Appendix K

2016 IRP Quarterly Update

Draft 2018 WA IRP

CASCADE NATURAL GAS CORPORATION®

A Subsidiary of MDU Resources Group, Inc.

In the Community to Serve®

CASCADE NATURAL GAS CORPORATION'S 2016 INTEGRATED RESOURCE PLAN QUARTERLY UPDATE 1

Item 1. Demand Forecast: For projecting customer growth, Cascade should use a regression model to more accurately gauge the correlation between demographic and employment growth and Cascade's load growth. The Company should also test the validity of its load forecasting model by conducting a back-cast with actual, observed data. For temperature data, the Commission prefers the use of National Oceanic and Atmospheric Administration (NOAA) data. If Cascade choses to rely on weather data from another source, it should provide detailed justification for doing so and verify the reliability of this data. Further, similar to other regulated utility IRPs, the Company should modify the regression models to account for seasonal differences in customers' weather sensitivity and use an autoregressive model to forecast load, when appropriate.

Response: Cascade will be running, and has been running for the 2018 OR IRP, ARIMA time series analysis with seasonal indicators to create a customer and demand forecast model. The customer forecast model will use population and employment growth to analyze customer growth. Cascade has chosen Schneider because Schneider has proven to be more reliable and more responsive with data than NOAA. This is because Schneider uses multiple sources to compute weather data for an area, and with Cascade's wide service territory, we feel it gives a better representation of our service territory's. Cascade also uses Schneider data throughout the company, therefore, Cascade finds having one set of data to use is best for the Company.

Item 2. Stochastic Analysis: The Commission requests that Cascade expand its stochastic analysis to include probability distributions of costs, such as system costs and resource mix, for multiple portfolios. The Company should run simulations to "stress test" different resource mix alternatives, including mixes with increased investment in conservation resources, which will provide more data and results for portfolio optimization.

Response: For its 2018 IRP in Oregon, Cascade has modified its stochastic analysis to incorporate many of these recommendations. The Company first uses SENDOUT® to derive optimal deterministic portfolios using all potential resources. Cascade then derives additional candidate portfolios by allowing SENDOUT® to generate the optimal deterministic mix of resources using only NWP solves, only NWP solves with storage, only GTN solves, only GTN solves with storage, and only storage. These six portfolios are then tested stochastically. The company records the mean total system cost and the 95th percentile of total system costs to capture an intrinsic and extrinsic value of each portfolio, which is in turn used to rank the portfolios and ultimately create a preferred portfolio. The Company expects to use a similar methodology in its 2018 IRP for Washington.

In a 2017 update to its 2014 IRP in Oregon, Cascade performed an analysis on the impact of accelerated DSM to its anticipated shortfalls. The Company concluded that accelerated DSM would not generate a material impact on the timing or quantity of incremental resources needed. The Company will perform a similar analysis for the 2018 Washington IRP.

Item 3. Conservation Potential Assessment (CPA) and Model: In consultation with its advisory group, Cascade should develop a request for proposal for a new CPA and new (or modified) model using the Northwest Power and Conservation Council's methodology for calculating conservation potential. The Company should continue to coordinate with the Northwest Energy Efficiency Alliance to include non-energy benefits in the CPA.

Response: The Energy Efficiency Department released a Request for Proposal (RFP) to more than twenty qualified independent evaluators of Energy Efficiency programs on behalf of the Company's Washington State Conservation Incentive Programs as of July 11th, 2017. The Company advised we

were seeking a comprehensive reassessment of the Company's residential, commercial and industrial energy efficiency potential (Conservation Potential Assessment or CPA) under the methodology currently employed by the Northwest Power and Conservation Council (NWPCC). We also noted we were seeking an executable and dynamic model to support goal setting in future years allowing for annual reassessment to be performed internally by CNGC for Integrated Resource Planning, or alternatively if a model could not be provided then a proposal from a vendor to provide ongoing support to obtain an updated CPA biennially. The RFP was developed in consultation with the Conservation Advisory Group (CAG) which included feedback and recommendations provided by Staff from the WUTC, Public Counsel and Northwest Energy Efficiency Alliance (NEEA). The Company also sought recommendations and insights from Regional Technical Forum (RTF) members and NWPCC representatives while developing the RFP and included elements of cost test evaluation as part of the RFP including the Total Resource Cost (TRC) test non-energy benefits guidance and inclusion of the Resource Value Test (RVT) as one of three ways to evaluate cost-effectiveness of the programs moving forward.

Three vendors responded to the RFP by the August 2nd deadline. The Company evaluated the responses for adherence to the requested elements, developed a matrix and advised our CAG of the results of the RFP evaluation and the vendor which was awarded the project. We are moving forward with Applied Energy Group (AEG) as the CPA evaluator and will be using LoadMap in the 2018 IRP for potential forecasting. We are on track to meet the February 5th completion date and will have AEG present to the CAG during our quarterly meeting in October about the project timeline, modeling software and current status.

Item 4. Clean Air Rule (CAR): While we acknowledge that the CAR is currently the subject of litigation by Cascade and others, WAC 173-441 and 173-442 are in force in Washington state unless and until a court decides otherwise. In its 2018 IRP expected case, Cascade should model specific CAR impacts. Moreover, Cascade should consider the costs and risks of additional environmental regulations, including a possible carbon tax ($/ton of carbon dioxide equivalent).

Response: Cascade is researching potential emission reduction unit (ERU) options for CAR compliance which include, but are not limited to, livestock projects, wastewater projects, renewable energy projects, renewable energy credits, transportation, natural gas system, and energy efficiency. We will evaluate the ERU options and costs, as well as any future carbon tax, and apply these costs in 2018 IRP cost modeling.

Item 5. Avoided Costs: The Company should expand its analysis of avoided energy and capacity costs (on and off peak), by year and end use, quantifying the following cost streams: carbon-inclusive price and transport, capacity (supply resource), capacity (distribution system), emissions with expected case adder of incremental carbon policy (CAR analysis), and a ten percent conservation adder. The Commission recommends the Company provide additional information with regard to its avoided cost calculation methodology, clearly delineating carbon costs included in the price of natural gas and external costs related to state-specific carbon policies, including but not limited to Washington's Clean Air Rule.

Response: Cascade has modified its avoided cost formula to incorporate many of these recommendations.

Item 6. Distribution System Enhancements: As the Commission promulgates new rules related to IRP transmission and distribution system planning, the Company will need to provide more analysis on distribution system enhancements in future IRPs.

Response: Late last year the WUTC opened Docket U-161024 to consider new, additional guidelines for Integrated Resource Plans (IRPs). These potential new rules impact all the areas of the IRP such as demand forecasting, price forecasts, DSM, environmental analysis, supply resources, integration modeling scenarios, stress testing of portfolios, and distribution system planning. Cascade has been an active participant in this process and anticipates making changes to its future IRPs to expand discussion of distribution resource planning to include date of resource need, analysis of least cost reasonable resources and alternatives considered. The Company also plans to implement other changes as needed once the WUTC provides final, updated guidelines.

Item 7. Resource Cost Assumptions: The Commission strongly reminds the Company to regularly update its analyses based on new information and ensure that resource acquisition decisions are based on updated analyses using the most current data available.

Response: Cascade agrees with the importance to have the most current, reasonably available information when modeling potential resource decisions. To this end, the Company has sought through its citygate study to confirm upstream pipeline receipt/flow information. Additionally, Cascade requested Northwest Pipeline (NWP) refresh their estimates for potential expansions along the I-5 corridor and the Yakima lateral. The Company is also currently in discussions with NWP about options to address potential concerns with flow on the Shelton lateral. Further updates will be provided in future quarterly updates and at 2018 WA IRP Technical Advisory Group meetings.

Item 8. Quarterly Reports on Action Plan: Cascade should submit quarterly reports, beginning in Quarter 3 of 2017, explaining progress made towards resolution of the issues identified in the 2016 IRP Action Plan and issues identified in this letter and attachment. Each progress report must be received by the Commission no later than the final business day of each fiscal quarter.

