



October 31, 2023

North Dakota Industrial Commission
ATTN: Clean Sustainable Energy Program
State Capitol – 14th Floor
600 East Boulevard
Bismarck, ND 58505-0840

Dear Clean Sustainable Energy Program,

Packet Digital is submitting the enclosed grant/loan application to request funding in support of the Clean Sustainable Energy Project, “Grand Power – United States Flexible Lithium-Ion Battery Cell Manufacturing Plant” in the amount of \$27,355,992 (\$10,000,000 Grant, \$17,355,992 Loan). This funding will be used as a match for the 36-month project which will run from January 1, 2024, to December 31, 2026, and has a total budget of \$56,558,592 million. Other partners in this project include the US Navy, Rainbow Energy, UND, NDSU, US Airforce Research Laboratory, Lockheed Martin, Anduril, and Toyota.

The development of high-performance US made Li-Ion battery cells for autonomous systems satisfies a Presidential Executive Order and the requirements of the US Military. End to end ownership of critical components of our national defense technology chain is essential for our National Defense and the safety of the American people. Reliable Unmanned Aircraft Systems (UAS) powered by clean sustainable energy will have a very significant impact on North Dakota and the world over. The applications for this technology include various applications including air, space, ground, and underwater autonomous systems.

If you have questions, I can be reached at 701-365-4421 or terri.zimmerman@packetdigital.com.

This letter sets forth a binding commitment on behalf of Packet Digital to complete the project as described in the application. Thank you for your consideration.

Sincerely,

A handwritten signature in blue ink, appearing to read "Terri Gunn Zimmerman", with a long horizontal flourish extending to the right.

Terri Gunn Zimmerman
CEO
Packet Digital, LLC
3241 University Dr. S
Fargo, ND 58104
enc

Clean Sustainable Energy Authority

North Dakota Industrial Commission

Application

Project Title:

**Grand Power – North Dakota Battery
Manufacturing Plant**

Applicant:

Packet Digital, LLC

Date of Application:

October 31, 2023

Amount of Request

Grant: **\$10,000,000**

Loan: **\$17,355,992**

Total Amount of Proposed Project:

\$56,558,592

Duration of Project:

36 months - Jan 1, 2023, to Dec 31, 2026

Point of Contact (POC):

Terri Zimmerman

POC Telephone:

701-365-4421

POC Email:

terri.zimmerman@packetdigital.com

POC Address:

3241 University Dr., Fargo ND 58104

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ABSTRACT

Objective: Packet Digital proposes to build an end-to-end Li-ion battery manufacturing facility in North Dakota to produce the most performant batteries with the longest cycle life batteries for autonomous systems. This plant will be a flexible manufacturing facility to produce high energy density batteries and will include raw material receiving & storage, inspection testing, production, quality control, final inspection, compliance, packaging, storage, and shipping. Our goal is to build upon our currently industry leading solutions, and through development and the licensing of intellectual property with our strategic partners enable the manufacturing of innovative batteries built solely in North Dakota, United States.

Li-Ion batteries are widely used in military and commercial applications, such as portable electronics, vehicles, drones, weapons, and energy storage systems. High Energy Density Li-Ion battery production is limited and is currently dependent on adversarial sources. Furthermore, drones in complex operations such as ship-to-ship, ship-to-shore, or long range ISR require data storage, processing, and communications built-in to provide real time state of battery information to the operator; therefore, military customers and drone manufacturers are highly concerned about cyber security for batteries obtained from adversarial sources.

Our collaboration with the Navy to define the standard for on-ship Li-Ion batteries, chargers, stowage and transport aboard the Navy's fleet provides us with a unique perspective and experience to create this solution at scale. Packet Digital's partnerships with many commercial customers, including Lockheed Martin, Toyota, Anduril, Easy Aerial, Pterodynamics, L3 Harris, Shield AI, and Skyways, also bring valuable resources and input to the requirements process and battery cell sales volumes at the completion of the plant.

Expected Results: To establish a US based Li-Ion battery cell plant to meet the unfulfilled need for domestic production and reduce the heavy dependence on foreign sources of raw materials and components. To meet these expectations, we will: Establish production line capacity design requirements. Establish production input requirements for flexible production line and related laws and regulations including safety procedures and protocols. Obtain Approvals, Acquire Land, Design and Build Facilities, Select and Procure Equipment, Install and Commission Equipment, Train Personnel, Execute Pilot Production, Start Mass Production, Operation, and Maintenance, Transition to 3 Shift operation, 7 days per week. This work will result in creating clean sustainable energy jobs, wealth, and tax revenues for North Dakota.

Duration: The battery cell plant factory will be commissioned in 2 years and fully operational in less than 3 years. **Total Project Cost:** Development of this capability will require approximately \$56,558,592: \$21,846,608 for Engineering, Technology, and Capital and \$34,711,984 for Land, Facilities, Equipment, Inventory, Interest, and Fees: Grant Totals: \$10,000,000 CSEA with grant matching of \$2,826,868 – Navy and \$9,019,740 - Packet Digital: Loan Totals: \$17,355,992 CSEA BND with matching of \$12,282,860 - Participating Bank and \$5,073,133 - Packet Digital **Participants:** Packet Digital, US Navy, Rainbow Energy, UND, NDSU, US Airforce Research Laboratory, Lockheed Martin, Anduril, and Toyota.

PROJECT DESCRIPTION

Objectives: To support the United States desire to onshore critical supply chain components for battery technology and products identified in Executive Order 14017, Packet Digital, a proven smart battery, smart charger, battery management system, and battery fleet management system manufacturer based in Fargo, North Dakota, will create a Lithium-Ion battery cell production facility in or near Fargo, ND. This is the final step in completely transitioning the Packet Digital battery solutions now being built for the Navy fleet and multiple additional military and commercial customers to become fully US made products.

