

LISTEN.
THINK.
SOLVE.®

Energy Efficiency

Understanding & Benefiting from the Opportunity

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July 2018

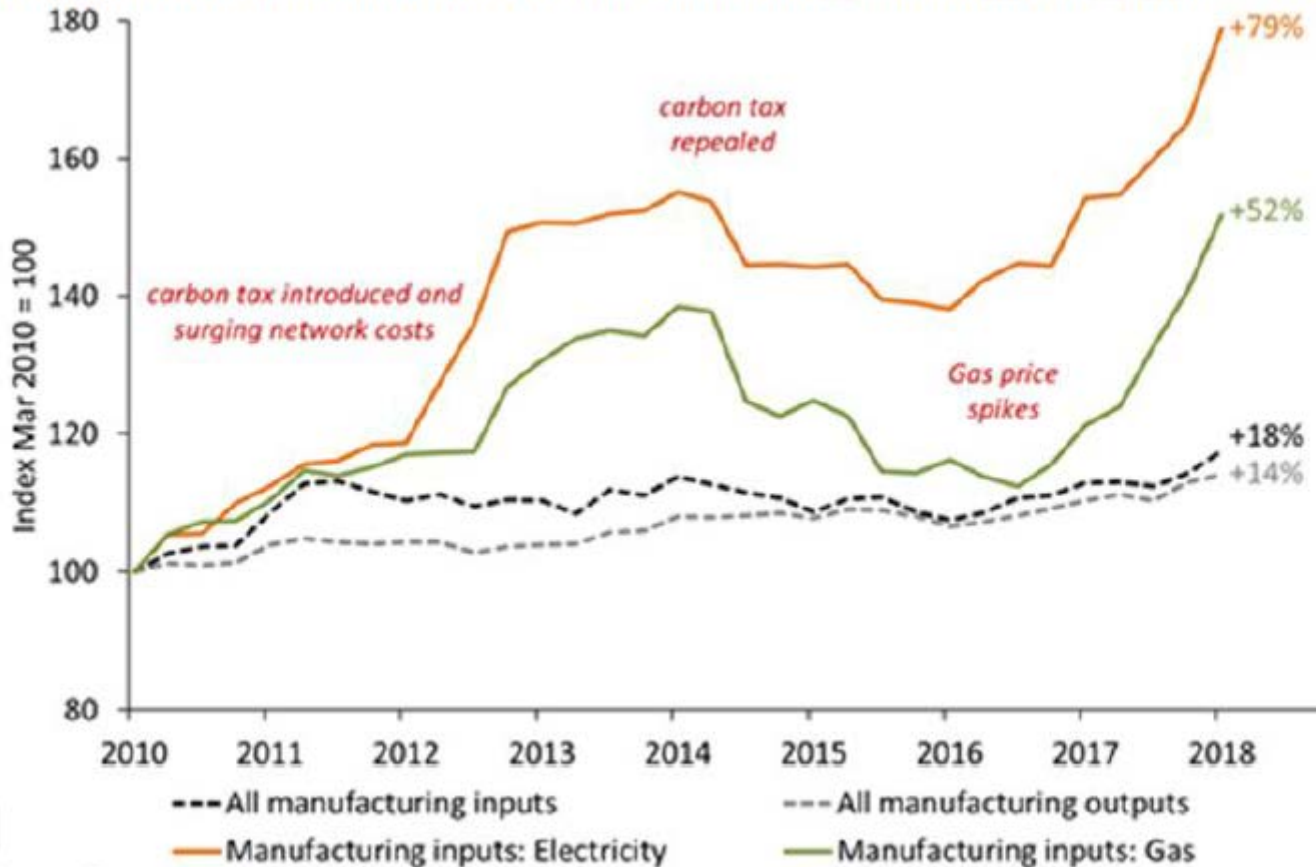
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- Energy Components :
 - Water / Wastewater
 - Air
 - Gas
 - Electricity
 - Steam
- Energy costs can be **20 percent of Cost of Goods Sold** for food & beverage plants
- Energy should be thought of as an **INGREDIENT**
 - Information can tell you how much of that ingredient is required for products you make (effectively becomes an input into a recipe)
 - Sustainability is a part of your **BRAND**

Electricity & gas cost impact

Chart 1: Manufacturing electricity and gas input prices indexes, cumulative change*, 2010 to 2018



* producer price indexes rebased to March Quarter 2000 = 100.

