Thank you to our Patrons

We will begin our presentation in a few minutes...
Thank you to our sponsor for financially supporting this webinar

Improving Lives Since 1913. Stanley Consultants has been helping clients solve essential and complex energy and infrastructure challenges for over 100 years, successfully completing more than 50,000 engagements in 110 countries and all 50 states and U.S. territories. Values-based and purpose-driven, Stanley is an employee-owned company of engineers, scientists, technologists, innovators and client-service experts who are recognized for their commitment and passion to make a difference.

For more information on Stanley Consultants, please visit http://www.stanleyconsultants.com.
Implementing an Energy Vision
Introduction by Phil Tunnah, Operations Director, Stanley Consultants

Speakers

David Longrie
Manager of Energy Resource Planning and Innovation
Colorado Springs Utilities

David Tennant, P.E.
Senior Engineer
Stanley Consultants
SINCE 1924, WE’VE PROVIDED 4 SERVICES IN 1 UTILITY.

Our customers enjoy competitive prices, exceptional hometown service, responsible environmental practices and a voice in how we operate.

Improving Lives Since 1913

- 110+ Years of Experience
- 100% Employee Owned
- 870+ Members
- +50K Projects
- 120 Countries Served
- #116 ENR's Top 500 Design Firms

Strategic Development

- Engineering Design
- Environmental and Regulatory
- Asset Management
- Planning and Consulting
- Program Management
- Project Management

Innovation & Future-Focused Thinking

Deliver Differently

At Stanley Consultants, we deliver differently: higher quality, faster and with less risk.
Agenda

- **PART 1** 2020 Energy Vision and Electric/Gas IRPs
- **PART 2** Delivery of the Drake Generation Portfolio
- **PART 3** 2023 Adaption of IRP to Regulatory Drivers
Agenda – Part 1
2020 Energy Vision and Electric/Gas IRPs
### Electric

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles of power lines</td>
<td>3,968</td>
</tr>
<tr>
<td>Substations</td>
<td>54</td>
</tr>
<tr>
<td>Generation plants</td>
<td>7</td>
</tr>
<tr>
<td>Service points</td>
<td>248,277</td>
</tr>
</tbody>
</table>

*Overhead and underground power lines.

**Average monthly residential use**
(kilowatt hours)

- 2021: 659
- 2022: 657

**Peak day demand**
July 15, 2022
(megawatts)

- 959 MW

**Avg. interruption duration**
36.24 minutes

**Electric reliability**
99.99%
Changing Planning Landscape

• Long-standing responsibilities of safety, reliability and affordability of service
• Major factors driving changes in the industry
  • Environmental and regulatory requirements
  • Need for increased resilience
  • Expanded customer choice
  • Innovation
• Changes have significant implications requiring a clear vision, integrated resource planning and ongoing customer engagement
Colorado Springs Utilities
Strategic Plan 2019-2023

Identified Strategic Energy Initiatives, including:
• Energy Vision/Integrated Resource Plans
• Energy Markets
• Grid Modernization
• Rate Design
• New Electric Business Model
• Plant Decommissioning
Energy Vision

Provide resilient, reliable and cost-effective energy that is environmentally sustainable, reduces our carbon footprint and uses proven state-of-the-art technologies to enhance our quality of life for generations to come.

STRATEGIC PILLARS TO SUPPORT THE ENERGY VISION

- ECONOMIC
- ENVIRONMENT
- RESILIENCY
- INNOVATION
EIRP and GIRP Process
Phase 1 – Input and Assumptions

- Electric Load Forecasts
- Gas Load Forecasts
- Demand Side Management Potential
- Planning Reserve Margin
- Gas Price Forecast
- Potential Electric and Gas Resources
- Environmental Data
- Energy Markets
- Operational Characteristics
Emissions

Total CO2e Emissions (Metric Tons)

- Natural Gas Actual
- Coal Actual
- Market Actual
- Emission Reduction Requirements

