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Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor
Harrisburg, PA 17120

Re: Petition of PPL Electric Utilities Corporation for Approval of its Act 129 Phase 111 Energy Efficiency and Conservation Plan; Docket No, M-2015-2515642

Dear Secretary Chiavetta:

Please find attached for filing with the Pennsylvania Public Utility Commission ("PUC" or "Commission") the **Comments of Nest Labs, Inc., to PPL's Act 129 Phase III Energy Efficiency and Conservation Plan** ("Nest"), in the above-referenced matter.

This document was filed electronically with the Commission on this date. All parties are being served a copy of this document in accordance with the enclosed Certificate of Service.

Please contact me if you have any questions concerning this filing.

Sincerely,

TUCKER ARENSBERG, PC

By: _____
Scott H. DeBroff, Esquire

SHD/ppt
Enclosure
cc: Administrative Law Judge Angela T. Jones (via E-mail and First-Class Mail)
Administrative Law Judge Darlene Heep (via E-mail and First-Class Mail)
Certificate of Service

HBGDB:155014-1 030988-173437

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BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Petition of PPL Electric Utilities Corporation	:	
For Approval of its Act 129 Phase III Energy	:	M-2015-2515642
Efficiency and Conservation Plan	:	

COMMENTS OF NEST LABS ON PPL'S ACT 129 PHASE III ENERGY EFFICIENCY AND CONSERVATION PLAN

Introduction

Nest Labs ("Nest Labs" or "Nest") is commenting herein to the Petition of PPL Electric Utilities Corporation ("PPL") for Approval of its Act 129 Phase II Energy Efficiency and Conservation Plan in Docket No. M-2015-2515642.

Summary of Request

Nest is generally supportive of the direction that PPL has taken in its Act 129 Implementation Plan. However, Nest believes that the plan could be improved to benefit PPL and its customers. Nest will detail several best practices from other leading utilities' energy efficiency programs that have demonstrated the proven value of smart thermostats. Nest believes that PPL should fully embrace the use of a $100 rebate incentive at retail outlets to facilitate the deployment of smart thermostats throughout PPL's service territory. Additionally, Nest believes that PPL should distribute smart thermostats to PPL's low-income customers at no cost to those customers. Finally, Nest outlines potential pilot studies that should be conducted to demonstrate how PPL can effectively leverage its installed base of smart thermostats to achieve a portion of its demand response targets and to learn the most effective outreach strategies for deploying the technology to low-income customers.

Procedural History

Act 129 of 2008 ("the Act" or "Act 129") created the Energy Efficiency & Conservation ("EE&C") Program, codified in the Pennsylvania Public Utility Code at Sections 2806.1 and 2806.2, 66 Pa. C.S. §§ 2806.1 and 2806.2, which requires an Electric Distribution Company with at least 100,000 customers to adopt an EE&C Plan, approved by the Commission, to reduce electric consumption by at least one percent (1%) of its expected consumption for June 1, 2009 through May 31, 2010 with increasing reductions in out-years. By November 30, 2013, and every five years thereafter, the Commission was to assess the cost-effectiveness of the EE&C Program and set additional incremental reductions in electric consumption if the EE&C Program's benefits exceed its costs.

At its June 11, 2015 Public Meeting, the Commission adopted its Phase III Implementation Order. With its Phase III Final Implementation Order, the Commission adopted additional reductions in electricity consumption and peak demand for the period of June 1, 2016 through May 31, 2021. On November 30, 2015, the EDCs each filed their Phase III Implementation Plans with the Commission.

Nest Labs herein responds to PPL's Implementation Plan ("PPL Plan" or "Plan").

Overview of Nest Labs

Founded in 2010, Nest Labs is dedicated to reinventing home products like the thermostat and smoke alarm to provide customers with simple, beautiful and thoughtful hardware, software and services helping them reduce energy consumption and keeping families comfortable and safe. Today, Nest products are sold in the United States, Canada, the United Kingdom, Ireland, France, Belgium, and the Netherlands, and are installed in more than 120 countries. Nest is a wholly-owned subsidiary of Google, Inc. and is based in Palo Alto, California.

Nest manufactures the Nest Learning Thermostat, a smart thermostat equipped with sensors, Wi-Fi capability, and processors, to help customers consume less energy: it learns their preferences, adjusts the temperature when the house is empty, and automatically lowers air-conditioning runtime when humidity conditions permit, helping people lower their energy use without sacrificing comfort. Nest is designed to enable "Do It Yourself" installation, and to date the majority of Nest Learning Thermostat customers have done the installation themselves,

most in under 30 minutes.[1] Nest also provides service offerings for utilities to help address load management needs similar to those required under Act 129.

