

Energy Democracy in Wisconsin:

Understanding the energy system in
changing times

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Madison, WI – Wisconsin Academy of Science, Arts & Letters



What is energy democracy?

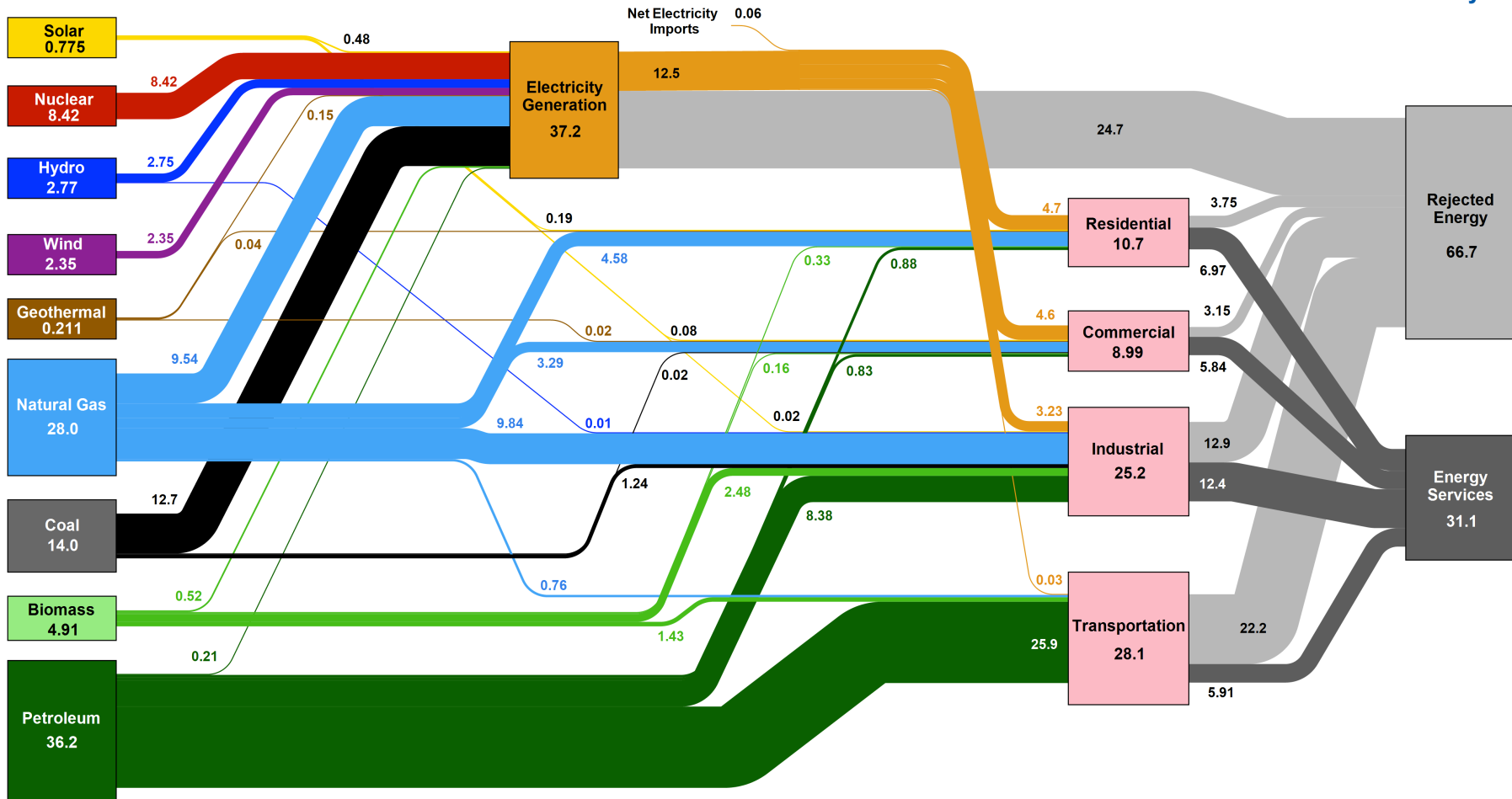
- Energy democracy is a concept, a social movement and a visionary organizing set of principles.
- Energy democracy is a political, economic, social and cultural concept that merges technology energy transition with a strengthening of democracy and public participation.

