

The Potential Costs of AI & Data Centers: Strategies in Tariff Design to Mitigate Ratepayer Risk

Montana Legislature's Financial Modernization & Risk Analysis
(MARA) Committee

May 14, 2026

Peter Cappers – Berkeley Lab

The technical assistance activity that produced this resource was funded by the U.S. Department of Energy's Office of Critical Minerals and Energy Innovation under Contract No. DE-AC02-05CH11231. The authors are solely responsible for any omissions or errors contained herein.



ENERGY TECHNOLOGIES AREA
BERKELEY LAB

Agenda

- Drivers of data center electricity demand increases
- Overview of the electric grid and the impacts of data centers on it
- Overview of cost-of-service ratemaking for electric utilities
- Financial risks imposed by data centers on electric utilities
- Using electric utility tariffs to mitigate some of these financial risks

Growth in electricity consumption from data centers is stark and expected to continue increasing

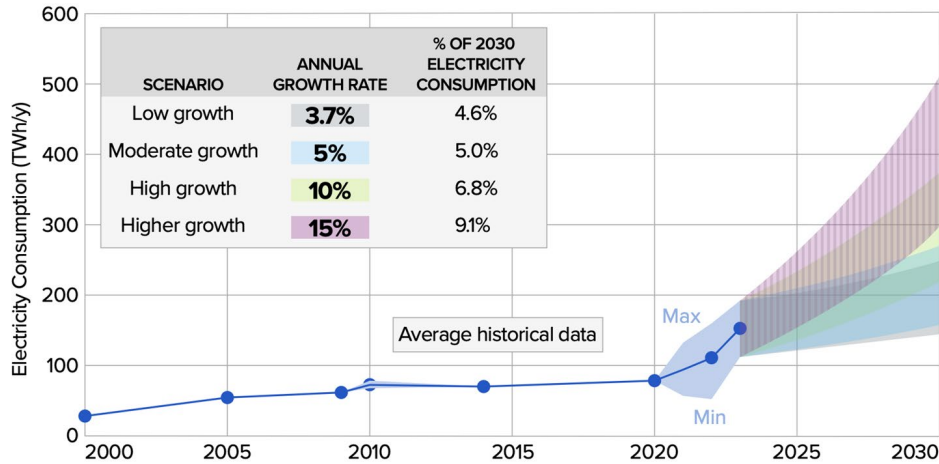


Figure ES-1. Projections of potential electricity consumption by U.S. data centers: 2023–2030. % of 2030 electricity consumption projections assume that all other (non-data center) load increases at 1% annually.

Source: EPRI

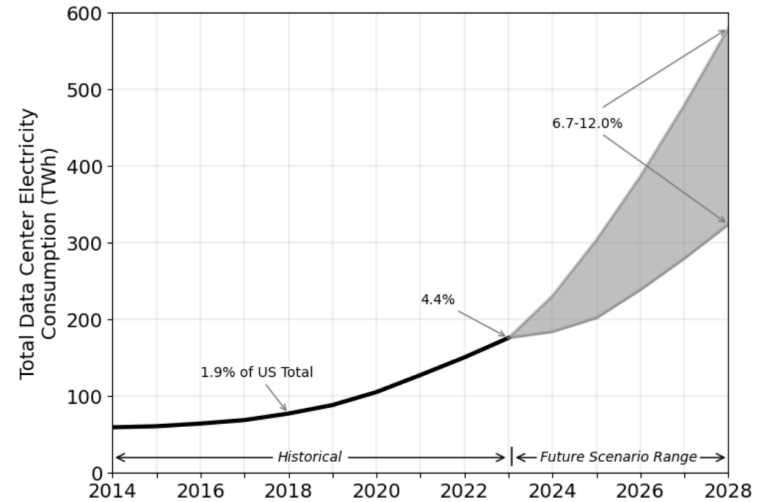


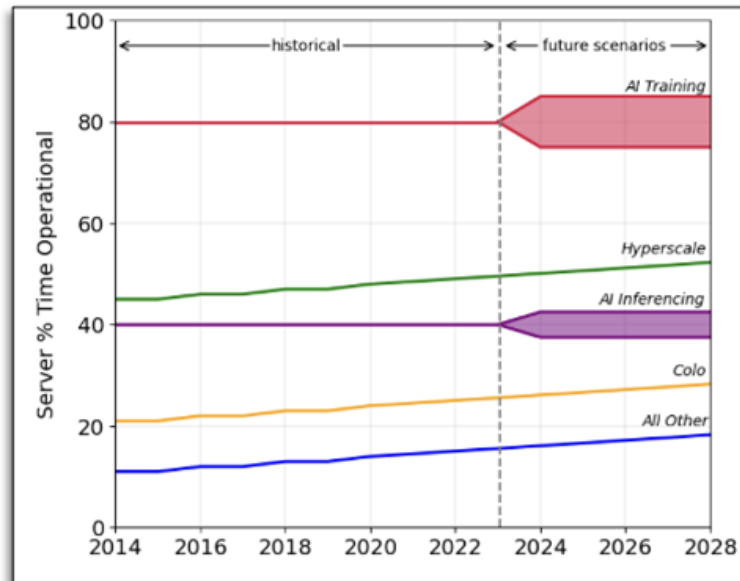
Figure ES-1. Total U.S. data center electricity use from 2014 through 2028.

Source: [LBNL](#)

Server utilization is increasing with increased usage of heavy computational activities

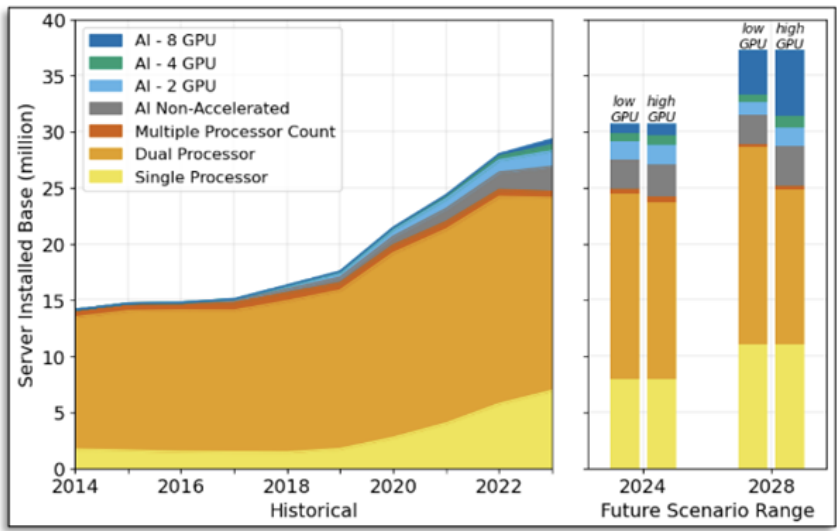
Operational time of servers by server type

(Source: [LBNL](#); Figure 3.6)



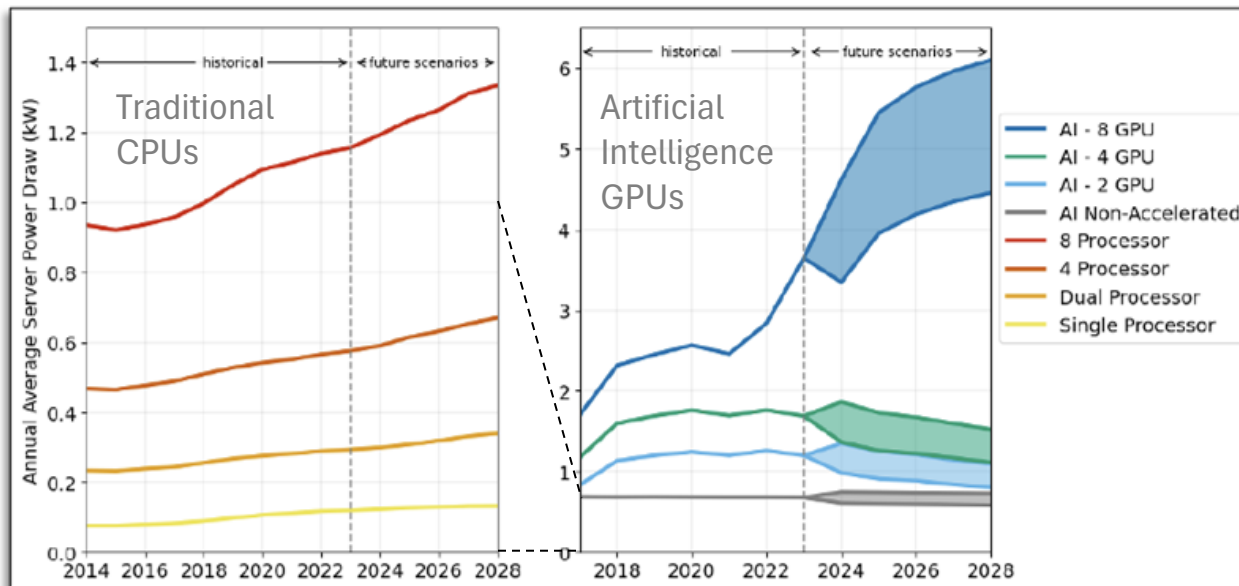
The number of installed data center servers is expected to grow by ~75% between 2020 and 2028

Total server installed base for 2014–2028 with higher bound shipments (left). Adjusted installed base with lower bound GPU shipments (right)
(Source: [LBNL](#); Figure 3.9)



