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TransGrid

FINAL REPORT

PROPOSED NEW LARGE TRANSMISSION NETWORK ASSET

DEVELOPMENT OF ELECTRICITY SUPPLY TO THE NOWRA AREA

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Executive Summary

This final report is published in accordance with Clause 5.6.6(h) of the National Electricity Rules. It relates to a proposal for a new large transmission network asset that would address network limitations affecting the electricity network supply to the Nowra area.

The proposal is addressing reliability requirements in NSW and is evaluated in accordance with the "least cost" test for reliability augmentations in accordance with the Australian Energy Regulator's regulatory test.

Section 1 provides the context of this final report within the regulatory process and summarises the outcomes of that process.

Section 2 describes in detail the regulatory requirements relating to proposals for new large transmission network assets, the existing supply arrangements, nature of the growing load in the Nowra Area and the network limitations that give rise to a need to augment supply to the area. The agreed network performance requirements (planning criterion) against which the need and effectiveness of augmentation options are assessed are also described.

In Section 3 four network augmentation options are described. Each option involves the construction of a double circuit 330 kV transmission line from the Kangaroo Valley – Capital Wind Farm 330 kV transmission line, the construction of a 330/132 kV substation initially with a single transformer and the construction of 132 kV lines by Integral Energy from TransGrid's 330 kV substation to their 132 kV network in the area and the construction of a 132/33 kV substation.

In Section 4 the results of an application of the regulatory test to the options are presented.

The main conclusion is that Option 4 Tomerong is the least cost option in all cases and satisfies the regulatory test. Additionally, Option 4 is preferred on the basis of shorter lengths of new line construction and avoiding the impact on an existing residential community to the east of the site in the case of Option 2, Braidwood Road. Option 4, Tomerong would relieve present and emerging network limitations in the Nowra Area for the foreseeable future.

Given that the constraint is existing, the timing of the requirement for reinforcement of supply is 2014 which is the earliest the development can be achieved if the decision to proceed is taken in 2010.

Consequently the proposed actions are for TransGrid and Integral Energy to construct the Option 4 works described in Section 3.4 by early 2014. The TransGrid component of the works are estimated to cost $45.6m and the Integral Energy component is $25.6m (2009$).

1. Introduction

1.1. Purpose and Scope

TransGrid owns the majority of the transmission network within NSW and is responsible, inter alia, for planning and developing its network to meet the requirements of customers within the State and to facilitate operation of the National Electricity Market (NEM). Integral Energy owns the 132 kV network which supplies the south coast of NSW. As part of its planning responsibilities and the requirements of the National Electricity Rules (the Rules) TransGrid consults with NEM registered participants, AEMO and interested parties on emerging limitations within its transmission network and options being considered to relieve them.

TransGrid and Integral Energy have responsibilities under the Rules to carry out joint planning to facilitate the optimal development of their networks.

This final report has been prepared in accordance with Clause 5.6.6 (h) of the Rules. It relates to a proposal for a new large transmission network asset that will address limitations in the capacity of the transmission networks supplying the Nowra Area.

It includes:

- A summary of the load forecast for the area;
- A description of the network reliability criterion that has been adopted for planning purposes;
- A description of the network limitations identified by TransGrid and Integral Energy that have led to a necessity for augmentation of the transmission networks supplying the Nowra Area;
- A description of all reasonable network and non-network options that have been identified to meet these limitations;
- An analysis of the ranking of these options in accordance with the Australian Energy Regulator's (AER's) regulatory test;
- An assessment of the outcome of the regulatory test and proposed course of action; and
- Information that may be relevant to persons who may wish to dispute any aspect of this final report.

1.2. Outline of Consultation Process

TransGrid has published a description of the need for the reinforcement of the transmission network in the Nowra area in its Annual Planning Reports (APRs) in 2007, 2008, 2009 and 2010. The 2009 APR foreshadowed the release of an application notice addressing these needs in 2009/10. The 2010 APR foreshadowed that the regulatory process would be completed in 2010.

In March 2010 TransGrid and Integral Energy published an application notice covering a proposal for a new large transmission network asset that would address the network limitations described in Section 2.6. A summary of the application notice was published on AEMO's website on 5th March 2010. Interested parties were invited to make submissions in the period to 20th April 2010. One submission was received from the proponent of the Bamarang generation project. This is further discussed in Section 2.12

This final report covers consultation and application of the regulatory test to reasonable network and non-network options to meet existing network limitations affecting the Nowra area and is the first step in the formal consultation process that is required by the Rules.

TransGrid and Integral Energy have applied the regulatory test to all known reasonable options to meet the network limitations described in this final report and have determined the option that satisfies the test.

Accordingly TransGrid and Integral Energy have completed their obligations under clause 5.6.6(b) of the Rules and will proceed in accordance with the proposed actions detailed in Section 5 of this final report.

Person's wishing to dispute any aspect of this final report are referred to Section 6.

A summary of this final report has been posted on AEMO's website.

2. Identification of a Necessity for Augmentation

2.1. Regulatory Requirements

2.1.1. Requirements of the National Electricity Rules

This final report covers a proposal for a new large transmission network asset.

Following consultation undertaken in accordance with the National Electricity Rules, the Australian Energy Market Commission (AEMC) made the National Electricity Amendment (Regulatory Investment Test for Transmission) Rule 2009 No.15 which commenced operation on July 2009[1]. The intention of this Rule is to replace the Regulatory Test and the associated consultation process undertaken by Network Service Providers for solutions to network constraints. Transitional provisions set out in Chapter 11 grandfather the key elements of the old rule for consultations commenced prior to 1st August 2010 including the consultation process and applicable economic test.

In accordance with those transitional provisions, this final report being part of a current application as at 1st August 2010 and associated consultation is based on:

- Version 29 of the National Electricity Rules;
- Version 3 of the Australian Energy Regulator's Regulatory Test; and
- The Australian Energy Regulator's Regulatory Test Guidelines issued November 2007.

The requirements for new large transmission network asset proposals are set out in Clause 5.6.6. This requires applicants (in this case TransGrid) inter-alia to:

- Set out the reasons for proposing the new large transmission network asset, including the actual or potential constraint or inability to meet network performance requirements;
- Describe all reasonable network and non-network options to address the constraint;
- Rank the options in accordance with the principles of the AER's regulatory test including detailed analysis of why the applicant considers the new large transmission network asset satisfies the regulatory test;
- Where relevant, provide analysis of why the applicant considers the new large transmission network asset is a reliability augmentation; and
- Provide an augmentation technical report or consents to proceed from affected TNSPs if the new large transmission network asset is likely to have a material inter-network impact.

These requirements are underpinned by Clauses 5.6.2 (a), (b) and (c) of the Rules, which require network service providers to:

- Analyse their networks and conduct joint annual planning reviews to identify necessities for augmentation or extension of those networks; and
- Undertake joint planning in order to determine plans that can be considered by registered participants, AEMO and interested parties.

2.1.2. Requirements of the Regulatory Test

The regulatory test may be applied in either one of two ways. The regulatory test states that an option satisfies the test if:

(a) in the event the option is necessitated principally by the inability to meet the service standards linked to the technical requirements of schedule 5.1 of the NER or in applicable regulatory instruments - the option minimises the costs of meeting those requirements, compared with alternative option/s in a majority of reasonable scenarios;

(b) in all other cases - the option maximises the expected net economic benefit to all those who produce, consume and transport electricity in the national electricity market compared to the likely alternative option/s in a majority of reasonable scenarios. Net economic benefit equals the market benefit less costs.

[1] The Rule As Made and Determination is published on the AEMC's website at http://www.aemc.gov.au/Electricity/Rule-changes/Completed.html

The Rules define a reliability augmentation as:

> A transmission network augmentation that is necessitated principally by the inability to meet the minimum network performance requirements set out in schedule 5.1 or in relevant legislation, regulations or any statutory instrument of a participating jurisdiction.

Thus for reliability augmentations clause (a) of the test should be used. That is for reliability augmentations the option that satisfies the regulatory test is the one that minimises the cost of meeting the minimum network performance requirements set out in schedule 5.1 of the Rules or via a jurisdictional or customer requirement.

For reliability augmentations, the Regulatory Test requires each option being assessed should be:

- a genuine option in that it has a clearly identifiable proponent and meets the reliability requirements; and
- is a practicable alternative and technically feasible.

2.2. Requirements of the Energy Services Corporations Act

TransGrid's enabling legislation is the Energy Services Corporation Act 1995. Section 6B of the Act sets out the five principal objectives which in summary are:

1. To be a successful business. This includes:
    a. To operate at least as efficiently as any comparable business;
    b. To maximise the net worth of the State's investment in it;
    c. To exhibit a sense of social responsibility by having regard to the interest of the community in which it operates;
2. To protect the environment by conducting its operations in compliance with the principles of ecologically sustainable development;
3. To exhibit a sense of responsibility to regional development;
4. To operate efficient, safe and reliable facilities; and
5. To promote effective access.

It is important to note that the Act explicitly identifies that each of these objectives is of equal value, and thus a balanced approach must be taken in decision making to reflect this obligation. In particular it is worth noting that efficiency is not superior to the environment or the community.

When developing options to overcome actual or potential network constraints, TransGrid initially assesses possible options against the above requirements and then applies the regulatory test to those which satisfy them.

Possible options which were considered but not pursued are described in Section 3.5.

2.3. Jurisdictional Requirements – Reliability Criterion

As stated in its Annual Planning Report, TransGrid is expected by the NSW jurisdiction to plan and develop its transmission network on an "N-1" basis. That is, unless specifically agreed otherwise by TransGrid and the affected distribution network owner or major directly connected end-use customer, there will be no inadvertent loss of load (other than load which is interruptible or dispatchable) following an outage of a single circuit (a line or a cable) or transformer, during periods of forecast high load.

