Lend Lease

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Committee Secretary
Senate Select Committee on Electricity Prices
PO Box 6100
Parliament House
Canberra ACT 2600
Australia

Submission to the Senate Select Committee's inquiry into Electricity Prices

Lend Lease is one of the world's leading fully integrated property and infrastructure solutions providers. We are involved in the development of many precincts and communities around Australia such as Barangaroo South and Victoria Harbour. Lend Lease aims to provide solutions for its precincts which consider environmental, social and economic impacts. As a result we are involved in the investigation of energy efficient design and decentralised energy systems for precincts (precinct energy systems). Our experience with precinct design and energy systems has demonstrated the potential for a number of positive impacts for the environment, developer, the community and for the infrastructure providers.

Contributing factors to energy prices include electricity generation, transmission and distribution. These also include maintenance and upgrades of these systems, as well as now with the Carbon Tax which add a price of carbon to electricity generation. In addition given the large distances to transport electricity between the generator and consumer there are losses which occur meaning that less electricity is provided to the end user than what is provided by the generator. These costs are all included within the final electricity costs paid by the consumer.

There are a number of factors which contribute to increases in energy prices for Australian consumers of electricity. These include:

- Current age of electricity infrastructure

  The current distribution and transmission infrastructure requires regular maintenance and end of life upgrade works. The significant maintenance costs are included in transmission and distribution charges included within the electricity price for consumers.

- Current capacity limitations of electricity infrastructure

  The current distribution and transmission infrastructure requires significant and costly upgrades in order to service new developments and increasing peak load requirements. Whilst some of these costs are passed on to the development, many costs are absorbed by the infrastructure service providers and then redistributed in the service charges to the consumer ultimately seen in the total electricity prices.

Lend Lease Management Services Limited
ABN 57 059 923 465
Level 4, 30 The Bond
30 Hickson Road
Millers Point NSW 2000
Australia

Telephone +61 2 9236 6111
Facsimile +61 2 9252 2192

www.lendlease.com

- Lack of investment in upfront costs of energy efficiency for residential and non-residential buildings.

  There is energy efficiency legislation applied through the National Construction Code (NCC) of Australia under Section J. Further investment in energy efficiency of buildings would further reduce the overall energy demands of those buildings; however there is little incentive to further reduce the peak and overall energy demands of buildings

- Large existing building stock with poor energy performance

  Whilst more and more new developments are incorporating some energy efficiency in their design, the existing building stock represents a much larger proportion of the building sector. Whilst voluntary schemes such as NABERS exist which can measure and demonstrate the energy efficiency of an operational building. There are few programs to support the upgrading of the performance of the existing building stock. Poor performance of existing building stock increases the overall energy consumption (and hence electricity costs) of tenants and residents within the buildings. In addition improving the existing building stock would reduce the strain on existing electricity infrastructure which would reduce network infrastructure costs by avoiding upgrades and maintenance requirements.

- Price of carbon associated with electricity generation

  As mentioned previously with the introduction of the Carbon Tax electricity generators have to pay for the carbon they emit. This is ultimately passed onto the consumer through the electricity retail rates.

- A reliance on electricity

  Building energy demands are predominantly met with electricity. Generally, only hot water used for heating and domestic hot water uses are powered by alternative forms of energy, namely natural gas. There exists an opportunity to diversify the fuel source, from which services within a building a powered.

Where Lend Lease is involved in the development of precincts, we investigate the most environmentally and cost effective method of reducing precinct energy and carbon emissions. This has included both energy efficiency measures in building design, master planning and precinct energy systems.

Precinct Energy Systems

Lend Lease has the opportunity through their development of precincts to develop the most effective mechanisms for reduced energy demand. This has been demonstrated to be a combination of both energy efficiency measures within the building design and master planning as well as through the infrastructure provided.

Precinct energy systems can include:

- Cogeneration or trigeneration - whereby natural gas or biofuels can be used to create low carbon electricity, and carbon zero hot water and/or chilled water from waste heat
- Central hot water or chilled water
- Central site approaches to energy systems (Photovoltaic, solar heating etc)
- Embedded networks (private distribution networks)
- Energy storage systems

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Mechanisms to assist reduced household and energy costs

The use of precinct energy systems assists in the reduction of energy costs through the following capabilities:

- Increased Energy Efficiency

  Increased energy efficiency of centralised systems, means that less fuel source (e.g. coal or gas) is required to provide the same amount of energy to the end consumer. Where greater losses exist in the local network system, these costs are passed on to the end consumer. Creating more efficient systems for energy provision reduces the price of energy for consumers. Increased efficiency of centralised systems occurs in the following ways:

  - Precinct scale services (e.g. hot water or chilled water) can be designed such that they operate more efficiently due to the provision of larger systems which often operate more efficiently than smaller ones. In addition, a greater level of maintenance and ongoing commissioning/tuning is provided to centrally based systems, rather than distributed systems within buildings.
  - In the instance of cogeneration or trigeneration systems, the total energy output of these systems is significantly higher due to the utilisation of waste heat streams for hot and chilled water. Heat recovery is used to maximise total energy output.
  - Reduced transmission and distribution requirements means that lower energy losses are experienced where precinct energy systems reduce grid electrical demand.

