REDACTED

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APPENDIX B – WEC Utilities' Economic Analysis

GRP Economic Analysis – Red Barn Wind

Historically, changes in the electric portfolio were incremental, typically driven by an increase in demand for electricity. The business case was evaluated on a project-by-project basis to meet the demand, *i.e.* Project A versus Project B. However, recently the increase in demand has become relatively modest year over year as market trends and policy have increased energy efficiency and demand side management on a macro level. The business case for new generation has shifted from being primarily driven by increases in demand to being driven by the need to replace retiring older, less efficient, carbon-emitting resources. This has resulted in substantial changes across the energy industry and is causing the need to evaluate long-range decisions on a portfolio basis in order to make sound economic decisions, ensure reliability and resiliency, and ensure environmental responsibility. In evaluating the significant industry changes as well as the current state of their own portfolios, Wisconsin Electric Power Company ("WEPCO") and Wisconsin Public Service Corporation ("WPSC") (collectively "the WEC Utilities") have determined that they can deliver significant value for their customers and society by employing a holistic economic, reliability, and environmental approach to reshaping their generation portfolios.

The Red Barn wind project ("Red Barn Project" or "the Project") is part of the WEC Utilities' overall Generation Reshaping Plan ("GRP") that will provide significant economic savings for customers while ensuring reliability, resiliency, and environmental stewardship. WEC Energy Group ("WEC") has established CO_2 emission reduction goals as part of its overall environmental strategy with a 55% reduction in CO_2 emissions as compared to 2005 emission levels by 2025 and 70% reduction in CO_2 emissions by 2030. The GRP is the WEC Utilities' first step in achieving these goals and will provide the foundation for meeting the 70% reduction level by 2030. As part of the GRP the Utilities will retire approximately 1,800 MW of generation, which includes a combined 1,385 MW of older, less efficient coal generation, 190 MW of end-of-life gas generation, and [redacted]. The energy and capacity need caused by these retirements will be met with a combination of low cost renewable technology, BESS and highly-efficient natural gas technology. The WEC Utilities have determined the best approach to meet these goals is to evaluate the overall GRP against continued operation of their respective existing generation portfolios over the study period of 30 years.

The following sections provide and identify the detailed planning assumptions and results of the WEC Utilities' economic analysis focusing on the quantifiable components of the Project as part of the GRP. The economic analysis is a comprehensive evaluation that tests and validates how the Project provides

economic value as part of the WEC Utilities' overall robust GRP. In addition to the base assumptions, the economic analysis includes a sensitivity analysis, which determines how independent variables, *i.e.* planning assumptions, affect the economic value the Project provides, and in this case, how they affect the overall GRP's economic value compared to status quo.

As described in greater detail in **Section 5.0** below, the GRP, including the Project, provides a cumulative nominal savings of **$1,049 million** over the first 20 years and a combined NPV savings of **$880 million** for the WEC Utilities' customers compared to maintaining the WEC Utilities' existing generation fleet.

1.0 Generation Resource Modeling

1.1 Long-Term Capacity Expansion Model - PLEXOS

WEC utilized Energy Exemplar's ("EE") PLEXOS market simulation software ("PLEXOS") to evaluate each utility's optimal long-term expansion plan. The PLEXOS model provides the most robust model functionality and is a proven power market simulation tool that is a leader in modeling flexibility, efficiency, simulation alternatives and advanced analysis. In addition, the support, continuous improvements, and its capability to perform both fuel budget runs and capacity expansion simulations made this model the obvious choice for WEC when it came time to replace the long-term capacity expansion modeling.

PLEXOS is a comprehensive production cost model with regional databases for conducting capacity expansion planning and is used by over 280 customers with utilities being the largest customer base.[1] The model provides the capability to solve the capacity expansion problem simultaneously with commitment and dispatch. PLEXOS also accounts for all types of generation and storage resource options during generation capacity expansion. This allows PLEXOS to build balanced portfolios of conventional, renewable and storage resources, which accounts for the delivery curves of price taking wind and solar generators.

PLEXOS allows the WEC Utilities to forecast future generation portfolios and locational marginal prices across MISO; identify low cost resource options to meet the Utilities' future system needs; and simulate the dispatch, costs, and revenues of those portfolios as part of the Midcontinent Independent System Operator, Inc. ("MISO") market. Because of the robustness of the modeling capabilities

[1] Notable customers includes AEP, Xcel Energy, Dominion, Southern California Edison, MISO, PJM, and California ISO

described above, PLEXOS was chosen by the WEC Utilities as their long-term capacity expansion model to evaluate the economic value the GRP provides the WEC Utilities' customers.

1.2 Economic Modeling Approach

As described above, the economic analysis evaluates the overall GRP against continued operation of WEC Utilities' respective existing generation portfolios over the planning period, with the exception of the older gas technology for WPSC, which is described in more detail in **Section 4.2**. The WEC Utilities utilized the PLEXOS model to economically dispatch the Utilities' portfolios, optimize CO_2 emissions, and economically select new "Generic Units" to meet future capacity need in the future for both the GRP and Status Quo Alternative scenarios.

In the GRP scenario, the PLEXOS model was populated with the detailed unit characteristics and assumed in-service dates for the GRP facilities, including the Red Barn Project, as well as the planned existing unit retirements. In the Status Quo Alternative, the GRP units are not included in the modeling run and the existing units continued to operate throughout the study period. The following provides a breakdown of how economic analysis was developed utilizing the PLEXOS model and specific internal financial calculations for each of these scenarios. A detailed breakdown of these variables is provided in the confidential attachment *GRP Economic Results_rev2 – Base Case*.

