

**ITEM 4. GREEN SQUARE PRIVATE WIRE AND GREEN SQUARE AQUATIC CENTRE TRIGENERATION PLANT****FILE NO: S116501****SUMMARY**

On 24 June 2013, Council endorsed a revised strategy for delivery of decentralised energy. A key element of the revised strategy was to investigate options for the delivery of trigeneration at the City's own facilities.

**Green Square Town Centre Private Wire**

On 24 February 2014, Council noted the private wire concept to connect the City of Sydney's own buildings and facilities at Green Square (including the Green Infrastructure Centre, the Child Care Centre, the Aquatic Centre, community facilities and public area lighting).

The private wire consolidates individual electricity connections into a single connection, providing the benefit of reduced network connection charges and lower network tariffs. It also provides the flexibility to connect solar photovoltaic and trigeneration systems in the future to supply low-carbon electricity to the City's own facilities "behind the meter" and avoid network charges. Ausgrid has advised that registration of the private wire as an electricity network will not be required. The City would manage maintenance as it currently does with the private wire supplies to its public lighting systems.

A business case investigation has established that the capital cost of consolidating the electricity connections for the City's own buildings and facilities associated with the former South Sydney Hospital Site and the Green Square Aquatic Centre into a single electricity connection is the same as the business-as-usual cost of connecting each building and facility individually to the Ausgrid electricity network.

It is proposed to proceed with a single connection for the City's own buildings and facilities associated with the former South Sydney Hospital site and the Green Square Aquatic Centre, which will benefit from lower ongoing network tariffs.

**Green Square Aquatic Centre – Trigeneration Plant**

The Aquatic Centre at Green Square is proposed to be a year-round facility. Trigeneration has been demonstrated to be an effective method of providing low emission pool heating and electricity to aquatic centres by other Councils in NSW, including Leichhardt, North Sydney, Willoughby, Hornsby and Wagga Wagga.

The City has investigated a number of options to incorporate a trigeneration plant into the proposed Aquatic Centre. If connected to the private wire, the plant would also supply electricity to other City buildings and facilities on the South Sydney Hospital site. As well, the plant would provide heat energy to the Aquatic Centre. However, it is not planned to install absorption chillers for air-conditioning in this project, as air-conditioning from low-carbon electricity is more cost-effective in this instance.

A business case investigation established that a small trigeneration plant that only services the Aquatic Centre would achieve a cost of carbon abatement comparable with the benchmark cost of GreenPower. If connected to the private wire described above, a trigeneration plant would achieve considerably more carbon abatement at a cost significantly less than GreenPower. It would reduce the City's carbon emissions by 10,000 tonnes over the project life and contribute an additional one per cent toward the City's forecast organisational emission reductions by 2019. The business case investigation is summarised in Attachment A.

It is therefore preferable that the City incorporate a trigeneration plant into the Aquatic Centre that is appropriately sized to heat the pool and to supply electricity both to the Aquatic Centre and to other City buildings and facilities connected to the private wire.

## RECOMMENDATION

It is resolved that Council:

- (A) note the plan to consolidate electricity connections for the City's own buildings and facilities associated with the former South Sydney Hospital Site, nearby street lighting and the Green Square Aquatic Centre into a single electricity connection to benefit from lower ongoing network tariffs and facilitate sharing of energy between buildings;
- (B) approve incorporating a trigeneration plant into the Green Square Aquatic Centre to heat the pool and to supply electricity both to the Aquatic Centre and to other City buildings and facilities connected to the Green Square private wire; and
- (C) note that a budget allowance has been made in the approved Capital Works Budget that was placed on exhibition as part of the Integrated Planning and Reporting documents in May 2014 for the Green Square private wire and Aquatic Centre trigeneration.

