Cascade Natural Gas Corporation

Integrated Resource Plan
Technical Advisory Group Meeting #1

March 15th 2018
SeaTac Airport
Seattle, WA

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Agenda

- Introductions
- About Cascade Natural Gas
- IRP Process
- Recap of latest CAG Meeting
- Best Practices Discussion
  - Load Forecast
  - Conservation
  - Carbon
  - Avoided Cost
  - Hedging
  - Stochastic Analysis Techniques
  - Renewables
  - Distribution System Planning
  - Additional Items
- 2018 WA IRP Timeline
- Next Steps

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A LITTLE HISTORY LESSON…

- Prior to 1955, natural gas was virtually unheard-of in the Pacific Northwest. Seeing an opportunity, Lester Pettit, Spencer Clark, and Stewart Matthews led a group of associates to form a company that would rise to the challenge. Cascade Natural Gas Corporation was incorporated January 2, 1953.
- In July 2007, Cascade was acquired by MDU Resources headquartered in Bismarck, ND.
  - Founded in 1924 as an electric utility in eastern Montana.
  - Core businesses are construction, utilities, and pipeline.
  - Approximately 9,600 employees, operating in 48 states.
  - Operates four utilities across eight states:
    - Montana-Dakota Utilities Co.
    - Great Plains Natural Gas Co.
    - Cascade Natural Gas Corporation
    - Intermountain Gas Co.

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AND TODAY WE ARE …

- Cascade Natural Gas Corp. serves 282,000 customers in 96 communities – 68 of which are in Washington and 28 in Oregon. Cascade's service areas are concentrated in western and south central Washington, and south central and eastern Oregon.

- Today, Cascade serves a diverse service territory covering more than 32,000 square miles and 700 highway miles from one end of the system to the other. Interstate pipelines transmit Cascade's natural gas from production areas in the Rocky Mountains and western Canada.

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Purpose of the IRP Process

Bruce Folsom

Bruce W Folsom Consulting LLC

March 15th, 2018

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Purpose of the IRP

- The purpose of an IRP is to depict the overall company plan more transparently …
  - For immediately-contemplated actions (i.e., in the next two years),
  - To characterize emerging issues and related approaches for mitigation, if necessary, and
  - To outline the long-term direction a company is headed *vis-a-vis* the industry, including economic trends, industry structure (partners such as the pipeline(s) and their impact/actions), technology, customer usage, etc.

IRP Objectives

- Present a transparent roadmap of the overall corporate plan per the previous slide
- Promote internal coordination
- Describe to key stakeholders and the public the complex utility system unique to the local distribution company and management decision-making processes
- Provide previews of future projects and issues which can lead to improved regulatory filings
- Meet regulatory requirements

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Benefits

- A company can describe its unique circumstances, opportunities and challenges over the planning horizon
- More specifically, while commissions do not approve the IRP—and, hence future actions—the description of potential actions generally provides for an improved process of future filings, because stakeholders have a basis, in advance, for what is driving those decisions

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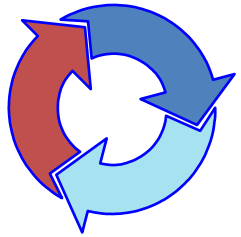
In Conclusion



- An IRP Provides an understanding of industry and utility-specific practices
- That the Commission acknowledges the plans, rather than approve them, does not lessen the process's regulatory importance
- The commitment from Cascade's senior leadership has been outstanding and recognized by stakeholders

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IRP Process

IRP GUIDELINES AND CONTENT

WASHINGTON
IRP Guidelines from WUTC WAC 480-90-238

CASCADE'S PHILOSOPHY
Primary purpose of Cascade's long-term resource planning process has been, and continues to be, to inform and guide the Company's resource acquisition process, consistent with state regulatory requirements.

Input and feedback from the Company's Technical Advisory Group (TAG) is an important resource to help ensure that CNGC's IRP is developed from a broader perspective than Cascade could have on its own.

Cascade continues its commitment to securing and supporting the appropriate internal and external resources necessary to work with all stakeholders to produce a 2018 Integrated Resource Plan that meets the requirements of Washington Administrative Code 480-90-238.

Stakeholder Engagement Process

- Input and feedback from Cascade's Technical Advisory Group (TAG) is an important resource to help ensure the IRP includes perspectives external to the Company and is responsive to stakeholders.
- Five TAG meetings will be held, with a potential sixth scheduled if needed.
- Multiple opportunities for public participation will be made available.

