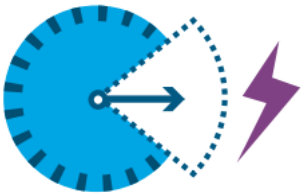
Australian Energy Market Commission
WHOLESALE DEMAND RESPONSE MECHANISM

Technology is developing fast. It won't be long before digitalisation gets to the point where a truly two-sided market is possible. That's a market where consumers actively manage their decisions to consume or not consume. ***We want to start opening up the market so when technology is mature enough there is a clear runway for widespread demand-side participation to take off***

- AEMC Infographic #1 – WDRM – DD – 18 July 2019

As the sector continues to transform*, we are increasingly seeing more variability, not only on the supply side (with more weather dependent generation), but also on the demand side. Increases in solar PV, the uptake of batteries and electric vehicles,* ***will increase the need for more information to be provided by the demand side****.*

- AEMC Infographic #2 – WDRM – DD – 18 July 2019

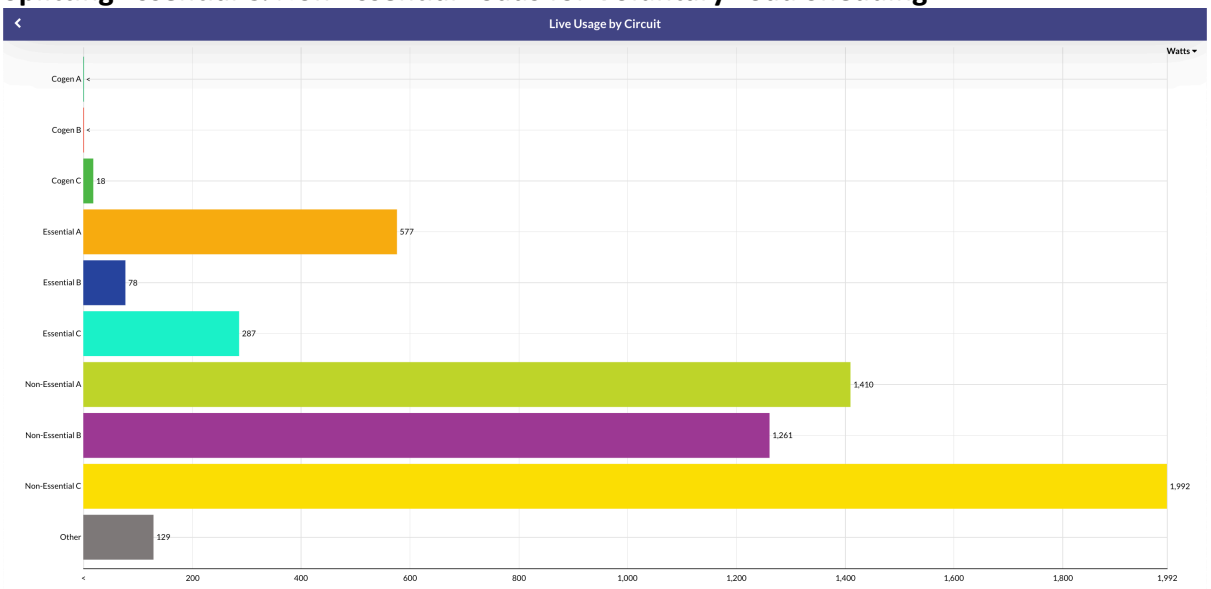


Valuing wholesale demand response

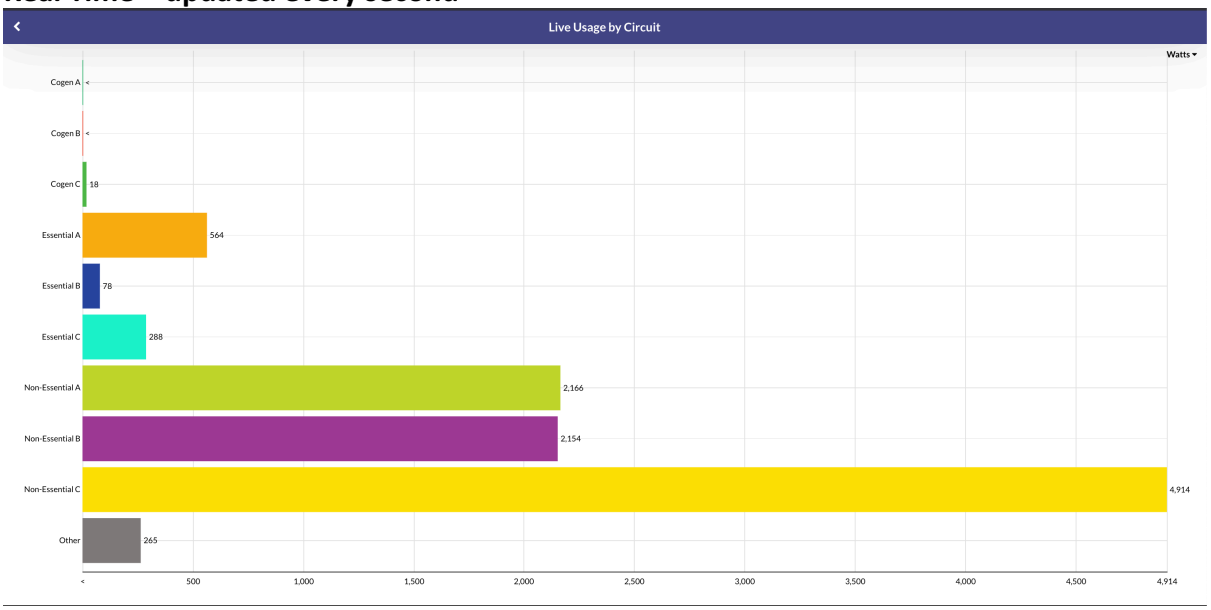
The value of 'demand response' would be determined against a baseline quantity to be set by the market operator. Because it is impossible to know exactly what energy would have been used at any given time, the baseline quantity must be estimated.
The framework under the draft rule makes AEMO responsible for determining the baseline, which provides greater certainty while also allowing for innovative approaches to be developed over time.
In time, technology will allow us to outgrow the need for baselines and move to an authentic two-sided market*.*

