Energy Policy Trends & Threats to the Energy System

Tuesday, April 30

Agenda

Emerging Issues:

- Future of Gas
  - Utility Influence and Tactics
- Transmission and Interconnection
- Electrification
- Rate Design
- Performance Based-Ratemaking
- Alternative Fuels and New Technologies

Future of Gas

Why Now?

- Natural gas has acted as a bridge fuel to cut down on coal
- Methane has more than 80 times the warming power of carbon dioxide over the first 20 years after it reaches the atmosphere.
- 2% methane release puts gas's climate risk on par with coal
- When considering the net emissions from all natural gas and coal greenhouse gases (including CO2, methane, and sulfur dioxide), the climate risk for natural gas and coal can be on par at just 0.2% methane leakage.

Key Questions

- How long is the natural gas bridge?
- When should we stop developing new natural gas infrastructure?
- How do we phase away natural gas?
- How do we make our use of natural gas beneficial without turning it into a long-term problem?

Facts and Considerations

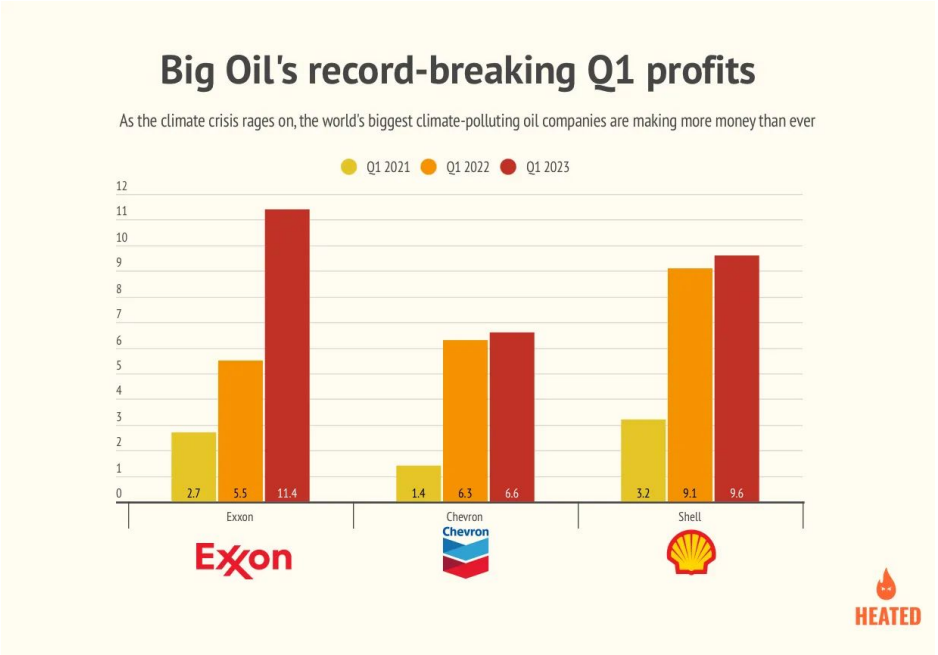
- Sunk costs and stranded assets associated with moving away from gas
  - In simple terms, stranded assets turn out to be worth less than expected as a result of changes associated with the energy transition.
- Impact of methane leaks and increased regulations
- Affordability of gas commodity and gas distribution
- Affordability and ease of electrification
- Targeting low-income areas for buildout
- American Gas Association (AGA) lobby
- Public sentiment re: heat and gas stoves

The Players

- American Gas Association: Represents natural gas companies in the US
- Edison Electric Institute: Association that represents all ~168 US IOUs
- Organizations and companies deploy thousands of lobbyists across the country to slow clean energy progress and advance utility interests
- Koch Industries: Multinational conglomerate that manufactures many of the products we interact with daily.
- American Petroleum Institute: represents all segments of America's natural gas and oil industry
- "Big Oil"
    - Exxon
    - Shell
    - BP
    - Chevron

Spending

- The world’s four biggest climate-polluting companies made a combined $32.6 billion in profit in just Q1 of 2023 (BP is missing from the chart on the right)
- Lobbyist spending has increased dramatically since the 1970s
- Exxon, Chevron, Shell, BP, and API spent a combined $452.6 million lobbying the federal government since 2011
- BP, Shell, Chevron, Exxon spend around $750 million annually on climate-focused communications



The Media

- Amplified Messages:
  - We need oil and gas
  - It would be dangerous to rely only on renewables
  - Climate action is too expensive
  - Energy freedom and independence
  - Now we're cooking with gas
  - You can only control cooking temp with a gas stove and flame
  - Food tastes better cooked on a gas range
  - Cost shift: Wealthy people have solar, and the cost of that on the grid will fall on low-income communities
- Omission: Not connecting climate impacts we are seeing today to climate change or fossil fuels and the companies behind them
- TV, social media, radio, papers etc are all fair game for utilities to promote their brand and mislead the public

Politics & Charitable Giving

- Donations to political leaders
- Contributions to local community organizations to quell criticism and community organizing
  - Direct donations
  - Sponsoring events
  - Donating to the buildout of public spaces
- Serving on local boards
- Infiltrating environmental and social justice spaces
  - Presenting at conferences
  - Funding science research that aligns with their interests

Utility	Total Charitable Giving (2013-2017)
Ameren	$35,276,349
American Electric Power	$116,102,421
Arizona Public Service	$38,919,576
Dominion Energy	$105,972,472
DTE Energy	$78,420,180
Duke Energy	$306,482,338
Entergy	$69,514,279
FirstEnergy	$28,312,221
NextEra Energy	$44,020,196
Southern Company	$209,214,246.45
Total	**$1,032,234,278**

