



Creating Infinite
Possibilities.

From Millions to Billions: SCTE Standards Evolve the Smart Grid at Scale

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Agenda

- Why evolve the grid: Resiliency and Sustainability
 - Financial & carbon costs require transformation of operations & business models
- Sustainability Financials
- History of grid and broadband
- The symbiotic future
- What broadband offers the grid

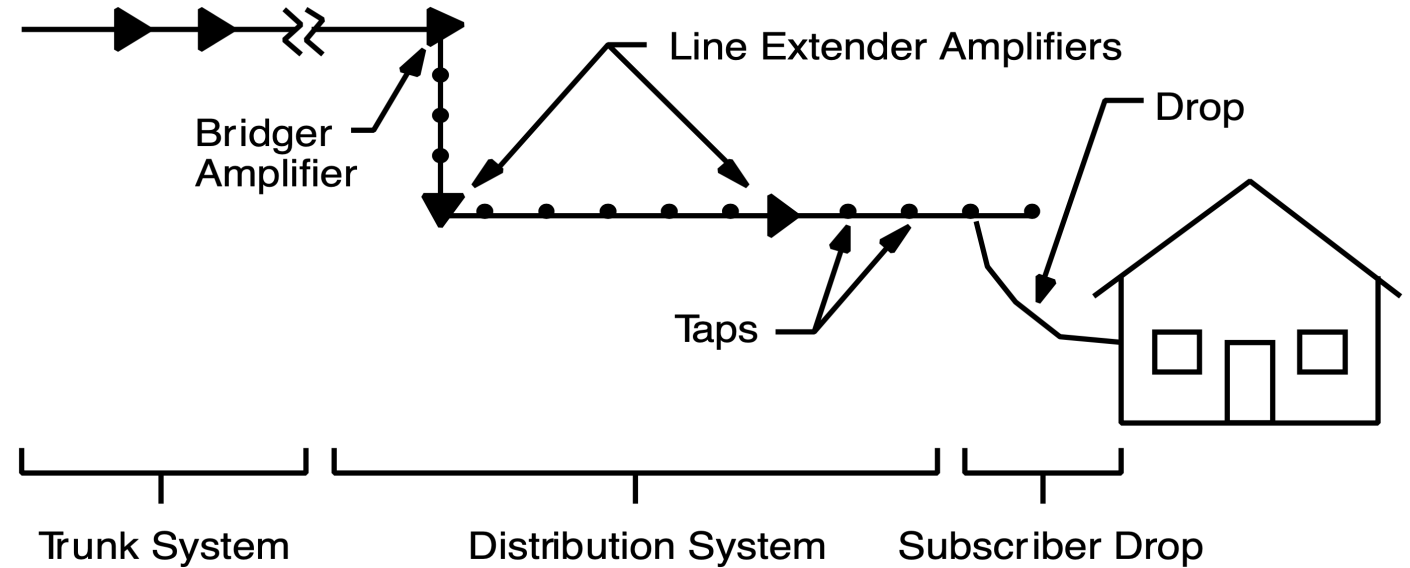
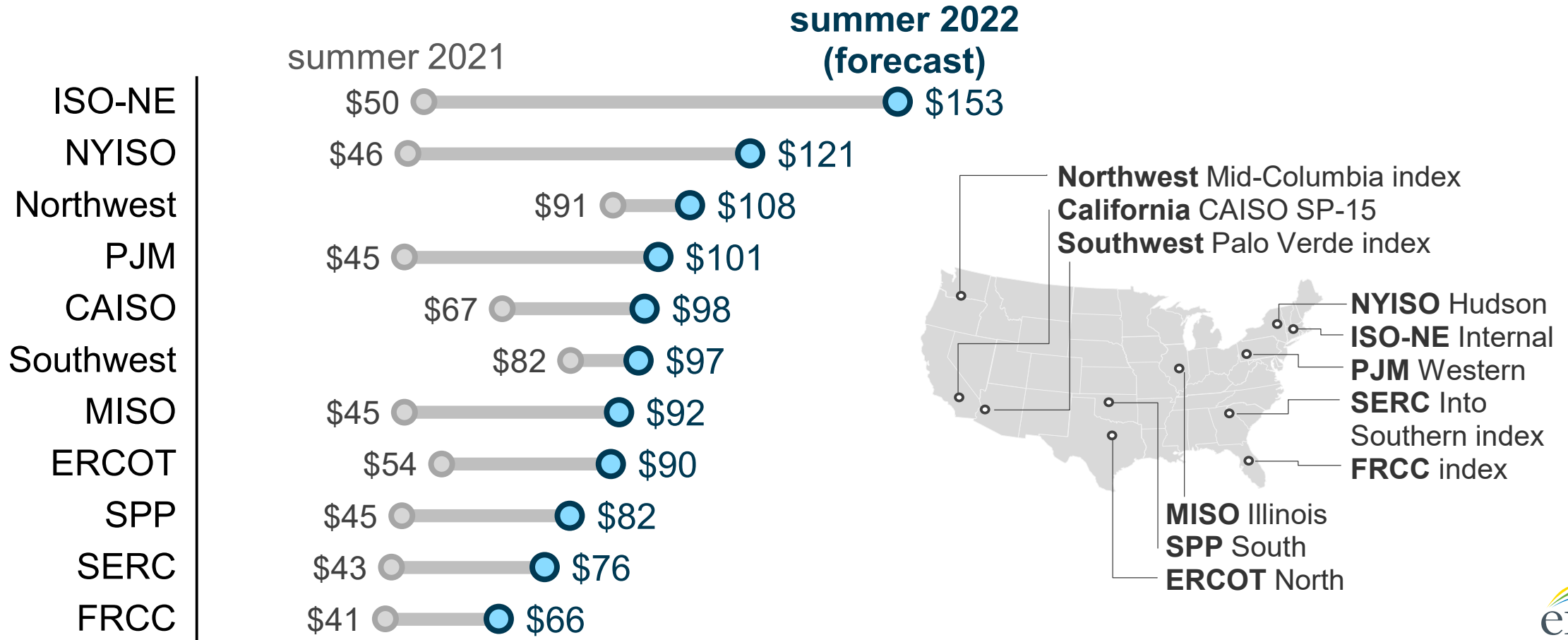


Image credit: CableLabs (1995) Walter Ciciora, *Cable TV in the U.S.*

We accelerated an industry... and can do it again!

