



ECONOMIC IMPACTS OF THE COOPER NUCLEAR STATION

AN ANALYSIS BY THE NUCLEAR ENERGY INSTITUTE

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Cooper's operations support more than **1,000 Nebraska jobs**, including more than **680 jobs** in its 5 neighboring counties

Cooper provides more than **\$112 million annually** in state economic output, including **\$66 million** in its 5 neighboring counties

EXECUTIVE SUMMARY

The Cooper Nuclear Station (Cooper), located along the Missouri River in the southeast corner of Nebraska, has long been a vital part of the region's energy portfolio, providing reliable electricity since it began operating in 1974. In addition to this reliable, carbon-free electricity, the plant supports hundreds of direct jobs. Employee involvement in their community also makes Cooper a significant social and economic contributor to Nebraska. Cooper is Nebraska's largest single source of carbon-free electricity.

KEY FINDINGS

Cooper's operations provide:

Employment benefits

Cooper supports hundreds of jobs in the five counties surrounding the plant (Cass, Johnson, Nemaha, Otoe and Richardson) and the rest of Nebraska through its operations. NEI estimates that the total number of jobs supported by Cooper annually is more than 1,000. That includes more than 680 jobs in the five counties surrounding the plant and 320 jobs in the rest of Nebraska. These employment numbers include direct and additional jobs created as a result of the expenditures from Cooper operations.

While there are economic benefits to other states, particularly in nearby Missouri and Iowa, this study focused on the state of Nebraska.

Economic stimulus

Cooper produces significant economic benefits for Nebraska through its plant operations. NEI's analysis finds that Cooper generates more than \$112 million in annual economic output (value added), which includes

To quantify the economic impacts of this facility in Nebraska, the Nuclear Energy Institute (NEI) conducted an independent analysis. Based on data provided by Nebraska Public Power District (Cooper's owner/operator) on employment and operating expenditures, NEI conducted the analysis using the PI+ model provided by Regional Economic Models Inc. (REMI), a nationally recognized model.

more than \$66 million for the five counties surrounding the plant and more than \$46 million for the rest of Nebraska.

2018 total estimated economic benefits for the Cass, Johnson, Nemaha, Otoe and Richardson counties surrounding the Cooper Nuclear Station include:

- \$66 million in economic output from plant operations
- \$63 million increase in gross state product
- \$70 million in disposable personal income

2018 estimated economic benefits for the rest of Nebraska include:

- \$46 million in economic output from plant operations
- \$26 million increase in gross state product
- \$32 million in disposable personal income

Cooper prevents CO₂ emissions
equal to approximately
1.4 million cars
each year

Cooper's operation will result in more than
\$1.9 billion in
economic benefits
for Nebraska between 2018 and 2034

Long-term economic stimulus

This study finds that between 2018 and 2034 (60-year license expiration date), Cooper's operations will generate more than \$1.9 billion in economic output for Nebraska, including \$1.2 billion to the five counties surrounding the plant and an additional \$675 million in the rest of Nebraska.

Clean electricity for Nebraska

Cooper's operations generate carbon-free clean electricity. Cooper prevents the release of more than 6.5 million metric tons of carbon dioxide annually,¹ the same amount released by approximately 1.4 million cars every year.² For perspective, there are an estimated 733,000 passenger cars in Nebraska.³

Reliability benefits

As part of the Nebraska Public Power District's fleet of generating facilities, Cooper provides 820 MWs of reliable, carbon-free electricity. During the past five years, the station operated at more than 93 percent of capacity,⁴ on par with the industry average and significantly higher than other forms of electricity generation. This reliable production helps offset potential price volatility of other energy sources (e.g., natural gas) and the intermittency of renewable electricity sources.

¹ Emissions prevented are calculated using the weighted average CO₂ emissions rate (2,095 lbs/MWh) for the Midwest Reliability Organization region, provided by the U.S. Environmental Protection Agency. Nebraska Public Power District reported electricity generation of 6.9 million MWh in 2017 from Cooper.

