



Centre for Energy and  
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# **Distributional Effects of the Australian Renewable Energy Target (RET) through Wholesale and Retail Price Impacts**

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Insight in Economics™

- Background on Australian Renewable Energy policy
- Wholesale and retail price impacts of the RET
  - Merit order effects
  - Industrial exemptions
  - Retail regulation
- Policy implications

# Interesting times in Australian Energy Policy

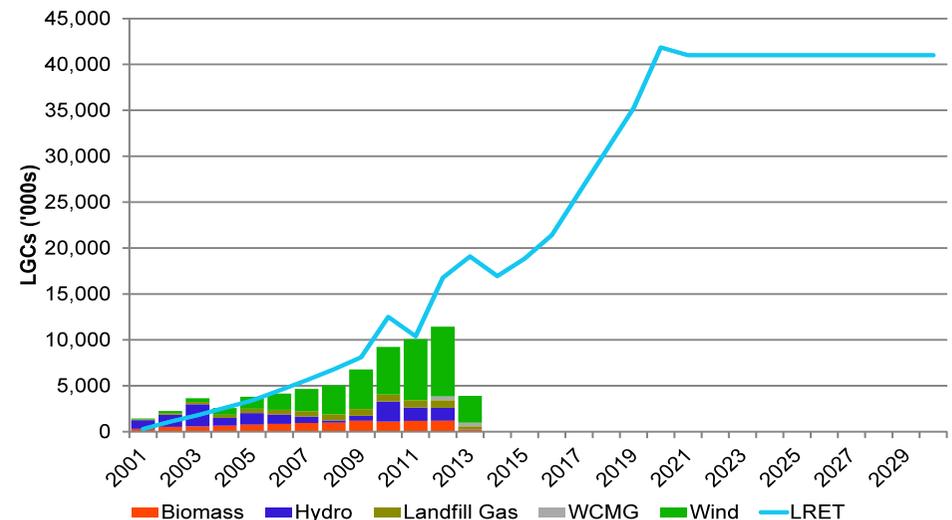


- Carbon price - \$24.15/tCO<sub>2</sub>
  - New conservative prime minister in Sept 2013 who has committed to removing the current carbon price
  - It would make us the first country to remove a price on carbon
- Renewable Energy Target – 20% by 2020
  - Review of RET currently being undertaken
  - Chair of review is a sceptic of man-made global warming
  - Certificate prices have dropped by around 30% since late 2013 in anticipation of potential removal

# Renewable Energy Target in detail

- Target is for 20% of demand to be met from renewable sources by 2020
- Target based on estimate of demand in 2010 which is significantly higher than current forecasts
- Certificates are traded separately for small-scale and large-scale generation schemes
- Liability is created for a retailer in proportion to the target and they must acquire certificates to meet the liability

