Before the Public Service Commission of Utah

Docket No. 17-057-20

IN THE MATTER OF THE PASS-THROUGH APPLICATION OF DOMINION ENERGY UTAH FOR AN ADJUSTMENT IN RATES AND CHARGES FOR NATURAL GAS SERVICE IN UTAH

Prepared Direct Testimony of

Frank T. DiPalma

DPU Exhibit 4.0 DIR

On Behalf of the

Utah Division of Public Utilities

April 23, 2018

Introduction and Background

Q. Mr. DiPalma, please state your name and business address.

A. My name is Frank DiPalma. I am with Williams Consulting Inc. my business address is 702 Pinegrove Ave. Jupiter, FL 33458.

Q. Mr. DiPalma, what position do you hold at Williams Consulting, Inc.?

A. I am currently a Partner/Principal with Williams Consulting.

Q. Mr. DiPalma, what is your background and qualifications for your testimony in this proceeding?

A. I am an energy industry management consultant with over 30 years of experience assessing and working for electric and gas utilities. In addition to Williams Consulting, my consulting experience includes employment with Jacobs Consultancy as Director and Stone & Webster Consultants as Associate Director. My direct utility operating experience has been gained from being employed as an officer, manager, or engineer for Mountaineer Gas Company and Public Service Electric & Gas Company. My expertise includes: General and operations management, distribution system engineering, business development, customer service, process engineering, project management, strategic planning, and regulatory compliance.

As an energy industry management consultant, I have been frequently called upon to review the planning, load forecasting and system engineering practices of the electric and gas delivery functions of utilities as part of a reliability and safety related assessment. Recent gas reliability and safety-related assignments include:

- Management and Operations Audit of New York State Electric & Gas and Rochester Gas & Electric (New York State Public Service Commission), 2017-present.
- Operational Due Diligence Consulting – AltaGas Ltd. and WGL Holdings, Inc. Merger (Maryland Public Service Commission), 2017.

- Management and Operations Audit of Central Hudson Gas & Electric Corporation (New York State Public Service Commission), 2016-2017.
- Gas Infrastructure Filing – Public Service Electric and Gas Company (Public Service Enterprise Group), 2015.
- Operational Due Diligence Consulting – Exelon-Pepco Holdings Incorporated Merger (Maryland Public Service Commission and Delaware Public Service Commission), 2015.
- Gas Program and Activities Assessment of UGI's Penn Natural Gas, Inc. (UGI Corporation), 2014.
- Connecticut's Electric Distribution Companies and Gas Companies in Restoring Service following Storm Sandy (Connecticut Public Utilities Regulatory Authority), 2013.
- Assessment of Safety Policies and Emergency Response Procedures (NiSource), 2013.
- Enhancing Emergency Preparedness and Response (Connecticut Public Utilities Regulatory Authority), 2012.
- Pacific Gas & Electric Co. Pipeline Safety Enhancement Plan (California Public Utilities Commission), 2011-2012.
- Management Audit of Public Service Electric and Gas Company (State of New Jersey, Board of Public Utilities), 2010-2011.
- Management Audit of Fitchburg Gas and Light Company d/b/a Unitil (Massachusetts Department of Public Utilities), 2010-2011.

I provided expert power generation and electric and gas transmission and distribution testimony and testified during the hearings relating to:

- AltaGas Ltd. and WGL Holdings, Inc. Merger (Maryland Public Service Commission), 2017.
- Eversource Energy Service Charge and Stranded Costs Review (New Hampshire Public Utilities Commission), 2017.
- Exelon-Pepco Holdings merger (Delaware Public Service Commission), 2015.

- Exelon-Pepco Holdings merger (Maryland Public Service Commission), 2015.
- Public Service New Hampshire Clean Air Project at Merrimack Station cost of service (New Hampshire Public Utilities Commission), 2014.
- Exelon and Constellation Energy merger (Maryland Public Service Commission), 2011.
- First Energy Corp. and Allegheny Energy, Inc., merger (Maryland Public Service Commission), 2010.
- South Jersey Gas Company Rockford Eclipse valve replacement cost of service (New Jersey Public Utilities Commission), 2010.
- Electricité de France purchase of Constellation Energy Group's Nuclear Holdings (Maryland Public Service Commission), 2009.
- Exelon and PSEG merger (New Jersey Public Utilities Commission), 2006.

I have also assisted others in the preparation of testimony. While at both Mountaineer Gas and PSE&G, I helped prepare testimony in the following areas: Specific distribution system capital initiatives or projects to be included in rate base, operations and maintenance programs to be recovered as expense, rate case preparation and documentation, and appliance service costs.

I am a graduate of New Jersey Institute of Technology with a Bachelor of Science in Mechanical Engineering and Fairleigh Dickinson University with a Master of Business Administration.

A copy of my resume, which includes a list of electric and gas utility clients and commission requested assessments, is attached to this testimony as DPU Exhibit 4.1 DIR.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to support Overland Consulting Inc. in assisting the Utah Division of Public Utilities in assessing proper peak day and peak hour planning needs and associated transportation contracts at Dominion Energy Utah (DEU or Company). Specifically, I was asked to address the following:

- Evaluate DEU's distribution system planning with respect to the transmission and distribution facility requirements needed to accommodate design day and peak hour demands.
- Assess the engineering impacts on DEU's distribution system at design day and peak hour conditions in terms of operating pressures and the Company's ability to meet customer requirements.
- Evaluate the operational issues associated with serving all of DEU's utility customers with reliable safe service on design day and peak hour conditions.
- My testimony is based on limited information available at the time it was prepared; and it should be noted that no management interviews were conducted, nor were field assessment regarding implementation of Company policies, programs, or contemplated plans conducted. I reserve the right to amend my testimony should new information become available.