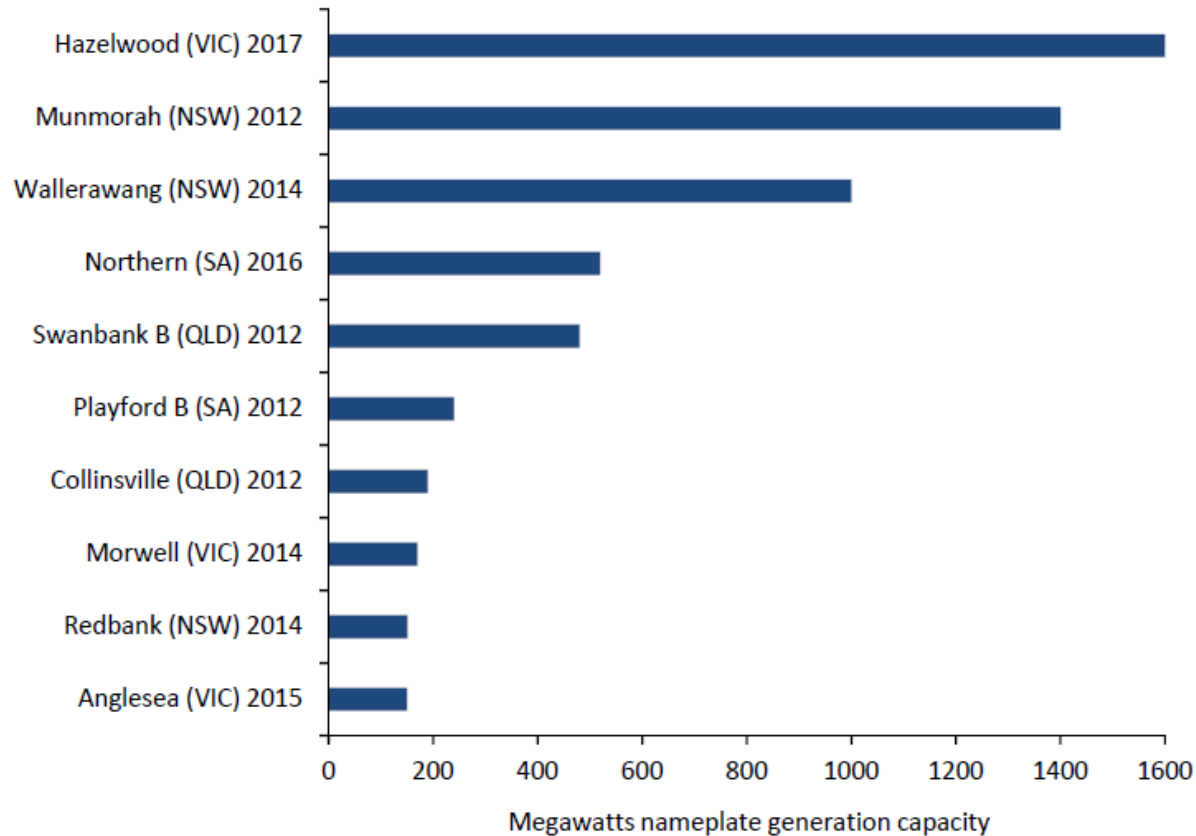
Source: ABS, Producer Price Index, Mar 2018.

Volatile electricity prices



What is causing this?

