



Energy+Environmental Economics

# Regional Wind Costing Model

Presented to:

County Officials from Colorado, Montana, New Mexico and Wyoming

Prepared by:

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# Background

- Wyoming state government was interested in understanding how state policy initiatives may affect the cost-competitiveness of Wyoming wind resources.
- Wyoming recently enacted an excise tax on energy production at wind farms in the state.
- Wyoming was interested in obtaining an economic model that compares the cost of developing wind resources in Wyoming to the cost of developing resources in other states.
- Project was funded by the Wyoming Infrastructure Authority and led by the Governor's Office, for the benefit of the Wyoming Legislature.



# About E3

E3's expertise places them at the nexus of planning, policy and markets in California and the West

## Regulatory/Policy

- ❑ EE avoided costs for CA utilities
- ❑ Calculate MPR for CPUC
- ❑ 33% RPS and GHG studies for CPUC
- ❑ Advising CPUC on long-term planning
- ❑ CA Solar Initiative cost-effectiveness
- ❑ EPA National Action Plan for EE
- ❑ 2007 Idaho Energy Plan

## Utility

- ❑ WEIL Group "Towards 2020" study of renewables and transmission
- ❑ BC-California renewable energy partnership
- ❑ Advising PG&E on Diablo relicense
- ❑ Assisting HECO with Feed-in Tariff
- ❑ Expert testimony for CAISO on Sunrise line
- ❑ Economic assessment of HPX line

## IPPs/Technology Companies

- ❑ Advising BrightSource, First Solar, Hydrogen Energy International
- ❑ Analysis of market opportunities for storage for EPRI and VC clients
- ❑ Represented Powerex and IPP/Marketers coalition in RTO West market design negotiations



# Goals

- Develop a *pro forma* model of wind resources around the WECC with the following features:
  - **LCOE**
    - Calculate the Levelized Cost of Energy (LCOE) given assumptions on capital costs, O&M costs, capacity factor, tax incentives, etc.
  - **State Taxes**
    - Detailed treatment of state taxes including income, property, sales, and gross receipts taxes.
  - **Federal and State Incentives**
    - Incorporate federal and state incentives
  - **Delivery Cost**
    - Calculate the cost of delivering the energy to a major CA load center
- Understand the impact of Wyoming's tax structure on cost competitiveness on Wyoming wind



# Drivers of Cost Differences

- The key drivers in differences of statewide wind resource costs are:
  - Capacity Factor
    - Regional differences in average wind speeds
  - Capital Cost
    - Regional differences in cost of land, labor and materials
  - State Tax Treatments
    - Income tax, gross receipts, sales tax, property tax rates
    - State tax credits and incentives





# Tax Treatments by State

# Important Disclaimer

- Tax treatment is an important, if not critical, component of the economics
- E3 are not tax professionals
  - Budget constraints preclude hiring tax advisors for each state
- Unless otherwise clearly specified otherwise in federal or state tax law, E3 assumed
  - 5-year MACRS depreciation is applicable at the state level
  - Projects can be structured to take full advantage of available tax benefits in each year (i.e., through parent companies)
    - Highest marginal state tax rates for New Mexico, Oregon
  - Additional assumptions are detailed in following tax slides



# Summary of State Tax Assumptions

State	State Income Tax Rate	State Tax Incentive	Property Tax Incentive	State Sales Tax Incentive	State Gross Receipts Tax Rate
Arizona	6.968%	Yes	Yes	Yes	
California	8.84%	No	No	Yes	
Colorado	4.63%	No	Yes	Yes	
Idaho	7.60%	No	Yes	Yes	3.0%
Montana	6.75%	No	Yes	n/a	
Nevada	None	No	Yes	Yes	
New Mexico	4.8% to \$500k 6.4% to \$1MM Then 7.6%	Yes	No	n/a	6.53%
Oregon	6.6% to 250K Then 7.9%	Yes	Yes	n/a	
Utah	5.00%	Yes	No	Yes	
Washington	None	No	No	Yes	0.484%
Wyoming	None	No	No	Yes	

\*In Montana, projects can take either the state tax incentive or the property tax incentive.

