**STATE OF NEW HAMPSHIRE**

**BEFORE THE**

**PUBLIC UTILITIES COMMISSION**

# DEVELOPMENT OF A STATEWIDE, MULTI-USE ONLINE ENERGY DATA PLATFORM

**DOCKET NO. DE 19-197**

**DIRECT TESTIMONY OF**

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**CHIEF EXECUTIVE OFFICER**

**PACKETIZED ENERGY**

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## I. INTRODUCTION

**Q. State your name, the organization you work for, your position and your business address.**

A. My name is Paul Hines, I am the Chief Executive Officer of Packetized Energy Technologies, Inc. (Packetized Energy), which is located at 1 Mill Street, Suite 110, Burlington, VT 05401. I am also Professor and L. Richard Fisher Chair of Electrical Engineering at the University of Vermont, which is located at 33 Colchester Avenue, Burlington, VT 05405.

**Q. Describe your background and qualifications.**

A. I have worked in the electricity industry, in the federal government, and in academia for the past 20 years, all with a focus on solving critical energy problems. Currently, I am co-founder and CEO of Packetized Energy, a cleantech startup based in Burlington, Vermont. Packetized Energy provides software and hardware technology solutions for the electricity industry. For the last 12 years I have also been a tenure-track professor at the University of Vermont where I have led a team of up to a dozen researchers and graduate students, all focused on solving problems associated with power systems reliability, resilience, smart grid technology, and renewable energy integration. I am also a member of the external faculty at the Santa Fe Institute and at the Carnegie Mellon Electricity Industry Center. Our research at the University of Vermont has been sponsored by numerous federal, state and industry organizations, including the U.S. Department of Energy, the U.S. National Science Foundation, electric utilities, and independent system operators, such as PJM. Outcomes from this research have been highlighted

in Science Magazine, Scientific American, and NPR, and have informed important ongoing changes in the electricity industry.

Before working at the University of Vermont, I worked at the U.S. National Energy Technology Laboratory, where I participated in smart grid research, at the U.S. Federal Energy Regulatory Commission, where I studied interactions between nuclear plants and grid reliability, at Alstom ESCA, where I worked on short-term load forecasting, and at Black and Veatch, where I was a substation design engineer. Packetized Energy, the company that I lead, is a spinoff from research that my co-founders Drs. Jeff Frolik, Mads Almassalkhi and I started at the University of Vermont.

I earned a Ph.D. in Engineering and Public Policy from Carnegie Mellon University in 2007 and M.S. and B.S. degrees in Electrical Engineering, with a focus on power systems engineering, from the University of Washington and Seattle Pacific University, respectively.

**Q. Have you previously testified before the New Hampshire Public Utilities Commission (Commission) or other regulatory bodies?**

A. I have not.

**Q. On whose behalf are you testifying?**

A. I am testifying on behalf of Packetized Energy. Packetized Energy's mission is to enable the future of clean energy for all people. Our Nimble® software platform transforms energy devices at the edge of the grid—such as HVAC systems, water heaters, EV chargers, and behind-

the-meter batteries—into dispatchable grid resources. We call these "Virtual Batteries" (also known as Virtual Power Plants), for the electricity industry. Through the Nimble platform, we provide software-based grid services and energy IoT devices to electric utilities and to wholesale electricity markets, while providing comfort, resilience and savings for consumers. And we do all of this in a way that greatly simplifies the complexity of deploying and managing distributed energy resources, so that grid operators and electric utilities can reliably and cost effectively transition to clean energy sources, and consumers get clean, resilient and simplified energy services.

Since our start in 2016, Packetized Energy has become known as a leading innovator in the electricity industry. We have leading roles in five federally funded R&D projects (principally from the U.S. Department of Energy's Advanced Research Projects Agency, ARPA-E) and have developed software and hardware solutions that are being used today by seven electric utilities in California, Vermont, South Carolina and Ontario, Canada. We have also developed valuable partnerships with innovative energy device manufactures, such as LG Electronics in Korea and Nyle Systems, which is a manufacturer of heat pump water heaters based in Maine.

