
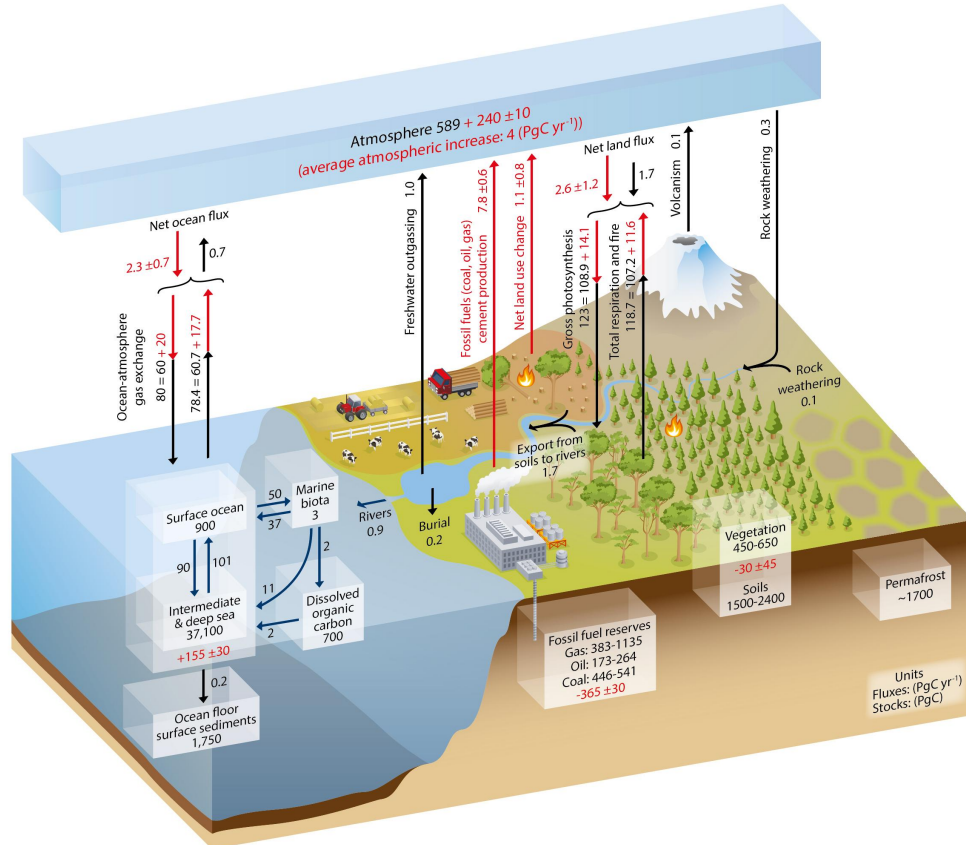


Energy Data Privacy: How Climate Changes Everything

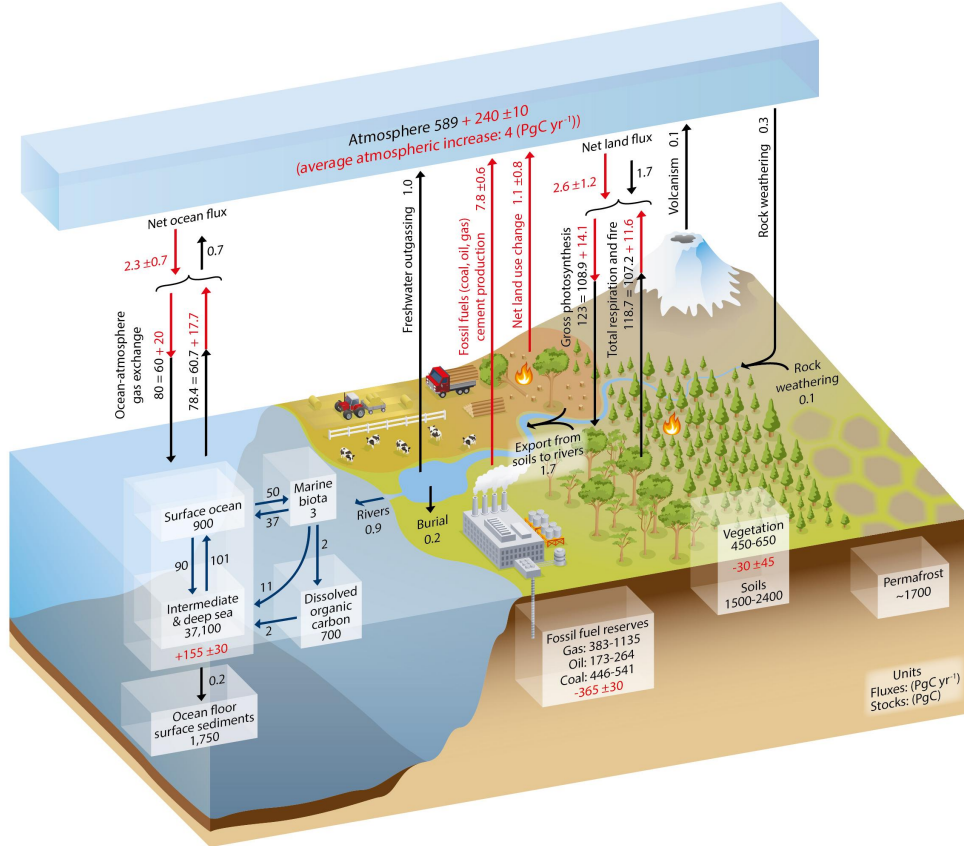
Daniel Roesler, UtilityAPI
EFF-Austin Meetup - Nov 12, 2019 - Austin, TX