² Calculated using U.S. Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator. <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.

³ Retrieved using January 2017 release of the highway statistics from the U.S. Department of Transportation Federal Highway Administration.

⁴ Retrieved using ABB Velocity Suite, which sourced the data from U.S. Energy Information Administration.

Cooper Nuclear Station

- Type: Boiling water reactor
- Commencement of commercial operation in 1974
- Located along the Missouri River in SE Nebraska
- 60 year license expires in 2034
- Total gross electricity capacity: 820 MW



HISTORICAL BACKGROUND

Cooper Nuclear Station is located along the Missouri River in the southeast corner of Nebraska. It consists of one boiling water reactor that produces 820 megawatts (MW) of carbon-free baseload power. Cooper Nuclear Station is owned and operated by Nebraska Public Power District (NPPD) and supplies the electric grid through the Southwest Power Pool, a regional transmission organization.

Cooper is named after Humboldt, Nebraska, natives Guy Cooper Sr. and Guy Cooper Jr. in recognition of their contribution to public power in Nebraska. Cooper began commercial operation in 1974 under an initial 40-year operating license, which was renewed in 2010 by the U.S. Nuclear Regulatory Commission for an additional 20 years. Its current license expiration is in 2034.

RELIABLE ELECTRICITY GENERATION

Cooper operated at a capacity factor of over 93 percent over the last five years.⁴ Capacity factor, a measure of electricity production efficiency, is the ratio of actual electricity generated to the maximum possible electric generation during the year.

As the sole nuclear power plant in Nebraska, Cooper generated more than 6.9 million megawatt-hours in 2017,⁵ a new record for the plant. This results in Cooper providing power to over 385,000 Nebraskans during a nonrefueling outage year like 2017. Refueling outages occur every 24 months, with the next one scheduled for fall 2018.

⁵ Nebraska Public Power District reported the 2017 electricity generation to via U.S. Energy Information Administration Form EIA-923.

⁶ Nebraska Public Power District provided 2016 actual employment numbers.

⁷ "Nuclear Energy's Economic Benefits—Current and Future." Nuclear Energy Institute, 2014.

THOUSANDS OF LOCAL JOBS

Cooper employs approximately 680 people, with more than 550 of them living in Nebraska.⁶ The annual payroll and benefits are more than \$76 million for permanent employees and contractors, including over \$60 million in the five counties surrounding the plant and more than \$2.8 million in the rest of Nebraska. Most jobs at nuclear power plants require technical training and are typically among the highest-paying jobs in the area. Nationwide, nuclear energy jobs pay 36 percent more than average salaries in a plant's local area.⁷

SAFE AND CLEAN FOR THE ENVIRONMENT

Generating clean energy is an important step in reducing the effects of climate change and vital to protecting the environment for current and future generations. Nuclear energy facilities generate large amount of electricity without emitting greenhouse gases. State and federal policymakers recognize nuclear energy as an essential source of safe, reliable electricity that meets both environmental needs and demand for electricity.

Cooper, like all nuclear power plants, produces baseload power that is carbon-free. Cooper avoids the emission of over 6.5 million metric tons of carbon dioxide annually, the same amount released by approximately 1.4 million cars every year. For perspective, there are an estimated 733,000 passenger cars in Nebraska. Cooper also prevented the release of other air pollutants—over 7,900 short tons of sulfur dioxide⁸ and more than 5,590 short tons of nitrogen oxide⁹—which are precursors to acid rain and urban smog.

⁸ Emissions prevented are calculated using the weighted average sulfur dioxide emissions rate (2.2994 lbs/MWh) for the Midwest Reliability Organization region, provided by the U.S. Environmental Protection Agency.

⁹ Emissions prevented are calculated using the weighted average nitrogen oxide emissions rate (1.6203 lbs/MWh) for the Midwest Reliability Organization region, provided by the U.S. Environmental Protection Agency.



