Energy-smart Parliament House

by the Australian National Team

An integrated approach to energy management and auditing over the past 10 years has turned Australia's Parliament House into an energy champion. Total energy consumption and associated greenhouse gas emissions over that time have been culled by an impressive 52.3% and 41.2% respectively. Equally impressive is the fact that all energy efficiency improvements have been fully funded from energy savings. This performance is well ahead of industry benchmarking and governmental policy targets and there are ongoing commitments to further reduce energy consumption by 1.5% per annum over the next six years.

Photo: The entrance court to the federal Parliament House building, Canberra.

Building a new public building such as Parliament House is a unique opportunity to incorporate innovative design approaches and technologies. Opened in 1988, the building was constructed partially buried in Capital Hill, Canberra (the national capital) and comprises 250,000 m² of floor space, divided into about 4,500 rooms over four levels. It is the only parliament building we know where visitors can walk on the grass over the roof.

The building was designed to last for 200 years. Nevertheless, the energy consumption of the building was found to be excessive from the start. An immediate programme of energy saving was instigated.

Energy services

The energy services required for large public buildings such as Parliament House are air conditioning, lighting and catering for personal needs and information transfer. Improving the latter services has been simple, through gradually replacing outdated systems with high-efficiency equipment and installations.

Space conditioning, however, demanded special attention to details such as the choice of energy carrier (gas or electricity), control issues, system management and servicing. The most significant energy improvements have come from this area. Forty-seven projects to improve space conditioning and climate control had reached practical completion by mid-1997.

Energy consumption

By 1992/93, total energy consumption in the building had been reduced by 27.5% with a further 25.3% reduction by 1996/97. This represents a specific annual energy consumption of 193.8 kWh for electricity and 430 MJ for natural gas per square metre of air-conditioned floor area.

A total of 38.2% (power) and 66% (natural gas) has been saved during these nine years of operation (**see Figure 1**). The reduction was achieved despite the increase in air-conditioned floor area from 144,000 m² in 1988 to 152,000 m² today. Major projects have included: conversion of the ventilation system for underground car parks to include contaminant-sensing and variable-speed drives, a sophisticated integrated building management system and a complete recommissioning and reprogramming of the heating, ventilation and air-conditioning systems.

Today, close to 50% of the remaining annual power consumption of the Parliament House is needed for lighting. Improvements in technology and controls are continuously being evaluated for economically justifiable retrofit measures.

Economics

In the financial year 1996/97, the annual cost per square metre of gross floor area was AUD 13.67, with electricity bearing the lion's share, around 80%. This performance compares very favourably with best practice standards.

Investment in new energy efficiency projects is taken solely from savings already made on energy. Compared with the first year of operation in 1988/89, close to AUD 2.5 million has been saved in 1996/97 alone from energy efficiency measures implemented over the nine years of operation. This figure compares with a total annual energy expenditure of just under AUD 3 million for the financial year of 1996/97.

Nationwide reforms have created a competitive energy market which has also reduced energy costs and will result in a 1997/98 figure of about AUD 2.3 million.

The average payback period of energy efficiency measures has gradually changed. While the simple measures with almost instant payback have all been implemented early in the programme, current projects have typical energy payback periods of 4-5 years, offering an internal rate-of-return of around 20%.

Even disregarding all non-cost benefits, such as a more comfortable work environment, this rate of return makes most investments in energy efficiency measures highly commendable.

So far, optimisation has largely been possible with smart energy technologies. However, to achieve significant further improvements there is now a strong requirement for active support and participation by all the Parliament House occupants.

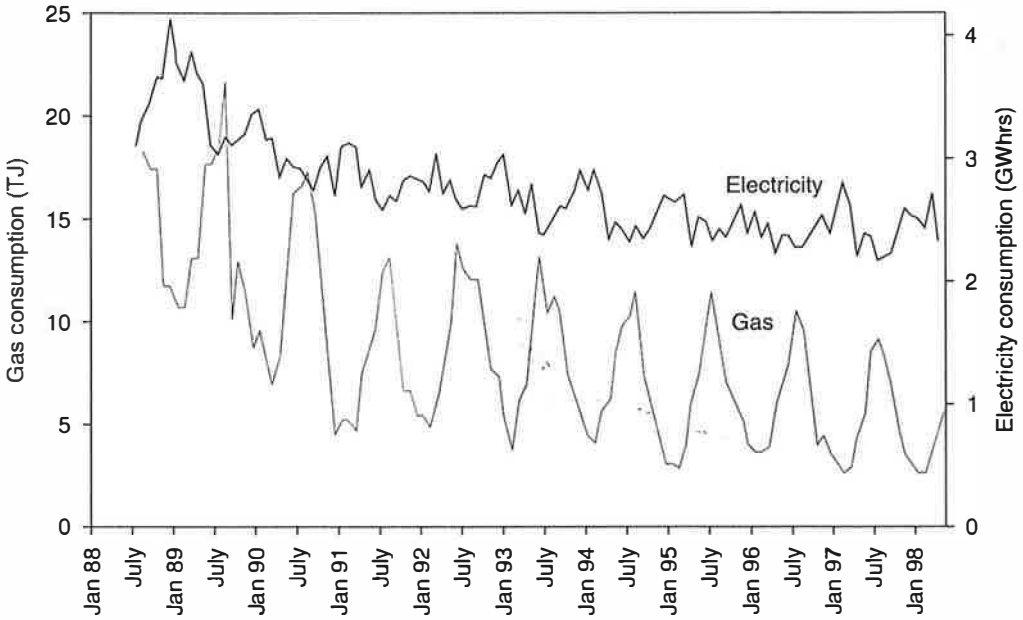

Figure 1: Electricity and gas consumption at Parliament House 1988/98.

Conclusions

The group responsible for buildings and services at Parliament House has implemented a broad range of cost-effective energy efficiency measures throughout the nine years of operation. The achieved reductions in energy consumption and greenhouse gas emissions already well exceed all targets in national programmes. This success encourages the team to continue with a commitment to further reduce energy consumption at a rate of 1.5% per annum over the next six years.

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