2016
Integrated
Resource Plan

Platte River Power Authority

Filing Date:
June 15, 2016

prpa.org

Inside this Document

This document is in response to Western Area Power Administration's (Western) requirement of its federal hydroelectric customers to submit an Integrated Resource Plan (IRP) every five years after the approval of the customer's initial IRP. Platte River Power Authority's (Platte River) initial IRP was submitted on November 20, 1996, and its official anniversary date is June 15 of each filing year. Platte River's last IRP was effective for the period July 27, 2011, to June 15, 2016.

This document will address the following IRP requirements, as prescribed and summarized by Western:

- Provide ample opportunity for full public participation
- Describe efforts to minimize adverse environmental effects of new resource acquisitions
- Conduct load forecasting
- Identify and compare all practicable energy efficiency and energy supply resource options
- Include action plan with timing set by customer
- Include brief description of measurement strategies for options identified in IRP to determine whether objectives are being met

IRP Checklist

In general, each Western customer must prepare and submit an IRP to Western that considers its electrical energy resource needs. In order to satisfy the specific requirements of the regulation, the IRP must address the following questions.

Document Section	Requirement	Included in this IRP	Page
Public Participation	Does the IRP provide ample opportunity for full public participation in preparing and developing the IRP?	✓	p.8
Public Participation	Does the IRP include a brief description of public involvement activities?	✓	p.8
Load Forecast	Does the IRP contain a statement that the customer conducted load forecasting, including specific data?	✓	p.10
Load/Resource Balance	Does the IRP provide adequate and reliable service to the customer's electric consumers?	✓	p.14
Load/Resource Balance	Does the IRP take into account the necessary features for system operation?	✓	p.14
Demand Side Management	Does the IRP take into account the ability to verify energy savings achieved through energy efficiency?	✓	p.22
Demand Side Management	Does the IRP take into account the projected durability of such savings measured over time?	✓	p.22

Document Section	Requirement (continued)	Included in this IRP	Page
Environmental	Does the IRP, to the extent practicable, minimize adverse environmental effects of new resource acquisitions and document these efforts?	✓	p.29
Environmental	Does the IRP include a qualitative analysis of environmental effects in a summary format?	✓	p.29
Portfolio Analysis	Does the IRP list the time period that the action plan covers?	✓	p.33
Portfolio Analysis	Does the IRP evaluate the full range of alternatives for new energy resources?	✓	p.33
Portfolio Analysis	Does the IRP treat demand and supply resources on a consistent and integrated basis?	✓	p.33
Portfolio Analysis	Does the IRP consider electrical energy resource needs? The IRP may, at the customer's option, consider water, natural gas, and other energy resource options.	✓	p.33
Portfolio Analysis	Does the IRP identify and compare resource options?	✓	p.33
Portfolio Analysis	Does the IRP clearly demonstrate that decisions were based on a reasonable analysis of the options?	✓	p.33
Portfolio Analysis	Does the IRP identify a baseline from which the customer will measure the benefits of IRP implementation?	✓	p.33
Results and Key Findings	Does the IRP include an action plan describing specific actions the customer will take to implement the IRP?	✓	p.41
Results and Key Findings	Does the IRP include an action plan summary consisting of actions the customer expects to take in accomplishing the goals identified in the IRP, milestones to evaluate accomplishment of those actions during implementation, and estimated energy and capacity benefits for each action planned?	✓	p.41
Results and Key Findings	Does the IRP contain a brief description of measurement strategies for identified options to determine whether the IRP's objectives are being met?	✓	p.41

Executive Summary

Platte River Power Authority (Platte River), in coordination with its owner municipalities (Estes Park, Fort Collins, Longmont, and Loveland), has prepared this integrated resource plan with an emphasis on CO_2 emission reduction options, covering the 20-year planning period from 2015 to 2035. The IRP focuses on two distinct analytical segments—the near-term ***Resource Acquisition Period*** (2015-2020), and the ***Planning Period*** (2020-2035).

The purpose of this document is to satisfy the Integrated Resource Plan filing requirements as prescribed by Western, and to provide recommendations and actions for changes to Platte River's existing operations in preparation of long-run energy industry changes arising from technological progress, consumer preferences, and regulatory mandates.

Due to the growing interest in the climate impacts from greenhouse gases, this 2016 IRP places emphasis on portfolio options that can provide significant CO_2 emission reductions. Platte River considers this to be particularly relevant now, given the increasing likelihood that carbon regulations will come into effect, including possible future implementation of the US EPA's Clean Power Plan (CPP), a federal rule designed to reduce carbon emissions from the electric power sector.

Many uncertainties could change the outlook for Platte River's resource needs in the coming years, but Platte River enters the future with a portfolio of reliable resources and the momentum to adjust to changing conditions. The remainder of this IRP report will focus on the methodology and key findings from an extensive portfolio analysis used to satisfy Western's IRP requirements.

Platte River's 2016-26 Strategic Plan

Annually, Platte River develops a Strategic Plan to guide long-term business decisions. The Strategic Plan is an important catalyst for Platte River's IRP—it helps tie together Platte River's business practices from its high-level Vision, Mission, and Values down to its daily Operating Goals. Details of the 2016-26 Strategic Plan can be found on our website under "Plans."

In particular, several of Platte River's Key Operational Goals work to inform this IRP and act as the drivers for our resource analysis:

Platte River Initiatives and Objectives that Influence this IRP

2016 Strategic Initiatives

Safety
Compliance
Financial Stability
Employee Engagement
Resource Management
Operational Excellence
Exceptional Customer Service
Collaboration And Communication
Technological Innovation and Sustainability

Key Operating Goals

Renewable Energy Supply Integration
Optimize integration of the 60 MW Spring Canyon wind resource and 30 MW Rawhide Flats Solar project into Platte River's operations

EPA Clean Power Plan
Actively engage in Colorado's stakeholder process to help shape the State Compliance Plan so it aligns with Platte River's strategic direction

Climate Change and Resilience
Assess risk and uncertainty due to climate change, and then develop plans to improve electric system infrastructure resiliency

Resource Planning
Develop and implement a strategy to exit ownership of Craig Unit 1, expand system-wide energy efficiency programs, implement a system-wide demand response technology pilot, and develop a distributed resource strategy

Rate Planning and Coordination
Continue collaborating with the owner municipalities, including exploring long-term rate development and potential changes to rate structure

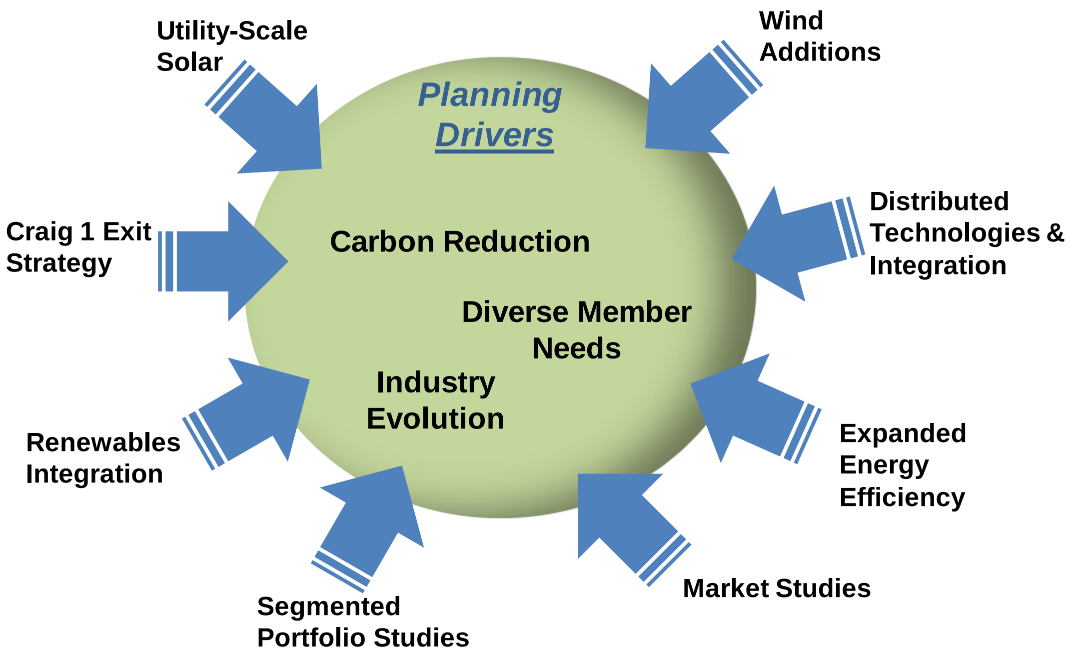
Regional Wholesale Market Initiatives
Proactively engage in the design and development of organized markets in the Rocky Mountain region to help ensure that the market structure is workable for all participants

Action Items for the 2016 IRP

Platte River is well-suited to provide its customers long-term, reliable, and low-priced power for the foreseeable future. Under a variety of traditional planning standards, Platte River does not show a need for additional generating capacity until the late 2020s—well outside the Resource Acquisition Period. Similarly, under state standards, Platte River's next renewable resource would not be needed until after 2030. For the purposes of this IRP, near-term capacity additions are not the primary driver for future resource needs.

The purpose of this IRP is to determine Platte River's action plan to prepare for pending federal emissions legislation, industry evolution, and changes in the mix of resources our customers prefer, while continually focusing on the reliability of our power system.

Current and Planned Actions to Prepare for Future Resource Needs



It is likely that carbon regulations and the long-term goals of our communities will advance the need for portfolio changes. Platte River has taken steps over the past several years to help position the business for these changes and we will continue to focus on enhancing our portfolio to respond to these emerging needs. ***The common thread for the 2016 IRP Goals is carbon dioxide (CO_2) reduction. The 2016 IRP emphasizes CO_2 reduction as one of the primary drivers of the analysis.***

2016 IRP Action Plan	Schedule
Continue to diversify the portfolio to prepare for long-run CO_2 reductions	
▶ **Immediately pursue a diversification strategy to exit Platte River's share of Craig Unit 1**	**2016-17**
▶ **Integrate 30 MW of new solar generation into the portfolio beginning in 2016**	**2016-17**
▶ **Evaluate the acquisition of additional renewables generation**	**Ongoing**
Prepare for business structures, products, and programs preferred by our member-owners	
▶ **Work with member communities to develop customized future supply portfolios**	**2016-17**
▶ **Continue expansion of cost-effective energy efficiency programs**	**Ongoing**
▶ **Continue development and implementation of a demand response pilot**	**2016-17**
▶ **Participate with member-owners in the development of distributed technologies such as community solar and combined heat-and-power applications**	**Ongoing**

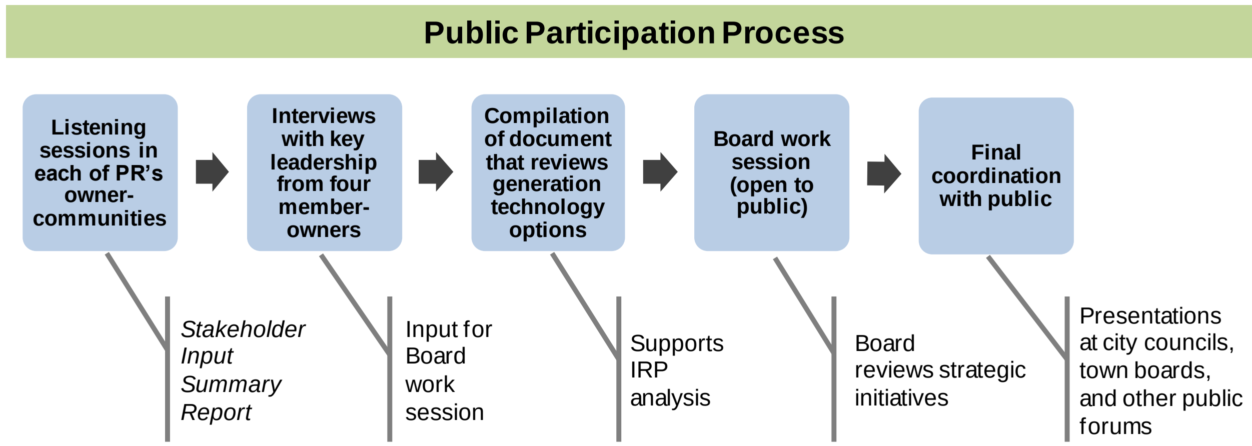
2016 IRP Action Plan (continued)	Schedule
Continue to implement ways to maintain the high reliability of Platte River's power system	
▶ **Look to secure affordable ways of balancing expected long-term growth in renewables generation through contracted tariff services or future services markets**	**2016-2020**
▶ **Manage unit outage risk through mutual support agreements, use of peaking resources, or other market opportunities for capacity**	**Ongoing**
▶ **Actively monitor regional markets to understand options for cost-effective reliability products**	**Ongoing**
▶ **Provide direction to influence the development of regional energy and ancillary services markets**	**2016-17**

Measuring Progress

Through arrangement with Western, Platte River issues a report on or before June 15 of each year to define progress toward its IRP objectives. Platte River uses Western's electronic program to provide the requested information.

Western's IRP Regulations (10 CFR Part 905) require Platte River to submit IRP progress reports that list accomplishments pursuant to the IRP Action Plan, including projected goals, implementation schedules, resource expenditures, energy and capacity benefits, and renewable energy developments achieved compared to those anticipated.

Public Participation



Several public communications processes in recent years have influenced the content of the 2016 IRP documents. Frequent interactions between Platte River, the member utilities, municipal boards and councils, and the citizens of member communities have facilitated an effective exchange of information on the public issues of electric load growth, resource supply, and environmental stewardship.

Listening sessions for the 2016 IRP

- Platte River began its IRP public participation process in 2014 by conducting a total of five community listening sessions: four in-person sessions at each municipality, as well as a webinar. Discussions centered on the subject of future electricity resources.
    - **Loveland, CO** – 3/24/2014
    - **Longmont, CO** – 3/26/2014
    - **Fort Collins, CO** – 3/27/2014
    - **Estes Park, CO** – 3/31/2014
    - **Webinar** – 4/9/2014

The discussions followed a collaborative Q&A format between Platte River and community representatives, primarily focusing on Platte River's future renewable options by comparing environmental values relative to competitive rates. Input from the Listening Sessions was summarized into a *Stakeholder Input Summary Report*, which was used to help develop high-level planning concepts for the 2016 IRP.

Interviews with Municipalities

Prior to the Board Work Session in 2015, Platte River conducted a formal interview plan with key leaders from each of the four municipalities. An independent representative discussed resource planning issues with the key leaders to help develop a report profiling the similarities and differences in long-term planning expectations for each of the municipalities. This report helped guide the discussion and outcomes of the Board Work Session.

Analysis of Generation Technology Options

Based on outcomes from the Listening Sessions with our owner communities, Platte River developed a report that evaluates a full range of potential resource options to be included in the IRP analysis. This report acts as the screening tool that reduces the amount of analytical effort required for the IRP by limiting modeled resources to those considered most viable.

Board Work Session

The Board of Directors met on August 19, 2015 for a work session to discuss Platte River's future resource needs. Agenda items included the Clean Power Plan, resource needs during the Resource Acquisition Period, mid-term strategic planning (through 2030), updated consideration of Platte River's resource planning guidelines, and the IRP stakeholder process. The Board heard Platte River's findings from its Craig resource analysis, which was the foundation for the 2016 IRP modeling scenarios. From the discussion, a new set of guidelines was developed for resource planning (for use in future IRP and resource planning) as shown at right:

Employ an adaptive strategy to cost-effectively maintain reliability, manage risks, and ensure regulatory compliance

Final Coordination with the Public

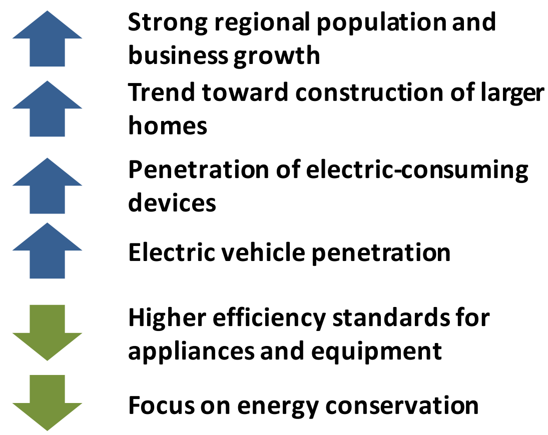
After the Board Work Session, additional meetings were held at regional public forums and civic events to communicate direction of Platte River's overall resource planning efforts and the 2016 IRP process. The list below represents just a few of the public meetings that were presented at by Platte River.

