



# Policy and Regulation for the Future Grid - Leading the Transition or Lagging the Disruption?

UNSW Project for the CSIRO Future Grid Cluster: *Robust energy  
policy frameworks for investment into future grids*

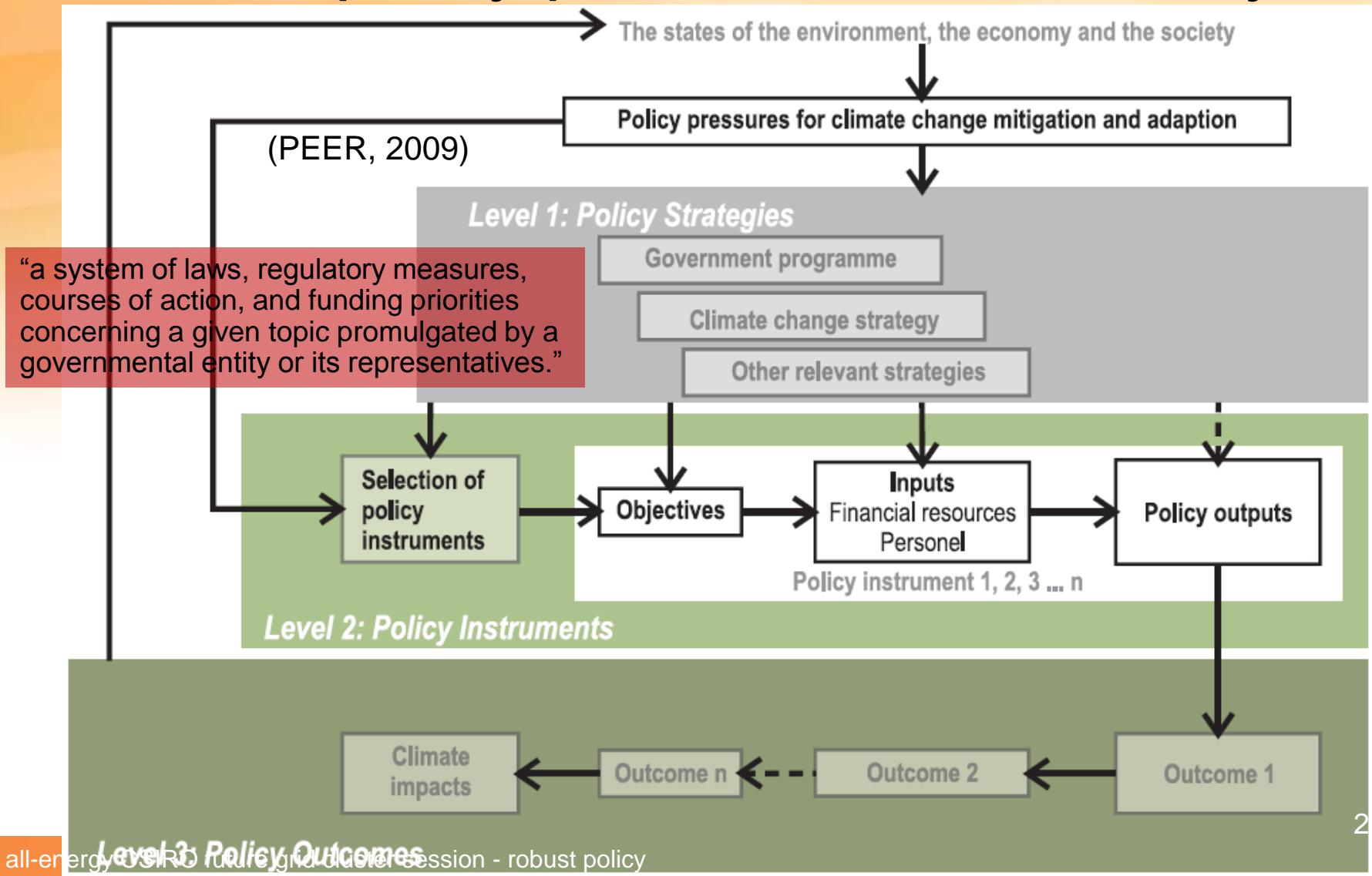
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CSIRO Future Grid Collaborative  
Research Cluster Project  
*Australia All-Energy Conference*  
*Melbourne, 15-16 October 2014*