Q. Can you summarize the approach that you used utilized in carrying out this independent review?

A. My approach to conducting this independent review included:

- Identification and development of relevant discovery, discovery filed by others, and identification and development of additional discovery requests.
- Review of applicable testimony and related exhibits.
- Brief examination of gas system modeling and related engineering policy, practices, and procedures and how they are currently managed.
- Review of load forecasting results.
- Application of my general knowledge and experience in the utility industry.

<u>DEU's Natural Gas Load Forecasts</u>

Q. Would you please describe how DEU's natural gas load has grown?

A. Based on the Company's Integrated Resource Plan (IRP), for the plan year June 1, 2017 to May 31, 2018, DEU's gas load between 2002 and 2016 has grown as follows:

- System sales, which includes both general sales and firm transportation, have increased from 104 MMDth[1] in 2002 to 106 MMDth in 2016. The overall 14-year average increase for system sales is a relatively small growth rate of 0.14% per year.[2]
- System sales, on a weather-normalized basis, have increased from 97 MMDth in 2002 to 113 MMDth in 2016. The overall 14-year average increase for temperature adjusted system sales is 1.2% per year.[3]

Q. What is DEU's forecast for firm gas load over the next 10 years?

A. Again, referring to the Company's IRP for the plan year June 1, 2017 to May 31, 2018, DEU's gas load is projected to be 114.9 MMDth in 2017, and increasing to 123.6 MMDth in 2027. Overall the forecasted 10-year average increase for gas load is anticipated to be 0.76% per year.[4]

Q. How does the system sales forecast for 2017/2018 compare to the actual system sales, weather normalized, in 2016/2017?

A. The system sales forecasted for the 2017/2018 are just 1.02 times greater than the actual weather normalized system sales in 2016/2017.

Q. Would you please describe how DEU's day of highest firm send-out has varied?

A. Once more **r**eferencing the Company's IRP for the plan year June 1, 2017 to May 31, 2018, between 2012/2013 and 2016/2017 actual firm send-out for the coldest day varied in each of the last five winters from 1.225 MMDth to 1.239 MMDth. .[5] The overall

[1] MMDth is an abbreviation for a Million dekatherms, where one decatherm equals one million Btu or approximately one million cubic feet.
[2] Response to Discovery, DPU 2.82, DEU's IRP, June 14, 2017, Exhibit 3.10.
[3] Response to Discovery, DPU 2.82, DEU's IRP, June 14, 2017, Exhibit 3.10.
[4] Response to Discovery, DPU 2.82, DEU's IRP, June 14, 2017, Pg. 3-1.
[5] Response to Discovery, DPU 2.82, DEU's IRP, June 14, 2017, Exhibit 3.9.

average growth rate for DEU's day of highest firm send out during this period is 0.23%; and is significantly less than the year-over-year average for system sales growth of 1.2%.

Q. What is DEU's forecast for firm sales Peak Demand at Design Day over the next 10 years?

A. Based on the Company's IRP for the plan year June 1, 2017 to May 31, 2018, DEU's firm sales Peak Demand at Design Day projection is forecasted to grow from 1.778 MMDth in 2017/2018 to 1.905 MMDth in 2026/2027. The overall increase for firm sales Peak Design Day is forecasted to grow at 0.71% per year for the next 10-years.[6]

The forecasted increase for firm sales Peak Design Day of 0.71% closely tracks the overall forecasted average increase for gas load, which is projected to grow at 0.76% per year.

Q. How does the firm sales Peak Design Day forecasted for the 2017/2018 winter compared to the actual highest firm sales send out on the coldest day five-year average and the coldest day in 2016/2017?

A. The firm sales Peak Design Day forecasted for the 2017/2018 winter is 1.4 times greater than the coldest day five-year average; and is 1.5 times greater than the actual highest firm send out on the coldest day in 2016/2017.

Q. Did DEU provide any historical information on actual hourly flows for the total system on the highest send out day?

A. Yes, the Company provided actual hourly flows for the total system on the highest send out day of each of the last five heating seasons.[7] The peak hourly send out on each of the coldest winter days occurred between 7 AM and 9 AM. In further reviewing the data, peak hour swings tend to be inconsistent from year to year, with 2014/2015

[6] Response to Discovery, DPU 2.82, DEU's IRP, June 14, 2017, Exhibit 4.10.
[7] Response to Discovery, DPU 4.21, Attachment 1.

experiencing the lowest peak hour flow of .130 MMDth and 2016/2017 the highest peak hour flow of .157 MMDth. Over the five-year period the actual hourly flows have averaged .141 MMDth.

Q. Would you please describe the peak-hour demand forecasted on DEU's system?

A. The Company forecasts its peak-hour demand will continue to increase as system demand increases. In 2017/2018 the peak hour required flow rate is projected to be 0.2 MMDth and by 2021/2022 is forecasted to grow to 0.22 MMDth.[8].

Q. How does the 2016 historical information on actual hourly flows compare with the 2017 forecasted peak hour required flow rate and the 10-year average projected peak hour required flow rate?

A. The Peak Hour required flow rate forecasted for the 2017/2018 winter is 1.3 times greater than the actual Peak Hour required flow rate in 2016/2017, and 1.3 times greater than the six -year average projected Peak Hour required flow rate.

