Proposed Contingent Project Triggers and Indicative Costs

(Costs exclusive of risk and escalation)

Project name	Triggers	Indicative capital cost
Kemps Creek – Liverpool 330 kV line: undergrounding of all or part of the proposed connection	1. A determination by the environmental consent authority that inclusion of a specific amount of undergrounding is required for the project to be approved, and 2. The project with undergrounding satisfies the Regulatory Test. The ex –ante capital submission includes the cost of the overhead line. The contingent project cost is the differential cost of the cable over and above the overhead line.	Additional cost to the value of $108m Associated additional Opex $400k per year
Darlington Pt – Balranald – Buronga system upgrade to 275 kV operation	1. Satisfies the Regulatory Test on market benefits criteria.	$51m
Development of a second 500 kV link within the Revenue Reset period: <u>Either</u> Hunter Valley to coast 500 kV development which includes: • A double circuit 500 kV line development; • Transfer of the Bayswater units 1 & 2 to a 500 kV connection; • 3rd Kemps Creek 500/330 kV transformer <u>or</u> Bannaby – South Creek 500 kV development which includes: • A double circuit 500 kV line development; • A 500/330 kV substation at South Creek	1. Significant power station, interconnection or load development which requires both 500 kV links between Bannaby and Sydney **and** between the Hunter Valley and the coast to be developed. 2. The two 500 kV line developments satisfy the Regulatory Test. The TransGrid capital expenditure for forecast projects includes the capital cost of the Bannaby to Sydney 500 kV line development and the Hunter Valley to Eraring 500 kV line development on a probabilistic basis according to the future planning scenarios. Hence it is possible for more or less capital to be provided than is required to develop the Bannaby to Sydney 500 kV system. The contingent project cost allocation for the Hunter Valley – Eraring 500 kV system development is therefore the additional capital cost required for development of the second 500 kV line development. *Note that the transfer of the generating units associated with the Hunter Valley to coast development requires new generator transformers (units 1 & 2) at Bayswater which will trigger a cost of approximately $50m, which is likely to be treated as a pass through amount for network support.*	Additional cost to the value of $331m Associated additional Opex $950k per year
Establishment of a 500/330 kV substation at Richmond Vale	1. The environmental consent authority determines that a 500 kV transmission line between the Hunter Valley and Eraring must utilize the route of an existing 330 kV line that supplies the Newcastle area in order to be approved, and 2. The project including the 500/ 330 kV substation satisfies the Regulatory Test.	$80m Associated additional Opex $840k per year
Yass to Wagga double circuit 500 kV line, operating at 330 kV. This may include the installation of power flow control plant.	1. As a result of increased generation capacity located electrically south of Yass, or of increased interconnection with Victoria, augmentation of network capacity between Wagga and Yass is required, and 2. The project satisfies the Regulatory Test.	$329m

Project name	Triggers	Indicative capital cost
Liddell – Tamworth: new 330 kV line	1. Significant upgrade of QNI including the new line development satisfies the Regulatory Test. and/or 2. As a result of generation development connected electrically north of Armidale the new line development satisfies the Regulatory Test.	$163m
Tamworth – Armidale: new 330 kV line	1. Significant upgrade of QNI including the new line development satisfies the Regulatory Test. and/or 2. As a result of generation development connected electrically north of Armidale the new line development satisfies the Regulatory Test.	$130m
QNI upgrade involving no new line development (involves line series capacitor banks, voltage control plant and substation plant developments)	1. The interconnection upgrade development, including consequential line developments satisfies the Regulatory Test	Note 1
Interconnection development with Victoria which may include new transmission lines from south west NSW to Victoria and reinforcement of the system south of Bannaby / Marulan	1. The interconnection development passes the Regulatory Test	Note 2
Bannaby to Yass system reinforcement – uprating of the following 330 kV lines to 100°C design conductor clearance: • Bannaby to Yass (No. 39); and • Marulan to Yass (two lines No. 4 and No. 5)	1. As a result of increased generation capacity located electrically south of Bannaby, or of increased interconnection with Victoria, augmentation of network capacity between Bannaby and Yass is required, and 2. The project satisfies the Regulatory Test.	$45m
Supply to the CBD and Inner Metropolitan Area	1. As a result of the retirement of 132 kV cables owned by Energy Australia the supportable load of Energy Australia's network in this area is exceeded, and 2. The project satisfies the Regulatory Test. A range of possible solutions exist to address the expected need, and each would require a further 330 kV cable to be installed from an outer area substation to one or more 330 kV busbars close to the Sydney CBD.	$650m Associated additional Opex $3m per year
Gadara/Tumut Load Area Support	1. Confirmed expansion of the Visy Gadara Mill imposing an increase in load beyond the present transmission network's maximum supportable load, and 2. The project satisfies the Regulatory Test The expected need could be addressed by the development of a further 132 kV line between Wagga and either Tumut or Gadara Substations.	$54m Associated additional Opex $350k per year

