Florida Public Service Commission

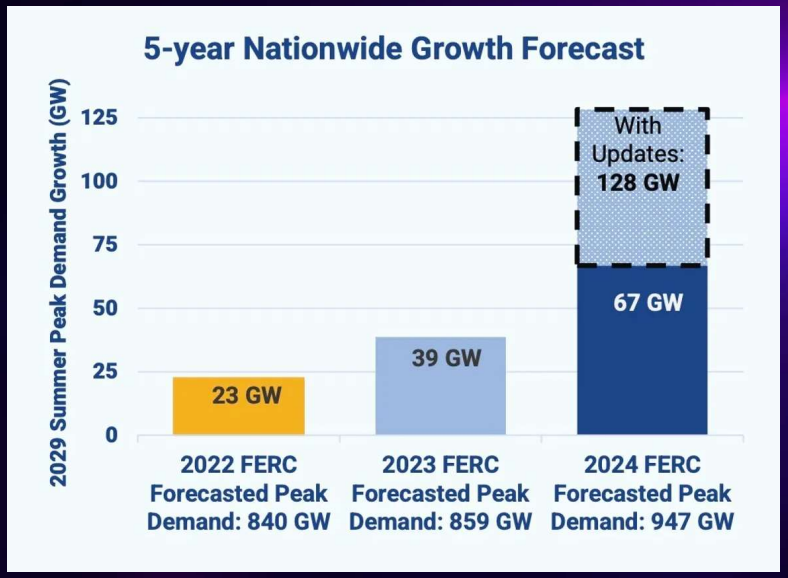
Emerging Technologies to Meet Accelerated Demand Growth

10 Year Site Plan Workshop

Morgan Scott
Vice President, Global Partnerships & Outreach, EPRI

U.S. Grid Growth Continues to JUMP

…and it's still climbing

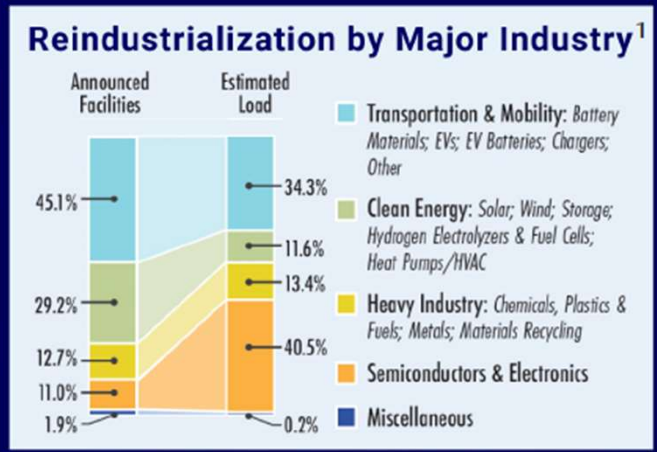


Source: Canary Media

The BIG (Demand) Picture

Industrial:

From Jan 2021 – May 2024, **534** new or expanded manufacturing facilities accelerating from COVID, CHIPs and IRA legislation.



Electrification:

