18 South Canterbury regional plan

In this chapter:

18.1 Regional overview

This chapter details the South Canterbury regional transmission plan. We base this regional plan on an assessment of available data, and we welcome feedback to improve its value to all stakeholders.

Figure 18-1: South Canterbury Region

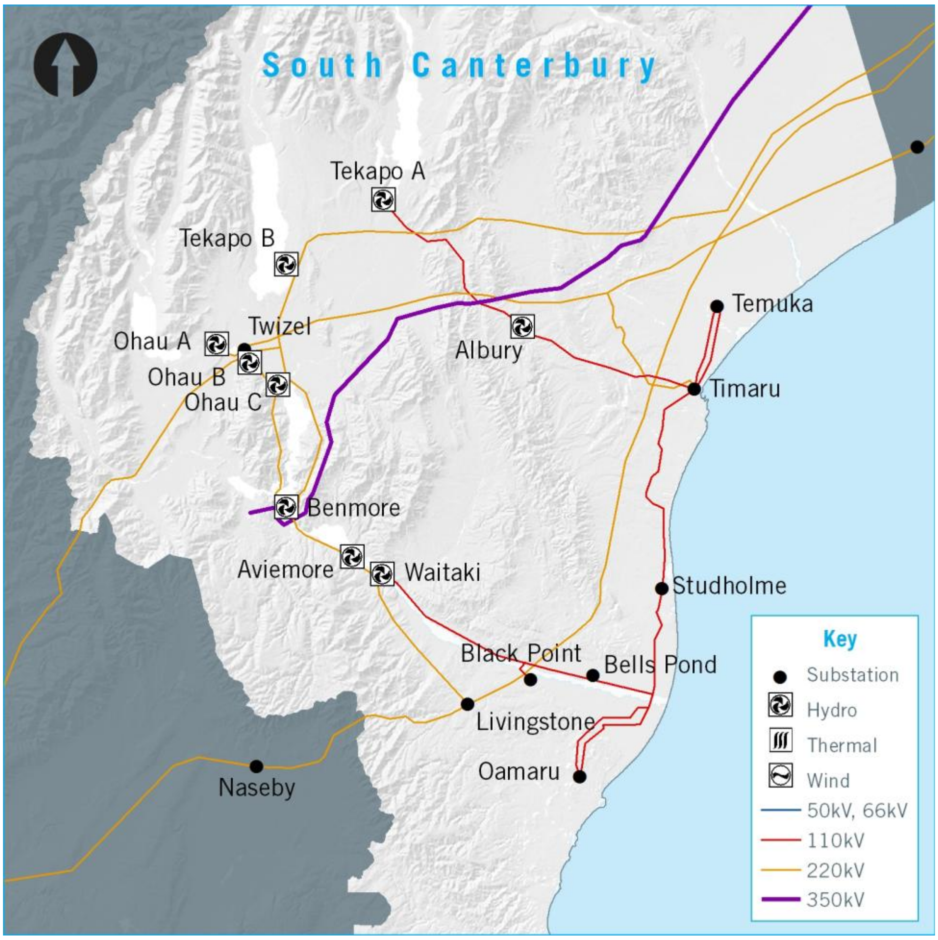
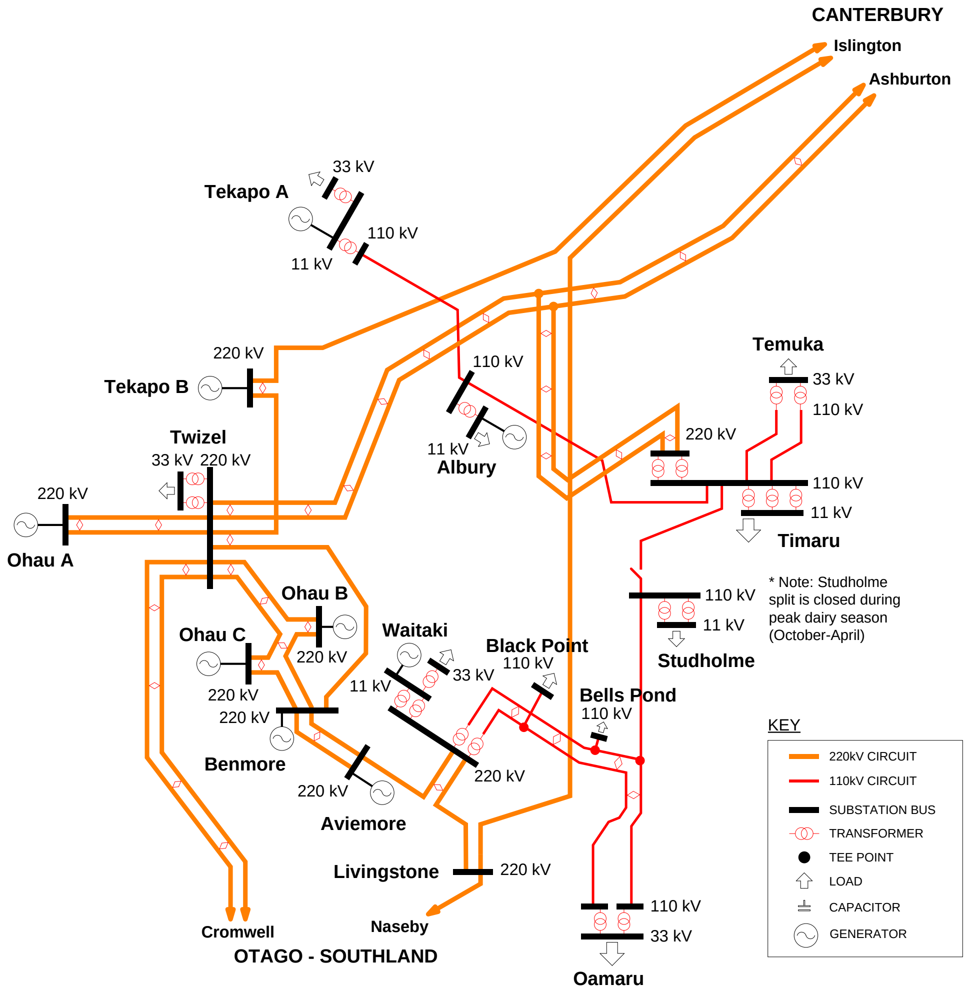


