Tackling peak power demands

Recent moves to reduce electricity prices for consumers have not necessarily focused on whether demand management will lower emissions.

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The past year has seen several processes to reduce the price of electricity to consumers. Each has highlighted the importance of demand management (DM), with consumers lowering use at peak times to reduce the amount of new infrastructure needed. But no one has asked whether this will reduce emissions as well as prices.

DM can theoretically provide a range of environmental benefits, including emissions reductions, lower urban air pollution, lower overall energy consumption, responsiveness to fluctuating supply, integration of intermittent renewable generation and electric vehicles, lower transmission losses, and limiting the resources and land-clearing needed for new poles and wires. But will it lower emissions?

Given the National Electricity Objective, by which all national electricity market policy is measured, does not include environmental concerns, this has not been a question on policymakers' minds.

A discussion paper from the Total Environment Centre (TEC) suggests assessing the environmental effects of DM is not as easy as it may seem.

Understanding DM's impacts

In most countries, base load power is provided by the cleanest generators. Only when demand is high are the older and less efficient generators switched on. In this context, reducing demand at peak times can significantly reduce emissions by taking the dirtiest plants offline.

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In Australia, we have the opposite situation: we get almost all of our base load power from black and brown coal-fired generators. We only turn on the efficient gas-fired generators at times of high demand. In this context, reducing peak demand may actually increase emissions by increasing the amount of demand met from dirty coal-fired generators.

One reason for this is the 'rebound effect': energy consumption foregone at peak times is subsequently made up by consumers following the peak. In Australia any such shift from peak to base load would mean some increase in emissions.

However, the effect overall does not appear to be significant. On the other hand, research suggests there is also a 'conservation effect': consumers actually save energy as a result of DM programs. These programs increase energy awareness and provide feedback for consumers on their usage behaviour, promoting more efficient consumption overall. In addition, there is sometimes no need for the foregone usage to be made up. For example, an office that dims its lights will not need to be "overlit" later on to compensate. Such initiatives are therefore better for the environment as they encourage a net reduction in energy usage.

DM programs can also support the deployment of more renewable energy.

Renewables' intermittent nature can be balanced with DM resources, which saves on building expensive gas-fired plants as back-up power. As a result, the International Energy Agency has recognised DM as one of six areas of structural change that will directly benefit renewables.

It is difficult to know how the interaction between the rebound and conservation effects will play out. One study assessed 100 dynamic-pricing programs; the results varied from a 5% increase in consumption to a 20% reduction.

No clear variables correlated with an overall conservation effect, but combining different types of programs provided the best benefits.

So where does this leave the environment in the current push for DM? In the short-term, we are likely to see some increase in emissions as peak demand is shifted away from our cleaner gas-fired power plants and down to our dirtier base load coal plants.

In the medium-term, as consumer awareness and renewables grow, negative environmental impacts are likely to be neutralised.

In the long-term, the environmental benefits are much clearer. DM will be an essential part of a well-balanced energy system, helping users to manage their usage, facilitating renewable energy deployment, and shifting usage away from gas-fired peaking plants to renewable sources.

Part of a bigger problem

While it may seem paradoxical that reducing consumption could increase emissions, this is just one curiosity in an energy market that is struggling to deal with the challenges presented by climate change.

It is feasible, and likely cost-effective, to introduce DM initiatives that also benefit the environment, and we should be better integrating DM policies with climate, renewables, energy efficiency and planning policies. Unfortunately, the current National Electricity Law and Rules do not support such a holistic perspective and reforms are needed at the highest level.

The National Electricity Objective should be revamped to ensure that environmental issues are integrated into energy policy making, and DM must be given greater priority in electricity network planning to ensure that we move towards a future-ready energy system as soon as possible. WME