Valuing Demand Response

Helen Murphy

Manager Energy Technology

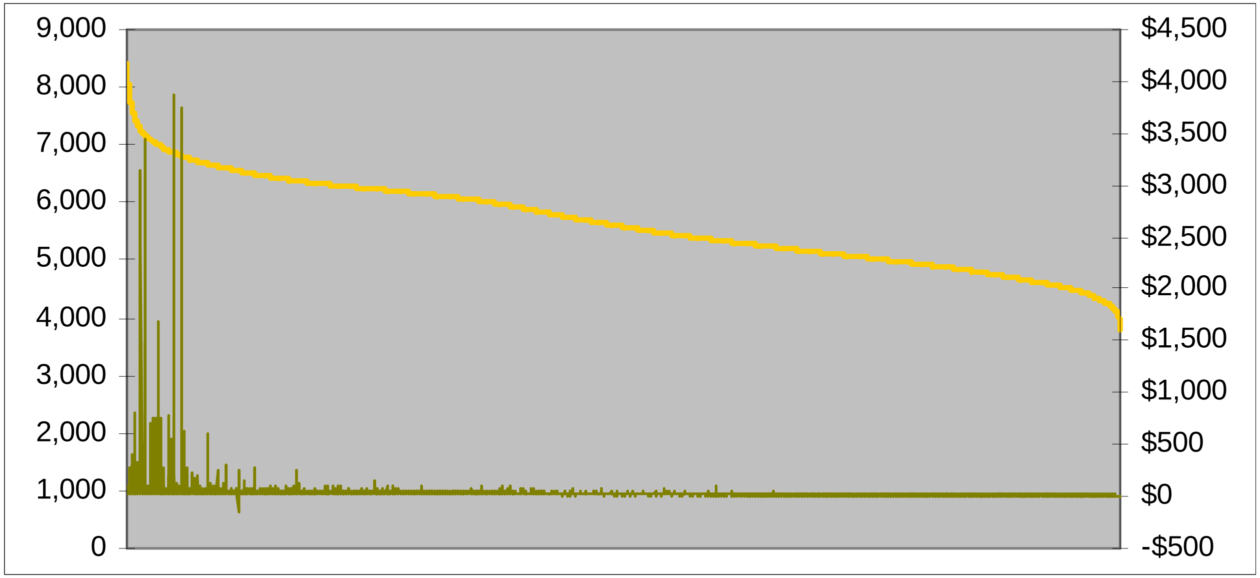
Department of Infrastructure, Victoria

Demand – Victorian situation

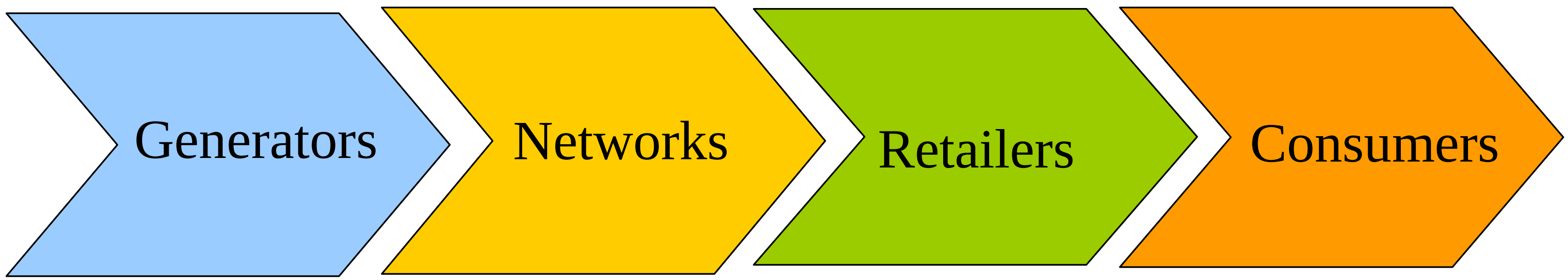
- **High "needle peak" demand**
- **Major driver is temperature**
- **Peak demand in summer, but still significant peaks in Winter**
- **Growth in peak demand greater than growth in energy consumption**

