The Bridge to Energy's Future

CPower

HESNI -- Healthcare Engineers Society of Northern Illinois Webinar

Smart Grid and Demand Management

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CPower Presenter

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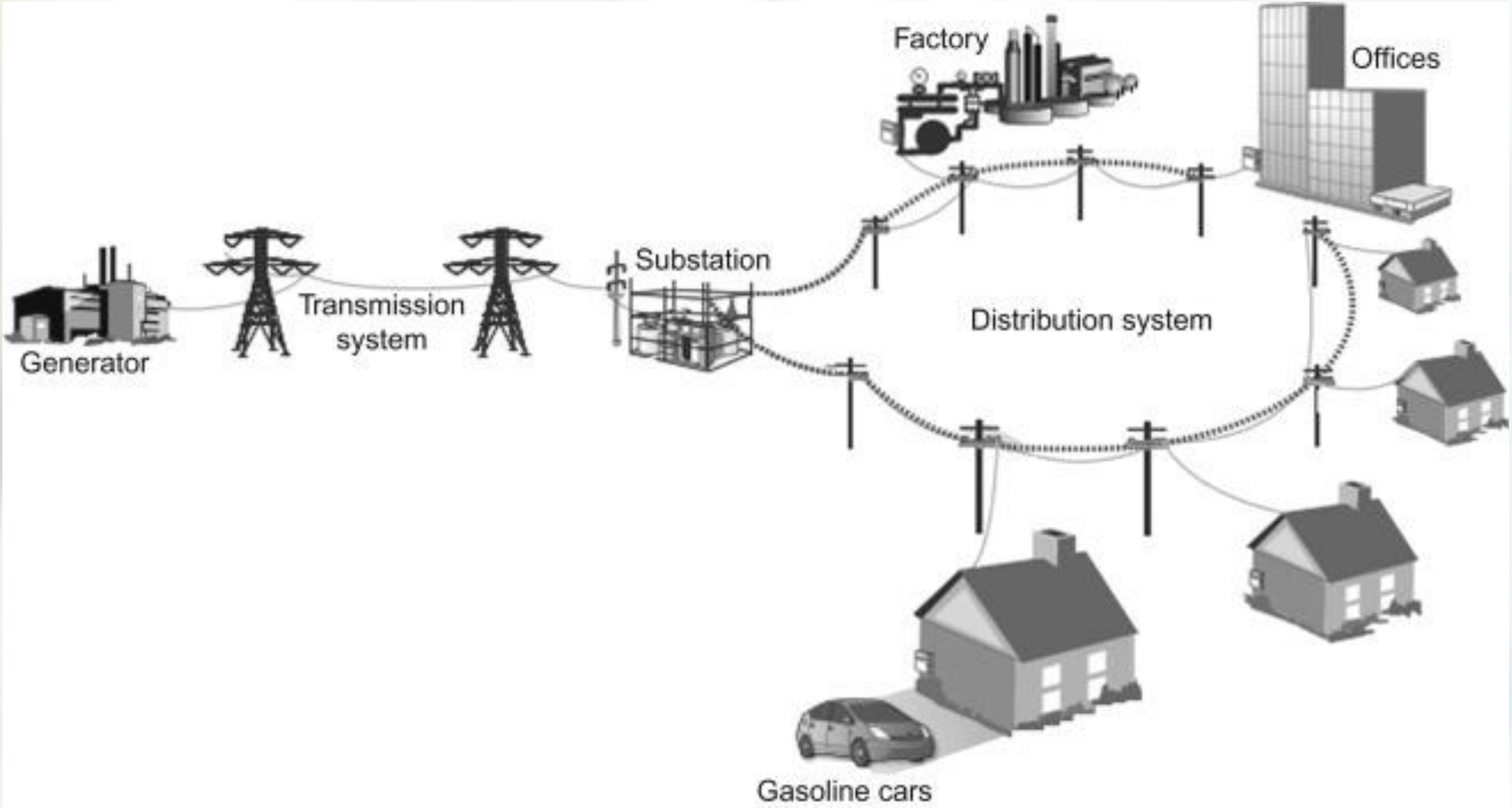
Content of today's session