These requirements are underpinned by the introduction in 2005 of mandatory licence conditions for Distribution Network Service Providers (DNSPs) which inter-alia set out reliability standards for subtransmission and distribution networks. The licence conditions for Integral Energy specify N-1, one minute reliability levels for subtransmission lines and zone substations supplying loads greater than or equal to 10 MVA in urban and non-urban areas. Consequently Integral Energy has requested TransGrid to incorporate N-1 reliability levels into its planning standards and processes.

Accordingly TransGrid and Integral Energy have jointly agreed that the network performance requirements for reliability to be applied to transmission networks in the Nowra area are as follows:

1. With all network elements in service, the loading on each element is not to exceed the continuous rating of that element.

2. Following outage of one network element, the loading on each remaining element is not to exceed the short time emergency rating of that element whilst operator actions, such as opening of other network elements and transferring of loads via lower voltage networks, are taking place.
3. With one network element out of service and following operator actions:
    - The loading on each remaining element is not to exceed the contingency rating of that element;
    - The voltage levels at end-user premises are to be within acceptable levels following switching of reactive plant and operation of transformer tap-changers.

In terms of network reliability standards as described in the Rules, this constitutes a nominal "N-1" reliability criterion (as described in S5.1.2.2 (b) (4)).

2.4. Supply Arrangements in the Nowra area

The present transmission system supplying the NSW South Coast area from Dapto as described in this document includes the local government areas of Shellharbour, Kiama, Shoalhaven and Eurobodalla. They have a total population of around 214,000. The electrical load is characterised primarily by residential loads with some commercial and light industrial loads in the major population centres, rural and agricultural loads in surrounding areas and holiday loads.

TransGrid's and Integral Energy's transmission network serving the Nowra area is shown in Figure 1 with the Nowra area of interest indicated by the dotted ellipse and in schematic form in Figure 2.

The 132 kV transmission system supplying the Nowra area continues south to supply Integral Energy's Ulladulla 132/11 kV substation and then to supply Country Energy's 132 kV substations at Batemans Bay and Moruya North. Other transmission infrastructure in the far south of the state include 132 kV supplies at Bega owned by Country Energy and supplied from TransGrid's Cooma 132 kV substation via a 132 kV system emanating from Canberra.

A development in the Nowra area (of relevance to but not covered by this final report) is planned and includes a 132/33 kV substation in the Tomerong area south of Shoalhaven by Integral Energy to address constraints in the Shoalhaven 33 kV network.

Figure 1 Transmission Network Serving South Coast and Nowra Area

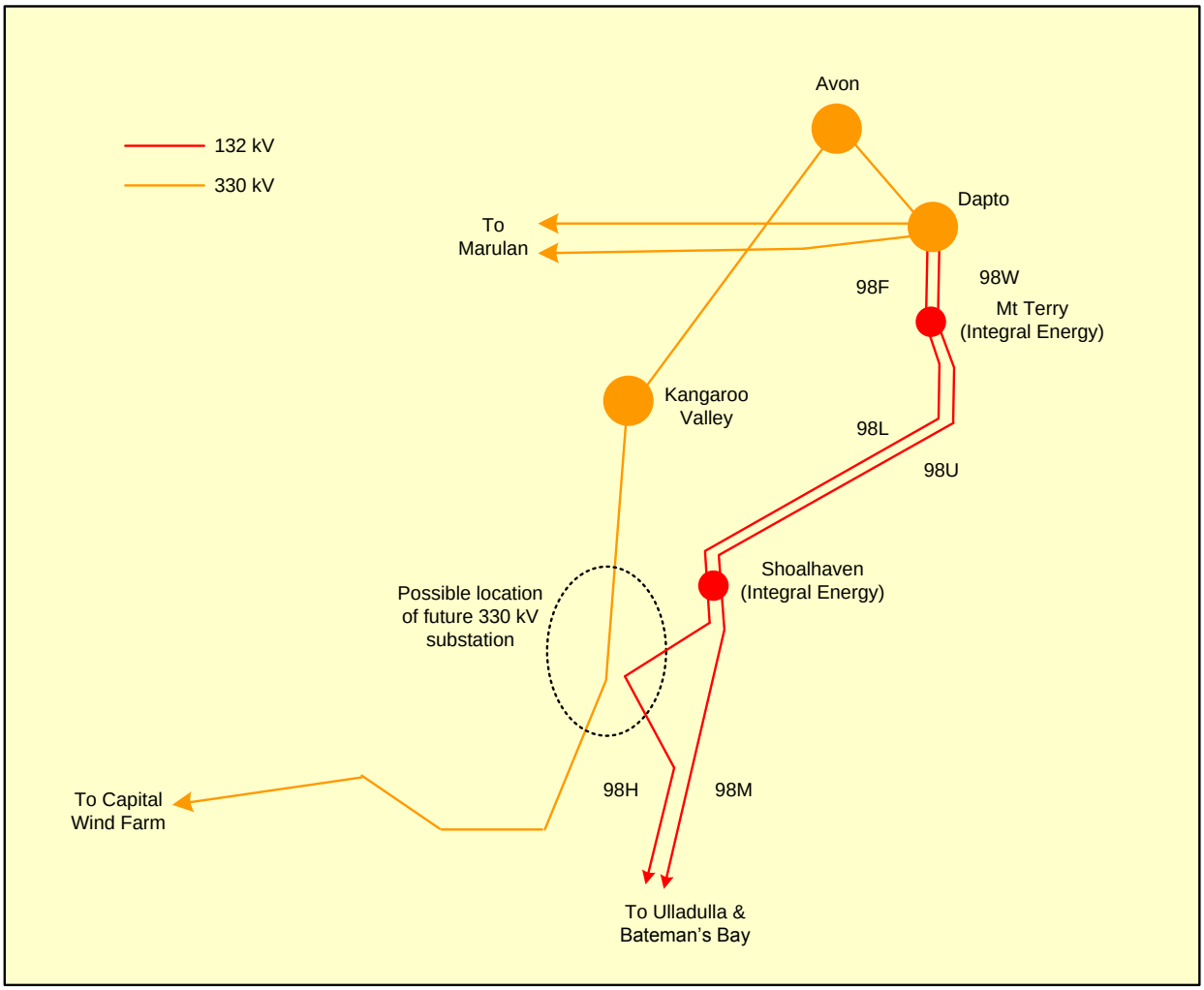
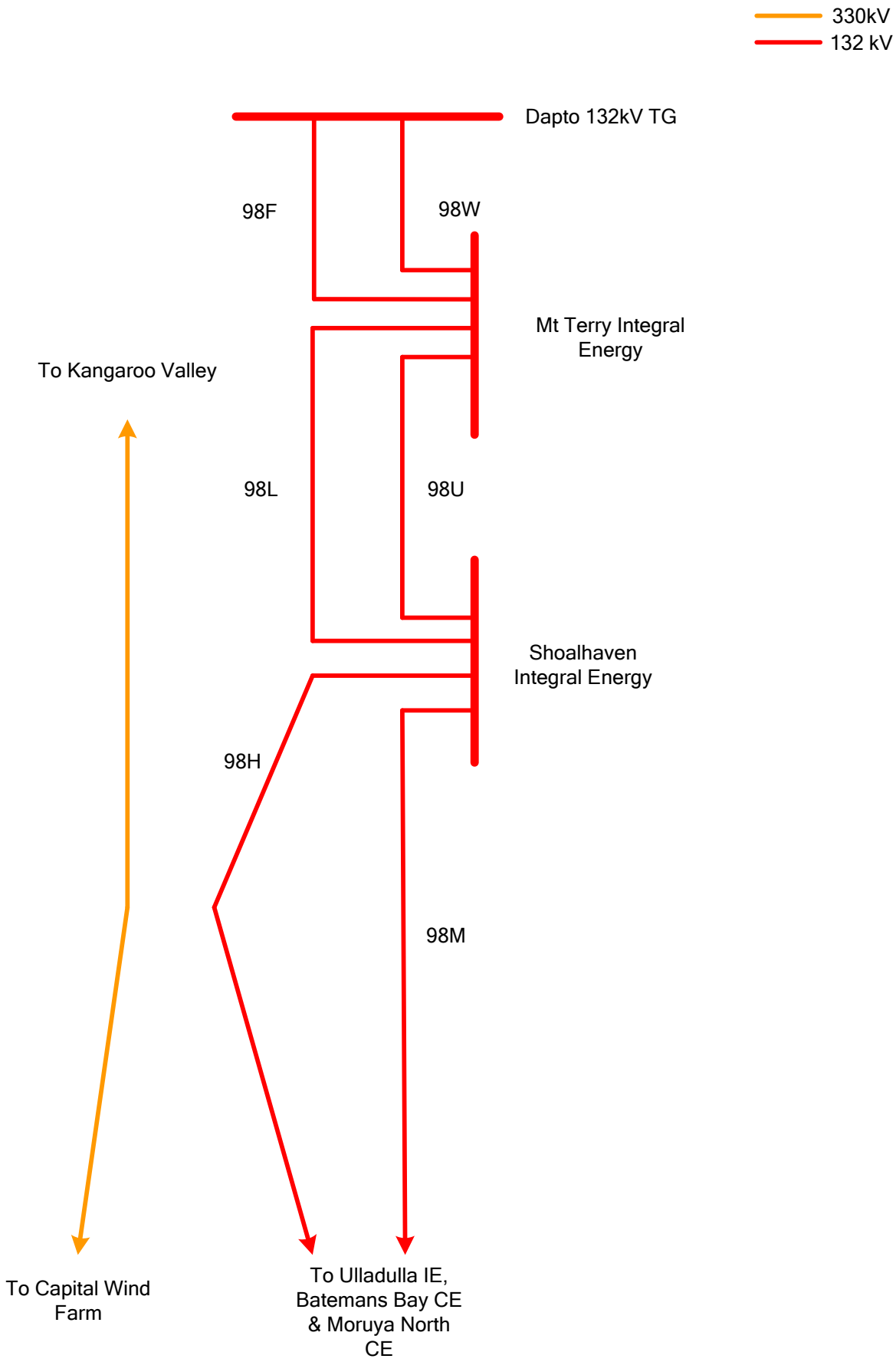


Figure 2 Schematic Transmission Network Connections in the Nowra Area



2.5. Local Load Forecast

The load in the Nowra area and areas of interest is growing strongly with the holiday load of particular concern. Table 1 and Table 2 show the forecast summer and winter maximum demands (in MVA).

