The Third Electric Energy Transition Calls for Geothermal Energy Assurance

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GRC

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Three Major U.S. Electric Energy Transitions Have Occurred Since 1930

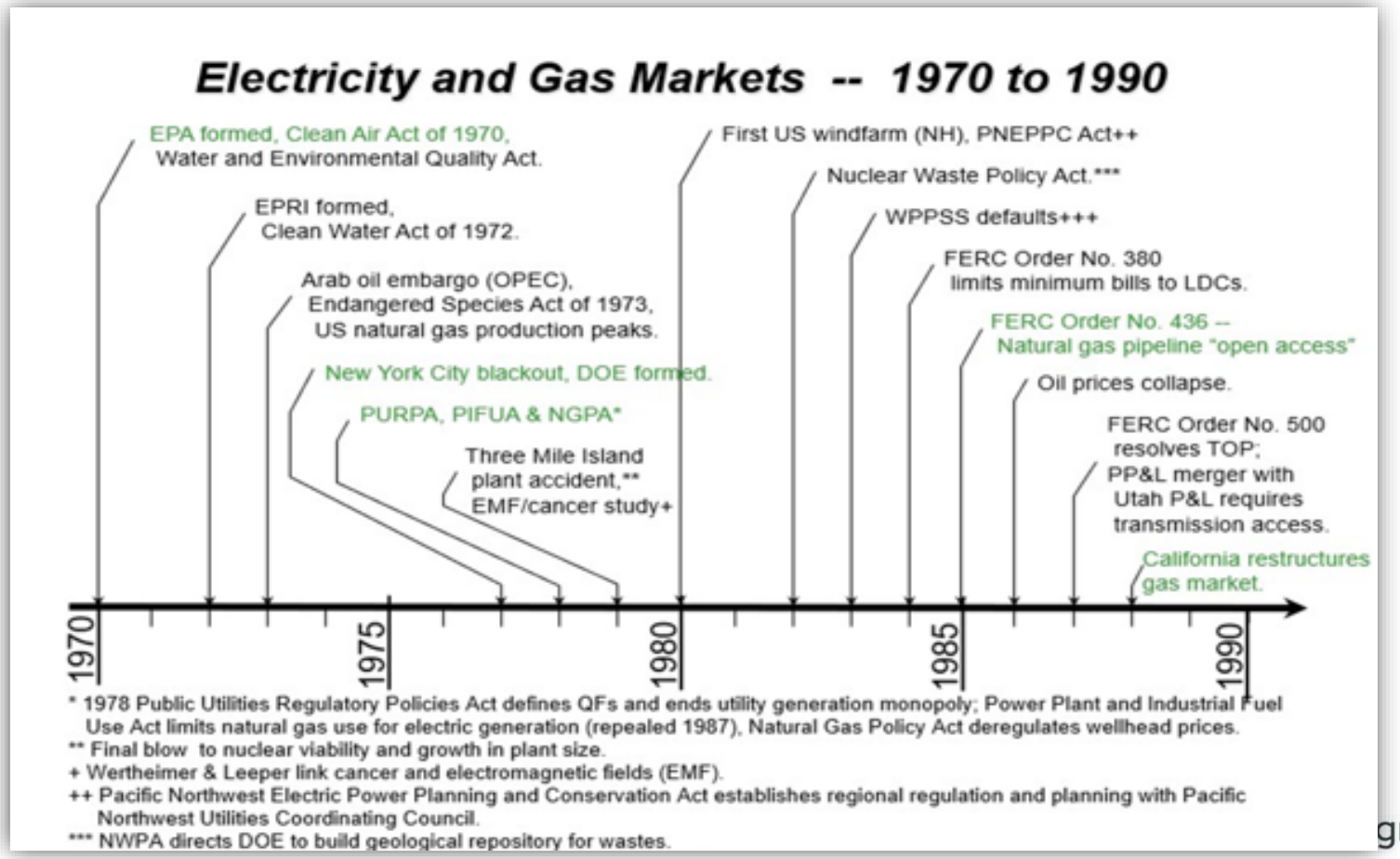
Expansion of Electricity Service via the Creation of Regional Transmission Grids: TVA, BPA, Grand Coulee and Hoover Dams brought power to rural USA during the 1930s.