Chart 11: Coal generator closures since 2012

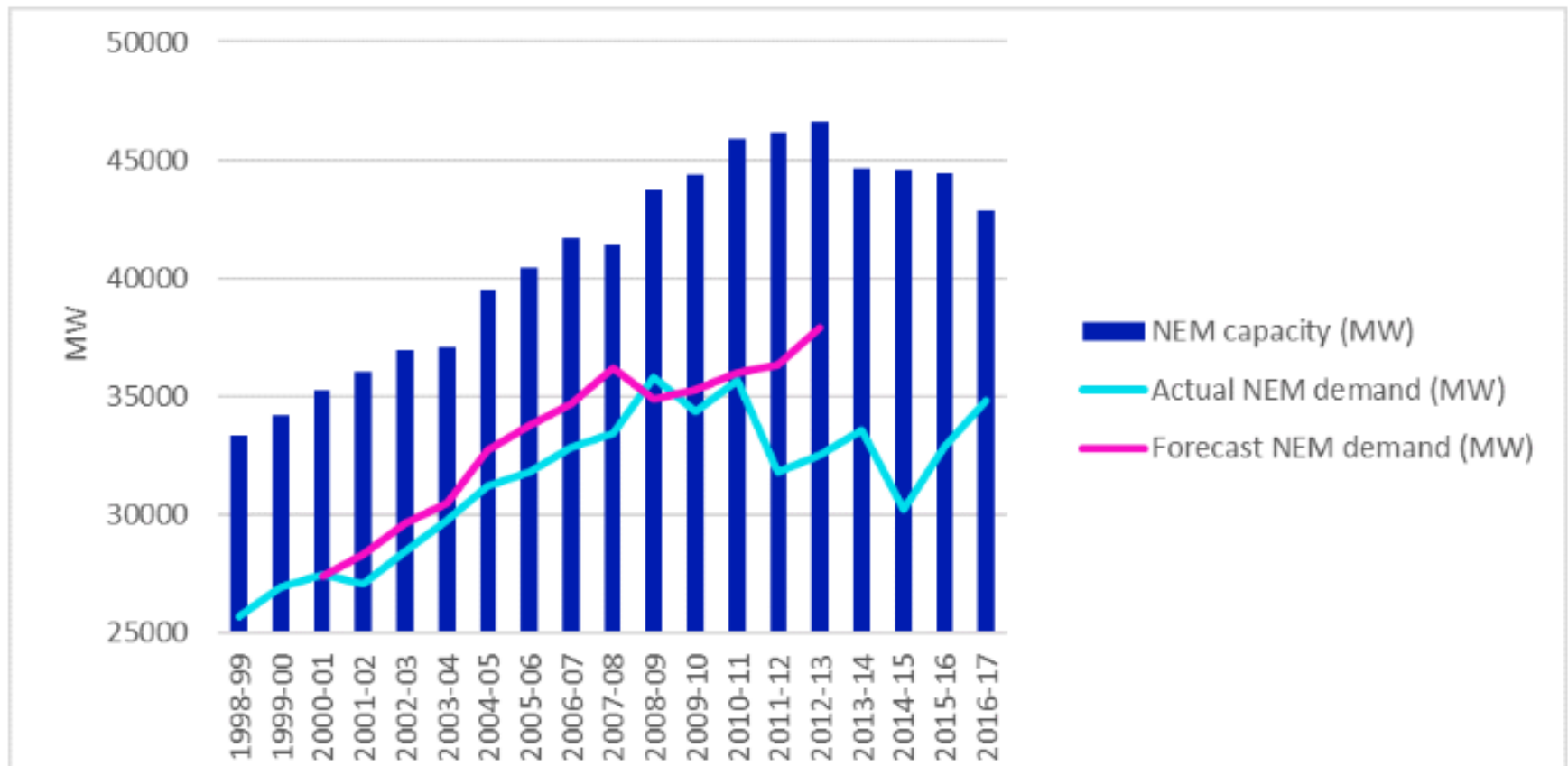


Source: Ai Group

Energy Generation capacity has reduced

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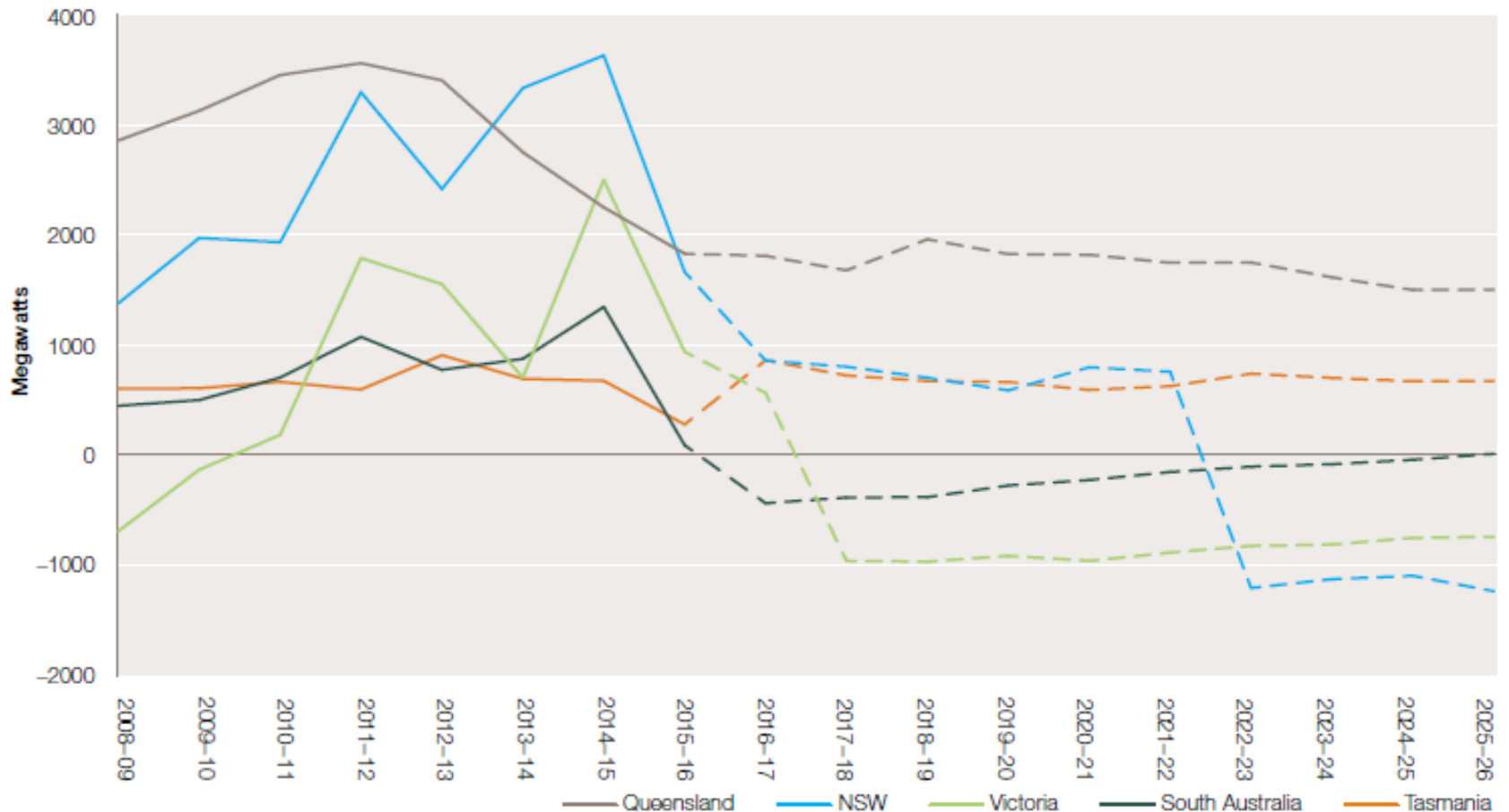
Actual NEM capacity and demand 1998-2017