Q. Can you summarize these actual and forecasted load numbers and their respective percent increases in a table format?

A. Yes, Table DPU FTD-1 summarizes the historical natural gas load growth and the average percent increase, the forecasted natural gas load growth and the average percent increase, compares the 2017/2018 forecast of the 2016/2017 actual, and compares the 2017/2018 forecast to the previous five-year average.

[8] DEU Exhibit 3.7, Page 3 of 11.

Table DPU-FTD- 1

DEU Natural Gas Load Growth

	Actual (MMDth)			Forecast (MMDth)			Comparison of 2017/2018 Forecast to 2016/2017 Actual	Comparison of 2017/2018 Forecast to Previous Five-year Average
	2002	2016	Percent Increase per year	2017	2027	Percent Increase per year		
System Sales (includes general sales and firm transportation)	104	106	0.14%	NA	NA	NA	NA	NA
System Sales (weather normalized)	97	113	1.2%	114.9	123.6	0.76%	1.02 X greater	NA
*Firm Sales Peak Day or Peak Design Day	1.225	1.239	0.11%	1.778	1.905	0.71%	1.4 X greater	1.5X greater
*Peak Hour Demand	0.144	0.157	1.81%	**0.2	0.22	1.7%	1.3 X greater	1.3X greater

Notes: *Earliest available data for firm Peak Design Day and Peak Hour required flow rate is 2012/2013.

**Forecast Peak Hour Demand is from 2016/2017 to 2021/2022.

Q. Based on information summarized in Table DPU FTD-1, do you have any comments?

A. Yes, I have several observations concerning DEU's forecasts, as follows:

- The annual system sales forecasted for the 2017/2018 are just 1.02 times greater than the annual actual system sales in 2016/2017.
- The firm sales Peak Design Day forecasted for the 2017/2018 winter is 1.4 times greater than the actual highest firm send out on the coldest day in 2016/2017 and 1.5 times greater than the previous five-year average.
- The Peak Hour required flow rate forecasted for the 2017/2018 winter is 1.3 times greater than the actual peak hour required flow rate in 2016/2017 and 1.3 times greater than the previous five-year average.
- The forecasted growth rate for Firm Sales Peak Day to increase .71% per year, while the forecasted Peak Hour required flow rate is projected to increase 1.7%, over 2.4 times faster.

Q. Based on these observations are there any conclusions that can be drawn?

A. Yes, I have several comments regarding these observations, as follows:

- It appears that the forecasted sales Peak Design Day, as DEU defines it, may be estimated too high. The reliability of the Peak Day Design is addressed in Mr. Kenneth Ditzel's direct testimony.
- The projected firm sales Peak Hour growth rate of 1.3 times is greater than what was experienced in the last five winter seasons and 1.3 times greater than the previous five-year average and appears to be projected too high.
- The projected firm sales Peak Hour growth rate of 2.4 times is faster than the forecasted sales Peak Day rate, also appears to be projected too high.

Q. With respect to the last two observations concerning the projected Peak Hour growth rate has DEU presented any explanation for its projections?

A. No, DEU has not presented any explanation for these projections.

Q. If the projected Peak Hour growth rate were accurate, would this present a concern from a system capacity and supply perspective?

A. Yes, system capacity must be designed to accommodate the Peak Hour loads and supply must have the flexibility to meet Peak Hour loads.

Q. **Does DEU have flexibility in its options to meet a projected Peak Hour flow?**

A. Yes, DEU Exhibit 3.8, titled "Meeting Peak-Hour Demand Option Evaluation Summary:", contains eight options which the Company has identified to meet Peak Hour flow.

Distribution System Planning Models

Q. What are the key elements a utility should take into consideration when planning a gas distribution system?

A. In my experience, the key elements for successful gas system planning include:

- Develop a master plan for the system, which considers long-term system expansion, delivery reliability, system aging, and safety.
- Utilize standard planning processes, guidelines, and practices employed by a qualified staff.
- Consider the economic conditions, regulatory environment and legislative policy initiatives.
- Keep network analysis models current by receiving a variety of timely data, collecting verification feedback regarding actual system pressures on the coldest day and obtaining the results of various distribution system related field initiatives.

Q. Does DEU design its distribution system for a Design Peak Day or Peak Hour Loads?

A. DEU designs its distribution system to meet maximum flow conditions, which by definition, implies peak hour loads. Facilities such as: service lines, meters, regulator stations, gate stations and intermediate high pressure (IHP) were always designed to meet maximum flow conditions. The Company further states, the only facilities that were an exception, were high pressure (HP) mains, which historically were designed for Design Peak Day and occasionally for an estimated peak hour. In 2010 the Company initiated designing for Peak Hour Loads to HP mains through the expanded use of its unsteady state (transient flow) models[9].

Q. What are steady-state and unsteady-state flow condition analysis models?

A. The steady-state and unsteady-state are hydraulic flow condition analysis models that are used to analyze gas networks. The models support daily operating decisions for load approval and operational support, and for sizing main extensions and replacements for economy and performance. They are also used to create long-term strategic plans to maximize a gas utility's existing infrastructure. The models are developed using global growth projections as well as anticipated growth from specific planned developments. The steady-state model provides a view of the average daily pressure and usage over a 24-hour period. The steady-state model assumes consistent hourly flow throughout the day.

The unsteady-state model analyzes pressure and usage hour by hour, showing hourly fluctuations. The unsteady-state model is also used to determine the amount of Peak Hour demand/supply required on a Design Peak Day.[10] The hourly flow is built in the unsteady state model, customer by customer for the entire system.