# Relevant policy processes ... in theory

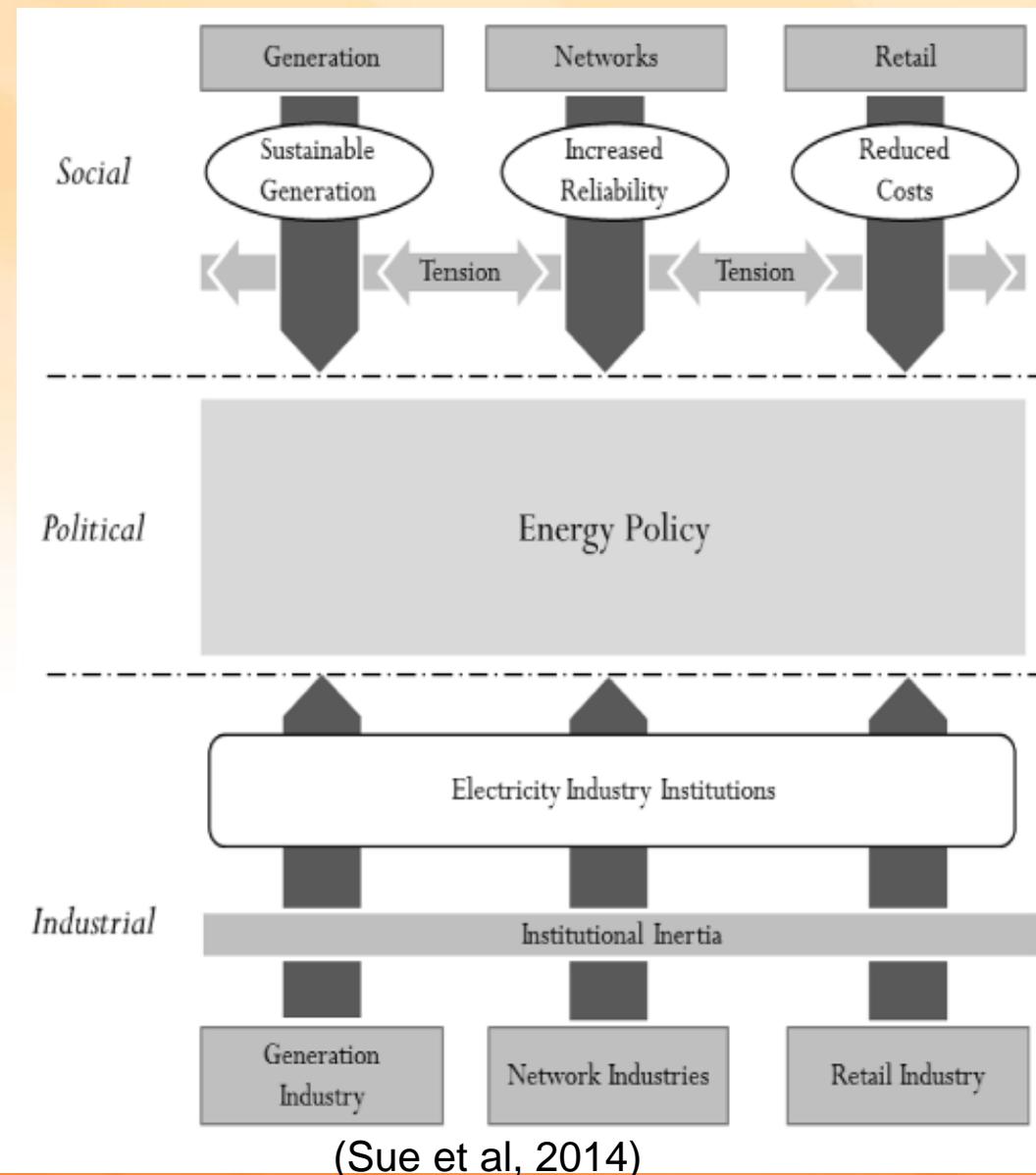


In practice – contested, potentially rapidly changing context, high associated uncertainty  
*always challenging, occasionally shambolic*



# Policy guidance in practice...

## *Electricity Industry as a Socio-Technical System*





# Policy: proactive transition vs reactive disruption?

- "Prediction is very difficult, especially if it's about the future."
  - Nils Bohr, Nobel laureate in Physics
- "The best qualification of a prophet is to have a good memory"
  - Marquis of Halifax,
- "If you have to forecast, forecast often"
  - Edgar R. Fiedler in *The Three Rs of Economic Forecasting*
- "Many of us who keenly observe the energy sector can take a pretty good guess at what our next big challenges are"
  - Senator MacFarlane, 10th September 2014



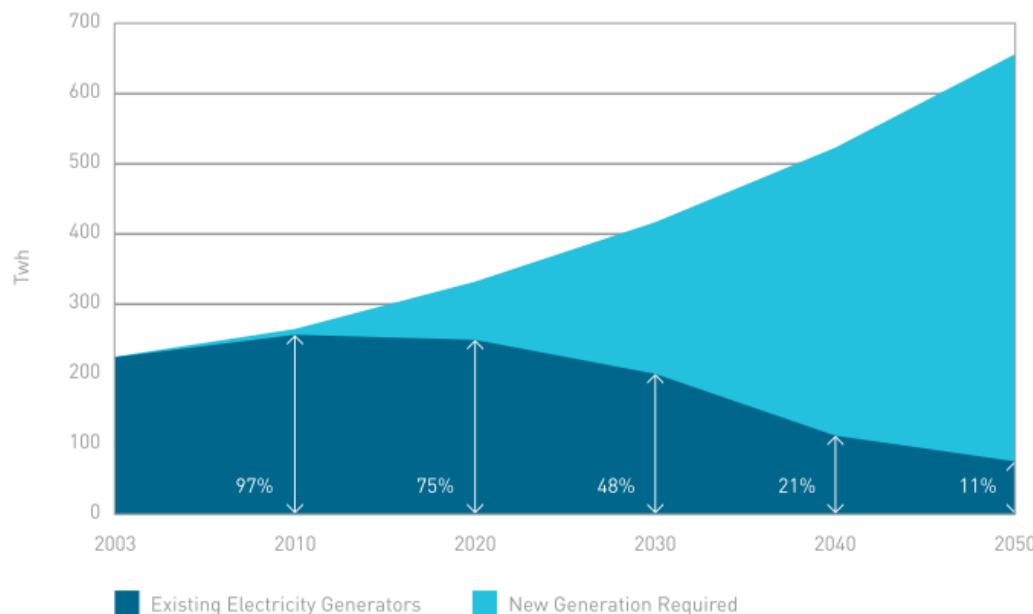


To achieve energy prosperity, security and sustainability, the government has put in place policies to:

