

North Dakota



COMPLEMENTARY SYSTEMS

FY 2018 - 2025

*Coming together is a beginning; keeping together is progress;
working together is success. – Henry Ford*

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Message from the Authors

Brief

We believe humanity's greatest power is collaboration, where each person plays a part and shares a reward. The colors of our logo represent the synergy of freedom, friendship, and future.



Freedom

We work to put power in the hands of people, promoting energy independence, distributed affordably.



Friendship

We create sustainable relationships where participants are rewarded by the degree of their participation.



Future

We design solutions that draw on the wisdom of the human network to power a better tomorrow.



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“We propose North Dakota focus on energy and technology that complement each other: solar, unmanned air/ground, and big data storage.”

Executive Summary

Strategic Highlights

This systems strategy is driven by 3 primary initiatives:

1. Create an ecosystem of complementary energy, unmanned technology, and big data.
2. Secure North Dakota as a robust leader in future energy production.
3. Maximize the resource of low population density and winter climate in North Dakota.

Relevant Economic Conditions in North Dakota

16% State GDP is finance, insurance, real estate, rental, and leasing.

12% State GDP is petroleum production.

Large sector agriculture production.

Asset: low population vs. land area.

1 of 9 sites testing unmanned aerial systems.

AI and big data presence, i.e., Microsoft.

Breaking ground with small unmanned aerial for utility - SkySkopes.

Developing off-road unmanned ground - John Deere, Bobcat Company.

Positioning

With the continuing trend of lower costs of solar power generation, the increase in demand for electricity from the pending boom of electric automobiles, and the succession of Artificial Intelligence (AI), Lightspring, LLC believes the time is ripe for land owners to transition low-yield tracts to solar power generation and data storage. Big Data feeds AI, which runs autonomous vehicles; both can be fed by solar power and make a more resilient and robust grid. With the majority of small UAS and unmanned ground automobiles being electrically powered, we propose North Dakota focus on energy and technology that compliment each other: solar, battery, unmanned air/ground, and big data storage. Developing these market sectors will secure North Dakota as an economic leader in 2025 and beyond.

Looking Ahead

1. Move North Dakota from 51st to 15th in solar power capacity by December 2025.
2. Remove regulatory roadblocks for solar, unmanned and data in 2019 legislative session.
3. Attract and cultivate new and existing solar, battery, and big data business with a targeted marketing and incentive campaign.



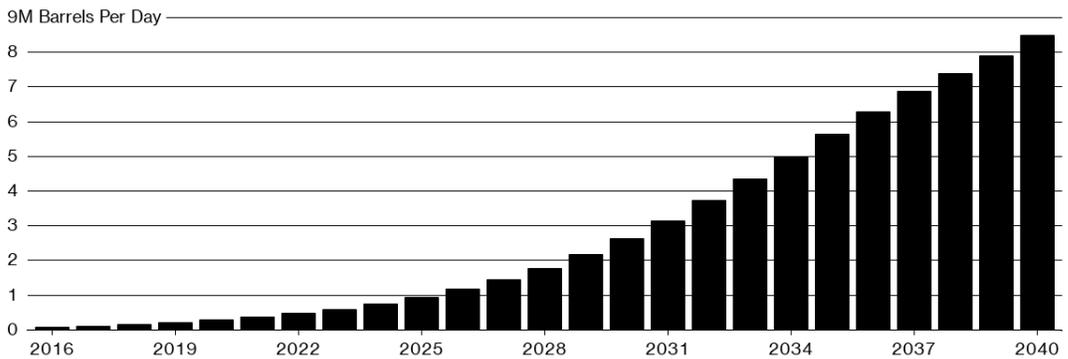
Solar Farming

Positioning

North Dakota is a leader in fossil fuel energy production, and the time is at hand for the state to complete its energy portfolio with the production of solar power. U.S. electric automobile production is estimated to be 850,000 units by 2021, or 10% of the total U.S. motor vehicle market.¹ Electric cars will outsell fossil-fuel powered vehicles within two decades, turning the global auto industry upside down and signaling turmoil for economies who rely on exporting oil. The seismic shift will see EVs account for a third of the global auto fleet by 2040 and displace about 8 million barrels a day of oil production. Electricity consumption from EVs will grow to 1,800 terawatt-hours in 2040, or 5 percent of global power demand, from 6 terawatt-hours in 2016.²

