Dear Michelle Turner,

With offices in Lincolnville Maine and Portland Oregon, Alonetics, LLC is an agnostic, IoT service organization that focuses on energy management applications. We seek to significantly expand the supply of cost-effective DR resources by lowering the cost of communication per device. We will facilitate seamless, digital connectivity between large electric loads (i.e., appliances), located in a customer's premises and 1) the electric utilities that serve that customer, and/or 2) the manufacturers who make these appliances. The mission of Alonetics is to simplify the complexity of access to flexible loads so as to enable a more cost-effective future with high levels of wind and solar generation. Incorporated in 2020, Alonetics, LLC aspires to be B Corporation.

In a mature smart grid, load flexibility will be key to supporting a cost-effective integration of renewable energy portfolio standards and decarbonization; connectivity to enable control of large-load residential devices will be critical. Recognizing this illusive need, eight Pacific Northwest utilities participated in a ground breaking demonstration project of a promising technology based on open standards that makes demand response both cost effective and customer friendly. The co-founder of Alonetics, Conrad Eustis, PhD, was co-project manager and the principal author of the report and financial model on which the economic findings are based. (Link to both documents here.) The study became the basis for 2019 legislation signed by Washington Governor Inslee requiring all water heaters installed in that state to have an open connectivity standard (CTA-2045) "port". The same requirements are expected to be adopted this year in Oregon and likely in California by 2022. Initially, Alonetics is working with two major utilities in the PNW to implement a program for connecting all future water heaters in these territories.

With the most successful heat pump water heater program in the U.S., Maine is well positioned to take advantage of the good work that has been done in the PNW to advance the implementation, at scale, of load flexibility using the technology proven cost-effective in the Northwest. Much of the heavy lifting has already been done; at least one OEM has already begun shipping CTA-2045 compliant appliances to Maine. Alonetics, seeks to leverage the first-hand knowledge and experience gained in the PNW to create a similar large scale non-wires alternative capability here in Maine.

Co- Founder Lance Ahearn, Lincolnville, Maine has over 30 years of executive management experience in the engineering, environmental and energy fields. He has served as the CEO of utilities and companies focused on energy efficiency and optimization, energy supply, energy trading, energy technology, environmental consulting-engineering and affordable housing development and operation. His responsibilities have included the purchase, sale, successful start-up and operation of numerous businesses. CV attached.

Co- Founder Conrad Eustis, PhD, Portland Oregon has 45 years of experience in the energy industry including 5 years as an officer in the nuclear Navy. He recently completed a 33-year career at Portland General Electric as the Director Retail Technology Strategy where he implemented over twenty smart grid platforms for smart meters, demand response, and energy storage. He holds multiple patents including one for an advanced thermal storage system. CV attached.

Response to Request for information (RFI) on Efficiency Maine Trust Triennial Plan V (fiscal years 2023- 2025)

Section 3.2 Responses

1. The comments below and Alonetics proposal for an "Infrastructure as a Service" (IaaS) model simultaneously address what would be programs in the areas of; Distributor Initiatives; Retail Initiatives, Grid Support and Load Management, Low Income Initiatives, Renewable Resource Fund (Demonstration Program) and Innovation Program.

2. The proposal responds to the Innovation Program by seeking to leverage technologies and standard protocols which have been studied and thoroughly tested through multiple pilot programs and which are ready for commercialization at scale but have lacked a single entity with the wherewithal to develop a structure for commercialization that contemplates the needs of all stakeholders.

3. In what specific ways could we improve these resources and services? Making citizens comfortable with control of their appliances will take more than a decade. Just as the concept of sorting your garbage seems crazy at first, citizen education, making it easy, and civic responsibility eventually made scale garbage sorting a success. Efficiency Maine should start now, with input from utilities, to develop web content that educates citizens on the value load shifting that won't affect their lifestyle. After successful NWA programs are established, content that focuses on simplicity and low lifestyle impact should follow. The push to enroll because of civic responsibility should come last and might best be done through other entities.

