Integrated Resource Planning Modeling Update

Loveland Utility Commission

12/17/14

Platte River POWER AUTHORITY

Background

- Resource planning history:
  - A new Integrated Resource Plan (IRP) has been completed every 5 years
  - 1997 --- 2002 --- 2007 --- 2012
  - IRP guides resource additions ("supply side" and "demand side"):
    - 388 MW peaking + 78 MW wind + 30 MW solar + DSM programs & services
    - Board of Directors makes individual investment decisions
- New Strategic Plan approved by Platte River Board:
  - Guidelines provided:
    - 20% retail renewable energy + 20% reduction in CO_2 emissions
    - 15% reserves (reliability) + Competitive Wholesale Rates
  - Preliminary scenarios have been developed and modeled
  - Lots of work still needs to be done
  - Draft IRP expected during spring/summer of 2015
  - Stakeholder process planned before final IRP is approved

Strategic Plan Guidelines – Resource Planning

Minimum Reserve Margin 15%

CO_2 Reduction
- 20% x 2020
- 35% x 2030
- 80% x 2050

Renewables 20% x 2020

Competitive Rates

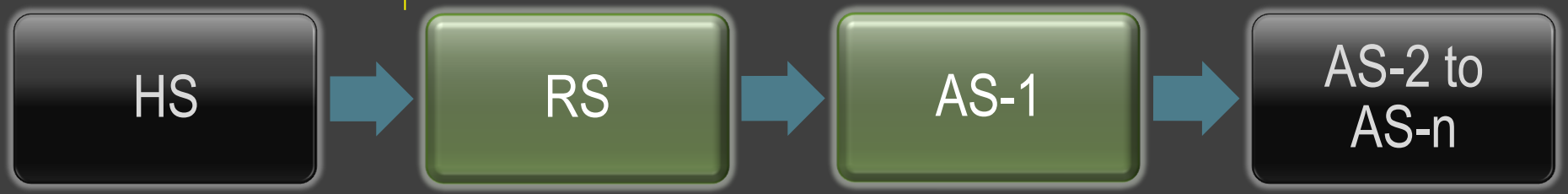
Modeled as a tax on CO_2 emissions

Forecast at $11-$76 per ton

Planning Scenarios

Common Assumptions:

- 40-yr term starting in 2015
- 2015 official load forecast
- CO_2 and non- CO_2 expense scenarios



Historical (validation)

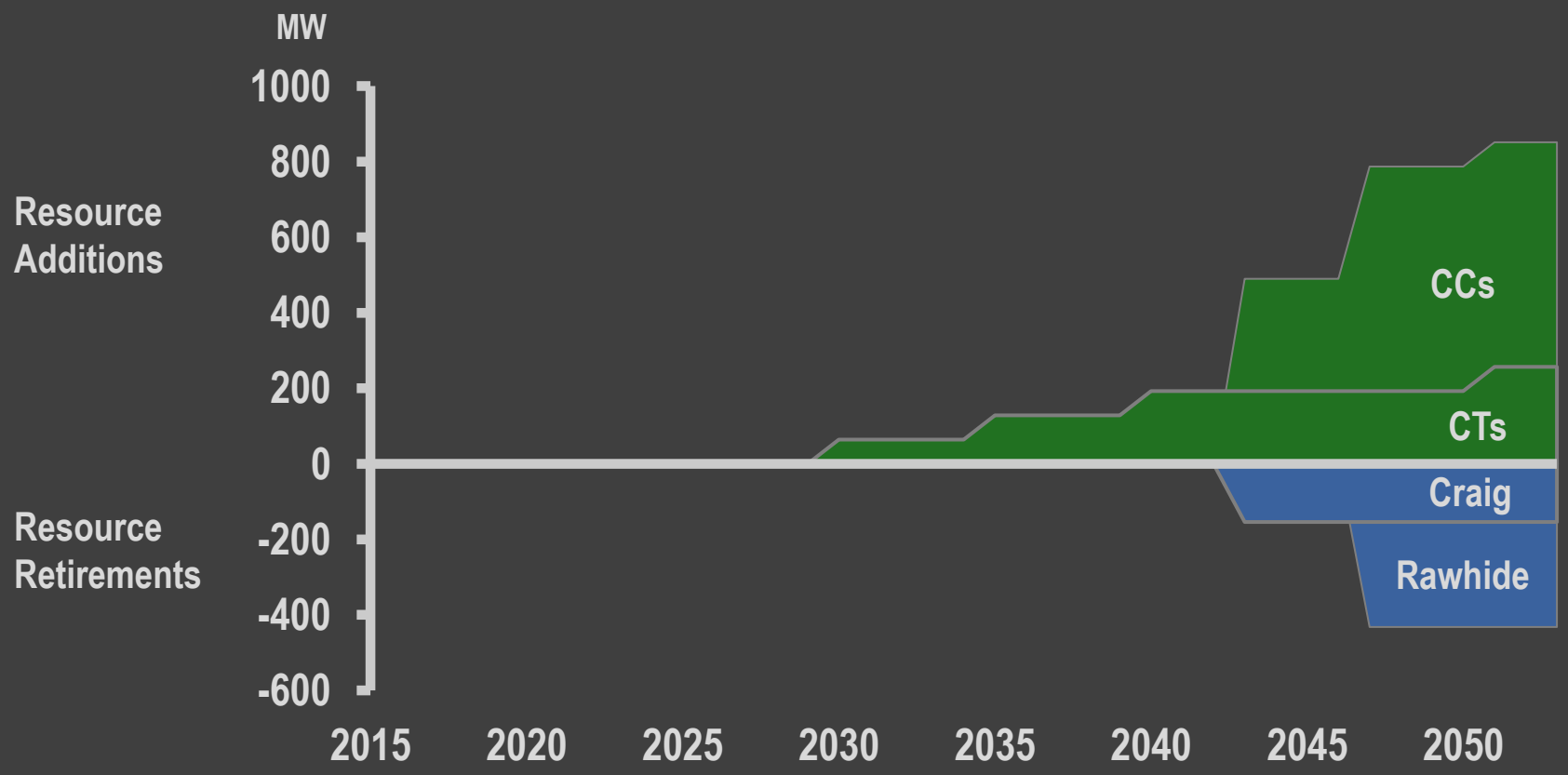
Reference (baseline)

