
# NV Energy Nevada Dynamic Pricing Trial Interim Report – Volume 1

## Nevada Dynamic Pricing Trial marketed as the NV Energize Choose When You Use Program

An interim evaluation of the pilots design, implementation and evaluation of Year 1 of NV Energy's Choose When You Use Program

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## *Definition of Terms:*

This table provides an alphabetical list of acronyms used in this document.

*Table 1:* ***Definition of Terms***

| Acronym | Description |
|---|---|
| ACP | Advanced Customer Programs |
| ADM | Advanced Device Management |
| ADR | Automated Demand Response |
| AMI | Advanced Metering Infrastructure |
| ANSI | American National Standards Institute |
| API | Application Programming Interface |
| ARRA | American Recovery and Reinvestment Act |
| ASD | Advanced Service Delivery |
| BCCM | Baseline Change Control Meeting |
| BCWS | Budgeted Cost of Work Scheduled |
| BDG | Boice Dunham Group |
| BIOT | Business and IT Oversight Team |
| BIS | Business Intelligence System |
| BRD | Business Requirements Document |
| C&I | Commercial & Industrial |
| CBSP | Consumer Behavior Study Plan |
| CCB | Change Control Board |
| CCP | Consumer Confidence Plan |
| CEO | Chief Executive Officer |
| CFO | Chief Financial Officer |
| CIP | Critical Infrastructure Protection |
| CIS | Customer Information System |
| CMP | Configuration Management Plan |
| CPP | Critical Peak Pricing |
| D-1 | Single Family Residential Customer Class (NV Energy North) |
| DA | Distribution Automation |
| DBA | Data Base Analysis or Data Base Administrator |
| DM-1 | Multi-Family Residential Customer Class (NV Energy North) |
| DMS | Distribution Management System |
| DNP | Distributed Network Protocol or Disconnect, Non-Pay |
| DOE | Department of Energy |

| Acronym | Description |
|---|---|
| DPT | Dynamic Pricing Trial |
| DR | Demand Response |
| DRMS | Demand Response Management System |
| DSM | Demand Side Management |
| DVT | Design Verification Testing |
| EAI | Enterprise Application Integration |
| ED | Energy Display |
| EHV | Extra High Voltage |
| EMS | Energy Management System |
| EPI | End Point Installer |
| ESB | Enterprise Service Bus |
| ESC | Executive Steering Committee |
| EV | Electric Vehicle |
| EVT | Engineering Verification Testing |
| EWAM | Enterprise Work Asset Management |
| FAT | Field Acceptance Test |
| FCC | Federal Communications Commission |
| FCI | Faulted Circuit Indicator |
| FD | Facilities Demand |
| Flexnet | Sensus Advanced Metering Infrastructure System |
| FMEA | Failure Mode and Effects Analysis |
| FTP | File Transfer Protocol |
| GIS | Geographical Information System |
| GPS | Global Positioning System |
| GRC | General Rate Case |
| GS | Small Commercial Customer Class (NV Energy South) |
| GS-1 | Small Commercial Customer Class (NV Energy North) |
| GUI | Graphical User Interface |
| HAN | Home Area Network |
| HVAC | Heating, Ventilation, and Air Conditioning |
| IDM | Enspiria's Integrated Delivery Methodology |
| IEC | International Electrotechnical Commission |
| IEE | Itron Enterprise Edition (Itron's MDM application) |
| IEEE | Institute of Electrical and Electronics Engineers |
| IHD | In Home Display |

| Acronym | Description |
|---|---|
| IOU | Investor Owned Utility |
| IP | Internet Protocol |
| IRP | Integrated Resource Plan |
| ISA | Installation Service Agreement |
| IT | Information Technology |
| kW | Kilowatt |
| kWh | Kilowatt-hours |
| L+G | Landis+Gyr |
| LAN | Local Area Network |
| LBNL | Lawrence Berkeley National Laboratory |
| LCD | Liquid Crystal Display |
| LMS | Load Management Systems |
| MBRP | Metrics and Benefits Reporting Plan |
| MCF | 1,000 Cubic Feet |
| MDM or MDMS | Meter Data Management System |
| MoM | Minutes of Meeting |
| MW | Megawatts |
| MWh | Megawatt-hours |
| MWM | Mobile Workforce Management |
| NAICS | North American Industry Classification System |
| NASPI | North American Synchro-Phasor Initiative |
| NDPT | Nevada Dynamic Pricing Trial |
| NEBS | Network Equipment Business Systems |
| NERC | North American Electric Reliability Corporation |
| NIST | National Institute Standards and Technology |
| NPC | Nevada Power Company |
| NRS | Nevada Revised Statutes |
| NVE | NV Energy |
| O&M | Operations and Maintenance |
| OCM | Organizational Change Management |
| ODS | Operational Data Store |
| OMS | Outage Management System |
| OSI | Open System International, Inc. |
| PCT | Programmable Controllable Thermostat |
| PDC | Phasor Data Concentrators |

| Acronym | Description |
|---|---|
| PEP | Project Execution Plan |
| PHEV | Plug-in Hybrid Electric Vehicles |
| PI | Program Integrator (Enspiria Solutions) |
| Plt | Measure of long term perception of flicker |
| PMO | Project Management Office |
| PMB | Performance Management Baseline |
| PM | Project Manager |
| PMU | Phasor Measurement Unit |
| Pst | Measure of short term perception of flicker |
| PTR | Peak Time Rebate |
| PUC | Public Utilities Commission |
| PUCN | Public Utilities Commission of Nevada |
| QAP | Quality Assurance Plan |
| RF | Radio Frequency |
| RFP | Request for Proposal |
| RM | Multi-Family Residential Customer Class (NV Energy South) |
| RMA | Return Meter Authorization |
| RMP | Risk Management Plan or Requirement Management Plan |
| RNI | Regional Network Interface (head end) |
| RS | Single Family Residential Customer Class (NV Energy South) |
| RTM | Requirements Traceability Matrix |
| SAT | System Acceptance Testing or Sector Acceptance Testing |
| SCMP | Software Control Management Plan |
| SDLC | Systems Development Life Cycle |
| SEP | Smart Energy Profile |
| SGIG | Smart Grid Investment Grant |
| SI | Systems Integrator (IBM) |
| SLA | Service Level Agreement |
| SNMP | Simple Network Management Protocol |
| SOA | Service Oriented Architecture |
| SOAP | Simple Object Access Protocol |
| SOW | Scope of Work or Statement of Work |
| SOX | Sarbanes-Oxley |
| SPPC | Sierra Pacific Power Company |
| SQL | Sequel Query Language |

| Acronym | Description |
|---|---|
| SSL | Secure Socket Layer |
| TAG | Technical Advisory Group |
| TGB | Tower Gateway Base station (data collector) |
| TOU | Time-of-Use |
| UCE | Universal Calculation Engine (Itron) |
| UEC | Universal Energy Charge |
| UOM | Unit of Measure |
| UTC | Coordinated Universal Time |
| UTM | Universal Transverse Mercator |
| VEE | Validate Estimate and Edit |
| VP | Vice President |
| WAN | Wide Area Network |
| WBS | Work Breakdown Structure |
| WECC | Western Electricity Coordinating Council |
| WIG | Wildly Important Goal |
| WMS | Work Management System |
| XML | Extensible Markup Language |

# NV Energy Nevada Dynamic Pricing Trial Interim Report – Volume 1

Nevada Dynamic Pricing Trial marketed as the NV Energize Choose When You Use Program

## *Executive Summary*

The NV Energy Nevada Dynamic Pricing Trial (NDPT) Interim Report is in four volumes:

- Volume 1: Design & Operations
- Volume 2: Program Year 1 Data Analysis
- Volume 3: Program Year 1 Direct Customer Research
- Volume 4: Appendices

This interim report covers analysis and results of NDPT operations from its formal inception with recruiting in January 2013 through the close of the first program year February 28, 2014. The NDPT Final Report to be submitted in September 2015 will cover analysis and results of operations from the program's inception through the close of the second program year February 28, 2015.

The NDPT is a set of research experiments jointly sponsored by NV Energy and the federal Department of Energy (DOE) as required by the terms of the Smart Grid Investment Grant (SGIG) that DOE awarded to NV Energy. The NDPT design was approved by NV Energy, the DOE, and by the Public Utilities Commission of Nevada (PUCN), as originally described in the NDPT Consumer Behavior Study Plan, and subsequently amended.

NV Energy conducted the NDPT as a program for single-family residential customers called Choose When You Use. NV Energy enrolled volunteer households, and then supplied them with new time-varying rates, programmable thermostats, and digital energy education. Every participating household had previously been on standard flat rate pricing, and received either a time-of-use (TOU) rate or a TOU rate with critical-peak-pricing (CPP) events as part of the Choose When You Use program. Some households received digital energy education in addition to the rate and some households further received programmable thermostats. The intent of the NDPT is to monitor and understand the household changes in electricity use that may occur in response to these treatments.

Because the NDPT spans two years, and this Interim Report only considers the NDPT's first year, analysis is kept to a minimum. The Interim Report aims to describe the NDPT's activities (Volume 1), summarize the electricity usage data from the first year (Volume 2), recount how participants described their experiences in focus groups (Volume 3), and provide key materials employed in the NDPT (Volume 4). This Interim Report demonstrates compliance with the operating and reporting

policies established by NV Energy and the DOE. In the Final Report, the NDPT research hypotheses will be addressed as conclusively as possible.

The NDPT as it is happening is a field trial, combining design and implementation elements. Field trials provide richer results than model-building, simulation or laboratory experiments, but field trials are often impacted heavily by the unique conditions of their implementation. Certainly the NDPT has been impacted by its circumstances. In some ways, these impacts were typical and informative about the challenges many similar new initiatives would face. In other ways, these impacts were specific to the NDPT.

An effort to confirm the NDPT's findings would need to recreate the NDPT's conditions or account for any differences experienced in a new test environment. The reader of this Interim Report is cautioned to keep in mind that this report is preliminary and its results cannot be easily applied in other circumstances.

With those cautions in mind, this report offers seven major observations from the first program year. As illustrated by the recruiting and energy usage data:

> (1) In recruitment and in the program, NDPT participants as a group responded to a) the TOU and CPP rates, b) the customer education provided, and c) the enabling technology by addressing, shifting, and reducing energy usage (i.e., by managing their energy use);
>
> (2) As a group, the NDPT participants displayed energy management responses to the rates, education, and technology treatments that differed significantly over time (e.g., from season to season, from weekday to weekend, from off-peak to on-peak time periods), and also differed among demographic segments of customers; and
>
> (3) Across cells, different combinations of rates, technology and education treatments were associated with many significantly different energy management results for different segments of the NDPT participants.

As illustrated by the focus group narrative:

> (4) NDPT participants reported devoting little time to specific reflection, planning, deliberation, study or analysis regarding the program. Instead, participants tried out shifting and conserving behaviors, noticed how they felt afterwards, noticed what feedback they received, and became more mindful of electricity use as these new practices continued.
>
> (5) The approaches to shifting and saving electricity usage undertaken by NDPT participants were similar across treatment cells. With different levels of engagement, participants worked with the rates, technology and education available to them, whether these were preexisting or provided by the NDPT.
>
> (6) In recruitment, reenlistment and managing electricity use, NDPT participants' evaluation of the NDPT was largely based on money (savings). Some participants also considered experiential benefits (e.g., stewardship, control, and challenge), but most

participants sought savings outweighing the program's experiential costs (e.g., discomfort, inconvenience, and mental effort).

(7) For many participants, the program's experiential costs were prohibitive or were not balanced by sufficient savings. For many participants, the program's experiential costs were minor or were more than balanced by savings. Few participants, whether they viewed themselves as successful in the program or not, said they had changed their views of NV Energy as a result.

These observations are preliminary: there are exceptions to each, and they may be modified or reversed with additional data and analysis from the entire duration of the NDPT. Following the conclusion of the NDPT, NV Energy will make recommendations for permanent optional offerings based off the data, analysis and market research.

The results from Program Year 1 in the NDPT indicate that participants responded to the rates, technology and education made available to them by trying to shift and reduce their electricity usage. Across segments, participants described similar efforts that varied over time, and the different results they achieved seemed to depend to some degree upon the treatments they had been recruited for.

However, the results of participants' efforts were more than changes in electricity usage and hard savings. Participants' efforts also resulted in new experiences of using electricity and these experiences could be better than before (adding stewardship, control and challenge to their lives) or worse than before (adding discomfort, inconvenience and mental effort to their lives). Most participants seemed to view the program as a chance to save that they had volunteered to take, with the outcome depending to a strong degree on them.

The rest of Volume 1 summarizes the objectives, design, customer recruitment and marketing, technology, education, and operation and performance elements of the study. Throughout Volume 1 are comments and insights into what worked and what didn't.

# *Introduction*

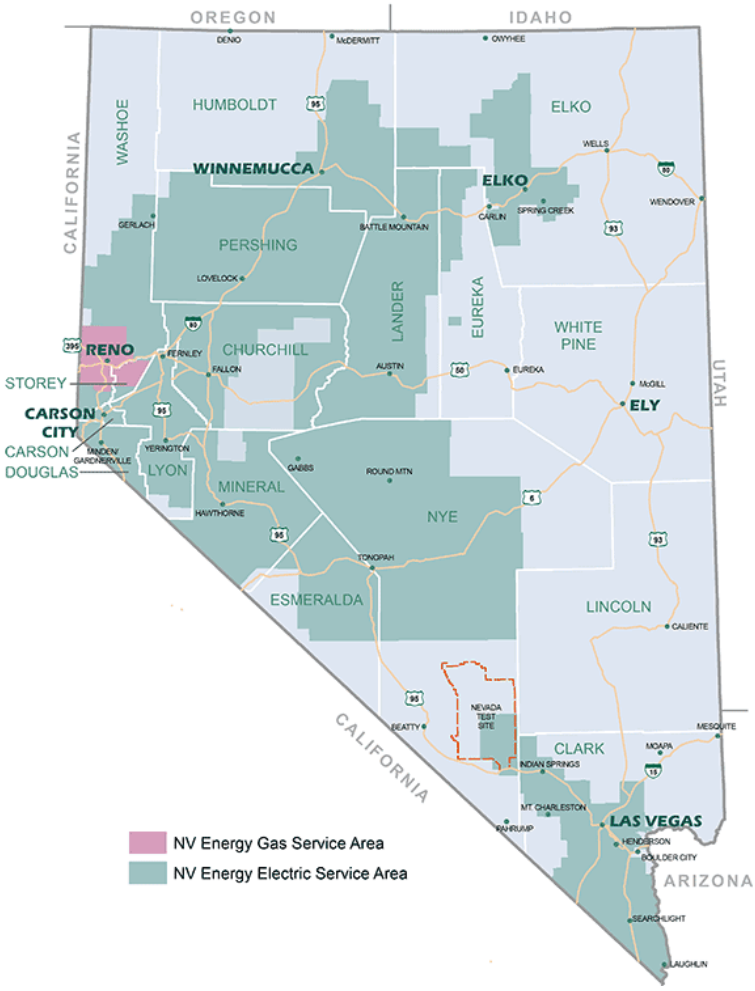
## About NV Energy

NV Energy, a MidAmerican Energy Holdings Company, has provided Nevada with power for more than a century. NV Energy has served citizens in northern Nevada for over 150 years beginning as Sierra Pacific Power, and southern Nevada since 1906 as Nevada Power. The companies merged in 1999 and began doing business as NV Energy in 2008. NV Energy was acquired by Berkshire Hathaway Energy in 2013.

NV Energy's roots go back to the California Gold Rush and the discovery of silver and gold on the Comstock Lode. The Farad Hydroelectric Plant was built alongside the Truckee River in 1899 in northern Nevada and was the first electric generating plant on the eastern slope of the Sierra Nevada Mountains. The plant was funded primarily by mining interests to pump water out of the

ever deepening mine shafts in Virginia City. The Virginia City electric distribution system was one of only a handful nationwide designed by inventor Thomas Alva Edison. Demand for electricity grew as the mines prospered in the early 1900's.

In southern Nevada, NV Energy began its journey into helping make a name for the city in 1906 with "modern and cosmopolitan improvements" as a local newspaper stated, with the distribution system powered by a small generator and copper wires supported by 6" x 8" timbers from the local lumber yard. Small, gasoline-powered generators were added as needed until 1914 when the company negotiated a contract to buy all its electricity from the railroad powerhouse. In 1937 Southern Nevada Power became the first utility to distribute electricity from the newly completed Hoover Dam, the major source of power for the city of Las Vegas for the next 18 years. Because demand from the fast growing city was exceeding supplies available from Hoover Dam, Southern Nevada Power started construction on its own steam turbine generators in the 1950s, starting with Clark Station.




Nevada continues to grow rapidly and its economy is becoming increasingly diverse as new companies take advantage of the state's favorable tax structure and pro-business environment.

Today NV Energy provides electricity to 1.3 million customers and a state tourist population of over 40 million annually. Its nearly 46,000-square-mile service territory stretches north to south from Elko to Laughlin. The company also provides natural gas to more than 155,000 citizens in the Reno-Sparks area.

With over 2,500 employees, the company demonstrated a commitment to the community by NV Energy employees and their families volunteering 44,834 hours of their own time to nonprofit organizations throughout the state in 2013. Additionally, in 2013, NV Energy and its Foundation supported hundreds of nonprofits throughout Nevada with nearly $5.4 million in funding. NV Energy is the largest corporate and employee supporter of the United Way of Southern Nevada and the United Way of Northern Nevada and the Sierra, contributing more than $1.3 million statewide.

Nevada is the seventh largest state in land area and currently one of the least-populated states comparatively. Public lands include three national parks, two dozen state parks and several

thousand acres of wilderness areas, national recreation areas, national forests, wildlife refuges and other protected places. With its 110,540 square miles of terrain, Nevada offers a multitude of outdoor recreational and business opportunities. Because of this, new businesses are coming to Nevada to take advantage of the tax breaks, convenient location to larger, more populous cities and the tourism industry within the state.

Nevada's varied land contributes to a wide range of economic development. High plateau areas offer excellent areas for cattle and sheep industries and grazing while below the surface gold, silver and mercury make Nevada the leading producer of these minerals and several others. Gaming taxes make up a primary source of the state's revenue putting a heavy dependence on tourism and its gambling industry in Las Vegas, Reno and Lake Tahoe.

Approximately 2,790,136 people call Nevada home according to the US Census estimate for 2013. Roughly two-thirds of those residents live within the Clark County/Las Vegas metropolitan area. The Reno-Sparks area in northern Nevada make up the next largest populated city with nearly 326,576 residents, and the remaining population spread out in the large open-land areas and rural communities. Despite Las Vegas being known as a busy tourist location, the city and state were deeply affected by the financial crisis of 2008. In 2012 the Corporation for Enterprise Development (CFED) Assets and Opportunity Score Care ranked Nevada number 50 out of 51 in how residents fare in terms of financial security. This means that Nevadans lack adequate savings or other assets to cover expenses compared to all other states and the District of Columbia. The score card went on to rank Nevada 49th in foreclosure rates, 51st in delinquent mortgage loans and 48th for homeownership rates.

The majority of companies employing Nevadans are located in Southern Nevada. Top industries throughout the state according to the Department of Employment, Training and Rehabilitation (DETR) include Accommodations, Food Services/Drinking Places, Administrative/Support Services, General Merchandise Stores, Hospitals, Amusement, Gambling and Recreation Industries among others. In 2012, the CFED reported that one in five jobs was considered low-wage and nearly half of the employers do not offer health insurance. Fifty-five percent of those employed do not participate in or are not offered retirement plans. In June 2014, the overall state unemployment rate was 7.7%, down from 13.9% at its peak in 2010.

As the unemployment rate went down, Henderson and North Las Vegas became a part of the United States' top 20-fastest growing cities of over 100,000 people creating a unique problem for NV Energy to overcome in providing energy and collecting bill payments. In contrast, the state has large open-land spaces and rural communities with small populations. NV Energy provides utility services to both spectrums of customers.

To help overcome those challenges, the Advanced Metering Infrastructure (AMI) project known as NVEnergize began after being awarded the Smart Grid Investment Grant (SGIG) on December 24, 2009. The first smart meter was installed in southern Nevada in September 2010 and since then smart meters have been installed at homes throughout the state giving NV Energy the opportunity to provide customers with options to manage their energy use through enhanced technology, tools

and programs. Customers now have online self-service move-in, move-out and service transfer capabilities and it will further enhance service of pinpointing an outage and therefore the ability to restore power even faster.

A number of programs have been implemented to help customers manage their energy use and to determine energy efficiency for customers. These Demand Side Management (DSM) programs include:

- Home Energy Reports Program: provides periodic energy use reports to residential customers
- Energy Efficient Lighting Program: offers incentives for lighting products
- Refrigerator Recycling Program: designed to reduce utility system energy consumption by permanently removing functioning second refrigerators or freezers and safely disposes of potentially environmentally harmful materials
- Residential Solar Thermal Water Heating Program: provides incentives to residential customers with electric water heating systems who install qualifying solar thermal water heating systems
- Nonprofit Agency Grants Program: offers qualifying nonprofit organizations a financial means to implement energy efficiency measures.
- Energy Smart Schools Program: facilitates energy efficiency and peak demand reduction in public and private schools, K-12 and higher education
- Commercial Incentives Program: energy efficiency technical assistance and incentives to commercial and industrial customers to promote investments in energy efficient retrofit and new construction
- Energy Education and Consultation Program: educate and assist residential, small/medium commercial and large commercial customers: builders, developers and realtors
- Market and Technology Trial Program: focus on assessment and testing of innovative and energy efficient technologies
- Demand Response Program: recruits customers into an ongoing program in which the customer allows the Company to interact temporarily with their end-use loads such as air conditioning and agricultural irrigation pumps on hot summer day when system peak loads occur or during emergency conditions in order to help the company reduce peak demand
- Low Income Weatherization Program: provides energy efficiency services to low income residential customer earning below 150% of the Federal Poverty Level
- Residential High Efficiency AC Program: encourages customers to make energy and efficiency upgrades to their existing air conditioners and heat pumps
- Energy Efficient Pool and Spas Program: provides rebates for upgrading single spaced pumps to more energy efficient variable-speed pumps

The Nevada Dynamic Pricing Trial is an experimental program created to test consumer response to combination of advanced dynamic rates, enhanced education and in-home technologies. This offers customers the opportunity to customize their energy use based on their individual needs as it fits with the rate structure and season change.

## *Consumer Behavior Study Background*

After consultation with the Public Utilities Commission of Nevada, the NDPT was originally proposed as a compliance item in NV Energy's application for a federal Smart Grid Investment Grant (SGIG).

Once the federal grant was awarded to NV Energy, the NDPT team drafted the 2010 NDPT Consumer Behavior Study Plan (CBSP), which was approved by NV Energy and the U.S. Department of Energy as represented by Lawrence Berkeley National Laboratories (LBNL).

### The Research Hypotheses

The NDPT CBSP identified these hypotheses to be tested:

> (1) Customers will respond to a) the time of use (TOU) and critical peak pricing (CPP) rates, b) the customer education and c) the enabling technology provided by addressing, shifting, and reducing energy usage (i.e., by managing their energy use).
>
> (2) Customer energy management responses to the rates, education and technology treatments will differ significantly over time, and among segments of customers.
>
> (3) Combinations of rates, education and technology treatments will yield customer energy management responses that differ from the sum of the individual responses to those elements over time and among segments.
>
> (4) The extent and persistence of customer energy management responses to rates, education and technology treatments are significantly correlated with customer attitudes of a) energy ownership, and b) satisfaction with energy ownership.

These four hypotheses were chosen based on the new opportunities available to Nevadans, and to utilities, through the customer experience of the Smart Grid. Evaluating these hypotheses would be feasible because of the NVEnergize Smart Meter deployment funded in part through the federal SGIG.

NV Energy's Smart Grid plans included a statewide deployment of smart meters, providing energy use interval data that could be used to help customers better manage their energy use. NV Energy also recognized that increasing customer use of web-based and mobile tools would be important features of the Smart Grid.

Even before the Smart Grid arose, NV Energy had a strong and successful demand response program, based on supplying programmable thermostats and incentive payments to customers. The utility recognized that not only would the Smart Grid make such technology-based programs more attractive and economical, the Smart Grid would also make time-based rates and customer energy education more feasible.

NV Energy's previously-established time-based rates had been elected by few customers. The utility's previous efforts at customer energy education were channeled through mass media and events.

NV Energy needed to better understand the statewide opportunity for Smart Grid-based rate, education, and technology programs -- alone, or in combination. The NDPT was designed to offer typical examples of rate, education and technology programs to customer volunteers. Because the NVEnergize smart meter deployment was across the NV Energy service territory, the NDPT could randomly recruit enough participants to yield results that could be projected to a statewide level.

The NDPT was designed to provide different sets of customers with different combinations of these experimental treatments (i.e., rates, education and technology), and would then examine the newly-available hourly household meter data to assess the impacts these treatments had on household electricity use across the year before the trial began and the two years of the trial. Based on the NDPT, NV Energy can understand how its customers manage their energy use with the help these treatments provided.

NV Energy's interest in energy ownership and customer satisfaction arose from the utility's conviction that its customer-oriented programs should be voluntary and should be based on well-informed customer choice. NV Energy believed that customers who were pleased to take charge of their own energy management would make the best choices about how and when to use energy. So while NV Energy aimed the NDPT to help understand the statewide opportunity for Smart Grid-based, rate, education and technology programs, the utility's interest was always to design better voluntary programs and to learn how to help more customers choose among its programs more wisely.

## The Treatments & Cells

The cornerstone of NV Energy's NDPT is a series of controlled randomized experiments to test customers' energy consumption response to treatments consisting of different combinations of rates, education and technology.

Because NV Energy had relatively little experience with residential time-based rates, and the NDPT was established as a pricing trial, the NDPT elected to field two rate offerings: a simple time-of-use (TOU) rate, and a TOU rate that included critical peak pricing (CPP) on select event days. NV Energy's franchise includes two territories, one centered in Reno (North) and one centered in Las Vegas (South). Therefore, the NDPT includes four new rates to test. These four rates were all notably different from one another in pricing levels and structure. NV Energy decided every NDPT participant should receive one of these new rates. Some NDPT participants received only a new rate and some received additional education and technology combinations.

The utility industry had few education treatments for household outreach, and because none of these treatments at the time were enabled for web and mobile communications. As a result, the NDPT elected to field a single education offering: the game, print and prizing-based system

developed by Vergence Entertainment. Some NDPT participants received the Vergence Entertainment education treatment (E) in combination with their rate treatment.

NV Energy had the most experience with technology-based programs. Therefore, the NDPT elected to field a single technology offering: the thermostat, web and mobile-based energy management system from EcoFactor. Some NDPT participants received the EcoFactor technology treatment (T) in combination with their rate and education treatments.

The three treatments are described in more detail below. These treatments were provided to NDPT participants across 12 cells:

*Table 2:* ***NDPT Cells by Region***

| **NDPT Cells by Region** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **North** | TOU | TOU+E | TOU+E+T | | CPP | CPP+E | CPP+E+T |
| | | | | | | | |
| **South** | TOU | TOU+E | TOU+E+T | | CPP | CPP+E | CPP+E+T |

**Legend**
TOU: Time-of-Use rate treatment
CPP: Critical Peak Pricing rate treatment
E: Education treatment
T: Technology treatment

The rate experience was fundamental to the NDPT, treatment cells were not established for education or technology alone. Because NV Energy had extensive experience combining financial incentives and technology in its demand response programs, NDPT treatment cells were not established for technology in the absence of education.