Electric energy drives our economy and society



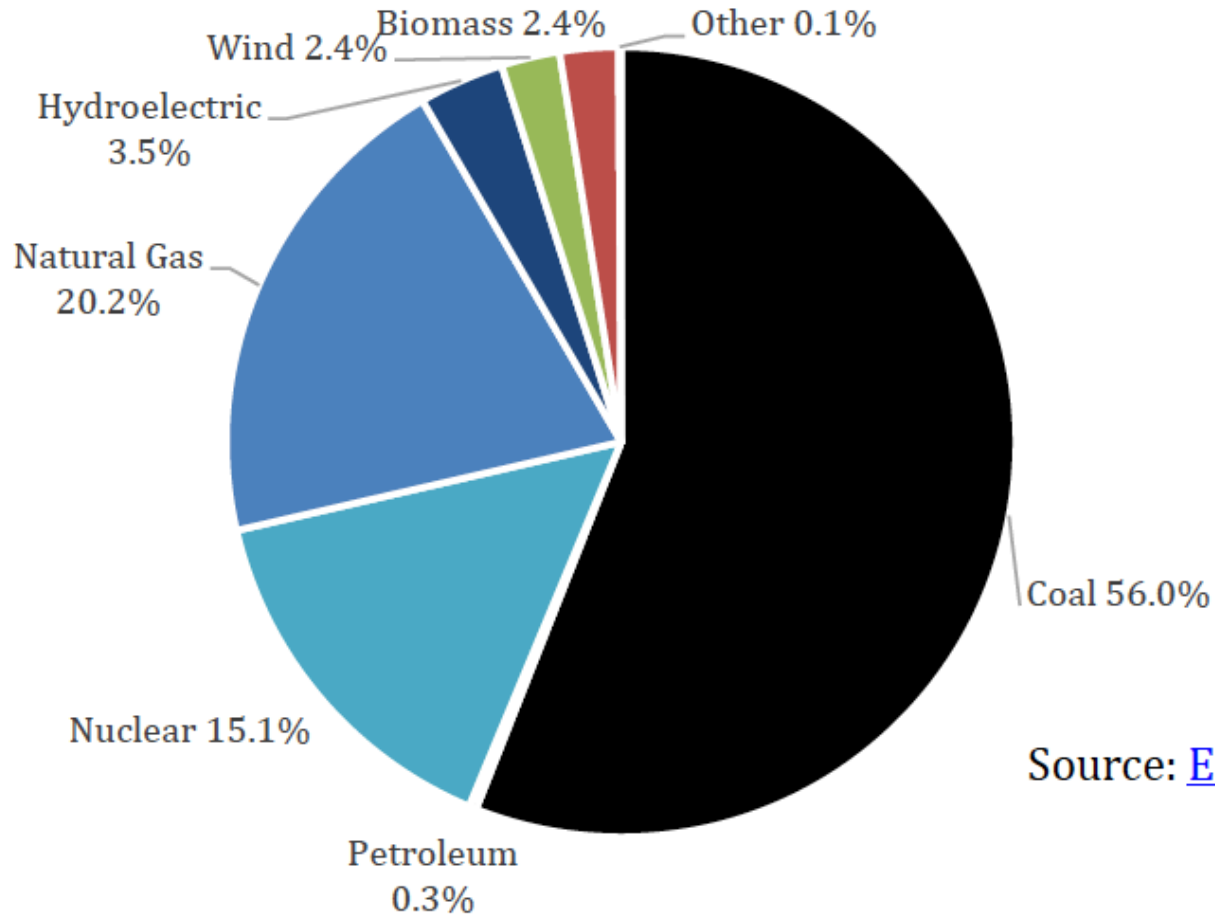
U.S. Energy Consumption 2017

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



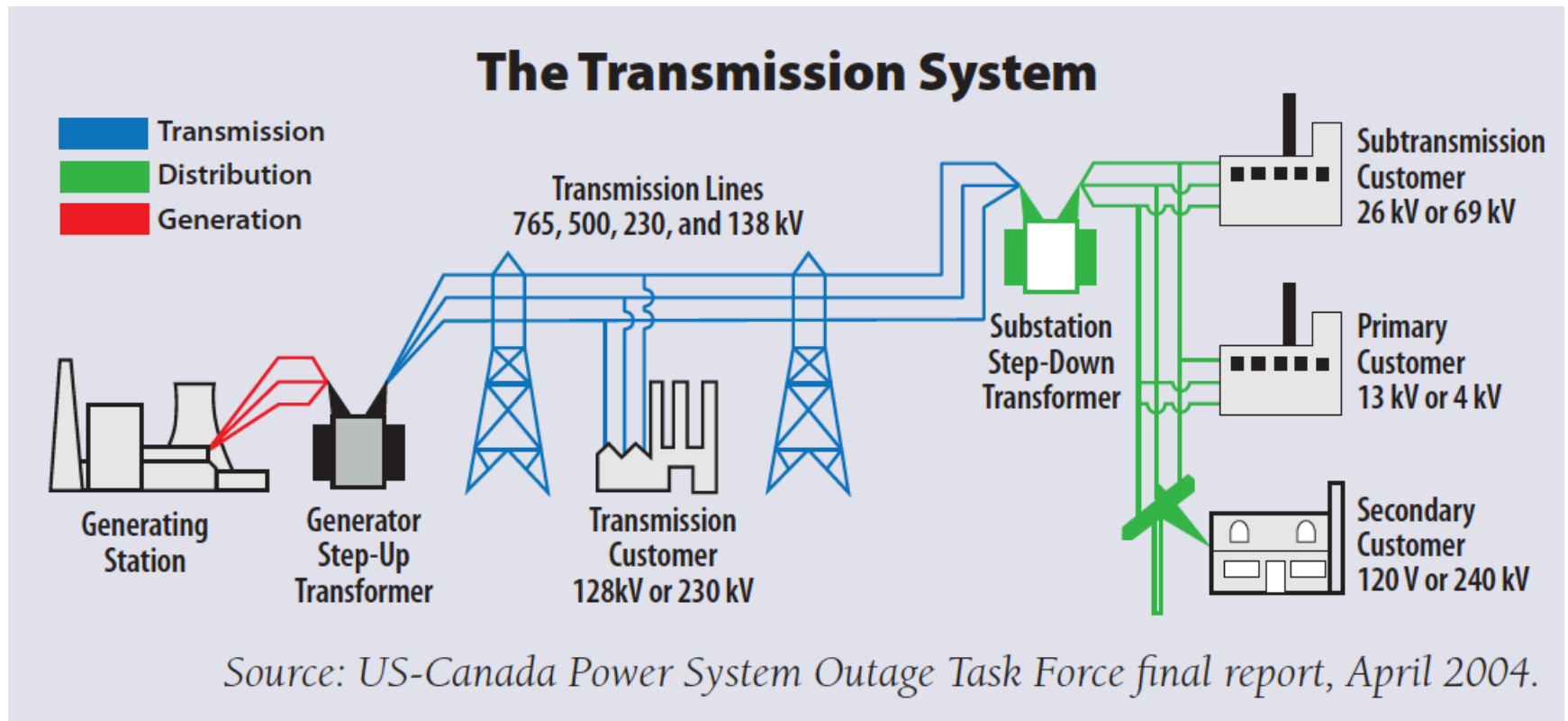
Wisconsin's Energy Mix

(EIA 2016)



Source: [EIA](#)

Basic Transmission System



Wholesale = ISO/RTO

(Source NY ISO)

Wholesale vs. Retail Segments of Electricity Service



1

Generating Station

Electricity is typically generated by a steam- or hydro-driven turbine at the power plant.

2

Step-Up Transformer