Between 1970 and 1990 Major Regulatory Bodies, Government Agencies and Research Institutions Were Formed, Leading to the Advent of Competition.

- EPA, DOE, EPRI, CEC, state and federal agencies
- PURPA, PIFUA, NGPA and major FERC Orders.

Technological Advances, Competitive Market Entry, Electrification, and the 4 D's: Decentralization, Digitalization, Decarbonization, and Disintermediation Initiated and Accelerated the Third Transition now underway.

Actions and Events During 1970-1990 Initiated Today's Rapidly Evolving Energy Markets



- Legislation, Regulation, R&D, and Funding were dominated by the Oil and Gas, Coal, Nuclear, and Wind and Solar Industries, their Lobbyists, and Political Supporters.
- On a National Scale, the Geothermal Industry was Largely Absent.

Why the 3rd U.S. Electric Transition Is Important!

Major Concerns Affecting the Direction and Pace of the Third U.S. Electric Energy Transition Now in Progress Must be Addressed:

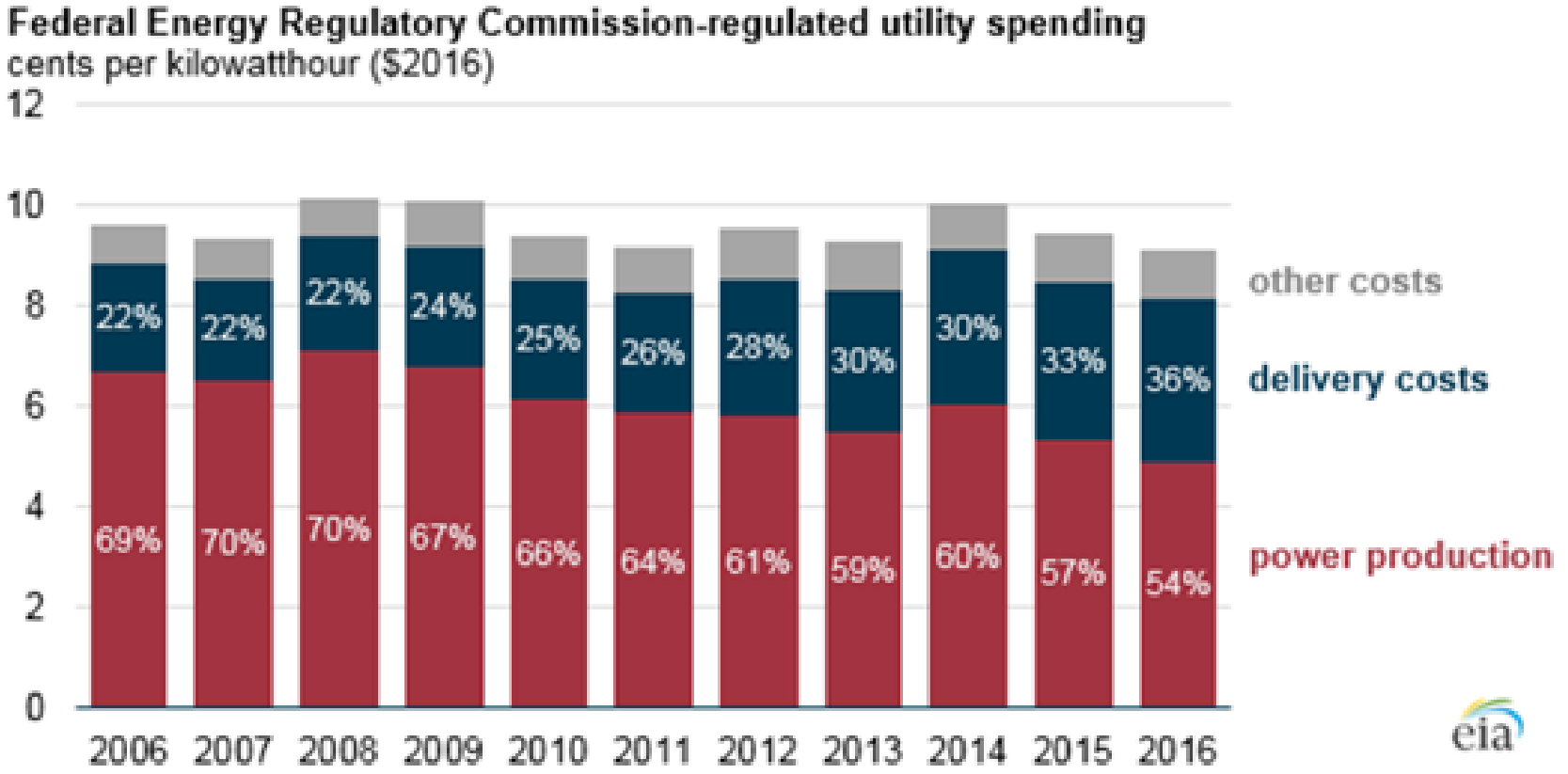
The availability, reliability, resilience, security, deliverability and costs of future electricity, heating, and fossil energy supplies.