The NDPT was established as a controlled test, with a control reference group and a 'non-complier' reference group (selected from those who received the offer to participate in the NDPT, but declined). These reference groups and the set of NDPT participants were all comprised of customers with three years' worth of meter data available (the year before the NDPT began and the two years of the NDPT).

Early in the NDPT design phase, NV Energy and LBNL revised the original targets and timing of the research[1], but kept the hypotheses intact. LBNL confirmed that NV Energy's research objectives were also important for the industry as a whole.

[1] The original NDPT design envisaged research including small businesses as well as multi-family residential households, and was slated to begin fourteen months earlier. The revised NDPT design focused solely on single-family residential households (but included more of them), and supplied the DOE with much more data from non-experimental households (control group households, and households from the so-called 'non-compliance' group).

# *Consumer Behavior Study Overview*

## NDPT Resources & Responsibilities

The NDPT has been led by a small team organized within the NVEnergize SGIG project. The NDPT team has been managed day-to-day by the NV Energy Rates Department. NV Energy contracted with the Boice Dunham Group ("BDG") for project management and to provide market research; the NDPT has been led by Craig Boice. The NV Energy Rates Department provided the NDPT with two primary full-time staff. These staff members coordinated all major operating activities of the NDPT, including recruitment, enrollment and opt-out, data collection and verification, billing, field service activities, and regulatory filings. Further, NDPT staff was responsible for communications, including preparation and delivery of the monthly energy reports, focus group organization and documentation, and regular team meetings.

The NV Energy Rates Department has also provided staff and support as needed. The NV Energy Demand Response team has been responsible for operating the primary NV Energy information technology system supporting the NDPT, for managing the technology treatment contracts, and for delivering alerts to participants on the CPP rates. Many other departments of NV Energy have been called upon to support the introduction and operations of the NDPT.

Much of the NDPT's work has been undertaken by contractors. ADM Associates has supplied data analysis, measurement and verification services. Vergence Entertainment built and supplied the education treatment. EcoFactor has supplied the technology treatment. ATS has aided in recruiting, and has provided customer service to prospects and participants. The University of Nevada, Las Vegas Cannon Center has assisted with market research. MTEC has provided technical assistance and troubleshooting across the education, technology, and rates treatments, and also regarding data management. A variety of contractors and subcontractors assisted with developing the education curriculum, led by JLOOP and Honebein Associates. Mad Dash had the majority of the responsibility for field installation of the technology treatment.

## NDPT Schedule

The NDPT is running from January 2013, when recruiting began, through March 2015, when NDPT participants will be taken off their new rates as the Choose When You Use program ends. Major events in the NDPT schedule are listed below:

2009

- DOE Assistance Agreement issued, subject to final definition (December 24)

2010

- First draft of Experimental Design for NDPT supplied to DOE for discussion
- Met with PUCN to review draft Experimental Design for NDPT, adjusted as appropriate to reflect DOE input
- Draft Consumer Behavior Plan (Version 1.0) submitted to DOE (March 24)
- Revised Consumer Behavior Study Plan (Version 1.1) accepted by DOE (July 30)

- Rate tariffs filed for NDPT for PUCN approval in Docket Nos. 10-08014 & 10-08015 (August 18)
- Revisions to Consumer Behavior Study Plan (Version 1.1) accepted by DOE, reflecting the new January 1, 2013 start date for the NDPT in the North (October 26)

2011

- Rate tariffs approved by PUCN (March 10)
- Revisions to Consumer Behavior Study Plan (Version 1.1) accepted by DOE, reflecting the new January 1, 2013 start date for the NDPT in the South, to match the North (May 23)
- Installed AMI meters and communications in trial areas
- Collected baseline market research data
- Tested data collection and reporting functions
- Finalized sample designs
- Contracted for provision of education treatment

2012

- Modification to NDPT tariffs filed with PUCN to reflect elimination of multi-family residential and small commercial classes from the NDPT, as well as modify the start date to 3/1/14; Docket Nos. 12-10020 & 12-10021 (October 18)
- Evaluated representativeness of control and trial sample groups
- Finalized billing and customer service functions, procedures and training
- Began collecting benchmark load data
- Completed systems integration testing
- Tested billing under new technology
- Confirmed provision of NDPT technology treatment through NV Energy relationship
- Selected control and treatment group samples

2013

- Began NDPT recruiting
- Began NDPT rates (March 1)
- PUCN approves revisions as filed in Docket Nos. 12-10020 & 12-10021 (April 19)
- Provided education and technology treatments to participants through online and in-home installations
- Completed baseline participant and control group survey
- Conducted Program Year One market research to assess status and changes in trial participants' demographics, attitudes, and behavior

2014

- Conducted Program Year 2 reenlistment and best bill guarantee
- Completed Program Year 1 (February 28)
- Analyze 1st year data, prepared and submitted Interim Report
- Began Program Year 2 market research to assess status and changes in trial participants' demographics, attitudes, and behavior
- Revisions to NDPT tariffs filed with PUCN to formally change language about customers' ability to opt-out during program year two; Docket Nos. 14-06045 & 14-06046 (June 27)
- PUCN approves revisions as filed in Docket Nos. 14-06045 & 14-06046 (August 13)

2015

- Complete market research and energy usage data compilation

- End NDPT rates and move participants to other programs/rates (February 28)
- Prepare and deliver final reports to NV Energy, PUCN and DOE
- Deliver final invoices before September 30, 2015

## Research Questions & Hypotheses

As noted above, the NDPT CBSP identified these hypotheses to be tested:

> (1) Customers will respond to a) the time of use (TOU) and critical peak pricing (CPP) rates, b) the enabling technology, and c) the customer education provided by addressing, shifting, and reducing energy usage (i.e., by managing their energy use).
>
> (2) Customer energy management responses to the rates, technology, and education treatments will differ significantly over time, and among segments of customers.
>
> (3) Combinations of rates, technology and education treatments will yield customer energy management responses that differ from the sum of the individual responses to those elements over time and among segments.
>
> (4) The extent and persistence of customer energy management responses to rates, technology and education treatments are significantly correlated with customer attitudes of a) energy ownership, and b) satisfaction with energy ownership.

This NDPT Interim Report includes some analyses and findings, but conclusions will wait until our final report in 2015.

NDPT analysis is not only based on meter data, but also on a set of other NV Energy and vendor databases, and direct customer research. These additional sources will be very important in the NDPT final report for characterizing how NDPT participants are managing their electricity use by addressing, shifting, and reducing energy usage. For example, the NDPT baseline survey provides demographics on participants and the control group. NDPT recruitment data provides metrics regarding customers' willingness to deliberately address energy usage by choosing to participate in this voluntary program. Vendor engagement data provides indications about customer intentions and treatment functionality. Data about weather and occupancy changes will help adjust energy usage data.

As noted above, the NDPT is designed to investigate four research hypotheses. These hypotheses will be tested as alternative hypotheses against the null hypotheses that pricing, technology and education will have no impact (either as individual elements or in combination) on (1) customers' energy usage and demand, and (2) customers' energy ownership. The tests that form the basis of this interim report are primarily based on preliminary analyses of energy usage and market research data from participants in Program Year 1. The tests that form the basis of the final report will be more extensive.

The first NDPT research hypothesis is:

1. Customers will respond to a) the time of use (TOU) and critical peak pricing (CPP) rates, b) the enabling technology, and c) the customer education provided by addressing, shifting, and reducing energy usage (i.e., by managing their energy use).

For this interim report, addressing energy use is demonstrated by a set of program-level behaviors: recruitment, attrition and reenlistment. Shifting and reducing energy use are demonstrated by energy use and bill savings data. For the interim report, these factors are considered by treatment, cell and region. For the final report, energy use strata, demographic and behavioral segmentation will also be considered.

The second NDPT research hypothesis is:

2. Customer energy management responses to the rates, technology, and education treatments will differ significantly over time, and among segments of customers.

In the interim report, responses over time are demonstrated by energy use data across the year divided into seasons, day of the week and rate period (e.g., on, mid and off-peak). For the interim report, these factors are considered by treatment, cell and region. For the final report, we will also consider persistence.

In this report, segments are identified at basic demographic and behavioral levels. Demographic segmentation is by geography (North vs. South), age and income. Behavioral segmentation is by reenlistment (opt-out vs. reenlist) and savings (economic savings or loss); these factors are considered by treatment, cell and region. For the final report, we will also consider other demographic factors enabled by our final survey and other behavioral factors our various databases suggest (e.g. engagement and ownership).

The third NDPT research hypothesis is:

3. Combinations of rates, technology and education treatments will yield customer energy management responses that differ from the sum of the individual responses to those elements over time and among segments.

The third hypothesis is intended to focus on the difference between cells that are rate-only, and cells that are a rate coupled with one or more additional treatments. For this interim report, we compare energy impact differences between rate-only and rate+ cells, and we examine whether or not the treatments' impacts appear to be additive or not in Program Year 1. For the final report, we will make these comparisons again for Program Year 2 and consider persistence.

The fourth NDPT research hypothesis is:

4. The extent and persistence of customer energy management responses to rates, technology and education treatments are significantly correlated with customer attitudes of a) energy ownership, and b) satisfaction with energy ownership.

Electric meter data reveals customer behavior (i.e., energy usage), but it cannot directly confirm customer attitudes. Direct customer market research (i.e. surveys, interviews, focus groups) reveals

customer attitudes, but it may also influence them. Because attitude measurement is intrusive, the NDPT has confined its attitude measurement to focus group investigation in Program Year 1.

Energy ownership is a customer attitude that takes a variety of forms, in each case identified by a customer's assumption of a certain level of responsibility for energy usage (i.e. energy consumption, management, costs, and environmental consequences).

Among the behaviors that contribute to the development of energy ownership and indicate its form are these:

(1) awareness, analysis and assessment of past and current energy usage;
(2) understanding, mastering and using energy management tools;
(3) understanding the costs of energy, rate design and rate selection;
(4) preparing and executing individual, household or workplace changes in energy use behavior;
(5) initiating and completing energy management measures and projects; and
(6) understanding and engaging in the development of energy management norms, standards, guidelines, policies, regulations and laws in the household, workplace or community.

For many of these behaviors, confirming them requires direct dialogue with the customer. By calling the behaviors to mind, and prompting consideration of them, the dialogue may be an intervention that influences those behaviors going forward. For example, NDPT recruitment (an integrated print, e-mail and telephone marketing campaign) may have similarly influenced behavior among the 'non-compliers' who declined to participate in the program.

For this interim report, we consider participants' recruitment decisions; summer experiences and reenlistment decisions as discussed in focus groups (see Volume 3). These discussions shed light on what energy ownership is and why satisfaction with energy ownership is something different.

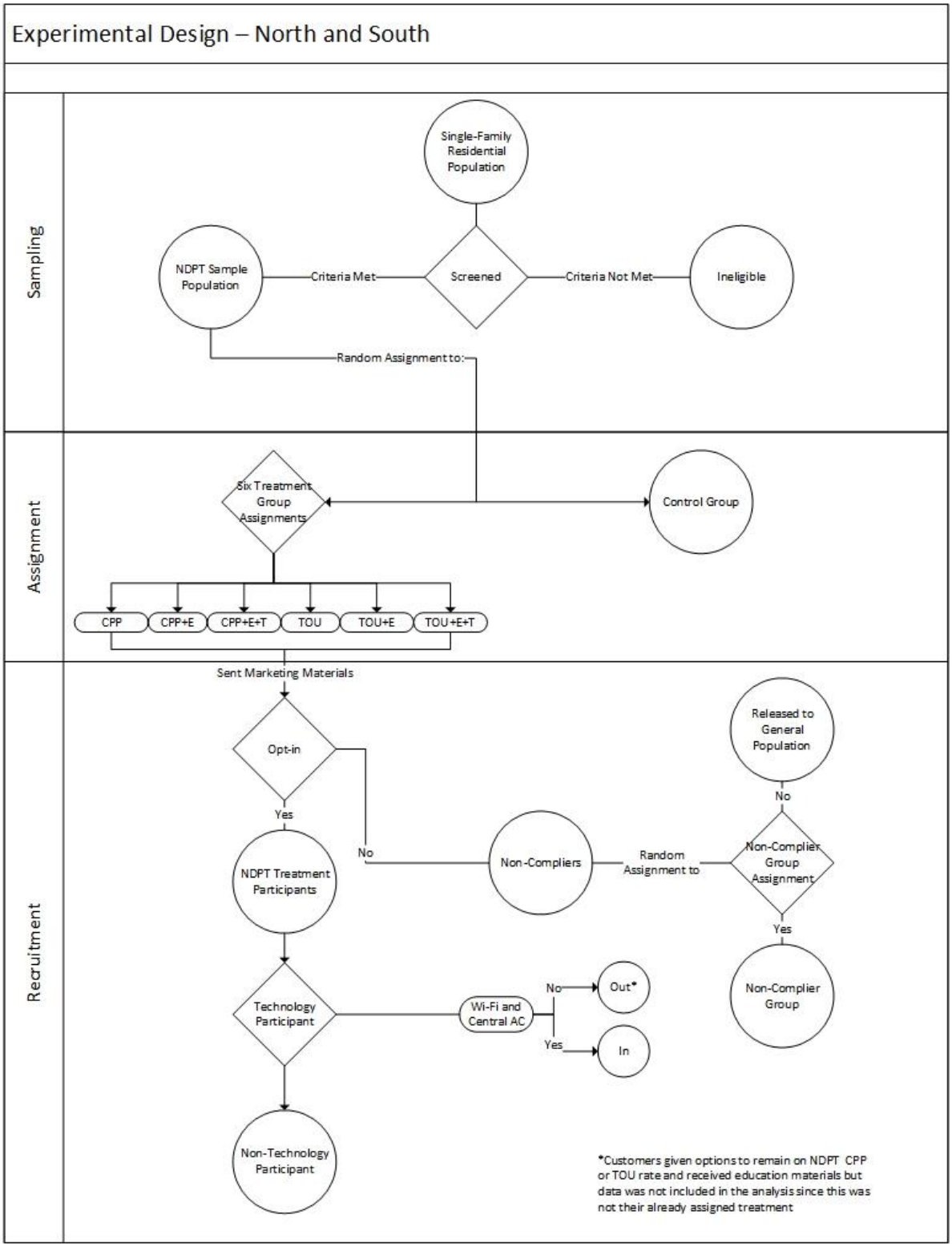
For the final report, we will describe the results of NDPT-wide direct market research regarding participants' attitudes, and we will identify correlations (if any) between these results and participants' energy management behavior. Analysis of energy management responses over time by segment and type may allow the identification of stages for certain customers where attitudes change, develop and lead to behaviors changing and becoming habits. Alternatively, attitudes and behaviors may influence one another in an evolving feedback loop.

Beyond these four hypotheses, the interim report also considers selection bias. Because NDPT recruitment was voluntary and dependent on the particular recruitment provided, the set of NDPT participants may differ from the general population of NV Energy customers. Those differences may influence how the NDPT results should best projected across the entire population. However, on their own, the NDPT participants' results are generalizable to the recruited class of customers and are useful as such.

Across the interim and final reports, NDPT deliverables include the experimental results of hypothesis tests identified above, including the measured magnitudes of the impacts of rates, technology and education on customer attitudes and behavior. They also include results from the additional analyses discussed above regarding customer attitudes and behavior.

## Consumer Behavior Study Description

***Figure 1: Experimental Design North and South***



## Target Population

### *Background*

The NDPT utilizes NV Energy's SGIG-funded and newly-installed Smart Meters, which were installed as a part of its Advanced Service Delivery Project (ASD), NVEnergize, in order to use highly granular consumption data. The trial is a controlled randomized experiment designed to test consumer response to combinations of the treatments measured against a defined control and non-complier group. The null hypothesis was that these treatments or combinations thereof would have no impact on consumer behavior, i.e., usage and demand.

The company had originally outlined a two-wave recruiting approach in the CBSP in which the majority of eligible participants would be marketed to for their assigned treatment. After initial recruitment results, the remaining population would be allocated, as necessary, to the treatments most at risk of not achieving recruitment minimums. However, the fourteen month delay in the start of the trial resulted in a shortened recruiting period, forcing NV Energy to deviate and employ an all-in single wave recruitment strategy.

## Treatments to be assessed

Table 3 illustrates the cohorts created by offering the various combinations of treatments, as well as the control and non-compliers groups. Table 3 is applicable to both service territories, resulting in a total of twelve treatment cells, two control groups and two non-compliers groups.

*Table 3:* ***NDPT Treatments and Control Groups***

| | **Rates Applied to Treatments** | |
|---|---|---|
| | **Time-of-Use (TOU)** | **Critical Peak Pricing Rate (CPP)** |
| Rate Only | Treatment group sample | Treatment group sample |
| Rate + Education | Treatment group sample | Treatment group sample |
| Rate + Education + Technology | Treatment group sample | Treatment group sample |
| No treatment | Control Group | |
| No treatment – Eschewed offer | Non-Compliers Group | |

## Sampling

### *Eligible Population*

The NV Energy service territory is divided into two smaller territories: the North, served by Sierra Pacific Power, and the South, by Nevada Power. Only the single-family residential rate class is eligible to participate in the NDPT. At the time of selection and recruitments, there were approximately 211,000 customers in the single-family residential class in the North, and 499,000 in the South.

Despite the relatively large numbers of customers in the class, both North and South, the number eligible for the NDPT is significantly less due to multiple inclusion criterions:

- Customers had to have been in their home and had a smart meter installed prior to the start of the 2012 summer in order to have adequate summer pretrial data (June 1, 2012 at NPC; July 1, 2012 at SPPC)
- Customers could not be participating in any demand response program (e.g. NPC's existing ACLM program, Cool Share), net metering, Standby or existing optional TOU rate
- Customers could not be an employee of the Utility or be part of its load research sample
- Customers had to previously be taking service under the flat rate and could not be part of a master-metered mobile home park
- Geographic bounds limited the northern trial to just the greater Reno/Sparks area known as Truckee Meadows (i.e. no outlying districts such as Fernley or Elko)

Smart meters began to be installed earlier in southern Nevada than northern Nevada, which led to a larger percentage of smart meter population from which to draw a sample population. Additionally, because of the delay in the NDPT from its modified start date of January 1, 2012, the NDPT marketing coincided with an expansion of Nevada Power's ACLM program, mPowered. It was not an option for either program to delay recruitment, especially with such a large population from which to draw. An eligible population sufficient for NDPT marketing was removed from the population and the balance was provided to Demand Response for marketing. After taking in to account all the inclusion criterions, 150,371 customers were eligible for the NDPT in the South and 52,897 were available in the North.

### *Stratification*

The eligible customers were assigned to sub-groups, or strata, in which their consumption characteristics are more homogeneous than for the entire class population. Stratification was not a DOE requirement, and was not a necessary element of NV Energy's SGIG grant application, but it has historically been used by NV Energy for developing estimates of class load shapes for load research analyses. Stratified samples allow for much smaller sample sizes because it reduces the usage variability by assigning customers to homogenous usage groups. An extract of customer billing data and population information was used to develop monthly kWh usage variables to determine optimal strata definitions and number of strata for each service territory.

A four stratum design was ultimately selected with the kWh breakpoints in Table 4 below. Table 5 shows the number of eligible customers available by strata in each service territory for NDPT solicitation.

*Table 4:* ***NDPT Strata Boundaries***

| Stratum | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **South Strata boundaries (kWh)** | 0-800 | 801-1,500 | 1,501-2,500 | 2,501+ |
| **North Strata boundaries (kWh)** | 0-500 | 501-900 | 901-1,750 | 1,751+ |

*Table 5:* ***NDPT Eligible Population***

| Stratum | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| **South households (#)** | 30,910 | 71,435 | 37,092 | 10,934 | 150,371 |
| **North households (#)** | 15,423 | 22,935 | 13,234 | 1,305 | 52,897 |

### *Determining Recruitment Targets*

The NDPT had a fixed population from which to draw samples and to which NV Energy could market. This didn't allow for an expansion of the geographic bounds, in order to target more customers if necessary, as originally outlined in the CBSP. As mentioned above, stratification allows for smaller samples as you group customers together into smaller subgroups who are more homogeneous around some attribute, average monthly kWh consumption in this case. Sample sizes were based on achieving no more than ±10% error at an 80% confidence level in the North and 90% confidence in the South. The statistical minimums were set at a floor of 30. Further, NV Energy inflated the minimum cell sizes by 50% (new floor of 45) in order to account for attrition across the two year NDPT. This was to try to ensure that enough customers were present at the end of the trial such that results would still be statistically significant. Tables 6 and 7 include the stratum-level summary of the target sample size estimates for each of the treatment cells. The three CPP cells in the South are twice as big as the TOU groups because DOE has specific interest in CPP and NV Energy agreed to double those cells because of available population in the South.

*Table 6:* ***Sampling Target Numbers by Group SPPC (North)***

| Stratum | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| **CPP** | 45 | 83 | 75 | 45 | 248 |
| **CPP+E** | 45 | 83 | 75 | 45 | 248 |
| **CPP+E+T** | 45 | 83 | 75 | 45 | 248 |
| **TOU** | 45 | 83 | 75 | 45 | 248 |
| **TOU+E** | 45 | 83 | 75 | 45 | 248 |
| **TOU+E+T** | 45 | 83 | 75 | 45 | 248 |
| | | | | | |
| **Treatment Total** | **270** | **498** | **450** | **270** | **1,488** |
| | | | | | |
| **Control** | 450 | 830 | 750 | 450 | 2,480 |

*Table 7:* ***Sampling Target Numbers by Group NPC (South)***

| Stratum | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| **CPP** | 90 | 208 | 108 | 90 | 496 |
| **CPP+E** | 90 | 208 | 108 | 90 | 496 |
| **CPP+E+T** | 90 | 208 | 108 | 90 | 496 |
| **TOU** | 45 | 104 | 54 | 45 | 248 |
| **TOU+E** | 45 | 104 | 54 | 45 | 248 |
| **TOU+E+T** | 45 | 104 | 54 | 45 | 248 |
| | | | | | |
| **Treatment Total** | **405** | **936** | **486** | **405** | **2,232** |
| | | | | | |
| **Control** | 900 | 2,080 | 1,080 | 900 | 4,960 |

## Assignment

### *Treatment and Control Group Assignment*

After the eligible population had been defined, by service territory, and broken down into stratum, customers were assigned to the control and treatment groups. First, customers were randomly ordered within their strata. Second, the control group was populated (ten times the minimum number of participants for the largest treatment). Lastly, the remaining population was split across the six treatment groups as those who would be solicited for participation.

It was NV Energy's assumption that different treatments could be more or less appealing to customers, and these differences could lead to different acceptance rates. Therefore, different weights were applied to different treatments during the cell assignment process.

Evidence from similar research around the country led NV Energy to assume a ~3% acceptance rate should be achievable in general. Because 'rate-only' was assumed to be a relatively less-attractive program, as it only included a rate, the expected acceptance rate for these targeted participants was set at 2%. Rate coupled with education was expected to be a more attractive program, so it was expected acceptance rate was set at the median value of 3%. Lastly, rate with education and technology was assumed to be even more attractive, as it includes three elements and a tangible device (i.e., the thermostat), so its acceptance rate was set at 4%.

Additionally, recruitment and installation experience from NV Energy's large demand response program indicated that approximately 25% of recruited customers would later be determined to be ineligible (as addressed in recruitment section later on), or would abandon their commitment to have the device installed before joining the program. So the technology recruitment targets were inflated accordingly by 33% (4/3 is the reciprocal of 3/4).

Tables 8 and 9 below show the number of customers assigned to the control groups and assigned to treatment cells for solicitation. The North Strata 4 was problematic in design, as an average acceptance rate greater than 30% would be required to fill the cells to achieve statistical targets.

*Table 8:* ***Solicitation Numbers by Group SPPC (North)***

| Stratum | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| **CPP** | 2,936 | 4,339 | 2,450 | 168 | 9,893 |
| **CPP+E** | 2,205 | 3,253 | 1,838 | 126 | 7,422 |
| **CPP+E+T** | 2,343 | 3,460 | 1,956 | 133 | 7,891 |
| **TOU** | 2,941 | 4,338 | 2,449 | 168 | 9,896 |
| **TOU+E** | 2,204 | 3,253 | 1,838 | 126 | 7,421 |
| **TOU+E+T** | 2,344 | 3,462 | 1,954 | 134 | 7,894 |
| | | | | | |
| **Control** | 450 | 830 | 750 | 450 | 2,480 |
| | | | | | |
| **Total** | **15,423** | **22,935** | **13,234** | **1,305** | **52,897** |

*Table 9:* ***Solicitation Numbers by Group NPC (South)***

| Stratum | 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|
| **CPP** | 8,502 | 19,649 | 10,203 | 2,834 | 41,188 |
| **CPP+E** | 6,377 | 14,735 | 7,651 | 2,126 | 30,887 |
| **CPP+E+T** | 5,097 | 11,781 | 6,119 | 1,698 | 24,695 |
| **TOU** | 4,250 | 9,823 | 5,100 | 1,417 | 20,590 |
| **TOU+E** | 3,188 | 7,368 | 3,826 | 1,063 | 15,445 |
| **TOU+E+T** | 2,551 | 5,895 | 3,061 | 850 | 12,357 |
| | | | | | |
| **Control** | 900 | 2,080 | 1080 | 900 | 4,960 |
| | | | | | |
| **Total** | **30,910** | **71,435** | **37,092** | **10,934** | **150,122** |

Using the available population and the assumptions above, the treatment groups were assigned by strata. Figure 1 illustrates the experimental design process.

### *Non-Compliers Group Assignment*

Table 3 references the creation of a non-compliers group. The process and the results are discussed in the recruitment section later in this report, as non-compliers could only be assigned after recruitment ended.

## Design History

### *Proposed Design*

As originally described in the March 24, 2010 Consumer Behavior Study Plan (CBSP), the NDPT was a controlled randomized experimental design established to support objectives, test hypotheses and support the development of deliverables.

The NDPT's primary objective was indicated as helping motivate customers to take ownership of their energy usage, and be more than satisfied to do so, as a benefit for customers and the utility related to the Advanced Service Delivery project funded under the DOE SGIG. NV Energy believed that to the degree customers displayed energy ownership, they could be effective partners with NV Energy in developing, deploying and operating the Smart Grid. NV Energy noted that motivating customer energy ownership would call for providing these customers with the ability to save energy and money, enhance their lives and benefit their communities. These abilities would be provided through combinations of rates, technology and education. NV Energy stated that the NDPT would test and measure customer response to (1) advanced marginal-cost-based, time-differentiated rates (in CPP and TOU versions), (2) on-premises energy management technology and (3) customer education.

The hypotheses to be tested in the NDPT have been noted above in this report. The NDPT deliverables were described as the experimental results of tested hypotheses (and other analyses), including the measured magnitudes of the impacts of prices, technology and education on customer attitudes and behavior.

The NDPT CBSP described the stratified random selection and assignment process designed to populate the NDPT's cells. At that time, the NDPT planned to include single-family residential, multi-family residential and small commercial cells. The CBSP also described the utility's plans for developing NDPT rates, provided initial descriptions of the technology and education treatments, and described the regression approach intended to be used for energy impact analysis. The CBSP also noted that certain elements (e.g., rate designs) would be confirmed with the DOE and the PUCN.

### *Modified Design*

After review with both the DOE and the PUCN, a series of five significant changes were made to the CBSP following its initial submission. These changes were reviewed as required with the DOE and PUCN.

First, the NDPT changed deployment schedules. The NDPT was originally scheduled to run from October 2011 to October 2013, covering two summers in both the North and the South. The NDPT would have begun one year earlier in one region than the other. However, meter deployment and software installation schedules in the NV Energy ASD project were revised. The NDPT began recruiting in both regions (North and South) in January 2013 and adjusted its experimental period to be from March 1, 2013 until February 28, 2015.