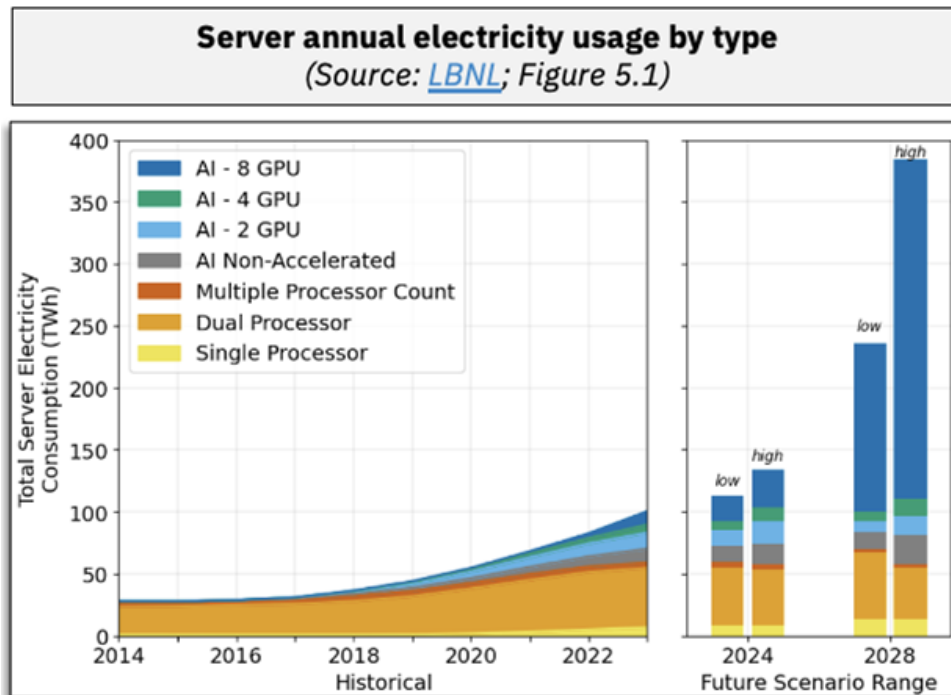
Artificial Intelligence GPUs can use 3X to 10X more electricity than traditional processors

Aggregate average power draw of various server types across each analysis year
(Source: [LBNL](#); Figure 3.7)



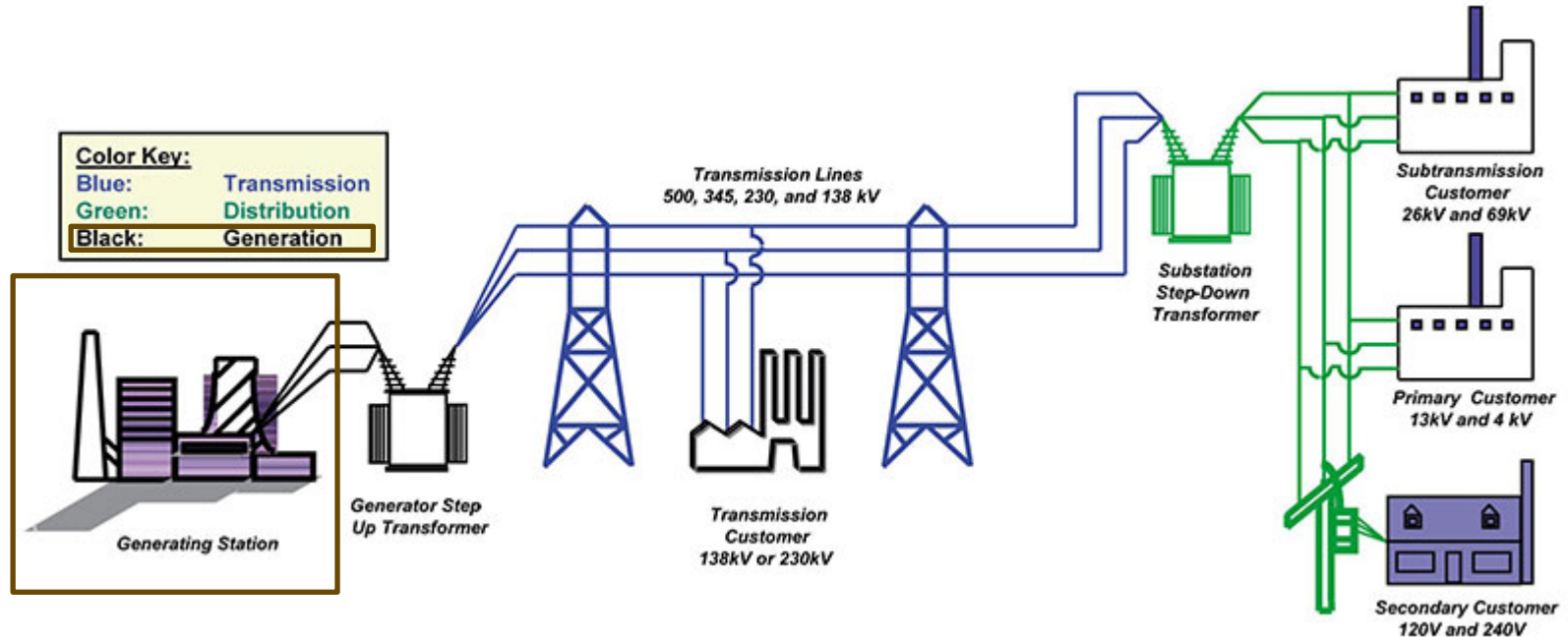
Source: [Berkeley Lab](#), [EPE](#)

These three factors lead to 140%-280% increase in data centers' demand for electricity between 2023 and 2028