4. No Response

5. Changes to Benefit and Cost Analysis Supporting Efficiency Maine's: NWA and beneficial electrification objectives will require methods that go beyond avoided energy costs. In 2020, California completed a comprehensive review of Integrated Resource Planning (IRP) ending with and OPUC decision[1]. The most notable outcome of their reference portfolio is that in includes only renewable generation and energy storage. This is landmark change in IRPs because it does not include peaking generation plants to

[1] https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M331/K772/331772681.PDF

provide capacity. The implication is that integration of flexible loads (NWAs) should be evaluated relative to the cost of a storage system. Maine is already promoting heat pump water heaters (HPWHs) as low-cost energy efficiency resource, and as a means to reduce green house gas creation, but now evaluation should also include how controlled water heaters can be implemented at less cost than a battery. A major conversion of fossil-fueled space and water heating systems to heat pumps will have a major, and costly, implication on system peak demand at 7a and 6p unless these loads are control to mitigate their coincident demand.

6. While the proposal focuses on HPWHs, the same technology has been deployed with heat pumps (and is being deployed in Maine in a pilot). The implementation of load management of heat pumps – because they, in most cases must interface with existing heating systems – will necessarily involve the cooperation and training of contractors. The Proposal facilitates load management of and data capture from heat pumps which will be essential in developing training programs for contractors.

7. The proposal[2], through the use of open, rather than proprietary standards addresses the issue of equity by standardizing the communication interface with large load appliances and by creating a common customer experience; allowing all retail customers to participate in carbon mitigation programs.

8. The proposal draws from the first-hand experience with the largest evaluation of a demand response program controlling HPWHs.[3] This study and subsequent Washington State law requiring a CTA-2045 interface on all water heaters shipped to the state demonstrate the significant NWA resource that can be built on this open standard.

9. The proliferation of EV will present a significant challenge to load management and will need to be addressed. The same CTA- 2045 open standard protocol has been deployed in car chargers (e.g., the Siemens VersiCharge™ whose effectiveness was tested by EPRI) and can serve as a mechanism for load management of this class of DER's. The infrastructure required to create the load management for water heaters will also serve for car chargers equipped with the CTA-2045 interface.

[2] For ease of implementation our Proposal builds on Efficiency Maine's successful HPWH program. However, social equity under our service is best achieved if resistance water heaters are shipped with UCMs as well. Because of their low cost and their easy-to-install small footprint resistance water heaters have considerable penetration in low-income households. See our response in to #11 for more information.

[3] https://www.bpa.gov/EE/Technology/demand-response/Documents/Demand%20Response%20-%20FINAL%20REPORT%20110918.pdf

10. The Proposal specifically addresses a mechanism by which Efficiency Maine can address beneficial electrification and Climate Action Plan Goals. Recognizing that the largest cost to Efficiency Maine is the cost of the hardware that goes in the home, Alonetics utilizes a project finance model where Efficiency Maine funds a levelized cost of service and avoids up-front costs. This modest scale model may be appropriate as a broader solution for the achievement Climate Council goals to fund beneficial electrification.

11. Alternative Compliance Payments, if available, should be used for the same policy goals; namely, to lower greenhouse gas emissions in Maine. Building renewable generation is not a responsibility of Efficiency Maine but reduction in greenhouse gas emissions can be achieved through its responsibility to implement NWA. Cost-effective control of flexible load as proposed by Alonetics to control of water heaters specifically supports greenhouse gas reductions and provides a policy-consistent use of revenues from Alternative Compliance Payments.

    A second use of Alternative Compliance Payments would be to UCMs installed on resistance water heaters. While resistance water heaters are not an energy efficiency resource, they are essential in both NWA and beneficial electrification programs. HPWHs achieve their efficiency by removing waste heat in the air that surrounds them, thus their installation is not recommended in confined spaces typically found in apartments, manufactured homes, and indoor spaces heated by an electric resistance option. Despite their low efficiency compared to HPWHs, resistance water heaters have superior benefit as flexible loads, and reduce net greenhouse emission when the average electric generation emission fall below 0.45 lbs. CO_2 per kWh. Maine would be below this level under the 2030 80% RPS mandate, even if the 20% balance came entirely from coal. In other words, replacing a natural gas water heater, today, with an electric resistance water heater will contribute a reduction to the 2030 greenhouse gas reduction target of 45%, even if the resistance tank system produces a bit more CO_2 initially.