Second, the NDPT narrowed its focus to single-family households. Further analysis confirmed concerns that it would be difficult for the NDPT to achieve the statistical recruiting targets established for small business and multi-family participants in the North. DOE representatives expressed a primary interest in single-family households and the NDPT was restructured accordingly.

Third, the NDPT agreed to supply additional data to the DOE. DOE representatives indicated that beyond the level of control group data required by the NDPT design, they required additional data from the control group (customers never approached about the NDPT) and from non-compliers (customers who were recruited for the NDPT, but declined). NV Energy agreed to supply this additional data.

Fourth, the NDPT changed the nature of the technology treatment. The NV Energy ASD team originally specified the technology treatment to include both programmable-communicating thermostats (PCTs) and energy displays. The team then switched primary vendors, converting to technology based solely on PCTs.

Fifth, the PUCN ordered the NDPT to supply specific studies of Equal Payment Plan (EPP) participants and participants with payment arrearages.

These changes, while important, left the NDPT unchanged in its fundamental research objectives and approaches.

# *Recruitment, Enrollment & Installation*

## Contractors

Most of the work for recruitment and enrollment was completed by outside contractors as it was a short term work effort that could not be accomplished by internal service departments.

| | |
|---|---|
| Las Vegas Color | printing, mail merging and mailing for the heads-up postcard and initial solicitation packet |
| UNLV-CC | created and hosted an online web enrollment tool |
| Active Telesource | inbound and outbound phone customer service, as well as processing inbound mail and web enrollments; they also provided scheduling and support for field service installations |
| Mad Dash | field service installations of the in-home technology |

## Systems

All of the recruitment information was held within NV Energy's already-existing Demand Response Management System (DRMS), which was also used to facilitate existing demand response programs. Likewise, field service installations were scheduled in this system, and this system was employed as the repository of all of the NDPT in-home device information.

## Initial Mail Recruitment

Customers were first contacted by mail through two separate mailings as a program announcement and notice that they have a time-limited choice to either enroll as a participant in the particular treatment offered, or continue taking service under the default flat rate. The first mailing was a generic "heads-up" postcard that provided notice that an important packet would be coming in the mail in the next few days and encouraged customers to read it. The second mailing came two days later and included multiple materials about the program, their treatment and instructions on how to enroll. The second packet included the following materials inside a 6x9 envelope (included in Appendix A: Recruitment Materials):

- Six-panel brochure
- Two-page letter
- Disclosure statement
- Rate card with return mail enrollment form
- Return mail envelope

Recruitment for the twelve treatments (six North and six South) was broken down into three waves: (1) rate with education and technology, (2) rate only and (3) rate with education. The wave approach was necessary in order to avoid overwhelming the call center with inbound calls from too many of the 195,580 customers who would otherwise receive enrollment packets on the same day. Table 10 shows the mailing dates for the postcard and packet across the three waves.

*Table 10:* ***NDPT Customer Recruitment Mailing Schedule***

| Description | Date | Treatments |
|---|---|---|
| **Heads-Up Postcard** | 12/31/2012 | Rate with Education & Technology – North and South |
| **Heads-Up Postcard** | 1/2/2013 | Rate only – North and South |
| **Heads-Up Postcard** | 1/5/2013 | Rate with Education – North and South |
| **Solicitation Packet** | 1/2/2013 | Rate with Education & Technology – North and South |
| **Solicitation Packet** | 1/4/2013 | Rate only – North and South |
| **Solicitation Packet** | 1/7/2013 | Rate with Education – North and South |

## Enrollment

Customers were able to enroll or decline through four channels:

- Returned mail postcard
- Outbound calls
- Inbound calls
- Enrollment website

In each channel, the customer was given the opportunity to either choose to participate or decline. If they chose not to participate, their information would be removed from the recruiting lists to discontinue NDPT solicitation. If they chose to participate, assuming all enrollment criteria had been met, they would be added to the participant lists and a technology installation scheduled, if applicable.

## Return Mail Postcard

A postage-paid return mail postcard was included in the initial solicitation packet. Customers had to confirm their decision of "yes" or "no," enter their customer information, acknowledge the terms and conditions of the program, and answer any applicable eligibility questions. The postcards were scanned in and the electronic versions processed daily by ATS. If any information was missing, CSRs would outbound call the customer to try and complete their enrollment. CSRs would also have to contact technology participants in order to schedule their in-home installation.

A letter was sent to each of these customers informing them that they were either enrolled in the NDPT or ineligible to participate.

## Outbound/Inbound Calling

For customers who either called the number provided or were reached via outbound dialing campaign, the entire enrollment process was conducted in one phone call. Customer information and acknowledgement of terms and conditions were collected by the agent. Participants were required to schedule their technology install at the time of enrollment or else their enrollment would be cancelled.

Recruitment only went through February 28, 2013 as the rates went active on March 1, 2013. As such, no phone enrollments were accepted after February 28, 2013 and the web enrollment site was shut down at midnight of the same date. Lastly, return mail had to be signed, dated and mailed on or before February 28, 2013 in order to be processed.

Because of the one-wave recruitment approach, the Company was not able to regulate how many people volunteered for the program as well as originally planned. As a result, more people enrolled in certain treatment/strata combinations than were necessary for statistical accuracy. The company allowed cells to be oversubscribed up to a certain point, at which point enrollment for

that cell was closed and people trying to volunteer were turned away and pointed to other NV Energy programs.

### Enrollment Website

In the initial solicitation packet, customers were provided a special offer code and a website address where they could enroll online. Once they entered their code, customers could affirm "yes" or "no" to participate. If they chose to participate, they were led through a series of screens to confirm their eligibility. Customers were also required to enter their contact information and accept the terms and conditions of the program. After providing the necessary information, the customer was then notified in real time whether or not they were eligible to participate. Electronic enrollments were processed daily by ATS. For incomplete submissions, CSRs would outbound call the customer to try and complete their enrollment. CSRs would also have to contact technology participants in order to schedule their in-home installation.

### Eligibility Criteria (Exclusions)

Primary eligibility criteria that applied to all groups were handled during the development of the eligibility pool as described in prior sections, but secondary eligibility criteria were assessed for education and technology treatment participants during their time of enrollment. Education treatment customers were required to supply an email address in order to participate; if they were not able or refused, their enrollment was not processed. Technology treatment customers were required to meet all of the criteria below, or they were deemed ineligible and their enrollment not processed.

- Own the home or have permission from their landlord for the technology installation
- Have 24/7 always on broadband internet service
- Have working central air-conditioning

## *Secondary Recruitment Efforts*

### Outbound Phone Dialing Campaigns

The Company engaged in two types of outbound phone campaigns. The first type of outbound dialing campaign was for incomplete applications or to schedule technology installation for customers who enrolled via return mail or the web. The second was outbound recruitment to those customers who hadn't responded to the Company and were assigned to open treatment cells.

Table 11 shows all outbound dialing campaigns.

*Table 11:* ***Outbound Dialing***

| Date | Group | Purpose |
|---|---|---|
| **1/8/2013** | Web enrollments | Schedule install |
| **1/9/2013** | Web enrollments | Schedule install |
| **1/11/2013** | Web enrollments | Schedule install |
| **1/14/2013** | Web enrollments | Schedule install |
| **1/14/2013** | Mail enrollments | Schedule install |
| **1/15/2013** | Incomplete mail - list 1 | Missing information |
| **1/15/2013** | Mail enrollments | Schedule install |
| **1/15/2013** | Web enrollments | Schedule install |
| **1/16/2013** | Web enrollments | Schedule install |
| **1/17/2013** | Incomplete mail - list 2 | Missing information |
| **1/17- 1/18/2013** | All North technology customers | Recruitment |
| **1/18/2013** | Incomplete mail - list 3 | Missing information |
| **1/21/2013** | Web enrollments | Schedule install |
| **1/22 - 1/24/2013** | All North customers with open cells, not yet called | Recruitment |
| **1/23/2013** | Web enrollments | Schedule install |
| **1/23/2013** | Web enrollments | Schedule install |
| **1/24/2013** | Incomplete mail - list 1 | Missing information |
| **1/24/2013** | Incomplete mail - list 2 | Missing information |
| **1/25/2013** | Web enrollments 01/14 | Schedule install |
| **1/25-2/1/2013** | North strata's 1-3 TOU & 1-3 CPP (open cells) | Recruitment |
| **1/25 - 2/01/2013** | South strata's 1-3 TOU & 1-3 CPP (open cells) | Recruitment |
| **2/01 - 2/04/2013** | Strata 4's South | Recruitment |
| **2/5/2013** | Unreachable/unscheduled technology | Schedule install |
| **2/7 - 2/08/2013** | Strata 4's North | Recruitment |
| **2/8 - 2/09/2013** | Unreachable/unscheduled technology | Schedule install |
| **2/08 - 2/11/2013** | Strata 4's South | Recruitment |
| **2/11 - 2/13/2013** | South strata's 1-3 TOU & 1-3 CPP (open cells) | Recruitment |
| **2/1 - 2/14/2013** | North strata's 1-3 TOU & 1-3 CPP (open cells) | Recruitment |
| **2/13/2013** | Unreachable/unscheduled technology | Schedule install |
| **2/14/2013** | Strata 4's North | Recruitment |
| **2/15- 2/18/2013** | South strata's 1-3 TOU & 1-3 CPP (open cells) | Recruitment |
| **2/23/2013** | Unreachable/unscheduled technology | Schedule install |

## Follow Up Mailings

There were two different kinds of follow-up mailings conducted. First, a second mailing was made on February 22, 2013 to any customers in treatment cells still open to enrollment and who hadn't

provided a response to the company. This mailing included a two-page letter and was mailed to 9,580 customers in the North and 19,779 in the South. Second, letters were sent to customers who couldn't be reached by phone to complete their enrollment (missing information) or schedule their technology installation for those who enrolled across return mail or the web. Tables 12 and 13 show all outbound mail campaigns.

*Table 12:* ***NDPT Follow-Up Mailings***

| Date | Group | Purpose |
|---|---|---|
| **2/5/2013** | All North & South unreachable & unscheduled technology | Missing Info / Schedule install |
| **2/20/2013** | All North & South unreachable & unscheduled technology | Missing Info / Schedule install |
| **2/22/2013** | All open cell customers | Recruitment |

## Follow Up Emails

Emails were sent to customers who couldn't be reached by phone to complete their enrollment (missing information) or schedule their technology installation for those who enrolled across return mail or the web. The table below shows all outbound email campaigns.

*Table 13:* ***Follow-Up Emailing***

| Date | Group | Purpose |
|---|---|---|
| **1/24/2013** | All North & South unreachable &unscheduled technology | Missing Info / Schedule install |
| **2/5/2013** | All North & South unreachable & unscheduled technology | Missing Info / Schedule install |
| **2/20/2013** | All North & South unreachable & unscheduled technology | Missing Info / Schedule install |

## Technology Installation

Customers volunteering to participate in treatment cells including the in-home technology had to allow the physical installation of the technology in their home prior to their enrollment being finalized. The installation also included the distribution of printed technology information and limited field service education.

Customers who affirmed participation and were successfully enrolled in a technology treatment were required to schedule a time for the installation within the next ten days. This appointment was either scheduled while on the same phone call as when they enrolled (inbound/outbound phone), or through a follow-up outbound call (web/mail enrollment).

ATS called the participant 24-hours prior to the installation to confirm their appointment time. The field service technician then called 30-minutes before their estimated arrival time to confirm that the customer was still available. If upon arrival, the installer was not able to access the premises, they made note that the customer was a "no-show" and proceeded to their next installation

appointment. The customer was called to reschedule the appointment. After three failed attempts to install the device, the customer was removed from the NDPT and no further attempts made.

Upon arriving at the participant's residence the installer would introduce the customer to the NDPT and walking them through the installation process. The installer would verify customer eligibility. If the installer found that the customer was not eligible, they would inform them of their ineligibility and the customer would be removed from the program. Provided the participant was home and eligible, the installer would install the thermostat and gateway, connect it to the online portal for remote operation and test the system for functionality. The installer then provided the participant with instructional material as well as a brief demonstration of its operation and the online portal. The customer was required to program the thermostat prior to the installer leaving the premises. While the program criterion was to have always on broadband internet, it never stated the necessity of having a router or open port. The Company provided a router in the case the customer did not have an open port.

If customers failed to have their in-home devices installed by March 25, 2013, they were removed from the NDPT and their rate was reverted back to the otherwise applicable flat rate. The rate change was effective March 1, 2013, which meant they never billed on the dynamic rate. Note: these customers are not included in the participation numbers cited within this report as they were already removed.

The NDPT conducted market research by having a staff member attend many of the installs from January 17, 2013 to March 1, 2013 and acting as a silent observer. The staff member noted the level of understanding, interaction and interest by the customer. They also made notes about what in the process worked and didn't work from installer to installer in order to come up with best practices.

## Recruitment Result

The table below shows the number of participants recruited by territory and by treatment. As compared to the original targets, only the North TOU+E+T group fell short.

*Table 14:* ***Final Recruitment by Territory and Treatment***

| | South | North | Total |
|---|---|---|---|
| **CPP** | 914 | 334 | 1,248 |
| **CPP+E** | 731 | 300 | 1.031 |
| **CPP+E+T** | 703 | 322 | 1,025 |
| **TOU** | 430 | 435 | 865 |
| **TOU+E** | 323 | 296 | 619 |
| **TOU+E+T** | 317 | 150 | 467 |
| **Totals** | **3,418** | **1,837** | **5,255** |

## Challenges

Recruitment, enrollment and installation were major NDPT processes. Below are a few high level challenges and observations about them:

- The NDPT solicitation was in English only. However, the call center did have bilingual representatives with the ability to accommodate Spanish-speaking customers, and some bilingual households were recruited.
- Despite spreading out the mailing of materials across six days, the number of customers who responded in the first week overwhelmed the customer service center, which caused longer wait times and created more human errors.
- Field installations of treatments proved to be difficult to arrange and complete. Scheduling appointments was difficult. Cancellations by customers were frequent. Many customers were not at home for scheduled appointments. Once appointments were kept, many homes (especially larger homes, with advanced air-conditioning systems) were ruled ineligible because of technology incompatibility with the NDPT technology treatment.
- Online installations of treatments also proved difficult to arrange and complete. Getting customers' attention through e-mails or voicemail was difficult. Incomplete downloads of the education treatment were common. Once the software was downloaded, or the web sites accessed, some customers found the applications to be difficult to use or confusing.

## Non-Compliers Group

NV Energy reached an agreement with the DOE in December 2012 that data would be submitted for up to 37,000 customers; including participants, control group members and non-compliers. Because the non-compliers are those that didn't take advantage of the offer to participate, this

group was selected after recruitment had completed. The groups of non-compliers were assigned a random number (by strata and within the treatment cell they were offered to participate) and then ordered by that random number. The minimum size of the non-complier group is 24,305 (37000 - 5,255 participants – 7440 control group). After inflating 24,305 by 20% to account for attrition during the two years, the minimum target is 29,165. The number of non-compliers selected for each treatment is proportional to the minimum recruitment population necessary. Rounding to whole non-compliers for each treatment and each strata, the target selection total for the North is 11,670 and 17,502 for the south for a total target of 29,172 non-compliers. Table 15 lists the number of non-compliers allocated and selected for each treatment. At the end of year two, all remaining active customers from this group will be included in analysis and in data submission to the DOE. Notice that the table lists 17,502 non-compliers for the south but only 10,296 for the north, 1,374 less than the target. This is because in all three TOU and all three CPP treatment cells, there were insufficient non-complier counts in strata 4 remaining to completely fill the non-complier group. Each of those treatment groups had a target of 1,945 with the difference between this target and the totals listed in Table 15 all accounted for by insufficient strata 4 non-complier counts.

*Table 15:* ***NDPT Non-Compliers by Region and Treatment***

| Treatment | North | South |
|---|---|---|
| **CPP** | 1,708 | 3,890 |
| **CPP+E** | 1,705 | 3,890 |
| **CPP+E+T** | 1,738 | 3,890 |
| **TOU** | 1,717 | 1,944 |
| **TOU+E** | 1,696 | 1,944 |
| **TOU+E+T** | 1,732 | 1,944 |
| **Total** | 10,296 | 17,502 |

# *Treatments: Rates*

## Background

As its name indicates, the NDPT was designed as a pricing research study, with the additional impacts of technology-based and education-based treatments included.

All of the NDPT rates were designed to follow two principles: better cost alignment and customer choice. First, all of the NDPT rates were designed to better align the costs customers pay with the true costs of providing service. When electricity is cheaper to provide, it costs the customer less (off-peak) and when it's more expensive to provide, it costs the customer more (mid-peak and on-peak). Second, all of the NDPT rates included a best bill guarantee for the first year of the program, and permitted participants to elect the Equal Payment Plan (EPP) as an option to mitigate potentially high bills.

The NDPT tests two different kinds of rates. The first is a time-of-use (TOU) rate similar in design to NV Energy's existing optional TOU rate, but more closely tracking the real cost of providing service hour by hour, and season by season. The second NDPT rate is a critical peak pricing rate, using the NDPT's TOU rate design as a basis, but overlaying a fixed number of dispatched pricing events

across certain hours on certain summer days. For the South, the costs from 18 of the highest cost (generation and energy) non-holiday weekdays, from 3 p.m. to 7 p.m., during the four-month summer were used to develop rates for the Critical Peak Period. In the North, 16 of the highest costs days during the three month summer were used.

## *Rate Structure*

### Southern Nevada

In the South, the NDPT TOU definitions separate the summer season into two periods for the TOU rate structure: core and shoulder. The Core Summer is July and August, and the Shoulder Summer is June and September. Winter is the balance of October through May. The Core and Shoulder Summer On-peak periods are both from 2 p.m. to 7 p.m. These changes provide TOU periods that are reflective of system costs across the year.

The Critical Peak Pricing (CPP) rate schedule for southern Nevada uses the same period definitions as the TOU schedule but adds another element: 72 very high cost on-peak hours are allocated across 18 Critical Peak events, each four hours long, from 3 p.m. to 7 p.m., weekdays.

For the NDPT in the South, four of the 18 Critical Peak Events will be called in June and September, and 14 will be called during July and August.

*Table 16:* ***Southern Nevada TOU Periods***

| | **Winter** | **Summer Core** | | **Summer Shoulder** | |
|---|---|---|---|---|---|
| | **October through May** | **July and August** | | **June and September** | |
| **Southern Nevada** | Off-Peak | On-Peak | Off-Peak | On-Peak | Off-Peak |
| | | 2:00 p.m. - 7:00 p.m. daily | 7:00 p.m. - 2:00 p.m.[2] daily | 2:00 p.m. - 7:00 p.m. daily | 7:00 p.m. - 2:00 p.m.[2] daily |

### Northern Nevada

The TOU period definitions in the North TOU schedule are split into two seasons: summer and winter. Winter (October through June) on-peak is 5 p.m. to 9 p.m. daily, and off-peak is 9 p.m. to 5 p.m. daily. Summer (July through September) on-peak is 1 p.m. to 6 p.m. weekdays, and mid-peak is 10 a.m. to 1 p.m. and 6 p.m. to 9 p.m. weekdays. Summer off-peak is all other hours in July through September, including all weekend hours.

For the CPP rate schedule in the North, the Critical Peak costs and rates are separated from the Summer On-peak period, consistent with the method used in the South, but with only one Summer

[2] 2:00 p.m. the following day

Season and one Critical Peak Rate. The Critical Peak Periods in the North are the last four hours (2 p.m. to 6 p.m., weekdays) during the Summer on-peak period for 16 non-holiday weekday events called by the company. During each summer of the NDPT in the North, the Company will call 14 events between July and August and two in September.

*Table 17:* ***Northern Nevada TOU Periods***

| | **Winter** | | **Summer** | | |
|---|---|---|---|---|---|
| | **October through June** | | **July through September** | | |
| | On-Peak | Off-Peak | On-Peak | Mid-Peak | Off-Peak |
| **Northern Nevada** | 5 p.m. - 9:00 p.m. daily | 9:00 p.m. - 5:00 p.m. daily | Weekdays 1:00 p.m. - 6:00 p.m. | Weekdays Early: 10:00a.m. - 1:00 p.m. Late: 6:00 p.m. - 9:00 p.m. | All Weekend hours and Weekdays 9:00 p.m. – 10:00 a.m. |

## Control Group

The assigned control group for both service territories continued taking service on the existing flat rate and continued to bill on the billing cycle they were on prior to the NDPT.

# *Rate Design*

## Marginal Cost & Attenuation

Rates are developed based upon the reconciled marginal costs for the otherwise applicable flat rate schedules. The rates are revenue neutral, such that the average consumer would pay the same amount as they would have on the flat rate, assuming no changes in consumption behavior. The rates were approved in March 2011 and updated quarterly when all rates are changed as a result of a change in a component of the rate; they also change as a result of the General Rate Cases. Appendix B includes all changes to the rates during 2013 and 2014 to date.

The NDPT rates have been designed so that participating customers who have changed their consumption behavior will create lower individual cost structures than the class average and save money under the NDPT schedules. Those participants who have higher than class average cost structures will pay more. Rates for both companies have been attenuated somewhat from full cost-based rates, but the NDPT rates are more reflective of full costs than the rates participants will have experienced in the past. TOU period definitions in each region vary due to different costs at each company.

For each rate class, CPP on-peak rates and the Critical Peak Period rates were calculated from the same period on-peak marginal costs as the TOU rates, but these marginal costs are now split between two periods instead of being consolidated into one. For the CPP rates, marginal

transmission and distribution costs per kWh for both the Critical Peak Periods and the on-peak periods are the same as the marginal cost per kWh identified by the on-peak rate calculations for the TOU rates.

During NDPT rate development, the marginal generation and energy costs per kWh were identified separately for the CPP rate periods, and are higher for the Critical Peak Period than they are for the corresponding CPP rate Summer On-Peak periods. This separation establishes the Critical Peak Period rate as higher than the corresponding Summer on-peak rate and causes the on-peak CPP rate (for non-Critical Peak hours) to be less than the corresponding on-peak TOU rate for all non-Critical Peak hours. The lower on-peak rate balances against the fact that the rate for CPP participants during Critical Peak hours is much greater than the on-peak TOU rate.

The resulting full-cost based and attenuated rates are provided on the next two pages in Tables 18 and 19, which summarize the rate designs for the NDPT's North and South TOU and CPP rates for single family residential customers. These tables use the marginal costs that were in effect in 2010 when the rates were originally developed and approved; they have not been updated to reflect the recent General Rate Cases at both companies, which have adjusted overall rates due to other factors outside of the NDPT.

## *Table 18:* ***ASD DPT Rate Design Summary, NPC (South)***

Note: Rates include BTER current as of April 1, 2010.

**TOU-E Cost Based** — **RS**

| MONTHS OF JULY AND AUGUST | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11658 |
|---|---|---|---|---|---|
| On Peak, Core Summer Period | 310 | 3.5% | $0.65374 | 13.11 | 5.61 |
| Critical Peak, Core Summer Period | na | na | na | na | na |
| Off Peak, Core Summer Period | 1,178 | 13.4% | $0.04986 | 1.00 | 0.43 |
| MONTHS OF JUNE AND SEPT | | | | | |
| On Peak, Shoulder Summer Period | 300 | 3.4% | $0.18655 | 3.74 | 1.60 |
| Critical Peak, Shoulder Summer Period | na | na | na | na | na |
| Off Peak, Shoulder Summer Period | 1,140 | 13.0% | $0.04986 | 1.00 | 0.43 |
| MONTHS OF OCT THROUGH MAY | | | | | |
| Winter (same rate as in summer off prds) | 5,832 | 66.6% | $0.04986 | 1.00 | 0.43 |
| Total | 8,760 | 100.0% | | | |

**TOU-E Rate Design** — **RS**

| MONTHS OF JULY AND AUGUST | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11659 |
|---|---|---|---|---|---|
| On Peak, Core Summer Period | 310 | 3.5% | $0.46734 | 6.40 | 4.01 |
| Critical Peak, Core Summer Period | na | na | na | na | na |
| Off Peak, Core Summer Period | 1,178 | 13.4% | $0.07299 | 1.00 | 0.63 |
| MONTHS OF JUNE AND SEPT | | | | | |
| On Peak, Shoulder Summer Period | 300 | 3.4% | $0.16259 | 2.23 | 1.39 |
| Critical Peak, Shoulder Summer Period | na | na | na | na | na |
| Off Peak, Shoulder Summer Period | 1,140 | 13.0% | $0.07299 | 1.00 | 0.63 |
| MONTHS OF OCT THROUGH MAY | | | | | |
| Winter (same rate as in summer off prds) | 5,832 | 66.6% | $0.07299 | 1.00 | 0.63 |
| Total | 8,760 | 100.0% | | | |

**CPP Cost Based** — **RS**

| MONTHS OF JULY AND AUGUST | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11658 |
|---|---|---|---|---|---|
| On Peak, Core Summer Period | 254 | 2.9% | $0.56326 | 11.30 | 4.83 |
| Critical Peak, Core Summer Period | 56 | 0.6% | $0.99771 | 20.01 | 8.56 |
| Off Peak, Core Summer Period | 1,178 | 13.4% | $0.04986 | 1.00 | 0.43 |
| MONTHS OF JUNE AND SEPT | | | | | |
| On Peak, Shoulder Summer Period | 284 | 3.2% | $0.17720 | 3.55 | 1.52 |
| Critical Peak, Shoulder Summer Period | 16 | 0.2% | $0.36559 | 7.33 | 3.14 |
| Off Peak, Shoulder Summer Period | 1,140 | 13.0% | $0.04986 | 1.00 | 0.43 |
| MONTHS OF OCT THROUGH MAY | | | | | |
| Winter (same rate as in summer off prds) | 5,832 | 66.6% | $0.04986 | 1.00 | 0.43 |
| Total | 8,760 | 100.0% | | | |

**CPP Rate Design** — **RS**

| MONTHS OF JULY AND AUGUST | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11659 |
|---|---|---|---|---|---|
| On Peak, Core Summer Period | 254 | 2.9% | $0.38384 | 5.26 | 3.29 |
| Critical Peak, Core Summer Period | 56 | 0.6% | $0.78479 | 10.75 | 6.73 |
| Off Peak, Core Summer Period | 1,178 | 13.4% | $0.07299 | 1.00 | 0.63 |
| MONTHS OF JUNE AND SEPT | | | | | |
| On Peak, Shoulder Summer Period | 284 | 3.2% | $0.14674 | 2.01 | 1.26 |
| Critical Peak, Shoulder Summer Period | 16 | 0.2% | $0.31941 | 4.38 | 2.74 |
| Off Peak, Shoulder Summer Period | 1,140 | 13.0% | $0.07299 | 1.00 | 0.63 |
| MONTHS OF OCT THROUGH MAY | | | | | |
| Winter (same rate as in summer off prds) | 5,832 | 66.6% | $0.07299 | 1.00 | 0.63 |
| Total | 8,760 | 100.0% | | | |

## *Table 19:* ***ASD DPT Rate Design Summary, SPPC (North)***

Note: Rates include BTER current as of April 1, 2010.

