AGENDA

……for the regular meeting of the Public Utility Commission of the City of Farmington, Wednesday, January 11, 2017 at 3:00 pm in the Executive Conference Room at City Hall, 800 Municipal Dr., Farmington, New Mexico.

I. GENERAL
   A. Roll Call
   B. Convening of Meeting by Dr. James Spence, Chair
   C. Minutes of December 14, 2016 regular meeting submitted for approval… 1

II. BUSINESS
   A. Water/Wastewater Report - Jeff Smaka (5 min) ......................... 2
   B. Water/Wastewater Operations Report – Monica Peterson (5 min)..... 3
   C. Pace Global Presentation – Proposed Integrated Resource Plan (IRP)
      Fengrong Li, Gary Vicinus, Britt Chesnut (75 min) ......................... 4
   D. Electric Utility Report – Sue Nipper Greaves (5 min) ................... 5
   E. Director’s Report – Hank Adair (5 min) ..................................... 6

III. ADJOURNMENT

The next regular meeting will be on February 8, 2017

The City of Farmington will make every effort to provide reasonable accommodations for people with disabilities who wish to attend a public meeting. If you need to request that an accommodation be made, please notify the Electric Administration office (599-1160) at least 24 hours prior to the meeting.
BOARD OF PUBLIC UTILITY COMMISSION

The regular meeting of the CITY OF FARMINGTON BOARD OF PUBLIC UTILITY COMMISSIONERS was held Wednesday, December 14, 2016 at 3:00 p.m., in the Executive Conference Room at City Hall, 800 Municipal Dr., Farmington, New Mexico in full conformity with the laws and ordinances of the Municipality.

GENERAL

Commission members present: James Spence
Jeff Parkes
Bill Standley (departed at 4:15 p.m.)
Gordon Glass
Marty Johnson
Bill Hall
Chris Hunter
Carol Cloer

Commission members absent: Rubin Armenta
Tory N. Larsen

City Council Liaison; Gayla McCulloch

City personnel present:
Electric Utility Director Hank Adair
Electric Business Operations Manager Sue Nipper Greaves
Electric Transmission and Distribution Luke Lugeneel
Electric Generation Manager Britt Chesnut
Electric Engineering John Armenta
Customer Service Nicki Parks
Public Works Department David Sypher
OMI/CH2MHill Monica Peterson
Administrative Services Accounting Sheree Wilson
City Manager Rob Mayes
PUC Secretary Amy McKinley

Guests: Matt Dodson
Kolbjorn Lindland
Magnus Lindland
Mike Eisenfeld
Mary Huff
Emily Bowie
David Fosdeck
Jill Sangster, NewGen Strategies and Solutions (via phone)

Chair Spence called the meeting to order at 3:00 p.m. with a quorum present to conduct business of the Commission.

Chair Spence asked for a motion to approve the Minutes of the November 9, 2016 regular PUC meeting. Commissioner Hunter made the motion to approve the Minutes as presented and Commissioner Standley seconded the motion, and upon voice vote the motion passed unanimously.

BUSINESS

Water/Wastewater Report:
Mr. Sypher provided a photographic presentation of the progress of the Wastewater Treatment Plant Phase III project. Commissioner Parkes asked if the project is on target for completion as well as budget. Mr. Sypher said the project timeline is on target and while there has been some fine tuning, the project budget is on target. Commissioner Hunter suggested the Wastewater Treatment Plant Phase III project be brought to the Newspaper at an appropriate time.

Mr. Sypher reviewed the current status of the various renewal and replacement projects.
Water/Wastewater Operations Report:
Ms. Peterson, OM/CH2M Hill addressed Commissioner Hunter’s question about capacity for the Wastewater Treatment Plant stating the capacity of 6.67 million gallons per day will remain the same; this project is changing the method of wastewater treatment. Her report also noted the filling of Lake Farmington has resumed and the water level has increased to 85%. The lake will remain below 100% until the end of December to allow for the completion of various projects.

