Montana’s energy landscape is evolving, changing from a state that produces more electricity than our citizens can use 24x7, 365 days a year, to a state where there is a growing risk there won’t be enough electricity to serve our citizens at critical times of peak load. A similar situation is occurring throughout the Pacific Northwest – a key source for NorthWestern’s market purchases. The NorthWestern Energy Electricity Supply Resource Procurement Plan addresses this critical risk and outlines how the company’s Montana customers’ energy needs will be met with reliable energy at the lowest cost.

Reductions in regional and in-state coal generation are limiting the ability of Montana to import and export energy, and growth in customer energy demand across the Pacific Northwest means the energy available from the market will be less certain at key times and prices will be more volatile. NorthWestern Energy has been reducing our customers’ exposure to the market by developing a portfolio that includes hydro, natural gas, coal, wind, and solar generation. However, in order to manage the increasing risk to our customers and continue providing them with reliable energy, NorthWestern Energy must work quickly to reduce our customers’ exposure to power markets, especially for certain types of power products. To just assume the market will always be able to provide customers with sufficient electricity at affordable prices is a reckless approach that could have severe reliability and cost consequences.
NorthWestern Energy’s current peak requirement (the amount of electricity needed to service all customers at the times of highest demand plus planning reserve margins) is about 1,400 megawatts (MW). This is 645 MW more than the peak capability of NorthWestern’s current portfolio.

- Planned regional retirement of 3,600 MW of coal-fired generation will cause regional peak energy shortages as early as 2021.
- Due to planned Montana coal generation retirements (and potential unplanned retirements), critical transmission capacity and access to other states’ power markets will be limited.
- NorthWestern is planning to join the Western Energy Imbalance Market (EIM) in 2021 which will bring many benefits to our customers. However, this will require NorthWestern to control sufficient supply to meet hourly loads – including peak loads.
- Regional discussions are currently underway to build upon the EIM and develop a more fully organized market which will require NorthWestern to control the full amount of peak energy to serve demand, plus a reserve margin.

The Colstrip Transmission System was designed to primarily export energy, but it is also used to import energy from out-of-state sources, especially during critical times. Due to its designed purpose, under many circumstances the Colstrip Transmission System may not be adequate to import energy from markets outside of Montana to replace the power used in Montana that is generated now at the Colstrip units.
Planning For the Future

Capacity Needs

NorthWestern Energy’s current resources provide about 755 MW of peaking capacity, which is the energy available during periods of our customers’ highest demand. An additional 645 MW of peaking capacity must currently be purchased from the market to meet our needs. Without new peaking capacity, the market exposure will increase to about 725 MW by 2025 (including reserve margins). This peaking need assumes continued development of cost-effective demand side management (conservation) and small distributed generators (net-metering). Meeting peak load with market purchases means being exposed to the market at the worst possible time – when the market is volatile and prices are high.

Figure 1-1. Peaking Capacity Needs
Flexible Capacity Needs

NorthWestern’s customers need resources capable of providing more than just energy and peaking capacity. NorthWestern’s resource portfolio generally generates enough energy to serve average load, but is significantly short both peaking and flexible capacity. Resources that can be dispatched on-demand to ramp up or shut down relatively quickly are identified as flexible capacity. Flexible capacity is needed to match generation to short-term variations in load. Additionally, variable energy resources like wind and solar require dispatchable energy resources to balance the energy grid and assure reliability. NorthWestern Energy’s current levels of flexible capacity resources are adequate for the existing resource portfolio, but will fall short following the current planned (and future unplanned) additions of wind and solar resources. *(Unplanned additions come mainly through “Qualifying Facilities” that our customers are required to purchase by law.)*

Energy Needs

While NorthWestern Energy is in need of resources to supply our customers during periods of their highest demand, our current portfolio is much better off when looking at customers’ average energy needs. The type of products generation resources can produce is critical to ensure the specific needs of the portfolio are met without having to acquire excess
generation. During heavy load hours, the current resource portfolio produces a little less energy (on a monthly basis) than customers consume. During light load hours, the portfolio produces more energy (on a monthly basis) than customers consume. Excess energy is sold into the wholesale electricity market at lower prices, often lower than the cost of the energy being produced. This is done because NorthWestern must take the energy from variable resources like wind even if it is not needed, and the hydro and thermal resources like Colstrip have minimum production levels or must be operating in order to respond to changes in wind generation or loads.