A Diminished OPEC

EVs could cut 8 million barrels of use, or 25% of current OPEC output



Source: Bloomberg New Energy Finance

Figure 1: **Reduction** in oil use vs. time as a result of electric vehicles.²

With a signification sector of North Dakota’s economy based in oil production, we must position the state to supply new energy sources as the rise of EVs lower the demand for petroleum.

California is the number one solar farming state in America, producing enough solar energy to power well over one million homes. In the next tier of solar states is North Carolina, Nevada, Massachusetts, Arizona and New Jersey, with enough capacity to power between 38,000 and 50,000 homes. Third tier states New York, Texas, Hawaii and New Mexico generate enough solar energy to power between 14,000 and 25,000 homes.³

In the last decade, solar has experienced an average annual growth rate of 59%.⁶



Solar energy is consistent energy, even during North Dakota's long winters.

Solar Farming

Positioning (cont.)

Currently, North Dakota ranks 51 out of 52 in U.S. solar power production, with only 3 solar installations totaling 0.09MW. Compare this capacity to #4 New Jersey, with 51,047 installations totaling 2284MW.⁴

Current Assets

#4 New Jersey and #5 New York being similar in latitude and winter peak sun hours to North Dakota, and North Dakota having greater useable land area, ND has the potential to be one of the top 5 solar power producing states in the nation.

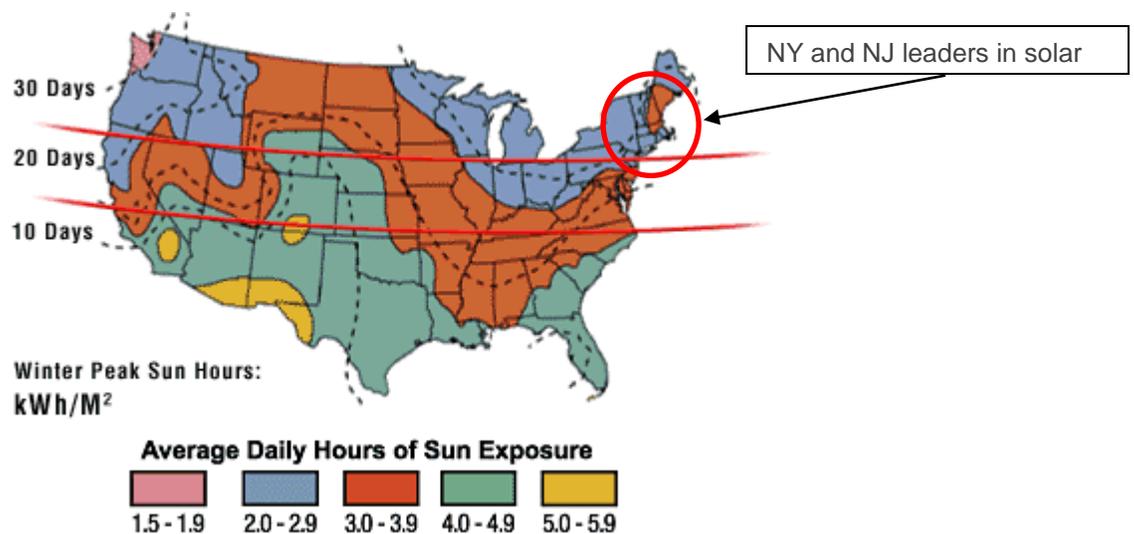


Figure 2: North Dakota's winter peak sun hours are competitive with leading states, i.e., NY and NJ.⁵

With the future reduction in gasoline fueled automobiles, there will be less demand for the agricultural corn used to produce ethanol. Current data from NDSU research presents solar power generation as 30x more economic activity than the yield from harvesting corn ethanol.⁷

Solar Farming

Current Assets (cont.)