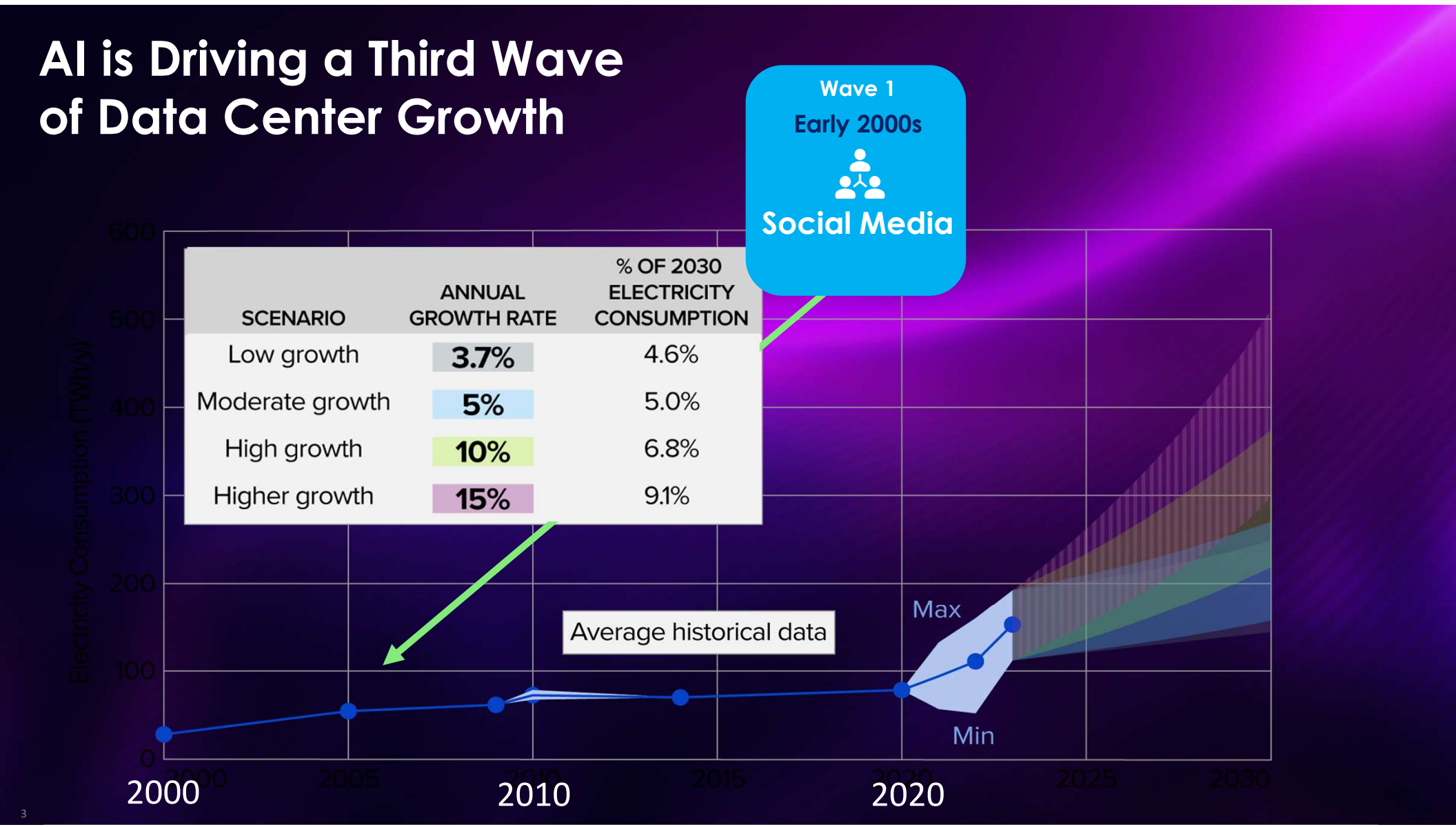
In 2024 - EV sales increased **15%**; electric heat pump sales surpassed gas furnace sales **32%**[3]

Computation:

Data center load could rise from **4.4%** of U.S. electricity demand to **12%** by 2028.[2]