Three key functions of an electric utility

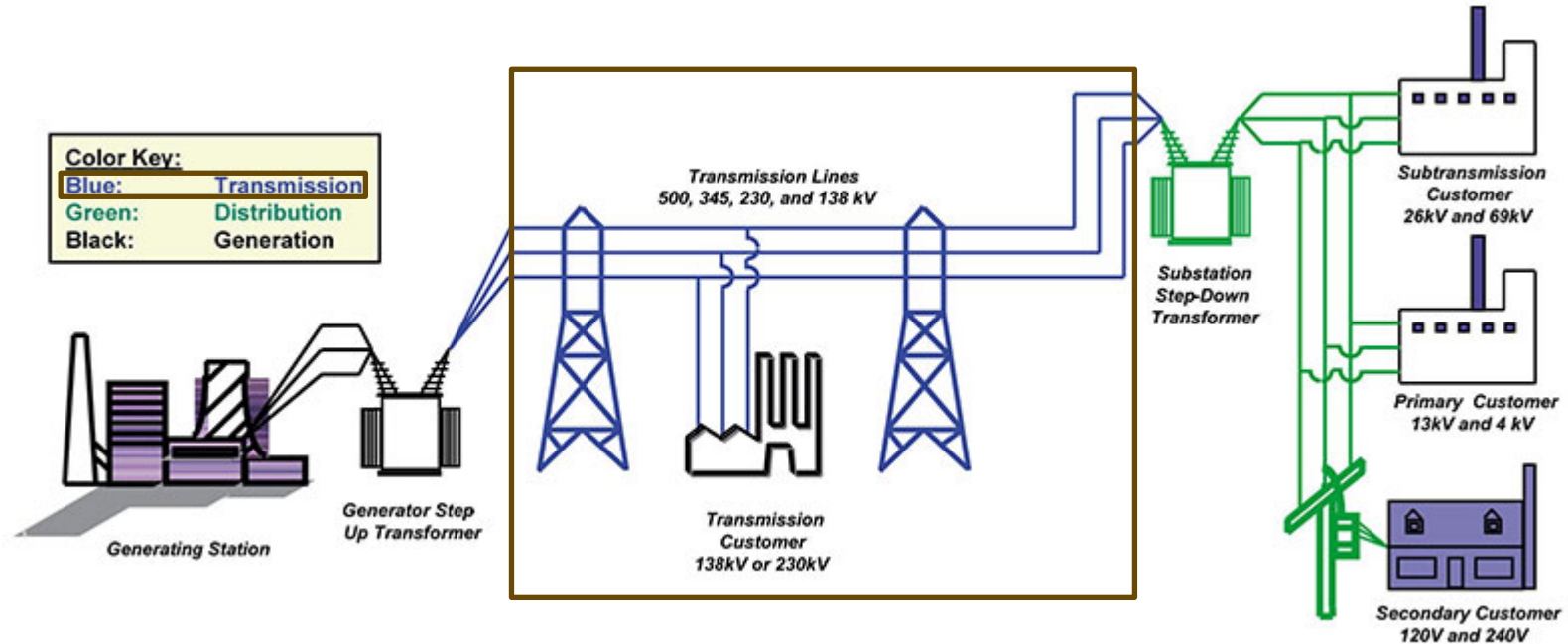
Generation



Credits: Union of Concerned Scientists

Three key functions of an electric utility

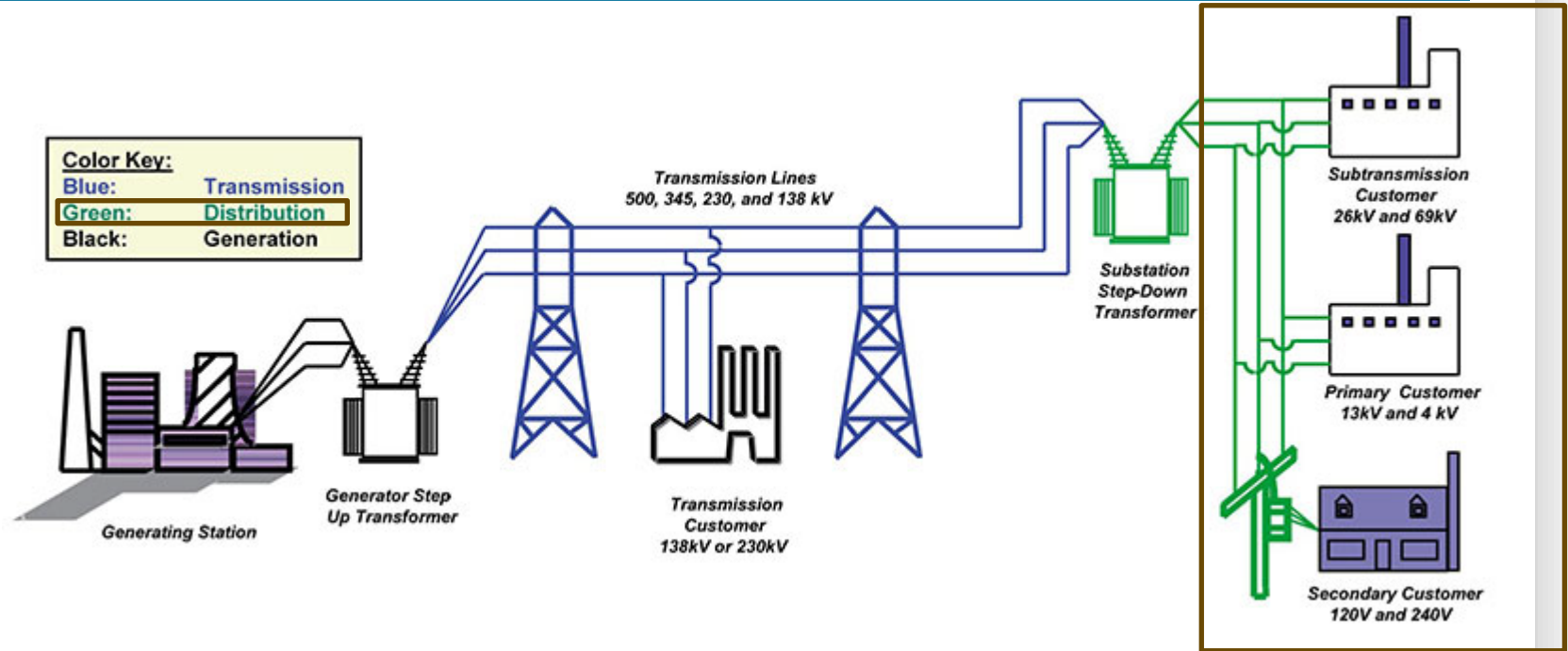
Transmission



Credits: Union of Concerned Scientists

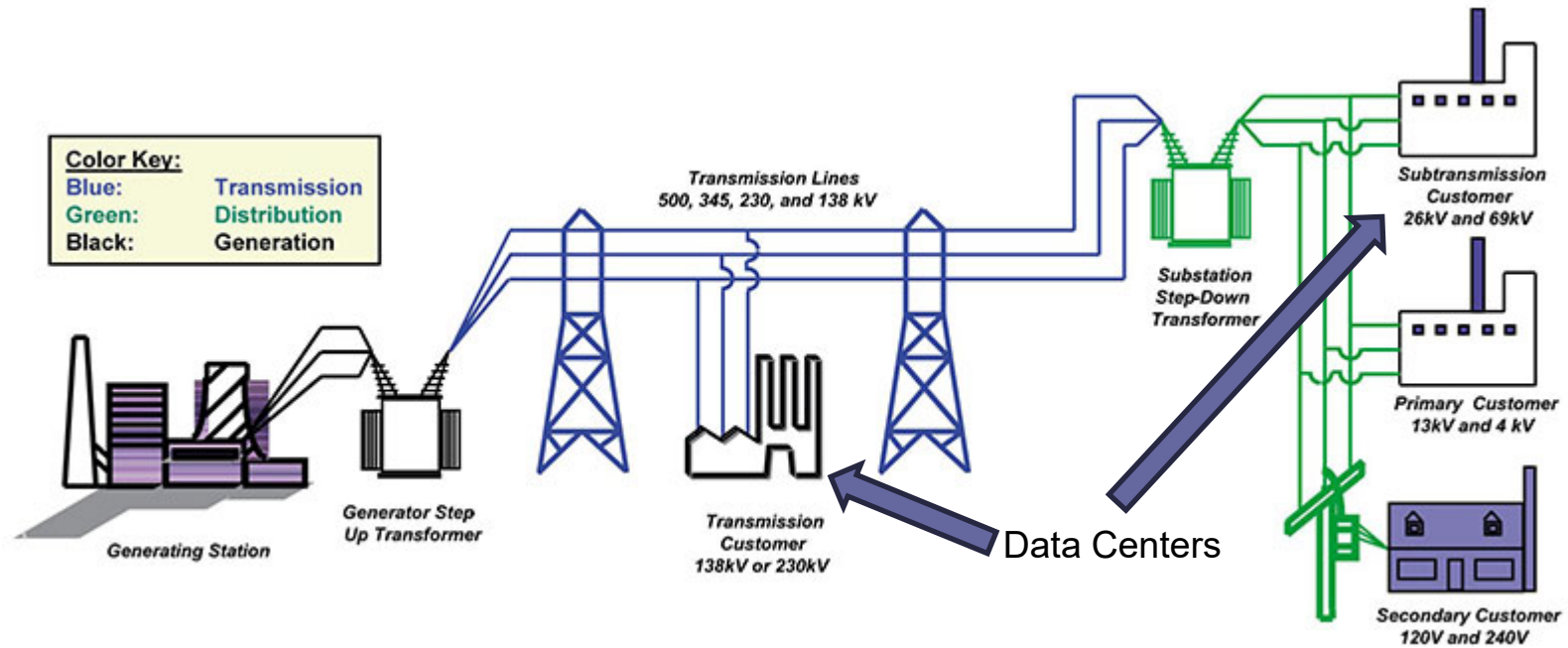
Three key functions of an electric utility

Distribution



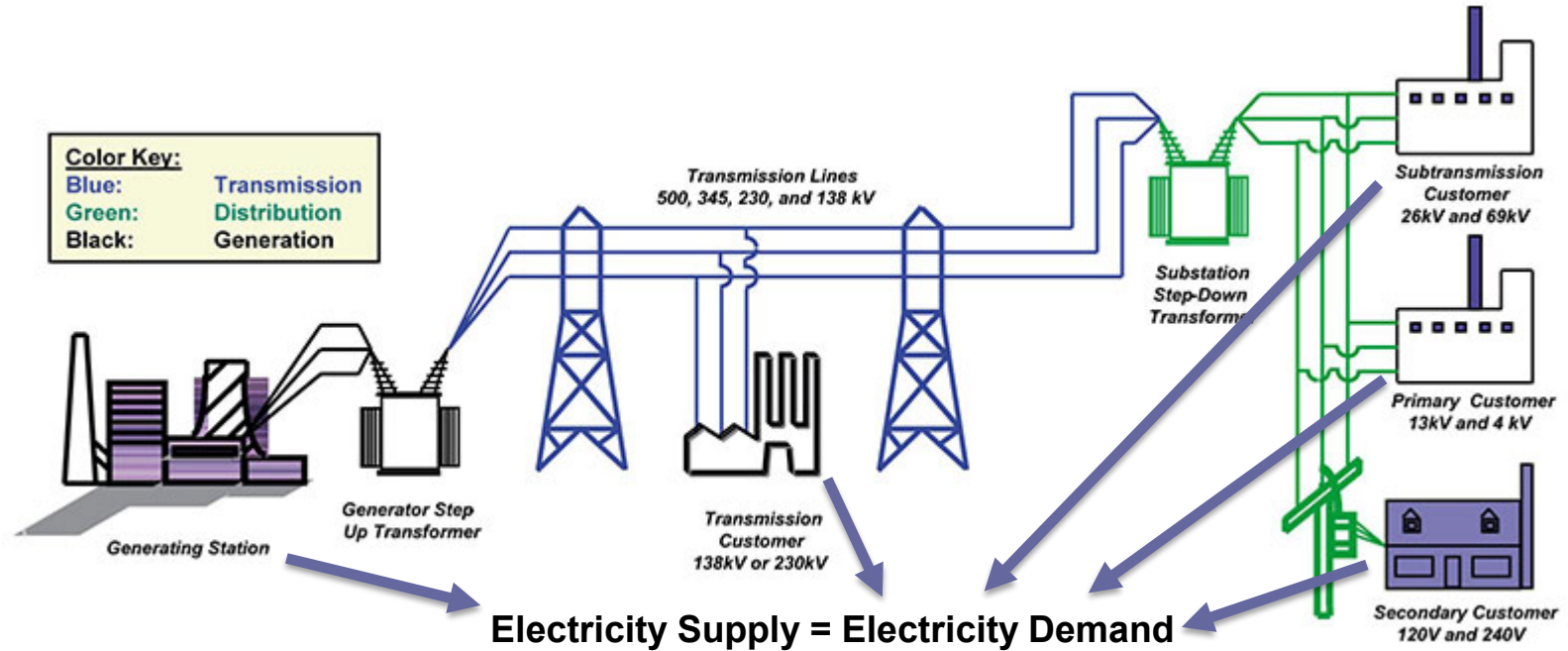
Credits: Union of Concerned Scientists

Due to their size, data centers are typically connected to the transmission system or at the highest levels of the distribution