- **Loveland Utility Commission** – 12/17/2014
- **Fort Collins Energy Board** – 9/2/2015
- **Loveland Utility Commission** – 9/16/2015
- **Local Legislator Contingent** – 9/18/2015
- **FortZED** – 10/2/2015
- **Fort Collins Staff** – 10/8/2015
- **Estes Park Town Board** – 10/13/2015
- **Loveland City Council** – 10/27/2015
- **Longmont City Council** – 11/10/2015
- **Joint Technical Advisory Committee** – 11/18/2015
- **Loveland Key Accounts** – 12/10/2015
- **Longmont Power and Communications Staff** – 1/26/2016
- **Fort Collins Climate Action Plan Executive Team** – 2/18/2016
- **Fort Collins Energy Board Coordination Meeting** – 4/28/16

Load Forecasting

Platte River conducts load forecasts annually for business planning purposes, producing a base case forecast, along with high and low sensitivities. Econometric and statistical models are used to develop long-term monthly energy and demand forecasts. Each forecast scenario projects loads absent of transmission losses. Projected losses are added to the calculated load forecasts for analysis and planning purposes. Hourly load shapes utilized for modeling purposes are derived from the monthly forecasts.

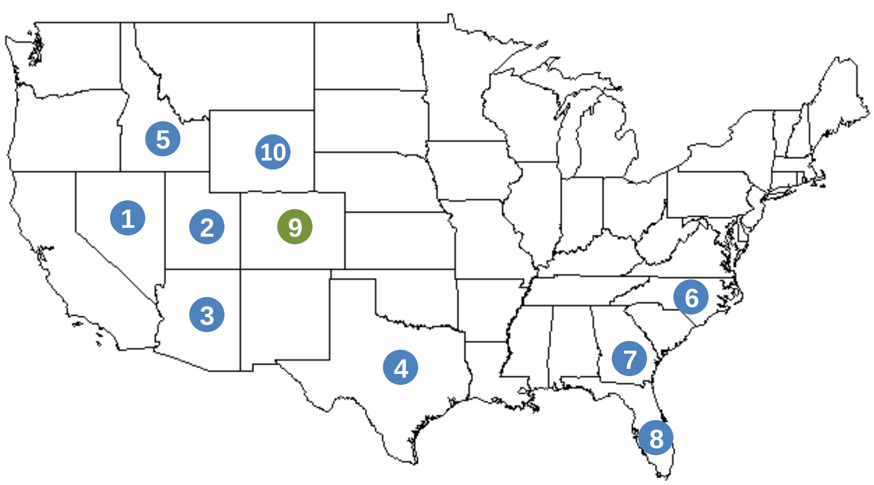
The load forecast in the 2015-2025 Strategic Plan was modified to reflect updated energy savings assumptions used in this IRP.



Drivers of Electricity Consumption

Electricity consumption at the national level continues to grow due to several significant underlying trends, some of which are more pronounced in northern Colorado. Driving total electricity consumption in Colorado are strong population and employment growth. During the past ten years, Colorado has ranked as the ninth fastest growing state at an average annual rate of 1.5% vs. the US average of 0.9%. The movement of individuals around the US has favored milder states in the Western and Southern US, with Midwestern states experiencing high out-migration as effects of the recent recession struck traditional manufacturing states.

Top Ten States in Population Growth, 2014



Platte River Load Forecast

In the modified 2015 Official Load Forecast, 2015 base case energy consumption was projected to increase 1.5% relative to 2014. An annual average growth rate of 1.6% was projected for energy consumption over the course of the twenty-year IRP term. The high case projects 2.6% average annual growth from 2015 through 2035, while 0.9% average annual growth is projected over the same timeframe in the low case.

The peak demand in 2015 was projected in the base case to increase by 3.2% over the 2014 peak demand. Below average weather conditions during 2014 resulted in a lower than projected peak demand. Normal weather conditions are assumed in 2015 for the Base Case, resulting in a higher one-year growth rate. Peak demand was forecast to grow at an average rate of 1.6% from 2015 through 2035 in the base case. The high case projects 3.3% annual average increases for peak demand during the IRP term, while peak demand increases 0.7% annually in the low Case.

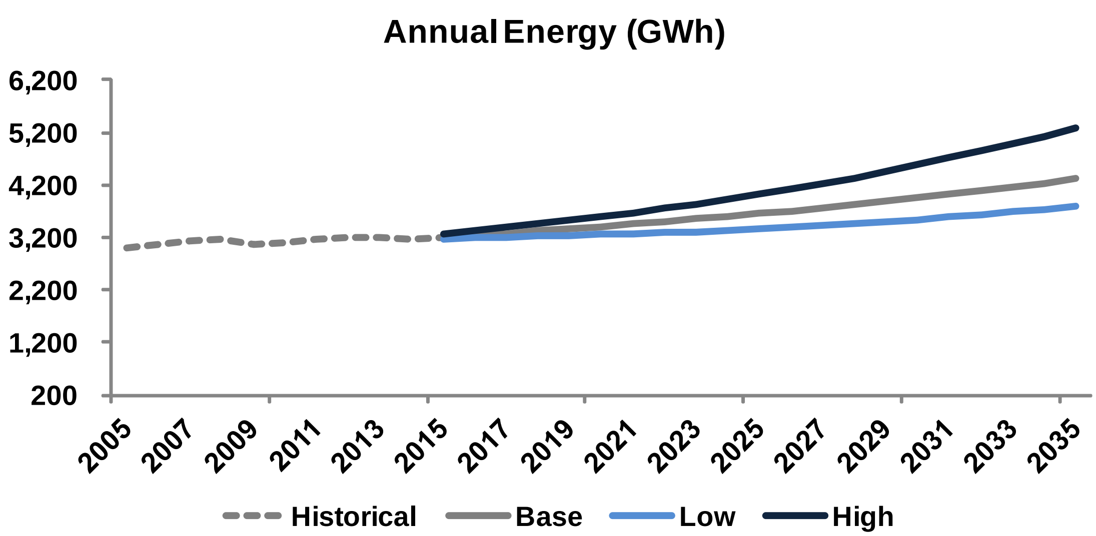
The following table summarizes the three forecast scenarios—base, high, and low.

Forecast Summary by Scenario

	Annual Energy (GWh)			Peak Demand (MW)		
Year	**Base**	**Low**	**High**	**Base**	**Low**	**High**
2015	3,202	3,168	3,258	646	639	657
2016	3,241	3,184	3,321	654	642	670
2017	3,282	3,200	3,387	663	646	684
2018	3,323	3,216	3,455	672	649	698
2019	3,365	3,233	3,526	681	653	712
2020	3,409	3,251	3,600	691	657	727
2021	3,455	3,270	3,678	700	661	743
2022	3,502	3,290	3,759	710	665	759
2023	3,551	3,313	3,844	720	669	781
2024	3,602	3,336	3,933	731	673	807
2025	3,655	3,362	4,027	742	677	835
2026	3,711	3,394	4,128	753	682	865
2027	3,769	3,427	4,233	765	687	896
2028	3,829	3,461	4,342	777	692	929
2029	3,890	3,497	4,457	789	697	964
2030	3,955	3,537	4,578	801	703	1,000
2031	4,023	3,583	4,708	814	708	1,039
2032	4,092	3,630	4,842	828	714	1,080
2033	4,163	3,680	4,983	841	720	1,123
2034	4,236	3,731	5,131	855	726	1,168
2035	4,312	3,786	5,286	869	733	1,216

Historical and Base Case Forecast Energy (GWh)

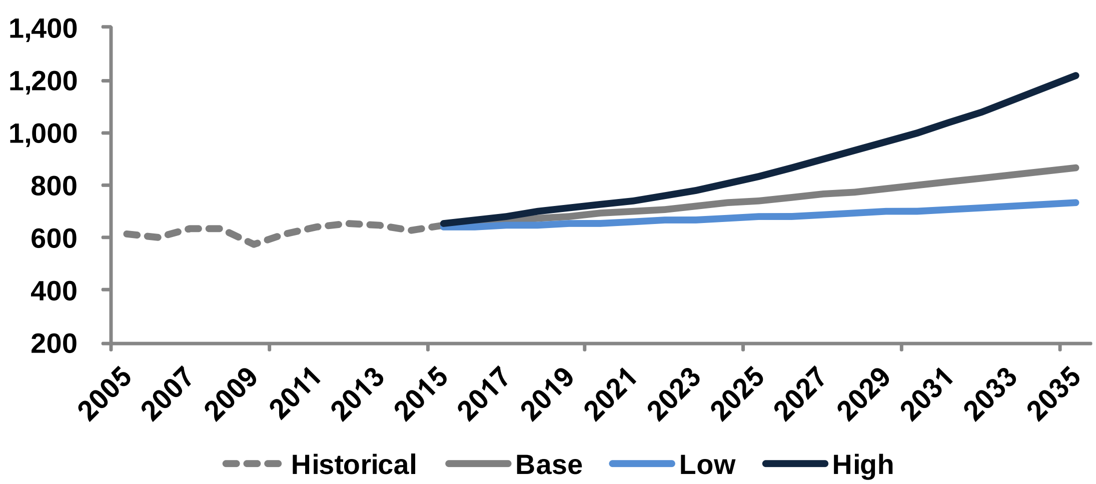
	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Historical	**2005**	254	224	240	224	237	250	298	273	245	237	238	268	2,986
	2006	251	235	248	226	244	274	299	287	234	243	244	269	3,052
	2007	278	242	245	235	242	264	315	307	251	246	245	278	3,147
	2008	279	249	254	240	248	260	313	290	246	250	246	281	3,157
	2009	269	234	247	237	241	246	283	277	248	249	244	282	3,056
	2010	271	242	249	231	239	266	298	296	252	245	252	271	3,112
	2011	275	250	251	236	243	261	315	317	252	250	253	281	3,182
	2012	267	253	247	234	247	295	321	302	254	242	248	275	3,185
	2013	276	245	256	243	248	278	303	304	262	250	248	282	3,196
	2014	275	251	254	237	248	259	299	288	264	249	254	283	3,163
Forecast	**2015**	278	251	254	239	246	276	312	305	258	251	251	282	3,202
	2016	282	255	256	242	248	280	316	308	261	254	253	285	3,241
	2017	286	259	259	245	250	284	320	312	265	258	256	289	3,282
	2018	290	263	262	247	252	289	325	316	268	262	258	292	3,323
	2019	294	267	265	250	254	293	329	320	271	266	261	296	3,365
	2020	298	271	268	253	256	298	334	324	275	270	263	299	3,409
	2021	303	275	271	256	258	303	339	328	279	275	266	303	3,455
	2022	308	280	274	259	261	308	343	332	283	279	268	307	3,502
	2023	312	284	278	263	263	313	349	337	287	284	271	311	3,551
	2024	317	289	281	266	266	319	354	341	291	289	274	315	3,602
	2025	323	294	285	269	268	324	359	346	295	294	277	319	3,655
	2026	328	299	289	273	271	331	365	352	300	299	281	324	3,711
	2027	334	305	293	277	274	337	371	357	304	305	284	329	3,769
	2028	339	310	297	281	277	343	377	362	309	311	288	334	3,829
	2029	345	316	302	285	280	350	384	368	314	317	291	339	3,890
	2030	351	322	306	289	284	357	390	374	319	323	295	344	3,955
	2031	358	328	311	294	287	365	397	380	325	329	299	349	4,023
	2032	365	334	316	299	291	373	404	386	330	336	303	355	4,092
	2033	371	341	321	303	295	380	411	393	336	343	308	361	4,163
	2034	378	347	326	308	299	389	419	399	342	350	312	367	4,236
	2035	386	354	331	313	303	397	427	406	348	358	317	373	4,312



Platte River Historical and Base Case Forecast Demand (MW)

	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Peak
Historical	**2005**	459	428	402	386	476	537	618	550	503	407	447	497	618
	2006	435	458	429	392	462	603	591	590	445	418	473	467	603
	2007	478	478	442	396	425	611	635	614	529	410	446	482	635
	2008	487	460	435	400	459	551	614	634	483	419	450	518	634
	2009	490	434	410	404	474	536	576	559	499	432	436	512	576
	2010	486	454	414	389	470	575	615	595	487	422	476	468	615
	2011	487	513	450	388	405	573	639	612	586	455	440	505	639
	2012	464	451	428	418	464	653	651	612	547	423	451	479	653
	2013	481	448	438	429	460	639	649	624	618	423	458	505	649
	2014	479	511	445	399	490	545	626	591	565	433	461	505	626
Forecast	**2015**	488	483	439	409	458	604	646	619	569	437	456	501	646
	2016	495	490	443	413	461	613	654	627	576	443	460	507	654
	2017	502	497	448	418	465	623	663	634	583	450	464	512	663
	2018	509	505	453	423	468	632	672	642	591	456	469	518	672
	2019	517	513	458	427	472	642	681	650	598	463	473	525	681
	2020	524	521	463	432	476	652	691	658	606	470	477	531	691
	2021	532	529	469	437	480	663	700	666	614	478	482	537	700
	2022	540	537	474	443	484	674	710	675	622	485	487	544	710
	2023	548	546	480	448	489	685	720	684	631	493	492	551	720
	2024	557	554	486	454	493	696	731	693	640	501	497	558	731
	2025	565	564	492	459	498	709	742	702	649	510	502	565	742
	2026	574	573	498	465	503	721	753	712	658	519	508	573	753
	2027	584	583	505	471	508	734	765	722	668	528	514	581	765
	2028	593	593	511	478	513	748	777	732	678	537	520	589	777
	2029	603	603	518	484	519	762	789	743	688	547	526	597	789
	2030	613	613	525	491	524	776	801	754	698	557	532	605	801
	2031	623	624	533	498	530	791	814	765	709	568	538	614	814
	2032	634	635	540	505	536	807	828	777	720	579	545	623	828
	2033	645	646	548	512	542	823	841	789	731	590	552	632	841
	2034	656	658	556	520	548	839	855	801	743	601	559	642	855
	2035	667	670	564	527	555	856	869	813	755	613	566	651	869

Annual Peak (MW)



Load/Resource Balance

This section summarizes the predicted balance between Platte River system loads and existing resources over the long-term, and discusses the potential need for new firm capacity resources in the future. The decision to add a new capacity resource is based on ensuring an adequate balance between loads and resources at all times.

Resource Addition Criteria

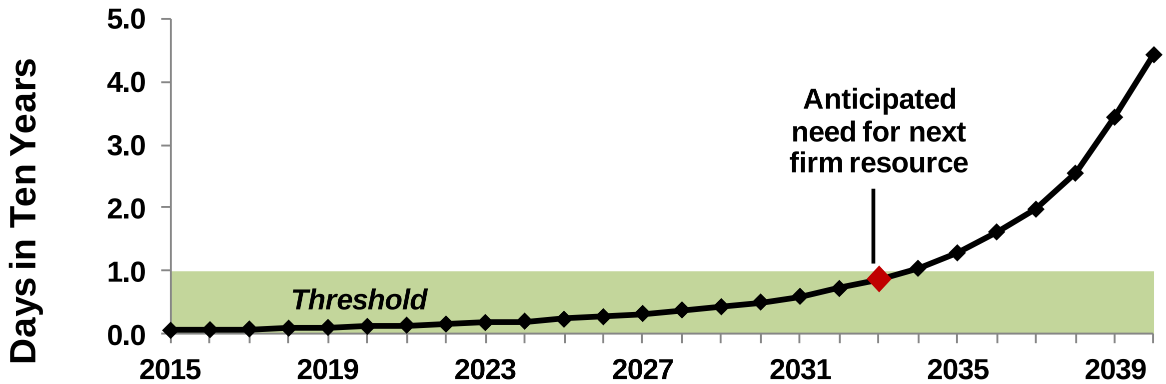
Maintaining a planning reserve margin of 15% with all generation units operating represents typical practice for electric utilities in the region. In the future, standards may be set by Western Electricity Coordinating Council (WECC), North American Electric Reliability Corporation (NERC) or Federal Energy Regulatory Commission (FERC), which could require different levels of planning reserves. Platte River will continue to monitor such developments over time.

