FORT COLLINS AREA CHAMBER OF COMMERCE

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April 8, 2019

To the Reader:

In June 2017 Platte River Power Authority (PRPA), the wholesale electrical energy supplier to four cities in Northern Colorado, commissioned an analysis to determine if there is a path for PRPA to achieve and sustain a zero net carbon (ZNC) energy portfolio of generation resources by the year 2030 and if so at what cost. That analysis released in December of 2017 concluded that a portfolio strategy to reach zero net carbon is achievable but would require additional investment and an assumption of additional market risk for PRPA and it owner communities.

Although going "zero carbon" for power generation was not the objective when PRPA commissioned the analysis, once the findings showed that a path to zero ***net*** carbon did exist, climate activists seized on this to press for zero carbon by advocating for the elimination of coal at PRPA's Rawhide Power Plant as quickly as possible.

After this issue surfaced through the news media, the Fort Collins Area Chamber of Commerce began receiving inquiries from Chamber members concerned about the future of PRPA energy transmission reliability and energy cost.

The Fort Collins Chamber reached out to the chambers of commerce in Loveland and Longmont as other PRPA owner communities with the idea of creating a study task force committed to understanding the true potential impacts of options being outlined in available studies. It was agreed that the three Chambers would form a task force that would include representatives from major electricity-user businesses.

The Northern Front Range Zero Net Carbon Task Force reviewed relevant literature and documents, held meetings with PRPA, City staff and policymakers, did public opinion polling and conducted twenty-four face-to-face interviews with major electricity users along the North Front Range. A summary of the information gathered along with conclusions of the Northern Front Range Zero Net Carbon Task Force are provided here-in.

Sincerely,
Fort Collins Area Chamber of Commerce

David L. May
President & CEO

Northern Front Range Zero Net Carbon Task Force

Summary Report

March 2019

Northern Front Range Zero Net Carbon Task Force Summary Report

March 2019

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EXECUTIVE SUMMARY

The Task Force concludes, based on first hand interviews with Front Range major power users, that electrical reliability must be the highest priority for Platte River Power Authority (PRPA). Reliable and low cost electricity along with a favorable state tax climate and excellent water have been key factors in attracting and retaining businesses along Colorado's Northern Front Range. These factors have been paramount in establishing our exceptional quality of life.

Key points learned by the Task Force through study and interviews include:

- The use of intermittent resources requires an overbuilding of power capacity that comes at a significant cost. The greater the intermittent mix, the more massive the overbuilding required.
- Overbuilding capacity to accommodate intermittent resources when a paid-for asset, Rawhide, is in use runs counter to supporting financial sustainability.
- The realization of a regional transmission organization has to be considered a MUST-DO before making any commitments beyond the current 50% renewable by 2021.
- PRPA needs to acknowledge and account for the lack of any realistic battery storage technology in the near future that can guarantee reliability at a reasonable cost.

The Task Force sees the 2020 PRPA Integrated Resource Plan (IRP) bringing together the massive amount of information and analysis necessary to build a realistic path forward in an electric power industry experiencing great change. The IRP should

include: costs of resources being proposed; timeline and impacts of PRPA's planned energy mix changes; a comparative analysis of Net-Zero and Zero Carbon strategies. PRPA's 2020 IRP should be directed to advance with objectivity and as little political influence as is possible. At the same time the Task Force fully supports prudently improving the renewables portfolio over time based on reliability and affordability goals that allow businesses to flourish in the community.

INTRODUCTION

In June 2017 Platte River Power Authority (PRPA), the wholesale electrical energy supplier to four cities in Northern Colorado, commissioned an analysis by Pace Global. The purpose of this analysis was to determine if there is a path for PRPA to achieve and sustain a zero net carbon (ZNC) energy portfolio of generation resources by the year 2030 and if so at what cost. *The Pace Global Zero Net Carbon Portfolio Analysis* [herein: Pace Study] released in December of 2017 concluded that a portfolio strategy to reach zero net carbon is achievable but would require additional investment, costs and an assumption of additional market risk.[1] Among the other key assumptions of the Pace Study was "All [PRPA] coal plants exit service by 2030."[2]

Because the path described by the Pace Study to a zero net carbon energy portfolio included additional investment costs, assumptions of additional market risk and the premature retirement of PRPA's primary coal-fired power plant – Rawhide Unit 1 – the Fort Collins Area Chamber of Commerce began receiving queries from major power-user members concerned about possible threats to future energy reliability and rates in the region. The concerns centered primarily around (1) the ability to plan in both the short and long term and (2) erosion of key considerations for companies locating and expanding along the Northern Front Range.

In response to the concerns expressed by businesses the Fort Collins Area Chamber of Commerce along with the Longmont and Loveland Chambers of Commerce

[1] Zero Net Carbon Portfolio Analysis prepared for Platte River Power Authority, Pace Global, a Siemens business, December 5, 2017, p. 26
[2] Ibid., p.4

joined together in February 2018 to form the Northern Front Range Zero Net Carbon Study Task Force [herein: Task Force].[3] The Task Force purpose was to research Platte River Power Authority's Customized Resource Planning Portfolio and Zero Net Carbon study in terms of potential impacts on business and the economy. Specifically the Task Force looked at electric rates, reliability of the electric generation system, and the costs/challenges of distribution if PRPA shifts to primarily non-carbon based power sources. The Task Force also committed to conduct interviews with major power users in Longmont, Loveland and Fort Collins to better understand the needs and concerns of business relative to electricity.[4]

