2018 Integrated Resource Plan Summary

Vernon Public Utilities
Development of the Integrated Resource Plan

Contributors

Acknowledgments

ABB

Joule Megamorphosis

Energy Consulting
Definitions

Commonly Used Energy Industry Terms

- AB = Assembly Bill
- BESS = Battery Energy Storage System
- BTM = Behind the Meter
- CARB = California Air Resources Board
- CEC = California Energy Commission
- CAISO = California Independent System Operator
- CPUC = California Public Utilities Commission
- DER = Distributed Energy Resources
- DR = Demand Response
- DG = Distributed Generation
- EE = Energy Efficiency
- ES = Energy Storage
- EV = Electric Vehicle
- FRAC = Flexible Resource Adequacy Capacity
- IRP = Integrated Resource Plan
- GHG = Greenhouse Gas
- LSE = Load Serving Entity
- MW = Measure of Capacity or Peak Demand
- MWh = Measure of Generation or Energy Demand
- MGS = Malburg Generating Station
- Net Load = Load less renewables
- PCC1 = Portfolio Content Category 1
- PPA = Power Purchase Agreement
- RA = Resource Adequacy
- REC = Renewable Energy Credit
- RPS = Renewable Portfolio Standards
- SB = Senate Bill
- TOU = Time of use
- VPU = Vernon Public Utilities
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Supply and Demand Considerations

Role and Objectives of the IRP

- VPU is required to perform an IRP
- Plan for necessary investments to maintain reliable power system
- Meet sustainability goals
- Ensure compliance with reliability requirements
- Provide the lowest rates to customers
- Work in conjunction with the VPU Capital Improvement Plan
- Facilitate adoption of distributed energy resources (DERs)

Developing an IRP requires consideration of many known and unknown variables
Regulatory Compliance

Meeting Key Sustainability Requirements

2011
Senate Bill X 1-2
- 25% RPS by 2016
- 33% RPS by 2020

2015
Senate Bill 350
- 50% RPS by 2030
- Doubling of energy efficiency

2016
Senate Bill 32
- Establish targets for 40% GHG reduction from 1990 levels by 2030

2018
Senate Bill 100
- 50% RPS by 2026
- 60% RPS by 2030
- 100% carbon free by 2045

Challenge will be to procure more clean energy while maintaining a reliable system and keeping rates as low as possible for customers.
Stakeholder Survey Summary

5 = Most Important and 1 = Least Important

- Low Electric Rates: 4.2
- Reliable Power Supply: 4.1
- Quality of Customer Service: 3.0
- Minimizing Adverse Environmental Impacts: 2.5
- Distributed Generation options (i.e. rooftop solar, energy storage): 2.0

Maintaining low rates and providing reliable power are most important issues.
Customer Survey Feedback

Good Job

More than 95% of customers answered that VPU provided above average reliability of service and customer service.
Customer Survey Feedback

Average Job

Action plans from this IRP are aimed at addressing customer feedback.
Resource Plan Results
## Renewable Portfolio Standard (RPS)

### Actual and Committed Renewable Procurements to Date

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail Sales (MWhs)</td>
<td>1,061,829</td>
<td>1,083,066</td>
<td>1,193,636</td>
<td>1,204,467</td>
</tr>
<tr>
<td>RPS Requirement (MWhs)</td>
<td>286,694</td>
<td>314,089</td>
<td>370,027</td>
<td>397,474</td>
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</table>

### Resource (MWhs)

<table>
<thead>
<tr>
<th>Resource</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomethane</td>
<td>92,841</td>
<td>53,684</td>
<td>54,522</td>
<td>52,289</td>
</tr>
<tr>
<td>Wind</td>
<td>74,162</td>
<td>64,000</td>
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</tr>
<tr>
<td>Solar</td>
<td>138,485</td>
<td>198,194</td>
<td>190,221</td>
<td>189,603</td>
</tr>
<tr>
<td>Total</td>
<td>305,488</td>
<td>355,878</td>
<td>348,743</td>
<td>345,892</td>
</tr>
</tbody>
</table>

### Annual RPS %

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>29%</td>
<td>33%</td>
<td>29%</td>
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<td></td>
</tr>
</tbody>
</table>

### VPU Average RPS

<table>
<thead>
<tr>
<th>Resource</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
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### Compliance Period Requirement

- VPU is on track to meet RPS compliance for the 2017-2020 compliance period

Note: RPS is calculated using the amount of renewable divided by retail sales
**Energy Supply Mix**

Transition to Clean Energy Supply

### Changing Energy Supply

- **Renewables** increase from 31% in 2018 to 56% in 2030
- **Natural gas sources** decrease from 58% in 2018 to 36% in 2030

Increasing renewable procurement will displace natural gas in the supply mix.