\*Washington has a Business and Occupation (B&O) tax rate on gross receipts instead of an income tax.

\* Idaho has a gross energy earnings tax in lieu of property tax.

\* New Mexico has a gross receipts tax in lieu of sales tax. Includes 1.4% average local gross receipts taxes

# Federal & State Tax Incentives

## ■ Federal Tax Incentives

- ❑ Investment Tax Credit (30% of capital costs)
- ❑ Production Tax Credit (2.2¢/kWh inflation adjusted for 10 years)
- ❑ 5-year MACRS

## ■ State Tax Credits or Incentives

- ❑ Arizona: 1.0 ¢/kWh for 10 years with \$2 million annual max.
- ❑ New Mexico: 1.0 ¢/kWh for 10 years with \$4 million annual max.
- ❑ Oregon: 2.5% of capital costs with \$1.5 million annual max.
- ❑ Utah: 0.35¢/kWh for 4 years

## ■ State Excise Tax

- ❑ Wyoming: 1\$/MWh after the first 3 years of production



# Federal Income Tax Credits

## ■ Production Tax Credit (PTC)

- ❑ Electricity generated by wind resources receive a 2.2¢/kWh tax credit in 2010 dollars (indexed for inflation) during the first 10 years of operation.
- ❑ The current in-service deadline for wind's eligibility of the tax credit is December 31, 2012.

## ■ Investment Tax Credit (ITC)

- ❑ The American Recovery and Reinvestment Act of 2009 (H.R. 1) revised the credit by allowing PTC-eligible technologies to instead opt for the federal ITC equal to 30% of eligible costs. Cash grant in lieu of ITC available through 2011.
- ❑ This option also expires December 31, 2012.

## ■ 5-year Modified Accelerated Depreciation (MACRS)



# Arizona's Tax Credits

- Corporate tax credit equal to 10% of installed costs, up to a maximum of \$50,000.
  - Program budget capped at \$1 million annually
  - Expires 12/31/2012
- Production tax credit for wind over 5 MW
  - 1.0 ¢/kWh state tax credit during the first 10 years of operation, up to a maximum tax credit of \$2 million per year
  - Program expires 12/31/2020
- Production tax credit is modeled



# Montana's Tax Credit

- Commercial energy investments of \$5,000 or more are eligible for up to 35 percent investment tax credit against corporate tax on net income produced by the eligible equipment.
- The tax credit must be taken the year the equipment is placed in service; the unused portion has a 7 year carryforward.
  - 5-yr MACRS state tax depreciation assumption effectively eliminates the value of this tax credit.
- Taxpayers may not take this credit in conjunction with any other state energy or state investment tax benefits, or with the property tax exemption for nonfossil energy property.
  - **E3's model assumes that the property tax exemption has been taken instead of this tax credit.**
- Tax credit legislation has no expiration date.



# New Mexico's Tax Credit

- The New Mexico Renewable Energy Production Tax Credit provides a tax credit against the state corporate income tax of \$0.01/kWh for wind
- For wind, the credit is applicable only to the first 400,000 MWh (\$4 million) of electricity in each of 10 consecutive taxable years.
- Excess credit shall be refunded to the taxpayer in order to allow project owners with limited tax liability to fully utilize the credit.
- Legislation expires 1/1/2018.



# Oregon's Tax Credit

- Oregon's Business Energy Tax Credit (BETC) applies to wind and other renewable energy resources
- Wind projects over 10MW:
  - 50% of certified project costs,
  - Certified project costs account for 5% of total project costs (including equipment cost, engineering and design fees, materials, supplies, installation costs, loan fees and permit costs)
    - Maximum of \$3.5 million if before 12/31/2010
    - Maximum of \$2.5 million if before 12/31/2011
    - Maximum of \$1.5 million if before 12/31/2012
  - Pass-through option allows for transfer of tax credit in return of a lump sum cash payment.
    - **E3 model uses current pass-through rate approximation of 82%.**



# Utah's Tax Credit

- For commercial wind with a total capacity of 660 kW or greater, the credit is 0.35¢/kWh (\$0.0035/kWh) for four years.
- The credit may not be carried forward or back.
  - E3 model assumes projects can be structured to fully utilize this credit.
- No expiration.