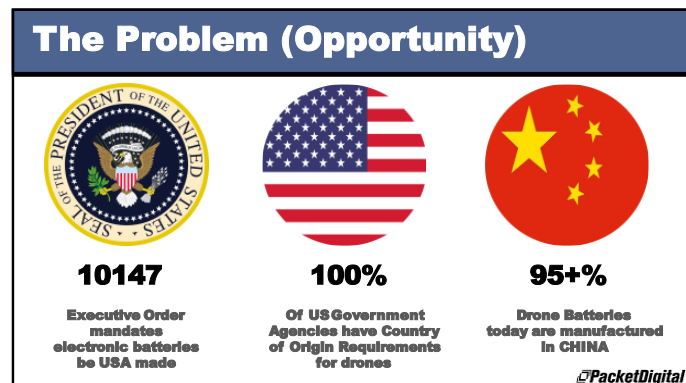
This work is critical for the National Defense of the United States and critical to the efficient and self-sustaining operation of the US economy. Li-Ion batteries are found in nearly every weapon system used by the US Department of Defense, particularly for portable equipment. They provide more energy for less weight, which is essential for a soldier carrying between 15-25 pounds of batteries alone, in addition to their use in autonomous systems where performance and weight are of utmost concern.

Development of this capability will require approximately \$56 million in public and private financing to optimize the facility, buy the equipment, develop the manufacturing processes, and train the manufacturing and engineering talent. It will be profitable and cash flow positive in four years.

Li-ion batteries are essential for powering electric vehicles (EVs), Autonomous Systems like drones, dismounted soldier communications, missiles, munitions, and reconnaissance. However, the US currently relies heavily on foreign sources of lithium and other critical

materials for its battery supply chain. This poses economic, environmental, and national security risks for the country.

The US Government has established country of origin requirements for unmanned systems. Drones in complex operations such as ship-to-ship, ship-to-shore, or long range ISR require real time information regarding power, such as communications through a CAN interface reporting



real time state of the battery. It is a risk to national security to have such batteries produced by adversarial parties. In addition, military and commercial customers are concerned that adversarial parties could limit the available supply of cells. Therefore, it is essential that all electronics on the drone, including the battery, are produced from trusted suppliers.

According to a report by the US Department of Energy, the global demand for Li-Ion batteries is expected to grow by more than 500% by 2030, driven by the transition to clean energy and transportation. However, the US only produces about 1% of global lithium supply and less than 10% of global battery cell manufacturing capacity.

Methodology: Our approach is to build a Li-Ion battery cell manufacturing plant in North Dakota optimized for military and commercial battery cell production. The effort will focus on high power pouch cells and the facility will be optimized with multiple production lines to support various formats and cell models needed in the market. These types of batteries are only produced by foreign sources today. This effort will accelerate the onshoring of battery manufacturing processes and support the US-designed / US-made imperative. To support the demand from customers and provide return on investment the production lines will run multiple shifts. This plant will be a flexible manufacturing facility to produce high energy density batteries and will include raw material receiving **and** storage, inspection testing, production, quality control, final inspection, compliance, packaging, storage, and shipping. Our project process and timeline include:

Establish Production Line Capacity Design Requirements –

Initial target production model: 6.8Ah LCO 4.45V Pouch Cell lithium-ion battery. Modular design expanding to 6.6/Ah,15.4AH, and 2.19Ah, and more.

Production volume: 2,000 pieces per day. Certain processes can operate 24 hours a day.

Production Line Compatibility: Compatible size and capacity parameters, Thickness: 3 to 12 millimeters, Width: 43 to 100 millimeters, Length: 80 to 200 millimeters, Capacity range: up to 30Ah. The line will be a segmented automated production line to allow for flexible production capacity.

Electrochemical System Compatibility: The production line environmental control can accommodate the production of electrochemical systems such as LFP, NCM, and others with higher environmental requirements.

Establish Project Requirements for Flexible Production Line and Related Laws and Regulations

Requirements: document the structure and layout of the plant, the load-bearing capacity of the workshop, define detailed static electricity requirements, power configuration capacity, gas power specifications and any other relevant information, the quantity of orders per batch and the frequency of model changes.

Local Laws and Regulations: document the necessary requirements and provisions concerning local labor laws, safety regulations and guidelines, include environmental protection requirements, detailed energy consumption regulations, sanitation (occupational health) guidelines, include fire prevention and lightning protection requirements, define guidelines for special equipment, include regulations for handling radioactive sources, detailed requirements for hazardous waste disposal. Include any other relevant requirements pertaining to the design specifications of the lithium-ion battery plant and production, as well as storage-related requirements.

Design – Technical data has been created to establish the target cell models with performance indicators reaching the levels for energy and power density requirements for unmanned aircraft, including cell formula, materials standards, material supplier lists, manufacturing instructions, standard operating procedures, quality control plan, and failure modes and effects analysis (a step-by-step approach for identifying all possible failures in design, manufacturing process, and the manufactured product). The design will optimize the layout of the production line(s) and the process flow of battery production, considering the capacity, volume, power, HVAC and airflow requirements of each piece of equipment, and expected output, functional module distribution, and overall plant layout.

Equipment Selection and Procurement – Equipment includes environmental, propulsion and logistics equipment, test instrumentation, chemical material test instrumentation, performance test equipment, and production equipment. This process will include comparison and selection of vendors, optimization of production lines in terms of performance, precision, efficiency, automation and data, confirmation and signing of equipment technical agreements and business contracts, and inspection of equipment before shipment from vendors.

Facility Installation and Commissioning - Typically, the equipment vendors send technicians onsite to lead installation and commissioning. Packet Digital engineers will also assist in the completion and debugging. The methods, procedures and standards for installation and

commissioning of each equipment will be established separately according to the requirements of each piece of equipment and the equipment manufacturer's recommendations.

Personnel Training – Personnel (including cell design engineers, production management, production engineering, quality control, and others) will be trained through the equipment installation process, engineering, production of samples, during the Pilot Run process and throughout mass production.

Pilot Production I & II – Verification - This effort includes two pilot run phases with two verification periods.

Mass Production, Operation and Maintenance - Quality control, training and process implementation will continue.

Anticipated Results: Anticipated result is an end-to-end Li-Ion battery manufacturing facility in North Dakota to produce the highest energy density and longest cycle life batteries for autonomous systems. Upon award Packet Digital will conclude the requirements capture and commence the design process, equipment selection, equipment procurement, installation, staffing and training of personnel, pilot production runs, and verification and ultimately mass production, operation, and ongoing maintenance. Packet Digital expects to begin operations of the proposed cell factory within 30 months of funding approval. Pilot production runs will be completed and ultimately lead to three shift operations within 42 months. The anticipated result will be lightweight, high energy density battery cells with industry leading cycle life and competitive pricing.