Response: Cascade has filed the first Quarterly Update on September 29, 2017.

Item 9. Expanding forecasting to test non-linear regression methodology using SAS.

Response: As mentioned in item #1, Cascade will be running ARIMA time series analysis with seasonal indicators to create a customer and demand forecast model. The customer forecast model will use population and employment growth to analyze customer growth.

Item 10. Consider the new weather normalization model in the forecast

Response: The Company filed a new weather normalization methodology using the forecast model in the most recent Rate Case (No docket number assigned yet)

Item 11. Cascade will work on gathering growth information from other locations to compare with Woods & Poole. Also include analysis from State Economist Report

Response: The Company produces an internal monthly market intelligence report that includes sources such as SNL, Wood Mackenzie, EIA's short and long-term energy outlooks, U.S. Census Bureau's state data center program, as well as regional and national newspapers. These sources are used in conjunction with Woods & Poole's growth data to confirm or challenge the information provided. The Company will consult with our regional LDCs and continue to work with Staff to identify other potential sources of growth information for Cascade to consider.

Item 12. Investigate incorporating distribution system costs into the avoided cost calculation

Response: The Company has worked with internal stakeholders such as Engineering and Industrial Services to obtain more cost information regarding enhancements to the distribution system so that these may be considered in our avoided costs calculations. Additionally, Cascade has reached out to other utilities to understand how they each developed their methodologies for including distribution system costs into their avoided costs calculations. Cascade has some unique issues regarding allocation of distribution system costs due to the Company's wide geographical area. In addition, unlike many LDCs, Cascade's system is largely non-contiguous. The Company will continue to develop potential methodologies for inclusion of distribution cost into the avoided cost calculation for the 2018 WA IRP.

Item 13. As specific carbon legislation is passed, the Company will update its avoided cost calculations, conservation potential and make modifications to its DSM incentive programs as necessary.

Response: While no specific carbon legislation has yet passed during the time this update was written, the Company monitored all proposed carbon bills that emerged during the legislative session, and is actively monitoring the development of policy in this area. Cascade has also begun to communicate with environmental stakeholders interested in putting a price on carbon, petroleum, natural gas, electricity, and stationary sources in WA. This engagement will help us be proactive in updating avoided cost calculations, conservation potential and other DSM modifications if/when legislation is passed.

Item 14. The Washington State Dept. of Ecology issued a new carbon rule. Cascade will need to consider IRP implications

Response: Cascade continues to evaluate IRP implications of CAR, such as increasing costs and any potential changes with gas supply and delivery. Cascade will provide another update prior to the first 2018 IRP TAG meeting.

Item 15. Expand Monte Carlo methodology to include analyses of a variety of potential portfolio scenarios (e.g., high growth, low pricing, etc.)

Response: For its 2018 IRP in Oregon, Cascade has modified its stochastic analysis to incorporate many of these recommendations. The Company first uses SENDOUT® to derive optimal deterministic portfolios using all potential resources. Cascade then derives additional candidate portfolios by allowing SENDOUT® to generate the optimal deterministic mix of resources using only NWP solves, only NWP solves with storage, only GTN solves, only GTN solves with storage, and only

storage. These six portfolios are then tested stochastically. The Company records the mean total system cost and the 95th percentile of total system costs to capture an intrinsic and extrinsic value of each portfolio, which is in turn used to rank the portfolios and ultimately create a preferred portfolio. The Company expects to use a similar methodology in its 2018 IRP for Washington.

Item 16. Negotiate with TransCanada for the needed incremental GTN capacity for November 2017

Response: On August 30, 2017, Cascade's Gas Supply Oversight Committee authorized the Company to secure an incremental amount of GTN capacity. The path is Kingsgate to Malin. The volume is 10,000 dths/day. The effective date is December 1, 2017, terminating October 31, 2032. The principle reason for the acquisition of this capacity is to address potential capacity shortfalls in central Oregon through 2029. This incremental capacity may also provide some additional flexibility to move more AECO gas to Washington. The Company will use the interim period to consider potential DSM, capacity or changes in demand to address any suspected Oregon deficiencies beyond 2029.

Item 17. Work with NWP to define what delivery rights can be modified to meet potential shortfalls

Response: Over the course of summer 2017, Cascade and NWP have had on-going discussions regarding potential re-alignments. NWP has provided several proposals with are currently under review. It is expected that these modeling results will be presented to Cascade's Gas Supply Oversight Committee (GSOC) by year end.

Item 18. Work with NWP and potentially other regional LDCs to determine if a combination of I-5, Wenatchee, etc. expansion or segmentation can address shortfalls and regional infrastructure concerns.

Response: The Company has had informal discussions with several regional LDCs and NWP regarding potential expansions at a joint level. Options at this time for a joint undertaking faces several hurdles at this time (e.g., lack of common pathways, and shortfalls or potential anchor tenants). Consequently, while Cascade will continue to reach out to the parties regarding a joint effort, at this time it appears that the LDCs will likely work separately with NWP to address specific infrastructure needs.

Item 19. Incorporate the citygate study into the IRP.

Response: The Cascade Resource Planning team has completed the citygate study. Currently, the Company's engineering team has the study to confirm the accuracy of the physical capability numbers at each citygate.

Item 20. Use the results of the Study to confirm aligning of alternative resources, specifically satellite LNG

Response: This will be updated in the third progress report.

Item 21. Upon confirmation of need for satellite LNG, proceed with implementation of facility

Response: No determination has been made at this time regarding the need for satellite LNG. The Company continues to gather information about the need, costs and risks associated with satellite

LNG as a viable alternative resource. In addition, the Company continues to review other alternatives such as trucked-in LNG, pipeline expansions, DSM, etc. to address potential shortfalls.

CASCADE NATURAL GAS CORPORATION®

A Subsidiary of MDU Resources Group, Inc.

In the Community to Serve®

CASCADE NATURAL GAS CORPORATION'S 2016 INTEGRATED RESOURCE PLAN QUARTERLY UPDATE 2

Item 1. Demand Forecast: For projecting customer growth, Cascade should use a regression model to more accurately gauge the correlation between demographic and employment growth and Cascade's load growth. The Company should also test the validity of its load forecasting model by conducting a back-cast with actual, observed data. For temperature data, the Commission prefers the use of National Oceanic and Atmospheric Administration (NOAA) data. If Cascade choses to rely on weather data from another source, it should provide detailed justification for doing so and verify the reliability of this data. Further, similar to other regulated utility IRPs, the Company should modify the regression models to account for seasonal differences in customers' weather sensitivity and use an autoregressive model to forecast load, when appropriate.

2017 Q3 Response: Cascade will be running, and has been running for the 2018 OR IRP, ARIMA time series analysis with seasonal indicators to create a customer and demand forecast model. The customer forecast model will use population and employment growth to analyze customer growth. Cascade has chosen Schneider because Schneider has proven to be more reliable and more responsive with data than NOAA. This is because Schneider uses multiple sources to compute weather data for an area, and with Cascade's wide service territory, we feel it gives a better representation of our service territory's. Cascade also uses Schneider data throughout the company, therefore, Cascade finds having one set of data to use is best for the Company.

2017 Q4 Response: Cascade has continued to implement and test additional statistical software in its modeling to improve the accuracy of its forecasts.

Item 2. Stochastic Analysis: The Commission requests that Cascade expand its stochastic analysis to include probability distributions of costs, such as system costs and resource mix, for multiple portfolios. The Company should run simulations to "stress test" different resource mix alternatives, including mixes with increased investment in conservation resources, which will provide more data and results for portfolio optimization.

2017 Q3 Response: For its 2018 IRP in Oregon, Cascade has modified its stochastic analysis to incorporate many of these recommendations. The Company first uses SENDOUT® to derive optimal deterministic portfolios using all potential resources. Cascade then derives additional candidate portfolios by allowing SENDOUT® to generate the optimal deterministic mix of resources using only NWP solves, only NWP solves with storage, only GTN solves, only GTN solves with storage, and only storage. These six portfolios are then tested stochastically. The company records the mean total system cost and the 95th percentile of total system costs to capture an intrinsic and extrinsic value of each portfolio, which is in turn used to rank the portfolios and ultimately create a preferred portfolio. The Company expects to use a similar methodology in its 2018 IRP for Washington.