- Fuel Costs – Determined by PLEXOS
- Variable Costs – Determined by PLEXOS
- Market Energy Purchases and Sales – Determined by PLEXOS
- Avoided dispatch costs from reshaping the combined generation fleet, included as part of the impact on Fuel Costs– Determined by PLEXOS
- Market Capacity Purchases – Determined by PLEXOS
- BESS Ancillary Purchases – Internal calculation based on 3 years of historic MISO Ancillary Service Market ("ASM") data
- GRP/Status Quo Specific Unit Capital Recovery – Internal calculation using utility specific financial parameters to more accurately calculate return on and of investment and correctly incorporate investment tax credits ("ITC") and production tax credits ("PTC") when applicable

- GRP/Status Quo Specific Unit Annual Fixed Costs – Internal calculation
- Future Generic Unit Expansion Optimization – Determined by PLEXOS
- Generic Unit Capital Recovery/Fixed operations and maintenance ("O&M") – Fixed O&M and unit build costs were provided as inputs to the PLEXOS model based on internal calculations.

The cost information developed above was used to provide economic comparisons between the GRP and Status Quo Alternative.

2.0 Planning Assumptions

2.1 Discount Rate

The discount rate used in determining the net present value ("NPV") of the annual cost streams for the Project and the Alternatives is equal to the WEC Utilities' average weighted average cost of capital ("WACC"). The WACC used in the evaluation for WPS is 7.22% and is 7.49% for WEPCO. The NPV values in the economic evaluation are expressed in 2021 dollars.

2.2 Study Period

The study period focuses on a 30-year time period from 2021 to 2050, which lines up with the PLEXOS capacity expansion model. However, the economic model also includes a 10-year extension period to allow capital investments and their corresponding revenue requirements unwind, which equates to a total 40-year study period. All other costs in the 10-year extension period escalate at the defined escalation rate described in **Section 2.3**.

2.3 Escalation Rate

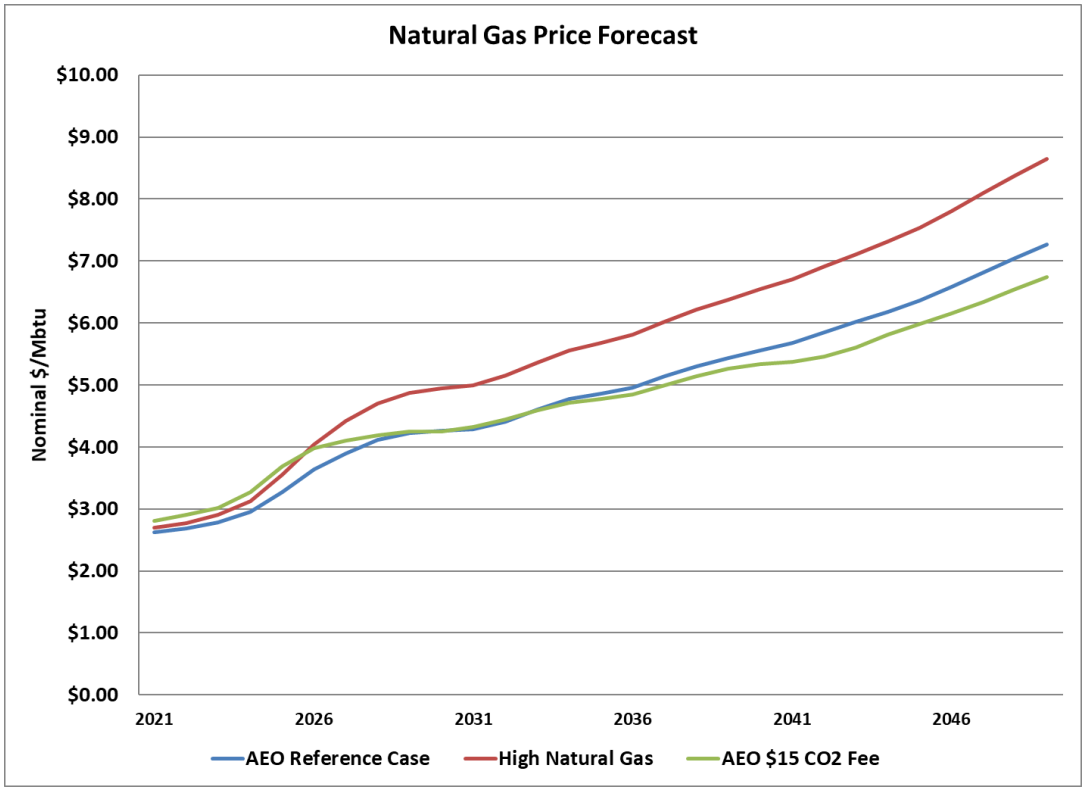
The base escalation rate assumption utilized in the economic analysis to account for increases in costs due to nominal and real inflation was [redacted]. This rate was applied to fixed and variable O&M, market capacity prices, CO_2 monetization costs, arbitrage value (BESS), and coal prices. Additional sensitivities were performed on this variable and are described below.

2.4 Natural Gas Price Forecast

The base natural gas price forecast used in the economic evaluation was developed and provided in EIA's 2020 Annual Energy Outlook ("AEO") – Reference Case. Two natural gas price

sensitivities were performed to test the overall impact natural gas prices would have on the overall economics of the GRP. A high natural gas price forecast was developed by calculating and adding one standard deviation to the Reference Case forecast. The other forecast was based on AEO's assumption of a $15 Carbon Dioxide Allowance Fee scenario, which included a CO_2 tax on every ton of CO_2 produced. This gas price forecast reflects AEO's assumption that such a tax would be implemented and was included as a sensitivity to the base assumptions, which do not include [redacted] as described further in **Section 2.10**. These natural gas prices were then used to develop the market price forecasts for MISO's LRZ2 area that was used in the capacity expansion model. **Figure 2-1** below includes the natural gas price forecast assumptions used in the evaluation.

