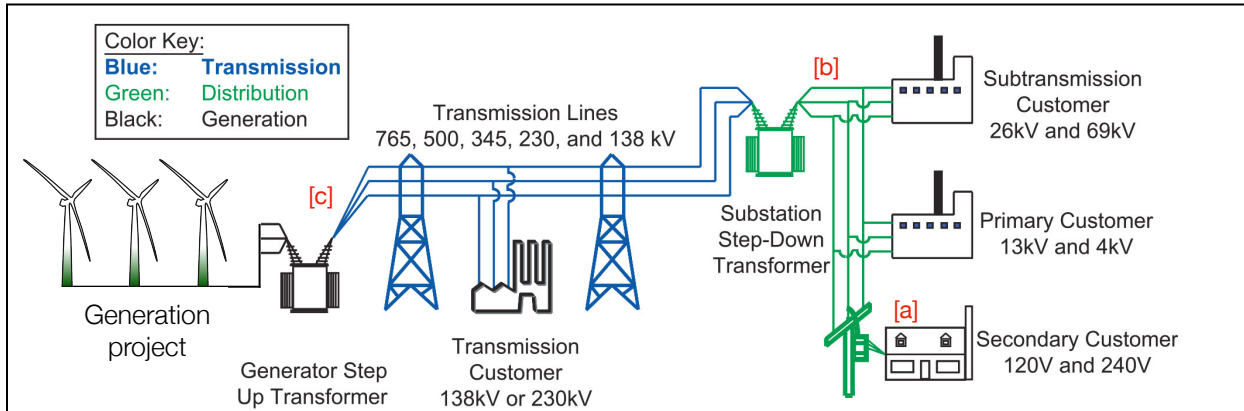


What is the Grid?

The **grid** is the physical system of power lines and related equipment used to transmit electricity. It is made up of:

1. **generation**, provided by individual facilities that produce electricity from primary energy sources, such as wind, water, coal, or natural gas;
2. a **transmission** system used to transport electricity over long distances at high voltage (HV: 110 kV or more); and
3. a **distribution** network that delivers electricity to commercial and residential customers, also known as the electric **load**, at low voltage (LV: up to 110 kV).



From diagram of standard North American electric grid from the [Federal Energy Regulatory Commission \(FERC\)](#)

Transformers, which convert electricity between voltage levels, can either step up to higher voltages for electricity *transmission*, or step down to lower voltages for *distribution*. Electricity is traditionally thought of as flowing in one direction on the grid: from *generation*, through *transmission*, to *distribution*. That is starting to change as smart meters and *distributed generation* become more common.

Distributed Generation (DG) refers to electricity generation plants that feed directly into the *distribution* network. Often they are located close to the *load*, are sometimes locally-owned, and may even be on customer's property, behind their electric meter, with the ability to export extra electricity back onto the *grid*. Rooftop solar is an example.

Load is made up of a constant component, known as the **baseload**, and a variable component. *Baseload* is the minimum amount of electricity demand over a given period of time. Variable loads change over the course of the day, usually rising to a peak in the evenings. In many cities, the annual peak is reached on a summer evening, when air-conditioning units add to the usual variable load.

Intermittent electricity comes from typically renewable sources that are not continuously available on demand. Examples include solar, wind, tidal, and wave power. In order to adjust to constant variations in *load*, intermittent generation has to be matched with *dispatchable generation*, or with energy storage.

Dispatchable generation can be adjusted to increase or decrease power output as needed. Examples include reservoir-based hydropower, and biogas- or natural gas-fired generators.

Renewable Energy (RE) comes from sources that replenish naturally with time. These include wind, water, tides, biomass (plant-life) and sunshine.

RE project sizes can be broken down very roughly into **small-scale**, **mid-scale**, and **large-scale**. Size classification is mainly governed by the generation capacity of the project, which in turn limits where the project can connect to the grid, how it can be classified under federal regulations, and who is likely to own it. These key characteristics are set out in the table below.



What is the Grid?