The power is then ramped up to high voltage for long-distance transmission.

3

Transmission

Next, a series of high voltage lines transmit the electricity through the power grid.

4

Step-Down Transformer

Power is then reduced to a lower voltage for use in homes and businesses.

5

Subtransmission Customer

The electricity then passes through a series of switches to distribution lines.

6

Customers

Power is then delivered to customers via local lines.

WHOLESALE

RETAIL

Utility Rate Making

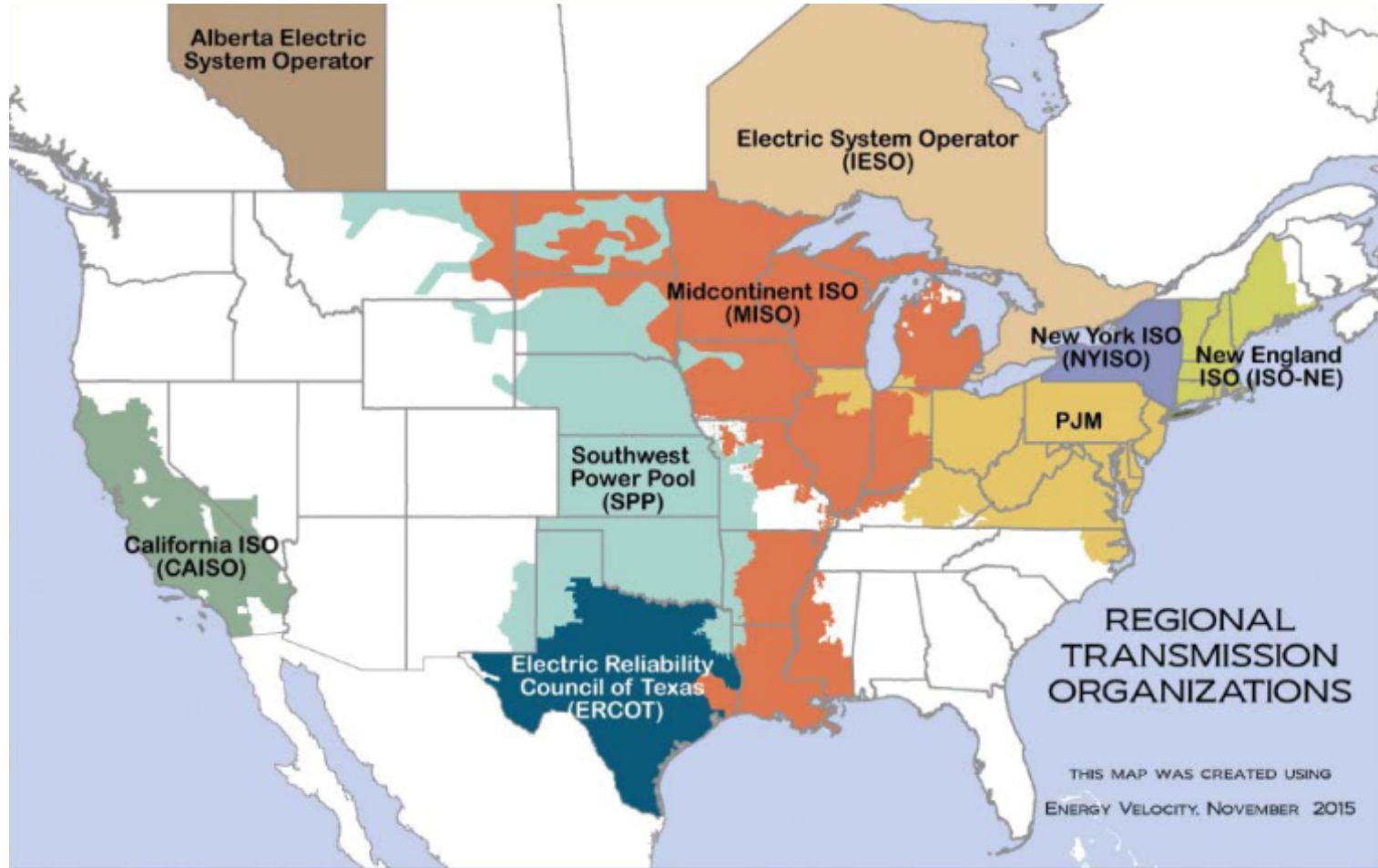
(Current Model)