**TOU-E Cost Based** **D-1**

| MONTHS OF JULY THROUGH SEPTEMBER | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11712 |
|---|---|---|---|---|---|
| On-Peak, Summer Season | 330 | 3.8% | $0.75096 | 12.01 | 6.41 |
| Mid-Peak, Summer Season | 396 | 4.5% | $0.28708 | 4.59 | 2.45 |
| Critical Peak, Summer Season | na | na | na | na | na |
| Off Peak, Summer Season | 1,482 | 16.9% | $0.06253 | 1.00 | 0.53 |
| MONTHS OF OCTOBER THROUGH JUNE | | | | | |
| On-Peak, Winter Season | 1,092 | 12.5% | $0.09460 | 1.51 | 0.81 |
| Mid-Peak, Winter Season | 2,730 | 31.2% | $0.06253 | 1.00 | 0.53 |
| Off Peak, Winter Season | 2,730 | 31.2% | $0.06253 | 1.00 | 0.53 |
| Total | 8,760 | 100.0% | | | |

**TOU-E Rate Design** **D-1**

| MONTHS OF JULY THROUGH SEPTEMBER | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11712 |
|---|---|---|---|---|---|
| On-Peak, Summer Season | 330 | 3.8% | $0.48697 | 6.61 | 4.16 |
| Mid-Peak, Summer Season | 396 | 4.5% | $0.25477 | 3.46 | 2.18 |
| Critical Peak, Summer Season | na | na | na | na | na |
| Off Peak, Summer Season | 1,482 | 16.9% | $0.07366 | 1.00 | 0.63 |
| MONTHS OF OCTOBER THROUGH JUNE | | | | | |
| On-Peak, Winter Season | 1,092 | 12.5% | $0.14181 | 1.93 | 1.21 |
| Mid-Peak, Winter Season | 2,730 | 31.2% | $0.07366 | 1.00 | 0.63 |
| Off Peak, Winter Season | 2,730 | 31.2% | $0.07366 | 1.00 | 0.63 |
| Total | 8,760 | 100.0% | | | |

**CPP Cost Based** **D-1**

| MONTHS OF JULY THROUGH SEPTEMBER | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11712 |
|---|---|---|---|---|---|
| On-Peak, Summer Season | 266 | 3.0% | $0.64107 | 10.25 | 5.47 |
| Mid-Peak, Summer Season | 396 | 4.5% | $0.28708 | 4.59 | 2.45 |
| Critical Peak, Summer Season | 64 | 0.7% | $1.08072 | 17.28 | 9.23 |
| Off Peak, Summer Season | 1,482 | 16.9% | $0.06253 | 1.00 | 0.53 |
| MONTHS OF OCTOBER THROUGH JUNE | | | | | |
| On-Peak, Winter Season | 1,092 | 12.5% | $0.09460 | 1.51 | 0.81 |
| Mid-Peak, Winter Season | 2,730 | 31.2% | $0.06253 | 1.00 | 0.53 |
| Off Peak, Winter Season | 2,730 | 31.2% | $0.06253 | 1.00 | 0.53 |
| Total | 8,760 | 100.0% | | | |

**CPP Rate Design** **D-1**

| MONTHS OF JULY THROUGH SEPTEMBER | Hours | Pct | Rate | Relative to Off-Pk | Relative To Flat Rate $0.11712 |
|---|---|---|---|---|---|
| On-Peak, Summer Season | 266 | 3.0% | $0.37089 | 5.04 | 3.17 |
| Mid-Peak, Summer Season | 396 | 4.5% | $0.25477 | 3.46 | 2.18 |
| Critical Peak, Summer Season | 64 | 0.7% | $0.83493 | 11.33 | 7.13 |
| Off Peak, Summer Season | 1,482 | 16.9% | $0.07366 | 1.00 | 0.63 |
| MONTHS OF OCTOBER THROUGH JUNE | | | | | |
| On-Peak, Winter Season | 1,092 | 12.5% | $0.14181 | 1.93 | 1.21 |
| Mid-Peak, Winter Season | 2,730 | 31.2% | $0.07366 | 1.00 | 0.63 |
| Off Peak, Winter Season | 2,730 | 31.2% | $0.07366 | 1.00 | 0.63 |
| Total | 8,760 | 100.0% | | | |

Tables 20 and 21 show average price per kWh during each TOU period, as well as the price in relation to the off-peak price.

*Table 20:* ***Northern Nevada Average Prices per kWh by Period***

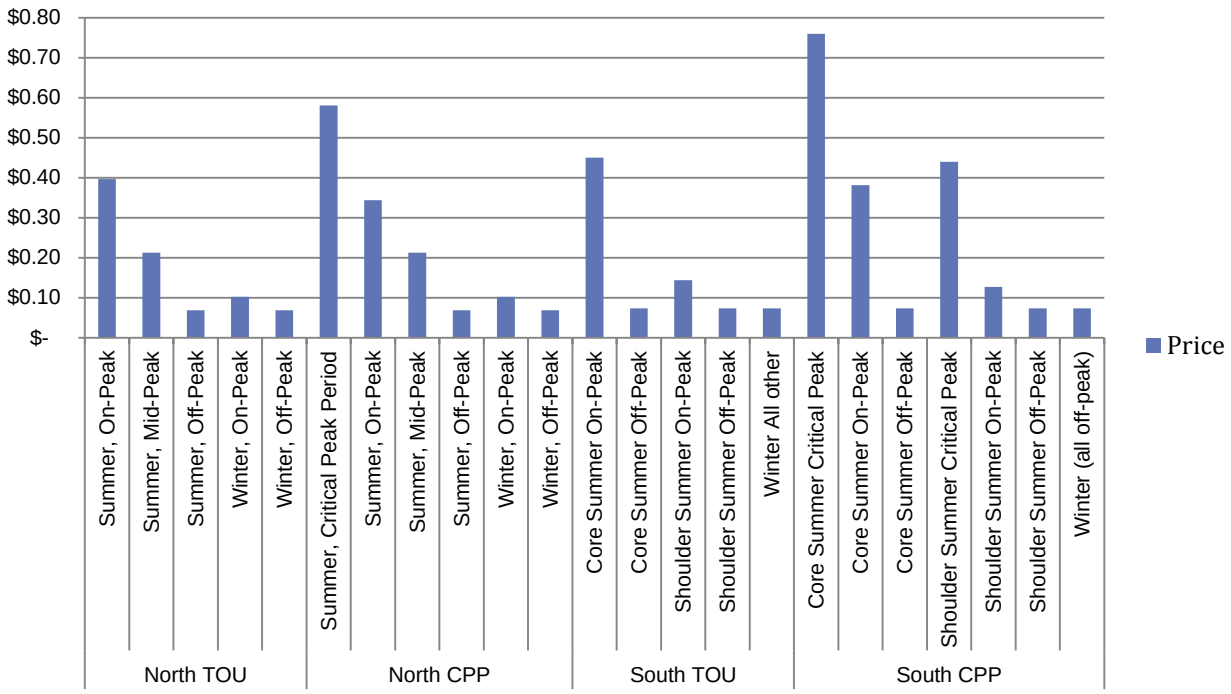
| Rate | Period | Price ($) | Price/Off-Peak Price |
|---|---|---|---|
| TOU | Summer, On-Peak | 0.40 | 5.75 |
| | Summer, Mid-Peak | 0.21 | 3.09 |
| | Summer, Off-Peak | 0.07 | 1.00 |
| | Winter, On-Peak | 0.10 | 1.48 |
| | Winter, Off-Peak | 0.07 | 1.00 |
| CPP | Summer, Critical Peak | 0.58 | 8.42 |
| | Summer, On-Peak | 0.34 | 4.99 |
| | Summer, Mid-Peak | 0.21 | 3.09 |
| | Summer, Off-Peak | 0.07 | 1.00 |
| | Winter, On-Peak | 0.10 | 1.48 |
| | Winter, Off-Peak | 0.07 | 1.00 |

*Table 21:* ***Southern Nevada Average Prices per kWh by Period***

| Rate | Period | Price ($) | Price/Off-Peak Price |
|---|---|---|---|
| TOU | Core Summer On-Peak | 0.45 | 6.10 |
| | Core Summer Off-Peak | 0.07 | 1.00 |
| | Shoulder Summer On- | 0.14 | 1.95 |
| | Shoulder Summer Off- | 0.07 | 1.00 |
| | Winter All other | 0.07 | 1.00 |
| CPP | Core Summer Critical | 0.76 | 10.29 |
| | Core Summer On-Peak | 0.38 | 5.17 |
| | Core Summer Off-Peak | 0.07 | 1.00 |
| | Shoulder Summer | 0.44 | 5.96 |
| | Shoulder Summer On- | 0.13 | 1.72 |
| | Shoulder Summer Off- | 0.07 | 1.00 |
| | Winter (all off-peak) | 0.07 | 1.00 |

Figure 2 compares the values of the average prices of each TOU period.

***Figure 2: Average NDPT Price by Period***




## Bill Impact Analysis

During the NDPT rate design, an analysis was completed based upon the proposed rates to determine the potential impacts that these rate structures might have on individual customer bills. Monthly bill comparisons are provided as Table 22 for the South and Table 25 for the North. These tables use the average usage per customer in each class to calculate a monthly bill on the otherwise applicable flat-rate and each of the NDPT pricing options. The resulting impact analysis showed that the rates are essentially revenue neutral with respect to the existing flat-rates, without considering customer responses to the provided price signals. The monthly bill impacts for each company are higher for the average customer during seasons with higher costs and lower for those seasons with lower costs.

Table 23 for the South and Table 24 for the North provide results showing the percentage of the class population that would benefit from the NDPT optional schedules without a change to their energy usage patterns. These tables use the hourly data from the Load Research Department's sample set of customers, used to develop the class loads for the GRC filings mentioned above. The analysis calculates monthly bills under the flat-rate schedule and the alternative NDPT pricing options. Once the annual bills were compared, the results show that a significant portion of the population at Nevada Power, and a majority of customers at Sierra, would benefit from these

schedules even if they did not change their energy usage patterns in response to the NDPT. It is important to note (see the volume of this report discussing the focus groups) that only a few NDPT focus group attendees reported making similar analyses on their own, and then concluding based on the results that they would merely wait and see how the program worked out before deliberately shifting or reducing their electricity use.

These tables also include the simple assumptions of behavior changes used in the NDPT rate design for comparison to the respective flat-rate schedules. These assumptions indicated how customers might benefit if they responded to the NDPT's time-varying rates. The results show that a majority of customers at both companies could save on their annual bills from the amounts paid on the flat-rate with simple changes in their energy usage during On-Peak and Critical Peak periods. The results also demonstrated that while some customers could benefit without changing behavior, others might have to significantly reduce their On-Peak and Critical Peak Period energy usage to benefit from these schedules, or would otherwise end up paying significantly more than they would have on the flat-rate schedule.

Regardless of where an individual customer falls on the spectrum, the stated diversity in the results show that the implementation of time-of-use pricing has the potential to reduce intra-class subsidies by having customers pay prices more closely matched with those costs that they impose on the system. Other things equal, those customers currently subsidizing others due to their lower cost of service, could pay less under these pricing options and those being subsidized due to their higher cost of service, could pay more of the costs that they contribute to the overall system.

*Table 22:* ***Monthly Bill Comparison under NDPT Rates – NPC (South)***

| | | No Change in Consumption | | 5% On-Peak Response Only | TOU-E with Critical Peak Pricing (5% On-Peak Usage Reduction and Following Changes during CPP Events): | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | DPT Rate Options | | | | | | | |
| Month | Existing Flat Rate (Control Group) | Enhanced TOU (TOU-E) | TOU-E with Critical Peak Pricing (CPP) | Enhanced TOU (TOU-E) | (20% 1-Hour CPP Reduction) | (20% 2-Hour CPP Reduction) | (20% 3-Hour CPP Reduction) | (20% 4-Hour CPP Reduction) | (40% 4-Hour CPP Reduction) |
| January | $ 112.13 | $ 73.20 | $ 73.20 | $ 73.20 | $ 73.20 | $ 73.20 | $ 73.20 | $ 73.20 | $ 73.20 |
| February | $ 95.46 | $ 62.76 | $ 62.76 | $ 62.76 | $ 62.76 | $ 62.76 | $ 62.76 | $ 62.76 | $ 62.76 |
| March | $ 93.87 | $ 61.76 | $ 61.76 | $ 61.76 | $ 61.76 | $ 61.76 | $ 61.76 | $ 61.76 | $ 61.76 |
| April | $ 92.57 | $ 60.95 | $ 60.95 | $ 60.95 | $ 60.95 | $ 60.95 | $ 60.95 | $ 60.95 | $ 60.95 |
| May | $ 129.52 | $ 84.08 | $ 84.08 | $ 84.08 | $ 84.08 | $ 84.08 | $ 84.08 | $ 84.08 | $ 84.08 |
| June | $ 218.93 | $ 192.80 | $ 193.68 | $ 188.02 | $ 187.76 | $ 187.50 | $ 187.24 | $ 186.98 | $ 185.94 |
| July | $ 269.01 | $ 435.39 | $ 429.13 | $ 419.75 | $ 416.85 | $ 413.96 | $ 411.07 | $ 408.18 | $ 396.61 |
| August | $ 261.89 | $ 435.24 | $ 429.69 | $ 419.34 | $ 416.36 | $ 413.37 | $ 410.38 | $ 407.40 | $ 395.45 |
| September | $ 188.23 | $ 166.68 | $ 166.02 | $ 162.52 | $ 162.34 | $ 162.15 | $ 161.96 | $ 161.77 | $ 161.01 |
| October | $ 102.15 | $ 66.95 | $ 66.95 | $ 66.95 | $ 66.95 | $ 66.95 | $ 66.95 | $ 66.95 | $ 66.95 |
| November | $ 97.74 | $ 64.19 | $ 64.19 | $ 64.19 | $ 64.19 | $ 64.19 | $ 64.19 | $ 64.19 | $ 64.19 |
| December | $ 125.52 | $ 81.58 | $ 81.58 | $ 81.58 | $ 81.58 | $ 81.58 | $ 81.58 | $ 81.58 | $ 81.58 |
| Annual | $ 1,787.04 | $ 1,785.58 | $ 1,773.98 | $ 1,745.09 | $ 1,738.77 | $ 1,732.44 | $ 1,726.11 | $ 1,719.78 | $ 1,694.46 |
| Average monthly bill | $ 148.92 | $ 148.80 | $ 147.83 | $ 145.42 | $ 144.90 | $ 144.37 | $ 143.84 | $ 143.31 | $ 141.21 |
| Difference from flat-rate | $ - | $ (1.46) | $ (13.06) | $ (41.94) | $ (48.27) | $ (54.60) | $ (60.93) | $ (67.26) | $ (92.57) |
| Percent difference | 0.0% | -0.1% | -0.7% | -2.3% | -2.7% | -3.1% | -3.4% | -3.8% | -5.2% |

**PERCENT DIFFERENCE IN MONTHLY BILLS FROM EXISTING FLAT RATE**

| | | No Change in Consumption | | 5% On-Peak Response Only | TOU-E with Critical Peak Pricing (5% On-Peak Usage Reduction and Following Changes during CPP Events): | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | DPT Rate Options | | | | | | | |
| Month | Existing Flat Rate (Control Group) | Enhanced TOU (TOU-E) | TOU-E with Critical Peak Pricing (CPP) | Enhanced TOU (TOU-E) | (20% 1-Hour CPP Reduction) | (20% 2-Hour CPP Reduction) | (20% 3-Hour CPP Reduction) | (20% 4-Hour CPP Reduction) | (40% 4-Hour CPP Reduction) |
| January | 0.0% | -34.7% | -34.7% | -34.7% | -34.7% | -34.7% | -34.7% | -34.7% | -34.7% |
| February | 0.0% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% |
| March | 0.0% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% |
| April | 0.0% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% | -34.2% |
| May | 0.0% | -35.1% | -35.1% | -35.1% | -35.1% | -35.1% | -35.1% | -35.1% | -35.1% |
| June | 0.0% | -11.9% | -11.5% | -14.1% | -14.2% | -14.4% | -14.5% | -14.6% | -15.1% |
| July | 0.0% | 61.8% | 59.5% | 56.0% | 55.0% | 53.9% | 52.8% | 51.7% | 47.4% |
| August | 0.0% | 66.2% | 64.1% | 60.1% | 59.0% | 57.8% | 56.7% | 55.6% | 51.0% |
| September | 0.0% | -11.4% | -11.8% | -13.7% | -13.8% | -13.9% | -14.0% | -14.1% | -14.5% |
| October | 0.0% | -34.5% | -34.5% | -34.5% | -34.5% | -34.5% | -34.5% | -34.5% | -34.5% |
| November | 0.0% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% | -34.3% |
| December | 0.0% | -35.0% | -35.0% | -35.0% | -35.0% | -35.0% | -35.0% | -35.0% | -35.0% |
| Difference from flat-rate | 0.0% | -0.1% | -0.7% | -2.3% | -2.7% | -3.1% | -3.4% | -3.8% | -5.2% |

*Table 23:* ***Comparison of NDPT Rates and Flat Rate – NPC (South)***

**TOU-E**

| | No Price Response | 5% On-Peak Price Response | 10% On-Peak Price Response |
|---|---|---|---|
| Percent benefiting: | 30.57% | 41.90% | 53.11% |
| Average % benefit: | 5.67% | 5.80% | 6.48% |
| Average % loss: | -8.96% | -7.59% | -6.21% |
| Maximum % benefit: | 17.54% | 18.68% | 19.82% |
| Maximum % loss: | -24.49% | -20.72% | -16.95% |

**CPP Rate**

| | No Price Response | 5% On-Peak Usage Reduction and Following Changes during CPP Events (For CPP Schedule): | | | | |
|---|---|---|---|---|---|---|
| | | (20% 1-Hour CPP Reduction) | (20% 2-Hour CPP Reduction) | (20% 3-Hour CPP Reduction) | (20% 4-Hour CPP Reduction) | (40% 5-Hour CPP Reduction) |
| Percent benefiting: | 31.73% | 40.75% | 50.10% | 53.11% | 57.64% | 75.49% |
| Average % benefit: | 5.51% | 5.98% | 5.97% | 6.25% | 6.38% | 7.27% |
| Average % loss: | -9.38% | -7.72% | -7.16% | -6.67% | -6.39% | --- |
| Maximum % benefit: | 18.04% | 19.16% | 19.74% | 20.04% | 20.33% | 21.50% |
| Maximum % loss: | -24.94% | -21.15% | -18.78% | -17.59% | -16.40% | -11.65% |

**Notes/Assumptions:**
Data from 2008 NPC GRC (Docket No. 08-12002) including RS sample customers with 12 months of available data.
18 Critical Peak events called on non-holiday weekdays (3-7pm). Initiated 2 in June, 7 in July, 7 in August, 2 in September.
Rates based upon 2008 GRC Compliance Filing Jan 1, 2010 rates.

***Figure 3: NDPT Rates by Month – NPC (South)***

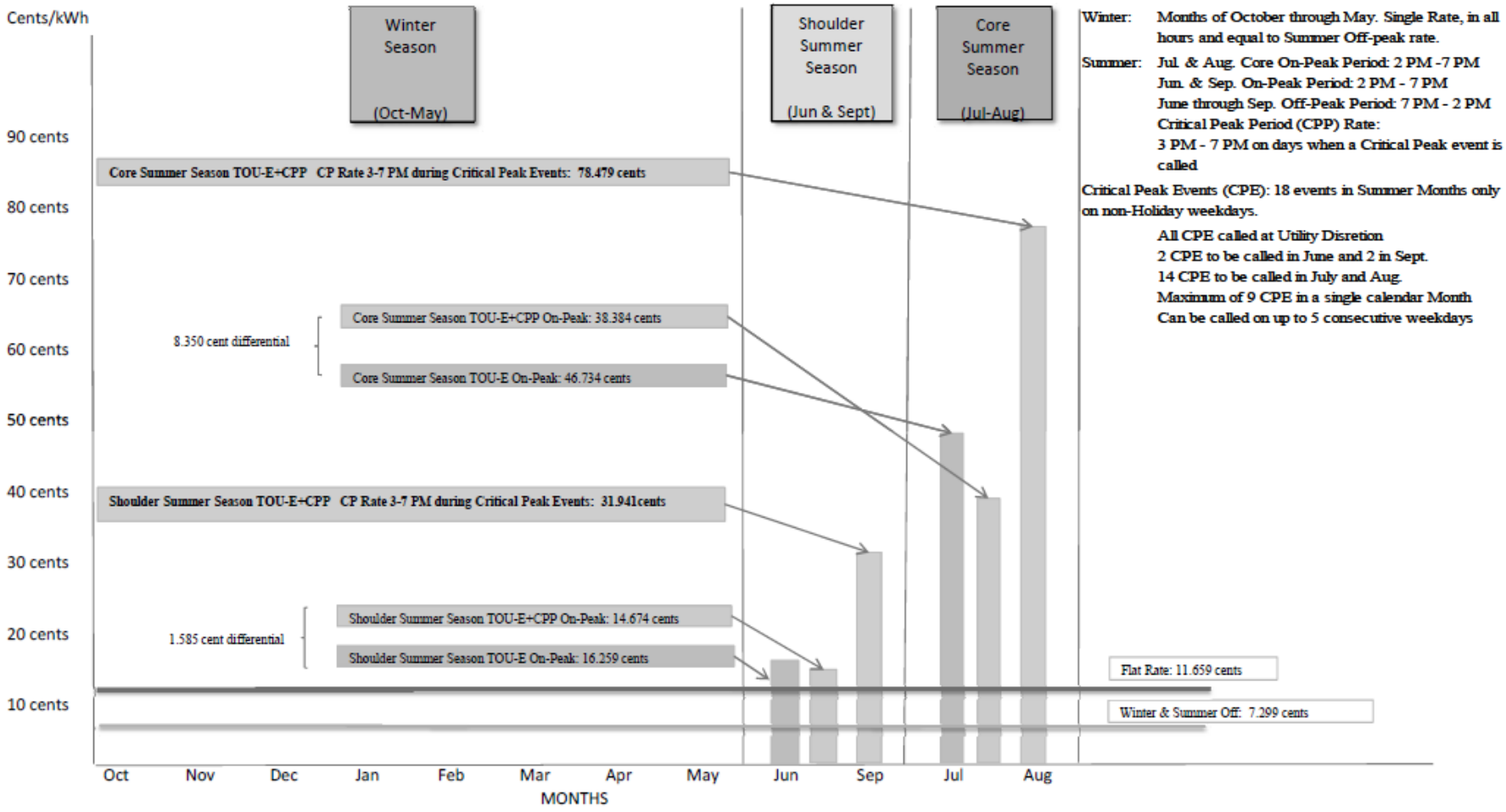


*Table 24:* ***Monthly Bill Comparison under NDPT Rates – SPPC (North)***

| | | No Change in Consumption | | 5% On-Peak & 2.5% Winter On and Summer Mid-Peak Response Only | TOU-E with Critical Peak Pricing (5% On-Peak & 2.5% Winter On and Summer Mid-Peak Usage Reduction and the Following Changes during CPP Events): | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | DPT Rate Options | | | | | | | |
| Month | Existing Flat Rate (Control Group) | Enhanced TOU (TOU-E) | TOU-E with Critical Peak Pricing (CPP) | Enhanced TOU (TOU-E) | (20% 1-Hour CPP Reduction) | (20% 2-Hour CPP Reduction) | (20% 3-Hour CPP Reduction) | (20% 4-Hour CPP Reduction) | (40% 4-Hour CPP Reduction) |
| January | $ 111.64 | $ 86.59 | $ 86.59 | $ 85.90 | $ 85.90 | $ 85.90 | $ 85.90 | $ 85.90 | $ 85.90 |
| February | $ 91.21 | $ 71.09 | $ 71.09 | $ 70.54 | $ 70.54 | $ 70.54 | $ 70.54 | $ 70.54 | $ 70.54 |
| March | $ 89.44 | $ 69.52 | $ 69.52 | $ 68.99 | $ 68.99 | $ 68.99 | $ 68.99 | $ 68.99 | $ 68.99 |
| April | $ 80.87 | $ 62.92 | $ 62.92 | $ 62.45 | $ 62.45 | $ 62.45 | $ 62.45 | $ 62.45 | $ 62.45 |
| May | $ 84.56 | $ 65.91 | $ 65.91 | $ 65.41 | $ 65.41 | $ 65.41 | $ 65.41 | $ 65.41 | $ 65.41 |
| June | $ 91.89 | $ 72.16 | $ 72.16 | $ 71.57 | $ 71.57 | $ 71.57 | $ 71.57 | $ 71.57 | $ 71.57 |
| July | $ 121.50 | $ 203.96 | $ 204.50 | $ 197.57 | $ 196.29 | $ 195.02 | $ 193.74 | $ 192.47 | $ 187.36 |
| August | $ 103.16 | $ 157.26 | $ 164.66 | $ 152.69 | $ 151.41 | $ 150.14 | $ 148.86 | $ 147.58 | $ 142.48 |
| September | $ 87.94 | $ 135.16 | $ 128.03 | $ 131.27 | $ 130.91 | $ 130.54 | $ 130.18 | $ 129.81 | $ 128.35 |
| October | $ 85.54 | $ 66.84 | $ 66.84 | $ 66.32 | $ 66.32 | $ 66.32 | $ 66.32 | $ 66.32 | $ 66.32 |
| November | $ 92.84 | $ 72.77 | $ 72.77 | $ 72.18 | $ 72.18 | $ 72.18 | $ 72.18 | $ 72.18 | $ 72.18 |
| December | $ 114.25 | $ 89.23 | $ 89.23 | $ 88.48 | $ 88.48 | $ 88.48 | $ 88.48 | $ 88.48 | $ 88.48 |
| Annual | $ 1,154.83 | $ 1,153.41 | $ 1,154.21 | $ 1,133.37 | $ 1,130.45 | $ 1,127.53 | $ 1,124.62 | $ 1,121.70 | $ 1,110.03 |
| Average monthly bill | $ 96.24 | $ 96.12 | $ 96.18 | $ 94.45 | $ 94.20 | $ 93.96 | $ 93.72 | $ 93.47 | $ 92.50 |
| Difference from flat-rate | $ - | $ (1.43) | $ (0.62) | $ (21.47) | $ (24.39) | $ (27.30) | $ (30.22) | $ (33.13) | $ (44.80) |
| Percent difference | 0.0% | -0.1% | -0.1% | -1.9% | -2.1% | -2.4% | -2.6% | -2.9% | -3.9% |

PERCENT DIFFERENCE IN MONTHLY BILLS FROM EXISTING FLAT RATE

| | | No Change in Consumption | | 5% On-Peak & 2.5% Winter On and Summer Mid-Peak Response Only | TOU-E with Critical Peak Pricing (5% On-Peak & 2.5% Winter On and Summer Mid-Peak Usage Reduction and Following Changes during CPP Events): | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | DPT Rate Options | | | | | | | |
| Month | Existing Flat Rate (Control Group) | Enhanced TOU (TOU-E) | TOU-E with Critical Peak Pricing (CPP) | Enhanced TOU (TOU-E) | (20% 1-Hour CPP Reduction) | (20% 2-Hour CPP Reduction) | (20% 3-Hour CPP Reduction) | (20% 4-Hour CPP Reduction) | (40% 4-Hour CPP Reduction) |
| January | 0.0% | -22.4% | -22.4% | -23.1% | -23.1% | -23.1% | -23.1% | -23.1% | -23.1% |
| February | 0.0% | -22.1% | -22.1% | -22.7% | -22.7% | -22.7% | -22.7% | -22.7% | -22.7% |
| March | 0.0% | -22.3% | -22.3% | -22.9% | -22.9% | -22.9% | -22.9% | -22.9% | -22.9% |
| April | 0.0% | -22.2% | -22.2% | -22.8% | -22.8% | -22.8% | -22.8% | -22.8% | -22.8% |
| May | 0.0% | -22.1% | -22.1% | -22.7% | -22.7% | -22.7% | -22.7% | -22.7% | -22.7% |
| June | 0.0% | -21.5% | -21.5% | -22.1% | -22.1% | -22.1% | -22.1% | -22.1% | -22.1% |
| July | 0.0% | 67.9% | 68.3% | 62.6% | 61.6% | 60.5% | 59.5% | 58.4% | 54.2% |
| August | 0.0% | 52.4% | 59.6% | 48.0% | 46.8% | 45.5% | 44.3% | 43.1% | 38.1% |
| September | 0.0% | 53.7% | 45.6% | 49.3% | 48.9% | 48.4% | 48.0% | 47.6% | 45.9% |
| October | 0.0% | -21.9% | -21.9% | -22.5% | -22.5% | -22.5% | -22.5% | -22.5% | -22.5% |
| November | 0.0% | -21.6% | -21.6% | -22.2% | -22.2% | -22.2% | -22.2% | -22.2% | -22.2% |
| December | 0.0% | -21.9% | -21.9% | -22.6% | -22.6% | -22.6% | -22.6% | -22.6% | -22.6% |
| Difference from flat-rate | 0.0% | -0.1% | -0.1% | -1.9% | -2.1% | -2.4% | -2.6% | -2.9% | -3.9% |