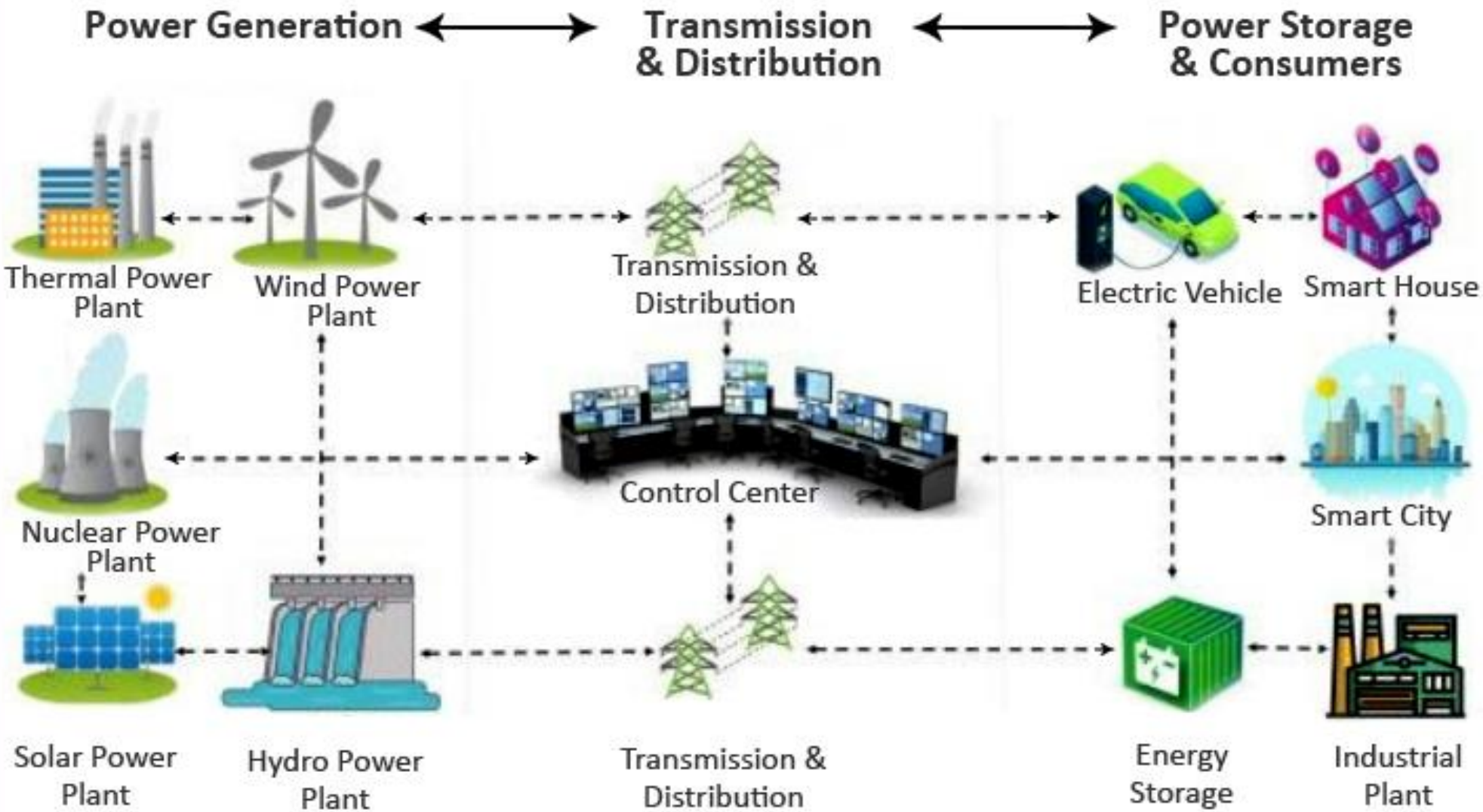
- High level review of the electric grid
- Power demand management programs that can help the grid while compensating participants
- Application of such programs for hospital facilities