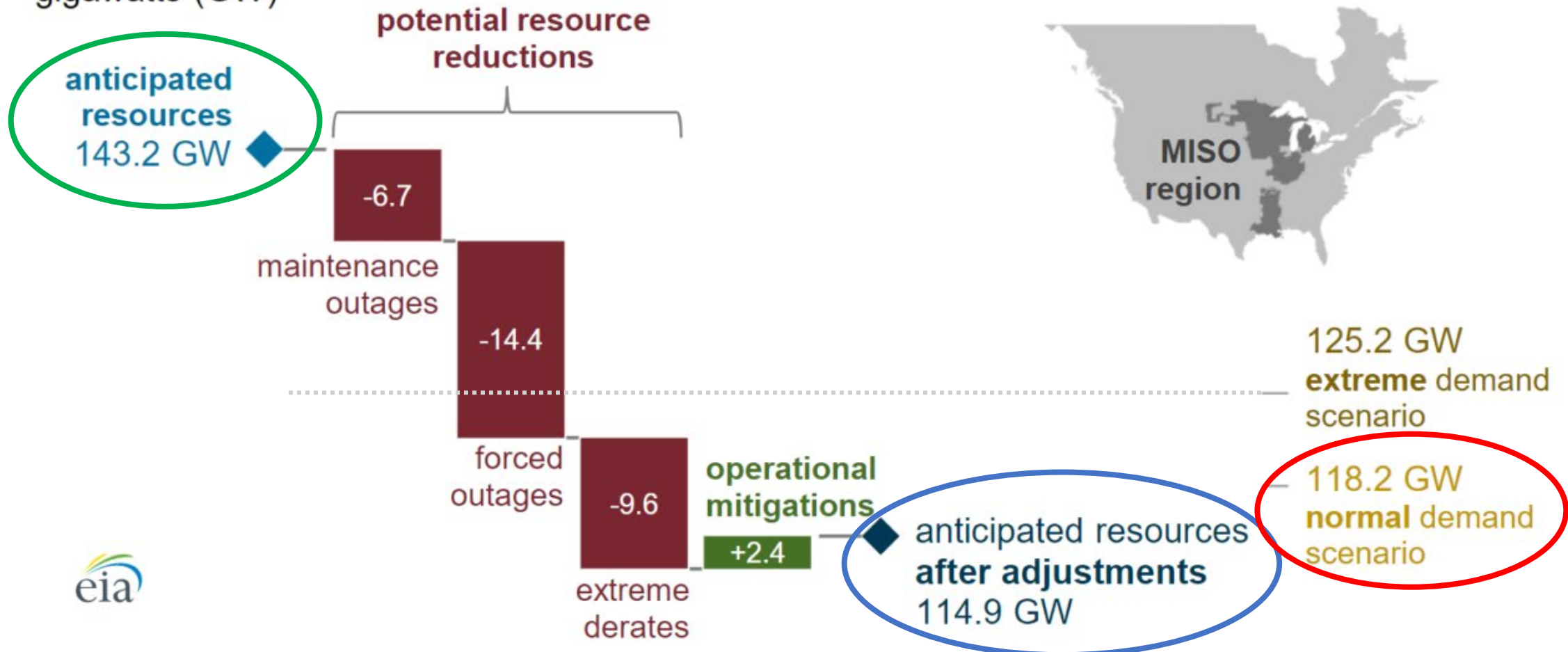
Summer average wholesale electricity prices at selected price hubs (Jun–Aug, 2021–2022) dollars per megawatthour



Source: U.S. Energy Information Administration (6/16/22), *Short-Term Energy Outlook*. <https://www.eia.gov/todayinenergy/detail.php?id=52798>

Why evolve grid. Declining Reliability: Age, frailty, storms, supply unable to meet increasing demand

