Northern Great Plains
Climate Change and the U.S. Energy Sector: Regional vulnerabilities and resilience solutions

Summary in Brief
The Northern Great Plains is home to less than 2% of the U.S. population but is a major supplier of critical energy resources used throughout the nation. These resources include coal from the Powder River Basin, electricity exported via interstate transmission lines, and rapidly growing oil production from the Bakken formation. Extensive rail and pipeline networks transport energy resources across the region. Major climate change impacts projected to increasingly threaten the region’s energy infrastructure include the following:

- **Climate change is projected to increase both the frequency and severity of heavy precipitation events in northern states, increasing heavy runoff and the risk of flooding.** Floods threaten low-lying assets such as power plants and rail lines located in flood plains, and they can disrupt delivery of fuels and damage infrastructure.

- **Average temperatures are projected to increase, and extremely hot days are projected to occur more frequently.** Heat waves are likely to become more frequent, more severe, and longer-lasting. Extreme heat can delay or disrupt rail service, affecting fuel shipments. As air and water temperatures rise, thermoelectric power plants operate less efficiently, and electricity demand for cooling increases. Higher temperatures also cause sag and increase resistance in transmission lines. Together, these effects may reduce available power supply during the hottest months when demand is highest.

- **Decreasing water availability is projected in the summer for parts of the region as a result of seasonal changes in precipitation patterns from climate change and competing uses for water.** Limited water availability may reduce the availability of thermoelectric power generation and affect biofuel production and oil and gas operations. Power plants, biorefineries, and agriculture are all major water users and require more water as temperatures increase. Competing uses for water, such as crop irrigation, may also contribute to limited availability.

Examples of important energy sector vulnerabilities and climate resilience solutions in the Northern Great Plains

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<tr>
<th>Subsector</th>
<th>Vulnerability</th>
<th>Magnitude</th>
<th>Illustrative Resilience Solutions</th>
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<tbody>
<tr>
<td>Fuel Transport</td>
<td>Increased disruption from roadbed washouts and erosion from heavy precipitation and flooding</td>
<td>From the Bakken fields, rail accounts for more than 70% of total oil shipments and 100% of deliveries to the West Coast</td>
<td>Preventive maintenance, track inspection, and reliability standards</td>
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<td>Increased disruption of coal and oil by rail from extreme heat and rail buckling</td>
<td>Almost 50% of the coal produced in the United States travels along a small number of central rail lines in the region</td>
<td>Improved detection of track defects including buckling and weak points</td>
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<td>Thermoelectric Power</td>
<td>Reduced efficiency from increasing air and water temperatures and decreasing water availability</td>
<td>The region exported over 70 TWh of electricity in 2012, so reductions in available generation may also affect neighboring regions</td>
<td>Alternative water sources, recirculating, dry, or wet-dry hybrid cooling systems</td>
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<td>Generation</td>
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<td>Electricity Demand</td>
<td>Increased electricity demand in the summer from higher temperatures</td>
<td>An additional 200–800 CDDs per year is projected by mid-century for most of the region</td>
<td>Capacity expansion, energy efficiency, and demand-side management programs</td>
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