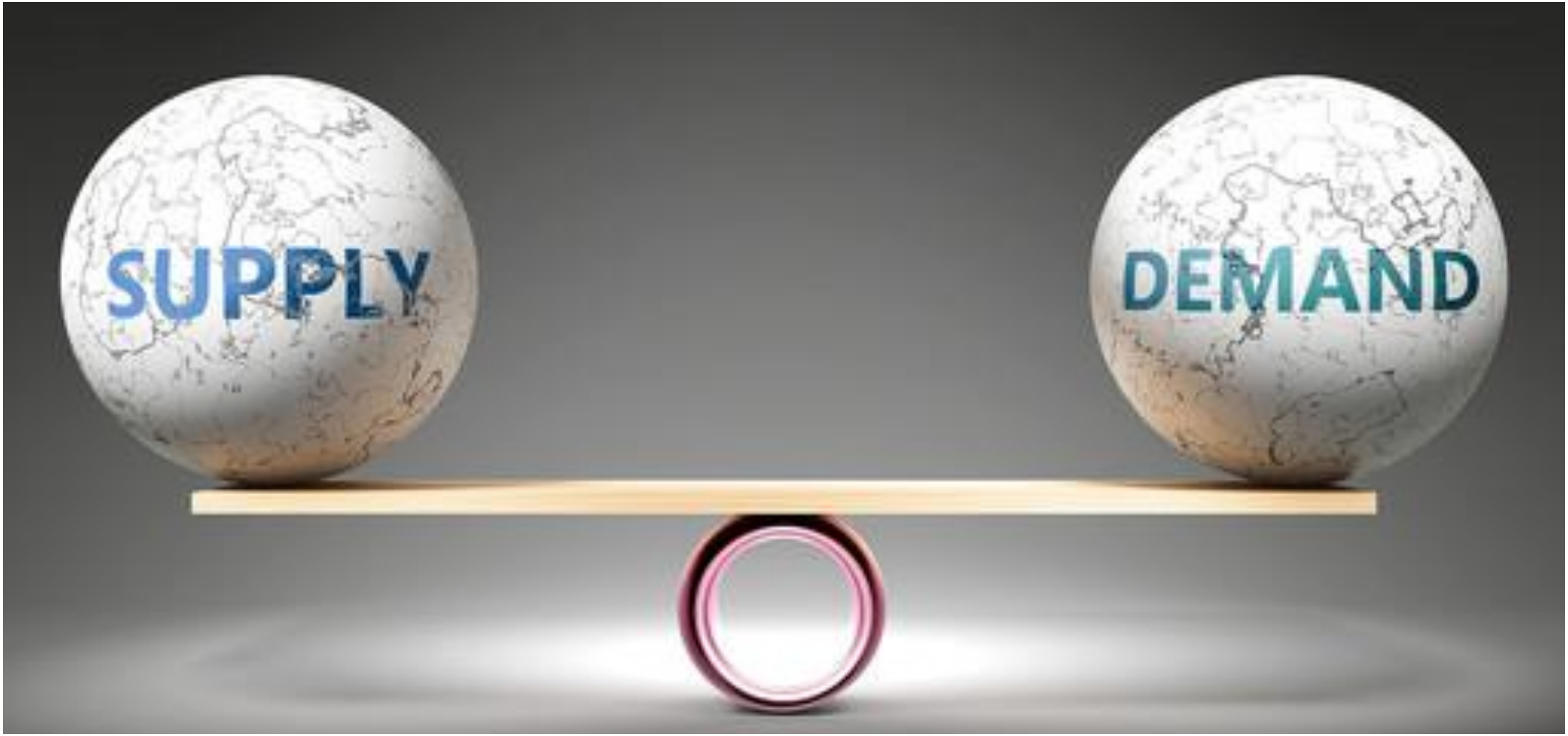
Question

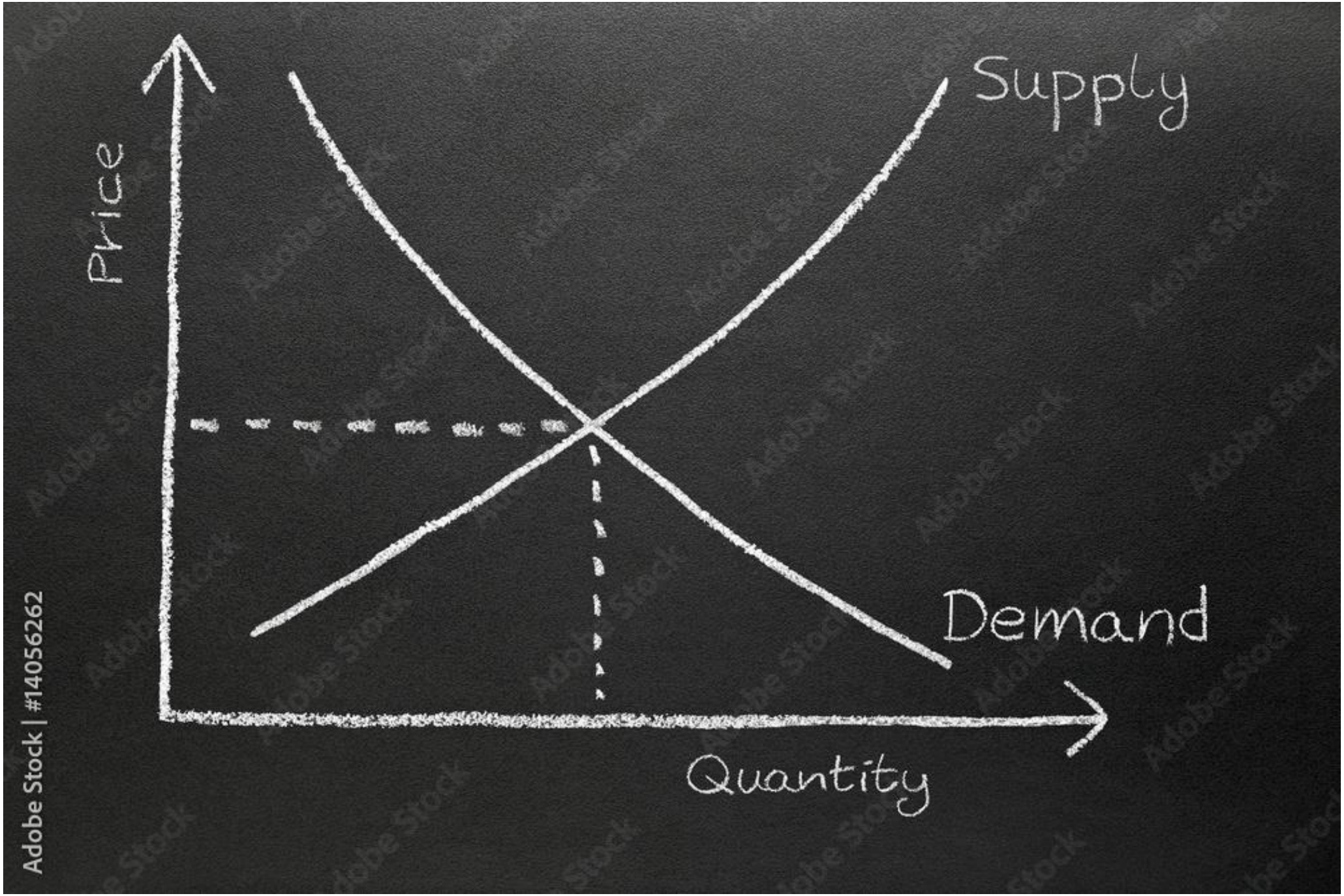
Where does our electric power come from?


Factory
Offices
Substation
Transmission system
Distribution system
Generator
Gasoline cars

