Centre for Energy and Environmental Markets

UNSW

Electricity Industry Restructuring for Efficiency & Sustainability - *Lessons from the Australian Experience*

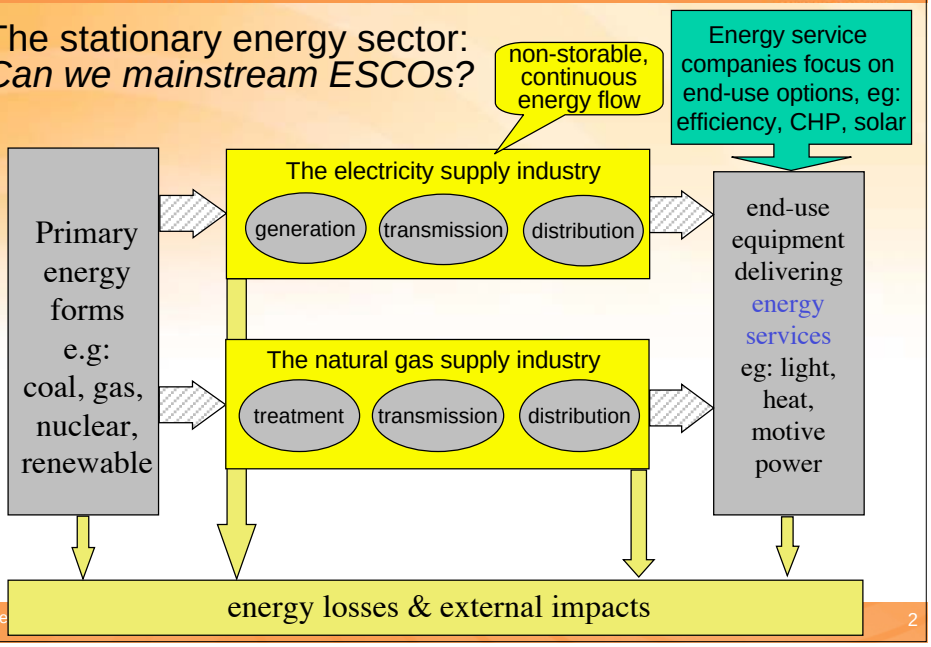
Hugh Outhred & Iain MacGill,
Centre for Energy & Environmental Markets
University of New South Wales
Email: h.outhred@unsw.edu.au

www.ceem.unsw.edu.au

Centre for Energy and Environmental Markets

UNSW

The stationary energy sector: *Can we mainstream ESCOs?*



Centre for Energy and Environmental Markets

UNSW

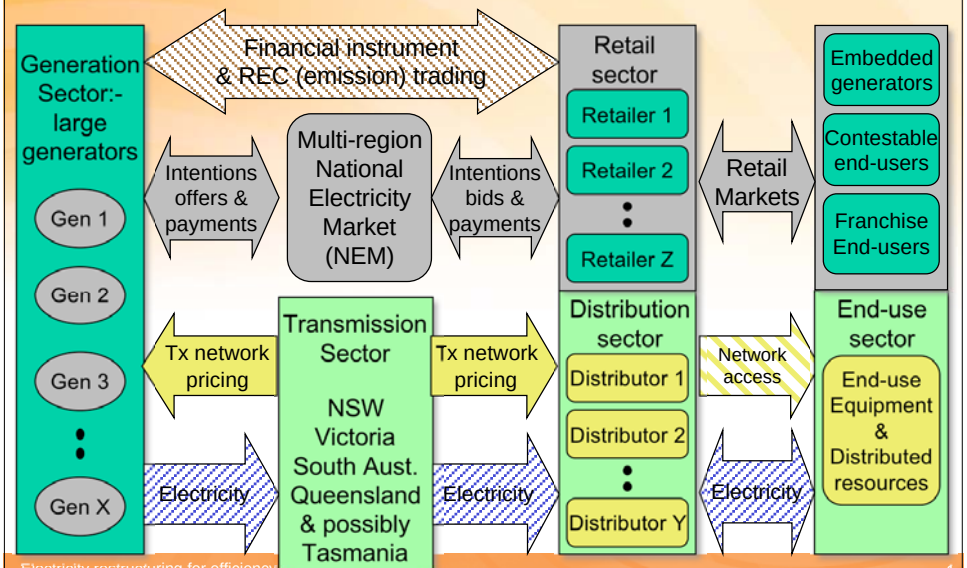
Why improve efficiency of energy use?