- AEMC Infographic #2 – WDRM – DD – 18 July 2019

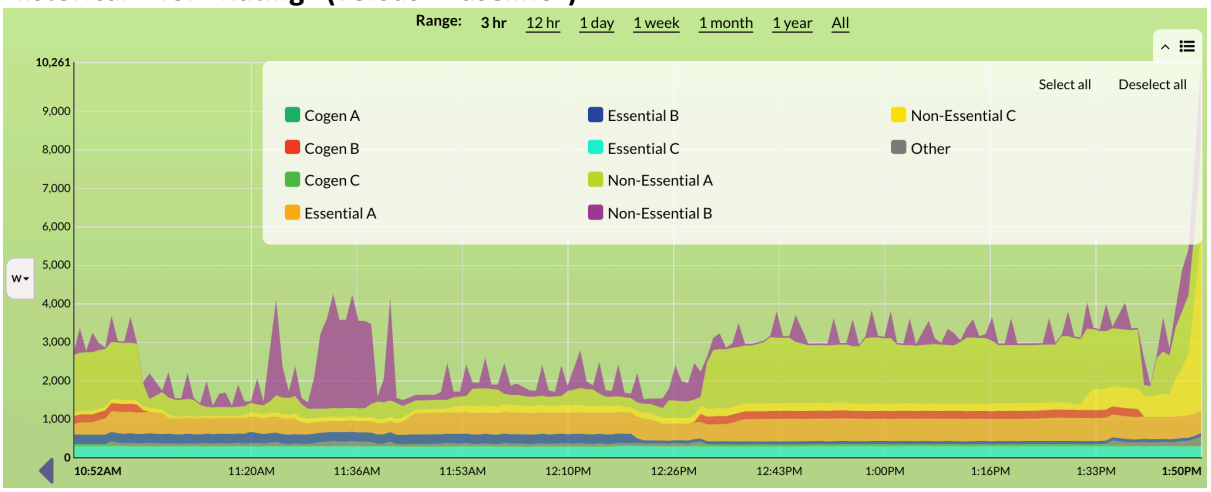
Splitting Essential & Non-Essential Loads for Voluntary Load Shedding



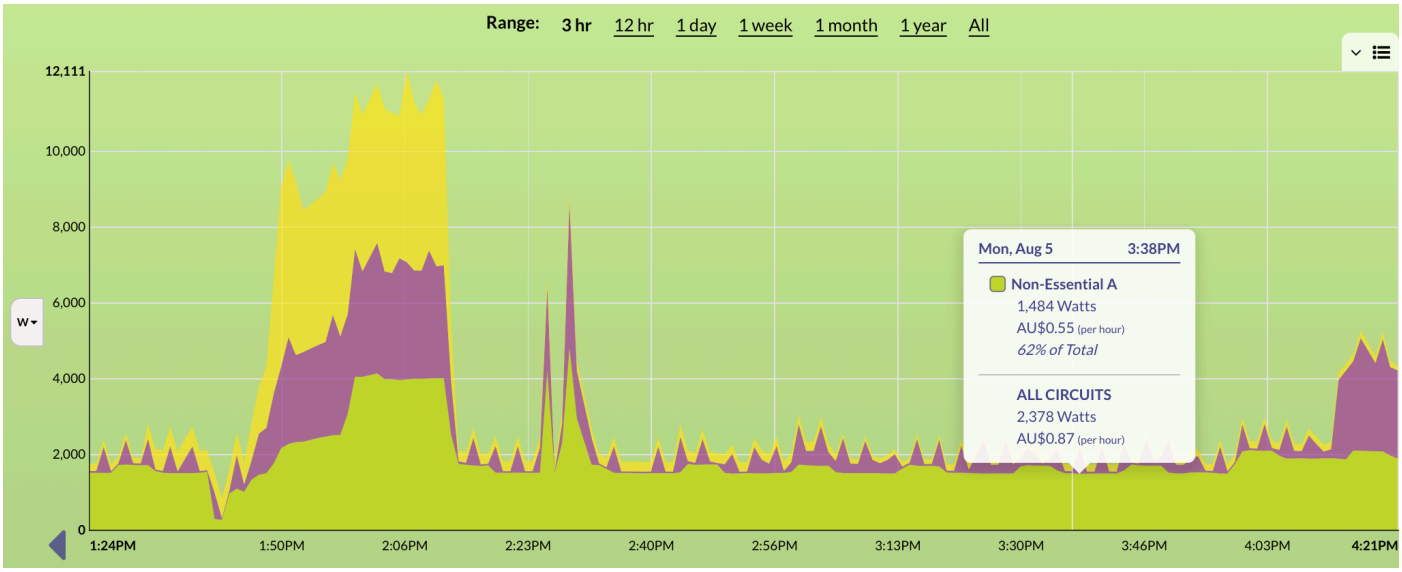
Real Time – updated every second



Historical – for "Rating" (versus "Baseline")