Currently, individual balancing authorities within the WECC have the latitude to determine their own resource adequacy levels, and there are no requirements for specific analytical techniques. However, most NERC regions employ planning methods that use loss-of-load probability (LOLP) and/or loss-of-load expectation (LOLE).

Platte River uses the following criteria for determining the timing of new firm generation resources:

Planning Standard	Expected Capacity Needs
Maintain a minimum planning reserve margin of 15%	Under this standard, Platte River is not expected to need additional firm capacity until after 2030.
Ensure loss of load expectation (LOLE) of less than one day in ten years.	Platte River's LOLE analysis indicates that system peaks are likely to exceed available supply on a one-in-ten basis in the 2033 timeframe. The addition of about 10-15 MW/year may be required after 2033 for Platte River to maintain the one-in-ten threshold.

Platte River Loss-of-Load Expectation



To maintain the one-day-in-ten-years standard, Platte River would need to add approximately 10-15 MW per year after 2033.

Projected Balance of Peak Loads and Firm Resources

This section describes the projected balance of peak loads and firm resources under various scenarios of resource availability.

Currently, available firm resources include the Rawhide coal unit, Platte River's share of the two Craig coal units, the five Rawhide natural gas peaking units, and the Colorado River Storage Project (CRSP) and Loveland Area Projects (LAP) hydroelectric contracts with Western. Additional purchase options may also be available from Western—Western Replacement Power (WRP) and Customer Displacement Power (CDP). In the event Rawhide is out of service, firm energy is available through a third-party outage assistance agreement under most conditions. Platte River's wind and future solar generation, discussed in later sections, are not firm resources. Each of the firm resources has some risk of availability as outlined below:

Expected Reliability of Platte River's Portfolio Components

Rawhide coal unit	The Rawhide coal facility has consistently demonstrated high availability. For planning, Platte River assumes a forced outage rate of 3%, which is in line with recent historical marks. Unexpected outages have typically been caused by failure in plant equipment. Curtailments in output have also been caused by transmission limitations, though these have been rare.
Craig coal units	Although the Craig facility has been a historically reliable plant, it has had lower availability over the past five years. Platte River uses a planning assumption of 5% for forced outages at Craig. Equipment failures have been the driver for recent outages, although transmission curtailments can also limit deliveries from the Craig units.
Rawhide gas peaking units	These units are only operated at peak times or when another resource is unavailable, so the forced outage rate is not a consistent unit of comparison. Historically, the average availability has been over 93%. Equipment failures, transmission limitations, and fuel supply disruptions are risks that must be managed for these units.
CRSP and LAP hydropower purchases	These deliveries are made on a monthly basis, according to contracts with Western. Hydro deliveries have been highly reliable.
WRP/CDP hydropower purchases	Western can provide short-term capacity with two products: Replacement power – must be scheduled in advance; Western uses its transmission system to deliver firm market purchases to Platte River. Customer displacement power – Platte River can generate or acquire power, and use Western's firm transmission system to deliver to load.
Forced Outage Assistance Agreement	This agreement only applies for a period of up to one week per occurrence, so any unplanned outage beyond one week would require additional capacity. Also, this agreement may be terminated with two-year notice. Platte River plans to evaluate options for ensuring the agreement remains in place for several years into the future.

Firm transmission	Platte River's transmission system has traditionally operated at high levels of reliability (average reliability over the past five years in excess of 99.99%). Platte River coordinates transmission planning with neighboring utilities to optimize long-term capacity needs, and will continue to look for ways to enhance the system's overall reliability.
Natural gas supply	Platte River owns a 15-mile natural gas pipeline from the Cheyenne Hub to the Rawhide Energy Station. The supply contract is interruptible, but delivery interruptions have been rare. Platte River has sufficient pipeline capacity to operate all existing peaking units simultaneously (about 388 MW). Platte River will need to evaluate future firm delivery if a new intermediate gas resource is added to the system.
Coal supply	Rawhide—multi-year coal contracts are negotiated for coal supply certainty and stockpile inventory levels. Inventory levels are maintained at strategic targets. Rawhide's coal supplier has never caused a generation interruption. Craig—the primary source of coal for the Yampa Project is the Trapper Mine, of which Platte River is a 19.93% owner. Trapper is a mine-mouth operation which requires no rail transportation to the plant. Supplemental coal is provided through a contract with Colowyo Mine, which is set to expire in 2017. Both Trapper and Colowyo have the ability to expand mining operations to meet future coal supply needs. Proximity of mines, coal mine diversity, and adequate stockpile inventories provide fuel supply reliability.
Coal transportation	Rawhide's coal supply is delivered by Burlington Northern Santa Fe Railway through a multi-year transportation contract. Platte River has never experienced a generation interruption due to delivery performance. Additionally, Platte River owns and maintains the railcars for Rawhide, and spare railcars are maintained to be used for further reliability. There is no anticipated long-term interruption of Rawhide coal transportation.

Shown below are Platte River's loads and resources table for two scenarios—under current resource conditions, and with Craig units 1 and 2 exited early (described later in "Portfolio Analysis"). Using a 15% planning reserve margin, the need for additional capacity is expected to occur after 2030.

Peak-month Loads and Resources Balance—Under Current Portfolio (MW)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Loads																					
Foundation Forecast	648	659	670	681	693	705	717	729	741	754	767	780	794	807	821	835	849	864	879	894	909
DSM	-4	-8	-13	-19	-25	-32	-39	-46	-53	-60	-68	-75	-82	-89	-97	-104	-111	-118	-125	-130	-136
Municipal Loads (Base)	644	651	657	662	667	672	677	683	689	694	699	705	711	718	724	731	738	746	754	764	773
Losses	13	13	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	16	16	16
Total Loads	658	664	671	676	681	686	691	697	703	708	713	720	726	733	739	746	753	761	769	780	788
Planning Reserves (15%)	99	100	101	101	102	103	104	105	105	106	107	108	109	110	111	112	113	114	115	117	118
Load Plus Planning Reserves	756	764	771	777	783	789	795	801	808	814	820	827	835	843	850	858	866	875	885	896	907
Resources																					
Rawhide	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
Craig	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154	154
CRSP	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
LAP	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Wind ELCC	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	14	14	14	14	14	14
Solar ELCC	0	0	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Peaking	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388
Total Resources	922	922	931	931	931	931	931	931	931	931	931	931	931	931	930	935	935	935	935	935	935
Surplus (Above Planning Reserve Requirements)	165	158	159	153	147	142	136	130	123	117	111	103	96	88	80	77	68	59	50	38	28
Reserve Margin	40%	39%	39%	38%	37%	36%	35%	34%	32%	31%	30%	29%	28%	27%	26%	25%	24%	23%	21%	20%	19%

With all resources available during the annual peak (assumed to be July of each year), Platte River's reserve margin is well above the 15% reliability standard beyond 2030.

Peak-month Loads and Resources Balance—Exit of Both Craig Units by 2030 (MW)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Loads																					
Foundation Forecast	648	659	670	681	693	705	717	729	741	754	767	780	794	807	821	835	849	864	879	894	909
DSM	-4	-8	-13	-19	-25	-32	-39	-46	-53	-60	-68	-75	-82	-89	-97	-104	-111	-118	-125	-130	-136
Municipal Loads (Base)	644	651	657	662	667	672	677	683	689	694	699	705	711	718	724	731	738	746	754	764	773
Losses	13	13	14	14	14	14	14	14	14	14	14	15	15	15	15	15	15	15	16	16	16
Total Loads	658	664	671	676	681	686	691	697	703	708	713	720	726	733	739	746	753	761	769	780	788
Planning Reserves (15%)	99	100	101	101	102	103	104	105	105	106	107	108	109	110	111	112	113	114	115	117	118
Load Plus Planning Reserves	756	764	771	777	783	789	795	801	808	814	820	827	835	843	850	858	866	875	885	896	907
Resources																					
Rawhide	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
Craig	154	154	154	154	154	77	77	77	77	77	77	77	77	77	77	0	0	0	0	0	0
CRSP	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
LAP	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Wind ELCC	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	26	39	39	39	39	39
Solar ELCC	0	0	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Peaking	388	388	388	388	388	388	388	388	388	388	388	388	388	388	388	490	490	490	490	490	541
Total Resources	922	922	931	931	931	854	854	854	854	854	854	854	854	854	853	895	908	908	908	908	959
Surplus (Above Planning Reserve Requirements)	165	158	159	153	147	65	59	53	46	40	34	26	19	11	3	37	41	32	23	11	52
Reserve Margin	40%	39%	39%	38%	37%	24%	23%	23%	21%	21%	20%	19%	18%	17%	15%	20%	20%	19%	18%	16%	22%

With the removal of one Craig unit, Platte River has sufficient capacity through 2030, but will need additional resources upon the exit of the second Craig unit in 2030.

Timing and Type of the Next Firm Capacity Resource

Platte River's reliability planning standards indicate that a new firm capacity resource will not be required until after 2030, and with the current load patterns of our customers, the next resource is likely to be needed only at time of system peak. Many influences could accelerate the timing and type of Platte River's next firm resource, including:

- Resolution of the US Supreme Court stay on the EPA's Clean Power Plan
- The impacts of expanded demand-side management (DSM)
- Unexpected new load growth (such as the addition of new large customers)
- Changes in energy consumption patterns (air conditioning, electric vehicles, miscellaneous electrical devices, etc.)

The Portfolio Analysis section of this report analyzes various types of peaking generation that Platte River may expect to incorporate into its system in the future. Of particular interest are highly-flexible gas resources that can help integrate growing shares of renewable generation.

Need and Timing for Additional Renewable Energy Sources

Because of Platte River's recent efforts to add renewable generation resources, further renewable resources are not required to meet existing state standards until well after 2030. However, Platte River will continue to evaluate options to add more renewables to our generation fleet as renewable costs continue to decline—for the purpose of diversifying the fleet and providing further fuel risk mitigation.

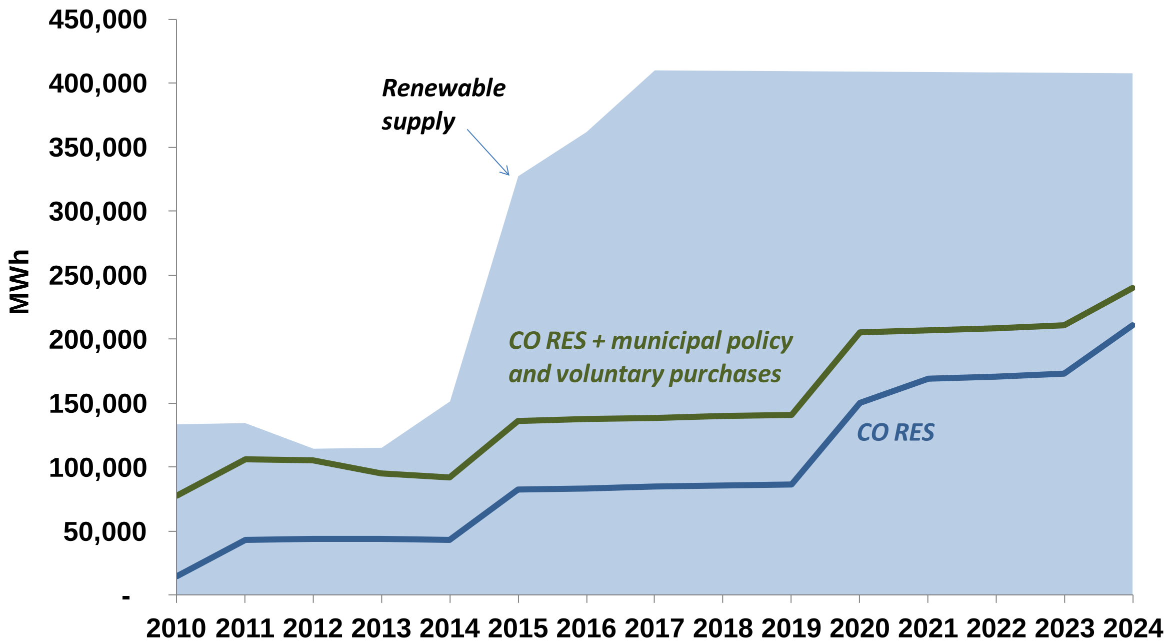
In 2016, Platte River will begin purchasing power from a new solar facility to complement its existing wind purchases. With the solar addition, Platte River will generate over 400,000 MWh of energy annually, well in excess of the Colorado Renewable Energy Standard (RES).

Platte River expects to further diversify its portfolio in the coming years through the addition of more renewable generation.

The specific amount and timing of new renewable sources acquired by Platte River can also be affected by formal requests from the municipalities in the future. These have been driven by the Colorado RES, the municipalities' policies, and voluntary participation in renewable energy programs offered by the municipalities.

Though the Colorado RES and voluntary programs are the primary driver for new renewable supply for the municipalities, ***other considerations may include future carbon regulations, taxes or other costs for greenhouse gas emissions***, fuel price risk management, support of new technology research and development, local economic development, and retail customer preferences. Platte River will work closely with the municipalities in evaluating the costs and benefits of future renewable options, and will consider a range of options, including wind, biogas, biomass, solar, and small hydropower.

Platte River Renewable Energy Requirements



Demand Side Management

Platte River currently offers Demand Side Management (DSM) programs in collaboration with its municipalities, and in some cases, the municipalities offer additional DSM programs on their own. “Common DSM programs” are administered, managed, and jointly funded by Platte River and the municipalities.

Current Common DSM Programs

Platte River’s Common DSM Programs are currently focused in the area of Energy Efficiency. Platte River and its municipalities recognize that the more we can work together to provide a unified set of DSM programs, the better we can deliver the programs to customers. Common DSM Programs are all now part of a joint program known as *Efficiency Works* and the municipalities are free to include their DSM programs under it as well.

