



Upgrading regional supply

**PAL BUS 6.09 - Upgrading regional supply -
Jan2020 - Public**

Regulatory proposal 2021–2026

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Business	Powercor
Title	Upgrading regional supply
Project ID	PAL BUS 6.09 - Upgrading regional supply - Jan2020 - Public
Category	Augmentation capital investment
Identified need	Current regional electricity infrastructure is not meeting customers' needs, but targeted regional investment can result in significant economic and community benefits
Recommended option	Option 2—Upgrade existing single phase backbone to 3 phase
Proposed start date	2021/22
Supporting documents	<ol style="list-style-type: none"> 1. PAL MOD 6.08 - Upgrading regional supply - Jan2020 - Public 2. PAL ATT093 - Warrnambool forum questions - Jan2020 - Public 3. PAL ATT104 - Fonterra - Power line upgrade - Oct2019 - Public 4. PAL ATT105 - Mr Holmes - Letter regional upgrades - Public 5. PAL ATT106 - Rabobank - Letter regional upgrades - Apr2019 - Public 6. PAL ATT248 - MP - Upgrade investments - Jan2020 - Public 7. PAL ATT247 - MS - Network upgrades - Jan2020 - Public 8. PAL ATT246 - VFF - Support upgrading regional supply - Jan2020 - Public 9. PAL ATT095 - UDV - Support upgrading regional supply - Jan2020 - Public 10. PAL ATT057 - F&F - letter to support power upgrade - Jan2020 - Public. 11. PAL ATT107 - UDV - Energy options dairy industry - Jan2017 - Public 12. PAL ATT124 - EconSerch - Eco impact, dairy industry - Mar2016 - Public 13. PAL ATT231 - VFF - UDV policy priorities - Public 14. PAL ATT232 - VFF - Annual report 2012-2013 - Public 15. PAL ATT233 - Dairy Australia - Farming milk price - Public 16. PAL ATT240 - Woolcott - Warrnambool stakeholder roundtable - Apr2019 - Public

1 Overview

Supplying electricity to regional Victorians is core to our values and what we do. We are proud to support regional businesses throughout our network. Through our engagement, it has been made clear to us that the regional infrastructure located in dairy farm intensive regions is not meeting our customers' needs and that targeted regional investment can result in significant economic and community benefits.

The typical application of the Regulatory Investment Test for Distribution (**RIT-D**) often leaves our regional customers with poorer supply quality relative to their urban counterparts. While it is impracticable to achieve service level parity between these groups, a better balance can be achieved by broadening the benefits typically taken into account by the RIT-D framework to include the economic impact of regional business.

Our regional businesses underpin significant economic activity—the value of the dairy industry in 2016–2017, for example, was \$3.6 billion and Victoria accounted for 64% of milk production in Australia.¹ This business case represents a small but important change in the balance of network investment. It recognises and quantifies the contribution to our economy that rural businesses make and seeks solutions to strengthen and facilitate those contributions.

We have worked with the United Dairyfarmers of Victoria (**UDV**), Great South Coast Food and Fibre Council and Dairy Australia to understand the complex issues facing rural communities. Together with them, we have identified four key areas that would significantly benefit from upgrading single phase to three phase supply. This upgrade will provide net economic benefits by:

- supporting existing dairy farms and businesses to expand
- attracting new investment, including the conversion of lower value grazing land into dairy farms through the ability to irrigate
- supporting regional communities.

Table 1 outlines a conservative analysis of the present value (**PV**) from undertaking Option 2 presented in this business case—upgrading single phase to three phase supply.

Table 1 NPV of options (\$000, 2019)

Option	Project	PV costs	PV benefits (single farm)
Option 1—status quo	NA	-	-
Option 2—Upgrade single phase backbone to 3-phase	Tyrendarra	3,589	30,424
	Strathdownie	2,684	30,424
	Cape	1,912	30,424
	Bridgewater	1,522	30,424
	Gorae West		

Source: Powercor

Table 2 outlines the required capital investment for Option 2.

¹ <http://www.agriculture.gov.au/abares/research-topics/surveys/dairy>

Table 2 Capital investment (\$000, 2019)

Year	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Capital investment	4,930	3,770	-	-	-	8,700

Source: Powercor

2 Background

2.1 Regional customers are facing inadequate supply to support operations

The original intent of single wire earth return (SWER) lines was to provide a low cost option to supply small loads spread over a large areas. The ability of SWER to cater for these areas as they have developed has significantly reduced.