Facilities: The new cell manufacturing plant will be built in or near Fargo, ND to be relatively close to Packet Digital's engineering and prototyping location on University Drive South, and to their 25,000 sq ft. manufacturing and assembly plant on 7th Ave North. The facility will be purpose built to support the manufacturing process required for cell assembly and will support expansion through a modular expansion model. Facility recommendations and design advice will be procured from strategic partners with prior and successful experience in this type of manufacturing process. The initial battery cell plant building is planned at 31,528 sq feet. The building will include engineering/administrative, warehouse, production, material test, facility test areas. There is an additional 10,000 sq feet reserved for expansion in this initial building.

Resources: Packet Digital will call upon its experienced resources, developed partnership resources, and their geographic location.

Expertise – Packet Digital has been working on power solutions since its inception 20 years ago and with decades of experience building high performing power solutions for military and consumer solutions and acutely aware of current and future requirements. Currently Packet Digital is developing the power safety standards for the US Navy Fleet for batteries, charging, stowage, and transport, as well as developing power solutions with the US Airforce to be deployed in space, in addition to multiple commercial and battery customers. Packet Digital has a broad range of customers to draw upon for requirements capture. Packet Digital has battery and engineering expertise and is adding additional battery chemistry capabilities.

Developed Partnerships – Packet Digital has developed many strategic partnerships over the years, and they have signed letters of support with some of these partners to support the requirements, design, training, testing, and bringing up of the new battery facility. Please see letter of support from US Navy, US Air Force Research Lab, Rainbow Energy, Toyota, Lockheed Martin, University of North Dakota, and North Dakota State University.

Collaboration with the US Navy enables Packet Digital to accelerate requirements capture and provide collaboration of battery experts within the Navy.

Collaboration with Rainbow Energy has the potential to provide critical rare earth metals that Packet Digital will need for our high-performance battery chemistries. Rainbow Energy, a North Dakota company focused on turning energy produced using Coal plants into clean energy through Carbon Capture, while at the same time extracting critical rare earth metals needed to produce batteries.

Collaboration with local universities, including University of North Dakota (UND). UND is a world leader in energy-related research and education. UND offers a graduate certificate program in Energy Storage Systems that provides knowledge about lithium-ion battery technologies and how they can be effectively and sustainably integrated with various energy systems, this work will support the work that Packet Digital is doing on this project. UND has a focus on Energy Storage systems and Lithium-Ion Batteries technologies such as energy storage technologies, renewable energy sustainability, and the value of energy storage and e-mobility technology. UND also specializes in developing energy technologies that are economically competitive, reliable, sustainable, and politically and environmentally acceptable. UND's experience and

success developing high performance lithium-ion batteries from the byproducts of North Dakota lignite coal will be particularly valuable to this collaboration. During this project we will collaborate with UND to secure as many local raw materials as possible and seek raw materials from non-adversarial partners. Local raw materials will be put into use in products of significant need for our US Military.

North Dakota State University (NDSU) has amassed well over 110,000 square feet of state-of-the-art research facilities at the NDSU Research and Technology Park. The facilities support cleanrooms, laboratory space, microfabrication, device packaging, device testing, reliability/failure analysis, material synthesis, processing, and characterization. This project will utilize NDSU testing facilities.

The Energy & Environmental Research Center (EERC) is researching the extraction of rare earth elements (REEs) from lignite coal, which is abundant in North Dakota. EERC has demonstrated the ability to extract a synthetic form of Graphene, which is used to make Li-Ion batteries. Packet Digital will pursue opportunities to collaborate with EERC to test by-products produced through the EERCs efforts in our battery chemistries.

Packet Digital's partnerships with many commercial customers, including Lockheed Martin, Toyota, Anduril, Easy Aerial, Pterodynamics, Shield AI, L3 Harris and Skyways, also bring valuable resources and input to the requirements process and battery sales volumes at the completion of the plant.

Geographic Locations - The state of North Dakota is ideal for this factory. It has available land, a cooler climate which is highly desired for battery manufacturing and has made an ambitious and synergistic investment in UAS technology. North Dakota was selected for one of the seven national FAA UAS test sites and as one of 10 participants in the U.S. Department of Transportation's UAS Integration Pilot Program. It is one of the first states to offer a comprehensive Beyond Visual Line of Sight network for UAS. The state has also leveraged its natural resources, geographic advantages, regulatory flexibility, and innovation culture to become a leader in this field. North Dakota is a leading energy state. North Dakota is also providing funding to bring raw material processing into North Dakota that Packet Digital will leverage for this project. North Dakota State University and the University of North Dakota are home to two of the premier battery science departments in the country and will create a pipeline of talent to help staff the factory and drive future innovations.

Techniques to Be Used, Their Availability and Capability: While the process of manufacturing Li-Ion battery cells is complex and challenging, it is a process that is well known and there are multiple companies who have developed the skills around the world. Each type of battery is different and creates a different set of challenges for the design and manufacturing process. UAS batteries require very high-power density to support the high-power requirements for take-off and landing, while at the same time supporting the requirement for extremely low weight. As mentioned in the resources section, Packet Digital has developed multiple partnerships with battery cell producers across various scenarios, and they have partnership documents in place to gain the needed support and counsel to jump start the factory creation process.

Specialized chemistry formulas for the cathode and anode formulas will be used for production of the high-rate lithium-ion battery. Electrolyte is a critical component for the high discharge rate required and a specialized electrolyte formula will be utilized. The cell bill of materials includes specifications and material models and quantities. Product design standards include ratio design, electrode dimension design, electrolyte injection quantity design, capacity design, tab design, separator design, packing film length design, width design, cutting die dimension and layout design. Standard Operating Procedures and requirements in each production process (includes over 200 SOPs), such as coating work guide document for cathode, work methods and requirements for checking preparation, first inspection for trial production, coating, loading level inspection, cell performance test items (rate discharge, cycle life, discharge at high and low temperature, capacity retention, short circuit, over charge, forced discharge, thermal shock, free drop, impact) and in process quality control, process failure mode and effects analysis and raw material IQC inspection items and inspection standards and processes.