Wind and solar are capable of providing low-cost energy but are generally not available to provide capacity when customers need it most, like after sunset on the coldest winter days in December and January. The Winter and Summer peak load days of 2017 (January 3rd and July 13th) are shown in Figure 1-2 below. The black line represents customer load - shown as MW on the left hand scale. The dashed green line shows wind production (from the 364 MW of wind that we have to serve customers) as percentage of its nameplate capacity on the right hand scale. The orange line represents Colstrip 4 production, also shown as a percentage of its nameplate capacity on the right hand scale. NorthWestern has seen this pattern repeatedly since 2017, most recently during a cold spell occurring during the week of February 4th, 2019.

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As illustrated above, wind contributed very little of its maximum generation capability (especially on the critical winter peak day), while Colstrip 4 generated at 90 to 95 percent of its maximum capability. During peak load periods, customers need resources that NorthWestern can call upon as needed, 24 hours a day, 7 days a week.

**Carbon Emissions**

NorthWestern Energy purchased 11 hydroelectric facilities in 2014 with a current generating capacity of 448 MW (with potential for future upgrades). The hydroelectric system is primarily a run-of-the-river system which provides a large part of the backbone of our generation portfolio, contributes significantly to our low cost carbon-free energy production, and provides system reliability for our customers. In 2018 NorthWestern’s energy portfolio was 61% carbon free energy.
With the help of Montana’s generation portfolio, NorthWestern continues to be one of the leaders in the industry for carbon free portfolios. Carbon dioxide emissions associated with NorthWestern’s Montana portfolio have been significantly less than nearly all of our peers.

From 2008 to 2018 carbon dioxide emissions associated with NorthWestern’s resource portfolio have declined, and they are forecast to continue to decline. Resource opportunities, technology improvements, and technology cost reductions could also reduce emissions. As shown in Figure 1-4, carbon emissions associated with the Base portfolio decline over the term of the plan. Significant declines occur when Colstrip Energy Limited Partnership (CELP) and Yellowstone Energy Partnership (YELP) leave the portfolio. Together, CELP and YELP provide about 11% of the energy in our portfolio but contribute about 37% of the carbon dioxide emissions.
From 2008 to 2018 carbon dioxide emissions associated with NorthWestern’s resource portfolio have declined, and are forecast to continue to decline (Base portfolio shown above).

**State and Regional Coal Retirements**

Planned retirements in the Pacific Northwest region exceed 3,600 MW and the Northwest Power and Conservation Council forecasts regional capacity shortfalls as early as 2021. NorthWestern Energy’s continued reliance on the market to purchase energy to fill the gap during peak customer demand will significantly increase price and reliability risk to NorthWestern Energy’s customers because of the reduced energy supply availability. Future technological advances will help mitigate this risk, but NorthWestern Energy has
an ongoing obligation to plan for affordable and reliable resources. The measured multi-year approach NorthWestern proposes will allow for the incorporation of advancements in generation technology and potential costs declines.

Figure 1-5. NWPPC Planned Plant Retirements

Transmission Constraints
Transmission capacity is necessary for market access in order to purchase (import) and sell (export) power. During the most critical periods, NorthWestern Energy relies heavily on imports into our system in order to meet customer needs. The transmission system in Montana was constructed around, and is heavily reliant on, the generating resources and their location, including the entire Colstrip Power Plant. Retirement of Colstrip units will impact NorthWestern Energy’s ability to import sufficient power to meet peak energy demand. As discussed earlier, the transmission lines at Colstrip are limited for the import of energy because they are designed to export energy. Another concern is that if no additional generation is built to justify keeping the current Colstrip transmission lines,
those lines could also be retired, which will contribute to bottlenecks in the remaining energy transmission system used in Montana to serve NorthWestern Energy customers.

**Integrating Our Grid and Markets**

A significant event affecting NorthWestern’s 2019 Resource Procurement Plan process was the decision by NorthWestern to join the EIM. On November 8, 2018, NorthWestern announced our intent to enter the Western EIM in the spring of 2021. With NorthWestern’s execution of an Implementation Agreement, the total number of active and pending participants in the Western EIM now totals 14 utilities serving 80 percent of customer loads within the US portion of the WECC. Additionally, Bonneville Power Administration is currently undertaking a stakeholder process to consider EIM entry, and could join as early as 2022.