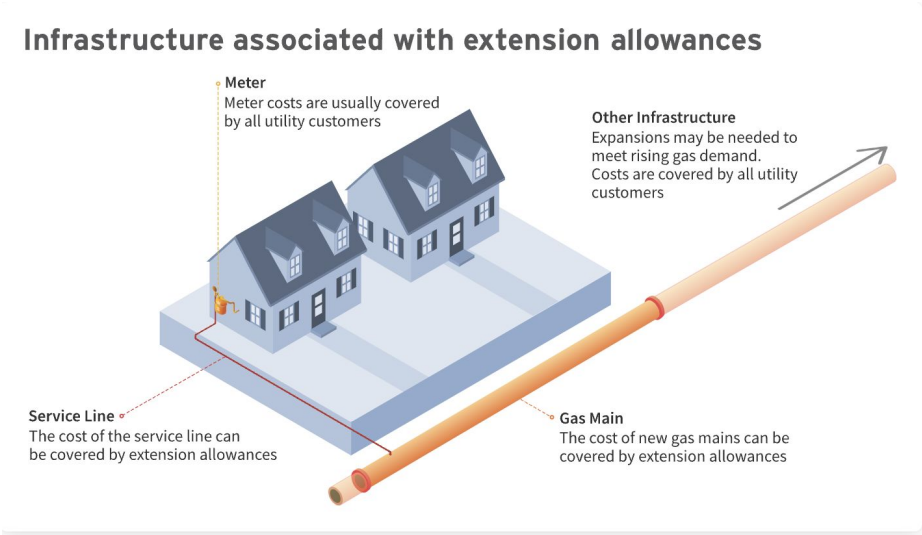
Corporate Greenwashing

- Big Oil utilities and API have expressed a commitment to the Paris Agreement but their actions have not lined up with those commitments
  - ExxonMobil invested only 0.22% of its capital expenditures in low-carbon projects between 2010 and 2018
  - Shell's 2020 emissions were nearly twice that of the entire nation of Canada, and the company plans to increase natural gas extraction by 20%
- Most corporate lobbying spending goes toward policies that are oppositional to clean energy progress and the Paris Agreement
- Misleading Claims
  - Washington Gas is being sued for claims made on customer bills: "Natural gas is clean, efficient, and reliable energy"
  - Moving away from saying "oil" and "gas" on their websites to more broad terms like "integrated energy"

Policies Shaping the Future of Gas

Policies:

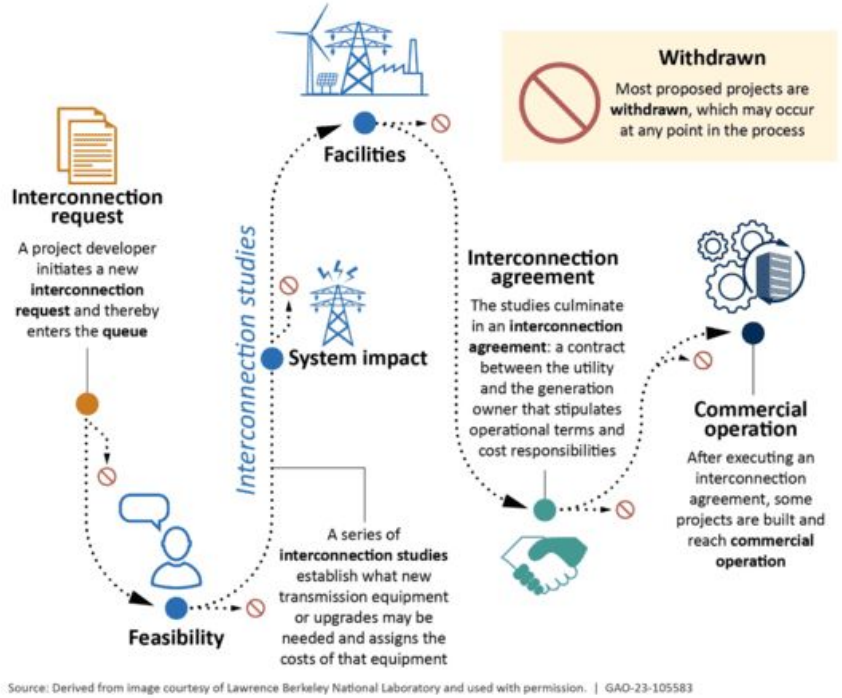
- Building Decarbonization / Building Electrification
- Clean Heat Standards/Clean Heat Plans
- Future of Gas dockets, investigations, processes
- Line extension allowances
- Gas Bans



Transmission

Infrastructure Needed to Support Electrification

- Transmission and Interconnection Issues
- Regional Transmission Organizations / Independent System Operators are backlogged
- Most projects are canceled because of the wait times
- Site selection is a difficult process with permitting delays



Electrification

Considerations with Electrification

- Factors:
  - Grid capacity
  - Affordability
  - Renters
  - Dirty vs. clean grid
  - Who pays for grid upgrades
  - Residential vs. industry
  - Light-duty vs. medium- and heavy-duty
- Policies:
  - Zero Emission Vehicle (ZEV) sales
  - Incentives
  - Managed charging
  - Make-ready buildings
  - Fuel-switching
  - Rate designs

Rate Design

Summary of Three Ratemaking Steps

1. How much revenue will the commission authorize the utility to earn? Revenue requirement
2. How do we divide that revenue among the different customer classes (residential, industrial, commercial)? Cost allocation
3. How do we design rates for each customer class? Rate Design

Step 1: Revenue

- How much does it cost to provide utility service? Investments, personnel, taxes. Include a level of profit.
- Traditional: level of profit is based on investments in infrastructure (or “capital”), not expenses like personnel.

