Centre for Energy and Environmental Markets

UNSW THE UNIVERSITY OF NEW SOUTH WALES SYDNEY • AUSTRALIA



What might "astute and effective policy" look like for the Future Grid?

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

A/Prof. Iain MacGill

Associate Professor, School of Electrical Engineering
Joint Director (Engineering), Centre for Energy and Environmental Markets

UNSW Australia

Electricity Users and the Future Grid: Dependence, Independence, or Interdependence?

Australia All-Energy Conference

Melbourne, 7-8 October 2015

Policy frameworks

"a system of laws, regulatory measures, courses of action, and funding priorities concerning a given topic promulgated by a governmental entity or its representatives"

- Astute and Effective policy
  - of keen penetration or discernment; sagacious; adequate to accomplish a purpose; producing the intended or expected result
  - Careful, thoughtful shaping of decision making to achieve desired shared objectives, without also working unduly against broader objectives
  - Robust: with the ability to perform reasonably well under a wide range of possible futures

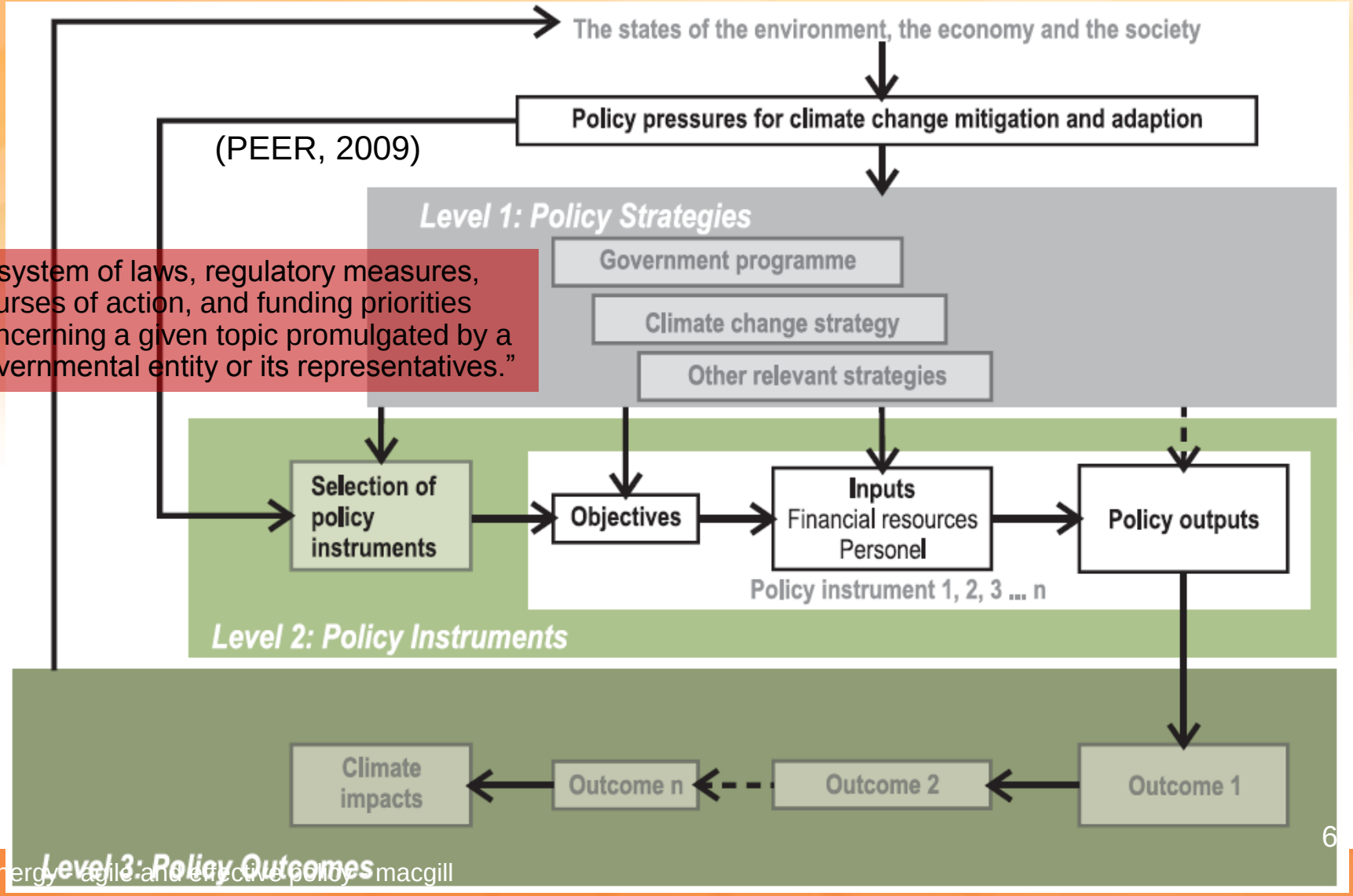
Driving desired decision making

- What policy options to drive ..
- What decisions out of the range possible for ..
- Which decision makers
- With what ‘private’ objectives and constraints
- To what shared ends?
  - Is what is “viable” for an individual consumer the best outcome for the economy as a whole? What about other consumers? And the environment?
  - What are the implications of these and other “disruptive” trends for grid stability, security, reliability, and ultimately, viability?

Energy users – a changing utility context

- From clients
  - Early tailored industrial or commercial (lighting) applications
- ..to citizens
  - Electricity as an essential public good – rural electrification
- ..to consumers
  - The vertically integrated utility of growing size and scope
- ..to customers
  - Electricity industy ‘reform’, liberalisation, deregulation, restructuring
- ..to perhaps now partners, competitors?

Relevant policy processes … in theory



"a system of laws, regulatory measures, courses of action, and funding priorities concerning a given topic promulgated by a governmental entity or its representatives."