STATE AND REGIONAL BENEFITS

NEI used the REMI PI+ model (version 2.1.5) to analyze economic and expenditure data provided by NPPD to develop estimates of its economic benefits from Cooper Nuclear Station's operations. More information on REMI can be found on [page 10](#).

The economic impacts of Cooper discussed in this section consist of the following variables that are used to analyze these impacts:

Output

Output, in this context, refers to the economic activity generated by Cooper Nuclear Station. The direct output is the economic activity produced by the facility. The secondary output is the value of the economic activity generated in other industries because of Cooper, as well as how people employed at the facility influence the demand for goods and services within the region.

Employment

The direct employment is the number of jobs at Cooper. Secondary employment is jobs in other industries as a result of Cooper's operations.

Gross state product

Cooper contributes to Nebraska's gross state product, which the REMI model calculates as value of goods and services produced by labor and property—minus intermediate goods. For a nuclear plant, electricity is the final good. The intermediate goods are the components purchased to make that electricity.

Disposable personal income

Cooper contributes a significant sum to Nebraska's disposable personal income, which is one of the indicators used by economists to monitor the state of the economy. Disposable personal income identifies the available household money for spending and saving after accounting for the income taxes.

Reliable power

The reliable availability of Cooper's power is critical to such things as national security and regional grid stability. Commercial businesses, industries, and manufacturing facilities which require power 24 hours a day, seven days a week also benefit from Cooper's constant supply of electricity.

STATE AND REGIONAL ECONOMIC EFFECTS

Cooper's total 2018 annual economic output impact on Nebraska is estimated to be over \$112 million in direct and secondary impact, including over \$66 million to the five counties surrounding the plant (Cass, Johnson, Nemaha, Otoe and Richardson) and more than \$46 million for the rest of Nebraska.

Cooper contributes more than \$89 million to Nebraska's gross state product in 2018, including \$63 million to the five counties and over \$25 million to the rest of Nebraska.

Cooper also contributes approximately \$102 million to Nebraska's disposable personal income in 2018, including \$70 million to the five counties and \$32 million to the rest of Nebraska.

[Table 1](#) summarizes the plant's effects on the five counties and the rest of Nebraska's economies, the gross state product and disposable personal income in 2018 from operations. Cooper's operations have substantial economic impact on other industries.

Cooper's output also stimulates the state's and region's labor income and employment. The plant employs approximately 528 people in permanent and contracting jobs in the five counties and 23 people in the rest of Nebraska.¹⁰ These jobs stimulate over 450 additional jobs in the five counties and the rest of Nebraska. [Table 2](#) details the quantity and types of jobs that Cooper supports. Plant workers are included in the table's utility occupation category.

LONG-TERM ECONOMIC BENEFITS

This study finds that between 2018 and 2034 (the 60-year license expiration date), Cooper's operations will generate over \$1.9 billion in economic output to Nebraska, including \$1.2 billion to the five counties surrounding the plant and an additional \$675 million in the rest of the state.

¹⁰ NPPD provided the 2016 actual employment numbers. Cooper also hires approximately 130 people across Iowa, Missouri and elsewhere, however the numbers were not utilized for the purpose of this Nebraska-based study.

Table 1
COOPER'S ECONOMIC IMPACT
(dollars in 2016 millions)

Description	Direct and Secondary Economic Output ¹¹	
	2018	2018 to 2034 (license expiration)
Five counties surrounding the plant (Cass, Johnson, Nemaha, Otoe and Richardson)		
Output	\$66	\$1,239
Gross State Product	\$63	
Disposable Personal Income	\$70	
Rest of Nebraska		
Output	\$215	\$675
Gross State Product	\$25	
Disposable Personal Income	\$32	