Figure 2-1

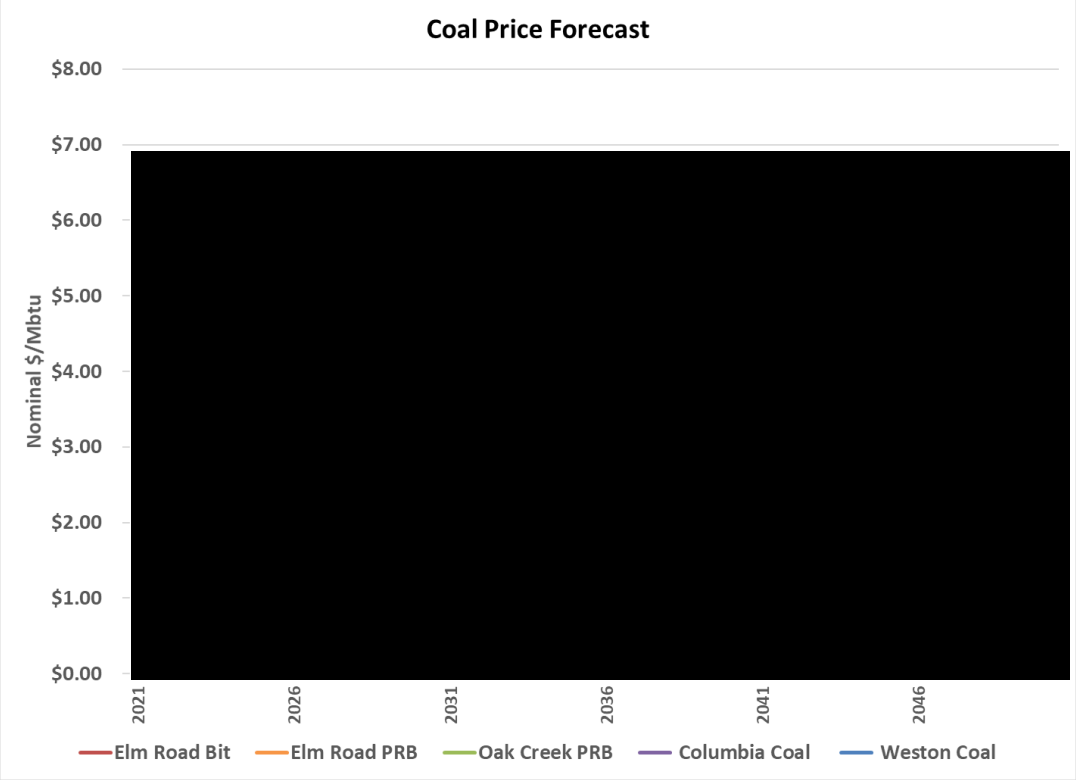


2.5 Coal Price Forecast

The coal price forecasts for each of the WEC Utilities' coal plants are based on the most recent internal forecasts. After the forecasted time period the coal prices are escalated [redacted] annually

over the balance of the study period. **Figure 2-2** below includes the base coal price forecast used in the economic evaluation.

Figure 2-2

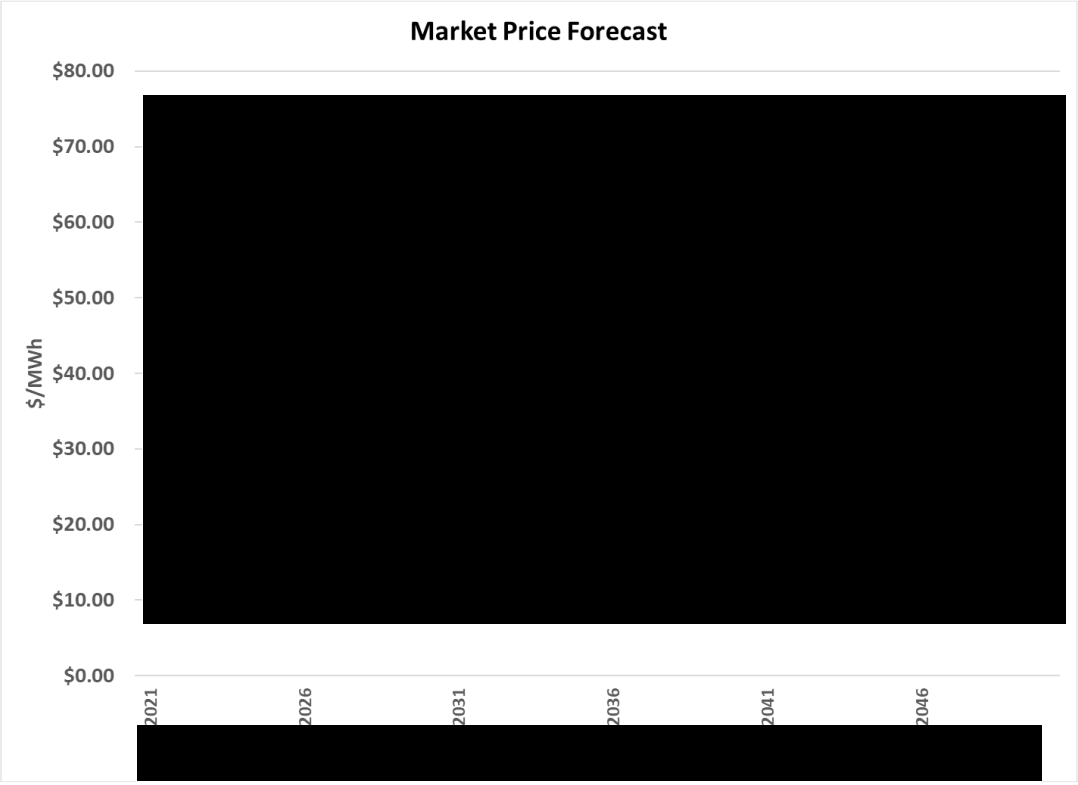


2.6 Market Energy Prices

As part of the overall process, the WEC Utilities contracted with Energy Exemplar and Siemens to model long-term expansion and the resulting market prices of the Eastern Interconnect and specifically MISO Load Resource Zone 2 ("LRZ2")[2]. Market price forecasts generated were then incorporated into PLEXOS to appropriately represent the market while optimizing each individual utility's integrated resource plan for 2021-2050. **Figure 2-3** shows the electricity market price forecast based on the natural gas price forecasts utilized in the evaluation.