Nest's interest in this proceeding is that smart thermostats such as the Nest Learning Thermostat could be, and in our view should be, a measure used by utilities to achieve their goals in Phase III of Act 129.

Questions about these comments can be directed to:

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Nest Supports PPL's Use of Smart Thermostats as an Efficiency Measure and Recommends a Demand Response and Low-Income Pilot

PPL supports the inclusion of smart thermostats in its energy efficiency programs. In PPL's Implementation Plan, smart thermostats are included in Table 24 as an Energy Efficient Home Program Eligible Measure (page 49) and in PPL's discussion of Home Energy Education Programs (page 58). PPL also discusses potential pilot studies around the use of smart thermostats (page 35). Nest supports the inclusion of smart thermostats in all of these programs and welcomes PPL's recognition of the important energy savings benefits of these devices.

Overview of Smart Thermostat Opportunity

Residential Thermostat Options Are Rapidly Evolving

Traditional manual thermostats allow the home occupants to simply turn the heating or cooling up or down. The result is that many residences "set it and forget it" resulting in unnecessary heating and cooling, and correspondingly higher energy bills.

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[1] *Statistics derived from Nest customer surveys.*

Traditional programmable thermostats (PTs) allow customers to set up a pre-programmed schedule for raising or lowering the temperature in the home. This enables occupants to ensure that the heating or cooling is not on high when they are away at work, for example.

While the ability to pre-program thermostats can be a convenience feature and save energy for some households, there are challenges and difficulties with PTs. For many people they are not intuitive and hard to program; therefore some people never establish a correct schedule. In that case, they may be used like non-programmable manual thermostats with people turning them up or down ad hoc. Even if PTs are programmed initially, they are often overridden or placed on "hold" at some point in the future and then not reprogrammed. This override could happen for any number of reasons; a house full of guests, unusual weather, daylight savings time, change in season, and may erode the energy savings of PTs. The U.S. Environmental Protection Agency originally had an ENERGY STAR specification for PTs but suspended it in 2009 as a result of continuing questions concerning the actual energy savings and environmental benefits achieved by PTs under the specification.[2]

A new category of thermostats, known as "smart thermostats" (STs), have a number of advantages over traditional PTs when it comes to energy efficiency assurance and persistence, demand response capabilities and ease of use. Smart thermostats can learn a household's habits and preferences and create a customized schedule without programming. Through motion sensors and/or geo-fencing technology, STs recognize when occupants have left the home and automatically adjust temperature settings. They can also connect to the Internet, enabling them to receive software updates, be controlled remotely by the user, and receive signals from a utility, energy aggregator or other home energy management system. Nest Labs proposed a definition for the smart thermostat category in November 2015 as part of the Illinois Technical Resource Manual process, which can be referenced in Appendix A.

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[2] See: https://www.energystar.gov/index.cfm?c=archives.thermostats_spec

Savings Potential of Smart Thermostats

Results of the Pennsylvania EE Potential Study

The Statewide Evaluator's ("SWE") Energy Efficiency Potential Study[3] ("EE Potential Study") acknowledges the substantial opportunity to deliver energy savings to Pennsylvania customers through improving the performance of HVAC equipment. Indeed, HVAC equipment has the second greatest energy efficiency potential behind lighting during Phase III and will become the greatest source of energy efficiency in Phase IV as the efficiency potential of lighting is codified through the Energy Independence and Security Act. Further, the EE Potential Study recognizes the difference between programmable thermostats and smart thermostats, and the SWE submitted data to the Commission demonstrating the benefits of utilizing STs for energy efficiency in homes, as compared to PTs. The SWE submitted data for both attached and detached single-family homes and multi-family homes. The SWE further segmented the data between low-income homes and non-low-income homes, between homes with electric heat and air conditioning, and between those with a non-electric heating fuel coupled with air conditioning. In every segment, the SWE showed that smart thermostats offered superior efficiency savings (see table below).