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Regional Transmission Organization (RTO)

In early 2018, the California Independent System Operator (ISO) began a process to enhance the day-ahead market within the full Independent System Operators footprint (the EDAM initiative). The enhancements to CAISO’s day-ahead market are targeted to go live in 2019 with a platform that will allow the addition of a day-ahead market to the Western EIM. The extension of the day-ahead market to EIM participants, if supported by EIM members and CAISO, could go live as early as 2022. The next step to a full RTO or ISO typically follows quickly. NorthWestern Energy assumes for the purposes of the 2019
Resource Procurement Plan that EIM entry will occur in 2021, followed by EDAM entry in 2022 and full RTO/ISO entry in 2025.

**Resource Portfolios**

NorthWestern’s resource plan shows the results of thirteen “future” resource portfolios. Each portfolio satisfies our peak capacity needs by adding resources that achieve resource adequacy by 2025 and maintain resource adequacy throughout the plan period. The graph below shows average peak capacity additions by year for all portfolios using automatic resource selection (ARS) to achieve a 16 percent reserve margin by 2025.

**Figure 1-7. Peaking Capacity Additions by Year**

![Average ARS Peak Capacity Additions by Year](image)

The portfolios identify resources with known costs and indicate that thermal resources provide the best value (lowest cost) to meet our customers’ future needs for peak capacity.
Renewable resources and energy storage technologies are projected to continue to decline in cost, but are still more expensive than natural gas fired resources, and were not selected by the model. A portfolio which meets our customers’ future resource needs without the addition of any new carbon producing resources would lower carbon emissions, but at a cost. Meeting our customers’ future needs by adding carbon free resources is projected to cost $523,000,000 more than meeting their needs using natural gas fired resources. Moving to a 100% carbon free portfolio was not modeled, but a recent regional analysis indicates that it would be cost prohibitive.1

While our portfolio modeling shows that natural gas resources provide the lowest cost portfolio, competitive solicitations open to a wide variety of technologies will be used to determine which resources will ultimately serve our customers’ needs as identified in this Plan at lowest cost.

**Strategy in Action**

In order to have adequate energy supplies to meet peak load requirements by 2025, NorthWestern Energy will solicit competitive proposals from a variety of resources and will also consider opportunity resource purchases. The model used to evaluate resources in this plan will also be used to evaluate resources submitted in competitive solicitations or opportunity resources. Opportunity resources consist of existing resources that become available for purchase and cannot be known or modeled in advance (the purchase of the hydroelectric system is a good example of an opportunity resource).

NorthWestern will use a staged multi-year approach to add up to 200 MW of capacity per

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1 Resource Adequacy in the Pacific Northwest study to be released March 2019 by Energy + Environmental Economics (E3).
year from 2022 to 2025. NorthWestern Energy will evaluate all resources which can meet the portfolios’ needs, including renewable and thermal based generation, power purchase agreements, and owned energy resources comprised of different structures, terms, and technologies with the long term objective of a lowest cost, stable, and reliable energy portfolio. The staged approach allows for incremental steps through time with opportunities for different resource types and new technologies while also building a reliable portfolio to meet local and regional conditions while minimizing customer impacts.

Table 1-1. RFP Resource Acquisition Goals

<table>
<thead>
<tr>
<th>RFP Date</th>
<th>RFP Amount</th>
<th>Online Date</th>
<th>Remaining 2025 Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>Up to 200 MW</td>
<td>2022</td>
<td>725 MW</td>
</tr>
<tr>
<td>2020</td>
<td>Up to 200 MW</td>
<td>2023</td>
<td>325 MW</td>
</tr>
<tr>
<td>2021</td>
<td>Up to 200 MW</td>
<td>2024</td>
<td>125</td>
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<tr>
<td>2022</td>
<td>Up to 200 MW</td>
<td>2025</td>
<td>0</td>
</tr>
</tbody>
</table>

In the past, NorthWestern has updated its Electricity Supply Plan every two years, involving a technical advisory committee with third party facilitators and multiple public meetings. An incremental approach to generation acquisition is also consistent with this planning cycle. NorthWestern is considering whether maintaining the technical advisory committee is the best means of incorporating the public into the planning process.

NorthWestern Energy will consider all opportunity resources and solicit competitive proposals to meet customers’ future energy resource needs. NorthWestern Energy will use an independent evaluator to conduct a proposal solicitation process open to all resources (including “demand side” resources) for up to 200 MW of peaking capacity in 2019, which is about one-fourth of NorthWestern Energy’s projected need in 2025. This process will be repeated in subsequent years to provide a resource-adequate energy portfolio. The proposal solicitation process will consider a wide variety of resource options, resource sizing, ownership options and contract lengths.