*Table 25:* ***Comparison of NDPT Rates and Flat Rate – SPPC (North)***

**TOU-E**

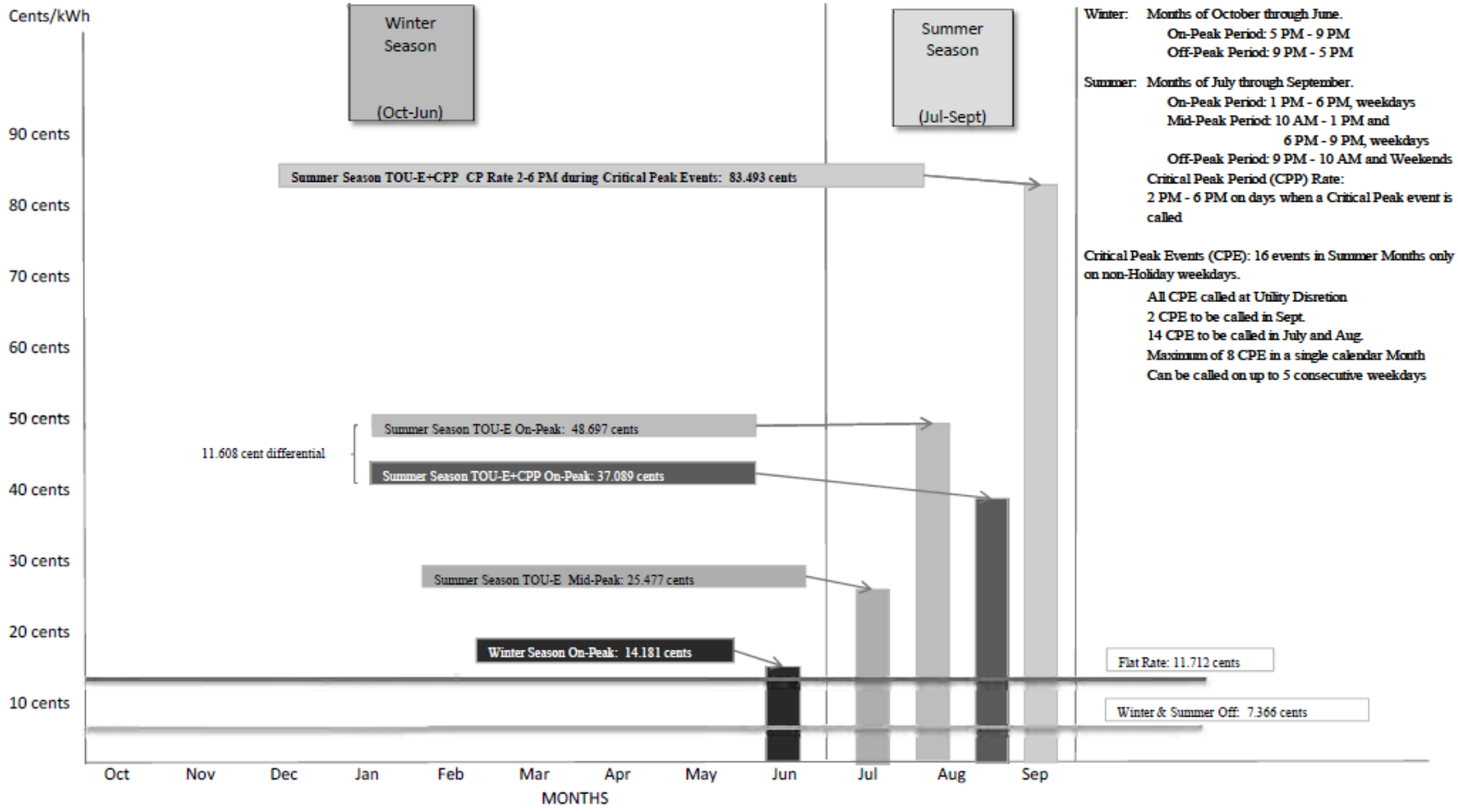
| | No Price Response | 5% On-Peak & 2.5% Winter On and Summer Mid-Peak Price Response | 10% On-Peak & 5% Winter On and Summer Mid-Peak Price Response |
|---|---|---|---|
| Percent benefiting: | 57.79% | 64.65% | 69.90% |
| Average % benefit: | 7.47% | 7.90% | 8.58% |
| Average % loss: | -8.96% | -8.32% | -7.29% |
| Maximum % benefit: | 22.88% | 23.47% | 24.07% |
| Maximum % loss: | -26.47% | -23.29% | -20.10% |

**CPP Rate**

| | No Price Response | 5% On-Peak & 2.5% Winter On and Summer Mid-Peak Usage Reduction and Following Changes during CPP Events (For CPP Schedule): | | | | |
|---|---|---|---|---|---|---|
| | | (20% 1-Hour CPP Reduction) | (20% 2-Hour CPP Reduction) | (20% 3-Hour CPP Reduction) | (20% 4-Hour CPP Reduction) | (40% 4-Hour CPP Reduction) |
| Percent benefiting: | 59.41% | 65.43% | 66.21% | 66.50% | 68.15% | 71.75% |
| Average % benefit: | 7.59% | 7.96% | 8.01% | 8.12% | 8.08% | 8.28% |
| Average % loss: | -10.19% | -8.08% | -7.84% | -7.49% | -7.44% | -6.51% |
| Maximum % benefit: | 22.98% | 23.50% | 23.53% | 23.55% | 23.58% | 23.69% |
| Maximum % loss: | -31.04% | -22.69% | -22.26% | -21.83% | -21.41% | -19.70% |

**Notes/Assumptions:**
Data from 2007 SPPC GRC (Docket No. 07-12001) including D-1 sample customers with at least 9 months of available data.
16 Critical Peak events called on non-holiday weekdays (2-6pm). Initiated 7 in July, 7 in August, and 2 in September.
Rates based upon 2007 GRC Compliance Filing rates.

***Figure 4: NDPT Rates by Month – SPPC (North)***



## CPP Event Rules

The number of CPP events differed in the North and South (18 in the South, 16 in the North), because the South had two events in June in addition to the 14 events in July and August and two events in September. In both regions, there were no more than nine events in one month, and no more than five events in a row on eligible days. The event times differed, but were consistent across events in each region (North: 2-6 p.m., South: 3-7 p.m.). Below are dates on which Critical Peak Pricing events were called, by service territory, in 2013.

*Table 26:* ***2013 NDPT CPP Event Days***

| North | South |
|---|---|
| - | June 7 |
| - | June 28 |
| July 1 | July 1 |
| July 2 | July 2 |
| July 3 | July 3 |
| July 5 | July 5 |
| July 9 | July 9 |
| July 15 | July 15 |
| July 19 | July 19 |
| July 22 | July 25 |
| July 25 | July 26 |
| August 5 | August 5 |
| August 6 | August 6 |
| August 13 | August 7 |
| August 14 | August 14 |
| August 30 | August 15 |
| September 13 | September 6 |
| September 23 | September 16 |

## CPP Event Nomination

CPP events were elected by utilizing a forward cascading model that took into account how many days needed to yet be nominated, versus the eligible days remaining in the month. The model nominated days based on seasonal and weekly forecasts of system demand. Each morning, the seven day forecast was inserted in the model and run to decide if the next business day should be nominated for an event by evaluating if that next day would be one of the x highest forecasted demand days left in the month, assuming there were x days left to nominate. For example, if there is a need to select three more events in July, tomorrow would be an event if it was at least the third highest forecasted day remaining in the month,

in terms of system demand. Because the north and south trials are separate and the systems aren't directly interconnected, events were nominated independently for each territory.

## Best Bill Guarantee

Both NDPT rates included a best bill guarantee for the first year in which participants were held harmless from possibly paying more annually on the dynamic rate than they would have had they been billed on the otherwise applicable flat rate. At the end of the first year, if customers paid more on the dynamic rate than they would have on the flat rate, a bill credit was issued on their account. The bill guarantee went away for the second year as customers had the proper information to determine if they should continue on with the program or not. This process mirrors what is done for the existing optional time-of-use programs at NV Energy. Of those customers who completed Program Year 1, 754 (41.0%) participants in the North and 339 (9.9%) in the South received a refund. The full results are in Tables 28 and 29 below.

*Table 27:* ***NDPT Participants Receiving a Best Bill Guarantee Refund - North***

| | Eligible Participants (#) | Participants Refunded (#) | Average Refund ($) |
|---|---|---|---|
| **CPP** | 318 | 93 | 83.25 |
| **CPP+E** | 284 | 147 | 85.61 |
| **CPP+E+T** | 303 | 113 | 64.32 |
| **TOU** | 420 | 186 | 81.57 |
| **TOU+E** | 273 | 141 | 96.89 |
| **TOU+E+T** | 136 | 74 | 77.01 |
| | | | |
| **All North** | 1,734 | 754 | 82.40 |

*Table 28:* ***NDPT Participants Receiving a Best Bill Guarantee Refund - South***

| | Eligible Participants (#) | Participants Refunded (#) | Average Refund ($) |
|---|---|---|---|
| **CPP** | 833 | 53 | 39.44 |
| **CPP+E** | 643 | 39 | 35.69 |
| **CPP+E+T** | 651 | 10 | 20.83 |
| **TOU** | 375 | 98 | 75.77 |
| **TOU+E** | 290 | 76 | 75.56 |
| **TOU+E+T** | 290 | 63 | 70.30 |
| | | | |
| **All South** | 3082 | 339 | 62.79 |

In this Interim Report, we provide only a limited characterization of the three treatments tested. Evaluation of the individual treatments, and comparisons of the treatments' impacts, will be major elements of the NDPT Final Report. Our limited characterization of the rates treatment does need to note several operational items that arose during NDPT Program Year 1: (1) CPP event notification, (2) changes to the Monthly Energy Reports, and (3) a CPP billing error.

## CPP Event Notification

NDPT participants receiving the CPP rate (CPP rate only, CPP+E, CPP+E+T) were scheduled to be notified by the Company the day prior to a CPP event. Customers were generally notified in the mid-afternoon with the requirement that notification started prior to 4 p.m. Once customers were notified of an event, the event would not be cancelled. Customers were notified via NV Energy systems via the communication channel(s) elected by the customer at the time of enrollment. Customers could select up to five notifications per event of one SMS message, two voice calls and two emails. Day-ahead and day-of notifications were also posted within the customers' energy portal, MyAccount.

Early in the summer 2013, NV Energy determined that some NDPT CPP participants weren't receiving their automatic CPP event notifications. As a result, NV Energy put manual work-arounds in place for the balance of the summer. An investigation and analysis was conducted after the CPP summer season had ended, concluding that 601 (62.9%) of North customers and 1,964 (93.6%) of South customers had not received day-ahead notification for one or more events.

As a result, NV Energy issued a one-time bill credit on affected customers' November 2013 bill, received in December 2013. The refund was for the amount of energy consumed in kWh for the event in which notification wasn't received, multiplied by the difference between the critical peak rate and the applicable on-peak rate. Total rebates across both service territories for the 2,565 NDPT participants affected were in the amount of $49,478.36 (an average of $19.29 per affected household). A letter went out prior to the bills, so that customers would be aware of the credit if applicable. Customers who didn't receive a refund were also sent a letter, but lacking any comments on CPP event notification. An example of both letters as well as a more complete description of the analysis and investigation can be found in Appendix B.

## Monthly Energy Reports

As part of the rate treatment, the NDPT is sending a monthly Energy Report to customers with customer-specific information about their performance. The report provides to customers a comparison of their energy bills versus what they would have been under the flat rate, both monthly and from program inception. The monthly Energy Report also includes information about their rate and energy savings tips. The Energy Reports were created in-house by NV Energy Rates Department staff.

As customers provided feedback about the reports through the focus group sessions, the reports were modified. There were three versions of the monthly summary during the first year. The changes are summarized in Table 29 and the versions are included in Appendix C.

*Table 29:* ***Changes to Monthly NDPT Energy Reports (2013)***

| Month | Notable Changes |
|---|---|
| **April** | • First monthly summary sent to customers; one page |
| **June** | • Pie charts comparing customer's usage to other participants<br>• Added specified day energy usage graph<br>• Report now two pages with the rate card graphic |
| **October** | • Removed pie charts comparing participant usage<br>• Changed the specified day energy usage graph colors and removed the red lettering |

Please see the focus group analysis in Volume 3 of this report for participant discussions regarding how and when they read their monthly Energy Reports. It is important to note that participants reported spending only a limited amount of time with these reports, yet the reports were important to participants in indicating their monthly and program-to-date savings or losses.

## South CPP Billing Error

In August 2014, the NDPT team discovered a billing programming error that affected the South CPP cohort of participants. For the four summer months of 2013, the ten hours of on-peak usage each weekend (five hours each Saturday and Sunday) was mistakenly billed at the off-peak rate, rather than the on-peak rate. This mistake resulted in these 2,127 customers being under-billed for the four summer months. The number of customers affected and the average total dollar amount of the mistake is shown in Table 30.

NDPT participants focused on the annual savings (or lack thereof) as a key element in their reenlistment decisions. The billing programming error resulted in 455 participants receiving erroneous annual energy reports indicating that the efforts these participants had made to shift and reduce electricity usage under the rates they believed they were on had resulted in savings. Table 30 indicates how these participants divided by cell. The billing programming error was a contributing factor in the result that while only 75% of South TOU customers saved in NDPT during Program Year 1, 95% of South CPP customers seemed to have saved during the first NDPT program year. Had the South CPP billed correctly, only 74% of CPP customers would have saved during NDPT Program Year 1. The large increase in the number of customers who would have received a refund in Program Year 1 is illustrated in Table 31. We do not know how many of these incorrectly billed customers would have opted-out of the NDPT, had their losses been correctly reported to them, particularly since we do know that the opt-out decisions for many participants were the result of a comparison of savings to experience (e.g., discomfort, inconvenience, mental effort). We assume that some of the incorrectly-billed participants who stayed in the program would have opted-out if correctly billed, and some would have remained in the program despite the change.

Although unfortunate from a trial perspective, this error provided an opportunity to correct an insufficient process associated with a new system unrelated to the trial prior to potentially impacting a larger number of NV Energy customers billed under complex rate structures.

*Table 30:* ***NDPT South CPP Participants Billing Mistake Bill Impact***

| NDPT CPP South Cell | Savers in Program Year 1 Due to Billing Error (#) | Average Total Mistake ($) |
|---|---|---|
| **CPP** | 207 | 151.59 |
| **CPP+E** | 145 | 153.06 |
| **CPP+E+T** | 103 | 136.84 |
| **Total** | 455 | 148.72 |

*Table 31:* ***NDPT South CPP Participants Billing Mistake Annual Report Impact***

| NDPT CPP South Cell | Non-Savers During Program Year 1 (Billed in Error) (#) | Non-Savers During Program Year 1 (If Properly Billed)(#) |
|---|---|---|
| **CPP** | 53 | 260 |
| **CPP+E** | 39 | 184 |
| **CPP+E+T** | 10 | 113 |
| **Total** | 102 | 557 |

Please see the focus group analysis in Volume 3 of this report for participant discussions regarding the role of saving vs. non-saving in their views of the program.

# *Treatments: Technology*

## Background

The NDPT design includes two treatments in addition to rates: technology and education. It is important to note that the NDPT design was limited in two respects. First, the NDPT does not include rate + technology cells. Prior to the NDPT, NV Energy already had considerable experience with rate + technology interaction through its demand response program and its studies of home energy displays. Second, the NDPT does not include technology-only or education-only cells in its analysis. The NDPT was designed to be a pricing study, and to be focused on the roles that technology and education may have when employed in addition to new rates. Therefore, in the NDPT, the technology treatment was provided only to some participants who had also received a new rate and the education treatment.

The NDPT was designed to test treatments feasible to introduce once the program's research was complete and capable of providing the data required to assess the treatments' impacts on energy usage shifting and conservation. The EcoFactor system had been tested previously at NV Energy and had been deployed in the NV Energy demand response program. Applying the EcoFactor system in the NDPT was a natural extension of these previous activities.

The EcoFactor NDPT technology treatment consists of one or more new programmable thermostats with online connections linking the participant, NV Energy and EcoFactor. The EcoFactor website provides the participant with the ability to program the thermostats online, through a computer or a mobile telephone. The online connection also enables the utility and EcoFactor to program and reprogram the thermostats directly. During the NDPT, NV Energy did not program or reprogram participants' thermostats, but during

Program Year 1 EcoFactor did regularly reprogram participants' thermostats as part of its optimization feature (see below).

To receive the NDPT technology treatment, the participants needed to schedule and attend the field installation of their new thermostats, which included the establishment of a communications link between the thermostats and EcoFactor. At installation, installers walk the participant through programming their thermostats according to the participants' preferences. NDPT staff monitored some NDPT field installations of EcoFactor technology for compliance with specified procedures, and for an understanding of the customer experience.

After installation, the EcoFactor technology treatment requires little participant intervention, although several sources of information are available. Afterwards, participants continue to have access to the web portal that allows them to reprogram their thermostat via a "Scheduling Wizard". The "Scheduling Wizard" helps participants divide their desired setpoints into four weekday time bins and two weekend time bins. The web portal also provides participants with a dashboard of real time information (e.g., inside temperature, outside temperature, heating/ventilating/air conditioning (HVAC) mode, fan mode, and connectivity). A reports section within the portal allows participants to see HVAC run-time data with a three-hour delay, and also allows participants to self-generate historical HVAC usage reports of different resolutions. NDPT technology treatment participants also have three channels to access either the EcoFactor thermostat or customer service: manually at the thermostat, online or via a smartphone application.

While the EcoFactor technology treatment is designed to be automatic, its functioning is not strictly one-way from the participant to the system. The EcoFactor technology treatment can also intervene in the participants' experience through a function EcoFactor terms 'optimization'. Optimization is designed to provide participants with a more economical experience than they had programmed, by evaluating the participants' programming and operating conditions, and then taking the initiative to adjust the participants' programming without any specific notification of the individual adjustments to the participant, or any specific authorization from the participant. In other words, EcoFactor optimization nudges the participant automatically to be more energy efficient.

NDPT participants were not directly advised in the recruiting materials, the installation or later communications that the EcoFactor technology treatment would be reprogramming their systems at EcoFactor's initiative, although it was possible to learn more about optimization from the EcoFactor website or by contacting customer service. The NDPT was designed to permit customers to shut off the EcoFactor optimization feature by contacting customer service.[3]

One premise of the EcoFactor system design is that customers may accept and appreciate the nudging provided by the optimization feature, in part because the optimization is mild, and in part because the optimization is brief. The optimization can be mild because the EcoFactor optimization algorithms take into account both outside weather conditions and the individual home's thermal characteristics, as understood

[3] However, individual NDPT participants did report that when they contacted customer service with concerns about the optimization feature, representatives either did not offer the option of shutting off the feature, or stated that it would be shut off but then failed to do so. Other NDPT participants contacted customer service with concern about their thermostat operations but after receiving explanations of the optimization feature, left it in place.

through the system's ongoing operations. The optimization can be brief because EcoFactor coordinates thermostat settings with ambient temperatures, HVAC runtimes, and modeled heating and cooling requirements. The NDPT employed the EcoFactor optimization function only during Program Year 1.

## NDPT EcoFactor Framework

As part of the NDPT, 2,217 EcoFactor thermostats were installed in 1,385 homes in the North and South trials. Most installations were completed between January and March 2013. All technology treatment participants are on either the NDPT's TOU rate or the NDPT's CPP rate, and all participants receiving the technology treatment also received the education treatment (see below for a discussion of the NDPT education treatment).

*Table 32:* ***EcoFactor Device Installations by Territory and Treatment Class***

| | North | | South | | |
|---|---|---|---|---|---|
| | **CPP+E+T** | **TOU+E+T** | **CPP+E+T** | **TOU+E+T** | **Total** |
| **Devices Installed** | 400 | 152 | 1,232 | 433 | 2,217 |
| **Participating Households** | 303 | 139[4] | 652[4] | 291[4] | 1,385 |

The EcoFactor system is comprised of a communicating thermostat (Computime), an Internet gateway (Digi ConnectPort X2), broadband Internet and EcoFactor Energy Management Services. The Internet interface between the thermostat and the EcoFactor Energy Management Services software enables EcoFactor's optimization, as described above.

EcoFactor's NDPT optimization protocol requires roughly one month of passive learning by the system. During this period EcoFactor's algorithms recorded data about the physical properties of both the conditioned space and the household's HVAC system, as well as the patterns of interaction between occupants and their thermostat(s) (e.g., manual setting). During the passive learning phase the EcoFactor thermostats operated purely on the schedules programmed or manually set by the participants.

At the conclusion of the passive learning phase, EcoFactor began the process of active optimization. EcoFactor regards their optimization algorithms and methods as proprietary; the specific algorithms employed vary both from system to system and over time for any given system. The effect of the same algorithm in two different homes will also vary based on both the physics and the patterns of the interaction with the two systems. In general, however, the system develops dwelling-specific rules over

[4] These numbers differ slightly (136, 651 and 290, respectively) from tables 56 and 57 on page 97 of this report as there were a few corrections made to the files containing enrollment and terminations after the data had been submitted to ADM for analysis.

time to make relatively small setpoint changes in the direction of energy efficiency (that is, higher setpoints in the summer and lower setpoints in the winter). These adjustments are intended to take place during likely periods of non-occupancy. However, the EcoFactor system is also designed to give immediate effect to manual overrides (e.g., those that counter EcoFactor's energy-efficient adjustments) in order to maintain customer operating influence over the system.

The time-varying rates of the NDPT were incorporated to some degree into the EcoFactor optimization algorithms. For example, the EcoFactor NDPT programming permitted running modified demand response events using existing EcoFactor demand response techniques, where the peak rate period is set up as a mild load shed phase, while the prior periods are used for mild pre-cooling. However, the optimization strategy did not differentiate between TOU and CPP participants, i.e. EcoFactor took no additional actions as a result of CPP events.

A single optimization strategy was employed during Program Year 1 in northern Nevada, and a single optimization strategy was employed during Program Year 1 in southern Nevada. Moreover, the single strategy applied in each region was applied homogeneously across all participants. The only variations across participants in a service territory would be if the participant's optimization service was reduced or turned off.

EcoFactor regards their algorithms, adjustments to their algorithms, and the application of their algorithms as proprietary, so we have little data to assess whether the participants' savings performance is due to operation of the algorithms, or due to the participants' self-selected approaches to shifting and conserving electricity usage. Furthermore, the additional constraint on the system created by time-variant electricity prices may have created competing outcomes for the optimization algorithms. If the algorithm is optimizing with respect to total energy usage and customer savings in a situation where customers have a time-varying rate, it is possible that any impacts of the optimization net out. In cases where customers are on a flat rate, optimizing to reduce a customer's total energy consumption will necessarily also reduce the amount of money they pay, but this is not the case when customers are on a TOU rate.

Again, in this Interim Report, we provide only a limited characterization of the three treatments tested. Evaluation of the individual treatments and comparisons of the treatments' impacts will be major elements of the NDPT Final Report. Our limited characterization of the technology treatment does need to address two considerations regarding NDPT Program Year 1: (1) customer service interactions and (2) initial impact analysis.

## Customer Service Interactions

NDPT technology treatment customer service data was available from NV Energy's Demand Response Management System (DRMS) for review. This data was comprised of Tier 1, 2 and 3 customer service information collected by customer service representatives. For the NDPT, Tier 1 and Tier 2 issues were handled by ATS, while Tier 3 issues were handled by EcoFactor.

The NDPT team reviewed customer service representative comments to identify issues that related to the treatment's technical performance. Examples of the types of customer service issues that were flagged were:

- EcoFactor Issues:
  - Time synchronization, the clock did not adjust for Daylight Saving Time
  - Request to cancel optimization
  - Away mode was not functioning properly
  - Customer had no heat
- Thermostat Issues:
  - Bad control button thermostat
  - Equipment needed repair
- Installation Issues:
  - Thermostat registered to wrong PAN ID
  - No cool button on one of the installed thermostats
  - Thermostat indicated heat but only cool air was flowing
  - Thermostat displaying wrong mode
- Gateway Issues:
  - Gateway not reachable
  - Only one of two thermostats connected to internet
  - Thermostat not connected to internet
  - Internet is down and unable to control thermostat
- Customer Issues:
  - Customer programmed the wrong thermostat
  - Customer didn't understand how to program the thermostat
  - Customer wanted help with creating schedule

The table below details the number of technology treatment performance-related customer service calls by treatment class and territory. During Program Year 1, 12 % of technology treatment participants called customer service regarding technology treatment issues.

*Table 33:* ***NDPT Technology Treatment Performance-Related Customer Service Calls by Treatment and Territory (Program Year 1)***

| | North | | South | | |
|---|---|---|---|---|---|
| **Treatment** | **CPP+E+T** | **TOU+E+T** | **CPP+E+T** | **TOU+E+T** | **Total** |
| **Unique Calls** | 46 | 14 | 69 | 43 | 172 |
| **Total Participants** | 303 | 139 | 652 | 291 | 1,385 |
| **Calls/Total Participants (%)** | 15% | 10% | 11% | 15% | 12% |

An initial examination of these performance-related service calls indicated that inquiries could be caused by problems with the initial installation (4%), the thermostats (1%), the gateway (17%), or the participant's own interaction with the system (13%). However, the majority of the performance-related service calls were for issues arising within the EcoFactor system (65%). These tended to be the more complicated Tier 3 calls. During Program Year 1, 50 participants called for Tier 1 or Tier 2 service more than once, and 24 participants called for Tier 3 service more than once.

The nature and level of customer service interactions in the NDPT technology treatment generated during Program Year 1 was comparable to the ranges the NDPT team had observed in other similar field tests of residential electricity management devices and systems. In those other field tests, many more customers actually experienced issues than called customer service about them.

During NDPT Program Year 1, 110 participants with the technology treatment opted-out of the NDPT; 28 (23%) of these had contacted customer service regarding the treatment. These opt-out participants were allowed to keep the thermostat the NDPT provided if they so choose (in the absence of the EcoFactor system the thermostat would function simply as a standard programmable thermostat). Of the 110 technology-treatment opt-outs, 94 (85%) affirmed they would prefer to keep the EcoFactor thermostat. NDPT participants who received the technology treatment opted out of the program in a slightly smaller proportion (7.36%) than NDPT participants who did not receive the technology treatment (8.66%).