- Reduced Carbon Content (Carbon Price Increase)

  With the commencement of the Carbon Tax in Australia, there exists a price of carbon. Electricity generators must pay for the carbon they emit. This is ultimately passed on to the consumer. Decentralised energy systems have reduced carbon content through increased energy efficiency, use of clean (low carbon) or renewable fuel sources which can benefit the customer and encourage investment.

- Reduced Operating Costs

  Precinct energy systems can provide services for a precinct, rather than by a building by building level. Providing services for a precinct will have reduced capital cost through economies of scale and diversification of load, as well as reduced operating costs through centralised maintenance and operation requirements. Rather than each building having their own hot water, chilled water and clean energy solutions, a precinct style solution can provide these services to each building within the precinct. This allows for one maintenance regime to be implemented across multiple buildings, with much of the infrastructure being provided in one central location.

- Reduced Infrastructure Costs

  Decentralised approach to energy and energy efficiency and savings particularly targeted at peak energy reduction has positive impacts on existing and future energy provisions for existing energy infrastructure. Even though such savings can have a benefit to existing or future spend on existing energy infrastructure there is little consistency for existing network providers to share some of this saving with precinct systems which could increase their viability and implementation, benefiting all parties and the consumer.

Wider Adoption of Technologies
Precinct energy systems have allowed for a wider adoption of technologies through the following:

- Utilisation of waste heat streams with absorption chiller

  Absorption chillers are not widely implemented in the building sector. Absorption chillers utilise heat streams such as hot water to create coolth through a thermochemical energy conversion process. In the instance of precinct hot water networks coupled with cogeneration, waste heat streams can be utilised for chilled water production which can be used to cool a building.

- Greater ability to adapt to more sustainable and low carbon fuel sources

  Precinct energy systems can be designed with greater future proofing in mind. This is demonstrated through the use of cogeneration facilities which have the technical capability to use biofuels as a fuel source as opposed to the commonly used natural gas fuel source. If biofuels become more viable in the future, they can be integrated into the existing cogeneration facilities. This is an example of how precinct energy system can be upgraded to account for emerging technologies as they become viable.

- Utilisation of load diversification

  One of the biggest advantages of precinct energy systems is their ability to take advantage of load diversification between different building types allowing systems to operate at more constant overall load. Commercial and residential sectors will have non-coincident peak periods with residential peaks occurring outside of business hours. A precinct system will require a lower overall capacity to be installed than in a building by building solution, given that peak energy requirements (electrical and thermal) are not concurrent among different building type. This also allows the precinct energy system to operate at a more consistent demand throughout the day, allowing the system to be designed to operate closer to the most efficient operating point.

Reduce peak demand on the national electricity system
Creating distributed energy generation facility within precincts reduces peak demand on the electrical system through the following:

- Increasing the use on non-electrical energy sources

  The flexibility of precinct energy systems means that a wider adoption of technologies is possible. With this includes a wider adoption of fuel and energy sources. In a 'business as usual' residential or office building all energy except hot water (which is used for heating and domestic hot water) is provided by electricity. In the case of a precinct system, the energy source can come from natural gas or biofuels, such as in cogeneration or trigeneration.

  Energy sources can also come from clean or renewable energy in the form of photovoltaic (solar panels) or other technologies such as fuel cells. Having these energy systems at a precinct scale can improve the economic viability and utilisation of these technologies. These systems can reduce the amount of energy required from the national electricity network for the precinct. While this will reduce the overall electricity

required from the national electricity network it will, perhaps more significantly has the ability to reduce the peak electrical demand required by these precincts.

- Storage technologies

  Electricity as an energy source is used instantaneously. Precinct energy systems which use hot water or chilled water often have significant commercial benefit from utilising thermal energy. This is largely due to the significant capital cost required to meet the peak demands for hot and chilled water, as well as the inability to ramp up energy delivery as quickly as electricity. Precinct energy systems will aim to operate as consistently as possible. This is realised through diversification of loads from with different building types within the precincts as well as energy storage.

- Distributing energy generation to reduce transmission losses and reducing transmission infrastructure requirements.

  Decentralised solutions which deliver electricity do so over shorter distances between the generation and end user, they don't require high voltage transmission within the precinct, and have shorter distribution requirements. This significantly reduces the transmission and distribution requirements for the national electricity network. This in turn reduces the infrastructure requirements (and upgrade requirements) for both distributers and transmission networks.