Smart Grid : The Electrical Grid of the Future

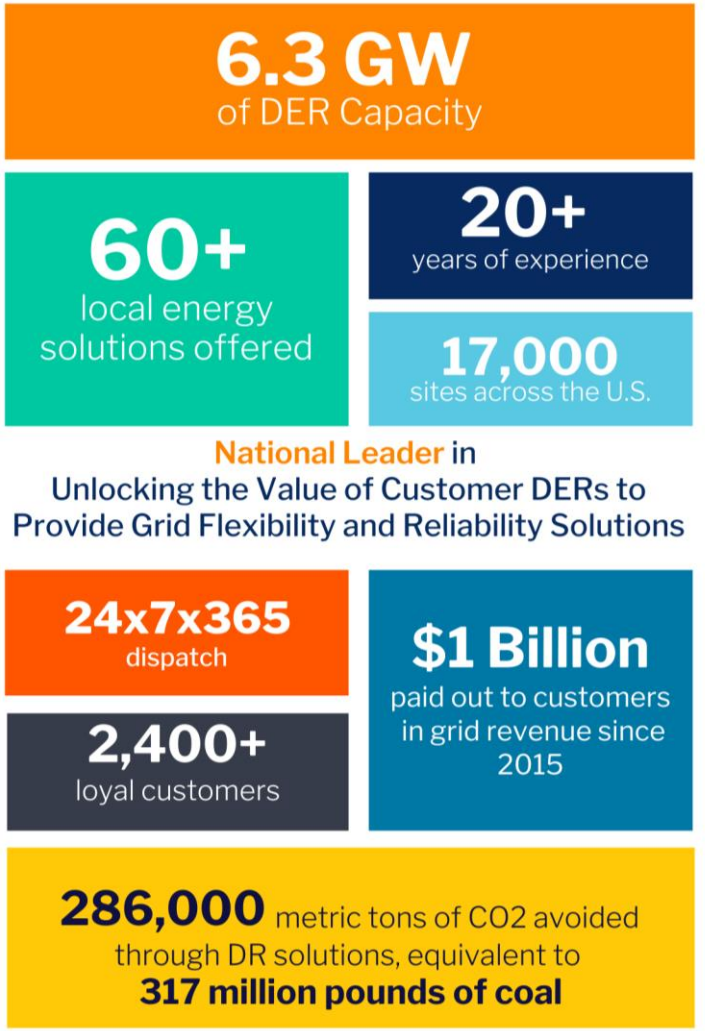



SUPPLY
DEMAND


Price
Supply
Demand
Quantity
Adobe Stock | #14056262

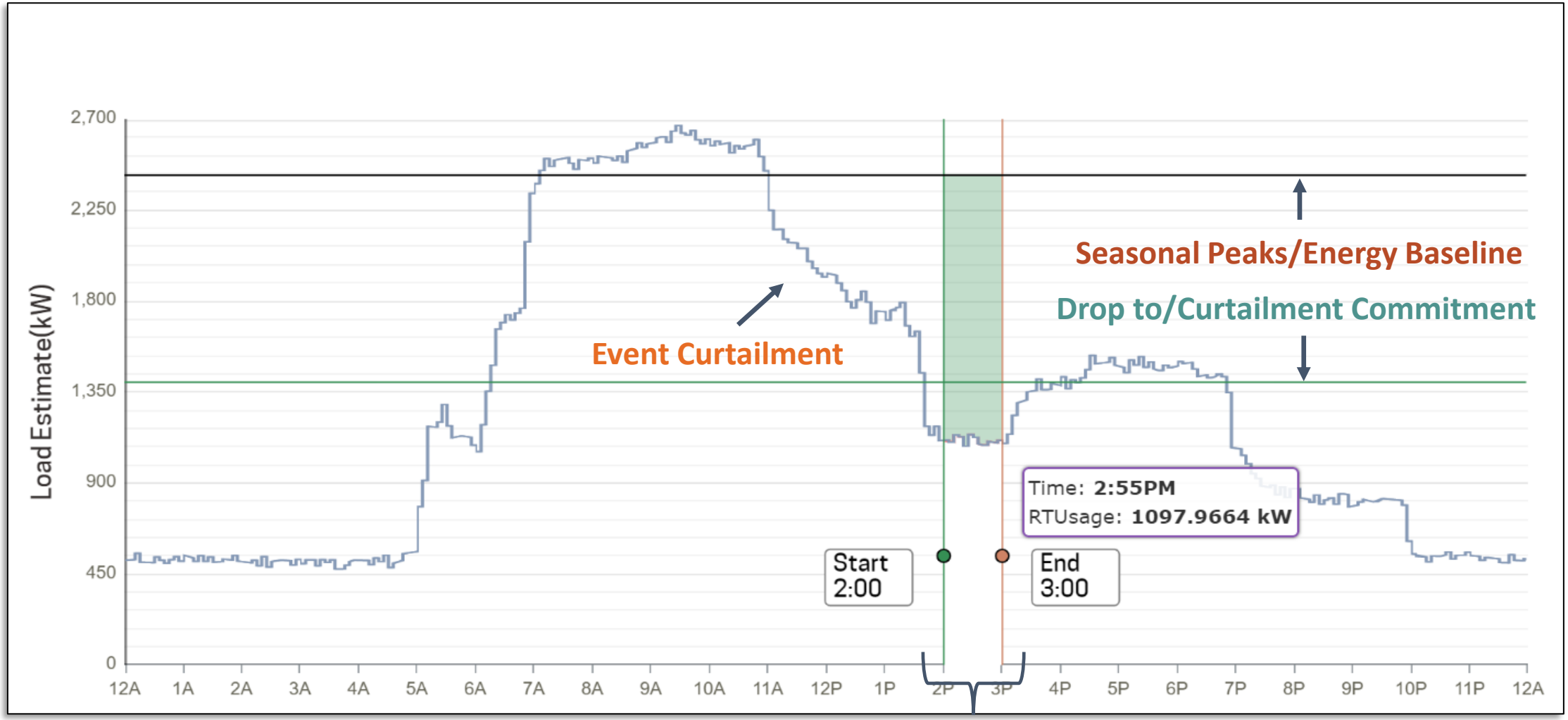
About CPower Energy

- We maximize the value of our customers' electricity loads, facility assets and distributed energy resources (DERs) and help them **save on energy costs**.
- CPower guides **partners and energy users on how to manage their DERs** to strengthen the grid when and where it's needed most.
- Our technology **integrates any energy asset** to provide superior economics, while delivering the highest-rated customer service in the industry with near-perfect 100% retention



What is Demand Response / Curtailment?

Event Participation from the CPower Dashboard



The Bridge to Energy's Future

CPower

Winter Storm Elliott

- Unprecedented winter storm in the PJM region December 23rd – 25th
- PJM needed nearly 30 GW of reserve capacity to maintain reliability
- Estimates of nearly $2 billion in generator non-performance charges
- PJM dispatched over 11 GW of DR resources during the storm
- Represents the first mandatory winter DR event
- CPower responded with over 50 GWh of DR load relief across 197 unique emergency event dispatches to help stabilize the grid

Maximize Profitability While Providing Relief to the Electric Grid

Economic DR Program Pricing (Real-Time)

Hours LMP > Strike Price				
COMED				