Cost of Service and Rate Design Update:
Mr. Adair and Ms. Nipper Greaves offered a presentation regarding the Cost of Service and Rate Design Study prepared by NewGen Strategies and Solutions. Ms. Jill Sangster of NewGen Strategies and Solutions joined the presentation via telephone. Ms. Nipper Greaves commented that at the November 2016 PUC meeting NewGen Strategies and Solutions offered a complete presentation of the Cost of Service Study and proposed Rate Design. She said the November 2016 presentation demonstrated a 4-year phase in of the proposed rate design. At the November meeting Commissioner Cloer asked if a 3-year phase in proposal should also be considered so FEUS staff and NewGen representatives prepared such documentation and both the 3-year phase in and 4-year phase in options were presented at this December meeting. Ms. Nipper Greaves stated the goal of this presentation is to ask the PUC to recommend to the City Council the approval of the cost of Service and one of the proposed Rate Designs.

City Manager Mayes commented it is not the intent of the December presentation to replay the many meetings and large presentations that have already been offered. He said it was his office that wanted to see a 4-year phase in plan but should the PUC recommend the 3-year plan to the City Council his office will support that recommendation.

Discussion ensued regarding fairness in rate increases between customers with low energy consumption versus those with high energy consumption. Additional discussion revolved around new solar tariffs with a standby charge versus the current net metering tariffs.

Chair Spence stated he felt there had been a very healthy difference of opinions and he appreciated the commissioners bringing their perspectives to the table and there being no further discussion he would entertain a motion to move forward with one of the recommendations, either the 3-year phase in or 4-year phase in.

Commissioner Hunter made a motion that the Commission recommend approval of the 3-year phase in schedule of this rate design as presented. Commissioner Johnson seconded the motion.

Vice Chair Parkes noted that a rate increase is a difficult decision and he was impressed with the work done by NewGen Strategies and Solutions. He said the utility has to be focused on what it costs to provide services and while Commissioner Glass brought up good concerns about equity, Vice Chair Parkes wondered if the best way to approach those equity concerns isn’t through the Utility Assistance Program where those concerns can be looked at individually rather than trying to build each individual concern into the utility’s rate structure. Vice Chair Parkes also noted that he does note some societal benefits to encouraging solar, but not on a completely subsidized basis as it is presently done.

There being no further discussion those voting aye: Jeff Parkes, Bill Hall, Chris Hunter, Bill Standley, Marty Johnson, Carol Cloer. Those opposed: Gordon Glass. The motion carried.

Electric Utility Report:
Ms. Nipper Greaves offered the Electric Utility Report for October, 2016. Her report indicated Commercial Revenue is down 1% for one year and for 2 years it is down approximately 3.26%. She said the Industrial Revenues were down 18% over 2 years. Commissioner Hunter asked if the October report is the first time this report to showed a Commercial Revenue decline. She commented that Commercial Revenue tends to go up and down.

Ms. Nipper Greaves stated Mr. Adair arranged for FEUS staff to participate in tours of the San Juan Coal Mine and the San Juan Generating Station.
Director's Report:
Mr. Adair briefly reviewed the issues related to the equipment failures at the Aztec Substation. He noted the substation was energized under no load on November 3, 2016 and the substation was running smoothly for approximately 12 hours and then there was a failure of a potential transformer which caused an outage. Additional testing was performed, crews replaced the potential transformers and on November 17 attempted to energize and encountered another failure. He said a root cause investigation is in progress and new transformers have been placed on order of oil filled design to replace the oil-less design currently in place.

Mr. Adair stated the final grade design change work for the Cottonwood Substation has been completed and a bid opening will take place in early January, 2017.

ADJOURNMENT

There being no further business to come before the Commission, upon motion duly made and seconded, the meeting was adjourned at 4:17 p.m.

Approved this 11th day of January, 2017.

James Spence, MD, Chair
ACCOMPLISHMENTS

- **Waste Water Treatment Plant.** Phase III - Construction of WWTP Phase III improvements to provide redundancy at the WWTP and maintain compliance with EPA permit. NMED approved funding the waste water treatment plant upgrade through the Clean Water State Revolving Loan Fund (CWSRF) program. Design by HDR Engineering completed; Contract awarded to RMCI Inc. from Albuquerque - $20,303,500; Contractor Mobilized on August 22, 2016; Demolition – 95% complete; Medium Rate Activated Sludge (MRAS) Basin #1 - excavation completed, concrete foundation completed, walls 70% completed; MRAS Basin #3 - excavation completed, concrete foundation completed; Final Clarifier #2 - excavation completed, concrete foundation completed; DWAS Tank - excavation completed, concrete foundation completed; Solids Handling Building - excavation completed; working on concrete footings and underground piping and electrical layout.