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[3] State Wide Evaluator Team, Energy Efficiency Potential Study for Pennsylvania, Final Report, February, 2015. See: http://www.puc.state.pa.us/Electric/pdf/Act129/SWE_EE_Potential_Study-No_Appendices.pdf

Comparison of Efficiency Savings -- Smart Thermostats and Programmable Thermostats				
			Percentage of Annual Electricity Savings	
Home Type	Income Classification	Heat Source	Programmable Thermostats	Smart Thermostats
Single Family Detached	Low	Electricity	3.3%	10.8%
Single Family Detached	Low	Other	2.0%	13.9%
Single Family Detached	Non-Low	Electricity	3.3%	10.8%
Single Family Detached	Non-Low	Other	2.0%	13.9%
Single Family Attached	Low	Electricity	3.2%	10.9%
Single Family Attached	Low	Other	2.0%	14.0%
Single Family Attached	Non-Low	Electricity	3.2%	10.9%
Single Family Attached	Non-Low	Other	2.0%	14.0%
Multi-family	Low	Electricity	2.8%	12.5%
Multi-family	Low	Other	2.0%	14.6%
Multi-family	Non-Low	Electricity	2.8%	12.5%
Multi-family	Non-Low	Other	2.0%	14.6%

Source: 2015 SWE Potential Study, Appendix D, Measure Appumptions - PPL.

Similar to the SWE's energy efficiency potential study for Pennsylvania, Illinois recently completed an energy efficiency potential study[4] that identified HVAC improvements as the second greatest source of residential electric efficiency potential (after lighting) and the greatest source of gas efficiency potential. In response, Commonwealth Edison (ComEd) has launched a campaign to install one million smart thermostats over the next five years. ComEd provides service to approximately 3.8 million customers across Northern Illinois, or 70 percent of the state's population.[5] While ComEd is a larger EDC than PPL, ComEd's goal is to provide the benefits of smart thermostats to over 25% of its customer base over the next five years. Nest *respectfully submits that PPL should strive in its Plan to achieve a similar goal.*

Recent Studies Show that Smart Thermostats Can Save 10 to 15% of HVAC Energy

Three recent independent studies have found that Nest thermostats can save residential customers significant energy and money on their heating and cooling bills: two studies in Indiana and another study in Oregon which focused solely on heating savings from heat pumps.

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[4] ComEd Energy Efficiency Potential Study Report 2013-2018. http://ilsagfiles.org/SAG_files/Potential_Studies/ComEd/ComEd_EE_Potential_Study_Report_2013-2018_August_2013_ICF_Intl.pdf

[5] See: https://www.comed.com/about-us/company-information/Pages/profile.aspx

In addition, Nest completed an assessment on thermostat performance nationwide. Each of these studies has the benefit of being based on actual pre/post billing data, rather than modeled from theoretical baseline set point temperatures or usage patterns. The studies have consistently found that Nest thermostats saved residential customers on average approximately 10%-15% of heating and cooling energy use.

Indiana Studies

Vectren – The Vectren study,[6] designed, funded and overseen by Vectren Energy, was a pilot project to assess the energy savings of Nest Learning Thermostats. In the fall of 2013, Vectren hired a contractor to install Nest Learning Thermostats in 300 homes. The main findings from a third party evaluation included:

- Nest homes had average electricity savings of 429 kWh/yr, equal to 13.9% (±5%) of cooling use; and
- Homes that received a Nest Learning Thermostat had average natural gas savings of 69 therms/year, equal to 12.5% (±1.5%) of the heating use.

NIPSCO – NIPSCO commissioned the Cadmus group to study the impact of Nest thermostats in 400 randomly selected dual fuel households.[7] The study, published in January 2015, found these customers saved 16% of their electric cooling load and 13% of their gas heating load.

These two study results were from Indiana, which has similar climate and demographic characteristics as many parts of Pennsylvania.[8]

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6 Aarish, C., M. Perussi, A. Rietz, and D. Korn. Evaluation of the 2013–2014 Programmable and Smart Thermostat Program. Prepared by Cadmus for Vectren Corporation. 2015.

7 Evaluation of the 2013-2014 Programmable and Smart Thermostat Program. https://myweb.in.gov/IURC/eds/Modules/Ecms/Cases/Docketed_Cases/ViewDocument.aspx?DocID=0900b631801c5039

8 Data from existing Nest thermostats in both Indiana and Pennsylvania show that average annual cooling hours in IN were 724 versus 687 in PA. Similarly, average annual heating hours in IN were 956 versus 940 in PA.