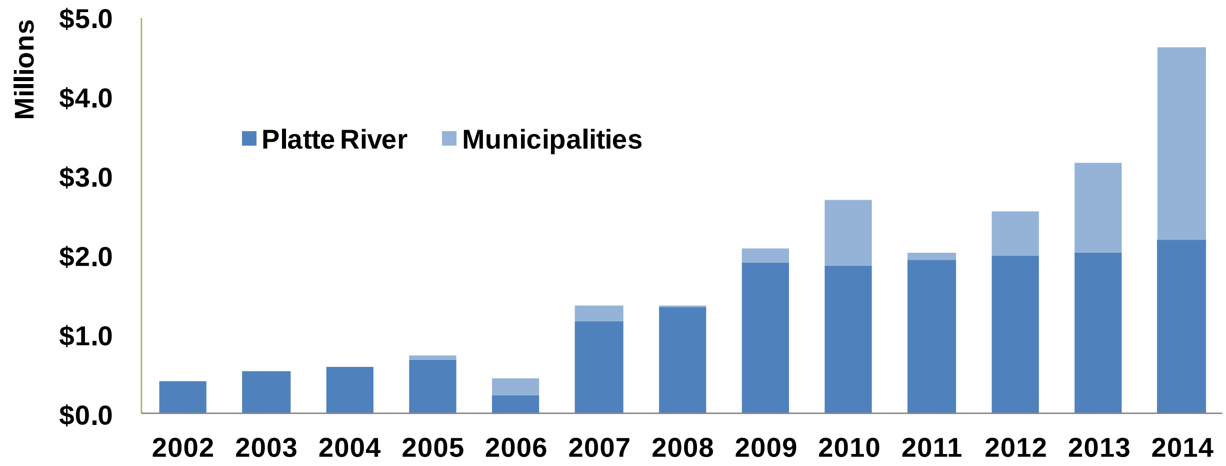
Efficiency Works DSM Services

Efficiency Assessments	These programs help home and business owners identify and implement energy and water efficiency improvements that may consist of retrofits or tune-ups—and may be eligible for incentives.
Rebates	Rebates through Efficiency Works encourage energy and peak demand savings by reducing the cost of installing efficient equipment and increasing the customer’s return on investment.
Building Tune-Ups	These programs provide retro-commissioning services to commercial customers. Retro-commissioning is a systematic process by which a building and its energy systems are evaluated to ensure that they are meeting the design intent and doing so in an effective and efficient manner.
Energy Efficient Lighting	Lighting programs provide “upstream” rebates to retailers selling lighting controls and energy-efficient lighting to enable them to sell products at agreed-upon discounted prices. The discounted prices help residential and small commercial customers to purchase energy efficient lighting for their homes and businesses.
Northern Colorado ENERGY STAR Homes	This program is supported by a coalition of regional utilities to promote major improvements in the efficiency of new homes being built in Northern Colorado.
Innovation & Pilot Programs	A portion of the overall energy efficiency budget is set aside to fund and initiate innovative energy efficiency and demand reducing technologies through individual customer projects and/or new efficiency program models.

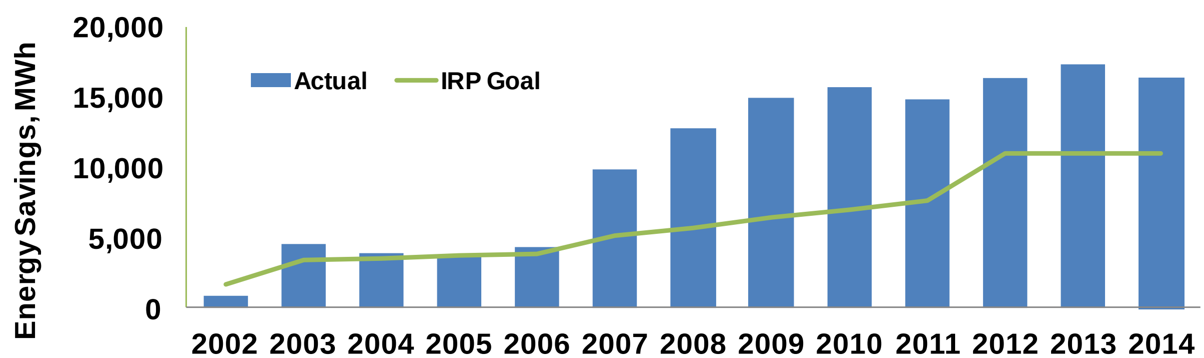
Historical Results of Common Programs

From 2002 through 2014, nearly $23 million was invested in Common Programs, including nearly $6 million of funding provided by the municipalities. The charts below show program impacts since 2002. As seen in the figures, energy and demand savings have exceeded goals set in Platte River’s 2007 and 2012 IRPs due to additional funding provided by the municipalities.

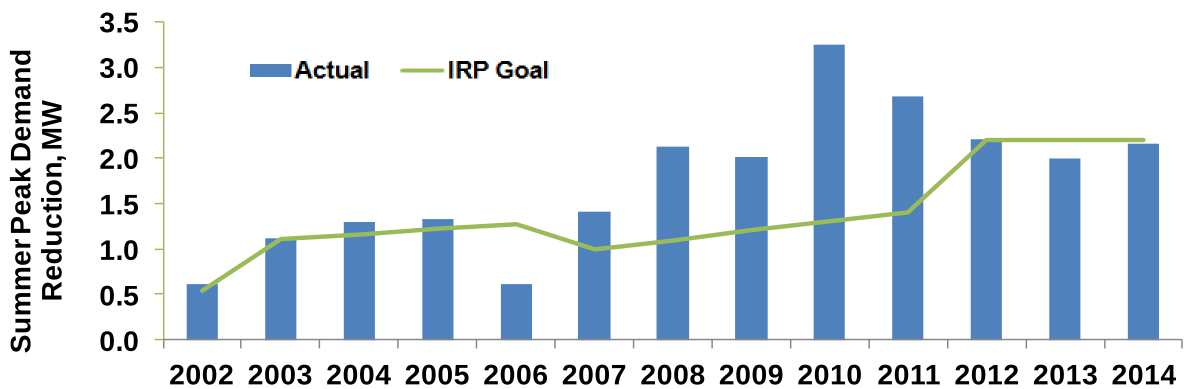
Annual Investment in Common DSM Programs



Incremental Energy Savings from Common DSM Programs



Incremental Summer Peak Demand Reduction from Common DSM Programs



Expanded DSM Programs

For this IRP, Platte River conducted two studies to evaluate the DSM potential within its service area, including a demand response (DR) potential study and an analysis of the potential for energy efficiency (EE) and distributed generation (DG). Both studies included high-level screening to determine the cost effectiveness of DSM options compared to supply-side options. Platte River used these results as it evaluated resource options in the 2016 IRP.

Demand Response

Demand response refers to programs that seek to alter customers' energy use patterns, shifting energy use away from times when energy is expensive or system reliability is jeopardized. When employed reliably and on a large scale, DR has the potential to provide firm capacity that can be used in a variety of ways for operational needs and to reduce the cost of providing electric service. DR can be operated to provide benefits from capacity deferral, optimize economic dispatch, help facilitate renewables integration, and provide supplemental reserves.

For this IRP, Platte River assessed the potential for cost savings as well as the potential cost of operating DR programs, and found some DR to be marginally cost effective:

- DR capacity: 19 to 49 MW of potential by 2030
- Net present cost of $13 million to $26 million (including all incentive costs) or $7 million to $15 million if the cost of providing incentive payments to customers are not included
- Net present benefits of $8 million to $19 million

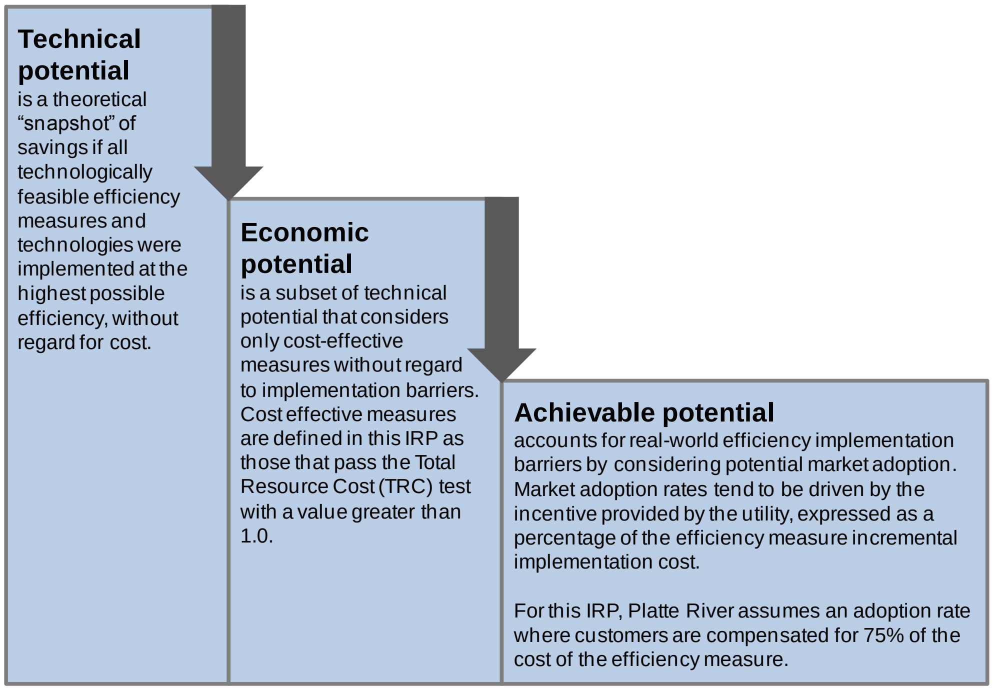
Over the next few years, Platte River will be engaged with its municipal owners in the development of a pilot program to demonstrate the viability of DR as an option for future resource planning efforts.

Expanded Energy Efficiency Programs

For this IRP, Platte River performed an EE potential study to achieve the following objectives:

- Characterize and quantify the technical, economic, and achievable potential summer peak reduction and annual energy savings achievable in Platte River's customer base over a 40 year period (2014 to 2053) via energy efficiency
- Estimate the customer and utility costs of the programs
- Summarize the secondary resources and research utilized to estimate potential
- Characterize the likely sources of energy and peak demand reduction based on customer class and technology type

Measuring the Potential for Energy Efficiency

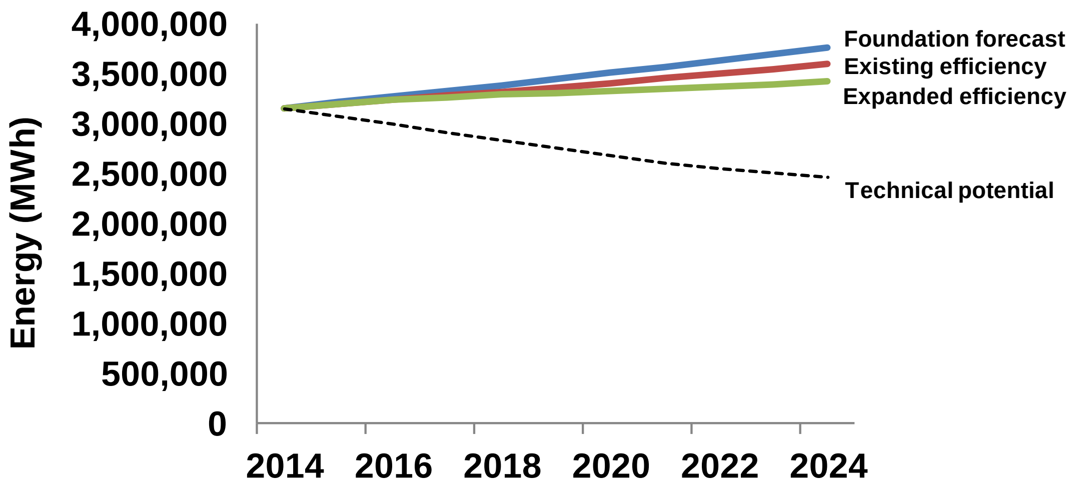


For the purpose of the Total Resource Cost test screening, Platte River used the following supply-side cost assumptions:

- Avoided generation capacity costs are based on a combined-cycle gas turbine (CCGT) installed in 2015.
- Avoided generation fixed and variable operation and maintenance costs are also assumed to be based on costs typical for CCGT.
- Avoided fuel costs are based on forecast gas costs and a CCGT operating as the marginal resource during all hours of the year. Avoided CO_2 costs are based on Platte River's projected cost of CO_2 compliance with the proposed Clean Power Plan.
- Avoided transmission costs are based on Platte River's wholesale transmission rate.

The diagram below shows the results from the potential study. Platte River estimates that approximately 2,500 GWh of technical potential exists in its service area. Approximately one-fourth of the technical potential (about 700 GWh) is achievable with incentives paying 75% of the incremental cost. Platte River recommends growing its EE programs towards this achievable 75% incentive estimate.

Energy Efficiency Potential



<u>Distributed Generation Programs</u>

For the 2016 IRP, Platte River also assessed the potential (technical, economic, and achievable) for cost-effective distributed generation (DG) programs, following a process similar to that described in the Expanded Energy Efficiency Programs section. The assessment focused on the two types of DG that are most likely to be cost effective now or in the near future—solar photovoltaic (PV) and combined heat and power (CHP).

1. Solar Photovoltaic Programs

Platte River estimated the technical potential for PV by using the forecast energy consumption within Platte River's service area disaggregated by customer classes and building types.

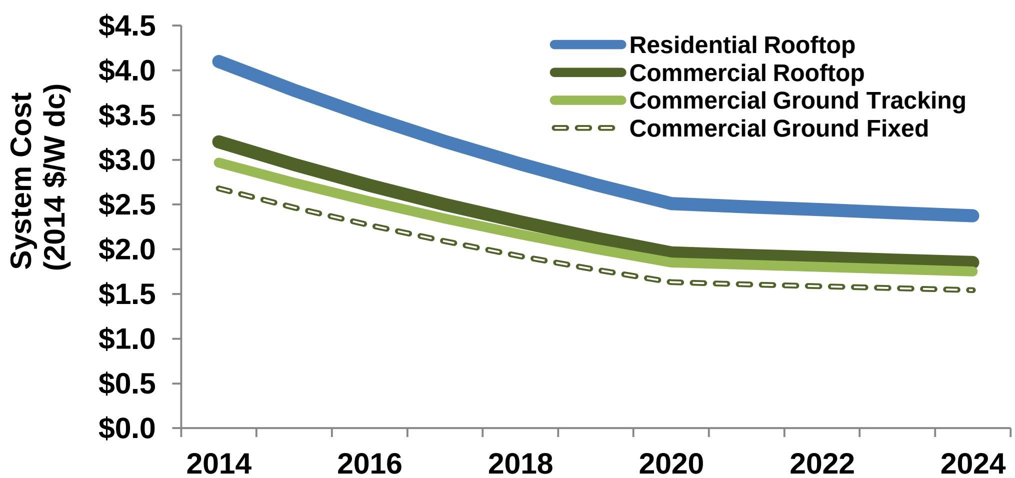
For each building type, the amount of usable roof area was estimated based on assumptions for energy consumption intensity (i.e., energy use per square foot) and number of floors. The maximum PV capacity and energy outputs were estimated based on the usable roof area, typical PV power density, ac-to-dc power ratio, and annual capacity factor. The technical potential screening did not consider limitations that could be imposed by distribution system capacity, and no distribution system costs were included in the economic evaluation.

To assess cost-effective PV potential, Platte River assumed that PV costs would decline over time. Historic and projected reductions in the cost of PV have been significant, so a static-cost analysis would have been unrealistic. Industry literature on PV cost trends suggested that the price of PV modules will drop 6.6% annually from 2014-20 and 1.4% annually thereafter. The balance-of-system costs were assumed to drop by 55% through 2020, and then decline at 1.4% annually thereafter. The figures below depict the affect of these assumptions on PV system cost between now and 2053.

PV Potential Assumptions

	Residential	Commercial	Industrial
Sloped Roof Share	92%	10%	5%
Flat Roof Share	8%	90%	95%
Usable Sloped Roof	18%	18%	18%
Usable Flat Roof	70%	65%	65%
PV Density (watts/kW, dc basis)	14.3	14.3	14.3
ac-to-dc Power Ratio	85%	95%	95%
Annual Capacity Factor (ac basis)	20.6%	20.6%/25% (fixed/tracking)	20.6%/25% (fixed/tracking)

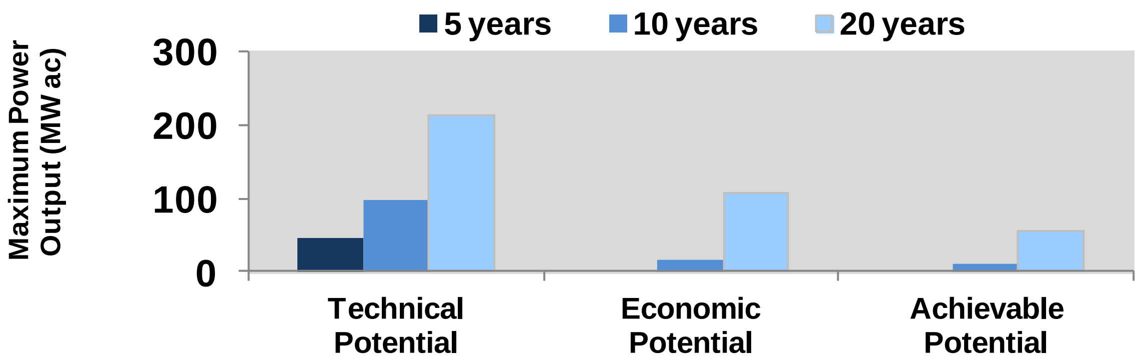
Distributed Solar PV Cost Assumptions



The chart below shows the PV potential over five, ten, and twenty year horizons. There is no economic potential over the next five years, and only a small amount over the next ten—primarily larger commercial and industrial applications. Over the next 20 years, about half of the PV technical potential could become cost effective, assuming prices drop as forecast. Therefore, distributed PV is included in one of Platte River's planning scenarios under the "Portfolio Analysis" section.