Step 1: Revenue example

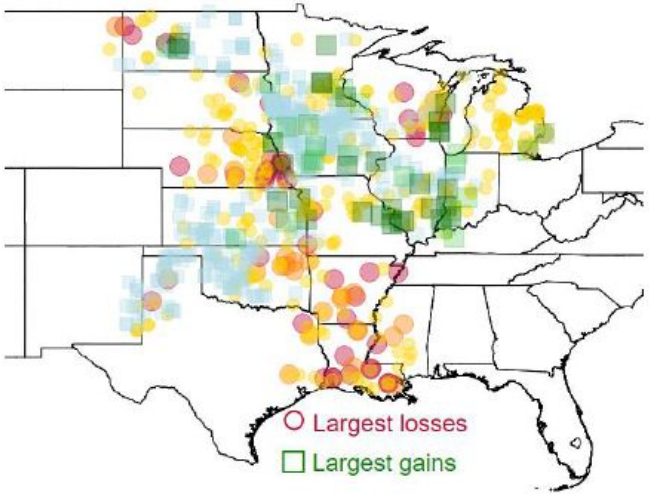
- If the utility builds and owns a solar farm that costs $ 1 million, it might earn $1,050,000 per year ($1,000,000 investment + 5% profit)
- If a community invests in that solar farm, the utility does not have to invest the $1 million, but it also does not get the 5% profit of $50,000 per year. The community solar might also be enough that another utility generator is no longer economic and must be retired, taking away the profit associated with the retired generator as well.

*note that some states required utilities to divest generation assets and become ‘wires only’ utilities. But the utilities’ parent company might own affiliates that own generation

Step 1: Real Life Example

- With better transmission, clean power costs less
  - "...power plant dispatch in the Midwestern U.S. is more costly than it would be in a world without curtailments and without transmission constraints."
- The four utilities that stand to lose the most would have $1.6 billion lower revenues in 2022 alone

Figure 5: Power Plants That Gain Versus Lose Are Located in Different Regions



Note: This figure shows whether individual power plants would win or lose if transmission across regions were increased and wind fully dispatched, rather than curtailed. Plants losing more than 10 million dollars per year, based on 2022 counterfactuals, are displayed in large red circles (a drop in net revenues of at least $20 million) or orange circles (a drop between $10 and $20 million). Plants with a drop in net revenues of less than 10 million dollars are in small gold circles. Plants with net revenue gains of at least 10 million dollars are in large dark green squares (gains greater than $20 million) or light green squares (gains between $10 and $20 million), and plants with smaller net revenue gains in small blue squares.

Source: Catherine Hausman, Power Flows: Transmission Lines, Allocative Efficiency, and Corporate Profits (National Bureau of Economic Research, Jan. 2024)

Step 1: Strategy

At this stage, all customers are mostly aligned on the same side against the utility

- The utility (mostly) wants revenue to go higher
- The customers (mostly) want revenues to go lower

Step 2: Cost allocation

This is a complicated step.

Looking the “Cost Allocation” document shared last week, it generally breaks down to:

- Take all the utilities’ expenses and all the utilities’ investments
- Which investments and which expenses are used to serve residential customers?
- Which investments serve industrial customers?
- Which investments serve commercial customers?
- What public policy concerns inform the analysis (e.g., economic development, low-income assistance, etc.)

Step 2: Strategy

Unlike at Stage 1, where all customers were on the same “side,”

Customers at this stage might be opposed to one another’s proposals

Step 3: Rate Design

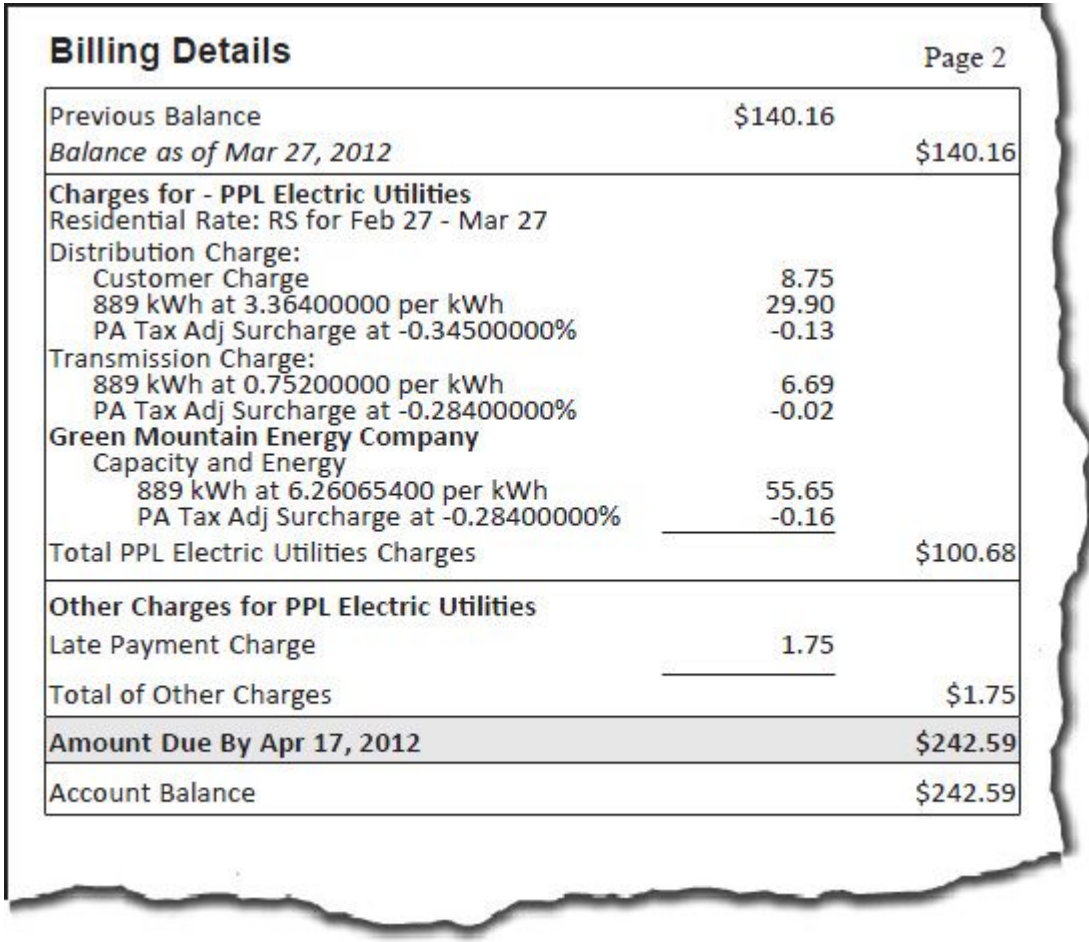
At this stage, it gets even more complicated