Colorado's Northern Colorado Front Range corridor is historically rooted in agriculture but today is fairly urbanized with a rapidly growing population. It occupies an area from approximately 25 miles north of Denver to the Wyoming border and from the Rocky Mountain Continental Divide east to Interstate I-25. Most of the area falls within Larimer County and is home to three communities with populations greater than 75,000 – Fort Collins (165k), Longmont (94k), Loveland (76k)[5] – and one major university – Colorado State University (approximately 34,000 students).[6] The area also includes approximately half of Rocky Mountain National Park and the national park mountain gateway community of Estes Park (year-round population 6,339).[7]

[3] A roster of the Northern Front Range Zero Net Carbon Study Task Force is attached as Appendix A.
[4] PRPA member community Estes Park was not included in Task Force activity because Estes Park does not have a Chamber of Commerce and no major power users were identified.
[5] Sources include: United States Census Bureau
[6] Source Colorado State University, In Fact 2017-2018: http://irpe-reports.colostate.edu/pdf/infact/InFact-2017-2018.pdf
[7] Sources include: United States Census Bureau

TASK FORCE INTERVIEWS

Interview Methods - The methodology used in conducting interviews was conversational and based on a set of pre-conceived questions. Questions were open-ended and while some questions asked the respondent to rank or weight items the questions were not designed for use in any statistically significant way. The information gathered is primarily qualitative at a nominal level. Even the number of questions asked in interviews varied. Fort Collins interviews were comprised of thirteen questions, Loveland five and Longmont twelve. Interviewers varied as well since each Chamber of Commerce took responsibility for their respective community.

Twenty-six companies and institutions were sent a letter requesting an interview (Appendix B). Of those contacted twenty-four agreed to be interviewed; twenty companies, three K-12 public school systems and one university (Appendix C). Interviews varied from 30 to 90 minutes in length and took place between April and September of 2018.

A composite listing of all interview questions is provided (APPENDIX D), but all interviewees were assured anonymity with respect to the information recorded by interviewers.

Interview Findings – A complete set of themes derived from the twenty-four interviews conducted by the Task Force is included (APPENDIX E).
Key interview findings are:

- *Any variance in electrical power can result in substantial business losses* - Electrical energy reliability is comprised of at least two aspects: The existence of the power (when we flip the switch the power flows) and the quality of the power supplied (steady supply voltage with proper frequency and waveform to be compatible with the load it is plugged into). In some cases the absence of electrical power or variance in the quality of electrical power for even a few seconds can result in lost inventory or lost research time costing hundreds of thousands or millions of dollars.
- *Confidence in electrical energy in the US power grid is viewed as good to very good* – Reliability within the US power grid was viewed as generally good. Companies with a global footprint responded that reliability at their US facilities is very good compared to their facilities outside the US.
- *Reliability is the top priority for electrical energy followed by cost and then environment* – When asked to prioritize electricity Reliability, Cost and Environment, Reliability and Cost were by far the most important factors to all of the companies and organizations interviewed except one. One respondent represented a common theme by saying "…the minute US power starts having reliability issues, reliability moves to #1 in priority and cost and environment doesn't matter in this situation."
- *The conversation of achieving Zero Net Carbon is all by itself adversely impacting local business decisions* – One respondent stated "The conversation alone around this topic has created enough uncertainty around the long-term predictability of costs that we have put all expansion plans in the area on hold."
- *At the point added energy costs cannot be absorbed by increased efficiency those costs will be passed on to the customer. If competitive advantage is threatened then it becomes mission critical to which all other priorities must*

yield – Competitive advantage was a common decision marker among those interviewed.

- *Those in the health and education sectors are tied to their communities in such a way that they are unable to simply re-locate or expand elsewhere as a response to rising costs* – The health sector will absorb all that it can through greater efficiency but after that would likely be forced to pass costs on to customers. In the case of some educational facilities when efficiency cannot keep up with demand/use charges it would likely impact salaries, positions and as a last resort educational programming.
- *Premature retirement of PRPA's coal-fired Rawhide Unit 1*- If there was a common theme regarding premature retirement of PRPA's coal-fired Rawhide Unit 1 it was a concern about the impacts to cost and reliability. Responses ranged from a simple "No, we don't have a problem with premature closure" to it's a "Silly thought" to "It's an irrelevant question" to "Premature closures elsewhere have created problems for our company." Following is a broader representation of interviewee responses:
    - Getting off the coal grid trumps reliability because gas can modulate. Is the gas plant sized accordingly if wind and solar are down?
    - If reliability remains as high as it is now and costs to our company stay the same then Rawhide can go.
    - Stranding an asset isn't right but it boils down to reliability and cost.
    - Closure of a coal plant supplying one of our facilities elsewhere has created real problems. Based on what we see there it is a bad idea. It is akin to making payments on two assets instead of one.
    - Premature retirement is a silly thought with seventeen years of capital left. Especially when Rawhide is one the cleanest burning plants in the country. Sacrificing price and reliability is not worth the small carbon gain.
    - Is it really going to make a difference globally or is it virtue signaling? The money gained over the coming years through depreciation if it is kept online could be spent on researching new and better energy solutions.

- Since retirement of Rawhide is not possible the question is irrelevant. Continued operation will be necessary for at least 12 years in the overly optimistic ZNC plan and far longer in any realistic plan. Debt was retired in 2018.
- Even at the point of "retirement" Rawhide should remain capable of running as a backup in the event other systems fail.
- Leave closure decisions to the experts but it is about balance and it doesn't take much of a shift to tip the balance. PRPA has worked hard to balance emissions with renewable technology and gas turbines. With a growing population you have to be cautious of premature goals.