Sources: 1. EPRI, 2. Berkeley Lab, 3. IEA

AI is Driving a Third Wave of Data Center Growth



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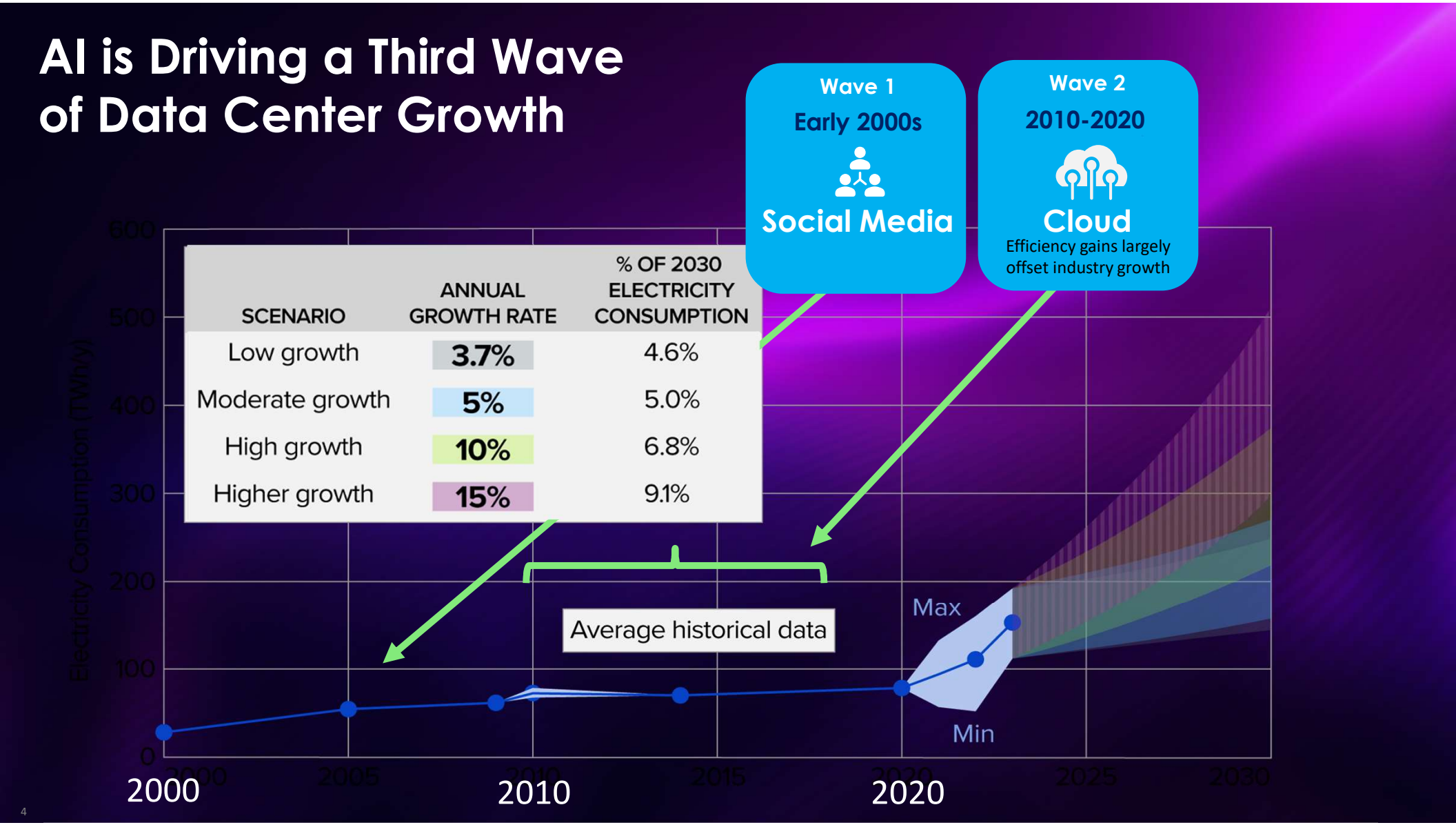