In a 2017 update to its 2014 IRP in Oregon, Cascade performed an analysis on the impact of accelerated DSM to its anticipated shortfalls. The Company concluded that accelerated DSM would not generate a material impact on the timing or quantity of incremental resources needed. The Company will perform a similar analysis for the 2018 Washington IRP.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 3. Conservation Potential Assessment (CPA) and Model: In consultation with its advisory group, Cascade should develop a request for proposal for a new CPA and new (or modified) model using the Northwest Power and Conservation Council's methodology for calculating conservation potential. The Company should continue to coordinate with the Northwest Energy Efficiency Alliance to include non-energy benefits in the CPA.

2017 Q3 Response: The Energy Efficiency Department released a Request for Proposal (RFP) to more than twenty qualified independent evaluators of Energy Efficiency programs on behalf of the Company's Washington State Conservation Incentive Programs as of July 11th, 2017. The Company advised we were seeking a comprehensive reassessment of the Company's residential, commercial and industrial energy efficiency potential (Conservation Potential Assessment or CPA) under the methodology currently employed by the Northwest Power and Conservation Council (NWPCC). We also noted we were seeking an executable and dynamic model to support goal setting in future years allowing for annual reassessment to be performed internally by CNGC for Integrated Resource Planning, or alternatively if a model could not be provided then a proposal from a vendor to provide ongoing support to obtain an updated CPA biennially. The RFP was developed in consultation with the Conservation Advisory Group (CAG) which included feedback and recommendations provided by Staff from the WUTC, Public Counsel and Northwest Energy Efficiency Alliance (NEEA). The Company also sought recommendations and insights from Regional Technical Forum (RTF) members and NWPCC representatives while developing the RFP and included elements of cost test evaluation as part of the RFP including the Total Resource Cost (TRC) test non-energy benefits guidance and inclusion of the Resource Value Test (RVT) as one of three ways to evaluate cost-effectiveness of the programs moving forward.

Three vendors responded to the RFP by the August 2nd deadline. The Company evaluated the responses for adherence to the requested elements, developed a matrix and advised our CAG of the results of the RFP evaluation and the vendor which was awarded the project. We are moving forward with Applied Energy Group (AEG) as the CPA evaluator and will be using LoadMAP in the 2018 IRP for potential forecasting. We are on track to meet the February 5th completion date and will have AEG present to the CAG during our quarterly meeting in October about the project timeline, modeling software and current status.

2017 Q4 Response: The Energy Efficiency Department continues its work with Applied Energy Group (AEG) on the 2018 Conservation Potential Assessment and is currently aligned to have it completed in February to discuss with the Conservation Advisory Group (CAG) during the first quarterly meeting of the year. The CAG stakeholders, including the Northwest Energy Efficiency Alliance, have been consistently informed of the progress of the CPA and LoadMAP modeling tool and were provided an opportunity to provide feedback and comments on the measure lists and any requested elements to be included in the final CPA and report. AEG and the Company are referencing multiple regional sources as part of the evaluation, including NEEA's Residential Building Stock Assessment and Commercial Building Stock Assessment and ramp rate guidance from the Northwest Power and Conservation Council. The final potential will be available for the following cost tests run under the NW Power and Conservation Council's methodology – Utility Cost Test, Total Resource Cost Test and Resource Value Test.

Item 4. Clean Air Rule (CAR): While we acknowledge that the CAR is currently the subject of litigation by Cascade and others, WAC 173-441 and 173-442 are in force in Washington state unless and until a court decides otherwise. In its 2018 IRP expected case, Cascade should model specific CAR impacts. Moreover, Cascade should consider the costs and risks of additional environmental regulations, including a possible carbon tax ($/ton of carbon dioxide equivalent).

2017 Q3 Response: Cascade is researching potential emission reduction unit (ERU) options for CAR compliance which include, but are not limited to, livestock projects, wastewater projects, renewable energy projects, renewable energy credits, transportation, natural gas system, and energy efficiency. We will evaluate the ERU options and costs, as well as any future carbon tax, and apply these costs in 2018 IRP cost modeling.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 5. Avoided Costs: The Company should expand its analysis of avoided energy and capacity costs (on and off peak), by year and end use, quantifying the following cost streams: carbon-inclusive price and transport, capacity (supply resource), capacity (distribution system), emissions with expected case adder of incremental carbon policy (CAR analysis), and a ten percent conservation adder. The Commission recommends the Company provide additional information with regard to its avoided cost calculation methodology, clearly delineating carbon costs included in the price of natural gas and external costs related to state-specific carbon policies, including but not limited to Washington's Clean Air Rule.

2017 Q3 Response: Cascade has modified its avoided cost formula to incorporate many of these recommendations.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 6. Distribution System Enhancements: As the Commission promulgates new rules related to IRP transmission and distribution system planning, the Company will need to provide more analysis on distribution system enhancements in future IRPs.

2017 Q3 Response: Late last year the WUTC opened Docket U-161024 to consider new, additional guidelines for Integrated Resource Plans (IRPs). These potential new rules impact all the areas of the IRP such as demand forecasting, price forecasts, DSM, environmental analysis, supply resources, integration modeling scenarios, stress testing of portfolios, and distribution system planning. Cascade has been an active participant in this process and anticipates making changes to its future IRPs to expand discussion of distribution resource planning to include date of resource need, analysis of least cost reasonable resources and alternatives considered. The Company also plans to implement other changes as needed once the WUTC provides final, updated guidelines.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 7. Resource Cost Assumptions: The Commission strongly reminds the Company to regularly update its analyses based on new information and ensure that resource acquisition decisions are based on updated analyses using the most current data available.

2017 Q3 Response: Cascade agrees with the importance to have the most current, reasonably available information when modeling potential resource decisions. To this end, the Company has sought through its citygate study to confirm upstream pipeline receipt/flow information. Additionally, Cascade requested Northwest Pipeline (NWP) refresh their estimates for potential expansions along the I-5 corridor and the Yakima lateral. The Company is also currently in discussions with NWP about options to address potential concerns with flow on the Shelton lateral. Further updates will be provided in future quarterly updates and at 2018 WA IRP Technical Advisory Group meetings.

2017 Q4 Response: Cascade met with NWP personnel on 12/13/2017 to discuss their latest proposal. Resource Planning anticipates modeling the latest proposal beginning in January 2018. Further updates will be provided in future updates and at 2018 WA IRP TAG meetings.

Item 8. Quarterly Reports on Action Plan: Cascade should submit quarterly reports, beginning in Quarter 3 of 2017, explaining progress made towards resolution of the issues identified in the 2016 IRP Action Plan and issues identified in this letter and attachment. Each progress report must be received by the Commission no later than the final business day of each fiscal quarter.

2017 Q3 Response: Cascade has filed the first Quarterly Update on September 29, 2017.

2017 Q4 Response: Cascade has filed the second Quarterly Update on December 22, 2017.

Item 9. Expanding forecasting to test non-linear regression methodology using SAS.

2017 Q3 Response: As mentioned in item #1, Cascade will be running ARIMA time series analysis with seasonal indicators to create a customer and demand forecast model. The customer forecast model will use population and employment growth to analyze customer growth.

2017 Q4 Response: Cascade has continued to implement and test additional statistical software in its modeling to improve the accuracy of its forecasts.