The ability to mitigate global warming and enable global electrification.

How might we best achieve resource adequacy, avoid or mitigate adverse environmental and health impacts, acquire public acceptance and ensure resource and societal sustainability?

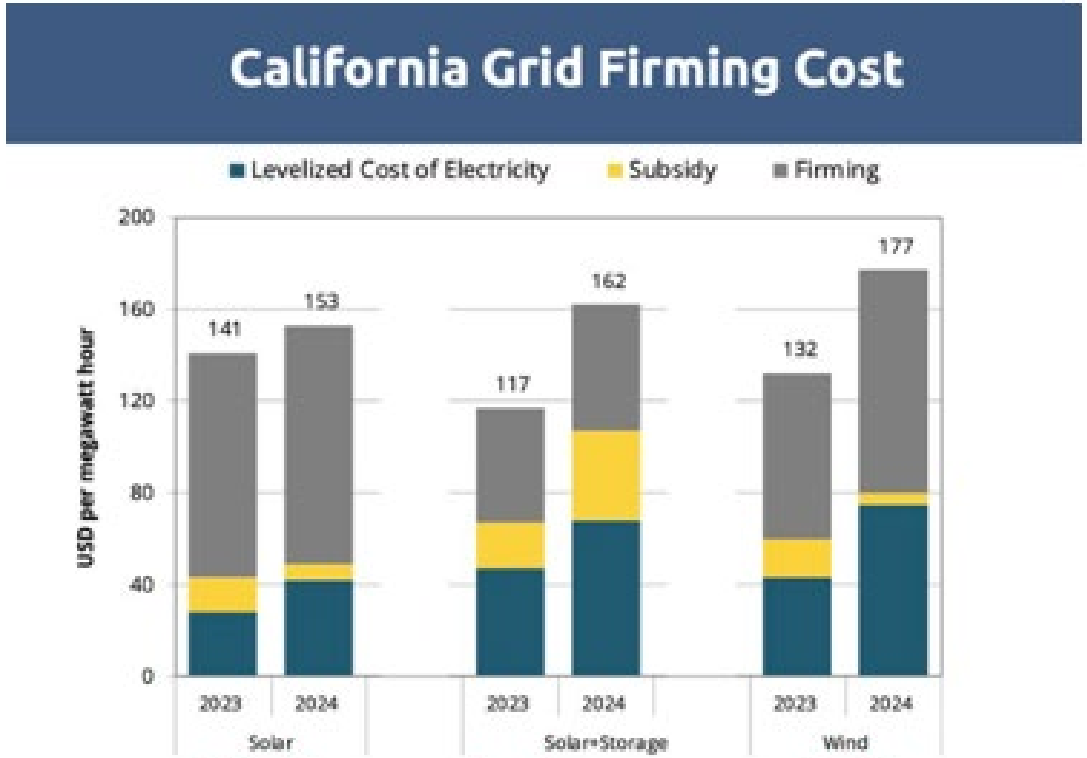
Where, how, and when does geothermal heat and power fit in?

Generation Costs Have Declined to about Half the Cost of Delivered Grid Energy



Source: US Energy Information Administration, FERC Financial Reports, September 2017

Costs of Firming the Grid Go Up with Increasing Levels of Intermittent Renewable Energy Sources



Factors Driving the Third Electric Transition - 1

Price Increases and Price Instability

After decades of relative price stability, electric power consumers are confronted with the rapid escalation of power prices and increased price volatility.