- *With respect to which sources should be included in the PRPA energy mix the overwhelming response was "all of the above" – Coal, gas, hydropower, solar, wind and new technologies if and when they occur.*
- *There is a clash between fiscal and social expectations* –Investors, often driven by customer expectations, are asking for greener energy which comes typically at a higher cost. These same investors concurrently demand ever-improving returns on investment.

GENERAL CONCLUSIONS

Platte River Power Authority has a track record of making long-term decisions in the best interest of its member communities and has historically provided some of the nation's most reliable energy at some of the nation's most competitive prices. That combination of low priced, highly reliable electricity when coupled with excellent water and a relatively favorable state tax climate has been key in attracting and retaining business along Colorado's Northern Front Range.

Platte River Power Authority of its own volition has taken significant steps to increase use of renewable energy and "prepare for long-term business needs, by adding sizable shares of wind and solar generation, increasing investment in demand-side management programs and looking for ways to reduce reliance on coal-fired generation."[8] In 2018 PRPA will deliver approximately 32% renewably sourced energy to its member communities; 50% by 2021.[9]

In July 2017 when the Platte River Power Authority Board of Directors approved the Pace Study it opened the door to a highly emotional and politically charged subject: The generation of electricity using all renewable – or non-carbon emitting – resources. Though PRPA had already been working toward a low-to-no carbon portfolio for a few years release of the Pace Study in December 2017 activated groups passionate about renewable energy. Groups such as the Colorado Sierra Club and Northern Partners for Clean Energy have pushed for PRPA to commit to

[8] 2016 Integrated Resource Plan, Platte River Power Authority, Filing Date June 15, 2016, prpra.org
[9] Platte River Power Authority, 2018 https://www.prpa.org/irp/

generating energy using 100% renewable resources and leapfrogging the zero net carbon step completely.

The Task Force concludes, based on interviews with Front Range major power users, that electrical reliability in both availability and quality must be the highest priority for PRPA. The PRPA 2020 Integrated Resource Plan (IRP) should be allowed and encouraged to advance as objectively and thoroughly as possible with as little political influence as possible. The PRPA Board has provided direction. Now PRPA staff needs to be left to do the job of modeling, forecasting, planning and decision-making. History suggests strongly that the internal IRP process together with a robust and intelligent staff, independent of externalities, stands the best chance of continued safe, highly reliable, competitively priced, fiscally sound and environmentally responsible energy from PRPA.

A Task Force Review of the literature supports that 80% (not 100%) renewable energy is achievable by 2050 (not 2030). The scientific paper providing the strongest rational and evidence for the 80% renewable energy by 2050 position (the Clack paper[10]) was prepared in response to an earlier paper by Mark Jacobson and nine other scientists (the Jacobson paper[11]). Though it is easy to get derailed in the circular arguments of my-scientists-trump-your-scientists the Task Force, after reviewing both original and ancillary papers, concludes the Clack paper presents the best case. Note that while the debate between these major papers focuses on energy mix, feasibility, grid stability and cost, both the Clack and Jacobson papers

[10] Clack, Christopher T. M. et al., (2017). Evaluation of a proposal for reliable low-cost grid power with 100% wind, water, and solar. *Proceedings of the National Academy of Sciences of the United States of America*, PNAS June 19, 2017. 201610381; published ahead of print June 19, 2017. https://doi.org/10.1073/pnas.1610381114

[11] Jacobson, Mark Z. et al., (2015). 100% clean and renewable wind, water, and sunlight (WWS) all-sector energy roadmaps for the 50 United States, *Royal Society of Chemistry*, Energy, Environ. Sci., 2015, 8, 2093.

advance timeline and conversion rates of 80% renewable by 2030 and 100% by 2050.

A Task Force inquiry into costing amplified the need for comprehensive modeling and thorough analysis by PRPA staff and their contracted consultants through the IRP process. Opinions in the literature reviewed run a wide range and none seemed in depth enough to be conclusive. One message seemed clear – the cost of energy will increase over time. It is a matter of how much, when and what decisions are made about the energy source mix.

According to the Pace Study PRPA's 2030 IRP provides electricity at a cost 33% higher than the 2018 base portfolio.[12] An analysis prepared by Energy Ventures Analysis (EVA) concluded that residential electric bills will increase by 17% or $13.60 per month under the ZNC portfolio.[13] In that scenario the ZNC portfolio is almost a doubling of the current 2018 base portfolio. The Task Force is not aware of any analysis that suggested a lowering of costs by shifting the energy mix to more renewable resources.

In analyzing the Pace Study, the EVA analysis points to a massive overbuilding of power capacity necessary to achieve reliability in the ZNC by 2030 portfolio. This overbuild comes at the expense of cost increases to PRPA customers who would pay for excess generating capacity not needed for local demand.[14] The Pace Study itself

[12] The 33% figure is calculated from the Total Cost Row in Exhibit 14: Financial Overview (Nominal Dollars), Zero Net Carbon Portfolio Analysis prepared for Platte River Power Authority, Pace Global, a Siemens business, December 5, 2017, Exhibit 14, p. 21

[13] Review of Platte River Power Authority's Zero Net Carbon Energy Study; Energy Ventures Analysis, September 2018, p. 2

[14] Ibid., pp. 5-6

shows PRPA capacity requirements in the ZNC portfolio as 77% above PRPA's 2018 capacity and 89% above PRPA's 2016 IRP capacity projection for 2030.[15]