Harvest of Corn Ethanol vs. Solar Power

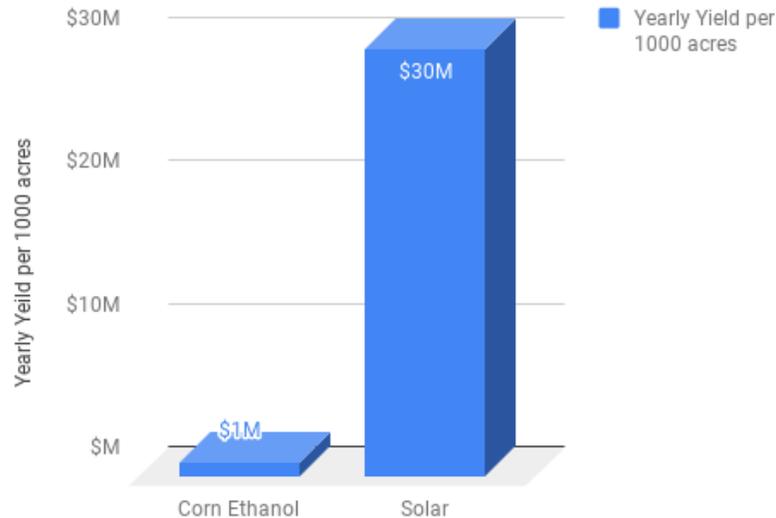


Figure 3: Solar has a potential 30x increase in economic activity over existing low-yield commodities.⁷

North Dakota farmers can transition low yield land into solar, for a higher yield, less volatile commodity.

Potential Threats

1. Pushback from fossil fuel industry and resistance from power co-ops to adopt solar.
2. Regulatory hurdles for solar, including net metering and restricted land use.
3. Cost to develop new infrastructure, including power substations, transmission line and energy storage.

FY2019 Targets

1. Revisit renewable portfolio standard (RPS) to increase solar production.
2. Remove regulatory hurdles for solar, including: net metering, restricted land use and monopolized power purchase agreements.
3. Incentivize solar through low interest loans, rebates, grants, and performance payments.



For every 1000 acres, solar farming has a 30 fold increase in yield vs. corn ethanol.⁷



ND can compete in Small Autonomous Space for utility and transport of goods, such as lawn mowers, on/off road vehicles, and aerial services.

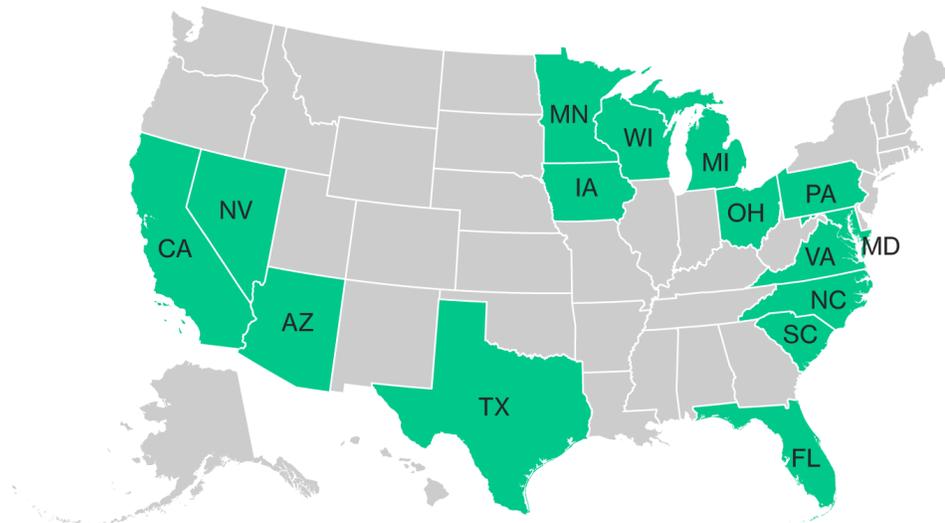
Small Autonomous Systems (SAS)

Positioning

Nearly 10 million cars with self-driving features will be on the road by 2020. By 2022 we'll see fully autonomous vehicles that can drive on roads and handle a range of scenarios with little or no interaction from the driver. At the moment, only a few states — including California, Florida, Michigan and Nevada — allow self-driving cars to be tested on public roads.⁸ Although passenger autonomous vehicle development is well underway by automakers in Detroit and innovators such as Tesla and Google, North Dakota is poised to be a leader in the small unmanned air and ground vehicle space.