Note that this analysis only considers the cost effectiveness of PV relative to the capital, fuel, and operational costs of combined cycle generation and transmission. A greater quantity of PV may appear to be cost effective when compared to retail rates, particularly as those rates rise while PV costs fall. In addition, some customers may choose to adopt PV before it is cost effective due to their interest in supporting clean, renewable energy. These factors could drive adoption of PV at a rate that exceeds the levels predicted by the potential study.

Photovoltaic Potential in Platte River's Service Area



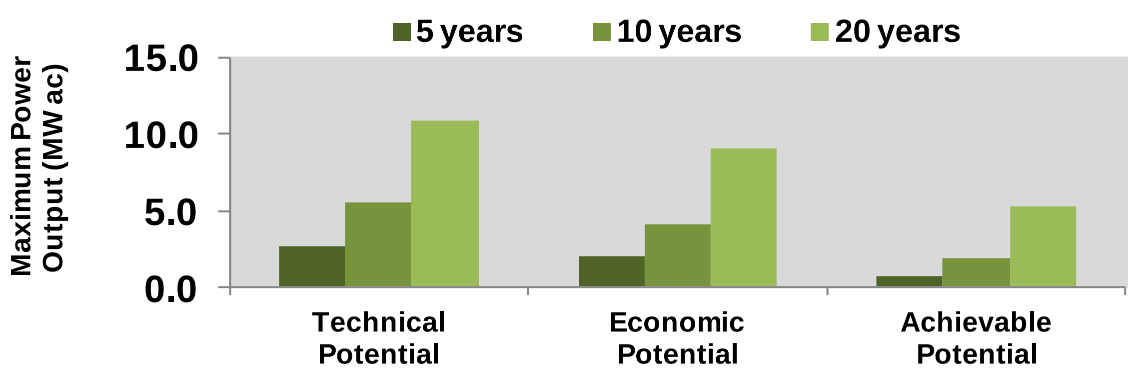
2. Combined Heat and Power (CHP) Programs

CHP refers to a generation system that uses a fuel—typically natural gas or biofuel—to generate electricity and also a heat recovery system that captures waste thermal energy for beneficial use, making steam or hot water. For the 2016 IRP, Platte River evaluated the potential for the following commercial and industrial CHP systems, focusing on systems 100 kW and up:

- Steam turbines, 1.5 – 5.5 MW
- Gas turbines, 2.5 – 3.5 MW
- Microturbines, 25 – 100 kW
- Fuel cells, 175 – 1,125 kW
- Internal combustion engines, 150 – 4,500 kW

Cost-effective CHP potential was evaluated based on expected project costs, incremental fuel use, and the utilization of thermal energy relative to avoided system costs. Platte River conservatively assumed 20 MW of achievable potential across its four owner-communities. Platte River will continue to engage with our owners and their customers to evaluate and deploy future CHP applications.

CHP Potential in Platte River's Service Area



Environmental Analysis

Platte River uses a set of principles to communicate environmental priorities and guide the daily actions and decisions of its management and staff. The objectives of the 2016 IRP were influenced by these principles, and demonstrate Platte River's emphasis on the IRP filing requirements Western asks of its customers. The environmental principles are outlined below.

Platte River's Environmental Principles

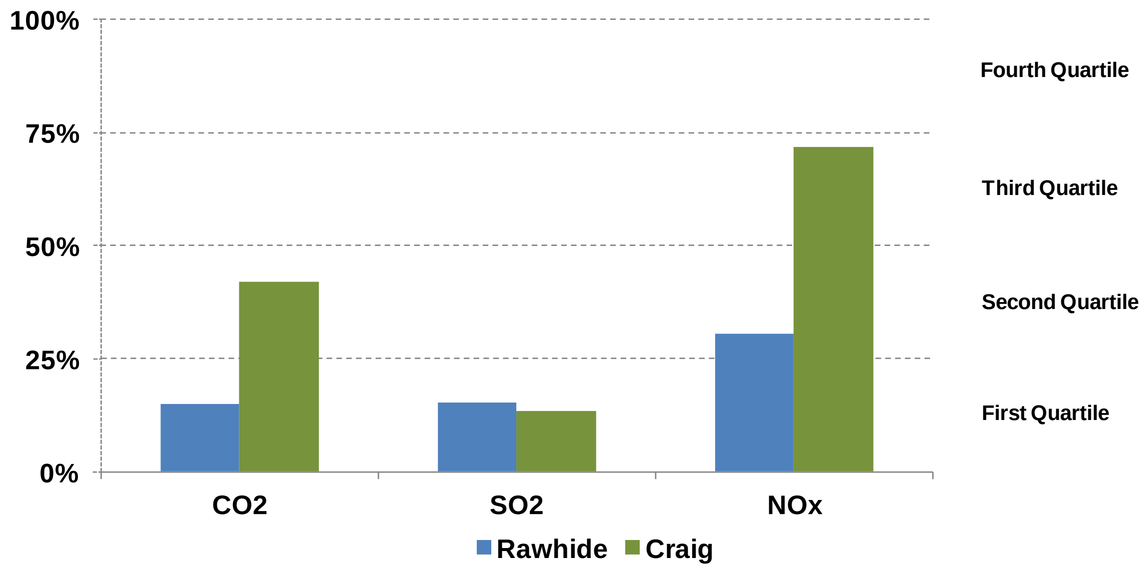
- ***Consider environmental factors in planning, design, construction, and operating decisions***
- ***Ensure compliance with applicable laws, rules, regulations, and permits***
- ***Conserve natural resources***
- ***Reduce environmental risks***
- ***Encourage pollution prevention***
- ***Communicate environmental values***
- ***Encourage public participation***
- ***Support cost-effective programs to conserve energy***
- ***Coordinate generation and transmission planning with neighboring utilities***
- ***Consider environmentally progressive technologies to meet future generation needs***

Platte River uses state-of-the-art air quality control systems at its power generation stations to meet or exceed all applicable environmental laws and regulations. As new legislation and regulations are proposed, Platte River participates in public processes and supports additional control requirements when costs are commensurate with measurable environmental benefits.

To capitalize on the emergence of new technologies, Platte River is proactive in evaluating and implementing improvements in its power operations that balance environmental and other socio-economic concerns.

Shown below is a chart that reflects the high performing nature of Platte River's emissions from owned coal resources relative to other US plants.

Platte River's Emission Rankings Relative to All US Coal Plants



CO_2 Reduction Drivers

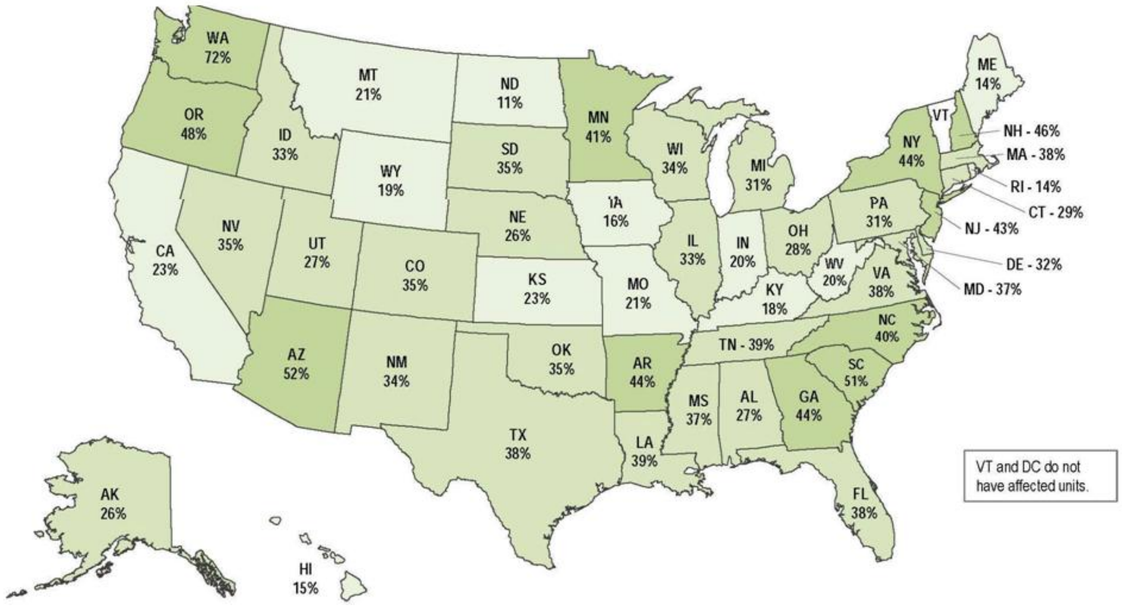
The attention of Platte River's 2016 IRP is on CO_2 emissions reduction as required by pending federal rules, and the individual and collective needs of our owner-members.

Federal

On August 3, 2015, the Environmental Protection Agency released the Clean Power Plan Final Rule under 111d of the Clean Air Act (CPP). The CPP is intended to curb CO_2 emissions from US power plants by 2030. For the nation overall, the CPP targets a reduction of 32% below 2005 levels by 2030, with potential interim targets for early progress. The responsibility for the implementation of the CPP is intended to be delegated to the states, and the reduction targets vary by state. Colorado's 2030 proposed target is 35%, relative to reported 2012 CO_2 emissions.

A stay was issued by the US Supreme Court on February 9, 2016, pausing implementation of the CPP while litigation proceeds. The outcome of this process is uncertain, but Platte River staff continues to analyze impacts of the CPP for planning purposes in order to remain prepared in the event that it is upheld without modification. ***The 2016 IRP assesses the potential implications of CO_2 reduction rules based on Platte River's current interpretation of the CPP.***

Clean Power Plan CO_2 Reduction Levels by State



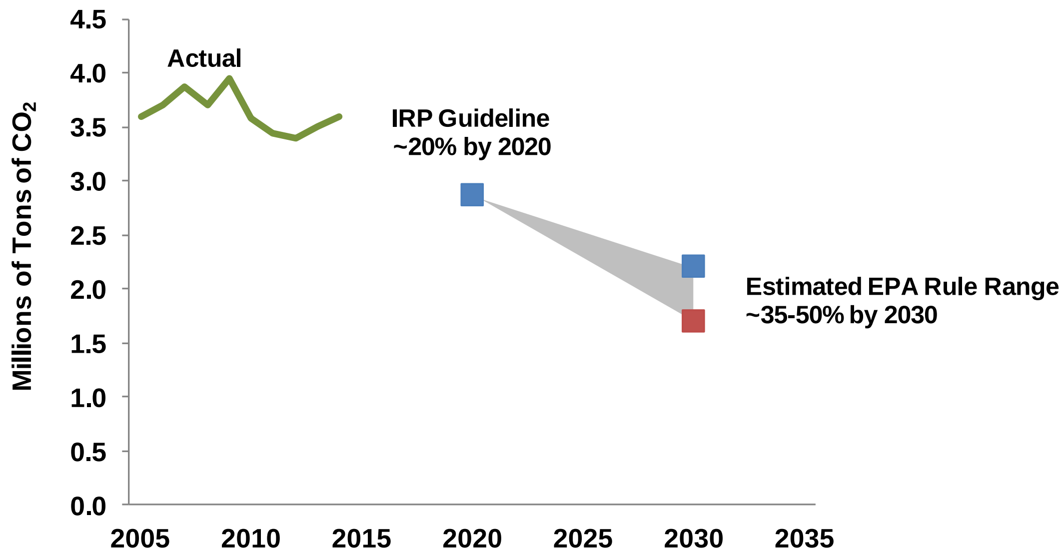
Source: ***EPA***

Local

In 2016, Platte River will begin discussions with its member owners to evaluate customized power production portfolios that best suit the individual needs of the communities. The goals for this project will be determined jointly by the member-owners, and driven by individual power cost and emissions reduction objectives of the communities. For example, Fort Collins has a council-approved climate action plan with specific CO_2 reduction objectives through 2050 that will be addressed within the context of the other cities' goals.

The 2016 IRP uses the CO_2 reduction guidelines shown in the chart below that were established by Platte River staff and the four municipalities represented on the Platte River Board. These guidelines are intended to capture ranges that are representative of the EPA's CPP 111d rule, and provide the details needed to complete the analytical efforts for the 2016 IRP.

Platte River CO_2 Emissions Reduction Planning Assumptions



CO_2 Planning

Platte River's existing portfolio is predominantly coal-fired, providing both risks and opportunities in the face of CO_2 regulation at the federal level. If implemented, the CPP would require significant CO_2 reductions across the country, with Colorado's requirements being slightly higher than the national average. The potential of this rule has state regulators and power plant owners contemplating strategies in order to be positioned for future requirements in the next decade. Early planning around CO_2 reduction opportunities for Platte River is therefore a critical component of the 2016 IRP.

Early planning around CO_2 reduction opportunities for Platte River is a critical component of the 2016 IRP.

Platte River's CO_2 Emissions by Fuel Type, 2014

	2014 CO_2, Tons	% of Total
Rawhide Coal	2,362,195	65.6%
Craig Coal	1,221,574	33.9%
Rawhide Gas	15,042	0.4%
Total	3,598,811	100.0%

Portfolio Analysis

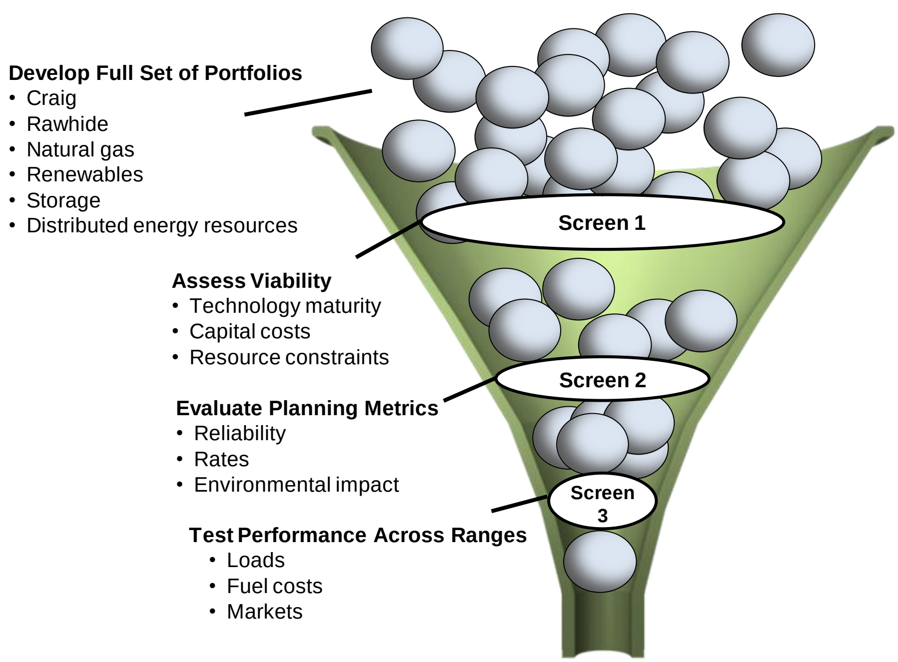
Platte River's planning functions are intended to be dynamic and adaptive, allowing the organization to respond to emerging business and market needs. The 2016 IRP focuses on current issues facing Platte River, including potential greenhouse gas regulation, the future diversification of Platte River's portfolio, as well as the individual and collective needs of the owner-members.