In practice

- contested, potentially rapidly changing context, high associated uncertainty, historical arrangements, institutions and incumbents with their own objectives and capabilities and capabilities
- *always challenging, generally reactive rather than proactive – hence disruption rather than transformation – occasionally shambolic*

Nothing so new about distributed storage

JOURNAL
OF THE
SOCIETY OF
Telegraph-Engineers and Electricians.
Founded 1871. *Incorporated* 1883.

VOL. XVII. 1888. No. 73.

The One Hundred and Seventy-seventh Ordinary General Meeting of the Society was held at the Institution of Civil Engineers, 25, Great George Street, Westminster, on Thursday, April 12th, 1888—Mr. EDWARD GRAVES, President, in the Chair.

The minutes of the previous meeting were read and approved.

The names of new candidates were announced and ordered to be suspended.

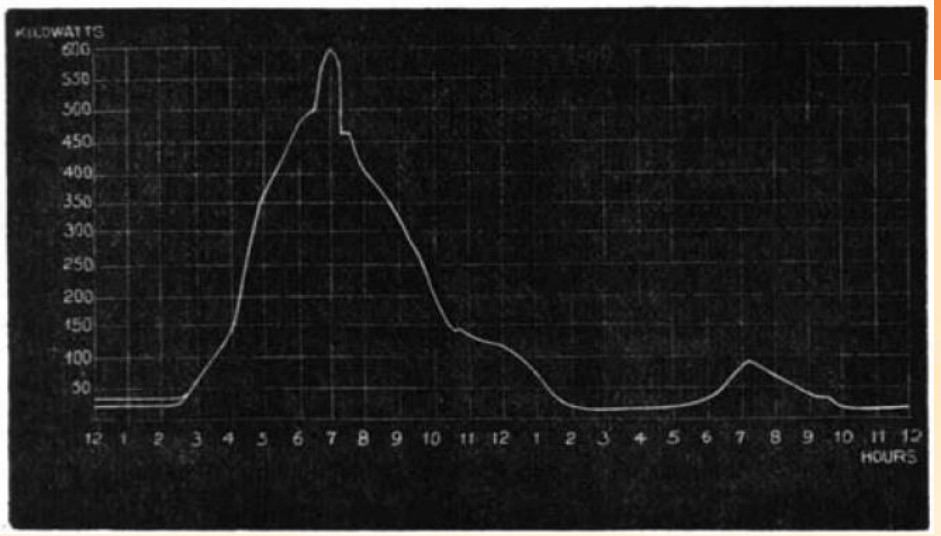
Donations to the Library were announced as having been received since the last meeting from Messrs. J. B. Baillière et Fils; Messrs. De La Rue & Co.; C. H. W. Biggs, Member; and R. H. Krause, Member; to whom the thanks of the meeting were heartily accorded.

The following paper was then read:—

CENTRAL STATION LIGHTING: TRANSFORMERS *V.* ACCUMULATORS.

By R. E. CROMPTON, Member.

The present paper is the outcome of the discussion which took place on Messrs. Kapp's and Mackenzie's papers on transformers, recently read before this Society. I was asked to give facts and figures in support of the statement I then made, that I believed the distribution of electricity by transformers offered no special advantages over other methods, particularly over distribution by means of accumulators used as transformers.



COST OF 10,000 LIGHT, OR 600-KILOWATT, PLANT.

A.T.—ALTERNATING TRANSFORMER DISTRIBUTION.

	£
Generating Station, Buildings, Chimney Shaft, Water Tanks, and General Fittings	11,000
Dynamos and Exciters — 865 Kilowatts, including spare sets, divided as convenient ...	5,540
Motive Power, *i.e.*, Engines, Boilers, Steam and Feed Connections, Belts, &c., at £8 12s. per I.H.P.	12,470
500 Transformers, *i.e.*, one to every pair of houses, at £15 each	7,500
2,000 yards Primary or Charging Main, exterior to area of supply, at £308 per 100 yards	6,160
20,000 yards Distributing Main, 50 m/m. sectional area, at £91 7s. (*see* Table 1)	14,270
Regulating Gear	500
	£57,440

B.T.—ACCUMULATOR TRANSFORMER DISTRIBUTION.

	£
Generating Station, Buildings, Chimney Stack, Water Tanks, and General Fittings	8,000
Dynamos — 600 Kilowatts, in 6 sets of 100 Kilowatts each...	4,800
Motive Power, *i.e.*, Engines, Boilers, Steam and Feed Connections, &c., at £8 12s. per I.H.P.	8,600
4 Groups of Accumulators, in all 240 cells, in series, at £40 per cell, including Stands ...	9,600
2,000 yards Charging Main, at £306 17s. 6d. per 100 yards (*see* Table 2)	6,137
20,000 yards Distributing Main, 161·25 m/m. sectional area, at £100 12s. 6d. (*see* Table 2) ...	20,125
Regulating Gear	2,500
	£59,762

Nothing new about the ‘death spiral’?

