

Cooling the air a

CSIRO is conducting trials on technology to reduce electricity use and shift power demand from peak periods, says **Rosslyn Beeby**.



A QUICK bit of tinkering with the air-conditioning slashed \$4000 off Essendon Football Club's annual energy bill and cut its greenhouse-gas emissions by 8 per cent.

It was as simple as kicking a match-winning goal from 30 metres out in front. Air-conditioning units at the club's offices were reprogrammed to run from 7am to 5pm weekdays, instead of from 5am to 8pm. The air-conditioning system at the Windy Hill social club was also switched off at the end of each night.

But, unfortunately, only a minority of Australia's businesses are emulating the Bombers' greenhouse game plan. According to a CSIRO report, air-conditioning accounts for more than 60 per cent of the commercial sector's carbon dioxide emissions and 68 per cent of energy consumption.

"In Australia, air-conditioning creates an enormous demand on the entire energy grid for a short period of time, and this creates massive economic issues with peak loads," said CSIRO energy-efficiency researcher Dr Stephen White.

"To provide for this peak moment when the weather is really hot, you have to build all the infrastructure required by a new electricity network — billions of dollars of wires, poles and generators — which will not be used for most of the year.

"You might have built 29 gigawatts worth of electrical power stations, but at any one time they're only producing about 14 or 15 gigawatts — so we've paid for all this stuff we're not using, yet we're considering building more to cope with rising peak demand."

Recent figures from the Australian Bureau of Statistics show Australians are buying more air-conditioners than any other domestic electrical appliance, with a 16 per cent increase in sales in recent years (compared with a 10 per cent increase for dishwashers).

Aggressive marketing campaigns have emphasised the comfort of summer air-conditioning for the family home (no more sweating while you try to sleep in summer), persuading consumers that they are both affordable and environmentally friendly.

However, a recent study of South Australian households found that houses with air-conditioning used up to 700kWh more electricity in summer than in cooler months. The Federal Court also recently found that an

air-conditioning company had "engaged in false, misleading and deceptive conduct" in advertising the supposedly "green" credentials of its air-conditioning units.

The CSIRO Energy Transformed flagship is conducting trials on new technology combining on-site gas-fired electricity generation with cooling devices powered by waste heat to cool buildings. They hope the combination will be a winning one that reduces electricity use and shifts power consumption away from periods of peak demand.

"We're looking to develop low-cost cooling technology that can be used to retrofit existing buildings — low-cost, simple devices that can convert waste heat into cooling," White said.

"We want to develop solutions that will be easy to bring into

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mass production — we want applications where we can roll out thousands each year, which is why we're looking at refrigeration and air-conditioning.

"Of course, you can build more 1000-megawatt coal-fired power stations to cope with the rise in peak demand that's generated when everyone switches on their air-conditioning units in summer, but that won't stack up economically or environmentally.

"We currently have more electricity infrastructure than we potentially need, which is why we need to tackle the problem by persuading consumers to switch off or shift their consumption away from peak times."

White's team is experimenting with low-cost heat pumps, thermal-storage technologies, absorption chillers and dehumidifiers. At the flagship's headquarters in Newcastle, the team is testing a turbo-chiller which will use heat from gas turbines generating on-site electricity to power cooling and dehumidification systems in offices.

"It could be used to cool office buildings or to cool the inlet to gas turbines so that they don't lose power. A large city building, like a hotel, generating its own power from a gas-fired turbine, could use one for air-

hot topic

conditioning. That would reduce the hotel's dependence on the electricity grid and its contribution to peak-load period, as well as cutting greenhouse emissions."

The prototype chiller is compact, energy-efficient, has a low noise level (a quiet hum) and is easy to install and service (no tricky rotating parts). Early results show that it could reduce greenhouse-gas emissions from air-conditioning by up to 25 per cent and may open up a new Australian export market if the technology can be mass-produced.

"If we can manufacture these chillers at an appropriate pricing level for the commercial-industry market then they will become an attractive proposition for businesses that need to cut their greenhouse emissions to comply with local government targets.

"City councils are really driving change in this area and are the front runners in promoting environmental awareness.

"At the end of the day, if you're going to achieve greenhouse-gas

reductions, it's about technology change because the existing technology mix is not going to do the job for us.

"We need new technologies and we need to implement technologies that have been sitting on the shelf and have never actually seen the light of day."

Using energy-efficient cooling systems in conjunction with gas-powered generators that can provide a reliable source of on-site electricity could open up new business possibilities for rural Australia.

"If we can bring in these new systems, then power becomes cheaper for rural areas because it cuts out the infrastructure costs for the poles and wires and transformers," White said.

"It will open up a lot of new possibilities right across the country."

TOMORROW

Powering up with solar reactors.



Where it all began... Dr Willis H. Carrier, regarded as the "father of air-conditioning", is pictured here with a centrifugal chiller, a commercial cooler. The picture was taken in the 1940s. The 100th anniversary of Carrier's invention of air-conditioning was celebrated in July 2002. According to a CSIRO report, air-conditioning now accounts for more than 60 per cent of the commercial sector's carbon dioxide emissions and 68 per cent of energy consumption.