP would identify other assets that have wider market benefits.</td></tr>
<tr><td>10 – 15 years</td><td>Linkages to gas pipeline development may need to be assessed out to at least 15 years</td><td rowspan="2">NTNDP: Supply scenarios would be required to assess life-cycle value of new transmission assets.</td><td rowspan="2">The NTNDP would show the potential future assets required and their dependence on market scenario factors.</td><td rowspan="2">NTNDP: Demand scenarios would be extrapolated from the SOO for the purpose of developing longer term forecasts by scenario.</td></tr>
<tr><td>15 – 30 years</td><td>Potential for new gas pipeline easements.</td></tr>
<tr><td>30 years +</td><td colspan="4">Extrapolations beyond 30 years would only be required for special matters such as choosing a high voltage transmission voltage level or the width of a new easement through developed areas or areas subject to future development.</td></tr>
</table>

Providing the focus of the NTNDP is the longer term focus and the broader scenario framework, it need not replace the APRs and SOO, both of which have shorter term focus on more immediate investment activities. The NTNDP would provide the longer term back-drop for the SOO and APRs. After a time, it may be feasible for the NTNDP to be reviewed only every 2 – 3 years with the intervening reviews a matter of updating the Value Functions or providing updates on specific projects or regional developments rather than a complete comprehensive review.

2.4.4 Research Matters – Technology Trends

The NTP should monitor developments in AC, DC and FACTS technologies and provide a framework for the development and costing of transmission options. To the extent that such trends have a material effect on the choice of options, then such factors should be included in defining the future scenarios. If transmission capacity relative to generation capacity becomes less costly, as might well occur under a carbon trading regime, then the relative viability of transmission versus local generation options may alter. Therefore we would expect the NTNDP to comment on these longer term matters and to make assumptions about those trends for the purpose of economic analysis of options.

Similarly, the relative costs of generation plant versus transmission assets may also have a material effect on optimal timing in some cases where reserve generation capacity and transmission capacity have similar long-term value. For this reason, the scenarios will need to include assumptions about the long-term cost trends of competing technologies.

2.5 Relationship between NTP and TNSPs (Section 3.5)

It is considered that the roles (a) to (d) would be appropriate to the relationship between NTP and TNSPs. We would think that NTP would monitor the project assessment and consultation processes to ensure that the planning processes are consistent with the way that projects are finally approved. However, if NTP were to have its resources consumed by being too much involved in such processes, it would likely get distracted from its broader focus.

The NTP's planning and market benefit evaluation principles would need to be consistent with the project assessment methods. However, the underlying assumptions of the relevant future variables would be focused on the particular risks of the project being assessed and would be expected to be more detailed than what we applied during the lead-up to financial commitment. The process would provide a guide as to the TNSPs performance in developing Value Functions for the project. This would be a matter of interest to the NTP and the market generally as they would rely on the Value Function to co-ordinate their own contribution to the project assessment and the formulation of competitive alternatives.

Requiring the TNSP to reconcile plan deviations from the NTNDP would help to clarify any changes in assumptions and valuation methodology. Such a requirement would not be expected to affect TNSPs' accountability but rather enhance it by strengthening the credibility of the TNSPs' analysis and encouraging TNSPs' refinement of the previous work by the NTP and the TNSPs during the planning phase.

2.6 Other Functions for NTP (Section 3.6)

The activities of the IRPC in co-ordinating development of interconnections and related matters should become part of the NTP role to minimise the number of bodies that have to co-ordinate their activities. The IRPC roles related to evaluation of interconnections and provision of planning data, and assumptions would be an important part of the overall planning and evaluation process. With an effective NTP established, it is difficult to see why inter-regional matters should be treated differently from the normal planning processes.

3 PROJECT ASSESSMENT AND CONSULTATION

3.1 Reliability and Market Benefits (Section 4.1)

Option 2 is unsatisfactory because it would be difficult to define network reliability standards and obligations in all circumstances that would closely reflect an economic balance of capacity and customer supply risk using a least cost method. The generalised cost-benefit approach of Option 1 is better in principle but may be cumbersome and difficult to apply in some circumstances at a cost which reflects the decision to be made. Standardised evaluation and screening procedures would assist in focusing effort on the important factors which discriminate between competing options.

