Power of Choice Review – Part B
DSP opportunities
in the electricity market

Stakeholder Reference Group
Second Meeting

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Scope of Work for the AEMCs Power of Choice Review

- **Identify the existing and potential foreseeable Demand Side Participation (DSP) options that may be enabled in the Australian electricity market**
  - current levels of DSP
  - stocktake of existing and planned trials/pilots and new initiatives
  - market conditions to enable take-up of DSP based on trials/pilots
  - market conditions not currently in place

- **Focus of today's presentation is on existing and planned pilots, trials, and new initiatives**
  - aim is to provide broad indications of what tends to work and to not work
  - areas of activity, lessons learned, and consumer behaviour and response

Outline for Today's Presentation

- **Historical context of DSP in the NEM**
- **Overview of current pilots and trials currently underway or planned**
- **Residential sector opportunities**
  - cost-reflective pricing strategies
  - direct load control (DLC)
  - broader-scale impacts of pricing strategies and DLC
  - community-based social marketing programs (CBSM)
- **Commercial and Industrial (C&I) DSP opportunities**
- **Distributed Generation (DG) and Storage**
- **Smart Grids**

‘First Wave’ of DSP in Australia

- **First and largest ever demand management (DM) program was implemented by the State Electricity Commission of Victoria (SECV) between 1990 and 1994**
- **Intended to provide an alternative to an anticipated shortage of generation capacity**
  - specifically designed to reduce total consumption
- **SECV budget of $55m to on a range of measures to build DM knowledge capacity in Victoria**
  - expectation that customers would spend another $250m on DM measures in their own premises
  - programs in all sectors to encourage energy efficiency
  - rebates, incentives, minimum energy performance standards (MEPS), labelling, audits, technology transfer, etc
- **Program terminated early with break-up and sale of SECV**
  - outcomes never evaluated

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‘Second Wave’ of DSP

- **DSP began to fall by the wayside as the industry restructured into generation, transmission, distribution, and retail businesses**
- **Some use by Transmission Network Service Providers (TNSPs) for system reliability**
  - eg Transgrid 350 MW in 2008 (C&I curtailables and gas turbine DG)
- **Some use by the Market Operator for reserve requirements**
  - eg NEMMCO 125 MW in 2006
- **Some use by Distribution Network Service Providers (DNSPs) in response to regulatory arrangements and incentives**
  - eg NSW d-factor 95 MVA between FY04/05 and FY06/07(mainly C&I curtailables, power factor, energy efficiency, and DGs)
- **Some use by retailers to physically hedge against high wholesale pool prices**
  - eg 243 MW in 2010 (mainly C&I curtailables, and standby DGs)

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‘Second Wave’ DSP Order of Magnitude MW of Resource

Region	Pre-dominant Source of DSP	DSP Resource[1]
NEM	Wholesale price hedging and network peak DM (curtailable loads, DGs, PFC, energy efficiency)	250 to 350 MW[2] (1% of peak)
WA	Reserve Capacity (curtailable loads and DG)	153 MW[3] (4% of peak)
UK	Short Term Operating Reserve (load reduction and back-up DG)	835 MW (35% of requirement)
S Korea	Reliability-triggered DSP (interruptible tariffs, DLC)	2,700 MW (4.5% of peak)
Italy	TOU pricing (mandated TOU roll-out)	10% of peak (expected)
California	Reliability-triggered DSP (eg DLC, interruptible tariffs)	3,300 MW (6% of peak)

Note 1. Based on published information
Note 2. 2011 ESOO, IPART d-factor, and ETSA Utilities
Note 3. IMO 2011 Statement of Opportunities

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‘Third Wave’ of DSP

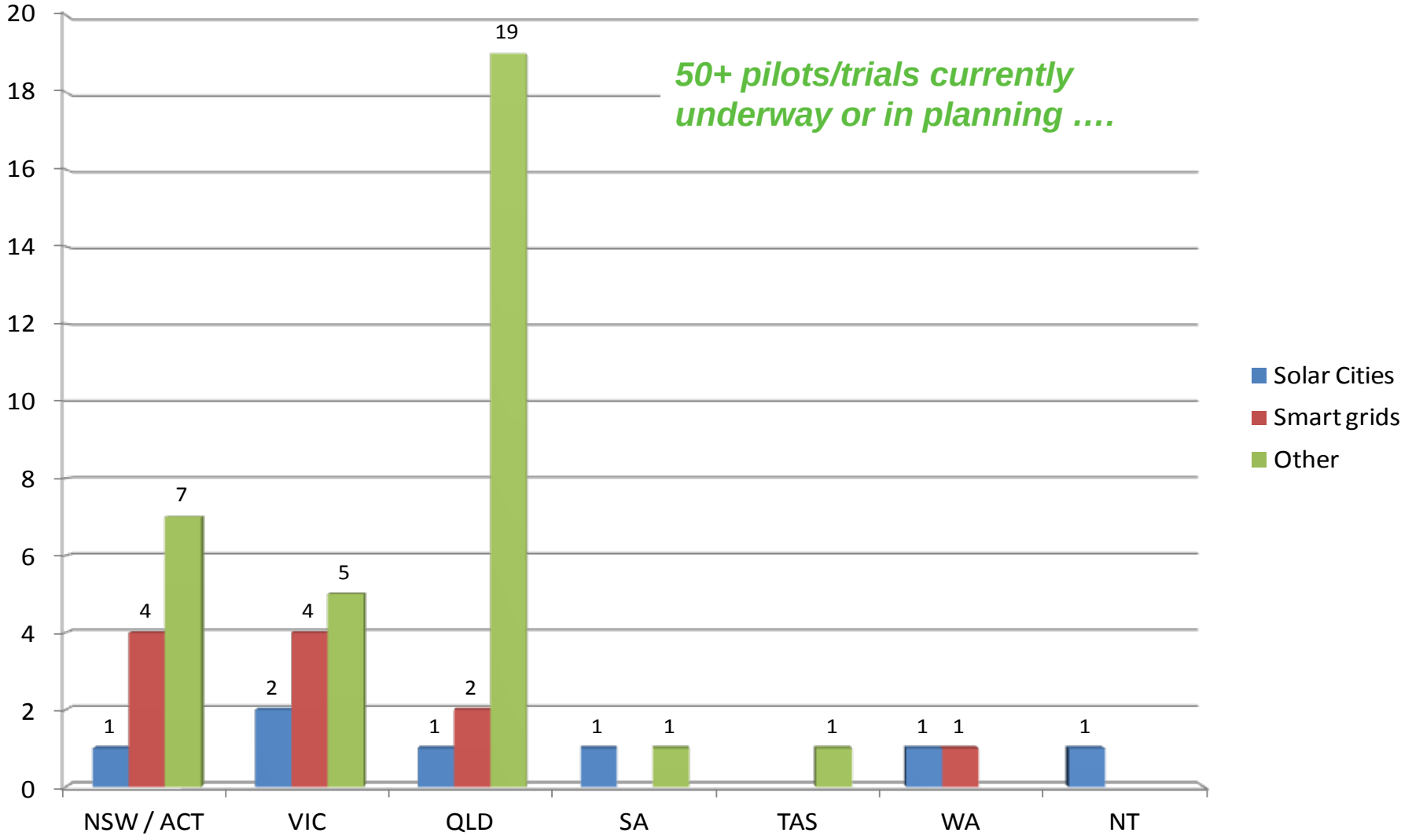
- **Current and planned trials, pilots, and new initiatives are founded on**
  - customer awareness, interest, and engagement
  - energy price innovation
  - technology developments