Table 2
JOB IMPACTS FROM COOPER OPERATIONS

Category	Five Neighboring Counties	Rest of Nebraska	Total
Utilities ¹²	528	23	551
Retail Trade	81	64	145
Other Services (except public administration)	19	35	54
Health Care, Social Assistance	16	57	73
Accommodation, Food Services	14	26	40
Finance, Insurance	9	16	25
Construction	6	10	16
Wholesale Trade	2	11	13
Professional, Scientific, Technical Services	1	19	20
Arts, Entertainment, Recreation	1	7	8
Manufacturing	1	6	7
Real Estate, Rental and Leasing	1	9	10
Transportation, Warehousing	1	6	7
Administrative, Waste Management Services	1	18	18
Other Industries	1	12	13
Total	681	320	1,001

¹¹ Direct output was calculated based on a four-year average between 2013 and 2016, in 2016 dollars.

¹² Utilities sector includes direct employment at Cooper Nuclear Station in Nebraska and secondary employment from the rest of Nebraska to support the operations.



COMMUNITY LEADERSHIP AND ENVIRONMENTAL PROTECTION

In addition to the economic benefits Nebraska Public Power District contributes to the region in the form of jobs, income and economic output, NPPD and its employees play a major role in the health and welfare of the community. Cooper employees are involved in local community organizations, providing both voluntary and financial support.

COMMUNITY ENGAGEMENT

Community leadership

Cooper employees are active members of their communities. They serve on city councils, coach athletic teams, and own local businesses. Cooper staff are engaged in local philanthropic events and responding to local community needs during such events as storms and floods. Cooper employees also volunteer in community parades, local chamber of commerce chili cook-offs, holiday angel tree gift donations and school science fairs.

School programs

Cooper Nuclear Station is directly involved with the Energy Generation Operations Program at Southeast Community College (SECC) in Milford, Nebraska. The program began in 2008 as a way to train future operators and has emerged into a successful program that gives students hands-on operations training at the plant site. The students are prepared for employment at a nuclear power plant during the two-year program. NPPD continually provides opportunities to the students through tours, job shadowing experiences and recruitment upon graduation.

NPPD's energy education team and communication professionals bring presentations to schools and local civic groups to educate them about the benefits of nuclear power and Cooper's support for the community. NPPD in 2017 set up its mobile science, technology, engineering and mathematics (STEM) lab at Johnson High School for two weeks. Students and teachers took time to explore the lab, create, engineer, and experience job-related tasks to understand the importance and excitement of a career in the energy industry. The mobile STEM lab is complemented by online curriculum models, in-class presentations, robotic interactions with students and a statewide robotics program. At least 400 middle and high school students in five schools from around Cooper participated in one or more of Cooper's energy education activities in 2017.

Site tours

NPPD encourages facility tours among its community. Cooper employees host the Nebraska LEAD Program, where members of the Nebraska Agriculture Leadership Council tour Cooper as part of the program's educational site visits. Cooper has hosted representatives from Japan, as well as the USS Nebraska (SSBN-739), a nuclear-powered, Ohio-class submarine. Cooper conducts about 20 tours of the station every year, including tours for the Nebraska National Guard, local law enforcement, state dignitaries, international visitors, and local schools and colleges.



Plant Neighbor Survey

A recent survey¹³ conducted for the Cooper Nuclear Station showed exceptional support from local residents, compared to the benchmarks from other nuclear power plants. The results are comparable to the same survey conducted in 2011.

Ninety-two percent of Cooper's neighbors have a favorable impression of the plant and its recent operations; 71 percent have a very favorable impression. In addition, 88 percent of Cooper's neighbors favor nuclear energy.

Respondents indicated their support for Cooper is based on perceptions of the plant's safe operations and their favorable view of NPPD regarding economic impact, jobs, safety, community outreach and environmental protection. The survey also found:

- 94 percent of respondents are confident in NPPD's ability to operate a nuclear power plant safely.
- 93 percent of Cooper's neighbors believe nuclear energy will be important to meeting the nation's electricity needs.
- 93 percent said NPPD is doing a good job of protecting the environment.
- 84 percent feel somewhat well informed about nuclear energy.
- 72 percent believe people living near a nuclear plant are unlikely to be exposed to harmful levels of radiation.