**Q. Explain Packetized Energy's interest in the creation of a statewide, multi-use online energy data platform.**

A. Packetized Energy believes that enabling data access via a data platform will promote the adoption of software tools—like Packetized Energy's GridSolver technology—that will in turn

significantly enhance New Hampshire's ability to meet its clean energy policy goals and keep energy affordable, reliable and resilient.

GridSolver, one of the core products within our Nimble energy flexibility platform, is a distribution network planning and operations tool that reduces utility capital and operating costs by transforming disparate datasets into valuable information and network management procedures. GridSolver combines together detailed three-phase, unbalanced AC power flow models of distribution networks with geographic (GIS), smart meter (Advance Metering Infrastructure, AMI), and SCADA (Supervisory Control and Data Acquisition) data in a way that dramatically reduces the complexity of distribution system operations and planning. The tool allows electric utilities and load serving entities to plan for future deployments of distributed energy resources (DERs) in order understand how grid operations will change as distributed solar, distributed batteries and electrification programs change how distribution systems operate. GridSolver simplifies DER interconnection studies and provides a way to predict the impact of future changes, such as the electrification of transportation or space/water heating. Along operational timescales GridSolver allows operators to set DERs to automatically respond to local grid conditions, such as under- or over-voltage conditions, thereby optimizing the performance of power distribution networks.

While GridSolver is a new product for us (launched only a few months ago), it has already proven to be useful. For example, one of our electric utility clients in Vermont recently had complaints about poor power quality at a campground. Previously, debugging these sorts of

distribution network problems would have taken days or even months of pulling data from various databases and then running complicated power flow models. With GridSolver, they were able to quickly pull up a map of the network, zoom into the site, and see that a section of the network was overloaded, leading to low voltage issues. The utility was able to immediately develop and implement a solution for the problem. Going forward, utilities won't even need to wait for customers to complain, since GridSolver will automatically run a wide range of operations planning scenarios and catch problems before they impact customers' quality of service. As a result, utilities will be able to target their infrastructure investments very narrowly on the real problems, while also planning for ways to avoid unneeded capital expenditures that can be solved more cost effectively through flexible distributed energy resources and non-wires alternatives.

Accurate, and easy-to-access (while also secure) data is essential to making this possible. If the data is difficult to access and only available from locally hosted, proprietary, utility-owned databases, it will be cost-prohibitive to adopt software tools like GridSolver, which can reduce customer costs and help utilities meet clean energy policy goals. If New Hampshire can develop a data platform that enables data access, while also preserving customer privacy and system security, then it will be better able to meet clean energy policy goals and keep energy affordable.

Thus, our interest in this proceeding is as a technology company who would potentially use the data platform to support electric utilities and load serving entities in New Hampshire.

**Q. Describe your involvement in DE 19-197 up until this point.**

A. Packetized Energy petitioned to intervene in the DE 19-197 proceeding on February 3, 2020. We provided scoping comments to the Commission on March 13, 2020. We have also participated in a number of the subsequent technical discussions, and are scheduled to provide an informational seminar to the group on August, 19, 2020 at 9:00 am (see the Aug 6, 2020 email announcement from Henry Herndon <henry@cleanenergynh.org> on the services list).

## II. SUMMARY OF POLICY CONTEXT & LEGISLATIVE OBJECTIVES

**Q. What is the purpose of your testimony?**

**A.** The purpose of my testimony is to assert that the development of a statewide data platform is important for keeping electricity in New Hampshire affordable and for helping New Hampshire to meet energy policy objectives, and to provide suggestions for making the data platform both useful and cost effective.

**Q. Briefly summarize the key points of your testimony.**

**A.** My testimony has two primary points.

My first point is that the development of a statewide data platform has enormous potential benefits for New Hampshire ratepayers in terms of keeping electric energy affordable and for meeting state energy policy goals. We already know about some of these beneficial applications, however the most beneficial applications are probably the ones that we have not yet discovered, which brings me to my second point.