Item 10. Consider the new weather normalization model in the forecast

2017 Q3 Response: The Company filed a new weather normalization methodology using the forecast model in the most recent Rate Case (No docket number assigned yet)

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 11. Cascade will work on gathering growth information from other locations to compare with Woods & Poole. Also include analysis from State Economist Report

2017 Q3 Response: The Company produces an internal monthly market intelligence report that includes sources such as SNL, Wood Mackenzie, EIA's short and long-term energy outlooks, U.S. Census Bureau's state data center program, as well as regional and national newspapers. These sources are used in conjunction with Woods & Poole's growth data to confirm or challenge the information provided. The Company will consult with our regional LDCs and continue to work with Staff to identify other potential sources of growth information for Cascade to consider.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 12. Investigate incorporating distribution system costs into the avoided cost calculation

2017 Q3 Response: The Company has worked with internal stakeholders such as Engineering and Industrial Services to obtain more cost information regarding enhancements to the distribution system so that these may be considered in our avoided costs calculations. Additionally, Cascade has reached out to other utilities to understand how they each developed their methodologies for including distribution system costs into their avoided costs calculations. Cascade has some unique issues regarding allocation of distribution system costs due to the Company's wide geographical area. In addition, unlike many LDCs, Cascade's system is largely non-contiguous. The Company will continue to develop potential methodologies for inclusion of distribution cost into the avoided cost calculation for the 2018 WA IRP.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 13. As specific carbon legislation is passed, the Company will update its avoided cost calculations, conservation potential and make modifications to its DSM incentive programs as necessary.

2017 Q3 Response: While no specific carbon legislation has yet passed during the time this update was written, the Company monitored all proposed carbon bills that emerged during the legislative session, and is actively monitoring the development of policy in this area. Cascade has also begun to communicate with environmental stakeholders interested in putting a price on carbon, petroleum, natural gas, electricity, and stationary sources in WA. This engagement will help us be proactive in updating avoided cost calculations, conservation potential and other DSM modifications if/when legislation is passed.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 14. The Washington State Dept. of Ecology issued a new carbon rule. Cascade will need to consider IRP implications

2017 Q3 Response: Cascade continues to evaluate IRP implications of CAR, such as increasing costs and any potential changes with gas supply and delivery. Cascade will provide another update prior to the first 2018 IRP TAG meeting.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 15. Expand Monte Carlo methodology to include analyses of a variety of potential portfolio scenarios (e.g., high growth, low pricing, etc.)

2017 Q3 Response: For its 2018 IRP in Oregon, Cascade has modified its stochastic analysis to incorporate many of these recommendations. The Company first uses SENDOUT® to derive optimal deterministic portfolios using all potential resources. Cascade then derives additional candidate portfolios by allowing SENDOUT® to generate the optimal deterministic mix of resources using only NWP solves, only NWP solves with storage, only GTN solves, only GTN solves with storage, and only storage. These six portfolios are then tested stochastically. The Company records the mean total system cost and the 95th percentile of total system costs to capture an intrinsic and extrinsic value of each portfolio, which is in turn used to rank the portfolios and ultimately create a preferred portfolio. The Company expects to use a similar methodology in its 2018 IRP for Washington.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 16. Negotiate with TransCanada for the needed incremental GTN capacity for November 2017

2017 Q3 Response: On August 30, 2017, Cascade's Gas Supply Oversight Committee authorized the Company to secure an incremental amount of GTN capacity. The path is Kingsgate to Malin. The volume is 10,000 dths/day. The effective date is December 1, 2017, terminating October 31, 2032. The principle reason for the acquisition of this capacity is to address potential capacity shortfalls in central Oregon through 2029. This incremental capacity may also provide some additional flexibility to move more AECO gas to Washington. The Company will use the interim period to consider potential DSM, capacity or changes in demand to address any suspected Oregon deficiencies beyond 2029.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 17. Work with NWP to define what delivery rights can be modified to meet potential shortfalls

2017 Q3 Response: Over the course of summer 2017, Cascade and NWP have had on-going discussions regarding potential re-alignments. NWP has provided several proposals with are currently under review. It is expected that these modeling results will be presented to Cascade's Gas Supply Oversight Committee (GSOC) by year end.

2017 Q4 Response: Cascade met with NWP personnel on 12/13/2017 to discuss their latest proposal. Resource Planning anticipates modeling the latest proposal beginning in January 2018, and provide an update to GSOC during the first quarter 2018.

Item 18. Work with NWP and potentially other regional LDCs to determine if a combination of I-5, Wenatchee, etc. expansion or segmentation can address shortfalls and regional infrastructure concerns.

2017 Q3 Response: The Company has had informal discussions with several regional LDCs and NWP regarding potential expansions at a joint level. Options at this time for a joint undertaking faces several hurdles currently (e.g., lack of common pathways, and shortfalls or potential anchor tenants). Consequently, while Cascade will continue to reach out to the parties regarding a joint effort, at this time it appears that the LDCs will likely work separately with NWP to address specific infrastructure needs.

2017 Q4 Response: The company has no additional update from the first quarterly update.

Item 19. Incorporate the citygate study into the IRP.

2017 Q3 Response: The Cascade Resource Planning team has completed the citygate study. Currently, the Company's engineering team has the study to confirm the accuracy of the physical capability numbers at each citygate.

2017 Q4 Response: The engineering team has confirmed the accuracy of the physical capability numbers at each citygate. Engineering has incorporated the citygate study to help determine areas where a citygate upgrade may be needed. The resource planning team will look at implementing this study into the SENDOUT model.

Item 20. Use the results of the Study to confirm aligning of alternative resources, specifically satellite LNG

2017 Q3 Response: This will be updated in the third Quarterly update report, which will be filed in the first quarter of 2018.

2017 Q4 Response: Similar to #19, Cascade will look at implementing this study into the SENDOUT model.

Item 21. Upon confirmation of need for satellite LNG, proceed with implementation of facility

2017 Q3 Response: No determination has been made at this time regarding the need for satellite LNG. The Company continues to gather information about the need, costs and risks associated with satellite LNG as a viable alternative resource. In addition, the Company continues to review other alternatives such as trucked-in LNG, pipeline expansions, DSM, etc. to address potential shortfalls.

2017 Q4 Response: The Company continues to gather information on LNG possibilities. Recently, the Company began discussions with PSE about their experience with LNG studies as well as an overview of services provided by their LNG affiliate. Further discussions are planned for early 2018.

CASCADE NATURAL GAS CORPORATION®

A Subsidiary of MDU Resources Group, Inc.

In the Community to Serve®

CASCADE NATURAL GAS CORPORATION'S 2016 INTEGRATED RESOURCE PLAN QUARTERLY UPDATE 3

Item 1. Demand Forecast: For projecting customer growth, Cascade should use a regression model to more accurately gauge the correlation between demographic and employment growth and Cascade's load growth. The Company should also test the validity of its load forecasting model by conducting a back-cast with actual, observed data. For temperature data, the Commission prefers the use of National Oceanic and Atmospheric Administration (NOAA) data. If Cascade choses to rely on weather data from another source, it should provide detailed justification for doing so and verify the reliability of this data. Further, similar to other regulated utility IRPs, the Company should modify the regression models to account for seasonal differences in customers' weather sensitivity and use an autoregressive model to forecast load, when appropriate.

2017 Q3 Response: Cascade will be running, and has been running for the 2018 OR IRP, ARIMA time series analysis with seasonal indicators to create a customer and demand forecast model. The customer forecast model will use population and employment growth to analyze customer growth. Cascade has chosen Schneider because Schneider has proven to be more reliable and more responsive with data than NOAA. This is because Schneider uses multiple sources to compute weather data for an area, and with Cascade's wide service territory, we feel it gives a better representation of our service territory's. Cascade also uses Schneider data throughout the Company, therefore, Cascade finds having one set of data to use is best for the Company.

2017 Q4 Response: Cascade has continued to implement and test additional statistical software in its modeling to improve the accuracy of its forecasts.

2018 Q1 Response: Cascade has completed preliminary results for the customer forecast. Cascade analyzed ARIMA models with Fourier terms with Population and Employment growth rates as additional explanatory variables. The Company utilized the statistical software called R for the customer forecast.