- Some arguments for energy efficiency policies:
  - Economic efficiency - electricity markets don't work
  - Climate change *(Hansen: reduce emissions this decade)*
  - Social policies, particularly for the disadvantaged
- Some arguments against energy efficiency policies:
  - Economic efficiency - electricity markets do work
- What has been the Australian experience?
  - Electricity cheap & ESCO role small
  - Electricity use & CO2 rising, load factor worsening
  - Difficult to implement effective white certificate trading

Centre for Energy and Environmental Markets

UNSW

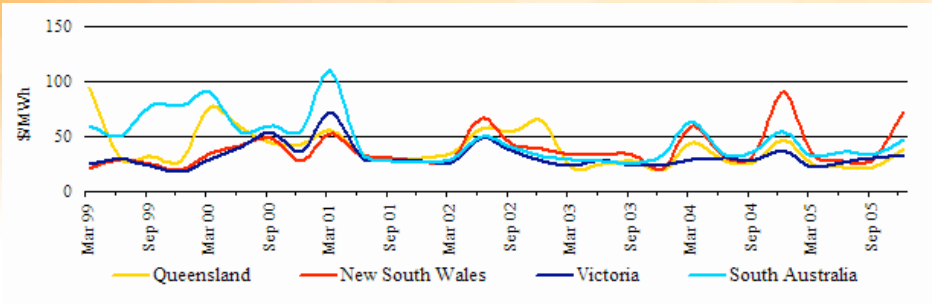
Present electricity industry structure in SE Australia



Centre for Energy and Environmental Markets

UNSW

Average NEM spot prices since market inception (12/98 to 12/05) (AER long term analysis)

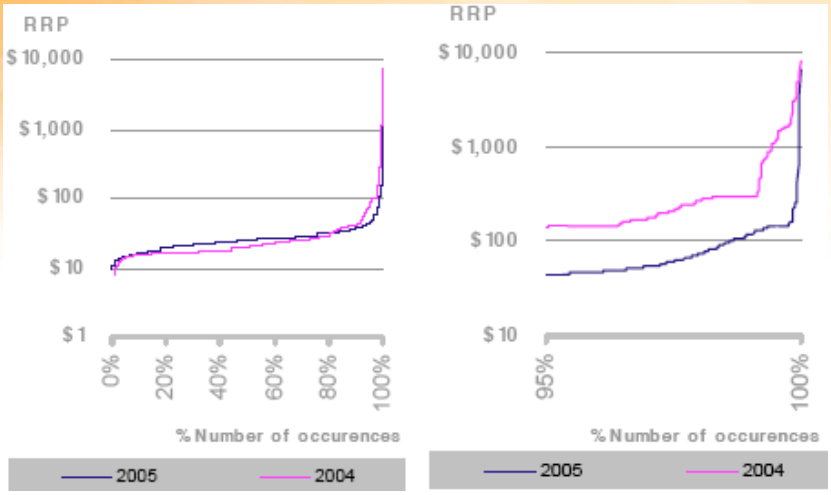


Centre for Energy and Environmental Markets

UNSW

Spot price duration curve, SA, Jan-Mar 05

(NECA, 05Q1 Stats, 2005; half-hour spot prices)