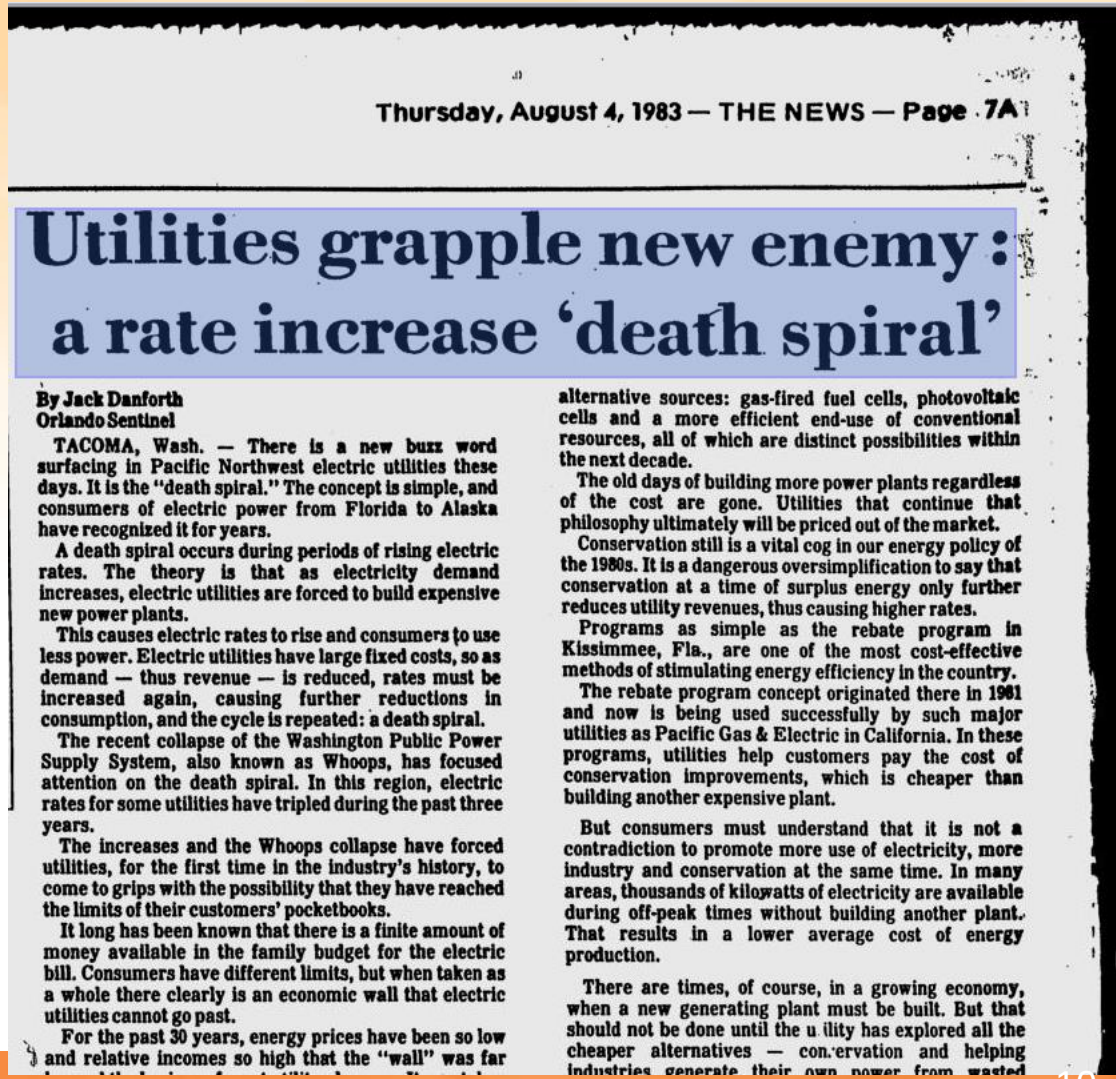
Argued that rising prices encourage end-users to reduce consumption or even leave, meaning fixed costs have to be recovered from less and less consumption and/or customers

Savings from demand reduction depend critically on energy/network tariffs

End-user departure depends critically on DG technology progress, particularly storage

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 u ility has explored all the cheaper alternatives — con ervation and helping industries generate their own power from wasted

Relevant future grid 'policy' domains

Comprehensive and coherent policy development process required across all domains

