Clean Fuels Development in the Southwest and Related Topics

Figure 2

RoundTable Agenda 26 August 2025

Short Round the Room Introductions

Name, Company, Where you sit in the value chain

Discussion Topic:

Emerald AI:
Workload orchestration for power-aware compute

Led by Aroon Vijaykar, Emerald AI

Roundtable Prompts

AzCaNE | CENTER FOR AN ARIZONA CARBON-NEUTRAL ECONOMY

SHINe

In the spirit of co-opetition, the Industry Roundtable aims to build community and establish a shared understanding of challenges, opportunities, gaps, and needs for a commercially viable clean hydrogen economy in the Southwest and related means to achieve deep decarbonization

Figure 2

RoundTable Agenda 26 August 2025

Roundtable Prompts:

- With AI driving rapid load growth, how might flexible data centers help manage this challenge without waiting years for new infrastructure?
- Beyond reliability, what community or economic benefits could come from treating data centers as “grid allies” rather than grid burdens?
- How do you see utilities, regulators, academia, operators, and industry working together to integrate this kind of flexibility into planning and operations?
- What role could Arizona/SW play in piloting or scaling these kinds of solutions as data centers expand here?

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Emerald AI: Workload orchestration for power-aware compute

Discussion Lead: Aroon Vijaykar

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Emerald AI | Overview for Partners

August 2025

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Emerald AI seeks to unlock multitrillion-dollar investments in AI data centers *today*, overcoming power grid constraints that threaten the AI revolution

- **Emerald AI transforms energy-intensive AI data centers into AI-powered grid allies through a software-only solution** by orchestrating compute power use to access electric grids and bolster grid stability, without compromising compute service.
- **The opportunity is massive:** Roughly 100 GW of data centers could be connected to existing grids *today* if data centers had just modest flexibility. Emerald AI aims to enable data centers & cloud providers to speed time-to-power and stay compliant.
- **Emerald AI successfully proved its technology suite in a first-of-a-kind commercial demonstration in Phoenix in May 2025 at a hyperscaler data center—power utilities and our cloud and AI partners have shared positive feedback**
- **Emerald AI is the only solution to get data centers access to power now** and will complement other solutions in future.

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Agenda

1. About Emerald AI

2. The Data Center Flexibility Opportunity

3. Emerald AI's Technology

4. Deep Dive on Emerald AI's First Commercial Demo

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1. About Emerald AI

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About Us | Investors

Institutional Venture Investors

RADICAL VENTURES

NVIDIA

crv

NEOTRIBE

AMPLO

Select Advisors

David Rousseau *President, Salt River Project*	**Arushi Sharma Frank,** *Fmr Energy Policy Lead, Tesla*
Sean Kelly *CEO, Amperon*	**Astrid Atkinson** *CEO, Camus Energy*
Tyler Norris *Duke University*	**Richard Stuebi** *Boston University*
Frank Lacey *CEO, EAC Advisors*	**Isaac Brown** *CEO, 38 North*

Select Individual Investors

Secretary John Kerry *68th U.S. Secretary of State*	**Tom Steyer** *Co-Chair, Galvanize*	**Mark Gallogly** *Co-Founder, Three Cairns Group*
Fei-Fei Li *Professor, Stanford University*	**Jeff Dean** *Chief Scientist, Google*	**John Doerr** *Chairman, Kleiner Perkins*
Malcolm Turnbull *29th Prime Minister of Australia*	**Kate Brandt** *Chief Sustainability Officer, Google*	**Rich Lesser** *Chairman, Boston Consulting Group*
Chase Lochmiller *CEO, Crusoe*	**Lukas Biewald** *CEO, Weights and Biases*	**Jonathan Frankle** *Chief AI Scientist, Databricks*
David Thorne *52nd U.S. Ambassador to Italy*	**Gerald Butts** *Vice-Chair, Eurasia Group*	**Markus Specks** *Managing Partner, Aventurine Partners*
Anna Patterson *CEO, Ceramic AI*	**Kiran Bhatraju** *CEO, Arcadia Power*	**John Melas-Kyriazi** *CEO, Standard Metrics*
Andrew Dayton *CEO, Constellation Fund*	**Srinivasan Sivaram** *CEO, Quantumscape*	**Michael Minto** *Partner, 38 North Ventures*
Cyrus Navabi *CEO, Qualex-Landmark*	**John and Sherri Goodman** *CEO, Accenture Federal*	**Oliver Cameron** *CEO, Odyssey*
Rashed Haq *VP, Head of AI, Cruise*	**Praveen Tyle** *Founder, Potens Pharmaceuticals*	**Jay Jackson** *VP, Oracle Cloud Infrastructure*

About Us | Team

Leadership

Dr. Varun Sivaram, Founder & CEO

- *Chief Strategy Officer, Orsted (NASDAQ: DOGEF, Fortune 500)*
- *CTO, ReNew Power (NASDAQ: RNW)*

Orsted · ReNew Power · Council on Foreign Relations · The White House · McKinsey & Company

Prof. Ayse Coskun, Chief Scientist

- *Professor, Boston University*
- *Director, Center for Information Systems and Systems Engineering*

Boston University · Oracle · CISE · Sun microsystems

Aroon Vijaykar, SVP Commercial

- *Sunrun (NASDAQ: RUN) Head of Corp Dev; GM and leadership team of three businesses: AEE Solar; Snapnrack; & Virtual Power Plants*
- *Investor at Partners Group; Consultant at Monitor Deloitte*

Partners Group · Sunrun · Monitor Deloitte

Shayan Sengupta, Head of Engineering

- *Amazon Web Services EC2 Nitro Storage Leader*
- *Led 50+ engineers, managing 100,000 specialized GPU servers for AWS clients*

aws · intel · Altera

Core Team

Dr. Daniel Wilson

intel · NetApp

Dr. Philip Colangelo

AMD · groq · intel

Chris Williams

lyft · Remedy Robotics · State Street

Dr. Ciaran Roberts

SPAN · Berkeley Lab

Jack Megrue

Barclays · Dyson, Cornell SC Johnson College of Business

Ethan Tiao

Stanford University · The White House

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About Us | Founder

UNIVERSITY OF OXFORD

Stanford University

Varun Sivaram, Ph.D.