Figure 18-2: South Canterbury transmission schematic



18.1.1 Existing transmission system

The South Canterbury regional transmission network is set out geographically in Figure 18-1 and schematically in Figure 18-2. It comprises 220 kV and 110 kV transmission circuits, with interconnecting transformers at Timaru and Waitaki. The 110 kV network is closed during the peak dairy season (October-April) and split at Studholme at other times. When split, this creates two radial feeds incorporating the:

- Timaru 220/110 kV interconnecting transformer banks supplying Timaru, Albury, Tekapo A and Temuka, and
- Waitaki 220/110 kV interconnecting transformer banks supplying Studholme, Bells Pond, Black Point and Oamaru.

This region contributes a major portion of the generation in the South Island, feeding the 220 kV network from the Tekapo, Ohau and Waitaki Valley generation stations.

18.1.2 Demand forecast

The South Canterbury region includes a mix of significant and growing provincial cities (Timaru, Oamaru) and dairy industries (Black Point, Studholme, Temuka). The after diversity maximum demand (ADMD) for the South Canterbury region is forecast to grow on average by 6% annually over the next 10 years, from 179 MW in 2010 to 320 MW by 2020. This is significantly higher than the national average demand growth of 2.1% per year.

18.1.3 Local generation

The South Canterbury region's generation capacity is 1,731 MW. This represents a major portion of total South Island generation and significantly exceeds local demand. Surplus generation is exported via the National Grid to other demand centres in the South Island, and via the HVDC link to the North Island.

18.2 Regional development plan context

Projects to address issues arising in the South Canterbury region over the next ten years, both planned and possible, are assessed within the framework of the wider system and possible requirements to 2040 and beyond. This section highlights the state of the region's transmission network and possible requirements over the longer term.

Longer term considerations involving the South Canterbury region include:

- transmission into the region, and
- transmission within the region.

18.2.1 Transmission into the region

Transmission into the region is via several major 220 kV lines, built to transfer power to Christchurch and the upper South Island, and to transfer power between the Waitaki Valley and the lower South Island.

Peak load in the region (approximately 165 MW in 2009) is about 10% of the region's generation capacity, so transmission capacity into the region is driven by generation export requirements and capacity required to transfer power from the lower South Island to the upper South Island.

18.2.2 Transmission within the region

All significant loads in the South Canterbury region are supplied via the 110 kV network that runs up the east coast from Oamaru to Temuka. This is supplied from two 220/110 kV interconnection points at Waitaki and Timaru. Up to 25 MW of generation is injected directly into the 110 kV network from Tekapo A.

Much of the 110 kV transmission network is reaching its capacity, as are the interconnection banks at Timaru. This is mainly due to growth associated with the dairy industry, and irrigation in particular.

We have a number of projects planned or under way to support the demand growth and supply security in the South Canterbury region. These include:

- the Lower Waitaki Reliability project, upgrading supply security to the area between Waitaki, Oamaru and Studholme grid exit points, and
- supply security upgrades at Timaru and Temuka.

18.3 Changes since the 2009 Annual Planning Report

Table 18-1 lists the specific issues that are either no longer referenced or are new for 2010.

Table 18-1: Changes Since 2009

Issues	Change
Supply security at Bells Pond	New issue.

18.4 Regional summary

Table 18-2 lists a summary of the issues involving the South Canterbury region for the next 10 years. For more information about a particular issue, refer to the listed section number.

Table 18-2: South Canterbury region transmission issues

Section number	Issue	Solution summary
18.9.1	Oamaru–Waitaki transmission security and voltage quality	Install reactive support at Oamaru and Studholme; upgrade existing transmission lines; and/or build new lines. Indicative implementation date: 2011-14. Indicative cost band: A - reactive support; E - transmission upgrades. Project status: possible customer-specific investment (reactive support) and possible economic reliability investment (capacity upgrade) projects. Property implications: will depend on preferred option.
18.9.2	Overloading of a Waitaki interconnecting transformer	Increase transformer capacity, or supply the Lower Waitaki Valley region from Livingstone (see also Section 18.9.1). Indicative implementation date: 2014-2019 - transformer; see also Section 18.9.1. Indicative cost band: B - transformer; see also Section 18.9.1. Project status: see Section 18.9.1 Property implications: none.
18.9.3	Overloading of a Timaru interconnecting transformer	Load transfer from the 110 kV bus to the 220 kV bus (see Section 18.9.4); and/or install a third interconnecting transformer. Indicative implementation date: see Section 18.9.4 - transferring load to 220 kV bus; to be advised - third interconnector. Indicative cost band: see Section 18.9.4 - transferring load to 220 kV bus; C - third interconnector. Project status: possible customer-specific investment (transferring load to 220 kV) and possible economic reliability investment (third interconnector) projects. Property implications: minor.
18.9.4	Overloading of a Timaru supply transformer	Increase the 11 kV supply transformer capacity or transfer some of the 11 kV load to a new 33 kV bus; and either install two 120 MVA 220/33 kV transformers or install two 110/33 kV transformers. Indicative implementation date: 2012 - new transformers. Indicative cost band: C - new transformers. Project status: possible customer-specific investment project. Property implications: none.
18.9.5	Overloading of a Temuka supply transformer and transmission security	Short term: uprate existing transformer capacity. Long term: parallel existing transformers and install a new 120 MVA transformer and upgrade the 110 kV circuits between Timaru and Temuka. Indicative implementation date: Q2 2010 - short term; to be advised - long term. Indicative cost band: A - short term; B - transformer; B - circuit upgrade. Project status: committed (transformer uprating) and possible (new transformer and 110 kV circuit upgrade) customer-specific investment projects. Property implications: property easements may be required for the 110 kV transmission capacity upgrade.
18.9.6	Transmission security at Albury and Tekapo A	The issue can be managed operationally. Indicative implementation date: not applicable. Indicative cost band: not applicable. Project status: information only. Property implications: none.