Source: AER, AEMO

Generation shortfalls in specific states

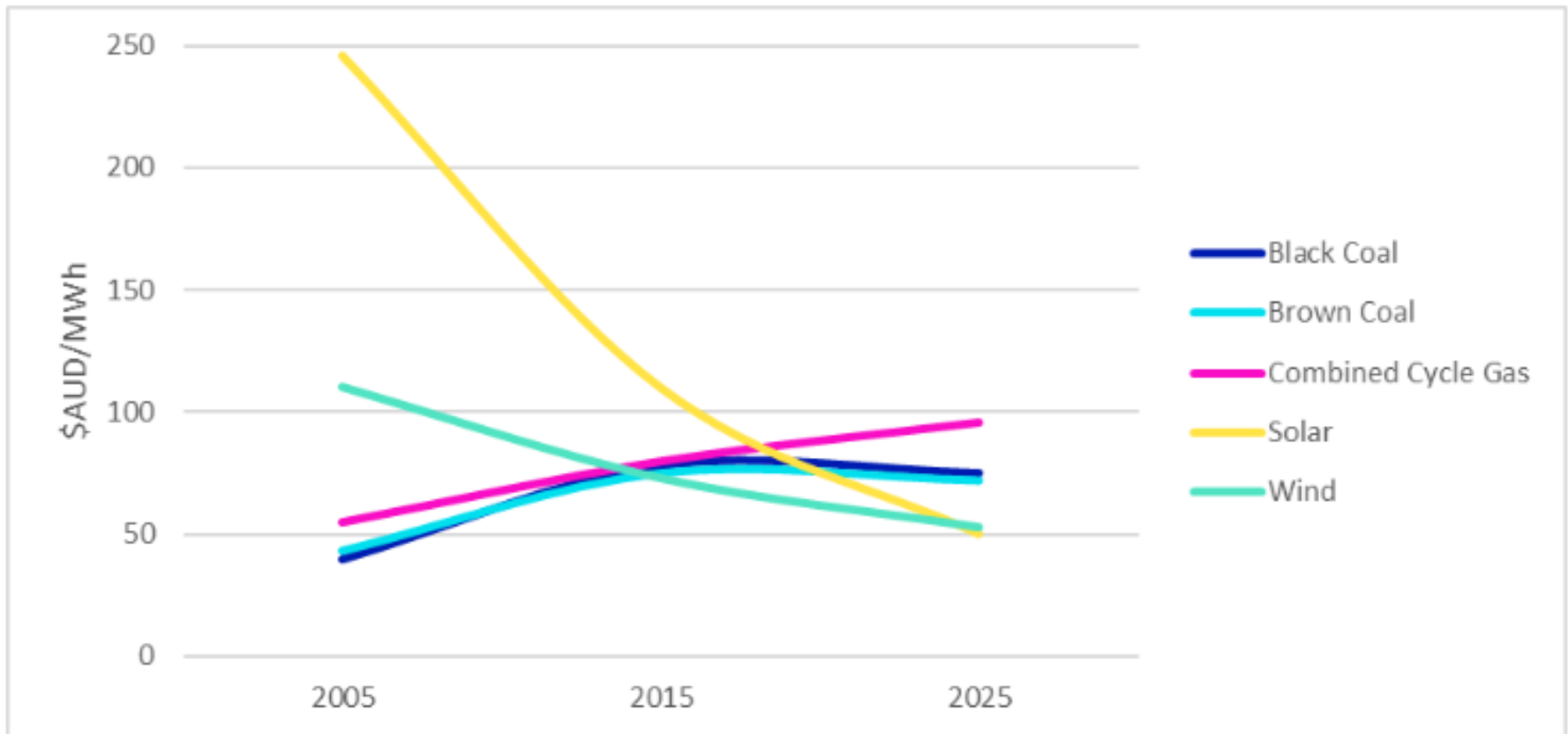
Figure 1.18
Surplus generation capacity, by region



Notes:

Renewables are competitive

Levelised cost of energy (2005-2025)