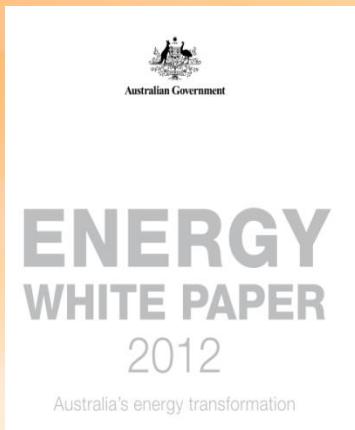
- attract investment in the efficient discovery and development of our energy resources for the benefit of all Australians
- deliver a prosperous economy while protecting the environment and playing an active role in global efforts to reduce greenhouse emissions
- encourage development of cleaner, more efficient technologies to underpin Australia's energy future
- develop effective and efficient energy markets that deliver competitively priced energy, where and when it is needed into the future
- minimise disruptions to energy supplies and respond quickly and effectively when disruptions occur
- establish an efficient energy tax base, restricting fuel excise to end use and applying resource rent taxes to offshore projects
- ensure Australia uses its energy wisely.



Figure 3: Demand/Supply balance for electricity—Medium electricity demand scenario

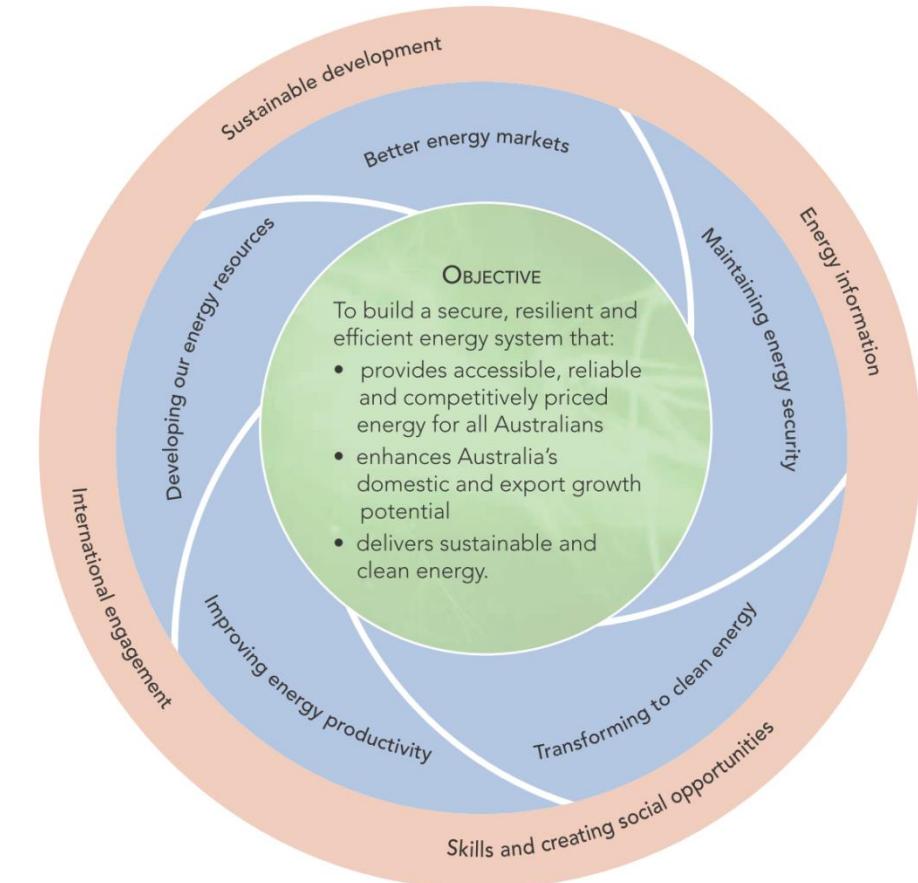


# More recently



- Internationally well regarded  
eg. *IEA support for CEF*
- However, no real discussion  
of potential:
  - Carbon Price Repeal
  - Reduction in RET target
  - Removal of ARENA, CEFC

Figure 1.1: Key elements of national energy policy

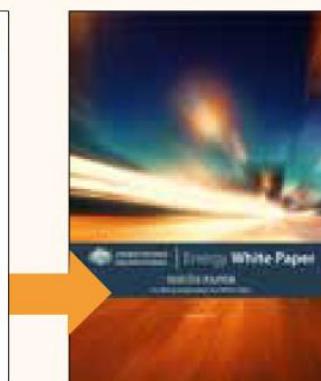




# Now, here we go again



Terms of Reference



Issues Paper



Green Paper



White Paper

## Foreword

Australia's economy and prosperity are built on access to secure, affordable and reliable energy.

Our energy diversity is one of Australia's natural strengths and one of our most potent competitive advantages. That diversity has provided Australian homes and business access to the energy required to build our industries and our communities.

Long an exporter of coal, Australia is now entering a new phase in which our gas and uranium exports will also supply global markets hungry for energy security.

While Australia consolidates its position as an energy superpower, it is essential that we have a long-term framework in which the energy sector can grow.

This Green Paper builds on our pre-election Policy for Resources and Energy in which we promised coherent, consistent energy policy to protect jobs and investment, and take cost pressures off energy users.