PRICING STRUCTURE	Cents/kWh or Cents/Day excl GST
Off peak	7.03 c/kWh
Shoulder	12.7 c/kWh
Peak	18.87 c/kWh
Critical Peak	37.74 c/kWh
Service Availability Charge (cents/day)	39.78 cents per day

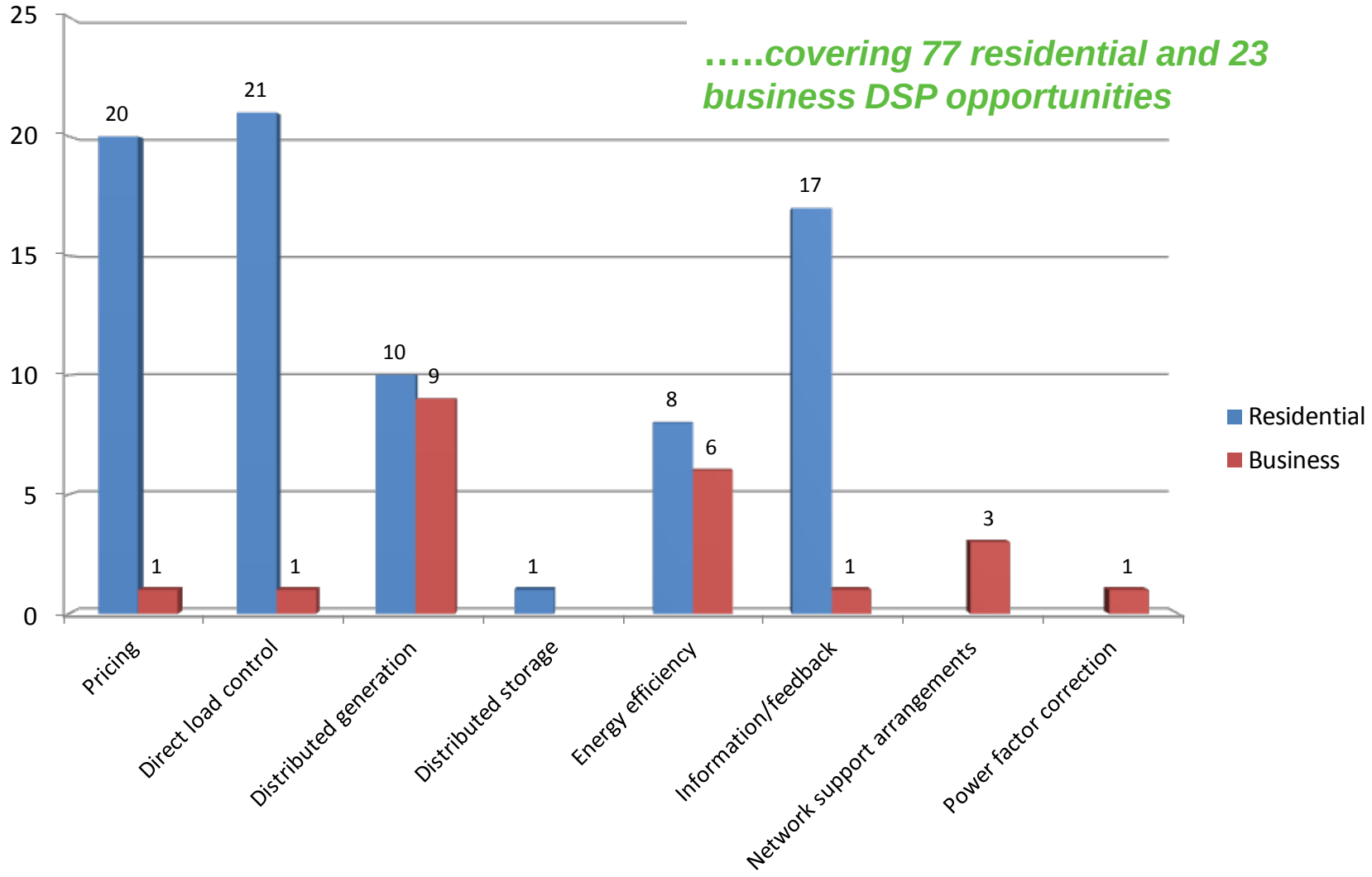
** A 5% step increase will occur on 1 January 2006*

  - current focus has shifted from C&I to mass market (residential)

Pilots and Trials Currently Underway, or in Planning (1)



Pilots and Trials Currently Underway or in Planning (2)