© Stanley Consultants, Inc. Not for further distribution, display, or reproduction.
## Phase 2

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>32%</td>
</tr>
<tr>
<td>Ability to react to variable or extreme daily operating conditions (i.e., the lights stay on).</td>
<td></td>
</tr>
<tr>
<td>Cost/Implementation</td>
<td>22%</td>
</tr>
<tr>
<td>Cost-effectively maintain competitive, affordable rates and the financial health of the utility to drive a strong economy with ability to execute portfolio in desired timeframe.</td>
<td></td>
</tr>
<tr>
<td>Environment/Stewardship</td>
<td>22%</td>
</tr>
<tr>
<td>Sustainably grow renewable portfolio, reduce carbon footprint and meet all environmental regulations while responsibly protecting and supporting quality of life now and for the future.</td>
<td></td>
</tr>
<tr>
<td>Flexibility/Diversity</td>
<td>14%</td>
</tr>
<tr>
<td>Ability to adapt to regulatory and market disruptions by balancing multiple types of generators and fuel sources, including distributed generation, and reduce reliance on fossil fuels.</td>
<td></td>
</tr>
<tr>
<td>Innovation</td>
<td>10%</td>
</tr>
<tr>
<td>Proactively and responsibly integrate technologies and programs.</td>
<td></td>
</tr>
</tbody>
</table>
Voice of the Customer – Community Input

- Residential Surveys
- Open Surveys
- Commercial Surveys
- Employee Surveys
- Business Workshops
- Public Workshops
- Customer Presentations
- Customer Comments
- QUAD
Inputs to Portfolio Recommendation

- Attribute Scoring
- Survey Results
- Community Feedback
- Stakeholder Presentations
- Portfolio Risks
- UPAC/Board/Employee Feedback
- Financial Results
- Sensitivity Results

PORTFOLIO RECOMMENDATION
<table>
<thead>
<tr>
<th>Reference case</th>
<th>Portfolio</th>
<th>Carbon targets</th>
<th>Rank (12)</th>
<th>2023</th>
<th>2026</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathway B</td>
<td>5</td>
<td>2030 80%</td>
<td>7</td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td>Gas &amp; DSM</td>
<td>Gas &amp; DSM</td>
<td>Renewable/storage/DSM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2050 90%</td>
<td></td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathway C</td>
<td>9</td>
<td>2030 80%</td>
<td>9</td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td>Renewable/storage/DSM</td>
<td>Renewable/storage/DSM</td>
<td>Renewable/storage/DSM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2050 90%</td>
<td></td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathway D</td>
<td>11</td>
<td>2030 80%</td>
<td>11</td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td>Non-carbon &amp; DSM</td>
<td>Non-carbon &amp; DSM</td>
<td>Non-carbon &amp; DSM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2050 100%</td>
<td></td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathway E</td>
<td>12</td>
<td>2030 80%</td>
<td>12</td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td>Gas/renewable/storage/DSM</td>
<td>Gas/renewable/storage/DSM</td>
<td>Birdsail retire</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2050 100%</td>
<td></td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsell retire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathway F</td>
<td>15</td>
<td>2050 100%</td>
<td>15</td>
<td>Drake, Nixon 1, Birdsail, Front Range retire</td>
<td>Nixon 1-3 &amp; Front Range retire</td>
<td>Birdsail retire</td>
<td>Renewable/storage/DSM</td>
<td>Renewable/storage/DSM</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Drake &amp; Birdsail retire</td>
<td>Nixon 1 retire</td>
<td>Birdsail retire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>2050 90%</td>
<td>17</td>
<td>Drake retire</td>
<td>Nixon 1 retire</td>
<td>Birdsail retire</td>
<td>Gas/renewable/storage/DSM</td>
<td>Gas/renewable/storage/DSM</td>
<td>Birdsail retire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Drake, Nixon 1-3, Birdsail, Front Range retire</td>
<td>Nixon 1-3 &amp; Front Range retire</td>
<td>Birdsail retire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Drake &amp; Birdsail retire</td>
<td>Nixon 1-3 &amp; Front Range retire</td>
<td>Birdsail retire</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Proposed Additional Resources Available by 2030