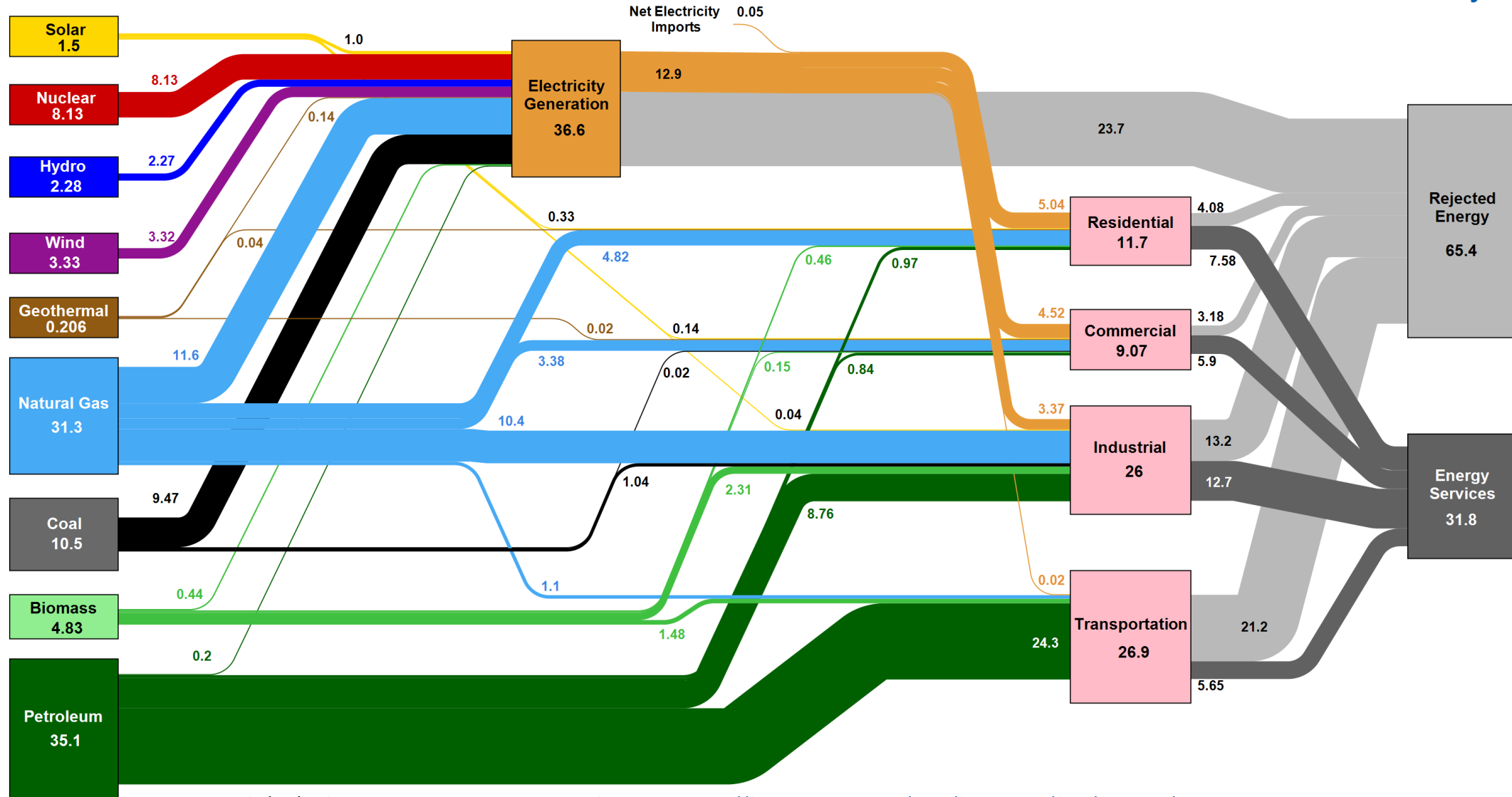
Midcontinent Independent System Operator (MISO) summer reliability projections (2022) gigawatts (GW)



Data: North American Electric Reliability Corporation (5/22), 2022 Summer Reliability Assessment. <https://cleantechnica.com/2022/06/05/potential-electricity-reliability-concern-for-central-u-s-a/>

Energy inputs, inefficiencies, uses and rejected heat

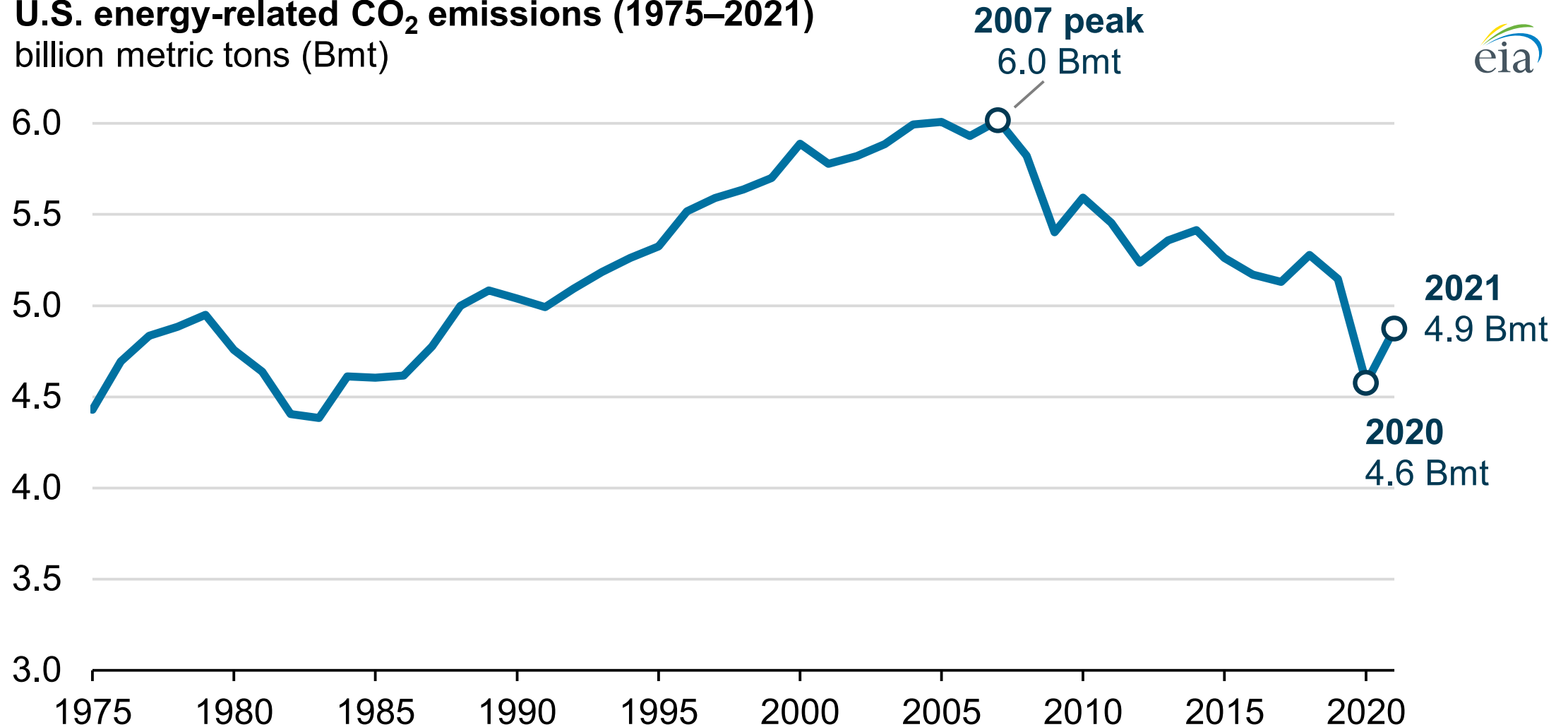
Estimated U.S. Energy Consumption in 2021: 97.3 Quads