Platte River uses the AURORAxmp Electric Market Model developed by EPIS Inc. to perform all modeling related to system dispatch and production cost analysis. Aurora simulates the hourly operation of Platte River's power system and its management within regional energy markets.

In order to facilitate effective decision-making, Platte River followed a structured process in the development of the 2016 IRP. This process, or some variant of it, is widely used across the electric utility business in order to support a variety of resource planning decisions. The process first identifies objectives and metrics and then evaluates all feasible resource options for analysis across a range of risks in order to produce sufficient information to identify preferred future portfolios and action plans.

After the identification of objectives and metrics, Platte River performed a quantitative screening and portfolio analysis. The analysis was designed to first narrow the list of potential portfolio options into a subset of top-performing portfolios within each strategy. Then, these portfolios were evaluated further using sensitivity analysis. A conceptual diagram of the screening and evaluation process is shown below.

Screening and Evaluation Framework

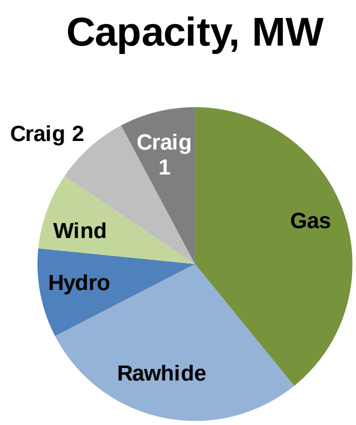


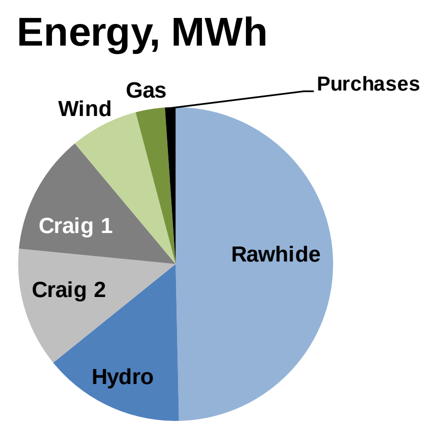
Planning Background

Platte River currently owns and contracts for a mix of both fossil-fueled and renewable generation. The existing portfolio of owned resources includes coal-fired generation located at the Rawhide and Craig stations and natural gas-fired combustion turbines at the Rawhide site. Platte River also receives energy through federal contracts for hydropower, as well as wind energy through contracts from the Medicine Bow and Silver Sage wind farms in southeast Wyoming, and the Spring Canyon site in northeast Colorado. Finally, Platte River has additional third-party options for obtaining temporary firm energy or capacity on a short-term basis.

The current mix of resources generates approximately 4,000 GWh per year, with about 3,200 GWh (net of energy losses) serving municipal load. Platte River supplements its overall system needs with market purchases and sales. Approximately three-fourths of this generation is produced by Platte River's two coal fired facilities.

2015 Platte River Capacity and Energy Positions





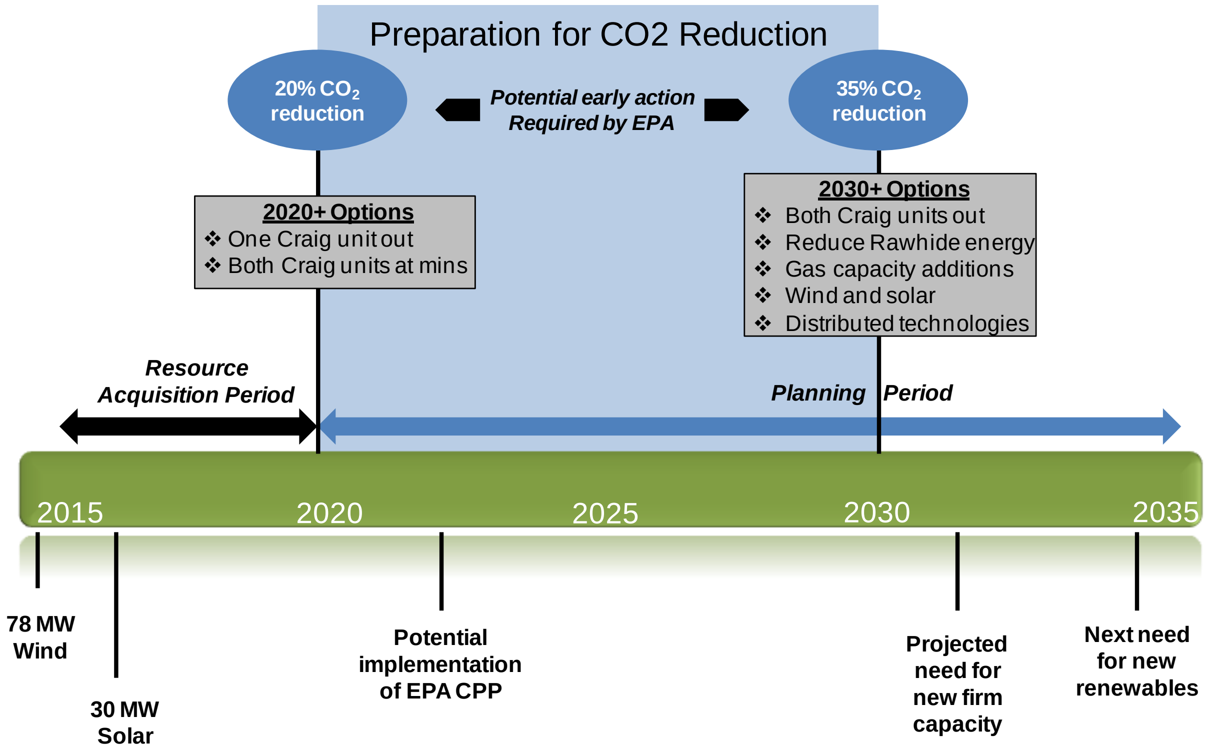
***Note**: The pie charts above do not include 30 MW of solar generation to be on-line in 2016.*

Although our municipal owners have historically benefitted from the low energy costs that coal can provide, the relatively high share of coal generation also carries long-term risks associated with emissions regulation, prices, and transportation and handling.

Platte River also has an operational gap in its resource lineup. With no true flexible generating resource, Platte River is exposed to potentially higher costs/operational impacts to manage a growing fleet of renewables designed to help reduce CO_2. Without a flexible generating resource, Platte River will be expected to manage its future intermittent resources with existing coal assets and/or fully rely on Public Service Company of Colorado (PSCo)—the region's balancing authority—for balancing and other reliability services at rates that are expected to climb in the future.

2015-35 Timeline for Resource Planning

The 2016 IRP covers the 20-year planning period from 2015 to 2035. Shown below is a high-level summary of Platte River's portfolio expectations through 2035.



Planning Objectives and Metrics

Traditionally, resource planning for electric utilities has focused primarily on balancing loads and generation through capacity planning, which is still a long-term focus for Platte River. However, Platte River's process incorporates an integrated review of a variety of objectives, ***with a consideration of potential CO_2 reductions in this IRP***. This section first details the minimum planning guidelines and then outlines the objectives and metrics used in the IRP.

Planning Guidelines for the 2016 IRP

CO_2 Reduction	Reserve Margin	Renewables Share
• 20% reduction by 2020 vs. 2005 actual tons • 35% reduction by 2030 vs. 2012 actual tons	A 15% reserve margin for planning is used by Platte River. This level is a commonly adopted reserve margin for utilities operating in the WECC, and is considered by NERC as its reference margin.	The 2016 IRP includes requirements of the Colorado Renewable Energy Standard for renewable energy (CRES, HB10-1001, 2004, 2010).

Portfolio Screening

Platte River began its IRP process in 2014 by collecting information from its Board and owner communities to assess the set of power generation resources that could potentially be modeled for future development or acquisition. Using input from this process, Platte River compiled and reviewed an extensive set of current and developing generation alternatives; however, the analytical requirements to model the full set would be far too extensive, so an initial screen was conducted to reduce the modeling requirements to a manageable set. The results of this screen are shown in the table below.

The process for the Technology Screen used three metrics—technological maturity, cost competitiveness, and adequacy of fuel/other resources. Using the Technology Screen, the full set was reduced to a group of resources to be modeled using the Aurora software.

Technology Screen

Resource	Technological Maturity	Cost Competitiveness	Adequacy of Fuel or Other Resources	Include in Study?
Coal—Carbon Capture	✗	✗	✓	No
Coal—IGCC	✗	✗	✓	No
Gas—Simple Cycle	✓	✓	✓	**Yes**
Gas—Combined Cycle	✓	✓	✓	**Yes**
Gas—Reciprocating	✓	✓	✓	**Yes**
Wind	✓	✓	✓	**Yes**
Solar—Thermal	✗	✗	✓	No
Solar—Photovoltaic	✓	✓	✓	**Yes**
Biomass	✓	✗	✗	No
Nuclear—Conventional	✓	✗	✗	No
Nuclear—Small Scale	✗	✗	✗	No
Hydro—Conventional	✓	✓	✗	No
Hydro—Small Scale	✓	✗	✓	No
Storage—Compressed Air	✗	✗	✓	No
Storage—Pumped Hydro	✓	✗	✓	No
Storage—Batteries	**?**	✗	✓	**Yes**

Resource Strategies

Platte River developed three primary strategies that can yield a significant amount of CO_2 reduction from its power generation fleet. Because of the relative overall strengths of the Rawhide power plant, the best potential for near-term emissions reductions can be derived from the Craig coal-fired power plant. The strategies could include either changes to Platte River's current ownership position or changes to operations at Craig through 2030. Platte River's IRP analysis found that modifications to operations at Rawhide would only be required to satisfy CO_2 guidelines post-2030.

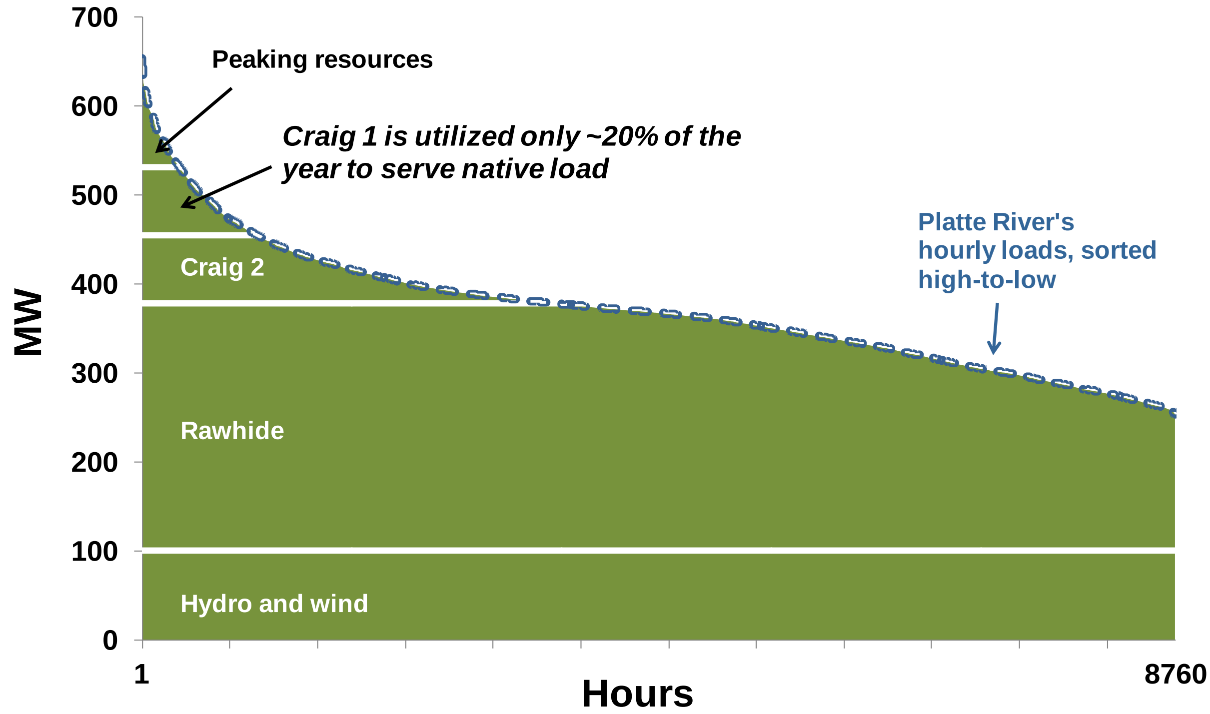
CO_2 Reduction Resource Strategies

	Action Assumed in 2016 IRP	Potential CO_2 Reduction
Strategy 1 **One Craig Unit Out** **(1C-out)**	• Exit ownership in 2020 of Platte River's share of Craig Unit 1 (77 MW) • Craig 2 (77 MW) retired in 2030	600,000 tons/year
Strategy 2 **Two Craig Units Out** **(2C-out)**	• Exit ownership in 2020 of both Craig units partially owned by Platte River (154 MW)	1,200,000 tons/year (600,000 tons/year/unit)
Strategy 3 **Craig at Minimums** **(C-min)**	• Maintain ownership of both Craig units, and operate at minimum contractual capacity through 2030 ○ 46-154 MW June - August ○ 46 MW September - May • Exit ownership of full share in 2030	840,000 tons/year (420,000 tons/year/unit)

These three strategies are compared to a ***Reference Scenario (RS)*** within this document. RS is representative of Platte River's existing power production portfolio, with standard capacity expansion assumptions and normal retirement dates for current owned resources.

Although the Craig facility is a valuable resource for Platte River, much of Platte River's share of the generation is marketed to other utilities as surplus sales, and is generally not required to meet the loads of our four owner municipalities. Also, Craig lags behind Platte River's Rawhide plant in performance, cost, and reliability, and will require additional future capital commitments for emissions compliance.

Platte River's Generation Commitment to Native Load



Partial ownership also provides less future certainty over the asset's operations and contracts than Platte River enjoys with the Rawhide station. Because of Rawhide's favorable position in ownership and operations, Craig is assumed to be the first baseload resource affected in Platte River's planning studies in the pursuit of CO_2 reduction. As can be seen in the highlighted rows in the table below, the Rawhide Energy Station is clearly the top performer of the two plants when comparing efficiency, reliability, emissions, and operating cost.

Comparison of Rawhide and Craig – Key Statistics

	Rawhide	Craig
Ownership	**Platte River**	Joint participation
Plant Capacity (MW)	280	154
Normal Retirement Date	2046	2042
Avg Generation (MWh)	2,246,949	1,035,297
Fixed O&M ($/kW-mo)	**$5.43**	$6.18
Avg Dispatch Cost ($/MWh)	**$14.40**	$20.26
Plant Heat Rate (kWh/Btu)	**9,991**	10,524
Avg Capacity Factor	91%	77%
Avg Equivalent Availability Factor	**96%**	88%
Transmission	**No path congestion**	Congested path Craig to Ault
Coal Contract Expiration	PRB - 2021	Trapper - 2020; ColoWyo - 2017
Avg Coal Quality (Btu/lb)	8,864	9,500
Avg Annual Coal Use (tons)	1,254,144	527,370
Avg CO_2 Emissions (tons)	2,338,114	1,141,572
Avg CO_2 Tons/MWh (millions)	**1.04**	1.1
NOx Controls	Enhanced combustion control system	**SCR-Unit 2 complete**
Debt on Assets	$46 million debt expires 2036	**$0**

Note: Averages based on 2010-2014 period

Portfolio Options

For each of the three resource *strategies* shown on page 37, Platte River evaluated a set of resource *portfolios* consisting of potential generation alternatives to Craig Unit 1 that would help meet Platte River's planning guidelines.