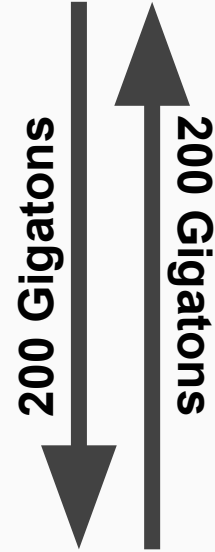
The Carbon Cycle



The Carbon Cycle

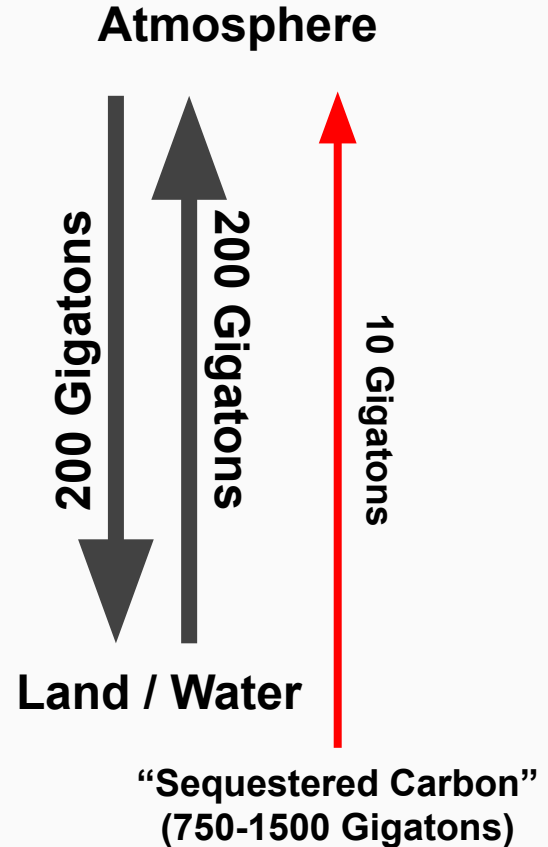
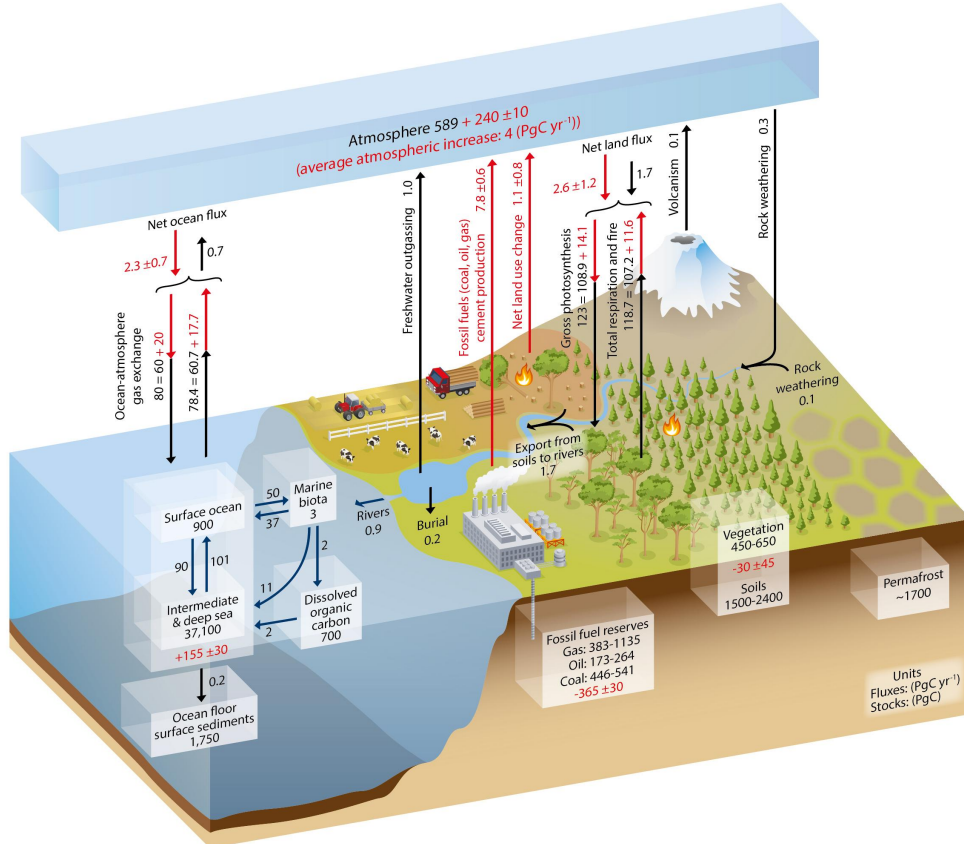