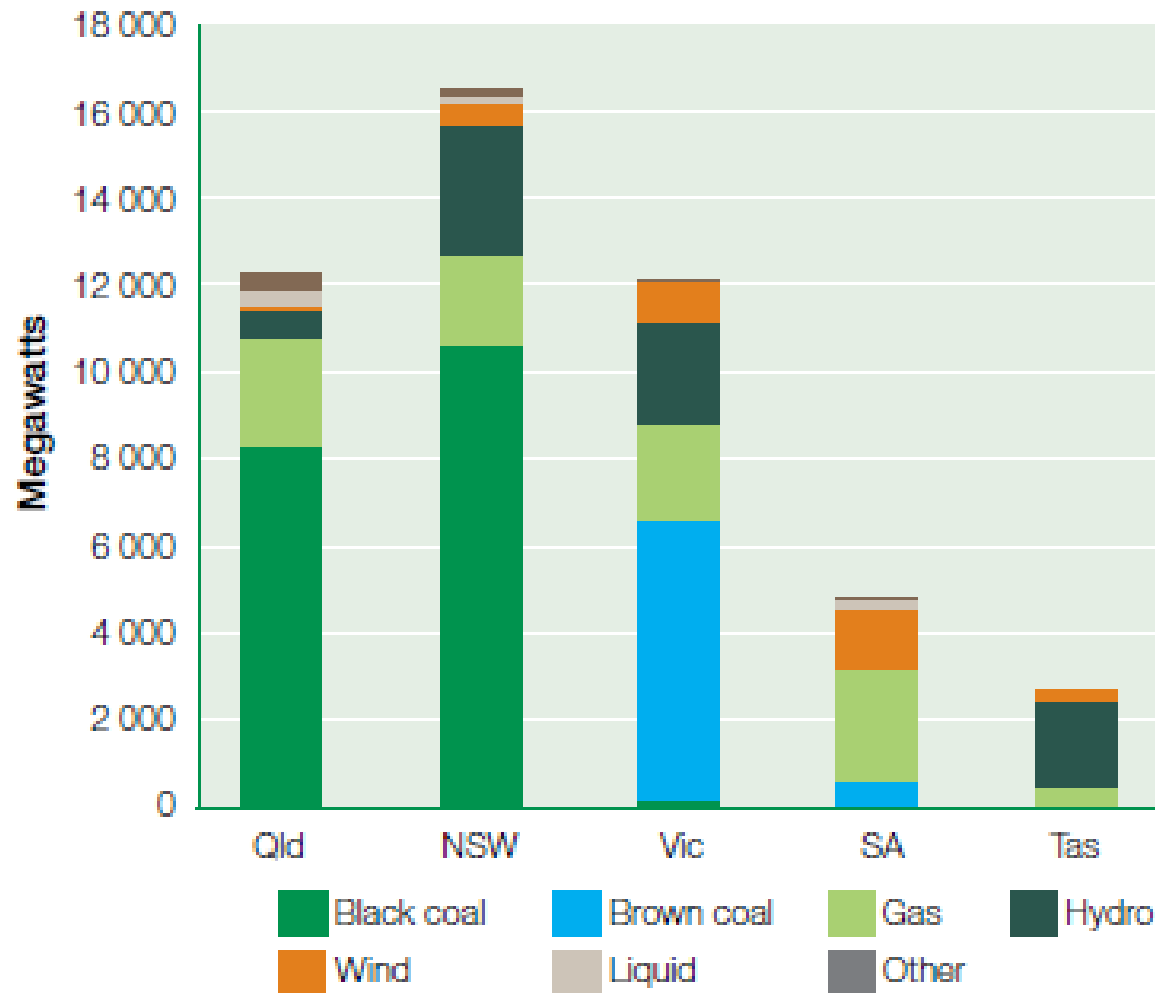


Source: AiGroup, 2017



Energy mix is changing however still coal dominant

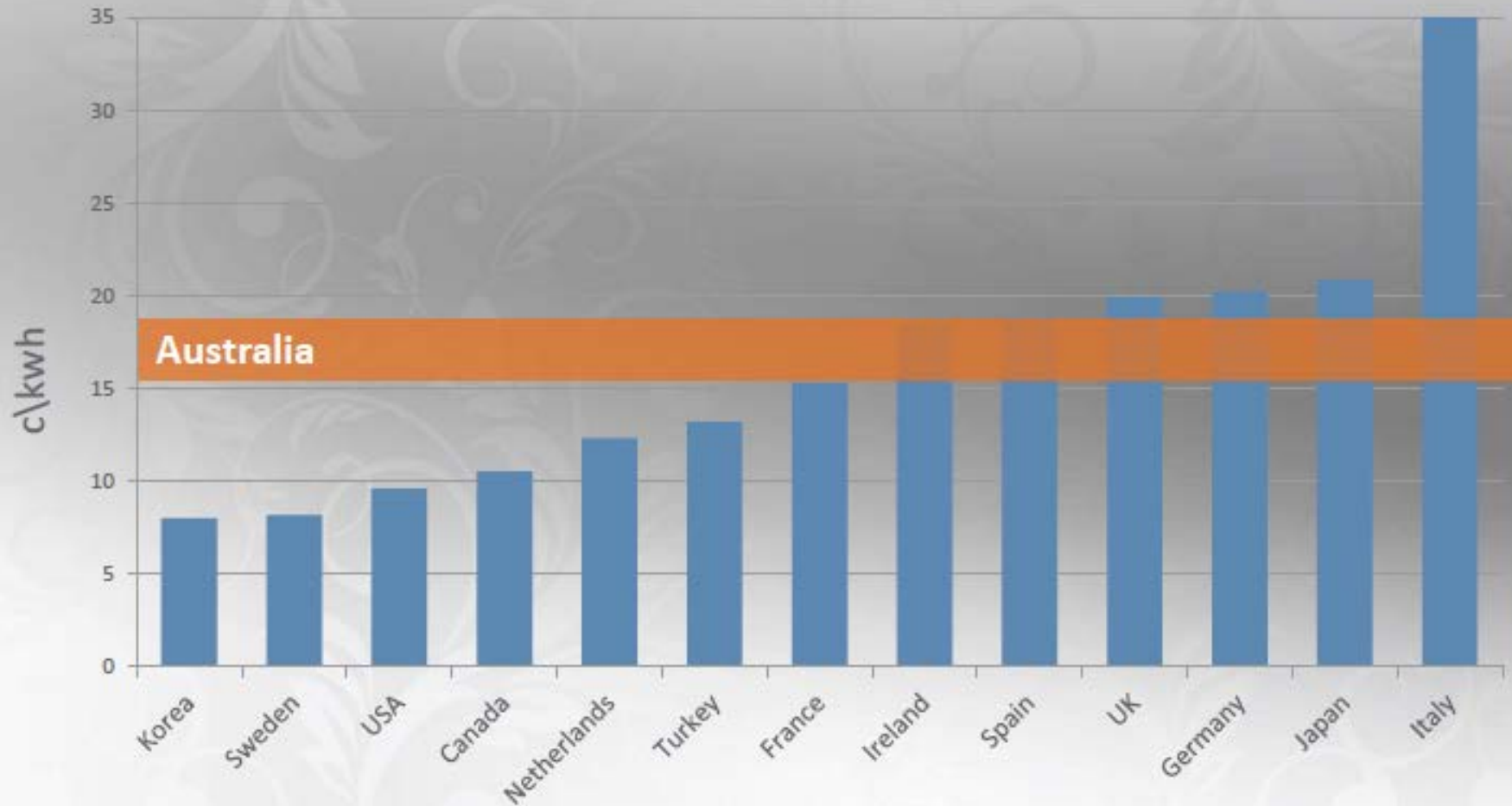
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Sources (figures 1.5–1.6): AEMO; AER.