Oregon Study

The Oregon study[9] *was a pilot project designed, funded, and overseen by the non-profit Energy* Trust of Oregon. In the fall of 2013, the Energy Trust had a contractor install Nest Learning Thermostats in 185 homes heated by heat pumps. The Energy Trust hired an independent firm to analyze changes in energy bills, and also survey participants about their experiences. The main findings from the energy billing data analysis and final customer survey included:

- Customers experienced an average 12% reduction in electric heating use (781 kWh/year per home) relative to their pre-Nest usage;
- 89% of customers were satisfied with their Nest Learning Thermostat; and
- 66% of participants reported feeling more comfortable after the Nest Learning Thermostat was installed

The report cited the Nest Learning Thermostat's "Heat Pump Balance" [10] feature as a key element in providing the savings. The 12% heating savings for heat pumps in Oregon is especially noteworthy given that programmable thermostats are typically not recommended for heat pumps.

National Study

In May 2013, Nest acquired MyEnergy – a company that helps customers track and analyze their utility usage and bills. The tools Nest acquired from MyEnergy enable customers to gather all of their utility usage and bills in one place, helping them monitor usage and costs month over month, year over year, and compare performance to other homes in their neighborhood. Nest also used these insights to help analyze energy usage patterns. By comparing energy use before *and after Nest Learning Thermostat installation, Nest was able to evaluate the energy savings* achieved in a sample of customers across 41 states.

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9 Apex Analytics LLC, "Energy Trust of Oregon Nest Learning Thermostat Heat Pump Control Pilot Evaluation", October 10, 2014 accessed from http://energytrust.org/library/reports/Nest_Pilot_Study_Evaluation_wSR.pdf

10 "What is Heat Pump Balance?" https://nest.com/support/article/What-is-Heat-Pump-Balance

In this Nest financed study,[11] customers saved an average of 56 therms per year, equal to 9.6% of pre-Nest (gas) heating use. Electricity savings averaged 585 kWh per year, equal to a 17.5% reduction from pre-Nest HVAC usage.

These studies reinforce the findings of the Pennsylvania EE Potential Study—significant savings *are available to Pennsylvania residential electric customers through increased deployment of* smart thermostats.

PP&L Should Clarify the Use of Smart Thermostats in its Programs

PPL's Plan includes five programs for residential customers (exclusive of two incremental programs for the low-income sector): 1) Appliance Recycling, 2) Efficient Lighting, 3) Energy Efficient Homes, 4) Student Energy Efficient Education, and 5) Home Energy Education. Nest concurs with PPL that the Energy Efficient Home program, specifically the Energy Efficiency Equipment sub-program, should be the primary avenue to encourage the adoption of smart thermostats in PPL's service territory.

As described above, Smart Thermostats offer significant residential energy efficiency benefits. The SWE estimates that the HVAC systems and components offer the second greatest efficiency potential (behind lighting) for a home.[12] PPL does not specify how it will promote deployment of smart thermostats for its residential customers. Nest respectfully submits that PPL should leverage best practices from other leading utilities by offering a retail rebate for smart thermostats. Nest further submits that PPL should concretize its approach by providing the details of such a rebate program in its Plan.

Smart Thermostat Rebate

Nest respectfully suggests that PPL provide, through the Energy Efficient Equipment subprogram, a $100 incentive for the purchase of a smart thermostat. This $100 rebate level is derived from the experience and best practices of other regional utilities such as

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11 Energy Savings from the Nest Learning Thermostat: Energy Bill Analysis Results. https://nest.com/downloads/press/documents/energy-savings-white-paper.pdf

12 See: State Wide Evaluator Team, Energy Efficiency Potential Study for Pennsylvania, Final Report, February, 2015, Figure 3.3, page 34.

Commonwealth Edison (IL), and Vectren (OH and IN). The rebate should be provided upon proof of purchase, which would make it widely accessible to and easily obtainable by consumers, while enabling PPL to verify that the attendant energy savings will be forthcoming.

Nest respectfully suggests that this rebate incentive remain in effect for the first three years of Phase III. Once year 3 is underway, PPL should evaluate the effectiveness of the program and the total progress made toward PPL's five-year efficiency goals. If warranted, PPL could then propose changes to the rebate program based on its own experience over the initial three-year period.

Residential New Construction Program

The Residential New Construction Program should also include incentives for smart thermostat deployment. Given thermostats' relatively long measure life, it is important to embed the technology into homes at the outset. Further, builders provide a concentrated group of stakeholders for PPL to influence that will impact the energy performance of thousands of homes. PPL's Plan states that it will "Promote the construction of energy efficient homes" and "Educate construction industry professional and other trade allies about the benefits of energy efficient homes."[13] While details about included products and services in this section of the plan await further development, the Plan should remove unnecessary uncertainty by stating expressly that smart thermostats are part of the Program.