Step 3: Rate Design

Take the revenue allocated to each class from Step 2

Divide by number of customers or by expected usage

- Customer charge: amounts usually do not change month to month, revenue is divided by number of customers
- Transmission/distribution and energy charges: changes month to month, revenue is divided by kilowatt hours (energy) used



Billing Details Page 2

Previous Balance	$140.16	
Balance as of Mar 27, 2012		$140.16
Charges for - PPL Electric Utilities		
Residential Rate: RS for Feb 27 - Mar 27		
Distribution Charge:		
Customer Charge	8.75	
889 kWh at 3.36400000 per kWh	29.90	
PA Tax Adj Surcharge at -0.34500000%	-0.13	
Transmission Charge:		
889 kWh at 0.75200000 per kWh	6.69	
PA Tax Adj Surcharge at -0.28400000%	-0.02	
Green Mountain Energy Company		
Capacity and Energy		
889 kWh at 6.26065400 per kWh	55.65	
PA Tax Adj Surcharge at -0.28400000%	-0.16	
Total PPL Electric Utilities Charges		$100.68
Other Charges for PPL Electric Utilities		
Late Payment Charge	1.75	
Total of Other Charges		$1.75
Amount Due By Apr 17, 2012		$242.59
Account Balance		$242.59

Step 3: Rate Design

The design will never lead to an exact amount of revenue

- Weather can increase or decrease usage based on air conditioning or heating

The utility might over recover or under recover

Step 3: Rate Design

Policy considerations

Laws can prohibit or authorize utilities to recover or refund amounts it has under-recovered or over-recovered

“Filed rate doctrine”: If a utility over- or under-recovers, it can file a new rate case and set new rates going forward, but it cannot be required to refund over-recovery or charge for under-recovery

“Fuel adjustment” amounts: A utility can set an expected fuel and purchased power cost amount, and adjust rates to refund or recover differences between revenues approved and revenues collected

Step 3: Rate Design

Policy considerations

Rate Design Reflects Important Policy Decisions

Is it fair to charge low-income customers the same amounts?

- What if high electric usage by low-income customers is for necessities like food refrigeration and air conditioning poorly insulated homes?
- What if high electric usage by high-income customers is for pool pumps or air conditioning larger homes?

Energy used during some parts of the day are more expensive. Do we change prices depending on the time of year or time of day? Are we shifting risks to customers from utilities, and if so how do we reflect that in rates?

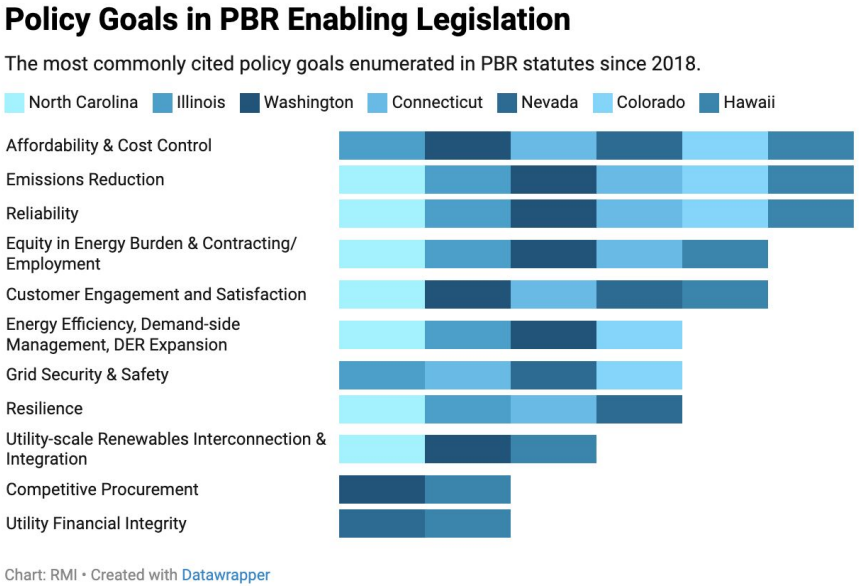
How do we realign utility interests to match customer interests?

- Revenue: How do we deal with the incentive to increase capital spending?
- Cost allocation: How do residential customers get the same voice at the table as utilities and big industries?
- Rate design: How should customers be charged for energy?