For several years the UDV has been seeking upgrades to Victoria's regional electricity infrastructure to support its member's energy needs.² It has found SWER lines are inadequate and that three phase supply is needed to support the ongoing operation and expansion of dairy farms in the South West region. In 2016, UDV's resolutions included 'that UDV calls on the State Government to take responsibility for the funding of a comprehensive upgrade of SWER and single phase lines supplying dairy farms to 3-phase.'³ UDV has also approached Powercor about the upgrades.

The UDV commissioned the 'New Energy Options for the Victorian Dairy Industry', which focussed on the Tyrendarra area. The stated problem in that report was that '...single wire earth return lines are seriously constraining the operations of dairy farmers and milk processors in Victoria and, hence, limiting the growth of those operations and the Victorian dairy industry at large.'⁴ The report found that all dairy operators serviced by SWER lines in or around Tyrendarra are capacity constrained to some extent.⁵

The main supply constraints for customers on a SWER system are:

- no option for three phase supply, which is needed for certain equipment
- the maximum capacity of SWER substations is 25kVA
- capacity available on SWER systems can be limited by the number of other customers connected and also the type of load, i.e. other dairy farms on the same SWER system
- long remote SWER systems can experience low fault levels due to high impedance
- SWER systems are susceptible to voltage and supply quality issues, a small change in load can create a large variation in voltage.
- SWER systems can have a higher incidence of supply interruptions, typically being on the end of long radial feeders.

2.2 Network constraints

We and our stakeholders identified high priority areas for upgrading supply to support regional communities. These areas were selected based on enquires received for supply upgrades and identifying farming intensive regions with little three phase supply penetration and good prospects for (high energy use) dairy farming. The areas are:

- Tyrendarra—the 37.4 kilometre single phase line between Yambuk and Narrawong currently supplying 497 customers, many of which are dairy farms and commercial businesses
- Strathdownie—the 28.5 kilometre feeder supplies 220 single phase and SWER customers

² PAL ATT231 UDV

³ PAL ATT232: Victorian Farmers Federation, Annual Report, 2015-16.

⁴ PAL ATT107: UDV, New Energy Options for the Victorian Dairy Industry, January 2017

⁵ PAL ATT107: UDV, New Energy Options for the Victorian Dairy Industry, January 2017, p. 8.

- Cape Bridgewater—supplies a total of 285 single phase and SWER customers with a 20 kilometre single phase feeder
- Gorae West—the Tuite feeder in Gorae West (near Portland) supplies 128 single phase and SWER customers.

2.3 Balancing rural and urban investments

To ensure our investments align with the objectives and framework established by the National Electricity Rules (**Rules**), we conduct cost benefit analysis in accordance with the RIT-D framework on all material investment decisions. The typical market benefit classes outlined in the RIT-D for evaluating an investment focuses on the value of unserved energy and changes to customers' costs. The outcome of this process is that rural customers generally receive lower levels of service than urban customers; primarily due to lower customer density resulting in:

- higher costs to service
- relatively low unserved energy.

However, the typical application of the RIT-D framework does not account for the differing value of electricity to customers and the economy at the local level. While it is impracticable to achieve service level parity between rural and urban groups, a better balance can be achieved by broadening the benefits typically taken into account by the RIT-D to include the economic impact of regional business such as Gross Regional Product (**GRP**).

This business case represents a small but important change in the balance of investment. It recognises the contribution to our economy that rural small businesses make.

3 Identified need

When developing new investment projects our responsibility is to provide a reliable, affordable and safe supply of energy to all our customers. However, the current process sees rural and regional communities left with lower capacity and reliability. After engaging with regional communities and the dairy industry it has become evident that their current situation is becoming increasingly untenable and a change to the process is required to ensure regional areas are adequately serviced.

The identified need in this business case is to:

- deliver on the services our regional communities have told us they need
- deliver net economic benefits in accordance with the regulatory framework

These are discussed in more detail below.