Atmosphere



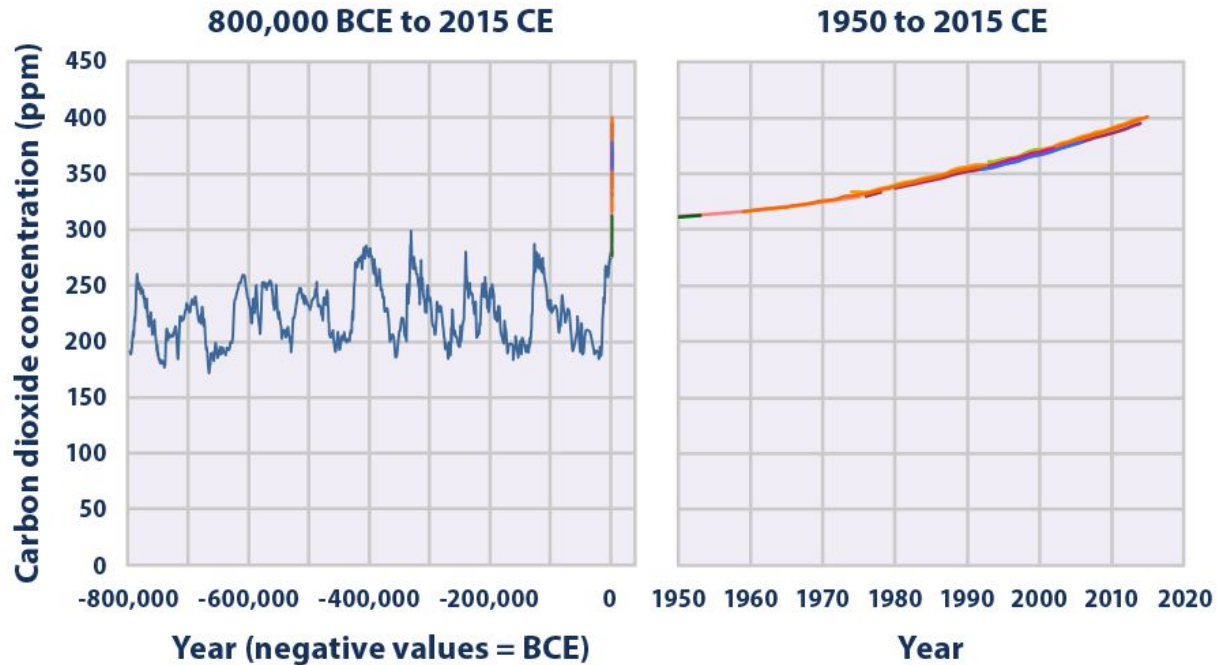
Land / Water

The Carbon Cycle



CO₂ Concentration

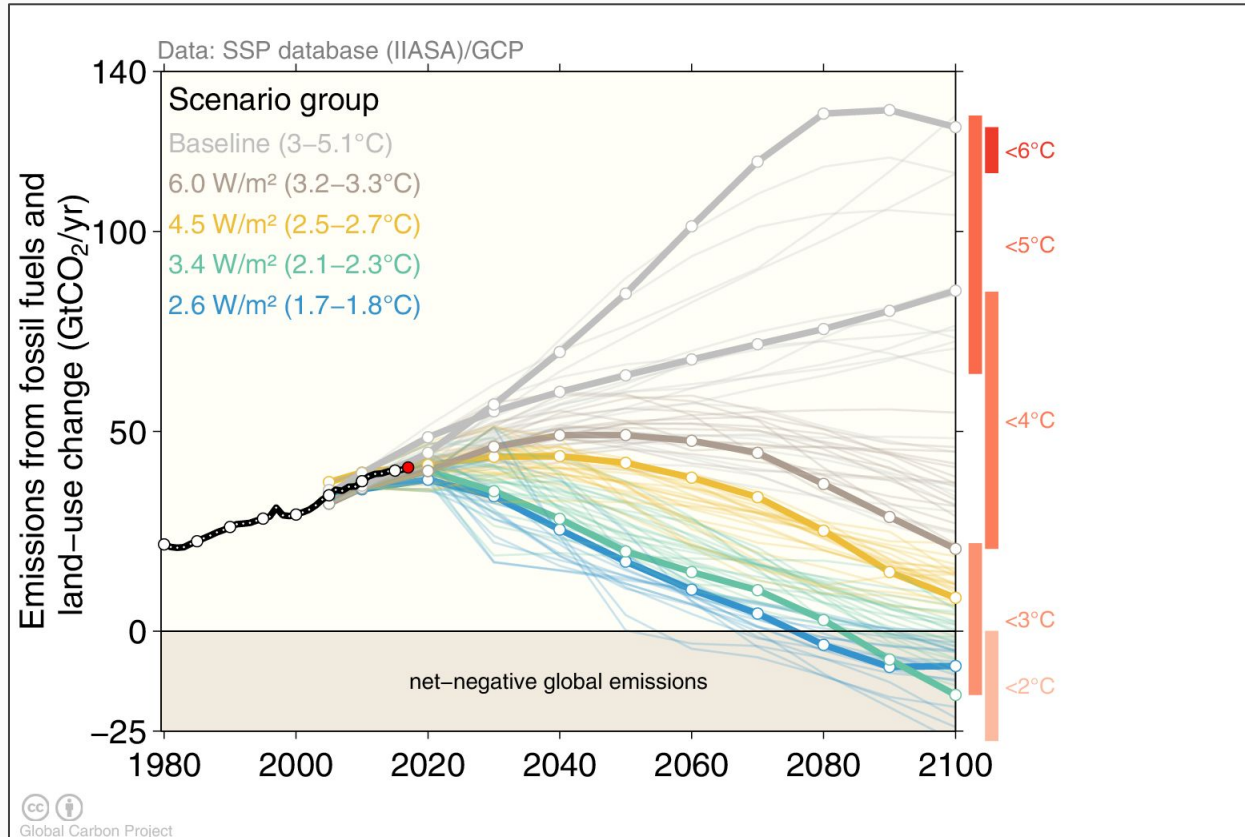
Global Atmospheric Concentrations of Carbon Dioxide Over Time



Data source: Compilation of 10 underlying datasets. See www.epa.gov/climate-indicators for specific information.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