Table 1 Forecast Summer Maximum Demands for the Nowra area and areas of interest (MVA)

Substation	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	Firm Rating
Mt Terry IE	98	101	106	^77.5	79	80.6	82.2	83.6	85	86.4	**120**
Shoalhaven IE	109.9	113.7	115.6	117.9	122.7	126.2	130.4	135.4	141.3	148.4	**120**
Ulladulla IE	23	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	**30**
Batemans Bay CE	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	**30**
Moruya North CE	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	**30**
Total	275	282	289	185	269	275	280	287	294	303	
Diversified Total	261	268	275	176	256	260	266	273	279	288	

Tomerong Deleted from Forecast to show constraint at Shoalhaven and Ulladulla
^ Transfer of Dapto Zone Substation (Mt Terry 132/33 kV substation to Springhill 132/33 kV substation under approved project, driven by Mt Terry constraint)

Table 2 Forecast Winter Maximum Demands for the Nowra area and areas of interest (MVA)

Substation	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Firm Rating
Mt Terry IE	139	140	114^	115	116	117	118	119	120	121	**120**
Shoalhaven IE	120	122	127	129	134	136	139	142	145	148	**120**
Ulladulla IE	30.8	31.3	31.8	32.4	32.9	33.4	33.6	33.8	34	34.2	**30**
Batemans Bay CE	28	28.5	29	29.5	30.1	30.6	31.2	31.7	32.1	32.5	**30**
Moruya North CE	28	28.5	29	29.5	30.1	30.6	31.2	31.7	32.1	32.5	**30**
Total	346	352	330	336	343	348	353	357	363	368	
Diversified Total	329	334	313	319	326	331	335	340	346	350	

Tomerong Deleted from Forecast to show constraint at Shoalhaven and Ulladulla
^ Transfer of Dapto Zone Substation (Mt Terry 132/33 kV substation to Springhill 132/33 kV under approved project, driven by Mt Terry constraint)

The above forecasts suggest that a new 132/33kV substation at Tomerong is required as described in Section 2.4 to relieve Integral's 33kV network in the area. This new substation would reduce the loading of the existing Shoalhaven and Ulladulla substations, as shown in Table 3.

Table 3 Substation Off-loaded by New Substation

New Substation	Existing Substations Off-loaded
Tomerong	Shoalhaven and Ulladulla

2.6. Network Limitations

The transmission network supplying the Nowra area is affected by network limitations which are described in the following sections.

2.6.1. Outage of the Dapto – Mt Terry 132 kV Line 98F or 98W

An outage of either of these two feeders results in a loading of the remaining feeder exceeding its thermal rating. This constraint presently exists at 98 MVA above the rating of the remaining feeder and by 2019 the load at risk is expected to rise to 116 MVA.

2.6.2. Outage of the Mt Terry - Shoalhaven 132 kV Line 98L or 98U

An outage of either of these two feeders results in a loading of the remaining line exceeding its rating. This constraint presently exists at 28 MVA above the rating of the remaining feeder and by 2016 the load at risk is expected to be 62 MVA.

2.6.3. Outage of the Evans Lane – Moruya North 132 kV Line 98H/3

An outage of this feeder results in the remaining feeders (98M/3 and 98T) carrying the combined loads of Moruya North and Batemans Bay. This results in low incoming voltage levels at Moruya North to a degree that the on-load tapchangers can only correct the voltage levels up to the loading levels in 2013. This constraint will require load shedding of approximately 50% (20 MVA) of the combined Moruya North and Batemans Bay load to maintain voltage levels within acceptable limits. Integral Energy has an approved project to install reactive support at Shoalhaven 132/33 kV substation to improve the voltage profile on the 132 kV system and this support has been included in the assessment of this constraint.

2.7. Joint Planning

TransGrid and Integral Energy have carried out annual joint planning reviews as required by Clause 5.6.2 (b) of the Rules. As required by Clause 5.6.2(c) they have identified that the network limitations outlined in Section 2.6 give rise to a need for network augmentations and have carried out joint planning to determine options for these augmentations.

2.8. Reliability Augmentation

It follows from Sections 2.1 – 2.6 that the proposals covered by this final report constitute a reliability augmentation and that the regulatory test should be applied in accordance with Clause 1(a) of the test.

2.9. Material Inter-network Impact

The Rules require TransGrid to assess whether a proposed new large transmission network asset is reasonably likely to have a material inter-network impact.

TransGrid has determined that none of the options described in Section 3 would impose power transfer constraints or adversely impact on the quality of supply to adjoining transmission networks. There is no material inter – network impact.

2.10. Consideration of Demand Management

As discussed in Section 1.2 the network limitations described in Section 2.6 have previously been described in TransGrid's Annual Planning Reports for 2007, 2008, 2009 and 2010.

Integral Energy implemented a demand management program for the Nowra and South Nowra areas primarily to assist in the deferment of the augmentation of the Nowra distribution network. The program targeted the commercial and industrial areas and achieved a demand reduction of 0.5 MVA. The program area is dominated by small to medium enterprises which made it difficult to identify and implement cost effective demand reducing initiatives.

The south coast area, for which this project covers, is dominated by a rural/residential load type and to a certain extent, tourism. At this stage, there are few DM initiatives that effectively address this load type. As detailed in section 2.6, up to 116 MVA of demand reduction is required by 2017 to maintain the subtransmission network within the N-1 load at risk (LAR) criterion. This exceeds both the TransGrid NSW jurisdiction requirements and the mandatory licence conditions for DNSPs.

The top 10 peak demand profiles for winter 2008 and summer 2008/09 are within 10 MVA of the maximum peak at Shoalhaven TS, the major load point for the south coast. This indicates that the peak demand for this area is consistent and not driven by unusual events.

Demand management is not considered feasible for this project for the following reasons:

- Up to 116 MVA of demand reduction is required over a seven year period
- The load type of the area cannot deliver this level of demand reduction
- The current level of LAR contravenes regulatory requirements for network security
- Previous demand management programs have delivered low levels of demand reduction

2.11. Consideration of Generation Proposals

The Nowra area has been identified by a number of generation developers as a prospective area for the establishment of generation. The Australian Energy Market Operator (AEMO) applies strict criteria when defining the status of a proposed generation project. These criteria introduce a consistent approach to forecasting the impact of a proposed project on NEM operations. To be considered as committed, a project (including upgrades) must satisfy all of the following criteria:

- The project proponent has leased or acquired, or commenced legal proceedings to lease or acquire, land for the construction of the project.
- Contracts for the supply and construction of major plant or equipment (generators, turbines, boilers, transmission towers and conductors), including contract provisions for project cancellation payments, have been executed.
- The project proponent has obtained all required planning and construction approvals and licences, including completed and approved environmental impact statements (which include planning and environmental approvals from duly authorised planning bodies at both State and Federal Government levels).
- Financing arrangements for the proposal, including debt plans, have been finalised and contracts executed.
- Construction has either commenced or a firm date has been set for it to commence.

The above criteria are consistently adopted within the National Electricity Market to assess whether a generation proposal has achieved committed status. Should a generation option not have achieved committed status then the full capital cost along with the operating cost must be included in the economic evaluation.

Delta Electricity has developed a generation option for a site at Bamarang, south of Nowra. The project is the subject of a number of applications by Delta Electricity and approvals by the NSW Department of Planning[2].

In this final report all options are assessed on the basis that Delta Electricity's Bamarang Generation Project is not committed. Should this generation project be committed prior to the conclusion of the regulatory process, TransGrid and Integral Energy will undertake a review and take account of this change in status. As the outcome of any review will depend on circumstances prevailing at the time it arises, it would not be prudent at this time to predict the outcome.

2.12. Submissions Received

The application notice invited submissions from interested parties closing on 20th April 2010.

One submission was received from Delta Electricity. TransGrid and Integral Energy have provided a detailed response to Delta Electricity.

A number of points have been raised by Delta in relation to their Bamarang generation project which is mentioned in Section 2.11. It is important to note that this regulatory consultation process is in accordance with Version 29 of the Rules and the Regulatory Test applying as detailed in Section 2.1.1.

A summary of Delta's main points is as follows:-

- The Department of Planning is considering and has approved a number of aspects of this project
- Option 1, Bamarang should have been included as an option for analysis in the application of the regulatory test
- Option 1 is cheaper than Option 2 one of the options chosen for analysis
- All options are assessed on the basis that Bamarang is not a committed project but a review should be undertaken should the circumstances change
- Option 1 line works feasibility and planning approval have been carried out or are under way and Delta disagree with the "extremely difficult" assessment for Option 1 line connections

The main points TransGrid and Integral Energy have made in response to the submission are as follows:-

- TransGrid and Integral Energy are obliged to consider the circumstances in place at the time. The committed project status criteria are detailed in the application notice
- The two options with the highest prudency ranking detailed in Section 3 were selected for analysis in the preliminary application of the regulatory test

[2] Full details of the applications made by Delta Electricity and any approvals by the NSW Department of Planning can be found at http://majorprojects.planning.nsw.gov.au/page/determinations/

- If Option 1 had been included in the efficiency analysis the outcome would have been the same as Option 1 is significantly more expensive than Option 4
- Certain aspects of the environmental approval obtained by Delta for 132 kV connection circuits would have to be revisited as a suitable connection requires a line with a larger structure than that submitted for environmental approval and the relocation of lower voltage lines
- The transitional provisions in the Rules provide that a current application commenced before 1st August 2010 can be concluded from 1st August 2010 under those same Rules

TransGrid and Integral Energy have considered the content of Delta Electricity's submission and have decided to proceed with the final report as the next step in the regulatory consultation process.