Founder & CEO, Emerald AI

- **Boards**: Atlantic Council, Stanford University Doerr School of Sustainability
- **Books**: *Taming the Sun* (2018), *Energizing America* (2020), *Digital Decarbonization* (2018)
- **Education**: Ph.D. Condensed Matter Physics, Oxford University (Rhodes Scholar); B.S., B.A., Stanford University
- **Awards**: TIME 100 Next, World Economic Forum Young Global Leader, MIT Top 35 Innovators

Ørsted
Chief Strategy and Innovation Officer

White House
Sr. Advisor to Sec. John Kerry;
Managing Director for Clean Energy, Innovation and Competitiveness

COLUMBIA UNIVERSITY
Columbia University
Faculty, School of International & Public Affairs

ReNew POWER
ReNew Power (NDAQ: RNW)
Chief Technology Officer

COUNCIL on FOREIGN RELATIONS
Council on Foreign Relations
Director, Program on Energy & Climate

McKinsey & Company
McKinsey & Company
Consultant

City of Los Angeles
Sr. Advisor to the Mayor

15 years in energy industry, C-suite at 2 public companies including Ørsted (Fortune 500 clean energy major) and former Senior U.S. diplomat

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About Us | Press from July 1 Unstealthing

Recent Press

Press Release Pickup

- The press release was picked up by 230 outlets, with a combined potential audience of 96 million viewers, including Yahoo Finance and AP
- The release was distributed to another 956 outlets through the Associated Press
- 140 credentialed journalists viewed the release via PR Newswire's journalist-only outlet
- The release was 1,831 times on PR Newswire, with 232 clicks through to the links included in the release

News Coverage

- **6 stories earned across leading names:** Axios, Politico, Data Center Dynamics, Latitude Media, BU CISE, Sherwood News
- **8 newsletters:** Axios (Pro Rata, Generate, AI+), Fortune Termsheet, Pitchbook Daily Pitch, WSJ Pro Venture Capital, Heatmap AM

Social Media Launch

- X/Twitter
  - Emerald AI's post: 4,061 views, 5 reposts, and 14 likes
  - Varun's post: 16.7K views, 20 reposts, and 94 likes
- LinkedIn
  - Emerald AI's post: 44 likes, 2 comments
  - Varun's post: 501 likes, 86 comments, 24 reposts

AXIOS

Nvidia stakes new startup that flips script on data center power

AI giant Nvidia and boldface names in tech and finance are backing a new startup that aims to transform data centers into flexible grid assets instead of liabilities…. There's growing interest in data centers' flexibility to lower power use for limited stretches.

The Economist

How Managing Energy Demand Got Glamorous

Emerald ai, an American startup, recently showed it can cut power use at ai data centres with software to manipulate computational loads without meaningful loss of performance. The economic logic is compelling.

POLITICO

Nvidia-backed startup wants data centers to be grid assets

A new software startup backed by chipmaker Nvidia aims to solve a crucial problem as data centers proliferate: how to stop the power-hungry operations from crashing the grid. Emerald AI…orchestrates and coordinates artificial intelligence workloads in real time to avoid straining the grid in times of peak demand.

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2. The Data Center Flexibility Opportunity

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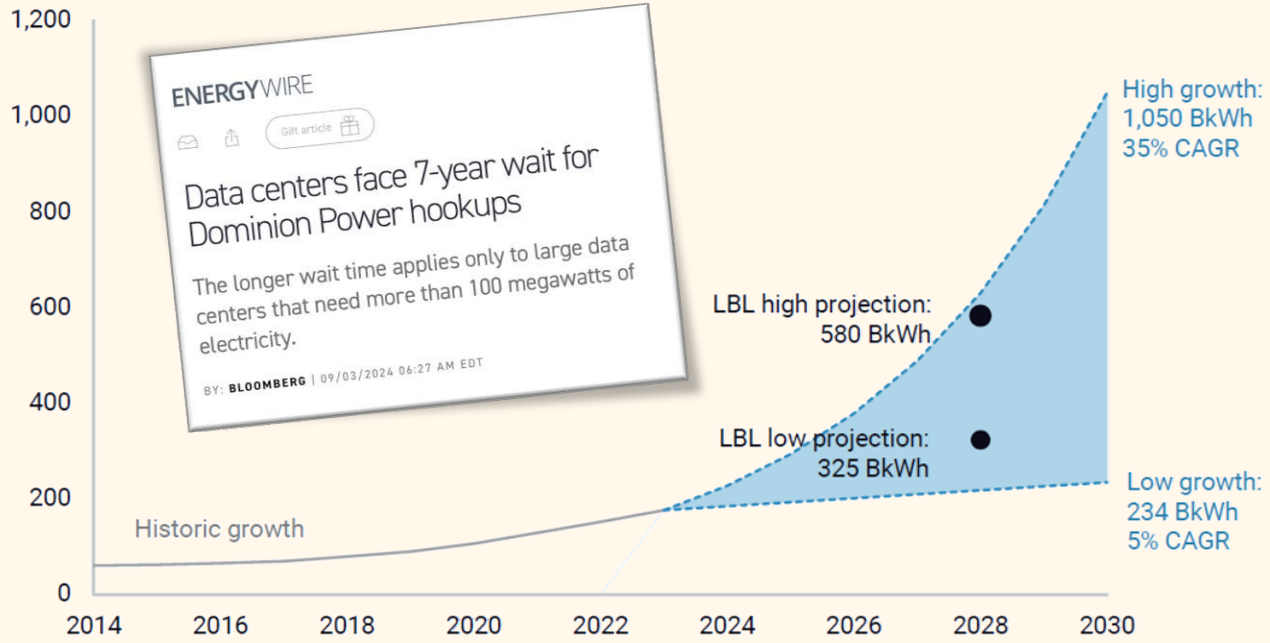
A looming power crunch could stunt AI's growth

Power grid & generation constraints are the binding constraint on AI growth…

Historical and expected electricity demand growth from data centers, 2014-2030
Billion kilowatt-hours



ENERGYWIRE

Gift article

Data centers face 7-year wait for Dominion Power hookups

The longer wait time applies only to large data centers that need more than 100 megawatts of electricity.

BY: BLOOMBERG | 09/03/2024 06:27 AM EDT

Source: Rhodium Group, Lawrence Berkeley Lab

…and new infrastructure is slow to build and expensive

> **Gas-fired generation is moving forward but won't be available at scale until 2030** and then only in certain pockets of the U.S. **…gas-fired generation is more expensive than it has been,** -
>
> John Ketchum, Chairman, President & CEO, NextEra
> NEE Q4 Earnings Call, 01/24/2025

> **Gartner Predicts Power Shortages Will Restrict 40% of AI Data Centers By 2027**

50-100 GW

The incremental power required through 2030 to support data center demand growth

Source: Company filings and press releases, Bloomberg, Goldman Sachs research, Gartner, BCG, BNEF, NERC, Barclays research, Cushman & Wakefield research.