$$\frac{\text{Operating expenses} + (\text{Capital Investment, net of depreciation}^* (1 + \text{rate of return}))}{\text{forecast of sales}} = \text{Rate}$$

Rate Base:

The value, specified by a regulatory authority, upon which a utility (usually an IOU) is permitted to earn a specified rate of return. Generally, this represents the amount of property used and useful in public service and may be based on the following values or combinations thereof: fair value, prudent investment, reproduction cost, or original cost; and may provide for cash working capital, materials and supplies, and deductions for accumulated depreciation, contributions in aid of construction, and accumulated deferred income taxes.

Regional Transmission Organizations





What does MISO do?

Provides all **market services** for Energy, Operating Reserves, and Transmission Service in accordance with the Energy & Operating Reserves Market Tariff and Business Practice Manuals (BPM)

Manage and administer the Energy and Operating **Reserve markets tariff**

Acts as the Midwest Certified **Balancing Authority**

Administers the **Day-Ahead and Real-Time Energy and Operating Reserves Markets**

Provides reliable **operation of the transmission system**

Provides reliability coordination services for Transmission Operators

www.miso.org

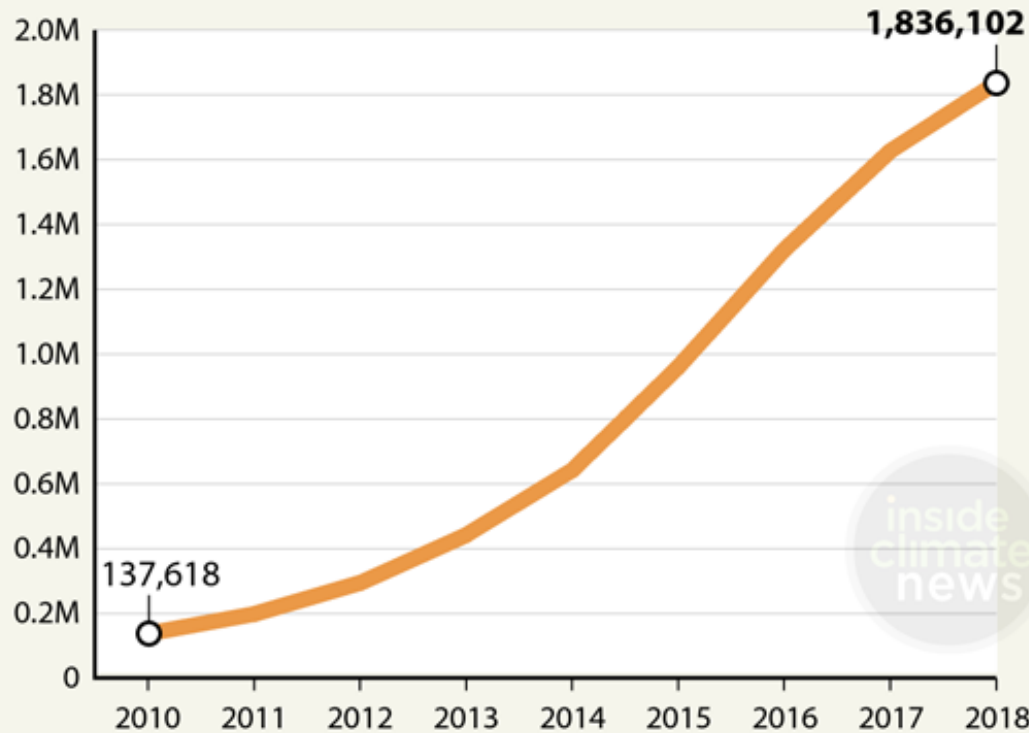
Rooftop solar 12x growth since 2010

Rooftop Solar's U.S. Growth

The number of U.S. households that generate their own electricity from solar panels has increased more than 12-fold since 2010.