States Giving Clearer Paths to AV Industry

These states have testing grounds for self-driving cars



Source: Bloomberg New Energy Finance



Current Assets

Bobcat Company is developing autonomous off-road operations where owners can assign operatorless equipment to complete redundant and repetitive tasks like site prep.⁹ John Deere has released an unmanned lawn mower for sale in Europe called the Tango.¹⁰ Within John Deere's Fargo location, research is being done to optimize sensor systems, image processing and algorithms for autonomous vehicle control. These employers have seeded the necessary talent pool and kicked off the planting of professional labor to move Small Autonomous Ground systems forward in ND.



North Dakota company SkySkopes has demonstrated business viability of SAS for utility services.¹¹

Small Autonomous Systems (SAS)

Current Assets (cont.)

Grand Sky is a well established investment and North Dakota is a pioneer in commercial UAS testing. However, unmanned aerial manufacturers use the State primarily as a testing ground, with ease to relocate. As more fields to test become available nationwide, the potential for current UAS investment to leave the State becomes a threat. The key for sustainable growth will be to root manufacturer's engineering, testing, and production of SAS in North Dakota.

Potential Threats

1. Difficulty attracting and maintaining workforce with technical skills for SAS development.
2. Attrition of existing SAS business.
3. Lack of regulatory framework to allow SAS testing on public roads and airspace.

FY2019 Targets

1. SAS is a new industry. Focus efforts on cultivating startups and emerging technologies within the sector.
2. Incentivize SAS manufacturers through low interest loans, grants, and tax exemptions
3. Remove regulatory hurdles for SAS including allowing limited testing on public roads. Develop state-wide air and ground SAS charging stations and test sites.



In 2018, Big Data is projected to be a \$40 billion dollar market.¹³ 70% of enterprises expect to implement AI over the next 12 months.¹⁴

Big Data

Positioning

Big data has increased the demand of information management specialists so much so that Software AG, Oracle Corporation, IBM, Microsoft, SAP, EMC, HP and Dell have spent more than \$15 billion on software firms specializing in data management and analytics. In 2010, this industry was worth more than \$100 billion and was growing at almost 10 percent a year: about twice as fast as the software business as a whole.¹²

66% of enterprises already outsource between 11% and 75% of their Business Intelligence applications. Forrester predicts that up to 80% of firms will rely on insights service providers for some portion of their insights capabilities in 2018.¹³