- A markedly changed context in some regards but still many shared issues, some new and some now largely missing issues
  - Only 1 mention of climate change in 2014 Green paper

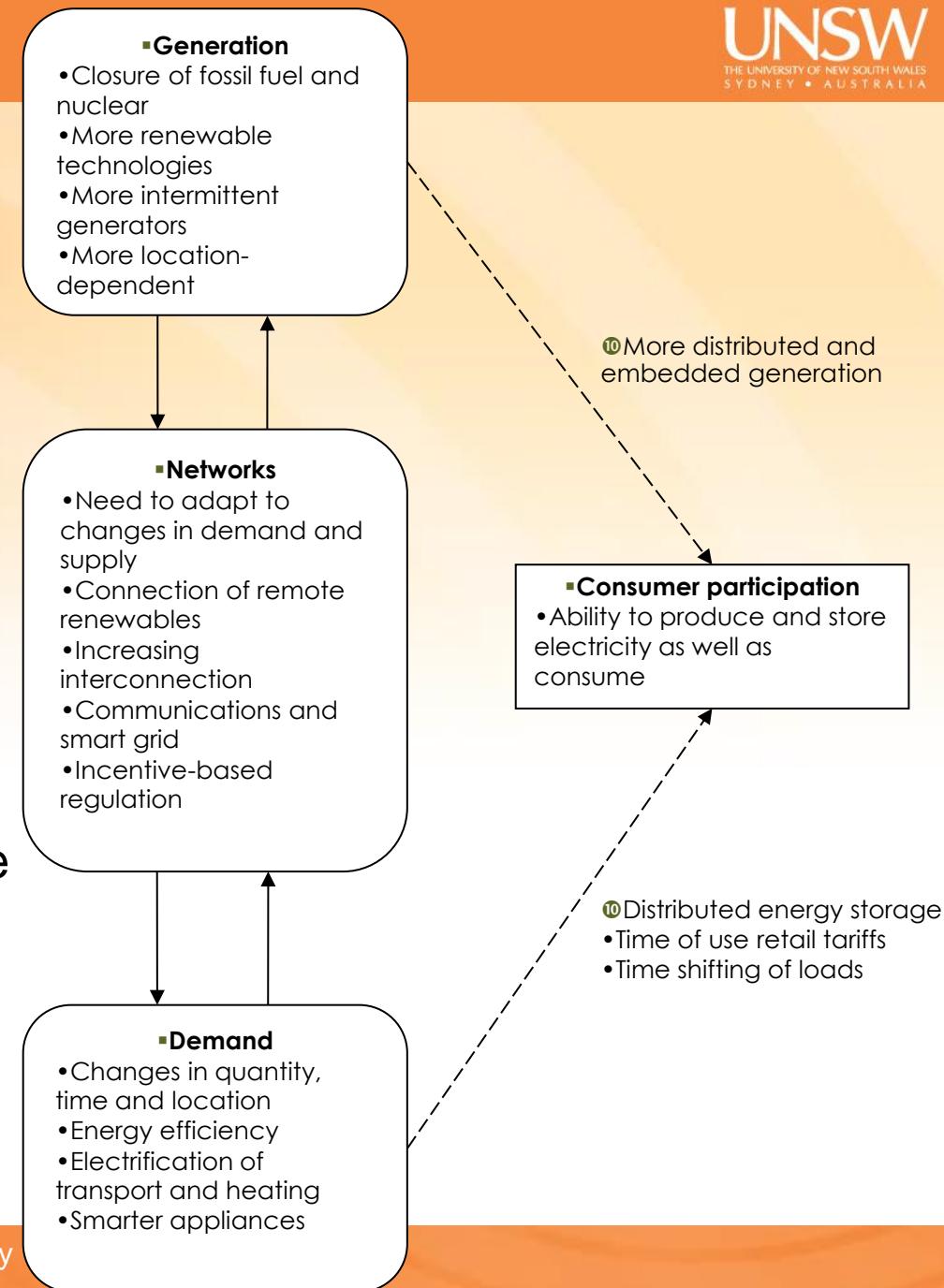
Australia is engaged, with other countries under the United Nations Framework Convention on Climate Change (UNFCCC), in negotiations for a new global agreement that will include emission reduction commitments for the period beyond 2020. Countries will consider their commitments to post 2020 climate action in the lead up to the final negotiations on a new agreement in 2015. These post-2020 commitments could have implications for the composition of the global energy mix.

# Policy guidance in practice - *Robust policy frameworks*

- Optimal decision or policy
  - one that is expected to be optimal for a given predicted future  
... but how will it perform under other possible scenarios
- Robust/resilient decision or policy
  - one that has *the ability to perform reasonably well under a wide range of possible futures*
- Strategies for developing more robust policies
  - **Anticipatory**: scenario analysis, multiple policy instruments for comprehensive, coherent action driving multiple, diverse and ideally modular options
  - **Adaptive**: built-in policy adjustments, effective policy review and learning (governance) (*adapted from Twomey et al, forthcoming*)

# Robust energy policy frameworks for investment into future grids

- What will be different for future grids?
  - High renewables
  - Distributed generation
  - Storage? EVs? DSP?
  - *Other surprises*
- Real challenge not getting single policies right, but framework
- Hence, explore robustness of energy policy frameworks in “challenge” scenarios incorporating these elements