# Wyoming's Excise Tax

- Wyoming recently passed an excise tax on all electricity produced from wind resources for sale or trade on or after January 1<sup>st</sup> 2012
- Tax rate is \$1.00 per MWh
- Exempt for the first 3 years after the turbine first produces electricity for sale
- No expiry date



# Sales Tax

State	State Sales Tax Rate	Sales Tax Policy on Wind	Expiration Date	Average Local Tax Rate
Arizona	7.3%	Exempt	1/2017	2.4%
California	8.25%	Exempt	1/2021	0.81%
Colorado	2.90%	Exempt	1/2017	4.34%
Idaho	6.00%	Exempt	7/2011	0.00%
Montana	0.00%	n/a		0.00%
Nevada	6.85%	2.6% to 6/11 2.25% after	2049	0.74%
New Mexico	0.00%	n/a		0.00%
Oregon	0.00%	n/a		0.00%
Utah	5.95%	Exempt	6/2019	0.66%
Washington	6.50%	100% Exempt 75% Exempt	6/2011 6/2013	2.28%
Wyoming	4.00%	Exempt	1/2012	1.38%

- Sales tax exemptions listed apply to only the state portion of sales tax.
- Some local jurisdictions also offer sales tax abatement.
- The E3 model assumes only the state sales tax rate is eligible for exemption.

# Property Tax

State	Property Tax Rate Modeled	Property Tax Policy for Wind	Exp.
Arizona	0.3%	Exemption of 80% on 1.52% rate. Depreciated.	2040
California	1.0%	No Exemption	
Colorado	0.35%	2.03% on basis of \$421 to \$1128 per kW. Depreciated with 20% floor.	None
Idaho	0%	1.01% rate fully exempt	None
Montana	1.2%	10-yr exemption on up to \$100k of basis. Depreciated.	None
Nevada	0.49%	If over 10MW, 55% abatement of 1.09% for 20 years	2049
New Mexico	0.99%	No Exemption. Depreciated.	
Oregon	0%	0.8% rate fully exempt	7/2012
Utah	0.6%	No Exemption	
Washington	1.0%	No Exemption	
Wyoming	0.74%	No Exemption. Depreciated.	

- Except for Colorado, property tax rates have been converted to the rate applicable to installed capital cost values.
- “Depreciated” indicates property taxes that decline over time as plant nears useful life.
- The next slide details Wyoming, New Mexico, and Montana.

# Property Tax Comparison for Select States

	<u>Wyoming</u>	<u>New Mexico</u>	<u>Montana</u>
Fair Market Value (capital cost)	100,000,000	100,000,000	100,000,000
Assessed Value Factor	11.5%	33.0%	3.0%
Taxable Value	11,500,000	33,000,000	3,010,000
Mill Levy	64	29.8	400
Property Tax	736,000	983,400	1,204,000
Percent of Capital Cost	0.74%	0.98%	1.20%
Taxable Value Depreciated?	Yes	Yes	Yes

- The above table describes calculation of first year property taxes for a hypothetical project costing \$100MM
- The property taxes are expressed as a percentage of installed capital cost to facilitate modeling.