- Solar: 35%
- Wind: 32%
- Natural Gas: 18%
- Storage: 15%

2030 Proposed New Resources

- 175 MW Solar Underway
- 200 MW Battery Storage Underway
- 525 MW Solar
- 100 MW Storage
- 625 MW Wind
- 350 MW Gas Generation

A greener future
Agenda – Part 2
Delivery of the Drake Generation Portfolio
TNGG Project Highlight Outline

Project Overview
- Before and After
- Technology Selection

Project Stakeholders
- Owner
- Engineering
- Procurement
- Construction

Project Constraints
- Site Constraints
  - Existing high-voltage yard
  - Existing coal pile and undergrounds
  - Liquid fuel deliveries
- Equipment Scope and Procurement
  - Equipment reuse
- Future Relocation Considerations
  - Redundancy requirements
- Environmental Considerations
  - Gas turbine stack emissions
  - SCR ready exhaust and CO catalyst
  - Fuel oil containment
  - Drains storage and containment
Project Overview: Before and After

**Project Site – Before Project**
- Existing high-voltage yard
- Existing operational coal plant
- Existing coal pile and conveyance systems

**Project Site – After Project**
- New 162 MW total, 27 MW each gas turbines
- Reused transformers from coal facility at new plant and tied into existing switchyard
Natural Gas vs. Coal Generation:

- 90 times less sulfur dioxide
- 5 times less nitrogen oxide
- 50% less carbon dioxide
- Natural gas is the least carbon-intensive fossil fuel
Project Overview: Technology Selection

Gas Turbines

General Electric (GE) model LM2500+G4 Xpress

Aeroderivative package, dual fuel (fuel gas & fuel oil), dry low emissions (DLE) combustor (no water injection required to meet emissions)

- Quick Start – 8 mins
- Efficiency – 39.2%
- Reliability – 99.7%
- Availability – 98.2%
Project Overview: Technology Selection

Reliability

Inlet Cooling System
Evaporative Cooling
Available > 60°F

Protection to ensure power output on hot ambient days

Water Spray Module w/ Drift Eliminator

Gas Turbine Air Inlet

Water Supply
Project Overview: Technology Selection

Reliability

Inlet Heating System
Designed to -20°F

Equipment
Exhaust Heat Exchanger
Electric Heaters

Protections
Turbine Blade Anti-Icing
Emissions Compliance
Project Stakeholders

**Owner**
Colorado Spring Utilities

**Engineering**
Stanley Consultants
Civil, Structural, Electrical, Mechanical, Instrumentation and Controls

**Procurement**
Colorado Springs Utilities Procurement Department

**Construction**
TIC – The Industrial Company
MMR

**Major Equipment**
General Electric – Gas Turbines
Project Constraints - Site Constraints

Existing substation and high-voltage yard

South Plant Substation
Project Constraints - Site Constraints

Existing Coal Pile and Conveyance Equipment

Geotechnical Evaluation and Soil Borings
  South end of site
  Middle of site as coal supply used
  North end of site once conveyance equipment removed
Project Constraints - Site Constraints

Existing Underground Utilities

Maintained Existing Site Drainage

Overhead Power Lines

Design And Construction to Avoid Interference with Existing Transmission Lines
Project Constraints - Equipment Scope and Procurement

Reuse of equipment:

(2) Generator Step-Up (GSU) Transformers

(2) Unit Aux Transformers

(2) Switchgear Lineups

From decommissioned Drake coal units 6 and unit 7
Project Constraints - Future Relocation Considerations

Redundancy Requirements:

(6) Gas Turbines
(6) Fuel Gas Compressors
(6) Fuel Oil Storage Tanks
Project Constraints - Environmental Considerations

Gas turbine stack emissions
Third-party emissions testing

GE emissions guarantees

**Fuel Gas:**

Emissions are valid for T2 within 10°F-100°F and a GTG load down to 50% as defined in steady state conditions for emissions guarantee.