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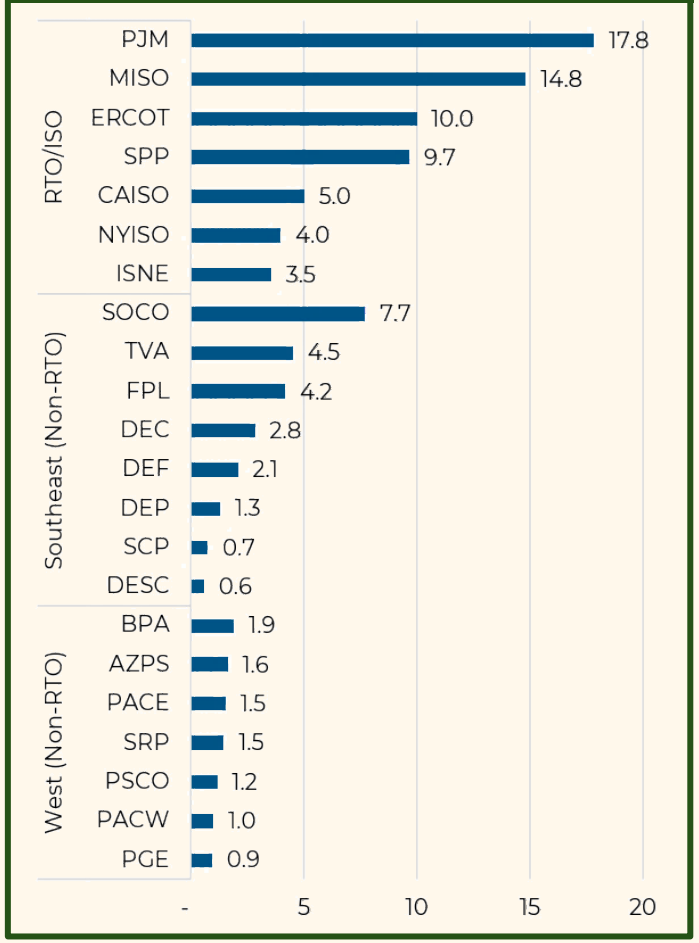
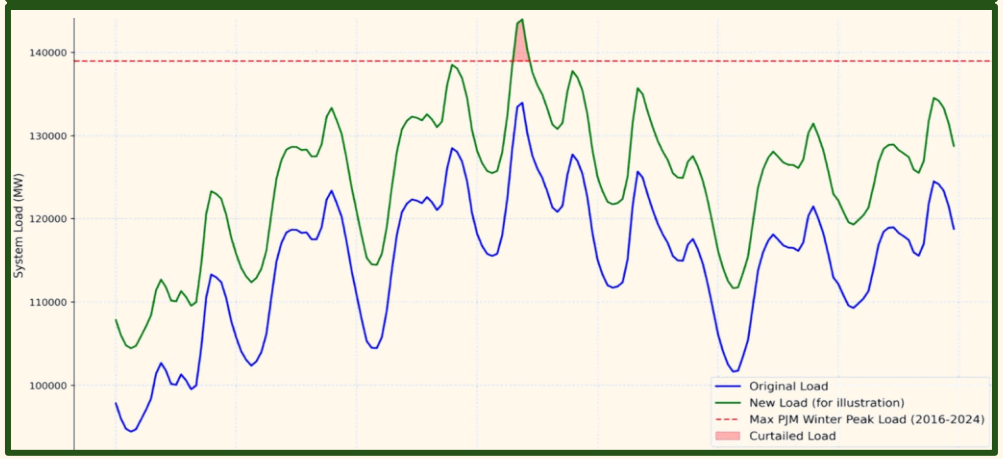
Power Demand Flexibility Can Bring AI Online—*Now*

Roughly 100 GW of new data centers could be connected to US power grids today—without new grid or power plant infra—using just modest load flexibility. More than 4 Project Stargates!

New capacity with 0.5% Load Flexibility (GW)



How flexibility enables new loads to utilize existing power system



Emerald AI is a First Mover (Duke, 2025)

Category	Examples
Operational flexibility	· Google deployed a "carbon-aware" temporal workload–shifting algorithm and is now seeking to develop geographic distribution capabilities (Radovanović 2020). · Google data centers have participated in demand response by reducing non-urgent compute tasks during grid stress events in Oregon, Nebraska, the US Southeast, Europe, and Taiwan (Mehra and Hasegawa 2023). · Startup companies like Emerald AI are developing software to enable large-scale demand response from data centers through recent advances in computational resource management to precisely deliver grid services while preserving acceptable quality of service for compute users

Source: Norris et al., Duke University, 2025

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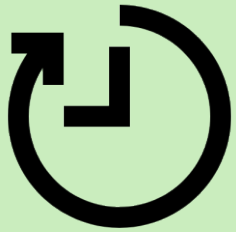
Unlocking the Value of Flexibility

Four distinct value streams for data center owners and cloud service providers`

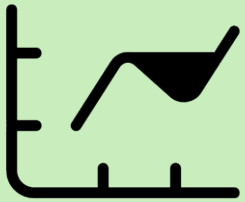
1 Faster Time-to-Power

- Dominion Energy: 7+ year wait time
- Centerpoint Energy: 700% increase in data center queue
- **APS, ERCOT, others developing priority interconnection for flexible loads**



2 Increased Interconnection Capacity

- Utilities and transmission service providers limit load capacity based on worst-case load study results
- **Flexible loads can be interconnected at higher capacities (e.g., 400MW->500MW)**



3 Mandate Compliance

- Grid reliability and price affordability are suffering around the country.
- **Demand response mandates are coming: e.g., legislation already proposed in TX, VA.**

4 Flexibility Revenues

- As peak demand soars, regional power systems are increasingly desperate for shock absorbers.
- **Skyrocketing flexibility revenues in 2025 could become material.**