Both the EVA and Energy Strategies analyses questioned the Pace Study assumptions and calculations with respect to CO_2 emission rates. The EVA analysis questions PRPA's ability to secure sufficient market demand for excess renewable energy sales to neighboring utilities, specifically Public Service Company of Colorado (PSCo), based in part by the recently approved Colorado Energy Plan that will have PSCo adding up to 2,400 MW of wind, solar and energy storage to its system.[16] Energy Strategies uses words like "problematic" and "erroneous" in a description of Accounting Assumption Issues in the Pace Study[17] while EVA states "…Pace's assumption that all of PRPA's surplus energy sales are replacing marginal fossil fuel generation at an emission rate of 1,803 lbs/MWh is unreasonable."[18]

The report done by Energy Strategies suggested that unknown regulatory costs and the social impacts of carbon emissions need to be factored into any cost analysis of electricity generation.[19] At the same time the Task Force interviews of major power users expressed a general acknowledgement that while at some point in the future regulatory and social costs will be better defined, given the current federal administration and political landscape, it is extremely difficult to include these

[15] Zero Net Carbon Portfolio Analysis prepared for Platte River Power Authority, Pace Global, a Siemens business, December 5, 2017, p. 19

[16] Review of Platte River Power Authority's Zero Net Carbon Energy Study; Energy Ventures Analysis, September 2018, p. 6

[17] Platte River Power Authority's Zero Net Carbon Analysis: A Critique of the Pace Global Report and Recommendations for Future Analysis prepared for Colorado Sierra Club and Northern Colorado Partners for Clean Energy; Energy Strategies, March 30, 2018, pp. 12-13

[18] Review of Platte River Power Authority's Zero Net Carbon Energy Study; Energy Ventures Analysis, September 2018, p. 6

[19] Platte River Power Authority's Zero Net Carbon Analysis: A Critique of the Pace Global Report and Recommendations for Future Analysis prepared for Colorado Sierra Club and Northern Colorado Partners for Clean Energy; Energy Strategies, March 30, 2018, p. 35

factors into any realistic short-term (2 to 5-year) planning scenario. Long-term planning scenarios usually do not give much if any weight to particular administrations and usually assume tighter carbon controls. The EVA analysis states "It is unusual in the integrated resource planning process to predict regulatory changes that go above and beyond federal regulations currently in place or in the rule making process."[20]

The characteristic of intermittency in renewable energy resources make them more difficult and costly to manage than coal-based fuel sources.[21] The participation of PRPA in a regional transmission organization (RTO) is therefore critical in PRPA's move toward more renewable generation. Participation in an RTO would allow more renewable energy to be integrated within an organized market making it easier to manage imbalance and reduce costs.[22] The current bi-lateral market balancing structure used by PRPA will allow up to a 50% renewable mix but beyond that resources will become more difficult to manage.[23]

PRPA's most recent attempt to participate in an RTO began in 2013 and experienced a major setback in April of 2018. The Mountain West Transmission Group (MWTG) Initiative would have allowed PRPA and six other interests to participate in the Southwest Power Pool.[24] On April 20, 2018 Public Service Company of Colorado, a

[20] Review of Platte River Power Authority's Zero Net Carbon Energy Study; Energy Ventures Analysis, September 2018, p. 8

[21] Note that the Task Force distinguishes between "intermittent" and "reliable" energy generation. Intermittent energy sources exist independent of reliability. Reliability is a function of system management while intermittency is a characteristic of the energy source itself. Intermittent energy sources such as solar and wind can operate within the most reliable energy supply systems depending on system management.

[22] Platte River Power Authority, Board of Directors Meeting, May 31, 2018, Agenda Item 8: Managing Renewables in Markets, Presentations p. 45 https://www.prpa.org/wp-content/uploads/2018/05/05.31.2018-Combined-Presentations-1.pdf

[23] Ibid.

[24] Mountain West Transmission Group FAQ, Platte River Power Authority https://www.prpa.org/wp-content/uploads/2017/10/Mountain-West-FAQ-101217.pdf

key participant in the Mountain West Transmission Group announced that the initiative "was not in the best of interest of our customers or the company."[25] On October 30, 2018 the Western Area Power Administration (WAPA) announced it "has decided to defer further Mountain West activity while continuing to evaluate opportunities to optimize the use of generation and transmission resources."[26]

Since forming in February, the Task Force has watched the landscape shift from an investigation by PRPA toward net zero carbon in 2030 to a push by PRPA member communities for 100% renewable energy by 2030. Two of these communities Longmont and Fort Collins have adopted resolutions to that end.[27,28] The EVA analysis points out that "…there are no specific proposals to develop the resources needed to achieve [100% renewable energy supply by 2030], nor are there any studies of the impact on the cost and reliability of electric power for PRPA's members."[29] Further EVA states that because "There has been little-to-no growth in demand for electricity for the last decade…new power plants are not needed to meet demand growth. The construction of new renewable plants to replace existing fossil plants (like Rawhide) will drive up retail power prices, as shown in the Pace ZNC Study."[30]

[25] Svaldi, A., The Denver Post, Xcel Energy ditches effort to join regional network as potential cost savings evaporate, April 23, 2018 https://www.denverpost.com/2018/04/23/xcel-energy-pulling-out-mountain-west-transmission-group/
[26] Western Area Power Administration, https://www.wapa.gov/About/keytopics/Pages/Mountain-West-Transmission-Group.aspx

[27] Longmont, City of - Resolution R-2018-05 A Resolution of the Longmont City Council in Support of Utilizing 100% Renewable Energy Sources for Longmont's Electrical Energy Supply by 2030; January 11, 2018 and related document Proclamation in Support of 100% Renewable Electricity by 2030; December 5, 2017
[28] Fort Collins, City of - Resolution 2018-094 of the Council of the City of Fort Collins Establishing a Communitywide 100% Renewable Electricity Goal, October 2, 2018
[29] Review of Platte River Power Authority's Zero Net Carbon Energy Study; Energy Ventures Analysis, September 2018, p. 10
[30] Ibid., p. 11