[2] Energy Exemplar's Aurora model was used to produce the market prices for the Eastern Interconnect and MISO LRZ2.

Figure 2-3



2.7 Demand and Energy Forecast

The annual peak demand and energy forecasts are provided in **Table 2-1** for both utilities.

Table 2-1: Demand and Energy Forecasts

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
WEPCO											
Energy	MWh										
Peak Demand (MISO Coincident)	MW										
WPS											
Energy	MWh										
Peak Demand (MISO Coincident)	MW										

** Assumes wholesale contracts are not renewed upon expiration and load remains flat after 2030*

2.8 CO2 Reduction Levels

As previously mentioned, the Utilities' have established CO_2 emission reduction targets from 2005 emission levels. **Table 2-2** reflects the CO_2 reduction targets for each utility by 2025 and 2030.

Table 2-2

CO_2 Emission Reduction Goals	2025 Total Tons (55% Reduction Level)	2030 Total Tons (70% Reduction Level)
WEPCO	[redacted]	
WPS		

2.9 Market Energy CO2 Content

The average CO_2 content per MWh used in the evaluation assumes [redacted] as a starting point. The Utilities looked at the average CO_2content of overall generation in the Eastern Interconnect in the long-term market runs and applied the annual ratio decrease in CO_2content observed from those results to the [redacted]. For example, the CO_2 content for market energy assumption is [redacted]

2.10 Avoided dispatch costs from reshaping the combined generation fleet

The economic evaluation includes, as a part of the impact on fuel costs, an evaluation of [redacted] to meet carbon reduction goals when compared to operating the existing fleet into the future. To accomplish this objective, [redacted] The base assumption for this [redacted] This [redacted] over the balance of the study period. Sensitivities around this [redacted] were performed to test the robustness and impact it has on the GRP's overall economic benefit.

PLEXOS has the ability to optimize dispatch in order to meet CO_2 reduction level targets at the lowest system cost. Within the PLEXOS model, constraints are applied that optimize the combination of unit-generated CO_2 emissions and market-purchased energy CO_2 emissions.

Market purchased energy is assigned a CO_2 rate as described in **Section 2.9**. Within the model, the total CO_2 output is calculated as a combination of each utility's unit-specific output and net purchases. PLEXOS then solves to meet the specified CO_2 reduction goals shown in **Section 2.8** with a balanced approach to self-generation or market energy purchases but with a soft limit on the CO_2 reduction limits. The model has the option to utilize a [redacted] for CO_2 emissions above the specified limits if it is economic to do so versus building additional generation to meet those goals. [redacted]

Unlike the base assumption [redacted] one of the gas price sensitivities included a [redacted] as described in **Section 2.4**, and therefore did not include the baseline [redacted] described above.

2.11 Market Capacity Price Forecast

Cost of New Entry (CONE) is the standard long-term price of capacity in resource planning. The reason for this assumption is that over time, any current excess capacity in the system will be utilized or removed (retirements or economic shutdown) and as such, the cost of any newly needed capacity will be the cost of building a unit. The most recent value of CONE in our area, MISO LRZ 2, is $90,940/MW-yr[3]. This long-term cost planning assumption is understandably too high to be utilized in the immediate future so the assumption is gradually increase up the value of CONE. This means that [redacted]

2.12 Generic Units

Generic units are utilized in the capacity expansion model to optimize the balance of the Utilities' portfolio with future decisions on additional generation when there is a capacity need in the future. Both of the WEC Utilities forecast modest load growth from 2021 to 2030 and then flat demand for the balance of the study period. Load growth is not a significant driver of capacity need. After the retirement of the older coal and gas units identified in this analysis, capacity need is primarily driven by [redacted]

[3] Sourced from MISO Annual CONE Filing: https://cdn.misoenergy.org/Final%20Annual%20CONE%20Filing%20(2020)480413.pdf

The generic units that were modeled in PLEXOS to meet future capacity needs [redacted] are provided below in **Table 2-3**. In addition to the generic units identified below, the model also has the option to select market capacity as a capacity source, [redacted] to meet capacity need [redacted]

Table 2-3: Generic Units

Generic Expansion Unit Parameters:	Capacity	ICAP Value	Capacity Factor	Forced Outage	Annual Maint.	Heat Rate	Capital Cost	Fixed O&M	[redacted]	Battery Repower	Variable O&M
	MW	%	%	%	Weeks/Yr	btu/kWh	$/kW	$/kW-yr		$/kW-yr	$/MWh
Solar	[redacted]										
Wind											
Combined Cycle											
Combustion Turbine											
RICE											
Battery Storage											
Solar "Plus" Battery Storage											
Wind "Plus" Battery Storage											

3.0 Generation Reshaping Plan

The WEC Utilities expect to retire approximately 1,800 MW of fossil-fueled generation by 2025.[4] The overall GRP is to replace a portion of the retired capacity by building and owning a combination of clean, natural gas-fired generation and zero-carbon-emitting renewable generation facilities. **Table 3-1** provides a summary of the technology parameters and costs in the GRP for both WEPCO and WPSC.