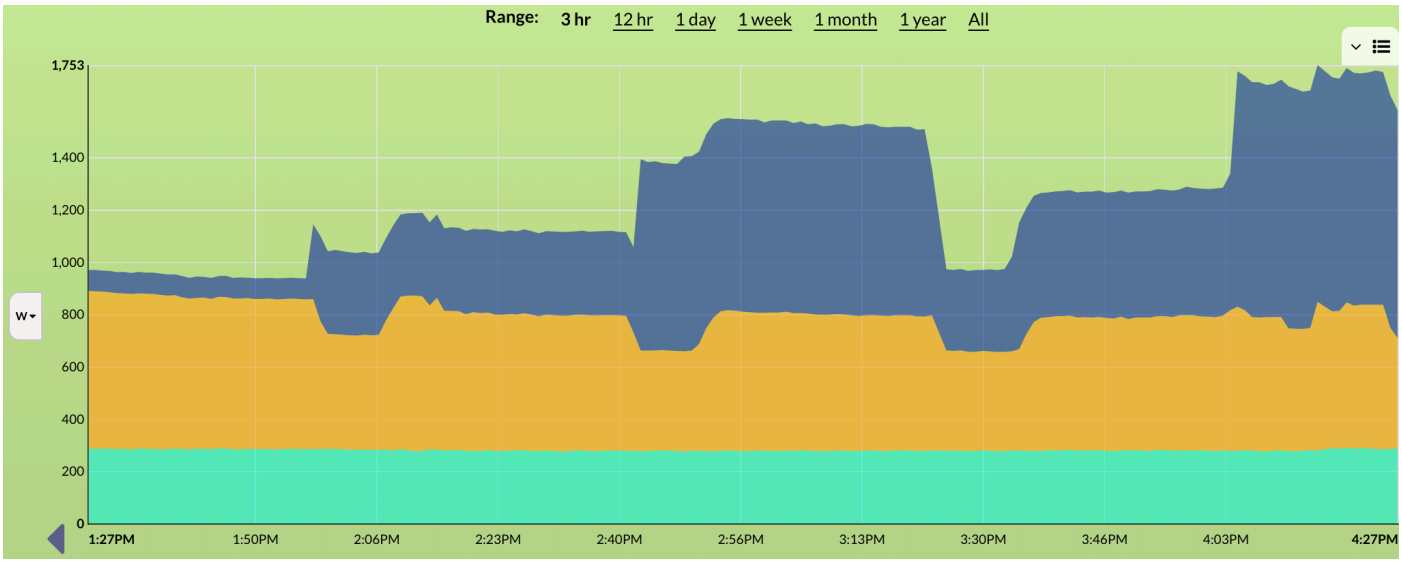


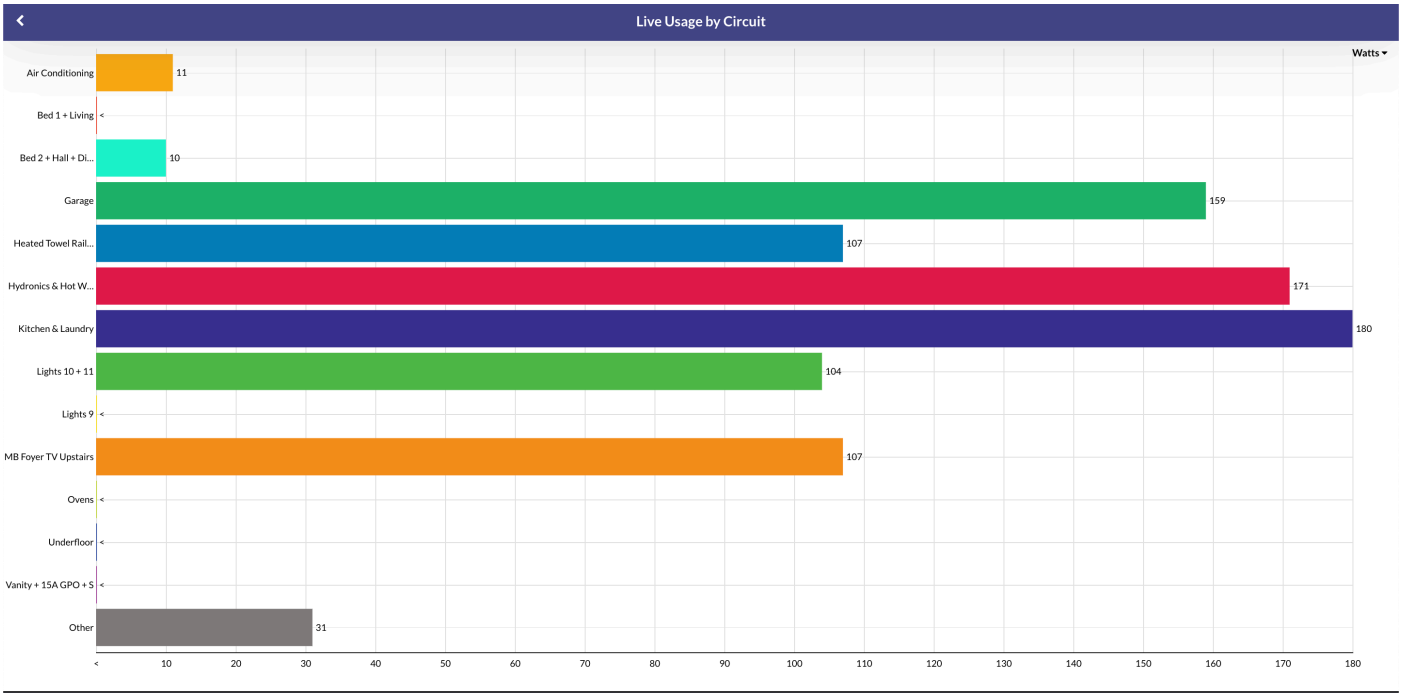
The loads below are the Non-Essential Loads – can be shed under Voluntary Load Shedding (“VLS”):