Performance Based Ratemaking

Aligning Performance with Rates

- Alternative or complement to cost of service regulation:
  - Revenue Requirement = (rate base x rate of return) + operating expenses (plus depreciation, taxes, etc.)
- Reliability, emissions reductions, and cost control among common goals for PBR policy



PBR Approaches

- **Revenue Decoupling:** A rate adjustment mechanism intended to reduce the "throughput incentive" that's present in COS regulation, by which utilities may have an inherent incentive to increase sales in order to increase revenue. Revenue decoupling is a mechanism that authorizes allowed revenues separate from utility sales and periodically adjusts rates to ensure actual revenues match allowed revenues.
- **Performance Metrics and Incentive Mechanisms:** Clear and measurable metrics—including some linked to targets and incentives—used to monitor and incentivize performance in priority areas.
- **Multiyear Rate Plans:** Intended to streamline the regulatory process, strengthen cost-containment incentives and provide utilities with greater operational flexibility, these plans combine a multiyear rate case moratorium with a mechanism that automatically adjusts utility rates between rate cases to account for drivers of financial attrition without being tied to actual costs.
- **Incentives for Underused Practices:** Cost-trackers and other financial incentives may be used to encourage utilities to pursue solutions that may be innovative but beyond the utility's normal appetite for risk. In other cases, utilities may avoid these solutions or practices to bolster capital revenue.

PIMs addressing distributive equity

State	Utility	Metric	Incentive
HI	Hawaiian Electric	1) Energy (kWh) savings beyond the energy efficiency program administrator (Hawaii Energy's) annual target 2) Peak demand reduction beyond Hawaii Energy's annual target, measured in kilowatts (kW) 3) Number of customers served beyond Hawaii Energy's annual target	Upside-only reward worth 50% of the projected benefits for each kWh saved and peak kW reduced, as well as 50% of the targeted first-year bill savings ($) from the eligible program divided by target number of customers (with a $2M cap on total incentives)
MA	All investor-owned utilities in the state	Percentage of planned energy efficiency portfolio equity benefits in 60 target communities	Incentives are pooled together into a statewide pool and then allocated as an upside incentive to each utility based on their share of the net benefits for all four components of the PIM (of which the equity component is one)
NY	Orange & Rockland, National Grid, Central Hudson	Annual savings for each company's electric and gas LMI energy efficiency portfolio	Upside-only ROE based incentive (All utilities: 1 to 5 bps depending on achievement)
NJ	All investor-owned utilities in the state	Verified lifetime energy savings from completed measures for low-to-moderate income (LMI) and overburdened customers (OBC)	Symmetrical ROE adjustment applied to each utility's energy efficiency program investment, ranging from +50 to -400 bps for performance against all 6 metrics of this PIM (of which the LMI and OBC metric is one)
DC	DC Sustainable Energy Utility	Percent of total expenditures dedicated to improving the energy efficiency and renewable capacity of low-income housing, shelters, buildings, etc.	Symmetrical, fixed reward worth up to +/- $500K

Source: Transforming the Way We Serve Vulnerable Communities: Performance Incentive Mechanisms and Beyond
Insights from the PIMs Database

Climate and Equitable Jobs Act (IL,2021)

CEJA Categories:

- Reliability – especially for EJ communities
- Peak load reductions attributable to DR
- Supplier diversity expansion
- Affordability
- Interconnection requests
- Customer service

Additional Considerations

- Must be within utility control.
- Performance metrics shall encourage cost-effective, equitable achievement of the above outcomes.
- Need at least one year of tracking data for performance metrics
- Performance metrics shall achieve incremental improvements over baseline values over 4-10 years.

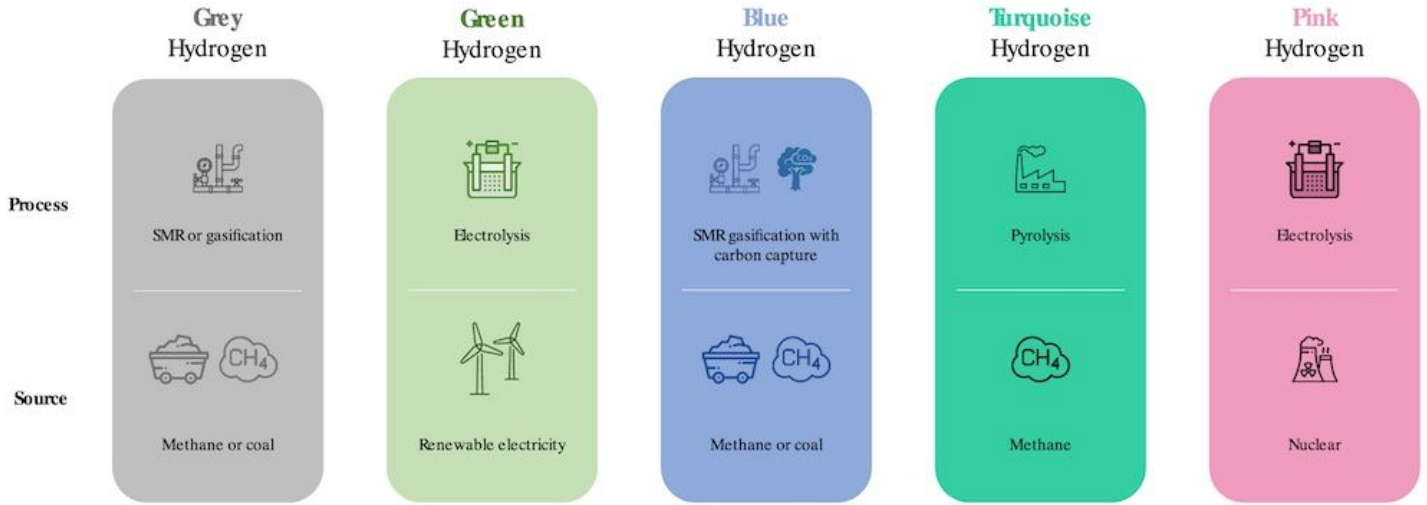
Climate Resilience and Cumulative Impacts