	Summer	**Winter**
10 % POE	32.9 deg	5.4
50 % POE	29.4 deg	7.1
90 % POE	27.3 deg	8.2

Victoria’s load duration curve



Markets for DSR



Energy Driven DSR

Network Driven DSR

IEA Task XIII

- **International Energy Agency Demand-Side Management Programme** Promoting Energy Efficiency and Demand-Side Management for global sustainable development and for business opportunities
- **Task XIII Demand Response Resources** involves 11 Member countries including the Australia, Canada, Denmark, Finland, Italy, South Korea, Netherlands, Norway, Spain, Sweden and the United States.
- The O**bjective** of the Task is to deliver the necessary methodology, business processes, infrastructure, tools and implementation plans for the rapid deployment of a demand response program into participating country electricity markets to meet the specific goals and policy objectives of that market.

IEA Task XIII - Scenarios

- **Least Cost Base Case Scenario –** in which system requirements are assumed to continue to be met by supply side resources and cost-effective DR is deployed to provide increased system reliability

- **Market Bidding Scenario –** in which the same amount of DR is deployed as in the base case, but generators are assumed to bid strategically in the NEM rather than at SRMC.

- **Integrated Resources Planning Scenario** – selection of supply and demand side resources that minimise total system cost for meeting aggregate demand is made via a control planning function

IEA Task XIII – Programs Modelled

- **Callable large Commercial and Industrial (C&I)** for customers with at least 0.25 MW load reduction capability
- **Residential Direct Load Control (DLC)** cycling of residential air conditioners and pool pumps
- **Price Response Load (PRL)** for residential customers
- **Voluntary Load Reduction (VLR)** for small business customers

Modelling the Value of Demand Response

- Specified base case of the NEM
- Developed specifications of a number of DR products, including annual take-up rates
- Modelled the base case with and without DR capacity plan using least cost and market bid based optimisation for both supply and DR measures
- Developed a set of random samples/futures to assess uncertainties
- Ran resource optimisation for all futures with and without DR using the assumed supply-side candidates

Benefits of Demand Response

1. **Increase the security of supply** by substituting voluntary load shedding for enforced load shedding.

2. **Provide** a means for **avoiding the use of expensive fuels** for meeting peak demand.

3. **Defer or avoid the need for investment in peaking generation plant.**

4. **Provide a check on the market power of generators**.