18.9.7	Supply security at Tekapo A	The issue can be managed operationally. Indicative implementation date: not applicable. Indicative cost band: not applicable. Project status: information only. Property implications: none.
18.9.8	Supply security at Albury	The issue can be managed operationally. Indicative implementation date: not applicable. Indicative cost band: not applicable. Project status: information only. Property implications: none.
18.9.9	Overloading of an Oamaru supply transformer	Raise metering and protection equipment limit. Indicative implementation date: 2013. Indicative cost band: A. Project status: business-as-usual project. Property implications: none.
18.9.10	Overloading of a Studholme supply transformer	Replace supply transformers and possibly install a new grid exit point. Indicative implementation date: Q3 2011 - transformers; to be determined - new grid exit point. Indicative cost band: B - transformer; not available - new grid exit point. Project status: both are possible customer-specific investment projects. Property implications: acquisition of land for a new grid exit point.
18.9.11	Supply security at Studholme	See Section 18.9.1.
18.9.12	Supply security at Black Point	The issue can be managed operationally. Indicative implementation date: not applicable. Indicative cost band: not applicable. Project status: information only. Property implications: none.
18.9.13	Overloading of the Waitaki supply transformer and security of supply	Transfer load to another grid exit point or upgrade existing transformers' capacity by adding fans and pumps. Indicative implementation date: 2011. Indicative cost band: A. Project status: possible customer-specific investment project. Property implications: none.
18.9.14	Supply security at Bells Pond	The issue can be managed operationally. Indicative implementation date: not applicable. Indicative cost band: not applicable. Project status: information only. Property implications: none.

See Chapter 1, Section 1.4 for project status definitions

Except for committed projects, the indicative implementation date reflects the earliest opportunity for resolution of the issue.

Actual commissioning dates for customer-specific investments would be subject to local lines company agreement.

Costs for committed and proposed projects are the costs as submitted to the Electricity Commission.

All reliability and economic investments will, in addition to reflecting Good Electricity Industry Practice and meeting the Grid Reliability Standards, be subject to satisfying the Grid Investment Test.

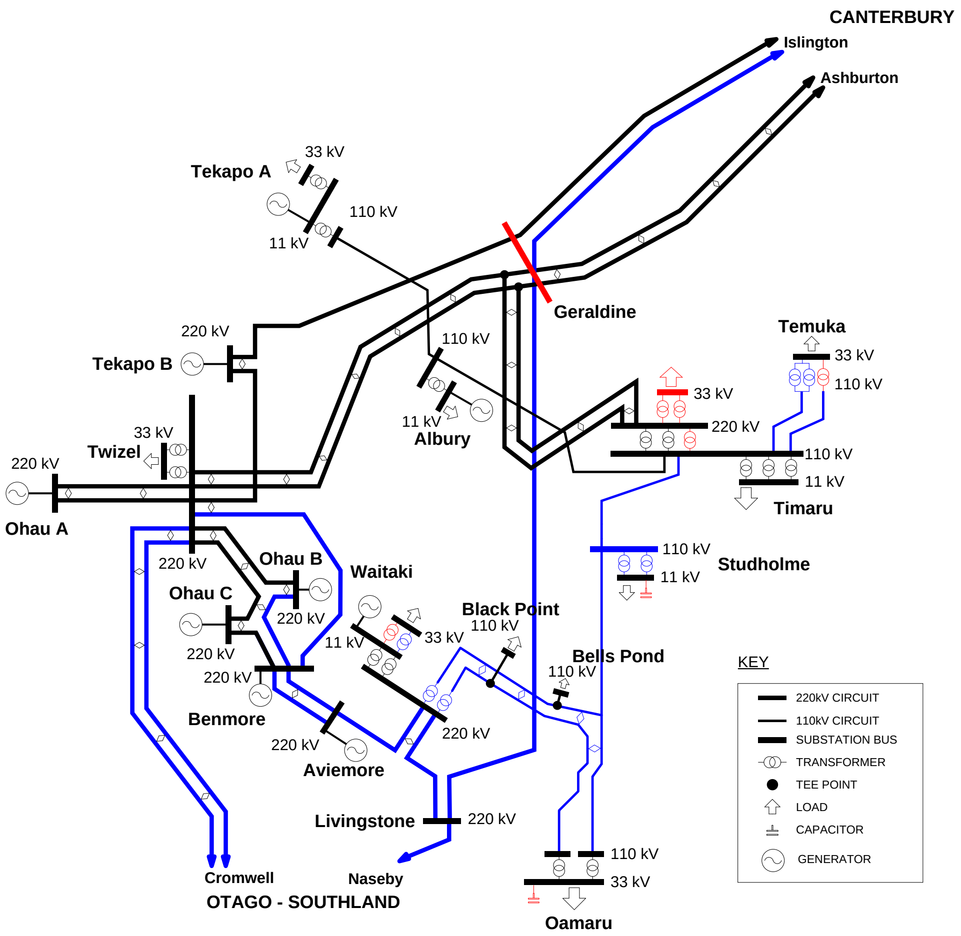
Cost Bands

A - Up to $5m, B - $5m to $10m, C - $10m to $20m, D - $20m to $50m, E - $50m to $100m, F - $100m to $300m, G - $300m plus