- Cumulative burdens and extreme weather
  - More frequent and longer-duration outages (electric, gas, water)
  - Less resources to withstand and recover from outages
  - Geographies that experience more frequent extreme weather, urban heat islands
- Reliability and system hardening investments
- Energy Burdens

Alternative Fuels and New Technologies

Alternative Fuel: Hydrogen

- $8 billion for regional clean hydrogen hubs
- Versatile fuel with energy storage applications
- Blending: Injecting or mixing hydrogen gas into existing natural gas pipeline networks.



Alternative Fuel: Hydrogen Concerns

- Water intensive process
- Minimizing hydrogen leaks
- Could involve more emissions and a perpetuation of natural gas
- Pairing hydrogen with false solutions
- Diverting of clean energy to hydrogen will mean more fossil fuels to meet power needs

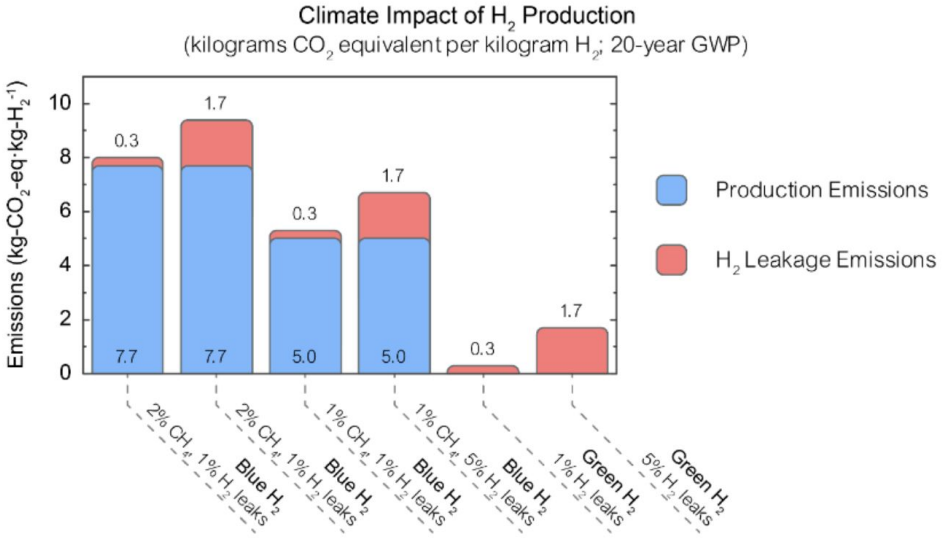
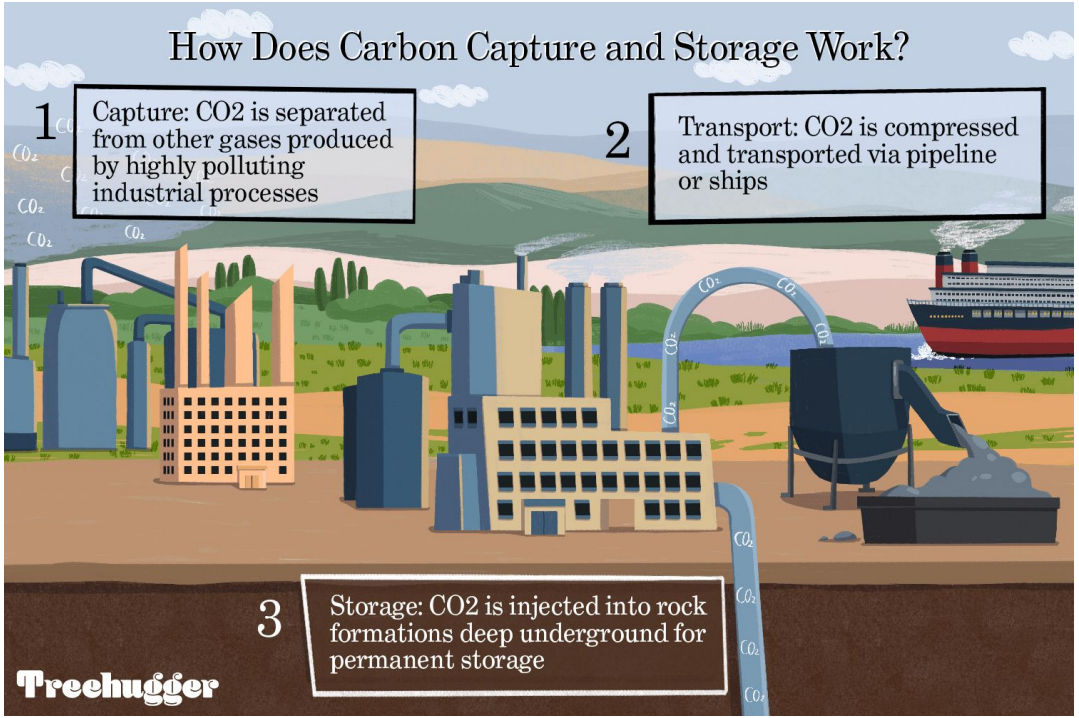


Figure 1: Only green hydrogen meets the 4 kg CO_2-eq/kg H_2 limit on clean hydrogen. GWP is global warming potential.