3. Options

TransGrid and Integral Energy have developed the four network options to meet the network limitations described in Section 2.6. They all involve construction of a new 330/132 kV substation initially with a single transformer and sections of 330 kV and 132 kV line to connect to TransGrid's and Integral Energy's networks in the area. For each option the substation works would be similar as would the length of 330 kV line.

These options are described in sections 3.1 to 3.4. The location of the four sites is shown in Figure 3. Substation single line diagrams are shown in Appendix B and Appendix C.

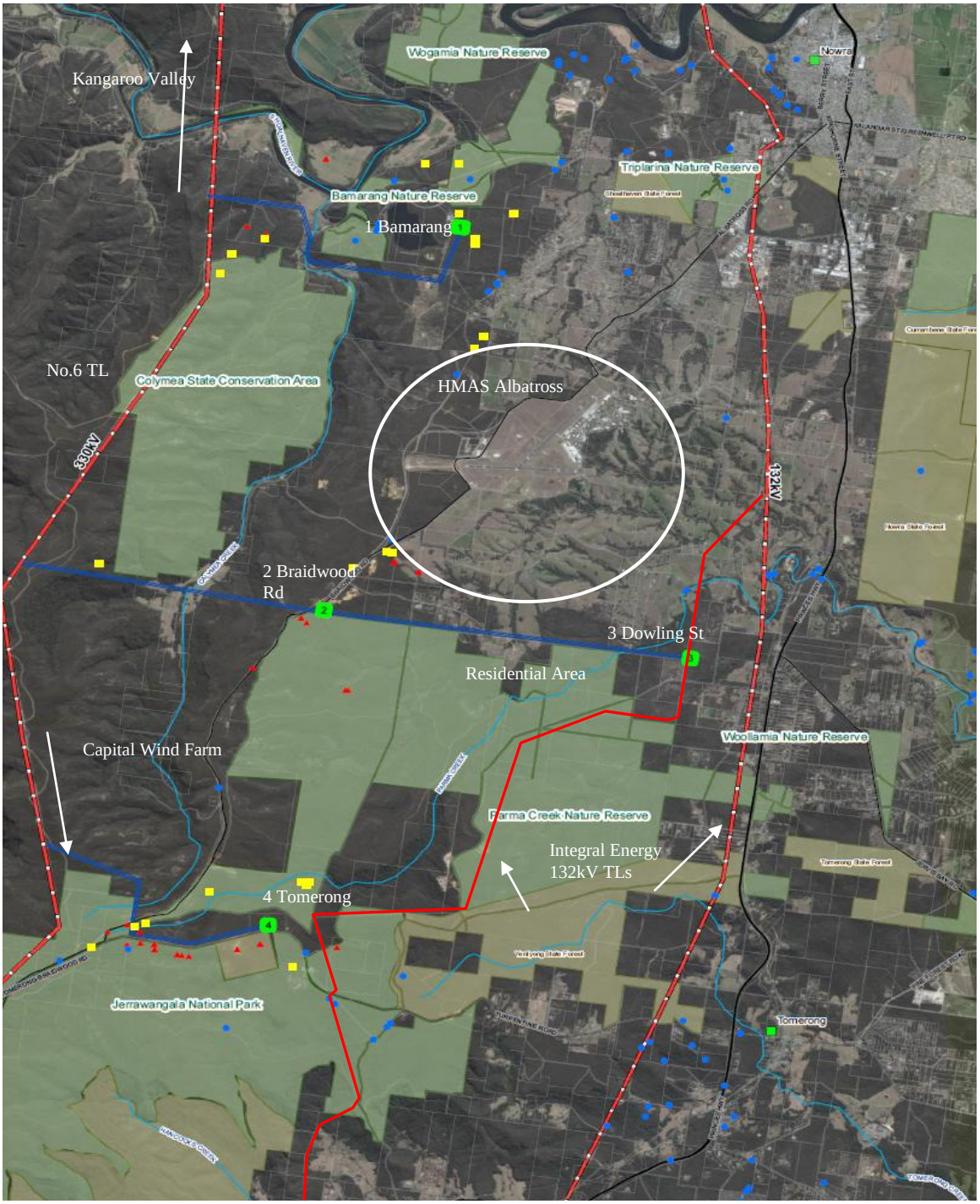
The options considered include works providing sufficient capacity to address all existing and emerging network limitations in the transmission network supplying the Nowra area over the planning horizon. Each of the four 330/132 kV substation site options were assessed for prudency against a range of criteria including, but not limited to:

- Site Characteristics
- Line connections
- Cost
- Impact on local community
- Vegetation clearing; and
- Visual Impact.

Each of the criteria were suitably weighted. The four 330/132 kV substation sites were assessed against the weighted criteria and ranked for prudency. The two options assessed to be the most prudent were then subject to an application of the Regulatory Test to assess efficiency.

Other developments that were considered but not pursued are described in section 3.5.

Figure 3 Options for New Substation Sites Considered



3.1. Option 1 – Bamarang

Option 1 would involve:

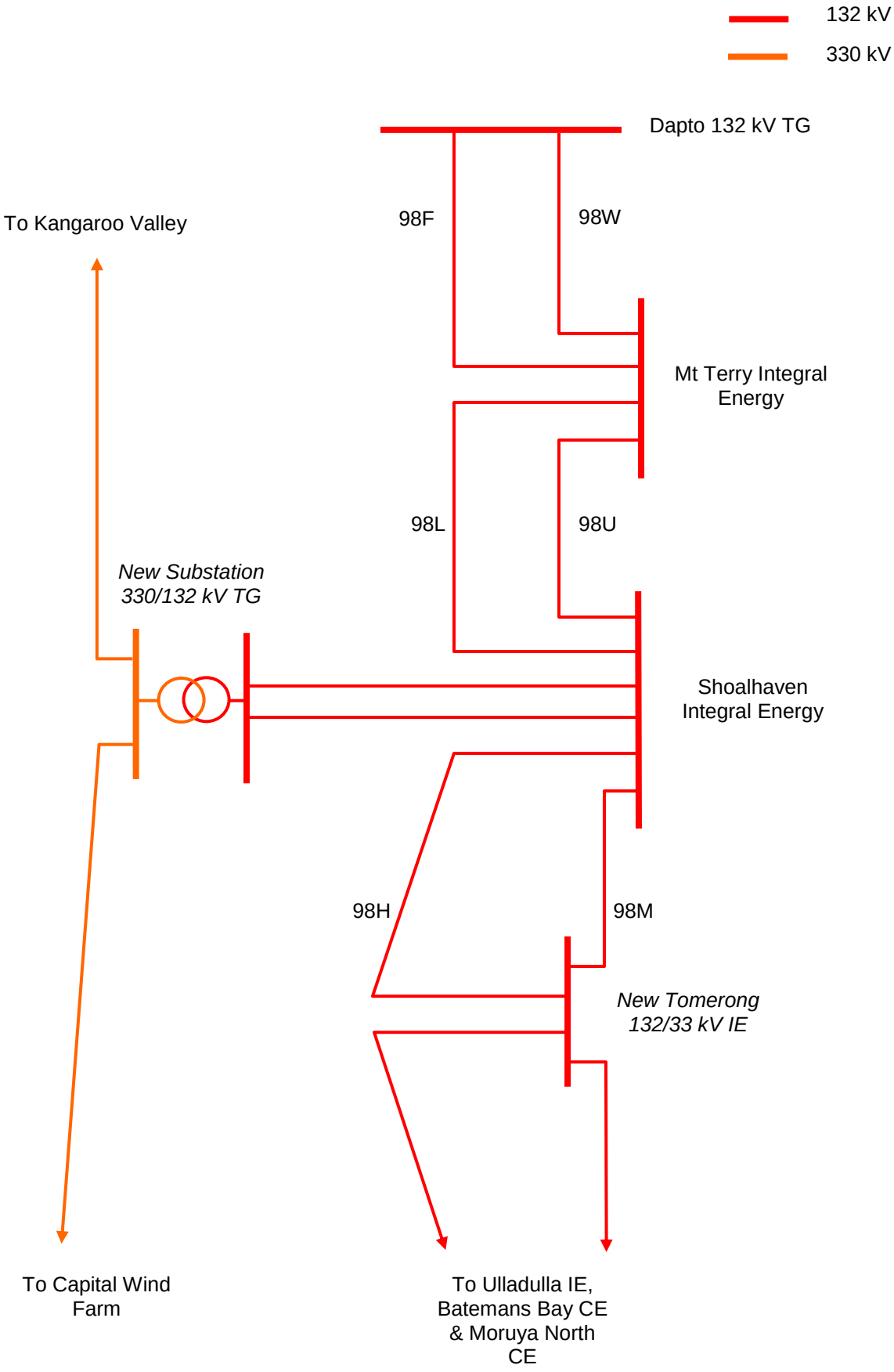
- Acquisition of a site and construction of a new 330/132 kV substation;
- Construction of a new double circuit 330 kV line between the 330/132 kV substation and a suitable point on the Kangaroo Valley – Capital Wind Farm 330 kV line to the west of the new site;
- Construction of new 132 kV lines to the east of the new substation to connect to the Integral Energy system in the area. The connection of these feeders would to Integral's Shoalhaven substation for this option.