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3. Emerald AI's Technology

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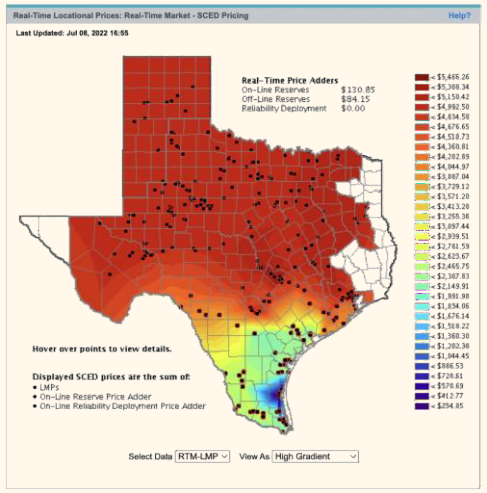
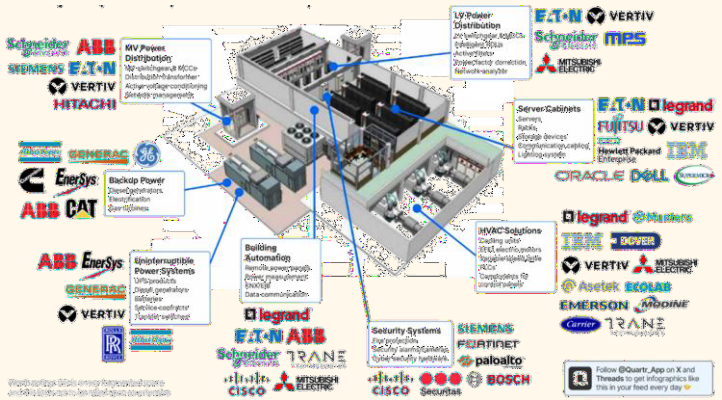
Emerald AI
Turning energy-intensive data centers into AI-powered grid allies

Emerald Conductor

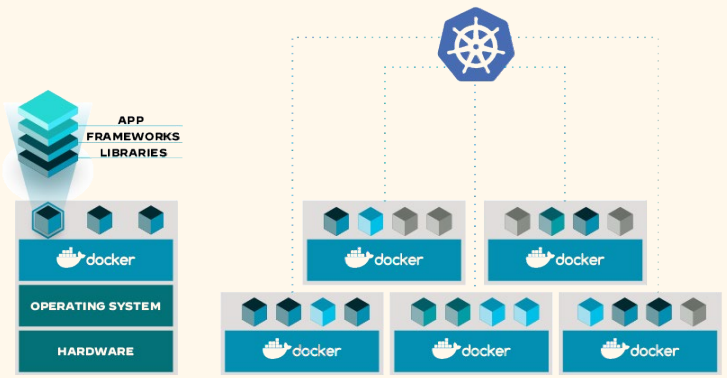
Power Markets & Grid Signals



Data Center Physical Infrastructure Controls



Computing Workload Orchestration



Source: ERCOT, Quartr, Palo Alto Networks

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Building Intelligence at the Grid-Data Center Interface

Ultimately, Emerald AI's technology stack will address transient power fluctuations from AI workloads to hours-long grid demand response performance—and everything in between

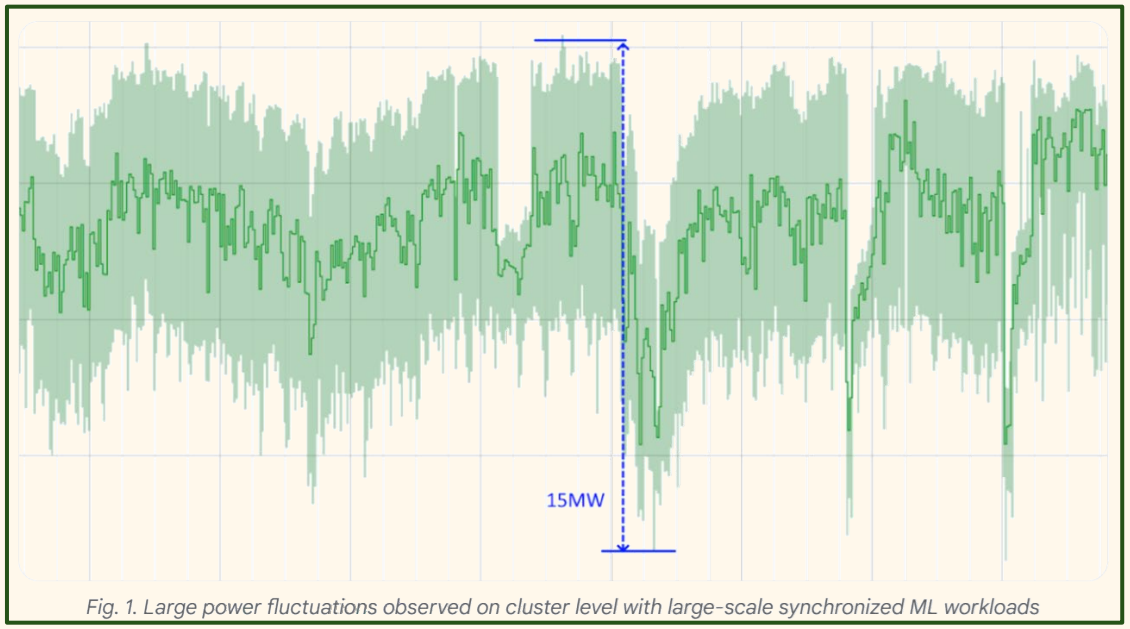
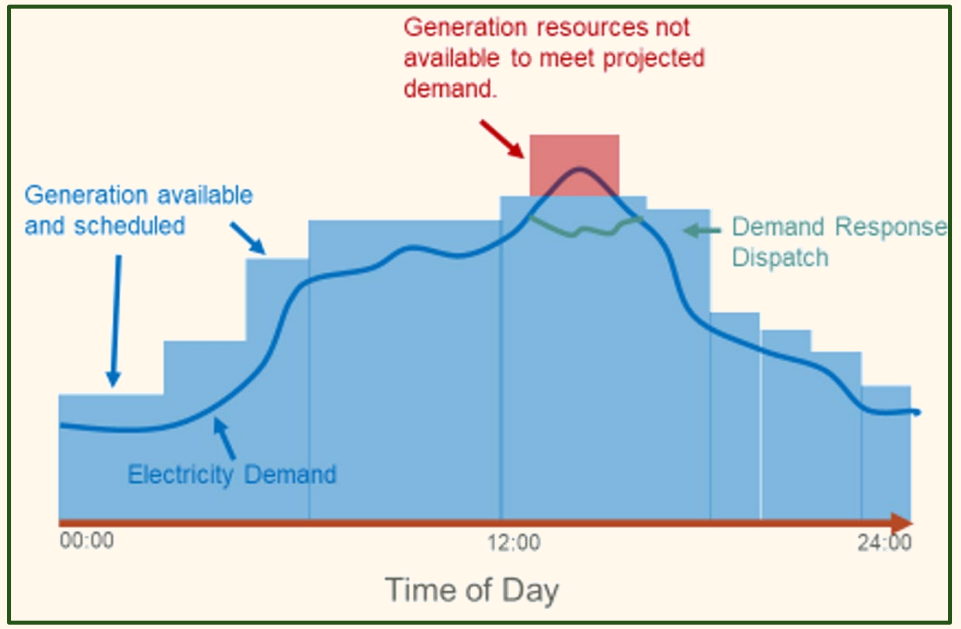


