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AutoGríd Virtual Power Plants: Forecasting Capacity

Farshid Arman Sr. Director, VPP Delivery July-18-2023

The Global Leader in Energy Flexibility Management



50+ Global Energy Customers



Flexible Resources



Operational Systems



Trusted by Utilities Globally and in California





Trusted by IOUs, CCAs, MUNIs and Coops



So far, during the summer of 2023, we have dispatched over 150 events

For the combined capacity of 3.5GW



AutoGrid Flex

(used by trading desks, IT)

- Manage dispatch of BTM assets
- Storage optimization across
 1000s of BTM batteries
- Optimize microgrids
- Perform M&V
- Manage **notifications**
- Post event analytics and dashboards

Base Product

AutoGrid FlexSaver

(used by program managers, and marketing)

- Recruit consumers
- Register BDR, EVs, EV Chargers, thermostats, batteries, water heaters (40+ partners)
- Set, calculate all incentives
- Manage referral programs
- Feedback to consumers on participations

Optional Product

MW Delivery

(used by procurement, IT, marketing, and operations)

- Use Flex and FlexSaver to
 create virtual power plant
- Connect to CAISO or other ISOs to place bids then settle
- Marketplace to sell devices
- Incentive payments
- Customer support

Optional Service



Creating and Managing a Virtual Power Plant



The goal is to create MWs of flexible capacity for many years and forecast availability days ahead of time



The Contribution of Each Asset Class to a VPP is Unique



And, other factors, such as local climate, culture, and equity



Challenges to Address

Modeling tools to create VPP

- What combination of devices should be used
- What incentive levels that attract consumers, equitably and profitably
- Forecasting tools for firm commitment
 - Performance by each OEM (Nest is not the same as ecobee)
 - Past performance by service point
 - Opt-out rates
 - Weather forecasts
 - Frequency/distribution of events (third day in a row vs first day)

- Create an availability plan for all 8,760 hours per year
- Create a forecast model for upcoming month (740 hours)
- Create <u>firm commitment</u> for the next 72 hours
 - Updated daily
 - Financial penalties







Workshop on Virtual Power Plants and Demand Flexibility Identifying R&D Needs

David Meyers



Current Capabilities

- Where the shiftable load is
- Shifting technologies
- Signaling*
- Customer drivers: ~elasticities
- Engagement models



AgFIT Participating Service Accounts August - September 2022 Post-Launch Load x Hour of Day Each color = one service account





"California's continuously changing DR market conditions make it difficult for consumers to engage with load modifications"

and '3rd parties'

Î			
			Key Hurdles
	Regional end-use systems and control providers e.g. ?	Regional energy market and technology providers, e.g. Olivine, Polaris	 Data and integrations
			 Patchwork of tariffs, programs, markets
	Global/national end- use systems and	Global/national energy market and technology	 Grid requirements vs. business models
	controls providers e.g. Nest, Siemens, GM, Wiseconn	providers, e.g. OhmConnect, EnelX, Gridium	 Scale and the long tail

Product Focus on Energy

Data and Integrations



- Data and integrations
- Patchwork of tariffs, programs, markets
- Grid requirements vs. business models
- Scale and the long tail

Data and Integrations



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Intelligence – Artificial and Otherwise – Sooner



- Data and integrations
- Patchwork of tariffs, programs, markets
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- Scale and the long tail

Human In The Loop





- Data and integrations
- Patchwork of tariffs, programs, markets
- Grid requirements vs. business models
- Scale and the long tail

Crossing the Chasm



- Data and integrations
- Patchwork of tariffs, programs, markets
- Grid requirements vs. business models
- Scale and the long tail



Intro to Kaluza: How EV managed charging can accelerate decarbonization and flexibility potential

Samuel Goda, Policy & Government Affairs Manager at Kaluza



Kaluza Flex - Unlocking EV Flexibility



World's largest domestic V2G trial and Partnerships





Challenges Barriers to Scale (V2X)



RECURVE

SHAPE THE FUTURE OF ENERGY

What Does Recurve Do?