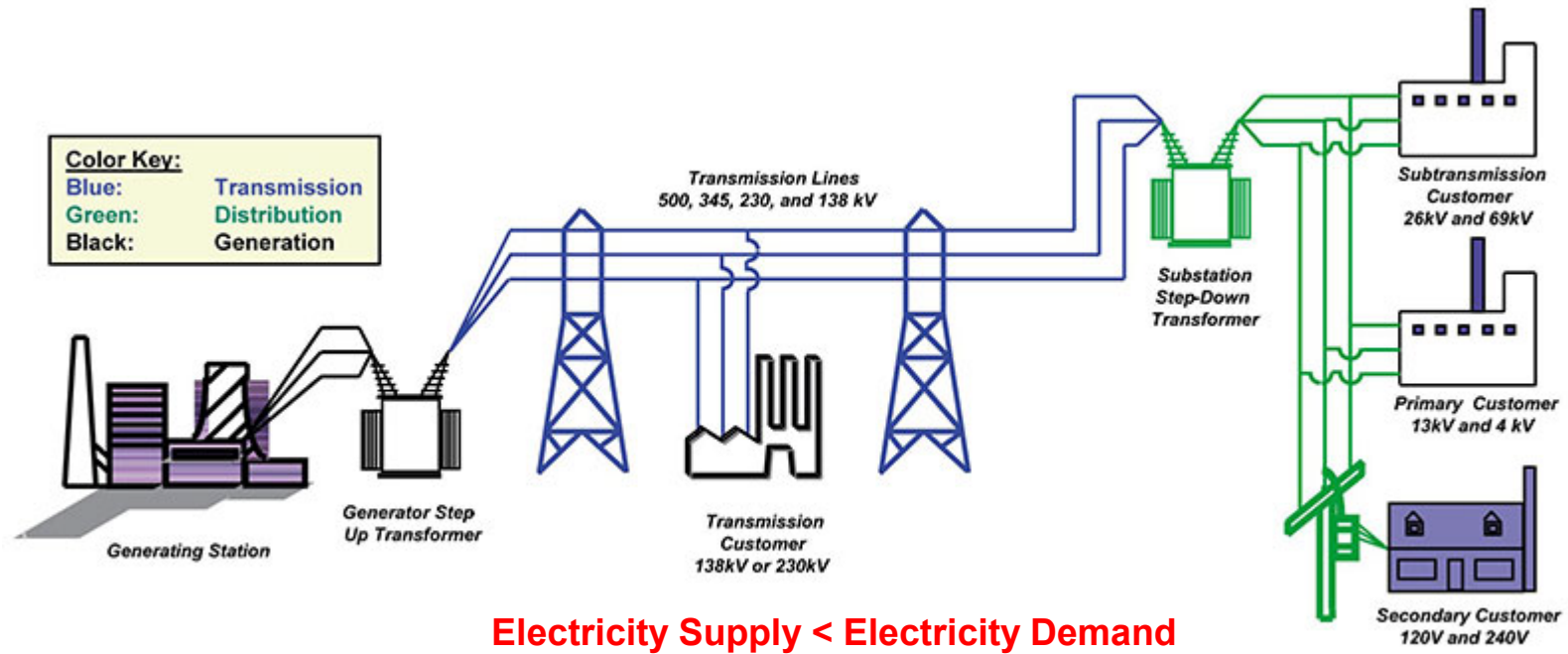
Credits: Union of Concerned Scientists

Utilities have a responsibility to provide reliable power as regulated monopolies



Credits: Union of Concerned Scientists

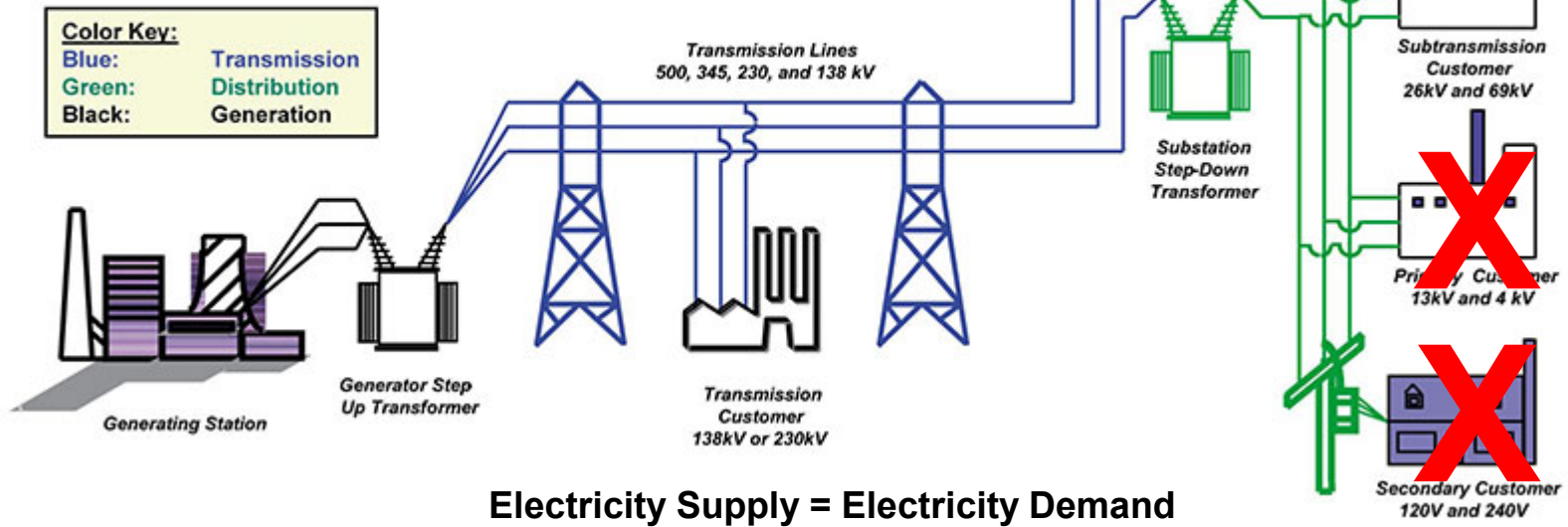
If the demand for electricity exceeds the supply of electricity...



Credits: Union of Concerned Scientists

System operators must reduce the demand for electricity (or increase the supply of electricity, if that is possible)