18.5 Future South Canterbury transmission configurations

Figure 18-3 shows the possible configuration of South Canterbury transmission in 2020, with new assets shown in red and upgraded assets shown in blue.

Figure 18-3: South Canterbury transmission configuration in 2020



18.6 South Canterbury demand

Figure 18-4 shows a comparison of the 2009 and 2010 forecast 10-year maximum demand (after diversity[152]) for the South Canterbury region. The forecasts use the Electricity Commission's (the Commission) prudent 10% probability of exceedance (POE) demand forecasts (from the 2008 Statement of Opportunities), modified to account for customer information where appropriate. See Chapter 4 for more information about demand forecasting.

152 The after diversity maximum demand (ADMD) for the region will be less than the sum of the individual grid exit point peak demands as it takes into account the fact that the peak demand does not occur simultaneously at all the grid exit points in the region.

Figure 18-4: South Canterbury regional after diversity maximum demand forecast

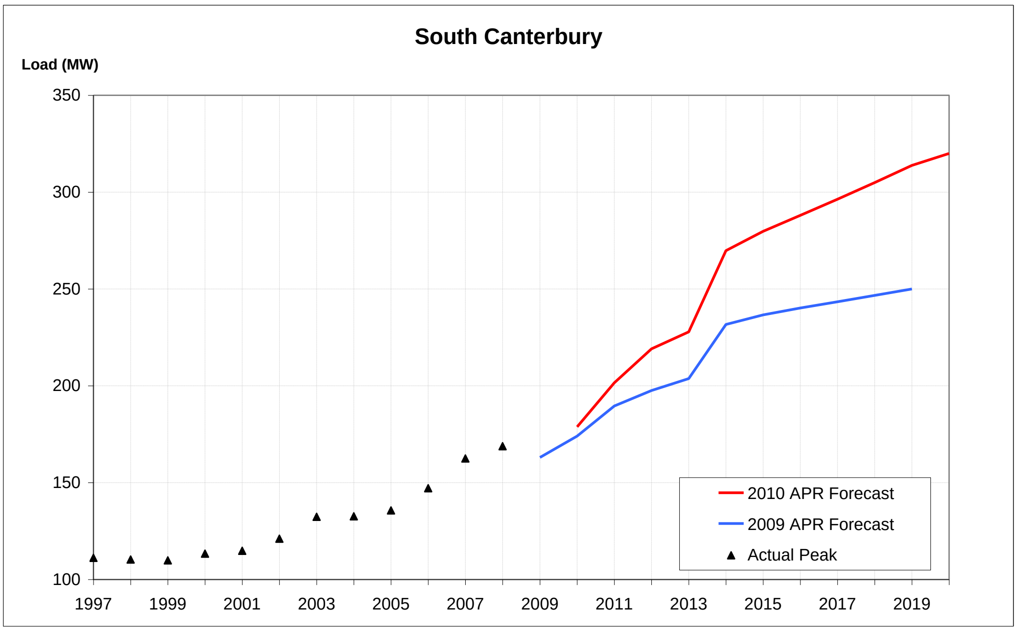


Table 18-3 lists forecast peak demand (prudent growth) for each grid exit point for the forecast period, as required for the Grid Reliability Report.

Table 18-3: Forecast annual peak demand (MW) at South Canterbury grid exit points to 2020

Grid exit point	Peak demand (MW)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Albury[1]	3	4	4	4	4	4	4	4	4	4	4
Bells Pond[2]	8	8	9	9	9	9	9	9	10	10	10
Black Point[2]	17	26	27	27	27	27	27	27	28	28	28
Oamaru[2]	36	39	51	55	59	63	65	66	68	69	70
Studholme[2]	16	20	21	23	65	67	69	71	73	75	76
Timaru[3]	69	74	75	75	83	84	85	86	87	88	90
Tekapo A[3]	3	3	4	4	4	4	4	4	4	4	4
Temuka[3]	58	69	72	76	80	84	88	92	97	102	107
Twizel	5	5	5	6	6	6	6	6	6	5	5
Waitaki[2]	7	7	7	8	8	8	8	9	9	9	9

1. The customer provided forecasts that are materially lower than the Commission's.
2. Forecasts provided by independent consultant, Covec (with adjustment made to Studholme following more recent discussions with the relevant lines company). These include major new irrigation and manufacturing loads.
3. The customer provided forecasts that are materially higher than the Commission's.

18.7 South Canterbury generation

Table 18-4 lists the generation forecast for each grid injection point (on the Transpower network) in the South Canterbury region for the forecast period, as required for the Grid Reliability Report. This includes all known and committed generation stations including those embedded within the relevant local lines company's network (either Network Waitaki or Alpine Energy)[153].

153 Only generators with a capacity of greater than 0.5 MW are listed.

No new generation is known to be committed in the South Canterbury region for the forecast period.

