

# VIRTUAL POWER PLANTS IN THE 20S: MOVING FROM THEORY TO PRACTICE

NARUC CENTER FOR PARTNERSHIPS & INNOVATION WEBINAR SERIES

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## WHAT IS NARUC

- The National Association of Regulatory Utility Commissioners (NARUC) is a nonprofit organization founded in 1889.
- Our Members are the state regulatory Commissioners in all 50 states & the territories. FERC & FCC Commissioners are also members. NARUC has Associate Members in over 20 other countries.
- NARUC member agencies regulate electricity, natural gas, telecommunications, and water utilities.





## WHAT IS NARUC'S CENTER FOR PARTNERSHIPS AND INNOVATION?

- Grant-funded team dedicated to providing technical assistance to members.
- CPI identifies emerging challenges and connects state commissions with expertise and strategies.
- CPI builds relationships, develops resources, and delivers trainings.

#### NARUC CPI **Topical Areas Energy Infrastructure Electricity System** & Technology Transition Modernization Critical Infrastructure, **Emerging Issues** Cybersecurity, Resilience

www.NARUC.org/CPI-1



# MODERATOR

LEA MÁRQUEZ PETERSON, CHAIRWOMAN, ARIZONA CORPORATION COMMISSION

# PANELISTS

DR. GABRIELLE KUIPER, INSTITUTE FOR ENERGY ECONOMICS AND FINANCIAL ANALYSIS (IEEFA)

CISCO DEVRIES, CEO, OHMCONNECT

GRAHAM TURK, INNOVATION STRATEGIST, GREEN MOUNTAIN POWER



#### **Australia's 'National Electricity Market'**

- Wholesale energy-only market
- Market price cap: \$AUD15,000/MWh, negative -\$AUD1000/MWh
- Deregulated market, typical bill:
  - Wholesale costs (30-40%)
  - Network costs (40-50% of bill) revenue-caped Tx and Dx
  - Environmental costs (5-15% of bill)

Figure 16 High prevalence of negative spot prices in four NEM regions

- Retailer and residual costs (5-15% of bill)
- Negative prices: 5.5% of all trading intervals across the NEM Q2 2021





Source: AEMO



Institute for Energy Economics and Financial Analysis IEEFA.org

© AEMO 2020 | 2020 Integrated System Plan

#### Household and business consumers are big investors



- To end of 2020: \$4+ billion of consumer investment in generation alone
- 2021: Over 2.8m household rooftop PV systems, 11+GW on rooftops
- Last 2-3 years: C&I rooftop PV taking off



### **Rooftop solar is eating utility solar's lunch**

#### South Australia had 100% solar for one hour 11 October 2020 (77% rooftop)



South Australian Generation Mix - 11th October 2020



### 1. Dynamic operating envelopes/ Dynamic connection agreements

- Set dynamically: 1-5-minute intervals, 24 hours in advance
- Needs regulatory support: including through consistency in APIs for information sharing – still a WIP
- Needs revenue allowances: but relatively small
   e.g. <1% revenue for SA Power Networks \$32m cf \$3.9b 5 year revenue</li>



Enabling greater market access - raising the limit

#### Institute for Energy Economics and Financial Analysis IEEFA.org

### 2. Demand response aggregation

Wholesale demand response mechanism from 24 October 2021 (finally!)

– large loads only at this point (>100MWh generally)

Some trials of aggregated household DR for emergency response

- e.g smart thermostats

#### • Minimum system load mechanism coming – hopefully





### **3. AEMO VPP trials (South Australia) – summary**

- Contingency FCAS (raise and lower: 6sec, 60 sec, 5min in response to large events) (Note: 2sec Fast Frequency Response (FFR) coming October 2023)
- Energy (response effectively >\$300/MWh spot market price)
- 7 aggregators:
  - Energy Locals (Tesla): currently 13MW \$2.2m revenue (first to join) (Stage 1 1,100 social housing properties \$2m grant, \$30m loan from SA Government, additional 3,000 social housing properties - \$60m total finance (including \$8.2 ARENA))
  - AGL: 3MW raise, 2MW lower \$99,000 revenue (over 12 months) (\$5m ARENA funding, \$19m total for 5MW – including demand response trial)
  - Simply: 3MW \$85,000 revenue (\$7.7m ARENA funding, \$23m total for 8MW)
  - ShineHub: 1MW \$180 revenue
  - *Sonnen*: 1*MW \$2,000* revenue (*NSW*)
  - Energy Locals (SolarSG/Members Energy): 1MW \$0 (Vic and NSW)
  - HydroTas: 1MW \$0 (Qld)
- Number of households to date (guess 4,600 assuming 5kW batteries)
- Revenue essentially all from extreme price events, especially islanding of SA 13 Jan-17 Feb 2020