Packet Digital is a highly experienced producer of very high energy density batteries and has attained up to 10X the cycle life of most drone batteries available today with smart power management capabilities and patented unique algorithms with proof points including:

- A 30 – 40% increased performance/efficiency for **Lockheed Martin** with 10X cycle life
- Software that automatically manages battery health of fleet of batteries for **Bell Helicopter** for commercial 100-pound payload UAS
- High efficiency batteries for **Anduril**, a DoD contractor for border protection
- Extended endurance from 90 minutes to 15-18 hours on **US Marine Corps** program
- Achieved multi day flight for **OSD** Operational Energy Office.
- Enhanced reliability and doubled endurance on Talon (UAS platform) for **NAVAIR**



- Designing battery for space power beaming for **Northrop Grumman SSPIDR** and designing next generation power solution for **AFRL** and their suppliers for small spacecraft.
- Designing battery for a sea glider drone that flies and submerges for 6 months for **NRL**.
- Developing drone batteries and chargers for the **Navy fleet**.



In addition, Packet Digital will be staffing additional experienced battery cell chemistry experts to supplement their current team's expertise.

Environmental and Economic Impacts while Project is Underway: There will be very little environmental impact during the project other than the environmental impact which can be attributed to the development and creation of the new facility, which will follow all applicable state and federal regulations.

From an economic point of view, we will be requiring multiple trades and construction workers to develop the new facility resulting in 10's of thousands of labor hours. In the first three years, not counting construction workers, this project will require over 250,000 hours of labor from current and future hires, with a go forward rate of approximately 120,000 hours per year.

Ultimate Technological and Economic Impacts: This project will create the foundation for a battery technology innovation center in North Dakota, Grand Power. The need for lighter, safer and more powerful battery technology is a never-ending journey. By providing leading technology from a US source with end-to-end supply chain ownership it is our goal to push the

boundaries of battery technology and research, development, and delivery faster than anyone in the market. Grand Power will accelerate North Dakota's leadership across all things power in the United States. Grand Power will create clean sustainable energy jobs, wealth, and tax revenues for North Dakota. Grand Power will attract and retain talent to North Dakota. Grand Power will promote the efficient, economic, and environmentally sound development and use of North Dakota's energy resources, materials and products. Finally, Grand Power will maximize the market potential for clean sustainable energy resources, materials and products and associated byproducts.

Why the Project is Needed: This effort is essential to support a critical national security issue and enable us to produce critical components of battery production for the US military in the United States. In addition, this project has a solid business case: the \$4 billion drone battery market is growing at 19% CAGR and is expected to grow to \$9.6 Billion in 2026. With a large growing market, the strong push for US made solutions, the demand from our military and commercial customers for US made cells, and Packet Digital's battery expertise, this plant will achieve profitability and be cash flow positive in four years.

Packet Digital has over a decade of experience in the power solutions space and has been deeply involved with the progress over the past 9 years, with a long and illustrious slate of both military and commercial customers. Packet Digital has the relationships and the leadership team in place to ensure the success of the project.

This funding, when combined with private funding, will enable Packet Digital to execute on this critical project for our national security and the safety and independence of the American people.

STANDARDS OF SUCCESS

The measure of success will be in achieving the project and stated goals and bringing value to North Dakota through new jobs and expanding North Dakota energy research, resources, materials and products and utilization of North Dakota energy byproducts.

The project goal is to provide the capability of a US based Li-Ion battery cell plant to counteract the current lack of domestic production to meet the unfulfilled need and reduce the heavy dependence on foreign sources of raw materials and components. To meet these expectations, we will:

- Document requirements for production line capacity
- Document requirements for flexible production line, related laws, and regulations
- Obtain approvals, acquire land
- Design and build facilities
- Select and procure equipment
- Install and commission equipment
- Train personnel
- Execute pilot production
- Start mass production, operation and maintenance
- Transition to 3 shift operation, 7 days per week

The value to North Dakota: This work will create clean sustainable energy jobs, wealth, and tax revenues for North Dakota and will promote the use of North Dakota resources through collaboration with Rainbow Energy, Coal Creek Station and utilize Coal Creek by-products.

Commercialization processes are underway as Packet Digital is already in discussion with several military customers including US Navy, NAVAIR, Naval Warfare, Air Force Research Laboratory, and with multiple commercial companies including Anduril, Lockheed Martin, Easy Aerial, Pterodynamics, L3 Harris, Shield AI, Skyways, Toyota, and Bell Helicopter regarding the product requirements and volume needs. Packet Digital's management team brings over 40 years of experience in developing, incubating, and commercializing new technologies. Packet Digital's CEO has extensive experience launching new products and services in global markets. This research and development effort will bring the manufacture of the highest energy density lithium-ion battery cells to North Dakota and address a significant need for military and commercial autonomous systems.

The University of North Dakota and North Dakota State Universities will assist in raw material research, and testing and analysis of the raw and processed materials. The high energy density lithium battery plant will create a new industry in the state and create more visibility for North Dakota with this cutting-edge battery technology. This effort will preserve jobs and create new jobs in the research and development with twenty-five persons being employed during this project at the plant and with more added as the battery plant revenue grows, research positions for testing and analysis at the universities and the Energy & Environmental Research Center.

This North Dakota project will enhance research and education in the area of battery cell development utilizing new techniques to manufacture high energy density cells. During the

project, Packet Digital will work with both NDSU and UND.

BACKGROUND/QUALIFICATIONS

Packet Digital is an engineering firm with over a decade of experience in designing and building power management solutions for autonomous systems and has market leading military and commercial customers. Packet Digital has developed patented innovative algorithms that bring advanced power system performance to many applications. Packet Digital has integrated these algorithms into smart batteries and secured a patent for our Smart Batteries that have extended life. We have also developed innovative algorithms for our Maximum Power Point Tracking power system for unmanned aerial systems (UAS). One of the key differentiators of our technology is that it offers active power savings, meaning the circuitry does not have to be put into a sleep mode to save power. This is critical in UAS applications because of the importance of maintaining full functionality while in flight. With our technology, we have extended battery life 400% in wireless sensors, 40% in a portable radio for the military, and reduced power consumption by 20% in data center servers. We are bringing expertise to building power efficient systems and intelligent power management algorithms for autonomous systems in the air, space, ground and underwater.