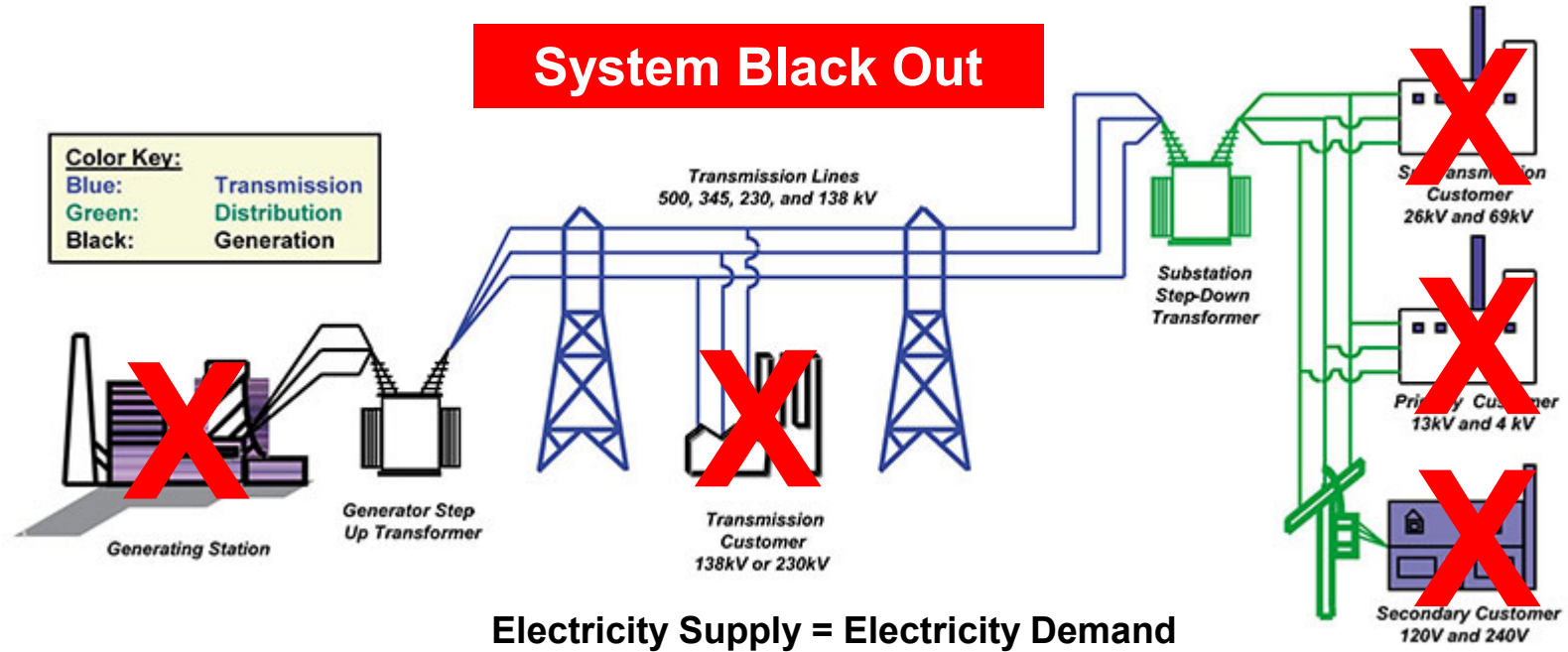
Local Black Out



Credits: Union of Concerned Scientists

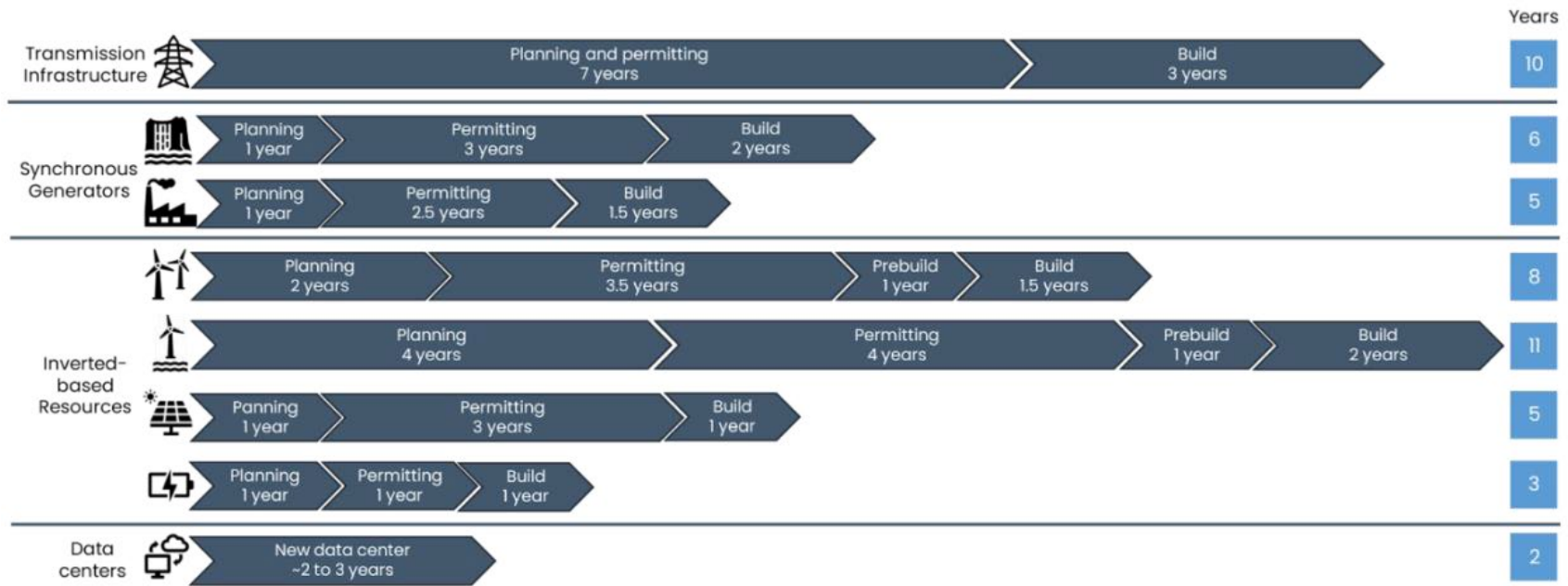
If system operators can't balance the electric grid fast enough, then the whole electric grid goes down

System Black Out



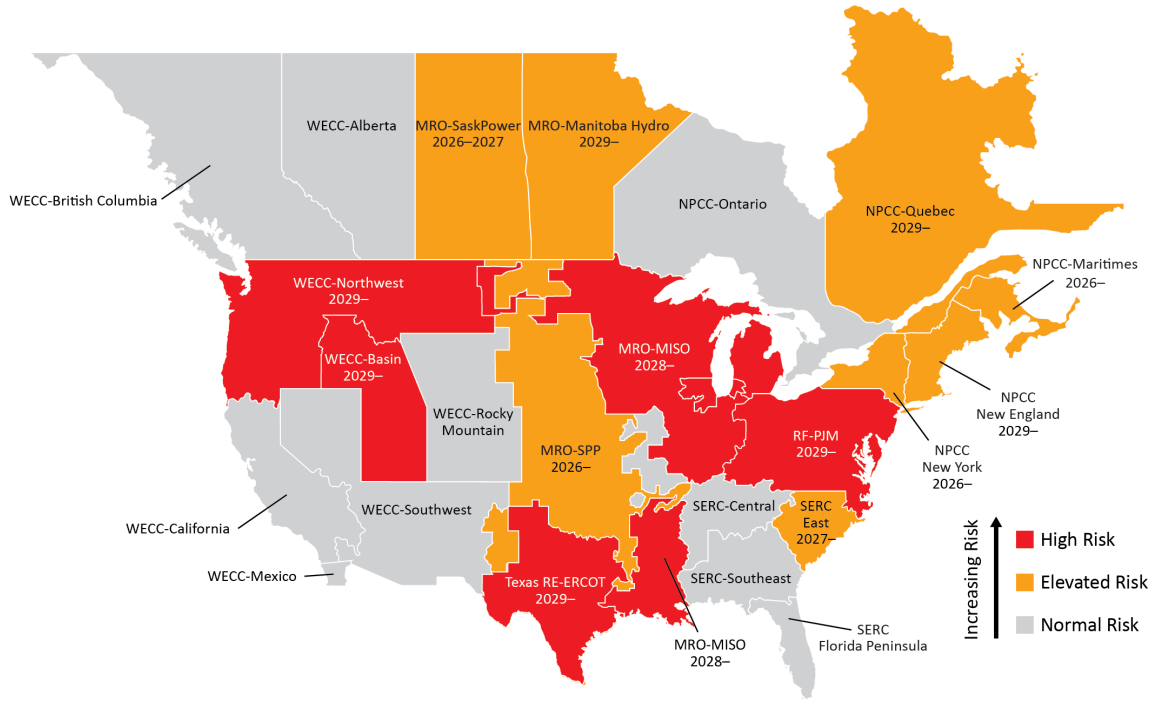
Credits: Union of Concerned Scientists

Electricity grid upgrades to meet expected demand growth from data centers takes time



Source: [Elevate Energy Consulting](#) (2025), Figure 1.4

Electricity demand growth, driven by data centers, is inducing higher risk of future outages in many parts of the US



“The overall resource adequacy outlook for the North American BPS is worsening ... Projections for resource and transmission growth lag what is needed to support new data centers and other large loads that drive escalating demand forecasts.”

NERC Long-Term Reliability Assessment 2025



Overview of Cost of Service (COS) Ratemaking

- Regulators strive to approve rates that are reflective of the costs of the services rendered by utilities
 - **Costs** must be deemed to be **prudently incurred** for inclusion in rates
 - **Capital assets** repaid through rates with an **allowed rate of return** must be deemed **used and useful**
 - Rates are determined to be **fair and reasonable**
 - Rates must allow a utility **the opportunity** to both **sufficiently recover its incurred costs** and **to earn allowed returns** comparable to what a similarly situated utility would achieve



Three Key Questions in Ratemaking

How much revenue should the utility be allowed to collect?



How much of the total revenue should be collected from each class of customers?



How much of the classes' revenue should be collected from each customer?





First Key Question in Ratemaking

How much revenue should the utility be allowed to collect?

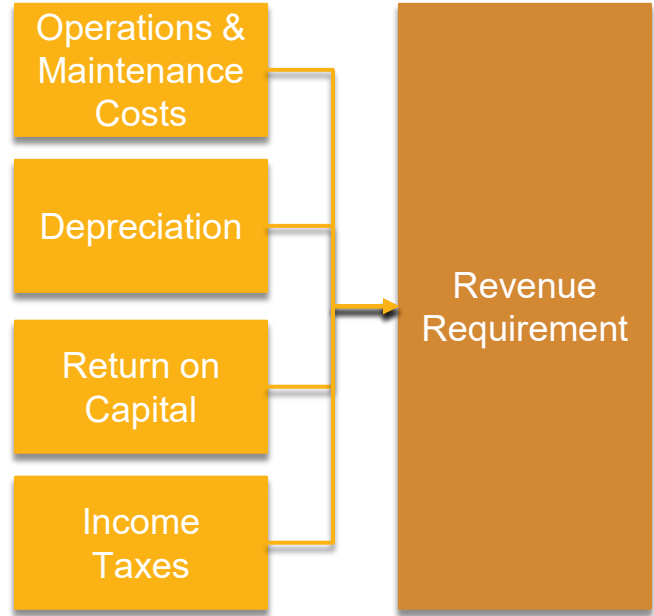


***A COST OF SERVICE STUDY
IS USED TO DEVELOP A
REVENUE REQUIREMENT***

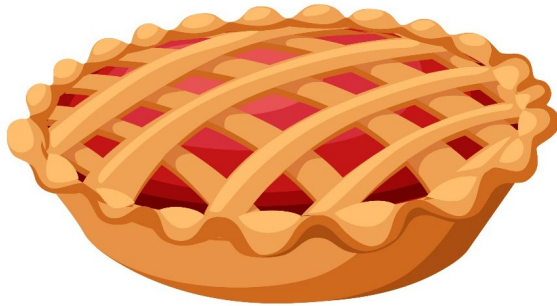


Elements of a Cost of Service (COS) Study

1. Determine the annual cost of serving all of the utility's customers



Test Year Revenue Requirement



- The annual revenue requirement amount can be compared to the size of a pie that is needed to cover the utility's costs to serve all of its retail customers over a year.
- The “Test Year” RR is the amount used to design rates.
 - **Historic Test Year** – A recent 12 month period which reflects the actual results of operations as adjusted for known and measurable changes
 - **Current/Future Test Year** – A future 12 month period which reflect the anticipated results of operations