# Additional State Incentives Confirmed After Model Completion

- Colorado's property tax is being modeled as a cost-based tax instead of an income-based tax. This assumption should be changed and results in an increased LCOE of \$1/MWh.
- The use of IRBs in New Mexico exempts projects from gross receipts tax and property taxes, in lieu of a negotiated PILOT. Assume net effect is a decreased LCOE of ~\$8/MWh.
- The model does not capture local sales tax exemptions in AZ, CO, WA, and ID





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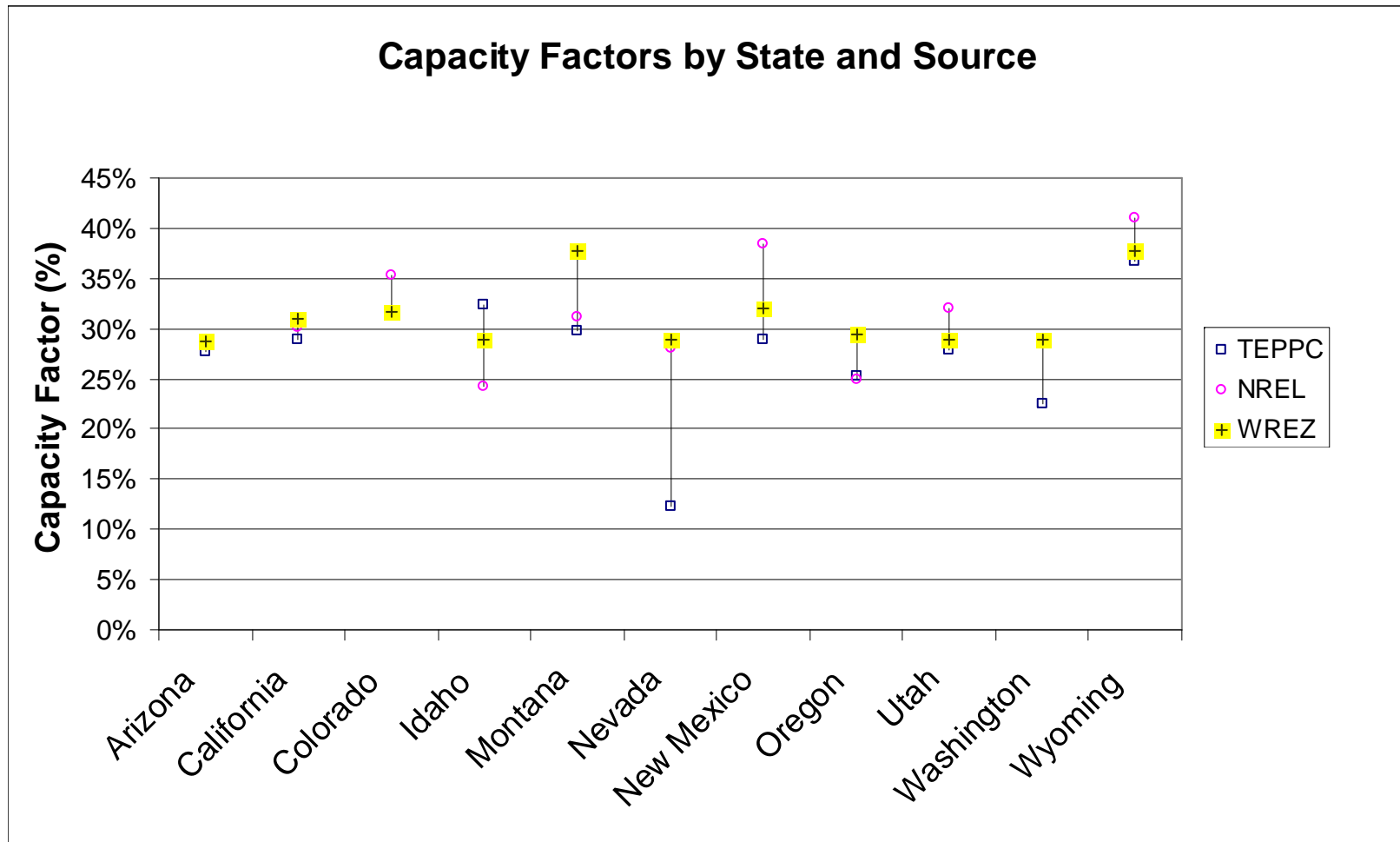
# Statewide Performance Parameters