Q. Are these models the same models that are used to forecast the Peak Design Day?

A. No, DEU uses an internally developed multivariate regression analysis model to forecast the Peak Design Day.[11] This model is further described in Mr. Ditzel's direct testimony.

Q. Who provides the steady-state and unsteady-state flow condition analysis models used by DEU and what modules does the Company use?

[9] Response to Discovery, DPU 2.56.
[10] Response to Discovery, DPU2.60.
[11] Response to Discovery, DPU2.35.

A. DEU uses a software product from third-party vendor named, DNV-GL. The software is called Synergi Gas 4.9.0 and the Company makes use of a variety of modules including: Synergi Gas (Steady-State), Unsteady-State, Model Builder, and Customer Management. These last two modules enable integration with the graphic information system (GIS) for automated model building of the network and integration with the customer information system (CIS) for load information.

DNV-GL hydraulic modeling software is considered an industry leader in gas network analysis modeling. In my experience, the use of Synergi Gas Modeling software to conduct gas network analysis is considered an industry best practice.

Q. Did you identify who at DEU performs the steady-state and unsteady-state flow condition analysis and review the training they receive?

A. Yes, DEU's System Planning and Analysis Engineering group performs the steady-state and unsteady-state analysis. Individuals in the group have received DNV-GL training on Synergi Gas Modeling, IGT training on Gas Distribution Engineering, and have attended the Synergi Gas TEAM conference. In addition, each engineer within the group has also obtained their professional license and has at least five years of experience in the field,[12]

Q. Did you review the planning processes, guidelines, and practices employed by the System Planning and Analysis Engineering Group with respect to the gas network model?

A. Yes, I reviewed a manual titled Model Build Manual dated February 12, 2018. Although still a work in progress, the manual is substantially developed and contains the pertinent sections required to accurately build IHP and HP load models. These models are needed to gain insight into system growth, identify where system reinforcements are required, determine where to spend capital dollars to ensure system reliability, and plan for gas supply. Major subjects covered in the manual include: Purpose, ongoing corrections, preliminary model build steps, facility configuration, facility extraction, update base

[12] Response to Discovery, DPU 2.58.

maps, load file creation, load models, model checking, reporting, initial design model set-up, model verification and distribution.[13]

Q. How often does DEU rebuild its steady-state and unsteady-state flow condition analysis models?

A. Since the gas distribution system and other critical inputs to the model are constantly changing, steady-state and unsteady-state flow condition analysis model rebuilds are completed by DEU on an annual basis, typically running from February through May. In my experience, annual model rebuilds are also considered an industry best practice.

Q. Please identify the information needed by DEU to populate the unsteady-state flow condition analysis model, as well as the model's major outputs?

A. An unsteady-state flow condition analysis model requires a variety of information from numerous groups within DEU and a variety of IT systems, including:[14]

- GIS (graphic information system) database of pipes and facilities
- CIS (customer information system) billing and customer use data
- Customer management module demand calculations for each customer
- Industrial Marketing Database daily contract limits for large customers
- SCADA (supervisory control and data acquisition) pressures and flow rates
- Transportation contracts and supply plans
- Design Peak Day estimate
- Intermediate high-pressure steady-state model results
- System maximum allowable operating pressures

The major outputs from the unsteady state flow condition analysis model include:[15]

- Resultant system pressures
- Gate station flow rates

[13] Response to Discovery, DPU 2.62, Attachment 3.
[14] Response to Discovery, DPU 2.63.
[15] Response to Discovery, DPU 2.64.

- Gas velocities and flow rates within pipelines

Q. Earlier in your testimony you mentioned that DEU's Design Peak Day load estimate might be forecasted too high, how would that impact the unsteady state flow condition analysis model results?

A. Design Peak Day Estimate is one of the inputs into the unsteady state flow model. Assuming the other model inputs remain the same, and the Design Peak Day load estimate as DEU defines it was forecasted too high, it would tend to result in underestimating actual system pressures (i.e. actual system pressures would be higher) and overestimating the need for the system capacity to meet the Design Peak Day load.

Verification of Distribution System Planning Model Results

Q. How does DEU verify Design Day system pressures as determined in the steady-state and unsteady state models with what is actually occurring in the gas distribution network?

A. Annually on the coldest winter day of the heating season, DEU compares actual system pressures at strategic points on their distribution system with pressures predicted by the models. The comparison covers a full 24-hour period displaying both the actual and the model generated pressures. The verification day chosen for the 2016 – 2017 heating season was January 5, 2017. All modeled pressures are sought to be verified within ±7% of their corresponding measured pressure.

Q. What were the results of this year's verification day?

A. DEU verified the accuracy of the steady-state (24-hour period) gas network analysis models by comparing the model pressures to actual pressures at 110 verification points, and the results indicated all were found to be within ±7% of the actual pressures. Of the 110 verification points 104 of the pressures in the steady-state model were within ±5% of the actual pressure.

The Company also verifies the unsteady-state (hourly results for a 24-hour period) models. The unsteady-state model minimum pressures were found to be within ±7% of the actual minimum pressures at 95 verification points on verification day. Of the 95 verification points 86 of the pressures in the unsteady-state model were within ±5% of the actual pressure.[16]

Q. What are your conclusions regarding DEU's gas network analysis models?

A. The Company utilizes state-of-the-art hydraulic network analysis models, appropriately engages a variety of model inputs and employs a skilled workforce. And based on the verification results of the steady-state and unsteady state models, the models are accurate to be used for their intended purpose.