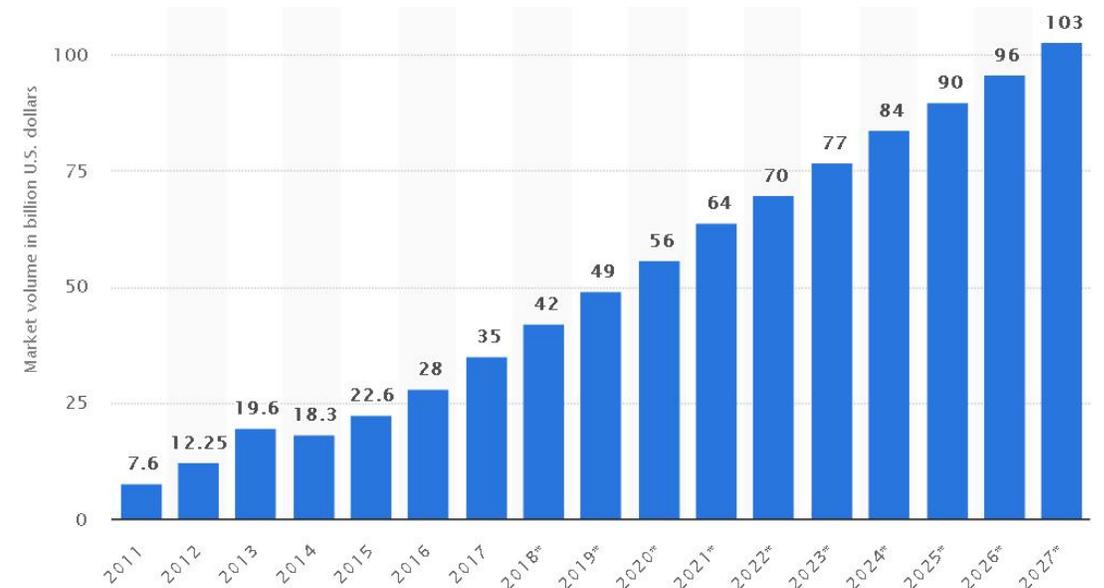


Figure 5: Big data market size revenue forecast worldwide 2011 to 2027 (in billion U.S. dollars).¹⁴

Data is a commodity. With Artificial Intelligence (AI) now in use, the future belongs to those who can acquire, store, and provide meaningful access to Big Data. We believe North Dakota is in an ideal position to securely store and manage Big Data.

Data is a right. Government has two main functions: provide safe infrastructure that supports growth and prosperity while protecting certain unalienable rights of its citizens. While developing a long term strategy to propel North Dakota into the future, we need to protect the rights and freedoms of the people that will be living in that future. We will need to create a digital bill of rights to protect our data and regulate how data is monetized.



Cavalier County Job Development Authority is repurposing missile launch sites for Big Data storage.¹⁵

Big Data

Positioning (cont.)

North Dakota will attract entrepreneurs by establishing high speed broadband as a publicly owned utility, offering free public wifi and discounted wired connections for the income restricted. Internet connectivity has become as important as water lines and electrical lines, and making them publicly owned will increase access while creating more revenue to pay for municipal and State services.

Current Assets

Below zero ambient temperatures means lower operating costs to keep data storage equipment running cool in the ND winters. The average data center consumes over 100 times the power of a large commercial office building. A large data center uses the electricity equivalent of a small U.S. city. With as much as 40 percent of the total operational costs for a data center coming from the energy needed to power and cool its racks of servers, energy inefficiencies encountered in power conversation are not to be overlooked.

North Dakota is in a prime geographical location close to the center of North America. The same reason the U.S. military strategically placed nuclear missile sites in ND, is the same reason North Dakota is ideal for secure, remote data storage. Low population density in the State equates to more effective site security.

Microsoft Corporation in Fargo is conducting research and analysis of AI systems. The potential exists for industry and subject matter experts to seed the development of Big Data in ND.

Potential Threats

1. Limited connectivity for high speed data transfer in rural locations.
2. Cost of infrastructure to build and connect data centers.
3. Competition from states established in the Big Data industry.

FY2019 Targets

1. Form Big Data task force with members from all stakeholders: industry, government, real estate, education.
2. Create action plan with technical requirements for the State to be a leader in Big Data.
3. Investigate feasibility of repurposing missile launch sites for data centers.

Summary

For North Dakota to be competitive in the future world economy, we must leverage our small size as an advantage, we are more agile and able to pivot faster than larger entities.