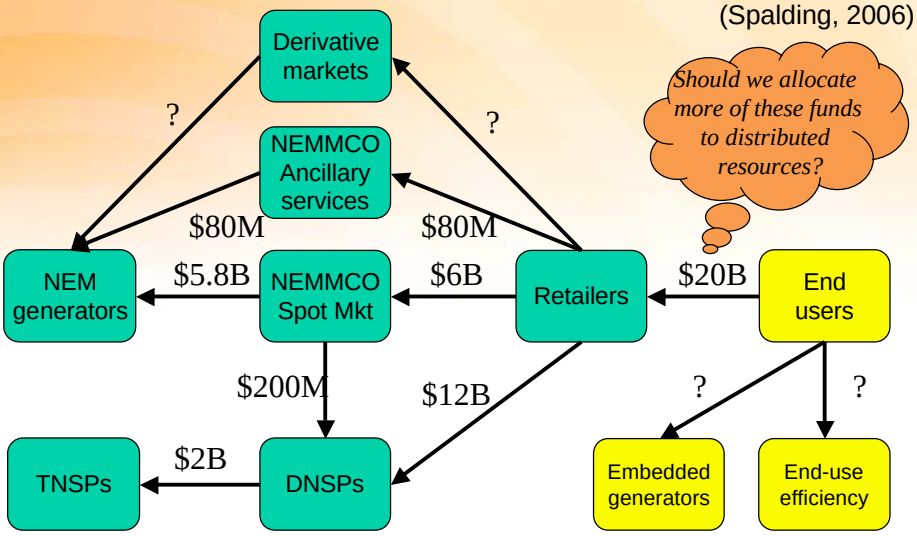


Centre for Energy and Environmental Markets

UNSW

Cash flow in SE Australia electricity industry

(Spalding, 2006)

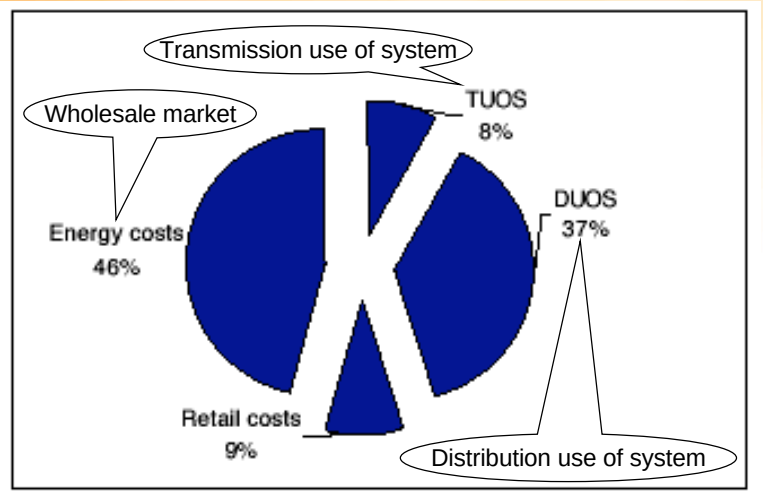


Centre for Energy and Environmental Markets

UNSW

Residential electricity bill cost components

(IPART, DNSP Review, 2003)



Centre for Energy and Environmental Markets

UNSW

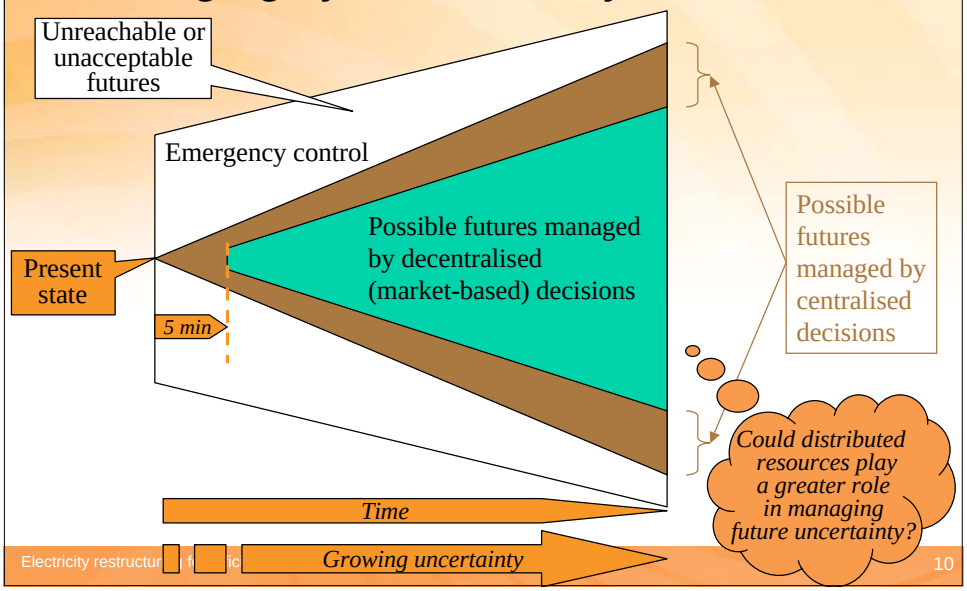
Availability & quality of supply:- the dominant policy issue for the electricity industry