Q. Does the veracity of the steady-state and unsteady state models conflict with your earlier observation that DEU's Design Peak Day load estimate might be forecasted too high?

A. No, it does not, the Design Peak Day estimate is one of the inputs into the network analysis model. The Design Peak Day estimate originates from a multivariate regression analysis forecast model.

<u>Distribution System Engineering</u>

Q. Please briefly describe DEU distribution assets and connecting interstate pipelines?

A. The Company's system consists of nearly 19,000 miles of distribution mains and transmission pipe operating at pressures that range up to 1,000 psig. The system is separated into many subsystems to deliver the pressures and volumes that customers require. The Company has 49 gate stations[17] and 394 full size or high capacity regulator

[16] Response to DPU Discovery 2.82, page 4-3.
[17] Response to DPU Discovery 2.84

stations where the capacity is 100 Mcfh[18] or larger.[19] DEU's high-pressure (HP) system, is connected to four interstate pipelines, Dominion Energy Questar Pipeline, Kern River Pipeline, Northwest Pipeline and Ruby Pipeline.

Q. What is the percent of Design Day delivery provided by each of the transmission pipeline companies?

A. Dominion Energy Questar Pipeline is the largest supplier, providing 1,004,214 Dth or approximately 58% of Design Day delivery. Dominion Energy Questar Pipeline is followed by Kern River, who provides for 738,379 Dth or approximately 41% of Design Day delivery. The remaining two pipeline companies, combined, provide 16,868 Dth or less than 1% of Design Day delivery.[20]

Q. Is DEU able to measure hourly flow from the interstate transmission pipelines it is connected with?

A. Yes, the Company does measure hourly flows from interstate transmission pipelines at its gate stations. The Company reports the only exceptions are small stations that serve only a few customers.[21]

Q. How are system upgrades and reinforcements determined?

A. Using IHP gas network models, the Company determines required system enhancements needed to maintain operational pressures for increased customer demand and growth. These models are used to identify the location and sizing of new mains and/or regulator stations. DEU also compares the required flow of existing regulator stations to the maximum delivery capacity, providing the information necessary to determine if upgrades or reinforcements are required. Each year the

[18] Mcfh is an abbreviation for 1000 feet per hour.
[19] Response to DPU Discovery 6.04.
[20] Response to DPU Discovery 2.84.
[21] Response to DPU Discovery 3.21.

Company constructs a number of IHP mains, new regulator stations and upgrades to existing regulator stations.

Similarly, the HP gas network models identify potential constraints to ensure that the Company's needs can be met. This entails considering gate station capacities, existing supply contracts, supply availability, line pack and the piping system itself. The interstate pipeline companies will work collaboratively with DEU to identify potential constraints. For example, DEU and Dominion Energy Questar Pipeline work together each year to update a Joint Operating Agreement (JOA) which includes details regarding the pressures and flows available at the jointly operated gate stations, as well as operational and facilities responsibilities. A key objective of the JOA is to ensure that the Company receives adequate inlet pressures to the gate stations to maintain system reliability.[22]

Q. Are collaborative meetings to discuss potential constraints between the owners of interstate pipelines companies and the utilities they serve with unusual?

A. No, transmission pipeline companies and the utilities they provide service to, meet periodically to discuss items of mutual interest including: Ownership and operation of interconnect facilities, installation of new interconnect facilities, maintenance and operation of measurement facilities and calculated pressures at each interconnect facility.

Q. Does DEU annually prepare a summary of distribution system facilities that need to be upgraded?

A. Yes, annually the Company publishes an Integrated Resource Plan (IRP) that identifies any areas where the projected distribution system pressures are near the 125-pound minimum.[23] As customer demand grows, the distribution system must be enhanced to meet the peak day needs. This results in a list of projects that need to be planned,

[22] Response to DPU Discovery 2.82, page 4-2
[23] Minimum operating pressure is the pressure in a distribution system at which if operated at a lower pressure no longer assures the safe and continuing operation of any connected gas burning equipment.

designed and constructed within certain time frames. These projects basically consist of reinforcements and replacements on the distribution system.

Projects for 2017 include both HP and IHP initiatives, such as: District regulator station installations and upgrades, preliminary work for a new gate station, feeder line projects, main replacement projects and obtaining the required approvals to build an on-system LNG storage facility.[24] Actual capital expenditures for 2017 totaled almost $69 million of which approximately $57.9 million was for HP projects and approximately $10.7 million was for work related to IHP projects.[25]

Previous IRP's between the years 2012 and 2016 were also reviewed and were in general found to be similar in content.[26] However, in the 2017 IRP a new chapter was introduced titled: Chapter 8 – Peak Hour Demand and Reliability. In this chapter DEU describes forecasts indicating that Peak Hour demand across the system will materially exceed the total firm capacity on the Peak Day for the next 10 heating seasons. The excess Peak Hour demand is projected to increase from 340,000 Dth per day during the 2017-2018 winter to 390,000 Dth/day during the 2025-2026 winter. Chapter 8 concludes with a list of potential options similar to those presented in Mr. William Schwarzenbach's direct testimony.

Q. As a result of your review of DEU's 2013 through 2017 IRP's, do you have any comments?

A. Yes, I have several observations regarding the IRP's as follows:

- Provides beneficial insight as to what is occurring within the natural gas industry.
- Continues to evolve by discussing a variety of DEU topics of interest.
- Contains a good summary of what is required to meet the natural gas requirements of the Company's customers for the ensuing year and future years.
- Opens dialogue with regulatory agencies and interested stakeholders.
- Includes Peak Hour Demand and Reliability as a separate chapter in the 2017 IRP.