3.2 Framework for the regulatory investment test (Section 4.1.3)

The process for evaluation should be based on the cost-benefit principle related to the cost of information and the value of the decision. The cost of the decision is the resources expended to make the decision. The value of the decision is the difference between the least cost / maximum net value option and the next most favourable. Since this cost/benefit equation is not fully known until after the analysis is done, there is always some judgement needed in estimating how much work is needed to confirm that the best decision has been made. For this reason, it is preferred to break down the decision making process into a series of analytical methods with increasing complexity.

The complexity of the analysis would vary according to:

- the size of the investment – bigger investments can support more expensive analyses because the difference between the least cost/ maximum benefit option and the next least favourable is normally greater
- the number of factors affecting the value of the investment – the more interacting and the more uncertain the factors, the more analysis may be justified
- the estimated gap between the most favourable option and the next best – the closer this gap, the less effort that is needed because the cost of an incorrect decision is less
- the risk of stranded investment – the more uncertain is the future, the more scenarios may need to be considered to find the most robust option.

Most transmission options can be initially screened based on suitable reliability standards, similar to an unserved energy criterion or a redundancy principle (such as N-1). At a later stage closer to commitment, the timing of the more favourable options based on their relative market benefits and reliability performance (allowing for the uncertainty in the value drivers) would be evaluated using models of increasing complexity until the major value determinants have been quantified. The smaller benefit components would remain based on simplified analysis because they would be small enough not to make a difference. This is a preferred approach to having a standard detailed methodology that is applied to all projects irrespective of cost, size and market benefit complexity.

Thus Option 3 could be applied initially based on reliability based rules, as long as for major projects the mandatory standard was still open to question as to whether it represented an economic choice between capacity cost and customer service reliability. If the simplified analysis showed that the reliability standard for initial screening might be uneconomic, then a full cost-benefit analysis would be undertaken if there was *prima facie* evidence that the higher evaluation costs could yield a benefit in confirming the option with maximum net benefits.

It is considered that this progressively more sophisticated analysis would be developed through the NTNDP development. Options for the long term would have simplified Value Functions based on indicative reliability standards or simplified market benefit analysis based on the value of generating reserve capacity, energy cost savings and loss savings. These components can usually be estimated to within a binary order of magnitude with simple estimating. As the projects progress toward the time of project assessment, the accuracy of assessment of the Value Function would be expected to increase because later studies would refine the estimates of the value determinants. Related studies of earlier projects in the NTNDP would provide more information on the value of the future projects.

If this approach is adopted, then a screening based approach using indicative or mandatory reliability standards initially and more detailed methods of estimating market and reliability benefits later would provide an adaptable approach and be least likely to over-burden the project planning assessment with excess costs that are not commensurate with the value of the decision.

Thus, the evaluation process would follow a process similar to that shown in Table 3-1. There is an implied economic evaluation at all stages. The level of detail and the particular methods would reach maximum detail and complexity at the Project Approval stage. This approach is sympathetic to Powerlink and ETNOF's objective "to balance the practicability of a revised assessment process against theoretical purity". Theoretical purity often requires more information than is readily available or accurately known or knowable, especially well in advance of actual requirements.

Thus the issue is not so much whether Option 1 or Option 3 is preferred, but the stages during the Planning Process where Option 3 is sufficient as the planning basis to determine how and when Option 1 is applied at the point of project approval. It is quite probable that transmission projects which mainly provide local reliability benefits could be approved using an Option 3 process with little doubt that the best decision has been made. This type of process would require Value Functions to guide the evolution of the planning process toward approval.

Table 3-1 Indicative Planning and Project Assessment Process

Planning Stage	Time Horizon	Processes to determine …	Information Required	Technical Evaluation Methodologies
Very Long-term Planning Phase	To 30 years or more	Easement and Voltage Level Planning for Transmission Lines	Generation and load by regional centres, bulk power transfers, loss parameters, power flow.	Simple power flow analysis, loss analysis. Criterion can be the cost of bulk power transfer. Reliability is not critical.
Long-term Planning phase	10 to 30 years	Sequencing of line and transformer developments. Resources will be required to deliver future generation resources to load centres. Project timing is not critical.	Patterns of load and generation. Relative cost of generation resources including emissions costs.	Load flows and simple stability studies. Basic bulk system reliability standards are sufficient.
Project optimisation – medium term planning and review	5 to 10 years	A more accurate sequencing of projects and the factors that determine timing. Develop Value Functions to identify alternatives on the supply and demand side. Optimal timing according to scenario parameters.	Projected costs of generation, transmission and demand side projects. Cost of unserved energy. Load shedding options and their impacts.	Measures of reliability performance as projects timing and sequencing is varied. Load flow and stability studies. Regression analysis of multiple transmission and generation system studies to develop Value Functions. Value Functions are used to screen alternative options by other proponents.