Alternatives (optimization / decision support)

RS Actions

GUIDELINE	ACTIONS STUDIED (RS)
15% minimum reserve margin	**2015 to 2030**: No new resources **2030 to 2050**: 851 MW of total new natural gas-fired capacity added (combined cycle and peaking) to offset coal retirements and meet load growth

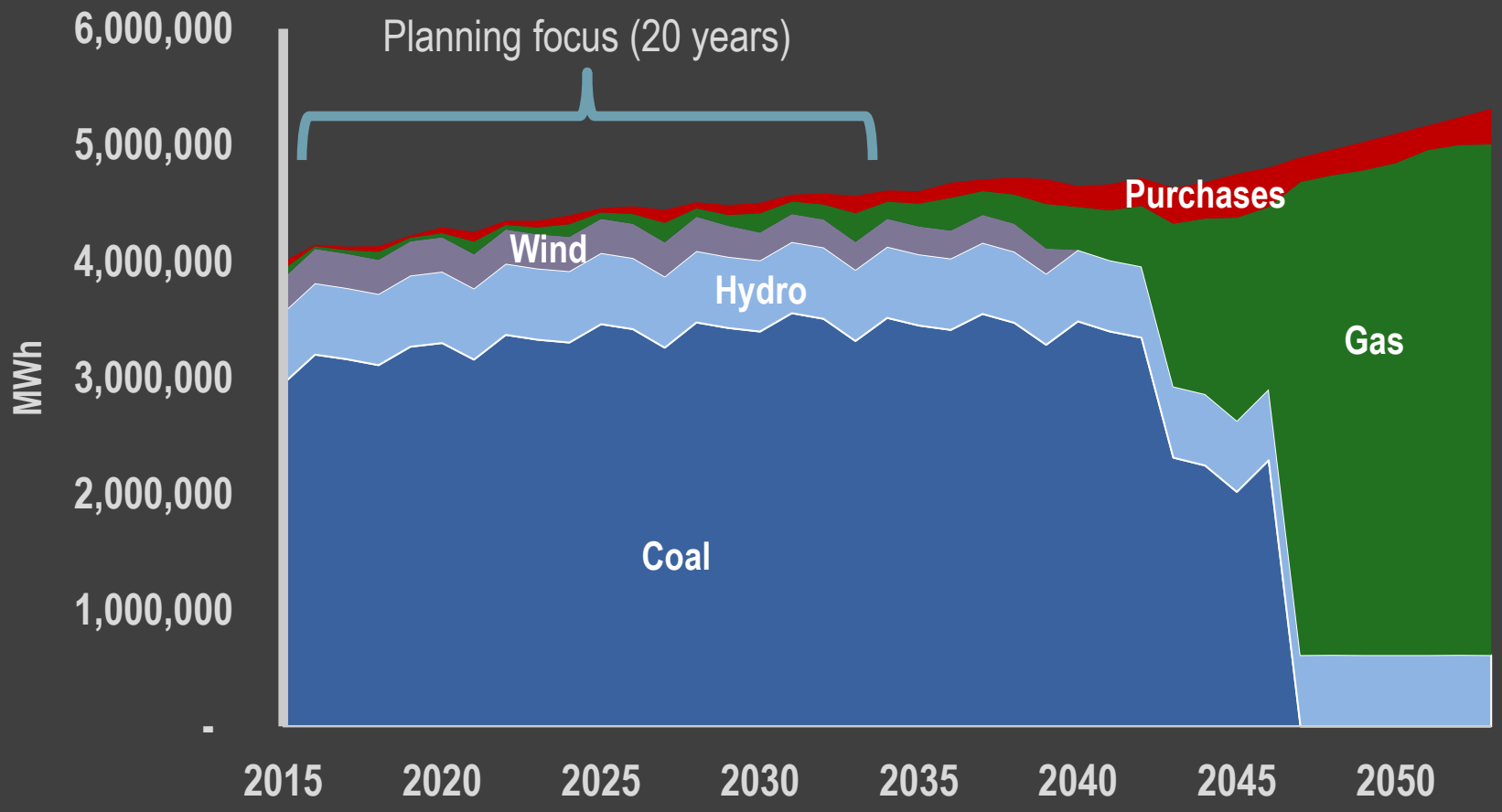
Capacity Additions under RS



- *RS assumes LM6000 CT additions and 1x1 GE Frame 7 CC additions (total of six units)*
- *Peak loads are expected to grow by ~450 MW through 2050*
- *Net capacity additions of ~409 MW through 2050*

