



Modeling approach



Two primary cases were studied using the AURORAxp dispatch model:

- Case 1** Platte River's Integrated Resource Plan (IRP) Portfolio
- Case 2** Zero Net Carbon Portfolio

- AURORAxp is an industry-standard model, used by both Pace Global and Platte River, that can determine the least-cost portfolio of generation assets that meets defined constraints.
- By solving for the *least-cost* means of meeting ZNC (carbon neutrality) and reserve margins, the costs of achieving ZNC can be compared to the costs of the 2017 IRP portfolio.
- A preliminary evaluation of a possible RTO structure is currently being developed.

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File: 101022-Platte River's ZNC Portfolio (01-2018).xlsx

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Steps to determine the least-cost ZNC portfolio



- Step 1** Define "market" carbon emission rate – 1,803 lb/MWh based on the market today
- Step 2** Assume an initial renewable energy requirement as a percent of load
- Step 3** Determine the least-cost portfolio that meets Platte River's defined reserve margin requirements (15%)
- Step 4** Determine if ZNC requirement is met in 2030 and beyond
- Step 5** Adjust renewable energy requirement as a percent of load and repeat Steps 3 and 4 until the ZNC requirement is met

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Carbon accounting methodology



	2030 Annual Generation (MWh)	Emissions Rate (lb/MWh)	Accounting Time of Carbon*
Coal	0	2,087	-
CT	18,713	1,351	12,641
CC	941,128	754	373,628
Hydro	611,793	0	-
Solar	1,026,758	0	-
Wind	1,385,805	0	-
Total Plant Generation	3,984,238		386,269
Exports	588,287	(1,803)	-528,537
Imports	47,658	1,803**	42,054
Net Carbon Emissions			(98,305)

Net carbon emissions

$\sum (\text{Energy}_{\text{net type}} \times \text{Emissions rate}_{\text{net type}}) / 2,000 - (\text{Market sales} \times 1,803 \text{ lb/MWh}) / 2,000 + (\text{Market purchases} \times 1,803 \text{ lb/MWh}) / 2,000$

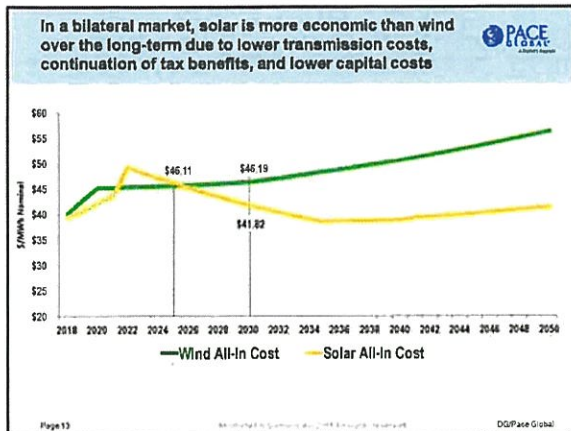
* The optimal level of renewables to achieve the carbon neutrality goal was considered in all years from 2020-50 in the build decision to balance the portfolio

** 1,803 lb/MWh is the eGRID Rockies state for non-baseload generation

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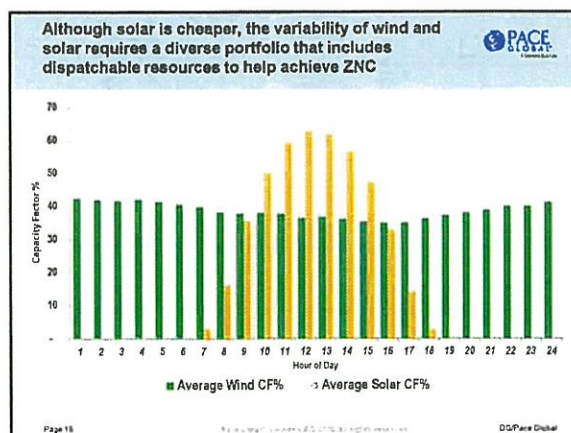


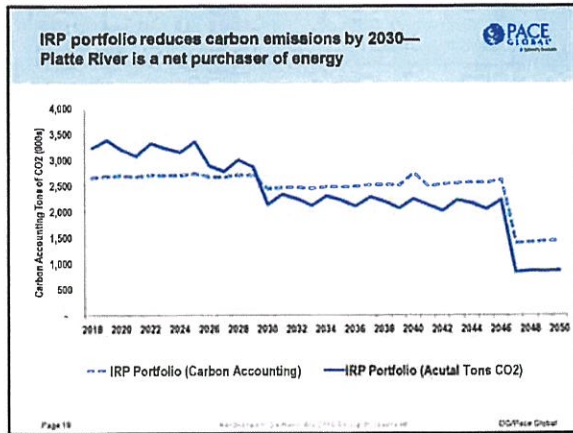
Composition of "all-in" wind and solar costs in the ZNC case