Source: LLNL (6/16/22), Energy, Water, and Carbon Informatics. https://flowcharts.llnl.gov/sites/flowcharts/files/2022-04/Energy_2021_United-States_0.png

Unsustainable 45-year carbon trajectory from all uses

U.S. energy-related CO₂ emissions (1975–2021)
billion metric tons (Bmt)

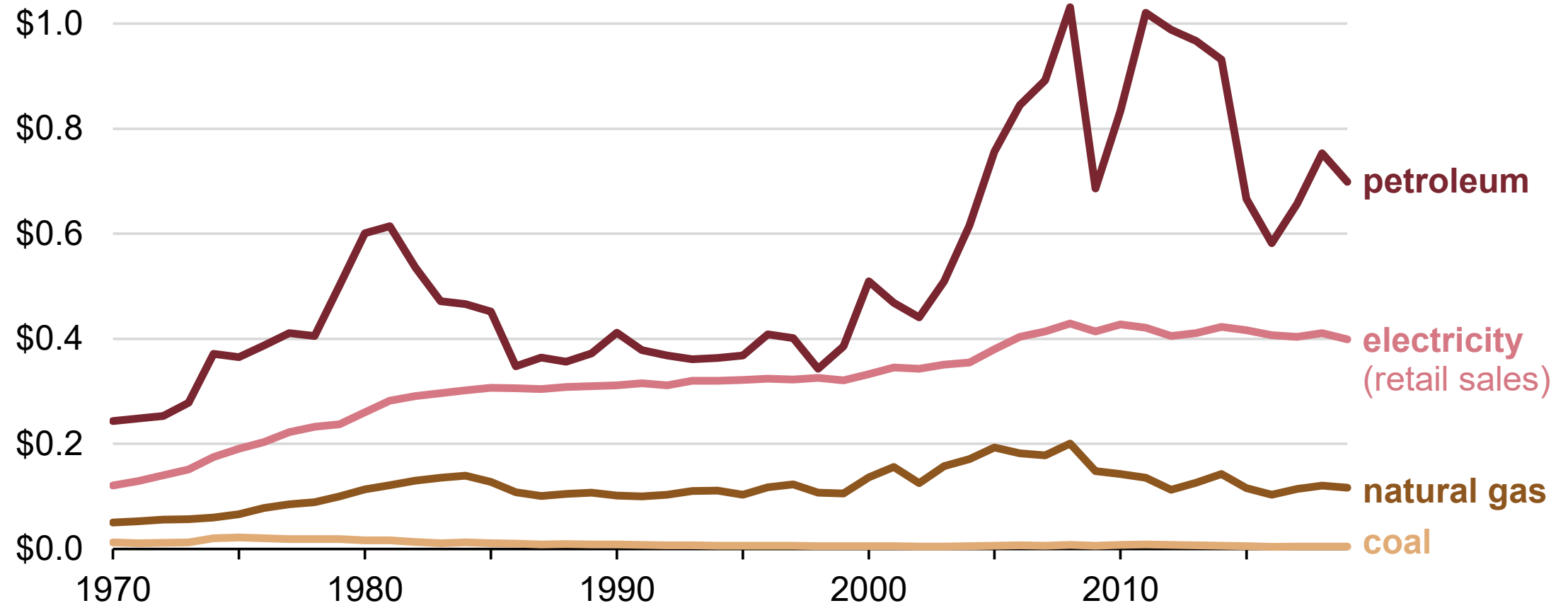


Source: U.S. Energy Information Administration (5/13/22), *Monthly Energy Review*. <https://www.eia.gov/todayinenergy/detail.php?id=52380>

Sustainability Financials: 3x wartime cost * 3x electricity use

U.S. energy expenditures by source (1970–2019)

trillion real 2019 U.S. dollars



Source: U.S. Energy Information Administration (9/9/21), *Today in Energy*. <https://www.eia.gov/todayinenergy/detail.php?id=52380>

Cable TV

- Centralized Headends
- Proprietary systems
 - General Instrument, Scientific Atlanta
- One-way delivery
- Two-way upgrades
 - Web Surfing, Streaming
 - Content creation at edge
 - Content caching, storage at edge
- Traffic engineering avoids slowdowns
 - How many CMs, 4k, 8k, streams?

Electric Grid

- Central station generators
- Proprietary systems
 - ABB, GE, IBM, Landis+Gyr, Itron, Siemens, Schneider ...
- One-way delivery
- Two-way upgrades
 - Distributed energy resources
 - Energy creation at edge: Solar
 - Grid and premises batteries
- Traffic engineering to avoid meltdowns
 - How many EVs, batteries?