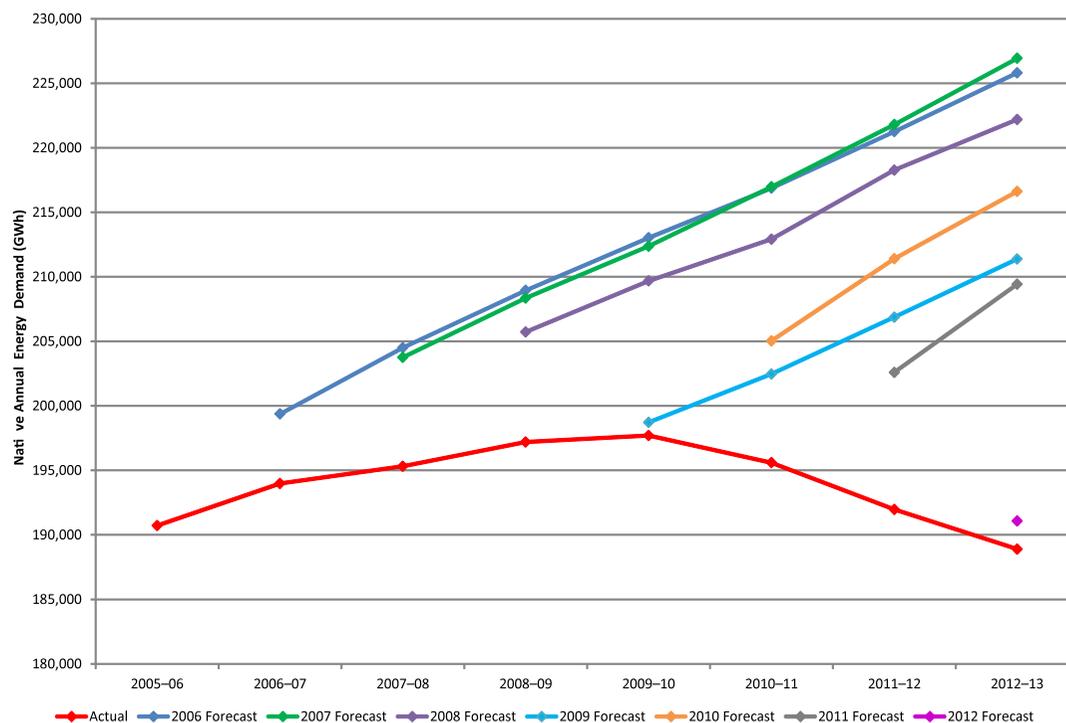
*Progress towards the LRET*



# Demand in the NEM is falling

- Demand has been falling since 2010-11, driven by:
  - Rooftop solar
  - Energy efficiency
  - Consumer to retail prices – high network costs, carbon price
  - Closure of aluminium smelters

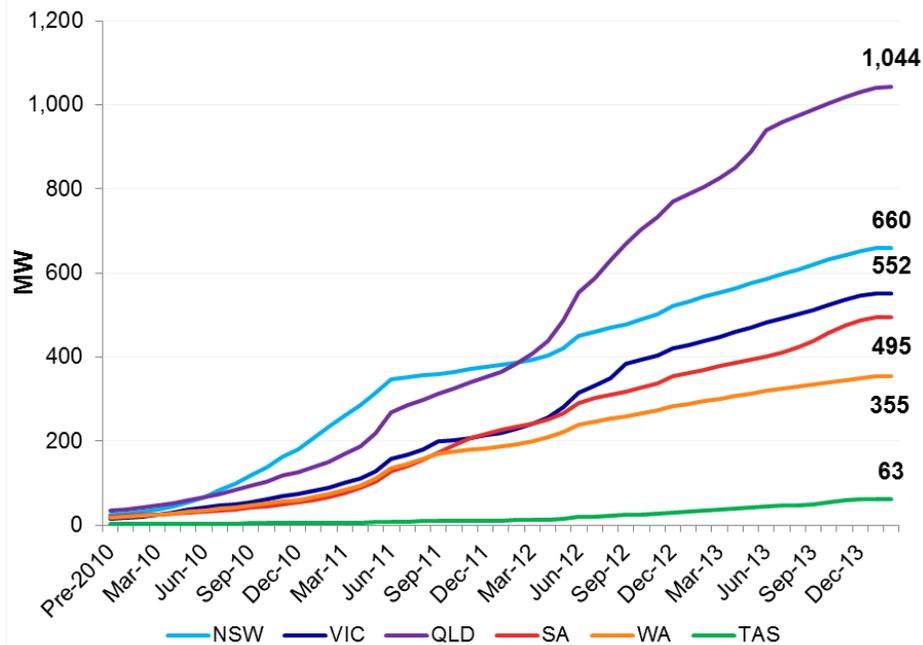
*Actual versus forecast demand –  
2005/06 to 2012/13*