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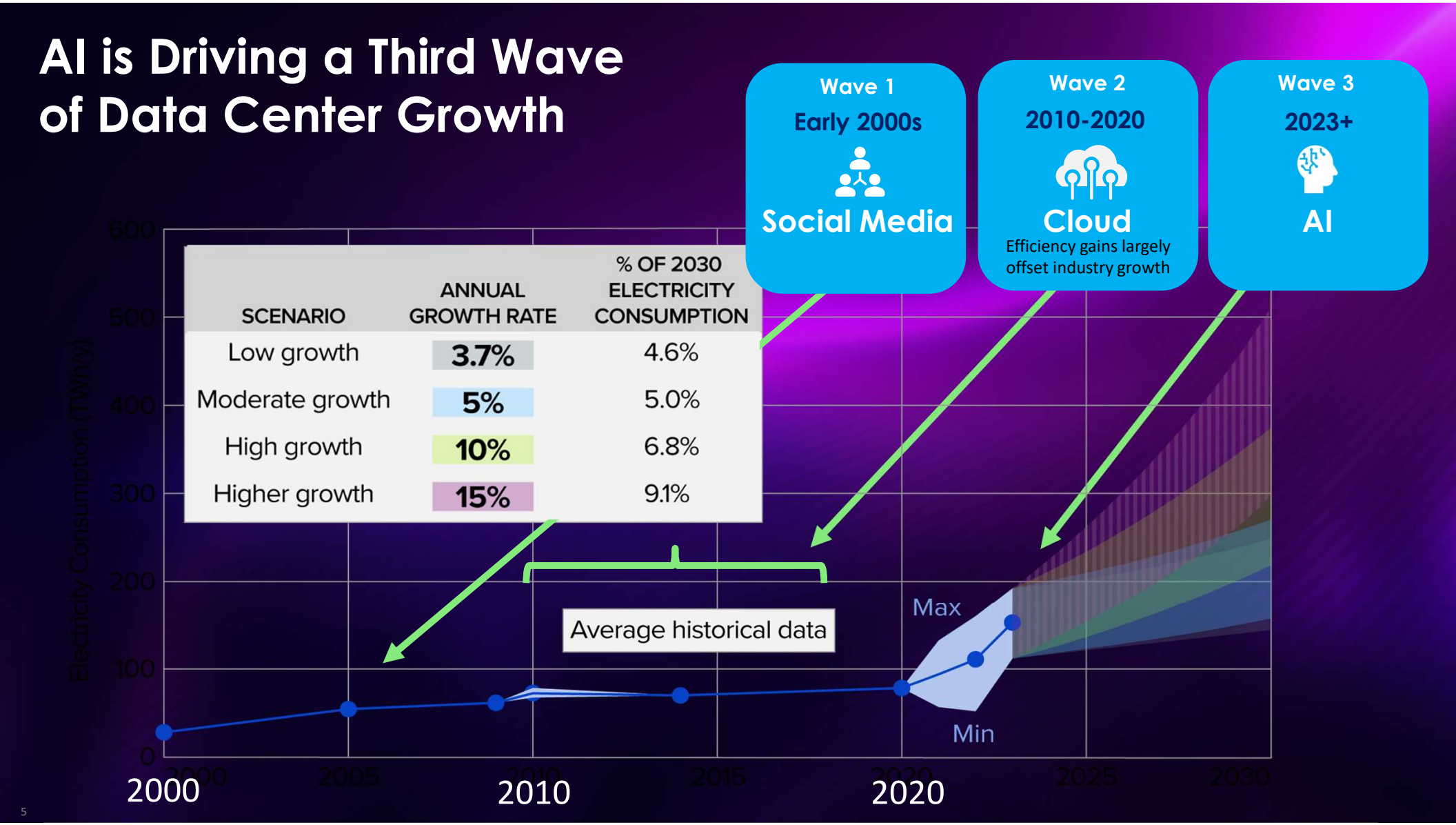
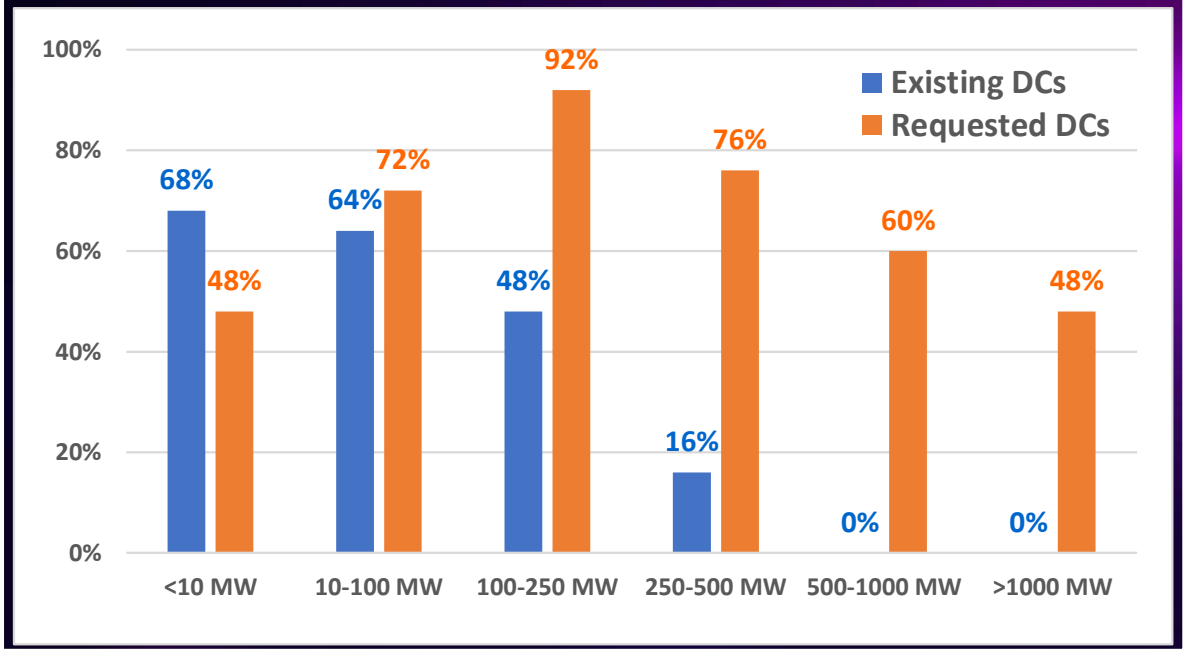