1. Regulation

- Transmission network planning
- Distribution network planning
- Grid codes

2. Market Design

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

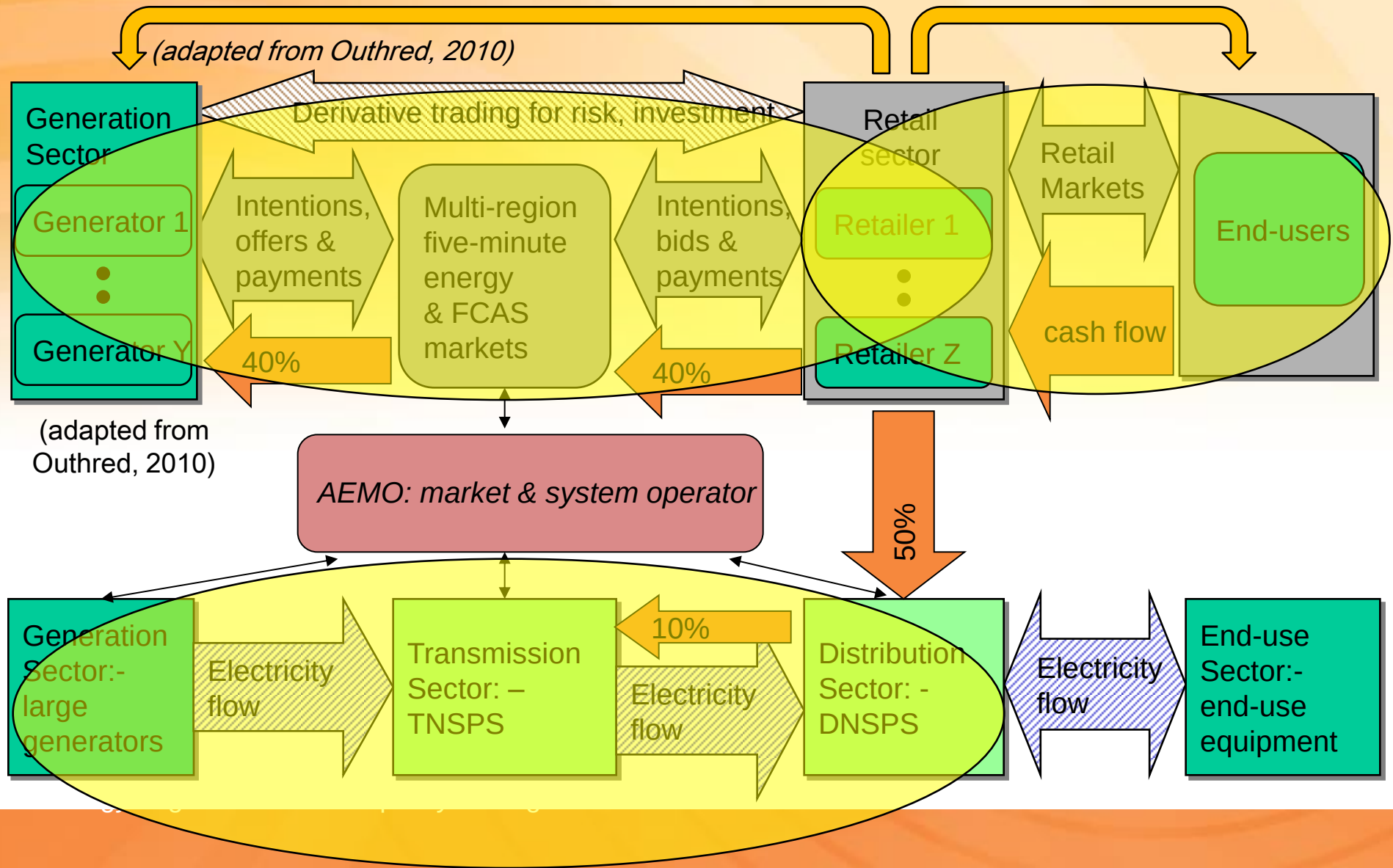
3. External Policy Drivers

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

Robustness and Resilience: ability to perform reasonably well under a wide range of possible futures

(from Riesz, 2014)

Australian NEM – regulatory, commercial regimes



Network regulation and distributed energy

- Monopoly economic regulation with revenue cap based on approved expenditure and approved tariffs
- Considerable discussion but limited progress to date on DE innovation on expenditure side – including delayed DMIA
- Move to so-called cost reflective network tariffs…. but
  - Which costs – past, present or future (future should be key)
  - Are such tariffs even feasible? – complexities and uncertainties in their calculation, political realities of implementation
  - Require judgement which may involve, eg. PV specific tariffs and charges, demand charges with fixed minimum demand or measured at any time of day and night….
  - *Risks of discriminating against Distributed Energy while allowing far greater existing cross subsidies b/n customers to remain*
    Is this an appropriate incentive structure for an electricity industry in desperate need of clean energy transition?

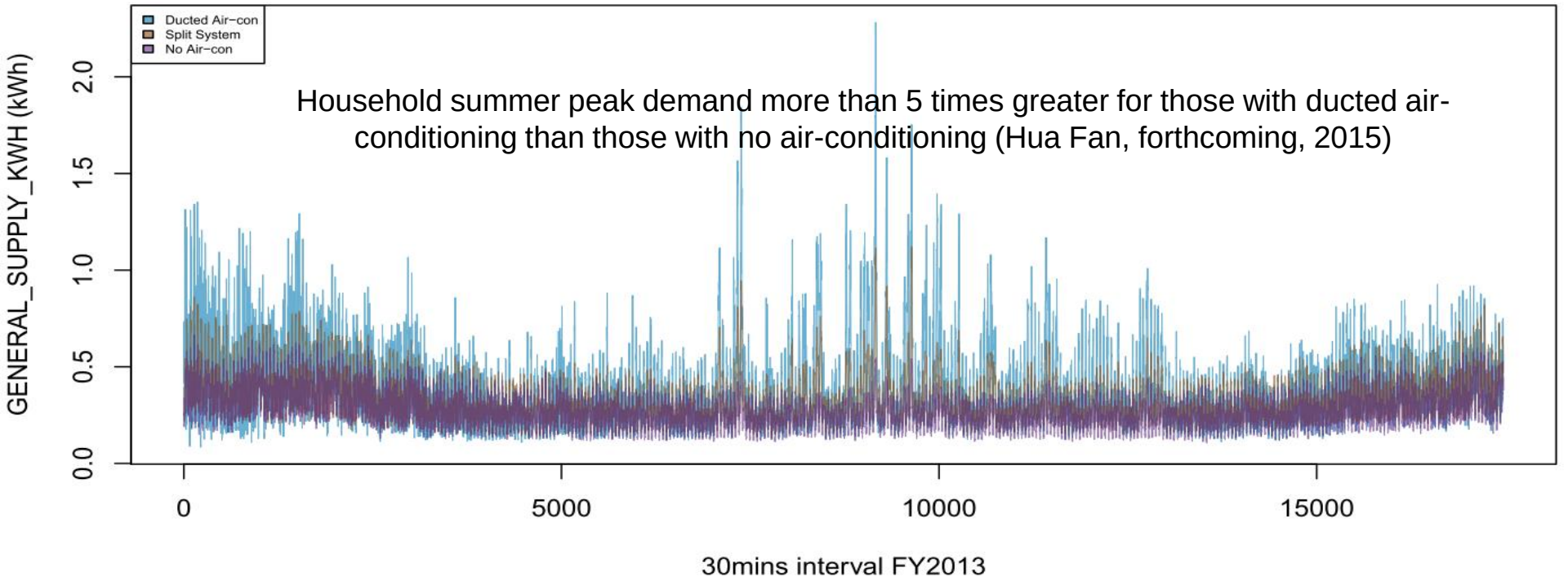
SA network wants solar homes to pay $100/year more for grid

By Giles Parkinson on 27 May 2015

SA Power Networks, the monopoly network operator in South Australia, has caused a furore in the solar industry by proposing a $100 a year network surcharge on solar households.

The proposal was revealed in a submission to the Australian Energy Regulator earlier this week, and follows decisions by both the Queensland and West Australian governments – the owners of their respective networks – to back away from similar moves.