Item 2. Stochastic Analysis: The Commission requests that Cascade expand its stochastic analysis to include probability distributions of costs, such as system costs and resource mix, for multiple portfolios. The Company should run simulations to "stress test" different resource mix alternatives, including mixes with increased investment in conservation resources, which will provide more data and results for portfolio optimization.

2017 Q3 Response: For its 2018 IRP in Oregon, Cascade has modified its stochastic analysis to incorporate many of these recommendations. The Company first uses SENDOUT® to derive optimal deterministic portfolios using all potential resources. Cascade then derives additional candidate portfolios by allowing SENDOUT® to generate the optimal deterministic mix of resources using only NWP solves, only NWP solves with storage, only GTN solves, only GTN solves with storage, and only storage. These six portfolios are then tested stochastically. The Company records the mean total system cost and the 95th percentile of total system costs to capture an intrinsic and extrinsic value of each portfolio, which is in turn used to rank the portfolios and ultimately create a preferred portfolio. The Company expects to use a similar methodology in its 2018 IRP for Washington.

In a 2017 update to its 2014 IRP in Oregon, Cascade performed an analysis on the impact of accelerated DSM to its anticipated shortfalls. The Company concluded that accelerated DSM would not generate a material impact on the timing or quantity of incremental resources needed. The Company will perform a similar analysis for the 2018 Washington IRP.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: After receiving feedback from WUTC staff during the Company's TAG 1 meeting, Cascade will be considering incorporating stochastic analysis into its conservation analysis, specifically related to the cost of carbon. The Company will discuss this further in TAG 4.

Item 3. Conservation Potential Assessment (CPA) and Model: In consultation with its advisory group, Cascade should develop a request for proposal for a new CPA and new (or modified) model using the Northwest Power and Conservation Council's methodology for calculating conservation potential. The Company should continue to coordinate with the Northwest Energy Efficiency Alliance to include non-energy benefits in the CPA.

2017 Q3 Response: The Energy Efficiency Department released a Request for Proposal (RFP) to more than twenty qualified independent evaluators of Energy Efficiency programs on behalf of the Company's Washington State Conservation Incentive Programs as of July 11th, 2017. The Company advised we were seeking a comprehensive reassessment of the Company's residential, commercial and industrial energy efficiency potential (Conservation Potential Assessment or CPA) under the methodology currently employed by the Northwest Power and Conservation Council (NWPCC). We also noted we were seeking an executable and dynamic model to support goal setting in future years allowing for annual reassessment to be performed internally by CNGC for Integrated Resource Planning, or alternatively if a model could not be provided then a proposal from a vendor to provide ongoing support to obtain an updated CPA biennially. The RFP was developed in consultation with the Conservation Advisory Group (CAG) which included feedback and recommendations provided by Staff from the WUTC, Public Counsel and Northwest Energy Efficiency Alliance (NEEA). The Company also sought recommendations and insights from Regional Technical Forum (RTF) members and NWPCC representatives while developing the RFP and included elements of cost test evaluation as part of the RFP including the Total Resource Cost (TRC) test non-energy benefits guidance and inclusion of the Resource Value Test (RVT) as one of three ways to evaluate cost-effectiveness of the programs moving forward.

Three vendors responded to the RFP by the August 2nd deadline. The Company evaluated the responses for adherence to the requested elements, developed a matrix and advised our CAG of the results of the RFP evaluation and the vendor which was awarded the project. We are moving forward with Applied Energy Group (AEG) as the CPA evaluator and will be using LoadMAP in the 2018 IRP for potential forecasting. We are on track to meet the February 5th completion date and will have AEG present to the CAG during our quarterly meeting in October about the project timeline, modeling software and current status.

2017 Q4 Response: The Energy Efficiency Department continues its work with Applied Energy Group (AEG) on the 2018 Conservation Potential Assessment and is currently aligned to have it completed in February to discuss with the Conservation Advisory Group (CAG) during the first quarterly meeting of the year. The CAG stakeholders, including the Northwest Energy Efficiency Alliance, have been consistently informed of the progress of the CPA and LoadMAP modeling tool and were provided an opportunity to provide feedback and comments on the measure lists and any requested elements to be included in the final CPA and report. AEG and the Company are referencing multiple regional sources as part of the evaluation, including NEEA's Residential Building Stock Assessment and Commercial Building Stock Assessment and ramp rate guidance from the Northwest Power and Conservation Council. The final potential will be available for the following cost tests run under the NW Power and Conservation Council's methodology – Utility Cost Test, Total Resource Cost Test and Resource Value Test.

2018 Q1 Response: The 2018 Conservation Potential Assessment is in the midst of finalization. The final iteration will be available shortly for incorporation into the 2018 IRP and a draft has been provided to the Company for review. The draft potential goals were provided to the Conservation Advisory Group as was the training on the new LoadMAP software during the Q1 CAG meeting held on March 8th in Bellingham.

Item 4. Clean Air Rule (CAR): While we acknowledge that the CAR is currently the subject of litigation by Cascade and others, WAC 173-441 and 173-442 are in force in Washington state unless and until a court decides otherwise. In its 2018 IRP expected case, Cascade should model specific CAR impacts. Moreover, Cascade should consider the costs and risks of additional environmental regulations, including a possible carbon tax ($/ton of carbon dioxide equivalent).

2017 Q3 Response: Cascade is researching potential emission reduction unit (ERU) options for CAR compliance which include, but are not limited to, livestock projects, wastewater projects, renewable energy projects, renewable energy credits, transportation, natural gas system, and energy efficiency. We will evaluate the ERU options and costs, as well as any future carbon tax, and apply these costs in 2018 IRP cost modeling.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: The Clean Air Rule was found to be invalid by Thurston County Superior Court Judge Hames J. Dixon, on December 15, 2017. Therefore, Cascade will not explicitly include the impacts of CAR in IRP cost modeling. Cascade has discussed its plans for modeling the costs and risks of environmental regulations during TAG 1, and received feedback from Staff that will be incorporated into carbon scenario modeling. Cascade will include discussion of carbon regulation and tax scenarios during TAG 4 which would be applied in 2018 IRP cost modeling.

Item 5. Avoided Costs: The Company should expand its analysis of avoided energy and capacity costs (on and off peak), by year and end use, quantifying the following cost streams: carbon-inclusive price and transport, capacity (supply resource), capacity (distribution system), emissions with expected case adder of incremental carbon policy (CAR analysis), and a ten percent conservation adder. The Commission recommends the Company provide additional information with regard to its avoided cost calculation methodology, clearly delineating carbon costs included in the price of natural gas and external costs related to state-specific carbon policies, including but not limited to Washington's Clean Air Rule.

2017 Q3 Response: Cascade has modified its avoided cost formula to incorporate many of these recommendations.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: Cascade presented a brief update regarding its new avoided cost formula during TAG 1. The Company will go into further depth regarding how the avoided cost formula will address these concerns in TAG 3.

Item 6. Distribution System Enhancements: As the Commission promulgates new rules related to IRP transmission and distribution system planning, the Company will need to provide more analysis on distribution system enhancements in future IRPs.

2017 Q3 Response: Late last year the WUTC opened Docket U-161024 to consider new, additional guidelines for Integrated Resource Plans (IRPs). These potential new rules impact all the areas of the IRP

such as demand forecasting, price forecasts, DSM, environmental analysis, supply resources, integration modeling scenarios, stress testing of portfolios, and distribution system planning. Cascade has been an active participant in this process and anticipates making changes to its future IRPs to expand discussion of distribution resource planning to include date of resource need, analysis of least cost reasonable resources and alternatives considered. The Company also plans to implement other changes as needed once the WUTC provides final, updated guidelines.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: The Company has no additional update from the first quarterly update.

Item 7. Resource Cost Assumptions: The Commission strongly reminds the Company to regularly update its analyses based on new information and ensure that resource acquisition decisions are based on updated analyses using the most current data available.