## ATTACHMENTS

**Attachment A:** Business Case Summary for Green Square Aquatic Centre Trigeneration

**Attachment B:** Business Capital Cost Estimates for Green Square Aquatic Centre Trigeneration (Confidential)

**(As Attachment B is confidential, it will be circulated separately from the Agenda Paper and to Councillors and relevant senior staff only.)**

**BACKGROUND**

1. Sustainable Sydney 2030 is the City's vision to make Sydney green, global and connected by 2030 - reflecting our residents' aspirations for the City of Sydney Local Government Area (LGA). Around 90 per cent of respondents to consultation on the draft vision said that they wanted urgent action on global warming or climate change.
2. Around 80 per cent of the City's greenhouse gas emissions are from centralised power generation, primarily coal-fired power stations, and this is where much of the emissions reduction potential lies.
3. Trigeneration is a key greenhouse gas emission reduction element in the Green Infrastructure Plan master plans and is necessary to deliver a 70 per cent reduction in greenhouse gas emissions required to fully meet the Sustainable Sydney 2030 target for the local government area.
4. Recent changes to the regulatory and economic environment have made some trigeneration projects less favourable. However, trigeneration projects which generate a significant amount of electricity for use behind the meter, such as the Green Square Aquatic Centre Trigeneration, when combined with the Green Square private wire, can be cost-comparable with GreenPower, even in the current regulatory environment.
5. The City has identified potential opportunities to install trigeneration in the current regulatory environment at the Aquatic Centre in Green Square (via the private Wire, supplying the Green Infrastructure Centre, Recycled Water Infrastructure, Child Care Centre, Aquatic Centre, Community Facilities and public area lighting).

**Green Square Private Wire Development Approach**

6. The former South Sydney Hospital site and a number of other nearby sites in or adjoining Green Square Town Centre are being redeveloped to provide a range of City buildings and facilities. These include a child care centre, community facilities, aquatic centre, recycled water plant, a library, urban open space, Gunyama Park and public lighting. A business-as-usual approach to the provision of electricity to each of these facilities would involve separate connections to the Ausgrid electricity network for each facility.
7. The private wire consolidates individual connections into a single connection providing the benefit of reduced network connection charges and lower network tariffs. It also provides the flexibility to connect a trigeneration plant in the future to supply electricity to the City's own facilities at Green Square "behind the meter", and supply thermal energy to the new aquatic centre to heat the pools.
8. Consolidating the individual connections will allow renewable electricity from solar photovoltaic arrays installed on City buildings and facilities to be shared between these buildings "behind the meter", further reducing network charges.
9. Investigations indicate that a significant level of solar photovoltaic panels can be installed on the City's buildings connected to the private wire. When the solar photovoltaic and trigeneration systems are combined, approximately 540 tonnes of carbon abatement per year can be achieved. This represents around 1.5 per cent of the organisational carbon emissions reduction target for the City.

10. Two options for a private wire were investigated which were:
  - (a) a larger-scale high voltage private wire that includes buildings and facilities on the former South Sydney Hospital site, across the road to the Aquatic Centre and more remotely located City buildings including the Green Square Town Centre Library; or
  - (b) a smaller-scale low voltage private wire that includes buildings and facilities on the former South Sydney Hospital site, neighbouring street lighting and the Aquatic Centre across the road.
11. The high voltage connection required to supply the Green Square Town Centre Library from the private wire was found to be uncompetitive, due to the cost of installing a high voltage cable and associated equipment along the street from the former South Sydney Hospital site to the Library (nearly half a kilometre). As a result, it is proposed not to connect the Library to the private wire.
12. Low voltage private wires are commonly used for public facilities in a campus setting. The operating South Sydney Hospital was serviced via a private wire, and the site remains currently serviced by a single Ausgrid connection for all buildings on the site.
13. Ausgrid has discussed the City's proposal to install its own private cable across Joynton Avenue to supply the Aquatic Centre at Green Square with NSW Trade and Investment. Ausgrid has advised that it accepts that the City will pursue the proposal to install its own cable and that Ausgrid will not object to the initiation of the contestable project to install the kiosk substation at the former South Sydney Hospital site, which will connect the private wire to the Ausgrid network.
14. Ausgrid has also advised that registration of the private wire as an electricity network will not be required. The City will be responsible and liable under the public safety regulatory framework for electricity.
15. This is similar to the situation that the City has managed for many years in relation to the thousands of City-owned smartpoles and other public area lighting fixtures that are connected via a series of low voltage private wires to the Ausgrid electricity network.
16. A business case investigation has established that the capital cost of consolidating the City's own buildings and facilities associated with the former South Sydney Hospital site and the Aquatic Centre electricity connections into a single connection, is the same as the business-as-usual cost of connecting each building individually to the Ausgrid network.
17. It is proposed to proceed with a single low voltage electrical connection for the City's own buildings and facilities associated with the former South Sydney Hospital site and the Aquatic Centre. This will result in lower ongoing electricity network tariffs.