The resource options that Platte River has identified for portfolio analysis include:

		Abbreviation
►	A conversion of Platte River's existing Rawhide GE7FA turbine to a 1x1 combined cycle facility	***Conv***
►	Construction of a new 1x1 combined cycle facility using GE7F.05 frame technology	***Frame***
►	Construction of a new 1x1 combined cycle facility using GE LM6000 aeroderivative technology	***Aero***
►	Construction of a new generation station(s) using Wartsila reciprocating gas engines	***RICE***
►	The addition of wind and solar generation (by contract) with supplemental RICE generation to provide flexibility	***RenG***
►	The addition of wind and solar generation (by contract) with battery storage	***RenB***
►	The addition of distributed technologies, including combined heat and power, distributed solar, and demand response (DR) technologies	***Dist***
►	Demand side management programs and technologies, assumed in all portfolios	***EE***

The table below summarizes the alternative portfolios that have been modeled for each of the Resource Planning Options. Platte River modeled the generation technologies listed under each portfolio option as the *first* replacement resource option for each Craig strategy. The portfolio options incorporate a variety of *additional* technologies listed through the entire planning period, depending on the timing and type of generation needed. For the 2016 IRP, Platte River does not evaluate the advantages of resource location—future detailed studies will consider preferred location(s) for generation alternatives.

Portfolio Options by Strategy – Replacement Capacity (MW)

Portfolio Options	Strategy: 1C-out	Strategy: 2C-out	Strategy: C-min
Conv	86 MW	86 MW	86 MW
Frame	298 MW	298 MW	298 MW
Aero	100 MW	100 MW	100 MW
RICE	101 MW	101 MW	101 MW
RenG	250 MW Wind/Solar by 2035 51 MW RICE	400 MW Wind/Solar incrementally through 2035 51 MW RICE	250 MW Wind/Solar by 2035 51 MW RICE
RenB	250 MW Wind/Solar 51 MW Battery Storage	400 MW Wind/Solar 51 MW Battery Storage	250 MW Wind/Solar 51 MW Battery Storage
Dist	51 MW RICE 10 MW CHP 150 MW Wind 115 MW DG Solar	51 MW RICE 10 MW CHP 100 MW Wind 115 MW DG Solar	51 MW RICE 10 MW CHP 150 MW Wind 115 MW DG Solar
EE	Included in all portfolios		

In addition to generation resources, demand side management plays a crucial role in Platte River's planning efforts. Each of the 2016 IRP portfolio options includes an explicit assumption for the capacity/energy benefits that accrue from DSM programs sponsored by Platte River. DSM is one of the most cost-effective methods to yield CO_2 reduction, and Platte River intends to expand its program offerings through 2040 to capture these benefits.

Results and Key Findings

The analysis conducted for the 2016 IRP makes several determinations that are important for Platte River to meet long-term strategic objectives and satisfy the individual and collective needs of our municipal owners.

This section summarizes the findings, and focuses on several areas of particular interest:

- Management of Platte River's capacity position
- Preparation for future CO2 reduction
- Planning for additional resource diversification
- Path for Platte River's share of the Craig Generating Station
- Management of growing shares of renewables
- Long-term modifications to Rawhide operations

Highlights

- Platte River can reduce portfolio risk by diversifying into natural gas and renewables generation.
- Intermediate generation resources can add flexibility to manage Platte River's existing system as well as accommodate future renewables additions.
- Demand side management programs are a cost-effective method to achieve CO_2 reduction and defer the need for generating capacity.
- By expanding energy efficiency, additional generating capacity is not needed until after 2030.

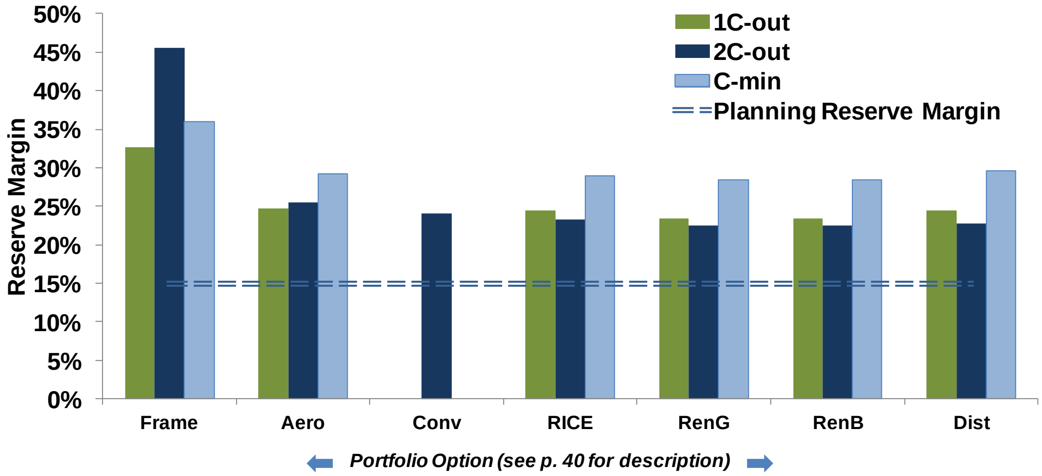
Management of Long-Term Capacity Position

Platte River currently has surplus generating capacity and projections indicate additional generating capacity is not needed until 2030 or after. As mentioned earlier in this document, the 2016 IRP included a variety of natural gas generation options—in both combined cycle and peaking configurations.

Due to Platte River's long capacity position, new-build, large combined cycle options were not deemed viable future alternatives in the 2016 IRP, so the analysis was reduced to portfolio options that include reciprocating gas engines and combined cycle aeroderivative plants.

This condition can be seen in the chart below. Strategies that include a new-build combined cycle option have reserve margins more than double the planning reserve margin. Platte River's objective, therefore, is to identify options that produce manageable capacity positions while providing needed resource flexibility.

Average Reserve Margin for Alternative Expansion Scenarios (Through 2035)



Strategy	***Description***
1C-out	-- Exit ownership in 2020 of Platte River's share of Craig Unit 1 (77 MW) -- Craig 2 (77 MW) retired in 2030
2C-out	-- Exit ownership in 2020 of both Craig units partially owned by Platte River (154 MW)
C-min	-- Maintain ownership of both Craig units, and operate at minimum contractual capacity through 2030 46-154 MW June-Aug; 46 MW Sept-May --Exit ownership of full share in 2030

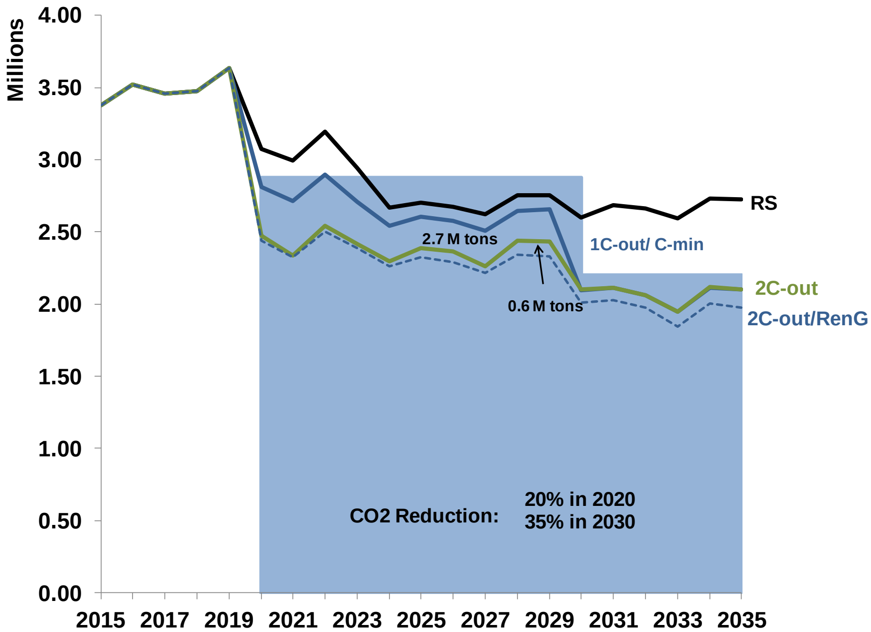
Preparation for CO_2 Emissions Reduction

With a high likelihood that carbon regulation will be enacted in the early 2020s, ***the most significant planning issue facing Platte River is the potential need to comply with federal rules to reduce CO_2 emissions.***

Platte River currently generates approximately 80% of its energy and virtually all of its CO_2 emissions from its two coal plants. Only 0.4% of total CO_2 is produced by Platte River's existing natural gas generating units. The two coal stations provide the only production alternatives to achieve the material reduction of CO_2 that will meet EPA guidelines.

Platte River modeled its portfolios to meet our interpretation of the EPA's original CO_2 reduction guidelines. The exhibit below demonstrates the expected CO_2 reduction that is achievable through 2035 under different strategies and portfolios. To meet the 2030 CO_2 reduction objective, both Craig units will need to exit Platte River's portfolio. Through 2030, exiting one Craig unit or operating Craig at minimum capacities can be viable options for CO_2 reduction. Additional CO_2 reduction can be achieved—at additional cost—through 2030 if both Craig units are released (an additional 2.7 million tons through 2030). Renewables scenarios can help Platte River achieve the greatest amount of CO_2 reduction through 2030 and beyond (another 0.6 million tons through 2030).

Potential CO_2 Reduction from Planning Scenarios



Strategy Description	
1C-out	-- Exit ownership in 2020 of Platte River's share of Craig Unit 1 (77 MW) -- Craig 2 (77 MW) retired in 2030
2C-out	-- Exit ownership in 2020 of both Craig units partially owned by Platte River (154 MW)
C-min	-- Maintain ownership of both Craig units, and operate at minimum contractual capacity through 2030 46-154 MW June-Aug; 46 MW Sept-May --Exit ownership of full share in 2030

Plan for Resource Diversification

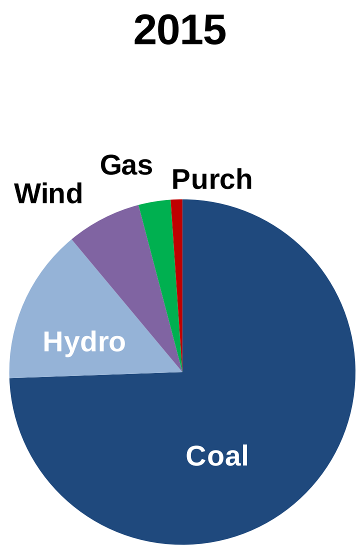
Platte River also has a gap in its resource lineup. With no true flexible generating resource, Platte River is exposed to potentially higher costs/operational impacts to manage a growing fleet of renewables designed to help reduce CO_2. Without flexible generating resources, Platte River will be expected to manage its future intermittent resources with existing coal assets or fully rely on PSCo (as the region's balancing authority) for balancing and other reliability services at rates that are expected to climb in the future.

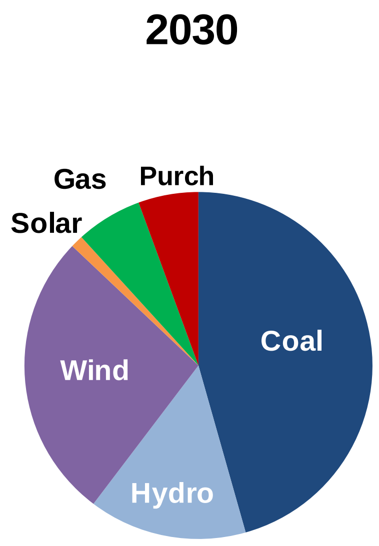
Portfolio diversification is intended to reduce financial and operating risks, and has many benefits, including:

- Diversification of resources can help optimize the power production process to better match changing daily loads with available generation alternatives.
- Diversification of fuel types can help mitigate portfolio risk associated with prices, transportation and handling, and produce emissions reduction benefits.
- Geographic diversification of resources can help provide additional system stability, capitalize on fuel transportation or transmission routes, and mitigate the impacts of cloud cover or regional wind patterns.

The effects of portfolio diversification can be seen in the charts below. Through 2035, Platte River's portfolio becomes less reliant on coal generation as renewables are added to the fleet, with additional gas generation providing integration services for the renewables.

Changes in Portfolio Composition through 2030





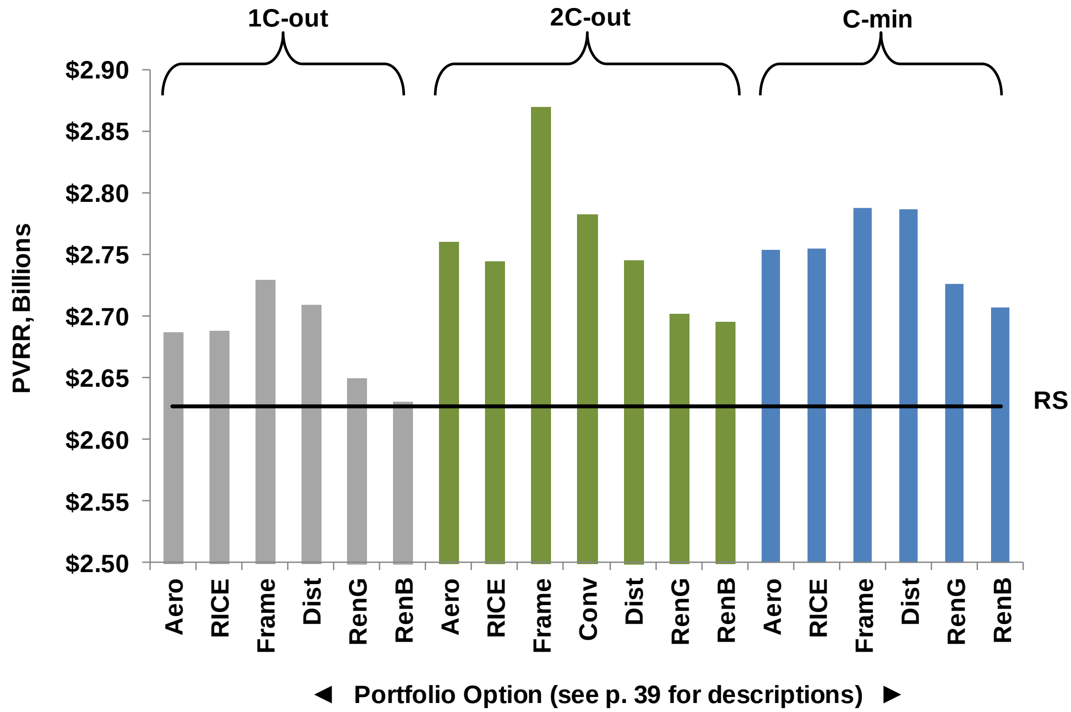
Cost and Risk Analysis

Platte River explicitly modeled the 2016 IRP portfolio options using its Aurora software program. All scenarios are designed to meet CO_2 standards/guidelines, renewables guidelines, and reliability measures, so the primary decision metric for the options is the overall portfolio cost.

In the portfolio cost screen, the metric used is present value of revenue requirements (PVRR), a measure commonly used in the energy industry for portfolio analysis. PVRR evaluates the present value of the costs associated with the investment in incremental resources and the total costs to operate the power generation portfolio. Platte River used a discount rate of 5% over the planning horizon to produce the PVRR results.

As can be seen in the chart below, the 1C-out strategy is favored over 2C-out and C-min strategies from a cost perspective. The 2C-out scenarios offer additional CO_2 reduction potential beginning in 2020, with an associated higher cost.