Would seem to be greater efforts to address solar PV cross subsidies than likely much larger subsidies for ducted air-conditioning and rural customers… despite environmental benefits of PV, adverse network expenditure aspects of rural supply and high peak demand



Leaving the grid

- The grid is a very valuable asset – not because we've spent a lot of money on it (sunk investment), but because of the valuable service it provides.
- With regard to possible grid defection, storage deployment etc, all market forecasts are wrong… although some useful
- Do not under-estimate the costs and challenges of off-grid supply – average demand and PV generation is irrelevant to understanding reliability of supply
- *However, distributed storage and generation providing an increasingly attractive option and alternative – will discipline network pricing*

A risk with renewables and energy storage

- A potentially influential political alliance between those who support energy storage and the role it can play in better integrating renewable energy and saving network $ ….
- and those who would like to see renewables saddled with expensive energy storage obligations, and/or wish to argue for ‘light handed’ network regulation on basis competition will discipline network service provider behaviour

Bootleggers and Baptists

From Wikipedia, the free encyclopedia

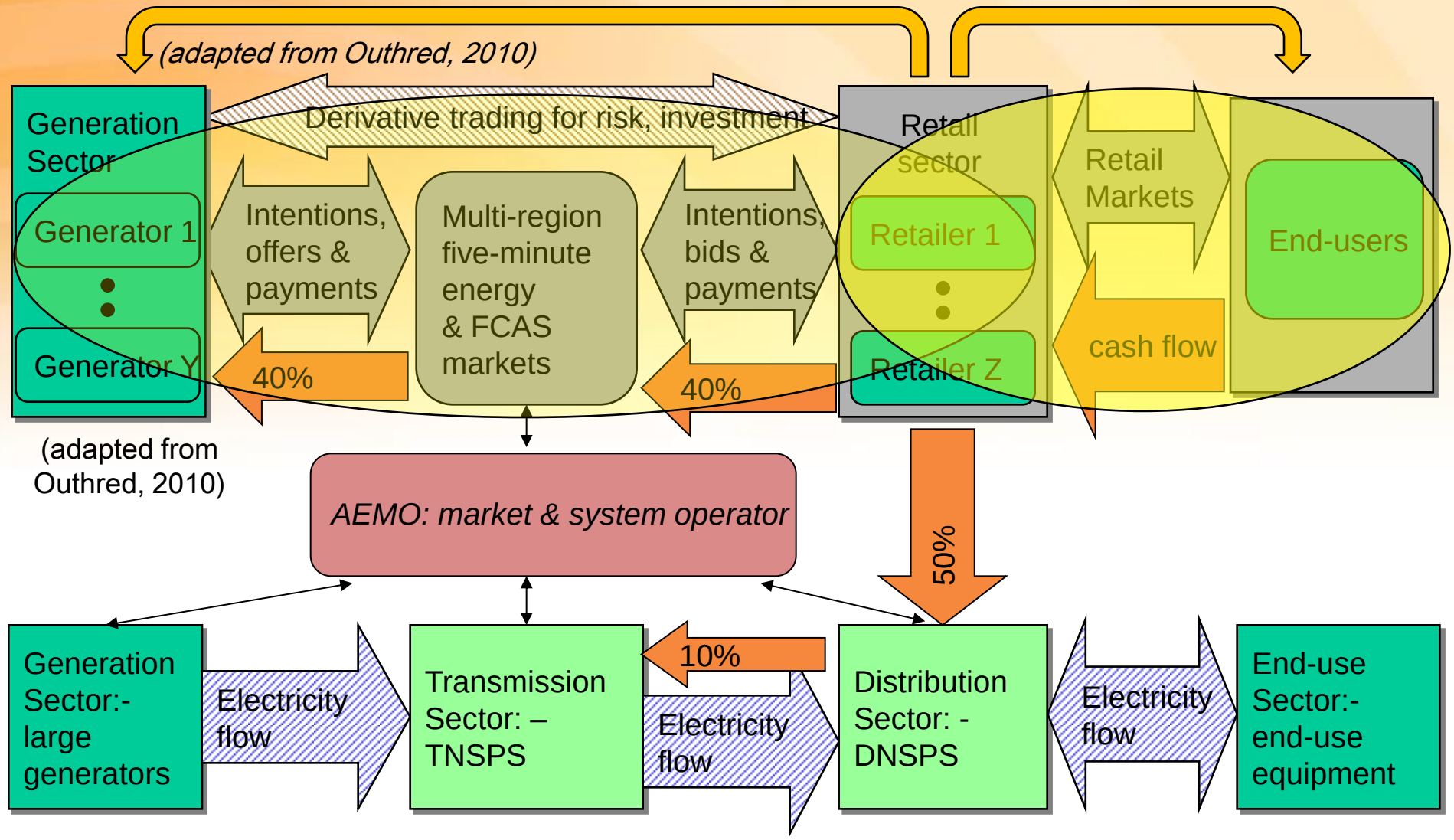
Bootleggers and Baptists is a catch-phrase invented by regulatory economist Bruce Yandle[1] for the observation that regulations are supported by both groups that want the ostensible purpose of the regulation and groups that profit from undermining that purpose.[2]

For much of the 20th century, Baptists and other evangelical Christians were prominent in political activism for Sunday closing laws restricting the sale of alcohol. Bootleggers sold alcohol illegally, and got more business if legal sales were restricted.[1] “Such a coalition makes it easier for politicians to favor both groups. … [T]he Baptists lower the costs of favor-seeking for the bootleggers, because politicians can pose as being motivated purely by the public interest even while they promote the interests of well-funded businesses. … [Baptists] take the moral high ground, while the bootleggers persuade the politicians quietly, behind closed doors.”[3]

Contents

Californian police agents dump illegal alcohol in 1925, Prohibition-era photo courtesy Orange County Archives.