- Quality of supply attributes of *electrical energy flow*:
  - Voltage, frequency, waveform purity
- ESI can't achieve perfect availability & quality:
  - Can vary greatly in distribution networks
  - Customer equipment can be to blame
- Risks to availability & quality of supply threaten the flow of end-use energy services:
  - Directly or indirectly through equipment malfunction
  - Poorly defined legal obligations (mainly on distributors) for availability & quality at end-user connection points
  - *Managed mainly by supply-side investment*

Centre for Energy and Environmental Markets

UNSW

Managing system security in the NEM



Centre for Energy and Environmental Markets

UNSW

Australian electricity restructuring to date

- Has focussed on wholesale electricity & ancillary services market design & network services
- Has not focussed on retail market design or encouraged active end-user participation
- However, there are now some relevant policies:
  - NSW DM code, energy efficiency fund & NGAS
  - Roll-out of interval metering in NSW & Victoria
  - Regulatory test for network augmentation
  - National Framework for Energy Efficiency
  - State policies on enhanced building energy performance for commercial & residential sectors

Centre for Energy and Environmental Markets

UNSW

NSW Demand Management Code

- DNSPS required to develop DR expertise
- DR options to be developed in-house & externally
- Market must be tested for options when reasonable
- Market to be informed well in advance of constraint
- Network & DR options to use the same database
- Clear & transparent option comparison
- Process assessed by DNSP regulator:
  - Regulator allows full cost recovery for cost-effective options as well as additional incentives for DR activities

Centre for Energy and Environmental Markets

UNSW

National Framework for Energy Efficiency (NFEE, 2003)

- Endorsed in 2002 by Ministerial Council on Energy:
  - To set directions for energy efficiency policy & programs
  - To promote a uniform approach across Australia
  - To reduce the predicted gap between supply & demand
  - To reduce the energy intensity of the economy & in the process, increase the GDP
- Proposed mechanisms:
  - Enhance mandatory energy performance standards
  - Facilitate the uptake of cost-effective measures
    - Reduce barriers & constraints in a nationally coordinated manner

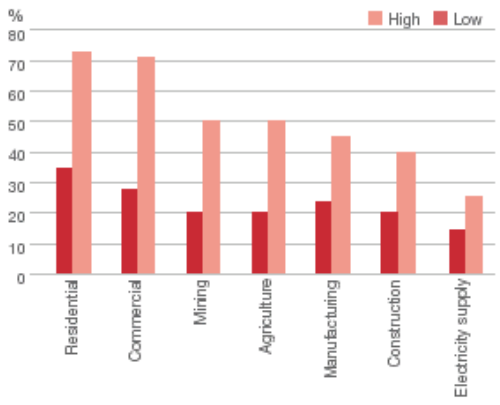
Centre for Energy and Environmental Markets

UNSW

Estimates of Australian cost-effective Energy Efficiency (NFEE, 2003)

- Estimates have high uncertainty however potential clearly very large (NFEE, 2003)
- Rebound effect may negate reduction in energy use unless electricity prices rise

Figure 4: Percentage cost–effective energy consumption reduction potential across different sectors.



Centre for Energy and Environmental Markets

UNSW

State policies on building energy performance

- NSW: all new houses & major refurbishments must pass BASIX assessment of energy use & other aspects of sustainability
- Victoria: 5-star code requirement for all new houses