After Packet Digital's success with military radios, the US Marine Corp called on Packet Digital in 2014 to extend endurance in an existing unmanned aircraft system (UAS) platform. Packet Digital built high performance battery systems and a Maximum Power Point Tracking System and successfully extended the flight times of the UAS from 90 minutes to 15-18 hours. Following this program, the Office of the Secretary of Defense called on Packet Digital for further innovations to extend flight times through the night and Packet Digital's power systems successfully enabled multiple days of flight time on this military UAS program. The visibility from these programs enabled Packet Digital to begin securing commercial customers. In collaboration with Lockheed Martin, Packet Digital improved power efficiency by 40% and cycle times to 10X of any battery Lockheed had ever worked with. Today, Packet Digital has contracts to set the battery and charging and safety standards for UAS power solutions for the US Navy Fleet (adding 5 new drone manufacturers as customers), to create power solutions for the Airforce Research Laboratory's space efforts, and with multiple commercial companies including Anduril, Lockheed Martin, Easy Aerial, Pterodynamics, L3 Harris, Shield AI, Skyways, and Bell

Helicopters. All of Packet Digital's customers are seeking a US made end-to-end battery solution including battery cells from Packet Digital.

Packet Digital has a very experienced team including key personnel:

Terri Zimmerman: Experienced CEO | Board Member | Leader with a demonstrated history of success with 30 years of working in the power, batteries, application-specific integrated circuits, software, unmanned systems industries. Strategic financial leader experienced at assessing, planning, and implementing large-scale projects with key alliances raising more than \$600 Million in capital. Strong business development skills, adept at establishing high-growth operations of substantial impact. Industry Chairperson of Research Institute of Autonomous Systems. Appointed by three governors to state economic development boards. Previous experience at Deloitte & Touche and C-Level executive at Great Plains Software.

Andrew Paulsen, CTO. Mr. Paulsen has led the development of new products and technologies since 2005. Extensive research, testing, and product development expertise in the batteries, power algorithms and power electronics, including air and ground based solar powered vehicles, batteries & electronics, and other technologies enabling electrification and autonomy.

Thanh Nguyen: Industry expert and consultant with over 30 years of business development experience in the battery industry covering all aspects of the manufacturing, sales, partnership, purchasing, delivery, and technology research processes.

Matt Steele, Director of Operations. Mr. Steele leads the project teams and manufacturing operations to develop and build batteries and chargers for UAS, space, and battery electronics and power applications. Bachelor of Science Electrical Engineering and MBA from NDSU.

Jason Stange, Senior Space Systems Engineer. Mr. Stange has 10+ years of experience designing power & instrument payloads for satellite-based science missions from concept through delivery to customers, including innovative designs for front-end amplifiers, digital high voltage power supplies, and analog-to-digital discriminators.

Joe Weinberg, Lead Engineer. Mr. Weinberg has an extensive background in circuit design, power electronics, batteries, instrumentation, and critical PCB layout. He has broad experience in hardware design, including aspects of high efficiency and high reliability power conversion.

Other participants in the project include:

The US Navy is a key participant in the project providing both expertise and requirements as well as funding. The US Navy is funding a separate project for a standardized battery to be utilized in the Navy Fleet for all UASs. For this project the Navy will provide matching dollars of \$2,826,868 for engineering labor to design and launch the cell plant and inventory costs.

The University of North Dakota will assist in rare earth mineral identification and extraction strategies. North Dakota State University will provide testing facilities prior to the plant completion.

MANAGEMENT

Management Plan: Packet Digital will lead the effort with significant collaboration with the Navy and support from University of North Dakota and North Dakota State University. Teams will work in parallel and interact directly as needed. Daily communication will take place via email. Weekly status meetings will be held via video conference, however, face-to-face meetings will be scheduled quarterly at a minimum to ensure team cohesiveness. Meeting minutes will be maintained. Both parties have developed a clear work breakdown structure that defines the content, responsibilities, and budgeted time for each sub-project. All parties will have a project team and work will be conducted in accordance with this structure. The development schedule and financial reports will be updated on a monthly basis. Major schedule items will include systems requirements definition, design and development activities, prototype development, integration and test, and final delivery.

Quality Assurance & Systems Engineering: Existing validated software and hardware will be leveraged as much as possible. A tailored systems engineering approach will be utilized for this development effort to efficiently execute the development while ensuring proper due diligence is maintained. A risk management approach will be utilized including a matrix to track requirements that are deemed to have high risk.

TIMETABLE

The schedule of phases is provided quarterly; however, we have scheduled the work on a weekly time frame. Our plan is to provide interim quarterly updates on progress. The left most blue bar indicates the quarter when a step in the project will start and the right most blue bar for a step indicates the quarter in which we expect the work to complete.

We have provided four years' worth of scheduled activities; however, we are requesting funding for the first three years. We expect the project to begin in January of 2024 and requesting funding through 2026.

Expected Project Timelines			Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
procedure	Estimated time required (weeks)		1	14	27	40	53	66	79	92	105	118	131	144	157	170	183	196
1. Document Requirements for Production Line Capacity																		
1.1 Finalize Production Line Requirements	2																	
1.2 Finalize Production Capacity Requirements	3																	
2. Document requirements for flexible production line, related laws, and regulations																		
2.1 Finalize flexible production line requirements	2																	
2.2 Research and document local applicable laws	3																	
2.3 Research and document applicable local and federal regulations.	3																	
3. Obtain Approvals, Acquire Land																		
3.1 Identify optimal areas with help from City of Fargo	2																	
3.2 Search for potential Locations	2																	
3.3 Review and Select Site	2																	
3.4 Close on Land Purchase	8																	
4. Design and Build Facilities																		
4.1 Finalize the technical process details	2																	
4.2 Plant layout design	8																	
4.3 Technical and after-sales requirements for production, testing and other equipment and instruments	8																	
4.4 ITB (Invitation to Bid) released, Vendors Proposal Evaluation	6																	
4.6 Obtain Building Permit	6																	
4.7 Construction	52																	
4.8 Receive Certificate of Occupancy	1																	
5. Select and Procure Equipment																		
5.1 Summary List of Equipment & Asset Purchased.	1																	
5.2 Equipment selection	8																	
5.3 Equipment and instrument manufacturing supervision and certification	20																	
5.4 (FAT) Factory acceptance test (FAT) for equipment and instrument	3																	
5.5 Equipment transportation	6																	
6. Install and Commission Equipment																		
6.1 Equipment Machinery Installation	8																	
6.2 Equipment commissioning	8																	
7. Train Personnel																		
7.1 Personnel training	8																	
7.2 Various tests and analysis	8																	
8. Execute Pilot Production																		
8.1 Preparation before pilot production	4																	
8.2 Minor and pilot tests	12																	
8.3 Project Final Acceptance	1																	
9. Start Mass Production																		
9.1 Start 1 Shift Operation	36																	
10. Transition to 3 shift operation																		
10.1 Start Two Shift Operation	36																	
10.2 Start 3 Shift Operation	1																	

BUDGET

We have provided two tables below to describe the budget breakdown of our \$56,558,592 project. The first table describes those expenses that qualify for grant funding. The second table describes those expenses that qualify for loan funding.