…..covering 77 residential and 23 business DSP opportunities

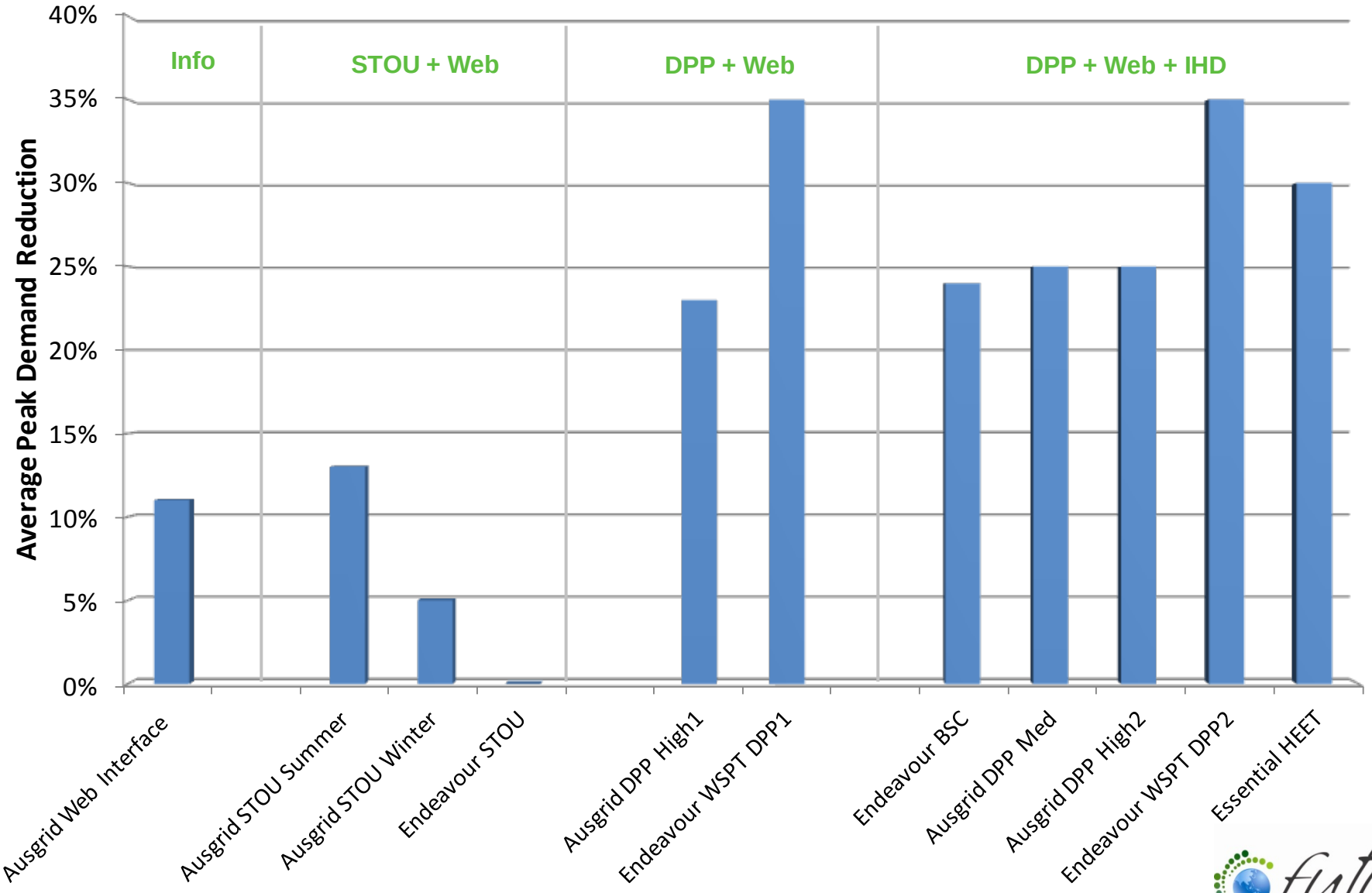
Cost Reflective Pricing Strategies

Completed Pricing Trials and Pilots

Name	Participants	Enabling Technology	Incentive	# of events	STOU or CPP Rate
HEET (Essential)	150 residential	(IHD)[1] Smart meter	$40 per Qtr	Max 12 p.a.	CPP[4] = 5 x Off-pk
WSPT STOU[2] (Endeavour)	295 residential	Web interface Smart meter	$100 Join $200 Complete	n/a	Pk/Off-pk = 3
WSPT DPP[3] 1 (Endeavour)	373 residential			Max 12 p.a.	CPP = 20 x Off-pk
WSPT DPP 2 (Endeavour)	356 residential	Web interface IHD, Smart meter			
SPS STOU (Ausgrid)	750 residential 550 business	Web interface Smart meter	$100 Join $100 Complete	n/a	Pk/Off-pk = 6
SPS DPP High1 (Ausgrid)				Max 12 p.a	CPP = 31 x Off-pk
SPS DPP Med (Ausgrid)		Web interface IHD, Smart meter			CPP = 13 x Off-pk
SPS DPP High2 (Ausgrid)					CPP = 31 x Off-pk
BSC DPP (Endeavour)	264 residential	Web interface IHD, Smart meter	$25 Join $100 Complete	Max 12 p.a	n/a

Note 1. In Home Display
Note 2. Seasonal Time of Use Tariff
Note 3. Dynamic Peak Pricing Tariff
Note 4. Critical Peak Price

DPP – Peak Demand Impacts



DPP - Some Lessons Learned (1)

- **Customers appear to be interested in participating in DPP Trials**
  - take-up rates in the 10% to 15% range (better than experienced for many retail products)
- **Financial incentives are an important reason for customers to participate in DPP trials**
  - all of the trials incorporated some form of bonus to recruit customers and to retain their involvement until trial completion
    - overcome inertia and recompense customers for any inconvenience (eg meter change out)
    - ensure customers were not penalised for participating
- **Residential customers do respond to STOU and DPP signals**
  - DPP average peak demand reduction of around 25%
  - STOU tariff appears to evoke lower peak demand response than DPP
  - demand response tended to be higher on hotter days and did not fall off with multiple events
  - customers with A/Cs had a greater ability to respond to DPP events through conservation
- **The DPP value proposition may suit domestic customer better than SMEs**
  - business customers consuming 0-160MWh p.a showed no response to DPP signals tariffs during the trial (Ausgrid SPS)
    - SMEs may be generally reluctant to modify behaviour during peak period pricing events or it may be that they would respond to price signals over the longer term
    - additional trials in this sector are needed to test this hypotheses

DPP - Some Lessons Learned (2)

➢ Value of information

- **the single trial that tested information in the absence of an STOU or DPP signal (Ausgrid SPS) did not show any consistent results**
- **the trials by Ausgrid (SPS) and Endeavour Energy (WSPT) showed no benefits of IHDs as a means of reducing peak demand**
  - the peak demand reductions for customers 'with IHDs' were not statistically different from customers 'without IHDs'
- **customers use of the IHDs in these trials appears to have waned as the trials progressed**
- **customers may 'like' and 'value' the information gained from home energy consultations but do not appear to be willing to pay for it**
  - BSC trialed pricing points for home energy audits with 100 households and found there was virtually no market for audits at any price above free
- **smart grid trials planned or underway should contribute to the body of knowledge regarding the impacts of information on customer behaviour**

DPP - Some Lessons Learned (3)

- **DPP strategies based on well managed customer recruitment and program service delivery can be executed with high levels of customer satisfaction**
  - many DPP participants showed interest in remaining on the tariff once the trial was over and stated that they would recommend the tariff to others
  - outcomes were achieved with few or no substantive complaints
  - few drop-outs (generally < 10%)
- **Customer satisfaction generally appears to have been driven by**
  - cost savings
  - increased awareness of electricity usage patterns
  - perceived contribution of benefits to the environment
- **Customer engagement that meets consumer's needs is crucial to the success of the trials**
  - clear and concise information on actions to take to reduce use during DPP events so participants felt they had capacity to make savings under the pricing structure
  - use of a variety of communications channels to make engagement convenient
    - contact centre, website, billing information, SMS, voice mail, and email

Peak time Rebate (PTR) Pricing Strategies – The Concept

- **PTR is a relatively new strategy – few trials as yet**
- **PTR pricing schemes are inverse forms of DPP tariffs**
  - DPP participants are penalised for not reducing use during critical peak hours
  - PTR participants are rewarded for reducing use at these times
  - rebates of around $1.50 per kWh for reduction during critical peak period dispatches with a cap set for the year (North American experience)
- **Lower risk than DPP**
  - customers are assured that their bill won't increase and that there is no risk of incurring higher prices if they fail to respond (appeals to the public and policy makers)
  - program host has less revenue risk (DSP rebate $ can be capped for the year)
- **Challenge is in establishing M&V baselines**
  - must develop representative baseline load profiles for participants on non-event days (used to 'measure' DSP response to peak demand period dispatches)
  - opportunity for participants to 'game baselines'