New Data Center Demands Growing

Size of Data Centers Served and New Service Requests (% of 25 Utilities Surveyed)



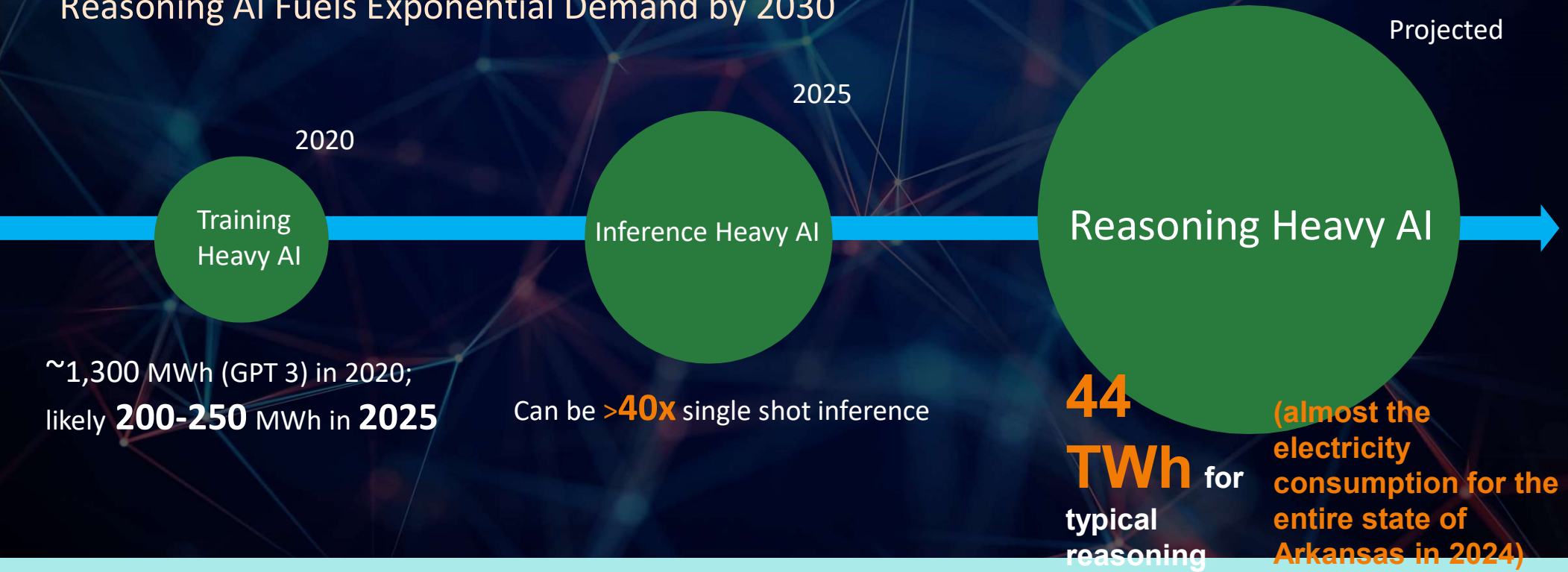
Key Points From Respondents

- All operating data centers today are less than 500 MW
  - Most < 100 MW
- 60% of respondents have requests for more than 500 MW
- 48% have single requests for more than 1000 MW

Faster than supply and delivery buildout

Let's Be Real: Demand Growth Despite Efficiency Gains

Reasoning AI Fuels Exponential Demand by 2030



~1,300 MWh (GPT 3) in 2020; likely **200-250** MWh in **2025**

Can be >**40x** single shot inference

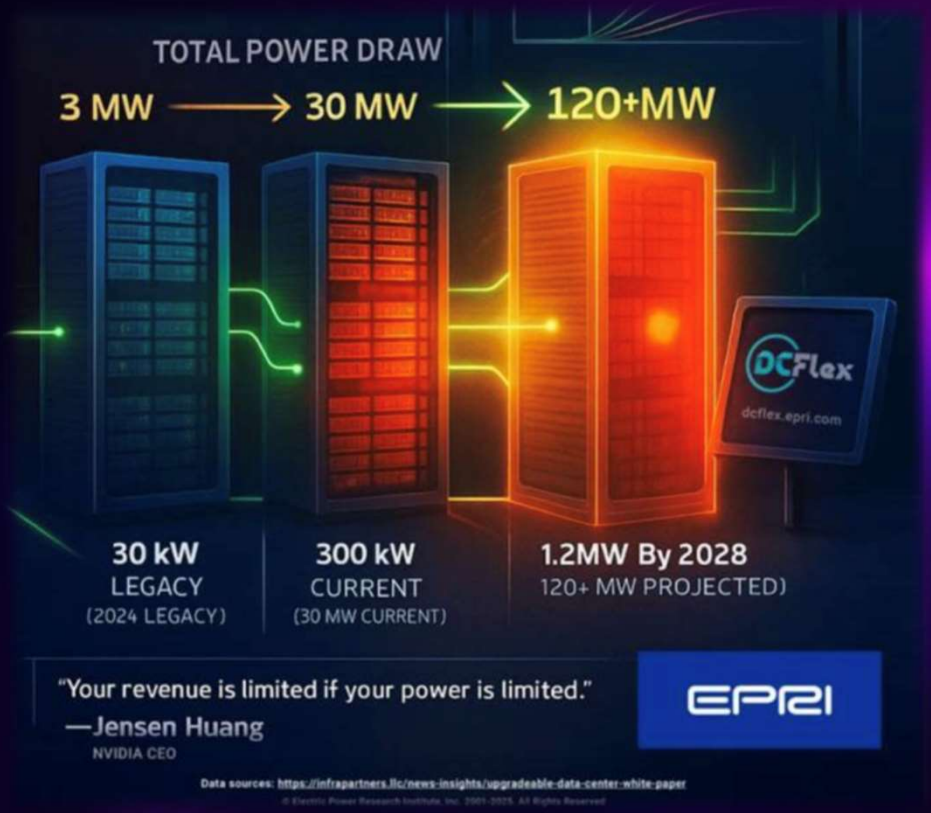
44 TWh for typical reasoning queries

(almost the electricity consumption for the entire state of Arkansas in 2024)

The escalating complexity of AI tasks and the exponential growth in usage drive a surge in overall computational demand and electricity consumption, despite efficiency gains.