With an average 93.6% equivalent availability factor and a 90.2% capacity factor Rawhide has reliability characteristics more similar to a nuclear power plant yet it maintains the operating flexibility of a fossil fuel plant.[31] Besides its high reliability Rawhide is one of the lowest-cost generating resources in Colorado. According to the Federal Energy Regulatory Commission's (FERC) Form 1 database, Rawhide is also one of the lowest cost fossil-fuel power plants in the Rocky Mountain Power Area region.[32]

The Task Force draws on the Pace Study for a general statement on making decisions before technologies are in place and making large commitments before technologies mature:

- "Within the last decade, there has been significant technological and price movement in wind and solar technology. Batteries will almost certainly assist in the transition towards zero-carbon generation options. However, batteries are currently costlier than alternatives for many applications, have limited storage capability, and cannot store energy indefinitely, but many of these risks may be resolved over time. In addition, technologies such as hydrogen fuel cells, solar thermal, and non-battery storage options are being tested around the world, and may offer a material change to the economics and availability of additional forms of renewable energy and storage. For this reason, preserving optionality and flexibility in its resource plans is an important strategy consideration for Platte River. Committing too early to any one technology could lessen the ability to adapt when these technologies mature. A prudent path for Platte River would be to agree on carbon reduction targets with its members, and develop a strategy that progresses toward the desired reductions while preserving the ability to benefit from continuing technological advancements and price reductions."[33]

The Task Force would add distributive energy to the Pace Study observations above.

[31] Ibid., p. 14
[32] Ibid.
[33] Zero Net Carbon Portfolio Analysis prepared for Platte River Power Authority, Pace Global, a Siemens business, December 5, 2017, p. 29

2019 Q1 SUMMARY UPDATE

On December 3, 2018 the Northern Front Range Zero Net Carbon Task Force Summary Report was submitted to Platte River Power Authority (PRPA) and was the primary focus of a meeting between PRPA and a subgroup of the Task Force held that same day.

Three days later on December 6 the PRPA Board of Directors adopted a Resource Diversification Policy directing the "Manager/CEO of PRPA to proactively work toward the goal of reaching a 100 per-cent non-carbon resource mix by 2030." The Resource Diversification Policy identified nine advancements – caveats if you will - that must occur in the near term to achieve the 100 per-cent non-carbon resource mix by 2030 (APPRENDIX F). These caveats or some variation of these caveats were included in three of the four PRPA owner communities' resolutions adopted by each City Council committing to the 100% renewable energy goal. Longmont's resolution does not reference the nine caveats because Longmont City Council adopted R-2018-05 on December 5, 2017 prior to PRPA forming the draft Resource Diversification Policy identifying the nine conditional advancements. With its two votes on the PRPA Board of Directors Longmont did support the Resource Diversification Policy as adopted by PRPA on December 6, 2018.[34]

On January 31, 2019 the Northern Front Range Zero Net Carbon Task Force held its ninth and final meeting determining its original working assignment to research PRPA's Customized Resource Planning Portfolio and Zero Net Carbon study in terms

[34] Links to the 100% renewable energy resolutions adopted by Estes Park, Longmont and Fort Collins are in the Resources section of this Summary Report. The City of Loveland did not adopt a formal resolution but on December 4, 2018 passed a motion of support for the PRPA Resource Diversification Policy as written and passed by the PRPA Board of Directors on December 6, 2018.

of potential impacts on business and the economy and produce a formal report had been completed.

At the same time the Task Force decided to continue as a redefined business electricity alliance and will continue to monitor the planning and actions of PRPA and its four owner communities with respect to energy generation, transmission, cost, reliability and business impacts.

APPRENDIX A:

Northern Front Range Zero Net Carbon Study Task Force
Member List
February 22, 2018

David May, President/CEO, Fort Collins Area Chamber of Commerce

Ann Hutchison, Executive VP, Fort Collins Area Chamber of Commerce

Kevin Jones, Business Advocacy Director, Fort Collins Area Chamber of Commerce

Mindy McCloughan, President/CEO, Loveland Chamber of Commerce

Bill Becker, Loveland Chamber of Commerce

Scott Cook, President/CEO, Longmont Chamber of Commerce

Ethan Gannett, Hewlett Packard Enterprise

Steve Stiesmeyer, Woodward

Darren Boyle, UCHealth

John Drigot, UCHealth

Marie Zimenoff, A Strategic Advantage

Tyler Kohlberg, Anheuser-Busch

Stuart Fishbeck, Advanced Energy

APPENDIX B

June 28, 2018

Hello ***name of prospective interviewee***,

I am reaching out to you as a member of the Northern Front Range Zero Net Carbon (NFRZNC) Task Force of the Fort Collins, Loveland and Longmont Chambers. The Task Force is reviewing various plans and studies related to Platte River Power Authority (PRPA). Our goal is to understand their potential impacts on electricity costs and reliability.

As you know, PRPA is the wholesale electricity provider for Fort Collins, Loveland, Longmont and Estes Park. This arrangement has been in place since 1973. The primary source of electricity from PRPA is the Rawhide Energy Station north of Fort Collins. Rawhide is a mixed-use site with a coal-fired unit, natural gas and solar.

To better understand the needs and concerns of business relative to electricity, we are interviewing important power users. ***Prospective interviewee company name*** is one of those companies.