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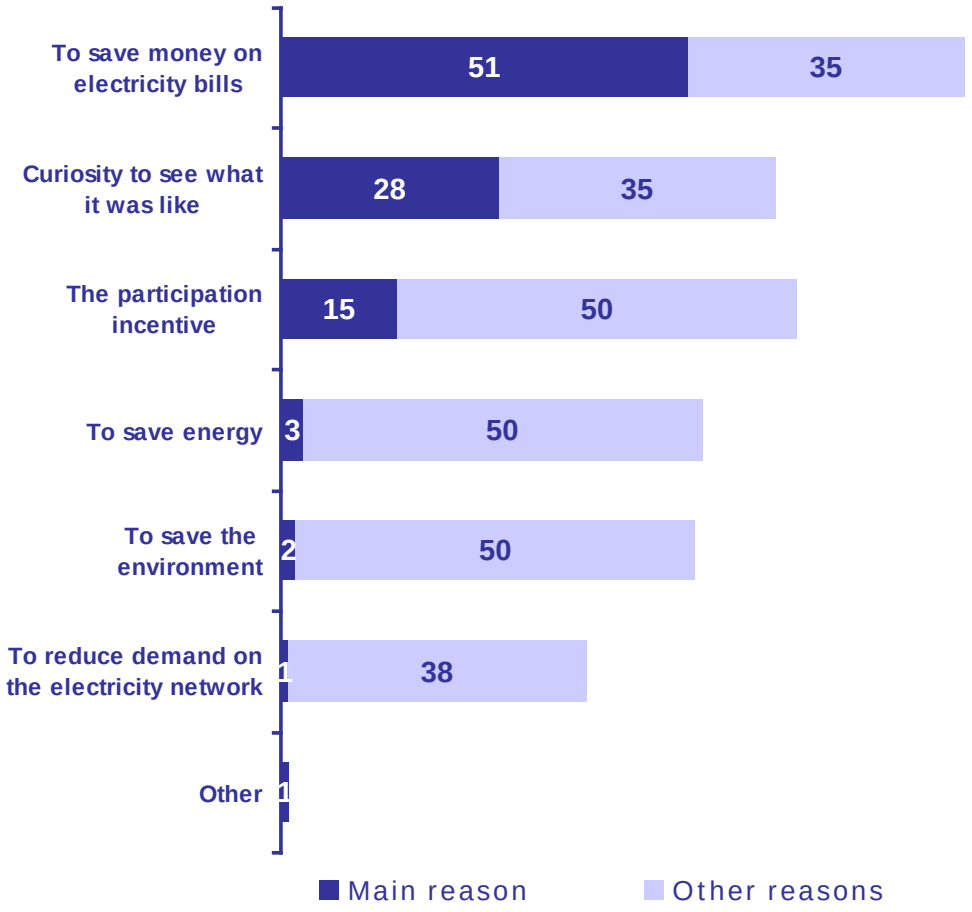
First (PTR) program in Australia – Endeavour Energy PeakSaver

- **Part of an integrated DSP initiative to defer augmentation of Rooty Hill ZS**
  - implemented in summer of 2010/11
  - participant n = 38 households
- **87% of participants took action**
  - 'went out' to avoid using A/C
  - shifted discretionary loads like pool pumps, dishwashers, clothes washers/dryers, etc
- **Average critical peak period demand reduction of 29% to 51%**
  - highest following prolonged hot spell
- **Lessons learned (early days)**
  - link between PTR events and very hot days not understood
  - PeakSaver did not appeal to 'energy efficient' customers
  - participants wanted information on ways to reduce consumption on event days

PeakSaver received satisfaction rating of 77% and no material complaints

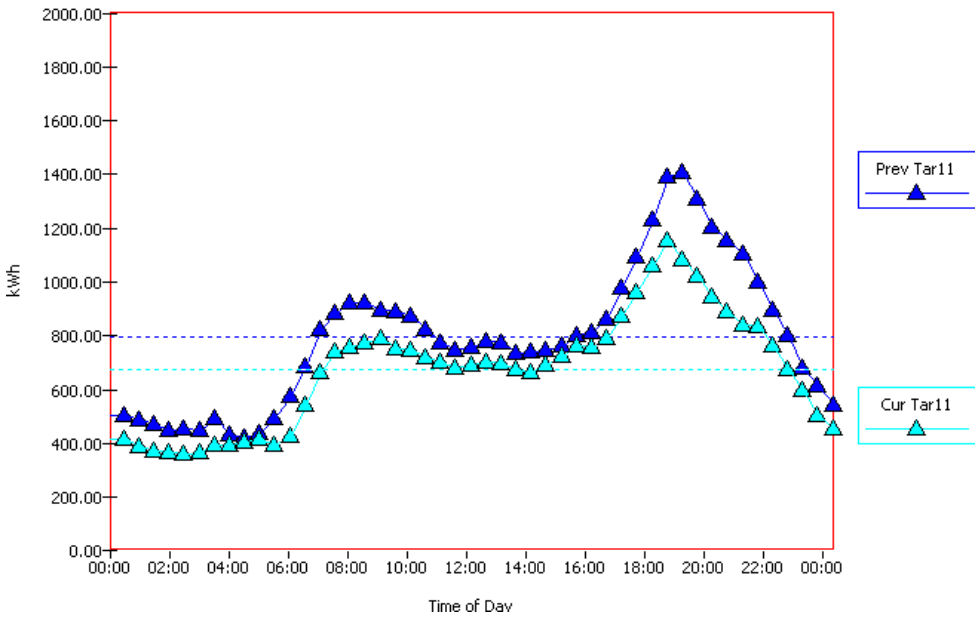
Reasons for participating



Ergon Energy Magnetic Island PTR

- **Aim is to educate customers on the effects of peak power demand on the network**
  - encourage them to make permanent shifts or lowering of their electricity use during peak periods
- **Participants earn up to $25 a month by using at least 15% less electricity between 6pm and 9pm *each day* compared with the same time last year (no event days)**
  - 86 participants to date
- **Customer behaviour and response**
  - early days and analysis of outcomes and follow-up with participants is yet to be undertaken

Average energy use reduction of 23% over peak period from preliminary analysis



DPP/PTR Hybrid – Energex & Ergon Energy Rewards Based Tariff (RBT) Consumption Trials