Planning Stage	Time Horizon	Processes to determine …	Information Required	Technical Evaluation Methodologies
Project approval.	2 to 5 years	The economic justification for the project and the consideration of the alternative options that are brought forward to the approval process.	Costs of unserved energy, reserve generation costs of available options. Generation options and production costs. Value Functions are used to confirm the basis for the project approval. They may be updated if value drivers have changed since the latest analysis.	Detailed modelling of transmission reliability and bulk system production costs and unserved energy costs to confirm economic choice and timing.
Project commitment	1 to 3 years	The final commitment to construction as lead time goes to zero.	As above updated for current conditions. Optimal timing should be able to be confirmed using the value Function which justified approval, unless it can be readily invalidated.	Update of analysis conducted at the project approval stage if the Value Function can be invalidated. Otherwise the Value Function should be sufficient to confirm the final timing as it should have been developed with sufficient accuracy.

If deterministic planning criteria are applied, then for the purposes of screening alternative options, the equivalent value of unserved energy could be estimated that would justify the deterministic capacity based criteria. This approach could be used to screen options that provide a fundamentally different risk profile than what is implied in an N-1 planning criterion in the absence of (for example) unreliable embedded generation.

A progressive evaluation methodology answers the question about assessing market benefits as immaterial before actually assessing them. Approximate answers for screening purposes can usually be estimated to a binary order of magnitude by an experienced and competent transmission and power market analyst. To refine the value estimate, the larger components are then estimated using more detailed modelling until it is unlikely that any further improvement would alter the decision.

3.3 Reconfiguration and refurbishment (Section 4.1.3.1)

The question about the evaluation of reconfiguration and refurbishment projects is a case in point where the method should match the circumstance. Replacement of fully utilised assets by equivalent assets is relatively rare. There is usually a case for additional capacity on site using more advanced technology or rationalisation of under-utilised assets. Therefore, the magnitude of potential market benefits based on an initial Value Function should identify whether market benefits are material to the decision as to whether there are likely to be cost effective alternatives to a near as possible asset replacement.

If there is a staged process for identifying the end of economic life of existing assets, then information about the costs and benefits can be assessed at the long-term planning stage and then refined as the generation and demand side alternatives become clearer. Publishing a Value Function well in advance would assist the assessment and commitment of any replacement options that do not require equivalent asset replacement. It would be unwise to assume that all replacements can be divorced from consideration of market benefits, and generation and demand side responses.

3.4 Cherry picking costs and benefits (Section 4.1.3.2)

It would be less likely that TNSPs could cherry pick costs and benefits if there is a long-term planning process that critiques the basis for initial estimates of value. If Value Functions are defined and published, any value gaps would be able to be identified by competent observers.

The problem with the current process is that it is too late to conduct such critical review when the project approval is underway and lead times are approaching. It is also counter-cultural for a TNSP to be pursuing alternative options to its own project. The publishing of a Value Function would then place more of the onus on other market participants to critique the Function and come forward with alternatives that displace or delay the more expensive option.

3.5 Risk management and customer benefits (Section 4.1.3.2)

Whilst it would be desirable to identify where customer benefits are more significant than the total economic benefit (consumer plus producer surplus) because some producers would be disadvantaged by a project, in practice this has proved imprecise and contentious because the sharing of economic benefits depends on the energy market bidding responses to new market conditions. Robust methods for predicting such outcomes with precision are not available. If there really are projects with substantial customer benefits, then the regulatory process should facilitate the beneficiaries to invest in such projects outside the regulatory process. Admittedly, it is not clear how this could be done unless the rights to an energy market buy and sell across a new section of transmission infrastructure or related infrastructure can be created to deliver the long-term value. However, in practice, parties cannot readily extract this value unless they can contract it for long periods of time commensurate with the economic life of transmission infrastructure. As seen with Directlink and Murraylink, this is not always feasible.