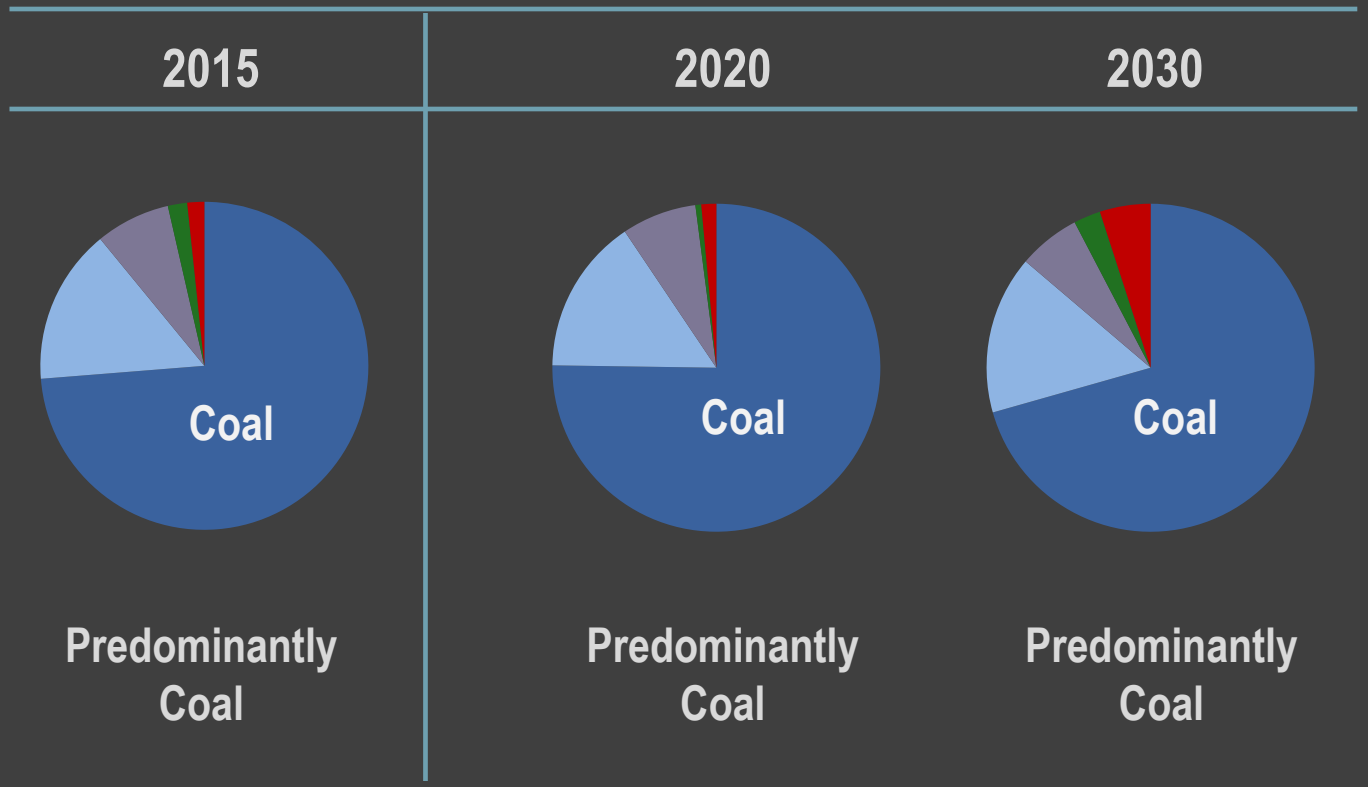
RS Energy Mix

- *Coal dominates Platte River's energy mix through 2042*
- *Gas replaces coal generation after normal coal retirement dates*
- *Only existing renewable resources are included*