Australian NEM –commercial regimes

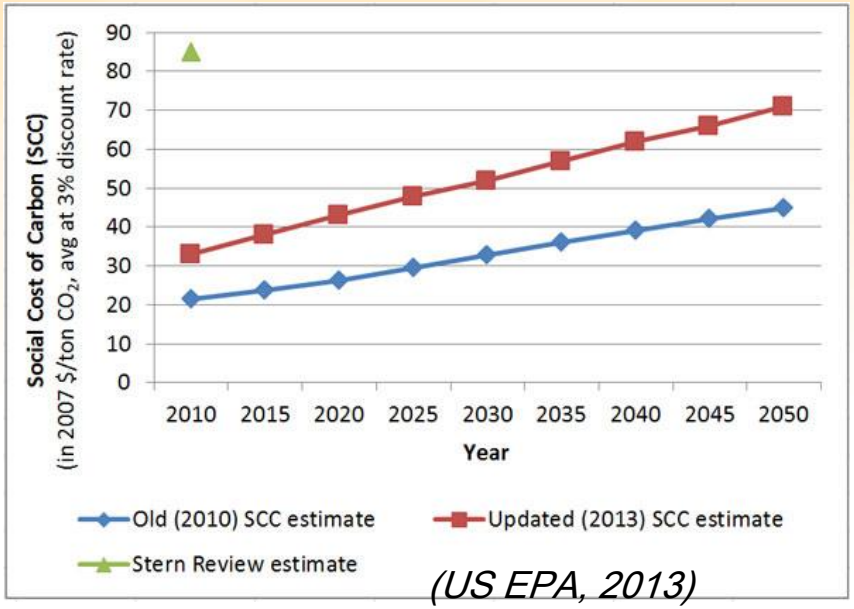


The question is not whether to have a price on carbon?

- Costs associated with reducing emissions regardless of particular means chosen (tax, emissions trading regulation, ERF…)

And / or

- Social costs associated with impacts of failing to effectively manage climate change (SCC)



(US EPA, 2013)

- *Instead, real question is who, pays how much, to whom, for what, when?*
- *Markets with unpriced externalities inefficient by definition*

Growing + welcome focus on consumers in NEM

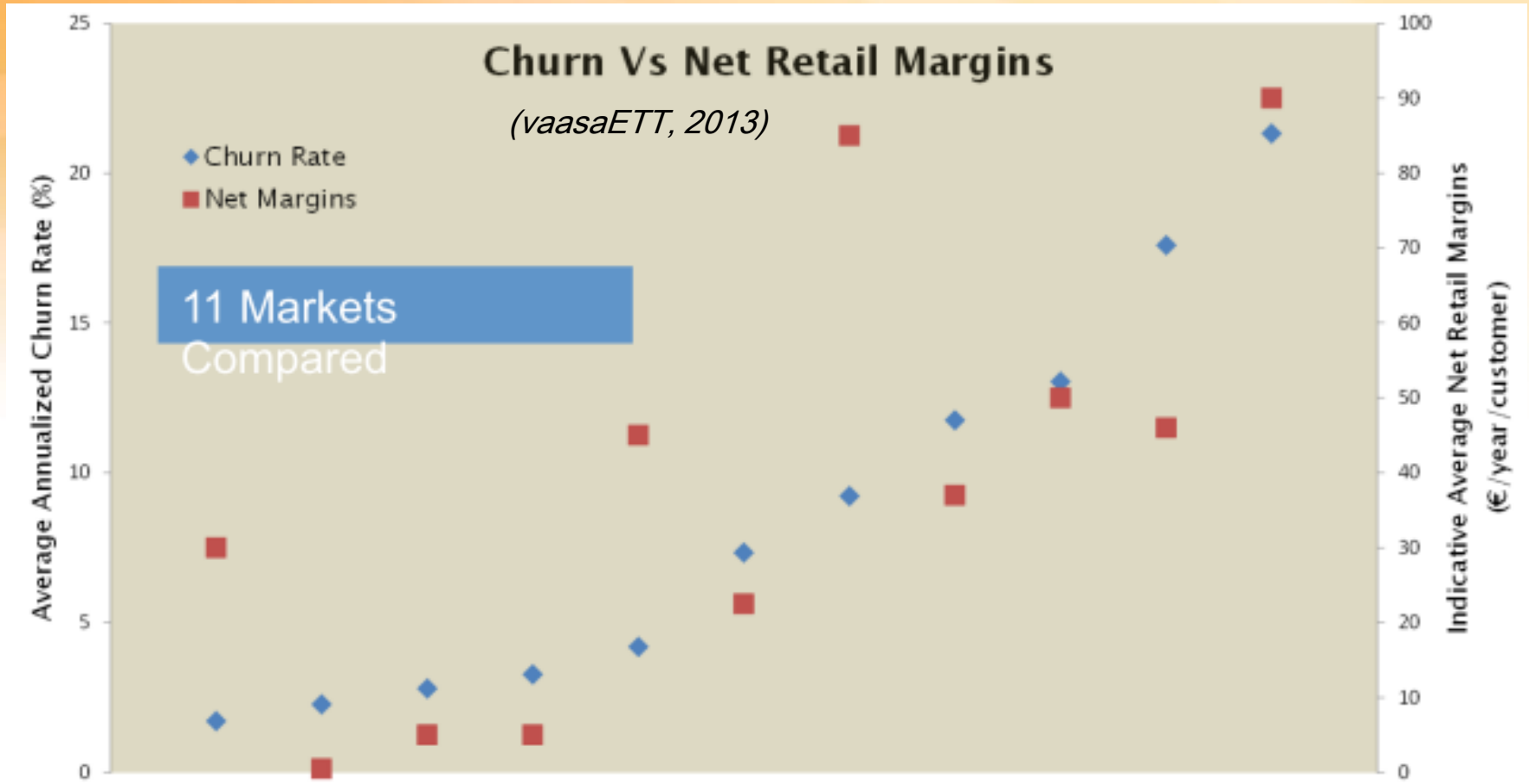
"…development of market frameworks to encourage innovative products & services that give consumers more choice in managing bills & support greater competition"

"Regulation should generally encourage competition & consumer choice, not stifle it"

(Energy White Paper, 2015)

- Incumbents will generally prefer less competition
  - engaged customers with real options key to true competition
- However
  - Limits to the interest, motivation, knowledge and capabilities of some consumers; *requires protection and facilitation to support engagement*
  - Consumers not always being offered meaningful choices; they want services, not an energy commodity
  - Inadequate measures of competition; *does 'churn' and market offer 'spreads' reflect competition or the absence of it? 1.4 million households have engaged through residential PV that reflects real competition beyond choosing a retailer*
  - Shared choices important too; *including question of renewable energy policy, further electricity industry privatisation*

More competition?