Role of TAG Meetings in the IRP Process

- Cascade believes the TAG meetings are of significant value to the IRP process, and encourages as much active stakeholder participation as possible.
- Feedback from stakeholders is critical to the production of a document that clearly and effectively communicates the Company's plan to acquire the least cost mix of natural gas supply and conservation resources to serve forecasted demand.
- At the same time, Cascade will ultimately produce a plan that accounts for the challenges unique to its service area.

Meeting Principles

- This will be an effective TAG meeting if…
  - Start and end on time, with participants fully present;
  - Allow for open, inclusive and balanced participation and discussions;
  - Ask questions;
  - Slides are disseminated to stakeholders in advance, and reviewed by stakeholders prior to the meeting; and
  - Be clear about next steps and action items.
    - Deadlines to hit milestones are presented clearly, and respected by all parties.

Importance of Milestones

- The IRP team plays an internal coordination role, assisting many departments working as one.
- This can be challenging, as each department has its own core function beyond the IRP.
- Milestones allow the Company to achieve this task while being respectful of each other's individual challenges and workload.
- The Company has critical milestones related to the completion of its load forecast, price forecast, avoided cost, and other critical processes. These often inform other parts of the IRP process, and must be met on time.

INTERNAL TEAM MEMBERS OF CNGC'S INTEGRATED RESOURCE PLAN:

LAST NAME	FIRST NAME	TITLE	COMPANY
Abrahamson	Jim	Manager, Conservation Policy	Cascade
Archer	Pam	Supervisor, Regulatory Affairs	Cascade
Bolton	Chris	Engineering II, Engineering	Cascade
Burin	Kary	Supervisor, Conservation	Cascade
Chiles	Mark	Vice President, Customer Service and Regulatory Affairs	Intermountain
Cooley	John	Manager, Industrial Services	Cascade
Cowlishaw	Monica	Manager, Conservation Programs	Cascade
Cunnington	Brian	Manager, Industrial Services	Cascade
Davis	Ashton	Resource Planning Analyst, Gas Supply	Cascade
Escobar	Michael	System Administrator	Cascade
Folsom	Bruce	Consultant	Bruce W Folsom Consulting LLC
Gross	Jennifer	Regulatory Analyst IV, Regulatory Affairs	Cascade
Krebsbach	Abbie	Director, Environmental	MDU

INTERNAL TEAM MEMBERS OF CNGC'S INTEGRATED RESOURCE PLAN:

LAST NAME	FIRST NAME	TITLE	COMPANY
Martuscelli	Eric	Vice President, Operations	Cascade
McGreal	Devin	Resource Planning Analyst, Gas Supply	Cascade
Mellinger	Becky	Financial Analyst	Cascade
Morman	Bob	Director, Gas Supply Utility Group	MDU
Ogden	Jeremy	Director, Engineering	Cascade
Parvinen	Mike	Director, Regulatory Affairs	Cascade
Robbins	Chris	Manager, Gas Supply and Control- CNGC/IGC	Cascade/ Intermountain
Robertson	Brian	Sr Resource Planning Analyst, Gas Supply	Cascade
Sargent	Amanda	Conservation Analyst	Cascade
Sellers-Vaughn	Mark	Manager, Supply Resource Planning	Cascade
Senger	Garret	Executive Vice President, Regulatory, Customer Service, Gas Supply	MDU
Spector	Allison	Manager, Conservation Policy	Cascade
Stone	Carolyn	Gas Supply Analyst	Cascade
Tyssen	Nathan	Network Administrator	Cascade
Wood	Eric	Supervisor, Gas Supply	Cascade/ Intermountain

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Impact of U-161024

- On September 1st, 2016, the WUTC kicked off U-161024 to discuss potentially amending the IRP process.
- Cascade has been, and will continue to be, an active participant in all workshops related to this rulemaking.
- Open question: What are stakeholder expectations regarding U-161024 for Cascade's 2018 WA IRP?

Recap of Conservation Advisory Group

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Last meeting 03/08/18

- Most recent discussions centered on the 2017 Conservation Potential Assessment and was proceeded by a training session on use of the Company's new Conservation Potential assessment tool – LoadMAP, developed by AEG.
- Therm savings accomplishments for 2017 were briefly discussed, and will officially be released as part of the Annual Conservation Report on June 1st to the Commission.