Table 18-4: Forecast annual generation capacity (MW) at South Canterbury grid injection points to 2020 (including existing and committed generation)

Grid injection point (location if embedded)	Generation capacity (MW)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Albury (Opuha)	8	8	8	8	8	8	8	8	8	8	8
Aviemore	220	220	220	220	220	220	220	220	220	220	220
Benmore	540	540	540	540	540	540	540	540	540	540	540
Ohau A	264	264	264	264	264	264	264	264	264	264	264
Ohau B	212	212	212	212	212	212	212	212	212	212	212
Ohau C	212	212	212	212	212	212	212	212	212	212	212
Tekapo A	25	25	25	25	25	25	25	25	25	25	25
Tekapo B	160	160	160	160	160	160	160	160	160	160	160
Waitaki	90	90	90	90	90	90	90	90	90	90	90

18.8 South Canterbury significant maintenance work

Table 18-5 lists the significant maintenance-related work[154] in the South Canterbury region that Transpower proposes for the next 10 years.

Table 18-5: Proposed significant maintenance work

Description	Tentative year	Related system issues
Albury supply transformer expected end of life	2016-2020	Section 18.9.8, Supply security at Albury
Albury 11 kV switchboard replacement	2011	None
Studholme supply transformers expected end of life	2010-2013	Section 18.9.10, Overloading of a Studholme supply transformer
Timaru 110 kV bus rationalisation	2010-2015	Section 18.9.4, Overloading of a Timaru supply transformer
Waitaki interconnecting transformers expected end of life	2018-2021	Section 18.9.2, Overloading of a Waitaki interconnecting transformer

18.9 South Canterbury transmission capability

18.9.1 Oamaru–Waitaki transmission security and voltage quality (Project context: Lower Waitaki Valley Reliability)

Issue

Two 110 kV circuits from Waitaki supply the Oamaru, Black Point, Bells Pond and Studholme grid exit points, which include the:

- Oamaru–Black Point–Waitaki 1 circuit (which supplies Black Point via a tee connection), and
- Oamaru–Studholme–Bells Pond–Waitaki 2 circuit (which supplies the Bells Pond and Studholme loads from tee connections).

154 This may include replacement of the asset due to its condition assessment.

Low voltages

The load at these four grid exit points peaks in summer. The voltage at the Oamaru 110 kV and Studholme 110 kV and 11 kV buses will fall below 0.9 pu for 110 kV and/or 0.95 pu for 11 kV by:

- 2010 with the loss of the Oamaru–Black Point–Waitaki circuit or
- 2011 with the loss of the Oamaru–Studholme–Bells Pond–Waitaki circuit.

There is also a voltage quality issue with a large voltage step immediately following the outage of either circuit. There are no steady state voltage problems at Oamaru 33 kV, due to the range of the supply transformer on-load tap changers.

Overloading

Thermal overloads occur by:

- summer 2010 on the Bells Pond–Waitaki section during an outage of the Oamaru–Black Point–Waitaki circuit and
- summer 2011 on the Black Point–Waitaki section during an outage of the Oamaru–Studholme–Bells Pond–Waitaki circuit

Solution

The recent closing of the transmission split between Studholme and Timaru has improved the voltage quality for Studholme.

Having a local voltage agreement may be appropriate in the short term for the 110 kV voltages.

In the medium term, the low voltage issues at Oamaru and Studholme buses can be resolved by installing approximately 20 Mvar of reactive support at Oamaru in 2010, increasing to approximately 35 Mvar at Oamaru and 20 Mvar at Studholme in 2013.

We will discuss the preferred option with the local lines companies (Network Waitaki and Alpine Energy), which may include them taking action to improve load power factor at these substations.

Installing capacitors at Oamaru and Studholme could also resolve the voltage quality issues during an outage of either of the circuits supplying Oamaru and Studholme. Long-term reactive support requirements and locations will depend on what developments are undertaken to resolve the capacity issue.

A wide range of options is being investigated to resolve the capacity issue, including:

- reconductoring and thermally upgrading the existing 110 kV circuits, and/or
- supplying Oamaru from Livingstone, or
- supplying Studholme from Timaru.

Easements may be required for the line upgrade work, and would be required for any new lines.

Indicative cost and timing

The estimated cost for the reactive support falls within band A, with an indicative commissioning date between 2011 and 2013.

The estimated cost of the capacity upgrade falls within band E. We anticipate seeking approval from the Commission in the second quarter of 2010, with an indicative commissioning date between 2012 and 2014.

Project status

The reactive support project is a possible customer-specific investment project. Our project reference is OAM-C_BANKS-DEV-01.

The capacity upgrade project is a possible economic reliability investment project. Our project reference is LWTK-TRAN-DEV-01.

18.9.2 Overloading of a Waitaki interconnecting transformer (Project context: Lower Waitaki Valley Reliability)

Issue

Two 220/110 kV interconnecting transformers (T23 and T24) at Waitaki supply the Waitaki 110 kV system demand at Black Point, Bells Pond, Oamaru and Studholme, providing:

- a total nominal installed capacity of 200 MVA, and
- n-1 capacity of 121.4/121.4 MVA[155] (summer/winter).

An outage of interconnecting transformer T24 will cause the other transformer to exceed its n-1 capacity by 2014.

Solution

We are investigating future transmission options for the region in consultation with stakeholders in the area, (see Section 18.9.1). The need for increased interconnection capacity will depend on the preferred option. An additional consideration is that these transformers have an expected end of life in the next 8-12 years. The options include:

- replacing the existing transformers with higher rated transformers, or
- abandoning this interconnection and supplying the area out of Livingstone, via Oamaru.

Indicative cost and timing

The estimated cost of replacing transformers with higher rated units falls within band B, with an indicative implementation date of 2014-2019.