- NOx: 25 PPMVD AT 15% O2
- CO: 1.25 PPMVD AT 15% O2, after catalyst
- VOC: 2.8 PPMVD AT 15% O2, after catalyst
- FORMALDEHYDE: 91 PPBVD AT 15% O2, after catalyst
- PM10: 4 lb/h (total with evap on)

**Fuel Oil:**

Emissions are valid for T2 within 10°F-100°F and a GTG load down to 75% as defined in steady state conditions for emissions guarantee.

- NOx: 74 PPMVD AT 15% O2
- CO: 2.8 PPMVD AT 15% O2, after catalyst
- VOC: 12.1 PPMVD AT 15% O2, after catalyst
- FORMALDEHYDE: 91 PPBVD AT 15% O2, after catalyst
- PM10: 10.7 lb/h (total with evap on)

**EPA Test Methods**

<table>
<thead>
<tr>
<th>ENGINE CONDITION</th>
<th>FIELD TEST METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW AND CLEAN ☑ 200 SITE FIRED HOURS</td>
<td>GE POWER &amp; WATER SGTGPTM</td>
</tr>
<tr>
<td>NOx</td>
<td>EPA METHOD 20</td>
</tr>
<tr>
<td>CO</td>
<td>EPA METHOD 10</td>
</tr>
<tr>
<td>PM10</td>
<td>EPA METHOD 5 / 202</td>
</tr>
<tr>
<td>FORMALDEHYDE</td>
<td>EPA METHOD 320</td>
</tr>
<tr>
<td>VOC</td>
<td>EPA METHOD 25A/18</td>
</tr>
</tbody>
</table>
Project Constraints - Environmental Considerations

SCR ready exhaust (pre-installed ammonia nozzles)

CO catalyst in exhaust
Project Constraints - Environmental Considerations

**Fuel oil containment strategy**
- Fuel truck unloading
- Self rising containment berm
- Storage tanks
- Secondary containment by metal dike
- Spills
- Concrete raised curbs
Project Constraints - Environmental Considerations

Drains, Storage and Containment
Above ground tanks drain into pre-fabricated concrete pits
Agenda – Part 3
2023 Adaption of Integrated Resource Plan to Regulatory Drivers
Regulatory Changes

Clean Energy Plan

• Retail Sales
• Market Emissions

Clean Heat Plan

• Building Energy Performance Standard
• New Source Performance Standards for Greenhouse Gas Emissions
Clean Heat Plan
Colorado State Law as of 2021

2024-2025
Spend 2% of total gas revenue working towards achieving 4%
Target: reduction in greenhouse gas below 2015 levels

Colorado Springs Utilities submitted plan on July 28, 2023

2026-2030
Spend 2.5% of total gas revenue working towards achieving 22%
Target: reduction in greenhouse gas below 2015 levels
Meeting our Energy Vision Pillars

ECONOMIC

ENVIRONMENT

RESILIENCY

INNOVATION

✅ ✅ ✅ ✅
Thank You

Questions?
Thank you for attending our webinar today.

Would you like to attend our next webinar?
We have several webinars happening soon. Go to https://www.aaees.org/events to reserve your spot.

Would you like to watch this webinar again?
A recording of today’s event will be emailed to all attendees.

Not an AAEES member yet?
To determine which type of AAEES membership is the best fit for you, please go to AAEES.org or email Marisa Waterman at mwaterman@aaees.org.

Need a PDH Certificate?
You will be emailed a PDH Certificate for attending this webinar.

Questions?
Email Marisa Waterman at mwaterman@aaees.org with any questions you may have.