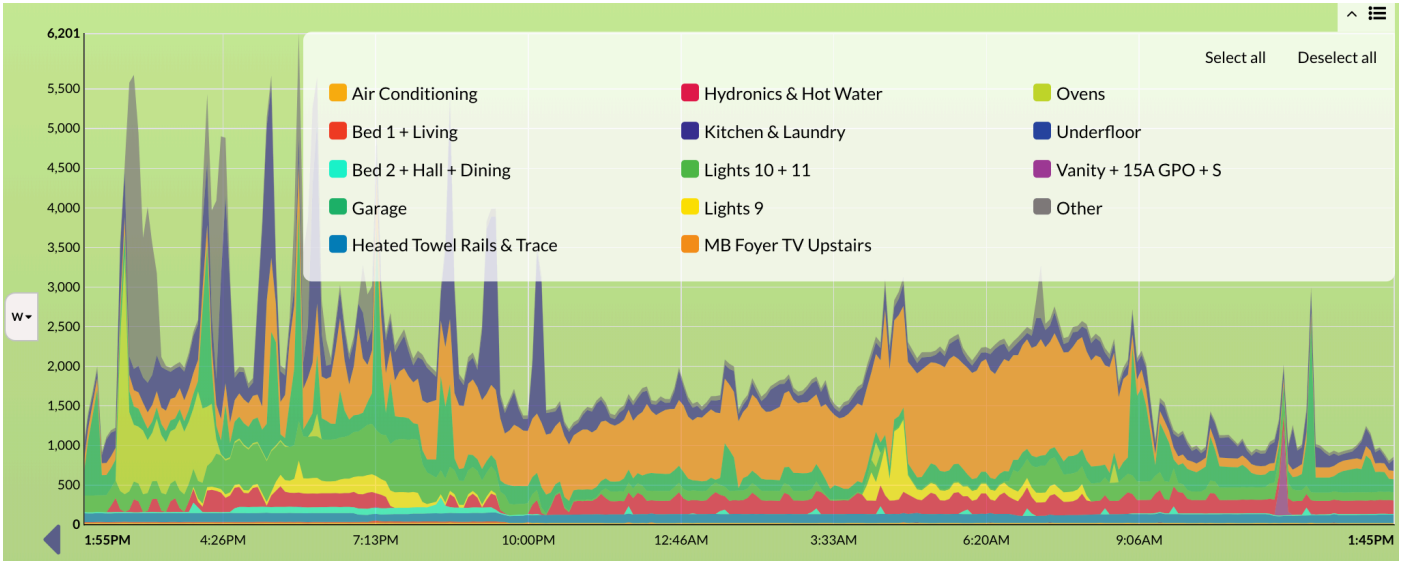


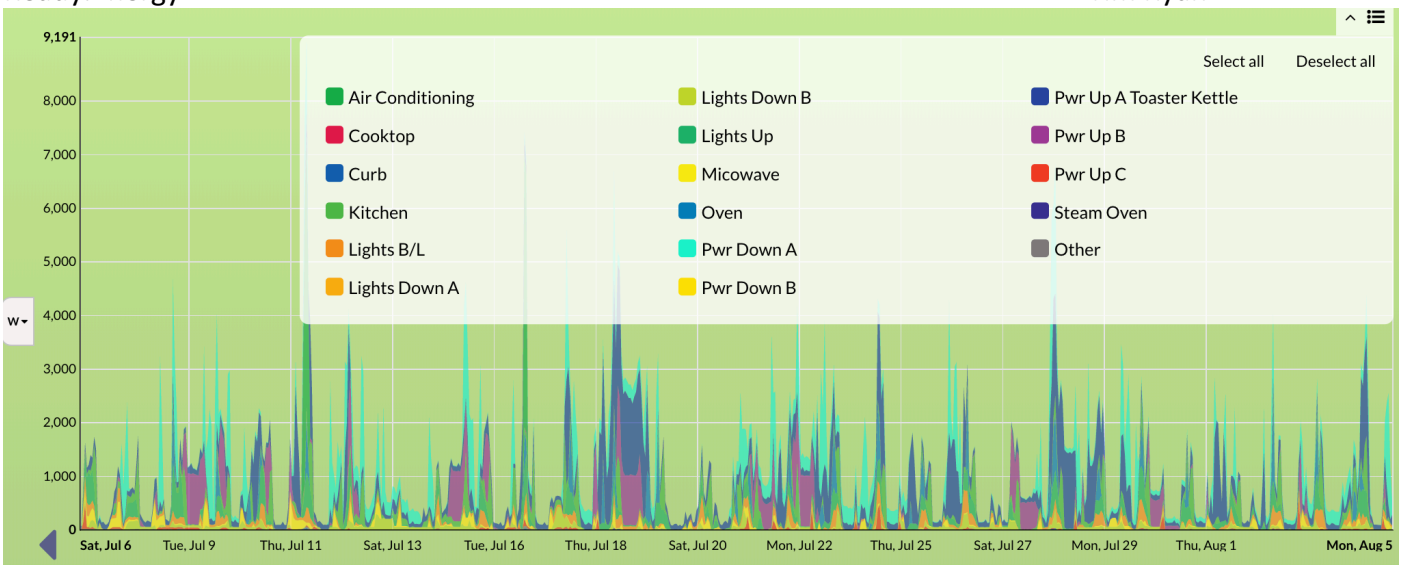
The loads below are Essential Loads – would NOT be shed under VLS and highlight why USE (Unserved Energy) is such an issue in forced load shedding.

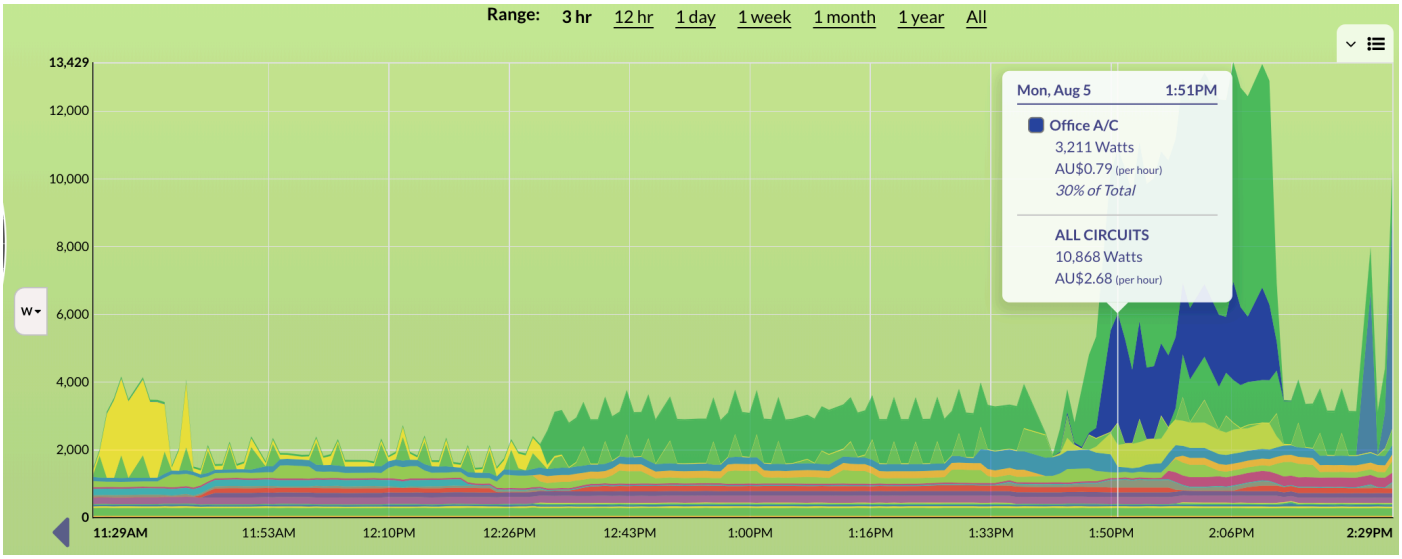
It should be an absolute priority for the AMEC to put in place a rule environment that will remove the need for forced / involuntary load shedding in AEMO’s “toolkit” – VLS should be able to deliver safe secure methodologies to support power system security.

