Intermodal Logistics Centre at Enfield Environmental Assessment

CHAPTER 18

ENERGY USAGE AND GREENHOUSE GAS EMISSIONS

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18. Energy Usage and Greenhouse Gas Emissions

This chapter addresses the requirement of the Director-General to outline energy use and the sustainable use of resources. It provides a general overview of the energy use requirements of the ILC site during the construction and operational phases of the project. In addition, the chapter includes information regarding the expected greenhouse gas emission savings resulting from the transfer of container freight from road to rail. Potential measures are identified which may be applied to reduce energy consumption and reduce greenhouse gas emissions, with the overall aim of increasing the sustainable use of resources by the ILC at Enfield.

18.1 Introduction

The majority of energy sources are based on the combustion of non-renewable fossil fuel including diesel, petrol, natural gas and coal for the generation of electricity. Consumption of energy from non-renewable resources has impacts on the environment which include effects on local, regional and global air quality and the depletion of non-renewable resources.

During the construction of the ILC at Enfield, energy would be primarily consumed through the operation of construction equipment and transport of construction materials. During operations, energy would be consumed mainly by the container transporting equipment, lighting and the movement of trucks and trains associated with transporting containers to and from the ILC site.

The operational energy use assessment is limited to an 'end-use' activity assessment, namely the energy consumption that occurs as a result of the whole ILC site functioning and covers the provision of energy services to the site, such as electricity provided through the grid.

18.2 Construction Phase

During the construction phase, energy consumption would result from activities including:

- Site preparation and major earth works, including remediation of contaminated soils, creation of landscaping mounds, construction of detention basins, levelling of the site and construction of haul roads;
- Construction of main road, bridge and rail infrastructure, including the construction of new railway line and sidings, and paving of container storage areas and internal roads;
- Construction of warehousing, administration and maintenance buildings and following completion of the ILC main site, erection of commercial or light Industrial buildings on Cosgrove Road.

It is anticipated that the main energy sources for these activities would be diesel fuel to power the plant, trucks and machinery used. Specifically, fuel would be consumed in the delivery and removal of materials to and from the site, fuel and electricity for plant and machinery and handheld tools on site.

18.3 Operational Phase

During the operational phase, many of the site operations would be powered by electricity. This would be required for:

- Lighting of container stacking areas throughout the night;
- Powering of refrigerated containers and air conditioned warehouses;
- Normal building functions (such as lighting, heating, computer and telecommunications facilities);
- Lighting and traffic signals on site;
- Maintenance facilities and equipment;
- Washbay facilities;
- Computer control systems; and
- Emergency management facilities and systems.

The estimated annual energy consumption over the operational life of the project is 47.5 Gigawatt hours per year. The estimates are on allocated Watts per square metre rate multiplied by separate areas on the concept drawings. Lighting demands were included, based on the preliminary lighting design developed for the light spill assessment.

18.4 Greenhouse Gas Considerations

18.4.1 Greenhouse Gas Issue and Climate Change

It is widely recognised that climate change is a major global issue, with human activity and the combustion of fossil fuels increasing the levels of greenhouse gases (GHGs) such as carbon dioxide (CO_2) in the atmosphere. The build-up of GHGs in the atmosphere may lead to long-term changes in water availability and rising sea levels as well as to changes in weather patterns, causing more extreme events such as droughts, floods and cyclones.

Major GHGs produced or influenced by human activities include carbon dioxide (CO_2) and methane (CH_4). Carbon dioxide is the main anthropogenic gas contributing to climate change and concentrations of this gas in the atmosphere have increased by 30% during the past 200 years (CSIRO, 2000). The major anthropogenic sources of carbon dioxide emissions are fossil fuel combustion and land clearing for agriculture.

Atmospheric methane concentrations have increased by 150% during the past 200 years (CSIRO, 2000) and, although there is less methane in the atmosphere, it is a significantly stronger greenhouse gas. The major anthropogenic sources of methane are cattle, rice growing and leakages during natural gas production, distribution and use. Presently, natural processes remove methane from the atmosphere at almost the same rate as it is being added to it. However, over the next 100 years, methane concentrations are likely to rise.

18.4.2 Greenhouse Gas Response

At a national level, the National Greenhouse Strategy was developed to provide the strategic framework for an effective greenhouse response and for meeting current and future international commitments (Commonwealth of Australia, 1998). Each State and Territory has developed greenhouse strategies to implement measures within the National Greenhouse Strategy and provide a basis for ongoing monitoring and reporting of progress on the Strategy. New South Wales has focused on reducing emissions from energy suppliers and has established the Sustainable Energy Development Authority (SEDA) (which has since been incorporated into the Department of Energy, Utilities and Sustainability (DEUS)), to promote sustainable energy and water supply and use.

18.4.3 Greenhouse Gases and the ILC

As part of the current study, the greenhouse impact was calculated by considering the decrease in truck vehicle kilometres travelled (VKT) that will result from the project and the relative increase in locomotive VKT. This is determined by considering the change in GHGs generated by transporting containers to/from container origin and destination (COD) points within the inner and middle western Sydney market via the proposed ILC, compared with the “no change” case. The “no change” case assumed the COD points within the market would continue to be served by trucks direct to/from Port Botany. For the ILC case, these COD points would be served by locomotives between Port Botany and the ILC and by trucks to/from the ILC. There would also be a newly created COD point at the ILC.