See Section 18.9.1 for indicative cost and timing information about supplying the Lower Waitaki Valley region from Livingstone.

Project status

This issue is part of the Oamaru–Waitaki Transmission Security issue (see Section 18.9.1).

The transformer replacement project is a possible economic reliability investment project. Our project reference is WTK-POW_TFR-EHMT-01.

18.9.3 Overloading of a Timaru interconnecting transformer

Issue

Two 220/110 kV interconnecting transformers at Timaru supply the Timaru 110 kV system demand (Timaru 11 kV, Temuka, Albury and Tekapo A), providing:

- a total nominal installed capacity of 240 MVA, and
- n-1 capacity of 122.1/124.9 MVA[156] (summer/winter).

[155] The transformers' capacity is presently limited by a protection limit; with this limit resolved the n-1 capacity would be 123/131 MVA (summer/winter).

Based on 2010 forecast peak loads, an outage of one transformer may cause the other transformer to exceed its n-1 capacity if Tekapo A is not generating. In addition, some development options for the Lower Waitaki Valley area may increase the loading on these transformers by supplying Studholme from Timaru instead of Waitaki (see Section 18.9.1).

Solution

Options to address this issue include:

- shifting the Timaru supply bus load from the 110 kV to the 220 kV side of the Timaru interconnection (see also Section 18.9.4), and/or
- paralleling the two existing interconnecting transformers and installing a third, higher capacity transformer.

Indicative cost and timing

See Section 18.9.4 for information about the estimated cost and timing of the load shifting option.

The estimated cost of a third interconnecting transformer falls within band C, with an indicative commissioning date yet to be advised.

Project status

See Section 18.9.4 for information about the load shifting option project's status.

The third interconnecting transformer option is a possible economic reliability investment project. Our project reference is TIM-POW_TFR-EHMT-02.

18.9.4 Overloading of a Timaru supply transformer

Issue

Three 110/11 kV transformers supply Timaru's load, providing:

- a total nominal installed capacity of 77 MVA (one 27 MVA and two 25 MVA), and
- n-1 capacity of 54/56 MVA (summer/winter).

The peak load at Timaru is forecast to exceed the transformers' n-1 winter capacity by approximately 12 MW in 2010, increasing to approximately 33 MW in 2020 (see Table 18-6).[157]

Table 18-6: Timaru supply transformer forecast overload

Grid exit point	Transformer overload (MW)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Timaru	12	17	18	19	27	28	29	30	31	32	33

There is a non-contracted spare transformer unit on site, allowing possible replacement within 8 to 14 hours following a unit failure (if the spare unit is available). Alpine Energy can also transfer some load from Timaru following a transformer fault.

Solution

Alpine Energy is considering options including increasing the 11 kV supply transformer capacity, or transferring some of its present 11 kV load to a new Timaru 33 kV bus. The remaining 11 kV load would be supplied by the existing 11 kV supply

[156] The transformers' winter capacity is presently limited by protection equipment; with this limit resolved the n-1 capacity would be 122.1/127 MVA (summer/winter).
[157] This is Alpine Energy's forecast. The forecast load is materially higher than the Commission's.

transformers. We are discussing the 33 kV connection options with Alpine Energy, including:

- installing two 220/33 kV, 120 MVA supply transformers and a new 33 kV switchboard, and retaining some or all of the 110/11 kV transformers, which will also reduce the load on the Timaru 220/110 kV interconnecting transformers (see Section 18.9.3 for more information), or
- installing two 110/33 kV transformers, building a new 33 kV switchboard and retaining some or all of the 110/11 kV transformers.

We do not anticipate any property issues as it is likely that both options can be implemented within the existing substation boundary.

Indicative cost and timing

The estimated cost of replacing the existing transformers with two 220/33 kV transformers falls within band C, with an indicative commissioning date of 2012.

The estimated cost of installing two 110/33 kV transformers falls within band C, with an indicative commissioning date of 2012.

Project status

These are possible customer-specific investment projects. Our project reference is TIM-POW_TFR-EHMT-01.

18.9.5 Overloading of a Temuka supply transformer and transmission security

Issue

Two 110 kV Timaru–Temuka circuits, each rated at 70/77 MVA (summer/winter) supply the Temuka 33 kV load.

Outage of one of these circuits will cause the parallel circuit to exceed its thermal capacity from 2012 during summer peak demand periods. Also, there is no 110 kV bus at Temuka. Therefore a circuit outage will also result in the loss of the 110/33 kV supply transformer connected to this circuit.

At Temuka, two 110/33 kV transformers supply the 33 kV load, providing:

- a total nominal installed capacity of 80 MVA, and
- n-1 capacity of 52/54 MVA (summer/winter).

The peak load at Temuka is forecast to exceed the transformers' n-1 summer capacity by approximately 6 MW in 2010, increasing to approximately 55 MW in 2020 (see Table 16-6).

Table 18-7: Temuka supply transformer overload forecast

Grid exit point	Transformer overload (MW)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Temuka	6	17	21	24	28	32	36	41	45	50	55

Solution

The Temuka transformer upgrade project is currently under way. This will increase the transformers' post-contingency ratings by 20 MVA and delay the overloading issue until 2012.

We are discussing options with Alpine Energy, including:

- a long term solution involving paralleling the existing transformers and installing a new 120 MVA transformer, and

- upgrading the 110 kV circuits between Timaru and Temuka.

The addition of a new transformer will not raise new property issues as it can be implemented within the existing substation boundary. However, upgrading the capacity of the 110 kV Temuka–Timaru circuits may require easements.