- **O&M Contract.** Operation and Maintenance Contract with CH2M - 8-year contract; 2016 - 2023.


- **Engineering Design Contract.**
  - 2P Waterline Replacement Project - Phase I - HDR has completed design drawings. Project funding under DWSRF program through NMFA. City Council approved loan application on August 11, 2015; this project is in the City’s Infrastructure Capital Improvement Plan submitted to the state. Phase I estimated cost $3.2 million. Plans reviewed and approved by NMED and NMFA, Submitted permit to NMDOT for construction within US 64 right of way. Anticipate construction to begin spring 2017.
  - 2P Waterline Replacement Project - Phase II - US64 – Intersection of Camina Flora to Miller Ave – Submitted preliminary project interest form to NMED – Estimated Cost $3.6 million, received verbal information from NMFA project was submitted to NMFA board with a 25% grant recommendation ($898,900) – approved by NMFA board.
  - LaPlata Highway - Project redesign for water line replacement and NMDOT permitting; staff will be hiring a consultant for this project.

- **Capital Project Review.**
  - **Capital Improvement Project**
    - Penny Lane Low Head Dam Modifications – Design by Riverbend Engineering – Contractor: Kimo Constructors, Albuquerque; Construction time 75 days; Demolition completed, excavation completed, Concrete ramps completed, placing river boulders.

- **Renewal and Replacement**
  - Wildflower Parkway - 4P Pump Station - Cheney-Walters-Echols (CWE) has completed pump station design. Property purchase approved by City Council. Property closing to be scheduled; Construction of new pump station 2017.
  - Foothills Dr. - Hill n Dale to Holmes - Replace existing 16" steel waterline with a 16" PVC waterline - design completed, construction summer 2017.
  - W. Main Street - W. Murray Dr to Valley Vista Dr - Replace existing 6" CI waterline with a 12" PVC waterline & Replace existing 8" clay tile sewer line with a 18" PVC sewer line - Preparing bid documents, Construction 2016/ 2017.
  - W. Navajo – Airport terminal to Municipal Drive – Replace 6" CI waterline with a 12" PVC waterline, Construction 95% complete.
  - W. 20th Street – Chilton Court to end of street - Replace 6" CI with a 8" PVC waterline & replace 8" sewer line; Sewer line construction completed; waterline replacement construction 25% complete.

-
- Pressure Reducing Valve (PRV)
  - none

- Sewer Lift Stations
  - Lift Station 9 Improvements (109 Meadow View Dr.) – The project is to rehob of the existing lift station which includes the mechanical, pumping equipment and electrical systems of lift station 9. Project is in design – 90% complete, Construction in FY17.
  - Lift Station 12 Improvements (1214 Mossycup Dr.) – The project is to rehob of the existing lift station which includes the mechanical, pumping equipment and electrical systems. Design in FY17, Construction in FY18.

- Budget. - FY17 –
- COF Department Support. Survey support to acquire manhole data for future sewer collection system model continues
- Annual Utility Contract. – preparing bid documents
- Federal Funding –
  - Water Projects – 2P Waterline Improvement Project
    - Staff submitted a funding request to NMED (DWSRLF) for the project to replace the existing 6" and 8" cast iron waterline (approximately 30,000 LF) along US 64 and various side streets. Estimated probable cost $8,160,000. – Project has been broken into three phases – Phase I – Estimated cost $3,200,000
  - Wastewater Projects - WWTP – MRAS Basin, Final Clarifier, Solids Handling Facility & UV Disinfection – NMED funding source is the Clean Water State Revolving Loan Fund (CWSRF) Program – Project approved by NMED. Loan amount $22,000,000.00, - Term 20 years, Interest Rate 3%, Contract awarded to RMC Inc. from Albuquerque - $20,303,500 plus tax.

- PROJECTS / INITIATIVES REQUIRING INTER-DIVISIONAL COORDINATION

- Farmington Reach – Navajo Municipal Pipeline.
  - Working with Bureau of Reclamation and Navajo Tribe for agreements to transfer title to the City for the tank and pipeline project along with an Operation, Maintenance, and Replacement (OM&R) agreement as required by Federal law - March 2009.

- WWTP NPDES PERMIT – EPA. New NPDES permit went into effect on November 1, 2016 permit expires October 31, 2021. New NPDES permit modified total dissolved solids (TDS) requirement from 400 mg/l incremental increase to 497 mg/l incremental increase for WWTP effluent.