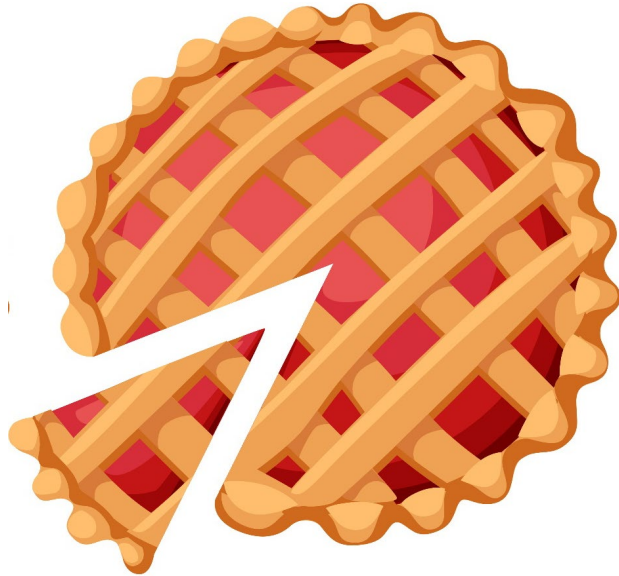
Second Key Question in Ratemaking

**COST ALLOCATION IS USED
TO DETERMINE HOW MUCH
OF THE REVENUE
REQUIREMENT TO COLLECT
FROM EACH CLASS**

How much of the total
revenue should be
collected from each
customer class?

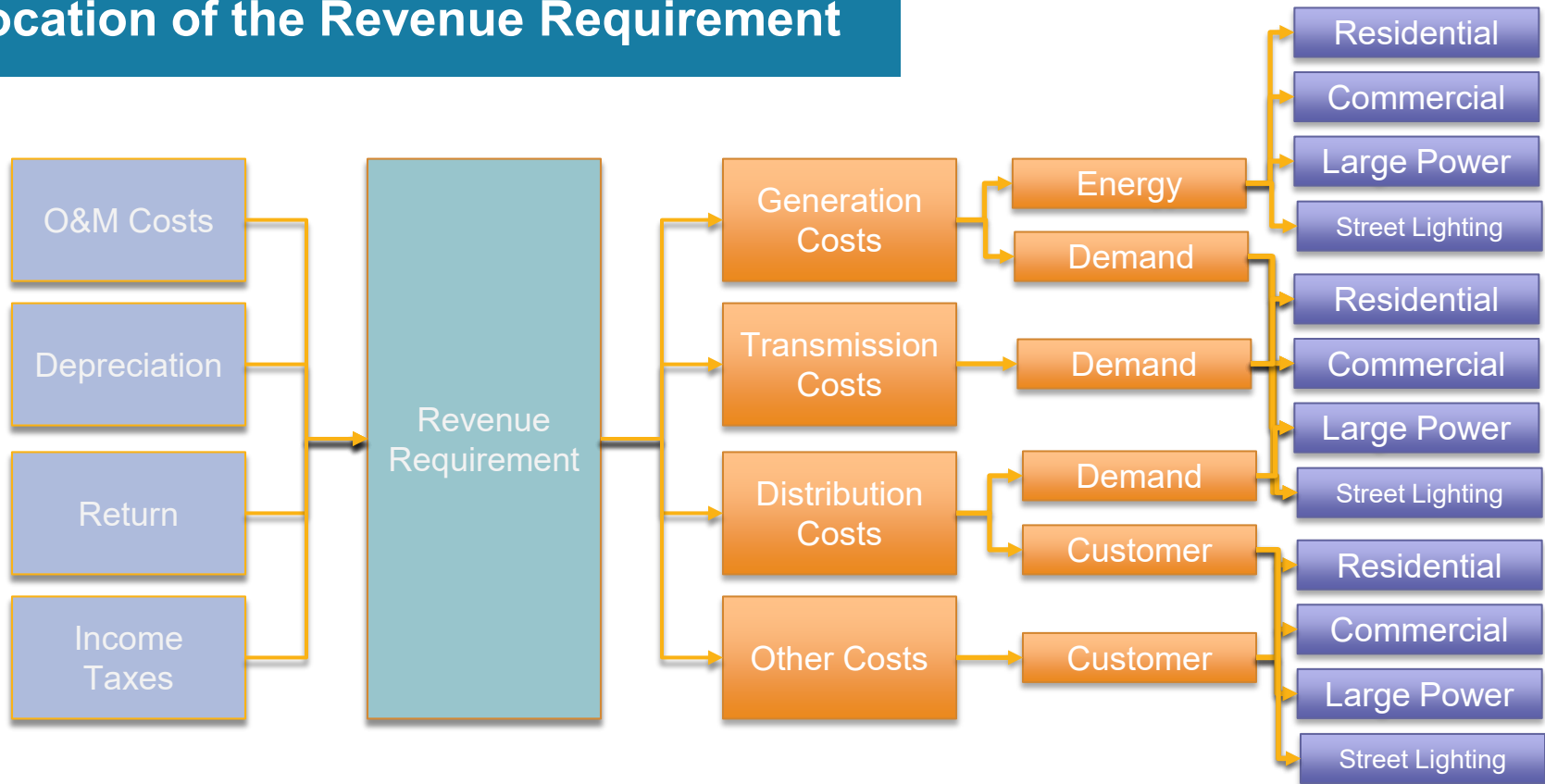


Allocation of Revenue Requirement to Customer Classes



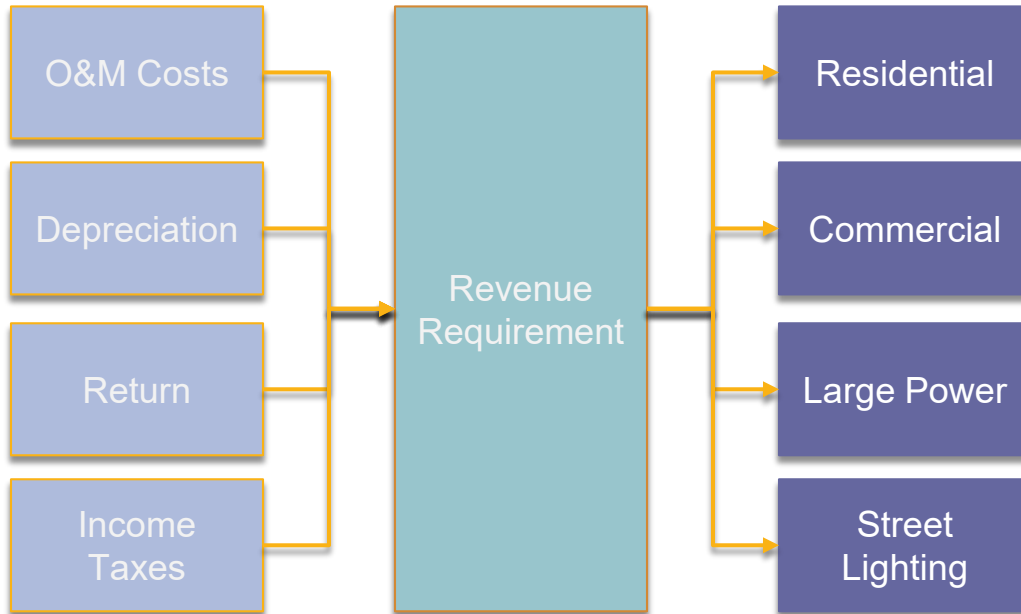
- An assessment of how much of the **utility's incurred costs are caused by each customer class** is used to **allocate the revenue requirement** to each class
- This is analogous to dividing the pie into slices that correspond to the revenue responsibility for each customer class

Allocation of the Revenue Requirement



Elements of a Cost of Service (COS) Study

2. Determine the cost responsibility for each customer class





Third Key Question in Ratemaking

***RATE DESIGN IS USED TO
COLLECT THE CLASSES'
REVENUE REQUIREMENT
FROM EACH CUSTOMER IN
THE CLASS***

How much of the
classes' revenue
should be collected
from each customer?





Rate Design

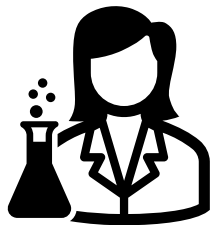


- Rate design determines how each slice of the revenue requirement pie is collected
- The rate design step allocates revenue responsibility to each customer in each class.
- Ideally, the entire slice of pie is collected from customers in each class annually.