Best Practices Discussion

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Context

- Cascade is very proud of its acknowledged 2016 IRP, but recognizes the importance of continuing to improve and grow.
- To this end, Cascade has actively been engaged in following the IRPs of other regional LDCs. This includes reading their IRPs and attending their versions of TAG meetings.
  - The goal has been to learn IRP best practices across the industry, and take back applicable elements to include in our IRP.
  - In the spirit of this, Cascade encourages stakeholder to tell us if there is an element of another LDC's IRP that they believe is particularly well done.
  - As stated earlier, Cascade has its own unique challenges and demographics, and will produce an IRP specific to Cascade.
- Cascade encourages feedback on its proposed approach to the following IRP elements, either today or future TAG meetings.

Load Forecast

- The Company currently utilizes an Autoregressive Integrated Moving Average (ARIMA) methodology with Fourier terms to predict customer count and usage.
- Cascade uses a 60 degree reference temperature to calculate HDDs.
- Multiple scenarios are analyzed such as high/low growth, warm/cold weather, peak day events, etc.
- Cascade has continued to evaluate other potential predictors such as housing starts, but have encountered the same problem as other regional LDCs related to the availability of data to accurately reflect its service area.

Customer Forecast

- $C^{CG,Class} = \alpha_0 + \alpha_1 Pop^{CG} + \alpha_2 Emp^{CG} + Fourier(k) + ARIMA \in (p,d,q)$
- Model Notes:
  - C = Customers; CG = Citygate; Class = Residential, Commercial, Industrial, or Interruptible; $ARIMA \in (p,d,q)$ = Indicates that the model has p autoregressive terms, d difference terms, and q moving average terms; Pop = Population; Emp = Employment; Fourier(k) = Captures seasonality of k number of seasons.

Use Per Customer Forecast

- $Therms/C^{CG,Class} = \alpha_0 + \alpha_1 HDD^{CG,\,M} + \alpha_2 I_w + \alpha_3 T + ARIMA \in (p,d,q)$
- Model Notes:
  - Therms/C = Therms per customer; CG = Citygate; Class = Residential, Commercial, Industrial, or Interruptible; HDD = Heating Degree Days; M= Month; I_w = Indicator Variable set to 1 if it is a weekend; T = Trend Variable increasing by 1 for each day forecasted; $ARIMA \in (p,d,q)$ = Indicates that the model has p autoregressive terms, d difference terms, and q moving average terms.

Conservation

- The IRP team is an active participant in Cascade's Conservation Advisory Group (CAG).
- The Company will continue to integrate relevant aspects of the CAG meetings in its IRP process.
- As per the commitment the Company made in its 2016 Addendum to the IRP we are finalizing the CPA in Q1 and will include the full study in the 2018 IRP. In the DSM chapter we will also include a re-run of the model's potential based on updated inputs for 2018 and a recap of some of the elements contained within the Conservation Plan.

Carbon

- Cascade recognizes that there is a strong regional desire to reduce carbon emissions.
- The Company is paying close attention to various initiatives, including a Carbon Tax proposed by Governor Inslee.
- Cascade will follow the example of its regional LDCs and include an analysis of various carbon reduction scenarios in its 2018 IRP.

Avoided Cost

- Cascade has revamped its avoided cost formula to create a more transparent and intuitive final number.
- Cascade will be incorporating elements of other LDCs methodologies for distribution system and risk premium costs.
- Cascade is considering including these items in its 2018 IRP avoided cost, but encourages stakeholder feedback on this item.

Avoided Cost Formula

$$AC_{nominal} = TC_f + TC_v + SC_f + SC_v + (CC * C_{tax} * E_{adder}) + DSC + RP$$

Where

- $AC_{nominal}$ = The nominal avoided cost for a given year. To put this into real dollars you must apply the following: Avoided Cost/(1+discount rate)^Years from the reference year.
- TC_f = Incremental Fixed Transportation Costs
- TC_v = Variable Transportation Costs
- SC_f = Incremental Fixed Storage Costs
- SC_v = Variable Storage Costs
- CC = Commodity Costs
- C_{tax} = Carbon Tax
- E_{adder} = Environmental Adder, as recommended by the Northwest Power and Conservation Council
- DSC = Distribution System Costs
- RP = Risk Premium

Hedging

- Cascade has been an active participant in UG-132019, and has successfully included its hedging plan with its 2017 PGA filing.
- The Company is also engaged in discussions with potential consultants to review and recommend any changes to the plan as appropriate.
- The Company will continue to include its current hedging activity related to fixed price physicals in the 2018 IRP, and welcomes feedback as to what stakeholders would like to see in the IRP related to hedging.

