New Energy Industry Task Force
Existing Infrastructure and Modernization of the Electric Grid
March 22, 2016
• **Existing Infrastructure**
  – Fossil generation and transmission
  – Renewable generation

• **Modernization of the grid**
  – Energy Imbalance Market (EIM)
  – Smart grid - the age of information
  – Energy efficiency programs

• **Emerging technologies**
  – Distributed generation
  – Energy storage
  – Electric vehicle, EV to the grid
NV Energy Background

- Headquartered in Las Vegas, Nevada
- 2,498 employees
- 1.2 million electricity and 0.2 million gas customers
- Provides service to 90% of Nevada population, along with tourist population of 41 million annually

Current Generation portfolio*

- Coal: 10%
- Natural gas: 68%
- Renewables: 22%

*Including renewable power purchase agreements
1. Northern Nevada resources consist mostly of geothermal, one large wind project and solar with storage near Tonopah.

2. Southern Nevada resources primarily solar.

3. Distributed generation primarily rooftop solar spread throughout the state.

4. Nevada is one of the highest geothermal and solar producers per capital.

5. Nevada has a renewable portfolio standard that is currently 20% of load moving to 25% by 2025.

6. NV Energy remains on target to meet the RPS.
1. Electricity is generated and leaves the power plant
2. Generated voltage is increased at a “step-up” substation
3. The energy travels along a transmission line to the area where the power is needed
4. Once there, the voltage is decreased or “stepped-down,” at another substation
5. A distribution power line carries the electricity
6. Electricity is delivered to your home or business
Smart Grid of the Future

The NV Energy Smart Grid Vision

- **System Monitoring**
  - Voltage Regulation
  - Outage Detection

- **Communications**
  - Infrastructure Statewide
  - Cyber Secure Base Stations
  - 900 MHz Licensed Frequency
  - Dedicated AMI and DA Spectrums

- **Substation**
  - Monitoring
  - Control
  - Supervisory Control and Data Acquisition (SCADA)
  - Automated Restoration

- **Systems**
  - Distribution Management System (DMS)
  - Regional Network Interface (RNI)
  - Meter Data Management System (MDMS)
  - Supervisory Control and Data Acquisition (SCADA)
  - Web Portal/Mobile
  - Mobile Workforce Management (MWM)
  - Customer Preference Center
  - Business Intelligence

- **Customers**
  - Usage Information
  - Communication Preference
  - Payment Options
  - Outage Information
  - Service Reliability
  - Energy Programs
  - Pricing Options

- **Advanced Metering**
  - 15-Minute Interval Billing
  - Remote Connect & Disconnect

- **Distribution Automation**
  - Intelligent Switching
  - Capacitor Control
  - Fault Isolation

- **Demand Management**
  - Demand Response
  - Home area Network (HAN)
  - Distributed Generation
Modernization of the Grid
Transmission and Generation

• Participation in the California Independent System Operator’s Energy Imbalance Market ("EIM")
  – NV Energy’s participation is voluntary
  – NV Energy received PUCN approval in 2014 and went live in December 2015 resulting in cost savings as soon as the first full month of participation was completed
  – Primary Benefits of EIM Membership for Nevada:
    • Members can avoid having to build new resources to follow imbalance in generation and load due to the fact that existing resources can be shared between balancing areas
    • Increases the cost effectiveness of intermittent renewable resources such as wind and solar because any excess generation can be delivered and used over a larger area
• MDC

  – NV Energy maintains an MDC that tracks over 100,000 data points at its power plants
  – The data helps to predict failures in advance so outages can be avoided or properly scoped
  – NV Energy spent roughly $5 million to build the state of the art facility
  – The MDC saved over $5 million in preventable maintenance in the first two years of operation
  – Advanced Pattern Recognition Software – GE SmartSignal is the model used to monitor and identify degradation through pattern recognition and failures
Modernization of the Grid Generation - MDC

Benefits
- Optimal dispatch and scheduling of resources based on performance data
- Forced outage avoidance
- Maintenance scheduling / optimization
- Centralized fleet-wide process engineering competency
Modernization of the Grid Distribution

• Distribution Operations objectives
  – Safety: Ensure highest level of employee and public safety through understanding and application of technology
  – Reliability: Minimize customer outages and improve communication
  – Efficiency: Efficient operation of distribution system
  – Performance: Improve system performance based on technological advancements
• Programs currently in place:
  – NV Energize
  – Distribution Line Capacitor Automation
  – Substation Automation and Restoration Schemes
  – Distribution Automation – Intelliteam Switches
  – Substation Gas Detection
  – Substation Transformer Bushing Monitoring
  – Distributed Generation Monitoring (Primary)
Modernization of the Grid