- Snowpack - Water Year 2017 - BOR reporting site:
  - Animas River Basin – 111%
  - San River basin - 112%

ATTACHMENTS

WATER USAGE - RESIDENTIAL CUSTOMERS
WATER USAGE - COMMERCIAL CUSTOMERS
WATER FUND (602) - RENEWAL & REPLACEMENT
WASTEWATER FUND (603) - RENEWAL & REPLACEMENT
GRAPH WATER REVENUE FY 13 – FY17
WATER

Renewal & Replacement

Water Fund - 602

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Main St. - Miller Ave to Orchard Ave. $250,000
Foothills Dr - Hill & Dale Dr. to Holmes Dr. $565,000
20th St - Hutton Ave to Main St $600,000
W. Navajo St - Municipal Dr to Mc Henry Dr. $350,000
W. Navajo St - McHenry Dr. to airport bldg $550,000
San Juan Blvd - American Ave to Fairview Ave. $600,000
Broadway - Auburn Ave to Miller Ave $560,000
Broadway - Schwartz Ave to Lake St $325,000
Schwartz Ave - Broadway to Apache St. $550,000
Northwood Dr - Crescent Ave to 30th St. $100,000
Polyline Service Replacement $350,000
Line Abandonment $150,000
Fire Hydrant 1960 Replacement $100,000

$5,000,000

WATER RENEWAL & REPLACEMENT

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FISCAL YEAR

Revenue
Expenditures

-2.3-
WASTEWATER

Renewal & Replacement

Wastewater Fund - 603

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BUDGETED FY 17 PROJECTS

- Sewer Rehab - W Main St $1,750,000
- Manhole Rehab $150,000
- Mainline Rehab - Robotic $350,000
- $2,250,000

PROJECTED EXPENDITURES FY07 - FY17 $10,437,975

WASTEWATER RENEWAL & REPLACEMENT

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-2.4-
### Total Water Revenue Per Month
**FY13 - FY17**

![Bar Chart]

### Budget to Actual Comparison Per Month

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### Revenue Per Class/Customer

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<th>FY 2016 **</th>
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<td>76,419</td>
<td>118,750</td>
<td>91,666</td>
<td>110,000</td>
</tr>
<tr>
<td>GRANTS</td>
<td>2,543,522</td>
<td>2,595,398</td>
<td>2,507,522</td>
<td>2,505,527</td>
<td>490,050</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td>13,981,694</td>
<td>15,670,762</td>
<td>16,526,091</td>
<td>14,790,311</td>
<td>16,629,040</td>
</tr>
</tbody>
</table>

### Schedule of Customers

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS</td>
<td>General Service, Single (commercial)</td>
</tr>
<tr>
<td>CU</td>
<td>Contract Users (bulk water users)</td>
</tr>
<tr>
<td>REC</td>
<td>Recreational/Raw Water Users (city facilities and)</td>
</tr>
<tr>
<td>FH</td>
<td>Fire Hydrants</td>
</tr>
<tr>
<td>R &amp; R</td>
<td>Renewal &amp; Replacement</td>
</tr>
<tr>
<td>OTHER</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

**-2.5-**
Summary:
Flows are near normal for this time of year.
Nov 22 @11:00 PM saw a moderate peak of 850 cfs due to a rain event.
Summary:
Top of the spill way is 5636.4
Max target is 5635.25
Current level is slightly below 89% to complete special projects.
Projects should be completed by Dec 31 and we will refill the lake.
Water Production

Total Effluent - WTP No.1 & No.2
January - December
2013 - 2016

Summary:
Production continues to trend up for 2016
Maintenance
New Meter Installations

Summary:
84 meters installed in 2015 compared to 84 installed in 2016 during the same time 12 month period.
Average of 7/mo.
Trend level for the year.
Maintenance

Summary:

Chart indicates that there are 80% more service line breaks than main lines.
Maintenance

# Water Line Repairs by pipe type

Summary:

Cast Iron has the highest failure rate due to age

Less breaks compared to same month last year
Maintenance
Water Line Repairs

Summary:
Black Poly line has the highest rate of failure do to short product life expectancy and is no longer used in the industry

Total breaks YTD = 178 compared to 140 the same time period in 2015 which is a 21% increase
Wastewater Treatment