HOUSEHOLDS WITH SOLAR PANELS

2010-2018

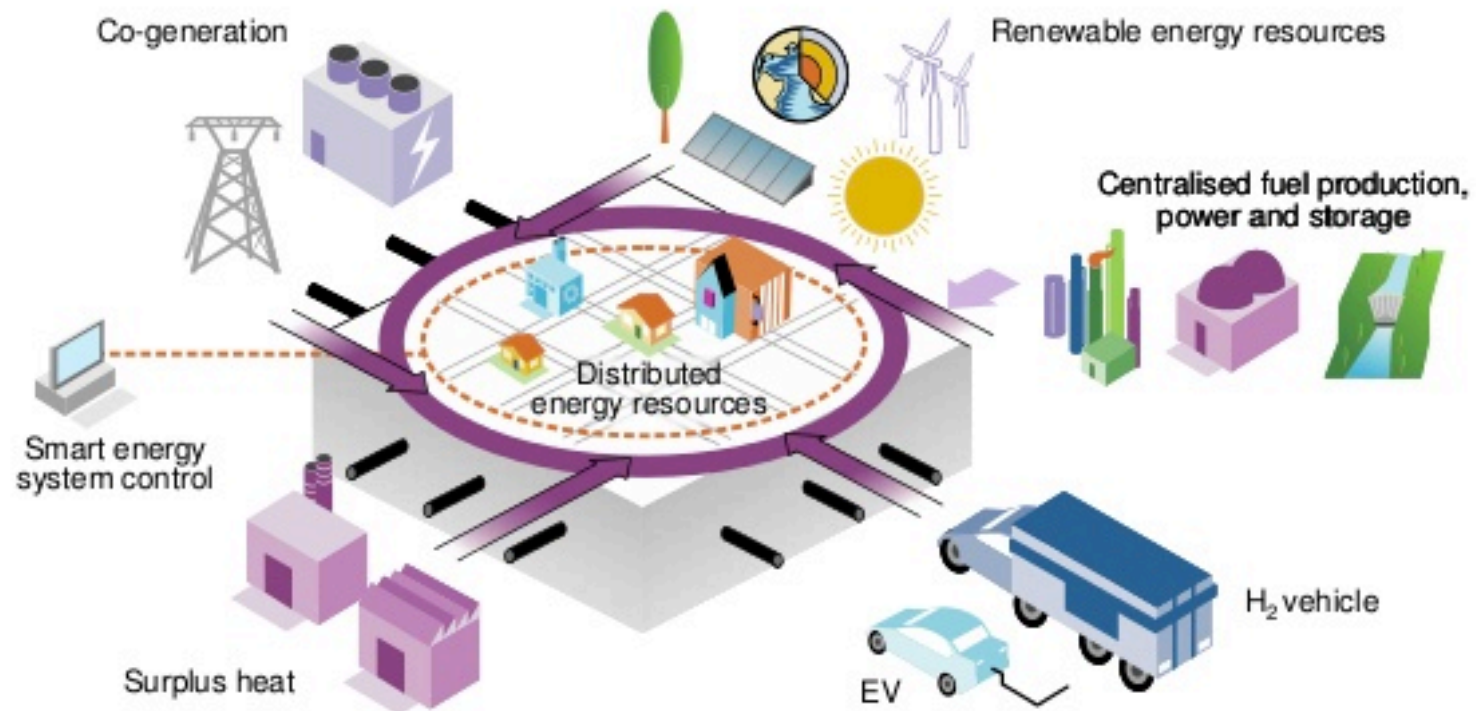


Growing Electricity Customer Options

(DERs = New supply & demand paradigm)