A long-term solution will depend on whether there is likely to be further growth at the Clandeboye dairy factory, which accounts for more than half the demand at this grid exit point.

Indicative cost and timing

The cost of increasing the existing transformers' capacity falls within band A, with an expected commissioning date in the second quarter of 2010.

The estimated cost of installing an additional transformer falls within band B, with a commissioning date to be advised.

The estimated cost of upgrading the 110 kV circuit falls within band B, with an indicative commissioning date yet to be confirmed. This estimate excludes property costs which can have a significant impact on the overall cost of the project.

Project status

The transformer upgrade project is a committed customer-specific investment project. Our project reference is TMK-POW_TFR-DEV-01.

Installing an additional transformer or replacing the existing transformers with larger units is possible customer-specific investment project. Our project reference is TMK-POW_TFR-DEV-02.

Upgrading the 110 kV circuits is a possible customer-specific investment project. Our project reference is TIM_TMK-TRAN-EHMT-01.

18.9.6 Transmission security at Albury and Tekapo A

Issue

A single 110 kV Tekapo A–Albury–Timaru circuit connects Tekapo A and Albury to the National Grid. If the circuit trips, demand located at Albury and Tekapo A will lose supply, and generation located at Tekapo A and Opuha will disconnect from the National Grid.

Solution

Albury and Tekapo A demand may be restored by local Opuha and Tekapo A generation. Alpine Energy considers the issue can be managed operationally for the forecast period. Future investment will be customer-driven.

Indicative cost and timing

Not applicable.

Project status

This issue is for information only.

18.9.7 Supply security at Tekapo A

Issue

A single 110/11 kV, 35 MVA transformer in series with a single 11/33 kV, 10 MVA[158] transformer supplies load at Tekapo resulting in no n-1 security.

The peak load at Tekapo A is not forecast to exceed the transformers' capacity for the duration of the forecast period.

Solution

Alpine Energy considers the issue can be managed operationally for the forecast period. Future investment will be customer-driven.

Indicative cost and timing

Not applicable.

Project status

This issue is for information only.

18.9.8 Supply security at Albury

Issue

A single 110/11 kV, 5 MVA transformer supplies load at Albury resulting in no n-1 security.

In addition, Albury is connected to embedded generation at Opuha, which may export power to the National Grid during periods of low demand.

Solution

Alpine Energy can supply Albury's load from Timaru after a short loss of supply, and considers the issue can be managed operationally for the forecast period. Future investment will be customer-driven.

Additionally, this transformer has an expected end of life within the forecast period. We will discuss options with Alpine Energy and the generator company for increasing supply security and coordinate for outages to minimise supply interruptions when replacing this transformer.

Indicative cost and timing

Not applicable.

Project status

This issue is for information only.

18.9.9 Overloading of an Oamaru supply transformer

Issue

Two 110/33 kV transformers supply Oamaru's load, providing:

- a total nominal installed capacity of 120 MVA
- n-1 capacity of 54/54 MVA[159] (summer/winter).

[158] The transformers' capacity is presently limited by protection equipment to 7.4 MVA.

The transformers' capacity is presently limited by metering and protection equipment settings.

The peak load at Oamaru is forecast to exceed the transformers' n-1 summer capacity by approximately 1 MW in 2013, increasing to approximately 15 MW in 2020 (see Table 18-8).

Table 18-8: Oamaru supply transformer overload forecast

Grid exit point	Transformer overload (MW)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Oamaru	0	0	0	1	5	8	10	12	14	15	15

Solution

The metering and protection equipment limit will be raised to allow the transformers' full post-contingency capacity to be utilised. This will provide sufficient capacity for the forecast period.

Indicative cost and timing

The project's estimated cost falls within band A, with an indicative commissioning date of 2013.

Project status

This is a business-as-usual project. Our project reference is OAM-POW_TFR-EHMT-01.

18.9.10 Overloading of a Studholme supply transformer

Issue

Two 110/11 kV transformers supply Studholme's load, providing:

- a total nominal installed capacity of 20 MVA, and
- n-1 capacity of 11.5/12.3 MVA (summer/winter).

The peak load at Studholme is forecast to exceed the transformers' n-1 summer capacity by approximately 5 MW in 2010, increasing to approximately 64 MW in 2020 (see Table 18-9). However, a step increase in demand in 2014 is due to a block load from a proposed irrigation scheme, which may be supplied from a new grid exit point in the area north of Studholme.

Table 18-9: Studholme supply transformer overload forecast

Grid exit point	Transformer overload (MW)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Studholme	5	9	10	11	53	55	57	60	62	64	64

Studholme has an unusual 110 kV bus arrangement, where the two transformers have no dedicated 110 kV circuit breakers. This means that a transformer fault will trip both, causing a loss of supply. Supply can be restored after the faulted transformer is disconnected.

Solution

We are discussing possible solutions with Alpine Energy, which include:

159 The transformers' capacity is presently limited by metering and protection equipment limits; with these limits resolved the n-1 capacity would be 72/75.6 MVA (summer/winter).

- replacing the existing transformers with higher rated units, and
- if the new irrigation load becomes committed, building a new grid exit point north of Studholme on the 110 kV Studholme–Timaru circuit and transferring some of the Studholme load.

Both Studholme supply transformers are approaching expected end of life within the next five years. If an agreement to proceed with the transformer upgrade has not been made prior to the need for replacement, we will discuss with Alpine Energy the transformer capacity upgrade project in conjunction with the replacement work.

Acquisition of substation land is required for establishing a new grid exit point north of Studholme.

