

Carbon Regulation Business Risk Options Analyses (Plan B)

Opening Remarks

NPPD Board of Directors

March Retreat

March 10, 2021

Tom Kent

President & Chief Executive Officer



Nebraska Public Power District

Always there when you need us

≡ Purpose

- Help the Board
 - Understand how NPPD's resource portfolio could look for various carbon scenarios while maintaining a reliable, low-cost system
 - Provide insight into potential impacts associated with different resource portfolios
 - Develop Board Policy Strategic Directive 05 (BP-SD-05)
 - Preliminary name – Sustainable Energy
- These analyses
 - Are **NOT** an Integrated Resource Plan (IRP)
 - Will **NOT** be used to make resource decisions

How did we get here?

- A Plan B team consisting of Board members, customers, and staff was created to develop a common understanding of the issues and business risks concerning future carbon regulations
- The team met from June 2019 to January 2020
- At the end of the meetings, there was a desire to find out more about the costs to meet various potential regulations
- Decision to hire two consultants to provide results
 - Two consultants will likely provide different results
 - Allow for a better understanding of the cost drivers
 - Time period from 2021-2050 to look at long range impacts

≡ Plan B - Meeting Recap

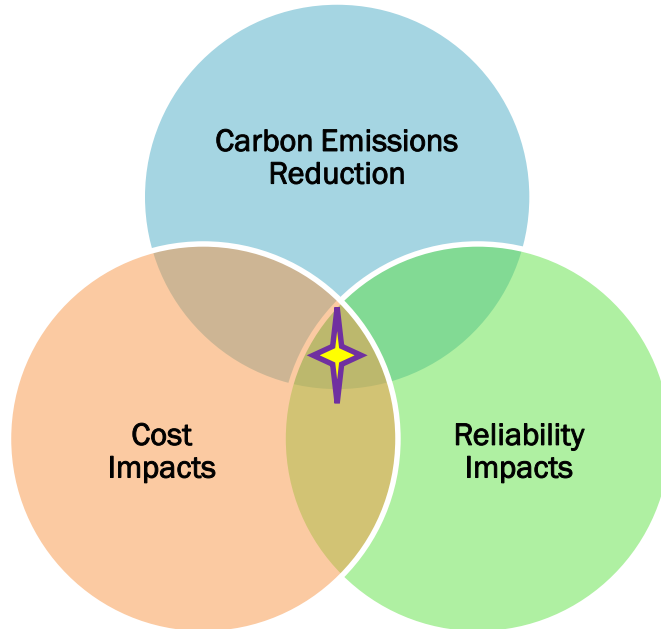
- Session 1:
 - Charter, Ground Rules, End in Mind: Pat Pope, NPPD
- Session 2:
 - State of Industry, Technology Options (Current and Future): David Young, EPRI
- Session 3:
 - NPPD Generation Resources: Mick Spencer, NPPD
 - NPPD Load Projections: Jim Fehr, NPPD
 - Regulatory Climate: Joe Citta, NPPD
 - Public Policy: John McClure, NPPD
 - Introduction of Scenarios for Plan B: Brad Kitchens, ScottMadden, Inc.

Meeting Recap

- Session 4:
 - Carbon Sequestration & Renewable Fuels: John Swanson, NPPD
 - Wartsila “Smart Energy“: Tom Kent, NPPD
 - Begin to Frame Scenarios with Stakeholder Group: Brad Kitchens, ScottMadden, Inc.
- Session 5:
 - Finalize Scenarios and Score, Consider Actions: Brad Kitchens, ScottMadden, Inc.
- Session 6:
 - Discuss Survey, Test Progress Against Project Charter: Brad Kitchens, ScottMadden, Inc.
- Session 7:
 - Finalize Plan B Discussion: Brad Kitchens, ScottMadden, Inc.
 - Renewable Natural Gas: Jedd Fischer, NPPD
 - Biochar, John Swanson: NPPD
 - Regulatory Discussion: Joe Citta, NPPD
 - Prepare for Cost Analysis: Tom Kent, NPPD

How did we get here?