Regulatory & Legal Inertia

Utilities are burdened by a complicated regime of regulations and restrictions that impede growth and inhibit efficiency.

Distributed Energy Resources, Microgrids, Resilient Community Grids, and Community Choice Aggregators have entered the supply mix.

Existing powerlines are congested and Building new transmission lines can require decades.

Intermittent power sources are inherently inefficient in using high-capacity transmission lines.

Factors Driving the Third Electric Transition - 2

Accelerated demands for clean energy

- The global demand for power has accelerated much faster than predicted, leading to shortages in some markets.
- United States projections of electricity demand growth have doubled from 3.8% in 2022 to 7.8% in 2023.
- Data Center load is expected to reach 21 GW in 2024, up from 19 GW in 2023.
- A.I. and Data Centers may require 9% of all U.S. electricity generation by 2030, up from about 4% in 2022.
- National and regional climate policies and basic competitive economics are reducing the use of traditional baseload energy sources, which are being retired.

Factors Driving the Third Electric Transition - 3

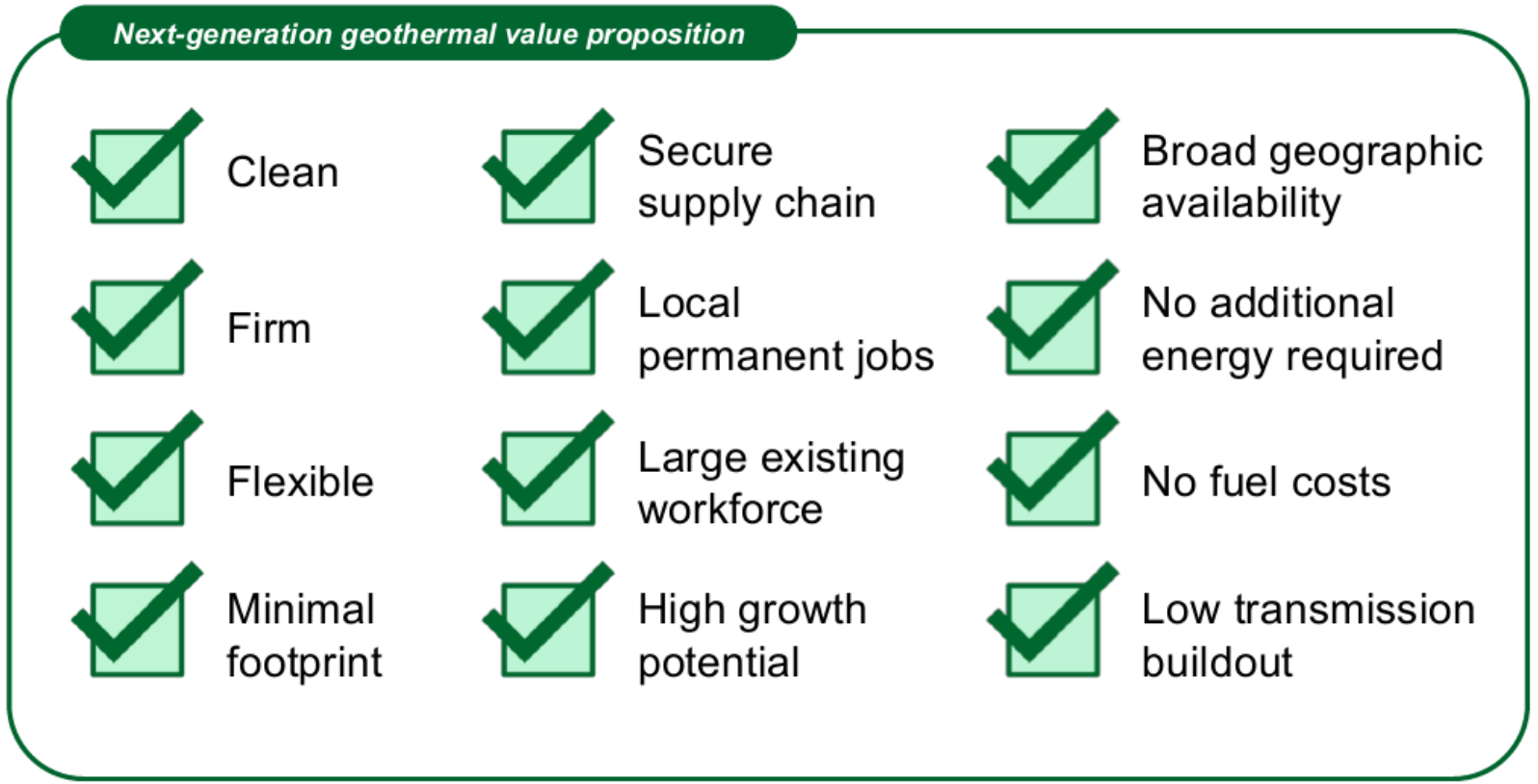
Grid Instability

- As intermittent and weather dependent resources, like wind and solar power, comprise a larger percentage of total generating capacity, the volatility of energy supplies and the need for firming increases.
- More frequent and prolonged power outages, brownouts, power shut-offs, and power rationing have become more frequent.
- Much of the electric grid, i.e., Generators and T&D systems, have aging infrastructure and are vulnerable to weather, fires, congestion, sabotage and other disruptions.
- Baseload coal and nuclear plants are being retired, storage battery durations and total duty cycles are uncertain, and non-geothermal renewables, including hydro power, are weather-dependent.

Energy Intensive Organizations Require Assured Clean Energy

- **Availability** – energy sufficient for growth and expansion
- **Flexibility** – various combinations of heat and power
- **Reliability** – high level of uptime and minimal unplanned/forced outages
- **Resilience** – resistance to and recovery from changing weather or attacks
- **Stable and affordable cost** – long term competitiveness
- **Low carbon impacts** over the entire supply chain and its lifecycles
- **Safe** – with acceptable risks for humans and the environment
- **Land frugality and water efficiency** accompanied by low air emissions

Geothermal Is Premium Power for the Global Energy Transition Now in Progress



Co-location with Geothermal Energy Offers Big Advantages to Energy Intensive Organizations