Project name	Triggers	Indicative capital cost
Williamsdale – Cooma 3rd Circuit	1. Confirmed generation (or other developments) in the Cooma/Bega area requiring additional transmission capacity to the Cooma area to meet reliability obligations.	$40m Associated additional Opex $240k per year
Orange area 330 kV substation	1. Confirmed expansion of the Cadia Gold Mine or the development of a new mine or industrial load imposing an increase in load beyond the present transmission network's maximum supportable load, and 2. The project satisfies the Regulatory Test The preferred solution will depend on the connection application yet to be made by Cadia Mine, and an assessment of solutions that would address the need. Based on the connection enquiry submitted by Newcrest a 330/132 kV substation could be required.	$63m Associated additional Opex $560k per year
Williamsdale 330kV supply	ACT government issues regulatory and planning approvals for Williamsdale 330/132kV Substation Stage 1	$35m Associated additional Opex $320k per year
Voltage control shunt compensation device such as a Statcom or SVC associated with a new load development	1. A new load development has a impact on the quality of supply in an area of the system and requires special remedial measures, and 2. The project satisfies the Regulatory Test	$40m Associated additional Opex $345k per year
Reactive power support at Bayswater, Liddell, Eraring, Vales Point, Munmorah, Mt Piper and Wallerawang 330 kV switchyards. It is expected that this reactive power supply would be undertaken by the existing generators under a network support arrangement. If this was not achievable or if this becomes uneconomic there would be a need to install capacitor banks.	1. The installation of reactive power support at the power stations in NSW passes the Regulatory Test	$36m
System Protection Scheme to increase the NSW import capability form Snowy. This may take the form of a network support contract with loads in NSW and a generator at Snowy or further south.	1. The installation of a System Protection Scheme passes the Regulatory Test. This scheme is still at a conceptual stage.	

Note 1 – The allocation of project works and therefore the allocation of costs between TransGrid and Powerlink are yet to be finalised. Refer to TransGrid/Powerlink Queensland 'Interim Report for Market Consultation QNI Upgrade Study 2008' released 10 March 2008 and available on TransGrid's website at http://www.transgrid.com.au/Reports.htm

Note 2 – There is a range of feasible projects and the project value has not been defined at this stage. The optimum project development would be defined through joint planning with VENCorp and application of the Regulatory Test process.

Proposed Contingent Project Descriptions

Project Title	Bannaby- South Creek 500kV lines & substation
Project No	5567
Category	Augmentation/ Easement

Two new double circuit 500kV transmission lines are proposed between Bannaby and the Sydney area, and between the Hunter Valley and Eraring, as part of the long-term strategy to progressively develop a 500kV network supplying the Newcastle – Sydney – Wollongong area. While the load growth in the Newcastle – Sydney – Wollongong load corridor is expected to be partially offset by potential gas turbine generation development, it is not expected to be able to be fully contained in the long-term.