AEMC perspective

Retail, networks and gas clearly identified as key unfinished business of electricity Industry restructuring

…but still questions regarding institutional capabilities, interest in driving major transformation

Market Reviews & Advice

In our reviews we take a long term view of what needs to be done to assure consumers of reliable, efficiently priced electricity and gas services.

STATUS All Open Completed REVIEWED BY All AEMC Reliability Panel

SUMMARY 88 Market reviews 4 Accepting submissions 0 Recently updated 0 Accepting public hearing registrations

Title	Date Initiated	Stage	Date Completed	Submissions Close	Reference
Review of the Victorian Declared Wholesale Gas Market	04-03-15	Initiation			GPR0002
East Coast Wholesale Gas Market and Pipeline Frameworks Review	20-02-15	Consultation on Draft Report		29-05-15	GPR0003
Implementation advice on the Shared Market Protocol	18-12-14	Preparation of Draft Report		12-02-15	EMO0029
Template for Generator Compliance Programs Review 2015	13-11-14	Publication of Draft Report		07-05-15	REL0054
2015 Retail Competition Review	31-10-14	Preparation of Draft Report		19-02-15	RPR0003
Last Resort Planning Power - 2014 Review	01-07-14	Review completed	06-11-14		EPR0042
2014 Residential Electricity Price Trends	10-03-14	Review completed	11-12-14		EPR0040
Optional Firm Access, Design and Testing	06-03-14	Consultation on Draft Report		30-04-15	EPR0039
Distribution Reliability Measures	30-01-14	Review completed	18-09-14		EPR0041
2014 Retail Competition Review	17-01-14	Review completed	22-08-14		RPR0002
Advice on linking the reliability standard and reliability settings with VCR	29-10-13	Review completed	20-12-13		EMO0026
Annual Market Performance Review 2013	02-09-13	Review completed	07-05-14		REL0052
Review of Electricity Customer Switching	07-08-13	Review completed	10-04-14		EPR0038
Framework for open access and communication standards	25-07-13	Review completed	10-04-14		EMO0028
Last Resort Planning Power - 2013 Review	15-05-13	Review completed	05-12-13		EPR0037
Gas market scoping study	09-05-13	Review completed	27-09-13		GPR0001
Reliability Standard and Settings Review 2014	09-05-13	Publication of Final Report	16-07-14		REL0051
Advice on Best Practice Retail Price Regulation Methodology	09-05-13	Review completed	27-09-13		EMO0027
Management of Negative Inter-regional Settlements Residues	18-04-13	Review completed	20-02-14		EPR0032
Differences between actual and forecast demand in network regulation	14-02-13	Review completed	26-04-13		EPR0035
Review of the national framework for distribution reliability	08-02-13	Review completed	27-09-13		EPR0033
Review of the national framework for transmission reliability	08-02-13	Review completed	01-11-13		EPR0028
2013 Residential Electricity Price Trends	19-12-12	Review completed	13-12-13		EPR0036
Review of Competition in the Retail Electricity and	13-12-12	Review completed	31-10-13		RPR0001

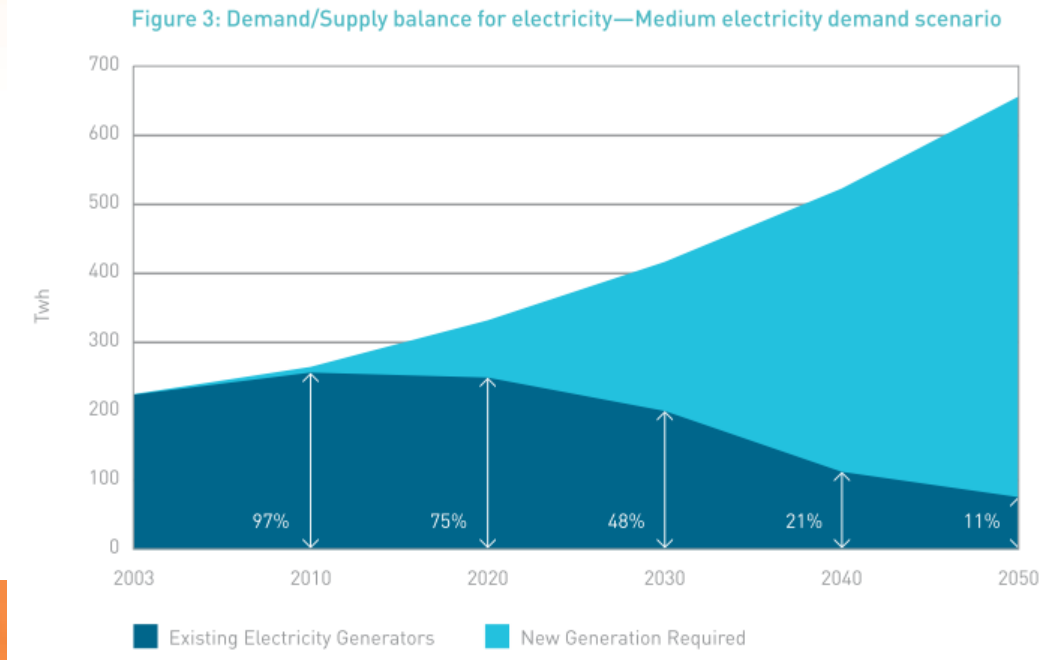
Present and possible future policies

- Emissions trading – good in theory, questionable in practice
  - "Emissions trading schemes are a valid mechanism", although they "have to date worked better in theory than in practice." *(Turnbull, 10/2015)*
- Emission Reduction Fund – poor in theory and practice
  - Low transparency, blind tender on 'imputed' emission reductions from what would *likely* have happened otherwise
  - "environment minister Greg Hunt has been achieving "significant reductions' with his emissions reduction fund" *(Turnbull, 10/2015)*
- RET and EE – poor in (simplistic) theory, good in practice
  - EE and RET our most successful genuine abatement mechanisms to date, whilst also providing additional env. and social benefits
  - A need and opportunity to expand efforts with both.
    - Although RET has issues requiring attention post 2020 if Australia is to adopt higher renewable energy targets including market power of incumbent retailers, sunsets on existing renewable projects

