Ene-5 Peak Energy Demand Reduction

POINTS AVAILABLE 2

AIM OF CREDIT

To encourage and recognise designs that reduce peak demand on electricity supply infrastructure.

CREDIT CRITERIA

Up to two points are awarded where it is demonstrated that the building has reduced its peak demand on electricity infrastructure as follows:

- One point where:
  - Peak electricity demand of the Proposed Building is 15% lower than the peak electricity demand of the Standard Practice Building;
- Two points where:
  - Peak electricity demand of the Proposed Building is 30% lower than the peak electricity demand of the Standard Practice Building.

COMPLIANCE REQUIREMENTS

Proposed Building and Standard Practice Building

The definitions of the Proposed Building and Standard Practice Building are the same as those used for Ene-Conditional Requirement and Ene-1 'Greenhouse Gas Emissions'. The definitions can be found in the Greenhouse Gas Emission Calculator Guide (released for Public Building v1, Office v3, Education v1 and Retail Centre v1), available for download from www.gbca.org.au.

Methodology to calculate percentage reduction in peak electricity demand

The peak electricity demand for the Proposed Building and Standard Practice Buildings are established by interrogating the outputs from the energy modelling undertaken for the Ene-Conditional Requirement and Ene-1: 'Greenhouse Gas Emissions' credits. The electricity consumption included in the calculation of the peak electricity demand therefore includes all electricity consumption within the building and any external lighting, but excluding process loads and small power. No further modelling is required to be undertaken for this credit.

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The percentage reduction in peak electricity must be calculated as follows:

$$\text{Percentage reduction in peak electricity demand} = \frac{(\text{Annual peak electricity demand for the Standard Practice Building (kW)} - \text{Peak electricity demand for the Proposed Building (kW)})}{\text{Annual peak electricity demand for the Standard Practice Building (kW)}} \times 100$$

Where:

- **The annual peak electricity demand** for the Standard Practice Building is determined by interrogating the outputs from the Standard Practice Building's energy simulation (undertaken for Ene-Conditional Requirements and Ene-1: 'Greenhouse Gas Emissions'). The day of the year when the maximum demand for electricity occurs must be identified as well as the magnitude of the electrical demand. Where additional electricity consumption calculations are undertaken outside of the building simulation, this electricity consumption must also be included in these calculations (e.g. lift energy calculations).

- **The peak electricity demand** for the Proposed Building is determined by interrogating the outputs from the Proposed Building's energy simulation (undertaken for Ene-Conditional Requirements and Ene-1: 'Greenhouse Gas Emissions') *on the day of the year where the peak electricity demand of the Reference Building occurs.* Where additional calculations for electricity consumption or generation are undertaken outside of the building simulation, this electricity consumption or generation must also be included in the calculation of peak electricity demand. For example, where electricity is generated by Photovoltaic Cells, the design team will need to establish the contribution of the Photovoltaic system at the 'peak hour' established in the simulation software outputs.

On-site electricity generators

Where on-site electricity generators are used to reduce the building's peak electricity demand, it must also be demonstrated that:

- The storage tank (for diesel/biofuel/biomass/gas etc...) is sized sufficiently to support the operation of the system for one month when it is expected to operate the most. Please note that fuel necessary for standby/emergency operation is considered to be in addition to the fuel for peak energy demand reduction; and

- The storage tank can be filled without disturbance to the building occupants and vehicle and pedestrian traffic.

Ene-5 Peak Energy Demand Reduction

POINTS AVAILABLE 2

DOCUMENTATION - DESIGN RATING

Submit all the evidence and ensure it readily confirms compliance.

☐ Short report

Short report prepared by a suitable professional that includes at a minimum:

- A description of the Proposed Building's attributes that contribute to the reduction in peak electricity demand. Reference must be made to extracts from tender specifications, drawings, and schedules. The extracts themselves can be included in the Ene-Con and Ene-1 credits submission, however It must be clear where in the submission these extracts can be found (section and page number);
- A description of the Standard Practice Building's attributes that contribute to the magnitude of the reported peak electricity demand, referring to the Ene-Con and Ene-1 submission as appropriate;
- Calculation of the peak electricity demand reduction, with supporting extracts from the energy simulation outputs and any other energy consumption or generation calculations, confirming the date, hour and magnitude of the Proposed Building's and Standard Practice Building's peak electricity demand; and
- Where on-site electricity generators are present, it must be demonstrated that the specific compliance requirements regarding tank size and filling regime are met.

DOCUMENTATION - AS BUILT RATING

Submit all the evidence and ensure it readily confirms compliance.