2017 Q3 Response: Cascade agrees with the importance to have the most current, reasonably available information when modeling potential resource decisions. To this end, the Company has sought through its citygate study to confirm upstream pipeline receipt/flow information. Additionally, Cascade requested Northwest Pipeline (NWP) refresh their estimates for potential expansions along the I-5 corridor and the Yakima lateral. The Company is also currently in discussions with NWP about options to address potential concerns with flow on the Shelton lateral. Further updates will be provided in future quarterly updates and at 2018 WA IRP Technical Advisory Group meetings.

2017 Q4 Response: Cascade met with NWP personnel on 12/13/2017 to discuss their latest proposal. Resource Planning anticipates modeling the latest proposal beginning in January 2018. Further updates will be provided in future updates and at 2018 WA IRP TAG meetings.

2018 Q1 Response: Cascade met with NWP and PSE personnel on 3/1/2018 to discuss NWP's latest proposals and consider joint resource options with PSE. Resource Planning anticipates modeling the latest proposal this spring. Further updates will be provided in future updates and at 2018 WA IRP TAG meetings.

Item 8. Quarterly Reports on Action Plan: Cascade should submit quarterly reports, beginning in Quarter 3 of 2017, explaining progress made towards resolution of the issues identified in the 2016 IRP Action Plan and issues identified in this letter and attachment. Each progress report must be received by the Commission no later than the final business day of each fiscal quarter.

2017 Q3 Response: Cascade filed the first Quarterly Update on September 29, 2017.

2017 Q4 Response: Cascade filed the second Quarterly Update on December 22, 2017.

2018 Q1 Response: Cascade filed the third Quarterly Update on March 30th, 2018.

Item 9. Expanding forecasting to test non-linear regression methodology using SAS.

2017 Q3 Response: As mentioned in item #1, Cascade will be running ARIMA time series analysis with seasonal indicators to create a customer and demand forecast model. The customer forecast model will use population and employment growth to analyze customer growth.

2017 Q4 Response: Cascade has continued to implement and test additional statistical software in its modeling to improve the accuracy of its forecasts.

2018 Q1 Response: Cascade will be using R, as mentioned in update #1, to complete the use per customer forecast. As presented at TAG 1, Cascade will be modeling non-linear ARIMA models that include HDD, weekend, trend and other explanatory variables. Cascade plans to present the results of the customer and demand forecast, including all variables that were considered and regressors ultimately selected, at the May 23rd, 2018 WA IRP TAG 2 meeting.

Item 10. Consider the new weather normalization model in the forecast

2017 Q3 Response: The Company filed a new weather normalization methodology using the forecast model in the most recent Rate Case UG-170929.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: The Company has no additional update from the first quarterly update.

Item 11. Cascade will work on gathering growth information from other locations to compare with Woods & Poole. Also include analysis from State Economist Report

2017 Q3 Response: The Company produces an internal monthly market intelligence report that includes sources such as SNL, Wood Mackenzie, EIA's short and long-term energy outlooks, U.S. Census Bureau's state data center program, as well as regional and national newspapers. These sources are used in conjunction with Woods & Poole's growth data to confirm or challenge the information provided. The Company will consult with our regional LDCs and continue to work with Staff to identify other potential sources of growth information for Cascade to consider.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: The Company is exploring other data sources used by regional LDC's to determine if more data is available or more accuracy can be obtained.

Item 12. Investigate incorporating distribution system costs into the avoided cost calculation

2017 Q3 Response: The Company has worked with internal stakeholders such as Engineering and Industrial Services to obtain more cost information regarding enhancements to the distribution system so that these may be considered in our avoided costs calculations. Additionally, Cascade has reached out to other utilities to understand how they each developed their methodologies for including distribution system costs into their avoided costs calculations. Cascade has some unique issues regarding allocation of distribution system costs due to the Company's wide geographical area. In addition, unlike many LDCs, Cascade's system is largely non-contiguous. The Company will continue to develop potential methodologies for inclusion of distribution cost into the avoided cost calculation for the 2018 WA IRP.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: During TAG 1, the Company outlined its intentions to incorporate distribution system costs into the 2018 WA IRP. While no formal technique has been settled on yet, Cascade is working on finalizing how this component will be entered to the avoided cost equation. Cascade will present its proposed methodology during TAG 3.

Item 13. As specific carbon legislation is passed, the Company will update its avoided cost calculations, conservation potential and make modifications to its DSM incentive programs as necessary.

2017 Q3 Response: While no specific carbon legislation has yet passed during the time this update was written, the Company monitored all proposed carbon bills that emerged during the legislative session, and is actively monitoring the development of policy in this area. Cascade has also begun to communicate with environmental stakeholders interested in putting a price on carbon, petroleum, natural gas, electricity, and stationary sources in WA. This engagement will help us be proactive in updating avoided cost calculations, conservation potential and other DSM modifications if/when legislation is passed.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: While no specific carbon legislation has yet passed during the time this update was written, the Company monitored all proposed carbon bills that emerged during the legislative session, and is actively monitoring the development of policy in this area. Cascade continues to communicate with stakeholders interested in putting a price on carbon, petroleum, natural gas, electricity, and stationary sources in WA. This engagement will help us be proactive in updating avoided cost calculations, conservation potential and other DSM modifications if/when legislation is passed.

Item 14. The Washington State Dept. of Ecology issued a new carbon rule. Cascade will need to consider IRP implications

2017 Q3 Response: Cascade continues to evaluate IRP implications of CAR, such as increasing costs and any potential changes with gas supply and delivery. Cascade will provide another update prior to the first 2018 IRP TAG meeting.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: Per the Company's update to question four, the Clean Air Rule was found to be invalid by the Thurston County Superior Court on December 15, 2017. Therefore, Cascade will not explicitly include the impacts of CAR in IRP cost modeling.

Item 15. Expand Monte Carlo methodology to include analyses of a variety of potential portfolio scenarios (e.g., high growth, low pricing, etc.)

2017 Q3 Response: For its 2018 IRP in Oregon, Cascade has modified its stochastic analysis to incorporate many of these recommendations. The Company first uses SENDOUT® to derive optimal deterministic portfolios using all potential resources. Cascade then derives additional candidate portfolios by allowing SENDOUT® to generate the optimal deterministic mix of resources using only NWP solves, only NWP solves with storage, only GTN solves, only GTN solves with storage, and only storage. These six portfolios are then tested stochastically. The Company records the mean total system cost and the 95th percentile of total system costs to capture an intrinsic and extrinsic value of each portfolio, which is in turn used to rank the portfolios and ultimately create a preferred portfolio. The Company expects to use a similar methodology in its 2018 IRP for Washington.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: After receiving feedback from WUTC staff during the Company's TAG 1 meeting, Cascade will be considering incorporating stochastic analysis into its conservation analysis, specifically related to the cost of carbon. The Company will discuss this further in TAG 4.

Item 16. Negotiate with TransCanada for the needed incremental GTN capacity for November 2017

2017 Q3 Response: On August 30, 2017, Cascade's Gas Supply Oversight Committee authorized the Company to secure an incremental amount of GTN capacity. The path is Kingsgate to Malin. The volume is 10,000 dths/day. The effective date is December 1, 2017, terminating October 31, 2032. The principle reason for the acquisition of this capacity is to address potential capacity shortfalls in central Oregon through 2029. This incremental capacity may also provide some additional flexibility to move more AECO gas to Washington. The Company will use the interim period to consider potential DSM, capacity or changes in demand to address any suspected Oregon deficiencies beyond 2029.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: The Company has no additional update from the first quarterly update.

Item 17. Work with NWP to define what delivery rights can be modified to meet potential shortfalls

2017 Q3 Response: Over the course of summer 2017, Cascade and NWP have had on-going discussions regarding potential re-alignments. NWP has provided several proposals with are currently under review. It is expected that these modeling results will be presented to Cascade's Gas Supply Oversight Committee (GSOC) by year end.

2017 Q4 Response: Cascade met with NWP personnel on 12/13/2017 to discuss their latest proposal. Resource Planning anticipates modeling the latest proposal beginning in January 2018, and provide an update to GSOC during the first quarter 2018.