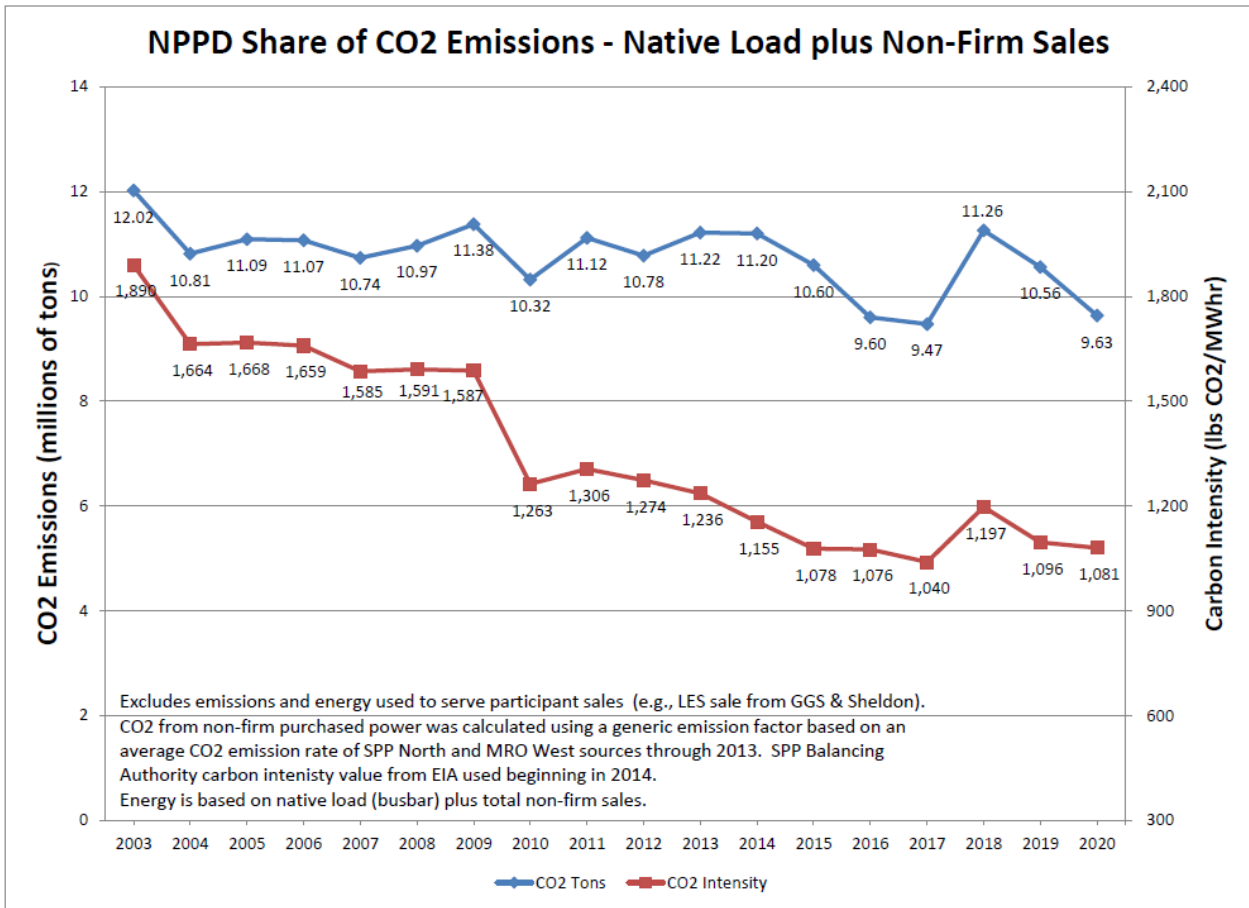
Finding the right balance between cost, reliability, and pace of carbon emissions reductions



How did we get here?

- Developed four (4) carbon scenarios for analysis
 - Base
 - No carbon restrictions
 - Scenario A
 - Maintain NPPD's relative position based on Balancing Authorities' data
 - ~17% reduction from 2017-18 and 45% reduction from 2005 by 2050
 - 915 lb./MWh (2050)
 - Scenario B
 - 80% reduction from 2005 by 2050
 - 330 lb./MWh (2050)
 - Scenario C
 - Net neutral by 2050
- Signed agreements with Ascend Analytics and Siemens in June 2020