3.1 Our regional communities are seeking improved electricity supply

3.1.1 Community leader's forum

In April 2019, we met with customers and community leaders in Warrnambool. They expressed strong support of us considering the broader benefits of upgrading electricity distribution infrastructure and highlighted any investment to improve supply will:⁶

- increase milk production for the region, the state and the country
- increase dairy industry confidence
- assist in keeping dairy farming operating /enable people to stay in business
- achieve a lower cost of production
- have a positive flow on effect for those who are suppliers to dairy farms.

They stated:

'It [the dairy industry] is providing the staple ingredients for the whole of Victoria. If we want to be competitive from a trade point of view then it is needed. 35% of milk comes from this region.'

'People don't know how much farmers contribute to society.'

3.1.2 Community support

Since the forum, we received overwhelming support for improving regional electricity supply and the view that the current supply is hindering potential new investment.

Ms Beverley McArthur MP, Member for Western Victoria Region, stated;

'As a member of the Legislative Council in the Victorian Parliament, my electorate – Western Victoria Region – covers a considerable portion of rural Victoria. I've lived my whole life there, on farming properties, and understand the limitations the power supply situation can cause. I'm writing, therefore, to strongly support your proposed investment, which would bring three-phase power to more than a thousand properties in Tyrendarra, Strathdownie, Cape Bridgewater and Gorae West.'

⁶ PAL ATT240: Woolcott, Warrnambool Stakeholder Roundtable Report, Report prepared for Powercor, April 2019.

Farmers and other businesses across my electorate, including in this area, frequently tell me how big a difference an upgrade like this would make. There is huge potential to be unlocked – the investment will not simply support existing business, but will enable them to expand, unleashing a wave of new enterprise. I am firmly of the belief that providing essential enabling infrastructure is the best thing we can do for business, and your proposal is an excellent example of what should be done.

I've been impressed by your engagement with UDV Wannon, and know from my own discussions how well received the investment would be with the local council, and across the communities concerned. I'm delighted to add my support, and would be very happy to provide any further endorsement when in due course you submit this proposal to the AER. Please don't hesitate to let me know if this would be of assistance.'

Fonterra outlined they are;

'aware of a number of dairy farming businesses in regional Victoria that have been unable to utilise underdeveloped land or expand existing operations due to the lack of adequate, reliable electricity supply to run essential plant and machinery'

Mr Holmes outlined;

'I am the owner of a steel fabrication/engineering workshop located [in Tyrendarra]... With my current power supply, I feel that the business has reached its maximum capacity in machinery and employees. To sum up I am at a financial standstill due to my lack of acceptable power supply.'

Food & Fibre Great South Coast stated;

'These upgrades are vital to build energy resilience in our rural communities. They will deliver millions of dollars in benefits, supporting farmers to increase milk production, reduce their cost of production, increase confidence in the farming sector and assist farming operations stay in business.'

Rabobank outlined;

'Rabobank is an agriculture based organisation and we would like to express our support for this type of infrastructure upgrade...Some collateral benefits of this project could be:

- *to encourage conversion of low intensity farm land to (highly intensive) dairying*
- *further development of milk processing capacity*
- *both farming and milk processing service providers expansion.'*

Victorian Farmers Federation outlined;

The potential of this proposal is significant for all Victorian farmers. Lack of access to safe and reliable energy is a major concern for farmers, limiting their ability to grow and develop their business.

Moyne Shire considered;

'[The Moyne Economic Development Plan] advocates for sector wide improvements and specifically states Council should pursue upgrades from Single Wire Earth Return (SWER) power line to 3-phase power. On behalf of Moyne Shire Council, I wish to thank Powercor Australia for their commitment to the region and urge Powercor Australia to proceed with the upgrades as soon as possible.'

These and other letters supporting the upgrade attached to this business case.⁷

3.2 Delivering net economic benefits

To upgrade regional supply it must be efficient in accordance with the regulatory framework. The UDV, Great South Coast Food and Fibre Council and Dairy Australia worked with us to quantifiably demonstrate the flow on effects to the economy from an upgrade, which has underpinned this business case.

This business case determines the economic impact, such as on GRP and employment, of investing in electricity infrastructure to support regional communities. While this is a different application of the RIT-D that has been undertaken in the past, it is consistent with the regulatory framework.