Fig. 1. Large power fluctuations observed on cluster level with large-scale synchronized ML workloads



Milliseconds *Hours*

Source: Google, CPower

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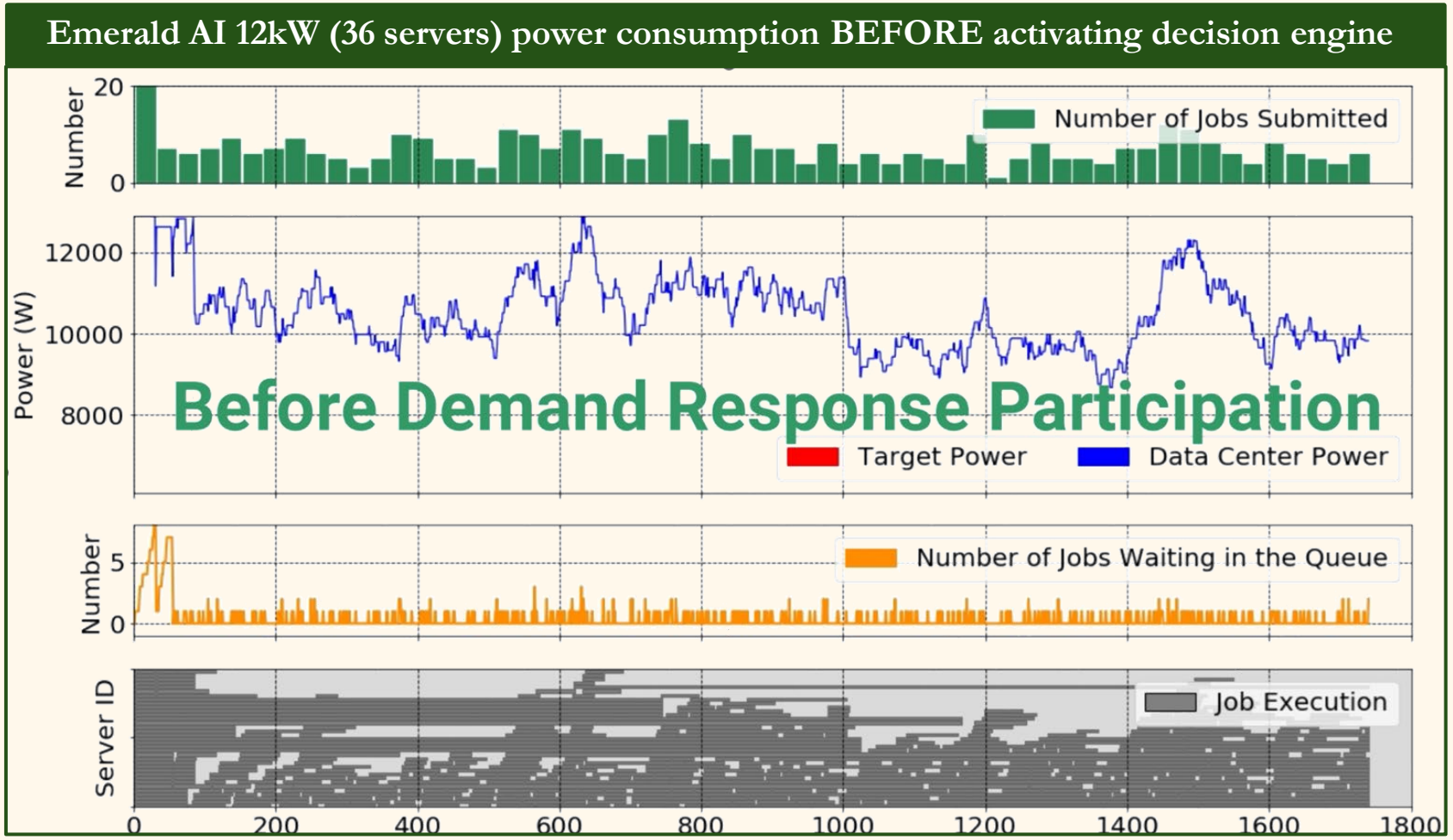
Emerald AI prototype aimed to show compute flexibility…



Source: Coskun et al., 2024

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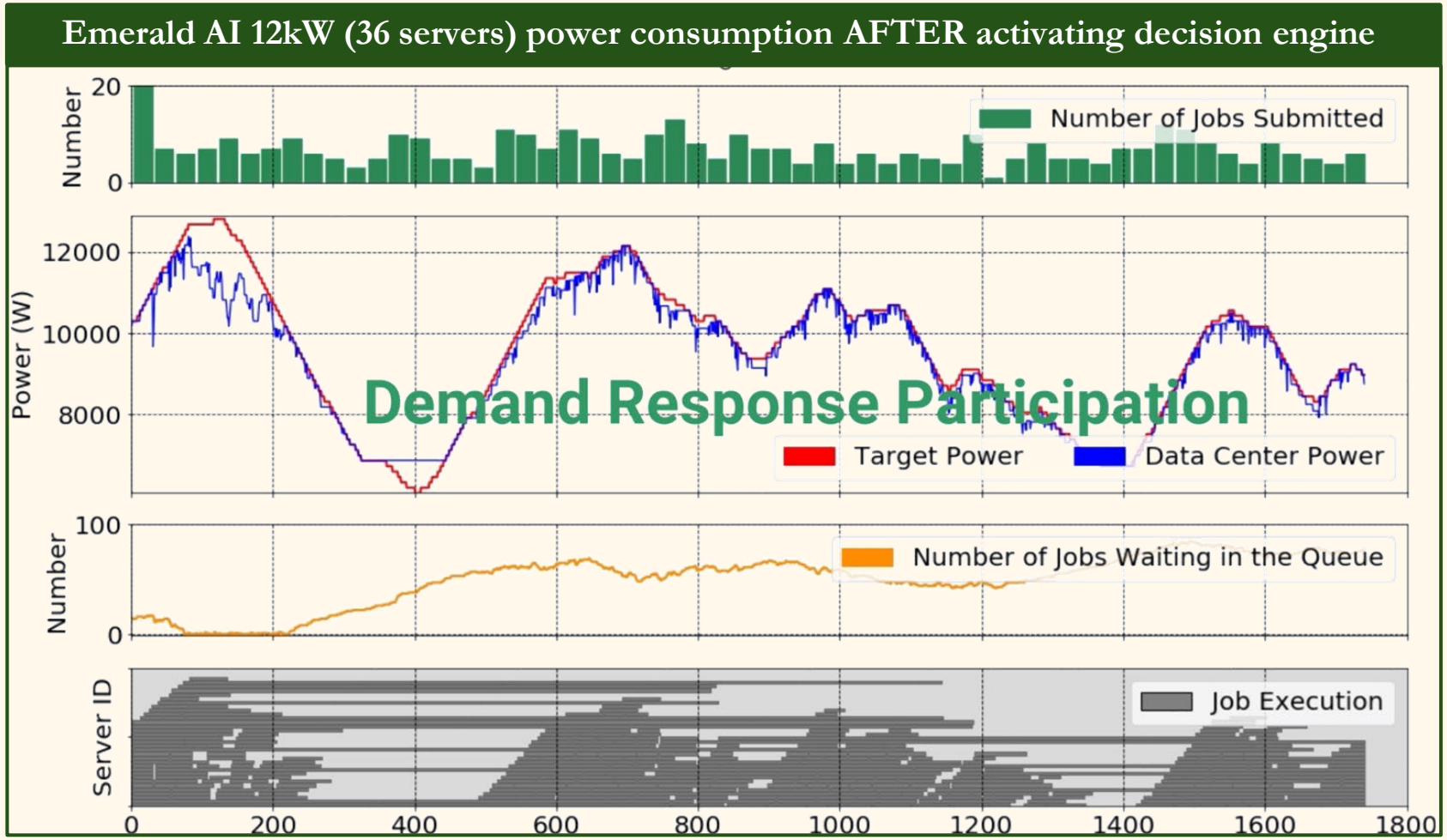
…and succeeded, meeting power grid AND compute user needs