Project Associated Expense	NDIC Grant	Packet Digital Grant (Cash)	Navy Grant Share	Bank Sponsor Grant Share	Other Grant Share	Total Grant
Working Capital	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Tech Transfer	\$ 7,173,133	\$ 7,173,133	\$ -	\$ -	\$ -	\$ 14,346,265
1st Yr Eng & Exp	\$ 509,684	\$ -	\$ 509,684	\$ -	\$ -	\$ 1,019,368
2nd Yr Eng & Exp	\$ 1,293,878	\$ -	\$ 1,293,878	\$ -	\$ -	\$ 2,587,755
3rd Yr Eng & Exp	\$ 1,023,306	\$ 1,846,608	\$ 1,023,306	\$ -	\$ -	\$ 3,893,220
Total	\$ 10,000,000	\$ 9,019,740	\$ 2,826,868	\$ -	\$ -	\$ 21,846,608

Project Associated Expense	NDIC Loan	Packet Digital Loan (Cash)	Navy Loan Share	Bank Sponsor Loan Share	Other Loan Share	Total Loan
Land	\$ 1,250,000	\$ 250,000	\$ -	\$ 1,000,000	\$ -	\$ 2,500,000
Improvements	\$ 7,167,250	\$ 1,433,450	\$ -	\$ 5,733,800	\$ -	\$ 14,334,500
Interest	\$ 399,819	\$ 399,819	\$ -	\$ -	\$ -	\$ 799,639
Fees	\$ 126,259	\$ 126,259	\$ -	\$ -	\$ -	\$ 252,518
Equipment	\$ 6,936,325	\$ 1,387,265	\$ -	\$ 5,549,060	\$ -	\$ 13,872,649
Inventory	\$ 1,476,340	\$ 1,476,340	\$ -	\$ -	\$ -	\$ 2,952,679
Total	\$ 17,355,992	\$ 5,073,133	\$ -	\$ 12,282,860	\$ -	\$ 34,711,984

Facility costs: The safety, air handling, and clean room requirements for a facility doing this type of manufacturing are critical to support this type of manufacturing process, therefore the budgeted price per square foot has been adjusted up accordingly to meet these requirements.

Equipment costs: The equipment needed for this project is highly specialized and we have coordinated with experienced partners in the industry to identify what is needed and how much it is expected to cost.

Labor Costs: Early training and requirements work is required. Staffing begins with a subset of staff early in the process, the rest of labor is budgeted to be added as needed over the first three years.

Technology Transfer: We are leaning heavily on the expertise of partners to ensure the factory, equipment, and processes.

Detailed project budgets have been created providing further backing for the expenses we have documented and can be made available if needed.

The cost and complexity of this project is high and without funding near the requested levels it would be difficult for us to proceed with this much-needed capability.

CONFIDENTIAL INFORMATION

We are requesting that some of the information in our submittal package be kept confidential. Please see attached confidentiality request template.

PATENTS/RIGHTS TO TECHNICAL DATA

Packet Digital reserves the right to file patents related to the intellectual property generated from this proposal and will work with legal counsel to determine if additional patents could be filed. Our power management algorithms and methodology are protected by our patent portfolio. We also have copyrights and our registered trademarks include On-Demand Power®, PowerSage®, and Packet Digital ®.

STATE PROGRAMS AND INCENTIVES

Below are the State Programs that we have participated in within the last five years:

North Dakota Development Fund – Revolving Working Capital Available Line of Credit of \$500,000 from 2006 to 2021– Paid off Feb 2, 2021.

North Dakota Development Fund and Bank of North Dakota (New Venture Fund) – Preferred Equity invested of \$999,999 Oct 19, 2009. On May 25, 2022, an agreement was made to commence repayment. Accrued dividend payment of \$300,000 have been paid and payments to return equity to the state on term schedule have commenced – Current balance \$957,925.

Bank of ND Interest Rate Buydown– PACE Program – 3241 University Dr S, Fargo ND \$200,000 – May 4, 2021, running for 81 months.

Bank of ND Interest Rate Buydown – PACE Program – 704 38th St N, Fargo ND – In process expected commencement January of 2024

North Dakota Renewable Energy Council – Solar Soaring Phase I, II, III - \$1,225,000 - Feb 2017 – Aug 2017 – Naval Research Lab and US Marine Corp provided matching dollars for UAS power systems. The first extended endurance UAS power system built by Packet Digital.

North Dakota Renewable Energy Council – Portable Solar Array Modules Phase I & II – \$1,000,000 - May 2018 – Sep 2020 – DoD contractor and Naval Research Lab through Office of Secretary of Defense provided matching funds – System revision requests continue from military customer. Last revision occurred Sept 2023. Systems shipping to customer.

**Industrial Commission
Tax Liability Statement**

Applicant:

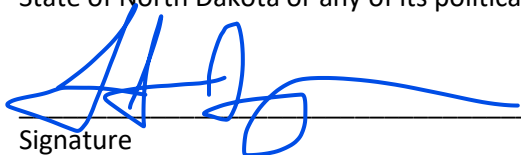
Application Title:

Program:

- Lignite Research, Development and Marketing Program
- Renewable Energy Program
- Oil & Gas Research Program
- Clean Sustainable Energy Authority

Certification:

I hereby certify that the applicant listed above does not have any outstanding tax liability owed to the State of North Dakota or any of its political subdivisions.