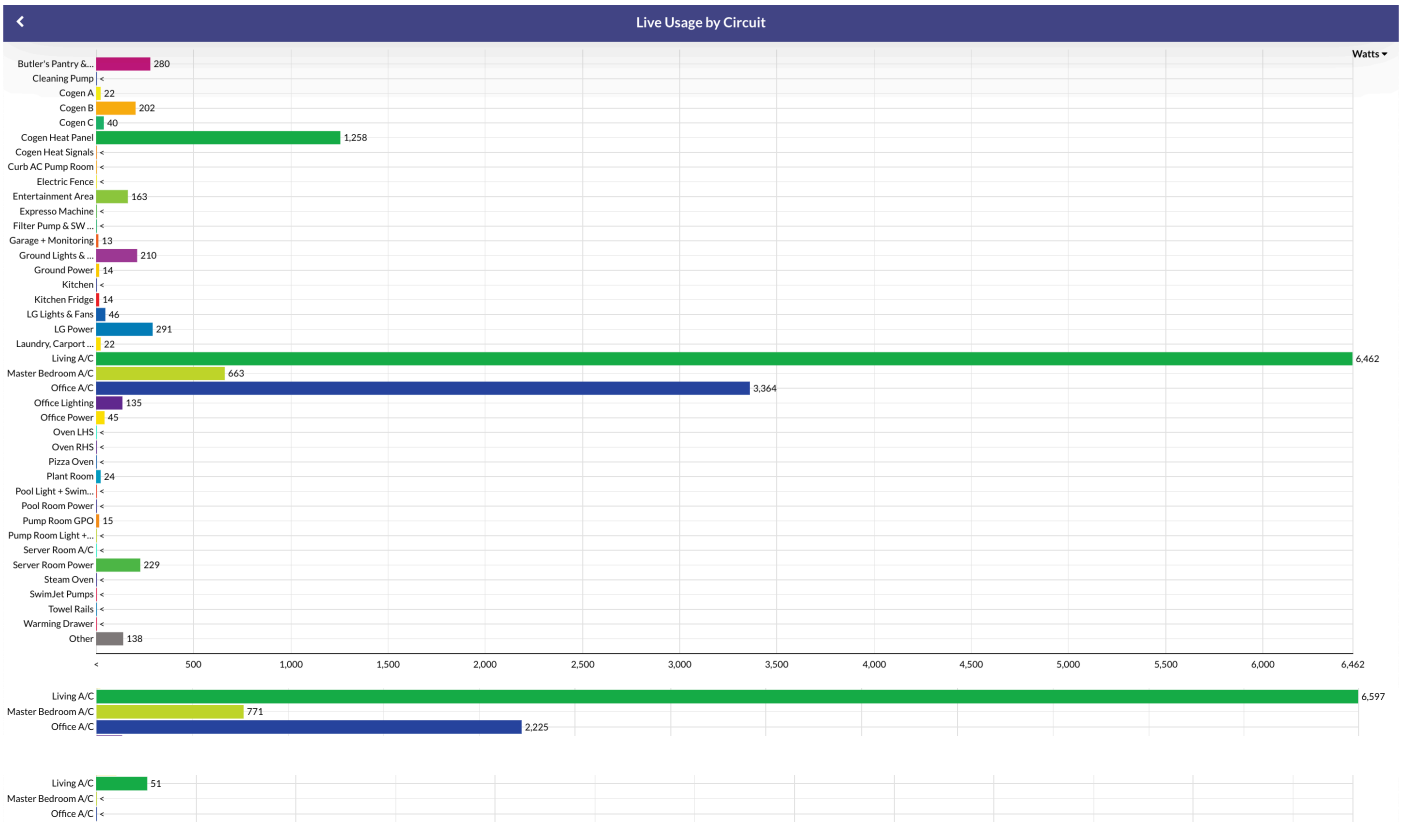


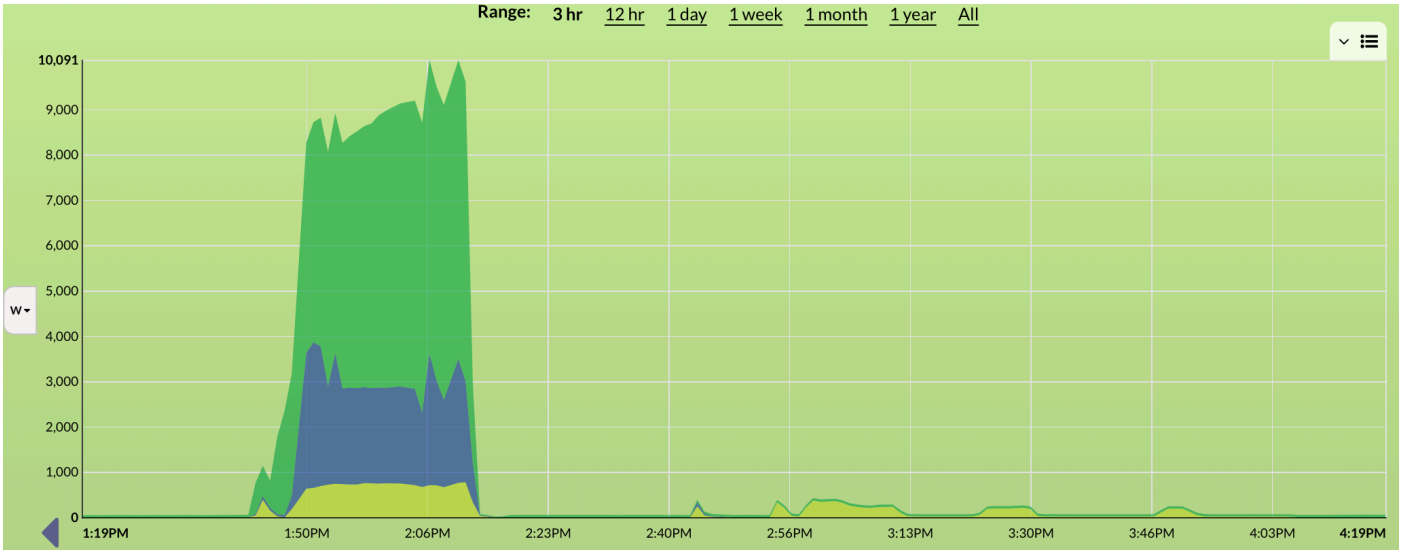

Live Usage by Circuit
Watts
Air Conditioning 11
Bed 1 + Living <
Bed 2 + Hall + Di... 10
Garage 159
Heated Towel Rail... 107
Hydronics & Hot W... 171
Kitchen & Laundry 180
Lights 10 + 11 104
Lights 9 <
MB Foyer TV Upstairs 107
Ovens <
Underfloor <
Vanity + 15A GPO + S <
Other 31
< 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

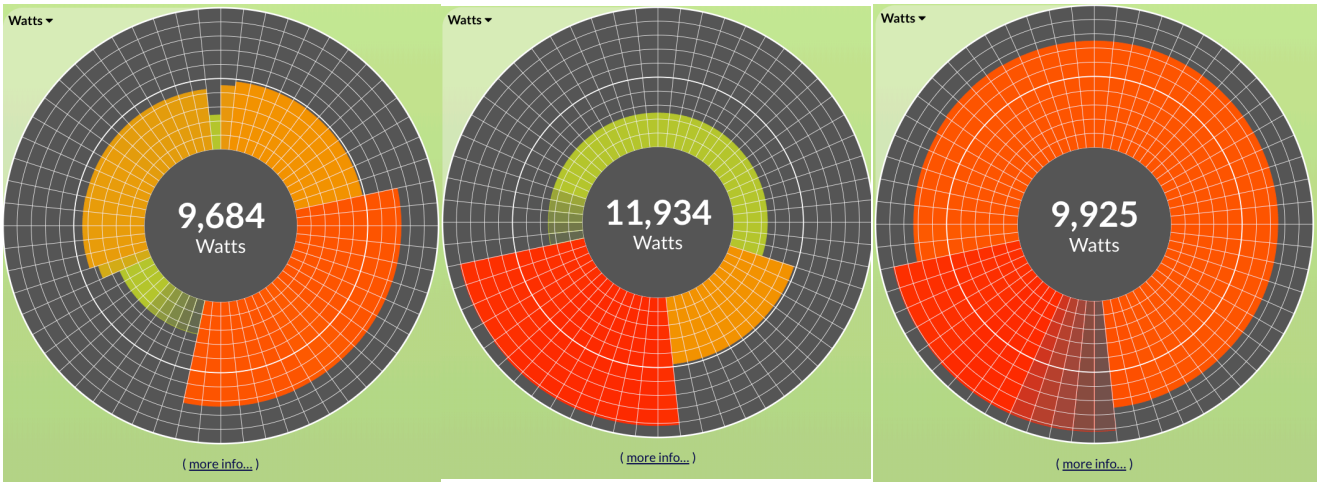

6,201
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
W
Select all
Deselect all
Air Conditioning
Bed 1 + Living
Bed 2 + Hall + Dining
Garage
Heated Towel Rails & Trace
Hydronics & Hot Water
Kitchen & Laundry
Lights 10 + 11
Lights 9
MB Foyer TV Upstairs
Ovens
Underfloor
Vanity + 15A GPO + S
Other
1:55PM 4:26PM 7:13PM 10:00PM 12:46AM 3:33AM 6:20AM 9:06AM 1:45PM