Renewable Energy Project Characteristics

Project size	Small-scale	Mid-scale	Large-scale
Capacity (plant power rating)	less than 10 MW	10 to 80 MW	above 80 MW
Interconnection point (where on the grid the power plant delivers its electricity)	Behind the meter [a]	Distribution grid [b]	Transmission grid [c]
Qualifying Facilities (QFs)?	Yes	Yes	No
Local ownership	Usual	Common	Uncommon

A **Qualifying Facility (QF)** is a generating facility of 80 MW or less whose primary energy source is renewable - hydro, wind, solar, biomass, waste, or geothermal resources.

QFs are defined by **FERC**, the Federal Energy Regulatory Commission, which is responsible for regulating the interstate transmission of electricity, oil, and natural gas, and for ensuring that all generators have access to the grid to sell their energy.

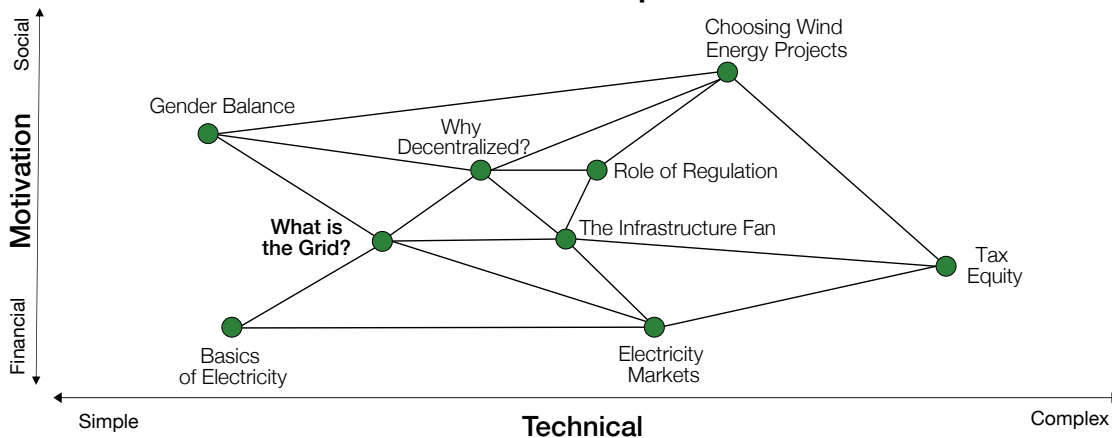
QFs benefit from certain rights protected by FERC.

Local ownership can range from all generation equipment being owned by an individual or cooperative to local individuals holding minority shares in a project developed and operated by others. Some states have tax incentives to encourage local ownership.

References and Further Reading

- [1] United States Department of Energy (DoE)'s webpage, "Understanding the Grid" (2014): <https://www.energy.gov/articles/infographic-understanding-grid>.
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- [3] University of Calgary's Energy Education webpage, "Dispatchable source of electricity" (2020): https://energyeducation.ca/encyclopedia/Dispatchable_source_of_electricity.
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- [5] United States National Park Service's Renewable Energy webpage, "Electrical Power Transmission and Distribution" (2016): <https://www.nps.gov/subjects/renewableenergy/transmission.htm>.
- [6] Union of Concerned Scientists' Reports and Multimedia webpage, "How the Electricity Grid Works" (2015): <https://www.ucsusa.org/clean-energy/how-electricity-grid-works>.
- [7] Federal Energy Regulatory Commission (FERC)'s webpage, "PURPA Qualifying Facilities" (2020): <https://www.ferc.gov/industries-data/electric/power-sales-and-markets/purpa-qualifying-facilities>.

Where this White Paper Fits In



About Treehouse Investments: Treehouse Investments is a minority-owned firm dedicated to addressing climate change. We are a family business, founded by a family from Puerto Rico. We target direct investments in both publicly traded and private entities. Our focus areas fall under the broad description of decentralized infrastructure: companies and projects that contribute to building sustainable and resilient energy, water, and waste systems.