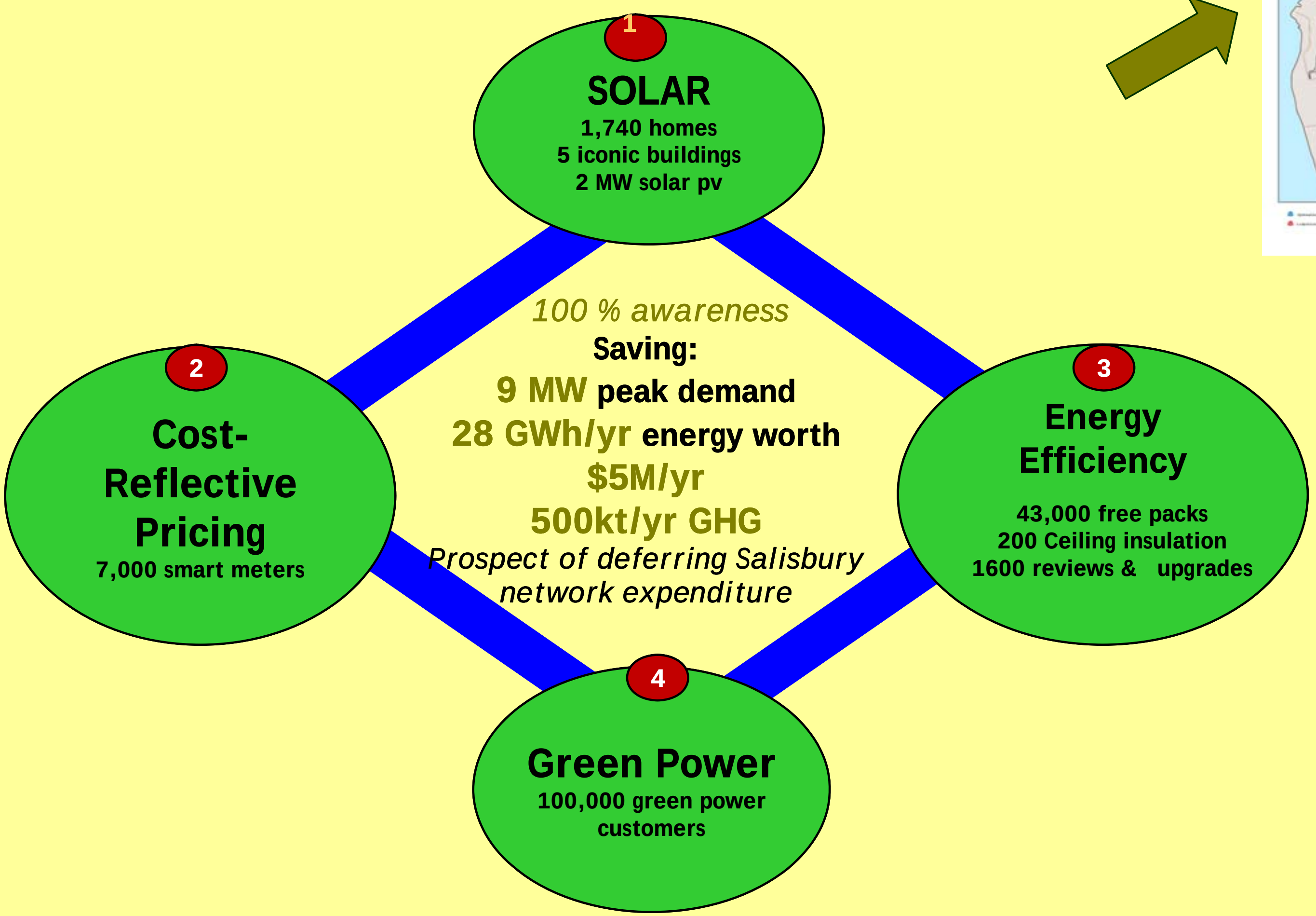
5. **Reduce final prices to consumers** by optimising use of all energy options.

6. **Reduce** greenhouse gas emissions and provide overall environmental impacts

Valuing Demand Response

Defer or avoid the need for investment in peaking generation plant.

Adelaide Solar City outcomes



Valuing Demand Response

Provide a means for **avoiding** **the use of expensive fuels** for meeting peak demand.

Reduce greenhouse gas emissions and provide overall environmental impacts

Integration Resource Planning Outcomes

Modelling of Integrated Resource Planning scenario indicated:

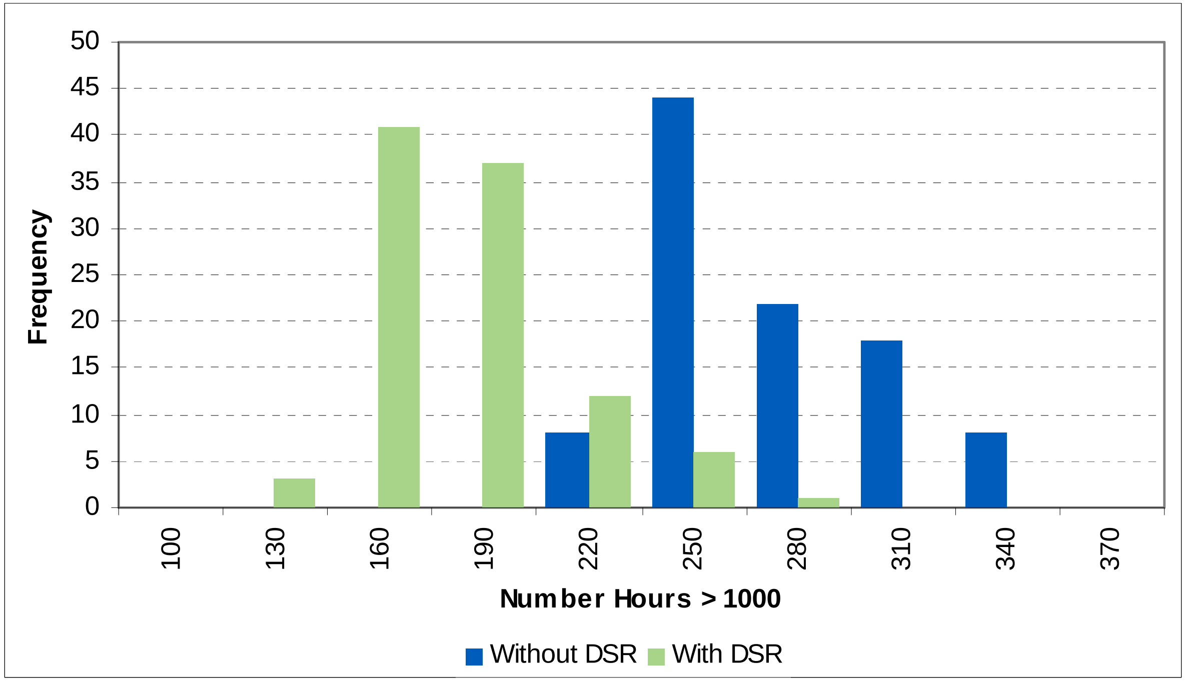
- reduction in peak capacity with deferral or avoidance of 3400 MW of peaking capacity
- addition of 600 MW of baseload

Valuing Demand Response

Provide a check on the market power of generators.

Reduce final prices to consumers by optimising use of all energy options.

Forecasting price events



Valuing Demand Response

Increase the security of supply by substituting voluntary load shedding for guaranteed load shedding.

Valuing Demand Response

DR Option	Total	QLD	NSW	VIC	SA	TAS
Summer						
Callable C&I	2,289	655	848	528	187	71
DLC	160	33	87	21	17	2
Price Responsive Load	171	46	81	27	15	2
VLR	150	24	61	48	11	7
Total Summer	**2,770**	**758**	**1077**	**624**	**230**	**82**
Winter						
Callable C&I	1,580	452	585	365	129	49
Price Responsive Load	86	23	41	14	7	1
VLR	104	17	42	33	8	5
Total Winter	**1,770**	**492**	**668**	**412**	**144**	**55**

Modelling the Value of Demand Response

	Least-Cost Base	Market Bidding	IRP
NPV of total system cost savings	$363 million	$949 million	$555 million

Modelling the Value of Demand Response

By the year 2025 → an additional **5%** (**or 2800MW**) reduction in system peak demand compared to the current situation.

Significant system-wide benefits → the NPV for **system-wide market benefits** 2007-2025 is **$363-$949 million**, (**excluding network related benefits**).