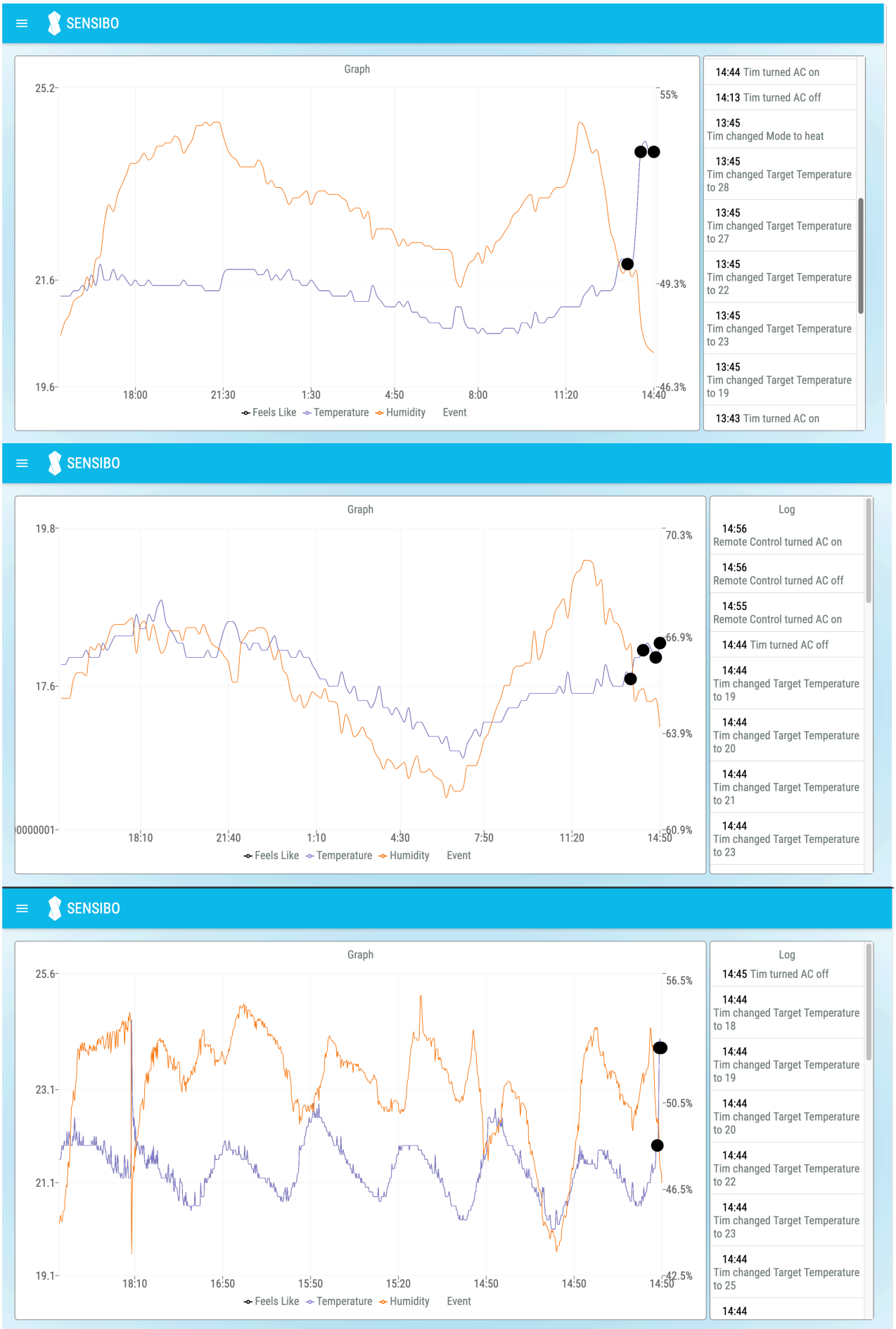

Select all
Deselect all
Air Conditioning
Cooktop
Curb
Kitchen
Lights B/L
Lights Down A
Lights Down B
Lights Up
Micowave
Oven
Pwr Down A
Pwr Down B
Pwr Up A Toaster Kettle
Pwr Up B
Pwr Up C
Steam Oven
Other
9,191
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
W
Sat, Jul 6
Tue, Jul 9
Thu, Jul 11
Sat, Jul 13
Tue, Jul 16
Thu, Jul 18
Sat, Jul 20
Mon, Jul 22
Thu, Jul 25
Sat, Jul 27
Mon, Jul 29
Thu, Aug 1
Mon, Aug 5


Range: 3 hr 12 hr 1 day 1 week 1 month 1 year All
13,429
12,000
10,000
8,000
6,000
4,000
2,000
0
W
Mon, Aug 5 1:51PM
Office A/C
3,211 Watts
AU$0.79 (per hour)
30% of Total
ALL CIRCUITS
10,868 Watts
AU$2.68 (per hour)
11:29AM
11:53AM
12:10PM
12:26PM
12:43PM
1:00PM
1:16PM
1:33PM
1:50PM
2:06PM
2:29PM


Live Usage by Circuit
Watts
Butler's Pantry &... 280
Cleaning Pump <
Cogen A 22
Cogen B 202
Cogen C 40
Cogen Heat Panel 1,258
Cogen Heat Signals <
Curb AC Pump Room <
Electric Fence <
Entertainment Area 163
Expresso Machine <
Filter Pump & SW ... <
Garage + Monitoring 13
Ground Lights & ... 210
Ground Power 14
Kitchen <
Kitchen Fridge 14
LG Lights & Fans 46
LG Power 291
Laundry, Carport ... 22
Living A/C 6,462
Master Bedroom A/C 663
Office A/C 3,364
Office Lighting 135
Office Power 45
Oven LHS <
Oven RHS <
Pizza Oven <
Plant Room 24
Pool Light + Swim... <
Pool Room Power <
Pump Room GPO 15
Pump Room Light +... <
Server Room A/C <
Server Room Power 229
Steam Oven <
SwimJet Pumps <
Towel Rails <
Warming Drawer <
Other 138
< 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 4,500 5,000 5,500 6,000 6,462
Living A/C 6,597
Master Bedroom A/C 771
Office A/C 2,225
Living A/C 51
Master Bedroom A/C <
Office A/C <


Range: 3 hr 12 hr 1 day 1 week 1 month 1 year All
W
10,091
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1:19PM 1:50PM 2:06PM 2:23PM 2:40PM 2:56PM 3:13PM 3:30PM 3:46PM 4:03PM 4:19PM


Watts
9,684
Watts
(more info...)
Watts
11,934
Watts
(more info...)
Watts
9,925
Watts
(more info...)