Is our electricity expensive? 2017 peak price viewpoint

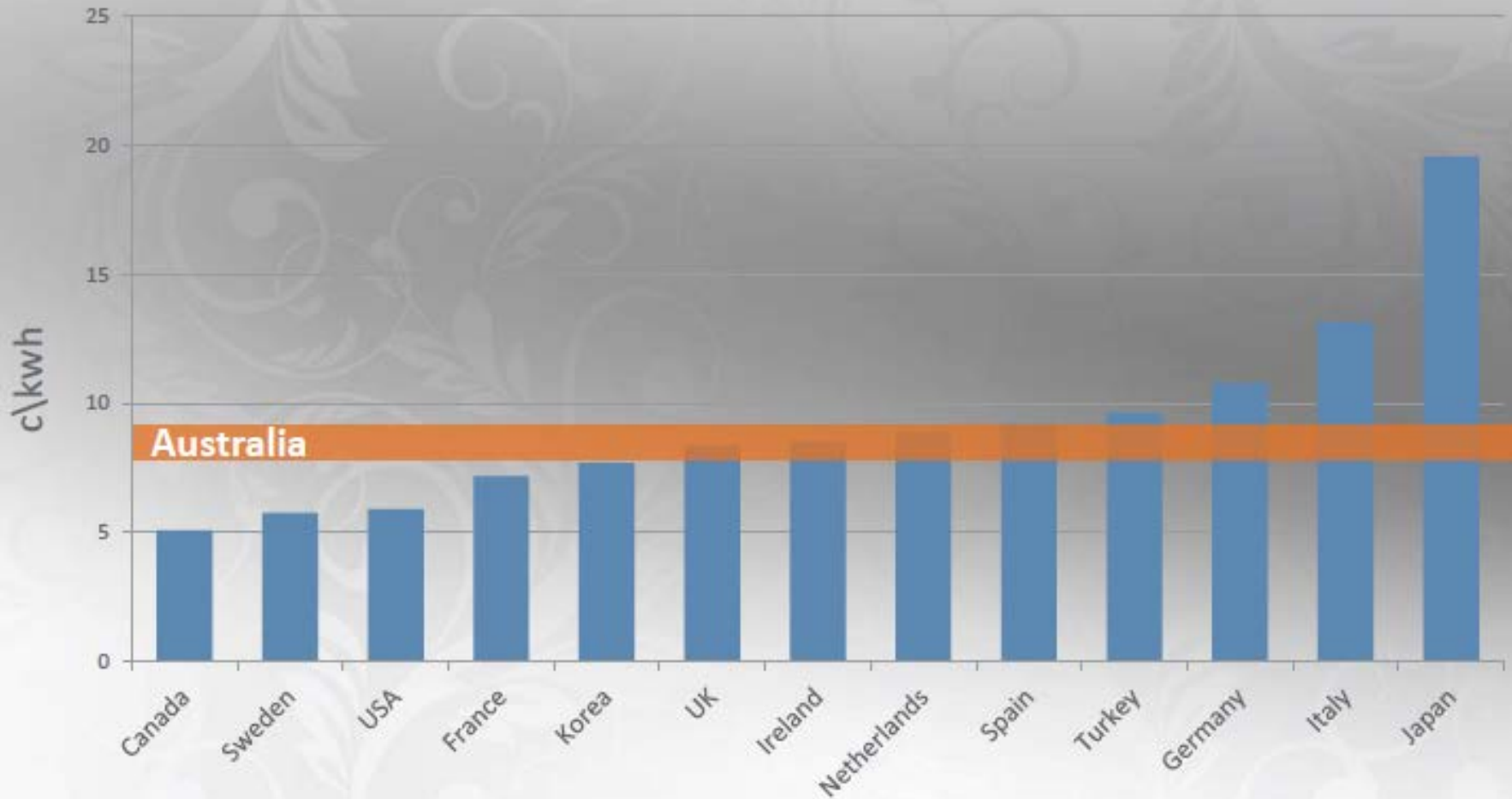
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Reference: UK Department of Energy and Climate Change September
2016 comparative data set

Remember the good old days? 1996 comparison...

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Reference: UK Department of Energy and Climate Change September
2016 comparative data set



LISTEN.
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What can be done?

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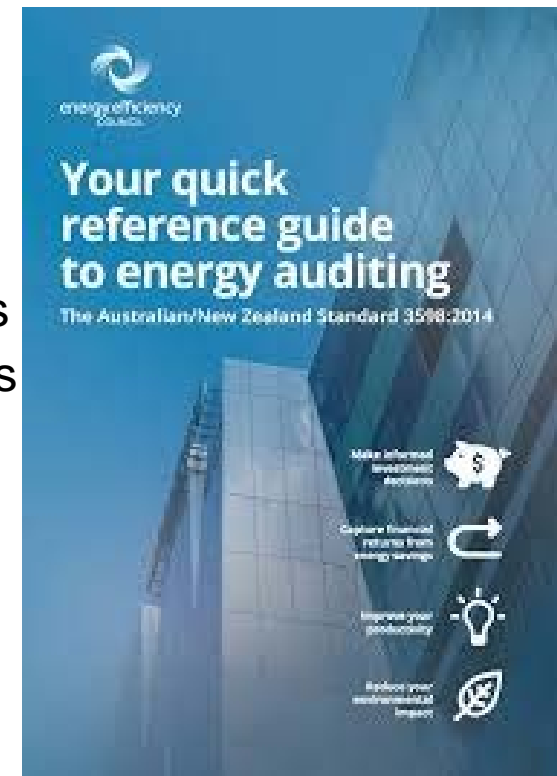
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Impactful results
BEGIN WITH A PLAN



Step 1: The plan

- Start with an Energy Audit
- 2014 Australian Standards
 - AS/NZS 3598.1:2014 Commercial buildings
 - AS/NZS 3598.2:2014 Industrial and related activities
 - AS/NZS 3598.3:2014 Transport and related activities
- 3 Levels of Audits
 - 1 Broad Brushed (Cheap....)
 - 2 Standard for site audits
 - 3 Precision subsystem audit



State Funding Available! South Australian Example

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South Australian Energy Productivity Program

- Component One: Energy Productivity Audit Grants
 - Grants of 75% of the cost of a level 2 audit up to \$15,000
- Component Two: Energy Productivity Implementation Grant

Stream One

Grants of up to \$2.5m

\$1 SA Government Contribution

\$2 Business Contribution

Stream Two

Grants of up to \$75k

\$1 SA Government Contribution

\$1 Business Contribution



Why?

- Different sites have different challenges, opportunities and payback models(without funding support)

	Payback Range	Industrial	Commercial
Lighting	3-5 years	Variable	Major
HVAC	3-5 years	Variable	Major
Refrigeration	3-6 years	Major	Major
VSD	2-4 years	Major	Major
Secondary	1-5 years	Major	Variable
Combustion	1-3 years	Major	Secondary
Fuel Switching (including solar)	4-7 years	Variable	Secondary
Control/Tuning	1-4 years	Major	Major
Powerfactor	2-5 years	Secondary	Secondary



Step 2: If you can't measure it you can't improve it

When do we incur peak demand charges & how can we avoid them?

What's on that should be off?

How do I create a more energy efficient machine?