Therefore it is preferable to base regulatory decisions on cost-benefit analysis and rely on limited market power in the energy market to deliver the producers' benefits to customers so that the ultimate customer benefits of these projects are in excess of the incremental network service costs imposed on customers. If there are clear beneficiaries on the supply side, then the costs of the transmission development commensurate with those benefits to generators should be assigned to the affected generators. It would be expected that generators would seek such new transmission projects as long as they can be assured that there will be no free-riders among subsequent new entrants. There have been several cases where minor upgrades to the transmission system would have been of benefit to particular market participants but it seems to the outside observer they have been unable to work together because of the perception of collusion and the free-rider problem.

3.6 Application of proportionality and avoidance of wasted effort (Section 4.1.3.3)

A progressive screening process using standard methods developed by the NTP should be a part of developing the NTNDP and informing the exchange of information between NTP and the TNSPs. The Value Function in preliminary form would show initial estimates of market benefits and their relative magnitude based on the scenario assumptions. The approval process would consider the sources of costs and benefits and the methods chosen to estimate them. More detail would be required for the larger benefits and where simple estimates are applied, it would be shown that significant errors in those estimates could not have a bearing on the overall value of the decision, being the difference in cost between the most and next most favourable option.

3.7 Treatment of strategic transmission developments (Section 4.1.3.4)

The treatment of asset development in advance of specific loads and generators and where economies of scale dictate initial capacity well in excess of immediate requirements is problematic under the current regulatory process. This will become an important issue if Australia has to repower its economy with large amounts of geothermal, nuclear or solar thermal energy from remote or new locations. It may be necessary to build in spare capacity initially and thereby accept a risk of a stranded investment if the expected supply/demand scenarios do not eventuate on the planned timelines. The NTP's preparation of long-term (30 year) supply scenarios would form the basis of such commitments. The pricing and funding of such assets would need to deal with the financial losses in the early phases of development.

The planning process should be able to recognise the long-term value and risk, and drive the innovation of options to scale the development as needed by means of building upgradeable options (stringing additional conductors and circuits, increasing operating voltage) to minimise initial investment. Clear Government policies on support for new renewable energy resources and commitments to emission abatement would provide some confidence that these new transmission developments will eventually be required. The present value method and scenario analysis may be used to quantify the risks and the optionality of strategic investments. Providing a scenario approach is adopted by the NTP as the basis for project planning and approval of strategic investments, there is no need to redefine national benefits.

3.8 Range of options to be considered (Section 4.1.3.5)

As discussed above, the Value Function provides the basis for the development and consideration of alternative projects in the planning and approval phases. The focus need not be so much about the inclusion of options but the provision of information about the potential Value Drivers. If new types of resources become available, then the Value Functions would need to be updated to reflect that change in value. Standard methods should be developed for known embedded generation and demand side response technologies. Where there are special seasonal or intermittency factors, the Value Function may need to reflect those types of resources. Clearly, there is a limit as to how sophisticated this analysis needs to be. A key objective should be to provide sufficient indicative information so that any competitive resources can be identified well before project approval. Any alternative project specific analysis of the Value Function would not be required until just before the project approval process commences, having regard to project development lead times.

3.9 Interaction between NTP and the operation of the RIT (Section 4.2)

Table 3-2 provides a matrix of responses to the questions raised in the Issues Paper relevant to the four possible modes of interaction between NTP and the RIT process.

3.10 Need for a Request for Information for reliability investments (Section 4.5.2)

The potential value of a Request for information (RFI) on non-transmission alternatives to reliability only investments has been raised in the Issues Paper. This could occur where the two limbs of the RIT are amalgamated and some large options remain as primarily "reliability" investments only with negligible prospects for showing broader market benefits.

It would seem preferable to require issuance of an RFI whenever there is the potential for significant deferment of investment from embedded generation and demand side response. The case could be based on the relative significance of these factors in the preliminary Value Function. If the magnitude of the potential available resources is such that a one year deferral could be achieved with significant net economic benefit, then an RFI should be issued. It is expected that the widespread publication of Value Functions would eventually encourage proponents to be pro-active in developing resources and apply for regulated revenue in association with deferment of new transmission assets. Thus the RFI would then initiate the formal process of introducing commercial alternatives that would be used to refine the optimal timing.