ENVIRONMENTAL STEWARDSHIP

There has been no significant environmental impact recorded at Cooper Nuclear Station. NPPD's environmental stewardship is multifaceted, including such initiatives as developing wetlands and participating in pollinator programs in the area around Cooper. The Radiological Environmental Monitoring Program at Cooper monitors radiation in ambient air, drinking water, river water, farm animal milk samples, soil, sediment, river fish and local vegetation. Samples are analyzed by an independent vendor and the results are provided to the public and the Nuclear Regulatory Commission. The results have never exceeded regulatory limits.

Fire Brigade and Emergency Medical Technicians

Cooper employs nearly 100 individuals who serve as members of the on-site fire brigade or who are certified as emergency medical technicians (EMTs). Additionally, all Cooper employees are trained to perform first responder duties in the event of an emergency. NPPD's Hazardous Material Emergency Response Plan also identifies specifically trained individuals and teams to respond to particular events (such as spills, fires or medical emergencies), if required.

This dedication to safety expands beyond Cooper. Members of its fire brigade also support their local fire departments, and Cooper's EMTs serve on area response crews. They also participate in and lead training courses for area fire departments and rescue squads.

¹³ The survey was conducted by Bisconti Research Inc. and Quest Global Research in the fall of 2017. Approximately 250 people living within 10 miles of Cooper Nuclear Station were surveyed. The purpose of the survey was to measure the opinions of local residents about the plant as a neighbor, employer and economic engine.



Emergency Preparedness Plan

Cooper's operations always prioritize safety. NPPD partners with the states of Nebraska and Missouri to ensure the public safety is always top of mind.

The Nuclear Regulatory Commission carefully regulates and tests the validity of Cooper's emergency preparedness plan, designed to protect public health and safety in the unlikely event of an incident. High training standards and well-qualified staff demonstrate NPPD's commitment to ensure that the physical environment is safe for all residents. Members of Cooper's emergency response organization are annually tested and qualified to perform their roles.

Cooper tests its emergency response plan multiple times throughout the year. Exercises and drills are conducted both on-site and in partnership with the Nebraska Emergency Management Agency and the State of Missouri Emergency Management Agency, as well as county, state and local law enforcement, and regulatory entities such as the Federal Emergency Management Agency and the NRC. Cooper provides both emergency information and an in-home radio alert system to residents living within a 10-mile radius of the plant. NPPD's call center also is part of Cooper's emergency response organization and will answer calls 24x7.

As a statewide utility, NPPD uses Cooper's emergency response plan as a reference for similar crisis preparations, including its cyber security response plan, emergency restoration exercises, and its participation in the national Grid Ex exercise.

Personnel qualifications

Cooper's Fitness for Duty Program ensures employees are qualified to access the site. Employees are hired after a stringent background check and drug screening. NPPD conducts random daily drug tests to measure and monitor employee performance.

Cooper is home to the Cooper Nuclear Station Learning Center which provides comprehensive training for employees on a variety of industry and operational programs. A specially-designed simulator of the power plant's control room assists in training NPPD personnel to operate the plant in both normal and emergency conditions.

Every Cooper reactor operator must undergo extensive training to earn an operator license from the NRC, and ongoing training is required to maintain a reactor operators' license.

Industry Performance and Regulatory Standing

Cooper Nuclear Station is a member of the Institute of Nuclear Power Operations (INPO) and benefits from the organization's evaluation and benchmarking processes. The mission of INPO is to "promote the highest level of safety and reliability—to promote excellence—in the performance of commercial nuclear power plants." Cooper continues to perform in the highest category of the NRC's Reactor Oversight Process Action Matrix.