Takeaway: Lack of grid standards slow innovation at scale

Two very different outcomes depending on standards

1. Proprietary limits on innovation

- Utilities unaware of SCTE 267 & 271
 - Realm of rapid transformation
- Event-based demand response
 - Non-interoperable: EVs, HVAC...
 - Limited deployment
 - Limited resiliency/decarbonization
- Less traffic engineering & load shaping
- Less proactive network maintenance
 - Customers declare outages
- Higher costs, outages, wildfire risk

2. Global resilience & sustainability

- Utilities embrace SCTE 267 & 271
 - Regulations and markets
- Continuous demand response
 - Interoperability across all DERs
 - Widespread deployment
 - Max resiliency/decarbonization
- More traffic engineering & load shaping
- More proactive network maintenance
 - Network finds/declares outages
- Lower costs, outages, wildfire risk

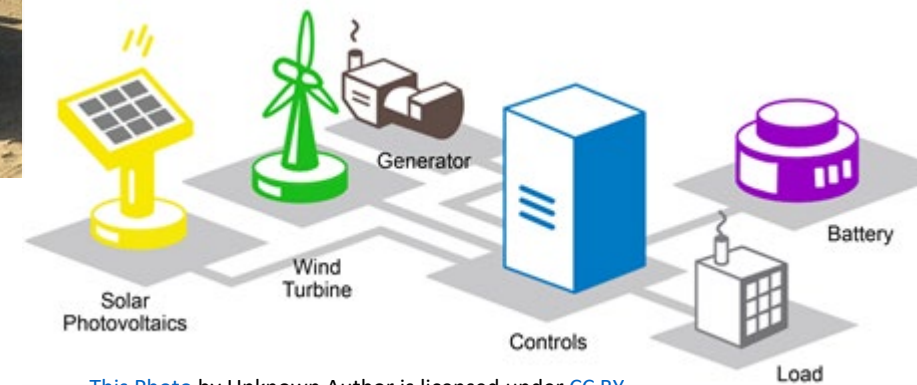
Standards manage & observe Distributed Energy Resources

PENS Real-Time Power Event Map

The Power Event Notification System (PENS) uses Gridmetrics' unique data set to provide an unmatched observational view of the state of power in the last mile of the distribution grid.

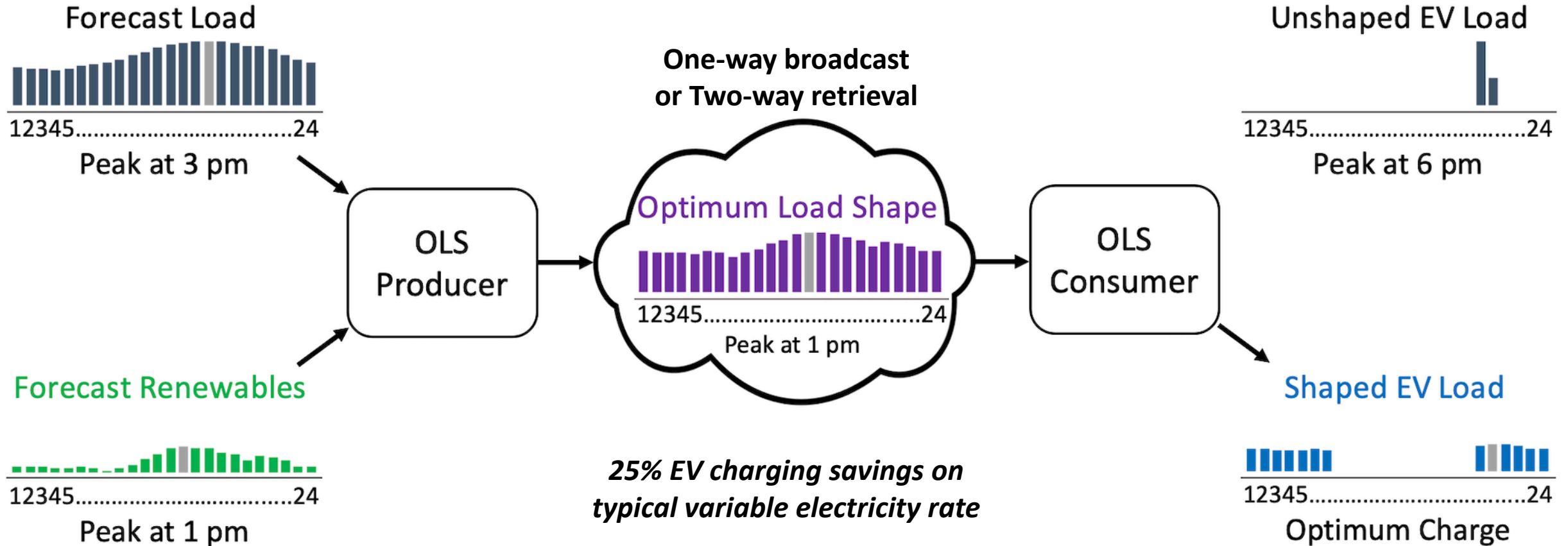


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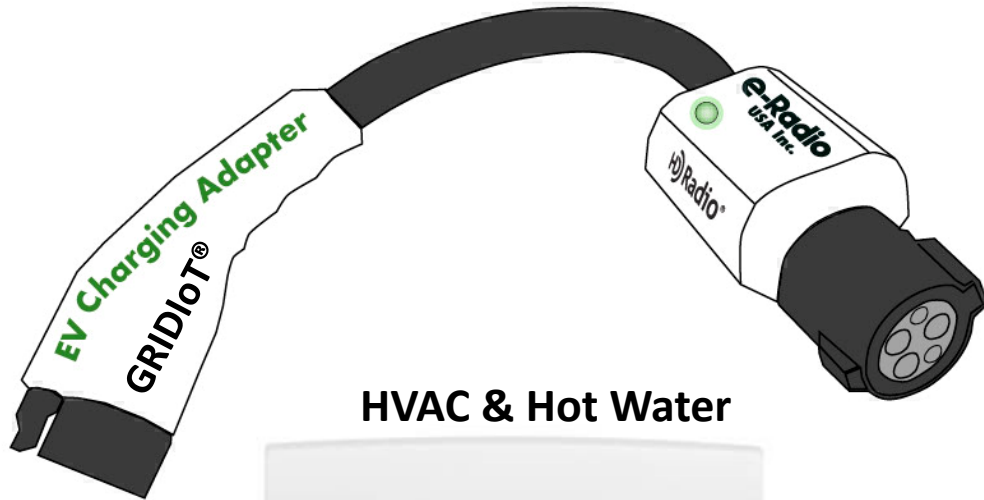
Fastest path to decarbonization and low-cost energy