☐ Short report

Short report prepared by a suitable professional that includes at a minimum:

- A description of the Proposed Building's attributes that contribute to the reduction in peak electricity demand. Reference must be made to extracts from as-built drawings and schedules, and Commissioning Reports, relevant test data and the Operations and Maintenance (O&M) Manual as appropriate, demonstrating that the solution(s) have been commissioned and operate as intended by the design. The extracts themselves can be included in the Ene-Con and Ene-1 credits submission, however It must be clear where in the submission these extracts can be found (section and page number);
- A description of the Standard Practice Building's attributes that contribute to the magnitude of the reported peak electricity demand, referring to the Ene-Con and Ene-1 submission as appropriate;
- Calculation of the peak electricity demand reduction, with supporting extracts from the energy simulation outputs and any other energy consumption or generation calculations confirming the date, hour and magnitude of the Proposed Building's and Standard Practice Building's peak electricity demand; and
- Where on-site electricity generators are present, it must be demonstrated that the specific compliance requirements regarding tank size and filling regime are met.

ADDITIONAL GUIDANCE

Standby generators

Unless they are designed and integrated into the base building for the purpose of peak energy demand reduction and can be activated automatically and without causing a blackout, stand-by generators do not qualify for this credit.

Load lopping

The use of load lopping by the BMS (or equivalent) does not meet the aim of this credit because it is an operational measure to reduce peak energy demand, not a building attribute.

While there may be an operational benefit in such strategy with regards to reducing peak electricity demand, load lopping/shedding strategies can lead to reduced indoor environment quality, and usually relate to aspects of energy use that could be better managed.

Multiple Buildings Single Rating Guidance

The credit is assessed based on the aggregate peak energy demand reduction of the project scope. Shared systems and facilities such as blackwater systems, path lighting, or shared carpark energy must also be included in the calculations for this credit.

Furthermore, the systems in use for this credit must be either exclusive to the project scope, or, sized to accommodate additional buildings for future development or other existing buildings. If the latter is the case, then the capacity of the peak energy demand reduction system must be apportioned between the project scope that is rated and the additional buildings based on a proportional basis.

Table Ene-5.1: Multiple Buildings Single Rating guidance

Rating	Guidance
Design	The documentation submitted at this stage must be for the whole project scope. The Short Report must contain a clear description of the project scope's peak demand requirement, and how it is being met by the systems within this credit.
As Built	The documentation submitted at this stage must be for the whole project scope. The Short Report must contain a clear description of the project scope's peak demand requirement, and how it is being met by the systems within this credit.

BACKGROUND

Electricity providers are obligated to have excess power generation and transmission capacity to handle peaks in the system, that is, typically a few hours in the afternoon during unusually hot weather. This peak capacity is needed to handle increased demand for air-conditioning in addition to ordinary business, industrial and residential needs. As a result, secondary power plants are built to handle these extra load requirements.

Ene-5 Peak Energy Demand Reduction

Reducing electricity use during peak demand is critical as it can increase the efficiency of the electricity network and deter the need to construct a new peak power station in 10-15 years time (Energy Australia, 2007). Currently 'about 15% of Australia's electricity network is used for only 1% of the time, which is equivalent to nearly $1.5 billion worth of electrical equipment used 3-4 days a year' (Energy Australia, 2007).

It is often the case that the life of older, 'dirtier' plants are prolonged to handle these peak loads rather than decommissioned. The result is extra capacity and infrastructure built into the system with the attendant greenhouse gas emissions from power generation. Lessening the demand at these peak times is one strategy for reducing the energy infrastructure required to meet the needs of buildings and industry.

Active peak electricity demand reduction systems include:

- Distributed energy systems, such as:
  - Cogeneration;
  - Micro-turbines;
  - Photovoltaics; and
  - Fuel cells.
- Energy and thermal storage systems, such as:
  - Batteries;
  - Ice storage;
  - Chilled water storage; and
  - Phase change materials.

Examples of passive design initiatives include the use of thermal mass, high performing glazing and insulation or thermal chimneys.

It is expected that where compliance is achieved using an active, rather than a passive, system, a significant amount of time and detail would be required to ensure the correct design and commissioning of such a system.

Energy storage systems may also be useful in combination with intermittent energy sources, a common trait of many renewable energy sources. The most common example of this is a system that utilises the excess electricity from a photovoltaic array to charge a battery during daylight hours, then draws off the battery during peak times.

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REFERENCES & FURTHER INFORMATION

- CSIRO, *Demand-Side Response and the Electricity Network*, www.det.csiro.au/science/de_s/de_dsm.htm.
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- Zammit, M. (2005), *Managing Peak Load Demand,* EUAA Peak Power & New Capacity Briefing, Melbourne, 7 December, www.energyresponse.com/uploads/managing%20peak%20demand%20by%20m%20zammit.pdf.