AVOID OR MITIGATE UTILITY PRICE AND RATE INCREASES

ELIMINATE GRID VULNERABILITIES

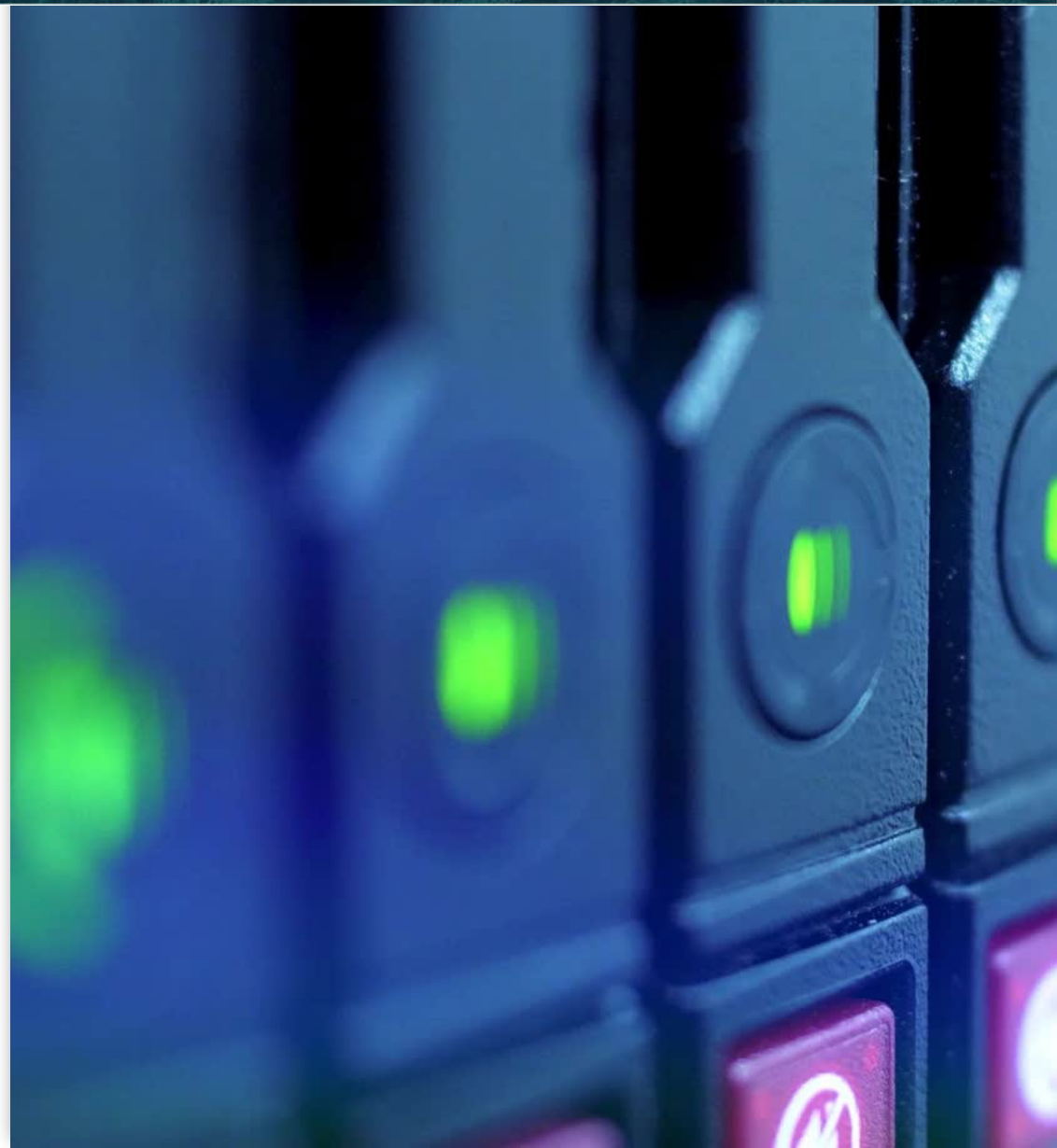
OBTAIN BOTH THERMAL ENERGY AND ELECTRIC POWER

MEET CLEAN ENERGY AND ENVIRONMENTAL STEWARDSHIP GOALS AND MANDATORY REQUIREMENTS