Source: Coskun et al., 2024

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4. Deep Dive: Emerald AI's First Commercial Demo

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Overview of May 2025 Phoenix, AZ Technology Demonstration

The Phoenix demonstration convened Oracle (hyperscaler), Databricks (AI customer), NVIDIA, EPRI, and local power utilities, to orchestrate a GPU cluster to meet grid AND compute user needs

Hyperscaler Phoenix Data Center

AI Customer Cluster

databricks

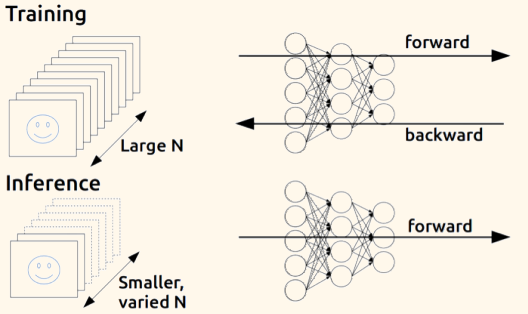
NVIDIA

ORACLE

256
A-100 GPUs

DCFlex

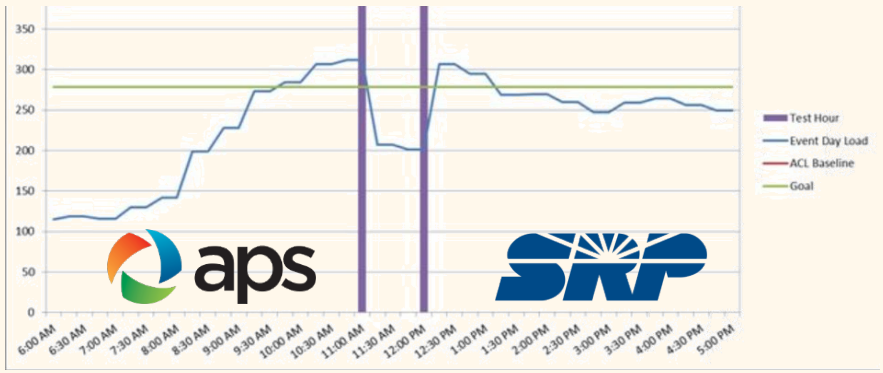
Orchestration of Representative AI Ensembles



Ensure acceptable Quality of Service (QoS)

- Runtime
- Throughput

Phoenix Utility Demand Response Demonstration



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How it works: Flow from Event Trigger to Software Execution

Demand Response Event Trigger

Automated Response

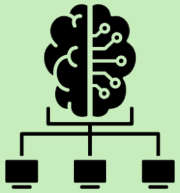
- In response to a utility demand response signal, the Emerald AI software stack executes a response—**no manual intervention necessary.**
- In future demonstrations, we will build a full telemetry link to the utility to enable demand response on timescales from seconds to minutes.

Emerald Simulator *"ES"*

Fully Simulated Future Courses of Action

- Upon receipt of the demand response signal, **ES simulates numerous orchestration options for AI workloads**
- Understanding the performance constraints of the grid and of the AI jobs, the simulations optimize for the quality of service for the AI customer