Climate Change



Must stop emitting carbon

ipcc
INTERGOVERNMENTAL PANEL ON climate change

Global Warming of 1.5°C

An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty

Summary for Policymakers

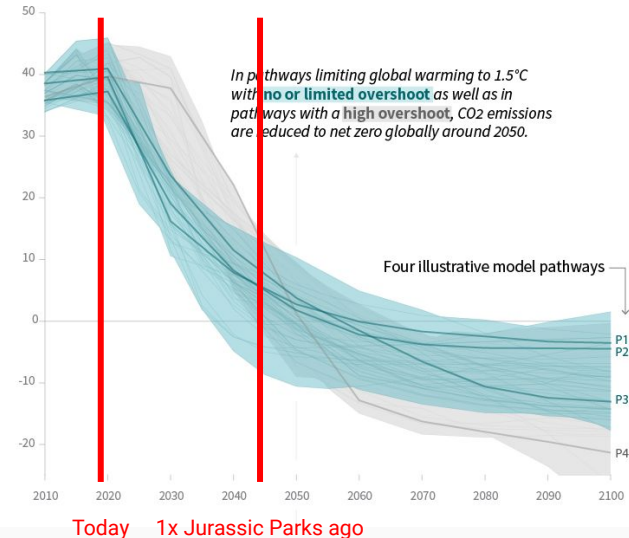
WG I | WG II | WG III

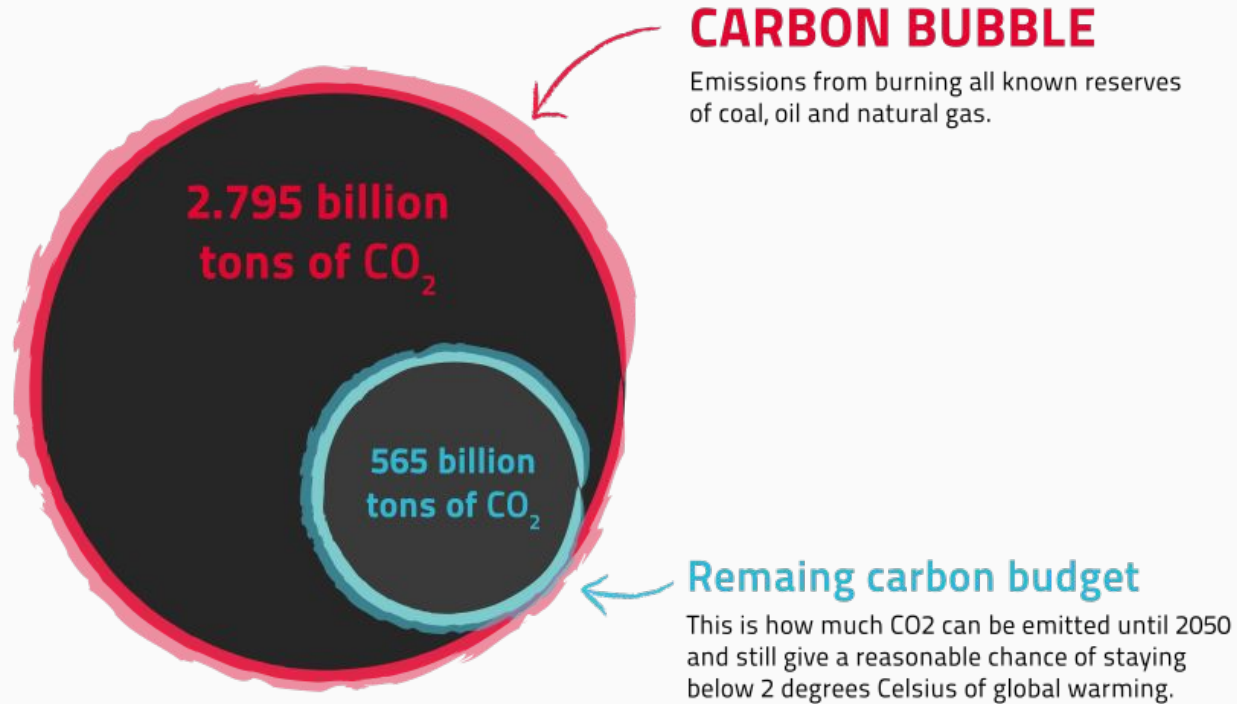
WHO | UNEP

“Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate.... Climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C.”

Global total net CO₂ emissions

Billion tonnes of CO₂/yr





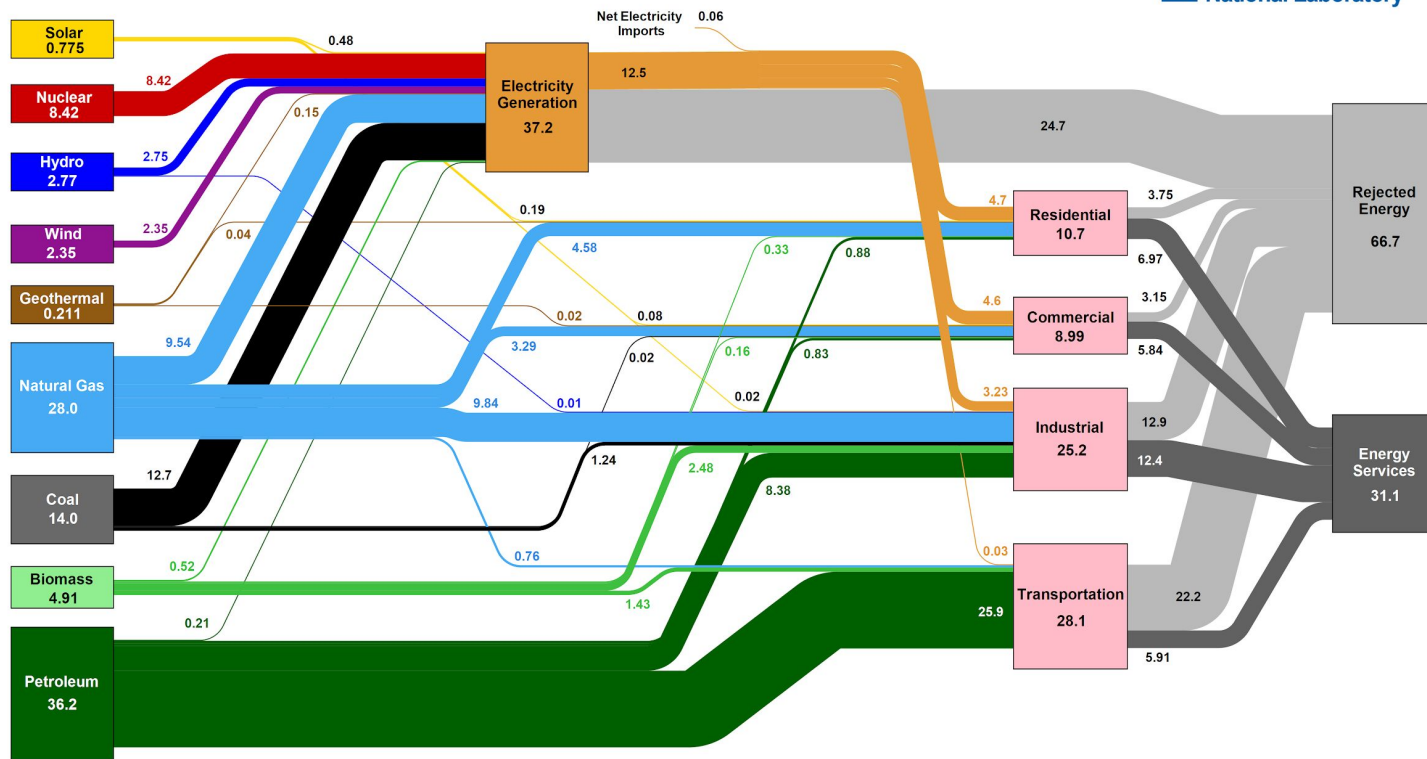
They say we won't act until it's too late...

They say we won't act until it's too late...

Luckily, it's too late!