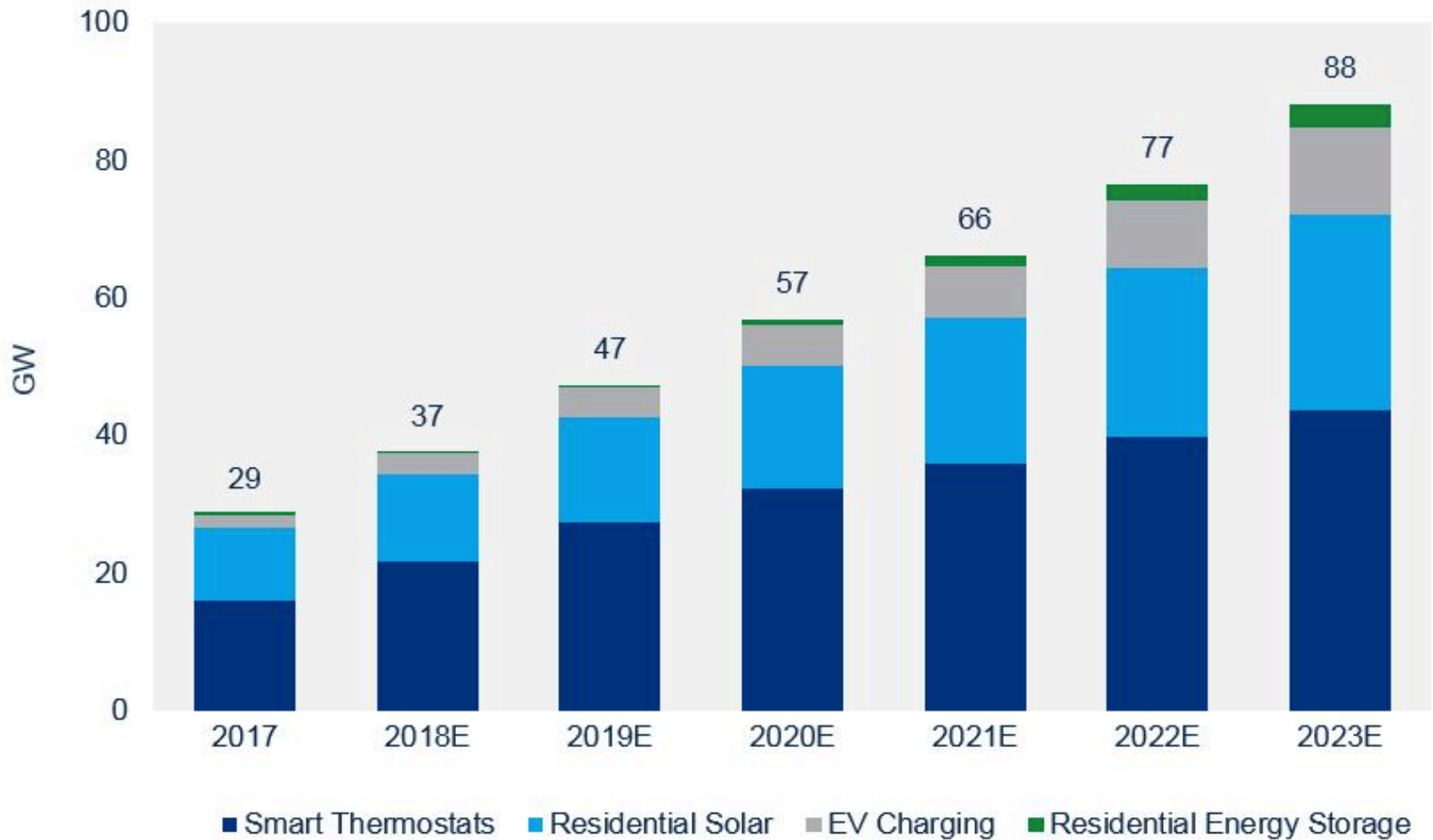
- **Buy it:** the legacy grid & utility are no longer the only option
- **Make it:** first challenge to status quo with solar PV, wind and biogas distributed generation options
- **Eliminate it:** energy efficiency or negawatts are raising the bar with innovative solutions and goals to reduce or eliminate waste.
- **Store it:** (energy storage) emerging disruptive to change to address multiple grid services, intermittent renewables, & potentially **dispatch it** yourself
- **Shift it:** demand response or demand flexibility is evolving from a traditional solution to a flexibility tool complemented by other DERs
- **Manage it:** Microgrids, virtual power plants, smart grid, home & business management software, algorithms to help prosumer buy and sell energy when the market is favorable. New business model (**aggregate it**)
- **Sell it or share it:** the advent of transactive energy and blockchain technology advances the concept of a new energy value proposition
- **Reduce it:** No investments in overbuilt generation and fewer system losses.

DERs allow for a paradigm shift



A sustainable energy system is a smarter, more unified and integrated energy system