# Capacity Factors by State

- Examined publicly available sources for statewide averages of wind capacity factors:
  - EIA Generator Data
  - TEPPC Generator List
  - NREL's Western Wind and Solar Integration Study
  - WREZ Transmission Model
- Default capacity factors in model are from WREZ Transmission Model



# Capacity Factors by State



# Capacity Factors by State

State	WECC TEPPC 2009 Study Plan	NREL Western Wind and Solar Integration Study	WREZ Phase 1: Qualified Resource Areas Identification Report
Arizona	27.69%	30.40%	28.78%
California	28.97%	30.20%	30.90%
Colorado	31.42%	35.35%	31.76%
Idaho	32.31%	24.20%	28.94%
Montana	29.76%	31.20%	37.81%
Nevada	12.36%	28.00%	28.93%
New Mexico	28.93%	38.40%	31.99%
Oregon	25.33%		29.46%
Utah	27.88%	32.00%	28.99%
Washington	22.44%		28.95%
Wyoming	36.63%	41.00%	37.66%

E3's model uses the WREZ capacity factors (highlighted)





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# Capital Cost and Finance Assumptions

# Capital Cost Assumptions

- Surveyed publicly available data on US average capital cost for new wind resources:
  - WREZ Transmission Model
  - RETI/CPUC 33% Implementation Analysis
  - CEC Cost of Generation model
  - Northwest Power and Conservation Council
  - U.S. Energy Information Administration
- Option for regional capital costs multipliers in order to reflect regional pricing differences



# Capital Cost Assumptions

Source	Capital Costs (\$2010/kW)	Fixed O&M (\$2010/kW-yr)	Variable O&M (\$2010/MWh)
CEC COG	\$2,370	\$14	\$6
NPPC	\$2,271*	\$43	\$2
WREZ	\$2,337	\$61	\$0
RETI Phase 1A	\$1,924 - \$2,430	\$51	\$0
33% RPS	\$2,333	\$53	\$0
EIA	\$1,991*	\$32	\$0
Recommended	\$2,350	\$50	\$0

\*Only "Overnight" costs reported by NPCC and EIA



# Regional Multipliers

- E3 allows for multipliers to reflect regional differences in cost of land, labor and materials
- E3 developed regional multipliers based on US Army Corps of Engineers, Civil Works Construction Cost Index System (CWCCIS)
- Varies for capital cost and O&M based on the variable portions of each cost
- E3's base case scenario assumes no regional cost adjustments.

State	Capital Cost Multiplier	O&M Cost Multiplier
Arizona	0.977	0.964
California	1.081	1.130
Colorado	0.991	0.986
Idaho	0.982	0.971
Montana	0.986	0.978
Nevada	1.036	1.058
New Mexico	0.977	0.964
Oregon	1.032	1.050
Utah	0.968	0.950
Washington	1.027	1.043
Wyoming	0.955	0.928



# Finance Assumptions

- Used similar finance assumptions to other public resource costing models:

Metric	Input
Percent Financed with Equity	Minimized to achieve Target DSCR
After-Tax WACC	8.5%
Debt Interest Rate	7.5%
Cost of Equity	Function of WACC, Interest Rate and leverage
Target average DSCR	1.4
Debt Period in Years	18

- Use of IRBs in NM would change the finance assumptions in the model for that State



# Other Input Assumptions

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- System lifetime of 20 years
- Degradation factor of 1% per year.