Retail rates are designed based on two broad concepts

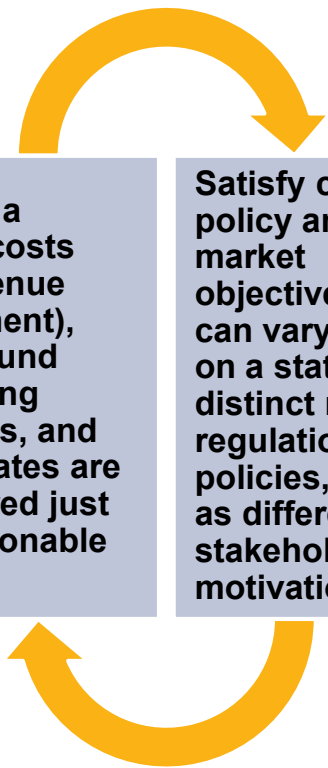
Science



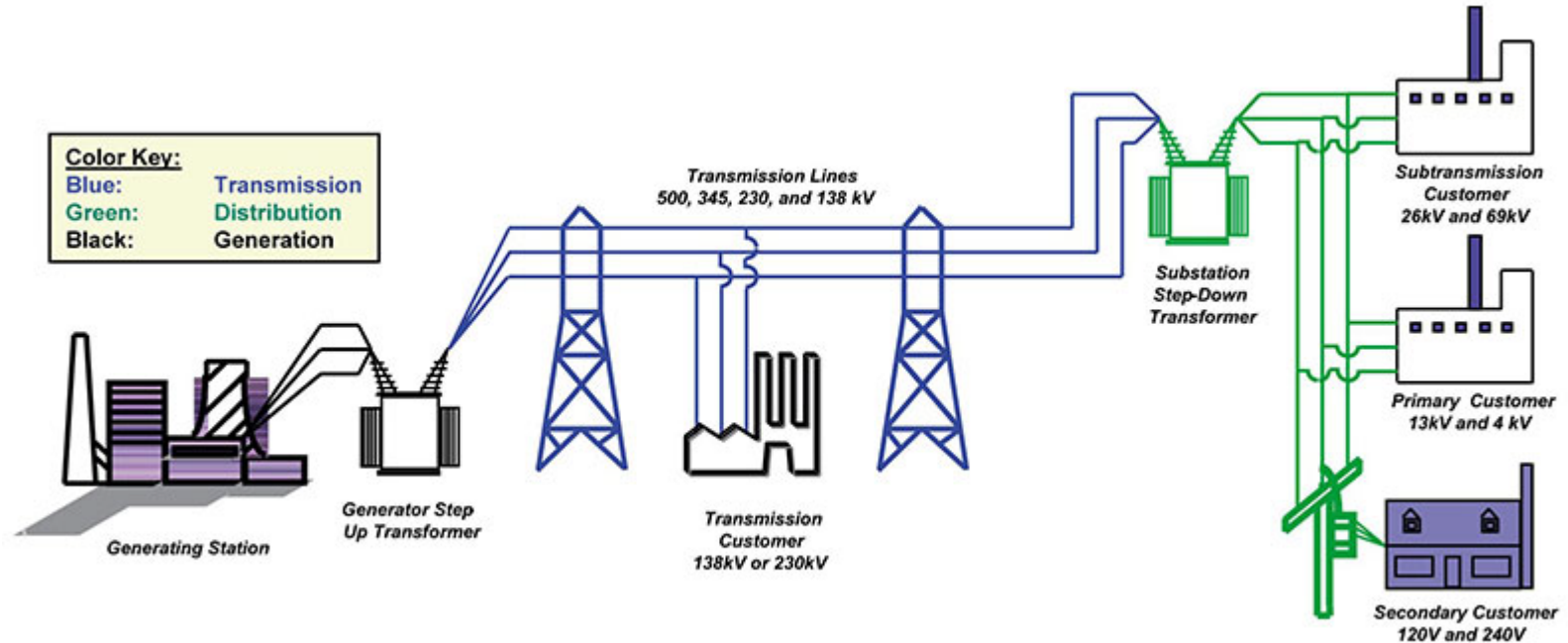
Recover a utility's costs (i.e., revenue requirement), apply sound ratemaking principles, and ensure rates are considered just and reasonable

Satisfy certain policy and/or market objectives that can vary based on a state's distinct rules, regulations, and policies, as well as different stakeholder motivations

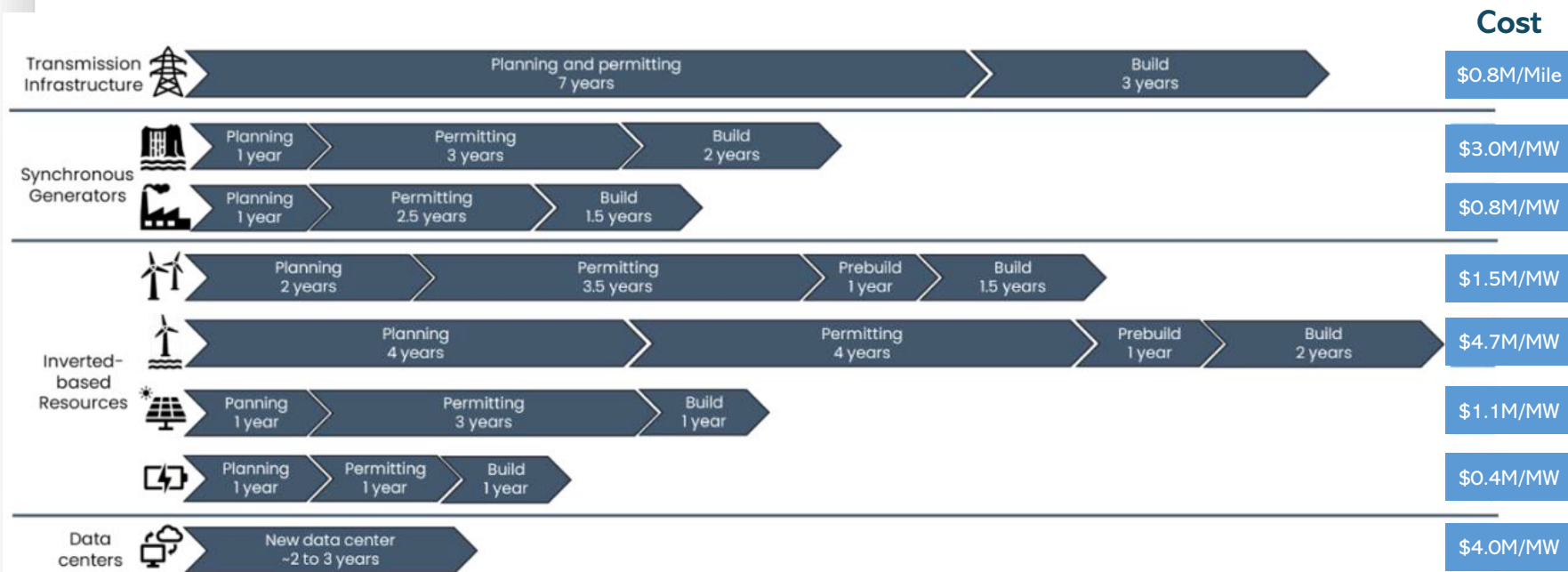
Art



Utilities have a responsibility to provide affordable power as regulated monopolies



Electricity grid upgrades to meet expected demand growth from data centers takes money





Data centers are contributing to an increase in electricity transmission costs in Virginia

*“The PJM Interconnection’s board last week approved **\$11.8 billion in baseline transmission projects**, with Dominion Energy’s Virginia utility landing roughly **\$4.8 billion in those projects**” - UtilityDive*

Data centers are contributing to an increase in electricity generation costs in Virginia