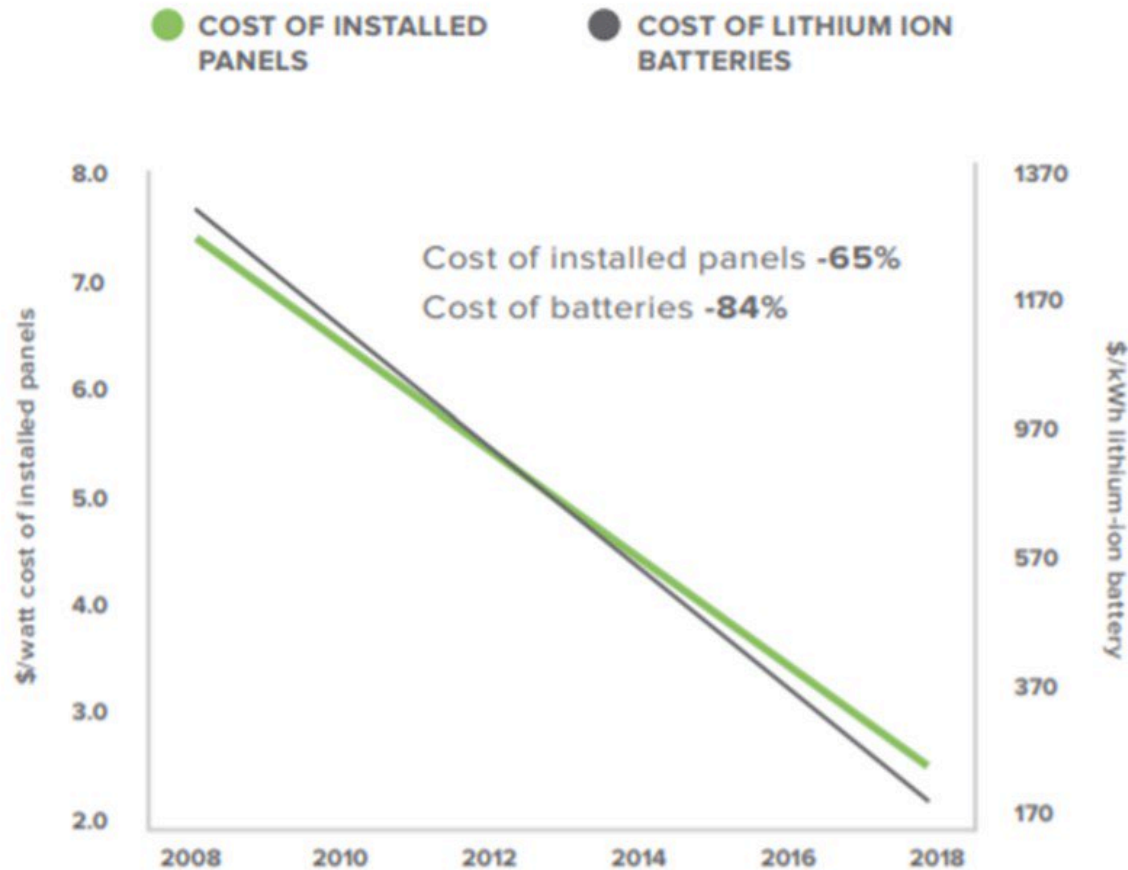
88 GW of Demand Flexibility in 2023



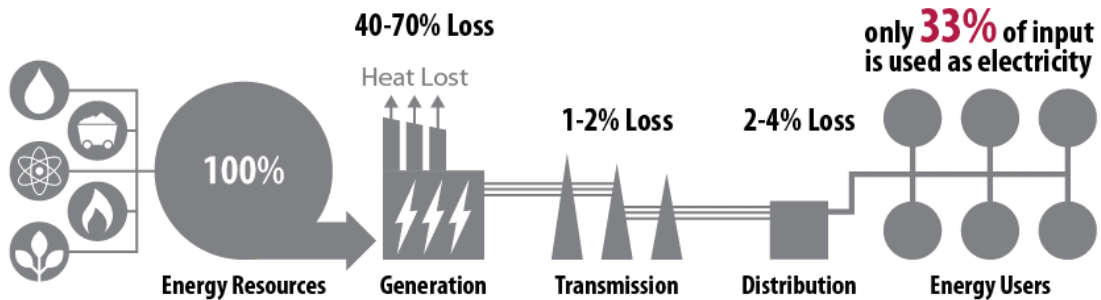
Solar plus battery cost decline in 10 years

COST OF SOLAR MODULES AND BATTERIES HAVE DECLINED SIGNIFICANTLY

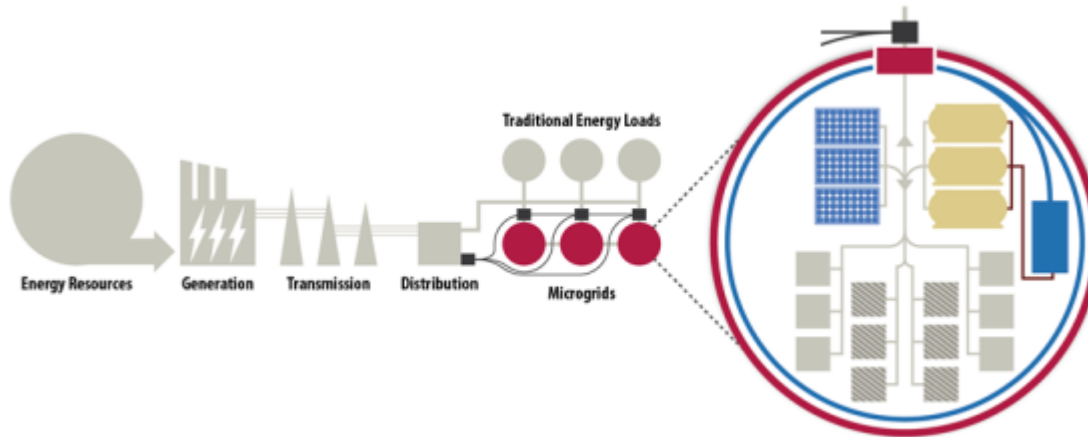
b)