Low-Income (WRAP) Program

Smart thermostats should also be incorporated into PPL's Low-Income (WRAP) program. Specifically, PPL should provide direct installation of this measure to reduce barriers for customers of limited means from implementing the technology. Doing so will broaden the base of PPL customers that can benefit from the substantial energy savings delivered by smart thermostats.

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[13] PPL Plan at Page 46.

According to PPL, it is spending approximately $0.62 per kWh reduced or $620 per MWh reduced in the low-income sector.[14] Nest estimates conservatively that a smart thermostat would achieve first year energy savings of approximately 295 kWh per unit installed in the PPL service territory.[15] Over the 11 year life of a smart thermostat measure,[16] then, PPL should realize energy savings of approximately 3,245 kWh reduced per unit installed or 3.245 MWh of energy reduced per unit installed. If PPL fully funded a smart thermostat at $250, it would yield a price of approximately $77 per MWh reduced – a fraction of the $620 per MWh reduced across the low-income portfolio.

For Comparison: ComEd's Million Thermostat Goal

On October 9, 2015, the Illinois Commerce Commission announced a smart thermostat initiative resulting from a public/private partnership between ComEd (the electric utility in Northern Illinois), three gas companies serving customers across the electric service territory, an environmental group, and a consumer watchdog organization.[17] Working together, the coalition set a goal to install one million smart thermostats over the next five years, representing nearly one-third of ComEd's residential customers. The initiative makes available $120 in energy efficiency rebates to customers who purchase either a Nest Learning Thermostat or an ecobee3 Wi-Fi Smart Thermostat online or at retail. The majority of the rebate, $100, is funded by the electric utility. The remaining $20 is funded by the respective gas utility. In addition, ComEd has a demand response program for which these smart thermostats are eligible, which provides an additional $40 per enrolled thermostat each year of participation. In sum, these rebates reduce the cost of a Nest thermostat by 64%, greatly expanding the technology's affordability to ComEd's residential customer base.

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14 PPL Plan, page 10.

15 The SWE estimates kWh savings from smart thermostats to be on average approximately 85% in the PPL service territory of what they are in the PECO service territory. PECO estimated that its aggregation of low income customers would achieve 346.6 kWh of energy reduction from the low income sector for each programmable thermostat installed. Nest conservatively assumed that none of these low-income residents are wi-fi connected and that it would achieve 85% of the results of the PECO portfolio, consistent with the SWE projections.

16 See: State Wide Evaluator Team, Energy Efficiency Potential Study for Pennsylvania, Final Report, February, 2015, Appendix D, page D-144.

17 See: https://www.icc.illinois.gov/press/ and click on the 10-9-2015 prOWess release.

Nest is not suggesting that PPL should set its commitment to smart thermostats at one million installations. However, this program provides an example of the savings that a state with comparable climate has determined are achievable through smart thermostat deployment. ComEd has more than 3 million residential customers and it has set a goal of installing these thermostats on almost one-third of its customers. PPL has approximately 1.2 million residential customers.[18] A similar penetration rate for PPL would yield approximately 400,000 customers.

The PPL Demand Response Proposal Should be Expanded to Residential Customers

PPL has a demand response obligation to reduce its peak load by 92 MW. To meet this obligation, PPL has proposed a load curtailment program for non-residential customers.

PPL states that its Plan meets the requirements of Act 129 and the Commission's Implementation Order. Specifically, PPL asserts that the Plan "offers a reasonable mix of programs for all customers"[19] yet does not offer a demand response plan for residential customers. This omission is understandable. Residential demand response goals have historically been achieved through direct load control programs that can be costly to implement because, among other reasons, they require a technician to visit a customer's home.

However, smart thermostats provide the opportunity to access residential DR at low cost relative to a direct load control program. Thousands of customers across the PPL service territory have already installed smart thermostats in their homes. With an effective customer incentive (similar to what has been proposed by PECO in its plan) smart thermostat companies like Nest could offer the incentive to their existing customers within PPL's service area (at no incremental installation cost), thereby providing PPL with a robust residential demand response program. Additionally, if the energy efficiency rebates discussed earlier are offered, then these newly installed smart thermostats could also be enrolled in the program, thereby deepening the demand response resource for PPL.