Based on current planning proposals, a 500kV transmission line is required between Bannaby and Sydney by 2013/14. Should power station development proceed in the Hunter Valley area, it is possible that the Hunter Valley – Eraring line development would take precedence. Hence preliminary planning work is being undertaken on both projects to cover all potential future generation developments.

The TransGrid capital expenditure for forecast projects includes the capital cost of the Bannaby to Sydney 500 kV line development and the Hunter Valley to Eraring 500 kV line development on a probabilistic basis according to the future planning scenarios. Hence it is possible for more or less capital to be provided than is required to develop the Bannaby to Sydney 500 kV system. The contingent project cost allocation for the Hunter Valley – Eraring 500 kV system development is therefore the additional capital cost required for development of the second 500 kV line development.

Project Title	Bannaby to Yass system reinforcement
Project No	4342
Category	Replacement

At times of high demand in NSW the import of power from the south at Snowy or from Victoria is an important component in the supply situation in the state.

The capability of this system to transfer power is limited by line rating constraints.

Uprating of the following 330 kV lines to 100^{o}C design conductor clearance is seen as an appropriate solution:

- Bannaby to Yass (No. 39); and
- Marulan to Yass (two lines No. 4 and No. 5)

Project Title	Darlington Pt – Balranald – Buronga system upgrade to 275 kV operation
Project No	6039
Category	Augmentation

The Darlington Pt – Balranald – Buronga system extends about 400 km west of Darlington Pt to the south west corner of NSW. The system is interconnected at 220 kV with Victoria at Buronga and also with the Buronga – Broken Hill 220 kV system. The Darlington Pt – Buronga system presently operates at a nominal voltage of 220 kV. The line design and insulation levels allow for operation at a nominal design voltage of 275 kV. Similarly part of the equipment at Balranald and Buronga is capable of 275 kV operation.

The upgrade to 275 kV provides the following benefits:

- A reduction in line losses of the order of 5MW or more at time of peak line loading and about 26 GWh over a typical year of operation; and
- A marginal improvement to the Victorian import capability from NSW and a marginal improvement to the power transfer capability from Victoria to South Australia over Murraylink.

The upgrade of the system to 275 kV operation requires new transformers at Darlington Pt and Buronga, new shunt reactors, new switchgear and minor works. No significant changes to the Darlington Pt – Buronga line are required.

Project Title	Establishment of a 500/330 kV substation at Richmond Vale
Project No	6005
Category	Augmentation/ Easement

The long-term plan for the NSW main system includes the establishment of a 500/330 kV substation at Richmond Vale near Newcastle to support the load in the Newcastle area. The substation would be connected to a Hunter Valley – coast 500 kV line. This 500 kV line development could be driven by either major load development in the Newcastle area or by generation development in NSW
The need for the 500/330 kV substation near Newcastle may arise in two ways, each related to the 500 kV line development between the Hunter Valley and the coast:

- Should a significant industrial load, such as an aluminium smelter potline, be established in the Newcastle area there may be a need to reinforce the 330 kV system supporting the Newcastle area.
- The 500 kV line development between the Hunter Valley and the coast may need to be developed by using an existing 330 kV line easement. There may then be a need to support the 330 kV supply to the Newcastle area.

However, under the scenarios where large-scale base-load power stations are developed in the Bayswater area or further north, possibly in conjunction with an upgrade of the interconnection capacity with Queensland, the preferred network reinforcement is a 500 kV double circuit line from the Hunter Valley to the coast.

Project Title	Gadara/Tumut Load Area Support
Project No	6218
Category	Augmentation/ Easement

Gadara is supplied via a 132 kV network that runs between Wagga 330/132 kV and Yass 330/132 kV Substations. This network is approximately 180km long with Gadara approximately 80 km from the Wagga end.

Gadara is currently equipped with a single 31.5 MVA 132/11 kV transformer which supplies the VISY paper mill. If the proposed expansion of Visy Paper Mill to 80 MW occurs the rating of some circuits in the area would be exceeded. The proposed expansion would require additional transformer capacity to be connected at Gadara and increased supply capacity to the Gadara substation.