The Integral Energy works that would be required under this option are detailed below. These works take account of the fact that Integral Energy has identified a suitable site for the establishment of its proposed 132/33 kV transmission substation on Blackbutt Range Rd.

1) Establish the new 132/33 kV substation with 4 x 132 kV feeder bays, 9 x 33 kV feeder bays, 2 x 60 MVA transformers with provision for a future 3rd transformer
2) Establish two (2) new 132 kV feeders (concrete pole, 220 MVA rating in delta construction) between the 132/33 kV substation and feeder 98H along Blackbutt Range Road (total length of 10 km, 2 x 5.0 km)
3) Cut in existing feeder 98M into Integral's new 132/33 kV substation (2 x 100 m sections in concrete pole, 220 MVA rating in delta construction)
4) Establish two (2) new 132 kV feeders (concrete pole, 220 MVA rating in delta construction or twin circuit on single steel pole construction) between the Bamarang TransGrid site to a transition point site along Yalwal Road using the road shoulder and existing easements (total length of 12.0 km; 2 x 6.0 km)
5) Continue the two 132 kV feeders (underground, 220 MVA rating in trefoil construction; single 800XLPE) between the transition point site and Shoalhaven 132/33 kV substation (IE) along Yalwal Road (total length of 2.6 km, 2 x 1.3 km)
6) The transition Point site would require attention to earthing design to minimise public risk
7) Establish two new 132 kV switchbays at Shoalhaven substation for connection of new feeders from the new TransGrid 330/132 kV substation
8) Relocate / Underground existing 33 kV construction (total length of 6.0 km)
9) Relocate / Underground existing 11 kV construction (total length of 5.0 km)

Figure 4 below shows the proposed arrangement for this option.

Figure 4 Option 1 - Bamarang Site Arrangement



Attributes of this option

This option is assessed on the basis that the Bamarang generation proposal is not committed and the substation and connecting line works proceed independently of the power station.

Option 1 site has extremely difficult 330 kV and 132 kV line construction requirements due to the nature of the terrain and the environmental impact is assessed to be greater than the alternative network options.

The prudency assessment ranking of this option is No.3.

Line lengths

330 kV line 6.5 km double circuit

132 kV 24.8 km (comprising various segments as detailed above)

The estimated cost for the Integral Energy component of these works is $40.6m. This estimate does not include connection costs to integrate Integral's 132/33 kV substation into the local 33 kV subtransmission system. This component of the works would be constant for all of the options considered.

3.2. Option 2 - Braidwood Road

Option 2 would involve:

- Acquisition of a site and construction of a new 330/132 kV substation;
- Construction of a new double circuit 330 kV line between the 330/132 kV substation and a suitable point on the Kangaroo Valley – Capital Wind Farm 330 kV line to the west of the new site;
- Construction of new 132 kV lines to the east of the new substation to connect to the Integral Energy system in the area. The connection of these feeders from the new 330/132 kV substation would be cut into feeder 98H south of Shoalhaven substation for this option.

From Integral's perspective, the requirements for this proposal are similar to that of the Bamarang proposal, except that the two lines to the 330/132 kV substation cut into existing feeder 98H, with no additional switchbays required at Shoalhaven substation. The initial works are summarised as follows:

1) Establish the new 132/33 kV substation with 4 x 132 kV feeder bays, 9 x 33 kV feeder bays, 2 x 60 MVA transformers with provision for a future 3rd transformer
2) Establish two (2) new 132 kV feeders (concrete pole, 220 MVA rating in delta construction) between Tomerong 132/33 kV substation and feeder 98H along Blackbutt Range Road (total length of 10 km, 2 x 5.0 km)
3) Cut in existing feeder 98M into the new 132/33 kV substation (2 x 100m sections in concrete pole, 220 MVA rating in delta construction)
4) Establish two (2) new 132 kV feeders (concrete pole, 220 MVA rating in twin circuit on single steel pole construction) between the Braidwood Road site to existing feeder 98H, using the road shoulder (total length of 13.0 km, 2 x 3.3 km overhead and 2 x 3.2 km underground)

It should be noted that connection to this site via feeder 98H only would result in network constraints at a future date based on longer term forecasts for an outage of either feeder from the new 330/132 kV substation. Connection to feeder 98M (7.7 km from the 330/132 kV substation) would be required to relieve this constraint in the longer term but this second connection would be initiated at a later date to suit the growth in demand. The timing need for this second set of feeders is somewhat fluid, as the longer term forecast is based on Shoalhaven City Council's draft Nowra/Bombaderry Structure Plan of February 2006 which sets out the strategic direction for the next 20-30 years for this area. Future development in the Sussex Inlet area is also likely as documented in Shoalhaven City Council's Sussex Inlet Settlement Strategy of April 2006. For the purposes of this analysis it is estimated that the need will evolve at 2020.

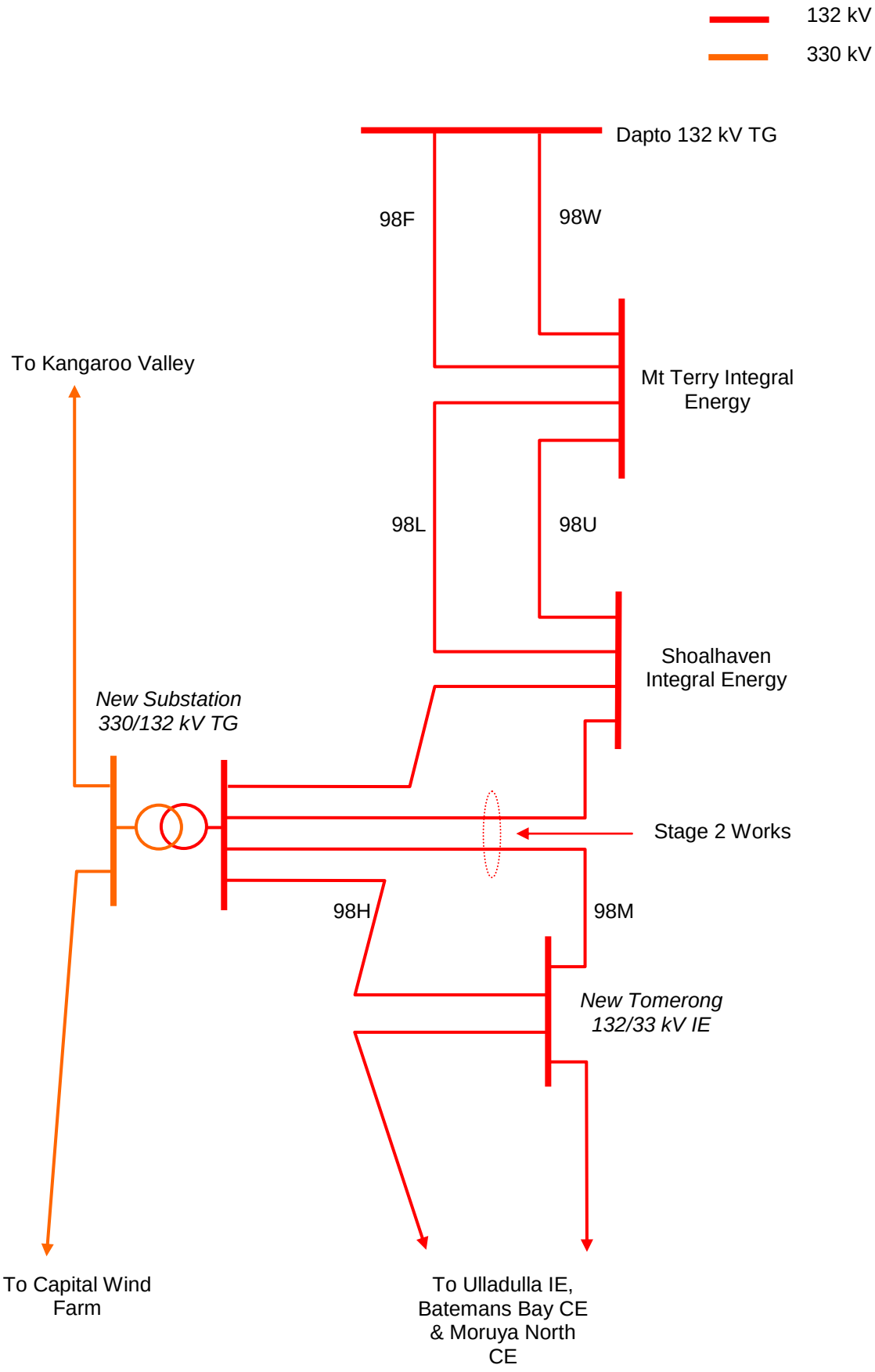
5) Establish two new feeders (concrete/steel pole, 220 MVA rating in twin circuit on single pole construction) between the Braidwood Road site to existing feeder 98M, using the road shoulder (total length of 15.4 km, 2 x 4.5 km overhead and 2 x 3.2 km underground).

This second set of feeders would be difficult to achieve due to lack of line routes for overhead options and may require that each of the two stages be built in twin circuit single structure construction.

Additionally this site poses a likely environmental and community risk due to the need to establish 132 kV line routes through small communities between the 330/132 kV substation and the connection points to IE feeders 98H and 98M. This aspect is likely to require undergrounding of the feeders between 330/132 kV substation and a location to the east of these communities and add substantial cost to this option.

Figure 5 below shows the proposed arrangement for this option.

Figure 5 Option 2 - Braidwood Rd Site Arrangement



Attributes of this option

Option 2 site is considered a feasible option with the main issues being the need to acquire a new site, perceived issues with the 132 kV line connections and their community impact to the east of the site and clearing of vegetation.

The prudency assessment ranking of this option is No.2.