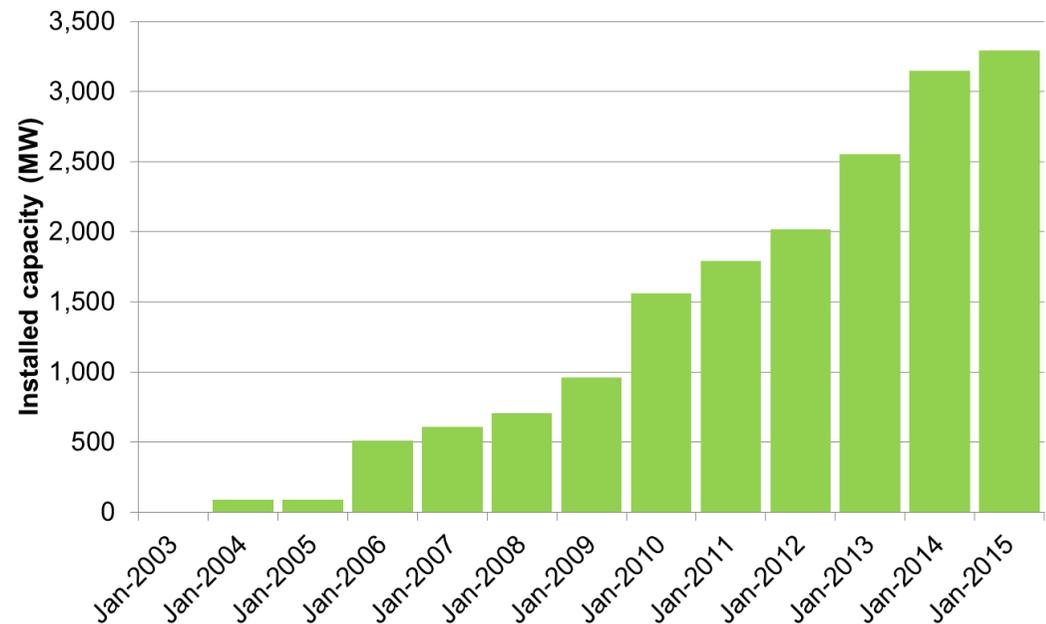
# Impacts of the RET

- Significant investment in wind and solar
  - Rooftop Solar installed capacity of ~3GW
  - Wind installed capacity of ~2.7GW as of Jan 2014

*Solar PV capacity  
Jan 2010 to Jan 2014*



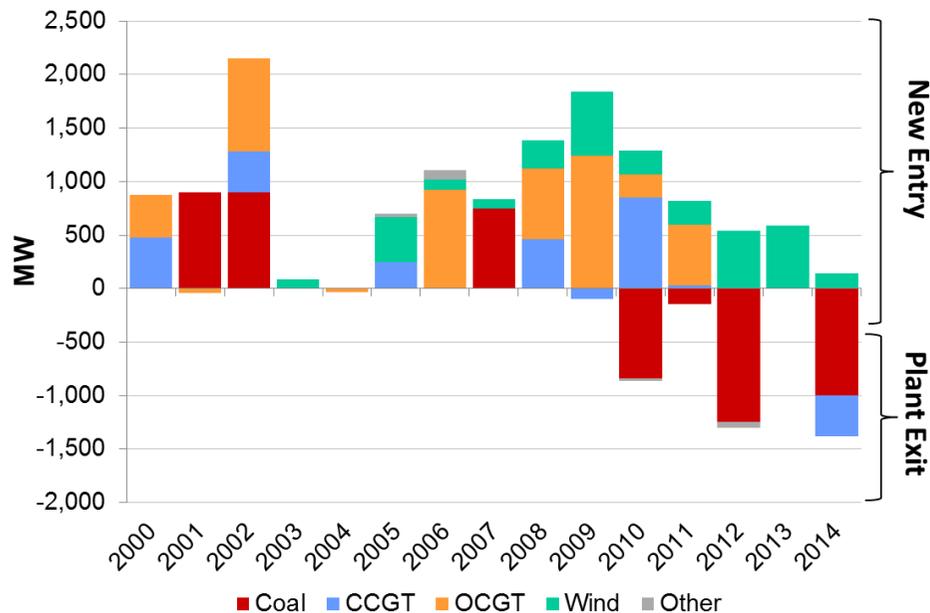
*Wind capacity (including committed projects)  
Jan 2003 to Jan 2015*