3.2.1 Regulatory framework

The National Electricity Objective (**NEO**) is 'to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to: price, quality, safety and reliability and security of supply of electricity...'. Quantifying the economics benefits of investment in electricity infrastructure, resulting in benefits for consumers, meets this objective. As discussed in section 3.2.2, it also results in more efficient levels of investment.

Further, in outlining the purpose of the RIT-D, the Rules specifically direct parties to consider the economic impact of an investment. It states parties should 'identify the credible option that maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the National Electricity Market'.⁸ The RIT-D framework also makes provision for 'any other class of market benefit that [the AER] determine to be relevant' to be considered in evaluating an investment, which can include broader economic benefits.

3.2.2 Externalities

The AER's RIT-D indicates economic benefits are externalities and should not be included in cost benefit analysis. Externalities—effects that are not priced or captured by a market—however, result in market failures and inefficient outcomes. We should therefore seek to overcome these. By valuing broader economic benefits we are in fact overcoming (or internalising) the externality that would otherwise arise in the form of broader economic benefits. In so doing, our analysis leads to more efficient outcomes, which in this case would prevent too little investment from occurring.

3.3 When economic benefits should be considered

'Economic benefits' is a market benefit class that may not have been considered before in the context of distribution determinations. Therefore, while our stakeholders were highly supportive of this proposal, they sought us to develop criteria for applying economic benefits.

We agree the NEO will be best met by defining the circumstances in which a consideration of broader economic benefits is appropriate. We have developed the following criteria for determining whether we will quantify economic benefits:

⁷ PAL ATT248 - MP - Upgrade investments - Jan2020 - Public. PAL ATT247 - MS - Network upgrades - Jan2020 - Public. PAL ATT246 - VFF - Support upgrading regional supply - Jan2020 - Public. PAL ATT095 - UDV - Support upgrading regional supply - Jan2020 - Public. PAL ATT057 - F&F - letter to support power upgrade - Jan2020 - Public. PAL ATT106 - Rabobank - Letter regional upgrades - Apr2019 - Public. PAL ATT105 - Mr Holmes - Letter regional upgrades - Public. PAL ATT104 - Fonterra - Power line upgrade - Oct2019 - Public

⁸ National Electricity Rules, clause 5.17.1.

1. The investment should be targeted at supporting regional communities—our stakeholder support for quantifying economic benefits was provided in the context of supporting regional communities (in this case, dairy farmers). We do not have information on whether this support extends to a broader range of projects and so it is not appropriate for us to apply it in other contexts.
2. The proposed investment must have demonstrated stakeholder support—distributors should demonstrate the investment is well supported by the affected stakeholders to ensure the investment has the desired impact. The investment should also be supported by the broader customer base that may be required to fund it.
3. The total investment should not exceed 1% of revenue over the regulatory period. Support for this program was premised on us undertaking targeted investment. On this basis, we consider the program costs should not exceed the materiality threshold defined in the Rules.
4. The investment should support customers that have a strong reliance on electricity—this program recognises that the average VCRs applied in the electricity industry do not reflect of the value of electricity to all customers. Considering the broader economic benefits of an investment should be limited to supporting specific industries that highly value of electricity; where it is likely to exceed average VCRs.
5. The investment should support customers that generate important or significant value/goods/services to Victorians (such as the dairy industry). Economic benefits should only be considered when those benefits are received by a large proportion of customers rather than specific interested parties.

We will continue to work with our stakeholders and the AER to refine these criteria over time.

4 Options analysis

This section outlines two options:

- the status quo
- undertaking targeted regional electricity infrastructure investments.

These options are outlined below.

4.1 Option one—Status quo

Option one is the status quo under which we would assess feeder upgrades on the standard RIT-D application and therefore not undertake an upgrade. This option would not address the concerns and limitations we heard from our stakeholder (and in particular the dairy farmers) at the Warrnambool forum, which would mean:

- existing dairy farmers will continue to reach capacity during peak milking times
- limiting expansion and hindering the possibility of a reliable supply of electricity for the farmers and regional communities.

There are no incremental costs or benefits from continuing with the status quo as outlined in table 3.