- **Paper-based study – no bill impact**
- **Incorporates DPP and TOU**
  - DPP rates of 5 to 8 x T11 Day Rate
    - kicks in on 15 peak days per year from 4pm to 8pm
  - TOU Night Rate (8pm to 8am)
    - 20% discount on T11 Day Rate
- **Participants can also receive a PTR rebate for reducing consumption**
  - bonus of $75 at start of year
  - bonus rises/falls according to usage below/above thresholds and 'theoretical DPP' prices
  - up $250 p.a
- **Performance reports let customers know how they are going**
  - usage, theoretical bill, and bonus balance

- **Consumer Response**
  - customers respond more strongly to DPP signals than to TOU prices
  - results in line with other trials
- **Consumer Behaviours**
  - 73% took action
    - pool pumps shifted
    - dishwashing, clothes washing, ironing, and vacuuming delayed
    - A/C conservation less popular
- **Consumer Feedback**
  - welcome kit, newsletter, and performance reports well received
  - most found it easy to keep usage below the peak day thresholds
  - many changed day to day energy use habits
  - little negative feedback

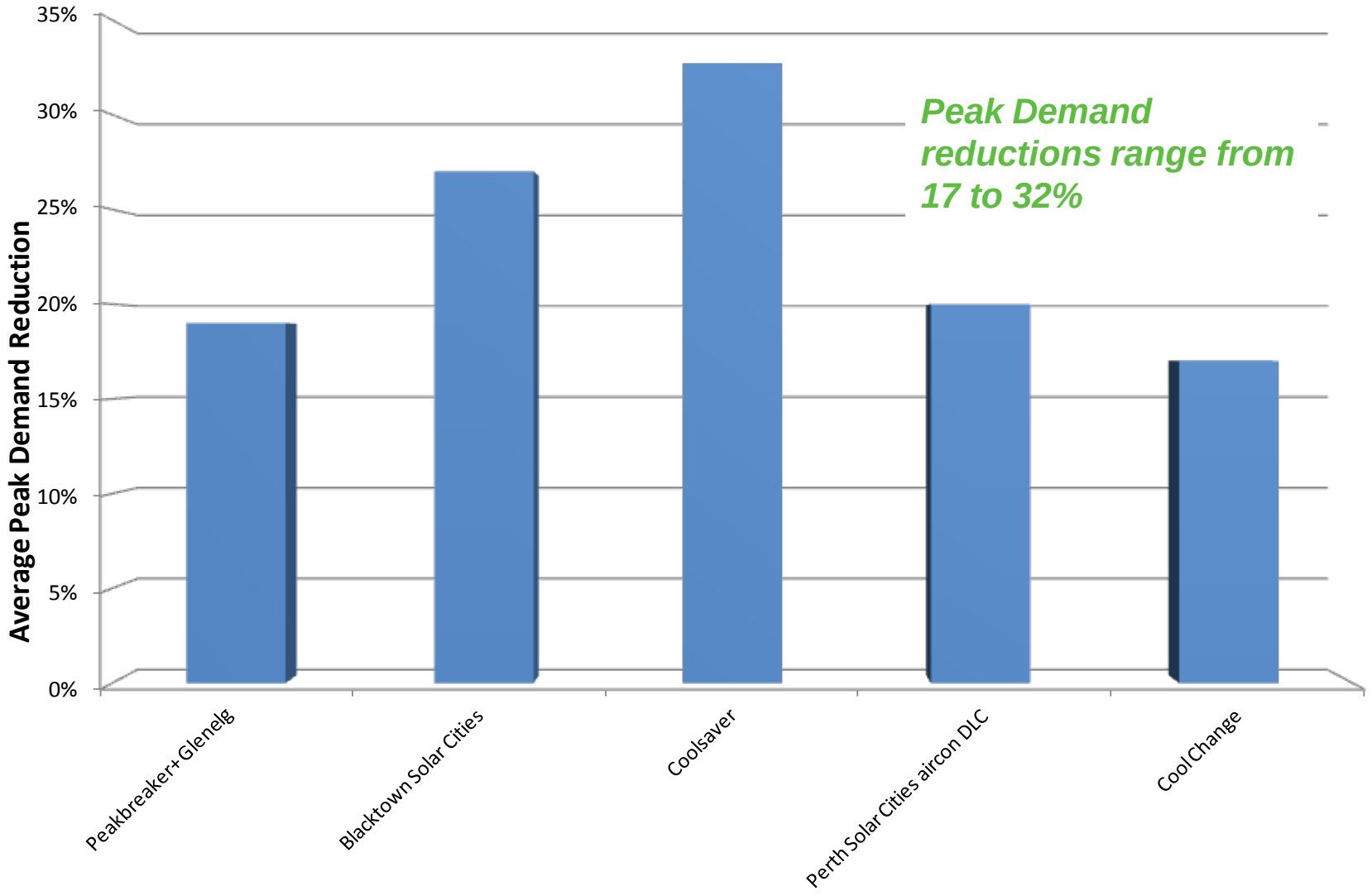
Direct Load Control

Air Conditioner DLC

Name	Participants	Enabling Technology	Incentive	# of events	Dispatch criteria
Coolsaver (Endeavour)	11	DRED[1] enabled, retrofit kit, Enermet relay, Ripple control, Smart meter	$60 (plus $100 A/C service)	4	Forecast high temps and load monitoring of network assets
Peakbreaker + (ETSA Utilities)	>2,000	Peakbreaker unit Smart meter	$100	n/a	n/a
Aircon DLC (Western Power, Perth Solar Cities)	203 (Year 1) 375 (year 2 target)	zigbee wireless HAN[2] external DRED Smart meter	$100 (Year 1) $200 (Year 2) to increase take-up	10 max	> 35 deg C
Energy Conservation Communities / Cool Change trials (Energex)	5,588	Split or ducted A/C External DRED Ripple control Smart meter	$60 cash card, vouchers	7	Extreme temp days (hot)
Blacktown Solar City	529	External load control switch, ripple control, Smart meter	$25 bill credit	12 max	Extreme temp days (hot)