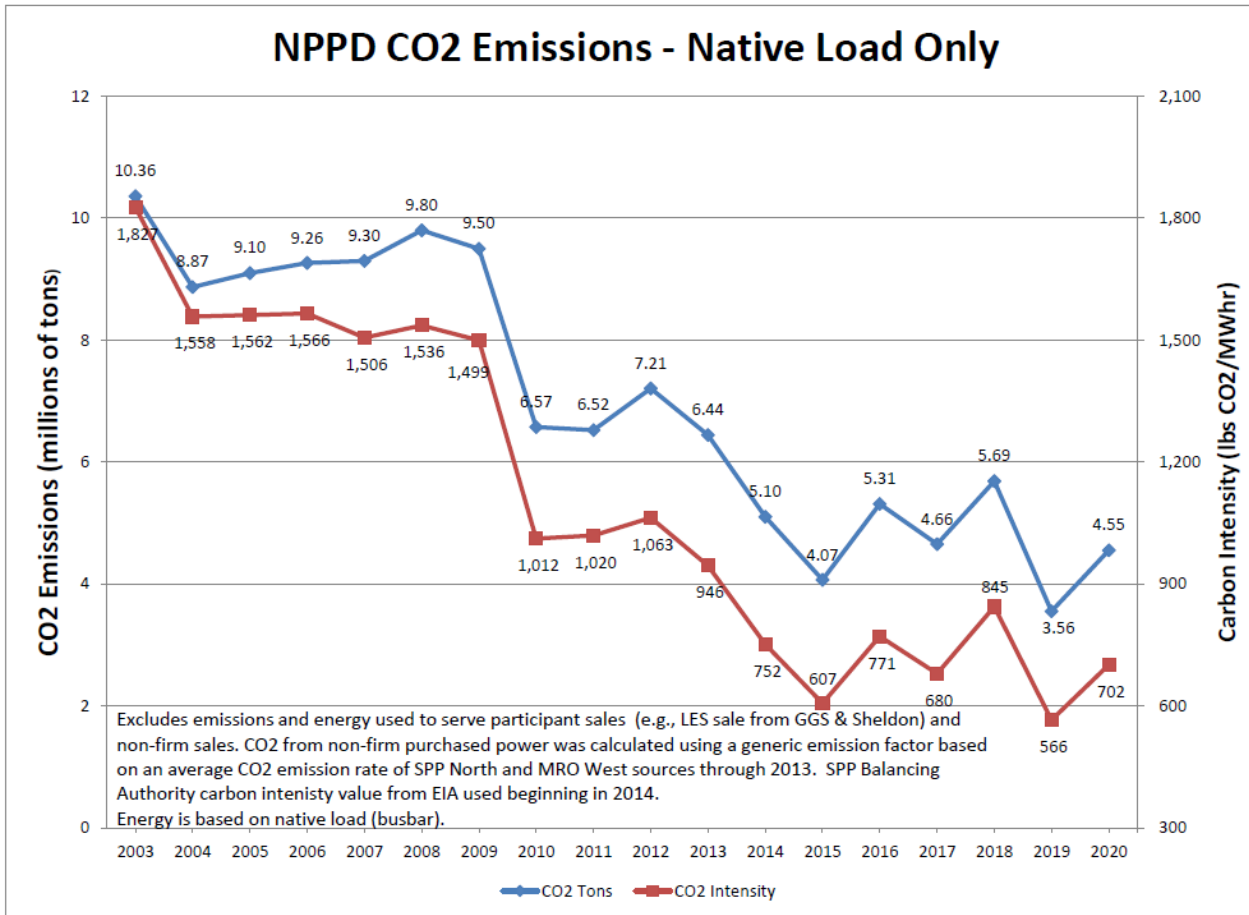
Current Performance



Reduction from 2005

- Emissions: -13.2%
- Intensity: -35.2%

Current Performance



Reduction from 2005

➤ Emissions: -50.0%

➤ Intensity: -55.1%

Remember ...

“All models are wrong, but some are useful”

George E. P. Box

≡ Consultants Presentations

- Ascend Analytics
- Siemens

Differences in the Models

Items	Ascend Analytics	Siemens
Time Period / Load	Through 2050 – keep existing load Stochastic of daily load/weather	Through 2050 – keep existing load Added EV growth
Purchases	Allow up to 50% purchases	Allow up to 30% purchases
Regional Modeling	Model region 1 st , then optimize NPPD's portfolio against market Reflecting percentage of GI buildout in region	Model entire region when optimizing NPPD's portfolio, natural gas pricing dynamic to carbon scenario Model develops regional buildout (includes announced builds and retirements)
Market Prices	Both models are predicting market declines in real terms, Ascend market prices lower than Siemens.	
Solar/wind	PPA contracts for wind/solar (no wind PTC)	NPPD owned
Other	Hourly (8760) model Includes sub-hourly and stochastics No estimate of transmission buildout	Hourly (8760) model No sub-hourly and stochastics Includes estimate of transmission buildout (outside model)

≡ Differences in the Models

Items	Ascend Analytics	Siemens
Carbon	Linear reduction Constraint in model (emission rate) Did not model carbon cost in the market Up to 7% offsets in some Scenario C resource plans	5-year step change Constraint in model (emission rate) Did not model carbon cost in the market No offsets allowed in Scenario C
New Resource sizes	Small for renewables, batteries, and RICE Provides reasonable trend but may not reflect the timing of actual resource buildout	Use economic sizes, resource decisions can be lumpy
Capacity Value / Expansion	Expansion based on reserve margin (constraint in model) Declining ELCC for storage	Expansion based on reserve margin (constraint in model) Flat ELCC for storage

Common Regional Themes

- Energy prices are expected to stay flat or drop in real terms
- Amount of baseload generation is expected to fall
- Amount of renewables and flexible generation is expected to grow
- Achieving a 100% carbon-free generation mix is expensive with today's understanding of current and future technology options (both consultants)
 - Ascend Analytics stated going above 90% carbon free is not recommended unless low-cost offsets are available

Common NPPD Themes

- Having high fixed costs can be problematic
- Being a net purchaser can be beneficial based on low market prices
- Investment of new capital / Power Purchase Agreements (PPA) before 2035 are included in both analyses
 - Results in significant debt/obligations after 2035

NPPD Observations

- Major drivers of resource decisions
 - CO2 restrictions
 - Market prices
 - Costs of existing and alternative resources
 - Resources meeting the demand and energy needs of our load
 - Wholesale contract extensions



Next Steps

- Complete BP-SD-05
 - Engage with customers / stakeholders
- IRP Development
 - Start developing assumptions by 4th quarter 2021
 - Customer / stakeholder engagement process
 - Board-Approved IRP to Western Area Power Administration (WAPA) by March 2023



Questions?