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# *Pro Forma* Costing Tool

# *Pro forma* Costing Model

- Simple, easy-to-use, open-source spreadsheet model
- Flexible and adaptable for changes in tax policies
- Balance of complexity and applicability for broad range of states and tax treatments



# Scenarios

- **Scenario 1: Base Case**
  - Scenario 1a: Busbar Costs
  - Scenario 1b: Delivered Costs
- **Scenario 2:**
  - Regional Cost Multipliers
- **Scenario 3:**
  - Same capacity factors by state
- **Scenario 4:**
  - PTC instead of ITC
- **Scenario 5:**
  - Neither ITC nor PTC
- **Scenario 6:**
  - WACC increase of 100 basis points



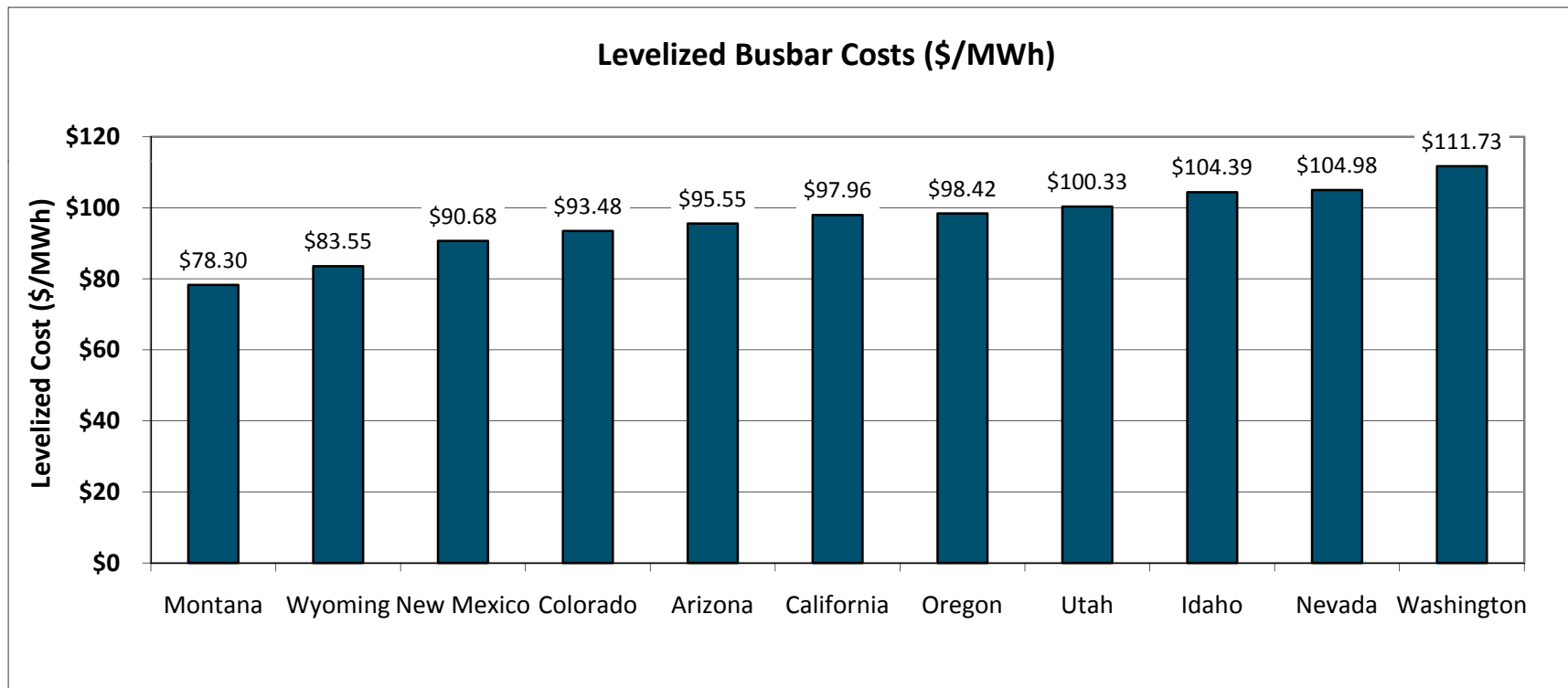


# Scenario 1: Base Case

- Different capacity factors by state
  - No regional cost multipliers
  - Current tax codes
    - 2012 COD year
    - ITC preferred over PTC