**Green Square Aquatic Centre Trigeneration Development Approach**

18. A trigeneration plant was investigated for the proposed Aquatic Centre at Green Square in accordance with the City's revised trigeneration strategy.
19. Trigeneration has been demonstrated to be an effective method of providing low emission pool heating and electricity to aquatic facilities by other councils in NSW, including Leichhardt, North Sydney, Willoughby, Hornsby and Wagga Wagga.
20. A business case investigation considered a series of options for low-carbon energy at City buildings and facilities at Green Square, including:
  - (a) installing solar photovoltaic panels only;
  - (b) installing a very small trigeneration plant that only services the Aquatic Centre; and
  - (c) installing a small trigeneration plant in the Aquatic Centre to meet average electricity demand for the Aquatic Centre and the Green Square private wire. This option could be combined with future installation of solar photovoltaic arrays on the rooftops of City buildings and facilities.
21. The solar-photovoltaic-only solution would not produce sufficient electricity to meet the average load for buildings and facilities connected to the private wire, as the quantity of solar photovoltaic panels is limited by available rooftop area. Also, the cost of carbon abatement from solar-photovoltaic-only is a more expensive than trigeneration-plus-solar-photovoltaic. Trigeneration has the added benefit that it can provide substantial heat for the pool, which would not occur with a solar-photovoltaic-only solution.
22. Installing a very small trigeneration plant that only services the Aquatic Centre could achieve a cost of carbon abatement comparable with the benchmark cost (GreenPower).
23. The preferred solution combines the benefits of trigeneration with the private wire, and is sized to meet the average electrical load for the private wire. The business case investigation shows the option of installing a small trigeneration plant in the Aquatic Centre to meet average electricity demand for the Aquatic Centre and the Green Square private wire would achieve a cost of carbon abatement that is considerably lower than GreenPower. The results of the business case investigation are summarised in Attachment A.
24. The preferred option is a 150 to 170 kilowatt trigeneration plant. This will reduce the City's carbon emissions by 10,000 tonnes over the project life of 25 years and contribute an additional one per cent toward the City's forecast organisational emission reductions by 2019.
25. Investigations have shown that, for this project, it would be less capital-intensive and more cost-effective to provide air-conditioning for the Aquatic Centre using low-carbon electricity. Accordingly, it is not planned to install absorption chillers for air-conditioning as part of this project.

26. It is recommended that the City proceed to incorporate a trigeneration plant into the Aquatic Centre at Green Square that is suitably sized to heat the pool and to supply electricity, both to the Aquatic Centre and to the City's own buildings and facilities associated with the former South Sydney Hospital site.