Alonetics Proposal:

1. **The Challenge**: Meeting Maine Climate Council Goals at Reasonable Cost (Carbon Neutrality by 2045, plus an RPS of 80% by 2030 and 100% by 2050)

   - The combination of increased RPS and increased electrification will require significant demand flexibility, necessitating the deployment of intelligent, connected loads in order to respond dynamically to varying wind and solar generation.
   - Alonetics was formed to remove a major barrier to this transformation, namely the need to establish, at scale, low-cost digital connectivity among all the relevant parties without claiming or interfering with the value propositions that exist, or might be created by, a utility, manufacturer of large-load home appliances, or intermediate entities like Efficiency Maine. The Alonetics approach also creates a common experience for all customers, thus solving a major barrier to customer acceptance.

2. **The Opportunity for Maine:**

   - Alonetics suggests that Efficiency Maine can accelerate its NWA by at least an order of magnitude by adopting the proposed model as in **Figure 1**. The diagram and proposal beg the question as to the relationship between Alonetics and Efficiency Maine. In this regard, Alonetics is flexible to the range of possibilities as to the nature of that relationship.

   - Leverage the very successful Efficiency Maine HPWHs program to connect 10,000 HPWHs per year
     - Restrict HPWH incentives to "connected, controllable" water heaters
     - Carbon reduction example: 1 event[4] on 10,000 HPWHs reduces CO_2 by 2 tons
     - 10,000 controllable HPWHs save about $2 million in avoided generation costs to serve peak demand.
   - The Alonetics' business model and its agreements with water heater, original equipment manufacturers (OEMs), means low-income housing residents reap benefits as landlords buy lowest cost tanks.[5]
   - Alonetics IaaS model provides an easy, practical entrance into demand response and load flexibility for Efficiency Maine to initiate non-wire alternatives at scale. The platform is scalable and capable of managing any CTA 2045 device, water heaters heat pumps car chargers.

[4] Shifting of peak load to off-peak period with high wind generation.
[5] Assumes Efficiency Maine also incents connectable resistance tanks.

Figure 1. Alonetics Infrastructure as a Service Model supplies UCMs[6],[7]

- Alonetics Funding Strategy
  - The IaaS, project finance model can facilitate public private investment opportunities which can accelerate deployment.
  - In this model Alonetics contracts with the OEM's for the financing of the Universal Command Module (UCM) while contracting with Efficiency Maine for the connectivity to and management of the UCM and its respective Distributed Energy Resource (DER) – in this case, large load appliance.
  - There will be some set up and integration costs depending on the specific needs of the relevant parties in the industry ecosystem– ISO NE, Maine Utilities, Efficiency Maine. We expect our interfaces to be OpenADR – which has been used in California demand response programs.

[6] UCM = Universal Communication Module. UCMs are defined in the ANSI/CTA-2045 specification as the communication device "plugged into" the CTA-2045 port on the appliance. The customer experience with the UCM is much like plugging in a Wi-Fi "thumb drive" into a USB socket on a TV. Alonetics-specified UCMs are in installed at factory.

[7] VPN = Virtual Private Network—a secure, dedicated internet communication path that exists between only two entities.

3. How Is This Possible Now?

- Washington Gov. Jay Inslee supported legislation based on the results of a Pacific North West (PNW) demonstration project conducted by the Bonneville Power Administration (BPA). The legislation requires open standard (CTA 2045) ports on all water heaters entering the state of Washington. OEM shipments of CTA 2045 compliant water heaters will start in January of 2021.

- One major water heater OEM has started shipping ported HPWS to Maine, others will have the ability to deliver to Maine in 2021.