### **3. AEMO VPP trials – findings to date**

- Can provide FCAS, energy and assist with minimum system load
- Only battery participants at this stage (not other DER)
- Forecasting challenges (up to 42% different from actual on an hour ahead)
- AEMO needs for visibility, forecast-ability, dispatchability system security challenges if VPPs scale
- Participants view: too many requirements, too costly
- Consumers overall satisfaction to date is high, but some value opaque
- Need for consumer protections especially for switching
- Also commercial offerings are emerging, but early days

   e.g. EnergyAustralia: \$200 credit for joining, flat \$20 credit paid per 'grid event' (max 20 grid events per year), 20% battery capacity reserved for the homeowner



### The state of DER integration in Australia

- Dynamic operating envelopes might remove the need for a DMO
- EVs will change everything
- Self-sufficiency will be the priority except if there are extremely high prices
- Market value/financial viability yet to be confirmed
- DER will provide opportunities for greater resilience
- Social licence is vital for VPPs
- Non-financial incentives should be considered

**Engaging households towards the future grid -** Monash University with UQ research Principles, include appeal to broader household interests and concerns (not merely financial)





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#### **Spare: Feed-in tariffs in Australia**

- State subsidies have varied dramatically over time: from 40-66c/kWh
- Now generally retailer set: roughly 6-12c/kWh BUT vary greatly (sometimes 0c)
- Note new solar sponge tariff in South Australia: 10:00am to 3:00pm 25% of normal rate (3.6c/kWh cf 18c/kWh peak)
- VADER (Value of DER) method being developed for network revenue regulation purposes (similar process used in Victoria for setting minimum tariffs)





#### **Green Mountain Power**

#### PEAK SHAVING 101: GENERATE SAVINGS FOR ALL CUSTOMERS



#### **Green Mountain Power**





- "Jumbo Storms" affect >100,000 GMP customers
- In the last 30 years, GMP has had 5 Jumbo Storms
- 4 of them alone have occurred in the last 6 years

## 2017 Pilot: Seamless backup at home for \$15/month



- Resilience
- Affordability

- Grid flexibility
- Carbon reduction





### **CUSTOMER STORIES**



"The Powerwalls pumped our water, ran our lights, appliances, TV, and computers, and even powered our electric snowblower just as seamlessly as if we were connected to the grid"

- Gerry Hawkes, GMP Customer who rode through a 4-day outage

## TWO STORAGE TARIFFS FILED IN 2019

**Bring Your Own Device (BYOD)** 

Upfront incentive from GMP for sharing stored energy during peaks

\$850/kW, \$950/kW in constrained areas)





**Energy Storage System Lease** 

\$55 per month for 10 years

2 Powerwalls per install: 27kWh/10kW per system

Customers can work with any participating Tesla-Certified installer

HOW IS IT GOING?

2020 ISO-New England Peak 13 MW curtailed = \$1M saved



2020 Greentech Media article

### From Pilot to Permanent: Green Mountain Power's Home Battery Network Is Here to Stay

2019 Greentech Media article after Halloween windstorm

## Batteries vs. Blackouts: 1,100 Homes Powered Through Vermont Outage With Storage

Utility Green Mountain Power's pilot programs paid off with clean, distributed backup power amid a statewide outage.



# Q&A

#### SUBMIT USING THE QUESTIONS PANE IN THE CONTROL PANEL

# NARUC Innovation Webinar series



Hosted one Thursday each month from 3:00 p.m. to 4:00 p.m. ET

Enabling Robust Stakeholder Engagement at Public Utility Commissions

• September 16, 2021 | 3:00 - 4:00 PM Eastern

#### A New Approach to Understanding the Economic Impacts of Electric Outages

• October 14, 2021 | 3:00 - 4:00 PM Eastern

Register at: <u>https://www.naruc.org/cpi-1/emerging-issues/innovation-webinars/</u>

NARUC thanks the U.S. Department of Energy for support for this series.





# THANK YOU



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