[redacted]

Table 3-1: GRP Parameters

TECHNOLOGY	UTILITY	CAPACITY		IN-SERVICE	CAPITAL COST	
		ICAP	UCAP		$MM	$/kW
SOLAR	WEPCO	788	551	2023/2024	1,091	1,385
	WPS	158	110	2023/2024	218	1,385
BESS	WEPCO	451	442	2023/2024	631	1,399
	WPS	107	105	2023/2024	146	1,357
WIND	WEPCO	n/a	n/a	n/a	n/a	n/a
	WPS	82	13	2022	146	1,774
GAS (RICE)	WEPCO	64	61	2023	86	1,331
	WPS	64	61	2023	86	1,331
GAS (RIVERSIDE)	WEPCO	200	190	2023/2024	182	910
	WPS	n/a	n/a	n/a	n/a	n/a
TOTAL	**WEPCO**	**1,503**	**1,244**	**2023/2024**	**1,990**	**1,324**
	WPS	**412**	**289**	**2022/2024**	**596**	**1,447**
	COMBINED	**1,915**	**1,533**	**2023/2024**	**2,585**	**1,350**

3.1 Red Barn Wind Characteristics

The Red Barn Project encompasses an overall capacity of a 91.6 MW wind farm with an expected 39% capacity factor. The Utilities will each own a percent share of the overall Project with WPSC owning 90% and Madison Electric and Gas will hold the remaining 10% ownership. This results in WPSC owning 82.4 MW of wind.

3.2 In-Service Date

For purposes of the economic analysis, the commercial operating date of the Red Barn Project is assumed to be December of 2022.

3.3 Capital Cost

The capital cost estimate for the entire Red Barn Project used in the economic analysis is approximately $162.5 million. WPSC's ownership share (90%) equates to approximately $146.3 million, or $1,774/kW. The calculations for the recovery on and of the investment and associated production tax credits ("PTC") can be found in the confidential attachment *GRP – Capital & Fixed Cost Estimates_rev2.*

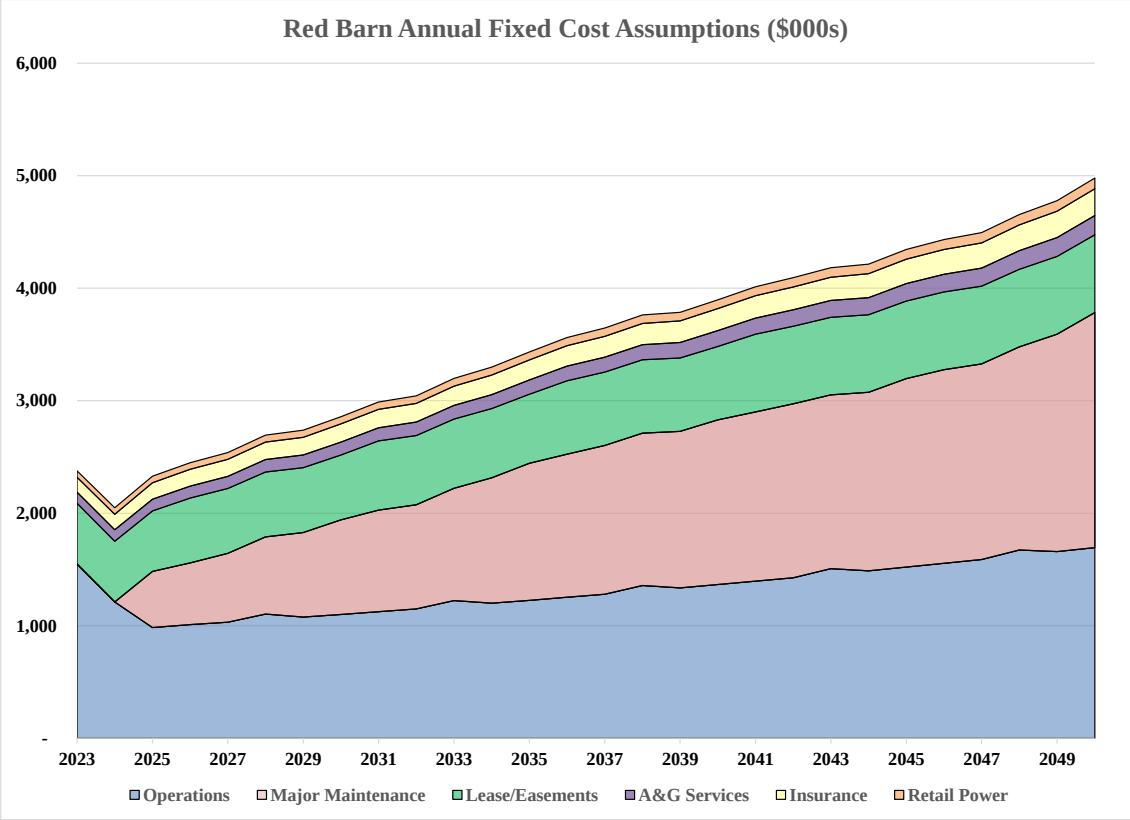
3.4 Production Tax Credit

The Red Barn Project is not eligible for 100% PTC but is eligible for 80% PTC, based on turbine equipment that meets the IRS Five Percent Safe Harbor Test. The ability to take advantage of these tax credits further reduces costs and provides more savings to customers. However, a delay in the planned in-service in December of 2022 will put this value at risk with a decrease in the PTC value to 60% as opposed to 80% if the facility's in-service date is not in 2022. Detailed calculations on the PTC value can be found in confidential exhibit GRP Capital & Fixed Cost Estimates_rev2.