[24] Response to DPU Discovery 2.82, pages 4-1 to 4-14.
[25] Response to DPU Discovery 7.2, Attachment 1, 2017.
[26] Response to DPU Discovery 6.1.

Distribution System Operations and Peak Hour Demand

Q. DEU states that in the 2017-18 Design Peak Day Model, the Peak Hour flow into the entire system is about 17% higher than the average flow on the Design Peak Day, 92% of the time.[27] Do you agree?

A. Data was not provided to allow replication of the results presented in Mr. Platt's direct testimony. However, based on the methodology described and the detail in the response to UAE discovery and my follow-up discovery,[28] I agree that based on the flow data as presented, the distribution systems Peak Hour has historically been approximately 17% higher than the Design Peak Day flow for 92% of the time.

Q. In determining that the Peak Hour volume flow will be at least 17% higher than the Design Peak Day flow, what assumptions does DEU make about loads from transportation customers and the Lake Side Power generation facility?

A. Transportation customers, including Lake Side Power Station, that have uniform loads throughout the day are modeled at their daily contract limit (DCL) as steady load throughout the modeled Design Peak Day. Transportation customers with consistent and predictable hour quantities are modeled consistent with their demand profiles.[29]

Q. What happens to the Peak Hour flow as compared to the Design Peak Hour Day flow calculation, if transportation customers, including Lake Side Power load are removed from the calculation?

A. In the previous proceeding, P.S.C.U. Docket No. 17-057-09, DEU stated if you took out the transportation customers and Lake Side Power, the Peak Hour is 5,205 Dth, or 7.3% higher than the average daily usage.[30]

[27] Platt Direct Testimony, page 3, lines 46-48.
[28] Response to UAE Discovery 2.04 and DPU Discovery 2.66.
[29] Response to DPU Discovery 2.67.
[30] Response to OCS Discovery 5.02.

Q. Doesn't the Lake Side Power generation facility load fluctuate throughout the day?

A. Yes, Lake Side Power's actual usage does fluctuate throughout the day. However, according to DEU the power plant load has never exceeded their DCL. In addition, the Company indicated it is able to physically flow control Lake Side usage to its firm contract limit.[31]

Also, it should be noted that based on the consumption rate chart presented in DEU's response to DPU 1.26, the Lake Side Peak Hour does not coincide with the DEU system Peak Hour and therefore does not directly impact the Company's Peak-Hour need.

Q. Please describe how DEU utilizes the flow control at the Lake Side Power generation facility?

A. There are actually two flow control valves at Lake Side, one controls the flow from DEU and the other flow from Kern River Pipeline. DEU states these valves serve two purposes; first, to ensure the total daily flow from each source matches the daily nominated quantities; and second, to stop flow if non-uniform flow rates in excess of quantities nominated become operationally unavailable or compromise the integrity of DEU's system.[32] To date, the Company reports it has not had the need to use valves to stop flow to Lake Side.[33]

Q. If all firm transportation customers demand was set at zero on a Design Peak Day, what impact would it have on DEU's unsteady-state model's results?

A. The unsteady-state model's results would not change. If DEU's transportation customers have no demand, then they presumably have not nominated any supply, therefore although the available gate station capacity would increase, without supply behind the capacity the model results do not change.[34]

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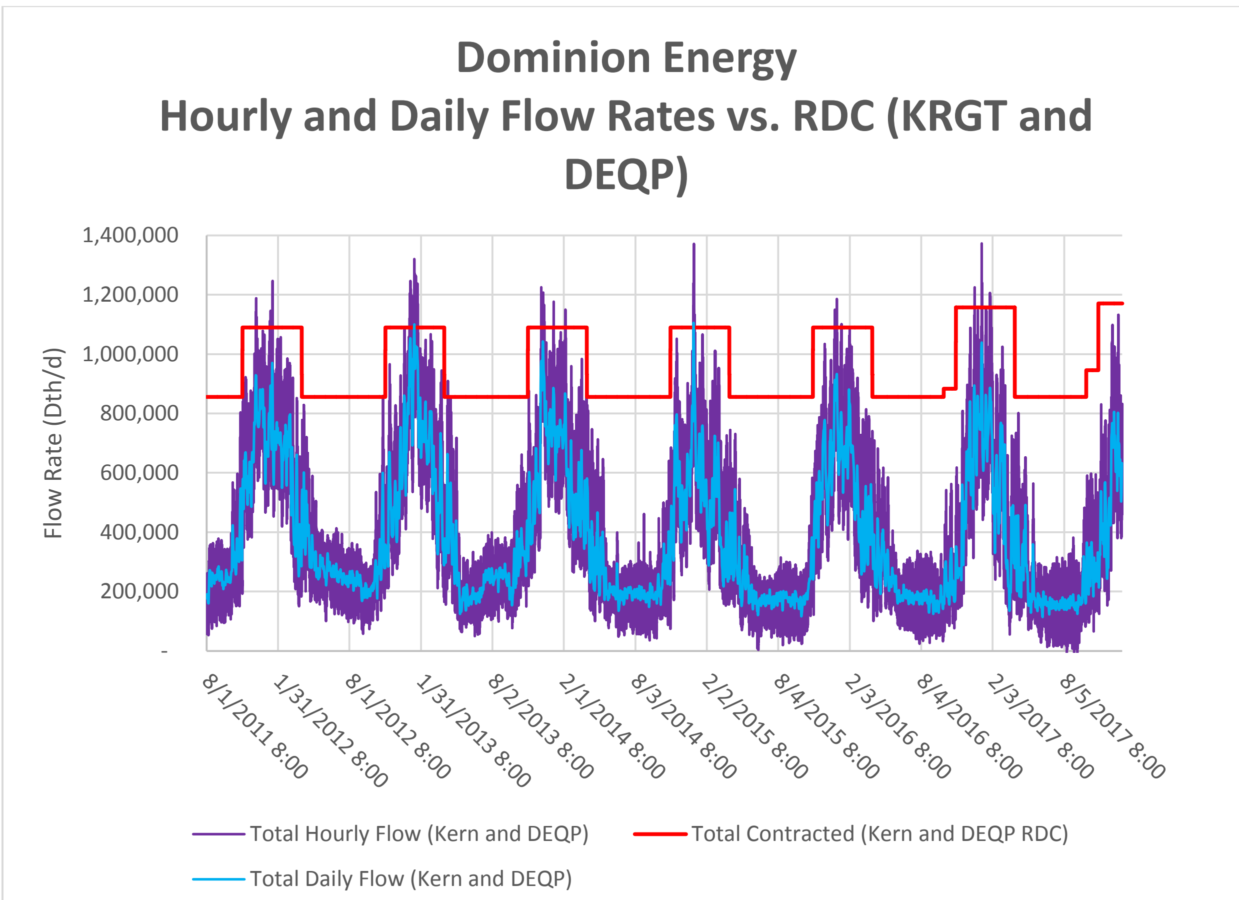
[31] Response to DPU Discovery 1.26.
[32] Response to DPU Discovery 1.28.
[33] Response to DPU Discovery 1.29.
[34] Response to DPU Discovery 3.10.9.