This would mean that the regulatory approval process may then result in a deferment of the transmission project and acquisition of other resources under the RIT. Rather than becoming a transmission approval process it would then become a "power delivery resource acquisition process". The result would be that a set of resources would be acquired after finalising an optimal sequencing and timing with the acquisition of resources that are within the required lead time and the deferment of other resources to a subsequent review guided by the medium term planning process.

3.11 Simultaneous reviews and contingent projects mechanism (Section 5.1)

The benefits of aligning of revenue reset periods would become less significant with an effective national transmission planning process. The planning process would identify which transmission projects have uncertain value drivers and would qualify as contingent projects in the regulatory period. The contingent projects mechanism should include any new contracted resource which provides network management benefits. This would reduce revenue/cost risk for TNSPs and support the project commitment process in finding the least cost options whether they be transmission projects or otherwise.

Table 3-2 Analysis of Interactions

<table>
<tr><th>Levels of Interaction ►

Questions ▼</th><th>Lead a process of co-ordinating and disseminating information on good practice in undertaking the RIT</th><th>Recommend or specify certain elements of a methodology to be applied in undertaking the RIT</th><th>Ensure compliance with how the RIT is applied</th><th>Take primary responsibility for undertaking the RIT in certain circumstances</th></tr>
<tr><td>What value might the NTP add to the RIT process under each of the different broad options identified above?</td><td colspan="2">Provide standardised scenarios and base cost assumptions that would provide confidence in an even-handed assessment of all options. Such an approach would assist stakeholders in understanding the value drivers and risks more clearly than if the assumptions are buried in the ‘black box’ economic models.</td><td>Ensure consistency with evaluation of other transmission and non-transmission options.</td><td>Where the benefits of a project are widespread throughout the NEM or where immediate costs are not fully recoverable and a more long-term focus is needed.</td></tr>
<tr><td>What particular aspects of an RIT methodology might the NTP specify or recommend?</td><td>Market scenarios, trends in technology costs and availability.
Methodology for developing Value Functions.</td><td colspan="2">Screening methods to identify when and how market benefits should be assessed in the RIT. Treatment of uncertainty in comparing options. Definition of categories of costs and benefits and the preferred means to evaluate them.</td><td></td></tr>
<tr><td>How binding should the views or recommendations of the NTP be on the party with primary responsibility for undertaking the RIT?</td><td>N/A</td><td>N/A</td><td>Review should adapt and evaluate the scenarios defined by NTP.</td><td>TNSP would be bound by a process undertaken by the NTP in special circumstances.</td></tr>
</table>

Levels of Interaction ► Questions ▼	Lead a process of co-ordinating and disseminating information on good practice in undertaking the RIT	Recommend or specify certain elements of a methodology to be applied in undertaking the RIT	Ensure compliance with how the RIT is applied	Take primary responsibility for undertaking the RIT in certain circumstances
How might a 'compliance and monitoring role interact with the AER's role of monitoring and enforcing compliance with the Rules?	N/A	N/A	NTP role would be limited to minimum technical standards on evaluation methodology and consistency with market scenarios.	N/A
However, it is not clear to the Commission if there is value in the NTP taking over the AER role in monitoring the application of regulatory tests.	The role of the NTP 4should be limited to the assessment of longer-term planning implications of network augmentation and expansion approved through regulatory test assessment processes. Although the role of the NTP could include the monitoring of the implementation of the regulatory investment test in specific instances, it is not clear whether vesting the NTP with a function that compels TNSPs or any other proponent to follow NTP assessments is consistent with the positions voiced elsewhere in this submission. The assessment of TNSP proposals relative to those proposed by the NTP should be left to the AER, and the NTP forecasts can be used by the AER in assisting in that assessment.			

3.12 Inter-regional charging arrangements (Section 5.4)

The question of inter-regional TUoS charging is a sub-set of the broader question of ensuring that beneficiaries of transmission service bear the costs. Where the primary role of a transmission system is the radial transmission of power from generation to load centres in a highly competitive market, then the current regime would be sufficiently accurate. However, the following market trends make this less viable:

- distributed intermittent generation which changes the role of the transmission from power delivery to capacity risk management and energy trading
- seasonal and daily changes in power generation between regions that make interconnectors deliver power with frequent changes of direction
- redesign of the network to increase delivery of low emission generation in new locations and where high emission generation is mothballed or retired.

These factors will increase the incentives for beneficiary pays pricing principles and enhance the value in inter-regional TUoS charging to assist the co-ordination of developments which lower cost and risk in the NEM.