3.5 Fixed O&M Forecast

The fixed O&M costs include in the GRP evaluation for the Red Barn Project, apportioned by category, are provided in Figure 3-1 below. The costs shown are representative of 100% of the total fixed costs for the facility with WPSC being allocated 90% for its ownership share. The O&M estimates were developed internally by WPSC based on the assumption that a third party contractor will provide O&M services and land fees based the terms of the project land agreements. The forecasted costs can be found in the confidential attachment *GRP – Capital & Fixed Cost Estimates_rev2*.

Figure 3-1



4.0 Status Quo Alternative

The Alternative included in the economic evaluation is a continuation of the WEC Utilities' existing portfolios, with one small exception for WPS. Estimates for continued fixed O&M, capital expenditures, and capital overhauls were considered and included for continued operation of WEPCO's Oak Creek Coal Facility (Units 5-8) and WPS's ownership share of the Columbia Coal Facility (Units 1-2).

4.1 WEPCO

The Status Quo for WEPCO includes continued operation of Oak Creek Units 5-8 (1,075 MW) through the 30-year study period and a [redacted]

Continued long-term operation the Oak Creek units for another 30 years would require the remainder of the plant projects identified in a 2014 analysis performed by an external consultant

HDR to determine a long-term capital spending plan. This effort defined the costs and benefits of potential plant projects aimed at improving Oak Creek Units 5-8 reliability, maintenance and safety to allow for increased plant availability and dispatch. A limited number of these projects were completed in the subsequent years as part of a major plant renovation. In order to operate for another 30 years, the remainder of the plant projects identified in this report would be required. The total cost to complete this major plant renovation is estimated at [redacted]. In addition to the capital cost for major renovation, plant fixed O&M and capital maintenance costs are modeled to continue at current levels, with escalation applied. O&M costs are estimated at [redacted] per year and capital maintenance costs are estimated at [redacted] per year for the entire facility, which is equivalent to [redacted] per year for each unit.

The average annual modeled cost of the [redacted] This includes a continuation of the [redacted] The [redacted]

Detailed information on the annual cost calculations for continued operation of these selected units can be found in the confidential attachment *GRP Economic Results_rev2 – Base Case*.

4.2 WPS

As previously mentioned WPS is planning on retiring some of its old, less efficient gas technology. These units include Weston 2 (steam unit), Weston 31 and 32 (aero derivative combustion turbines), and Marinette 31 and 32 (aero derivative combustion turbines). These units have been providing utility service to customers for nearly a half century and have reached the end of their useful life. Due to obsolescence of parts and services, less robust aftermarket on non-OEM support, longer lead times for replacement parts, and less predictability of sustaining O&M and capital costs these units are not considered for continued operation in the Status Quo Alternative. As a replacement to the retirement of these units and to reflect the need to have generation at or near the Weston facility to provide transmission support, [redacted] included in the Status Quo Alternative.

Similar to the continued operation of the Oak Creek units for WEPCO, additional capital would be required to renovate/overhaul Columbia Units 1 and 2 in order to continue operation for the next 30 years. WPS's ownership share of the estimated capital cost for overhaul is [redacted]

for both units and O&M costs are estimated at [redacted] per year and capital maintenance costs are estimated at [redacted] per year for both units.

Detailed information on the annual cost calculations for continued operation of these selected units and the replacement RICE facility at Weston can be found in the confidential attachment *GRP Economic Results_rev2 – Base Case*.

5.0 Economic Evaluation

WEC undertook a robust evaluation of the quantitative benefits the GRP provides the WEC Utilities' customers. As part of the evaluation it is important to test primary assumptions to understand the overall impact it has on the results. This type of evaluation determines how different values of an independent variable, *i.e.* planning assumptions, affect the economic value a project – or, in this case, an interrelated series of projects -- provides compared to alternatives. The planning assumptions identified and incorporated in the sensitivity analysis are as follows and shown in **Figure 5-1**:

- Gas price forecast
- Avoided dispatch costs from reshaping the combined generation fleet
- CO_2 content for market energy purchases
- Must run status on Oak Creek and Columbia Units
- Escalation rate
- BESS ancillary revenue estimates in the GRP
- Fixed O&M estimates in the GRP

Figure 5-1: Sensitivity Assumptions

Comparison Case	Scenario		Gas Price Forecast			CO2 Monetization Price				Market CO2 Content	Coal Must Run Months		Escalation Rate	GRP BESS Ancillary		GRP Fixed O&M Costs		
	GRP	Status Quo	Base	High	$15/ton CO2 tax	$20	$10	$30	$15 (tax)	[redacted]	Annual	Summer/ Winter	[redacted]	Base	Minus 50%	Base	Plus 25%	Minus 25%
Base Case	x	x	x x			x x				x x	x x		x x	x x		x x		
Sensitivity 1	x	x	x x				x x			x x	x x		x x	x x		x x		
Sensitivity 2	x	x	x x					x x		x x	x x		x x	x x		x x		
Sensitivity 3	x	x	x x			x x				x x	x x		x x	x x		x x		
Sensitivity 4	x	x	x x			x x				x x		x x	x x	x x		x x		
Sensitivity 5	x	x	x x			x x				x x	x x		x x	x x		x x		
Sensitivity 6	x	x	x x			x x				x x	x x		x x	x x		x x		
Sensitivity 7	x	x		x x		x x				x x	x x		x x	x x		x x		
Sensitivity 8	x	x			x x				x x	x x	x x		x x	x x		x x		
Sensitivity 9	x	x	x x			x x				x x	x x		x x		x x	x x		
Sensitivity 10	x	x	x x			x x				x x	x x		x x	x x			x x	
Sensitivity 11	x	x	x x			x x				x x	x x		x x	x x				x x

Using the base planning assumptions described in detail above, the GRP, including the Red Barn Project, provides a cumulative nominal savings of **$1,049 million** over the first 20 years and a combined NPV savings of **$880 million** for the WEC Utilities' customers compared to the Status Quo Alternative. Investing in renewable energy technology provides significant energy savings over their useful life compared to traditional fossil-fueled generation but also can mean a significant capital investment to realize those savings. That is very much evident in the results of the analysis. Breaking the $880 million NPV savings into two components illustrates this relationship. The combined fuel, fixed and variable O&M, market capacity and net energy purchases, CO_2 monetization and ancillary service NPV savings for both utilities is $1,933 million whereas the capital recovery NPV savings is a negative $1,053 million (increase in overall cost) compared to the Status Quo Alternative.