4. How Does Alonetics' "Infrastructure as a Service" Model Achieve Economy of Scale in Maine?

- **Speed** - Much greater demand response/load flexibility resource achieved faster; higher customer participation
  - Variant of opt-out approach
  - Opt-in programs yield only 30% to 50% after ten years

- **Cost -** Lower cost to utilities (or Efficiency Maine) because economies of scale apply in:
  - UCM cost
  - Back-office operations
  - Open standards and UCM modularity avoid stranded assets and are "future proof"

- **Neutrality –** As an IaaS, Alonetics is agnostic:
  - OEM device link is not disconnected by utility connection to device
  - Utility or Efficiency Maine relationship to customer is not diminished by OEM marketing or implementation
  - Utility or Efficiency Maine can use the DERMS[8] platform of its choice

- **Equity -** Open standards are Inclusive and address equity goals
  - Inclusion of low-income customers also improves demand response/load flexibility resource and penetration

[8] DERMS = Distributed Energy Resource Management System. This the general term for an operating system that can control any type of small energy resource on the distribution system—a battery, a solar PV panel, traditional demand response (DR) loads like water heater, thermostats, etc. There are more than a dozen DERMS providers and since EISA (2007) and ARRA (2009) which funded EISA objectives, this is a rapidly evolving area of development in the electric industry.

- **Innovation**
  - Multiple utilities using Alonetics' approach will create a strong, coordinated message to OEMs (and other states) regarding connectivity changes needed in the devices they manufacture (e.g., water heaters, heat pumps, etc.)
- **Funding:**
  - Alonetics utilizes a project finance model where Efficiency Maine funds a levelized cost of service and avoids up-front costs related to the hardware component (funding of the UCM's) of the IaaS model.
  - Efficiency Maine to fund set up and integration costs for software development specific to Maine.

Additional information, if interested:

- **Report on PNW Demonstration of CTA-2045 water heaters [BPA-funded]**
  (A 287-page report, but the Executive Summary is only 7 pages)
- **Economic Model to Justify CTA-2045 on all electric water heaters**
- **Useful OPUC links regarding storage as marginal resource**
  - OPUC Decision on IRP Planning 26Mar2020
  - Decision Summary26Mar2020
  - OPUC staff framework for IRP planning18Nov2020
- **Lance Ahearn CV** (attached as separate document)
- **Conrad Eustis CV** (attached as separate document)

Lance W. Ahearn
PO Box 300
Lincolnville, ME 04849
414 350 0191

Mr. Ahearn has over 30 years of executive management experience in the engineering, environmental and energy fields. He has served as the leader of companies focused energy efficiency and optimization, energy supply, energy trading, energy technology, environmental consulting-engineering and real estate development. His responsibilities have included the purchase, sale, successful start-up and operation of numerous businesses.

CEO of Alea Management (2008 – present)

*Project under current developmen*t:

Alonetics, LLC Co-Founder, Principal Alonetics was incorporated in 2020 to enable the emerging transformation of the electric industry by removing a major barrier; namely, the need to establish, at scale, low cost digital connectivity among all the relevant parties without claiming or interfering with the value propositions that exist, or might be created, by a utility or manufacturer.

Previous projects include:

Serving as an advisor to a Fortune 1000 OEM in the development of a grid interactive water heater as a grid scale solution for load flexibility.

Working with a major Mid-Western Investor Owned Utility in developing a next generation, enterprise-class data center as a potential energy asset and (in the context of the expansion of cloud computing) the nexus between the electric utility and telecommunications/data processing industries.

Partnership with National Trigeneration CHP Corporation, Mr. Ahearn served as **CEO of Source Energy, LTD (2008 – 2011)** the principal subsidiary of NTCC that was charged with building the co-generation business. Work included staffing an executive suite in Saudi Arabia which was charged with the execution of Source Energy's development strategy. In addition to other large scale co-

generation projects, Source Energy was awarded a major contract for the supply of energy infrastructure for the Jeddah Industrial City.

As the CEO of Trigen (2005-2007) Mr. Ahearn partnered with the Harvard Endowment Fund and Denham Capital Partners to pursue the roll up of the District Energy business in the United States. The eventual portfolio became a fully integrated, national platform operating in eleven cities, serving 250 million square feet and generating 3.5 GW of thermal energy and 250 MW of electrical power. Trigen was sold to Veolia, the largest operator of District Energy systems outside of the U.S., for $788 million in December of 2007, doubling investors' money in just over 2 years.