Smart Grid

NV Energize – Smart Grid Foundation

- Communications Infrastructure Statewide
- Cyber Secure Base Stations
- 900 MHz licensed frequency
- Dedicated AMI and DA spectrums

Multiple Prioritized Channels

- Smart Metering
- Event Management
- Outage Notification
- Demand Response
- Distribution Automation
- Voltage Regulation

Advanced Meter Infrastructure (AMI)

Distribution Automation (DA)
Modernization of the Grid
Smart Grid

Customer Preference Center

- Enables customers to specify which channels and devices they prefer to use when communicating with NV Energy
- Allows NVE to manage all of these customer communications from a single platform
- The Customer Preference Center enables reliable, consistent, effective, economical, and targeted communications
Modernization of the Grid
Smart Grid

MyAccount and auto notifications

• Enables NV Energy customers to report outages and to receive information, maps, and messages about outages occurring in the NV Energy service territory

• The outage communications platform links with the Customer Preference Center and operates via proven web and mobile applications
Customer Programs – Outage Reporting

Outage Reporting through multiple channels- Utilizing the Customer Preference Center customers have the ability to choose their preferred method to report outages:

Web Outage Reporting

Mobile Outage Reporting

Mobile 2-way SMS
Modernization of the Grid

Smart Meters

- Smart Meters
Modernization of the Grid
Smart Meters

• Deployment of smart meters has significantly changed the way NVE communicates and conducts business with customers

  – NV Energy pursued aggressive implementation of smart meter technology, spurred by a $139 million US Department of Energy grant. Over 1.4 million electric and gas meters were exchanged from 2010-2015.

  – Implemented essential communication networks necessary to collect and manage the metering information. These are the regional network interface (RNI), the meter data management system (MDMS) and the demand response management system (DRMS).

  – The project achieved two primary objectives:
    1. Substantially reduce operating costs while simultaneously improving meter data and billing quality. Also supports operational improvement, specifically as it relates to outage detection and restoration
    2. Provides a technology platform that automates and optimizes enhanced customer communications and demand management solutions.
• Smart meters - continued
  – Provides operating cost reductions of $20 million annually,
    • Over 600,000 avoided annual truck rolls (3.5 million during course of project),
    • Creates and improves a cyber secure network that also provides transmission and distribution operational benefits.
  – Customers benefit by having reduced operating costs, improved metering and billing accuracy, real-time outage and restoration information, remote connect and disconnect services and enhanced data analysis/communications regarding energy usage
Smart Meters
Leading The Way to New Customers Offerings

• **MyAccount**
  • Over 580,000 accounts (50,000+ annual increase)
  • Multiple new features added in December 2015
  • New dashboard
  • Scroll over data on temperature, use and cost
  • Downloadable two-year data
  • New net metering usage/production graphs
  • Time of use and demand (for commercial customers)

  – Outage map utilization growing dramatically
    • 1.4 million total hits in 2015 (web and mobile)

  – Serves as a product and service promotion platform
MyAccount Dashboard

Account Summary

Total Amount Due:

$0.00

Do Not Pay

No payment is due.
You are signed up for Automatic Monthly Payments

Account Summary as of Jan 27, 2016

Current Charges:
$104.23

View Bill

Pending Payment:
$104.23

View History

Next Meter Read Date: Feb 19, 2016

Smart Meter Highlights

You are 5 days into your billing

Estimated Cost To Date:
$23

As of Jan 27, 2016

Manage Energy Alerts

All amounts rounded to nearest dollar

Projected Bill:

$58 to $109

This month:

Actual Daily Usage (kWh)

View Usage

Switch to Paper

Cancel Automatic Monthly Payments

Change Bank Information

Enroll in Equal Pay
Sign-up for notifications to be provided by email, text or automated phone call
MyAccount
Weekly Energy Snapshot

Snapshot by Email

Account #: 30************645
Service Address: 3520 Amish Ave North Las Vegas NV 89031

MY ENERGY SNAPSHOT

Billing Cycle: 01/21 - 02/18
Data as of 01/23

Electricity Used to Date
63 kWh

| Cost to Date | $21 |
| Days Remaining | 26 |
| Projected Monthly Bill | $85 |

My Weekly Trends

<table>
<thead>
<tr>
<th>Previous 01/10 - 01/16</th>
<th>Current 01/17 - 01/23</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (low / high)</td>
<td>$3° / $3°</td>
<td></td>
</tr>
<tr>
<td>30° / 59°</td>
<td>33° / 62°</td>
<td></td>
</tr>
<tr>
<td>Electric Usage (kWh)</td>
<td>$27</td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>150</td>
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<tr>
<td>Cost</td>
<td>$3</td>
<td></td>
</tr>
<tr>
<td>$18</td>
<td>$21</td>
<td></td>
</tr>
</tbody>
</table>

Snapshot by Text

Cost-to-date: $21
Days remaining in billing cycle: 26
Projected bill this month: $85

NVE123 Alerts:
BILL SUMMARY
Acct at 3520
Cost-to-date: $21
Days remaining in billing cycle: 26
Projected bill this month: $85

NVE123 Alerts:
THRESHOLD EXCEEDED
Your estimated electric cost-to-date $26.00
MyAccount
Daily Energy Usage Data

Account Summary
- Total Amount Due: $0.00
- No payment is due.
- You are signed up for Automatic Monthly Payments.