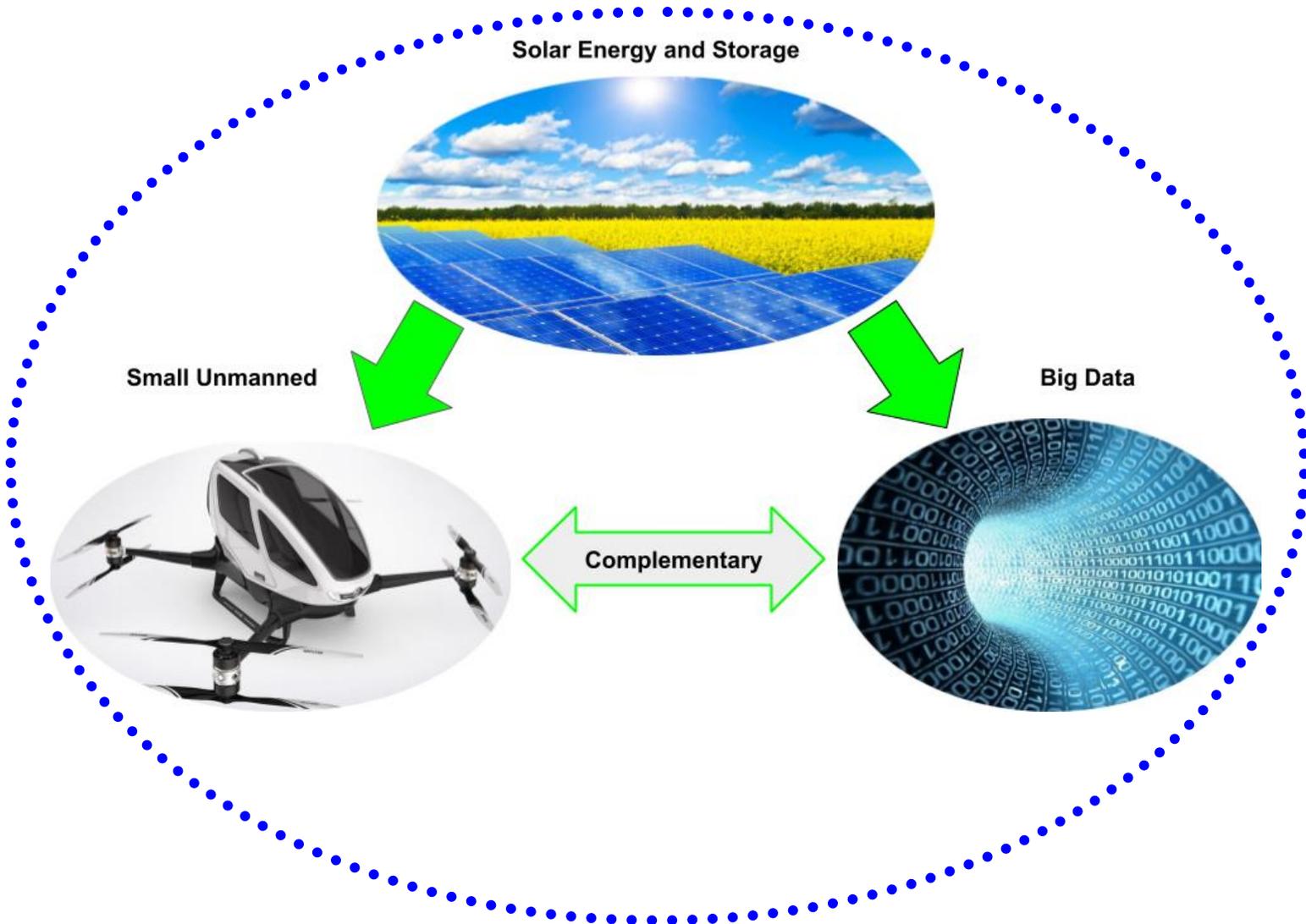
Solar power is 30x more productive⁷ than the State's current land use of growing corn for ethanol. Moving to solar optimizes the land we have for economic activity, and yields return from more stable commodities.

Big data feeds AI, which drives autonomy, and with solar power, will create a resilient and robust grid. The future requires solar power to meet electrical demand and a grid that is managed by AI, fed by data, and secured by autonomous systems. The future is an ecosystem built on technology, collaboration, and cooperation.

We propose an ecosystem of Solar power generation/storage, Small Autonomous Systems and Big Data storage. These 3 systems woven together create a natural symbiotic relationship, allowing each to thrive individually and collectively.

We look forward to the next 7 years and to what the brilliant citizens of this great State will produce.

The North Dakota Technology Ecosystem



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