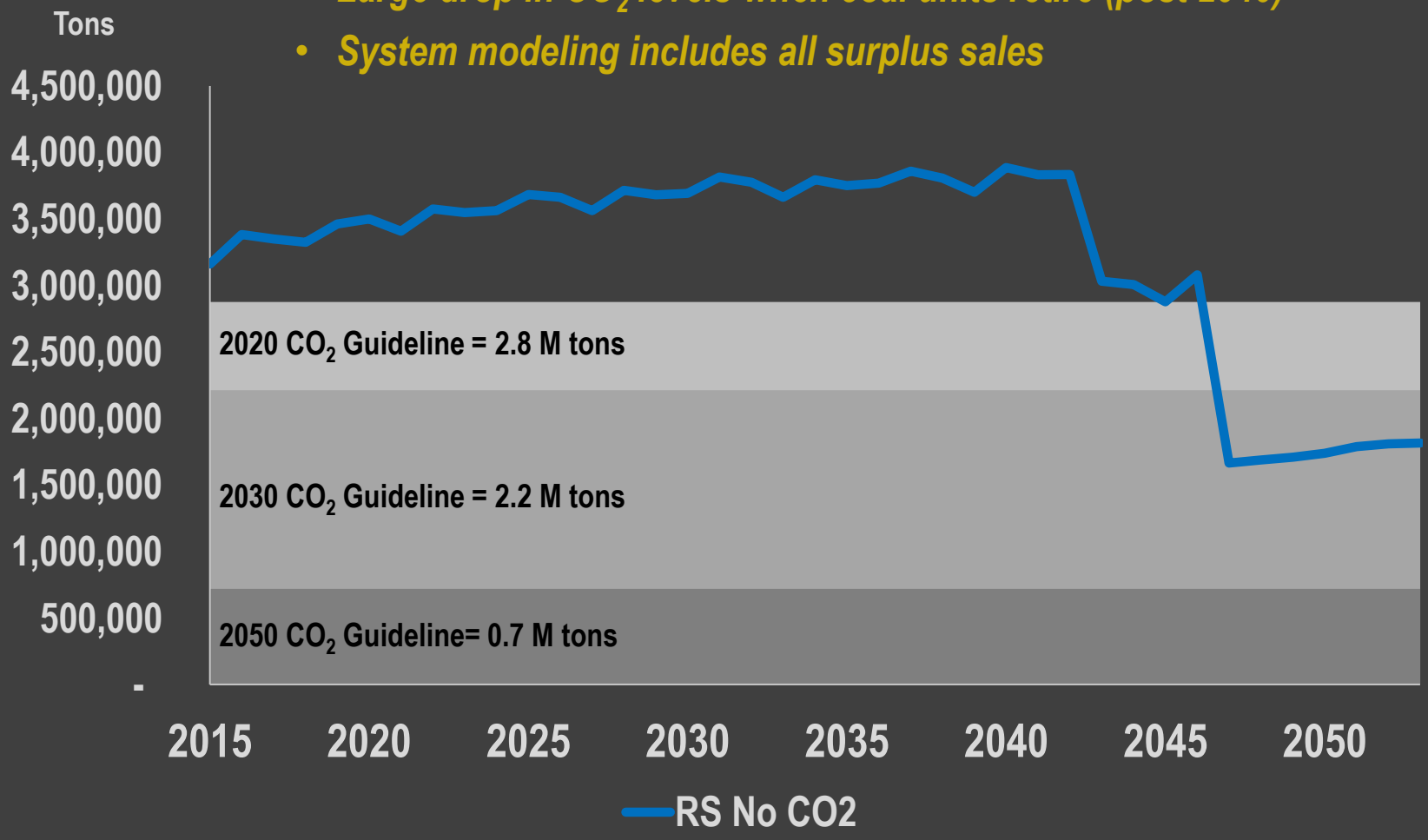
RS Change in Energy Mix

Reference portfolio remains relatively undiversified through all years



RS CO_2 Profile

- *RS CO_2 levels increase slightly due to load growth (2015 to 2040)*
- *Large drop in CO_2 levels when coal units retire (post 2040)*
- *System modeling includes all surplus sales*

