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

NARUC CENTER FOR PARTNERSHIPS & INNOVATION WEBINAR SERIES

AUGUST 12, 2021
WHAT IS NARUC

• The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit 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 & Technology Modernization
- Electricity System Transition
- Critical Infrastructure, Cybersecurity, Resilience
- Emerging Issues

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

Source: AEMO
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

**South Australia’s Rapid Uptake of Renewables**
Wind and solar gained traction while coal dropped to zero

*Demand met by renewables: 36% (2015) 60% (2020)*

- Solar
- Wind
- Gas
- Coal
- Other (net)

Source: OpenNEM (AEMO data) IEEFA

**Annual generation by fuel type (2019/20)**

- **Coal**: 68.39%, 135.92TWh
- **Gas**: 8.04%, 15.98TWh
- **Wind**: 7.53%, 14.97TWh
- **Hydro**: 7.12%, 14.15TWh
- **Grid-scale Solar**: 2.93%, 5.82TWh
- **Rooftop Solar**: 5.95%, 11.82TWh
- **Battery Energy Storage Systems**: 0.04%, 0.07TWh

Source: AEMO
Rooftop solar is eating utility solar’s lunch

South Australia had 100% solar for one hour 11 October 2020 (77% rooftop)
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
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:** 1MW - $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)
Thank you

gkuiper@ieefa.org
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)
PEAK SHAVING 101: GENERATE SAVINGS FOR ALL CUSTOMERS

- GMP power supply costs driven by single hour of highest VT demand each month
- Batteries lower the peaks by discharging when demand is highest
“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
“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 PANES 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: https://www.naruc.org/cpi-1/emerging-issues/innovation-webinars/

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

DLIBERATORE@NARUC.ORG
HTTP://WWW.NARUC.ORG/CPI-1