Summary:
Flows still trending down compared to previous years.
Total Dissolved Solids

Summary:
The New Permit Limit is 497 MG/L
Data shows being well in compliance.
Lab Quality Control Statistics

2016 Trending

2016 Lab QC - In-control Data

December 2016 QC Dashboard

245 Data Points

-3.10-
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Agenda

1. Executive Summary
2. IRP Process
3. Results and Recommendations
4. Detailed Assessment: Key Assumptions
   - San Juan Basin Assessment and Load Forecast
   - Two Clean Power Plan Cases
   - Candidate Portfolios
5. Stochastic Analyses:
   - Part 1 (assuming San Juan Unit 4 retires in 2027)
   - Part 2 (assuming San Juan Unit 4 retires in 2022)
   - Stochastic Analysis Summary
6. Preferred Resource Plan
7. Appendix:
   - Appendix A: IRP Approach
   - Appendix B: Stochastic Assessment Results
   - Appendix C: Stochastic Portfolios Profiles
   - Appendix D: Abbreviations
IRP Process and Key Consideration

- Pace Global conducted the Farmington IRP analysis with a structured screening process to develop a variety of portfolio options to be tested under a rigorous stochastic modeling assessment.
- This risk-based approach identified the Preferred Resource Plan that best achieves Farmington’s planning objectives including cost, risk, environmental and operational metrics under a variety of planning uncertainties and market conditions.
- Given the uncertainties around the San Juan Unit 4 coal plant retirement date, the IRP evaluated the impacts of two different coal retirement dates (2022 vs. 2027) to evaluated tradeoffs of cost and environmental metrics.
- The IRP also evaluated a broad range of new resource technologies including gas-fired generation facilities and viable solar capacity for the City.
# Motivating Questions for Farmington IRP

<table>
<thead>
<tr>
<th>Factors</th>
<th>Key Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost, Risk &amp; Environmental</td>
<td>What are the prudent, cost competitive and environmentally responsible approaches in Farmington’s long term resource planning to address the trends in the energy industry and the utility space such as decreasing prices for renewables and energy storage, finalization of the carbon regulation, and the penetration of distributed energy resources? Answer: See the recommended portfolio.</td>
</tr>
<tr>
<td>New Resources Types</td>
<td>How do these new trends impact the requirement for any new generation resources that Farmington considers adding to its fleet? Answer: Solar begins to be economic in the long term.</td>
</tr>
<tr>
<td>Carbon Regulation</td>
<td>How will the potential New Mexico Clean Power Plan (CPP) compliance strategy impact Farmington’s choice of a Preferred Resource Plan? Answer: The recommended portfolio is the same under both CPP options evaluated. Costs are higher under interstate trading.</td>
</tr>
<tr>
<td>Market Dependency</td>
<td>Should Farmington rely on market purchases to meet a portion of its peak load given the differences of its peak and average load? Answer: Yes. A portion of its requirements should be met with market purchases given relatively low forecasts for power prices.</td>
</tr>
<tr>
<td>Buy vs Build Decision</td>
<td>What are the pros and cons for Farmington to build generation resources versus purchase share(s) from a development project? Answer: Building provides a measure of control which give greater assurance of meeting load. Purchasing a share may have economies of scale associated with it.</td>
</tr>
<tr>
<td>Development and Control Risks</td>
<td>How should Farmington evaluate development risks and control risks as it considers adding new resources? Answer: Each risk can be explicitly factored into the balanced scorecard assessment.</td>
</tr>
<tr>
<td>Renewables Investments</td>
<td>Should Farmington consider solar generation additions after the expected reductions in capital costs? Answer: Yes, adding utility solar in later years of the study. In the near term, the City is progressing through steps towards a community solar project based on interest.</td>
</tr>
<tr>
<td>Load &amp; System Integration</td>
<td>How much solar capacity can Farmington integrate into its system considering the characteristics of its current generation fleet and load profile? Answer: Farmington believes that the limit is up to 15 MW.</td>
</tr>
</tbody>
</table>

Critical First Step

Identify Objectives, Metrics and Risk Perspectives

Establish Current and Future Market Views

Screen Resource Options

Select Portfolios

Perform Risk Analysis of Portfolios

Select "Best" Portfolios

Best Portfolio(s) selected on the basis of commercial reality, balance of objectives, and perspective of acceptable risk