Centre for Energy and Environmental Markets

UNSW

Example: Sydney region DM project

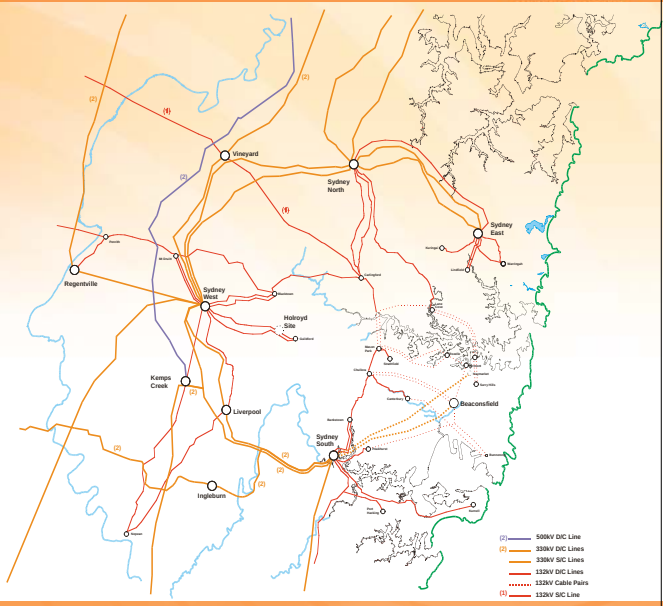
- Participants:
  - Transgrid, EnergyAustralia (distributor), NSW Dpt of Industry, Planning & Natural Resources (DIPNR)
- Objectives:
  - Identify & develop cost-effective DR options to defer or avoid network augmentation in inner Sydney region
- Options considered (2003 to 2006):
  - Stand-by generation, interruptible load, power factor correction, innovative HVAC, building design (Basix)