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**Note:** Energy Supply % is calculated using generation source inclusive of RECs divided by total generation.
Initiatives Under Development

**Distributed Energy Resources**

- Encourage customer-owned or leased solar
- VPU will double energy efficiency by focusing on upgrades on City-owned property and equipment
- Install and maintain electric vehicle (EV) chargers on City-owned property and customer facilities

DERs can add or subtract from the total energy demand VPU must serve
Customer Demand Forecast

New Large Customers are entering VPU system in the next two years

Demand is expected to grow at less than 1% a year over the long term horizon
Preferred Resource Plan – New Resources
Solar, Wind, Energy Storage, Geothermal, and Natural Gas

Initial renewable procurement during 2021-2024 time period is focused on utility scale solar resources
Small amounts of market-based flexible resources may be needed to integrate additional solar resources.
Renewable Energy

- Pursue a diverse renewable procurement plan consisting of solar, wind, and geothermal resources
- RPS compliance is based upon average procurement over multiple years
- Recently passed SB 100 RPS legislation sets more aggressive mandates than SB 350
  - 50% RPS by 2026
  - 60% RPS by 2030

The Preferred Plan meets the RPS requirements based upon the designated RPS compliance periods

![Graph showing RPS compliance periods with Committed Renewables, New Renewable, and Required Renewables]
Greenhouse Gas (GHG) Reduction Progress

40% GHG Reduction from 1990 Levels by 2030

**GHG Reduction Plan**

- Increasing renewable energy will displace generation from Malburg
- The renewable procurement plan will help meet the 2030 GHG reduction plan
- 2030 GHG Emission Target
  - 208,683 metric ton CO2-e
- 2030 Forecasted GHG Emission
  - 201,661 metric ton CO2-e

Forecasted GHG emissions generated by VPU will be **below** the 2030 GHG emission target set by the California Air Resources Board (CARB)
Path toward 100% Carbon Free

100% Carbon Free by 2045 Goal

- 2018: 44% Carbon Free
- 2026: 61% Carbon Free
- 2030: 71% Carbon Free
- 2037: 86% Carbon Free
- 2045: 100% Carbon Free

Generation from Hoover and Palo Verde are counted as carbon free generation.

Note: Carbon free calculation includes total renewable generation + carbon free generation divided by retail sales.
Vernon is 44% carbon free in 2018 and 71% by 2030
Compliance with Reliability Requirements

15% Minimum Reserve Margin Requirement

Procurement of renewables leads to over-procurement of system capacity
VPU Forecasted Net Load

Typical Spring Day

**Duck Curve Considerations**

- Net Load = Total load less renewable generation
- Renewable resources such as wind and solar are non-dispatchable and cannot serve load when the sun goes down or when the wind is not blowing
- Increasing solar procurement over time will dramatically fatten the “belly of the duck”
- Flexible resources like MGS or energy storage can be dispatched when renewable resources are unavailable

Wholesale electric market prices drop when solar output increases
Malburg Generating Station
Local Resource Requirement

MGS Power Purchase Agreement

- MGS is a local resource and the existing PPA will expire in 2028
- Resource options including acquiring MGS under favorable commercial terms or going to market for capacity
- VPU is currently evaluating options on how MGS can be reconfigured to provide more operational flexibility

In 2029 VPU will likely need to procure a reconfigured MGS or go to market for natural gas resources to meet reliability and operational requirements
Natural gas is primary fuel used to serve customer demand

MGS provides baseload generation for the power system
Projected Vernon Summer Day in 2030

Switching to Time of Use (TOU) rate schedules may benefit some customers

Energy storage charges up during the middle of the day and discharges during the early evening hours.
Energy Storage
Utility Scale and Behind the Meter (BTM)

Energy Storage Plan

- Higher correlation of customer demand to solar profile allows for more solar procurement with less solar over-generation and “duck curve” concerns
- VPU will work to develop a program to assist customers install and maintain customer-sited energy storage
- The Preferred Plan includes 20 MW of utility scale energy storage in 2029 to help partially replace MGS and reduce solar over-generation

<table>
<thead>
<tr>
<th>Year</th>
<th>Energy Storage (MW)</th>
</tr>
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<tbody>
<tr>
<td>2023</td>
<td>1</td>
</tr>
<tr>
<td>2024</td>
<td>2</td>
</tr>
<tr>
<td>2025</td>
<td>3</td>
</tr>
<tr>
<td>2026</td>
<td>4</td>
</tr>
<tr>
<td>2027</td>
<td>5</td>
</tr>
<tr>
<td>2028</td>
<td>5</td>
</tr>
<tr>
<td>2029</td>
<td>20</td>
</tr>
<tr>
<td>2030</td>
<td>20</td>
</tr>
</tbody>
</table>