Strike Price	2019	2020	2021	2022*
$50	163	188	1,449	3,814
$100	42	18	205	891
$250	11	2	14	13
$500	4	0	1	4
$1,000	0	0	0	2

1MW Revenue for Top 50 Hours				
Zone	2019	2020	2021	2022*
BGE	$14,510	$6,927	$15,667	$31,755
COMED	$10,149	$5,297	$11,888	$15,285

** Pricing through September 2022*

Synchronized Reserves Program Pricing

PJM SR - 1 MW/8760 Hours				
Month	2019	2020	2021	2022
January	$662	$303	$1,576	$5,730
February	$769	$295	$1,311	$2,218
March	$1,653	$688	$2,680	$4,304
April	$1,602	$1,273	$1,651	$6,830
May	$841	$636	$2,648	$5,829
June	$812	$759	$1,897	$10,766
July	$1,226	$1,173	$1,641	$6,919
August	$1,043	$1,418	$2,678	$7,310
September	$1,914	$1,049	$2,089	$3,335
October	$1,631	$2,937	$5,772	
November	$1,140	$2,196	$6,302	
December	$460	$1,928	$4,211	
Monthly Avg	$1,146	$1,221	$2,871	$5,916
Annual	$13,753	$14,655	$34,456	$70,988

Key PJM Program Options

Capacity Performance (CP)

- Minimal effort on participants - Curtail for one test event per year, and if a real event occurs.
- Earn additional Energy payments for participation
- CPower's large portfolio allows flexible enrollment to sites for seasonally imbalanced loads to maximize earnings
- Firm program enrollment deadline through Mid-May, pending availability

Economic DR

- Voluntary program that allows participants to curtail opportunistically when the earnings for their participation make a good business case for their site.
- Program payment rates increased dramatically in 2022