Energy in the United States

Estimated U.S. Energy Consumption in 2017: 97.7 Quads



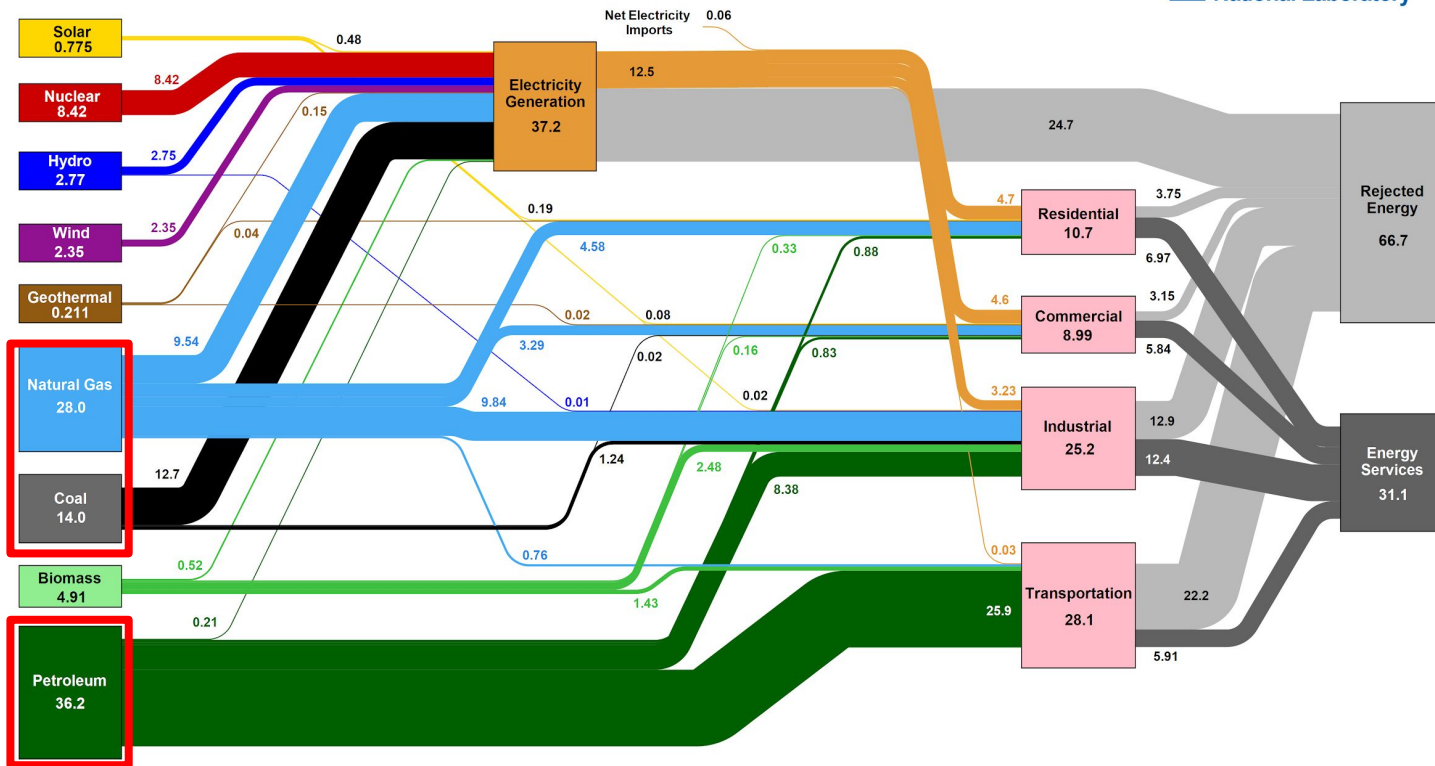
Source: LLNL April, 2018. Data is based on DOE/EIA MER (2017). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. This chart was revised in 2017 to reflect changes made in mid-2016 to the Energy Information Administration's analysis methodology and reporting. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector, and 49% for the industrial sector which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-419527