How do I increase throughput & reduce energy usage?

Where are our most energy intensive processes?

How much energy is consumed to make this product?



Step2: Building an Informative Platform

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- Here are some cost effective and starting points for building up intelligence on what your motor electricity costs are:

- Power Monitors

- PowerMonitor 5000 \$2k+



- Intelligent Motor Control Devices

- E300 Intelligent Overload Relays \$1k+
- PowerFlex® Variable Speed Drives



- Linking process control to Intelligent Electrical Devices

- Prosoft 61850 gateway modules

Why?

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Lighting	3-5 years	Variable	Major
HVAC	3-5 years	Variable	Major
Refrigeration	3-6 years	Major	Major
VSD	2-4 years	Major	Major
Compressed Air	1-5 years	Major	Variable
Combustion	1-3 years	Major	Secondary
Fuel Switching (including solar)	4-7 years	Variable	Secondary
Control/Tuning	1-4 years	Major	Major
Powerfactor	2-5 years	Secondary	Secondary

Refrigeration quick wins

- Monitor overall refrigeration circuit effectiveness
 - Temperature differential across heat exchanger, is this at specification? Typical issues
 - Low quantity of refrigerant, low pressure leaks
 - Wrong flow rates inlet to outlet
 - Are the pipework and storage tanks insulated
- Offsetting cooling cycles
 - Cooling/over chilling in off peak periods
 - Increasing cooling unit dead bands during non vintage periods

Refrigeration phase down

<ul style="list-style-type: none">• 1995	<ul style="list-style-type: none">• 2010-2020	<ul style="list-style-type: none">• 2018-2036
<ul style="list-style-type: none">• CFCs phased out due to severe ozone damage	<ul style="list-style-type: none">• HCFCs phasing out due to moderate ozone damage	<ul style="list-style-type: none">• HFCs being phased down due to global warming potential

R11, R12, R111, R112, R113	R22, R123, R124, R134a, R402, R404A, R409, R410A...	R134a, R410A, R417A, R418A, R419A, R421A, R422A, R423A, R424A, R425A, R426A, R427A, R428A, R429A, R431A, R432A, R433A, R434A, R435A, R436A, R437A, R438A, R439A, R441A, R442A, R443A, R444A, R445A, R446A, R447A, R448A, R449A, R450A, R451A, R452A, R453A, R454A, R455A, R456A, R457A, R458A, R459A, R460A, R461A, R462A, R463A, R464A, R465A, R466A, R467A, R468A, R469A, R470A, R471A, R472A, R473A, R474A, R475A, R476A, R477A, R478A, R479A, R480A, R481A, R482A, R483A, R484A, R485A, R486A, R487A, R488A, R489A, R490A, R491A, R492A, R493A, R494A, R495A, R496A, R497A, R498A, R499A, R500A, R501A, R502A, R503A, R504A, R505A, R506A, R507A, R508A, R509A, R510A, R511A, R512A, R513A, R514A, R515A, R516A, R517A, R518A, R519A, R520A, R521A, R522A, R523A, R524A, R525A, R526A, R527A, R528A, R529A, R530A, R531A, R532A, R533A, R534A, R535A, R536A, R537A, R538A, R539A, R540A, R541A, R542A, R543A, R544A, R545A, R546A, R547A, R548A, R549A, R550A, R551A, R552A, R553A, R554A, R555A, R556A, R557A, R558A, R559A, R560A, R561A, R562A, R563A, R564A, R565A, R566A, R567A, R568A, R569A, R570A, R571A, R572A, R573A, R574A, R575A, R576A, R577A, R578A, R579A, R580A, R581A, R582A, R583A, R584A, R585A, R586A, R587A, R588A, R589A, R590A, R591A, R592A, R593A, R594A, R595A, R596A, R597A, R598A, R599A, R600A, R601A, R602A, R603A, R604A, R605A, R606A, R607A, R608A, R609A, R610A, R611A, R612A, R613A, R614A, R615A, R616A, R617A, R618A, R619A, R620A, R621A, R622A, R623A, R624A, R625A, R626A, R627A, R628A, R629A, R630A, R631A, R632A, R633A, R634A, R635A, R636A, R637A, R638A, R639A, R640A, R641A, R642A, R643A, R644A, R645A, R646A, R647A, R648A, R649A, R650A, R651A, R652A, R653A, R654A, R655A, R656A, R657A, R658A, R659A, R660A, R661A, R662A, R663A, R664A, R665A, R666A, R667A, R668A, R669A, R670A, R671A, R672A, R673A, R674A, R675A, R676A, R677A, R678A, R679A, R680A, R681A, R682A, R683A, R684A, R685A, R686A, R687A, R688A, R689A, R690A, R691A, R692A, R693A, R694A, R695A, R696A, R697A, R698A, R699A, R700A, R701A, R702A, R703A, R704A, R705A, R706A, R707A, R708A, R709A, R710A, R711A, R712A, R713A, R714A, R715A, R716A, R717A, R718A, R719A, R720A, R721A, R722A, R723A, R724A, R725A, R726A, R727A, R728A, R729A, R730A, R731A, R732A, R733A, R734A, R735A, R736A, R737A, R738A, R739A, R740A, R741A, R742A, R743A, R744A, R745A, R746A, R747A, R748A, R749A, R750A, R751A, R752A, R753A, R754A, R755A, R756A, R757A, R758A, R759A, R760A, R761A, R762A, R763A, R764A, R765A, R766A, R767A, R768A, R769A, R770A, R771A, R772A, R773A, R774A, R775A, R776A, R777A, R778A, R779A, R780A, R781A, R782A, R783A, R784A, R785A, R786A, R787A, R788A, R789A, R790A, R791A, R792A, R793A, R794A, R795A, R796A, R797A, R798A, R799A, R800A, R801A, R802A, R803A, R804A, R805A, R806A, R807A, R808A, R809A, R810A, R811A, R812A, R813A, R814A, R815A, R816A, R817A, R818A, R819A, R820A, R821A, R822A, R823A, R824A, R825A, R826A, R827A, R828A, R829A, R830A, R831A, R832A, R833A, R834A, R835A, R836A, R837A, R838A, R839A, R840A, R841A, R842A, R843A, R844A, R845A, R846A, R847A, R848A, R849A, R850A, R851A, R852A, R853A, R854A, R855A, R856A, R857A, R858A, R859A, R860A, R861A, R862A, R863A, R864A, R865A, R866A, R867A, R868A, R869A, R870A, R871A, R872A, R873A, R874A, R875A, R876A, R877A, R878A, R879A, R880A, R881A, R882A, R883A, R884A, R885A, R886A, R887A, R888A, R889A, R890A, R891A, R892A, R893A, R894A, R895A, R896A, R897A, R898A, R899A, R900A, R901A, R902A, R903A, R904A, R905A, R906A, R907A, R908A, R909A, R910A, R911A, R912A, R913A, R914A, R915A, R916A, R917A, R918A, R919A, R920A, R921A, R922A, R923A, R924A, R925A, R926A, R927A, R928A, R929A, R930A, R931A, R932A, R933A, R934A, R935A, R936A, R937A, R938A, R939A, R940A, R941A, R942A, R943A, R944A, R945A, R946A, R947A, R948A, R949A, R950A, R951A, R952A, R953A, R954A, R955A, R956A, R957A, R958A, R959A, R960A, R961A, R962A, R963A, R964A, R965A, R966A, R967A, R968A, R969A, R970A, R971A, R972A, R973A, R974A, R975A, R976A, R977A, R978A, R979A, R980A, R981A, R982A, R983A, R984A, R985A, R986A, R987A, R988A, R989A, R990A, R991A, R992A, R993A, R994A, R995A, R996A, R997A, R998A, R999A, R1000A
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What's left??