I would appreciate 45 minutes of your time for a confidential interview to hear your perspectives on issues related to changes in electric rates and costs as PRPA shifts to more renewable power sources.

My office will be in contact with you in the near future about scheduling a time to meet. If you are not the right person, perhaps you could provide the contact information for that person so I can connect with them.

We appreciate what your company does for our area.

Thank you for considering this request,

APPENDIX C

Northern Front Range Zero Net Carbon Task Force
Companies and Institutions Interviewed

303 Signs (LONG)

Advanced Energy (FC)

Banner Health-McKee (LOV)

Broadcom (FC)

Centura Health (LONG)

Colorado State University (FC)

Food Services of America (LOV)

Hach (LOV)

Hewlett Packard Enterprise (FC)

Hewlett Packard Inc (FC)

High Country Beverage (LOV)

Horse & Dragon Brewing (FC)

Intel (FC)

Odell Brewing Company (FC)

Poudre School District (FC)

Praxair (LOV)

Saint Vrain Valley School District (LONG)

Seagate (LONG)

Thompson School District (LOV)

Tolmar (FC)

UC Health Longmont (LONG)

UC Health PVH/MCR (LOV)

Woodward (FC)

Wal-Mart Distribution (LOV)

Fort Collins (FC); Loveland (LOV); Longmont (LONG)

APPENDIX D

Northern Front Range Zero Net Carbon Task Force

Major Power Users: Suggested List of Interview Questions

CONFIDENTIAL

This information will be aggregated with other data and not attributed to your company without your consent.

1. How critical is electricity price stability to your company and what tolerance do you have for variability?
2. Are you able to share how much electricity costs contribute to overall operating costs? If so, please elaborate.
3. As related to electricity, what is the ranking and weighting of priorities for your company with respect to: Cost – Reliability – Environment? (Sum of the weightings to = 100%)
    a. How do you perceive the reliability of these energy sources: Solar? Wind? Hydro? Gas? Coal?
    b. To achieve reliability in a proposed energy portfolio, which of these energy sources do you think should be in the portfolio?
4. What impact would the following use/demand pricing changes have on your company? 5% 15% 25% 40% 70%
5. What would drive your company to generate its own energy?
6. Would increased electricity costs make your company more likely to consider moving your business or expanding in another locale?
7. Does your company have a sustainability plan?
    a. If so, what are the key goals of that initiative?
    b. If not, does your company have objectives related to energy?
8. Is your company a signer of the Corporate Renewable Energy Buyers Principles?
    a. If so, how does your company's differ from these principles, if at all?
9. Would your company support a large electricity customer green tariff?
    a. Under what conditions?
    b. Over what timeframe?

Contextual Questions

One of the observations by Pace Global (consultant PRPA used to conduct the zero net carbon study) is that coal unit #1 at Rawhide could be retired 17 years early. Coal would be replaced as a fuel source primarily by natural gas. Some would caution that doing so comes with some risks including:

- Eliminating a source of fuel injects a higher degree of uncertainty relative to price and reliability. Coal and natural gas now compete with each other. Eliminating one means the electric utility is now subject to the vicissitudes of the other sources' market fluctuations and the elimination downward price pressure due to competition.
- Eliminated a source of fuel reduces the power generator's discretion to adjust fuel mixes to generate electricity in the most cost effective manner.
- Narrowing fuel sources reduces power reliability in the event the supply of remaining source(s) is disrupted. For instance, domestic supplies of natural gas can be disrupted by more profitable exports of liquefied natural gas.
- The Rawhide coal unit is one of the cleanest burning coal plants in America. Prematurely retiring it would strand the capital investment for minimal environmental gains

Others would say:

- The environment would benefit from eliminating the coal unit as soon as possible.
- Natural gas is now plentiful, relatively cheap and cleaner burning. The time is now to eliminate coal.
- Stranding the capital investment in the Rawhide facility would be unfortunate but is good for the environment.
- Sufficient diversity exists in solar, wind, hydro, gas to counter the argument of price uncertainty, reliability, and ability to adjust fuel mixes.

10. Knowing the above, what concerns, if any, would your company have about premature retirement of the coal unit at Rawhide?

11. Where do you think federal policy is headed on the cost of carbon? What are the drivers?

12. What are your reactions to the City of Fort Collins adopting a resolution requiring PRPA to operate using 100% renewable energy by 2030?

13. Do you agree with a business perspective on energy that says?:

- Priority is reliable, affordable electricity
- Premature retirement of coal generation is not a business goal
- Prudent to maintain diversified portfolio of energy resources
- Premature retirement of efficient, clean operating generation facilities wastes expensive community investment
- Need to understand true cost to the businesses of any renewables plan

APPENDIX E

September 10, 2018

General Themes Extracted from Interviews with Twenty-four Major Electrical Power Users from Longmont, Loveland and Fort Collins Conducted April to September 2018

Reliability

Reliability is comprised of at least two aspects: The existence of the power (when we flip the switch the power flows) and the quality of the power (steady supply voltage with proper frequency and waveform to be compatible with the load it is plugged into).

- One respondent stated, "The first question that the manufacturers of our equipment have is 'How clean is your power.'" In this context 'clean' refers to the quality of the power and is a huge part of reliability.
- Another stated "Reliability is a must have. Without it we wouldn't be here."
- Another stated "We could lose hundreds of thousands to millions of dollars if we have a blip [in the electrical supply] of even seconds."
- One interviewee made the comment "Distributed storage will come sometime and that would allow doing things a different way but it is not there today."

Reliability within the US power grid is generally viewed as Good. Companies with a global footprint responded that reliability at their US facilities is Very Good compared to their facilities outside the US.