325,000 kWh 4,000 therms

\$240,000

Creating Equivalency for Resource Procurement

Supply E Demand



Supply: Energy Resources

Demand: Load Modifying Resources

Recurve's Demand FLEXMarket



... is an **open pay-for-performance marketplace** in which Aggregators receive **payments** for the value of energy and peak impacts **at the meter**.

BiocPower Increase your building's profitability with a madern heating and cooling system.	BRIGHT POWER Bright Power Bright Power is the premier previder of energy and water management services.	Carbon Lighthouse Carbon Lighthouse Cut Dengy at a Pontialio Scale. Because one building at a time doesn't cit it.	Elevation Home Energy Solutions We are on a misiton to Elevate the Home Energy Experience.	EVERWATT	Haico Hato a leading residential and commercial energy services provider in NY
CH Energy CH Energy Ch Energy is a separat in providing a turkiew unergy solution.	CLEAResult* CRAResult We note energy afficiency smarter, taster, and more accessible for veryone.	Conectric ^{LOT} Conectric LOT Opristional Asset Risk Management.	Sould Smart Joule Smart And give you passe of annot	Leo I he in a marketplace for grid services, to help balance the grid.	National Resource Management If your business relies on enfrogration systems, RNM has a way to help you.
DIVELET DEND Divident Finance Associates and a finance home supprates	ecobee code A start forme technology hulping a start forme technology hulping starts	EcoGreen Solutions EcoGreen Solutions We held companies save energy and cet costs.	Northern Pacific Power Systems Premier Exergy Sustems for the factors By Area in California	Conconnect Descenter Une exercise yoah i'n closest and earn rewards for saving when it's dury.	Packettee Energy Packettee Energy Packettee Energy makes electricity newble
Ecology Action Ecology Action is creating a througe environment and low- cation ecolomy.	Edgewise norgy Regevise norgy Hisping property waters to improve resiliency, sustainability, and profil.	ELECTROM Investor Electrom Electrom provides a home electrification concorrege marketplace	Sealed Sealed Sealed, they're not just a fantasy.	Swell Energy Swell Energy Swell Energy is an energy and smart grid solutions provider.	Voltus Voltus Better Energy, Mare Cash.

Align Incentives on Performance Value



Electric Avoided Costs By Hour of Day

Demand Flexibility Market

Utilities Pay for Delivered
 Flexibility at the Rate that
 is Cost-Effective Based on
 Time and Locational Price

Payments in MCE PeakFLEX Market

Aggregators include MCE

Seasonal: June 1 - September 30

Daily: Load Reductions or Shifting achieved during peak:

- Gross 4-9 PM: ~\$217/MWh
- Net 7-9 PM: ~\$352/MWh

Events: Up to 12 days (60 hours) called a day in advance and paid out at ~\$2000 per MWh for peak.

RECURVE



Demand FLEXmarket Delivers

- **57%** increase in commercial value delivered
- + 102% MWh realization rate
- + 147k Tons of avoided carbon

508 GWh in lifetime energy savings for the projects installed

RECURVE



Total System Benefit (TSB): The grid value in dallars, based on avoided cost of gas emissions, capacity, energy. T&D and other grid benefits.

Key Policy Challenges

- Technology and resource silos
- Opportunities for value stacking
- Cost-effectiveness approaches

California's policies are not aligned to scale.

^{ng} facilities requirements added additional ^{Ch} California ć R.13-11-005 investment: Senate Bill No. 100 tic rcent manner utility's measures achieving less Safety determined law₁ Senate Bill No. 350 System standards nent procure ancer load penalties targets ned customer established same Chapter wa ement wned set OV reduction need condition necessarv subject used annual tial recast Assembly Bill No. 3232 ad Act options every credit approved other Ctric comprehensive approved Operator Potential Sales powerplant R.19-01-011 ing intent policies more po: Senate Bill No. 700 30 any constructions of the services any constructions of the services and the services are services and the services and the services are services and the services are services and the services are services are services and the services are Senate Bill No. 676 corporations end-use resc subc usesSection authority qua onservation requirement ct new results benefits unless air made