Table 3 Option one benefits assessment (\$000, 2019)

Option	PV costs	PV benefits	Net economic benefits
Status quo	-	-	-

Source: Powercor

4.1.1 Customer side solutions

The most likely outcome from this option is that new and existing customers consider developing their own customer side solutions, such as diesel generators or batteries to address capacity issues. We have analysed the likelihood and impact of customer side solutions being developed based on the Tyrendarra upgrade as a representative sensitivity of the four areas considered in this business case.

The Yambuk to Narrawong (Tyrendarra) single phase backbone has a capacity of 1.2MW, which is being reached twice a day during peak milking times. Upgrading to three phase would provide access to 7.1MW. As a sensitivity, we have modelled the cost of 43 existing customers (the number of customers connected to the SWER system that was the focus of the New Energy Options for the Victorian Dairy Industry report) undertaking a small expansion by installing a 25kVA diesel generator. This is conservative from the perspective that the resultant capacity available to customers (current feeders plus diesel generation) would only provide one third the capacity of the upgrade and does not account for the diesel generation costs that any new customers would incur.

We have determined the price for a generator which supplies 25kW of capacity as outlined in the following table.⁹

⁹ Based on the market price and fuel use of a generator < <https://www.ablesales.com.au/industrial-diesel-generators/21kva-to-55kva-single-and-3-phase/able-25kva-415v-isuzu-foton-diesel-generator.html> >

Table 4 Price breakdown for 25kW generator over 20 years (\$000, 2019)

Item	Cost
Capital cost	10.9
Running costs (p/a)	15.6
PV of costs over 20 years	-248.5
Total NPV cost for 43 customers	-10,686

Source: Powercor

The cost of diesel generation far exceeds the cost of upgrading the network as discussed in section 4.2. Further, our stakeholders have told us one of the primary benefits from the network upgrade is facilitating irrigation; customer side solutions to support this would need to be on a much greater scale than we have considered in the analysis above and would be uneconomic compared to the network upgrade.

Our analysis is supported by the New Energy Options for the Victorian Dairy Industry report commissioned by the UDV in 2017 which considered the viability of using batteries and generators to address capacity issues for dairy farms. This report concluded that customer side solutions are not a financially viable option.¹⁰ With respect to storage, it found:

Given the nature of the power constraint we discovered (specifically, the power constraints experienced by dairy operators in and around Tyrendarra independent of other dairy operators and non-dairy operators) it is not feasible to consider energy storage as a power constraint relieving option. This technology would certainly be too cost-prohibitive at present for any individual dairy operator serviced by a SWER line we investigated.

Importantly, the findings are also consistent with actual outcomes—customer side solutions have been adopted out of necessity by some, but have not become a widespread preference and have not been adopted to the extent necessary to alleviate constraints.

Due to the high costs of multiple customer side solutions compared to a single network upgrade, customers in the area are seeking the latter. Moreover, as detailed in option two, the upgrade will support and incentivise new connections, further tipping the scales in favour of the upgrade.

4.2 Option two—Upgrade regional supply from single phase to three phase

Under option two, we propose upgrading the existing single phase feeders to three phase. Table 2 contain the costs, benefits and net economic benefits of upgrading the feeder for each site.

¹⁰ PAL ATT107: UDV, New Energy Options for the Victorian Dairy Industry, January 2017.

Table 5 Option two benefits assessment (\$000, 2019)

Option	Project	PV costs	PV benefits (single farm)
Option 2—Upgrade single phase backbone to 3-phase	Tyrendarra	3,589	30,424
	Strathdownie	2,684	30,424
	Cape	1,912	30,424
	Bridgewater	1,522	30,424
	Gorae West		

Source: Powercor

4.2.1 Benefits

The benefits of this project, as highlighted by our stakeholders, includes:

- reducing capacity constraints, thus enabling existing dairy farms and support industries to expand
- attracting new investment, including the conversion of lower value grazing land into dairy farms
- improving land utilisation for both existing and new farms through the ability to better irrigate land
- supporting regional communities

To quantify the benefits, the Dairy Australia commissioned independent group, EconSearch, to assess the economic impact of dairy industry investment.

EconSearch constructed an input-output (I-O) model for each of the eight main dairy regions, including Western Victoria as outlined in its report at attachment PAL ATT124. This approach to modelling economic benefits is well established as being robust and renowned for its ability to account for direct economic impact and the flow-on economic impacts. The EconSearch analysis provided multipliers of the economic impact of the Australian dairy industry. These multipliers can be applied to a change in dairy farm output to determine the economic impact of the output. They are expressed in terms of a \$1 change in dairy output.