As an independent consultant, 2000-2004 Mr. Ahearn served as an advisor to a Midwestern Investor Owned Utility in the their development of renewable energy projects and technologies. In addition, he served as an advisor to Johnson Controls (JCI) in the development of their energy strategy.

As President and CEO of Heartland Development Corporation (1990-1999), the unregulated arm of **Wisconsin Power and Light Holding Company**, **Mr. Ahearn served as Executive Chairman of each of the portfolio companies.** In this capacity, he was responsible for the restructuring and hands on development of the following: 1) *Heartland Energy* - A Greenfield start up, this company was the first Utility Affiliate in the United States to obtain a Federal Regulatory Energy Commission (FERC) license to trade electricity. Through a joint venture with Cargill, the company became the largest physical trader of the electric commodity in the country. 2) *RMT* (Residuals Management Technology) – A 750 person environmental consulting and engineering business, the company served energy intensive industries. 3) *Heartland Properties* - A Greenfield start up, the company developed a $250 million affordable housing portfolio.

As an executive with Bucyrus International (1973-1989), a Fortune 500 Company, Mr. Ahearn served as Managing Director of Minserco, the company's engineering and construction subsidiary, Managing Director of Bucyrus Africa, the company's largest subsidiary and was a member the management buyout team that took the company private in 1988.

Mr. Ahearn earned a BA from Hartwick College in 1971 and undertook graduate studies in mathematics and sciences at the State University of New York in 1972.
Mr. Ahearn has served as Chairman of the Board of ThermoChem Recovery International (a gasifier technology producer), a board member of STS (Soils Testing Service, a 500 person Civil and Environmental Consulting and Engineering Company), a board member of Orion Lighting and Energy Services (Lighting Manufacturer) and as Chairman of the Technology Transfer Committee of the Cardio Vascular Advisory Board of the Medical College of Wisconsin.
He has also served as a board member and Treasurer of Points North Institute and on the Board of Trustees of Penn Bay Hospital, Rockland, Maine.

Conrad Eustis
Principal, Reascend LLC
Cofounder, Alonetics LLC
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POSITIONS & PROFESSIONAL EXPERIENCE

- Cofounder and Principal Alonetics LLC, an entity founded 2020 dedicated to providing communication services to accelerate control of flexible loads.
- Founder and Principal Reascend LLC, an entity founded 2019 dedicated to advancing sustainability www.reascend.llc
- Director Retail Technology Strategy Portland General Electric Company (PGE) 1986 to 2019
- Principal Investigator in 3-year field demonstration of 600 Smart Water heaters funded by BPA's TI program. Project recognized by a 2019 PLMA Award.
- Sponsored and supervised research projects on battery and thermal storage at Portland State University and Harvey Mudd College
- 2009 to 2012 Adjunct Professor Portland State University teaching: *The Smart Grid and Sustainable Communities*
- Technical Director for PGE's contribution to the Pacific NW Smart Grid Demo Project (DOE-funded ARRA Demo), Prime Contractor Battelle Memorial Institute, 2009 to 2014
- Active Participant in EPRI's Demand Response Appliance Interface Project 2009 to 2012.
- Major contributor, in multiple forums between 2007 to 2016 to create ANSI/CTA-2045, an open standard that enables low-cost communications to mass-market, larger energy consuming devices/appliances.
- Member 2008 to 2012 NIST's Smart Grid Interoperability Panel, a NIST working created to advance digital standards in the Smart Grid as required in EISA 2007 Public Law 110-140
- Technical Director in PGE's AMI (smart meter) project 2007 through 2010.
- Provided general oversight and created most requirements in PGE's 2006 AMI RFP.
- Active investigator in Pacific NW Gridwise™ Testbed Demonstration Project 2005 to 2007
- Created the business case for PGE's $150 million advanced metering system. Direct contributions to the business case included: technology assessment, risks, the economic model, the deployment plan, and the assessment of recurring operations costs and impact assessment on more than 20 departments at PGE during 2004 and 2005.
- Project Manager (2004 to 1993) for over 15 customer-focused, AMI and Demand Response technology pilots and field demonstrations.
- Provided detailed specifications to vendor for in-home energy monitor, used in conjunction with network meters, to facilitate home energy and load management, 2002.