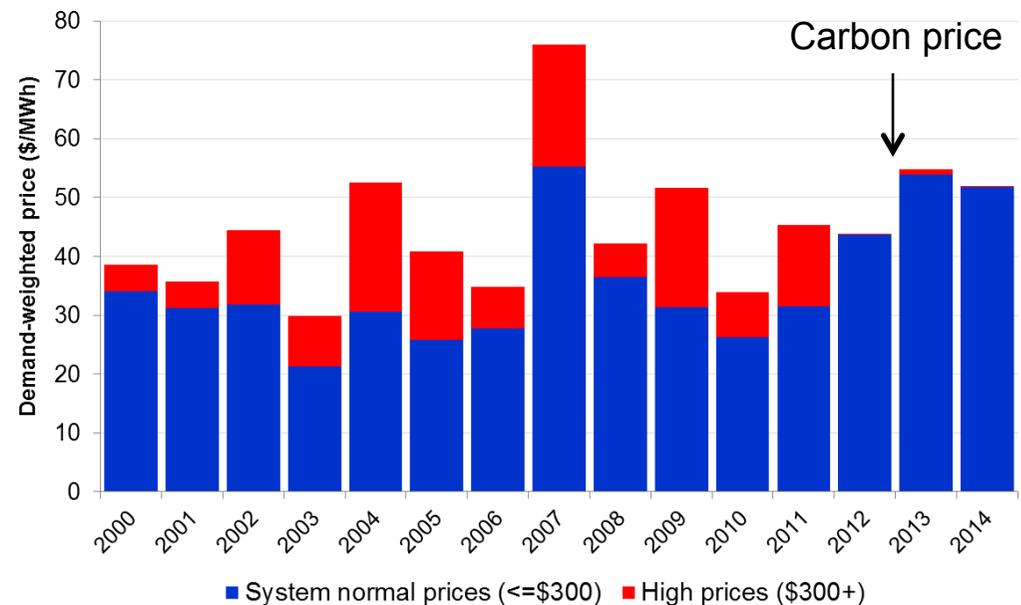
# Impacts of the RET

- Withdrawal of thermal generation – 1500MW withdrawn since 1 January 2014
- Low wholesale prices - when adjusted for carbon price prices are lowest since commencement of the NEM

*Entry and exit of NEM generation capacity*



*Demand weighted spot price – NSW\**



\* The NEM is an energy only, gross pool market

# Analysis of Distributional Effects



- Wholesale prices lower due to merit order effect of wind generation
- Retail prices increase due to costs of policies being passed through to consumers
- The net effect depends on:
  - Design of policy
    - Exemptions for industry
  - Design and structure of wholesale and retail markets
    - Pass-through of costs and benefits – regulation methodologies



Benefit



Cost



??

# Why bother?



- *Distributional aspects of renewable policy have been a concern globally*

*“Ensure that the cost but also the benefits of the German energy transition are allocated in a fair way across the different energy sectors and stakeholder groups.” (IEA, 2013)*

- *Impact of exemptions on costs for other consumers*

*“To date, little analysis has been publicly provided on the impact of these exemptions including the costs and benefits to other electricity customers.” (IPART, 2012)*

- *Debate around LRMC estimates used in retail price regulation for small customers*

*“[The approach to] LRMC ignores prevailing conditions in the electricity market, which can be influenced by a range of factors and which can have a significant influence on energy purchase costs” (QCA, 2012)*

# Measuring the effect of wind on wholesale price



- Wind is by far the highest contributor to the LRET so is the focus of the analysis
- Merit order effect measured using econometric model of wholesale prices based on Forrest (2013)

$$\ln(\text{price}_t) = c + \gamma \ln(\text{price}_{t-1}) + \alpha_1 \text{wind}_t + \beta_1 \text{demand}_t + \sum_j \mu_j S_{jt} + \eta_1 W_t + \varepsilon_t$$