Source: Society of Cable Telecommunications Engineers (2021), ANSI/SCTE 267: Optimum Load Shaping for Electric Vehicle and Battery Charging. <https://www.scte.org/standards/library/catalog/>

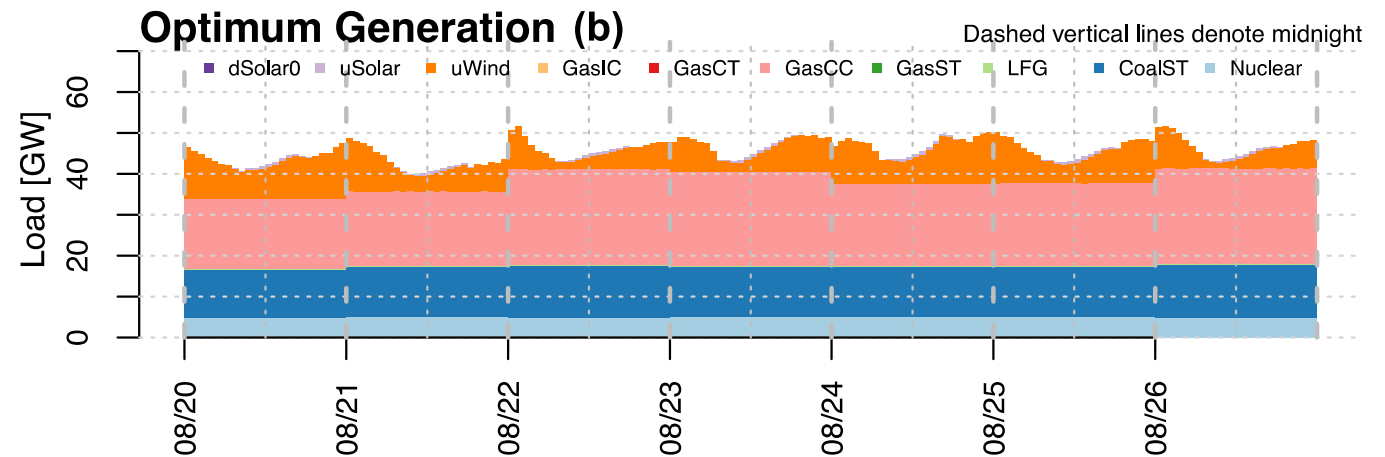
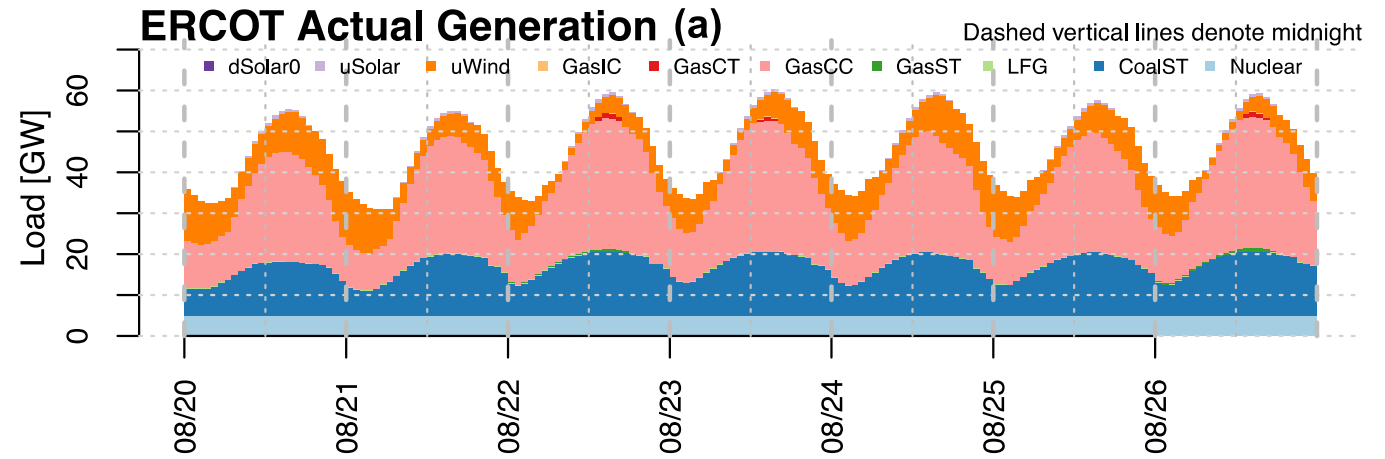
Fastest path to decarbonization and low-cost energy