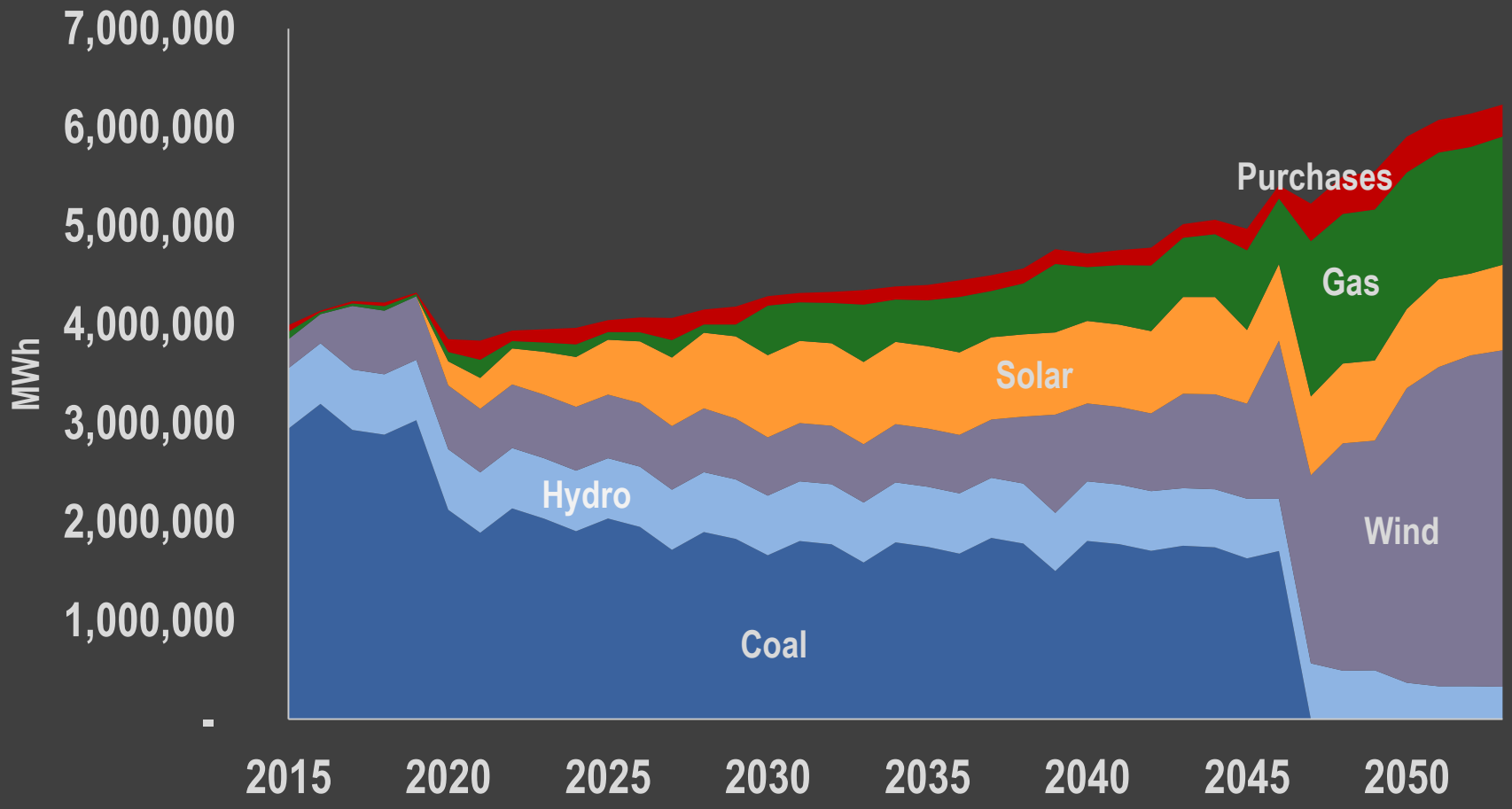


AS-1 Actions to Meet Study Guidelines

GUIDELINE	ACTIONS STUDIED (AS-1)
20% renewable supply (municipal retail sales)	• 100 MW new solar + 65 MW new wind
20% CO_2 reduction **-2020-**	• Retire both Craig coal units (154 MW) • Reduce surplus sales • 40 MW additional solar + 35 MW additional wind
35% CO_2 reduction **-2030-**	• Reduce Rawhide generation • Add new combined cycle gas generation (300 MW) • 340 MW additional solar
80% CO_2 reduction **-2050-**	• Retire 280 MW Rawhide coal unit • Add new peaking gas generation (230 MW) • 40 MW additional solar + 1,075 MW additional wind

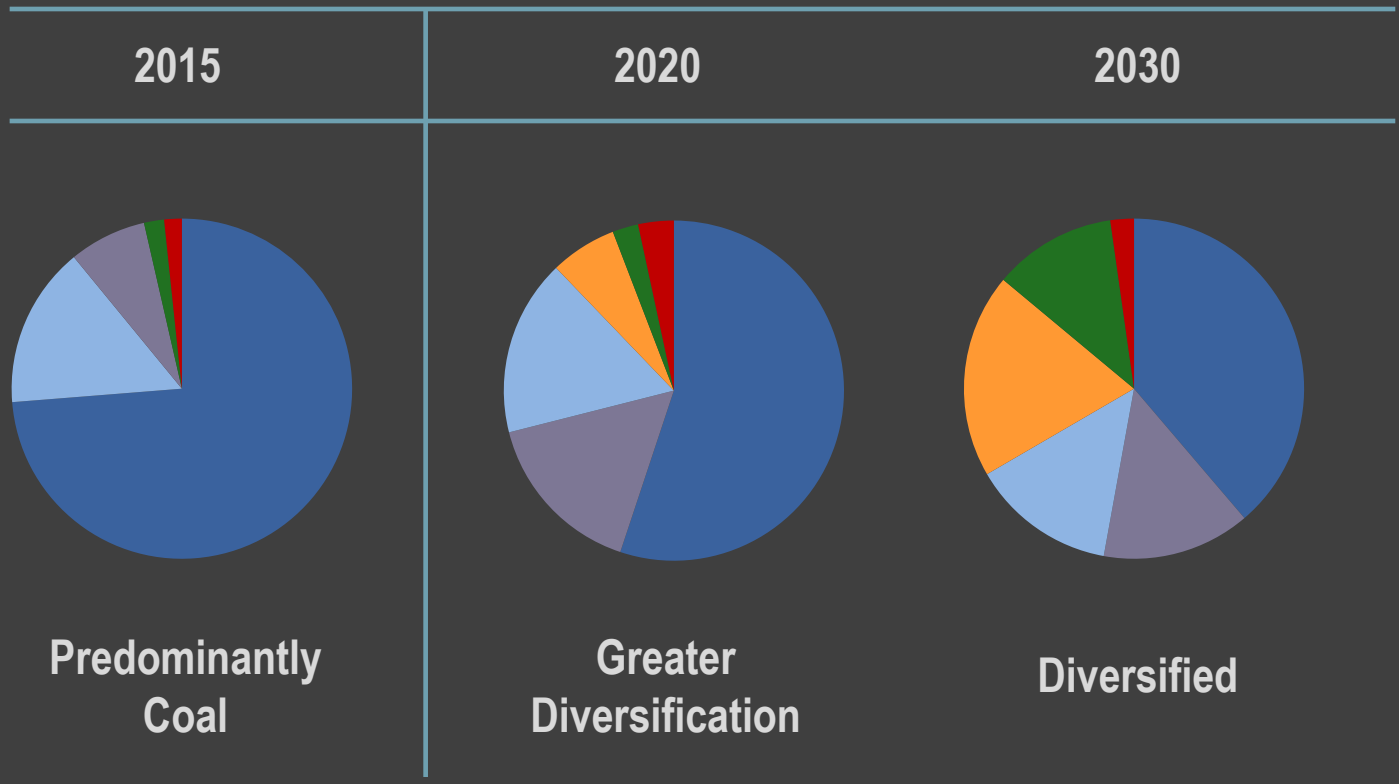
AS-1 Energy Mix

- *Coal generation reduced to decrease CO_2 – but remains part of the resource mix until 2046*
- *Solar and wind become significant sources over time*