Note 1. Demand Response Enabling Device
Note 2. Home Area Network

Air Conditioner DLC – Peak Demand Impact

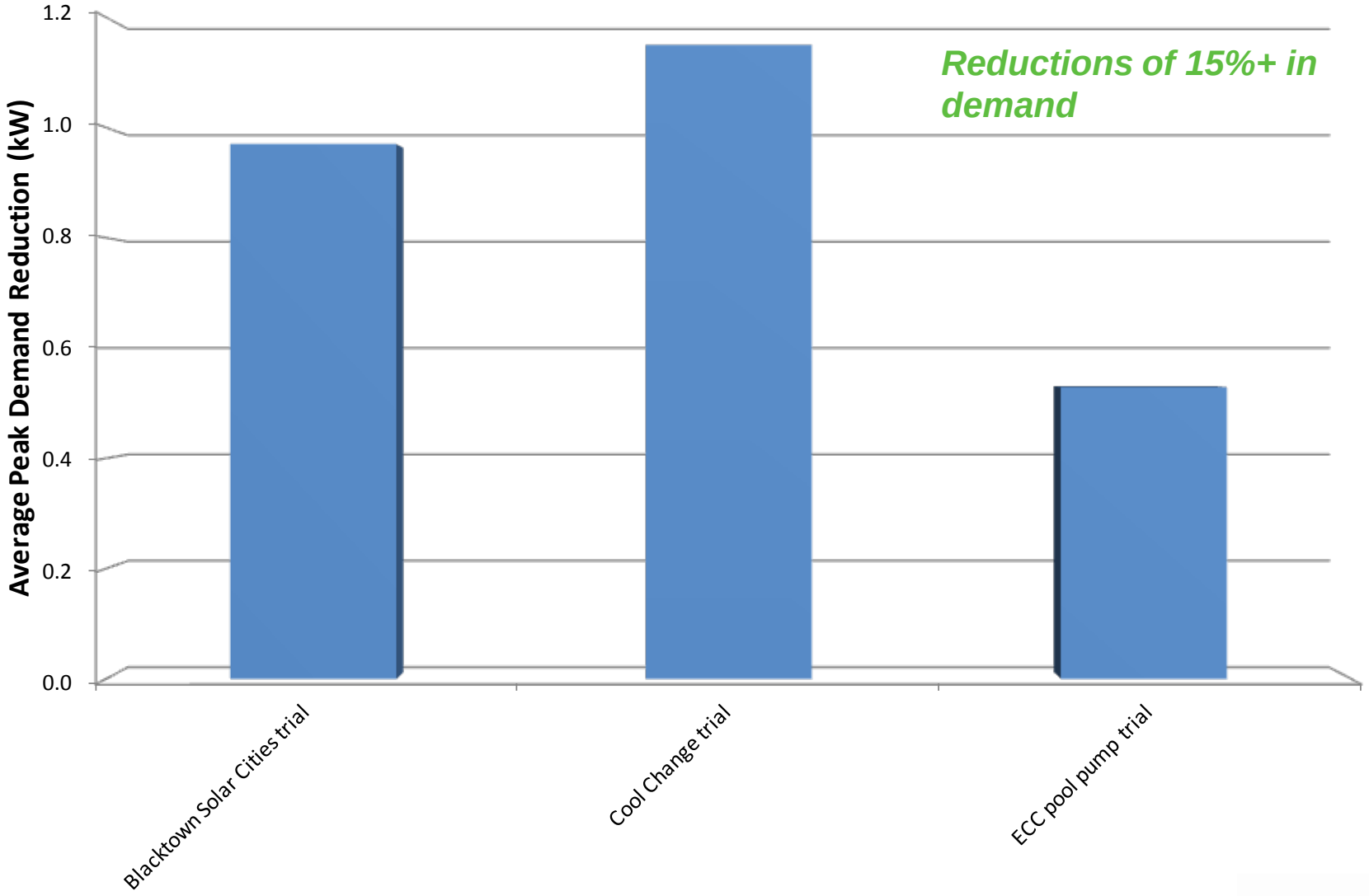


"Haven't noticed a difference, I think it's a good initiative."

Pool Pump DLC

Name	Participants	Enabling Technology	Incentive	# of events
Cool Change Trial (Energex)	400	External DRED device (peaksave) with boost button, Ripple control,	$50 join $50 each summer	15 – 20 max over summer
Energy Conservation Communities DLC (Energex)	610	External DRED device (peaksave), Ripple control	n/a	15 – 20 max over summer
Pool Pump DLC (Ergon Energy)	281	External DRED device (peaksave), Ripple control	$350 to transfer existing to T33, $250 rebate for new EE pumps	n/a
BSC (pool pump trial)	642	External load control switch, ripple control, Smart meter	$25 bill credit	max 12

Pool Pump DLC – Participant Response



Note: Energex ECC results are preliminary only (to be verified)

Hot water DLC

- **Several hot water DLC initiatives and trials underway to get more hot water load onto off-peak - some consumers not aware of the benefits of off-peak tariffs**
- **Energex**
  - 30% of electric water heaters are on continuous supply
  - targetting 12,000 additional systems to off-peak (7MW) by 2015
  - develop and trial DRED for instantaneous electric hot water systems
- **Ausgrid**
  - Some consumers have large storage systems connected on continuous supply believing they are on off-peak
  - 25% unaware of the potential savings of off-peak tariffs
  - trial to encourage households with existing storage systems to transfer to off-peak
- **Aurora Energy**
  - estimated 300 MW of hot water load on at peak times (25% to 30% of peak)
  - study underway to characterise numbers and types of units prior to developing a DLC (or pricing) strategy

DLC - Some Lessons Learned

- **Customers appear to be interested in participating in aircon and pool pump DLC trials**
  - take-up rates for trials have varied between 8% to 17%
  - drop out rates once on the trial are low (typically less than 10%)
- **Most consumers know that air conditioners are a high energy consuming appliance**
  - opportunity to reduce bill is a strong motivator to participate in trials
  - also like the 'automated' aspect of DLC – it makes it easy to participate
  - do something for the environment without having to think about it or remember to take action
  - some participate because they are curious – 'it's new and interesting'.
- **However there are concerns about impact DLC will have on comfort levels and understanding how their a/c will be managed on peak days**
  - in one trial 22% said it was too hot during events and 50% reduction was uncomfortable
  - no complaints that comfort levels affected in Western Power trial, however internal temp monitoring to be conducted
  - customers want to know what to expect and want to be notified of peak events
- **Overall, satisfaction amongst aircon and pool pump DLC trial participants is high.**
  - 60% to 90% satisfaction level across various aircon DLC trials
  - 72% in pool pump DLC were satisfied, and 3/4 would participate again