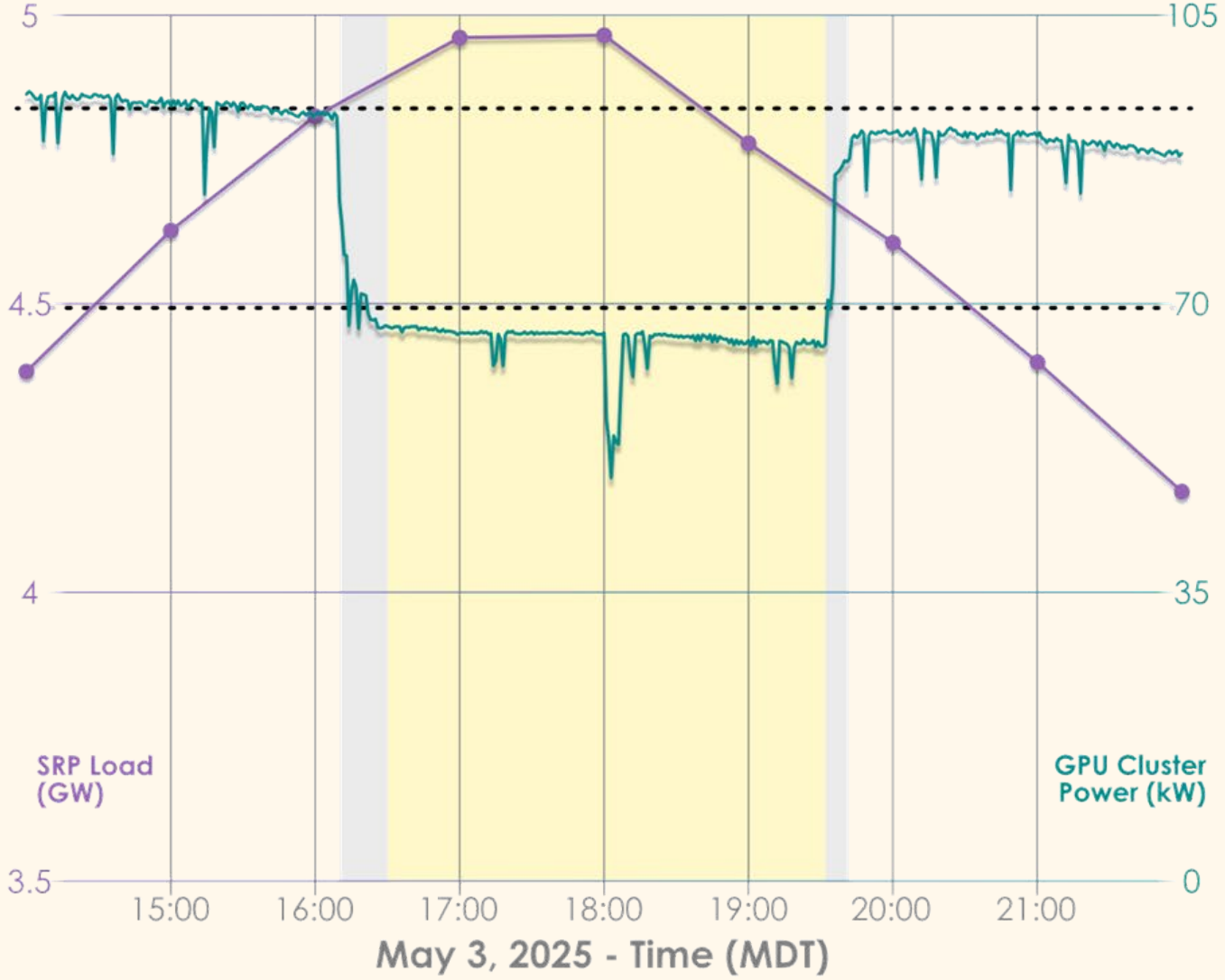
Emerald Conductor *"EC"*



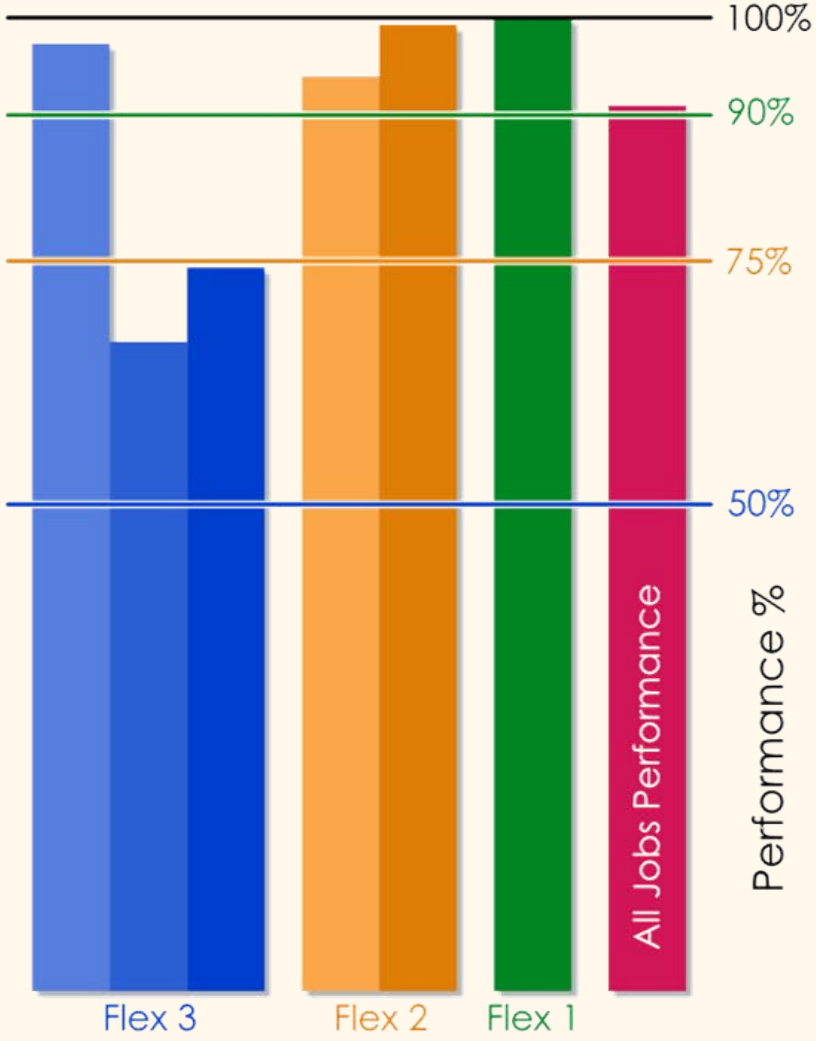
Verifiable Achievement of Grid & AI Objectives

- EC leverages the ES results to orchestrate the data center workloads—and **the results match the simulation with high fidelity.**
- Conducts the **optimal outcome for both the power grid objectives and the compute customer's service level agreement**