Source: Just Solutions Collective
https://justsolutionscollective-23820007.hs-sites.com/hydrogen-energy-facts

CCS: Carbon Capture and Storage/ Carbon Capture and Sequestration

- CCS: a set of technologies and techniques used to capture carbon dioxide (CO2) emissions from sources like power plants or industrial facilities before the CO2 enters the atmosphere, and then store it underground to prevent its contribution to global warming.

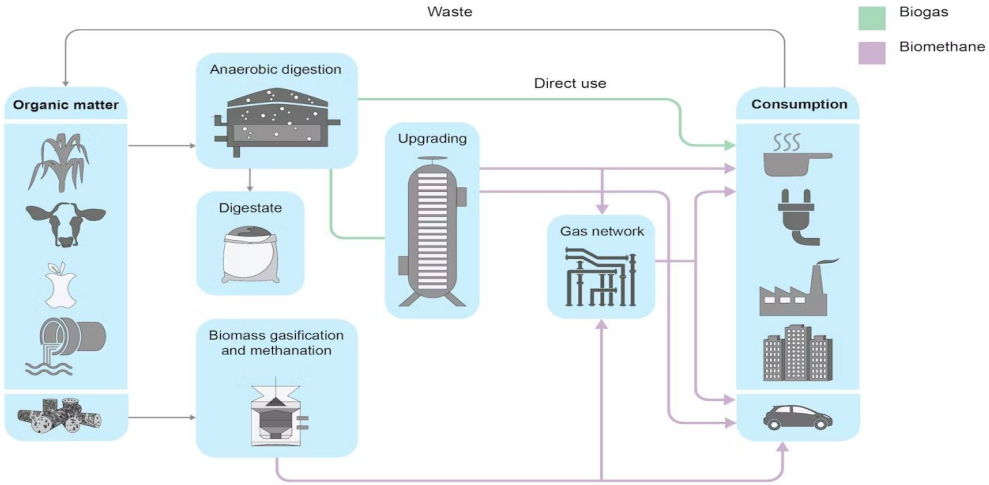


CCS: Carbon Capture and Storage/ Carbon Capture and Sequestration Concerns

1. Perpetuating fossil fuel extraction and use
2. Burdening disadvantaged communities
3. Opportunity costs and lock-in of emissions
4. Monitoring and liability issues

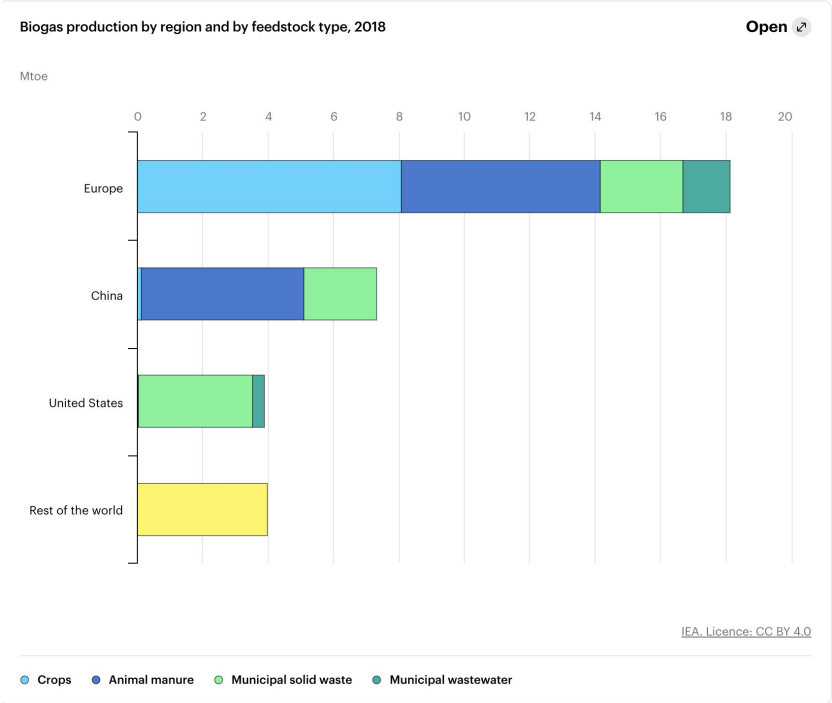
Biogas and Biomethane

- **Biogas** is a mixture of methane, CO2 and small quantities of other gases produced by anaerobic digestion of organic matter in an oxygen-free environment. The composition of biogas depends on the type of feedstock and the production pathway
- **Biomethane** (also known as “renewable natural gas”) is a near-pure source of methane produced either by “upgrading” biogas (a process that removes any CO2 and other contaminants present in the biogas) or through the gasification of solid biomass followed by methanation



Biogas and Biomethane Concerns

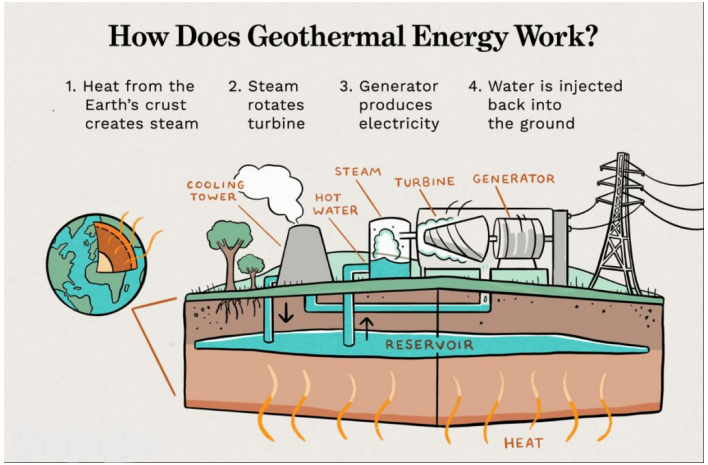
1. Facility Siting and Local Impacts
2. Land Use and Property Values Concerns
3. Worker Health and Safety
4. End Use Impacts