My second point is to propose that the Commission and the organization that ends up developing the data platform should not decide in advance how the data platform should be used and should not develop "applications" for the data. Based on my experience, it would not be a good use of state or ratepayer funds to develop applications for the data. Instead, this program should work to develop a secure and well-documented Application Programming Interface (API) that enables legitimate organizations to creatively develop solutions to emerging problems for the energy industry.

**Q. How might the data platform be useful in decreasing ratepayer costs?**

A. The most effective way that a data platform can help to reduce cost is by helping the electricity industry in New Hampshire to use data to make only those physical infrastructure investments that are absolutely necessary, and to identify alternatives to traditional infrastructure investments whenever possible.

Most of the cost of electricity comes from three sources: primary energy or fuel for power plants; infrastructure (generation, transmission, distribution) capital; and operational costs, such as utility staff time. As an increasingly large amount of our primary energy comes from renewable wind and solar generators, the cost of primary energy is decreasing. However, the cost of infrastructure is increasing, since wind and solar have large capital costs and have significant impacts on the transmission and distribution infrastructure. The transition to wind and solar power will undoubtedly require significant capital investments. However, if we are to ensure that energy remains affordable it is essential that we make only those capital investments that will

actually lead to a more reliable and resilient energy system. In my opinion, this is where the data platform can be particularly useful: by enabling electricity industry stakeholders to identify those investments that actually result in system benefits, while avoiding making investments to fix problems that could be more cost effectively solved through alternatives to conventional generation, transmission and distribution infrastructure upgrades.

The data platform could also reduce operational costs by making it less time consuming to find problems in power transmission and distribution networks, and by automatically identifying solutions, thus reducing the complexity and cost of operating electric energy systems.

**Q. What are some examples for how the data platform may be useful in helping to meet state energy policy goals?**

A. New Hampshire, like many states in the U.S., has both a renewable portfolio standard and net metering requirements, both of which have significant benefits for mitigating global climate emissions. However, incorporating distributed wind and solar into electric power systems is challenging for many reasons. If the data platform is well-designed it could make renewable energy integration easier by quickly identifying locations that are or are not good locations for new renewable energy investments, or transmission and distribution infrastructure upgrades.

**Q. Given that we know some of the potential applications for the data platform, should the state develop the data platform to provide specific applications of the data, or to develop the data platform with specific applications in mind?**

A. No. I believe that it will be far more cost effective for New Hampshire to develop a relatively simple and well-documented API that provides authorized parties with access to the relevant data sources. Developing data-driven software applications is expensive, and there is a significant risk that if the data platform is pre-designed for a only a few specific applications or use cases, that the investment will not be cost effective and could prevent future innovative applications of the data that we do not yet know about. This risks wasting or under-utilizing ratepayer funds.

Instead, the Commission should develop a platform that provides known, legitimate organizations who have applied for access to the data with security credentials needed to access the data through a well-documented API. Security credentials would be provided after the organizations have been verified to have a need to access the data and agreed to an appropriate non-disclosure agreement.

**Q. Are there examples in the electricity industry that New Hampshire can use to provide secure access to data?**

A. Yes. Many Independent System Operators in the U.S. provide data access through secure APIs. ISO New England, for example, provides access to market data through their "web services" server (see https://webservices.iso-ne.com/docs/v1.1/). This web interface does not have any complicated or pre-developed applications; it just provides access to raw data that authorized stakeholders can use to solve a wide variety of problems. Packetized Energy uses ISO New England's API on a minute-by-minute basis in our Nimble energy flexibility platform in a

number of ways. For example, we use the data to schedule DERs, such as smart water heaters, which has the effect of reducing power supply costs for our utility clients, allowing utilities to provide financial benefits to consumers who participate in our programs, and reducing carbon emissions reductions system-wide.

**Q. Does this conclude your testimony?**

A. Yes, it does.