REDUCE THE OVERALL ENERGY FOOTPRINT WITH LAND REQUIREMENTS <1/10 OF SOLAR AND WIND FARMS.

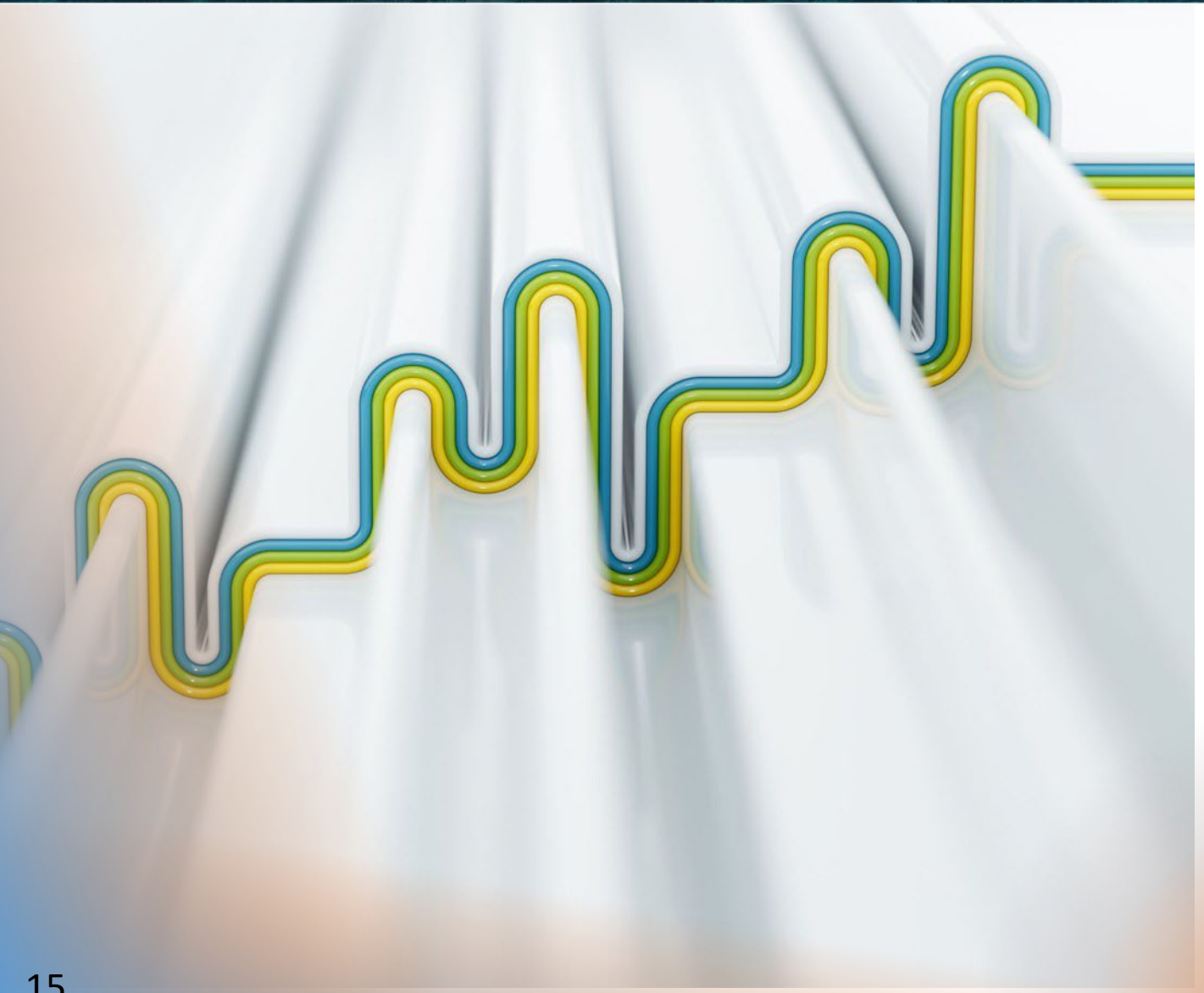
Energy Intensive Organizations Want Behind the Meter (BTM) Power - 1