Synchronous Reserves

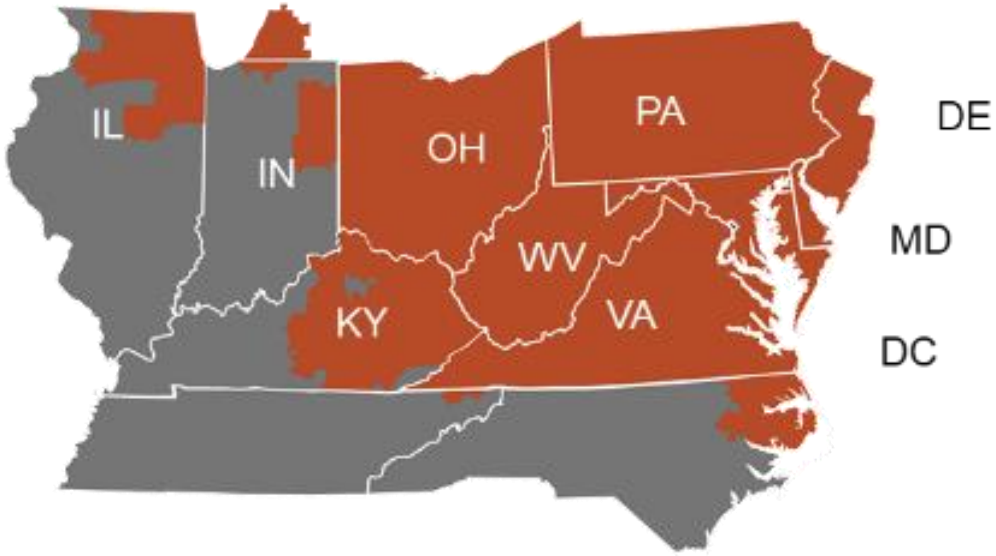
- Generous compensation for sites to curtail quickly
- Sites typically need automated curtailment to succeed
- Total annual dispatch hours are typically small (~4 hrs/yr)
- Sites are paid to offer and more when they are dispatched
- Flexibility to opt in/out each hour

A Range of PJM Programs are Available

Specifics	Capacity (CP)	Economic	Ancillary (SR)	Frequency Reg (FR)	Energy Efficiency (EE)	Peak Demand (PDM)
Notification Lead Time	LONGER 30 min. – 2 hour	LONGER Day-Ahead / Day-Of	SHORTER 0 – 30 min.	SHORTER: 2 second Signal	No curtailment action required	LONGER: Day Ahead/ Day of
Event Duration	LONGER 2 – 15 Hours	VARIABLE Customer price trigger choice	SHORTER </=10 min. to several hours	SHORTER: 1-5 Min +/- swing	No curtailment action required	Longer: 2-3 Hours
Event Frequency (annual)	Unlimited*	VARIABLE Customer price trigger choice	MORE >10	CONSTANT in Hours APPROVED	No curtailment action required	More: 10-15 Notifications
Performance Obligation	Mandatory	VARIABLE Customer price trigger choice	VARIABLE Customer participation choice	Variable Customer participation choice.	Measurement & Verification	Voluntary

DER Optimization in PJM

PJM Market Programs	▪ Capacity Performance ▪ Synchronized Reserves ▪ Real-Time and Day-Ahead Economic ▪ Frequency Regulation
On-Bill Programs	▪ Coincident Peak Management ▪ Transmission Peak Management ▪ Demand Charge Management ▪ Energy Savings (TOU or Index) ▪ Backup/resiliency



EnerWise enables your organization to capture available market and on-bill values, while helping to allocate assets via daily schedules, submit corresponding market bids, and dispatch assets based on awarded bid schedules.

EnerWise Site Optimization

Constraint Modeling

Site-Level Constraints

- Peak Load Contribution (PLC)
- Transmission Zone
- Net Energy Export Permission
- Utility Tariff Structure (gas and electric)
- DCM limits for the operation period/Month
- Minimum Energy Market Bid Price (NBT) for the operation Period (Month)
- Minimum market bid KW step size
- Shape and magnitude of load curve

DER Resource Level Constraints

Generator

- Max Operation Capacity
- Min Operation Capacity
- Controllable KW step size
- Ramping rate
- Operation period/month allocated hours
- Permit type – calendar year or rolling 12 months
- Outage Hours
- PDM reserved Hours
- Maximum daily operation Hours
- ECON Strike Price
- SR strike price
- Start up / shut down cost
- Variable and O&M cost

DER Resource Level Constraints

Battery Energy Storage System

- Max KWH Capacity
- Max KW Capacity
- Hourly SOC
- Outage Hours
- Round Trip Efficiency %
- Minimum reserve charge (kWh)
- Depth of charge/discharge limit
- Annual KWH limit (can be Operation Period (Month) limit)
- ECON Strike Price
- SR Strike price
- FR strike price
- PDM pre-allocation
- Maximum daily operation Hours/KWH
- ITC claimed
- Variable and O&M cost