- Prices truncated to reflect ‘market normal conditions’ and Tobit model applied

# Data set



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- Modelled on a NEM-wide basis, pre- and post-carbon
- Regional demand weighted 30-minute prices

**Table 1 Descriptive statistics – Price variables (\$/MWh)**

Variable	Mean	Standard Deviation	Min	1st Percentile	Median	99th Percentile	Max
<b>Pre-carbon (2011-12)</b>							
Price	29.24	30.22	-65.54	13.89	27.69	60.71	3,566.00
Price - censored	29.06	12.13	1.00	13.89	27.69	60.71	415.00
<b>Post-carbon (2012-13)</b>							
Price	60.56	68.86	-185.40	39.16	52.40	194.64	3,353.34
Price - censored	58.73	31.44	1.00	39.16	52.40	194.64	415.00

- Wind and demand aggregated across regions

**Table 2 Descriptive statistics – Demand and wind variables (MW)**

Variable	Mean	Standard Deviation	Min	1st Percentile	Median	99th Percentile	Max
<b>Pre-carbon (2011-12)</b>							
Demand	23,275	3,064	15,895	17,381	23,566	29,660	31,959
Wind	619	338	0	61	580	1,395	1,620
<b>Post-carbon (2012-13)</b>							
Demand	22,819	3,072	15,466	17,120	23,064	29,791	32,561
Wind	701	390	4	56	649	1,584	1,932

# Merit order effect



- Total merit order of wind generation estimated to be:
  - -\$2.30/MWh for 2011-12 (pre-carbon price)
  - -\$3.29/MWh for 2012-13 (post-carbon price)

Regression results 2011-12.

2011-12			
R-squared	0.6594		
Root MSE	0.1908		
Observations	17,568		
	Coefficient	S.E.	t-stat
Price ( $t-1$ )	0.587338	0.006109	96.140
Wind	-0.000060	0.000005	-12.530
Demand	0.000030	0.000001	23.600
Constant	0.791780	0.033021	23.980
Add. Controls: Dummies for seasonal trends and weekends			
<b>Total MO Effect</b>	<b>-2.30</b>	<b>\$/MWh</b>	

Regression results 2012-13.

2012-13			
R-squared	0.5301		
Root MSE	0.2078		
Observations	17,520		
	Coefficient	S.E.	t-stat
Price ( $t-1$ )	0.577430	0.007144	80.83
Wind	-0.000039	0.000005	-7.48
Demand	0.000032	0.000001	22.31
Constant	1.062013	0.039886	26.63
Add. Controls: Dummies for seasonal trends and weekends			
<b>Total MO Effect</b>	<b>-3.29</b>	<b>\$/MWh</b>	