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18 See: Pennsylvania Electric Shopping Statistics (10/1/2015), Office of Consumer Advocate at http://www.oca.state.pa.us/Industry/Electric/elecstats/Electric%20Shopping%20Statistics%20Oct2015.pdf.

19 PPL Plan, Page 6.

PPL has set aside $3 million of its Phase III budget for residential pilot programs. Nest respectfully submits that PPL should establish a pilot program to gain (and ultimately share with the Commission and the SWE) valuable demand response information about smart, wi-fi enabled and internet-connected thermostats while expanding the demand response resource for PPL.

A Pilot Should Study Low-Income Smart Thermostat Outreach Strategies

PPL has allocated 5% of its Phase III budget to "Research and Development". Nest respectfully suggests that PPL run a pilot program to assess the most effective outreach strategies for deploying smart thermostats to low-income customers. There have been dozens of deployments of smart thermostat programs nationwide using retail channels. However, to date, there have not been rigorous studies of the best ways to encourage the adoption of smart thermostats in low-income households. Gaining this understanding is important. As noted in the Pennsylvania EE Potential Study, low-income customers represent more than 25% of the state's achievable residential energy efficiency potential.[20] As previously described, in Phase IV, HVAC equipment will surpass lighting as the most significant potential source of energy efficiency. Consequently, clarifying the most effective pathways to deliver smart thermostats to low-income customers should be a critical learning objective in Phase III.

Conclusion

PPL is to be applauded for its recognition of the energy efficiency value of smart thermostats in its Implementation Plan. Smart thermostats have been shown to save between 10 and 15% of heating and cooling in multiple independent studies.

For the reasons stated herein, Nest respectfully suggests that the Commission require PPL to:
1) Specifically identify a long-term $100 rebate incentive for customers willing to invest in smart thermostats;
2) Incorporate the distribution of smart thermostats to its low-income customers at no cost to those customers; and

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[20] State Wide Evaluator Team, Energy Efficiency Potential Study for Pennsylvania, Final Report, February, 2015, Table 3.3, page 33.

3) Engage smart thermostat manufacturers in discussions about pilot programs similar to those outlined above.

Respectfully submitted,

Dated: **January 4, 2015**

By: _____

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COUNSEL FOR NEST LABS, INC.

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Appendix A: Smart Thermostat Definition

This measure characterizes the household heating and cooling energy savings from the installation of a smart thermostat(s). These thermostats reduce energy consumption using a combination of features described below.

Smart Thermostat: A device that controls heating, ventilation, and air-conditioning (HVAC) equipment to regulate the temperature of the room or space in which it is installed, and has the ability to communicate with sources external to the HVAC system.

For connection, the device may rely on a home area network (e.g. Wi-Fi) and an internet connection that is independent of the Smart Thermostat. A smart thermostat has the functionality to make automatic adjustment decisions regarding heating and cooling, using the following functions:

a. Two way communication between the thermostat and a utility, energy aggregator, or other home energy management service.
b. Automatic scheduling where the thermostat or the connected service automatically creates a configurable schedule of temperature setpoints and automatic variations to that schedule to better match HVAC system runtimes to meet occupant comfort needs. These schedules must be established through user interaction where the thermostat learns user temperature setting preferences over time, and can be changed manually at the device or remotely through a web or mobile app.
c. Automatic variations to that schedule driven by local sensors and software algorithms, and/or through connectivity to an internet software service. Data triggers to automatic schedule changes might include, for example: occupancy/activity detection, arrival & departure of conditioned spaces, historical and population energy usage trends, weather data and forecasts.

This class of products and services are relatively new, diverse, and rapidly changing.

Generally, the savings expected for this measure aren't yet established at the level of individual features, but rather at the system level and how it performs overall. This measure treats heating

and cooling savings independently. Note that it is a very active area of ongoing study to better map features to savings value, and establish standards of performance measurement based on field data so that a standard of efficiency can be developed. That work is not yet complete but does inform the treatment of some aspects of this characterization and recommendations. Energy savings are applicable at the household level; all thermostats controlling household heat and cooling should be smart thermostats. Multiple smart thermostats per home does not accrue additional savings.

This measure was developed to be applicable to the following program types: time of sale, new construction, and direct install. If applied to other program types, the measure savings should be verified.

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served a true copy of the foregoing document upon the following parties to this proceeding in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by participant).

VIA E-MAIL & FIRST-CLASS MAIL

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January 4, 2016