Microgrids and Advanced Distribution Networks



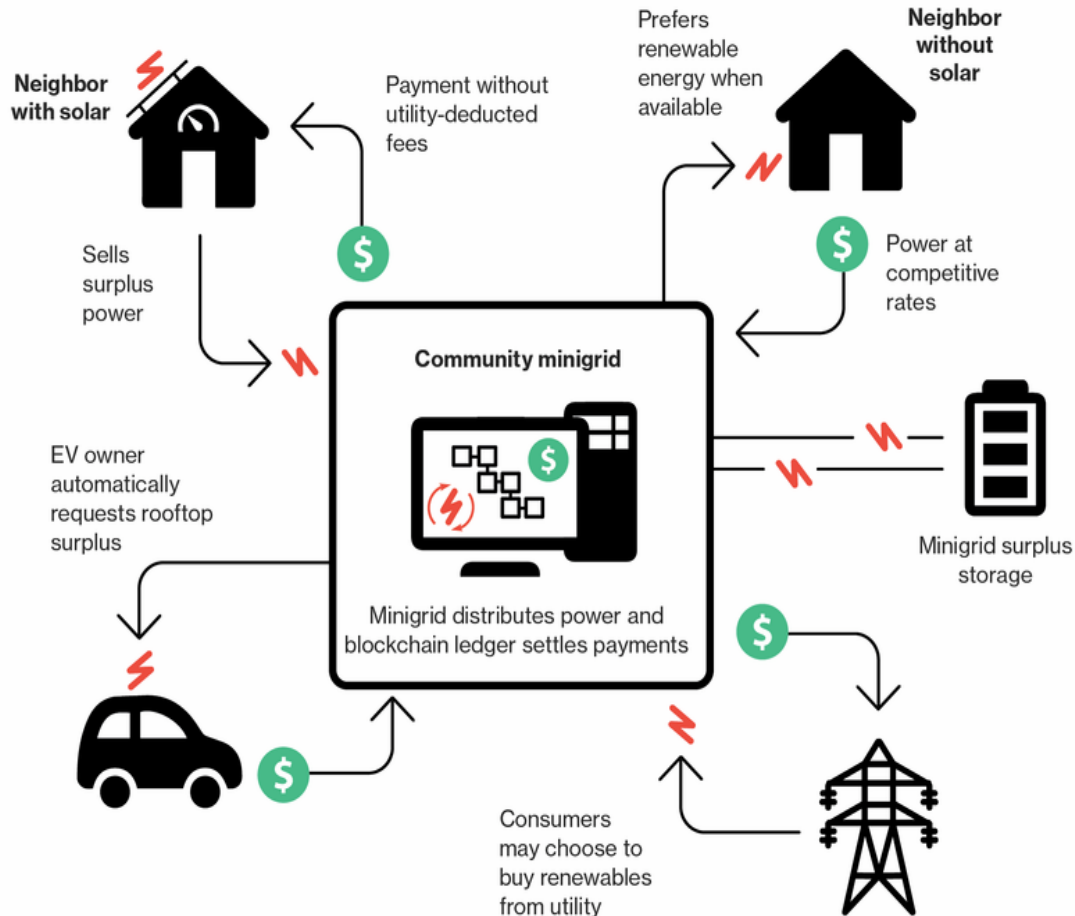
- Enables greater efficiency and resiliency.
- Helps address \$100B in business losses due to power disruptions.
- Deployed at hospitals, military bases, factories, more
- Offers new products and supply chains for Wisconsin's electrical equipment manufacturers.



Transactive Energy & Blockchain

Community Minigrid as Central Payment and Power Control

A blockchain ledger system can be used to trade power between consumers without a utility even knowing it.



Source: Bloomberg New Energy Finance

Bloomberg

Steps toward putting the “public” back in public utility

- Restore the working concept of “public utility” that to make an effective and efficient transition to a new energy economy.
- A public utility is an “undertaking” a rethinking of public goals and private industry toward a common sustainable solution. (i.e., We are in this together).
- Utilities can no longer look at the public as a obstacle, but rather as a source of promise.
- Likewise, the public can no longer see utilities as a obstacle to markets and innovation that could secure a low-carbon energy future.
- An “instrument of the commonwealth” must be built into the notion of a public utility. It can remain a business with shareholders and profits, but only after a refocusing on sustainability and the public good.
- See: Boyd, William: “Public Utility and the Low-Carbon Future.” *UCLA Law Review*. 61 UCLA L.Rev. 1614 (2014).

What kind of energy system do you want to see in the future?

- Integrated Distribution Planning (IDP)
- Grid Modernization (two-way energy flows and communications flows).
Energy democratization.
- Connected devices, sensors and controls, and robust public accessible data (will improve efficiency, create new value propositions and allow transparent policy goals.
- Distributed Energy Resources (DERs) and Non-Wire Alternatives (NWAs) including energy storage, demand response, next generation efficiency, net-zero buildings create a new supply and demand paradigm and manage system over builds.
- Local energy markets, peer-to-peer trading and sales.

KNOW YOUR UTILITY PROVIDER



IOU

Investor-Owned Utility

Service area:

Large, urban and rural

Electricity sales in WI:
83% of retail market*

Structure:

Private, for-profit

Business model:

Provide return on investment

Owned by:

Shareholders

Regulated by:

Public Service Commission



Muni

Municipal Utility

Service area:

Small to mid-size towns

Electricity sales in WI:
11% of retail market*

Structure:

Public, nonprofit

Business model:

Provide at-cost electricity rates

Owned by:

Local Government

Regulated by:

Public Service Commission



Co-op

Cooperative Utility

Service area:

Small to mid-size, rural

Electricity sales in WI:
6% of retail market*

Structure:

Private, nonprofit

Business model:

Provide at-cost electricity rates

Owned by:

Members

Regulated by:

Co-op boards of directors

*Source: U.S. Energy Information Administration, Form EIA-861, "Annual Electric Power Industry Report."

Contact Information

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