EnerWise Participation Examples

Crypto Mining (West Penn Power)

- Load-only
- Programs: Capacity Performance, Synchronized Reserve, RT and DA Economic, Coincident Peak Management (PLC)
- **% Revenue Added by Optimization: 55%**

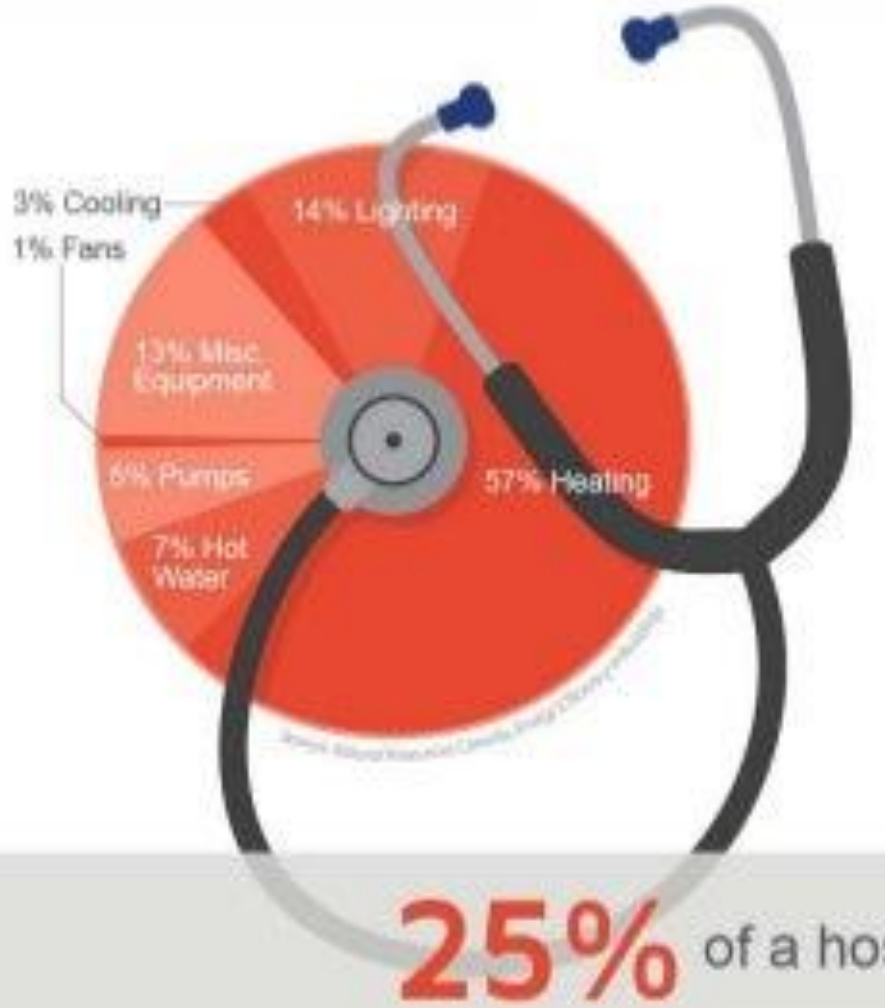
Vertical Farm (Duquesne)

- Generator + Battery + Solar
- Programs: Capacity Performance, Frequency Regulation, Synchronized Reserve, RT and DA Economic, Coincident Peak Management (PLC)
- **% Revenue Added by Optimization: 40%**

Government (Dominion)

- Generator-only
- Programs: Capacity Performance, Synchronized Reserve, RT and DA Economic, Demand Charge Management
- **% Revenue Added by Optimization: 68%**

Breakdown of Energy Use by Extended Care Facility



- Did you know healthcare facilities use 9% of all commercial energy consumption in the U.S.? Energy intensity (Btu/sq. ft./year) of inpatient healthcare facilities is second only to fast food establishments!
- The energy use intensity (EUI) of hospitals and other inpatient **healthcare facilities is nearly three times that of typical commercial buildings**.
- U.S. hospitals use an average of 27.5 kilowatt-hours of electricity and 110 cubic feet of natural gas per square foot annually.

25% of a hospital's cost is energy related.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Q&A

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