For Program Year 1, in our Final Report, the availability of EcoFactor data and further analysis will be required to distinguish the impacts of the automatic optimization routines and participants' self-selected behaviors. For Program Year 2, we expect any impacts will be due to the inertia of prior settings or participants' self-selected behaviors, since the automatic optimization routines were disabled for all participants.

## *Treatments: Education*

### Background

The NDPT was designed to test treatments (1) feasible to introduce once the program's research was complete, and (2) capable of providing the data required for an assessment of the treatments' impacts on energy usage shifting and conservation. The Vergence Entertainment Ringorang® engagement system had been tested previously at Puget Sound Energy, and by its nature provided specific and objective data about participant education. Applying the Vergence Entertainment system in the NDPT was a natural extension of these previous activities.

NV Energy selected Vergence Entertainment LLC ("Vergence") to design and deliver the education treatment component of NDPT. Vergence worked with partners in rich media development, incentives programs, research, and instructional design to develop a multi-media education treatment that included print, email, SMS, IVR, video and website development.

The NDPT rates treatment and the NDPT technology treatment were familiar to the electric utility industry at the time the NDPT was being designed. TOU rates had been employed for decades, and CPP rates for many years. Thermostat-based demand-response systems had been in use, and widely featured in field trials. NV Energy had established commercial programs with all of these elements. It was not the intention of the SGIG consumer studies to merely repeat what the industry had done before. For the NDPT to be an innovative pricing experiment, the innovation would come from its education treatment.

Because the NDPT was a structured field research project, the education treatment included several specific requirements. First, the NDPT Consumer Behavior Study Plan called for an education treatment to be administered to a randomly-selected, statistically-useful set of Nevada households across the full range

of energy usage strata, North and South. This mass-market requirement ruled out approaches addressing only a motivated segment of customers. Second, the education treatment also had to have a measurable impact on this broadly-recruited cohort of NDPT participants, in order to differentiate the customers receiving the education treatment from those who did not. This impact requirement ruled out approaches that merely presented information to customers. Third, the education treatment also had to be feasible to deploy across NV Energy's customer base. This requirement ruled out approaches that could intensively address a few customers, but were unable to scale.

The NDPT team recognized that most standard approaches to energy education were based on supplying targeted customers with print materials, or access to online materials. These approaches often focused on schoolchildren or identified environmentalists. Evidence of learning was qualitative and anecdotal. Deployment was limited. These standard approaches were unable to meet the NDPT's requirements for mass-market, measurable, and scalable education.

The NDPT elected to develop a different kind of education treatment based on the Vergence Entertainment Ringorang® engagement system. Vergence had piloted this innovative game-based approach to education with Puget Sound Energy, training utility employees in technical content through online and mobile game play. The repetition, competition, and entertainment of the game experience led players to learning. The NDPT team reasoned that a similar application could be developed for consumer energy education, and it was.

Eight of the twelve NDPT cells included the education treatment, always in combination with a rate treatment and a technology treatment. After recruitment, the NDPT included an initial cohort of 3,152 NDPT participants to be educated. As shown in Table 34 below, 2,873 of these participants completed Program Year 1, and were widely distributed across the eight cells North and South.

*Table 34:* ***NDPT Participants Enrolled at Program Year 1 Close, by Service Territory and NDPT Treatment Group***

| NDPT Treatment Group | Service Territory | | Totals |
|---|---|---|---|
| | North | South | |
| **CPP+E** | 284 | 643 | 927 |
| **CPP+E+T** | 303 | 652[5] | 955 |
| **TOU+E** | 274[5] | 290 | 564 |
| **TOU+E+T** | 136 | 291[5] | 427 |
| | | | |
| **Totals** | 997 | 1,876 | 2,873 |

[5] These numbers differ slightly (273, 651 and 290, respectively) from tables 61 and 62 on page 95 of this report as there were a few corrections made to the files containing enrollment and terminations after the data had been submitted to ADM for analysis.

## NDPT Vergence Entertainment Framework

The education treatment required three primary components: (1) the curriculum, (2) the operating system, and (3) the prizing system.

## Curriculum

The education treatment curriculum consisted of a finite set of measureable skills, attitudes, and knowledge to be imparted to NDPT participants. The design of the NDPT indicated that the treatments would be delivered separately, so the content of the education treatment was not specifically tied to either the rate treatment or the technology treatment. A team of industry experts worked with Vergence Entertainment to specify the curriculum elements.

The 16 NDPT curriculum learning elements ranged across energy, energy usage, energy costs and rates, and energy management. The curriculum spread across energy, rather than focusing solely on electricity use, because past team experience with residential customers indicated that these customers were oriented to 'energy' as a topic rather than any particular type of energy use.

The learning elements included attitudes, skills, and knowledge. The attitudes were assumed to motivate or frame behaviors, and might have spillover effects beyond their specific focus (e.g., a positive attitude toward ENERGY STAR appliance labels might encourage more attention to various labels and written materials regarding energy). Skills were assumed to enable behaviors, by translating intentions into actions. Knowledge was also assumed to enable behaviors, by guiding the selection of productive behaviors. In combination, attitudes, skills, and knowledge were assumed to be important ingredients in how participants would work to shift or conserve electricity usage.

The NDPT education treatment curriculum learning elements were these:

Attitudes

1. There are simple things I can do to control my energy usage and reduce my bill
2. The ENERGY STAR label will be helpful the next time I buy an appliance
3. Saving money over time makes purchasing an energy efficient appliance worthwhile
4. Reducing energy waste is the right thing to do

Skills

5. I know how to fix warm and cool air leaks around my home
6. I know how to schedule non-essential energy usage to off-peak hours in my home
7. I know where to find energy saving tips and resources online
8. I know how to monitor my energy usage by reading my bill

Knowledge

9. Sealing air leaks is the most cost-efficient way to reduce energy waste
10. The highest energy consuming appliances in a typical home are the heating and cooling systems and the pool pump

11. Laundry and dishwashing are among the most impactful activities to shift to off-peak times
12. Adjusting my thermostat by seven to ten degrees will save up to 10% on my bill
13. Appliances, like computers and televisions, continue to draw power even when shut off
14. Opening south-facing window coverings during cold days reduces energy usage
15. Switching to energy efficient lighting is one of the fastest ways to impact my energy bill
16. Peak hours are when most people need energy and the cost per kilowatt hour is the highest

The curriculum elements were selected to be accessible to NDPT participants, impactful on electricity usage, and measureable. Limited to 16 individual elements, the NDPT curriculum was not designed to be a complete or integrated set of items required for mastery of electricity use. Rather, the curriculum was designed to be specific enough, and impactful enough, to help understand the distinct role of energy education when coupled with time-varying electricity rates.

The NDPT team also recognized that merely presenting information to participants a single time, through a single channel, would be unlikely to cause retention of the information. Participants would learn at different paces, through different experiences. So the curriculum learning elements were incorporated into teaching modules that spanned print, online, and mobile channels, each capable of delivering the curriculum learning element multiple times, through multiple formats. The teaching modules were designed to deliver the curriculum elements from a number of perspectives (see Volume 4, Appendix E).

## The Operating System

The main component of the NDPT education treatment operating system was Play-Learn-Win (PLW), an online game application developed for the NDPT by Vergence Entertainment, and made available either on a computer (Apple or Windows systems) or over a mobile telephone (Apple, Android or Blackberry systems). PLW players received questions about energy usage pushed to them at different times of the day. Considerable effort was expended to ensure that the NDPT education treatment would be similarly available across a number of technical platforms and devices.

As explained in more detail below, participants would respond to the PLW questions with answers, and right answers would receive positive feedback (congratulations, and added points) while wrong answers would receive different feedback (corrections, and subtracted points). PLW employed a multiple-choice question and answer format to help make the education treatment accessible and easy to use. Education treatment participants received 196 online PLW questions (40 of which were repeats). These questions were organized into 17 separate games organized around curriculum elements. Each PLW game was typically one week in length, with a range of 7-24 questions and an average of 11 questions per game. Each game was played live over three days, with two days of makeup play following. During each game, the questions were posed one at a time, at different intervals. Each individual live experience was brief.

An individual PLW experience would begin with an alert at an apparently random time, inviting the participant to play. All NDPT education treatment participants would receive the same questions offered at the same time. Selecting play would open the application with a ticking clock. Not selecting play would postpone the question until a later time when the participant would choose to access postponed questions in a 'makeup' session. For a playing participant, the screen would then offer a clue about the question to

come. A few seconds later, the screen would display the multiple-choice question itself, with potential answers. Once the playing participant had clicked on an answer, the screen would display an insight about the topic, and then a few seconds later the screen would display either that the playing participant's answer was correct, or incorrect (with the right answer also displayed).

The entire experience, from alert through answer, would last about 50 seconds. Correct answers would receive points, and participants could access the points leaderboard through the PLW application. Participants could also click on 'learn more' to explore the topic in greater depth. The question by question experience was similar in 'makeup' mode, except that playing participants would be answering one question after another, at a time of their choosing. An example of PLW game play is included in the appendices to this report.

Enabling such broad and repeated outreach required that the NDPT education treatment engage participants, and engagement was a significant challenge. The NDPT technology treatment initially engaged participants through in-home field installation of equipment, but the education treatment required online remote installation of PLW software. Education treatment participants had to first understand that the PLW software related to their Choose When You Use program, and then they had to take the time to install the application, and become familiar with the game-playing routine. Because the education treatment communications were remote (mail, e-mail, and telephone), considerable effort was required to establish contact with recruited participants, and confirm that they had successfully downloaded the PLW software onto their computers or mobile devices.

The installation effort began immediately after recruitment, in February 2013, when participants were sent a Welcome Kit (see Volume 4, Appendix E). Again, just before the formal beginning of the NDPT in March 2013, education treatment recipients were sent a second copy of the Welcome Kit along with a deck of 56 cards that contained curriculum elements and energy-saving tips referenced in subsequent PLW games. Education treatment recipients who were late registrants, or were listed under incorrect addresses, or were non-responders were sent a Welcome Kit one more time as part of a "reenergizer challenge". Outbound telephone contacts were also used to engage participants at the outset of the NDPT.

PLW was not the only component of the NDPT education treatment: participants also received 34 weekly e-mails (two per game), six monthly print pieces (with questions and puzzles), and a deck of cards with the entire curriculum (see Volume 4, Appendix E). The education treatment communicated the 16 curriculum elements across multiple media, repetitively, so that participants could learn through different channels. The e-mails announced and concluded each PLW game, and included hints, reminders, and lists of winners. The monthly print pieces included puzzles and curriculum content for several modules at a time, and provided participants an alternative to the PLW experience by enabling SMS text messaging and IVR (interactive voice response). The deck of cards was regularly referred to through the other channels. For each game, associated cards were referenced several times throughout the playing of the game. In the email announcing a game, several concepts would be introduced by referencing several associated cards. After each question in a game, the cards were referenced again. They would also be referenced in the email that closed a game.

PLW and the other components of the NDPT education treatment were all developed as a new customer service specifically for the NDPT.

## Prizing

The third primary component of the NDPT education treatment was the prizing system. Prizes were assumed to be an important motivation for immediate behavior, e.g. increased game play. Before the education treatment could motivate behavioral changes in electricity usage, the NDPT needed to motivate engagement with the education treatment. The NDPT team believed the education treatment might also have immediate entertainment value for some participants, and might also have longer-term savings value for those participants who realized the connection between what they were learning and how they might lower their electric bills.

The prizes needed to be substantial enough to be effective, but not so large that they would become the primary motivation for changing energy use behavior. As a result, the education treatment included both modest gift card prizes, and a few sweepstakes prizes.

Households playing the PLW games could win various types of prizes, including:

- A $5 Amazon gift card, awarded to a household for participating in a game
- A $10 Amazon gift card, awarded for winning a game
- A "sweepstakes" prize distributed randomly, with participation in various games or other program events as the qualifying criteria
- Additional prizes for registration and game play, randomly awarded, including a $1,000 prize for registration, $500 prizes for playing games 1-5 and 7-17, and a $1,000 prize for playing game six

Modest prizes and sweepstakes entries were also available for those participants who did not engage with PLW. There were sweepstakes prizes of $10 Amazon gift cards for those participants who responded to e-mails and print mailings. These mail prizes were assigned to 90 households, 15 households each for the first three mailings, and 45 for the last three mailings taken as a group. Four more sweepstakes were used for entry pools consisting of persons who participated in a group of four games or in a mailing. These contests awarded grand prizes of increasing value from $1,500 to $6,000.

## Program Year 1 Impacts

As noted elsewhere, the individual NDPT treatments will be analyzed in more detail in our Final Report. However, in this Interim Report, we can note the participation, learning and electricity usage impacts observed in NDPT Program Year 1.

## Participation

As noted above, 3,142 NDPT participants began Program Year 1 eligible to receive the education treatment, and 2,873 of these completed Program Year 1. Participants who completed Program Year 1 (and whose tenure in the NDPT spanned the entire six months of education treatment delivery) are included in our analysis. As indicated below, 69% of these education treatment participants engaged with the treatment in some way. Nearly 24% of education treatment participants answered 50% or more of the PLW questions posed to them. Over 21% of education treatment participants responded via text or IVR to the mailings (an average of 2.87 responses each).

There were various degrees of customer engagement in the education treatment. Table 37 shows how the 2,873 households that completed year one were distributed by type and degree of their engagement with the education treatment. In our Final Report, we will examine these engagement segments in greater detail.

*Table 35:* ***Engagement in NDPT Education Treatment by Type and Degree***

| Engaged in Education Treatment through Play-Learn-Win Game | Engaged in Education Treatment by Responses to Mailings (%) | | | |
|---|---|---|---|---|
| | Did Not Respond to Mailings | Responded to <50% of Mailings | Responded to 50% or More of Mailings | Totals |
| **Did not download game** | 31.33 | 2.51 | 0.87 | 34.70 |
| **Installed game but did not play** | 4.00 | 0.21 | 0.14 | 4.35 |
| **Answered 1-9% of questions** | 21.16 | 1.64 | 0.63 | 23.42 |
| **Answered 10-24% of questions** | 5.71 | 0.97 | 0.24 | 6.93 |
| **Answered 25-49% of questions** | 5.08 | 1.01 | 0.77 | 6.86 |
| **Answered ≥50% of questions** | 11.42 | 4.07 | 8.25 | 23.74 |
| **Totals** | 78.70 | 10.41 | 10.89 | 100.00 |

In this Interim Report, we can note that 31% of education treatment participants did not appear to engage in any way with the education treatment. That is, these households neither downloaded the PLW game nor responded to the mailings. Further energy impact analysis may indicate that these households displayed some response to the treatment, but at this time, no response is evident.

Nearly two thirds (65%) of education treatment participants downloaded the PLW game. Some participants merely downloaded and installed the game but did not subsequently answer any questions from the game (4%). Other participants answered 1-9% of the PLW questions (23%), 10-49% of PLW questions (14%), or more than 50% of PLW questions (24%). An initial examination of demographics, and focus group discussion, did not reveal any particular predictors of which participants would be more engaged with the PLW game, and which would not.

## Prizes Awarded

For answering mailings or winning competitions, the NDPT awarded 1,560 prizes of $5 and $10 Amazon gift cards to 713 households for participating in the education treatment. In the Table 36 below, prizes awarded randomly to PLW participants and for answering mailings are referred to as “Random Prizes”. Prizes awarded for the top three scorers in each PLW game are labeled “Competitive Prizes.” Twenty “sweepstakes” prizes were also distributed randomly, with participation in various games or other program events as the qualifying criteria.

Of the 2,873 NDPT participants receiving the education treatment and completing Program Year 1, 716 won a prize (25%). The total number of prizes distributed to households that completed Program Year 1 was 1,544.

*Table 36**: Frequency Distribution of Prizes Won per Participant***

| | Number of Prizes Won per Participant | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Prize Type** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **$5 Random** | 307 | 148 | 62 | 11 | 6 | 0 | 1 | 0 | 0 | 0 |
| **$10 Random** | 306 | 96 | 24 | 5 | 1 | 1 | 0 | 0 | 0 | 0 |
| **$10 Competitive** | 12 | 6 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |

*Table 37: **Summary of Prize Count and Value by Prize Type***

| | Total Prizes Won | Number of Winners | Mean Prizes Per Winner | Value of Prizes |
|---|---|---|---|---|
| **Grand Prizes** | 4 | 4 | 1.00 | $13,200 |
| **$1000 Cash Prizes** | 2 | 2 | 1.00 | $2,000 |
| **$500 Cash Prizes** | 14 | 14 | 1.00 | $7,000 |
| **$5 Random** | 870 | 535 | 1.63 | $4,350 |
| **$10 Random** | 601 | 433 | 1.39 | $6,010 |
| **$10 Competitive** | 53 | 23 | 2.30 | $530 |
| **Total** | 1,544 | 718 | 2.15 | $33,090 |

There were two types of prizes, smaller gift card prizes and larger sweepstakes and grand prizes. Gift card winners were notified by e-mail, and given a link to follow to activate the gift card. Winners of the larger sweepstakes prizes had to provide additional information for tax purposes before the prize could be redeemed.

The reasons and times prizes were distributed are as follows:

- Random prizes of $5 and $10 Amazon gift Cards were distributed randomly at the end of question play.
- Competitive prizes of $10 Amazon gift cards were distributed to the top three scorers at the end of each game.
- Sweepstakes prizes of $10 Amazon gift cards were distributed by lottery at the end of mail issues 1, 2, 3, and 6.
- Cash prizes of $1000 were distributed by lottery at the end of registration and the end of game 9.
- Cash prizes of $500 were distributed by lottery at the end of all other games.

- 4 grand prizes, of values $1,500, $1,700, $4,000, and $6,000 distributed by lottery after each of the four "Connecting the Dots" review segments.
  - Grand prize #1 was a trip to Reno
  - Grand prize #2 was a trip to Las Vegas
  - Grand prize #3 was a Home makeover package including a $2,000 Home Depot gift card and $1,500 NV Energy Bill Credit.
  - Grand prize #4 was a Civics and Education package including an educational grant, and a trip to Carson City

*Table 38:* ***Top 10 Prize Winners Among Individual Participants by Total Prize Value***[6]

| Rank | Total Value | Prizes Won |
|---|---|---|
| 1 | $6,035 | Grand Prize #4, 3x Random $10, Random $5 |
| 2 | $4,010 | Grand Prize #3, Random $10 |
| 3 | $1,700 | Grand Prize #2 |
| 4 | $1,510 | Grand Prize #1, Random $10 |
| 5 | $1,020 | $1000 Cash Prize, 4 x Random $5 |
| 6 | $1,015 | $1000 Cash Prize, Random $10, Random $5 |
| 7 | $545 | $500 Cash Prize, Random $10, 7x Random $5 |
| 8 | $530 | $500 Cash Prize, 2 x Random $10, 2 x Random $5 |
| 9 | $520 | $500 Cash Prize, 4 x Random $5 |
| 10 | $520 | $500 Cash Prize, 2 x Random $10 |

As indicated in Table 38, six NDPT participants received prizes through the education treatment with total values ranging from $1,000 to $6,035, and 14 others received prizes with total values of $500.

## Learning

A primary outcome required of the education treatment was that participants' knowledge about energy matters would increase, demonstrating that the treatment had in fact been administered. To help evaluate customer knowledge gain, many education treatment participants completed two surveys, one before ("opening survey") and one after the education treatment ("closing survey"). These surveys asked a limited number of questions, and were not intended to be a complete test of curriculum recall. Furthermore, the surveys were intended to significantly sample the education treatment participants, rather than reach all of them. The surveys were not conducted against control groups. Participant response to these surveys was then analyzed to be an initial indication of learning among education treatment participants. More comprehensive analyses of learning will be included in our Final report, after analyses of the entire record of education treatment participant interaction.

[6] It is of note that the total value of competitive prizes won per household was strongly correlated with the number of questions answered, with a Pearson's R of 0.729 and a p. value less than .001. The total value of prizes won was significant but not strongly correlated with the number of correct answers on the closing survey, with an R of .182 and a p. value of less than .001. Additional analysis of the education treatment with be included in our Final Report.

Both the opening and the closing surveys (see Appendix E for a complete transcript of the surveys) were conducted through the web, using Survey Monkey. Each participant who signed up for PLW was sent an invitation to complete the survey, and was also sent a reminder if needed. Each participant was uniquely identified so that survey information could be linked with information from other NDPT databases, particularly participation information. The initial sample for the opening and closing surveys included 1,312 households. After the surveys with no responses to any substantive questions were removed, the sample remaining for analysis included 570 respondents to the opening survey and 660 respondents to the closing survey. These surveys were conducted during the periods from 3/8/13 to 4/8/13 and 8/28/13 to 9/17/13, respectively.

Survey respondents skewed toward education treatment participants who were more engaged with the treatment, as shown in Table 39. While 34% of education treatment participants did not install the PLW software, these households represented only 11% of the respondents to the opening survey and 8% of respondents to the closing survey. Similarly, while only 24% of education treatment participants answered 50% or more of the PLW questions, these households represented 51% of the respondents to the opening survey, and 64% of the respondents to the closing survey.

*Table 39:* ***Participation by Play-Learn-Win Response Category***

| Questions Answered (%) | Education Treatment Population (%) | Completed Opening Survey (%) | Completed Closing Survey (%) |
|---|---|---|---|
| **Did not download game** | 34.70 | 10.50 | 8.30 |
| **Installed game but did not play** | 4.40 | 3.00 | 1.10 |
| **1-9** | 23.40 | 17.90 | 11.40 |
| **10-24** | 6.90 | 8.20 | 6.10 |
| **25-49** | 6.90 | 9.80 | 9.70 |
| **≥50%** | 23.70 | 50.50 | 63.50 |
| | | | |
| **Total** | 100.00 | 100.00 | 100.00 |
| | | | |
| **Participating households** | 2,873 | 570 | 660 |
| p-value < .001 | | | |

*Table 40:* ***Participation by Mail Response Category***

| Questions Answered (%) | Education Treatment Population (%) | Completed Opening Survey (%) | Completed Closing Survey (%) |
|---|---|---|---|
| **None** | 78.70 | 57.50 | 48.50 |
| **<50%** | 10.40 | 16.70 | 19.20 |
| **≥50%** | 10.90 | 25.80 | 32.30 |
| | | | |
| **Total** | 100.00 | 100.00 | 100.00 |
| | | | |
| **Participants (#)** | 2873 | 570 | 660 |
| p-value < .001 | | | |

Analysis of variance or ANOVA is a statistical test of the differences of group means across three or more categories. ANOVA was used to analyze engagement in the NDPT's Education treatment because engagement in the treatment could be parsed into multiple categories, e.g., customers could have no mail participation, <50% mail or greater than or equal to 50%. ANOVA was used to test the difference in the means across all three categories at once.

There were two instances in the NDPT education treatment analysis in which adjusted p-values were used. First, they were used in the ANOVA to limit the total chance of error in all category to category comparisons (post hoc tests) to 5%. Second, they were used in weighted analyses to account for the true sample size and the variance added by weighting.

Table 41 shows that households responding to the opening and closing surveys were also significantly more likely to answer mail questions than typical education treatment participants. So the survey respondents were not only more likely to engage with PLW, they were more likely to have engaged with the education treatment's print materials.

*Table 41:* ***ANOVA of Correct Answers on the Closing Survey by PLW Participation***

| Engagement Indicator | Mean Number of Correct Answers | Standard Deviation | P-Value |
|---|---|---|---|
| **No Download or Participation** | 7.71 | 3.98 | <.001 |
| **Installed but did not participate** | 7.14 | 2.67 | |
| **1-9** | 8.11 | 3.63 | |
| **10-24** | 9.45 | 3.69 | |
| **25-49** | 9.83 | 3.90 | |
| **≥50** | 10.89 | 3.31 | |

*Table 42:* ***Post-Hoc Comparisons for ANOVA Answers on the Closing Survey***

| Engagement Indicator | Difference | Lower | Upper | Adjusted P-Value |
|---|---|---|---|---|
| **Installed but did not participate-no download or participation** | -0.566 | -4.560 | 3.428 | 0.999 |
| **1-9% answered-no download or participation** | 0.398 | -1.369 | 2.165 | 0.988 |
| **10-24% answered-no download or participation** | 1.741 | -0.327 | 3.809 | 0.156 |
| **25-49% answered-no download or participation** | 2.119 | 0.289 | 3.949 | 0.013 |
| **≥50% answered-no download or participation** | 3.176 | 1.749 | 4.604 | 0.000 |
| **1-9% answered-installed but did not participate** | 0.964 | -2.970 | 4.897 | 0.982 |
| **10-24% answered-installed but did not participate** | 2.307 | -1.771 | 6.385 | 0.587 |
| **25-49% answered-installed but did not participate** | 2.685 | -1.277 | 6.648 | 0.380 |
| **≥50% answered-installed but did not participate** | 3.743 | -0.051 | 7.536 | 0.056 |
| **10-24% answered- 1-9% answered** | 1.343 | -0.605 | 3.292 | 0.361 |
| **25-49% answered- 1-9% answered** | 1.721 | 0.028 | 3.415 | 0.044 |
| **≥50% answered- 1-9% answered** | 2.779 | 1.531 | 4.027 | 0.000 |
| **25% to 49% answered-10-24% answered** | 0.378 | -1.628 | 2.384 | 0.995 |
| **≥50% answered-10-24% answered** | 1.435 | -0.212 | 3.083 | 0.128 |
| **≥50% answered-25-49% answered** | 1.057 | -0.278 | 2.393 | 0.211 |

The number of questions answered correctly on the closing surveys is a useful metric for gauging customers' knowledge about energy matters as a result of the education treatment. Tables 41 and 42 above present the results of one-way analyses of variance of the mean number of correct answers among households when they are grouped by their degree of engagement with the education treatment.

The analysis for the PLW game shows that there are statistically significant differences in the number of correct answers between participation groups. Further significant differences were found by comparing scores to engagement levels. Participants answering 25-49% of the questions, as well as engaging by answering at least 50% of the questions, are both different from no engagement and statistically significant at the 5% level.

Tables 43 and 44 present the results of one-way analyses of variance of the mean number of correct answers among households when grouped by their degree of engagement in the mail participation. Similar to the PLW analysis, the survey results for the mail participation showed statistically significant differences overall and statistically significant differences between engagement at the 50% and above level and the other levels.

*Table 43:* ***ANOVA of Correct Answers on the Closing Survey by Mail Participation***

| Engagement Indicator | Mean Number of Correct Answers | Standard Deviation | P-Value |
|---|---|---|---|
| **No mail participation** | 9.28 | 3.87 | <.001 |
| **<50% of mail** | 9.98 | 3.42 | |
| **≥50% of mail** | 11.33 | 3.15 | |

*Table 44:* ***Post-Hoc Comparisons for ANOVA Answers on the Closing Survey***

| Engagement Indicator | Difference | Lower | Upper | Adjusted P-Value |
|---|---|---|---|---|
| **<50% of mail - no mail participation** | 0.706 | -0.172 | 1.584 | 0.143 |
| **≥50% of mail - no mail participation** | 2.051 | 1.310 | 2.791 | 0.000 |
| **≥50% of mail - <50% of mail** | 1.344 | 0.406 | 2.283 | 0.002 |

Table 45 and Table 46 present an analysis of variance of combined mail and PLW treatment participation. This compares those participants by participation type and level including greater than 50% participation in both. The number of correct answers on the closing survey varied significantly by type and intensity of participation. Those respondents who participated in more than 50% of both mail and PLW had a significantly higher mean number of correct answers than all other response levels. Respondents who participated in more than half of PLW had significantly higher score than all options except "half or more of mail". None of the other levels were significantly different from no participation in either mail or PLW.