Q. Has DEU described how total system actual hourly usage fluctuates, not only on the coldest day of the heating season, but at different times during the year?

A. Yes, originally DEU Exhibit 3.4 showed an approximation of the hourly deliveries to the Company's system for the last several years. This exhibit was later updated, as a result of DEU's response to DPU 1.39, to accurately reflect historical hourly flow and is shown below.

Chart DPU-FTD-1



The red line describes the daily average capacity, also known as the required daily capacity (RDC), on both Dominion Energy Questar and Kern River Pipelines. The purple line shows the total hourly flow from both pipelines. The light blue line shows an approximation of the average daily flow rate. As the load on DEU's system has increased, the actual hourly deliveries have started to exceed the RDC even though the daily deliveries do not. Any deliveries that exceed the RDC are subject to pipeline operational capacity availability and are not available on a firm basis.

Q. Historically, how has DEU been able to meet peak hour demands that exceed the required daily capacity (RDC)?

A. Traditionally hourly fluctuations during peak periods have been met on an operationally available basis utilizing available upstream capacity. As these peak periods, still within available firm capacity but above the RDC on DEU's system, have become greater in magnitude and more frequent the Company states it has stretched traditional transmission pipeline line-pack capabilities that historically met customer Peak Hour demand. Consequently, DEU believed there was a need to explore alternate ways to provide service during Peak Hours.

Q. Please define line-pack and explain why can it not be increased to meet the DEU customer Peak Hour demand?

A. Line-pack refers to the volume of gas that can be stored in the pipeline. Gas can be used to refill pipelines in periods of low demand, and gas withdrawals can be made in periods of shortfall. This is accomplished by injecting more gas into the pipelines during off peak times by increasing the gas pressure, and by withdrawing larger amounts of gas during periods of high demand.

The compressibility of natural gas allows for the use of line-pack to compensate for gas demand fluctuations. However, when gas is stored in the pipeline by compressing it, the pressure exerted on all parts of the pipeline increases. The quantity of additional gas volume that can be accumulated in a pipeline depends on and is limited to the pipeline's maximum allowable operating pressure (MAOP). Once the MAOP is reached the pressure in the pipeline can no longer safely be raised, putting a limit on how much gas is available to satisfy the DEU customer Peak Hour demand.

Q. With regard to line-pack as a way to address fluctuations of hourly gas demand, please briefly summarize the actions that have been initiated by Kern River Pipeline and Dominion Energy Questar Pipeline?

A. Kern River initiated contact on October 13, 2017 with DEU to discuss "System Balancing Procedures" and indicated that daily and hourly imbalances are impairing their ability to meet the commitment of providing reliable service. In order to manage imbalances on it system, Kern River implemented the following actions:[35]

- Stage One – allow shippers the greater of 1000 Dth or 2% of the days schedule quantity.
- Stage Two – will not allow a schedule quantity variance and will limit physical flows if deemed necessary during low line-pack or potential adverse operating conditions.

Dominion Energy Questar Pipeline, during an annual joint operating agreement meeting held in 2015, indicated that its system would no longer be able to meet the increasing peak hour demand fluctuations necessary to maintain adequate pressures on DEU's systems on a firm basis. Dominion Energy Questar Pipeline went on to state, it does not have an obligation to permit hourly fluctuations or guarantee that flows above the required daily capacity (RDC) will continue during the Peak Hour of any given day.[36] As a way to address fluctuations of hourly gas demand, based upon a request by DEU, both pipeline companies have offered DEU Firm Peak Hour Services.

Q. Please explain why the use of traditional transmission pipeline line-pack during peaking hours is different than services provided by Dominion Energy Questar and Kern River under their Firm Transportation tariff?