# Robust energy policy frameworks – 3 *policy pillars*

## 1. Regulation

- Transmission network planning
- Distribution network planning
- Grid codes

## 2. Market Design

- Fundamental market design
- Spot market rules
- Ancillary service market rules

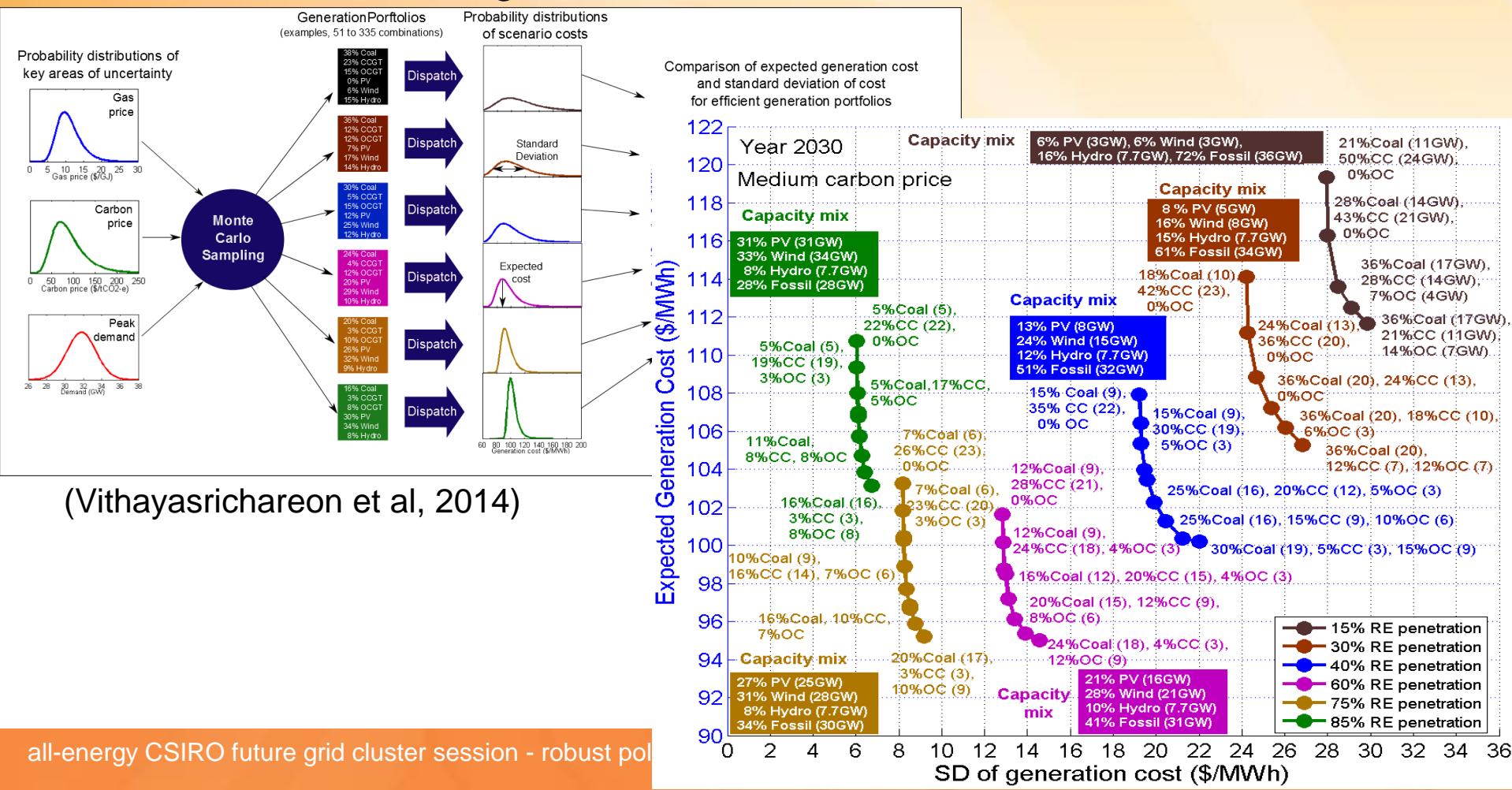
## 3. External Policy Drivers

- Carbon policies
- Renewable & energy efficiency policies
- Fuel policies
- Broader relevant policies

- Most policies will affect all three (complex and interrelated)
- Assessment of any policy must be **highly contextual**
  - Impact of a particular policy depends heavily upon surrounding policy settings
  - Subtle and seemingly distantly related factors can have a big influence

# Big picture external (+policy) uncertainties

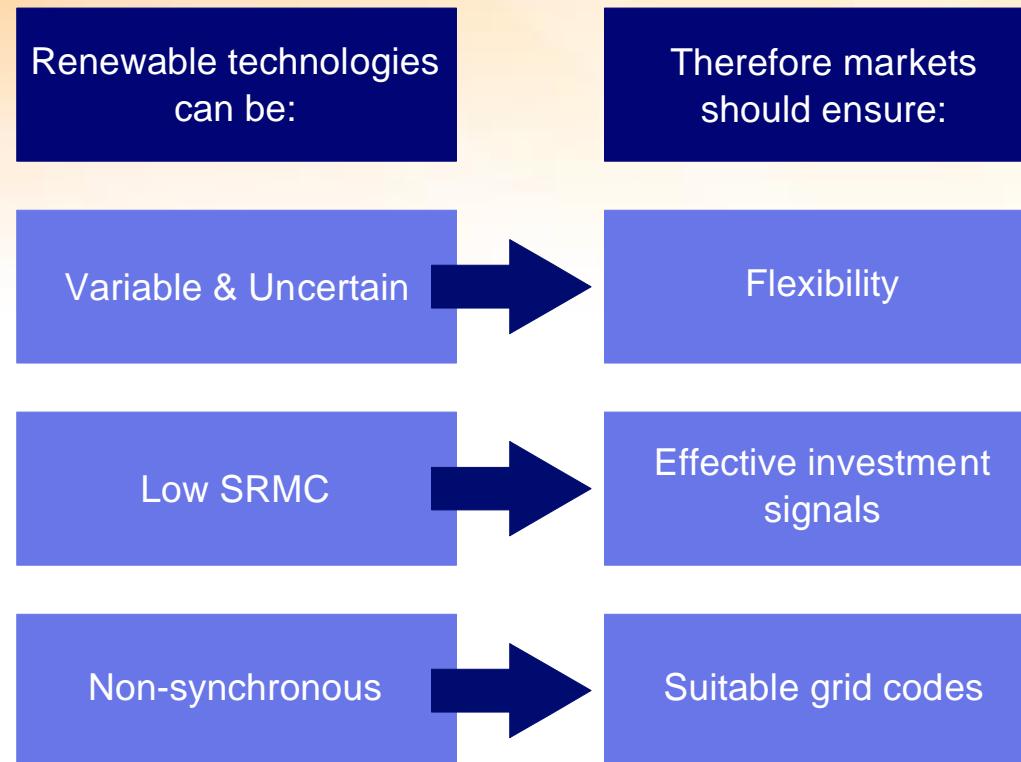
- More scenarios and sensitivities, computational multi-scenario simulation
- More formal modelling of uncertainties and tradeoffs...