SENSIBO
Graph
25.2
21.6
19.6
55%
49.3%
46.3%
18:00
21:30
1:30
4:50
8:00
11:20
14:40
Feels Like
Temperature
Humidity
Event
14:44 Tim turned AC on
14:13 Tim turned AC off
13:45 Tim changed Mode to heat
13:45 Tim changed Target Temperature to 28
13:45 Tim changed Target Temperature to 27
13:45 Tim changed Target Temperature to 22
13:45 Tim changed Target Temperature to 23
13:45 Tim changed Target Temperature to 19
13:43 Tim turned AC on
SENSIBO
Graph
19.8
17.6
70.3%
66.9%
63.9%
60.9%
18:10
21:40
1:10
4:30
7:50
11:20
14:50
Feels Like
Temperature
Humidity
Event
Log
14:56 Remote Control turned AC on
14:56 Remote Control turned AC off
14:55 Remote Control turned AC on
14:44 Tim turned AC off
14:44 Tim changed Target Temperature to 19
14:44 Tim changed Target Temperature to 20
14:44 Tim changed Target Temperature to 21
14:44 Tim changed Target Temperature to 23
SENSIBO
Graph
25.6
23.1
21.1
19.1
56.5%
50.5%
46.5%
42.5%
18:10
16:50
15:50
15:20
14:50
14:50
14:50
Feels Like
Temperature
Humidity
Event
Log
14:45 Tim turned AC off
14:44 Tim changed Target Temperature to 18
14:44 Tim changed Target Temperature to 19
14:44 Tim changed Target Temperature to 20
14:44 Tim changed Target Temperature to 22
14:44 Tim changed Target Temperature to 23
14:44 Tim changed Target Temperature to 25
14:44

UTILITY FACTOR

Utility Factor of a Gas Peaker Generator = Z E R O = NIL = NOTHING.

Utility Factor of DER Control Device = Variable but HIGH Probability of 100% (1).

Internet of Things (IoT) devices exist to provide owners/users with personal benefit.

Orchestration of IoT devices will deliver extra benefits to owners/users and to collective group.

A Network of 50,000 controlled air conditioners at an average consumption of 5 kW would allow maximum DR of 250 MW. This however would be VARIABLE as not all air conditioners would be (i) on and if on (ii) not a full power.

Comparative Cost – Gas Peaker Generation @ $1 million/MW = $250 million.
Comparative Cost – DER/DM network @$100/unit wholesale = $5 million.

So, to be comparable as "firm" capacity $/$ just 1-2% of air conditioners would have to be on at full capacity to be equivalent to a Gas Peaker (5 MW for network cost of $5 million i.e. @ $1 million/MW).

The serendipitous fact is that, as domestic air-conditioners are a significant factor in peak demand events, DER controlled air conditioner are (i) highly likely to be on; or failing that (if off) are (ii) more likely to be turned on in the near future.

The flexibility of control, and low cost for "nameplate" capacity, means that orchestration can deliver significant network benefits without major impact on individuals (at a lower cost).

THE BIGGEST MISTAKE

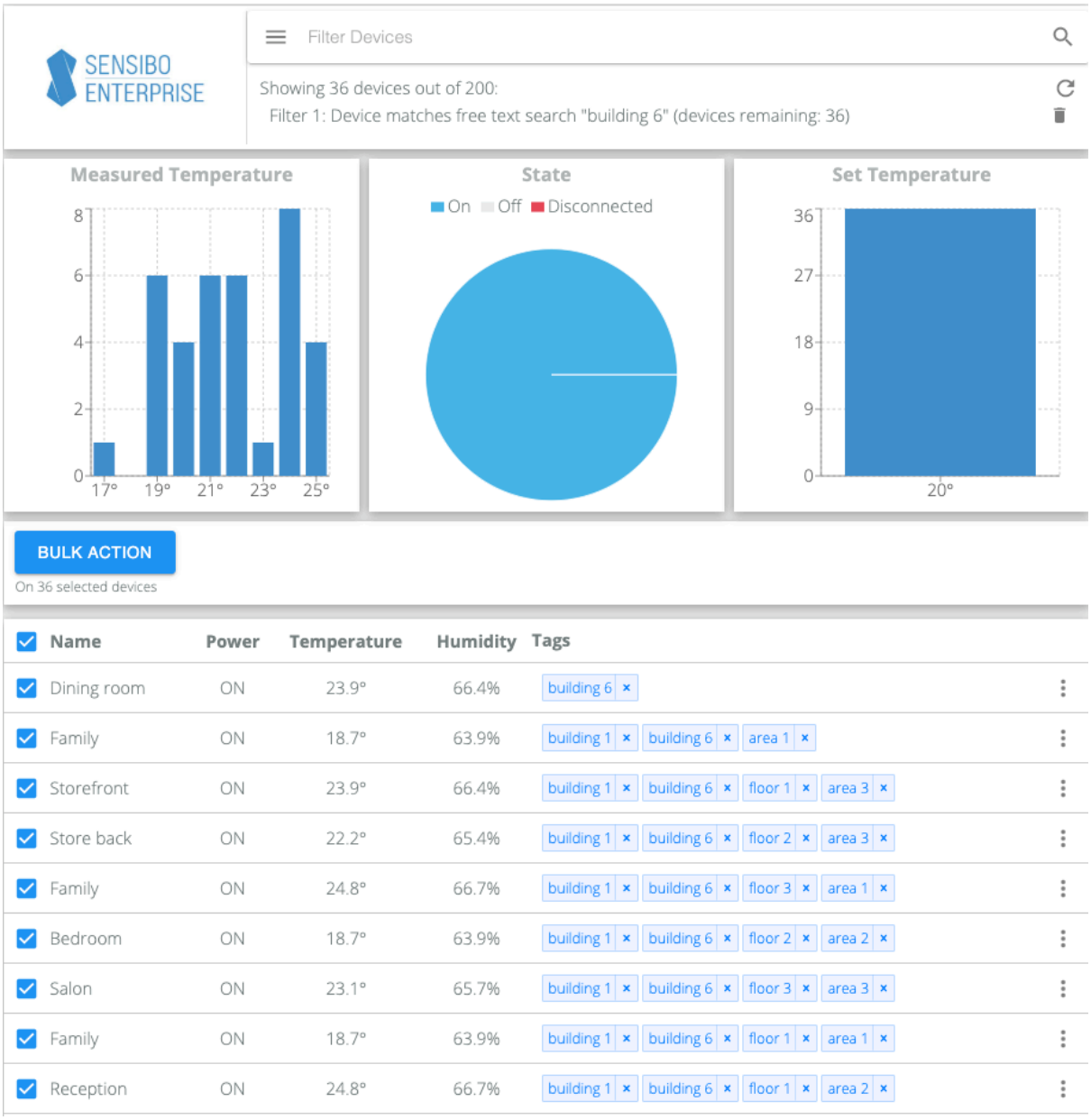
The single biggest mistake in the transformation of the energy system with the introduction of roof top solar was the fundamentally flawed decision of putting generation BEHIND the meter!