Line lengths

330 kV line 6.0 km double circuit

132 kV 38.6 km (comprising various segments as detailed above)

The estimated cost for the Integral Energy component of these works is $53.9m. Of this amount the component required to be built in 2020 for the stage 2 works described above is $15.0m. This estimate does not include connection costs to integrate Integral's 132/33 kV substation into the local 33 kV subtransmission system. This component of the works would be constant for all of the options considered.

3.3. Option 3 - Dowling Street

Option 3 would involve:

- Acquisition of a site and construction of a new 330/132 kV substation;
- Construction of a new double circuit 330 kV line between the 330/132 kV substation and a suitable point on the Kangaroo Valley – Capital Wind Farm 330 kV line to the west of the new site;
- Construction of new 132 kV lines to the east of the new substation to connect to the Integral Energy system in the area. The connection of these feeders from the new 330/132 kV substation would cut into feeder 98H south of Shoalhaven substation for this option, in a similar manner as for the Braidwood Road option, but the 132 kV line lengths would be much shorter and not traverse sensitive small communities.

From Integral's perspective the requirements for this option are similar to that of the Bamarang proposal except that the two lines to the new 330/132 kV substation cut into existing feeder 98H with no additional switchbays required at Shoalhaven substation. The initial works are summarised as follows:

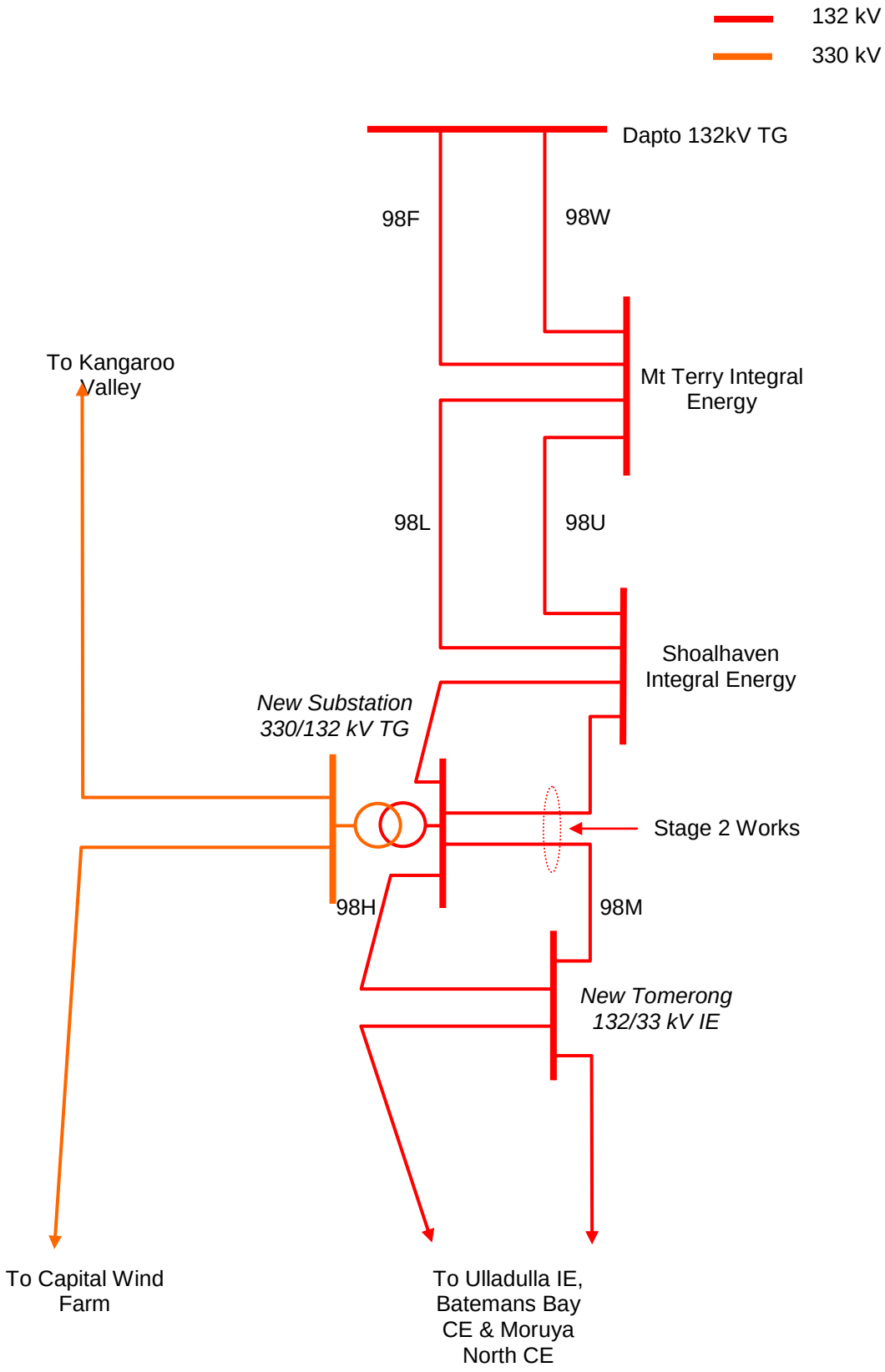
1) Establish the new 132/33 kV substation with 4 x 132 kV feeder bays, 9 x 33 kV feeder bays, 2 x 60 MVA transformers with provision for a future 3rd transformer
2) Establish two new 132 kV feeders (concrete/steel pole 220 MVA rating in delta construction) between the new 132/33 kV substation and feeder 98H along Blackbutt Road (total length of 10 km, 2 x 5.0 km)
3) Cut in existing feeder 98M into the new 132/33 kV substation (2 x 100m sections in concrete/steel pole 220 MVA rating in delta construction)
4) Cut existing feeder 98H to form two new 132 kV feeders into the Dowling Street (2 x 100m sections in concrete/steel pole 220 MVA rating in delta construction)

It should be noted that connection to this site via feeder 98H only would result in network constraints at a future date based on longer term forecasts for an outage of either feeder from the new 330/132 kV substation. Connection to feeder 98M (1.3km from the 330/132 kV substation) would be required to relieve this constraint in the longer term but this second connection would be initiated at a later date to suit the growth in demand. The timing need for this second set of feeders is somewhat fluid, as the longer term forecast is based on Shoalhaven City Council's draft Nowra/Bombaderry Structure Plan of February 2006 which sets out the strategic direction for the next 20-30 years for this area. Future development in the Sussex Inlet area is also likely as documented in Shoalhaven City Council's Sussex Inlet Settlement Strategy of April 2006. For the purposes of this analysis it is estimated that the need will evolve at 2020.

5) Establish two new 132 kV feeders (220 MVA rating in twin circuit on single pole construction) between the Dowling Street site to existing feeder 98M using the road shoulder (total length of 2.6 km, 2 x 1.3 km overhead)

Figure 6 below shows the proposed arrangement for this option.

Figure 6 Option 3 - Dowling Street Site Arrangement



Attributes of this option

Option 3 site is not preferred due to the high impact of the 330 kV transmission line on the community and substation developments occurring within close proximity to residential properties to the west of the site.

The prudency assessment ranking of this option is No.4.

Line lengths

330 kV line 12.5 km double circuit

132 kV 13.0 km (comprising various segments as detailed above)

The estimated cost for the Integral Energy component of these works is $26.8m. This estimate does not include connection costs to integrate Integral's 132/33 kV substation into the local 33 kV subtransmission system. This component of the works would be constant for all of the options considered.

3.4. Option 4 - Tomerong

Option 4 would involve:

- Construction of a new 330/132 kV substation on TransGrid's existing Tomerong site;
- Construction of a new double circuit 330 kV line between the 330/132 kV substation and a suitable point on the Kangaroo Valley – Capital Wind Farm 330 kV line to the west of the new site;
- Construction of a new 132 kV line to the east of the new substation to connect to the Integral Energy system in the area.

The requirements for connection to a Tomerong 330/132 kV substation are simplified, as follows:

1) Establish the new 132/33 kV substation with 3 x 132 kV feeder bays, 9 x 33 kV feeder bays, 2 x 60 MVA transformers with provision for a future 3rd transformer
2) Establish one (1) new 132 kV feeder (220 MVA rating in delta construction) between the new 132/33 kV substation and feeder 98H along Blackbutt Ridge Road (5.0 km), then along feeder 98H easement to the Tomerong BSP 330/132 kV substation site (3.3 km), total length of 8.3 km.
3) Cut in existing feeder 98M into Tomerong 132/33 kV (2 x 100 m sections in concrete/steel pole, 220 MVA rating in delta construction)
4) Cut in existing feeder 98H into Tomerong 330/132 kV substation (2 x 500 m sections in concrete/steel pole, 220 MVA rating in delta construction)

It should be noted that connection to this site via feeder 98H only together with the new line between the TransGrid 330/132 kV substation and the new Integral 132/33 kV substation would provide an arrangement that can cater for the area for the foreseeable future with no additional new lines required longer term.

Figure 7 below shows the proposed arrangement for this option.

Attributes of this Option

Option 4 is the preferred technical option due to :

- Simpler 330 kV and 132 kV line routes
- A large enough site is already owned by TransGrid
- Easements exist between the site and Integral's 132 kV line to the east
- There are access roads in close proximity, hence low community impact and least amount of clearing required of all the options.

In addition, Integral Energy requires only a single feeder between the proposed Tomerong 330/132 kV substation and Integral's proposed 132/33 kV substation. This would have the effect of significantly lowering Integral's line construction costs for this section by approximately half.

The prudency assessment ranking of this option is No.1.