The assessment of national benefits ought to eventually improve the calculation of how the economic benefits might be expected to flow to generators or customers and in which regions. This would provide a guide on a project basis to the allocation of costs to regions and market participants. Factors that can distribute costs elsewhere include:

- changes to power flow patterns and transmission losses
- impact on remote stability related constraints that may affect low SRMC and low emission generation
- increased power flows through a region that increases transmission losses to customers who otherwise do not benefit directly from the augmentation.

Until suitable and approved calculation methods are available to allocate costs for projects with substantial national benefits, the simplified allocation of costs across interconnections based on cross payment of TUoS may be applied as proposed by the second of three options in the Issues Paper.

3.13 Consideration of Models (Table 8.1)

This section reviews features of the Models presented in Table 8.1 of the Issues Paper.

3.13.1 Time Horizon

In reviewing the Models of structure and activity for the NTP, we recommend that the NTNDP would have three phases out to 30 year outlook period as follows:

- The period to 5 years would be expected to correspond to TNSPs' well developed plans plus any items that NTP considers have been overlooked by TNSPs. Scenarios may well be limited to the SOO demand forecasts and committed and advanced proposals for new power plants. This would be similar to the current ANTS analysis.
- The period from 5 to 10 years would develop options for transmission lines and their upgrades, and transformers needed to support the whole market economically. Timing of options would be scenario dependent. Scenarios would be more broadly developed with some alternative trends in supply as well as demand forecasts similar to the SOO. Network developments which have a significant impact on generation patterns and transmission losses would be identified.
- The period from 10 to 20 years would consider the main transmission plan at a less level of detail than the 5 to 10 year period. Some minor projects such as transformers between transmission and meshed sub-transmission networks would not be studied in detail unless they were expected to have significant market benefits.
- The period 20 to 30 years would focus on easements and terminal station sites based on a wide range of supply scenarios.

Rather than having the same level of detail out for a specified period of time, each planning consideration would be developed out for as long as it takes to show the longer term trends. The detail would be filled in over time as scenarios drive the planning needs.

3.14 Scenarios

Scenarios would commence in the early years with the typical SOO based view of the world and fan out in both supply diversity and load growth patterns to reflect the longer term uncertainties of the NEM. It would not be the role of the NTNDP to predict the timing of projects with great accuracy. The focus would be on identifying the projects that would be required in a number of scenarios and to identify the range of optimal timing over the scenarios. Therefore, the range of scenarios should be wide, credible and not limited by current Government policies, except within the lead time for policy change (say 3 - 5 years at most).

3.15 Definition of "National"

National should relate to overall market benefits rather than specific flow paths. The flow paths can provide a useful focus and starting point for the first NTNDP. NTP should be able to develop its analysis of NEM wide impacts based on the economic analysis and the materiality of energy market impacts.

3.16 Specificity of the Plan

The NTNDP should

- describe the current capability of the network on the national flow paths
- summarise the planning undertaken by the TNSPs as it affects power flow across the NEM
- discuss the plans developed by TNSPs in terms of particular assets and their timing as a function of scenarios
- include the range of uncertainty on the need for particular new assets
- present information on their value drivers, provide a Value Function and discussion of its current state of analysis and limitations
- identify if any assets are exposed to stranding under some scenarios
- identify the aggregate capital expenditure that may be needed for future network development taking into account TNSP plans and the NTNDP.

3.17 Range of Assets

The range of assets should include new easements, terminal stations, transmission lines, major plant replacements and refurbishment. The Value Functions will have regard to assumptions about load growth, generation location and costs, gas pipelines and their costs, and demand side response. These data would provide the linkage to other planning processes, including project development by market participants.

3.18 NTP Involvement in Regulatory Test

The Model 3 option would seem to offer the most flexibility for the NTP to influence the planning process. The primary responsibility for conducting Regulatory Tests would be the TNSPs but the NTNDP provides the longer term basis for valuation of benefits using the Value Functions for related assets and additional market modelling to refine the overall estimate of market benefits for the selected options. Given the limited degree of planning information provided by TNSPs in the past and the need for a greater national focus requested by COAG, the NTP will be required to lift the provision of market information.

3.19 Ancillary Functions

Model 3 best fits the long-term planning focus. If NTP were to publish the SOO, it might get side-tracked by shorter term requirements.