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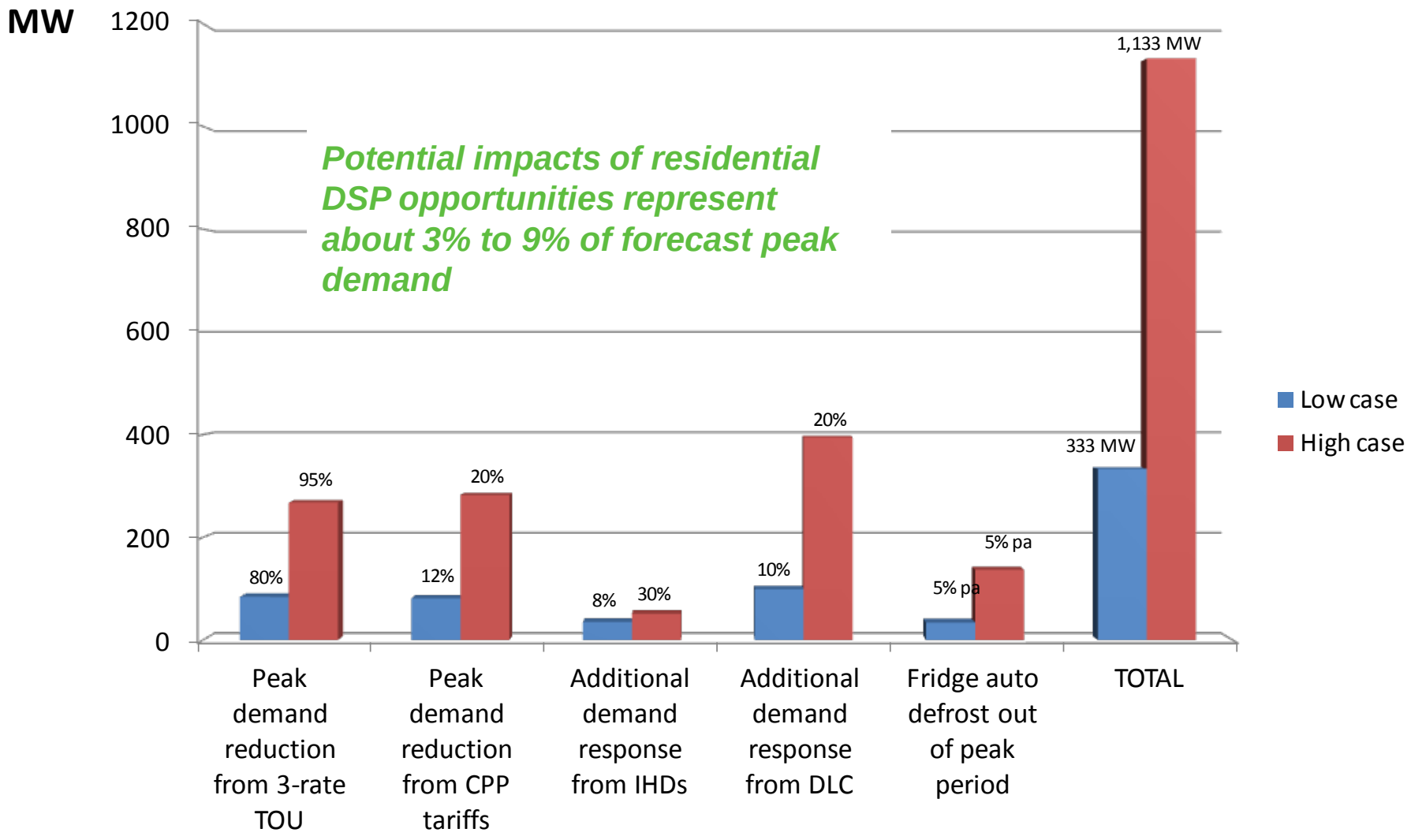
Broader-scale Impacts of DSP Pricing and DLC

Overview

- **Pilots have been relatively small scale to date**
- **To provide a 'snapshot' of the order of magnitude peak demand reductions that could be achieved through cost-reflective pricing and DLC of residential appliances Futura undertook a high level modeling exercise**
  - analysis was based on our previous work for the Victorian Government on the benefits realisation of the AMI program
  - developed estimates of the potentially achievable MW of peak demand reduction from 5 residential consumer DSP applications that could be enabled by AMI
  - modelling results suggest potential impacts of these residential DSP opportunities represent about 3% to 9% of forecast peak demand for Victoria in 2020
    - excludes significant additional potential from DSP opportunities in the C&I sector…

Victoria DSP Potential from Pricing, IHDs, and DLC at 2020



Notes: %s relate to take-up assumptions
Potential impacts compared against 2020-21 ESOO 50% POE MD for VIC of 12,470 MW

Community-Based Social Marketing Programs

CBSM – The Concept

- **CBSM has emerged as an alternative to information-intensive DSP approaches for engendering behaviour change**
  - a 'one-mechanism fits all' approach is likely to produce sub-optimal results
  - a process to ensure suitability of program design to the target audience is required to improve the potential for uptake of desired behaviours
- **Aim is to bring people in a community together to encourage pro-environmental behaviours**
  - **first step is to identify a specific desired behaviour or action**
    - eg save energy and reduce greenhouse gas emissions
  - **second step is to assess the various barriers the desired barrier faces**
    - barriers can be either internal (eg knowledge, skill, or attitude) or external (eg technological, or institutional)
  - **third step is to design a program to remove the barriers**
    - commitment strategies or incentives to reinforce intentions to take action
    - prompts to remind people to carry out activities
    - information on 'how to' and feedback on performance

Example of CBSM – Perth Solar City LivingSmart

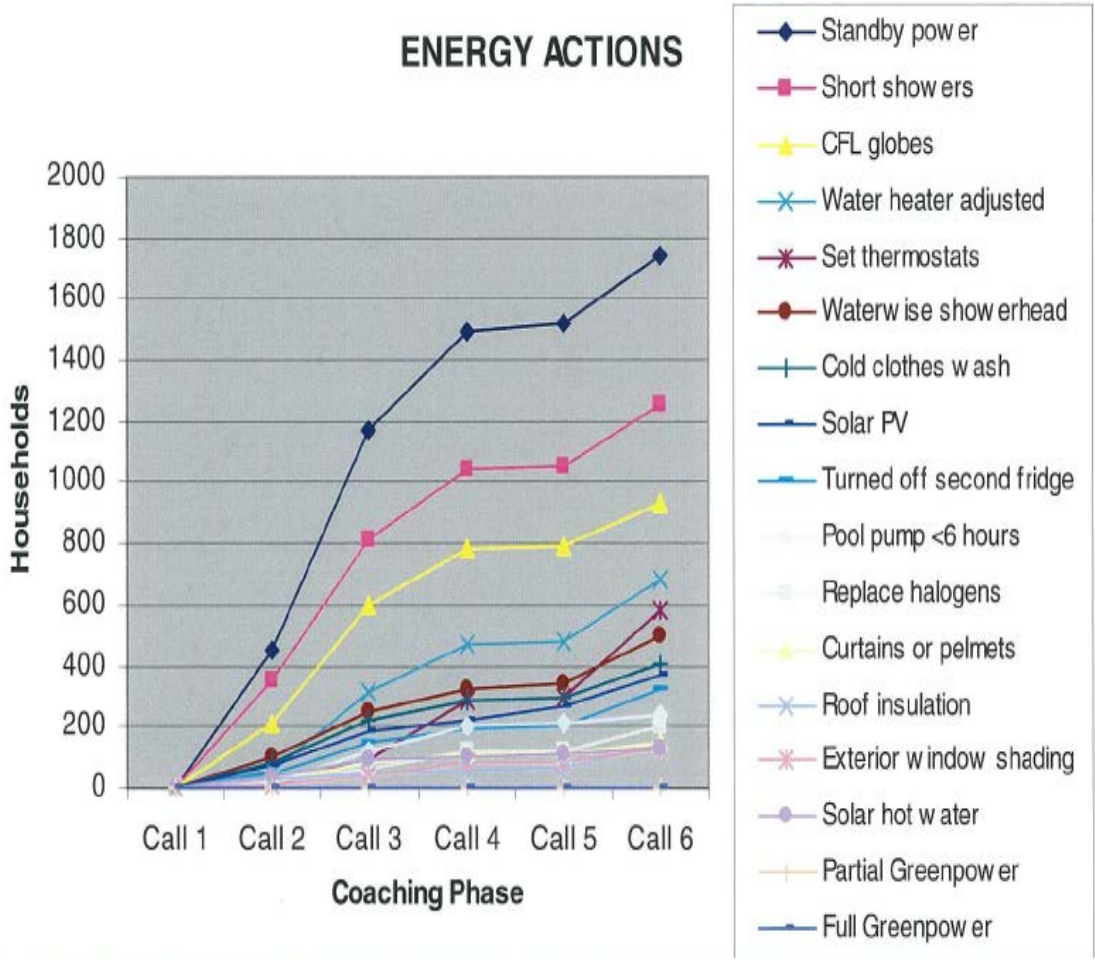
- **Aim is to change behaviour to help householders reduce their energy bills and CO2 emissions**
- **Program starts with a letter and a phone call to assess the individual requirements of each household**
- **Participants then choose from a menu of actions and are supported over the next year**
- **Key features include**
  - home delivery (by hand) of simple, practical 'how to' information
  - follow up telephone coaching calls
  - electricity meter readings benchmarked against the average use for the community
  - home consultations to improve energy (and water) efficiency
  - workshops on sustainable living