AI Cluster Achieves Demand Response Objectives in Phoenix



Job Performance By Flex Tier



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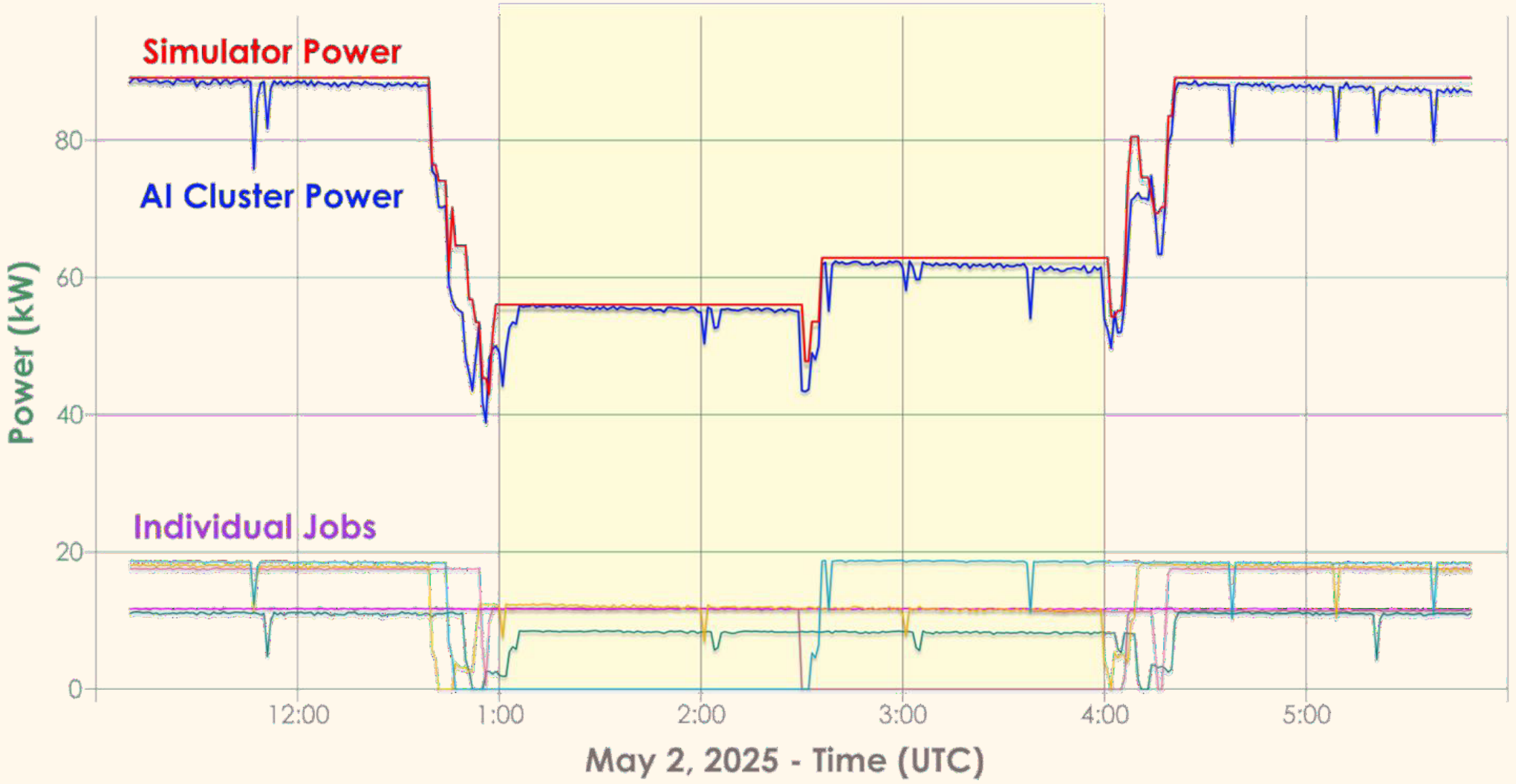
The strong match between forecast and actuals suggests grid planners can confidently rely on Emerald's technology when approving interconnection



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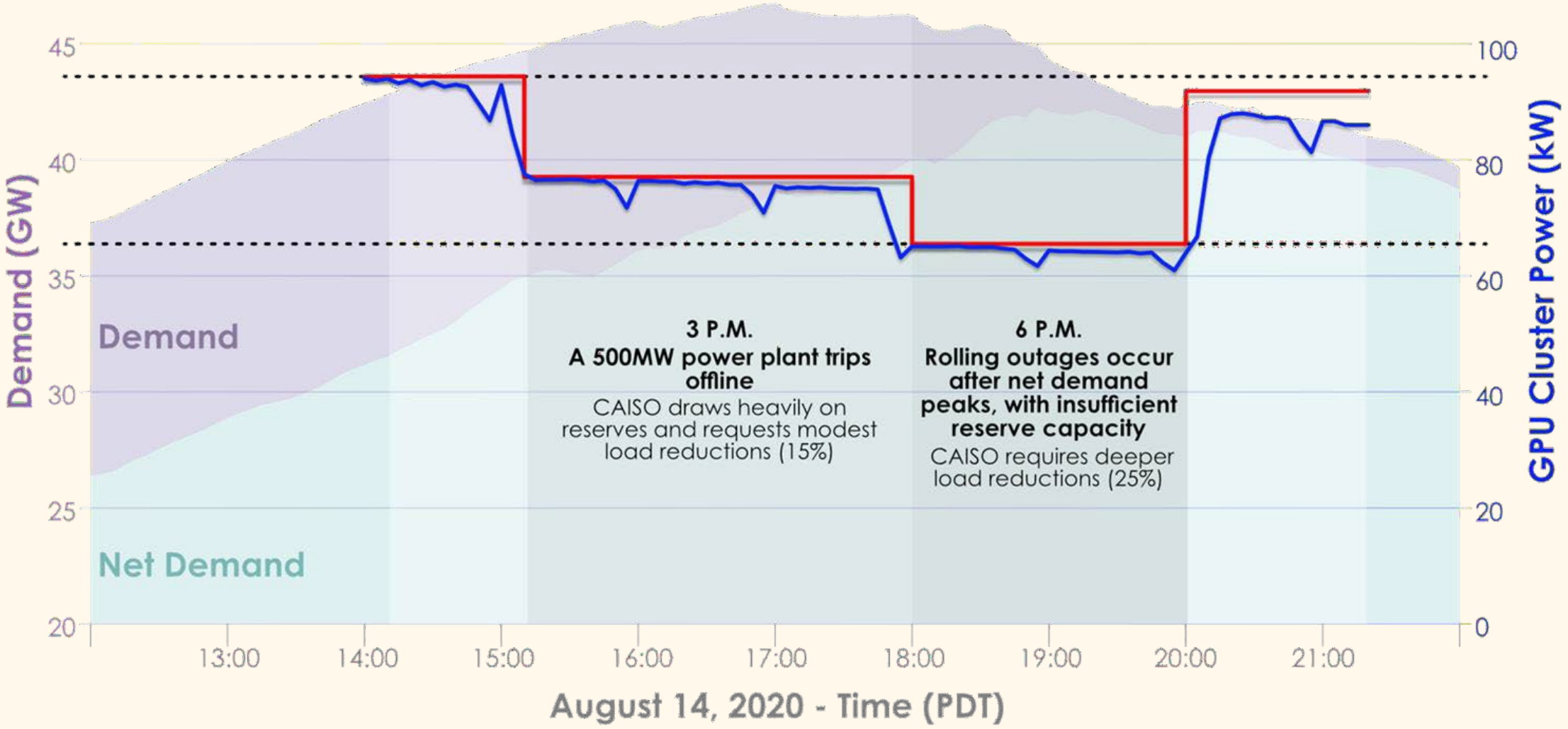
We also demonstrated the ability to generate a more complex load profile aligned with a real-world grid event from CAISO



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Thank you

Contact Us:

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Aroon Vijaykar, ***SVP Strategy & Commercial:*** aroon.vijaykar@emeraldai.co

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Figure 2

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- Beyond reliability, what community or economic benefits could come from treating data centers as “grid allies” rather than grid burdens?
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- What role could Arizona/SW play in piloting or scaling these kinds of solutions as data centers expand here?

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AzCaNE | CENTER FOR AN ARIZONA CARBON-NEUTRAL ECONOMY

Thank you for your participation

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