- Data center companies expect to multiply the number of data centers by fourfold due to growing computing demands, such as artificial intelligence (A.I.), but they can't afford the added electric power, don't trust the grid, and want to control future prices.
  - Google, Microsoft, Amazon, and others plan to refurbish, relicense, and restart nuclear plants and build new SMRs.
- A carbon capture company that needs thermal energy to extract carbon, knows heat is expensive, and fossil energy is not low-emitting,
- Military bases that require absolute power assurance, hardened infrastructure, and resilience.
- A government-controlled power company that is directed to develop geothermal resources.



Energy Intensive Organizations Want Behind the Meter (BTM) Power - 2

- Large chemical companies that need to expand operations but cannot get additional power, are water constrained and must meet GHG emission reduction targets.
- Steel manufacturing plants must have continuous power.
- Large textile companies that need to expand operations but cannot get additional power and are water-constrained.
- Oil companies that need power for field operations and seek to convert depleted oil wells into geothermal power wells, displacing diesel generators.
- Companies mining bitcoins. It has been estimated that cryptocurrency operations consumed 0.6% to 2.3% of all U.S. electricity demand in 2023. Of course, this electricity usage consumes resources and produces pollutants while producing no realizable or useful products.



How Can We Sustain the Third U.S. Electric Energy Transition?

- Greater funding for geothermal energy
  - Intensive and innovative RD&D,
  - Improved Geothermal Resource Exploration Technologies and Methods,
  - Better Drilling Technologies and Process Changes,
  - Advanced Geothermal Power Generating Technologies: EGS, AGS, and CLG.
- Tax credits, production credits, and other incentives comparable to wind and solar, and batteries.
- Streamlined generic permitting requirements and appropriate categorical exclusions.
- Persistent, Informed, and Persuasive Advocacy by the Geothermal Industry and Government Agencies.

GREENFIRE ENERGY

Appendix A – About GreenFire Energy, Inc.

- **GREENFIRE ENERGY REVITALIZES UNDERPERFORMING GEOTHERMAL ASSETS, EXTENDING THEIR LIFECYCLE AND INCREASING THEIR PRODUCTIVITY.**
- Hybrid solutions transform existing geothermal fields into reliable power sources that operate sustainably over time.
- Our innovative Closed-Loop Geothermal (CLG) energy technologies enable greenfield and retrofit applications for heat and power.
- www.greenfireenergy.com