

Generation 101

By Rick Nelson



Gerald Gentleman Station is Nebraska's largest generating plant.

Over the last 10 to 15 years, we have heard a lot of talk about renewable energy, reducing the amount of carbon in the air, and minimizing our dependence as a country on foreign oil. Each of these topics impacts the way we generate electricity. If it seems I am wandering off course while I give you some background information, stick with me. We'll get back to where we started.

Electricity is produced from four different categories of power plants. We stack them, just like building blocks, from the least cost to the highest cost per kilowatt-hour produced.

Base Load

First, we have what is called "base load" power plants. These are the most expensive to build, so you want to run them as much as possible to spread out the large capital costs of ownership (billions of dollars for one plant) over the

sale of as many kilowatt-hours as possible.

Base load generation units tend to be very large. It takes time for the units to start generating power. In some cases, it can take three to four days before they get to 100 percent power. The generating units that make up this class of electric generation are typically coal and nuclear fuel units. In Nebraska, these base load generators provide about 65 percent of the electricity we use at Custer Power.



Cooper Nuclear Station is located in southeast Nebraska on the west bank of the Missouri River

Intermediate

The second category of generating units is called intermediate. These units typically use more expensive fuels but are sometimes cheaper to build. They are usually gas-fired plants, but there are some coal-fired plants in this category. Intermediate plants are the ones



Gas turbine driven "peaking unit"

that kick in after all the base load units are running, but more power is still needed. In Nebraska, intermediate units make-up about 15 percent of all generating units and cost about 300 percent (three times) more than base load plants per megawatt-hour at Custer PPD.

Peaking

The third category is called peaking units. These are the highest cost units to run and typically include either gas-fired or diesel units. These machines run when everything else is going full blast, yet still more power is needed – such as in the middle of the afternoon on a hot, August day.

Peaking units can be turned on and get up and running fairly quickly, which means when they are not needed, they are shut off. In Nebraska, peaking units make up about five percent of all generating units and cost about eight times more than base load units.



Broken Bow Wind Farm

Renewable

The final category of generating units is renewable energy. This includes wind, solar, and hydro-electric generation along with anything else that can produce electricity from a source that is renewable.

These units will run whenever they can – when the wind is blowing, when the Corps of Engineers is letting water out of the dams, and when the sun is shining.

For the wind-powered generation that is typically 30 to 40 percent of the time. Since these units are capital intensive (our fancy word for “expensive to build”), the electricity produced must be forecasted and taken into the electric grid or distribu-

tion system 100 percent of the time no matter where they are generating at unless there is a reliability issue on the System. If the wind is blowing less than forecasted the wind farm will not generate and other units will be needed. The Units needed depending on when they are needed for the energy would be the higher cost Intermediate and Peaking Units. If the wind is higher than forecasted it puts additional pressure on the transmission system where other units will be dispatched down. At times when the wind is too high, the turbines are shut down due to potential damage to the turbines.

In Nebraska, renewable energy facilities make up about eight percent of all generating capacity, and wind energy currently costs more per kilowatt-hour than power from most base load plants.

Produce It the Instant You Need It

Now, let’s bring the subject around to where we started. The first thing to remember may

sound obvious, but it’s important to keep in mind: we have to produce electricity a split second before it is needed. This means, when you flip the switch, the power will be there and the light will come on.

Our energy operators are very good at knowing minute-by-minute how much electricity they need to be putting on the lines. They use the base load plants first because they’re the ones that are cheapest, most reliable and oftentimes have the most power output compared to the other generating types.

As demand for electricity increases, power plant operators kick on their intermediate units. During the summer months, both the base load and intermediate units will probably be running most of the time. During the winter months, base load plants run but most likely intermediate units may not, though they are always available.

The last units that come on during the highest peak demand times are the diesel units



As we spring forward in the month of March, take the time to review your account information. Accurate account information helps Custer Public Power District to better serve you.

Things that may need to be updated:

- Telephone and cellular numbers
- Stock well ownership changes and addresses
- Crop ground ownership changes
- Adding spouses or significant others to accounts
- Medical necessity of electrical power, e.g., oxygen or life support equipment



because they are so expensive and do not have as much power output. That means diesel provides a very small portion of the total electricity generated in Nebraska. It runs only in extreme circumstances.

Storage of Renewables

We don't yet have the technology for storing wind and solar energy on the scale required so that they could be used as base load power, which makes up the 65 percent of power Nebraska generates. What storage we do have technologically available right now is pretty expensive. Also, today, technology does not exist on a commercial-wide scale to remove carbon from coal plants.



Kearney Hydro – has been in existence since 1886 and an operational hydro since 1921.

While one may argue river dams could be used as a form of energy storage, there are also environmental considerations about building more dams and limits as to how much untapped hydropower potential we have available. In 2011, Hoover Dam produced about 4.2 billion kilowatt-hours, all the fossil fuel generating plants in the United States produced 2,788.9 billion kilowatt-hours. To replace all that energy with hydroelectric would require 644 Hoover Dams to be built. There is some potential, to be sure,

but not enough to be a magic cure-all.

What Can We Do?

With all of the above points in mind, I think most will agree that America should keep working on the technology that can solve these problems. In the meantime, focus on finding the right balance among the four existing categories of generation. NPPD, Custer's power provider, has more than 40 percent carbon-free generation today and customers benefit from this diverse

resource mix.

We also can do this: use the energy we do produce more efficiently and get better at conserving it. So far, our efforts to do that in Nebraska, using irrigation load control, have helped us avoid building at least one big power plant. It's a good start and it, too, needs to be part of the equation as we seek to find the right balance. ♦

ALWAYS CALL BEFORE YOU DIG

One free, easy call gets your utility lines marked AND helps protect you from injury and expense.

**Safe Digging Is No Accident:
Always Call 811 Before You Dig**

Know what's below. Always call 811 before you dig.
Visit call811.com for more information.

Reuben Pizza



INGREDIENTS

- 1 (12") pizza crust, pre-baked
- 1 pound Corned Beef, cut about 1/2" thick and cubed
- 1 cup Frank's Kraut
- 1/2 cup Thousand Island Dressing
- 8 ounces Swiss cheese, shredded
- 4 ounces Mozzarella cheese, shredded

INSTRUCTIONS

Pre-heat oven to 425 degrees. Pre-Bake crust for about 8 minutes, or until it just begins to brown.

Top with dressing, then corned beef, then sauerkraut, then cheese.

Bake for 10 minutes or until cheese is melted and golden brown.

Serve piping hot!

YIELD: 6 SERVING SIZE: 1
Amount Per Serving: CALORIES: 831

**May the luck of the Irish
Lead to happiest heights
And the highway you travel
Be lined with green lights.**



CUSTER CURRENTS

Newsletter of the

Custer Public Power District
Broken Bow, NE - Phone 872-2451
www.custerpower.com

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Board Meetings

The regular monthly meeting of the Custer Public Power District Board of Directors is on the last Thursday of each month, beginning at 9:00 a.m. (CDT) in the main office in Broken Bow on Hwy. 2.

An agenda for each regular meeting of the board is available for public inspection during business hours.

In the event of matters of an emergency nature or conflicts with other meeting dates, the Board of Directors will set changes. Any change in the monthly meeting date will be posted in the legal notice at the main headquarters building at Broken Bow and at each of the District's area service centers located in Callaway, Sargent, Stapleton and Thedford, Nebraska.