Stochastic Analysis

- Cascade appreciated Staff feedback requesting further stochastic analysis in the Company's 2018 IRP.
- In the 2016 IRP, Cascade only ran stochastic analysis on the preferred deterministic portfolio.
- For the 2018 IRP, Cascade will perform Monte Carlo simulations on all potential portfolios before scenario and sensitivity testing.

Stochastic Analysis

- Cascade will stochastically test multiple portfolios in its 2018 IRP to capture the extrinsic value of all portfolios before selecting a candidate portfolio.
- This candidate portfolio will then be tested through stochastic scenario and sensitivity modeling.
- Cascade will compare the Value at Risk (VaR) of the candidate portfolio in each scenario/sensitivity to a VaR limit to ensure that the extrinsic risk of the portfolio is within tolerable levels.

Renewables

- Cascade is continuing to look at renewables as an option for long-term supplies.
- The Company has met with several biodigestor developers who are trying to capture value in the current RIN market. However, none of these have moved passed the discussion phase to date.
- In addition, Cascade has met with the City of Richland (WA) to discuss the possibility of capturing biogas from their landfill. They have hired a consultant to assess the feasibility of that project and will keep Cascade in the loop if that moves forward.

Distribution System Planning

- IRP process for distribution system planning includes a discussion of the distribution scenario process related to enhancements.
- Cascade will provide all planned WA projects under confidential treatment.
- Cascade encourages stakeholder feedback related to distribution system planning.

Additional Matters

- Cascade is always looking for ways to enhance the IRP, feedback related to any best practices would be greatly appreciated.

2018 IRP Schedule

Date	Process Element	Location (Subject to change)
Thursday, March 8, 2018	TAG 1 slides distributed to stakeholders	
Thursday, March 15, 2018	**TAG 1: Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Plan for dealing with issues raised in 2016 IRP, C.A.R.**	**Seattle-Tacoma Internation Airport Conference Center 9am-12pm**
Wednesday, May 16, 2018	TAG 2 slides distributed to stakeholders	
Wednesday, May 23, 2018	**TAG 2: Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast. NWP/GTN Present Demand Taps.**	**Seattle-Tacoma Internation Airport Conference Center 9am-12pm**
Thursday, May 31, 2018	**2016 WA IRP 3rd Quarterly Update Filed**	
Thursday, June 28, 2018	TAG 3 slides distributed to stakeholders	
Thursday, July 12, 2018	**TAG 3: Distribution System Planning, Planned Scenarios and Sensitivities, Alternative Resources, Price Forecast, Avoided Costs. Current Supply Resources, Transport Issues.**	**Seattle-Tacoma Internation Airport Conference Center 9am-12pm**
Thursday, August 9, 2018	TAG 4 slides distributed to stakeholders	
Thursday, August 16, 2018	**TAG 4 Carbon Impacts, Conservation, Bio-Natural Gas, Preliminary Resource Integration Results, Proposed new 2 year Plan.**	**Seattle-Tacoma Internation Airport Conference Center 9am-3pm**
Tuesday, September 11, 2018	TAG 5 slides distributed to stakeholders	
Tuesday, September 18, 2018	**TAG 5: Final Integration Results, finalization of plan components.**	**Seattle-Tacoma Internation Airport Conference Center 9am-12pm**
Friday, October 5, 2018	Draft of 2018 IRP distributed	
Friday, November 2, 2018	Comments due on draft from all stakeholders	
Wednesday, November 14, 2018	TAG 6, if needed	WebEx Only
Friday, December 14, 2018	IRP filing in Washington	

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Questions/Next Steps

- Review Plans for TAG 2 Discussion
  - Demand and Customer Forecast.
  - Non-Core Forecast.
  - NWP/GTN Pipeline Capacity Overview.
  - Next TAG is Wednesday, May 23rd at SeaTac Airport in Seattle, WA.

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