Energy in the United States

Estimated U.S. Energy Consumption in 2017: 97.7 Quads

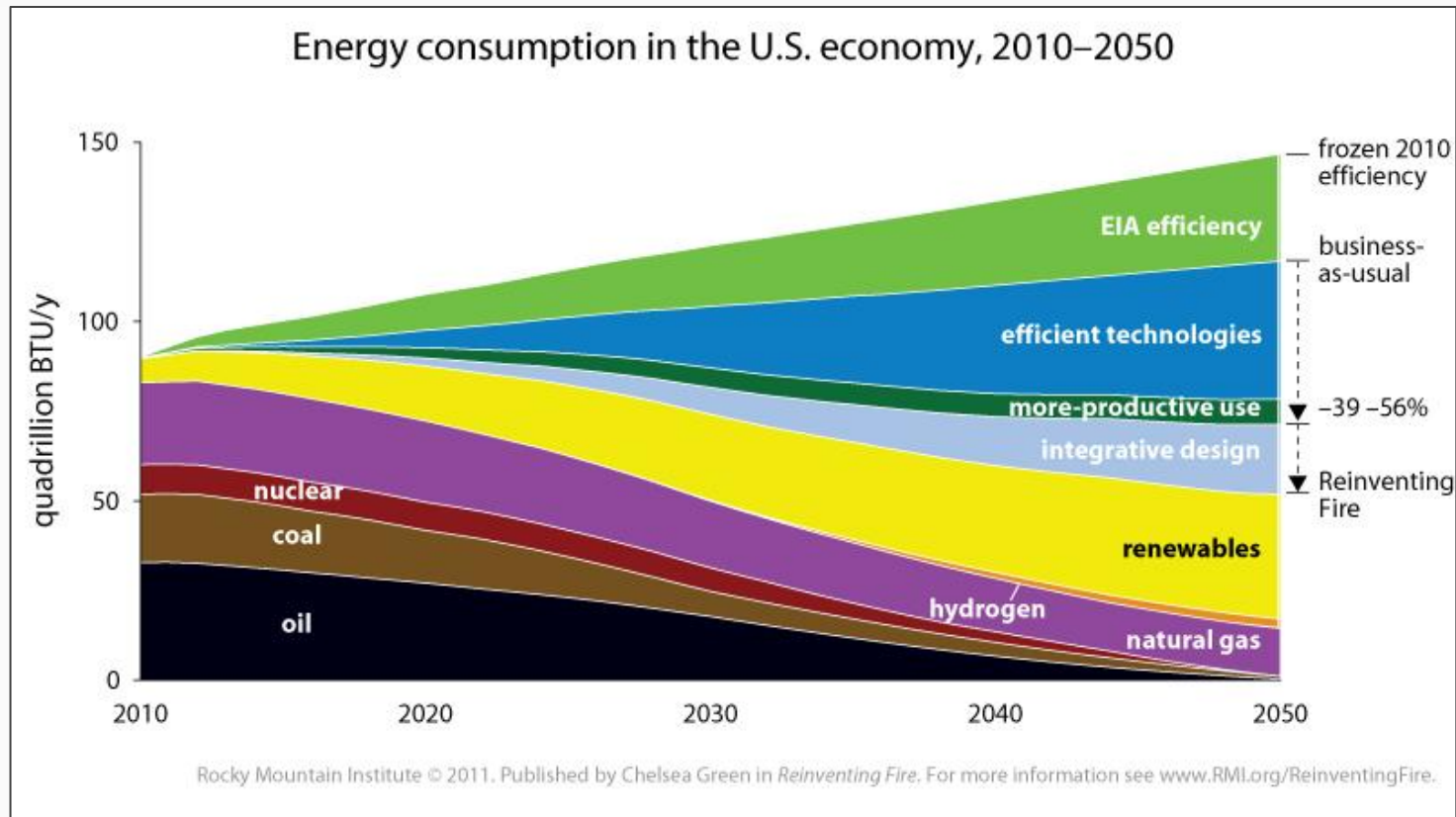


**Fossil Fuels
~80%**



Source: LLNL April, 2018. Data is based on DOE/EIA MER (2017). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. This chart was revised in 2017 to reflect changes made in mid-2016 to the Energy Information Administration's analysis methodology and reporting. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector, and 49% for the industrial sector which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-419527

Decarbonizing energy

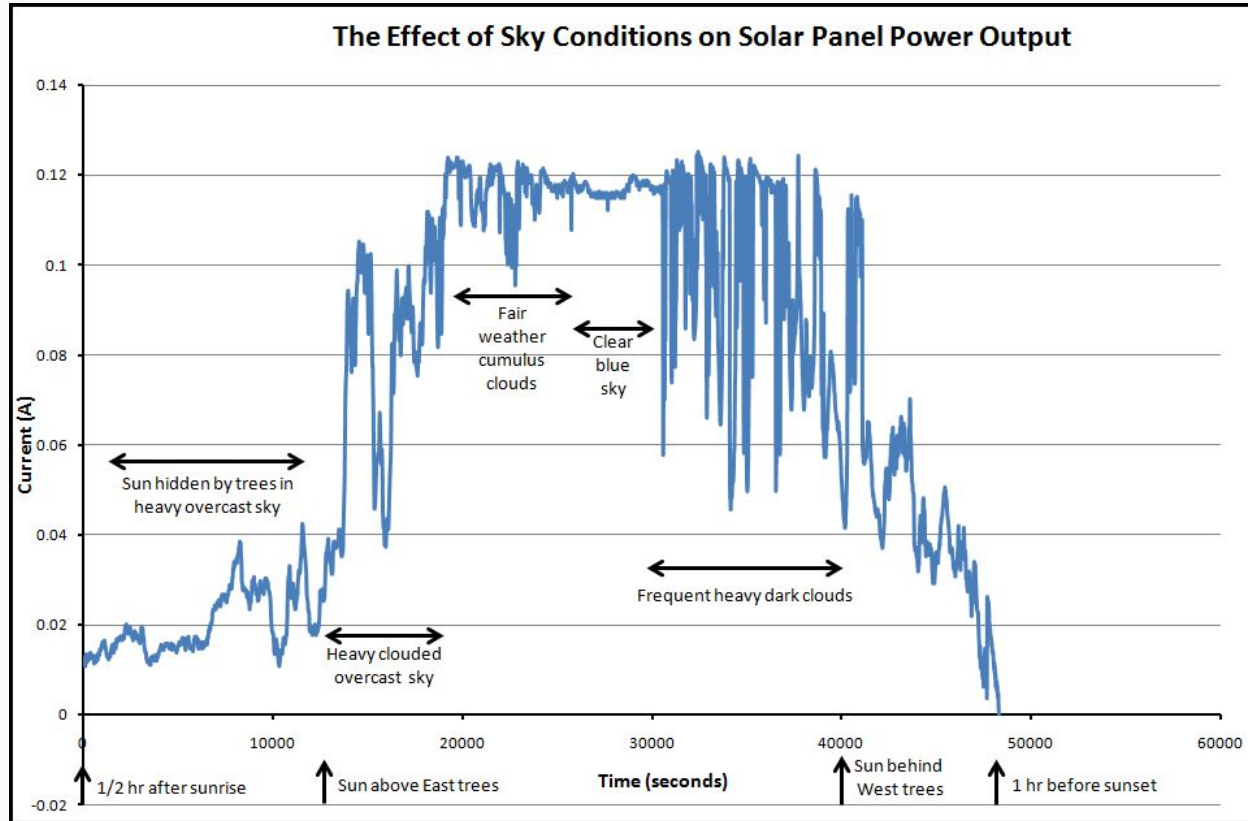


Conclusion:

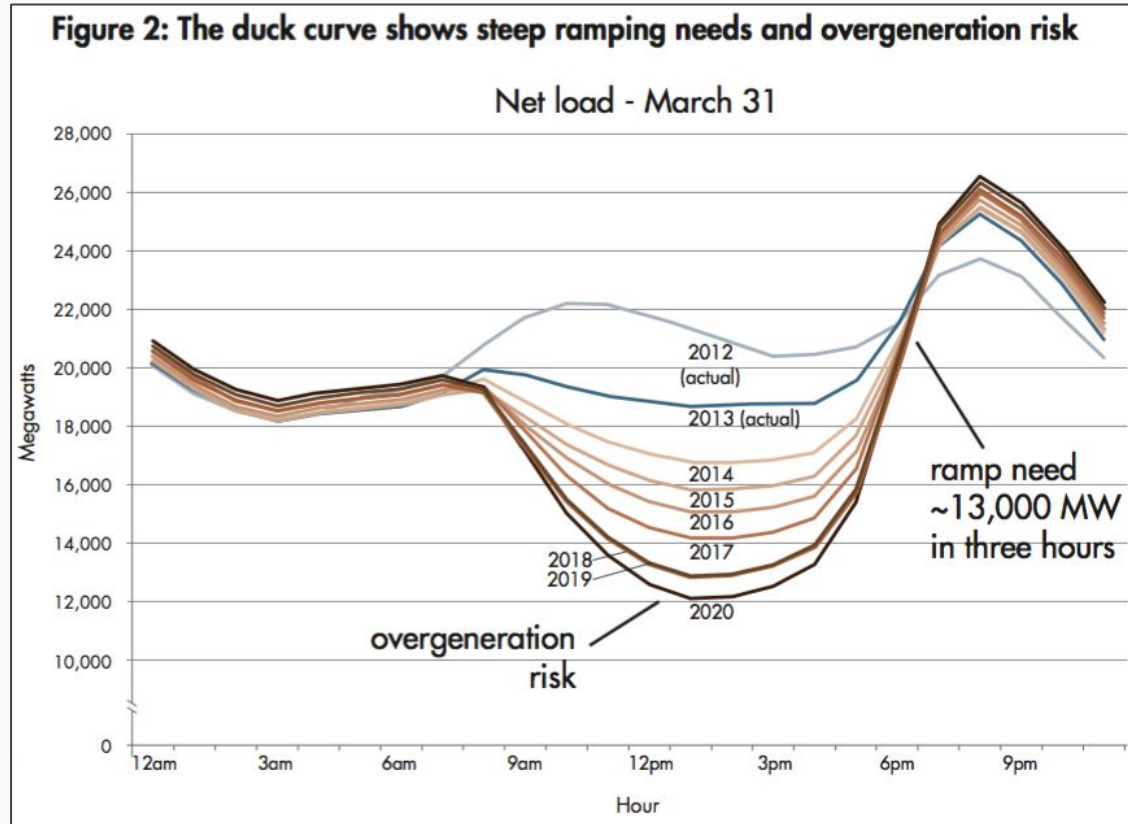
We need to:

- ★ Install massive amounts of renewables.
- ★ Install massive amounts of energy efficiency.
- ★ Electrify everything.

Renewable Intermittency



Renewable Intermittency



Conclusion:

We need to:

- ★ Install massive amounts of renewables.
- ★ Install massive amounts of energy efficiency.
- ★ Electrify everything.
- ★ Deploy stupid amounts of load flexibility.

Distributed Energy Resources (DERs)

Distributed Energy Resource (DER) - *noun* - A variety of small, modular power-generating technologies that can be combined with energy management and storage systems and used to improve the operation of the electricity delivery system, whether or not those technologies are connected to an electricity grid.



Demand
Response



Building
Automation



Energy
Storage



Distributed
Generation



Energy
Services

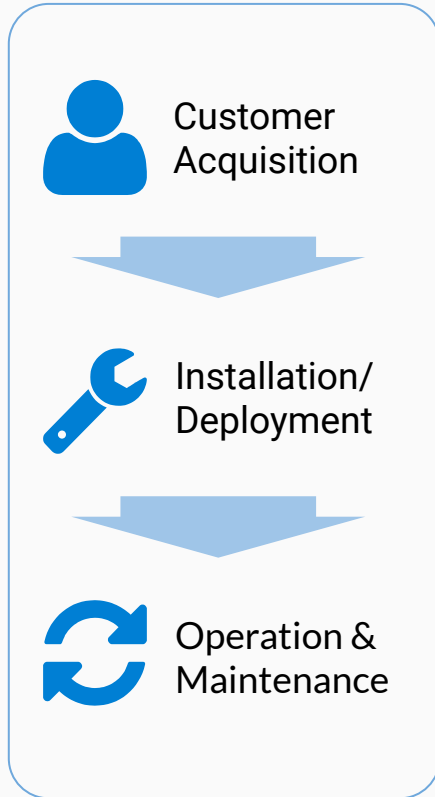


Electric
Vehicles

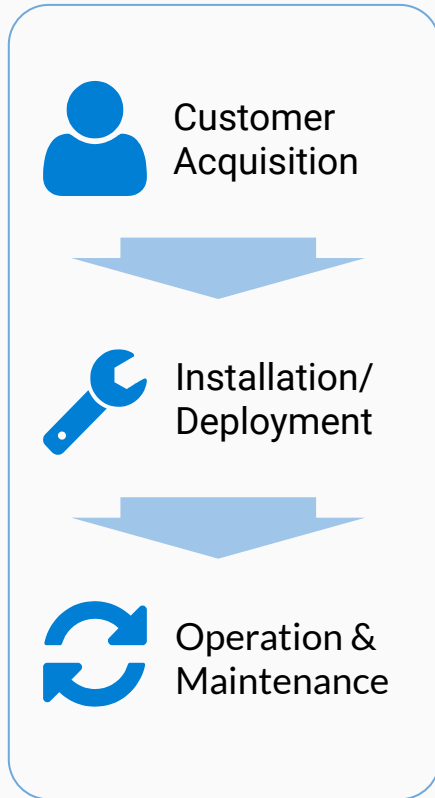


Smart Home
IoT

The need for customer utility data

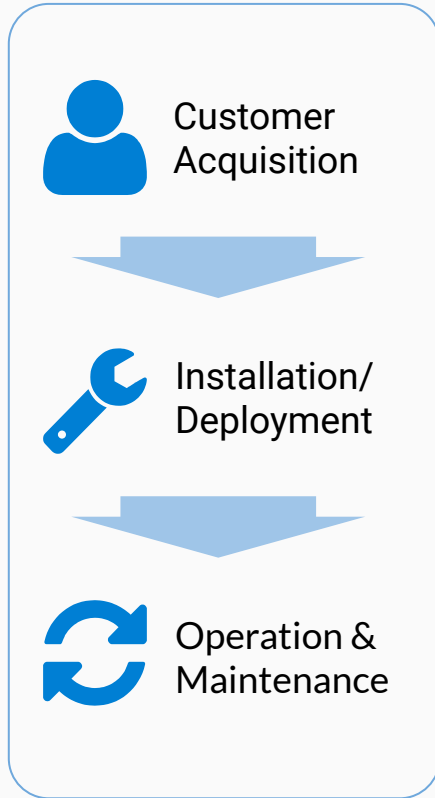


The need for customer utility data



← Need historical utility data for feasibility analysis.
"How much do you currently spend on energy?"

The need for customer utility data



← Need historical utility data for feasibility analysis.
"How much do you currently spend on energy?"

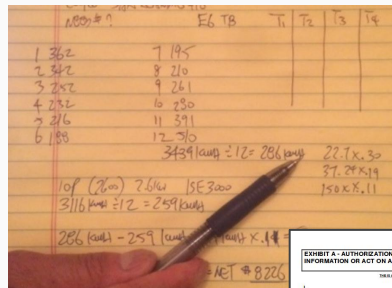
← Need ongoing utility data to monitor performance.
Savings reporting in dollars, not kilowatt-hours

Problems:

- 1) There hasn't ever been a big reason to share customer utility data.
- 2) No API or standards for sharing customer utility data at scale.
- 3) No pre-established privacy protections around utility data sharing.