Evolving a Complex Power System

The Power is in the Density



- AI Hardware Lifecycles are shrinking dramatically.
- Racks that are packaging these new chips are also getting more power dense within this life cycle.
- What was historically 10–15 years, is now just 3–6 years. Notably, GPU utilization rates are so high (60–70%) that these chips often become obsolete in 1-3 years.

Flexible ramp rates, rate structures, and scalable T&D infrastructure are critical to accommodate future growth.

What Can We Do to Meet This Demand Growth?

EXTEND THE LIFE OF TODAY'S ASSETS.

INCREASE THE UTILIZATION OF TODAY'S ASSETS.

MAKE ROOM TO BUILD NEW ASSETS.

Urgent Need to Accelerate Emerging Dispatchable Technologies

Nuclear

Advanced Geothermal

CCS

Emerging Fuels

LDES

From 1st of a Kind

...to Nth of a Kind

EPRI Supported Testing of Hydrogen for Power Generation

Hydrogen Testing Objectives

- Operate unit without major modifications
- Measure impacts on CO_2, NOx, CO, and unit performance
- Develop best practices for hydrogen blending
- Provide input on priorities for R&D needs

NEW YORK STATE OF OPPORTUNITY. | NY Power Authority

44%v | GE LM6000
(45 MWe - Aeroderivative)

Executive Summary report

Georgia Power

20.9%v | Mitsubishi 501G
(265 MWe – Heavy Frame)

White Paper report

WEC Energy Group

25%v | Wärtsilä RICE
(18 MWe – RICE)

Executive Summary report

Constellation.

38%v | Siemens **SGT6-6000G**
(246 MWe – Heavy Frame)

Press Release

Hydrogen Blending Demonstration Synopsis: EPRI-Affiliated Testing Summary (Report)

GET SET
Grid-Enhancing Technologies for a Smart Energy Transition

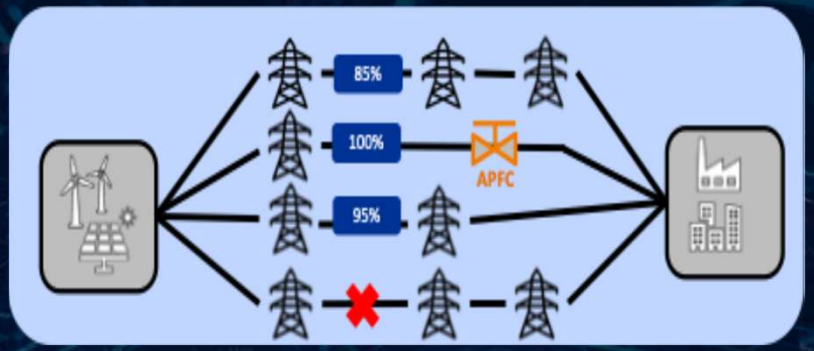
Unlocking Extra Transmission Capacity

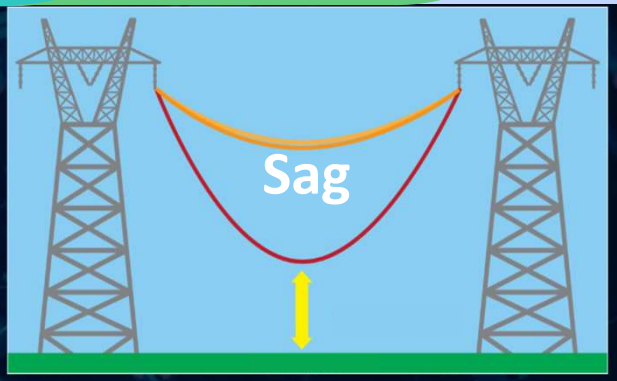
Advanced Conductors | Dynamic Line Ratings | Advanced Power Flow Controllers | Planning | Operations