(Vithayasrichareon et al, 2014)

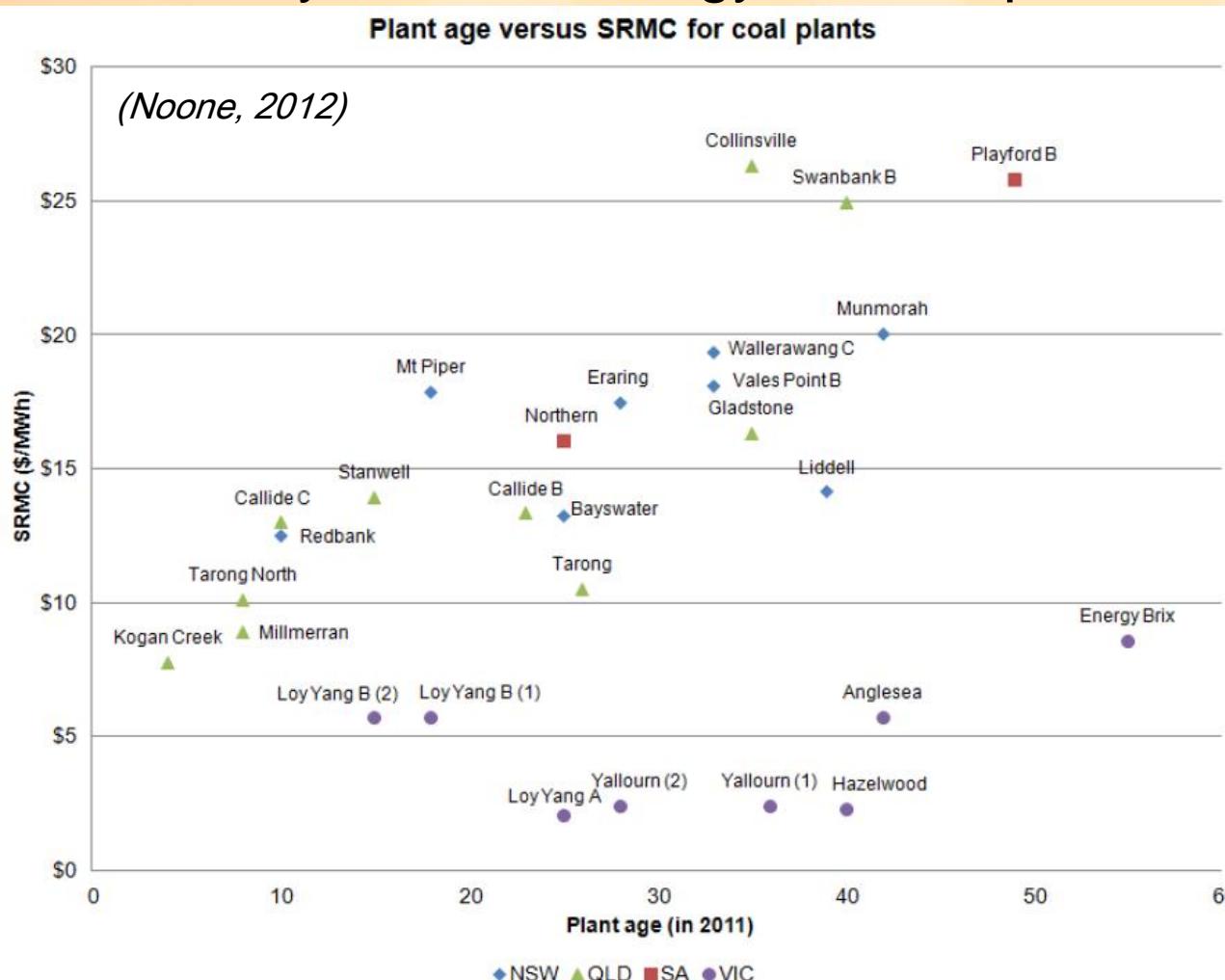
# Ongoing work on wholesale market design- *Designing electricity mkts for high RE penetrations*

- J. Riesz, M. Milligan, Invited overview article for Wiley Interdisciplinary Reviews – Energy and Environment (WIREs). Accepted (in press)



# NEM coal plant old & cheap – an exit problem

- ‘Steam punk’ alive and well in the electricity industry – one of the few industries where 50 yr old technology still competitive