The preferred solution to provide increased supply capacity is to develop a second 132 kV line from Wagga 330/132 kV Substation to Gadara 132/11 kV Substation.

Project Title	Hunter Valley – Central Coast 500kV Lines
Project No	5568
Category	Augmentation/ Easement

Two new double circuit 500kV transmission lines are proposed between Bannaby and the Sydney area, and between the Hunter Valley and Eraring, as part of the long-term strategy to progressively develop a 500kV network in NSW particularly to supply the Newcastle – Sydney – Wollongong area. While the load growth in the Newcastle – Sydney – Wollongong load corridor is expected to be partially offset by potential gas turbine generation development, it is not expected to be able to be fully contained in the long-term.

Based on current planning proposals, a 500kV transmission line is required between Bannaby and Sydney by about 2014 to 2016. Should power station development proceed in the Hunter Valley area, it is possible that the Hunter Valley – Eraring line development would also be required, with a possible completion date from about 2016 to 2017. The Hunter Valley – Eraring line may also take precedence if significant northern power station development eventuated. Hence preliminary planning work is being undertaken on both 500 kV projects to cover all potential future generation developments.

The TransGrid capital expenditure for forecast projects includes the capital cost of the Bannaby to Sydney 500 kV line development and the Hunter Valley to Eraring 500 kV line development on a probabilistic basis according to the future planning scenarios. Hence it is possible for more or less capital to be provided than is required to develop the Bannaby to Sydney 500 kV system. The contingent project cost allocation for the Hunter Valley – Eraring 500 kV system development is therefore the additional capital cost required for development of the second 500 kV line development.

Project Title	Kemps Creek- Liverpool 300kV lines
Project No	3978
Category	Augmentation/ Easement

The major load centres of Sydney South, Liverpool and Ingleburn as well as the inner Sydney 330 kV substations at Beaconsfield West and Haymarket, are supplied from the 330 kV network at Sydney West, Kemps Creek, Wallerawang and Dapto.

As a result of ongoing load growth there is increasing power flow across the lines supplying the load area. There is an emerging need to reinforce this system.

The reinforcement of supply will require a new double circuit 330 kV transmission line between Kemps Creek and Liverpool 330/132kV Substation. The line would be initially operated as a single circuit line.

The ex –ante capital submission includes the cost of the overhead line. The contingent project cost is the differential cost of the cable over and above the overhead line.

Project Title	Liddell – Tamworth: new 330 kV line
Project No	6003
Category	Augmentation

Under some future planning scenarios there is a need to improve the power transfer capability between Liddell and Tamworth. This applies in two situations:

- High power flow from the north towards the Hunter Valley; and
- High export to Queensland over QNI leading to high power transfers from Liddell towards the north.

The augmentation of this system may be driven by interconnection development or the development of power stations in the northern system.

This option considers replacing one of the existing lines with a double circuit 330 kV line.

Project Title	Orange area 330 kV substation
Project No	6262
Category	Augmentation/ Easement

A number of projects are planned to relieve existing and forecast network limitations as well as to address asset conditions are planned for the central west area of NSW. In addition to the forecast loads there is potential for major expansion of mining in the area. In the last year, enquiries about supply to mining loads at Cadia (south of Orange) and Copper Hill (near Molong) have been received.

Cadia Mine has submitted a connection enquiry to Country Energy which would substantially increase its present loading. To supply this load it is expected that a 330/132 kV substation would need to be established. The preferred solution is the development of the Icely 330/132kV Substation. The substation would be supplied via the existing Mt. Piper – Wellington 330kV No. 72 line.

The substation is to be established with two 330/132 kV transformers. The 132 kV connections will be via lines 947, 944 and 948.

Project Title	Supply to the CBD and Inner Metropolitan Area
Project No	6012
Category	Augmentation/ Easement

There is a need to improve the power transfer capability between Sydney West and the Inner Metropolitan area.