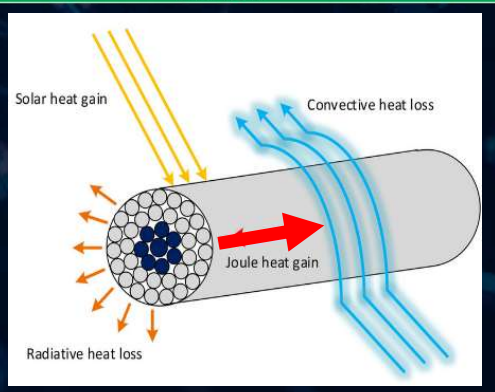
Higher Temperature Operation

Lower Sag as Temperature Increases

150 - 210°C







Lab Testing

Lenox
7 DLR
Technologies

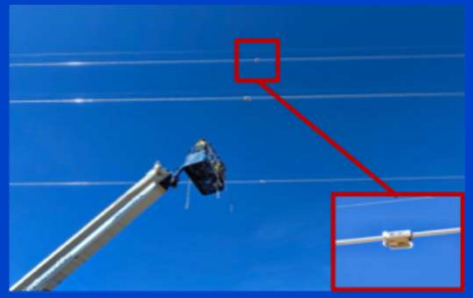
Charlotte
8 Advanced
Conductors
Types

Lenox/
Charlotte
SmartValve

Monitored Pilots

29 Sites @
6 Utilities

2 Sites



1 Sites +
Interest
Group

Ops & Planning

Planning Framework
Inform compliance with FERC O1920 & O2023

Implementation and Operations Playbook
Practical guidelines for operators & engineers to implement and operate GETS

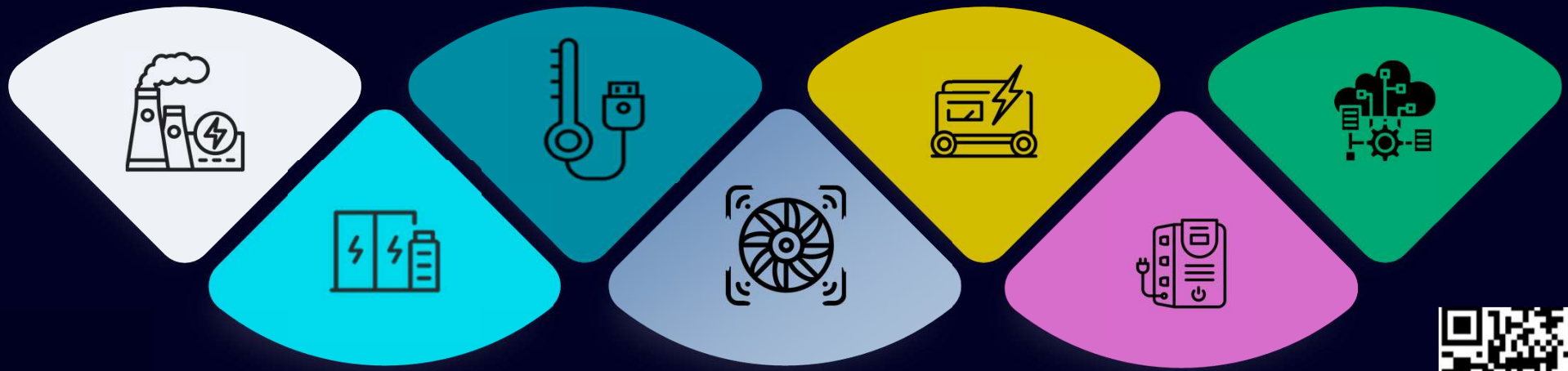
GET SET
Grid-Enhancing Technologies for a Smart Energy Transition

Affinity Group

DOE
Technology Providers
Regulators
Etc.

Technical Basis/Guidance to Select, Specify, Install & Maintain

Where Does Flexibility Lie Within a Data Center?



DCFlex Participants

Developers

COMPASS datacenters

QTS

Hyperscalers

Google

Meta

Microsoft

IPPs

CALPINE

Constellation

Jupiter POWER

nrg

VISTRA

ISO/RTO

California ISO

ercot

ieso

MISO

pjm

SPP Southwest Power Pool

Other

BLACK & VEATCH

ING

QUANTA

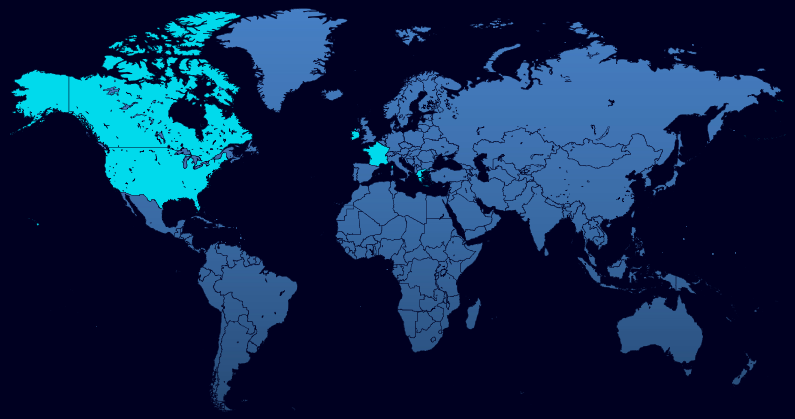
wesco

Technology Providers

CATERPILLAR

NVIDIA

Schneider Electric



Utilities

aps

AEP

Dominion Energy

DUKE ENERGY

EAST KENTUCKY POWER COOPERATIVE

ENOWA. NEOM

ESB Energy for generations

exelon

Georgia Transmission

LES

LCRA

Nebraska Public Power District

NEW YORK STATE OF OPPORTUNITY NY Power Authority

OglethorpePower

PGE

ppl

PSEG

REC Rayburn Electric

RTÉ

SRP

Southern Company

Initial Demonstration Projects

Compute Flexibility, Grid Services

Arizona

Emerald AI, Arizona Public Svc.