VPU will continue to evaluate the cost competitiveness of energy storage as the technology cost is expected to decrease over time.
Estimated Power Supply Costs

Annualized real rate of 0.9% increase from 2018 to 2028

Power Supply Components

- Main components of bulk power supply cost include:
  - Power Purchase Agreements (i.e. renewable energy)
  - Transmission Access (CAISO)
  - Natural Gas Fuel Cost
  - Net Market Purchase Cost

- Power supply costs are expected to drop when the existing MGS PPA expires in 2028

Declining cost of renewable energy helps to minimize future power costs while transitioning to a more sustainable power supply
Action Plans
Action Plan

Implementation Programs

Action Plans

- Distributed Solar
- Energy Efficiency
- Electric Vehicle Infrastructure
- Demand Response
- Distribution System
- Malburg Generating Station
Action Plan

Increase from 5 MW today to 15 MW by 2030

Distributed Solar

- Develop Green Pricing Program to allow customers to offset energy usage with renewable energy or renewable energy credits (RECs)
- Install solar at City-owned facilities and customer sites
- Investigate community solar offering
Action Plan

Double Existing Energy Efficiency from 3 GWh today to 6 GWh

Energy Efficiency

- Continue existing customer rebate program for qualified energy efficiency upgrades
- Upgrade City-owned facilities and equipment to be more energy efficient
- Replace street and traffic lights with LEDs when cost effective
- Educate customers on the efficiency and productivity of energy use, while limiting environmental impacts
Action Plan

Modest plan to increase Electric Vehicle charging load to 1.3 MW by 2030

Electric Vehicles (EV) Infrastructure

- Work on incentives and/or partnerships to encourage transportation electrification and investment in infrastructure
- Investigate installation of EV chargers at City-owned and customer facilities including maintenance services
- Evaluate increasing City-owned electric vehicle fleet
Action Plans

Develop Demand Response Programs responsive to Market Prices

Demand Response (DR)

- Design a Voluntary Load Management Program offering discounted rates to customers for reduced load
- Educate customers on demand response programs available through the CAISO and encourage participation in these programs
- Assist customers in the evaluation of energy storage and explore strategic partnerships
Action Plan

Modernize Distribution System

Distribution System Upgrades

- Continue to upgrade Vernon distribution infrastructure in order to maintain system reliability
- Evaluate cost savings by eliminating redundancy
- Upgrade line conductors, transformers, and other aging infrastructure
- Voltage conversion at substations
Action Plan

Re-configure, Replace, or Retire

**Malburg Generating Station (MGS)**

- Evaluate options to reconfigure MGS to allow for more operational flexibility
- Evaluate reduce generation levels required to support GHG reduction goals
- Determine how MGS may operate in the future to support higher levels of renewables
- Continue evaluating alternative resource options to replace when existing PPA expires
Customer Takeaways

What does all this mean for me as a customer?

Customer Impacts

- VPU is procuring the **lowest cost reliable power supply** to meet anticipated future demand while meeting sustainability targets
- VPU is procuring only the renewables that is required by state law
- Your business will be using more sustainable resources
- The Preferred Plan sets a roadmap for future resource procurement, but has the flexibility to adapt to changing market or regulatory conditions
- Pursuing a “wait and see” strategy for energy storage procurement is prudent given that energy storage costs are expected to decrease over time
- VPU will be offering more customer education programs, outreach and utility products in response to customer feedback
- Customers are encouraged to evaluate their energy usage and inquire about possible benefits by switching to time of use rates (TOU)
### IRP Timeline

#### Schedule of Events

<table>
<thead>
<tr>
<th>Item</th>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stakeholder Meeting</td>
<td>09/27/18</td>
</tr>
<tr>
<td>2</td>
<td>Plan Posted on City Website</td>
<td>10/08/18</td>
</tr>
<tr>
<td>3</td>
<td>Customer Feedback</td>
<td>10/25/18</td>
</tr>
<tr>
<td>4</td>
<td>City Council Approval</td>
<td>11/20/18</td>
</tr>
<tr>
<td></td>
<td><strong>Integrated Resource Plan</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Draft COS/ Rate Design Completed</td>
<td>10/15/18</td>
</tr>
<tr>
<td>6</td>
<td>Internal VPU Staff Review</td>
<td>10/15/18 - 11/07/18</td>
</tr>
<tr>
<td>7</td>
<td>Draft Report posted on City Website</td>
<td>11/07/18</td>
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<tr>
<td>8</td>
<td>Stakeholder Mtg./ Customer Feedback</td>
<td>11/28/18</td>
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<tr>
<td>9</td>
<td>City Council Approval</td>
<td>12/18/18</td>
</tr>
<tr>
<td></td>
<td><strong>Cost of Service (COS)/Rate Design</strong></td>
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