**OLS Adapters provide bridge
To OEM built-in functionality**



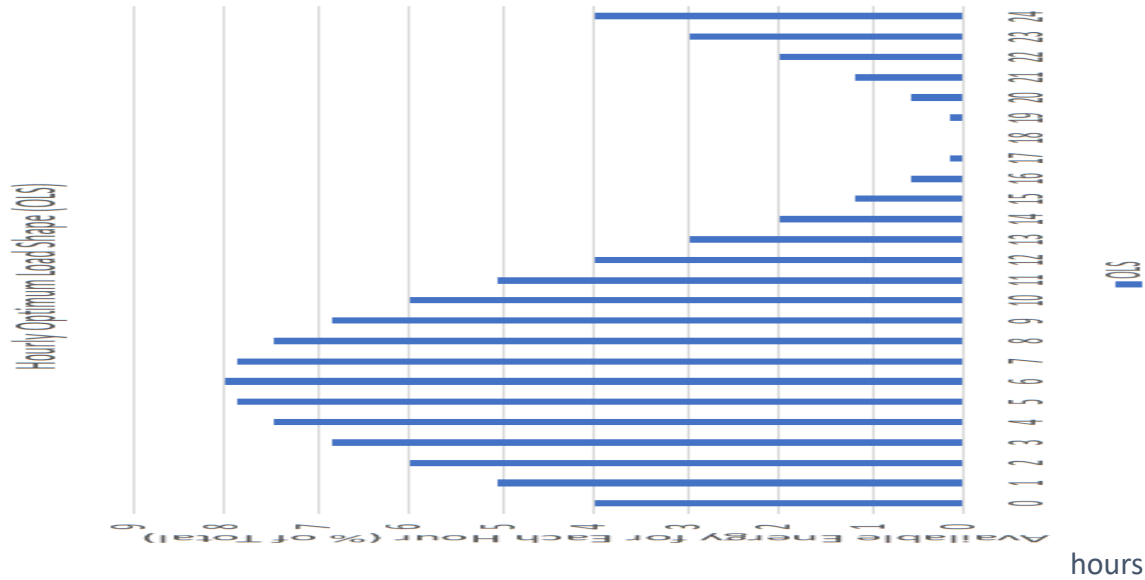
HVAC & Hot Water

Images courtesy
of e-Radio USA
and Xperi



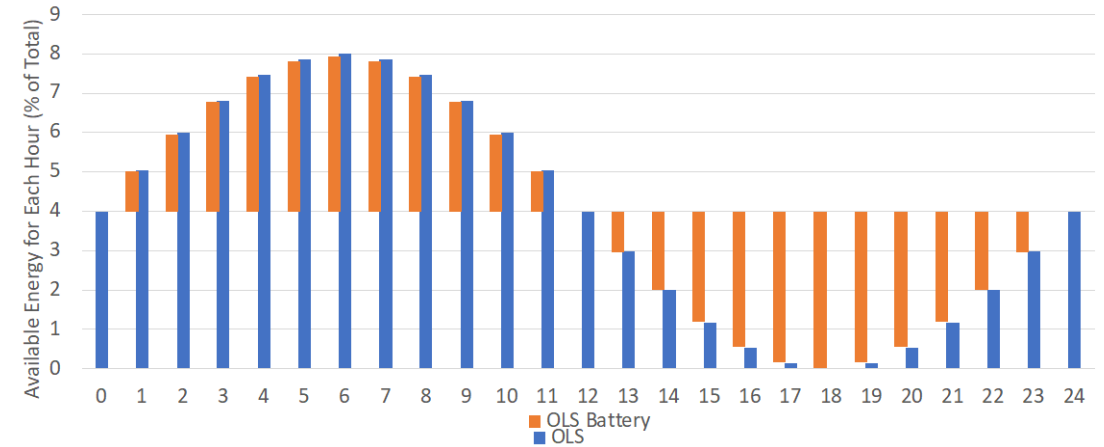
Source: JBPS (2021), R Cruickshank, G Henze, A Florita, C Corbin & K Stone *Estimating the value of jointly optimized electric power generation and end use*. DOI: 10.1080/19401493.2021.1998222

Manage EVs, residential and SMB batteries

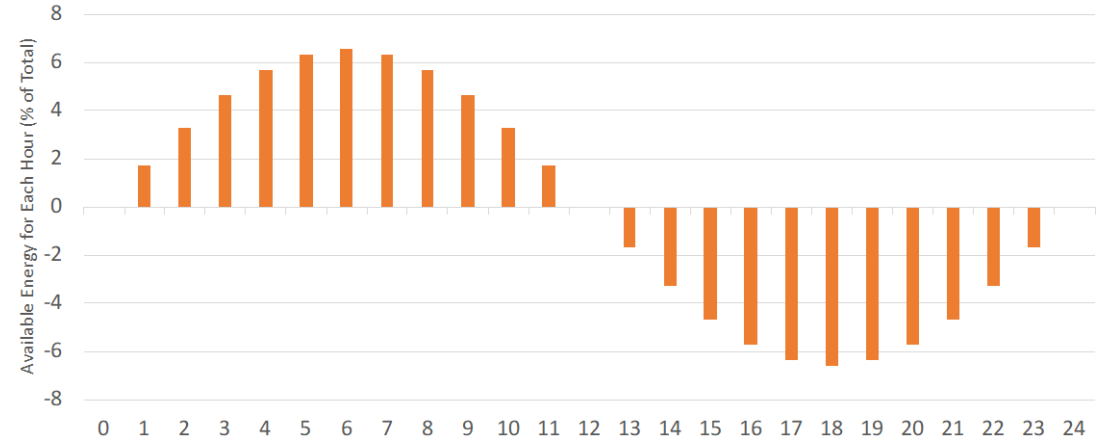


Cost-optimized load shaping signals available for 24,330 U.S. and Europe locations at <https://optimumloadshape.com>