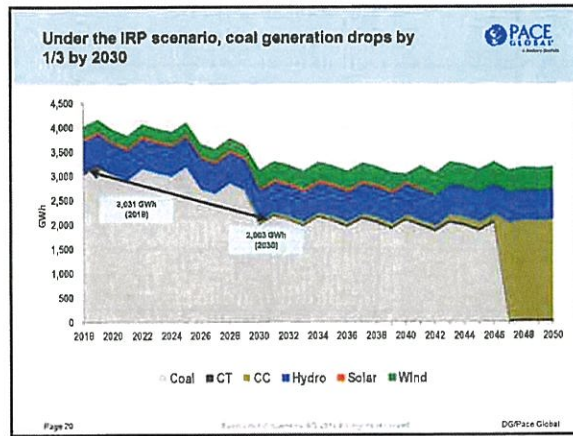
Renewable Costs (\$/MWh)	Wind	Solar
PPA In (2018)	\$23.00	\$32.50
PPA In (2030)	\$24.61	\$32.95
Transmission (2018/2030)	\$12.52/\$16.87	\$2.50/\$3.17
Integration (2018/2030)	\$4.50/\$6.71	\$4.50/\$5.71
Congestion Costs	\$0.00	\$0.00
Total (2018)	\$40.02	\$39.60
Total (2030)	\$46.19	\$41.82

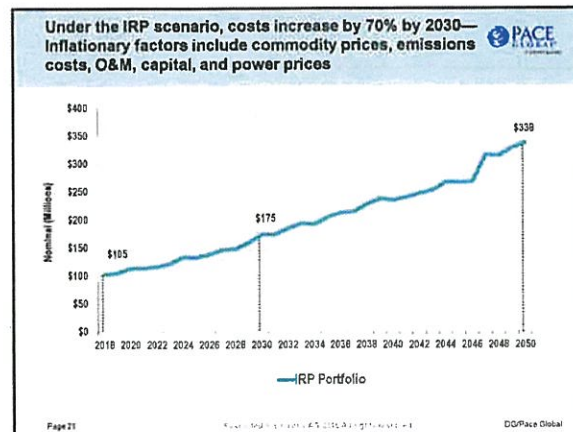
* Impact of safe harbor provisions could extend wind and solar tax credits by two years

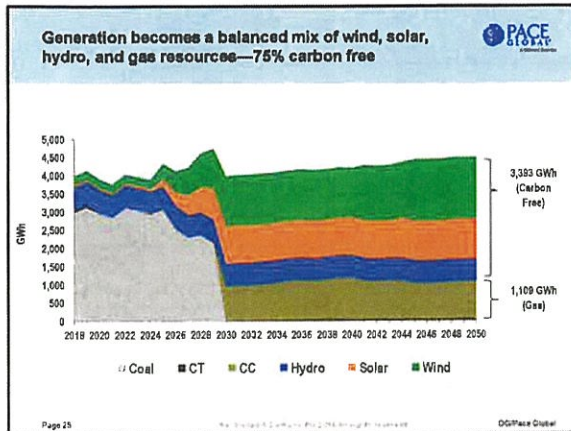
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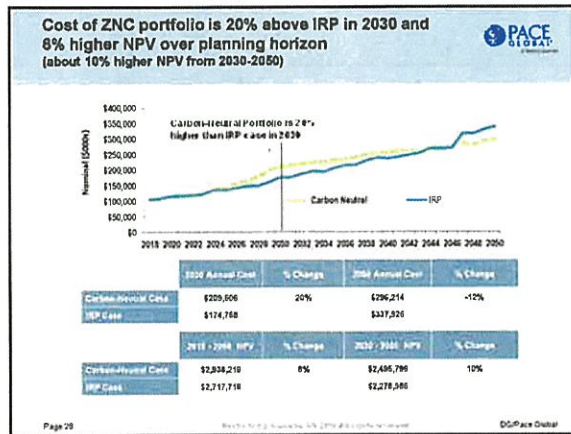














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- Approval of the RTO is uncertain
- The market rules are uncertain
- Who will ultimately join the RTO is not clear
- Whether participants will move more aggressively to renewables is unclear

- Transactions with market participants are easier and more likely to occur
- Transmission costs for remote sources will drop since wheeling charges will be eliminated
- Remote wind will become more economic relative to local solar
- Overall costs should be expected to fall with an RTO

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