Signature

Title

Date

Jeff Jonson

October 30, 2023

Grand Power – North Dakota Battery Manufacturing Plant
Packet Digital
terri.zimmerman@packetdigital.com

By Electronic Mail

Re: Letter of Support for Packet Digital

This Letter of Support indicates Rainbow Energy Center's (REC) support for the proposed development of a North Dakota Battery Manufacturing Plant by Packet Digital.

As a North Dakota company focused on the execution of our vision to maximize the operation of Coal Creek Station and Nexus Line and reduce our overall footprint and carbon emissions while finding new ways to further utilize the incredible resources right here in North Dakota, we support the efforts of Packet Digital to revolutionize battery manufacturing and development here in our state.

Our ongoing efforts to support the extraction of critical minerals and rare earth elements from our lignite coal go hand in hand with the efforts of Packet Digital to process those products into high-performance batteries.

As a board member of Packet Digital for over ten years, I am very familiar with the company's capabilities, products and strategies. It is very rewarding to have our interests completely aligned to create additional value for North Dakota and to produce a solution that also meets the needs of the United States Military to help protect American lives.

This Letter of Support is not binding and does not agree to any terms or conditions for a future arrangement.

Please feel free to contact me if you have any questions.

Regards,



Jeff Jonson
Executive Vice President



918 E Divide Ave 4th Floor
Bismarck, ND 58501
Office: 701 222 2290
Mobile: 701 226 2299
Email: j.jonson@rainbowenergy.com

26 October 2023

*Program Manager – Advanced Battery Technology
Naval Air Warfare Center Aircraft Division – Webster Outlying Field (NAWCAD WOLF)
17800 Molls Cove Road B8125
St Inigoes, MD 20684*

Re: Clean Sustainable Energy Authority Funding

The purpose of this letter is to provide the full support for and commitment to Packet Digital's proposed Clean Sustainable Energy Authority Project: Grand Power – North Dakota Battery Manufacturing Plant from the Advanced Battery Technology Program NAWCAD WOLF.

The Navy is rapidly expanding its use of autonomous systems throughout the Fleet to include functional areas such as weapons, transportation, intelligence, surveillance, and reconnaissance applications. Due to the increasing reliance on these autonomous technologies, it is critical that we ensure that our national security needs are backed by our national production industry. Unfortunately, current US production of lithium batteries and other energy storage systems are not fulfilling the demand of our national defense manufacturing infrastructure. The Packet Digital proposal closes the largest gap in those capabilities.

Packet Digital has a stellar record of accomplishment among leading US-based defense contractors who rely on their expertise to build high-efficiency batteries, chargers and power systems, expertise that enables increased operational capabilities across air, space, and undersea platforms.

Additionally, the constant increases in electric autonomous system deployment require higher battery manufacturing capacity than what is currently supported nationally. While much investment has gone toward the EV battery market, specifically autos, critical markets such as battery systems for unmanned systems have largely been left behind. This lack of US investment has led battery supply chains to continue to depend on China for fulfillment, which coupled with the ever-increasing operational dependence of unmanned systems operations, is creating a large risk to national security.

We currently have an active contract with Packet Digital in the amount of \$7,437,931.19 to commission equipment for a battery plant and build prototype solutions for batteries utilized within the Navy Fleet. Packet Digital has continuously demonstrated a strong reputation for delivering quality and innovation with their unmanned systems battery development. In addition, for fiscal year 2024, we are expecting follow on program funding to continue the unmanned systems battery development, prototype batteries, and production facility efforts. As such, this NAWCAD Program strongly supports government investment in unmanned system battery development and manufacturing in the US and strongly advocates for the continued relationship with Packet Digital.

Sincerely,

William A. Macchione
PM Advanced Battery Technology
NAWCAD WOLF

28 October 20223

Senior Project Manager
Toyota Tsusho America
700 Triport Road
Georgetown, KY 40324

Re: Packet Digital US Battery Factory Proposal

I'm writing this letter to document my full support for Packet Digital's US Battery Factory Proposal.

I worked closely with Packet Digital in my role as senior project manager at Toyota Tsusho America. We are collaborating on a battery recycling initiative with Packet Digital, where we are taking batteries from our hybrid vehicle lines of automobiles and working to reuse the cells for other purposes to satisfy other critical power solutions.

I have been very impressed with the technical capabilities of Packet Digital, their professionalism, and their ability to innovate on challenging technical problems.

I chose to work with Packet Digital after months of investigation. I learned that they have consistently demonstrated the ability to produce highly efficient and resilient batteries for both defense and commercial customers. Based on Packet Digital's success and the working relationship we have built, we have been in discussion regarding an investment in the Company.

I support government investment in US based development and manufacturing, and I strongly advocate for Packet Digital to be a recipient of those funds. There is no other unmanned systems battery development and assembly company in the U.S. with a stronger reputation for delivering quality and innovation than Packet Digital.

Sincerely,



Travis Malston
Project Manager

**Vice President for Research &
Economic Development**
Tech Accelerator, Suite 2050
4201 James Ray Drive Stop 8367
Grand Forks, ND 58202-8367
Phone: 701.777.6736
Fax: 701.777.2193
Email: vpr@UND.edu
Website: UND.edu/research

October 27, 2023

Re: Clean Sustainable Energy Authority Funding

The University of North Dakota has a history of collaboration with Packet Digital that goes back many years. Terri Zimmerman, Packet Digital CEO and a UND graduate, has been active in supporting the University in various roles over the years. The collaborations we've had with her teams and companies have been fruitful and successful. UND is very interested to support Packet Digital on the Grand Power – North Dakota Battery Manufacturing Plant Clean Sustainable Energy Authority Project.

For UND the importance of this work could not hit closer to home. As a university we are very active in both primary research and in creating technology advancements for autonomous flight. Our other collaborators, across the US Military and commercial companies, have made it crystal clear to us how important the work we are doing to advance autonomous systems is to the security of our country. The work that Packet Digital has been doing on Autonomous Power Solutions is groundbreaking and our faculty and students are excited to collaborate with them as they continue to advance the industry for the betterment of our National Defense and Safety.