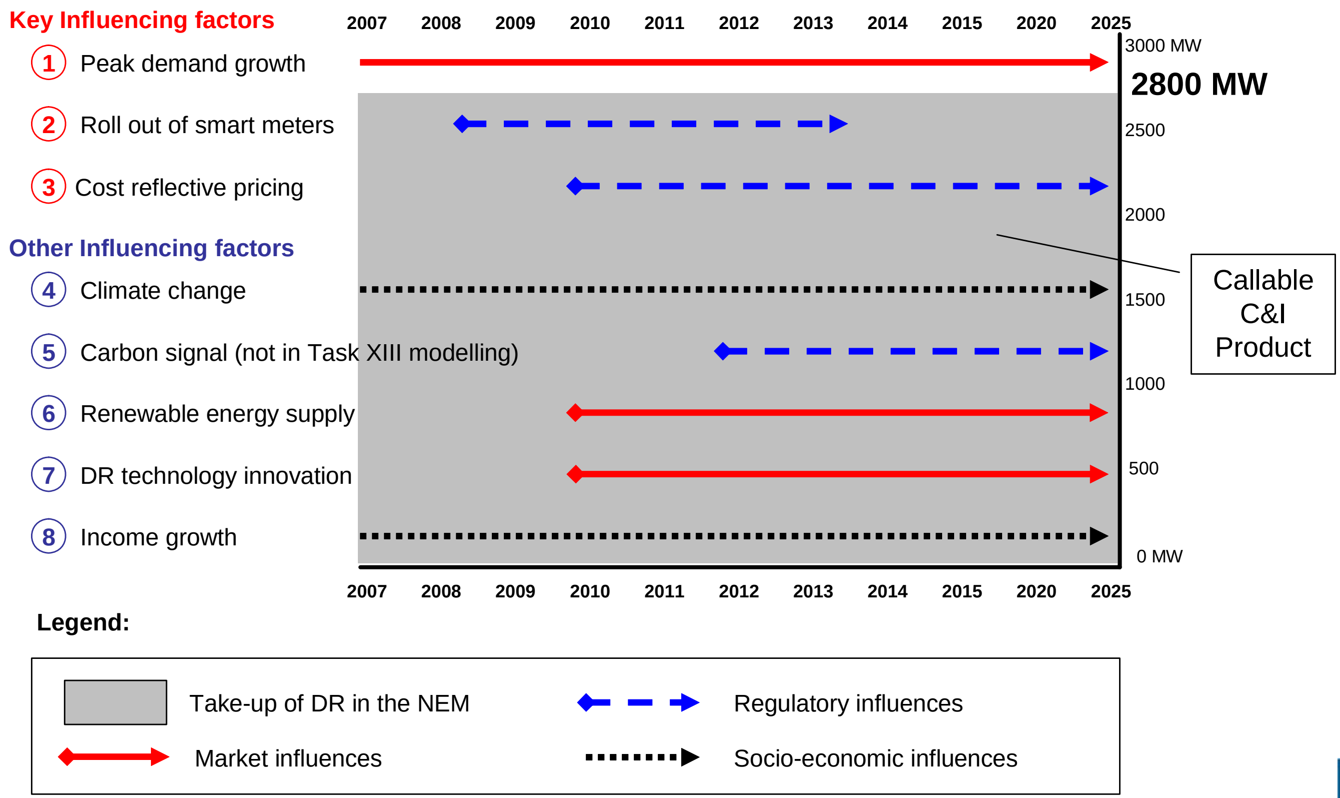
Demand Response → **critical factor** in **future management** and **efficient operation** of Australia's electricity market.

The Roadmap

DR Roadmap

Influencing factors

Roadmap Timeline



Key Influencing Factors

1. **Peak demand** - growing faster than total energy requirements → deterioration load factors for networks & generators → upward pressure prices & declining reliability → tens of billions of dollars of investment in the mid to long term.

2. **Roll-out of smart meters** - wider deployment → facilitate introduction of more cost-reflective pricing → more informed customer base.

3. **Improved price signalling** - progressive removal retail price regulation → increased ability for retailers to offer more innovative products → assist removal of cross-subsidies.

Other Influencing Factors

4. **Climate Change** – continued global warming trend → more frequent hot summer days → greater price volatility.

5. **Carbon signal** – due to climate change → inclusion of carbon price of some form in future electricity prices

6. **Renewable electricity supply** - significant increase in the generation mix → potential to create greater price volatility due to its intermittent nature.

7. **DR technology innovation** – technology changes on supply-side (DG) and demand-side (new cooling technology options, next generation electricity storage, developments in load control) → increased array and reduced cost of DR related technology.

8. **Income growth** - increased electricity consumption and increased consumer desire for comfort.

Conclusions

The challenges are **extensive** and **complex**.

Demand Response (DR) – **is a logical and economically viable way forward.**

References:

The Australian IEA DSM Task XIII (DRR) Team, Roadmap for Demand Response in the Australian NEM, November 2006

CRA International, Assessing the Value of Demand Response in the NEM, November 2006

Victoria
The Place To Be