The sensitivity analysis indicates the value the GRP provides over a wide range of planning assumptions with a minimum combined NPV savings of **$477 million** and a maximum combined NPV savings of **$1,183 million**.

A breakdown of the results of the economic analysis for WPSC and WEPCO are provided in the **Figures 5-2 and 5-3**, and the combined results are provided in **Figure 5-4**. Savings to the customer are shown as negative values in the tables.

Figure 5-2: WPSC Results

Net Benefits: GRP Cost/(Saving) Compared to Status Quo

Case ID	*Description*	WPSC		
		20-Year Nominal	*30-Year Nominal*	*Life Cycle NPV*
		$MM	*$MM*	*$MM*
Base Case	**Base Assumptions**	**(361)**	**(957)**	**(311)**
Sensitivity 1	*$10/ton proxy value for cost of CO2*	*(143)*	*(536)*	***(163)***
Sensitivity 2	*$30/ton proxy value for cost of CO2*	*(544)*	*(1,319)*	***(436)***
Sensitivity 3	[redacted] *CO2 content for market purchases*	*(327)*	*(932)*	***(291)***
Sensitivity 4	*Oak Creek/Columbia must run summer/winter only*	*(263)*	*(791)*	***(249)***
Sensitivity 5	[redacted] *escalation rate*	*(296)*	*(765)*	***(249)***
Sensitivity 6	[redacted] *escalation rate*	*(427)*	*(1,158)*	***(377)***
Sensitivity 7	*High natural gas price forecast**	*(345)*	*(960)*	***(311)***
Sensitivity 8	*$15/ton CO2 tax & gas price forecast**	*(285)*	*(826)*	***(265)***
Sensitivity 9	*GRP ancillary revenues minus 50%*	*(332)*	*(902)*	***(292)***
Sensitivity 10	*GRP Fixed O&M costs minus 25%*	*(402)*	*(1,031)*	***(338)***
Sensitivity 11	*GRP Fixed O&M costs plus 25%*	*(320)*	*(882)*	***(284)***

Combined metrics from above cases:

Minimum Savings	***(143)***	***(536)***	***(163)***
Average Savings	**(337)**	**(922)**	**(297)**
Maximum Savings	***(544)***	***(1,319)***	***(436)***

Figure 5.3: WEPCO Results

Net Benefits: GRP Cost/(Saving) Compared to Status Quo

Case ID	*Description*	WEPCO		
		20-Year Nominal	*30-Year Nominal*	*Life Cycle NPV*
		$MM	*$MM*	*$MM*
Base Case	**Base Assumptions**	**(688)**	**(2,497)**	**(569)**
Sensitivity 1	*$10/ton proxy value for cost of CO2*	*(158)*	*(1,681)*	***(314)***
Sensitivity 2	*$30/ton proxy value for cost of CO2*	*(967)*	*(3,094)*	***(747)***
Sensitivity 3	[redacted] *CO2 content for market purchases*	*(716)*	*(2,575)*	***(591)***
Sensitivity 4	*Oak Creek/Columbia must run summer/winter only*	*(417)*	*(1,935)*	***(396)***
Sensitivity 5	[redacted] *escalation rate*	*(448)*	*(1,902)*	***(380)***
Sensitivity 6	[redacted] *escalation rate*	*(900)*	*(3,264)*	***(782)***
Sensitivity 7	*High natural gas price forecast**	*(644)*	*(2,600)*	***(583)***
Sensitivity 8	*$15/ton CO2 tax & gas price forecast**	*(754)*	*(2,579)*	***(609)***
Sensitivity 9	*GRP ancillary revenues minus 50%*	*(568)*	*(2,270)*	***(492)***
Sensitivity 10	*GRP Fixed O&M costs minus 25%*	*(825)*	*(2,744)*	***(655)***
Sensitivity 11	*GRP Fixed O&M costs plus 25%*	*(551)*	*(2,250)*	***(484)***

Combined metrics from above cases:

Minimum Savings	***(158)***	***(1,681)***	***(314)***
Average Savings	**(636)**	**(2,449)**	**(550)**
Maximum Savings	***(967)***	***(3,264)***	***(782)***

Figure 5-4: Combined WPSC/WEPCO Results

Net Benefits: GRP Cost/(Saving) Compared to Status Quo

Case ID	*Description*	WPSC/WEPCO Combined		
		20-Year Nominal	*30-Year Nominal*	*Life Cycle NPV*
		$MM	*$MM*	*$MM*
Base Case	**Base Assumptions**	**(1,049)**	**(3,454)**	**(880)**
Sensitivity 1	*$10/ton proxy value for cost of CO2*	*(301)*	*(2,217)*	***(477)***
Sensitivity 2	*$30/ton proxy value for cost of CO2*	*(1,511)*	*(4,413)*	***(1,183)***
Sensitivity 3	[redacted] *CO2 content for market purchases*	*(1,043)*	*(3,506)*	***(881)***
Sensitivity 4	*Oak Creek/Columbia must run summer/winter only*	*(681)*	*(2,725)*	***(645)***
Sensitivity 5	[redacted] *escalation rate*	*(744)*	*(2,667)*	***(629)***
Sensitivity 6	[redacted] *escalation rate*	*(1,328)*	*(4,422)*	***(1,159)***
Sensitivity 7	*High natural gas price forecast**	*(989)*	*(3,561)*	***(894)***
Sensitivity 8	*$15/ton CO2 tax & gas price forecast**	*(1,039)*	*(3,406)*	***(874)***
Sensitivity 9	*GRP ancillary revenues minus 50%*	*(899)*	*(3,172)*	***(784)***
Sensitivity 10	*GRP Fixed O&M costs minus 25%*	*(1,227)*	*(3,775)*	***(992)***
Sensitivity 11	*GRP Fixed O&M costs plus 25%*	*(871)*	*(3,132)*	***(768)***