Table 2. RPM Base Residual Auction Resource Clearing Price Results in the RTO

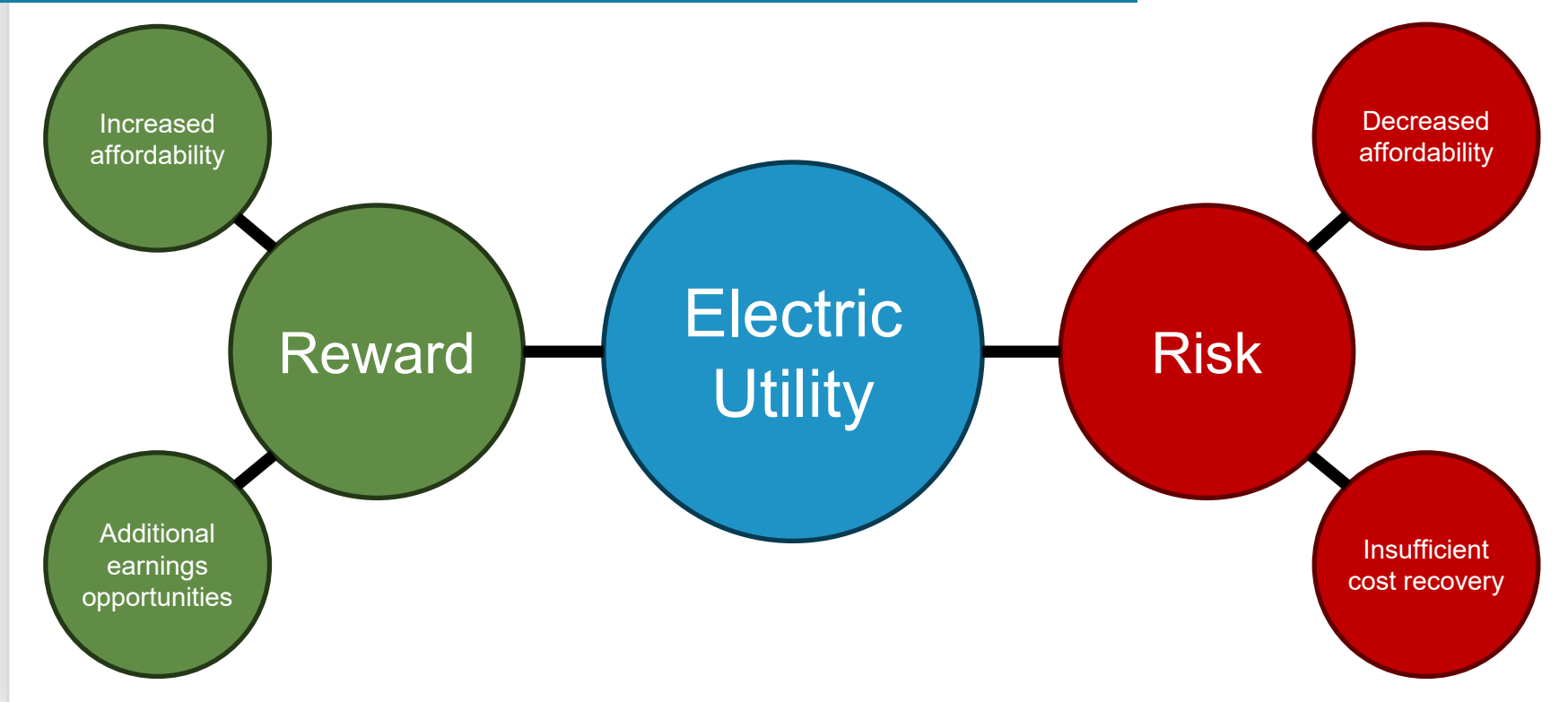
Delivery Year	Auction Results				
	Resource Clearing Price	Cleared UCAP (MW)	RPM Reserve Margin ¹	Total Reserve Margin ^{1,2,6}	Cleared MW Times Clearing Price (\$ billion)
2017/18	\$120.00	167,003.7	20.1%	19.7%	\$7.5
2018/19	\$164.77	166,836.9	20.2%	19.8%	\$10.9
2019/20	\$100.00	167,305.9	22.9%	22.4%	\$7.0
2020/21 ³	\$76.53	165,109.2	23.9%	23.3%	\$7.0
2021/22	\$140.00	163,627.3	22.0%	21.5%	\$9.3
2022/23	\$50.00	144,477.3	21.1%	19.9%	\$3.9
2023/24	\$34.13	144,870.6	21.6%	20.3%	\$2.2
2024/25	\$28.92	147,478.9	21.7%	20.4%	\$2.2
2025/26 ⁴	\$269.92	135,684.0	18.6%	18.5%	\$14.7
2026/27 ⁵	\$329.17	134,205.3	18.9%	18.9%	\$16.1
2027/28	\$333.44	134,478.1	14.4%	14.9%	\$16.4

¹ Reserve Margins converted to ICAP using Pool-Wide AUCAP Factor or EFORD prior to 2025/26 DY, PRD removed from Reliability Requirement in calculation of RPM Reserve Margin; ² Total Reserve Margin includes FRR+RPM (Total ICAP/Total Peak-1); ³ Beginning 2020/2021 Cleared UCAP (MW) includes Annual and matched Seasonal Capacity Performance sell offers; ⁴ DOM zone included in RPM; ⁵ EE removed from Market; ⁶ Total Reserve margin does not include FRR commitments to meet the threshold to allow sales into RPM.

“Data center load growth is the primary reason for recent and expected capacity market conditions, including total forecast load growth, the tight supply and demand balance, and high prices” – PJM Independent Market Monitor



Utilities must balance the rewards of new data centers with the financial risks



Utility tariff elements to mitigate utility and ratepayer financial risks

Minimum load requirements and demand charges

Total Contract Cap. (MW)	Min. Demand (MW)	Percentage
113	95.50	84.51%
114	96.50	84.65%
115	97.50	84.78%
116	98.50	84.91%
117	99.45	85.00%
117+	85.00%	

Upfront payment and exit fees



Source: [Financial Edge](#)

Credit rating and collateral requirements

MOODY'S	S&P	FITCH	DESCRIPTIONS	GRADE
Aaa	AAA	AAA	Highest credit quality, minimum credit risk	INVESTMENT
Aa	AA	AA	Very high credit quality, very low credit risk	
A	A	A	High credit quality, low credit risk	
Baa	BBB	BBB	Good credit quality, moderate credit risk	
Ba	BB	BB	Issuer faces adverse conditions and uncertainty, substantial credit risk	HIGH YIELD (or "junk")
B	B	B	High credit risk, issuer able to meet financial commitments	
Caa	CCC	CCC	Vulnerable and default likely	
Ca	CC	CC	Issuer is highly vulnerable or near default	
C	C	C	Lower ratings, issuer in default	
		D	Lower ratings, issuer in default	
		D	Lower ratings, issuer in default	

Source: [Giorgio Trovato on Unsplash](#)

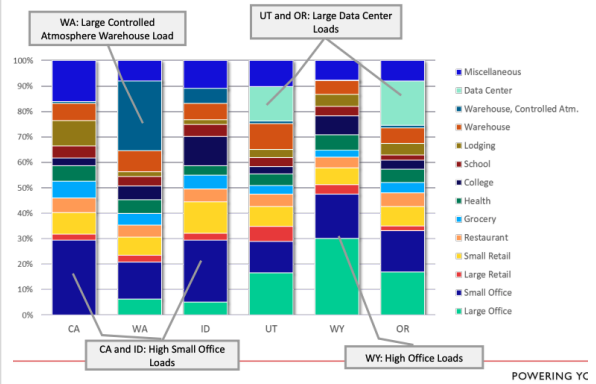
Contract duration, sizing and resizing



Source: [FreePik](#)

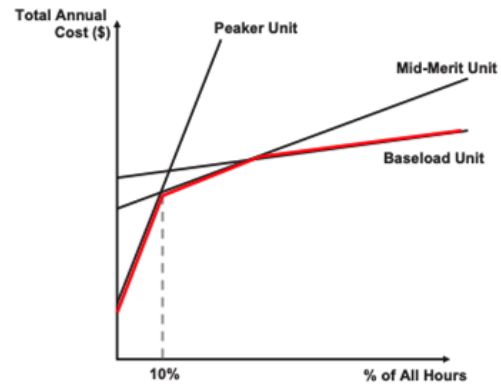
Utility tariff elements to fairly allocate system costs and mitigate risks of cost shifts to other utility customers

Applicability to specific customer type



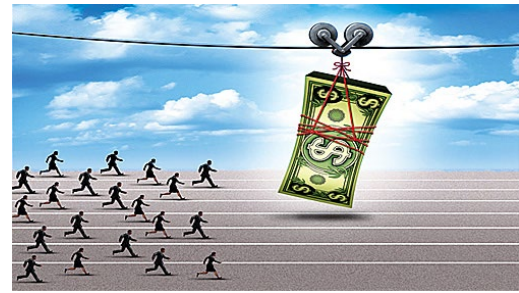
Source: [PacifiCorp](#)

Marginal pricing



Source: [Brattle](#)

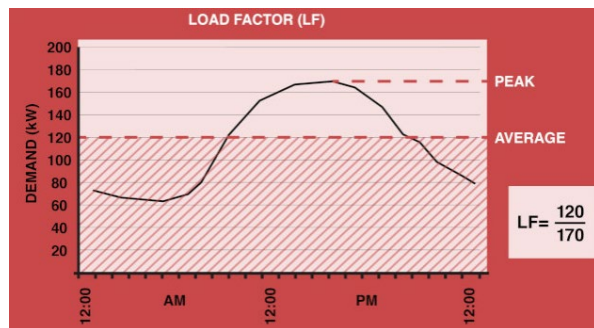
Economic development payments



Source: [Area Development](#)

Utility tariff elements to mitigate operational and resource adequacy risks

Minimum load factor



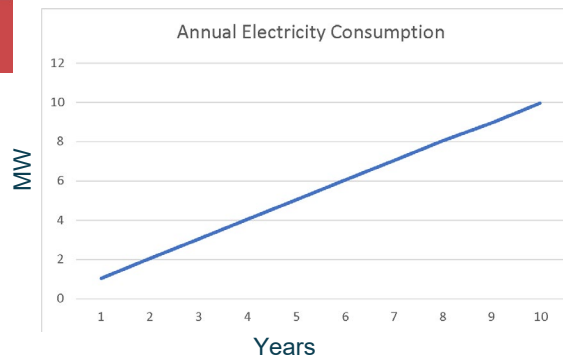
Source: [APS](#)

Behind-the-meter resources as backup and supplemental power



Source: [Sunlogix](#)

Ramp times





Questions?

Contact

Peter Cappers

PACappers@lbl.gov

(315) 637-0513

For more information

Download publications: <https://emp.lbl.gov/publications>

Sign up for our email list: <https://emp.lbl.gov/mailling-list>

Disclaimer

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof, or The Regents of the University of California.

Ernest Orlando Lawrence Berkeley National Laboratory is an equal opportunity employer.

Copyright Notice

This manuscript has been authored by an author at Lawrence Berkeley National Laboratory under Contract No. DE-AC02-05CH11231 with the U.S. Department of Energy. The U.S. Government retains, and the publisher, by accepting the article for publication, acknowledges, that the U.S. Government retains a non-exclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this manuscript, or allow others to do so, for U.S. Government purposes