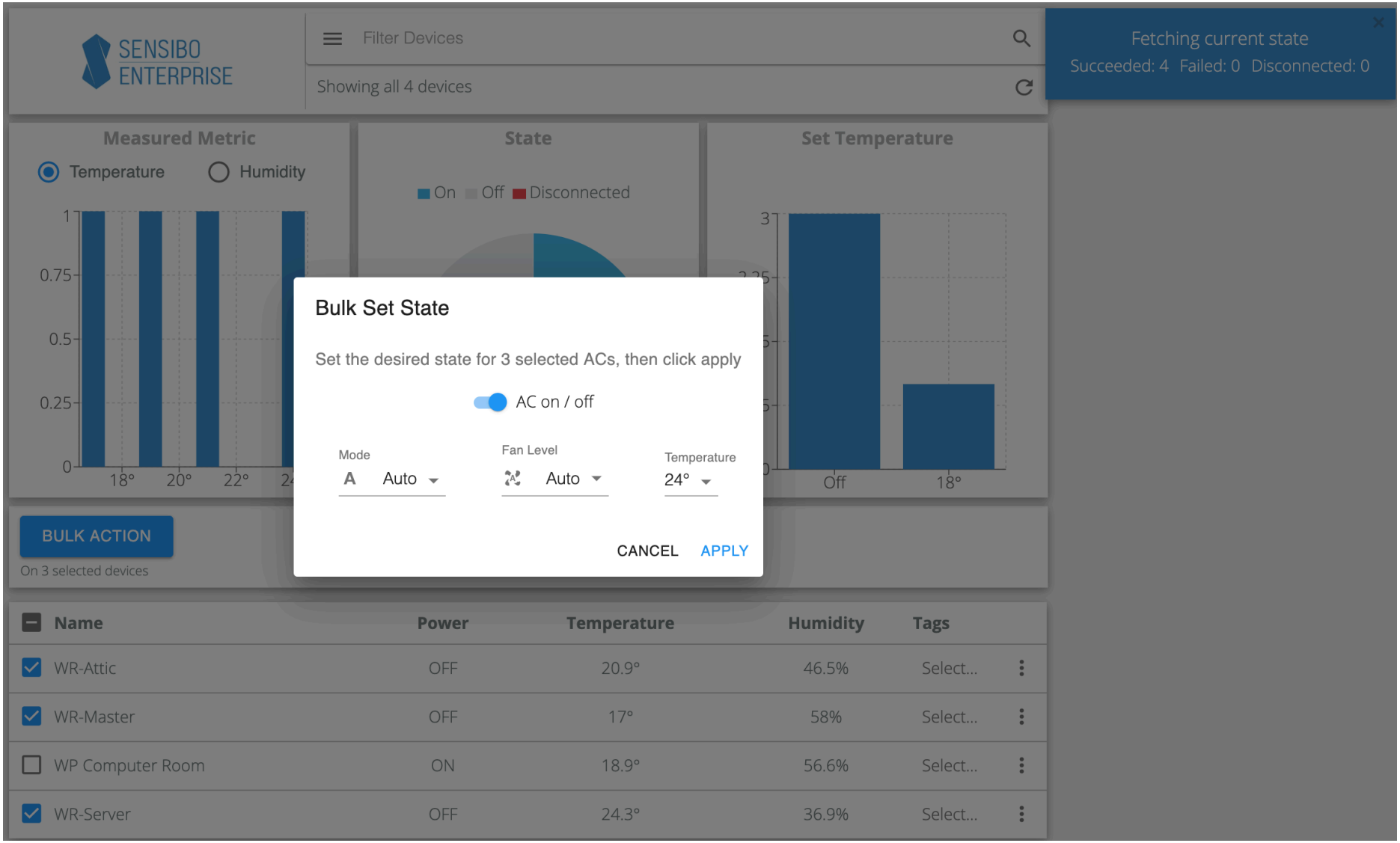
With one expeditious decision, we have had to live with an ongoing disaster of a lack of visibility not only of the RTS generation but of actual demand.

In our original submission, we presented a strong case that **any DER wishing to participate in the market for Demand Response (and Management) should be required to have suitable (sub) metering equipment that provides AEMO with the essential information needed to manage and evermore dynamic grid where both supply and demand are variable – and demand side control will be essential to mitigate uncontrolled variable renewable energy**.

The changes coming with batteries and electric vehicles make this requirement necessary and urgent.

It is not expensive, and delivers significant benefits to the DER asset owner (the consumer), the DNSP, and the community (AEMO).


SENSIBO ENTERPRISE
Filter Devices
Showing 36 devices out of 200:
Filter 1: Device matches free text search "building 6" (devices remaining: 36)
Measured Temperature
8
6
4
2
0
17°
19°
21°
23°
25°
State
On
Off
Disconnected
Set Temperature
36
27
18
9
0
20°
BULK ACTION
On 36 selected devices
Name Power Temperature Humidity Tags
Dining room ON 23.9° 66.4% building 6
Family ON 18.7° 63.9% building 1 building 6 area 1
Storefront ON 23.9° 66.4% building 1 building 6 floor 1 area 3
Store back ON 22.2° 65.4% building 1 building 6 floor 2 area 3
Family ON 24.8° 66.7% building 1 building 6 floor 3 area 1
Bedroom ON 18.7° 63.9% building 1 building 6 floor 2 area 2
Salon ON 23.1° 65.7% building 1 building 6 floor 3 area 3
Family ON 18.7° 63.9% building 1 building 6 floor 1 area 1
Reception ON 24.8° 66.7% building 1 building 6 floor 1 area 2


SENSIBO ENTERPRISE
Filter Devices
Showing all 4 devices
Fetching current state
Succeeded: 4 Failed: 0 Disconnected: 0
Measured Metric
Temperature
Humidity
State
On
Off
Disconnected
Set Temperature
Bulk Set State
Set the desired state for 3 selected ACs, then click apply
AC on / off
Mode
Auto
Fan Level
Auto
Temperature
24°
CANCEL
APPLY
BULK ACTION
On 3 selected devices
Name
Power
Temperature
Humidity
Tags
WR-Attic OFF 20.9° 46.5% Select...
WR-Master OFF 17° 58% Select...
WP Computer Room ON 18.9° 56.6% Select...
WR-Server OFF 24.3° 36.9% Select...