Account Summary as of Jan 27, 2016
- Current Charges: $104.23
- Pending Payment: $104.23
- Next Meter Read Date: Feb 19, 2016

Smart Meter Highlights
- Estimated Cost To Date: $23
- As of Jan 27, 2016
- Manage Energy Alerts
- Projected Bill: $58 to $109
  - This month:

Billing & Payment Options
- Switch to Paper
- Cancel Automatic Monthly Payments
- Change Bank Information
- Enroll in Equal Pay

Actual Daily Usage (kWh)
- Avg Usage
- kWh
- Avg Temp
- View Usage

Electrical: 6609765637
MyAccount
Additional Views For Net Metering Customers

Net Metering Usage Graph

Actual Daily Usage (Net kWh)

October 25, 2015 – October 31, 2015

Net kWh
Production: 34.8140 kWh
Usage: 12.7010 kWh
Production = Usage: 12.7010 kWh
Net Production: 22.1130 kWh

View 15 Min. Day Week Month

Ending 10/31/2015

Download Usage
Hide Detailed Energy Consumption
Available Now – NVEnergy Mobile App

NV Energy Mobile App – available in iTunes or Google Play

Cost to Date

1027 ANYSTREET AVE

You are 32 days into your billing cycle

Cost to Date
As of: Apr 21, 2015
$174

Manage Energy Alerts

All amounts rounded to nearest dollar

Projected Bill
This Month: $165 to $202

Angie
Customer Service
• Customer Energy Management Solutions
  – New program designs integrate energy efficiency and demand response to provide enhanced services to customers well beyond traditional rebate programs

• A new portfolio of programs leverage the smart grid infrastructure to allow customers to take advantage of new data driven solutions for enhanced energy management

• “Big data analysis” is applied on both sides of the meter to:
  – Optimize how customers use major energy systems
  – Allow NV Energy to actively manage its peak demand via peak shaping technology
Grid Modernization
New Customer Solutions

- Energy Efficiency Optimization Service
- HVAC Fault Detection Service
- Remote Control
- Enhanced data analysis identifies new savings opportunities

Enhanced data analysis identifies new savings opportunities.
Grid Modernization
Advanced Peak Demand Management

- DRMS – advanced platform integrated to other enterprise systems allows NV Energy to forecast and optimize the “dispatch” of customer loads to reduce and shape the electric peak load. New approaches minimize customer impact, and most customers do not notice events.

- NV Energy has deployed the most advanced integrated energy efficiency and demand response platform in the country allowing flexible and locational dispatch to support both system wide and distribution level demand management (~240 MW of demand response statewide).

Demand response event optimization flatlines the electric peak producing significant avoided cost savings.
Grid Modernization
Role of Demand Response

• Demand response – programs that allow NVE to control customer’s loads to assist in meeting the electric peak load without adding generation

• NVE’s Program is one of the largest in the country
  – Controls over 244 MW of load thus avoiding the need to construct new generation to serve the load
    • 201 MW at Nevada Power
    • 35 MW Irrigation load at Sierra Pacific
    • 8.4 MW other load at Sierra Pacific
Grid Modernization
What’s Next?

• Transmission
  – Continue to develop and expand working relationships with regional transmission organizations

• Generation
  – Expand MDC role in monitoring NVE and other generating assets

• Distribution
  – Distributed generation integration and impact to the grid
  – Study the benefits of smart inverters
  – Volt/Var optimization pilot program
  – Fault location, isolation, and service restoration
  – Remote controlled switching
  – Integrated mobile dispatch
  – Distribution automation
Grid Modernization – What’s Next?

• Customer service offerings
  – Continue to develop emerging technologies and interfaces with customers offering a suite of products and services to help customers track and manage consumption

• Use of Emerging Technologies
  – Use of storage technologies,
    • Batteries
  – Electric Vehicles (EV)
    • Infrastructure needed to promote EV use across Nevada
      - The “Electric Highway” is a catalyst
    • Forecast underway to determine potential EV penetration
    • Potential use as a demand side resource either through demand response or acting as a storage device