This option considers part of the 330kV network developments to satisfy this need by establishing a 330kV cable between the new Potts Hill substation and a new Surry Hills substation.

Project Title	Tamworth – Armidale: new 330 kV line
Project No	6290
Category	Augmentation/ Easement

Armidale is the terminal for a number of 330 kV and 132 kV lines that supply the northern and north coast NSW loads. Armidale is also connected to the Queensland system via the Queensland – New South Wales Interconnector and Directlink (via Lismore).

Two single circuit 330 kV lines connect Tamworth and Armidale, supported by an underlying 132 kV network. The 330 kV lines include one wood pole line with relatively small conductors (No. 86 line). The rating of this line has in the past imposed limitations on NSW export capability to Queensland. Under future scenarios of load and generation development the low rating of the line also imposes limitations on the power transfer to and from Queensland and on the ability to connect potential northern NSW generation.

The No. 86 line conductor rating is to be upgraded. Following this upgrade the only feasible means of providing a higher thermal line rating across this section of the network is to develop a new line between Tamworth and Armidale.

This option considers replacing No. 86 line with a new double circuit 330 kV line. The new line would be developed largely on the route of the existing No. 86 line with the No. 86 line dismantled and removed.

Project Title	Williamsdale 330kV supply
Project No	5564
Category	Augmentation/ Easement

Currently, the Australia Capital Territory (ACT) and surrounding areas are supplied via a 132 kV transmission network radiating from Canberra 330/132 kV Substation. The Cooma/Bega area is also supplied from the Canberra 330/132 kV Substation via two 132 kV transmission circuits on single circuit 330 kV structures.

The ACT jurisdiction's reliability criteria requires TransGrid to establish a second supply point for the ACT by 1 July, 2009 and to provide a 330 kV supply, independent of Canberra 330/132 kV substation, to that supply point by 1 July, 2012. Provision of the second supply point (Williamsdale 330/132 kV Substation Stage 1) has been initiated and is covered by PDR T.2109 Establishment of Williamsdale Substation.

The establishment of the proposed 330 kV Switching Station at Wallaroo and associated line works is seen as the most efficient and prudent solution.

Notwithstanding this, TransGrid will treat this project as a contingent until such time as the ACT government issues regulatory and planning approvals for Williamsdale 330/132kV Substation Stage 1.

Project Title	Williamsdale – Cooma 3rd Circuit
Project No	6261
Category	Augmentation/ Easement

The Cooma/Bega area is supplied by a 132 kV network emanating from Canberra 330/132 kV substation. A limited capacity 132 kV backup supply from Murray via Munyang is available. The Murray – Munyang 132 kV line traverses the highest altitude of any line in Australia, which results in a lower reliability performance than most other network elements.

The capacity of the network is limited by unacceptably low voltages at substations in the area, particularly Bega, on outage of one of the Canberra – Cooma 132 kV lines at time of high area load. If capacity is available on the network from Murray, supply can be restored by transferring some load to that network.

A number of gas fired and wind generation developments in the Cooma/Bega area have been proposed. Should sufficient of them proceed such that the net generation in the area exceed the firm capacity of the two 132 lines from Canberra/Williamsdale, additional transmission line capacity would be required.

Construction of either a 132 kV or a 330 kV line between Williamsdale and the Cooma area is seen as an appropriate solution.

Project Title	Yass to Wagga double circuit 500 kV line, operating at 330 kV
Project No	6009
Category	Augmentation/ Easement

Under some future planning scenarios there is a need to improve the power transfer capability between the Yass area and Victoria and the Wagga area. This applies in two situations:

- High power flow towards the NSW south west area and Victoria; and
- High import from Victoria and Snowy towards NSW.

This option considers developing a new double circuit 500 kV line (operating at 330 kV) between Yass and Wagga largely on the route of the existing Yass - Wagga 132 kV line.