The assessment does not consider greenhouse gas emissions from container handling equipment that will operate at the ILC. For example, reach stackers and gantry cranes would be operated either at the ILC at Enfield or at another intermodal facility elsewhere to accommodate the finite amount of Sydney’s containerised freight in any given year. In any case, the greenhouse gas emissions from these activities is considered very small when compared with the changes in emissions associated with trucks and trains calculated below.

Specifically, truck VKT would decrease as a result of more containerised freight being delivered by locomotive from Port Botany to the ILC at Enfield. The ILC is closer to the majority of COD points within the inner and middle western Sydney market than to Port Botany. There is a relative increase in locomotive VKT to the market from the additional delivery by rail of containers out of Port Botany to the ILC.

Traffic modelling outputs from the road traffic assessment described in Chapter 7 – Road Traffic and Transport provided the following truck VKT in 2016 associated with container transport in Sydney:

- “No change” case 9,614,207 VKT; and
- With ILC at Enfield 3,084,466 VKT.

The modelling data show the presence of the ILC will reduce truck VKT by 6,529,741 km in 2016. Based on a heavy vehicle fleet average fuel consumption rate of 0.33 litres / km (Australian

Greenhouse Office (AGO), 2003), this results in a reduction in diesel fuel consumption by trucks of 2,154,815 litres.

For rail locomotives, the ILC project would most likely result in an average of 16 one-way train movements each day between Enfield and Port Botany, with each train assumed to be operating with 2 locomotives. The containerised freight on a typical train out of Port Botany and bound for Enfield would require the power of 2 x 44 class locomotives. Given the return journey would be carrying a significant number of empty containers, 2 locomotives would not always be required.

The rail distance between Port Botany and Enfield is 18 km, equating to 288 train VKT / day or 105,120 train VKT / year, based on 365 days operation. The estimated fuel consumption at full load for the 2 x 44 class locomotive driven trains travelling at a typical speed of 25 km/h on the dedicated freight line between Port Botany and Enfield is 17 litres / km. As such, the calculated annual diesel fuel demand for locomotives hauling containers to/from the inner and middle western Sydney markets is 1,787,040 litres per year. It should be noted that modelling with 2 locomotives and full loads is likely to overestimate locomotive GHG emissions, as the average number of locomotives over a return trip is likely to be about 1.5.

The AGO (2003) provides an emission factor for automotive diesel as consumed by both trucks and locomotives of 2.7 tonnes of CO_2 per kilolitre of fuel consumed.

Using the above data to calculate CO_2 emissions, the results from the ILC project are:

- Decreased truck CO_2 5,818 tonne CO_2 / annum; and
- Increased locomotive CO_2 4,825 tonne CO_2 / annum.

This equates to an annualised 2016 reduction in CO_2 emissions of 993 tonne per annum within the Sydney airshed as a result of operation of the ILC. This demonstrates a reduction in fuel use and greenhouse gas emissions as a result of the project, in line with NSW Government strategies.

18.5 Energy Conservation and Management

Energy conservation measures would be implemented for the ILC on-site activities to ensure that the use of non-renewable resources is minimised. A key component of achieving energy conservation would be the development of relevant energy management measures as part of the Construction and Operational EMPs. Energy management measures would be assessed during detailed design and would be consistent with the energy conservation measures for commercial and industrial buildings outlined in the Strathfield Council’s Development Control Plan (DCP) 27 - Industrial Development. The DCP promotes efficiency in energy use and the conservation of non-renewable energy resources.

18.5.1 Construction Phase

The following measures would be undertaken during construction works and would be required to be detailed in the Construction EMP:

- Throttling down and switching off construction equipment when not in use;
- Switching off truck engines while they are waiting to be loaded and unloaded;
- Switching off site office equipment and lights; and
- Regular maintenance of equipment to ensure optimum operations and fuel efficiency.

18.5.2 Operational Phase

The following measures would be investigated and assessed prior the commencement of site operations. Appropriate measures would be incorporated into the relevant site or tenant Operational EMP.

Energy Efficient Design

Design of buildings and terminal layout would aim to achieve the following energy efficiencies:

- Reduction of heating, cooling and lighting use in buildings through climate-responsive design and conservation practices;
- Employing renewable energy sources such as day-lighting and passive solar heating wherever practicable;
- Optimising building performance and system control strategies, such as controlling lights with occupancy sensors and controlling comfort heating and cooling with time switches, timer delays or occupancy sensors;
- Designing and configuring lighting, as far as practicable, in accordance with lighting power density and other performance criteria provided in Strathfield Council's DCP 27 for Industrial Development; and
- Maximising the use of solar power for signage, navigation aids and pedestrian lighting.

Energy Efficient Practices

Large energy savings could be achieved in using energy efficient equipment. The following actions are examples of how energy savings could be achieved by the ILC operator(s):

- Fitting energy intensive equipment such as container RMGs with energy saving devices such as power factor regulators, harmonic filters, voltage regulators, and drive controls;
- Using energy efficient electrical appliances;
- Installing lighting control devices where appropriate and linking to photo-electric dimming;
- Providing sufficient energy metering and switching for energy management; establishing protocols to reduce the amount of truck and locomotive idle time; and
- Communication and education of energy conservation measures to all ILC operators.

18.6 Conclusions

The proposed ILC will result in an annualised 2016 reduction in CO_2 emissions of 993 tonnes per annum within the Sydney airshed. This reduction in fuel use and greenhouse gas emissions as a result of the project is in line with NSW Government strategies.

Energy conservation measures would be implemented to ensure that the use of non-renewable resources is minimised. A key component of achieving energy conservation would be through the development of energy management strategies which will be included as part of the Construction and Operational EMPs developed for the project.