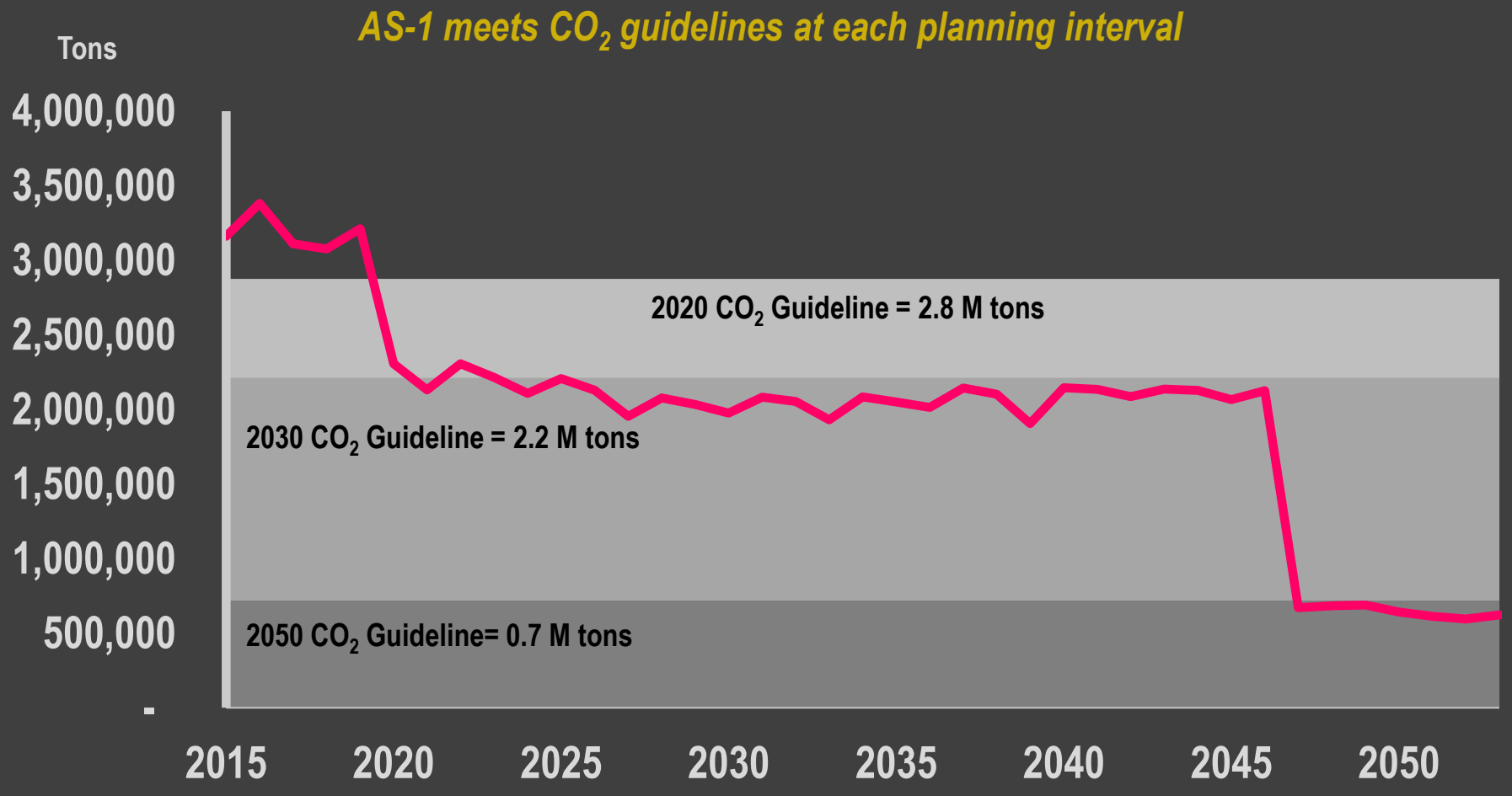


AS-1 Change in Energy Mix

Platte River's portfolio becomes more diversified until Rawhide's retirement



AS-1 CO_2 Profile

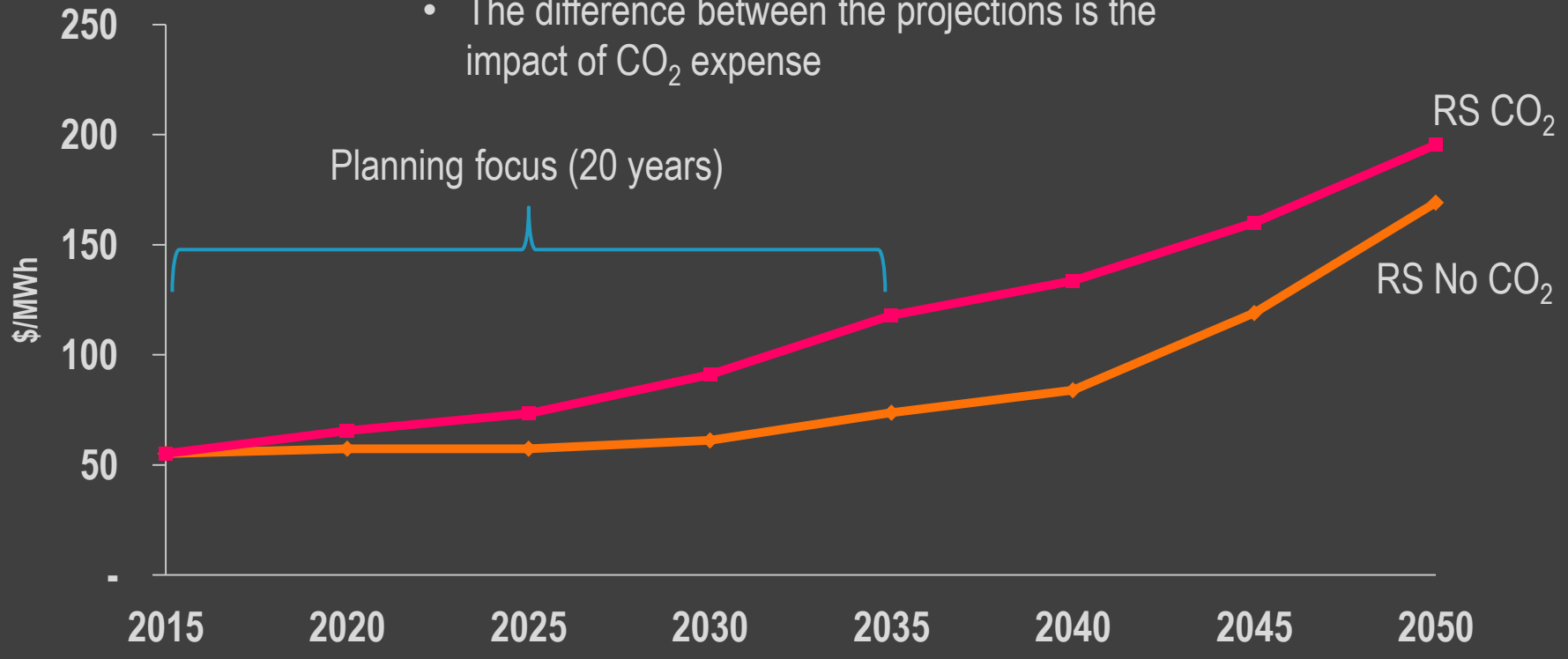


Rate Impact Comparisons

CO_2 Expense Comparison	• RS – with and without CO_2 expense