*Table 45:* ***ANOVA of Correct Answers on the Closing Survey by Mail and PLW Participation***

| Engagement Indicator | Mean Number of Correct Answers | Standard Deviation | P-Value |
|---|---|---|---|
| **No mail or PLW** | 7.49 | 3.71 | < .001 |
| **<50% of mail and PLW** | 8.84 | 3.87 | |
| **≥50% of mail** | 9.45 | 3.68 | |
| **≥50% of PLW** | 10.30 | 3.46 | |
| **≥50% of both** | 11.65 | 2.94 | |

*Table 46:* ***Post-Hoc Comparisons for ANOVA***

| Engagement Comparison | Difference | Lower | Upper | Adjusted P-Value |
|---|---|---|---|---|
| **<50% of mail and PLW - no mail or PLW** | 1.354 | -0.240 | 2.947 | 0.139 |
| **≥50% of mail - no mail or PLW** | 1.963 | -0.249 | 4.174 | 0.109 |
| **≥50% of PLW-no mail or PLW** | 2.811 | 1.270 | 4.351 | 0.000 |
| **≥50% of both -no mail or PLW** | 4.159 | 2.582 | 5.737 | 0.000 |
| **≥50% of mail - <50% of mail and PLW** | 0.609 | -1.245 | 2.464 | 0.897 |
| **≥50% of PLW – <50% of mail and PLW** | 1.457 | 0.497 | 2.418 | 0.000 |
| **≥50% of both – <50% of mail and PLW** | 2.806 | 1.787 | 3.824 | 0.000 |
| **≥50% of PLW - ≥50% of mail** | 0.848 | -0.962 | 2.658 | 0.703 |
| **≥50% of both - ≥50% of mail** | 2.197 | 0.356 | 4.038 | 0.010 |
| **≥50% of both - ≥50% of PLW** | 1.349 | 0.415 | 2.283 | 0.001 |

We observe that participation in the education treatment was correlated with the number of correct answers on the closing survey. Examining individual questions, and the changes from the opening to the closing survey, provides additional insight.

*Table 47:* ***Changes from Opening Survey to Closing Survey in Percentage of Questions Answered Correctly, Ranked by Difference***

| # | Question Text | Correct Answers - Opening Survey (%) n = 570 | Correct Answers - Closing Survey (%) n = 6604 | Opening Survey to Closing Survey Difference (%) | P-Value |
|---|---|---|---|---|---|
| Q1 | 90% of the energy used by your washing machine is used to do what? | 19.53 | 50.19 | 30.66 | < .001 |
| Q11 | If you wanted to save about 15% on your summer cooling costs, you would set your thermostat no lower than: ____. | 32.23 | 58.11 | 25.87 | 0.003 |
| Q14 | Where would you go first to get information about how to save energy? | 29.00 | 41.89 | 12.89 | 0.024 |
| Q4 | Which of these uses more energy? Washing dishes by hand or using a fully loaded dishwasher? | 55.30 | 67.64 | 12.34 | 0.129 |
| Q15.1 | In your home, in order, name the three appliances or other energy uses that use the most energy: #1 | 48.99 | 59.14 | 10.16 | 0.016 |
| Q7 | What would you use to seal air leaks around moveable items like windows? | 22.61 | 31.19 | 8.58 | 0.515 |

| # | Question Text | Correct Answers - Opening Survey (%) n = 570 | Correct Answers - Closing Survey (%) n = 6604 | Opening Survey to Closing Survey Difference (%) | P-Value |
|---|---|---|---|---|---|
| Q12 | If you wanted to save about 15% on your winter heating costs, you would set your thermostat no higher than___. | 41.92 | 50.13 | 8.21 | < .001 |
| Q13 | How would you use a power strip to save energy? | 59.58 | 66.73 | 7.15 | < .001 |
| Q8 | Compact fluorescent light (CFL) bulbs use how much less energy per hour of use than incandescent light bulbs? | 6.76 | 13.88 | 7.12 | 0.048 |
| Q2 | If you wanted to save 50% of the energy used by your dishwasher in a normal cycle, how would you do it? | 51.77 | 58.17 | 6.41 | 0.093 |
| Q18 | When your household is on a time-of-use (TOU) rate, what's the best way to save energy? | 69.95 | 75.55 | 5.60 | 0.001 |
| Q10 | The price we pay for electricity right now, during a weekday afternoon, is : _____cents/kilowatt-hour. | 0.38 | 5.06 | 4.68 | 0.012 |
| Q5 | What do you think is the most cost-efficient way to reduce energy waste? | 3.53 | 7.52 | 3.99 | 0.603 |
| Q6 | Many homes lose 20% of their air-conditioned air: why? | 7.36 | 11.15 | 3.79 | 0.129 |
| Q20 | Who is the MOST responsible for high electric bills? | 65.06 | 66.21 | 1.15 | 0.1766 |
| Q9 | Light-emitting diode (LED) bulbs use how much less energy per hour of use than Compact fluorescent light (CFL) bulbs? | 1.13 | 1.62 | 0.49 | 0.925 |
| Q3 | What uses more energy - Washing Machines or Dryers? | 76.56 | 76.26 | -0.29 | 0.126 |
| Q15.3 | In your home, in order, name the three appliances or other energy uses that use the most energy: #3 | 17.28 | 16.47 | -0.81 | 0.78 |
| Q15.2 | In your home, in order, name the three appliances or other energy uses that use the most energy: #2 | 8.34 | 7.20 | -1.14 | 0.603 |
| Q16.2 | Your electric bill includes charges for your household's electricity use, but it also includes other charges. Name two of them: #2 | 26.30 | 23.35 | -2.95 | 0.772 |
| Q16.1 | Your electric bill includes charges for your household's electricity use, but it also includes other charges. Name two of them: #1 | 40.27 | 34.76 | -5.51 | 0.941 |
| Q38 | Which of the following is closest to your personal opinion: (see Volume 4, page 155 for options) | 62.81 | 46.04 | -16.77 | 0.003 |

The survey data was adjusted to match population engagement using survey weights (see Volume 4, Appendix E for weight details). Using the weights, the percentages of households who correctly answered various questions on energy use and pricing on the opening and closing surveys was calculated (see Table 47). Table 47 is sorted from greatest to least difference between closing and opening results. Questions C1-C20 only indicated respondent's confidence in their answers, not their actual knowledge of the subject matter, and are analyzed later in this report[7].

Each question was scored as "1" for correct or "0" for incorrect responses, and the result was summed to create an overall score for each response. The number of questions answered correctly by respondent households was calculated for both the opening and the closing surveys. The number of correct responses on the opening survey was subtracted from the correct responses on the closing survey. The mean and standard deviation of these differences were used to calculate the test statistic.

A Student's t-test for weighted data was used to analyze the survey results.[8] The mean percentage of correct responses increased from 33.70% on the opening survey to 39.47% on the closing survey with a mean difference of 5.76%. The results of the t-test, shown in Table 48 indicate that the mean difference was statistically significant, with a p value < .001 for the test.

*Table 48:* ***Results of Design-Based t-Test for Difference in Mean Number of Questions Answered Correctly between Opening and Closing Surveys***

| **Alternative hypothesis: True mean difference is not equal to 0.** | | |
|---|---|---|
| **Sample Estimates** | | |
| | **Mean Number of Questions Answered Correctly** | **Standard Error** |
| Opening Survey | 33.90% | 0.007 |
| Closing Survey | 39.47% | 0.011 |
| Difference in means | 5.57% | |
| t = 4.2261 | df = 1,228 | p-value < .001 |

The difference from the opening to the closing survey was statistically significant by segmenting the results by various respondent groups. The following trends are worth noting:

- There were larger, statistically significant differences in the number of correct answers on the closing survey across engagement categories
- Learning that was statistically significant at the 5% level occurred at 25% participation and above. Thus learning was dependent on participation in the PLW game

[7] Question 17 was not analyzed as it appeared that respondents did not understand the question from the open ended responses.

[8] The null hypothesis was that the education treatment had no effect on the knowledge of the participants.

We can observe from our initial analyses that significant learning was correlated with the NDPT education treatment, and the learning seemed to be related in turn to the level of engagement participants had with the education treatment. The learning seems to be sufficient to view the set of NDPT participants who were engaged with the education treatment as different from other participants in the program.

However, we should also note that the survey results indicate that this learning seemed to be modest, rather than major. Many questions in the final post-treatment survey had low percentages of correct answers. Many questions in the final post-treatment survey improved little, or even declined, from the percentages of correct answers in the pre-treatment survey. Further analysis of both the surveys and the NDPT game play results is necessary to identify the participant segments learning the most, or answering correctly the most often.

Each of the questions in Table 50 was also followed by a question to assess respondent's confidence in their answers, rated 0% to 100% in increments of 10%. Confidence may be associated with willingness to act, and therefore may help to indicate whether or not exposure to the NDPT education treatment had an impact on participants regardless of whether or not their answers were right or wrong, or changed from one survey to the next.

Each confidence question used the same wording:

> *"How sure are you of your answer above? Please rank in percentage terms: I am ____% sure my answer is right."*

Table 49 is sorted from greatest to least difference between closing and opening[9].

- The change in the percentage of questions answered correctly was statistically significant at the 95% confidence level for questions CQ1-CQ7, CQ10-CQ14, and CQ18.
- The largest increase in percentage in confidence was for CQ1 ("90% of the energy used by your washing machine is used to do what?"), with the percentage increasing from 58.93% to 76.30%.
- The next largest increase was for CQ13 ("How would you use a power strip to save energy?"), with the percentage increasing from 53.76% to 68.51%.

[9] Question CQ17 was not analyzed, because the underlying question 17 was not analyzed.

*Table 49:* ***Changes from Opening Survey to Closing Survey in Average Percentage of Confidence in Answers***

| | **How sure are you of your answer above? Please rank in percentage terms: I am ____% sure my answer is right.** | | | | |
|---|---|---|---|---|---|
| **#** | **Preceding Question Text** | **Opening (%) n = 576** | **Closing (%) n = 664** | **Difference (%)** | **P-Value** |
| CQ1 | 90% of the energy used by your washing machine is used to do what? | 58.7 | 76.3 | 17.6 | < .001 |
| CQ13 | How would you use a power strip to save energy? | 54.0 | 68.5 | 14.5 | < .001 |
| CQ10 | The price we pay for electricity right now, during a weekday afternoon, is : _____cents/kilowatt-hour. | 46.6 | 60.9 | 14.3 | < .001 |
| CQ2 | If you wanted to save 50% of the energy used by your dishwasher in a normal cycle, how would you do it? | 69.1 | 80.0 | 10.9 | < .001 |
| CQ11 | If you wanted to save about 15% on your summer cooling costs, you would set your thermostat no lower than: ____. | 59.5 | 69.5 | 10.0 | < .001 |
| CQ18 | When your household is on a time-of-use (TOU) rate, what's the best way to save energy? | 62.1 | 71.4 | 9.3 | 0.005 |
| CQ7 | What would you use to seal air leaks around moveable items like windows? | 63.1 | 71.9 | 8.8 | 0.001 |
| CQ6 | Many homes lose 20% of their air-conditioned air: why? | 65.6 | 74.2 | 8.6 | < .001 |
| CQ12 | If you wanted to save about 15% on your winter heating costs, you would set your thermostat no higher than____. | 58.1 | 65.3 | 7.2 | 0.008 |
| CQ4 | Which of these uses more energy? Washing dishes by hand or using a fully loaded dishwasher? | 75.4 | 82.5 | 7.1 | 0.008 |
| CQ3 | What uses more energy - Washing Machines or Dryers? | 71.5 | 77.6 | 6.1 | 0.007 |
| CQ5 | What do you think is the most cost-efficient way to reduce energy waste? | 64.9 | 70.7 | 5.8 | 0.027 |
| CQ15 | In your home, in order, name the three appliances or other energy uses that use the most energy: | 61.4 | 65.9 | 4.5 | 0.09 |
| CQ16 | Your electric bill includes charges for your household's electricity use, but it also includes other charges. Name two of them: | 61.2 | 65.1 | 3.9 | 0.227 |
| CQ20 | Who is the MOST responsible for high electric bills? | 70.5 | 74.3 | 3.8 | 0.2281 |
| CQ8 | Compact fluorescent light (CFL) bulbs use how much less energy per hour of use than incandescent light bulbs? | 50.8 | 54.1 | 3.3 | 0.204 |

| | How sure are you of your answer above? Please rank in percentage terms: I am ____% sure my answer is right. | | | | |
|---|---|---|---|---|---|
| # | Preceding Question Text | Opening (%) n = 576 | Closing (%) n = 664 | Difference (%) | P-Value |
| CQ9 | Light-emitting diode (LED) bulbs use how much less energy per hour of use than Compact fluorescent light (CFL) bulbs? | 44.5 | 46.1 | 1.6 | 0.542 |
| CQ19 | Which of the following is closest to your personal opinion: | 78.2 | 79.0 | 0.8 | 0.776 |
| CQ14 | Where would you go first to get information about how to save energy? | 75.2 | 75.2 | 0.0 | 0.997 |

*Table 50:* ***Results of Design-Based t-Test for Difference in Mean Confidence in Answers Between Opening and Closing Surveys***

| Alternative hypothesis: True difference in mean is not equal to 0. | | |
|---|---|---|
| Sample estimates: | | |
| | Mean Confidence (1-100%) | Standard Error (%) |
| **Opening Survey** | 58.9 | 0.011 |
| **Closing Survey** | 66.6 | 0.015 |
| **Difference in means** | 7.7 | |
| **t =3.5598** | df = 1228 | p-value < .001 |

In order to assess respondent's overall confidence in their answers, the confidence questions were summed and divided by the number of questions analyzed (19). A Student's t-test for weighted data was used to analyze the survey results. Respondents' confidence in their answers increased from an average of 58.94% to 69.91% from the opening survey to the closing survey. This increase was significant at the 95% level.

We can observe from our initial analyses that a significant increase in confidence was correlated with the NDPT education treatment. However, we should also note that the survey results indicate that this increase in confidence seemed to be modest, rather than major. Further analysis of both the surveys and the NDPT game play results is necessary to identify the participant segments with the most confidence, or the most significant increases in confidence.

# *Variable Definitions & Data Sources*

## Hypothesis Testing

The objective of the NDPT follows the general ASD objective of motivating customers to take ownership of their energy usage and be more than satisfied in doing so. There are four hypotheses that will be tested against the null hypothesis that pricing, technology and education will have no impact (individually or in combination) on customers' energy usage and demand, and customers' energy ownership. Those four hypotheses are outlined below and follow directly from NV Energy's CBSP.

> (1) Customers will respond to the time of use (TOU) rates tested, customer education and the enabling technology provided, by addressing, shifting, and reducing energy usage (i.e., by managing their energy use).
>
> (2) Customer energy management responses to rates, education and technology will differ significantly over time and among segments.
>
> (3) Combinations of rates, education and technology will yield customer energy management responses that differ from the sum of the individual responses to those elements over time and among segments.
>
> (4) The extent and persistence of customer energy management responses to rates, education and technology is significantly correlated with customer attitudes of (a) energy ownership, and (b) satisfaction with energy ownership.

In order to test the hypotheses, the NDPT requires a significant amount of customer level data from a number of diverse systems, individuals and vendors. Not only is this information required of participants, but also for the control and non-complier groups that are tracked despite not receiving a treatment. The NDPT collects and stores a tremendous amount of data with the purpose of answering the hypotheses above. Hypothesis one is primarily answered by an analysis using records of which customers volunteered for the NDPT, which treatment they received and the interval usage data from the smart meter. Hypotheses two and three use the data from hypothesis one combined with the segmentation data from the baseline demographic survey. Hypothesis four is primarily answered by the customer market research being completed through opening and closing surveys, focus groups and in-home interviews.

## Data Sources

The data sources listed below are existing databases of NV Energy or one of its vendors participating in the NDPT. Additional information may be retained and collected by NV Energy, but these are the elements specifically required for answering hypotheses and fulfilling data reporting obligations under the SGIG award.

- Banner - Customer Information System (CIS):
  - Monthly Billing
  - NV Energy Customer Service Notes
  - Account Adjustments and Maintenance
  - Settlement data
- DRMS:

    - Customer Information
    - Treatment Cell Assignment
    - Recruitment and Field Service Installation
    - In-Home Technology Information
    - CPP Event Information
    - Customer Service and Field Service Notes
    - Program Year 1 CPP event notification
- Cannon Survey Center
    - Customer Demographic Survey
    - Education Baseline Survey
    - Education Verification Survey
    - Web Enrollments
- EcoFactor:
    - In-Home Technology settings and activity
- MDMS:
    - 15-minute energy usage
- NV Energy Rates Department
    - Rates and tariff information
    - Analysis of CPP notification
    - Monthly Summaries
- Vergence Entertainment
    - Ringorang education information and game response
- Weather Service:
    - Weather Information for cell participants
- iFactor's Notifi System:
    - Program Year 2 CPP event notification
    - Ad-Hoc program messaging
- Customer Market Research
    - In-home interviews
    - Focus group videos and transcripts
    - Technology installation experience

## NDPT Data Base & Workstation

Various NV Energy departments already utilized SAS as the primary analytic tool and it was determined that all analysis for the NDPT would likewise be conducted in SAS. The Unix SAS server was expanded to handle the large amount of additional NDPT data. This server made the most sense to utilize as it was already secured, accessible to relatively few employees and can store data of various different data types (e.g. .docx, .xlsx, .sas, .data, .pdf, .csv, etc.). A section of the server was carved out specifically for the M&V contractor such that they couldn't access the higher level directory and had dedicated workspace.

Data privacy is a concern for NV Energy and within Nevada. Because of this, we required the M&V contractor to perform all their analysis onsite so that data did not leave NV Energy's physical facilities. A room and multiple workstations were set up for both remote and direct access.

## Data Transfer

NV Energy's wide array of systems have integrations built between them in order to pass the data, on regulated intervals, necessary to carry out normal business operations, including the administration of the NDPT. There are two integrations that provide data to Vergence Entertainment and EcoFactor for the administration of the education and technology treatments. The rates treatment and other operational aspects (e.g. billing, MyAccount, DRMS, etc) use existing systems and integrations. The only integration that brings data from a system to the NDPT database is a direct integration with the MDMS which returns interval data for a date range and participants listed in a file. The balance of data collection and transfer is done through manual extracts, secured transfer and manual upload to the NDPT database.

As mentioned prior, the Unix server is capable of storing files of various types. Files are uploaded and retained in their original form and then copied in to SAS datasets as they become necessary for inclusion in SAS programming and analysis.

## Data Submission

In order to comply with the requirements of the SGIG award, NV Energy is required to provide to DOE the data prescribed in Guidance Document #11. This applies to both years and the data is to be submitted within 30 days of DOE accepting the program year report. For Program Year 1, data will be submitted sometime in Q1 2015.

The Public Utilities Commission was made aware of this requirement in combined Docket Nos. 10-08014 & 10-08015. Not only was it included in testimony, but it is also included in the individual tariffs under which customer volunteering for the NDPT take service. As found in the tariffs, Special Conditions 3 and 4:

> *Customers who choose to participate in the NDPT, including those choosing to take service under this rate schedule, will be solicited by the Utility (or its authorized representatives) to provide certain dwelling, demographic, and other relevant information, most typically through an initial survey and an ending or exit survey. Examples of the type of dwelling and demographic information likely to be solicited include, the age of customer's premise, the approximate size of premise in square footage, the age of certain electrical devices, the type of heating and cooling, the number of household occupants, the household income within a stated range, and typical work hours of occupants. Additionally, the Utility will seek feedback from the NDPT participants to better understand their experience on, and opinions of, the trial rate schedules they have been served under and other aspects of the NDPT. All the information solicited will be extremely valuable in helping to make sound statistical assessments regarding the trial outcomes, satisfying certain DOE grant requirements, and helping to guide future Utility efforts to better serve our customers given the new capabilities of the NVEnergize Project systems being installed.*
>
> *Other than for billing and customer service purposes, any customer-specific information or data collected under the NDPT, such as that described in Special Condition 3 above, will be kept confidential by the Utility, and will not be given to any other party or entity, without first redacting all information and records that may be used to associate that information or data*

*with an individual customer. The Utility may publicly or otherwise report various results and findings from the NDPT; including usage, demographic, dwelling, and other information, so long as the individual identity of customers providing such information cannot be ascertained. Certain informational reports will be made to DOE, the Public Utilities Commission of Nevada, and to other interested parties and professional organizations. By accepting service under this Schedule, the Customer authorizes the Utility to disclose this unidentifiable information in accordance with this Special Condition 4.*

Customers accepted this special condition when they elected to take service under the tariff, but the company required customers to additionally agree to a set of terms and conditions specific to their treatment offer. The terms and conditions are included for each treatment in the appendices as part of the recruitment materials, but the last item deals with data disclosure and is as follows:

*Disclosure of Research Information: I understand that participation in the Choose When You Use program is completely voluntary, and that NV Energy or its representatives will ask my household to provide demographic, dwelling and other information for research purposes through surveys, group interviews, and individual interviews. I understand that I may choose to answer or not to answer any individual question. I understand that: • NV Energy may disclose my electric usage and or data or information collected from me only to its own direct contractors, the Department of Energy, the Public Utilities Commission of Nevada, and other entities as required. • NV Energy will take reasonable steps to remove information (such as my name, account number or address) that would allow users of that information to associate my usage or research information with me.*

## Number of Customers

NV Energy reached an agreement with the DOE in December 2012 that data would not be submitted for more than 37,000 customers; this included participants, control group and non-compliers. The table below shows the breakdown of how many customers are projected to be included in data submission and analysis, for a total of 40,494. As noted prior in the section concerning non-complier selection, the discrepancy between 37,000 and 40,494 results from an inflation of the non-complier group by 20% to account for attrition through Program Year 2.

*Table 51:* ***Number of Customer Included in Potential NDPT Data Submission and Analysis***

| | North | South | Total |
|---|---|---|---|
| **Participants** | 1,837 | 3,418 | 5,255 |
| **Control** | 2,480 | 4,960 | 7,440 |
| **Non-compliers** | 10,296 | 17,502 | 27,798 |
| **Total** | 14,613 | 25,880 | 40,493 |

## Anonymizing of Data

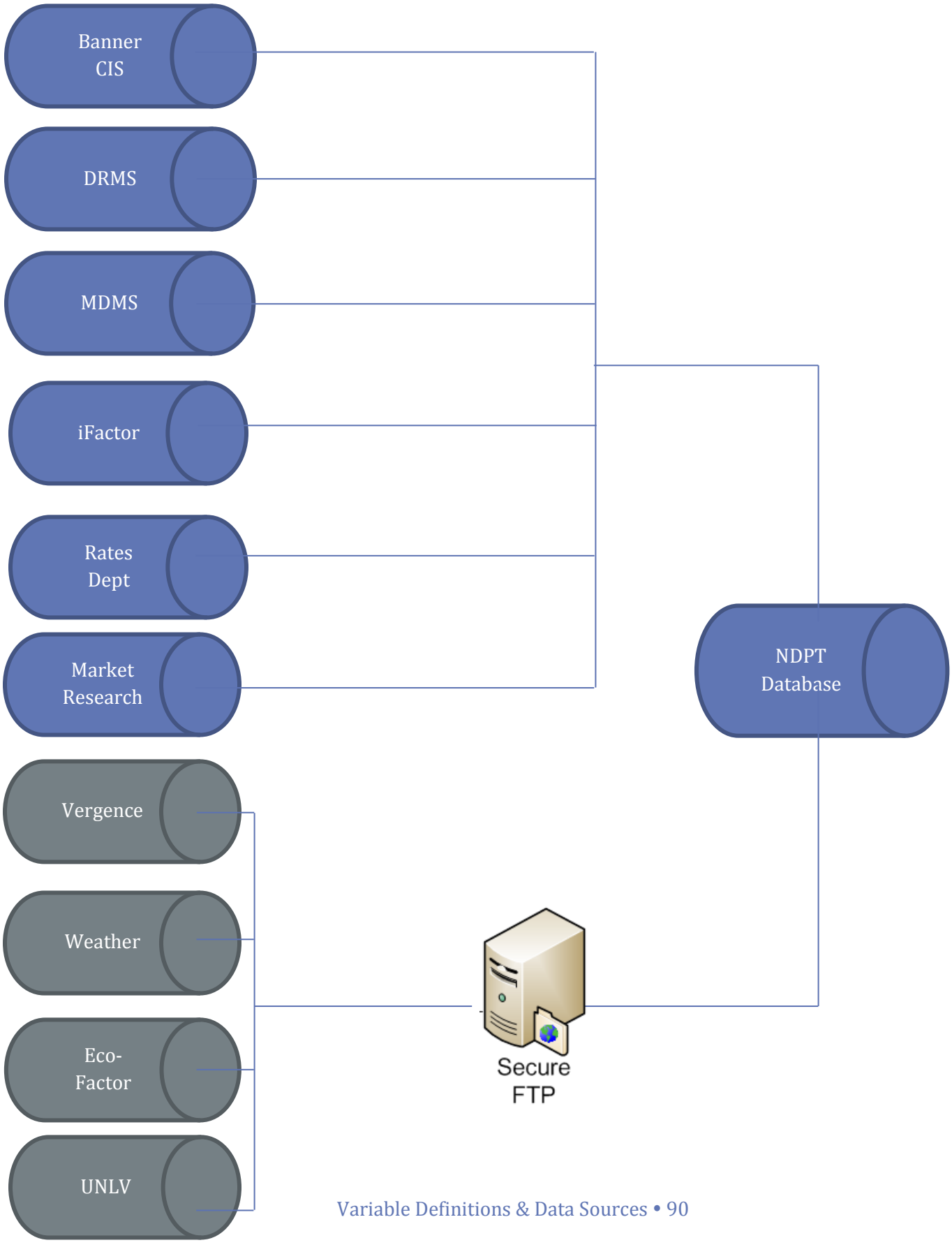
NDPT data will be anonymized prior to submission to the DOE and only linked by a random number across DOE data sets and reports. The data will be scrubbed for any identifiable information per our CBSP, tariffs, testimony, terms and conditions, and various data responses to the PUCN. Once all of the data sets have been compiled for the various treatments, control and non-complier groups, the customers will be randomly ordered. The customers will then be assigned a number and all of the personal identifiable information removed. NV Energy will be the only possessor of the 'cross walk' file that links the random numbers back to individually identifiable customers.

## Data Governance

The NDPT will comply with all DOE and NV Energy requirements concerning data retention and destruction.

Protecting customer data is of the utmost importance to NV Energy and all appropriate steps will be taken to ensure the data is transferred to the DOE's data retention contractor securely. Further, only the minimum data required to comply with the grant obligations will be made available and transferred.

*Figure 5:* ***Simplified Data Flow Diagram***



# *Participant Billing and Customer Service*

## Billing

Standard NV Energy billing spreads residential customers across many billing cycles. This makes it harder to present customers the same information at the same time, as they all bill at different times throughout the month. As a result, the NDPT tariffs have a special condition that allows NV Energy to move anyone participating in the NDPT to calendar month billing. Note that the customer was still allowed to pick their payment due date pursuant to Rule 5.

On March 1, 2013, the first day of the rate treatment, all participating customers were final billed on the flat rate for the number of days they were into their billing cycle. At the same time, they were moved to calendar month billing and placed on the new time-of-use rate. This brought all NDPT participants into the same billing cycle.

## Tariffs

The NDPT is regulated by four different tariffs for the two service territories and two dynamic rates (North TOU, South TOU, North CPP and South CPP) that were originally filed in Nevada Public Utilities Commission Docket Nos. 10-08014 & 10-08015. Those tariffs were then modified through advice letter filings in Docket Nos. 12-10020 & 12-10021 which modified the dates of the NDPT, modified language regarding the technology package and removed the requirement to physically sign an acknowledgement to participate in the trial.