- Author and principal consultant to Oregon's Direct Access Residential Portfolio Group regarding development of a Market-Based Rate design required by SB1149. Was the primary author to technical appendix of this document; ultimately approved by the OPUC in Order 2001 01-337.
- One of two primary contributors to PGE'S Retail Business Strategy, 1999
- Created broadband-to-the-home business case approved by CEO for initial steps in implementation, 1998
- Consultant to FirstPoint Utility Solutions in 1997 and 1998, an unregulated subsidiary that provides metering and meter data management services in California's emerging deregulated electric markets. Made major technical contributions to standards via the California direct access working groups.
- Designer and Project Manager (1995) for PGE's load control programs Heat Smart and Wake Warm.
- As Project Manager, obtained (1992) $240,000 grant from BPA and US DOE under the RSEP program together with co-funding from Tacoma PUD, EWEB, and PGE of $315,000. Project retrofitted residential homes with either heat pumps or standard weatherization methods in a fully sub-metered implementation. The project analyzed and contrasted the cost effectiveness of these measures.
- 1990: Created Demand Side Resource Plan for PGE's first Integrated Resource Plan.
- US Navy held various positions (1977 to 1980) as Division Officer in Electrical, Radiological Controls, and Communications Officer on board the nuclear submarine USS Skate. Qualified as Engineering Office of Watch and Office of the Deck

PUBLICATIONS

- *CTA-2045 Water Heater Demonstration Report including A Business Case for CTA-2045 Market Transformation*, Eustis, Koch, & Wickes, November, 2019
- *A Dual-Heat-Pump Residential Heating System for Shaping Electric Utility Load*, March 15, 2018; Barrett, Eustis, & Bass, published IEEE Power and Energy Technology Systems Journal Vol. 5, Issue 5
- 2014: Invented and presented word Alonetic to define grid-supportive mass-market appliances and generation devices
- Co-author: *Barriers to Responsive Appliances at Scale*, Cazalet, Eustis, Sastry, Smith, Levy, Kotting, and Wacks, published by the SGIP H2G working September 20, 2013
- Testimony to House Science & Technology Committee on Technological Innovation, July 1, 2010. [Included recommendation for "socket" [CTA-2045] as means to advance low cost DR]
- Primary author Home-to-Grid White Paper: *Free Market Choice for Appliance Physical Layer Communications*, June 4, 2010 for NIST's SGIP Home-to-Grid Working group
- *Appliance Interface for Grid Response*; Nov 7, 2007; Eustis, Horst, and Hammerstrom, award winning paper submitted to Grid-Interop 2007

- *Universal Identifiers: A Supplement to the Retail Settlement and Information Flow Workshop Report*; October 15, 1997; Co Authors Chris King Cell Net Data Systems, Lorenzo Kristov, California Energy Commission
- Neighborhood Vehicle Concept; won the Special Jury Award in *The Electric Vehicle and the American Community: A National Planning and Design Competition*, May 11, 1993; Co-Contributors: Ethan Seltzer PhD, Bill Rabiega PhD, Dennis Biasi, Brian Hoover, Tom LaBerge, & Geoff Hoover.
- PhD Thesis: *Industrial cogeneration: The implications of alternative policies on energy conservation, pollutant reduction, and savings to consumers of electricity.* CMU 1985

PATENTS

9,883,259	Synchronized metrology in power generation and distribution networks
9,677,809	Plural heat pump and thermal storage system for facilitating power shaping services on the electrical power grid at consumer premises

EDUCATION

- PhD in Engineering & Public Policy Carnegie-Mellon University 1985
- MS Mechanical Engineering Carnegie-Mellon University (CMU) 1983
- US Navy Nuclear Power Training 1975-1976; Qualified Engineering Officer of the Watch; Communications Officer, Officer of Deck, and shutdown Duty Officer
- AB Mathematics Brown University 1974