Resource Scenario Comparisons	• RS vs. AS-1 – with CO_2 expense
	• RS vs. AS-1 – no CO_2 expense

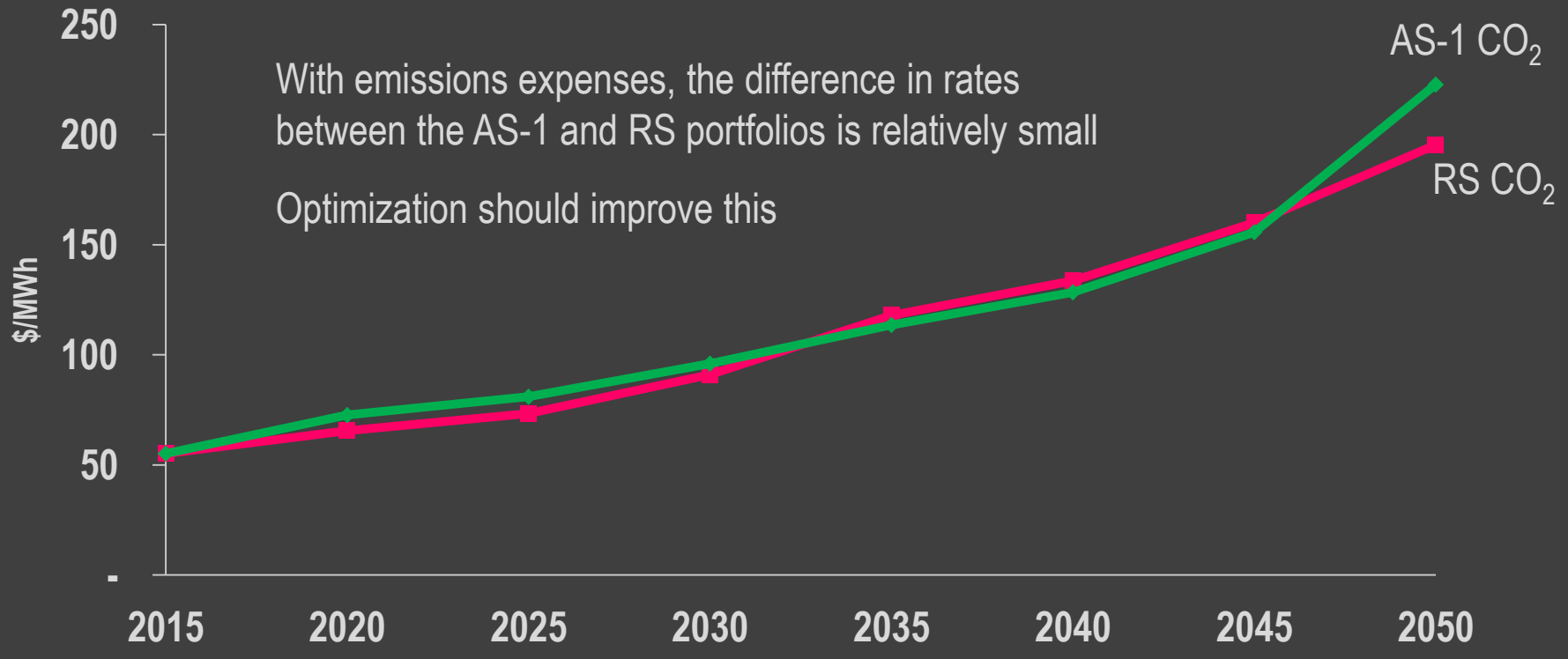
Rate Projections: RS – with and without CO_2 expense

- Identical resource portfolios (both RS)
- The difference between the projections is the impact of CO_2 expense