Portfolio Recommendations
Consistent with Objectives

Risk Integrated Market
Price Forecasts,
Characterize Uncertainty etc.
IRP Analysis Process

The Pace Global IRP methodology utilizes a structured process that consisted of the following steps:

1. Identify overall objectives and metrics
2. Fundamental analysis to inform portfolio construction
   - Two CPP compliance cases
   - Provide load forecast
   - Technology screening analysis
   - Long vs short position analysis
3. Stochastic risk analysis of candidate portfolios to identify the Preferred Resource Plan
4. Develop strategy and recommendations
# Step 1: Set Planning Objectives and Metrics

These metrics become the standards of evaluating portfolios.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>Minimize power supply costs and rate increases</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Risks</strong></td>
<td></td>
</tr>
<tr>
<td>Cost Stability</td>
<td>Achieve rate stability</td>
</tr>
<tr>
<td>Development Risks</td>
<td>Minimize project development risks</td>
</tr>
<tr>
<td>Control Risks</td>
<td>Minimize operation risks and other uncertainties</td>
</tr>
<tr>
<td>Market Risks</td>
<td>Decrease energy market purchase exposure</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
</tr>
<tr>
<td>Environmental Stewardship</td>
<td>Decrease emissions and increase renewable generation</td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td></td>
</tr>
<tr>
<td>Reserve Margin</td>
<td>Ensure reliability requirements with native capacity</td>
</tr>
<tr>
<td>Largest Contingency</td>
<td>Minimize largest contingency in the generation fleet</td>
</tr>
</tbody>
</table>
### Step 2: Fundamental Analysis to Inform Portfolio Construction

<table>
<thead>
<tr>
<th>Recommend two CPP Compliance Cases</th>
<th>Load Forecast</th>
<th>Technology Screening Analysis</th>
<th>Long vs Short Position</th>
<th>Portfolio Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Test under multiple sets of CPP scenarios for the state of New Mexico to determine the overall impact to City of Farmington's portfolio costs.</td>
<td>• Determine City of Farmington's expected load forecast for the next 20 years in order to understand the City's future capacity and energy needs.</td>
<td>• Assess all traditional fuel and renewable energy resources, including operational parameters and capital costs, deemed plausible for the City.</td>
<td>• Consider and test whether building over capacity can provide any financial incentives for the City.</td>
<td>• Initiate and develop list of plausible set of portfolios to be considered for the City's latest IRP.</td>
</tr>
</tbody>
</table>
Portfolio Screening and Development Process were Driven by Key Input Factors

Nine distinct and viable candidate portfolios were developed for the City of Farmington's stochastic IRP analysis.

**San Juan Unit 4**
Due to uncertainty in potential future retirements of San Juan Unit 4, IRP tested for different retirement dates.

**Technology**
Review for all viable technologies, including renewable and equity stake options, for the City. Some technologies considered included CCs, CTs, reciprocating engines and solar.

**Size and Timing**
Test for robustness of portfolios by creating short and long capacity positions throughout the forecasted time period.

**Operational Risk**
Eliminate technology options that would add significant reliability upgrade costs and/or compromise the City's system reliability.
Step 2: Fundamental Analysis to Inform Portfolio Construction (Cont.)

- **Motivating Question**: Should the City of Farmington explore various portfolios that are significantly above its expected peak capacity for the 2016 IRP?

- **Setup**: Two test portfolios were developed and intended to track an overall cost and reserve margin data.

  - **Portfolio “A”**
    - Farmington Assets & Contracts
    - New CC > 100 MW

  - **Portfolio “B”**
    - Farmington Assets & Contracts
    - New CC < 50 MW

- **Approach**: Two portfolios were simulated in a model environment under a deterministic market conditions.

- **Preliminary Findings**: An initial cost assessment indicates that a significant surplus capacity portfolio (“Portfolio A”) commands some cost premium for the City of Farmington under an assumed market conditions. It does not reward building long portfolios.

  - **Portfolio “A”**
    - Generally 15-20% premium in total portfolio costs than Portfolio “B”.