To undertake a sensitivity analysis of the benefits, we considered the case where the network upgrade resulted in just one additional dairy farm in each area. We used the average Western Victorian dairy herd cattle and the average amount of milk solids produced by each cow per year outlined in EconSearch's report as outlined in table 6.¹¹

Table 6 2017/18 typical Western Victorian farm as per Economic Impact of the Dairy Industry in Australia report

	Average herd of cattle	Milk solids sold (kg milk solids/cow)	West Vic milk price (\$/ Kg MS)	Total dairy farm output (\$ 000, p.a)
Dairy output	393	530	5.87 ¹²	1,223

Source: EconSearch

We then applied the economic multipliers to determine the impact on GRP and employment. As outlined in the table below.¹³

¹¹ PAL ATT124: EconSearch, Economic Impact of the Dairy Industry in Australia, April 2016, p. 23.

¹² PAL ATT233: Dairy Australia <<https://www.dairyaustralia.com.au/industry/prices/farmgate-milk-price>>

Table 7 2017/18 typical Western Victorian farm as per Economic Impact of the Dairy Industry in Australia report (\$000, 2019)

Economic output type	Dairy farm output	EconSearch output multiplier	Total (per annum)
GRP (\$000)	1,223	1.87	2,286
Employment (FTE)	1,223	6.2 (per \$million)	7.5

Source: EconSearch

We and our stakeholders consider that the addition of one new farm to be a conservative estimate of the benefits from upgrading the electricity infrastructure.

4.2.2 Unquantifiable benefits

Other benefits as a direct result of the upgrade to three phase are:

- improved land utilisation—land irrigation is one of the areas currently being constrained by the lack of capacity. Portions of the region are not suitable for dairy farms due to an inability to reasonably irrigate the land as a result of the capacity limitations. With the upgrade to three phase, the region will be able to become better irrigated and more usable land will become available, allowing expansion for existing farms and further incentive for new investment.
- support regional communities—as dairy farms grow so too do the surrounding regional communities. The upgrade will help these regional communities grow and support those already developed within the region.

4.2.3 Cost

We have determined the cost of upgrading the four feeders based on:

- the cost of historical feeder upgrade projects completed during the three years from 2016–2018, converted into into a per kilometre unit rate (the costs for necessary automatic circuit-reclosers was also included).
- the feeder length
- an allowance for maintenance (considered in the NPV analysis to compare options but not being sought as a step change to the investment forecast).

The table below details the lengths and the costs associated with each project.

¹³ PAL ATT124: EconSearch, Economic Impact of the Dairy Industry in Australia, April 2016, p. xiii.

Table 8 Capital investment (\$000, 2019)

Feeder	Description	Length (km)	Cost
Tyrendarra	1 phase to 3 phase line replacement	37.4	3,216
Strathdownie	1 phase to 3 phase line replacement	28.5	2,406
Cape Bridgewater	1 phase to 3 phase line replacement	20.0	1,714
Gorae West	1 phase to 3 phase line replacement	15.7	1,364
Total			8,700

Source: Powercor

5 Recommendation

We recommend adopting Option 2—upgrading regional supply because it results in higher expected net benefits and is in line with our customers' expectations. The PV over 20 years of both options is presented below.

Table 9 NPV of options (\$000, 2019)

Option	Project	PV costs	PV benefits (single farm)
Option 1—status quo	NA	-	-
Option 2—Upgrade single phase backbone to 3-phase	Tyrendarra	3,589	30,424
	Strathdownie	2,684	30,424
	Cape	1,912	30,424
	Bridgewater	1,522	30,424
	Gorae West		

Source: Powercor

The expenditure forecast to support this option is outlined in the table below.

Table 10 Capital investment (\$000, 2019)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Tyrendarra	3,216	-	-	-	-	3,216
Cape Bridgewater	1,714	-	-	-	-	1,714
Strathdownie	-	2,406	-	-	-	2,406
Gorae West	-	1,364	-	-	-	1,364
Total	4,930	3,770	-	-	-	8,700

Source: Powercor