Compute Flexibility

- Reducing load by up to 25%
- Matching utility program parameters
- Ramping capabilities
- Eliminating snap back potential

North Carolina

Google, Duke Energy

Compute Flexibility

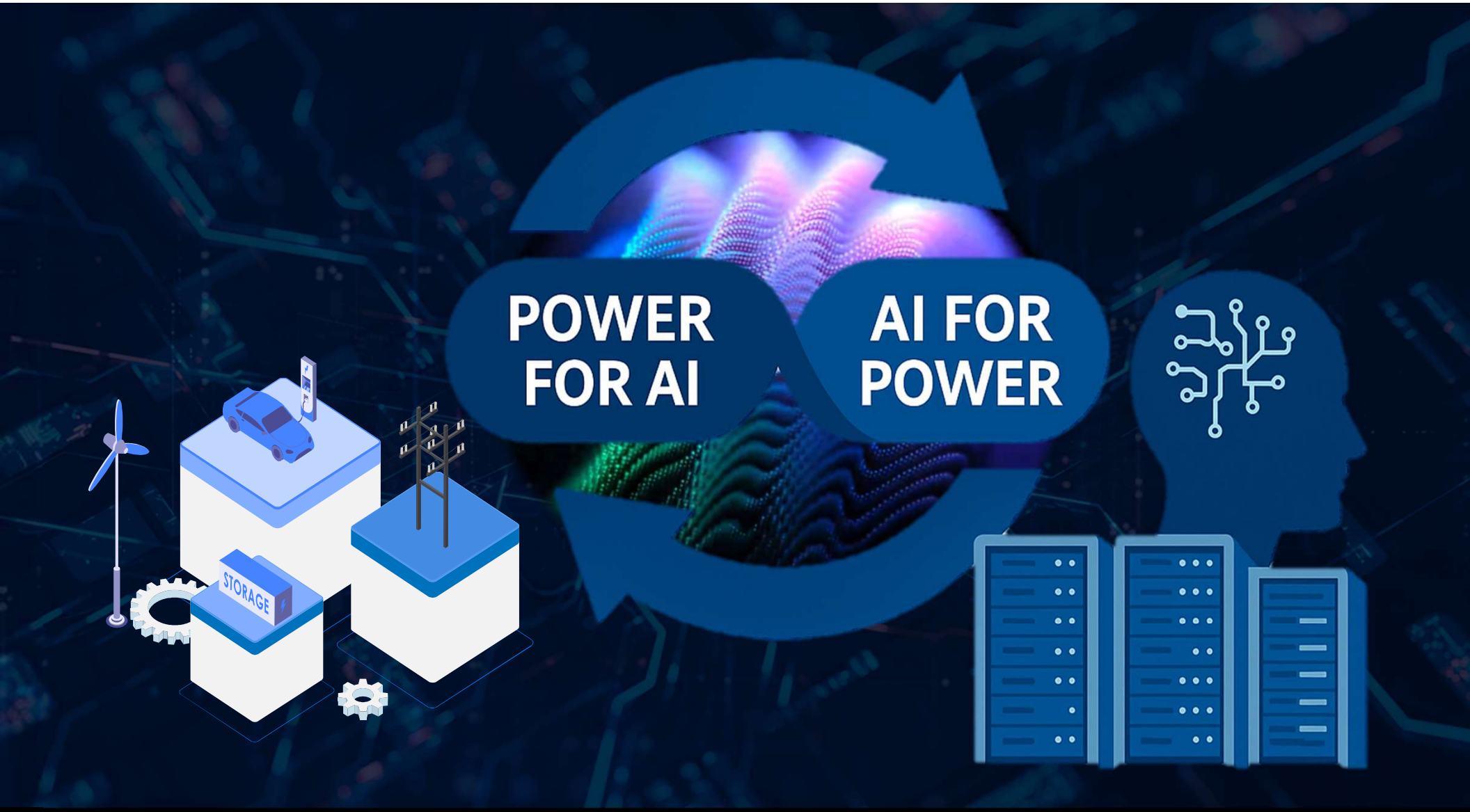
- Reducing electric load up to 20%
- Testing signaling and response times/durations
- Addressing various communications protocols

France

Schneider Electric, RTE

Ancillary Services to the Grid

- Fast frequency response
- Ride through
- VAR support
- Under frequency load shedding



LLM Refinement with More Relevant Data Increases Performance

www.epri.com