  - **Portfolio “B”**
    - Generally 15-20% lower total portfolio costs than Portfolio “A”.
### Step 3: Construction of Candidate Portfolios

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Portfolio 1</strong></td>
<td>Build a 39 MW GE 1xLM6000 PF in 2018 and convert this unit to 58 MW LM6000 PF 1x1 CC with duct fire in 2028.</td>
</tr>
<tr>
<td><strong>Portfolio 2</strong></td>
<td>Purchase 50 MW share from CPEC in 2021 and an additional 50 MW from the same plant in 2028.</td>
</tr>
<tr>
<td><strong>Portfolio 3</strong></td>
<td>Build two 8.6 MW reciprocating engines in 2018 and a 59 MW SCC-800 1x1 CC in 2028.</td>
</tr>
<tr>
<td><strong>Portfolio 4</strong></td>
<td>Build two 8.6 MW reciprocating engines in 2018; 58 MW LM6000 PF 1x1 CC with duct fire in 2028, and 5 MW solar in 2032.</td>
</tr>
<tr>
<td><strong>Portfolio 5</strong></td>
<td>Build a 58 MW LM6000 PF 1x1 CC with duct fire in 2023.</td>
</tr>
<tr>
<td><strong>Portfolio 6</strong></td>
<td>Build a 18 MW LM2500 in 2018 and a 59 MW SCC-800 1x1 CC in 2023.</td>
</tr>
<tr>
<td><strong>Portfolio 7</strong></td>
<td>Build a 44 MW LM6000 in 2018 and 15 MW solar in 2023.</td>
</tr>
<tr>
<td><strong>Portfolio 8</strong></td>
<td>Build a 18 MW LM2500 in 2018, 71 MW SCC-800 CC with duct fire in 2023 and 15 MW solar in 2030.</td>
</tr>
<tr>
<td><strong>Portfolio 9</strong></td>
<td>Build two 8.6 MW reciprocating engines in 2018; 58 MW LM 6000 PF 1x1 CC with duct fire in 2023, and 5 MW solar in 2032.</td>
</tr>
</tbody>
</table>

**Note:** (1) San Juan unit 4 retirement year is an assumption for the IRP modeling purpose only. The coal unit, as of the date of this analysis, has not announced a potential retirement date. (2) CPEC is the proposed Clean Path Energy Center, an early stage development project of combined cycle natural gas-fired capacity of 715 MW and solar photovoltaic (PV) capacity of 55 MW, with a target commercial on line date by April 2021.
Step 4: Stochastic Assessment of Nine Portfolios

Inputs

- Technology
- **Timing**
- Size
- Location

- Capacity
- Heat rate
- Costs

Outputs

Simulations were performed with uncertainty around load, fuel, capital and environmental costs.

AURORAxmp®

- Hourly Dispatch
- Bidding
- Dynamic Build & Retirements
- Detailed Market Representation

- Power Prices
- Plant Generation
- Power Supply Costs

Portfolio Options

Plant Parameters

Regional Footprint & Interconnections
Stochastic Market Input Drivers for the City of Farmington IRP 2016

Demand (NM Peak Demand)

Environmental Price (Mass Based CO₂)

Delivered Gas Price

Delivered Coal Price

Note: The delivered gas and coal prices reflects contract positions of Farmington during the term of the contracts.
Pace Global Stochastic Analysis Indicates Power Prices in New Mexico is Expected to Remain below $50/MWh by 2035

Note: The prices are under the mass-based interstate stochastic results for the New Mexico power zone. The prices under the mass-based intrastate stochastic results are similar but generally ~2% lower than what is shown in this slide.
### Portfolio 1-4 Balanced Score Card Summary

#### San Juan Coal Plant Retirement After 2027

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Cost (Inter/Intra)</th>
<th>Risk</th>
<th>Environmental</th>
<th>Operational</th>
<th>Overall Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Build a 39 MW GE 1xLM6000 PF in 2018 and convert this unit to 58 MW LM6000 PF 1x1 CC with duct fire in 2028.</td>
<td>$743M</td>
<td>$727M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Purchase 50 MW share from CPEC in 2021 and an additional 50 MW from the same plant in 2028.</td>
<td>$717M</td>
<td>$703M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Build two 8.6 MW reciprocating engines in 2018 and a 59 MW SCC-800 in 2028</td>
<td>$745M</td>
<td>$728M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Build two 8.6 MW reciprocating engines in 2018; 58 MW LM 6000 PF 1x1 CC with duct fire CC in 2028, and 5 MW solar in 2032.</td>
<td>$737M</td>
<td>$721M</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Score Rating:**
- **Favorable**
- **Neutral**
- **Unfavorable**