# Pass-through of the merit order effect and retail price regulation

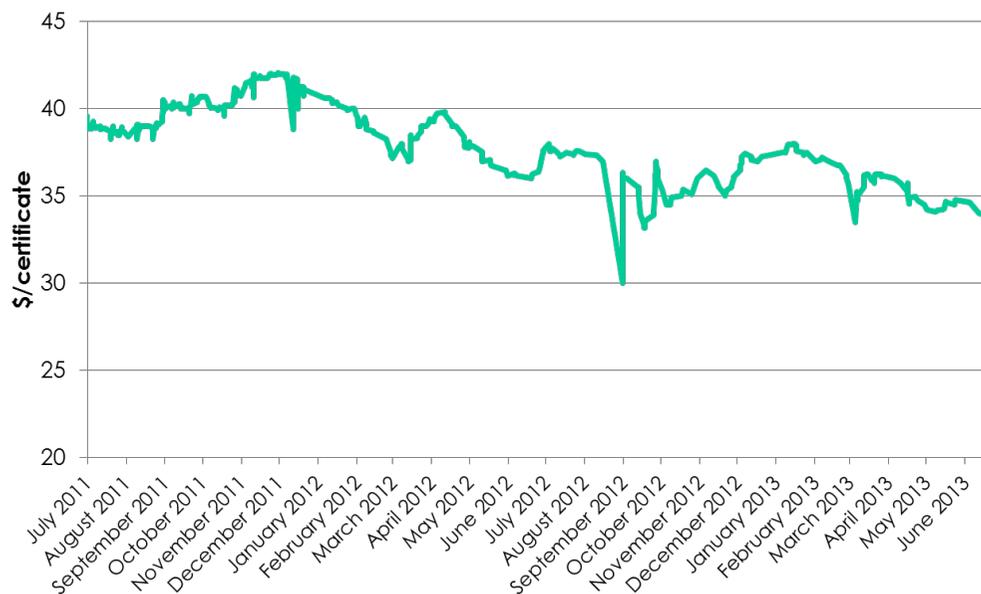


- Retail price regulation is in place in a number of jurisdictions
- The pass-through of wholesale price reductions in regulated retail prices as a result of wind depends on methodologies for estimating wholesale costs
- Reliance on simplistic ‘standalone LRMC’ approach for setting wholesale price components fails to adequately consider impact of renewable on wholesale price

# Retail LRET costs



- LRET costs for a retailer (\$/MWh) =  
Renewable Power Percentage x Certificate price (\$/MWh)
- Indicative LRET costs based on weighted average of regulator estimates
  - \$3.38/MWh for 2011/12 and;
  - \$5.58/MWh for 2012/13



# LRET cost exemptions



- Emission Intensive Trade Exposed (EITE) businesses receive exemptions from paying costs of the LRET scheme
- EITE businesses contribute approximately ~15% of demand
- Highly emissions-intensive activities (90% exemption), e.g.
  - aluminium and zinc smelting;
  - petroleum refining; and
  - the manufacture of iron and steel.
- Moderately emissions-intensive activities (60% exception), e.g.
  - include the manufacture of wood, paper and glass products, and;
  - certain chemical processes.

# Pass-through rates



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- Investigate a range of pass-through rates
  - Pass-through of merit order effect: 0%-50%-100%
  - Pass-through of RET costs: 0%-40%-100%

		Pass-through RET costs		
		100%	40%	10%
<b>through merit order effect</b>	0%	Electricity price not aligned to wholesale price movements; not exempt from RET costs	Electricity price not aligned to wholesale price movements; 60% exempt from RET costs	Electricity price not aligned to wholesale price movements; 90% exempt from RET costs
	50%	Electricity price partially aligned to wholesale price movements; not exempt from RET costs	Electricity price partially aligned to wholesale price movements; 60% exempt from RET costs	Electricity price partially aligned to wholesale price movements; 90% exempt from RET costs
	100%	Electricity price fully aligned to wholesale price movements; not exempt from RET costs	Electricity price fully aligned to wholesale price movements; 60% exempt from RET costs	Electricity price fully aligned to wholesale price movements; 90% exempt from RET costs

Small customer on regulated tariff

Large customer on negotiated tariff

Large exempt user

# Retail LRET costs



- All non-exempt consumers are estimated to have retail bills that are higher as a result of the LRET
- EITE businesses stand to benefit as a result of the LRET

		Pass-through RET costs		
		100%	40%	10%
<b>2011-2012</b>				
Pass-through	0%	3.38	1.35	0.34
merit order	50%	2.23	0.20	-0.81
effect	100%	1.08	-0.95	-1.96
<b>2012-2013</b>				
		Pass-through RET costs		
		100%	40%	10%
Pass-through	0%	5.29	2.11	0.53
merit order	50%	3.64	0.47	-1.12
effect	100%	1.99	-1.18	-2.77

# Policy implications



- Benefits and costs of renewable energy support policy could be distributed more equally in the short-run
  - LRET costs could be reduced if merit order effects
- Need an improved and uniform approach to determination of regulated retail prices
- Limitations: don't consider long-term effects, retirement of generation as a result of expansion of wind

# References



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