2018 Q1 Response: See update item 7 above. Also, the Company has asked NWP to provide a delivery rights overview at the 2018 WA IRP TAG 2 in May 2018.

Item 18. Work with NWP and potentially other regional LDCs to determine if a combination of I-5, Wenatchee, etc. expansion or segmentation can address shortfalls and regional infrastructure concerns.

2017 Q3 Response: The Company has had informal discussions with several regional LDCs and NWP regarding potential expansions at a joint level. Options at this time for a joint undertaking faces several hurdles currently (e.g., lack of common pathways, and shortfalls or potential anchor tenants). Consequently, while Cascade will continue to reach out to the parties regarding a joint effort, at this time it appears that the LDCs will likely work separately with NWP to address specific infrastructure needs.

2017 Q4 Response: The Company has no additional update from the first quarterly update.

2018 Q1 Response: See update item 7 above.

Item 19. Incorporate the citygate study into the IRP.

2017 Q3 Response: The Cascade Resource Planning team has completed the citygate study. Currently, the Company's engineering team has the study to confirm the accuracy of the physical capability numbers at each citygate.

2017 Q4 Response: The engineering team has confirmed the accuracy of the physical capability numbers at each citygate. Engineering has incorporated the citygate study to help determine areas where a citygate upgrade may be needed. The resource planning team will look at implementing this study into the SENDOUT model.

2018 Q1 Response: Once the customer and demand forecasts are completed, Cascade will begin modeling SENDOUT for the 2018 WA IRP. The goal is to implement the citygate study in SENDOUT to help determine area's where a citygate upgrade may be needed.

Item 20. Use the results of the Study to confirm aligning of alternative resources, specifically satellite LNG

2017 Q3 Response: This will be updated in the third Quarterly update report, which will be filed in the first quarter of 2018.

2017 Q4 Response: Similar to #19, Cascade will look at implementing this study into the SENDOUT model.

2018 Q1 Response: Similar to update #19, Cascade will be implementing the citygate study into SENDOUT.

Item 21. Upon confirmation of need for satellite LNG, proceed with implementation of facility

2017 Q3 Response: No determination has been made at this time regarding the need for satellite LNG. The Company continues to gather information about the need, costs and risks associated with satellite LNG as a viable alternative resource. In addition, the Company continues to review other alternatives such as trucked-in LNG, pipeline expansions, DSM, etc. to address potential shortfalls.

2017 Q4 Response: The Company continues to gather information on LNG possibilities. Recently, the Company began discussions with PSE about their experience with LNG studies as well as an overview of services provided by their LNG affiliate. Further discussions are planned for early 2018.

2018 Q1 Response: The Company continues to gather information on LNG possibilities. On 3/1/2018 Cascade held separate discussions with PSE about an updated proposal to secure of their LNG affiliate. Further discussions are planned for early 2018.

CASCADE NATURAL GAS CORPORATION®
A Subsidiary of MDU Resources Group, Inc.

In the Community to Serve®

On March 30, 2018, Cascade filed the third quarterly progress report as requested in the 2016 Integrated Resource Plan's (IRP) Compliance Acknowledgment Letter. On April 18, Commission Staff filed a request that Cascade be required to file one more status report by June 30, 2018. The following list includes Staff's request as well as Cascade's response:

1. Provide detailed justification for using weather data other than from the National Oceanic and Atmospheric Administration (NOAA), and verify the reliability of such data;

The Company has provided a Weather Analysis spreadsheet (Weather Analysis.xlsx) with NOAA and Schneider data dating back to January 1, 1981. The steps the Company took to gather NOAA data is provided below:

Search https://www.ncdc.noaa.gov/cdo-web/

Select Search Tool under 'Discover Data By'

On the Climate Data Online Search Page Cascade selected Daily Summaries, selected date ranges from 1/1/1981 to 12/21/2017, and searched for Stations. Under Enter a Search Term: Cascade used the following to find the locations:

- Bellingham, WA
- Bremerton, WA
- Yakima, WA
- Walla Walla, WA
- Baker City, OR
- Pendleton, OR
- Redmond, OR

A map is then provided where the Company selected the following locations to be added to the cart:

- BELLINGHAM INTERNATIONAL AIRPORT, WA US
- HOQUIAM BOWERMAN AIRPORT, WA US
- YAKIMA AIRPORT, WA US
- WALLA WALLA REGIONAL AIRPORT, WA US
- BAKER CITY AIRPORT, OR US
- PENDLETON E OR REGIONAL AIRPORT, OR US
- REDMOND AIRPORT, OR US

Once added to the cart, Cascade selected the cart in the top right and selected view all items.
The Custom GHCN-Daily CSV is selected under Select the Output Format. Confirm that the Select the Date Range is correct from the selected date range from earlier. Select Continue.
Enter email address where the data will be received and select Submit Order.

Results of weather comparison:

One of the reasons Cascade finds Schneider to be more reliable than NOAA is the fact that NOAA publishes data with missing values while Schneider has not provided a day with any missing data. Below is a list of the weather stations from NOAA and the missing values between the years of 1981-2017. When pulling the data, some of the dates were simply not in the file. Other missing values had dates in the file but had empty TMAX or TMIN values. For example, 11/16/2002 was provided with empty data values in the TMAX and TMIN.

- BELLINGHAM INTERNATIONAL AIRPORT, WA US – 814
- HOQUIAM BOWERMAN AIRPORT, WA US – 137
- YAKIMA AIRPORT, WA US – 2
- WALLA WALLA REGIONAL AIRPORT, WA US – 1353
- BAKER CITY AIRPORT, OR US – 33
- PENDLETON E OR REGIONAL AIRPORT, OR US – 0
- REDMOND AIRPORT, OR US – 784

Another reason is because “Schneider Electric collects weather observations from a variety of sources.” as stated in Schneider Electrics Observed, Normals and Forecast Data Methodologies and Processes document. This document has been provided in Cascades UG-170929 General Rate Case, named ‘UG-170929, CNGC Exh. BR-9C, 3.23.18(C) pdf’, under confidential treatment. The fact that Schneider uses multiple sources benefits Cascade because of the diverse service area the Company serves.

Cascade has provided an analysis in columns R:V showing the differences between the NOAA and Schneider data the Company has gathered. All but the Hoquiam (Bremerton) area have a mean absolute error on HDDs of less than one. The Company believes the big difference in the Hoquiam (Bremerton) area is because they are two different locations. Cascade believes the Bremerton location is better since most of the customers in the Hoquiam (Bremerton) area is in the Bremerton area.

2. Identify the cost of risks associated with environmental effects of emissions of carbon dioxide it will use in its IRP, and describe how the calculation of such cost will be accomplished;

Cascade will be analyzing a variety of potential carbon futures for the 2018 IRP, including but not limited to the social cost of carbon, legislation backed by Governor Inslee, and a ballot initiative proposed by various environmental groups. The cost of carbon compliance will then be converted into a dollar per dekatherm figure using regional standards for the carbon emissions of one dekatherm of natural gas. Once calculated, Cascade will generate a unique avoided cost for each potential carbon future, using the resulting DSM numbers in a variety of scenario and sensitivity analyses related to carbon compliance. Additionally, these costs will be used to analyze the cost effectiveness of renewable natural gas versus traditional natural gas purchase and transportation.

Ultimately the Company will select one potential carbon future for its base case analysis. This may not be a representation of what the Company believes is the best way to capture the cost of carbon, but rather a reflection of what stakeholders have indicated is the preferred forecast for regional carbon analysis.

3. Provide the date by which the Conservation Potential Assessment will be completed;

The Conservation Potential Assessment is complete, dated March 16th, 2018, and was discussed with the CAG during the Q2 meeting on April 18th, 2018. Volumes 1 and 2 are available to the CAG with a few of the Appendices being available upon request due to email size constraints.

4. Provide calculation of the economic potential of conservation within the IRP, or anticipated date of completion of such calculation;

Economic Potential based on the revised inputs for the 2018 IRP will be available as of TAG 4, currently scheduled for August 16th. It will be developed throughout July and will be discussed during the DSM chapter review and incorporated into the IRP narrative.