Centre for Energy and Environmental Markets

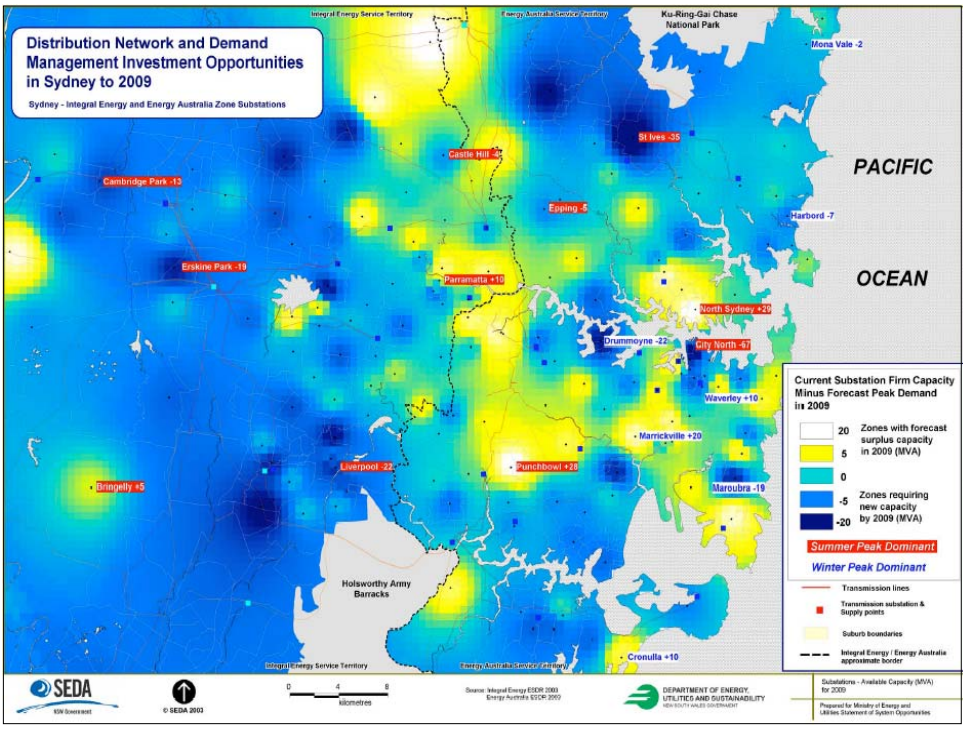
UNSW

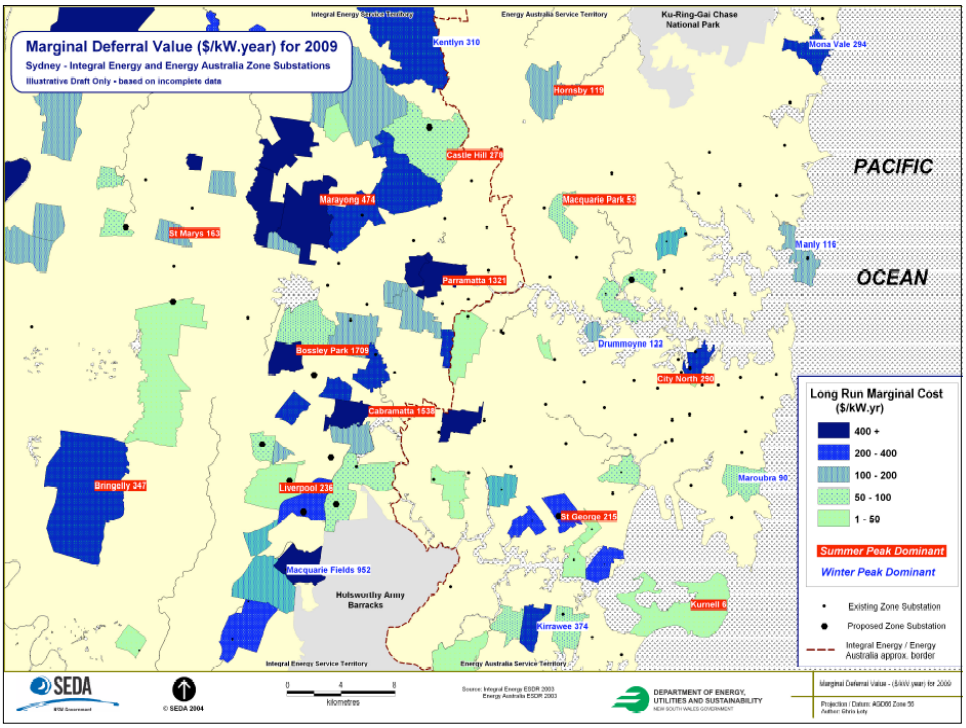
NSW transmission network, Sydney region

(M Park, 2005)



Electricity restructuring for efficiency & sustainability 17





Centre for Energy and Environmental Markets

UNSW

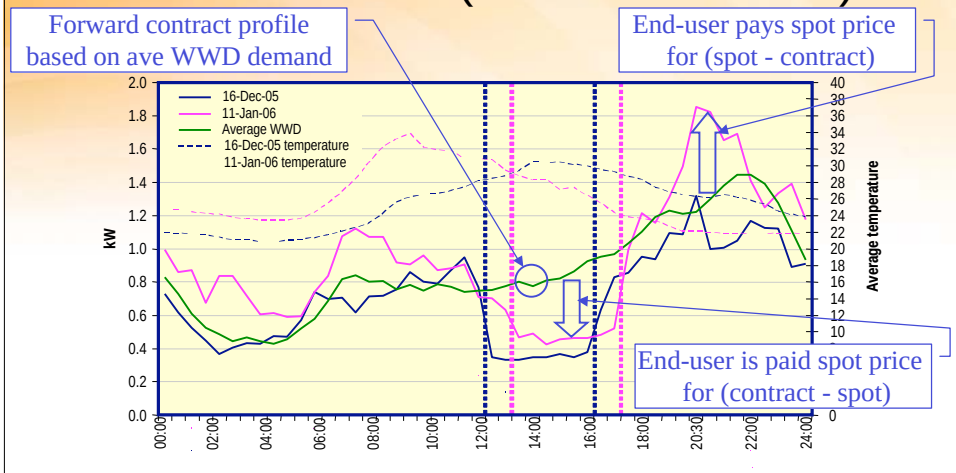
EnergyAustralia distributor meter & network tariff strategy (H Colebourn, 2005)

- Only half-hour meters installed since July 2004
- Replacement half-hour meters for most of 25,000 40-160 MWH end-users installed by June 2005
- Replacement half-hour meters for 110,000 15-40MWH end-users by June 2010
- 3-rate TOU network tariff from March 2005
- Seasonal TOU network tariff from July 2005
- Residential trials of non-predetermined pricing & interruptible loads

Centre for Energy and Environmental Markets

UNSW

Possible next step: spot & forward network access contract (based on EA trial)