One respondent represented a common theme by saying "…the minute US power starts having reliability issues, reliability moves to #1 in priority and cost and environment don't matter in this situation."

Prioritization of Reliability, Environment and Cost

When asked to prioritize electricity Reliability, Cost and Environment without assuming a reliable grid, Reliability and Cost were by far the most important factors to all of the companies and organizations interviewed except one.

- Overall Reliability was ranked with a weighting that made it twice as important a priority as Cost. Cost was weighted twice as important a priority as Environment.
- Depending on how the data was viewed Reliability was ranked overall 3 to 5 times more important than environment while cost remained consistently twice as important as environment.
- 54% of respondents ranked Reliability as the highest priority. 25% ranked Cost as the highest priority. 20% ranked Reliability and Cost as an equally shared top priority. One respondent ranked Environment as the number one priority.

The Impact of Changes in Use/Demand Pricing

Direct quote from interviews: "The conversation alone around this topic has created enough uncertainty around the long-term predictability of costs that we have put all expansion plans in the area on hold."

In general companies would try and absorb use/demand charges through increased efficiency but if efficiencies don't keep up then costs must be passed on to customers. In the case of industry the ability to pass costs on to customers is limited by a company's ability to maintain competitive advantage. If competitive

advantage is threatened it becomes a mission-critical issue to which all other priorities must yield.

In some educational facilities when efficiency cannot keep up with use/demand charges the dollars to fund electricity might come at the expense of salaries, positions and as a last resort educational programing. In general educational facilities said that demand pricing changes beyond 4% to 6% would be a burden with one saying a 15% increase in demand pricing is “unfathomable” indicating from their perspective a jump of that magnitude would never happen.

The electricity cost increase pain threshold for companies willing to assign a number to it ranged from 5% to 70%. There was consistency between large, medium and small manufacturers that a 15% increase in electricity cost was a significant marker that would drive action beyond simply trying to be more efficient.

Business Relocation and Expansion in Relation to Electricity Costs

One major power user interviewed would consider re-locating if electricity costs go too high but the vast majority of those interviewed would not. Expansion is another matter where 27% of those companies responding said they would consider expansion in another local or at other facilities they have elsewhere. Plainly stated by one interviewee, “If it impacts our competitive advantage we would expand elsewhere.”

The premature retirement of Rawhide Coal Unit 1

A main concern with premature retirement of the coal unit at Rawhide is reliability.

Some companies believe that “natural gas can modulate… for peak load. While another respondent shared “A coal plant closure has caused real problems for one of our operations outside of the US in attempting a shift to wind and solar.

Premature shut downs such as is being talked about for Rawhide is bad. It is akin to making payments on two assets instead of one."

Other responses ranged from "a silly thought with 17 years of capital left" to "it is not possible thus an irrelevant idea" to "in a Regional Transmission Organization Rawhide would be the last plant you shut down."

What Sources to Include in the Energy Mix

All of the currently available energy sources - coal, natural gas, wind, solar, hydroelectric - should be in the energy portfolio. One company stated that an important aspect of determining the desired balance in the case of PRPA is maintaining 60% to 70% firming energy in the mix (i.e., coal and gas).

A Set of Statements Reflecting the Business Case

The vast majority of respondents agreed with the following set of statements:

- Priority is reliable, affordable electricity
- Premature retirement of efficient and clean coal-fired energy facilities is not a business goal. To the extent it is premature wastes expensive community investment
- It is prudent to maintain a diversified portfolio of energy resources
- Need to understand true cost to the businesses of any renewable energy plan

Current Model Provides Competitive Advantage

The low utility rates, including electricity coming from PRPA and its four communities adds to the competitive advantage of Fort Collins manufacturing facilities when compared to both global units within the same company and global competition between companies.

Both Social and Fiscal Responsibility to Customers and Investors

All companies and organizations – some more than others - felt a sense of responsibility to customer and investor desires and expectations for clean energy. Concurrently those same companies expressed the reality that they are expected to forecast and balance budgets to be profitable and remain cost competitive for their customers and investors.

What Spurs Companies and Organizations to Generate Their Own Electrical Power?

Business and institutions are all over the board with respect to generating their own power. When electricity rate was considered to be the motivation toward self-generated power a cost increase of anywhere from 6% to 40% spurred action.

- 25% of the companies interviewed have no plans or intention to generate their own power.
- The other 75% are split between
    - Sentiment 1 - At a certain cost increase threshold (thresholds range from 6% to 40%) we would act on generating our own power. An inverse relationship; the larger the company the smaller the percentage in price increase required to spur action.
    - Sentiment 2 - If reliability ever becomes an issue we will act on generating our own power.
    - Sentiment 3 - We already do generate some of our own power and plan on doing more as the cost benefit ratio and cost effectiveness allow.
    - Sentiment 4 – Do not own the building so will not invest in self-generated power.

APPENDIX F:

Platte River Power Authority	**Policy**	Version #: 1.0 Original Effective Date: 12/06/2018 Next Review Date: 12/01/2020
	TITLE: Resource Diversification Policy	Page 1 of 3

Purpose:

This policy is established to provide guidance for resource planning, portfolio diversification and carbon reduction.

Policy:

The board of directors (the board) directs the general manager/CEO to proactively work toward the goal of reaching a 100 percent non-carbon resource mix by 2030, while maintaining Platte River's three pillars of providing reliable, environmentally responsible and financially sustainable electricity and services.