Participants in the NDPT are also subject to various other tariffs, like all residential customers, including Miscellaneous Charges, Deferred Energy Accounting Adjustment, Energy Efficiency rate and Renewable Energy Program Rate.

The Statement of Rates contains the actual price per kilowatt that customers are charged for energy by component. This tariff is updated as rates change for all classes, which is at least quarterly as energy prices are modified to reflect changes in the BTER (Base Tariff Energy Rate).

## Equal Payment Plan

The Equal Payment Plan (EPP) takes the customer's average power usage from the last 12 months and divides it into equal payments. This lets customers know what they'll be paying in advance each month. Customers may also refer to EPP as Levelized Billing or Budget Billing. All customers were still allowed to select EPP as an option to level out their bills throughout the year, pursuant to Rule 5. There is concern that the selection of EPP may blunt the price signal the time-of-use rates were designed to deliver. As a result, it was ordered by the PUCN that NV Energy would conduct an EPP study within 210 days of the end of each year of the NDPT. An example of a southern Nevada July CPP bill is in Appendix F: Billing for a customer who has selected EPP.

*Table 52:* ***Northern Nevada NDPT Participating in EPP by Month***

| Month | Count of NDPT Participants in EPP – North (#) | Count of NDPT Participants in EPP – South (#) |
|---|---|---|
| **March 2013** | 257 | 505 |
| **April 2013** | 258 | 506 |
| **May 2013** | 259 | 506 |
| **June 2013** | 258 | 514 |
| **July 2013** | 260 | 527 |
| **August 2013** | 301 | 660 |
| **September 2013** | 308 | 686 |
| **October 2013** | 310 | 695 |
| **November 2013** | 311 | 691 |
| **December 2013** | 311 | 694 |
| **January 2014** | 313 | 698 |
| **February 2014** | 317 | 688 |
| **Average** | 289 | 614 |

### Bill Line Items

The bills for the NDPT are significantly longer because of the TOU bill redesign done as part of PUCN Docket No. 11-03032 in which all line items are required to appear separately under each TOU period. While this does provide more granularity, it can also make bills more complicated and difficult to understand.

## *Customer Service*

Existing NV Energy customer service operations uses three different call centers; one call center in each service territory and an outsourced call center which assists with peak seasons, high volume and overflow. The NDPT decided to use the outsourced call center for recruitment and enrollment, as well as for the majority of customer service in lieu of in-house customer service support because of a number of program specific factors.

The NDPT is driven by both inbound and outbound call volume support for customer care and accelerated marketing. Peaks and valleys in marketing campaigns created large swings in call volumes that could not be effectively managed by in-house personnel without significant impacts to customer satisfaction. The

outsourced center was able to dynamically add and reduce work teams to match customer care and marketing demands. The NDPT program also relied on specialized support systems such as the Demand Response Management System (DRMS) to manage enrollment and technology installations. Additionally, NDPT Customer Service Representatives (CSRs) required specialized skills not required by typical in-house personnel. NDPT CSRs required specialized knowledge of program treatments involving customer education, advanced time-of-use rate treatments and technology. NDPT CSRs needed specialized knowledge of HVAC systems, energy management devices and equipment installation.

Despite using the outsourced call center for all of recruitment and most of ongoing customer service throughout the duration of the trial, a hybrid model was employed for both summers. This hybrid model was put in place for the extreme high bill summer seasons at both utilities. While the outsourced center had a wealth of knowledge and training specific to the program, they did not have training around high bill complaint resolution or advanced billing options. The hybrid model allowed the NDPT to use multiple sets of agents answering questions in the areas they were most qualified to provide and as much single point resolutions as possible. The outsourced team would handle all questions and concerns regarding the program and pass customers to a small internal team for questions related to complex billing involving the advanced time-of-use rates.

The outsourced call center was incrementally trained by the technology provider so that they could provide tier one and two customer service for things such as resetting passwords, re-syncing devices, and programming their heating and cooling schedules.

Lastly, the outsourced team was trained to provide all customer support for the education treatment. These agents had the ability to reset passwords, resend materials and enrollment emails, and diagnose connectivity and device issues.

## Participant Communications

Throughout the trial, customers were exposed to a number of communication pieces from the utility. These included NDPT program specific information, monthly bills, monthly energy reports, CPP event notifications for those on the CPP treatment, missed CPP alert refunds, prizes from the education treatment, focus group honorariums, website information for those who visited nvenergy.com, and all mass media exposure for utility wide programs and news.

The NDPT sent out several letters during recruitment, throughout the education treatment, before season changes and as part of the monthly energy report. These shaped the timeline of the trial and sought to engage customers.

Before the trial began, customers were used to receiving a monthly bill statement outlining their kilowatt usage, the current rate price and associated fees either through physical U.S. mail or as a paperless bill through their email. Approximately 14.42% of all NV Energy customers receive their monthly bill statement online. The customer's preference of receipt did not change when the trial began. Billing dates changed to line up all participants on the same schedule. Bills are mailed for the previous month within the first few days of the new month. Customer's received their bills on the following dates:

*Table 53:* ***NDPT Participant Bill Receipt Dates by Region***

| South | North |
|---|---|
| 4/3/2013 | 4/4/2013 |
| 5/3/2013 | 5/3/2013 |
| 6/4/2013 | 6/5/2013 |
| 7/3/2013 | 7/4/2013 |
| 8/2/2013 | 8/3/2013 |
| 9/5/2013 | 9/6/2013 |
| 10/3/2013 | 10/3/2013 |
| 11/2/2013 | 11/5/2013 |
| 12/5/2013 | 12/5/2013 |
| 1/3/2014 | 1/4/2014 |
| 2/4/2014 | 2/5/2014 |
| 3/4/2014 | 3/6/2014 |

Monthly energy reports were sent to customers to help track how they are using energy compared to the flat rate. Energy saving tips and important information are included within each report along with the customer service phone number for questions. The first summaries were sent in May 2013 for the month of April. No summary was sent for February 2014 because the Year 1 True Up letter was sent at the same time and both would contain similar information. Monthly energy reports were mailed on the following days:

*Table 54:* ***NDPT Participant Energy Report Mailing Dates by Region***

| South | North |
|---|---|
| 5/17/2013 | 5/17/2013 |
| 6/20/2013 | 6/19/2013 |
| 7/22/2013 | 7/24/2013 |
| 8/16/2013 | 8/16/2013 |
| 9/24/2013 | 9/30/2013 |
| 10/25/2013 | 10/30/2013 |
| 11/21/2013 | 11/22/2013 |
| 12/20/2013 | 1/6/2014 |
| 1/24/2014 | 1/16/2014 |
| 2/21/2014 | 2/21/2014 |

Customers on the CPP treatments received alerts for Critical Peak Pricing Events and in December 2013, CPP customers received a letter informing them, as applicable, of missed event notifications and in some cases a refund.

Customers always have the option of visiting nvenergy.com or obtaining their account information through MyAccount. Both can be accessed through the NV Energy website. In addition to logging on to MyAccount, customers can find tips to conserve energy and resources to help teach their children about the importance of using energy wisely through games and other outside links. When first visiting the website, customers are greeted with timely utility information and programs that they are able to sign up for. If the customer

needs utility service assistance such as starting, stopping or transferring service, reporting an outage, signing up for paperless billing and more, the website will direct them to the information that they need.

In addition to the NV Energy website, customers are exposed every day to mass media outlets and social media from third party sources and the company itself. Below is a small glimpse of some of the information going out to customers across the state during recruitment and throughout the first year of the program.

*Table 55:* ***Examples of NDPT Participant News Story Availability: 2013-2014***

| Date | News Story Topic |
|---|---|
| **Jan. 9, 2013** | Customers may choose analog meter as non-standard metering option |
| **Apr. 10, 2013** | SolarGenerations programs accepting applications |
| **Apr. 29, 2013** | Solar space heating for Reno-Sparks customers |
| **May 29, 2013** | NV Energy to join MidAmerican Energy Holdings Company |
| **Jun. 4, 2013** | NV Energy makes one company filing with the Public Utilities Commission |
| **Jun. 4, 2013** | NV Energy files General Rate Case in Northern Nevada |
| **Aug. 13, 2013** | Energy efficiency incentives available – Sure Bet Program |
| **Aug. 19, 2013** | NV Energy announces special stakeholder meeting for proposed MidAmerican Acquisition |
| **Sep. 25, 2013** | NV Energy shareholders approve MidAmerican merger |
| **Oct. 10, 2013** | NV Energy celebrates 50th anniversary of Tracy Generating Station |
| **Oct. 11, 2013** | NV Energy Foundation pledges $450,000 to renewable energy studies |
| **Oct. 18, 2013** | SolarGenerations program accepting applications beginning Nov. 1 |
| **Oct. 21, 2013** | NV Energy and Moana Nursery partner for Right Tree, Right Place campaign |
| **Nov. 4, 2013** | Northern Nevada customers get new green energy option |
| **Dec. 9, 2013** | Record demand for natural gas in Reno-Sparks |
| **Jan. 8 – Feb. 6, 2014** | Looking for methane – public education on identifying and reporting gas leaks |
| **Jan. 23, 2014** | One Nevada Transmission Line begins serving customers |
| **Feb. 5, 2014** | NV Energy residential lighting program offering rebates on LED energy star bulbs |
| **Mar. 19, 2014** | mPowered program now available in Reno-Sparks area |
| **May 2, 2014** | NV Energy files smallest General Rate Case in over a decade for southern Nevada |
| **May 12, 2014** | NV Energy adds tools for MyAccount |
| **May 27, 2014** | New solar pool heating program introduced |
| **Jul. 1, 2014** | NV Energy names Paul Caudill President and Chief Executive Officer |

These communications helped shape the customer's view of the trial program overall and had an impact on their decision whether or not to stay in the program for the second year.

## *Attrition*

As referenced in the Stratification section, the minimum statistical sample sizes for each treatment cell were inflated by 50%. Further, as referenced earlier, we allowed more customers to enroll than were minimally needed, prior to closing the cells to further enrollment. Both of these were done because of concerns that too much attrition would reduce the statistical significance of any findings in the trial.

## Program Year 1 Attrition

The NDPT experienced three types of attrition during Year 1, resulting in 440 participants, or 8.4% of the starting population, leaving the NDPT from March 1, 2013 to February 28, 2014.

- Move-outs: These are customers who moved out of the residence they occupied at the time of enrollment. Per the tariffs and CBSP, customers were not allowed to take their enrollment with them, nor were the new occupants allowed to take over the prior tenant's trial participation. We experienced 344 total move-outs. Move-outs account for 78.2% of attrition.
- Exempted: Despite the tariff specifically stating that customers could not leave the program until the end of the first year of participation, NV Energy made exceptions in order to foster better customer service by allowing some customers to leave during Program Year 1. NV Energy exempted 81 participants during Year 1. Exemptions account for 18.4% of attrition.
- Other: For disqualifying actions, 15 customers were removed from the pricing trial, including switching to net metering after installing renewable generation, having the smart meter removed and taking service under existing optional TOU. Miscellaneous removals account for 3.4% of attrition.

Tables 56 and 57 show the number of participants enrolled in the NDPT, as well as those who left by category.

*Table 56:* ***NDPT South Starting Population and Attrition (Program Year 1)***

| Treatment | Started | Moved | Exempted | Other | Retained |
|---|---|---|---|---|---|
| **CPP** | 914 | 63 | 16 | 2 | 833 |
| **CPP+E** | 731 | 62 | 21 | 5 | 643 |
| **CPP+E+T** | 703 | 46 | 5 | 1 | 651 |
| **TOU** | 430 | 41 | 12 | 2 | 375 |
| **TOU+E** | 323 | 26 | 6 | 1 | 290 |
| **TOU+E+T** | 317 | 16 | 9 | 2 | 290 |
| **Totals** | **3,418** | **254** | **69** | **13** | **3,082** |

*Table 57:* ***NDPT North Starting Population and Attrition (Program Year 1)***

| Treatment | Started | Moved | Exempted | Other | Retained |
|---|---|---|---|---|---|
| **CPP** | 334 | 15 | 1 | 0 | 318 |
| **CPP+E** | 300 | 14 | 2 | 0 | 284 |
| **CPP+E+T** | 322 | 16 | 3 | 0 | 303 |
| **TOU** | 435 | 13 | 1 | 1 | 420 |
| **TOU+E** | 296 | 18 | 5 | 0 | 273 |
| **TOU+E+T** | 150 | 14 | 0 | 0 | 136 |
| **Totals** | **1,837** | **90** | **12** | **1** | **1,734** |

## Year 1 Reenlistment

The tables above indicate the NDPT participants who completed Program Year 1, and were thus eligible to decide whether or not to participate in Program Year 2. The NDPT included an explicit first-year 'bill guarantee' provision which expired with Program Year 1 and participants who elected to remain in the NDPT would be proceeding without the potential of any additional reimbursements.

The NDPT had a defined period of time in which customers were presented results of their performance during Program Year 1 and provided an opportunity to opt-out. On February 28, 2014, NV Energy mailed customers a summary of their performance in Year 1, using an estimate for the last five days in February. The letter indicated whether the customer was estimated to lose or save money by being on the dynamic rate and the level of savings/loss. It also provided contact information on opt-out or asking questions, and provided information about changes in program Year 2, such as the removal of the best bill guarantee. Included with this letter was an energy consumption brochure of the most popular appliances in the home, and a letter outlining potential tips customers could try in Year 2 to better their experience in the trial. Versions of the savings and loss letter are included within Appendix F: Billing, respectively.

On March 26-27, 2014, the Utility mailed customers a final summary of their performance in Program Year 1, taking into account the last five days in February. The letter reiterated the deadline to opt-out and provided information on when the customer would receive their bill credit, if they lost money by being on the NDPT rate compared to the otherwise applicable flat rate. Those bill credits were included on the February usage bill received the first part of March. Versions of these letters are included in Appendix F: Billing.

The original window to opt-out was from March 1, 2014 to March 31, 2014. This was subsequently stretched to April 15, 2014 to account for any delays in mail processing, vacations, and etcetera. Within the six week window, 736 customers opted to not participate in the second year of the pricing trial; these results are outlined in Tables 58 and 59 below.

*Table 58:* ***NDPT Reenlistment Opt Outs (Number)***

| Cell | North | South |
|---|---|---|
| **CPP** | 67 | 96 |
| **CPP+E** | 87 | 69 |
| **CPP+E+T** | 66 | 43 |
| **TOU** | 74 | 56 |
| **TOU+E** | 62 | 57 |
| **TOU+E+T** | 23 | 35 |
| **Totals** | **379** | **356** |

*Table 59:* ***NDPT Reenlistment Opt Outs (Opt Outs as a % of Retained)***

| Cell | North (%) | South (%) |
|---|---|---|
| **CPP** | 21.1 | 11.5 |
| **CPP+E** | 30.6 | 10.7 |
| **CPP+E+T** | 21.8 | 6.8 |
| **TOU** | 17.6 | 14.9 |
| **TOU+E** | 22.7 | 19.7 |
| **TOU+E+T** | 16.9 | 12.1 |
| **Totals** | **21.9** | **11.6** |

Please refer to the focus group discussion in Volume 3 for perspectives on the participants' reenlistment decisions. At this time, we are not offering explanations of the differences in opt-out levels between regions, or between cells.

## Program Year 2 Population

Tables 60 and 61 outline the starting population for Program Year 2 after discounting those participants who left the trial prior to the end of the first program year and opted-out immediately following the end of Program Year 1.

*Table 60:* ***NDPT South Starting Population and Attrition (Program Year 2)***

| Treatment | Starting Program Year 1 Population | Removed during Program Year 1 | Opt-Out after Program Year 1 | Program Year 2 Starting Population |
|---|---|---|---|---|
| **CPP** | 914 | 81 | 96 | 737 |
| **CPP+E** | 731 | 88 | 69 | 574 |
| **CPP+E+T** | 703 | 52 | 43 | 608 |
| **TOU** | 430 | 55 | 56 | 319 |
| **TOU+E** | 323 | 33 | 57 | 233 |
| **TOU+E+T** | 317 | 27 | 35 | 255 |
| **Totals** | **3,418** | **336** | **356** | **2,726** |

*Table 61:* ***NDPT North Starting Population and Attrition (Program Year 2)***

| Treatment | Starting Program Year 1 Population | Removed during Program Year 1 | Opt-Out after Program Year 1 | Program Year 2 Starting Population |
|---|---|---|---|---|
| **CPP** | 334 | 16 | 67 | 251 |
| **CPP+E** | 300 | 16 | 87 | 197 |
| **CPP+E+T** | 322 | 19 | 66 | 237 |
| **TOU** | 435 | 15 | 74 | 346 |
| **TOU+E** | 296 | 23 | 62 | 211 |
| **TOU+E+T** | 150 | 14 | 23 | 113 |
| **Totals** | **1,837** | **103** | **379** | **1,355** |

The NDPT will continue to experience the same three kinds of attrition in Program Year 2 as it did in Program Year 1.

## *Survey Approach*

Customers were given several surveys to find out more about their energy habits and where customers fit in throughout the program. The survey modality varied and allowed the company to talk to customers in different avenues.

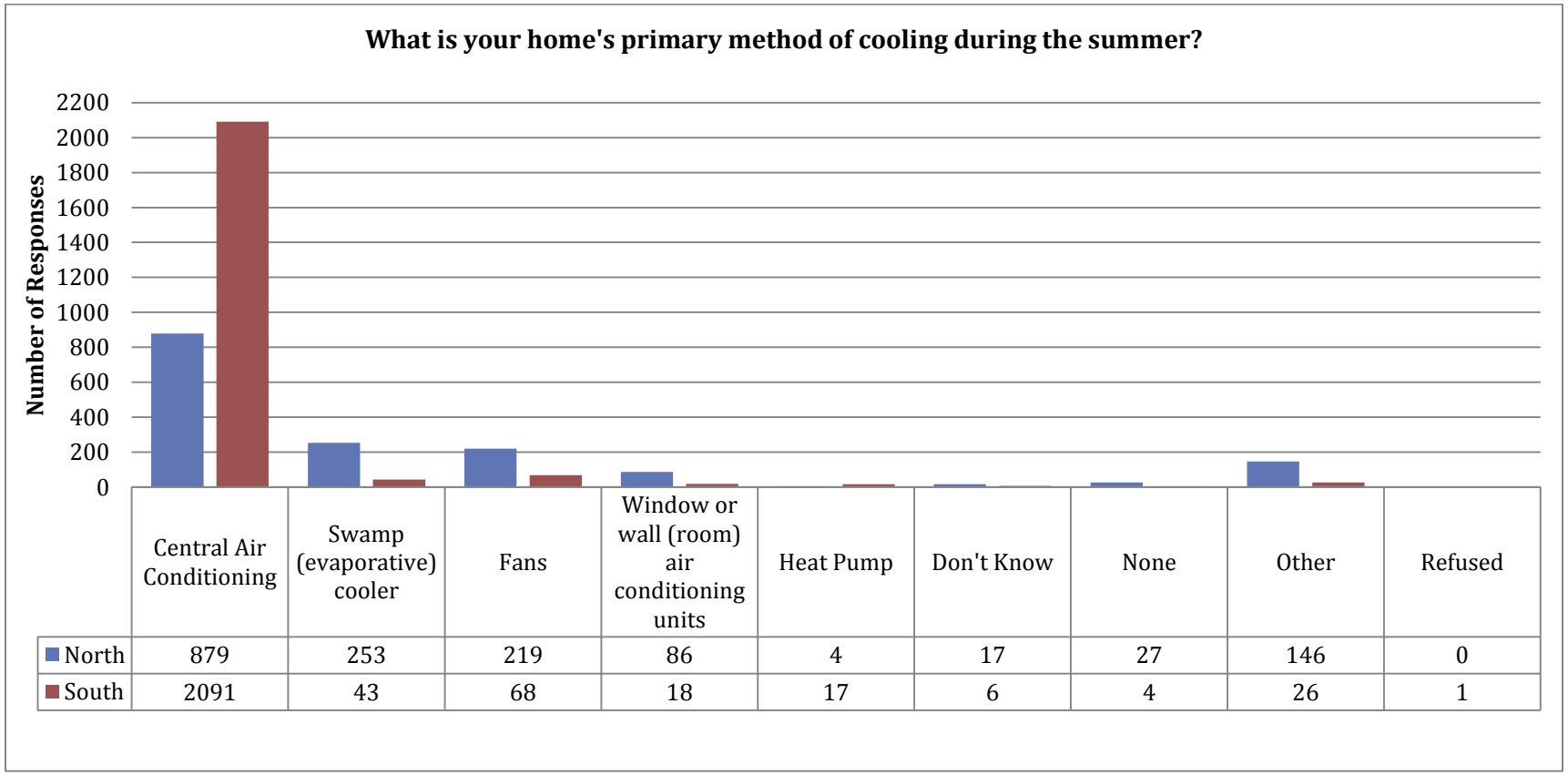
The baseline or demographic survey was administered by the University of Nevada, Las Vegas Cannon Survey Center and by Active TeleSource (ATS) over the phone. This survey determined basic energy use questions about the household habits and prior knowledge of the program. The baseline survey covered approximately 71 questions and allowed the participant to refuse any question if they did not want to answer it. The questionnaire agents used can be found within Appendix E: Education.

Of the 3,907 customers surveyed, 58% were from the South and 42% were surveyed from the North. Over 90% of respondents North and South live in single-family residences with mobile home and duplex residents being the second and third responses following with below 2% of responses.

The baseline survey included questions about the ages within the household, the racial or ethnic background and education level. Answers showed that most of the households surveyed house two adults over 18, with most not having children under 18 or adults over 65. Over 70% of respondents identified as White, not of Hispanic origin, while 10% identified themselves as multi-racial. The remaining 20% of responses varied between American Indian, Asian or Pacific Islander, Black, Hispanic or Latino or refused to answer.

To determine how customers use energy it was important to know about the largest type of energy use in their household: heating and cooling. Questions were also asked on the survey about major appliances and pieces of equipment throughout the house. Figure 6 shows how customers cool their house in the summer. Figure 7 shows how customers heat their house in the winter.

*Figure 6:* ***Baseline Survey: Primary Cooling During Summer***

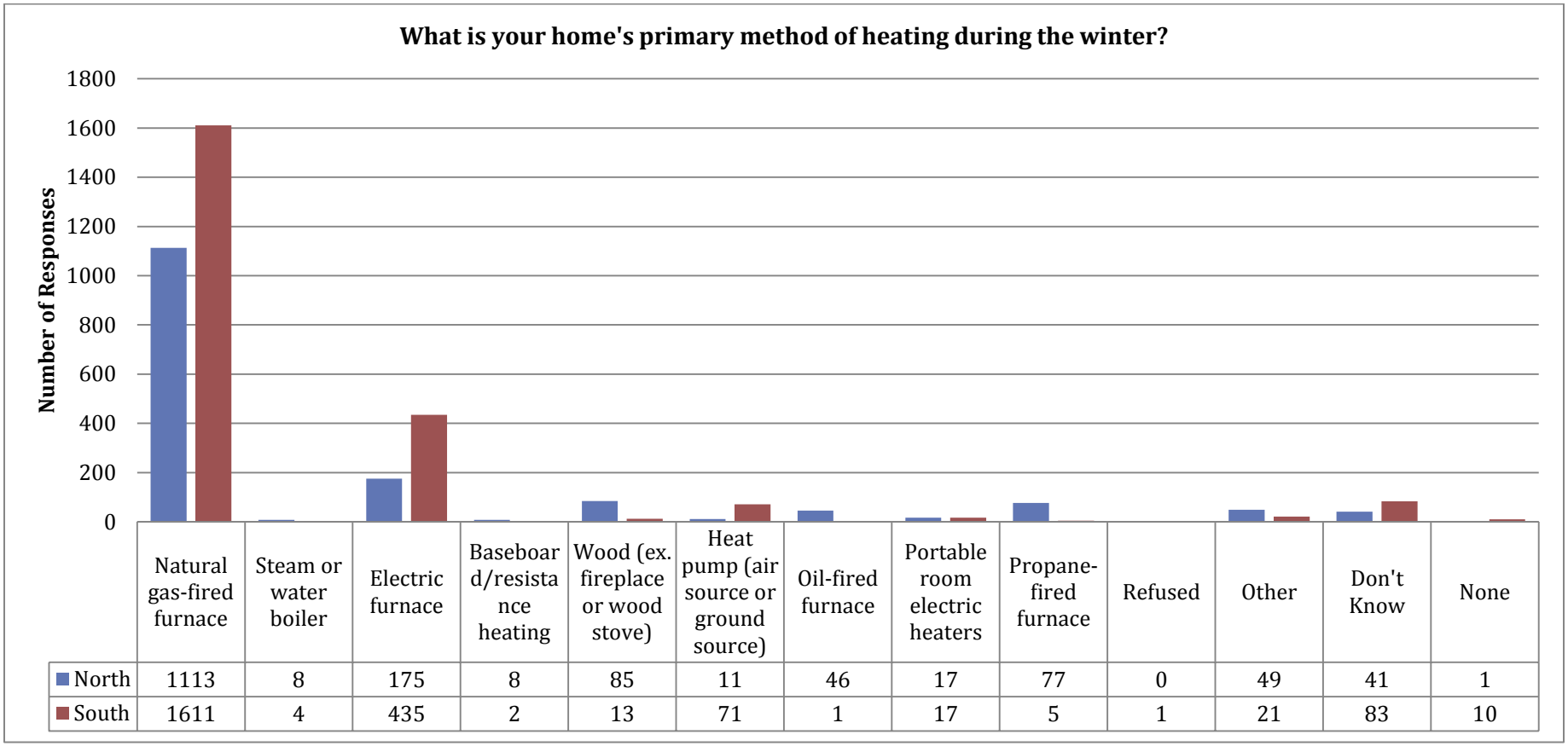



| | Central Air Conditioning | Swamp (evaporative) cooler | Fans | Window or wall (room) air conditioning units | Heat Pump | Don't Know | None | Other | Refused |
|---|---|---|---|---|---|---|---|---|---|
| North | 879 | 253 | 219 | 86 | 4 | 17 | 27 | 146 | 0 |
| South | 2091 | 43 | 68 | 18 | 17 | 6 | 4 | 26 | 1 |

Central Air Conditioning is the primary method of cooling a home in both regions with the predominate use seen in the South.

In Figure 7, we see that natural gas-fired furnaces are the typical method of heating a home in both North and South, followed by an electric furnace.

*Figure 7:* ***Baseline Survey: Primary Heating During Winter***




| | Natural gas-fired furnace | Steam or water boiler | Electric furnace | Baseboard/resistance heating | Wood (ex. fireplace or wood stove) | Heat pump (air source or ground source) | Oil-fired furnace | Portable room electric heaters | Propane-fired furnace | Refused | Other | Don't Know | None |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North | 1113 | 8 | 175 | 8 | 85 | 11 | 46 | 17 | 77 | 0 | 49 | 41 | 1 |
| South | 1611 | 4 | 435 | 2 | 13 | 71 | 1 | 17 | 5 | 1 | 21 | 83 | 10 |

These kinds of questions helped the NDPT determine the type of customer that was a part of the trial and what would need to be focused on the most with the education and technology treatments.

As shown earlier in the report, the education surveys provided opportunities to see where customers learned and improved their knowledge when applied to their home energy use. In Table 48 of that section, the knowledge gain is demonstrated by the difference in questions answered from opening survey to closing survey.