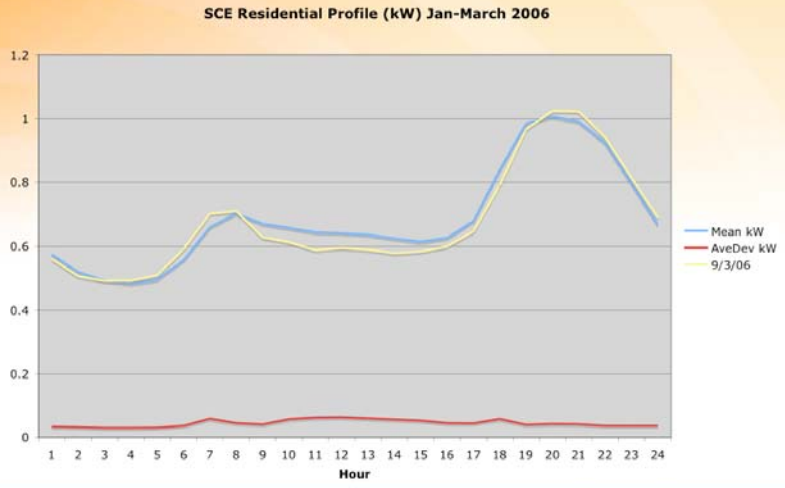


Centre for Energy and Environmental Markets

UNSW

Profile example: SCE Residential load

(http://www.sce.com/AboutSCE/Regulatory/loadprofiles/2006loadprofiles.htm)



Centre for Energy and Environmental Markets

UNSW

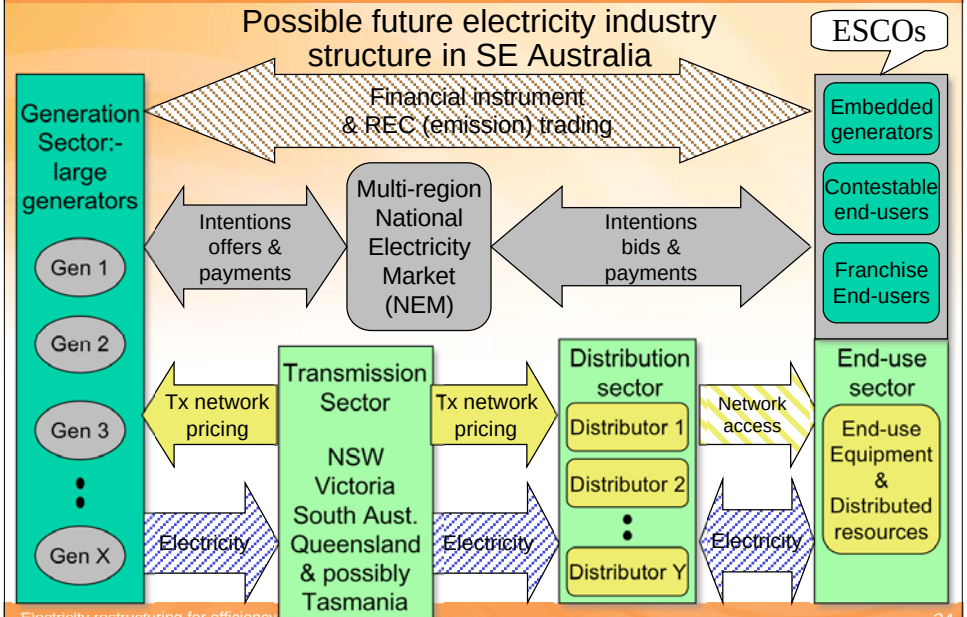
Default residential forward contracts

- Forward demand profile to meet basic household needs for normal weather conditions:
  - Energy and network access
- Forward price profile determined by area-specific network LRMC estimate for cost of supply:
  - Considering economically efficient investment in either supply-side or demand-side options
- Forward term to be 3-5 years with annual update
- Local spot price derived from wholesale market:
  - Allowing for network losses & flow constraints

Centre for Energy and Environmental Markets

UNSW

Possible future electricity industry structure in SE Australia



Centre for Energy and Environmental Markets

UNSW

Conclusions on valuing DR contribution

- Important issues in valuing DR:
  - Availability of supply
  - Quality of supply, particularly voltage & frequency
  - Obligation to serve,particularly network flow constraints
- DR role can be facilitated by coordinated technical & market mechanisms
  - Spot (30 minute) prices for energy & ancillary services
  - Interval metering with QOS measurement
  - Retail tariffs restructured as spot & forward contracts
- Enhanced role for ESCOs:
  - Key source of advice & options for end-users

Centre for Energy and Environmental Markets

UNSW

Many of our publications are available at:
www.ceem.unsw.edu.au