**Note:** CPEC is the proposed Clean Path Energy Center, an early stage development project of combined cycle natural gas-fired capacity of 715 MW and solar photovoltaic (PV) capacity of 55 MW, with a targeted commercial on line date by April 2021.
### Portfolio 5-9 Balanced Score Card Summary

#### San Juan Coal Plant Retirement After 2022

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Cost (Inter/Intra)</th>
<th>Risk</th>
<th>Environmental</th>
<th>Operational</th>
<th>Overall Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Build a 58 MW LM6000 PF 1x1 CC with duct fire in 2023.</td>
<td>$751M / $743M</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>6. Build a 18 MW LM2500 in 2018 and a 59 MW SCC-800 in 2023.</td>
<td>$781M / $773M</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7. Build a 44 MW LM6000 in 2018 and 15 MW solar in 2023.</td>
<td>$749M / $739M</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>8. Build a 18 MW LM2500 in 2018, 71 MW SCC-800 CC with duct fire in 2023 and 15 MW solar in 2030.</td>
<td>$763M / $755M</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9. Build two 8.6 MW reciprocating engines in 2018; 58 MW LM6000 PF 1x1 CC with duct fire in 2023, and 5 MW solar in 2032.</td>
<td>$757M / $748M</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Score Rating:  
- **Favorable**  
- **Neutral**  
- **Unfavorable**
Executive Summary of Preferred Resource Plan

- Pace Global recommends the Preferred Resource Plan that performs the best across a variety of objectives including cost, risk, environmental and operational metrics under a variety of planning uncertainties and market conditions.

<table>
<thead>
<tr>
<th>Near Term Decision</th>
<th>Build two 8.6 MW reciprocating engines in 2018.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This is driven by: (1) expiration of 25 MW Tri-State contract in 2017, (2) the economics of utilizing existing gas contract, and (3) need of flexible unit for voltage support.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mid Term Decision</th>
<th>Build CC (~58 MW) based on the load and timed to replace the City’s share of San Juan Unit 4.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This is primarily driven by the need to backfill the City’s share of San Juan Unit 4 due to retirement.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Long Term Decision</th>
<th>Build solar project (~5 MW) depending on load.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This is driven by: (1) diversification of the portfolio, (2) lower costs, and (3) environmental benefits.</td>
</tr>
</tbody>
</table>

Note: (1) When Pace Global selected new generation options for inclusion in portfolios, a particular unit design based on an actual product is chosen as representative of a class of similar units. (2) In all cases, there is at least one additional unit available from a different manufacturer with similar enough characteristics that competitive bidding will be possible at the time a project is implemented.
Key Findings Under the CPP Mass-based with Interstate Trading

**CPEC Option**

- Purchasing a portion of the CPEC plant provides the lowest cost portfolio option. This is largely driven by the assumption of the plant's advertised heat rate (~6,152 btu/KWh) over Farmington's other smaller CCs options considered in this study (~7,500 btu/KWh or greater). An additional benefit of this option includes addition of solar capacity on a pro rata basis.
- However, whether CPEC option can be realized is fraught with uncertainties beyond Farmington's control.

**Capital Investments**

- Market conditions do not reward building long portfolios because of high capital costs incurred, especially in the early 2020s.
- However, a phased approach to add smaller and incremental capacity resources on a need basis provides overall lower cost benefits for the City as well as maintain flexibility in the face of future uncertainties.
Summary of the Two Preferred Portfolios (Portfolio 4 & 9)

- Portfolio 4 and 9 ranks the best in an overall ranking when we assume two different San Juan 4 retirements.
- Between the two best portfolios, Portfolio 4 results in ~3% lower expected costs than Portfolio 9.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Market Risk (20 Years)</th>
<th>Development &amp; Control Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio 4 $737M</td>
<td>~55%</td>
<td>Low</td>
</tr>
<tr>
<td>Portfolio 9 $757M</td>
<td>~55%</td>
<td>Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk</th>
<th>Renewables (2035)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio 4 129%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Portfolio 9 98%</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Largest Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio 4 -10%</td>
<td>Bluffview CC</td>
</tr>
<tr>
<td>Portfolio 9 - 9%</td>
<td>Bluffview CC</td>
</tr>
</tbody>
</table>

* Above results are the mass-based interstate trading stochastic results.