The board recognizes the following advancements must occur in the near term to achieve the 2030 goal and to successfully maintain Platte River's three pillars:

- An organized regional market must exist with Platte River as an active participant
- Battery storage performance must mature and the costs must decline
- Utilization of storage solutions to include thermal, heat, water and end user available storage
- Transmission and distribution infrastructure investment must be increased
- Transmission and distribution delivery systems must be more fully integrated
- Improved distributed generation resource performance
- Technology and capabilities of grid management systems must advance and improve
- Advanced capabilities and use of active end user management systems
- Generation, transmission and distribution rate structures must facilitate systems integration

Resource planning is an ongoing process and Platte River continuously evaluates opportunities to add non-carbon resources. Platte River reviews its generation portfolio annually as part of the budgeting and planning process. This process sets the foundation for developing an integrated resource plan (IRP) submitted to the Western Area Power Administration every five years as required. The resource planning process includes evaluating the progress of energy storage, distributed power sources and new technologies.

As a leader in the utility industry in Colorado for many years, Platte River will continue to move forward to meet the resource needs and wants of the four owner communities. The board recognizes the integration of non-carbon resources and new technologies will shape the future of Platte River's and the four owner communities' energy supply.

Implementing Parties and Assigned Responsibilities:

The chief strategy officer reviews this policy and necessary revisions are brought before the Platte River Board of Directors.

Associated Items (if applicable):

Definitions (if applicable):

Reliable
Platte River will provide wholesale electric power to its owner communities with the highest possible power quality and transmission service availability while providing the lowest amount of energy supply disruptions. Platte River will abide by North America Energy Regulatory Corporation (NERC) regulatory conventions for reserve requirements and reliability standards using a planning reserve margin of 15 percent and a loss of load expectation (LOLE) of 1 day in 10 years. Platte River will continue to exceed NERC reliability standards by consistently providing power delivery and transmission service to our owner communities by meeting our goal of an annual availability factor of 99.97 percent or greater.

Environmentally responsible
Platte River will provide energy products and services to its owner communities while proactively minimizing environmental impacts. Platte River will meet or exceed all federal, state and local environmental regulatory requirements and will continue to work with its owner communities to respect, protect and enhance the ecosystems along the Front Range for future generations.

Financially sustainable
Platte River's strategic financial plan (SFP) is designed to provide long-term financial viability, manage financial risk and support Platte River's mission, vision and values. Financial metrics have been established in consideration of rating agency guidelines. To manage financial assets and risk, staff will continue to implement and maintain prudent business practices in the management of reserves, maintain the enterprise risk management program and comply with financial policies. Rates shall be established to generate adequate cash flows and maintain access to low-cost capital while providing wholesale rate stability. Platte River will continue to establish and offer competitive rates and services to provide value to our four owner communities.

Document Owner: Chief Strategy Officer	**Original Effective Date: 12/06/2018**
Authority: Board of Directors	**Review Frequency:** Annually
Counsel Review: General Counsel or Associate General Counsel	**Current Effective Date: 12/06/2018**

Version	Date	Action	Author	Change Tracking (new, review, revision)
1.0	12/06/2018	Original Policy or Board Resolution 28-18	Alyssa Clemsen Roberts	New

APPENDIX G: PRPA HISTORICAL BACKGROUND PRIOR TO 1973

The origins of Platte River Power Authority are rooted in the 1960s and the vision of then Fort Collins Light & Power Utility Director Stan Case. Prior to the 1960s electric power along the Northern Front Range came from a mixture of both public and private local-independent and regional-cooperative sources.

One local-independent energy source was the Fort Collins Municipal Power Plant. The Fort Collins plant was coal-fired and operated from 1938 to 1973. Stan Case was an original crew member at the Fort Collins plant in 1938 and in 1964 became Fort Collins Light and Power Utility Director.

The 1960's would change how American's viewed many things. The Civil Rights Movement, the assassination of President Kennedy, cold war escalation evidenced by the Cuban Missile Crisis, continued action in Vietnam, President Johnson's War On Poverty and a focus on the environment. It was the focus on environment that most influenced the future of energy power generation and water storage:

"The west was the focal point of much of that debate. There were many in the West who claimed that the environment and the quality of life were every bit as important as new power and water projects…by the mid to late 1960's, it was clear that Congress would no longer be a 'rubber stamp' to such efforts in the West or anywhere else. Congress passed the Clean Air Act, in 1963; the Water Quality Act in 1965; and the Clean Water Restoration Act, in 1966. When Richard Nixon won the White House in 1969, he pledged a comprehensive approach to enhancing and preserving the environment. The Environmental Protection Agency (EPA) was created a year later."

In 1963, a group of thirty-one municipal electric utilities, known as the Colorado Association of Municipal Utilities (CAMU), met to discuss statewide energy concerns created by the need to balance financial pressures, questionable fuel supplies, growing electricity demand and the new environmental regulations. The group divided the state into quadrants with the intent that the quadrants would be brought together into one statewide joint action agency. Only the Platte River quadrant moved forward. The Platte River quadrant originally included the communities of Fort Collins, Loveland, Longmont, Estes Park, Fort Morgan, Wray, Holyoke and Julesburg. Holyoke, Julesburg and Wray dropped out of the group early on but the remaining community utilities proposed the creation of a non-profit Platte River Power Association which they took to their respective city councils in July of 1964. The alliance was realized in 1966.

The Colorado non-profit corporation Platte River Power Association changed its name to Platte River Power Authority in 1973 and contracted 90 MW of hydropower operated by the Bureau of Reclamation and marketed by Western Area Power Administration (WAPA). At that time PRPA's peak load was 90 MW so in its beginning Platte River Power Authority utilized 100% renewable federal hydropower coming from the Loveland Area Project and Colorado River Storage Project.

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