- **Motivators for Desired Behaviours**
  - save money 53%
  - environmentally friendly 41%
  - to be more energy efficient 26%
  - save energy 24%

- **Barriers to Desired Behaviours**
  - costs to much 51%
  - no perceived benefits 11%
  - time poor 10%

LivingSmart – Results to Date

- Community response to the program very positive
  - ***"Fantastic project! I've never had such low power bills. It really raises awareness"***
- Over 6,000 participating households with average savings of 9% per day
- Over 80% of households found
  - the information provided encouraged them to change their electricity use
  - the benchmarking, newsletters and feedback phone calls very useful
  - the home consultations very useful
- Cost of delivery of approximately $250 per household
  - cost effective energy efficiency and CO_2 abatement



Commercial and Industrial DSP

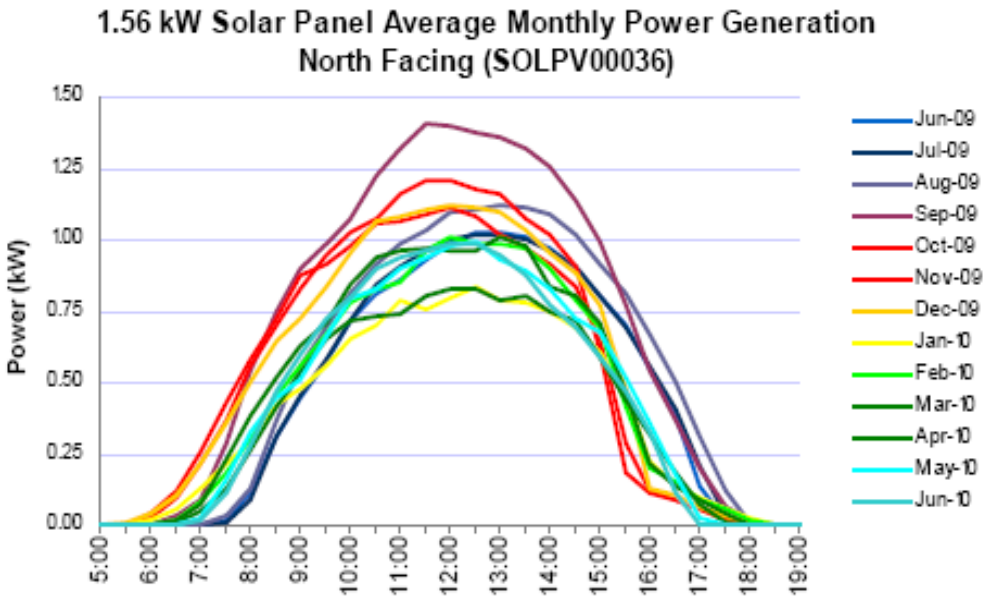
C&I Peak Demand Initiatives

- **SPAusNet C&I CPP Tariff**
  - applied to all customers >160 MWh from 2010/11
  - excellent Year 1 response due to active marketing of the tariff
    - two-thirds of eligible customers reduced peak load giving a total of 76 MVA
  - **active customer engagement used to drive tariff take-up**
  - **has created a market for third parties to support customer DSP**
- **Energex C&I**
  - initiative targetting peak demand reductions utilising existing DG, load curtailment, power factor and energy efficiency
  - 26 MW of reductions achieved to date in year 1
  - **customised solutions and engagement with retailers and market intermediaries have been found to be essential success factors**

Distributed Generation and Storage

Distributed Generation - PVs

- **Max kVA impacts not coincident with peak**



- **Consumer take-up and acceptance mainly driven by**
  - opportunity to reduce bill
  - environmental concerns
  - desire to be self sufficient and 'future focused'

- **Power quality issues - clustering**
- **Trials to date have mainly focussed on power quality issues**

Distributed Storage

- **Can *distributed storage* improve capital efficiency for networks?**
  - early days
    - cost of batteries has been a major barrier (eg $3,000 to $5,000 per MWh installed)
- **Trials are now being conducted or in planning by DNSPs in all NEM regions**
  - investigate the costs and benefits of utilising distributed battery storage and PV systems for network support
    - match PV output to times of peak demand
  - examine the scope for improving reliability on long rural feeders by storing backup supply and acting as a distributed island, in the event of a power outage
  - determine the benefits of Improving power quality through the such as optimisation of harmonic and voltage conditions
- **Expect M&V outcomes over the next 18 to 24 months**

‘Fourth Wave DSP’ – Smart Grid pilots / trials

- **Customer applications, smart meters, grid applications, and data IT are being pursued by market participants in all regions**
- **Range of customer applications being tested**
  - DSP from PTR
  - DSP from DRED enabled ACs
  - DSP from pool pump control
  - DSP and energy reduction from IHD and Web portal
  - DSP from HAN device control
  - DSP from appliance DLC

- **Participation rates and peak demand and energy impacts will be evaluated**
- **Incentives/rebates to encourage enrolment/behaviour change**
- **Electricity usage information and feedback**
- **Customer communications**
- **Participant feedback surveys**

Acknowledgements

- **In preparing our assessment of DSP trials, pilots, and new initiatives Futura met with or called representatives from network service providers, electricity retailers, regulatory agencies, and consumer advocacy groups**

We sincerely thank each of these individuals for the time they allocated to us and for the insights they provided to our analysis

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