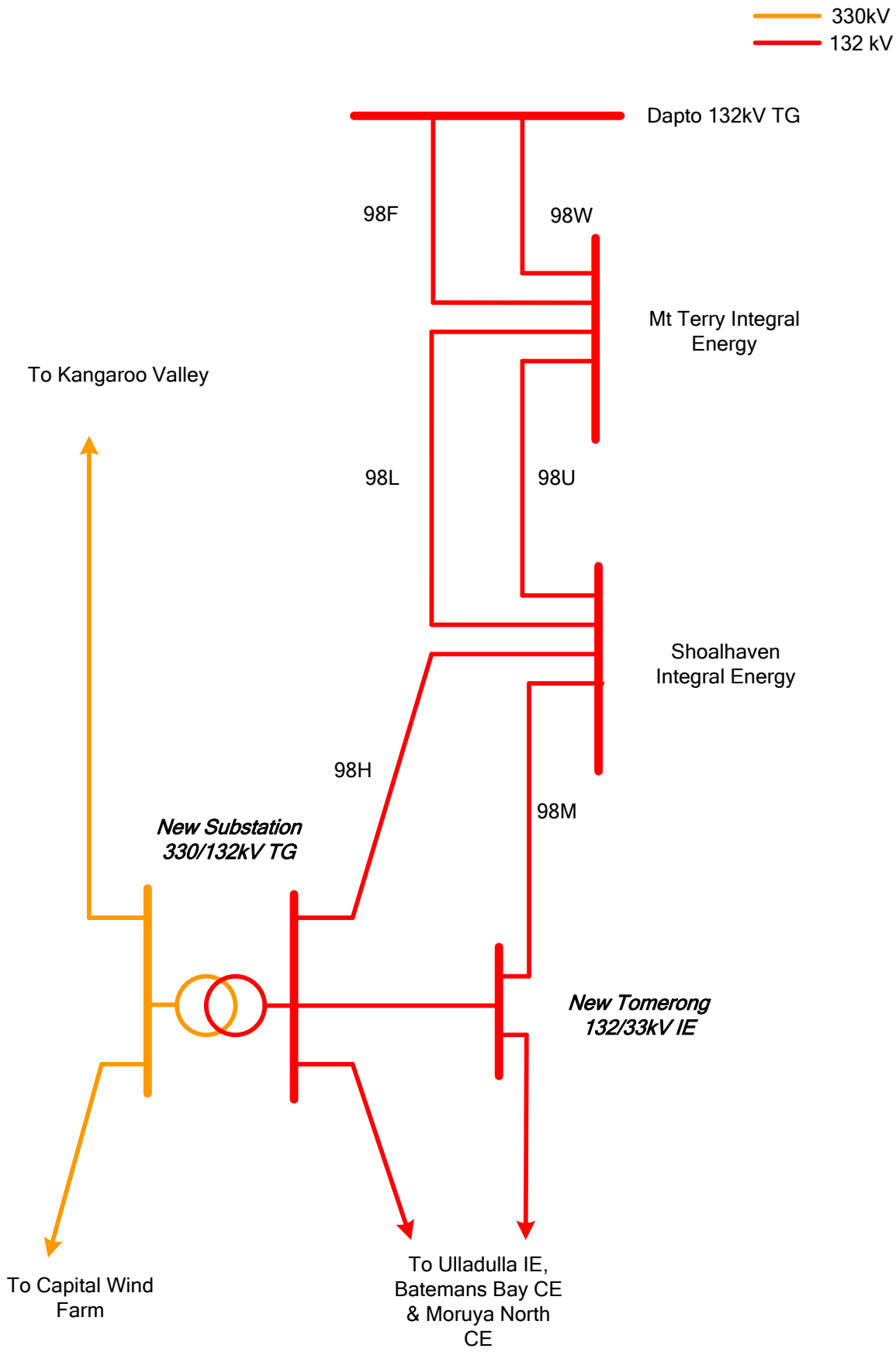
Line lengths

330 kV line 5.5 km double circuit

132 kV 9.5 km (comprising various segments as detailed above)

The estimated cost for the Integral Energy component of these works is $25.6m. This estimate does not include connection costs to integrate Integral's 132/33 kV substation into the local 33 kV subtransmission system. This component of the works would be constant for all of the options considered.

Figure 7 Option 4 - Tomerong Site Arrangement



3.5. Other Developments that were Considered

This section describes other developments that have been considered but not put forward as partial or complete options for various reasons.

3.5.1. Additional Dapto – Mount Terry – Shoalhaven 132 kV lines

Construction of additional 132 kV lines by Integral Energy to reinforce their Dapto to Mt Terry to Shoalhaven 132 kV system was considered in preliminary planning.

The alternate proposal to the establishment of a Nowra Area supply point is to provide additional capacity by establishment of an additional feeder from Dapto 330/132 kV Supply Point to Mt Terry 132/33 kV substation and from Mt Terry to Shoalhaven 132/33 kV substation. This proposal was considered in the earlier studies commissioned by both TransGrid and Integral Energy. The proposal was not favoured due to significant environmental constraints that were identified in constructing the additional new lines. The total line length would be in the order of 55km and would need to traverse residential and rural areas as well as National Parks and designated Forestry reserves.

3.5.2. Bega – Moruya 132 kV line

This development would form a very long 132 kV connection between Canberra and Dapto.

Flows in the connection would then be affected by flows in the main 330 kV and 500 kV network. Under some conditions the present limitations could be exacerbated.

Consequently this option was not pursued.

4. Application of the Regulatory Test

The four options were assessed for prudency according to the weighted criteria described in Section 3. Options 2 and 4 were considered to have the greatest merit. Therefore, an application of the regulatory test considering network Options 2 and 4 has been carried out to assess the efficiency of these options. A summary of the results is provided in the following sections.

4.1. Form of the Regulatory Test

As discussed in Section 2 the options covered by this final report are a reliability augmentation and the regulatory test is to be applied in accordance with clause 1(a) of the test:

(a) in the event the option is necessitated principally by inability to meet the service standards linked to the technical requirements of schedule 5.1 of the NER or in applicable regulatory instruments - the option minimises the costs of meeting those requirements, compared with alternative option/s in a majority of reasonable scenarios;

TransGrid's interpretation of the regulatory test for reliability augmentations is as follows.

The following costs should be included:

- Capital costs of options;
- Operation and maintenance (O&M) costs of options; and
- Costs of complying with laws, regulations and applicable administrative requirements in relation to the option;

The following avoided costs should not be included:

- Reductions in electrical losses;
- Reductions in unserved energy;
- Deferrals or avoidance of generation or transmission investment elsewhere in the NEM (ie not associated with the option); and
- Avoided fuel costs elsewhere in the NEM.

Market development scenarios are only relevant to the extent that they affect the timing of the onset of network limitations and/or the ability of options to meet those limitations.

4.2. Regulatory Test Application – Summary

4.2.1. Costs

For the regulatory test application only the capital and O&M costs of Options 2 and 4 have been explicitly included.

There are no known existing or anticipated government tax or subsidy schemes that would apply materially differently to either of these options.

There are no known emerging network limitations in the area (other than those described in Section 2.6) for which the solution would be materially differently affected by either of these options.

Site costs for Options 2 and 4 are assumed to be equal and are thus excluded from the analysis.

4.2.2. Scenarios Considered

The Regulatory Test for reliability augmentations requires that options to address network requirements be assessed against a number of reasonable scenarios. In considering reasonable scenarios, TransGrid and Integral Energy considered the following key parameters:

- Existing Network
- Future Network Developments
- Variations in load growth
- Existing and Committed Generators and demand side development
- Potential generation and demand side developments

Existing Network and Future Network Developments

As discussed in section 2.4 of this final report, existing and future network developments that have the potential to impact supply to the Nowra area have been included as anticipated projects in the underlying analysis.

Variations in Load Growth

The constraint is existing hence the timing of the requirement for reinforcement of supply is 2014 which is the earliest the development can be achieved if the decision to proceed is taken in 2010. Variations in load growth are therefore not further considered.

Existing and Committed Generators and demand side development

TransGrid and Integral Energy are not aware of any existing or committed generation projects that will directly impact the supply to the Nowra area. Demand side developments are analysed in section 2.10 of this final report.

Potential generation and demand side developments

TransGrid and Integral Energy are not aware of any committed projects that will directly impact the supply to the Nowra area. Demand side developments are analysed in section 2.10 of this final report. TransGrid and Integral Energy are aware of the Delta Electricity new generation proposal at Bamarang and this is the subject of discussion in sections 2.11 and 2.12 of this final report. This proposal is presently offered for sale under the NSW State Governments' sale process.

4.2.3. Sensitivity Tests

Sensitivity tests of the variability of the ranking of options with respect to the reasonable variations to major financial and technical assumptions have been carried out. The base case assumptions and the range over which sensitivity tests were conducted are shown in Table 11.

Table 11 Base Case Values and Range of Values Used in Sensitivity Tests

Parameter	Base Case Value	Sensitivity Tests at
Real Discount Rate	9%	6% and 12%
Annual O&M Cost	2% of Capital Cost	1% and 3% of Capital Cost
Asset Lifetimes Substations Transmission Lines	 30 years 45 years	 20 and 40 years 30 and 60 years
Capital Costs	Nominal Value	±25% variation

4.2.4. Results

The present values of costs of each option have been calculated for a base case of financial and technical assumptions and the options ranked accordingly. Sensitivity tests of these calculations due to reasonable variations to the major assumptions have been carried out.

The results of the analysis are shown in Tables 12 and 13. Details of the economic model for the base case scenario are shown in Appendix A.