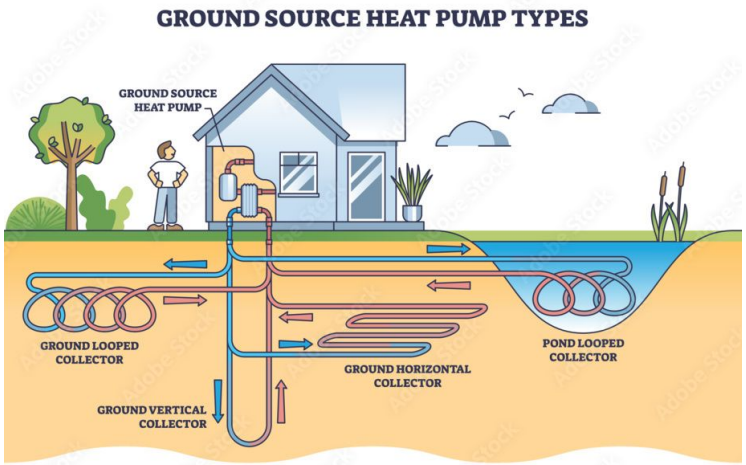


IEA (2020), Biogas production by region and by feedstock type, 2018, IEA, Paris https://www.iea.org/data-and-statistics/charts/biogas-production-by-region-and-by-feedstock-type-2018, Licence: CC BY 4.0

New Technologies

- **Batteries:** Energy storage batteries are devices that store electrical energy from any source and provide that energy later on demand. Energy storage batteries allow storing electrical energy from intermittent renewable sources like solar and wind when the supply is high but demand is low. This stored energy can then be dispatched onto the grid or used locally on-demand when needed later.
- **Geothermal:** renewable energy source that harnesses the heat contained within the Earth's subsurface to generate electricity or provide direct heating and cooling.



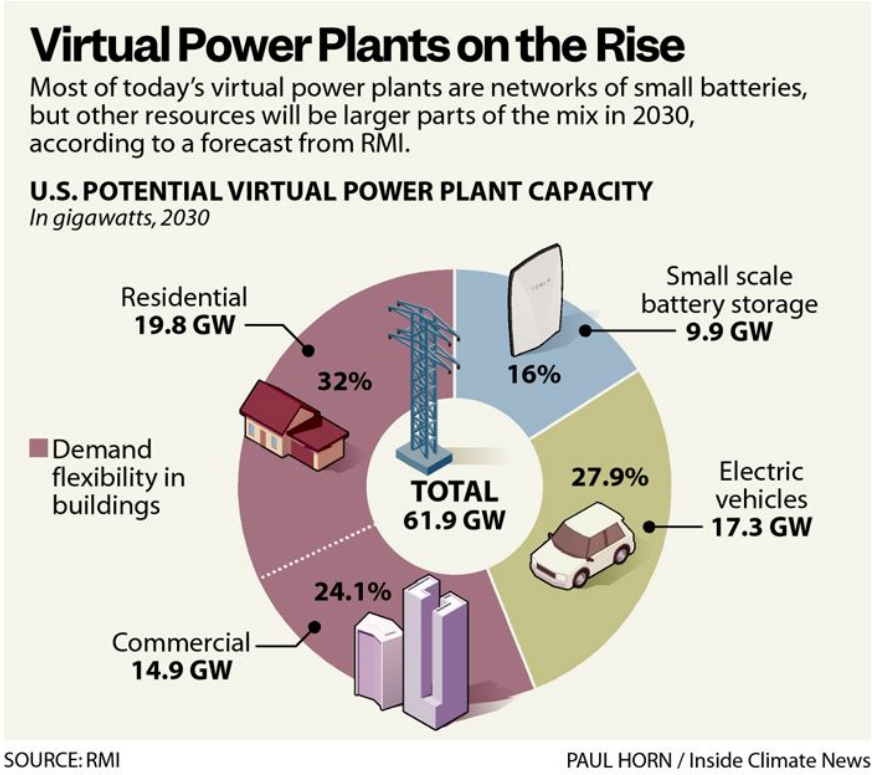


New Technologies

- Virtual Power Plants aggregate and optimize a network of distributed energy resources (DERs) to function as a single, unified power plant.

The key components of a virtual power plant include:

1. Distributed Energy Resources
2. Smart Software Platform: Using artificial intelligence, internet of things, and advanced controls, the VPP software aggregates, monitors, and remotely optimizes the operations of the distributed resources.
3. Bidding and Trading: The aggregated capacity from the distributed resources can be offered into electricity markets and grid service markets as supply or demand response.



Questions?

Resources for a Deep Dive

A performance puzzle: Untangling performance incentives and performance-based regulation

Clean Heat Standards: an effective climate policy for the thermal sector

DecarbNation, Issue 2: The Future of Gas

Electric Cost Allocation for a New Era: A Manual

EPA Final Methane Rule

Fossil fuel industry infiltrates civil rights convention

Overextended: It's Time to Rethink Subsidized Gas Line Extensions

Performance-Based Ratemaking

Performance-Based Regulation: Harmonizing Electric Utility Priorities and State Policy

States Move Swiftly on Performance-Based Regulation to Achieve Policy Priorities

Stranded Assets Overview

Transforming the Way We Serve Vulnerable Communities: Performance Incentive Mechanisms and Beyond

What's the Deal with Interconnection Queues?