5. Report to an expanded discussion of distribution resource planning to include date of resource need, analysis of least cost reasonable resources, and the alternatives considered;

The Resource Planning team has been working closely with the Engineering group to create a process that will provide the IRP with the information needed. This information includes the date of resource need, analysis of least cost reasonable resources as well as alternative analysis that was done but found to be not least cost. Cascade is also implementing any relevant projects into the avoided cost if they can by offset by demand side management. Cascade will also include the cost of each project in an Appendix under confidentiality protection.

6. Provide comparison between its growth forecast and information from the state economic report;

Cascade has provided a spreadsheet (W&P Comparison Workbook) that includes a comparison between Woods & Poole (W&P) as well as information from the state economic report in W&P Comparison Workbook.

The 'Data Comparison' tab includes WA and OR State forecast (medium) from the state economic report in yellow and the W&P WA and OR State forecast from W&P in green. The gold cells are a comparison between the two sources. The red columns contain counties that Cascade does not serve.

The 'W&P Data' tab includes the raw data Cascade receives from W&P.

The 'OR Population' tab includes the raw data Cascade pulled from the Office of Economic Analysis, Department of Administrative Services, State of Oregon. The data is a Forecast of Oregon's County Population and Components of Change, 2010-2050 as noted in cell A1 of that tab.

The 'WA Medium Forecast', 'WA Low Forecast', and 'WA High Forecast' are the respective medium, low, and high forecasts provided from data.wa.gov.

The 'Graphical Comparison' tab shows the comparison between the different sources. The comparison between W&P are very similar in the first few years and then the W&P projects a slightly higher growth in WA and a slightly lower growth in OR.

7. State whether proposals presented by NWP would modify delivery rights to meet potential shortfalls, or would otherwise address shortfall concerns; and

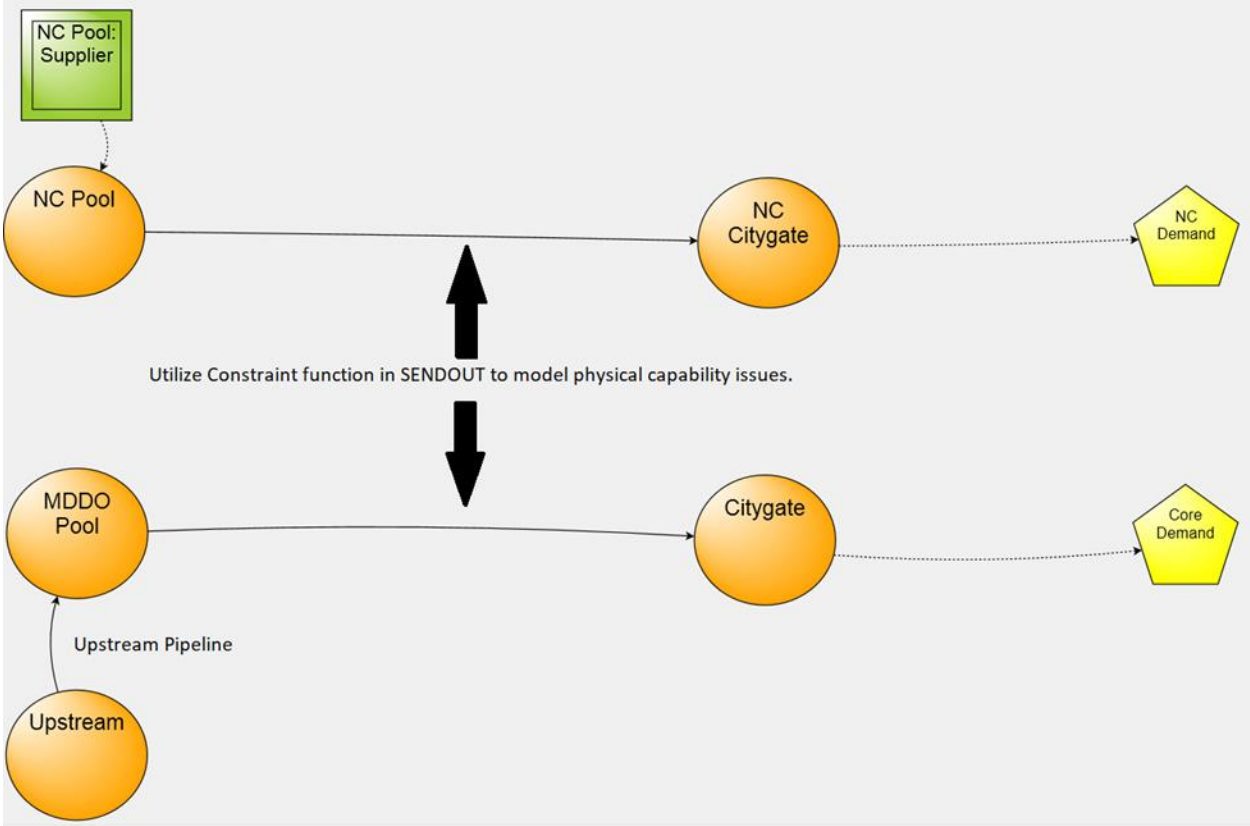
The Company will continue discussions with upstream pipeline and other parties to address the potential early 2020s shortfall along the I-5 corridor through incremental upstream pipeline capacity or through other parties via capacity release or other resources. Provide Gas Supply Oversight Committee (GSOC) with the model results from the most recent proposals from the upstream pipeline and other parties. Perform any additional analysis requested by GSOC. Communicate these findings to the WA IRP stakeholders for input and feedback. Seek GSOC approval of the appropriate action regarding acquiring additional capacity along the I-5 corridor.

8. Clarify response regarding incorporation of the citygate study into the IRP.

The purpose of the information below is to explain how Cascade currently plans to incorporate the citygate study will be incorporated into SENDOUT®. The citygate study was first built to determine if any citygates had a physical capability constraint. To calculate constraints, the Company needs to forecast both the core and non-core (NC) peak day demands. Since the physical constraint usually happens at the hourly level, and SENDOUT® is at the daily level, the Company converts the hourly physical constraint data into daily. Historically, the pipelines use a factor of 16.67 to get hourly MSCFH data into daily MSCFH.

How the citygate study is modeled

Once the daily physical capability in dekatherms is determined Cascade can then model it in SENDOUT. The diagram below illustrates how the citygate study will be modeled for each citygate. Optically, the diagram below looks odd because it separates the non-core and core when in reality they are on the same system. The reason for this is to make sure the upstream transportation is treated separately to model the fact that the core customers are bundled, and the non-core customers are unbundled. Being bundled means Cascade plans for the upstream capacity for the core where the NC customers must plan their own upstream capacity. Please note that NC Citygate and Citygate interconnects are the same citygate.



Since the Company does not plan for upstream purchases on the NC side the modeling will be simple. The Company will allow the NC to purchase the needed gas to meet demand. There will be no upstream transportation for the NC, so the gas will go straight to the NC pool. On the core side, Cascade will model

the upstream transportation as it has in the past. The MDDO Pool will consist of the gas transported for the demand at the citygate or citygates behind the demand tap (GTN) or zone (for NWP). Once the gas is gathered in the NC Pool and MDDO Pool the constraint function in SENDOUT® is utilized to model physical capability issues. The constraint function allows Cascade to treat two different transport lines as one. If we think of it as a formula where a is the line from NC Pool to NC Citygate, b is MDDO Pool to Citygate, and x is the physical capability. The formula would be $a + b \leq x$. If the demand for a and b is less than x, there will be no constraint. If a and b exceed x, there will be a constraint on the physical capability side and therefore may require a citygate upgrade.

Why the citygate study is modeled

By incorporating the citygate study into the 20-year planning horizon of the IRP, the Company will be better informed of potential physical capability issues at the citygates. The engineering team also runs a citygate study using Synergi and this will allow Cascade an opportunity to cross check results.