Combined metrics from above cases:

Minimum Savings	***(301)***	***(2,217)***	***(477)***
Average Savings	**(973)**	**(3,371)**	**(847)**
Maximum Savings	***(1,511)***	***(4,422)***	***(1,183)***

Additional information and calculations that were used to summarize the values shown in the figures above are provided as attachments to this Appendix.

5.1 Red Barn Project Economic Value

As mentioned in Appendix C, the addition of state-of-the-art, highly-efficient turbines at Red Barn to WPSC's portfolio will provide an additional [redacted] of zero cost energy, reducing WPSC's dependency on the MISO market from [redacted] Given the lower capacity value MISO attributes to wind facilities, the Red Barn Project provides more value in terms of energy than it does capacity. As a result, it is easier to identify the specific contribution, i.e. NPV savings, the Red Barn Project provides compared to the balance of WPSC's GRP plan. WPSC was able to quantify this value by executing an additional PLEXOS model run in which the Red Barn Project was removed from the Base Case run and replaced with market capacity and energy. This comparison indicates having the

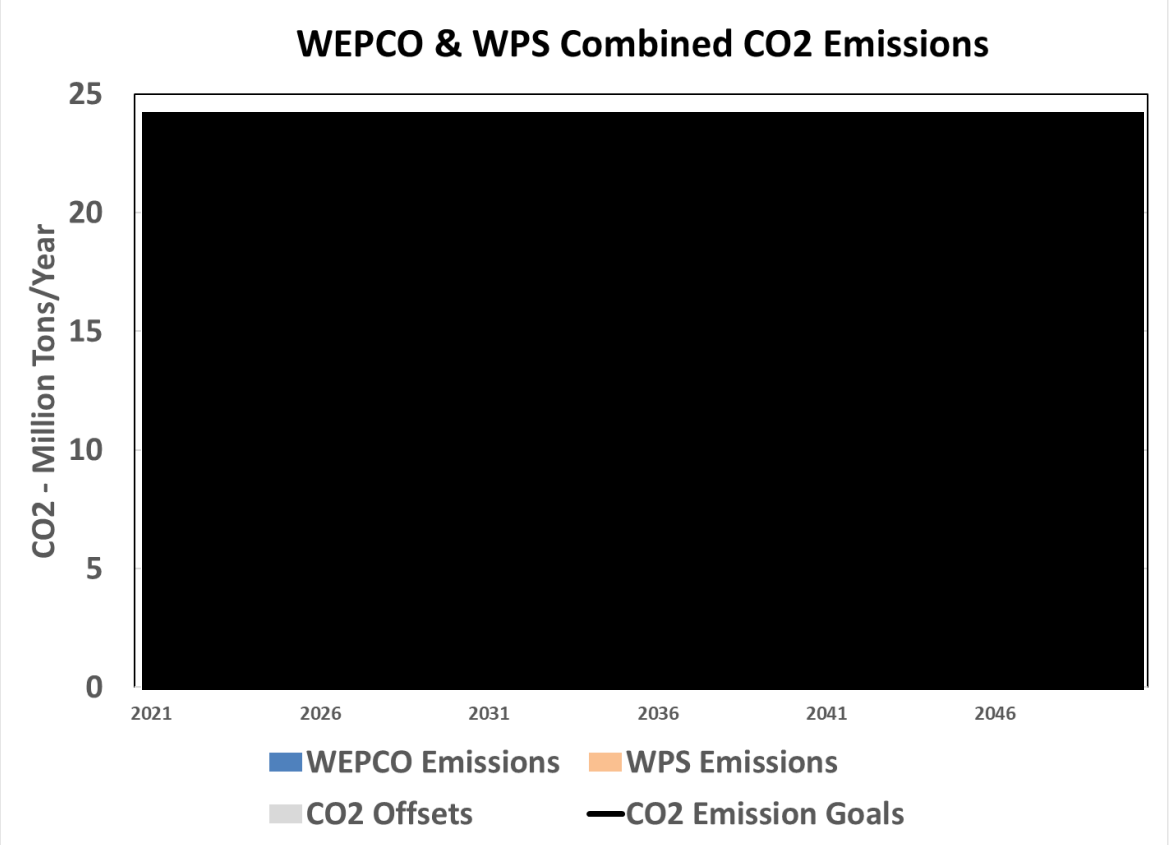
Red Barn Project in WPSC's portfolio will provide customers approximately **$88 million** in NPV savings and a 20-year nominal savings of **$107 million**. On an annual basis the Project begins to provide savings already in year three of service and continues to provide savings through the end of the study period. A detailed comparison can be found in the confidential attachment *Red Barn vs Market Energy-Capacity_rev2*.

5.2 CO_2 Goals

Using the base planning assumptions described in detail above, the GRP Plan, including the Red Barn Project, enable WEC to be in a position to meet its 2025 CO_2 emission goals as stated in Table 2-2 above. Investing in renewable energy technology provides significant reduction in CO_2 emissions compared to traditional fossil-fueled generation and is very much evident in the results of the analysis.

A visual of the results of the carbon reduction for combined WEPCO and WPSC are provided in **Figure 5-5**.

Figure 5-5



APPENDIX B ATTACHMENTS ARE REDACTED IN THEIR ENTIRETY