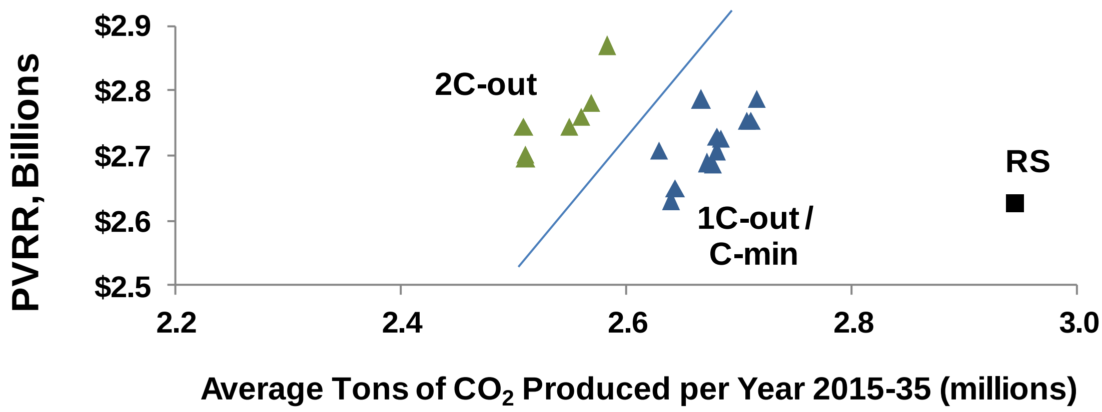
Anticipated Portfolio Costs for Modeled Portfolios (2015-35)



Strategy Description	
1C-out	-- Exit ownership in 2020 of Platte River's share of Craig Unit 1 (77 MW) -- Craig 2 (77 MW) retired in 2030
2C-out	-- Exit ownership in 2020 of both Craig units partially owned by Platte River (154 MW)
C-min	-- Maintain ownership of both Craig units, and operate at minimum contractual capacity through 2030 46-154 MW June-Aug; 46 MW Sept-May --Exit ownership of full share in 2030

The chart below brings together the two main drivers of this IRP analysis—CO_2 reduction and cost. As can be seen, CO_2 reduction is least costly to attain under a 1C-out strategy—approximately $55 million more than the reference scenario. To achieve greater CO_2 reduction, approximately $130 million needs to be invested under a 2C-out scenario.

Summary of Portfolio Results—PVRR vs. CO_2 Reduced, 2015-35



Strategy Description	
1C-out	-- Exit ownership in 2020 of Platte River's share of Craig Unit 1 (77 MW) -- Craig 2 (77 MW) retired in 2030
2C-out	-- Exit ownership in 2020 of both Craig units partially owned by Platte River (154 MW)
C-min	-- Maintain ownership of both Craig units, and operate at minimum contractual capacity through 2030 46-154 MW June-Aug; 46 MW Sept-May --Exit ownership of full share in 2030

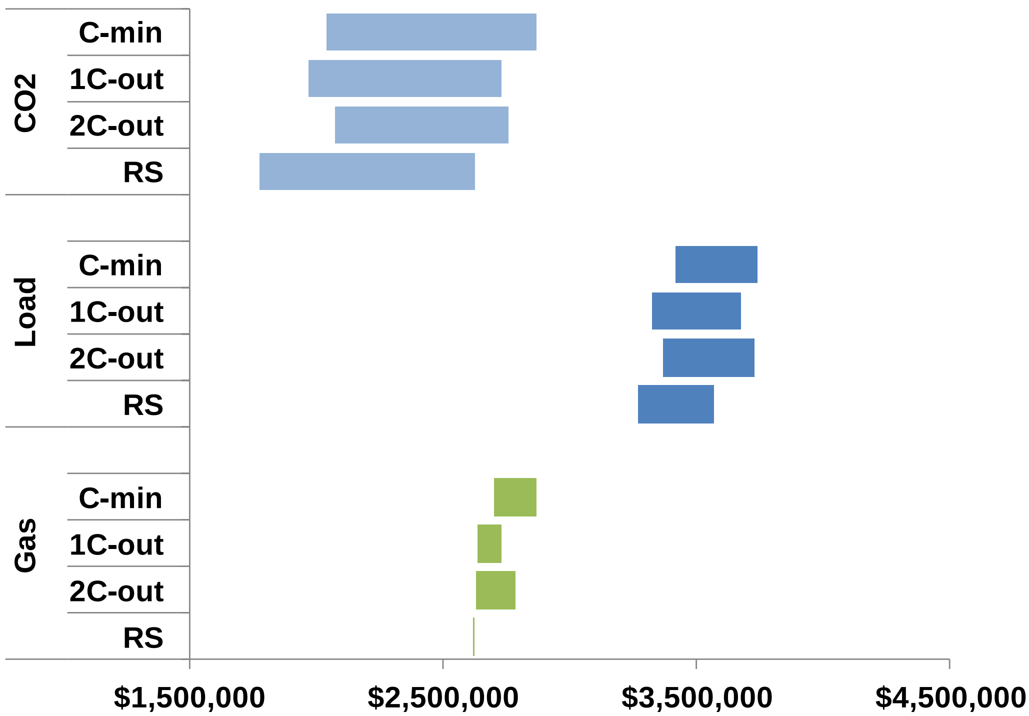
To assess the impact that uncertainty can produce on projected power portfolios, Platte River prepared a sensitivity analysis on the IRP portfolios by varying key driver inputs.

Variables Used to Evaluate Sensitivity

Cost of CO_2 regulation	Two alternatives for future CO_2 regulation were modeled—scenarios with and without a projected cost for CO_2 emissions.
Electric demand	The high and low scenarios were used from Platte River's official load forecast.
Fuel/power prices	Platte River's market price of power was adjusted using 20% high/low bands around the reference case for natural gas prices.

Platte River's risk analysis reinforces the cost screen. Across a range of inputs, a 1C-out strategy is preferable to a C-min strategy. The cost of CO_2 compliance is the single largest driver in Platte River's planning process. Variation around electric loads produces the next largest impact on portfolio cost. Gas cost variation plays a lesser role in the spread around portfolio costs due to expected low gas prices and the proportion of total energy expected to be generated with gas resources over time.

Impacts of Additional Variables (Spread in NPV, 2015-35)



Strategy Description	
1C-out	-- Exit ownership in 2020 of Platte River's share of Craig Unit 1 (77 MW) -- Craig 2 (77 MW) retired in 2030
2C-out	-- Exit ownership in 2020 of both Craig units partially owned by Platte River (154 MW)
C-min	-- Maintain ownership of both Craig units, and operate at minimum contractual capacity through 2030 46-154 MW June-Aug; 46 MW Sept-May --Exit ownership of full share in 2030

Portfolio Recommendations

Platte River's 2016 IRP was divided into three critical time periods for decision analysis:

Resource Acquisition Period	**2015-20**	Near-term need to determine path for Platte River's share of the Craig Station
Planning Period - *Mid-term*	**2020-30**	Mid-term need to manage renewables / determine best-fit resource for replacing Craig
Planning Period - *Long-term*	**2030+**	Long-term need to determine how to manage Rawhide to meet CO_2 reduction requirements

Resource Acquisition Period—Path for Platte River's Share of Craig Unit 1

In the near-term, Platte River faces a decision about how to achieve material CO_2 reductions to meet potential EPA emissions limits. The 1C-out and C-min strategies are similar in some respects—capacity reductions are comparable, and Platte River's plant shares would be managed/scheduled similarly (1C-out would be run 70 to 80% of the time at 77 MW, and C-min would be run 70 to 80% of the time at 46 MW). ***However, key differences separate the two strategies, leading Platte River to recommend pursuing the 1C-out strategy over a C-min strategy.***

Lower Costs The 1C-out strategy is projected to have lower overall costs for two reasons—future environmental upgrade costs could be avoided with a sale/transfer/retirement of Unit 1, and fixed operating costs would be lower per MWh produced. Overall, a 1C-out strategy PVRR is approximately $70 million lower than a C-min strategy.

Optimized Plant Operations and Expenditures A 1C-out strategy is a better solution operationally and financially—a C-min strategy would lower overall plant performance, and fixed costs would be spread sub-optimally (about three times higher per MWh produced).

Fewer Contract Uncertainties Uncertain fuel contract issues cast doubt on whether Platte River could satisfy its full long-run CO_2 reduction needs—a C-min strategy is best suited as a short-term measure to achieve CO_2 reduction while an exit strategy is formulated.

Potential Joint Effort A 1C-out strategy may be jointly preferable to other co-owners under future EPA rules—retirement of Unit 1 may be the best objective for joint owners facing similar emissions/cost constraints.

Maintains Flexibility Pursuing a 1C-out strategy still leaves the option to have the flexibility of a C-min strategy—under ownership of one unit, Platte River would have the contractual capability to manage its 77 MW down to 23 MW, yielding potentially more CO_2 reduction capability if needed (up to an additional 420,000 tons/year).

Comparison of 1C-out vs. C-min Strategies

	1C-out	C-min
PVRR Delta to RS	$55 M	$126 M
CO_2 Reduction	Meets 2020 needs	Meets 2020 needs
Diversification	Through release of asset	Through controlled operations
SCR Costs	Approx. 50% lower costs	Committed to full share
Fixed Operating Costs	Pro-rata share	Higher per-unit costs
Transmission	Potentially lower ownership capacity	Full ownership
Flexibility	Can operate between 23-77 MW	Can operate between 46-154 MW

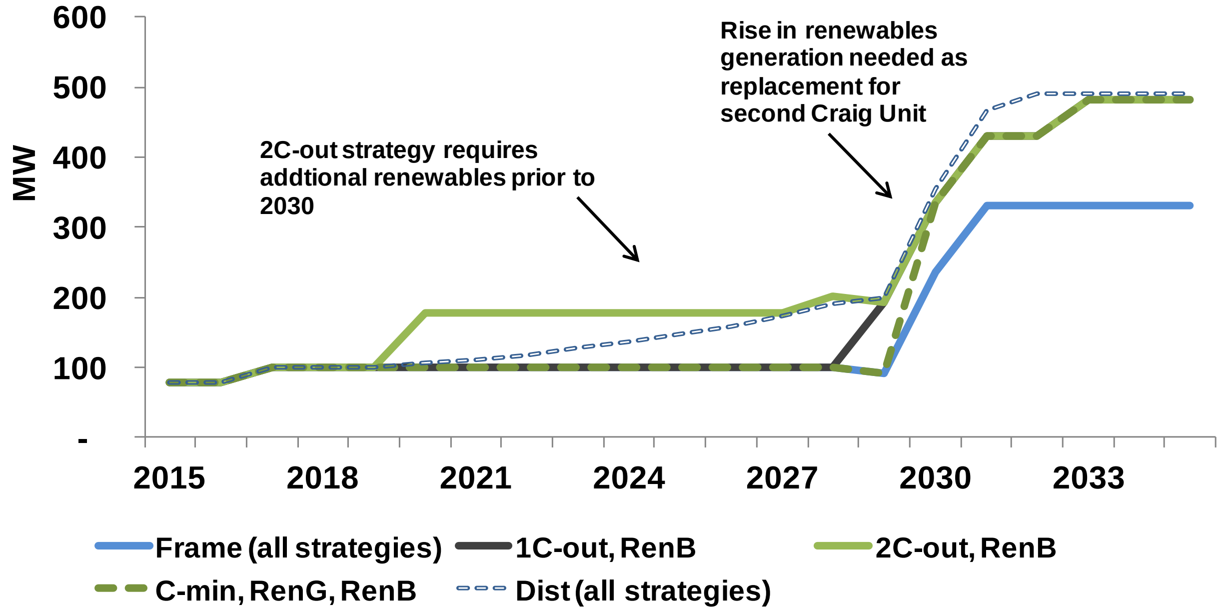
Mid-term Planning Period—Managing Renewables

By 2030, Platte River will need to have additional capacity in commercial operation to replace the two Craig units as well as meet projected capacity needs. Under most scenarios Platte River expects to maintain its existing position in renewable generation resources through 2030. After Craig's assumed full retirement in 2030, renewables generation (utility scale and/or distributed) becomes an increasing part of the generation portfolio.

Managing renewables will be an important effort for Platte River in the mid-term. Currently, Platte River has no true, highly-dispatchable generation resource to manage the intermittency of wind (40% capacity factor) and solar (20% capacity factor). Firming renewables that may account for one-third of Platte River's total generation will be critical in ensuring reliability of service. Currently, Platte River contracts for balancing services through PSCo, the regional balancing authority. PSCo's future costs are uncertain, and total reliance on tariffed services may be infeasible. To help determine best-fit resources, Platte River will continue to evaluate the impact that increasing penetrations of renewables have on cost/operations.

Of the gas resources that Platte River analyzed for its 2016 IRP, reciprocating gas engines are the favored generation type, and assumed capacity needs are filled with reciprocating gas engines.

Growth in Renewables Generation through 2040



Strategy Description	
1C-out	-- Exit ownership in 2020 of Platte River's share of Craig Unit 1 (77 MW) -- Craig 2 (77 MW) retired in 2030
2C-out	-- Exit ownership in 2020 of both Craig units partially owned by Platte River (154 MW)
C-min	-- Maintain ownership of both Craig units, and operate at minimum contractual capacity through 2030 46-154 MW June-Aug; 46 MW Sept-May --Exit ownership of full share in 2030

Long-term Planning Period—Long-Term Rawhide Modifications

Under current CO_2 reduction expectations, Rawhide will continue to operate at its existing full output through 2030. However, if the EPA's proposed rules come into effect, decisions will need to be made on how to manage Rawhide output to ensure that Platte River's CO_2 emissions meet compliance standards. It is expected that Rawhide will have to reduce its output by approximately 20% for the 2030-46 period, until its retirement date.

Several options are available to reduce Rawhide CO_2 output in the future. ***Many are deemed unlikely but may have future feasibility, so Platte River will continue to monitor these options.*** The list below shows several possibilities:

Co-firing with biomass	Although this option is technically feasible, the feedstock/supply are uncertain; also, the additional maintenance/performance effects of biomass residue on Rawhide's boiler and other systems may make this option unrealistic.
Coal-to-gas conversion	Platte River conducted a study in 2008 to address a coal-to-gas conversion. Although CO_2 emissions could be reduced, significant capital expenditures would be required, plant efficiency would drop, and the engineering efficacy is questionable.

Seasonal operation	If Rawhide needs to reduce output by up to 20% (over the period 2030-46), operating seasonally may be viable (for instance, only running for 10 of 12 months). This method increases the impact of fixed costs.
Plant efficiency gains	Given current technology, it is estimated that Platte River can achieve up to 2% additional plant efficiency through the addition of variable speed drives, lighting retrofits, and other efficiency measures.
Partial ownership	Since Rawhide is a top-performing plant, another owner may want to replace output from a lesser plant with a share of Rawhide. Joint-ownership could allow Rawhide to operate at its full performance level and help optimize state/regional resources.

Platte River is not explicitly modeling these scenarios due to the far-off dates. However, an adjustment for assumed future efficiency increases at Rawhide has been implemented in the 2016 IRP modeling scenarios starting in 2030.

Conclusion

As emphasized in this integrated resource plan, the energy industry is faced with the near-term prospect for many significant changes—from the mode of power generation to the amount of control customers have over the delivery of their power. Although Platte River has no immediate portfolio needs during the resource acquisition period, we anticipate that some form of federal CO_2 reduction rules will come into effect within the next few years, requiring more attention during the long-term planning period. Our member-owners have also expressed the desire for resource portfolios that satisfy the individual needs of their communities. Platte River will be at the forefront of these efforts to ensure that customer needs are met, while continuing to provide high system reliability and affordably-priced power.

Platte River is well-positioned to adapt to these industry changes, and continues to plan for the most effective mix of generation and consumer offerings that will meet the future needs of our customers.

As discussed throughout this document, our action plan centers on preparation for pending federal emissions legislation, industry evolution, and changes in the mix of resources our customers prefer, while continually focusing on the reliability of our power system.

Over the past several years, Platte River has been taking incremental steps to prepare for these long-term business needs, by adding sizable shares of wind and solar generation, increasing our investment in demand-side management programs, and looking for ways to reduce our reliance on coal-fired generation. Our Board of Directors has provided strong support for these changes, and we look forward to working with Western and our owner-communities as our business evolves.