Energy White Paper process

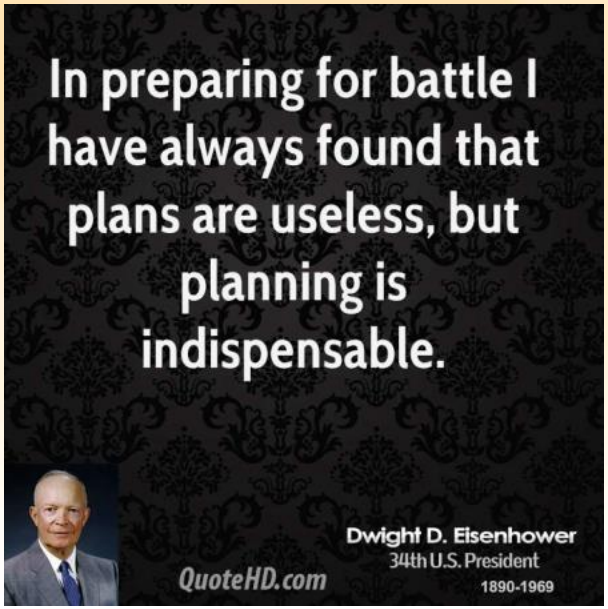
"Many of us who keenly observe the energy sector can take a pretty good guess at what our next big challenges are"
Senator MacFarlane, 10/9/2014

- History suggests not, certainly over medium to longer term:
  2004 Energy White paper had almost no discussion of:
  - *CSG (CSM)*
  - *East Coast LNG export*
  - *Falling demand*
  - *Falling costs and growing of Wind, PV*



Possible improvements to White Paper process setting broader policy settings

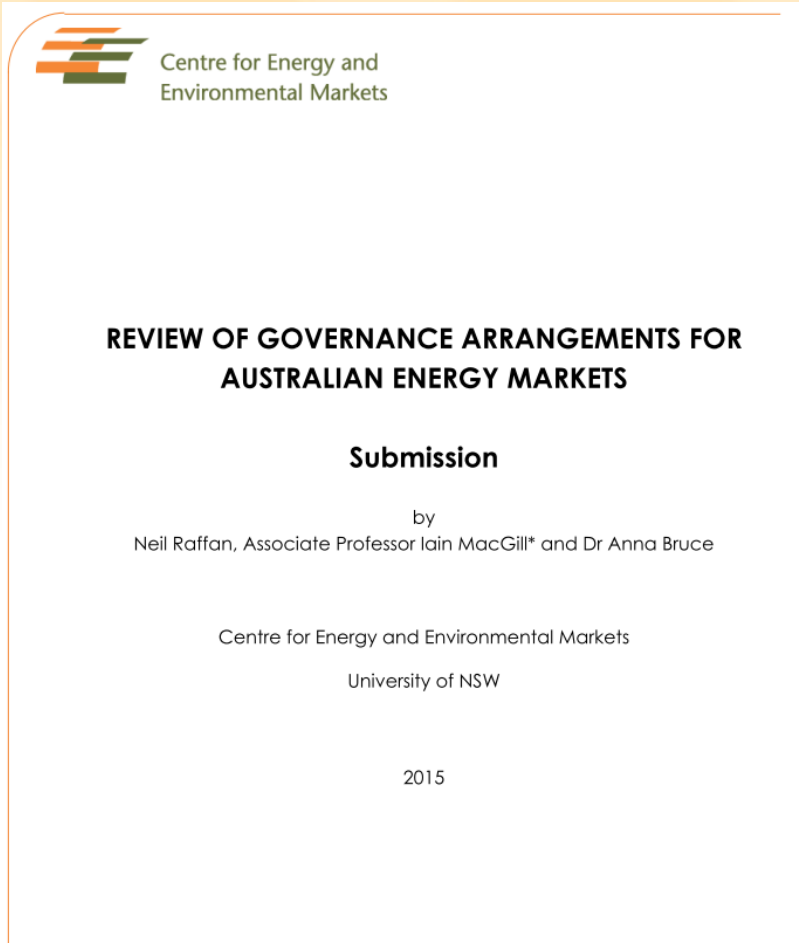
- As it stands, largely a ‘to do’ list of government priorities over near future
- In terms of vision and long term planning falls well short



- Opportunities to focus more on planning rather than the plan
  - Detach from political cycle *(currently one White paper per government)*
  - Broader, and ongoing stakeholder engagement
  - More scenarios and robustness testing of these
  - Leverage ICT to support an ongoing dialogue as new inputs emerge (eg. NESA), circumstances change, policies are implemented…

NEM Governance Review – draft report

- Highlights challenges yet seems to suggest only modest changes to current arrangements
- No assessment of governance performance to date
- Little to say on how to manage role of incumbents in governance
- Energy Council role remains unclear, yet has key tasks
- Climate Governance likely our greatest challenge but not receiving consideration


Centre for Energy and Environmental Markets

REVIEW OF GOVERNANCE ARRANGEMENTS FOR AUSTRALIAN ENERGY MARKETS

Submission

by
Neil Raffan, Associate Professor Iain MacGill* and Dr Anna Bruce

Centre for Energy and Environmental Markets

University of NSW

2015

Where next?

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

Abraham Lincoln

Certainly opportunities to improve likely outcomes through more thoughtful and effective policy efforts

Centre for Energy and Environmental Markets

UNSW
THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY • AUSTRALIA

Thank you… and *questions*

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