Indicative cost and timing

The estimated cost replacing the existing transformers falls within band B, with an indicative commissioning date in the third quarter of 2011 (subject to Alpine Energy agreement).

The estimated cost and timing of a new grid exit point is yet to be confirmed.

Project status

These are both possible customer-specific investment projects. Our project reference is STU-POW_TFR-EHMT-01.

18.9.11 Supply security at Studholme

Issue

The 110kV Oamaru–Studholme–Waitaki and Studholme –Timaru lines are through-connected at Studholme during the peak dairy season (October to April). At other times Studholme is normally supplied by the Oamaru–Studholme–Bells Pond–Waitaki circuit. In the event of a fault on this circuit, the supply automatically transfers to the Studholme–Timaru line, resulting in approximately 25 seconds loss of supply at Studholme before the switching occurs.

Solution

We are investigating options to increase supply security at Studholme. The long term solution will be part of the Lower Waitaki Reliability project (see Section 18.9.1).

Indicative cost and timing

See Section 18.9.1 for more information.

Project status

See Section 18.9.1 for more information.

18.9.12 Supply security at Black Point

Issue

Black Point has a single 110 kV circuit connected to an Oamaru–Waitaki circuit, resulting in no n-1 security.

Solution

Network Waitaki has not requested a higher security level and there are no plans to increase supply security at this grid injection point. Future investment will be customer-driven.

Indicative cost and timing

Not applicable.

Project status

This issue is for information only.

18.9.13 Overloading of the Waitaki supply transformer and security of supply

Issue

A single 11/33 kV 5.5 MVA transformer supplies load at Waitaki resulting in no n-1 security.

Network Waitaki can supply some of the Waitaki demand from Twizel after a short loss of supply. However, the peak Waitaki load is forecast to exceed the continuous supply transformer capacity by 1 MW in 2010, increasing to 4 MW in 2020 (see Table 18-10). Network Waitaki has requested options for security and capacity enhancements.

Table 18-10: Waitaki supply transformer overload forecast

Grid exit point	Transformer overload (MW)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Waitaki	1	1	2	2	2	3	3	3	3	4	4

Solution

We are investigating options to increase capacity and security of supply in the area with Network Waitaki.

A possible solution to increase the security of supply is to install a second supply transformer.

Possible options to resolve the capacity issues are:

- transferring 2 MW load to another grid exit point, delaying the issue until 2015, or
- increasing the capacity of the existing supply transformer by adding fans and pumps.

Indicative cost and timing

The estimated cost for upgrading the transformer’s capacity falls within band A. The indicative commissioning date is 2011.

Project status

This is a possible customer-specific investment project. Our project reference is WTK-POW_TFR-EHMT-01.

18.9.14 Supply security at Bells Pond

Issue

Bells Pond has a single 110 kV circuit connected to an Oamaru–Waitaki circuit, resulting in no n-1 security.

Solution

Alpine Energy has not requested a higher security level and there are no plans to increase supply security at this grid injection point. Future investment will be customer driven.

Indicative cost and timing

Not applicable.

Project status

This issue is for information only.

18.10 Other regional items of interest

There are no other items of interest identified to date beyond those set out in the preceding section. See Section 18.12 for more information about specific generation proposals relevant to this region.

18.11 Impact of generation scenarios on the regional plan

The generation scenarios (detailed in Chapter 5) represent a series of possible future generation outcomes. As anticipated by the Grid Reliability Report, generation scenario impacts are assessed for each region. Committed generation projects and grid backbone issues that may result from the generation scenarios are dealt with separately in previous sections.

There is no new generation in this region under any of the scenarios, resulting in no impact on the regional plan.

18.12 South Canterbury generation proposals and opportunities

This section details relevant regional issues for selected generation proposals under investigation by developers and in the public domain, or other generation opportunities. These are in addition to, or expand on, the five generation scenarios in the previous section.

18.12.1 Maximum regional generation

The maximum generation that can be connected at any substation depends on several factors and usually falls within a range. See Chapter 2, Section 2.5 for more information. Generation developers should consult with us at an early stage of their investigations to discuss connection issues. See our website for more information about connecting generation.[160]

18.12.2 North Bank project

A new hydro power station is proposed below the Waitaki power station on the north bank of the Waitaki River (known as the North Bank Project). The location of the power station is yet to be determined, but it can connect to either the existing Waitaki substation or in the general location of the 220 kV Livingstone–Waitaki circuit's Waitaki River crossing.

There are no connection issues with either location for connecting the North Bank Project. An assessment of the impact of North Bank generation on the grid backbone is not yet completed. Either location may bring forward or defer the need for additional grid backbone capacity north of the Waitaki Valley (see Chapter 6,

[160] http://www.transpower.co.nz/connecting-new-generation

Sections 6.6.2 and 6.7.2), and/or within the Waitaki Valley (see Chapter 6, Sections 6.6.3 and 6.7.3).

18.12.3 Wind generation

There are no issues with connecting wind or other generation at existing power stations within the Waitaki Valley at 220 kV.

Connecting too much generation to one of the four circuits to Christchurch may cause it to overload and reduce the total amount of load that can be supplied across all four circuits. The maximum generation limit varies with the point of connection and circuit. The generation is maximised when it is connected close to the Waitaki Valley and approximately equals the circuit rating. The worst case location and circuit will not support the dispatch of generation. The best case location and circuit will enable 400-700 MW of generation.

There is limited opportunity to connect new generation to the 110 kV Tekapo A–Albury–Timaru circuit because of the existing generation at Tekapo A and the Opuha generation embedded at Albury, unless the circuit is upgraded. The other 110 kV circuits can have generation connected up to or slightly greater than the circuit rating.