Distributed clean and renewable energy generation

Lend Lease has investigated distributed energy systems which incorporate clean and renewable technologies. Cogeneration utilises a fuel source more effectively to create a lower carbon content of electricity. Cogeneration system can utilise natural gas, rather than the grid to produce electricity and hot water and/or chilled water. This makes the electricity a cleaner (lower carbon) form of electricity than the national electricity network. Many cogeneration systems also have the technical capability to use biofuels which come from renewable fuel sources such as from biomass.

Opportunities and barriers to wider deployment of new and innovative technologies

Lend Lease is currently in the process of investigating distributed energy systems for its precincts including Barangaroo South and Victoria Harbour. These projects are striving to achieve a climate positive community without additional cost implications to the occupants. In its investigations Lend Lease has often found barriers to adopting distributed energy systems in the following:

- Fault protection capacity within the local distribution network.

  Fault protection is vital in the provision of decentralised energy generators which connect to the local distribution network, and for embedded networks (private distribution networks). There are often issues with the current fault protection capacity existing within the local distribution networks which limit the precinct energy systems from connecting, or significant upgrades are required at the expense of the precinct system.

- Lack of consistency between distribution networks nationally

  There are many distribution networks around Australia. It is the obligation of the precinct energy system to comply with the processes and requirements of the distribution networks which they will be connecting to. Currently there is no consistency between distribution networks in terms of requirements and processes, including application fees and timing of approvals. The AEMO is currently reviewing this process and has released a paper for comment which outlines a regulated process to create consistency.

- Issues with creating structure for services which run between multiple land owners

  A building management system within the precinct is required for the services which run between multiple land owners. This includes maintenance and access requirements. Lend Lease in the past has experienced significant barriers to provide centralised energy systems on site that can connect up multiply buildings through a private wire network. These barriers relating to approval time, cost of application and lack of shared incentives. Savings in network fees can be shared with the customer and enable more decentralised systems.

- Issues with benchmarking and rating scheme's such as NABERS to achieve appropriate recognition for each building.

  The current NABERS proposal does not account for carbon emissions benefit for buildings which are connected to a precinct system, where the system is not part of its land title. Lend Lease has submitted proposals to NABERS outlining how this can be appropriately accounted for under the NABERS scheme for Energy. If the current proposed NABERS solution was to be adopted as it relates to trigeneration, it would discourage decentralised plants being implemented or worse encourage individual building solutions to obtain a higher NABERS rating that would ultimately be less efficient and more costly to operate. Although, NABERS is a building rating tool it needs to evolve to address new master planned communities which are taking a more centralised approach to energy. For instance, in a master planned community those buildings with solar on their roof get the benefit from a NABERS rating but if there is a centralised solar array feeding the buildings, they do not take this green energy into account as it is not on the building title. This encourages building by building rather than creating opportunity to explore centralised outcomes.

- No economic sharing of the benefit for reducing peak energy demands (such as through decentralised systems)

  Precincts energy solutions can have a significant impact on the reduction of peak energy demands both for distributers and transmitters. This assists in the mitigation of upgrading of infrastructure to service these new developments, as well as the addition peak electricity generators. There is however, no incentive or benefit to precinct energy systems for reducing peak energy demand on the national electricity network. Any cost sharing benefits are negotiated on a case by case basis rather than looking at the grid as a whole. Lend Lease believes there should be a cost saving incentive to developers to reduce peak from centralised energy systems, thermal storage, building energy efficiency etc as this will reduce existing or future expenditures for the electricity network.

Lend Lease has found the following opportunities for the deployment of new technologies in developments:

- Economies of scale

  Precinct systems, when compared to building by building systems can utilise a wider variety of technologies and solutions by utilising economies of scale in both the capital requirements, as well as operational costs.

- Sustainability targets for developments

  Developments targeting high sustainability objectives relating to energy and carbon find that precinct systems provide a cost effective way to realise these targets both within the design and operation.

- Returns on investment through marketability

  Precincts which have low carbon solutions located on-site provide a much stronger connection between the occupants and the sustainability messaging in particular when compared to off-site solutions such as Green Power. This can lead to a return on investment for developers in the form of increased marketability and ultimately increased sales of the sites.

From this submission Lend Lease hopes to outline the many benefits of precinct energy systems, including a more efficient provision of services, low carbon energy sources, greater flexibility and future proofing in the fuel sources used, and significant reduction in peak electricity demand. Precinct solutions allow for reduced costs to the end consumer, a more effective method of reaching energy and carbon targets, and reduced infrastructure requirements for the national electricity networks.

Kind Regards,

Joe Van Belleghem
Director, Sustainability Solutions
Lend Lease