Table 12 Comparison of Options – Base Case

Option	Capital Costs ($M)	PV of Costs ($M)	Rank
Option 2	99.9	**37.5**	2
Option 4	71.6	**30.0**	1

Table 13 Comparison of Options - Results of Sensitivity Studies

Sensitivity Case	Option 2	Rank	Option 4	Rank
Base Case	37.5	2	30.0	1
12% Discount Rate	36.1	2	29.0	1
6% Discount Rate	37.5	2	29.9	1
25% Increase in Capital Costs	46.8	2	37.6	1
25% Decrease in Capital Costs	28.1	2	22.5	1
Decrease in Asset Lives	40.4	2	32.9	1
Increase in Asset Lives	36.0	2	28.6	1
Decreased O&M Cost	34.4	2	28.4	1
Increased O&M Cost	40.6	2	31.7	1

In each case Option 4 has a lower present value of costs and is therefore the highest ranked option.

5. Conclusions and Proposed Actions

The results in section 4.2.4 indicate that Option 4 is the highest ranked option in all of the cases considered. TransGrid and Integral Energy conclude that Option 4 satisfies the regulatory test.

Option 4 has a lower cost and would result in a significant reduction in the lengths of new line construction to achieve a similar network to that of Option 2 in the medium to long term and therefore Option 4 is preferred.

The proposed actions are for TransGrid and Integral Energy to construct the works described in option 4 for completion by early 2014. The TransGrid component of the works are estimated to cost around $45.6million. The Integral Energy component of the works are estimated to cost around $25.6m.

6. Notice of Disputes

Persons wishing to dispute the contents, findings, assumptions or recommendations of this final report are referred to clause 5.6.6(j) of the Rules.

Disputing parties must lodge a notice of the dispute in writing to the AER and provide a copy of the dispute notice to TransGrid within 30 business days of the publication of the summary of this final report on AEMO's website.

TransGrid copies of dispute notices regarding this final report should be forwarded to:

Mr Garrie Chubb Tel: 02 9284 3553

Fax: 02 9284 3456

Email: garrie.chubb@transgrid.com.au

Appendix A - Least Capital and Operating Cost Analysis of Base Case Nominal Scenario

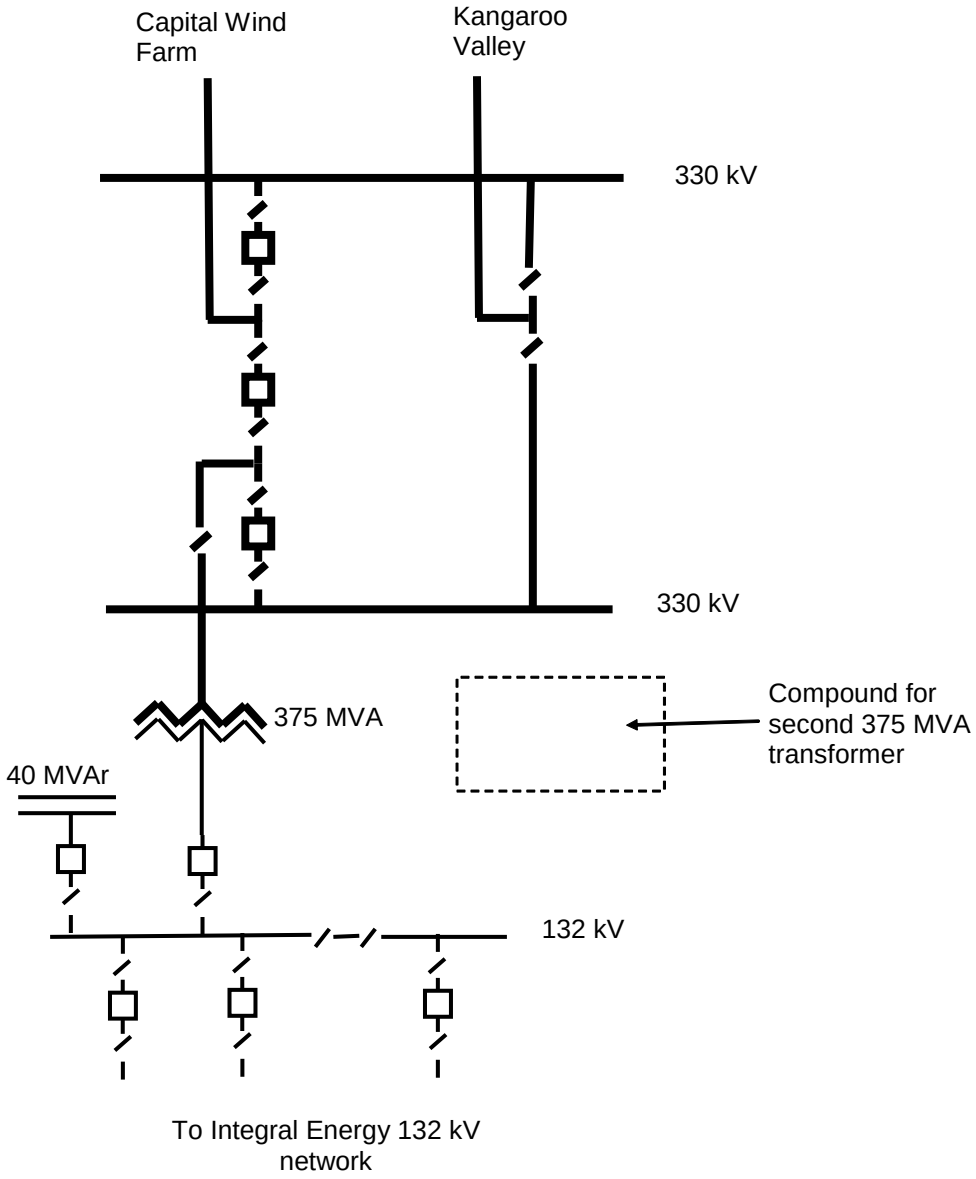
Supply to the Nowra Area: Preliminary Application of the Regulatory Test - Option 2 - Braidwood Road

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Residual
Integral Works 2014					38.9							-32.85
Integral Works 2020											15	-14.67
Line Costs					9.20							-7.77
Substation Costs					36.80							-28.21
O & M Costs					1.70	1.70	1.70	1.70	1.70	1.70	2.00	
Total Expenditure					86.60	1.70	1.70	1.70	1.70	1.70	17.00	-83.50
PW of Costs ($Million)	**37.5**											
Total Capex Costs ($Million)	**99.9**											

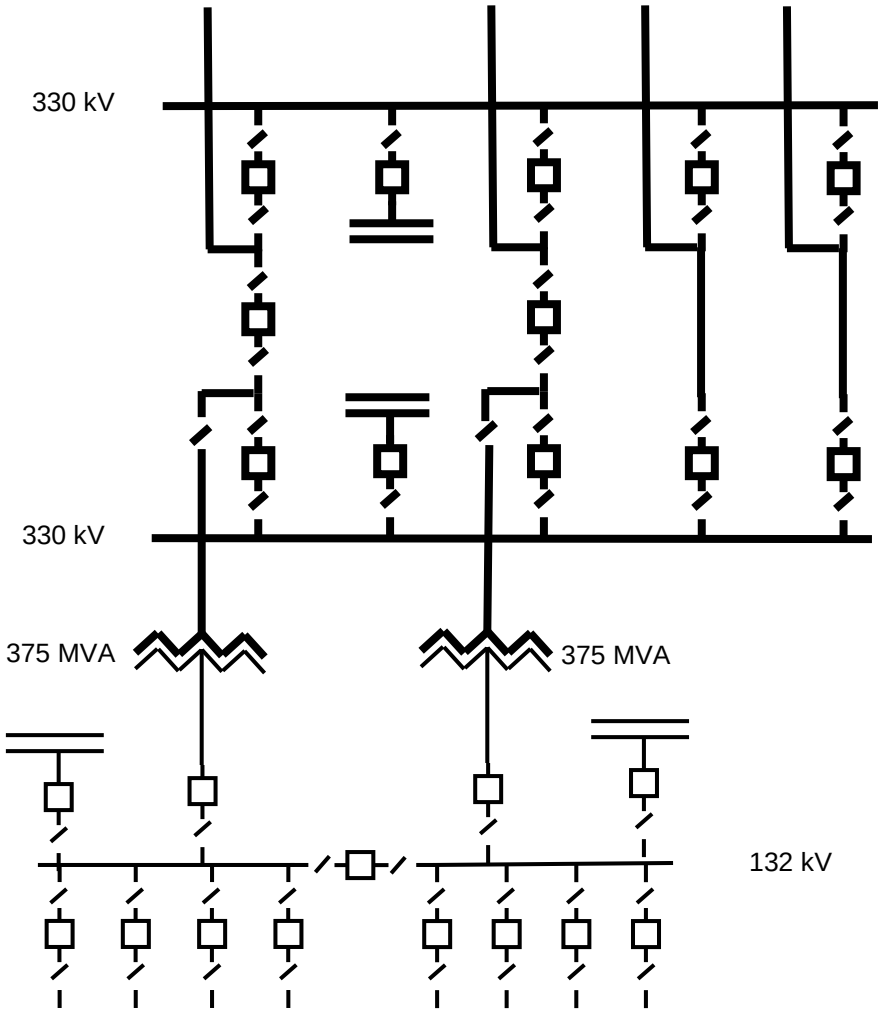
Supply to the Nowra Area: Preliminary Application of the Regulatory Test - Option 4 - Tomerong

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Residual
Integral works					25.6							-19.63
Line Costs					9.20							-7.77
Substation Costs					36.80							-28.21
O & M Costs					0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Total Expenditure					72.52	0.92	0.92	0.92	0.92	0.92	0.92	-55.61
PW of Costs ($Million)	**30.0**											
Total Capex Costs ($Million)	**71.6**											

Appendix B – Single Line Diagram Proposed New 330/132 kV Substation, Initial Development



Appendix C – Single Line Diagram Proposed New 330/132 kV Substation, Tentative Ultimate Development



Appendix D – Schematic Connection for Proposed New 330/132 kV Substation, Option 4 Tomerong