Hourly Optimum: 1) Load Shape, and 2) Charge/Discharge Shape

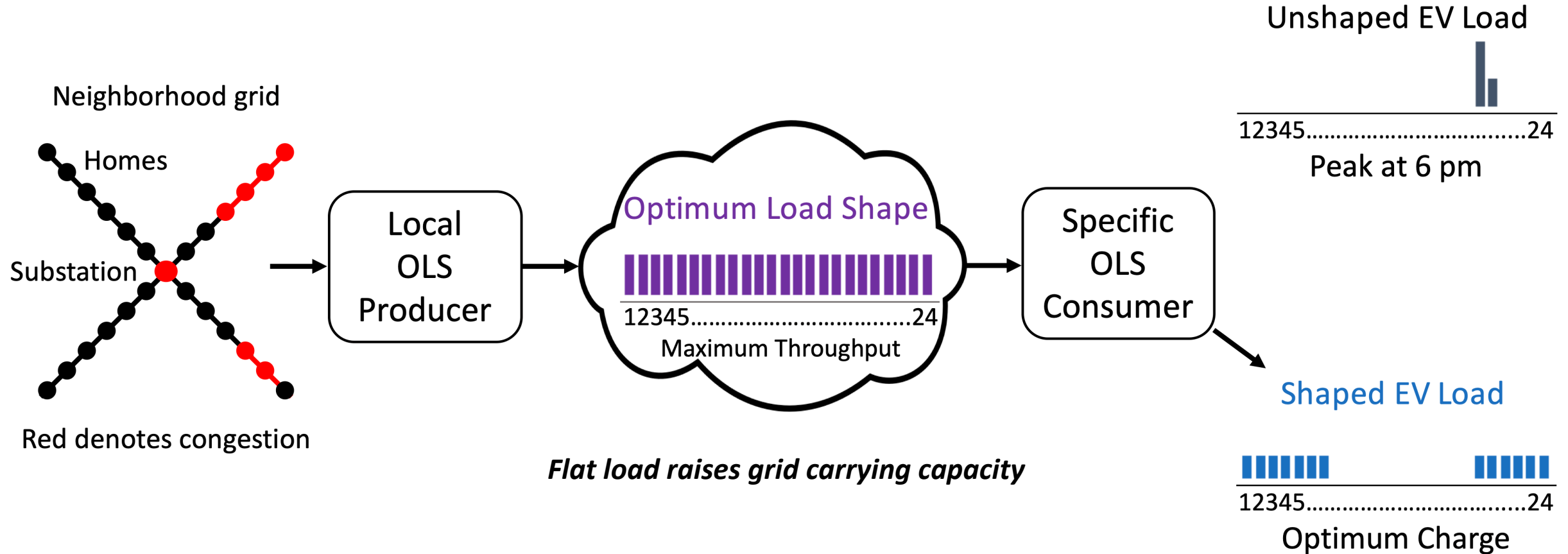


Hourly Autonomously Scaled Charge and Discharge Rate



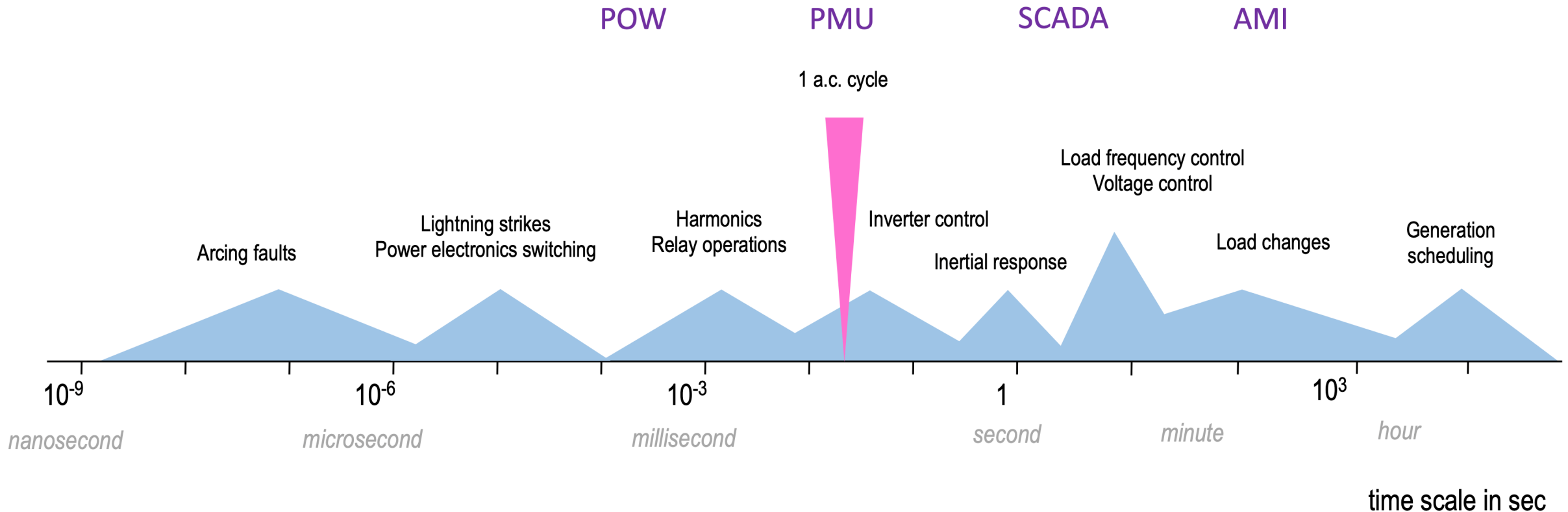
Adapted from: Standards Engineering Journal (Jun 2022), R Cruickshank, A Silverstein, A von Meier, *Broadband standards to manage and monitor the grid* <https://www.ses-standards.org/>

Getting the most electrons through congested grids



Adapted from: Standards Engineering Journal (Jun 2022), R Cruickshank, A Silverstein, A von Meier, *Broadband standards to manage and monitor the grid.* <https://www.ses-standards.org/>

Time scales for electric grid events and control



Source: International Council on Large Electric Systems (CIGRE) (Oct 2020), A von Meier, *AI on the grid: Understanding PMU data*. <https://www.youtube.com/watch?v=qRAPYVtC2zM>

SCTE standards evolve the smart grid at scale

- Game-changing standards enable broadband providers to monetize grid
 - Improve network reliability & resilience
 - Reduce energy costs & carbon while offering revenue-generating services
- Access network infrastructure provides unique, commercial-ready IoT
 - Already installed & operational
 - Unmatched density & distribution
 - High bandwidth, low-latency
 - Private, secure, backhaul
 - Battery-backed resilient power
- Grid neither sustainable nor reliable without load shaping and better monitoring
 - Must deploy ANSI/SCTE 267 and 271 quickly to maintain business continuity



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Thank You!

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