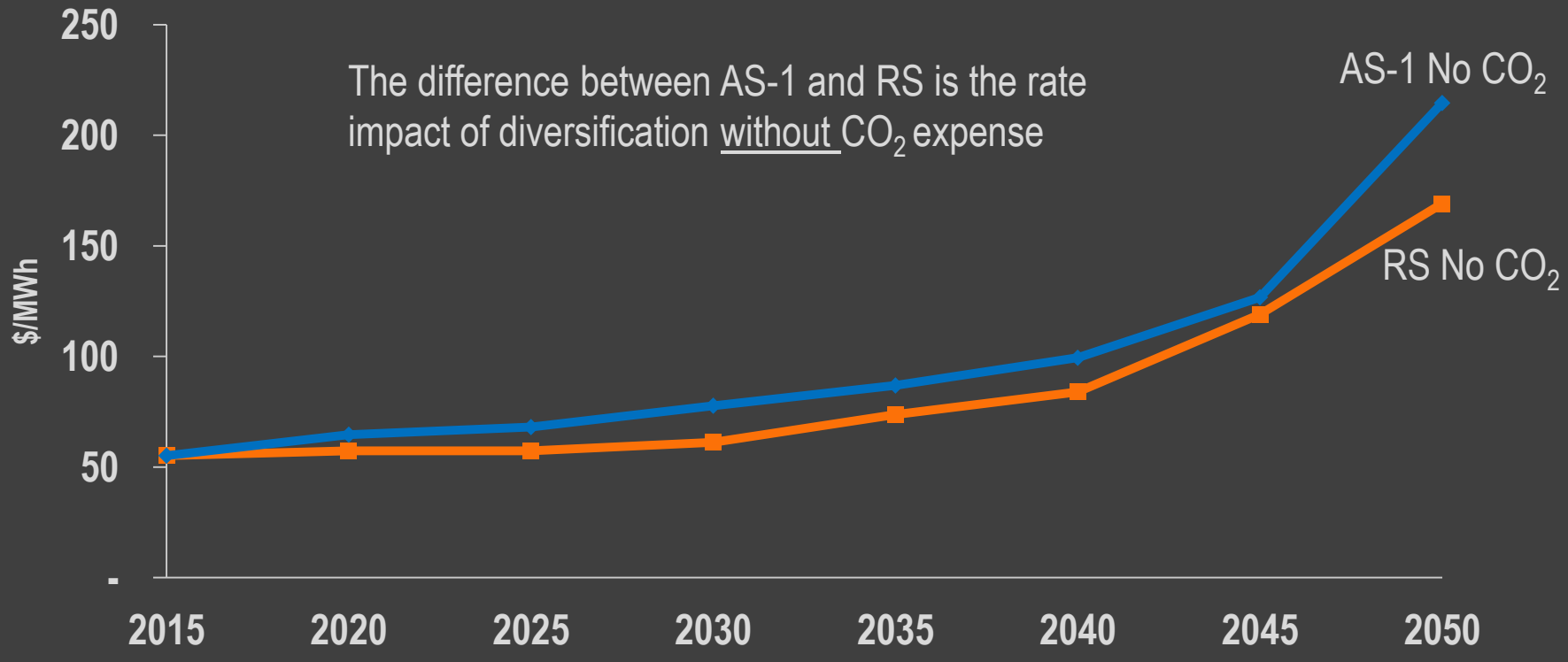
Vs. 2015 Rate	2020	2030	2040	2050
RS no CO_2	4%	11%	52%	207%
RS CO_2	19%	65%	142%	254%
Annual difference	~ 3%	~ 3%	~ 3%	

Rate Projections: RS vs. AS-1 (with CO_2 expense)



Vs. 2015 Rate	2020	2030	2040	2050
RS CO_2	19%	65%	142%	254%
AS1 CO_2	32%	74%	133%	304%

Rate Projections: RS vs. AS-1 (no CO_2 expense)



Vs. 2015 Rate	2020	2030	2040	2050
RS no CO_2	4%	11%	52%	207%
AS1 no CO_2	17%	41%	80%	287%
Annual difference	~ 3%	~ 2%	~ 1%	

Summary –

- Building confidence in modeling capabilities – some uncertainties:
  - Renewable energy integration at high levels
  - EPA final rule – possibly implemented June 2015
- Credible options exist to meet 2020 strategic planning guidelines:
  - 20% retail renewable energy + 20% reduction in CO_2 emissions
  - Mature / reliable technologies available for application
  - Need a more clear "boundary" on rates (e.g. – annual increase limit)
- Meeting 2030 EPA proposal more challenging – appears possible
- Options / analysis beyond 20 years – unclear / low confidence:
  - Renewable integration at high levels / system reliability considerations
  - Evolving technologies need to mature
  - More / potentially better options in the future
  - Analysis is focused on 20-year resource decision horizon

Summary –

- Neither RS nor AS-1 is optimal – just beginning scenario analysis
- CO_2 expense is the greatest cost factor for Reference Case
- Other factors – significant & complex:
  - Fuel price volatility, market dynamics, regulations, transmission, plant operations
  - Need to conduct sensitivity analysis to better inform decisions
- Cost of diversification using AS-1 roughly equals CO_2 cost
- Other benefits possible through resource diversification:
  - Fuel flexibility
  - Price certainty (fixed price renewable supply contracts)
  - Operational flexibility (renewable source integration)
  - Real reduction of CO_2
  - Support preferences of owner Municipalities

Next Steps –

- Modeling for Fort Collins Climate Action Plan – nearly complete
- Develop additional alternative scenarios (system level) and optimize:
  - Staging of renewable resource additions
  - Integration of smaller / more flexible gas resources (utility scale)
  - Additional Craig operational scenarios
  - Increased energy efficiency and distributed generation
  - Integrate new EPA CO_2 rule (once finalized)
- Complete a new Integrated Resource Plan:
  - Much more analysis required
  - Stakeholder engagement
  - Platte River Board decision expected during 2015
- Continue evaluating & recommending new resource options:
  - Rawhide Solar project
  - Other possible options

QUESTIONS/ DISCUSSION