[35] DEU Exhibit 3.3, page 11.
[36] Schwarzenbach Direct Testimony, pages 6-7, lines 118-129.

A. For both pipeline companies, Firm Transportation Service does not provide for meeting hourly fluctuations above the RDC during peak periods on a firm basis, aside from permissible variations within existing tariff provisions and no-notice service. Line-pack flows above RDC would be supplied only on an operationally (non-firm) available basis. Firm Peaking Services allow for increased flows above the RDC on a firm basis.[37].

Q. What resources does Dominion Energy Questar Pipeline and Kern River Pipeline use to provide their Firm Peaking Services?

A. Dominion Energy Questar Pipeline states that it utilizes capacity on the Overthrust Pipeline to provide its firm peaking service as well as the dedicated use of injection/withdrawal capacity at the Aquifer Storage. The cost for this capacity is included in the cost of Dominion Energy Questar's Firm Peaking Service contract.[38] The pipeline company further states that without DEU's need for Firm Peaking Service, the Overthrust capacity would not have been acquired and the Aquifer Storage flows would only be available when operationally available (not on a firm basis).[39]

Kern River Pipeline states that it utilizes capacity in its pipeline by allowing DEU to store gas through line-pack and withdraw that supply from line-pack during peak hours on a firm basis.[40] Both the Dominion Energy Questar Pipeline and Kern River Pipeline interconnections with DEU are flow controlled, so the Firm Peaking Service can provide for a set flow increase during peak hours.

Need for Peak Hour Service

Q. It is DEU's contention that additional Firm Peak-Hour Service is necessary on a Design Peak Day to maintain system reliability, do you agree?

[37] Response to DPU Discovery 2.14.
[38] Response to DPU Discovery 3.16.2.
[39] Response to DPU Discovery 1.50.
[40] Schwarzenbach Direct Testimony, page 10.

A. As mentioned previously in my testimony and further discussed in detail in Mr. Ditzel's direct testimony, I am not confident about the accuracy of DEU's Design Peak Day projections. However, to examine the Company's contention that it needs Peak Hour Service on a Design Peak Day, let's assume DEU's Design Peak Day load forecast as it defines it is correct.

To support its position that it needs Firm Peak Hour Service, DEU presented Exhibit 2.3, a list of transportation customers and regulator stations connected to the HP system feeding cities that would fall below operational pressures on a Design Peak Day without Firm Peak Hour supply.[41] The Company contends when the demand for gas exceeds the supply for too long, pressures on the system will eventually drop below the minimum operating pressure of 125 psig[42] affecting transportation customers and communities served by a one-way feed.

Q. Why is it necessary to maintain 125 psig at the inlet to a transportation customer's piping?

A. DEU's policy has been to provide a minimum of 125 psig to transportation customers. Industrial customers tend to press for higher delivery pressures to permit them to use smaller pipe in their fuel runs and/or avoid the installation of compressors, both of which are quite expensive. Consequently, maintaining the 125 psig pressure is critical to these transportation customers as their internal fuel runs and processes have been configured to receive gas at this minimum pressure. Any pressure reduction beyond 125 psig could result in reduced end use and/or appliance inefficiency and possibly loss of service.

Q. Why is it necessary to maintain 125 psig on one-way feed systems where the regulator station feeding the community is near design capacity?

[41] Platt Direct Testimony, pages 3 and 4.
[42] Psig (pound-force per square inch gauge) is a unit of pressure relative to the surrounding atmosphere.

A. On a one-way feed system, where a regulator station feeding a community is near its design capacity, customers on the system may experience outages when the inlet pressure goes below 125 psig. DEU designs its IHP system assuming there are 45 psig at the regulator station outlet. Any reduction below 125 psig at the regulator station inlet would reduce the capacity and/or the outlet pressure. As the pressure differential across the regulator becomes less, gas will continue to flow, but the reduced flow rate may not be enough to sustain the customer demand.

The decision to create one-way feed systems is primarily based on economics. Communities that are remote from DEU's network typically will be fed by a one-way feed system. Communities in more urban areas typically are fed by more than one regulator station as part of a distribution network. Transportation Service customers typically are fed by one-way systems.

Q. In addition, it is DEU's contention that if the Company were to interrupt firm transportation customers, it would likely take more than 70 minutes to affect such an interruption,[43] do you agree?

A. Through use of an automatic shut off valve (ASV) a firm service customer could be shut off almost immediately. However, interrupting a firm service customer with minimal notice will impact their ability to run their processes and equipment and could have a significant impact on their operations and products and ultimately be detrimental to the Company's commitment of supplying reliable service.

In my experience, a two-hour notice is provided to interruptible customers before they are shut off. Firm Service customers are not shut off except for force majeure type events.

Q. Based on the above DEU operations related contentions, in your opinion does the Company need a solution to meet its Peak Hour demands on a Design Peak Day?

[43] Platt direct testimony, page 6.

A. Again, as previously mentioned, I am not confident about the accuracy of DEU's Design Peak Day projections. Since Design Peak Day flow estimate is input into the unsteady state flow models, the results would be to underestimate the actual system pressures and overestimate the need for system capacity to meet the design Peak Hour demand. Mr. Howard Lubow addressed options to meeting peak period requests in his testimony.

Q. Are you aware of other utilities that plan their supply based on Peak Hour demand?

A. No, I am not, however I am aware that with the of advent of large loads, such as those for electric power generation which come and go quickly, they present increased difficulty to pipeline operators due to pipeline pressures changing with time.

Q. Does this conclude your direct testimony?

A. Yes, it does.