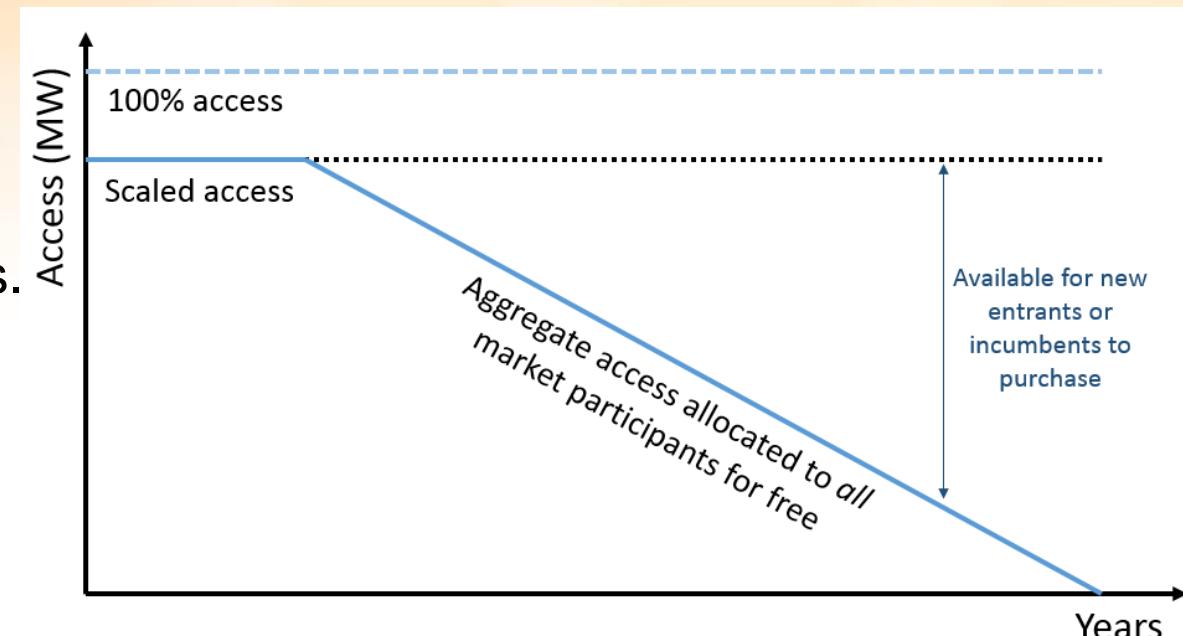


# Ongoing work on market design – *Optional Firm Access Model for Tx network*

(Riesz, Gilmore and MacGill, CEEM Working Paper, May 2014)

AEMC efforts reflecting a potentially significant issue of network congestion

However, grandfathering firm access to incumbents creates barriers to entry and exit, and exacerbates competitive disadvantage for new entrants.



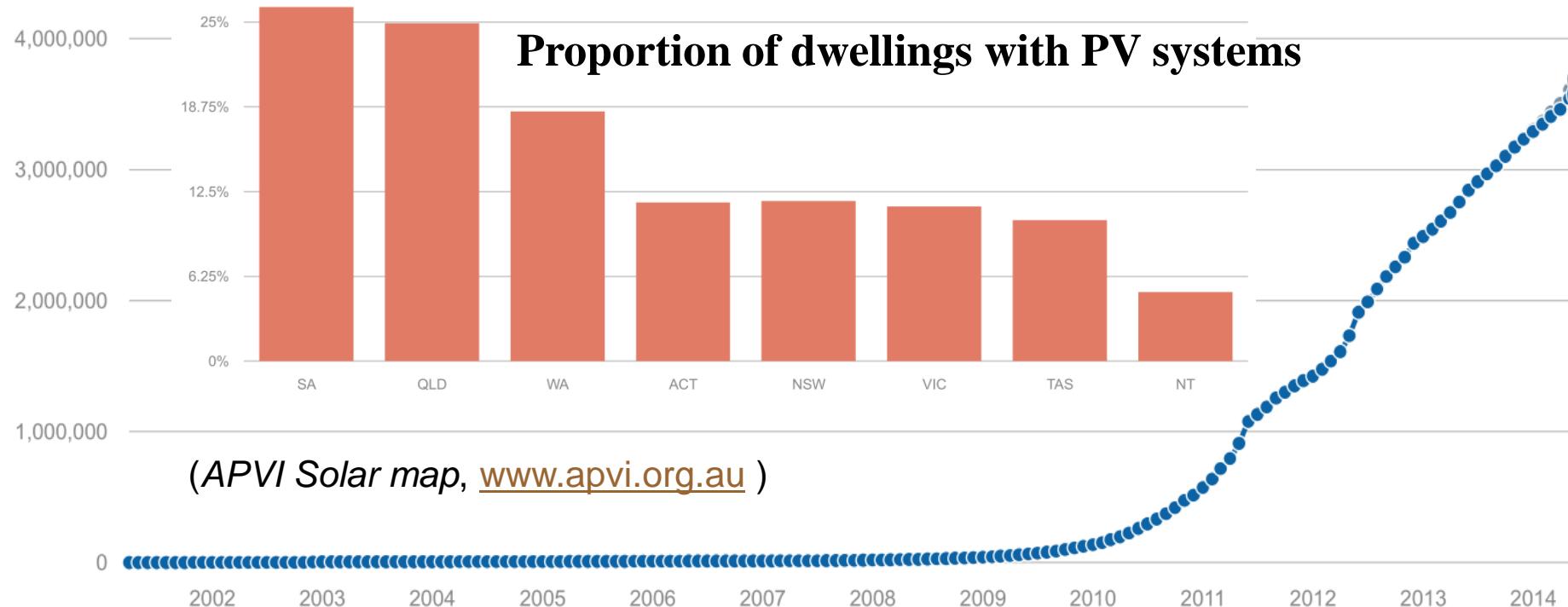
Propose instead that existing network access is auctioned.

OR

New entrants provided with scaled access on equal footing with incumbents.