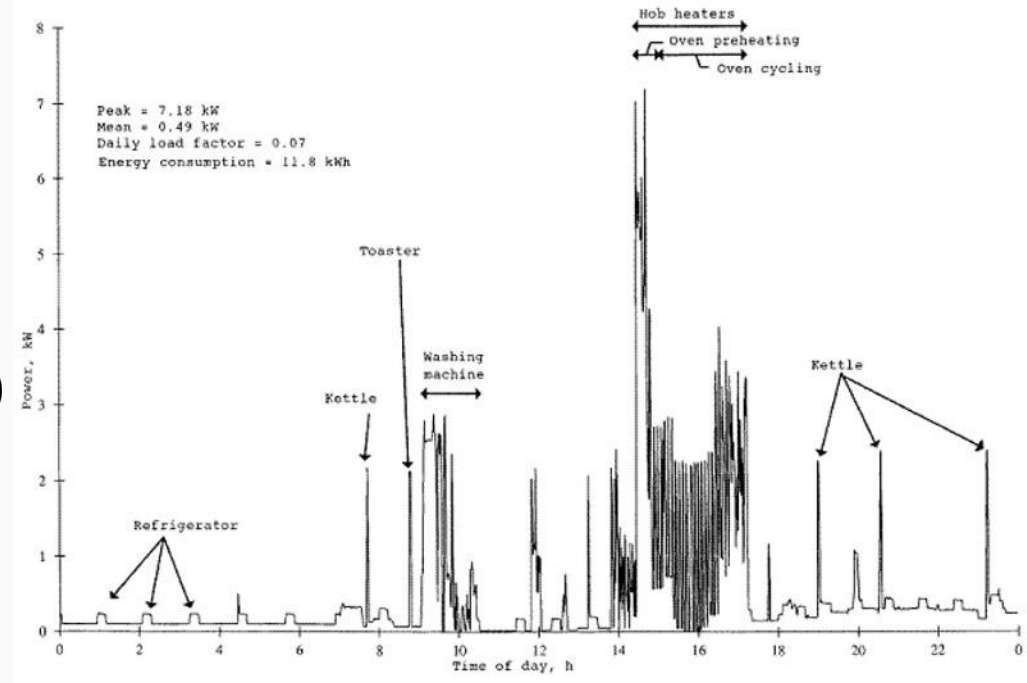
Present day solutions:

- 1) Manual data entry
(e.g. dig up old bills and hand type them in)
- 2) Paper data request form
(e.g. fax the utility a signed authorization form)
- 3) Login credentials sharing
(e.g. ask for access to online utility account)

A photograph of a printed authorization form titled 'EXHIBIT A - AUTHORIZATION TO RECEIVE CUSTOMER INFORMATION OR ACT ON A CUSTOMER'S BEHALF'. The form has fields for 'CUSTOMER INFORMATION' (Name, Address, City, State, Zip, Phone, Email) and 'AUTHORIZED PERSONNEL' (Name, Title, Organization, Address, City, State, Zip, Phone, Email). It includes a section for 'ACCOUNTS INCLUDED IN THE AUTHORIZATION' with checkboxes for 'Electricity', 'Natural Gas', and 'Water'. There is a large block of fine print and a signature line at the bottom.A screenshot of a digital login and authorization form. At the top, it shows 'Customer Email: lorgana@skideraan.gov.edt' and 'Customer Utility: PGE.edt'. Below are input fields for 'PGE Username' and 'PGE Password', each with a 'Don't have a PGE username?' and 'Forgot your PGE password?' link. A small icon and text state: 'UtilityAPI strongly encrypts your login and does not share it with anyone. You can revoke at any time. Read more'. The 'Digital Signature' section has a 'Full Name' input field and a text box: 'I, [Full Name], am the owner of the utility account(s) above, and, in accordance with UtilityAPI's Terms of Service and Privacy Policies, I authorize UtilityAPI, Inc. to:'. Below this are three checked checkboxes: 'Login to the above account on my behalf', 'Collect billing and usage history from my account(s)', and 'Share the collected data only with UtilityAPI'. At the bottom, there are two buttons: 'Authorize Access and Data Sharing' and 'Decline'.

Privacy concerns:

- 1) Interval data is personal (e.g. can tell your lifestyle)
- 2) Bill data reveals credit (e.g. how often you pay your bill)
- 3) Credential re-use (e.g. same logins as banks)



Ownership concerns:

- 1) Who owns your utility usage and bill data? Mixed rulings:
 - [*Court Grants Feds Warrantless Access to Utility Records*](#)
 - [*Smart meters protected by the Fourth Amendment*](#)
- 2) Who owns your smart energy device data? Wild west:
 - [*All your solar panels are belong to ME*](#)
- 3) GDPR? Still unknown:
 - [*GDPR in the Energy Sector*](#)

Conclusion:

We need to:

- ★ Install massive amounts of renewables.
- ★ Install massive amounts of energy efficiency.
- ★ Electrify everything.
- ★ Deploy stupid amounts of load flexibility.
- ★ **Not destroy customer privacy in the process.**

DataGuard (from U.S. Department of Energy SmartGrid.gov)



- 1) Voluntary Code of Conduct for requesting and handling energy data.
- 2) Outlines guidelines around energy data privacy.
 - a) Scoped consent and transparency
 - b) Safe data handling and redress
 - c) Basically GDPR for energy data in the U.S. ... except voluntary :(

Green Button (originally from NIST, spun off into Green Button Alliance)



- 1) OAuth-style utility data sharing
- 2) Requires utilities to adopt standard
 - a) Unfortunately, usually poorly implemented by utilities
 - b) Usually only offered when mandated by regulators
 - c) Slowly getting better (hopefully via UtilityAPI adoption)

UtilityAPI (platform used by DER/EE companies to request and download utility data)



- 1) Trying to establish consent-driven as default “best practice”.
- 2) Helps establish better data access standards/regulation:
 - a) On the Green Button Alliance board + technical working group.
 - b) Promotes DataGuard guidelines and privacy standards.
 - c) Wrote CPUC CDAC “Click-through” technical solutions.
(California Public Utilities Commission, Customer Data Access Committee)

Ask me next time about energy IoT cybersecurity!

Thanks!

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diafyqi@gmail.com
<https://daylightpirates.org>

Contact me if you want to use non-cited stuff from this presentation.