New Refrigerants, New Opportunities

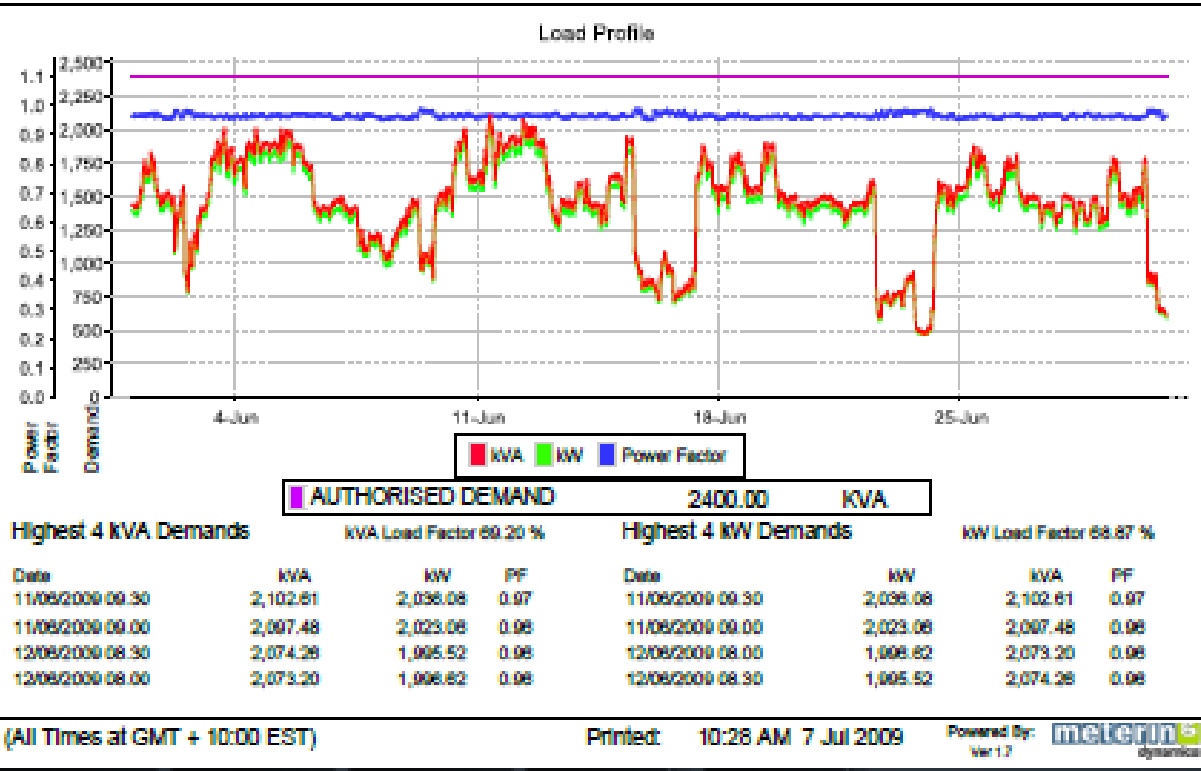
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- For commercial scale applications:
 - CO₂ (R744)
 - Wide range of applications, typically with significant efficiency benefit
 - Heat pumps
 - Commercial/industrial refrigeration
 - Often 20% improvement on HFC equivalents
 - HFO refrigerants R1234 and variants
 - Being used in car air-conditioners
 - New series of chillers being produced showing >10% efficiency improvements relative to current best practice
 - Quite early days for product in this area

Think carefully before investing in new HFC plant:

**Will you have to retire it before its time?
Is there a superior low GWP alternative?**

Powerfactor <0.96 – an opportunity Rockwell Automation



- As part of your energy contracts you are paying for a billing meter
- The metering provider has available reporting and analytics that you are paying for!

Final Words

Remember step 1 – the plan

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