# Retail market design matters too – Distributed PV represents ‘welcome’ competition to a currently dysfunctional set of arrangements

Australian PV installations since April 2001: total capacity (kW)



2014-06

Reported installed capacity (kW): 3,572,520  
Estimated installed capacity (kW): 3,690,858

## ■ In response...

<sup>10</sup>Hundreds of thousands of WA households could be hit with higher electricity prices under a proposed shake-up of bills aimed at recovering the massive cost to the system caused by the popularity of rooftop solar panels.

WA's energy chiefs are understood to be pushing for a change in the structure of bills to make customers pay more in fixed charges.

At present, most of a householder's electricity bill stems from the amount of electricity used. Fixed costs, such as the supply charge, make up about 15 per cent of the bill. However, solar panels have slashed consumption for those households, cutting revenue to State-owned power companies, including retailer Synergy and network operator Western Power.

The trend has been highlighted as one of the big issues facing the electricity system and Energy Minister Mike Nahan has been warned that if nothing is done the consequences could be catastrophic.

Either households without solar panels would be left to pick up the tab, forcing their bills to unaffordable levels, or electricity providers would be financially crippled.

WA's take-up rate of photovoltaic cells - initially fuelled by generous State and Federal incentives - stands at more than 10 per cent of households and this figure is expected to double within years." (*West Australian*, 2013)

**Table 1: Tariff 11 – Bill Impacts for the Typical (Median) Customer**

<i>Tariff Component</i>	<i>Frozen 2012-13</i>	<i>Transitional 2013-14</i>	<i>Increase</i>
Fixed charge (cents/day) <sup>1</sup>	26.170	50.219	91.9%
Variable charge (cents/kWh) <sup>1</sup>	23.071	26.730	15.9%
<i>Annual Bill<sup>2</sup> (\$, GST inclusive)</i>	<i>1,184</i>	<i>1,451</i>	<i>22.6%</i>

(QCA, 2013)

### 1. GST exclusive.

2. Based on a typical (median) customer on Tariff 11 consuming 4,250kWh per annum.

*(Solar Citizens, 2013)*



# Regulation and the 'death spiral'?

rising prices encourage end-users to reduce consumption or even leave, meaning fixed costs have to be recovered from less and less MWh and/or customers

*A problem arising from some highly desirable trends for a clean energy future*

*Challenge of retaining incentives for socially optimal investment whilst managing network returns*

*More of an issue for electricity or gas?*

(via google news archive)

Thursday, August 4, 1983 — THE NEWS — Page 7A

## Utilities grapple new enemy: a rate increase 'death spiral'

By Jack Danforth  
Orlando Sentinel

TACOMA, Wash. — There is a new buzz word surfacing in Pacific Northwest electric utilities these days. It is the "death spiral." The concept is simple, and consumers of electric power from Florida to Alaska have recognized it for years.

A death spiral occurs during periods of rising electric rates. The theory is that as electricity demand increases, electric utilities are forced to build expensive new power plants.

This causes electric rates to rise and consumers to use less power. Electric utilities have large fixed costs, so as demand — thus revenue — is reduced, rates must be increased again, causing further reductions in consumption, and the cycle is repeated: a death spiral.

The recent collapse of the Washington Public Power Supply System, also known as Whoops, has focused attention on the death spiral. In this region, electric rates for some utilities have tripled during the past three years.

The increases and the Whoops collapse have forced utilities, for the first time in the industry's history, to come to grips with the possibility that they have reached the limits of their customers' pocketbooks.

It long has been known that there is a finite amount of money available in the family budget for the electric bill. Consumers have different limits, but when taken as a whole there clearly is an economic wall that electric utilities cannot go past.

For the past 30 years, energy prices have been so low and relative incomes so high that the "wall" was far

alternative sources: gas-fired fuel cells, photovoltaic cells and a more efficient end-use of conventional resources, all of which are distinct possibilities within the next decade.

The old days of building more power plants regardless of the cost are gone. Utilities that continue that philosophy ultimately will be priced out of the market.

Conservation still is a vital cog in our energy policy of the 1980s. It is a dangerous oversimplification to say that conservation at a time of surplus energy only further reduces utility revenues, thus causing higher rates.

Programs as simple as the rebate program in Kissimmee, Fla., are one of the most cost-effective methods of stimulating energy efficiency in the country.

The rebate program concept originated there in 1981 and now is being used successfully by such major utilities as Pacific Gas & Electric in California. In these programs, utilities help customers pay the cost of conservation improvements, which is cheaper than building another expensive plant.

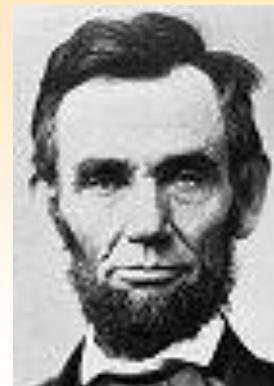
But consumers must understand that it is not a contradiction to promote more use of electricity, more industry and conservation at the same time. In many areas, thousands of kilowatts of electricity are available during off-peak times without building another plant. That results in a lower average cost of energy production.

There are times, of course, in a growing economy, when a new generating plant must be built. But that should not be done until the utility has explored all the cheaper alternatives — conservation and helping industries generate their own power from wasted

# Where next?

*"The best way to predict your  
future is to create it!"*

Abraham Lincoln



*"It depends...."*

- many factors outside our jurisdictional policy making efforts
- but certainly opportunities to improve likely outcomes



Centre for Energy and  
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Thank you... and *questions*

*Many of our publications are available at:*  
[www.ceem.unsw.edu.au](http://www.ceem.unsw.edu.au)