ECONOMIC IMPACT ANALYSIS METHODOLOGY

This analysis uses the REMI PI+ version 2.1.5 model to estimate the economic and fiscal impacts of the Cooper Nuclear Station.

REGIONAL ECONOMIC MODELS INC.

Regional Economic Models Inc. (REMI), headquartered in Amherst, Massachusetts, is a modeling firm specializing in services related to economic impacts and policy analysis. It provides software, support services, and issue-based expertise and consulting in almost every state, the District of Columbia, and other countries in North America, Europe, Latin America, the Middle East and Asia.

The REMI model has two main purposes: forecasting and analysis of alternatives. All models have a “baseline” forecast of the future of a regional economy at the county level. Using “policy variables,” in REMI terminology, provides scenarios based on different situations. The ability to model policy variables makes it a powerful tool for conveying the economic “story” behind policy. The model translates various considerations into understandable concepts like gross domestic product and jobs.

REMI relies on data from public sources, including the Bureau of Economic Analysis, Bureau of Labor Statistics, Energy Information Administration and the Census Bureau. Forecasts for future macroeconomic conditions in REMI come from a combination of resources, which serve as the main framework for the software model needed to perform simulations.

POLICY INSIGHT PLUS

REMI’s Policy Insight Plus (PI+) is a computerized, multiregional, dynamic model of the states or other subnational units of the United States economy. PI+ relies on four quantitative methodologies to guide its approach to economic modeling:

1. Input/output tabulation (IO)—IO models, sometimes called “social accounting matrices” (SAM), quantify the interrelation of industries and households in a computational sense. It models the flow of goods between firms in supply chains, wages paid to households, and final consumption by households, governments and the international market. These channels create the “multiplier” effect of \$1 going further.
2. Computable general equilibrium (CGE)—CGE modeling adds market concepts to the IO structure. This includes how IO structures evolve over time and how they respond to alternative policies. CGE incorporates concepts on markets for labor, housing, consumer goods, imports and the importance of competitiveness to fostering economic growth over time. Changing one of these will influence the others—for instance, a new knife factory would improve the labor market by increasing migration into the area, driving housing and rent prices higher, and inducing the market to create a new subdivision to return to “market clearing” conditions.
3. Econometrics—REMI uses statistical parameters and historical data to populate the numbers inside the IO and CGE portions. The estimation of the different parameters, elasticity terms and figures gives the strength of various responses. It also gives the “time-lags” from the beginning of a policy to the point where markets have had a chance to clear.
4. New economic geography—Economic geography provides REMI a sense of economies of scale and agglomeration. It quantifies the strength of clusters in an area and their influence on productivity in that sector. The concentrated labor in an area is specialized to serve companies, thus, their long-term productivity grows more quickly than that of smaller regions with no proclivity in that sector.

CONCLUSION

ECONOMIC AND EMPLOYMENT IMPACTS

NEI's analysis finds that Cooper generates more than \$112 million in annual economic output in Nebraska through its continued operations. This includes over \$66 million for the five counties surrounding the station (Cass, Johnson, Nemaha, Otoe and Richardson) and more than \$46 million for the rest of Nebraska. NEI's analysis also finds that Cooper supports more than 1,000 jobs annually, which includes 680 jobs in the five counties and more than 320 jobs in the rest of Nebraska from continued operations.

FURTHER BENEFITS OF COOPER

The station's economic benefits—through wages and purchases of supplies and services—are considerable. In addition, plant employees further stimulate the local economy by purchasing goods and services from businesses around the area, supporting many small businesses in Nebraska.

The facility generated 6.9 million megawatt-hours of carbon-free electricity in 2017, enough to serve the yearly needs for hundreds of thousands of homes.

Cooper Nuclear Station is an important contributor to NPPD's generation portfolio, serving the energy needs of Nebraskans with carbon-free and reliable electricity.



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