UND is a world leader in energy-related research and education. UND offers a graduate certificate program in Energy Storage Systems that provides knowledge about lithium-ion battery technologies and how they can be effectively and sustainably integrated with various energy systems. This work will support the work that Packet Digital is doing on this project. We focus on Energy Storage systems and Lithium-Ion Batteries technologies such as energy storage technologies, renewable energy sustainability, and the value of energy storage and e-mobility technology. We specialize in developing energy technologies that are economically competitive, reliable, sustainable, and politically and environmentally acceptable. Our experience and success developing high performance lithium-ion batteries from the byproducts of North Dakota lignite coal will be particularly valuable to this collaboration.

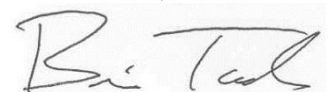
In closing, UND is very impressed with the work that Packet Digital is doing in this critical area. We fully support their application for this grant, and we look forward to collaborating with them on creating the best possible battery solutions in the world, built in North Dakota.

Mark Askelson, PhD



Associate Vice President for Research-National Security Dean, College of Engineering & Mines
University of North Dakota

Brian Tande, PhD.



University of North Dakota

October 24th, 2023
Advanced Space Power Program
Air Force Research Laboratory
Kirtland AFB

Re: Clean Sustainable Energy Authority Funding

I'm writing this letter, on behalf of the Air Force Research Lab's (AFRL), to document our full support for Packet Digital's **Grand Power – North Dakota Battery Manufacturing Plant** Clean Sustainable Energy Authority Project proposal.

Across all branches of the defense department, including the Air Force and Space Force, the use of Autonomous systems is growing rapidly. The Pentagon's recently announced 'Replicator' program is just the latest program supporting the growing momentum behind transitioning to autonomous systems. One of the baseline and fundamental requirements of all these efforts is the need to power these devices efficiently and effectively.

Power is exactly where Packet Digital's expertise shines and becomes critical to the effort. Packet Digital has demonstrated the ability to produce highly efficient and resilient battery packs for both defense and commercial customers for terrestrial, airborne, and upcoming space applications. Together with AFRL, Packet Digital has been working on turning their learning and expertise into essential solutions for our national space projects where high performance, reliability, and extended operating conditions are critical. Moving further up the supply chain to create the battery cells is essential to reducing our dependence on adversaries, like China, for items that are critical to our national defense.

Unfortunately, current U.S. production does not meet the demands of our national defense branches. The Packet Digital proposal helps to close one of the largest gaps in those capabilities.

Through the SSPIDER program, AFRL is seeking to harvest solar power from space, convert it to RF signals that can be beamed to forward operating positions for our war fighters and eliminate the need to move power along traditional supply chains. Once the power is received, in many cases it must be stored for use in light, safe, and resilient battery systems. Packet Digital's expertise will be instrumental in developing advances in this critical area of need.

AFRL has worked with Packet Digital on multiple projects, and they have consistently demonstrated very strong performance and capabilities. Without hesitation we support their proposal.

Sincerely,
Robert Walters, Ph.D.
ARFL/RVSV Senior Mentor,
Advanced Apace Power

October 25, 2023

Re: Clean Sustainable Energy Authority Funding

To Whom It May Concern:

North Dakota State University's Office of Research and Creative Activity is very interested in supporting Packet Digital with collaboration for the Grand Power – North Dakota Battery Manufacturing Plant Clean Sustainable Energy Authority Project.

With many NDSU graduates employed at Packet Digital, and a track record of multiple prior successful collaborations between Packet Digital and the University, we look forward to the opportunity to making a positive impact on driving high performance battery chemistry technologies that meet the performance and safety requirements of Packet Digital's national defense and commercial customers. Packet Digital is developing innovative battery technology in North Dakota that brings higher performance for autonomous vehicles in space, air, ground and underwater. Enabling power technologies across these applications impacts many American lives. We look forward to collaborating with Packet Digital on the innovation and testing of this important grant.

At NDSU we have amassed well over 110,000 square feet of state-of-the-art research facilities at the NDSU Research and Technology Park. The facilities support cleanrooms, laboratory space, microfabrication, device packaging, device testing, reliability/failure analysis, material synthesis, processing, and characterization.

We look forward to collaborating on the work that Packet Digital, the Navy, the Air Force, and others are doing on this critical area of importance for our country and for the safety of our communities.

Sincerely,



Colleen M. Fitzgerald, PH.D.
Vice President, Office of Research and Creative Activity
North Dakota State University

31 October 2023

Lockheed Martin Procerus Technologies
500 S Geneva Rd
Vineyard, UT 84058

Re: Packet Digital US Battery Plant Funding Support

I am writing this letter to provide Lockheed Martin's support for Packet Digital's proposed US Battery Plant Project in North Dakota.

Packet Digital is our supplier for batteries and charging systems. In addition, we are collaborating with Packet Digital on power systems including charging, batteries, and extended endurance batteries for our Indago 4 Drone. Packet Digital's batteries have not only provided increased performance but have also provided significant improvement in cycle life.

Lockheed Martin's Indago 4 is a small unmanned aerial vehicle (UAV) designed for expeditionary intelligence, surveillance, and reconnaissance (ISR) applications. It is a vertical takeoff and landing (VTOL) system that weighs less than 10 lbs. and can be deployed in approximately 2 minutes. It has an endurance of 50-70 minutes with payload and a range of 10-12 km. The Indago 4 is equipped with high-resolution camera systems that provide users with incredible zoom capability used to accurately identify people, objects, vehicles, and weapons. The EO or daytime cameras include low light settings for twilight, nighttime, and cloudy days. The IR cameras provide thermal infrared capabilities for covert nighttime operations providing heat signatures in white hot, black hot, and heat map color displays for detailed analysis and situational awareness in the darkness.

The Indago 4 is being sold to both military and commercial customers. To meet the requirements of our military customers it is imperative that we have a US-made solution for our Power Systems. For Lockheed, the best possible solution is that we can continue our productive relationship with Packet Digital and purchase our future batteries from their US factory in North Dakota.

Therefore, Lockheed Martin strongly supports continued investment in unmanned system battery development and manufacturing in the US and strongly advocates for Packet Digital to be a recipient of those funds. Throughout Lockheed Martin's experience with Packet Digital, they have demonstrated they are well positioned to continue delivering quality and innovation as a battery development and assembly company.

Sincerely,



Paul Kendrick
Contracts Manager
Lockheed Martin Procerus Technologies