### **Assumptions and Risks**

27. A financial analysis was completed on the recommended option. A number of scenarios were modelled to determine the sensitivity to changes in key assumptions, such as cost of gas and average level of generation. These are reflected in the range of costs set out in Attachment A.
28. The analysis has been completed on the projected electrical demands for the Aquatic Centre and other electricity loads associated with the private wire, including the future buildings and open space needs. Electricity loads have been derived from electricity consumption information for modern comparable facilities.
29. A conservative approach has been taken to estimate electricity loads to avoid over-sizing the trigeneration plant. The load calculations have assumed that the Aquatic Centre and other buildings and facilities connected to the private wire will be constructed with the latest energy efficient technology.
30. Gas and electricity price forecasts are based on industry standard gas and electricity market forecasts prepared by ACIL Allen.
31. Carbon charges have been removed from the energy price forecasts.
32. The reference cost of carbon abatement (GreenPower) is \$49 per tonne of CO<sub>2</sub>-e in financial year 2018. This is the relevant benchmark for this project, as financial year 2018 is the year when funds will be invested to install the trigeneration plant.
33. Project costing is based on a survey of five other recent comparable projects in NSW and Victoria.
34. The projected gas demands were modelled over the summer and winter periods to analyse the efficiency of the heat utilisation in the Aquatic Centre.
35. The project would be complementary to the City's other initiatives to reduce its greenhouse gas emissions, including the installation of solar photovoltaic panels on the City's own buildings and building energy efficiency improvement retrofits.
36. Additional emissions reductions may be achievable in buildings and facilities connected to the private wire network by way of an appropriate level of on-site renewables energy (in the form of one or more solar photovoltaic arrays). Any solar photovoltaic arrays would be complementary to the trigeneration facility and would be designed in such a way that they complement the efficient operation of the trigeneration facility. Provision of on-site energy storage, which will improve the operational performance of solar photovoltaic arrays and their interaction with the trigeneration plant, will be the subject of a separate investigation.

## KEY IMPLICATIONS

### Strategic Alignment - Sustainable Sydney 2030

37. *Sustainable Sydney 2030* is a vision for the sustainable development of the city to 2030 and beyond. It includes 10 strategic directions to guide the future of the city, as well as 10 targets against which to measure progress. This report is aligned with the following strategic directions and objectives:
- (a) Direction 2 provides a road map for the City to become a Leading Environmental Performer – the trigeneration plant will contribute to the City's current emissions reduction target.

### Organisational Impact

#### Private Wire

38. The private wire will impact on the planning, design and delivery of electricity connections for buildings and facilities at Green Square Town Centre. A project plan is currently under development to coordinate the works between the various building projects.
39. In the operational phase, there are potential impacts on the management of energy supply from solar photovoltaic arrays installed in Green Square Town Centre facilities. An operational plan will need to be required to optimise the use of the available energy from the trigeneration plant and the on-site renewables.

#### Trigeneration Plant

40. The trigeneration plant will impact on the planning, design and delivery of the Aquatic Centre. A performance specification for the trigeneration plant is to be incorporated into the initial project specifications for the Aquatic Centre to optimise the Aquatic Centre design and minimise the potential for variations.

## BUDGET IMPLICATIONS

41. A budget allowance for the Green Square Private Wire and Trigeneration in the Aquatic Centre has been made in the approved Capital Works Budget that was placed on exhibition as part of the Integrated Planning and Reporting documents in May 2014.

## RELEVANT LEGISLATION

42. Attachment B contains confidential commercial information which, if disclosed, would confer a commercial advantage on a person with whom Council is conducting (or proposes to conduct) business.
43. Discussion of the matter in an open meeting would, on balance, be contrary to the public interest because it would compromise Council's ability to negotiate fairly and commercially to achieve the best outcome for its ratepayers.

**CRITICAL DATES / MILESTONES**

44. The following table sets out project key dates and milestone:

<b>Date</b>	<b>Milestone</b>
September 2014	Council considers recommendation to include a trigeneration plant in Green Square Aquatic Centre
October 2014	Complete performance specification for the inclusion of the trigeneration facility in Green Square Aquatic Centre
September 2015	Lodge Development Application for Gunyama Park and Green Square Aquatic Centre
December 2015	Install private wire switch room in Green Infrastructure Centre
May 2016	Invite Expression of Interest/ Tenders for Construction of Gunyama Park and Green Square Aquatic Centre
November 2016	Complete and approve Gunyama Park and Green Square Aquatic Centre Construction Certificate documentation
Early 2017	Commence construction work
2019	Commence commercial operation

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