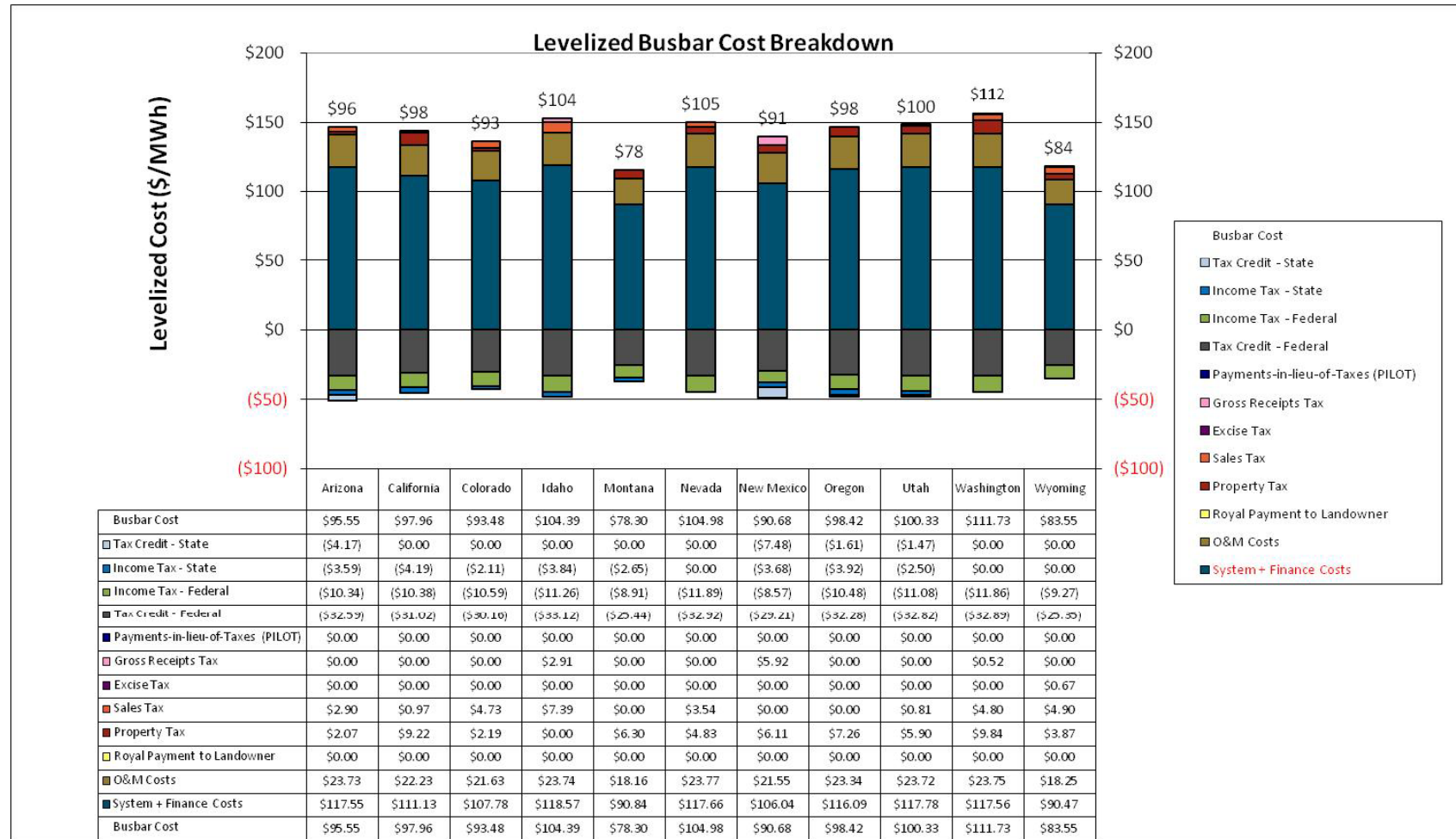
# Scenario 1a: Base Case

## Levelized Busbar Costs



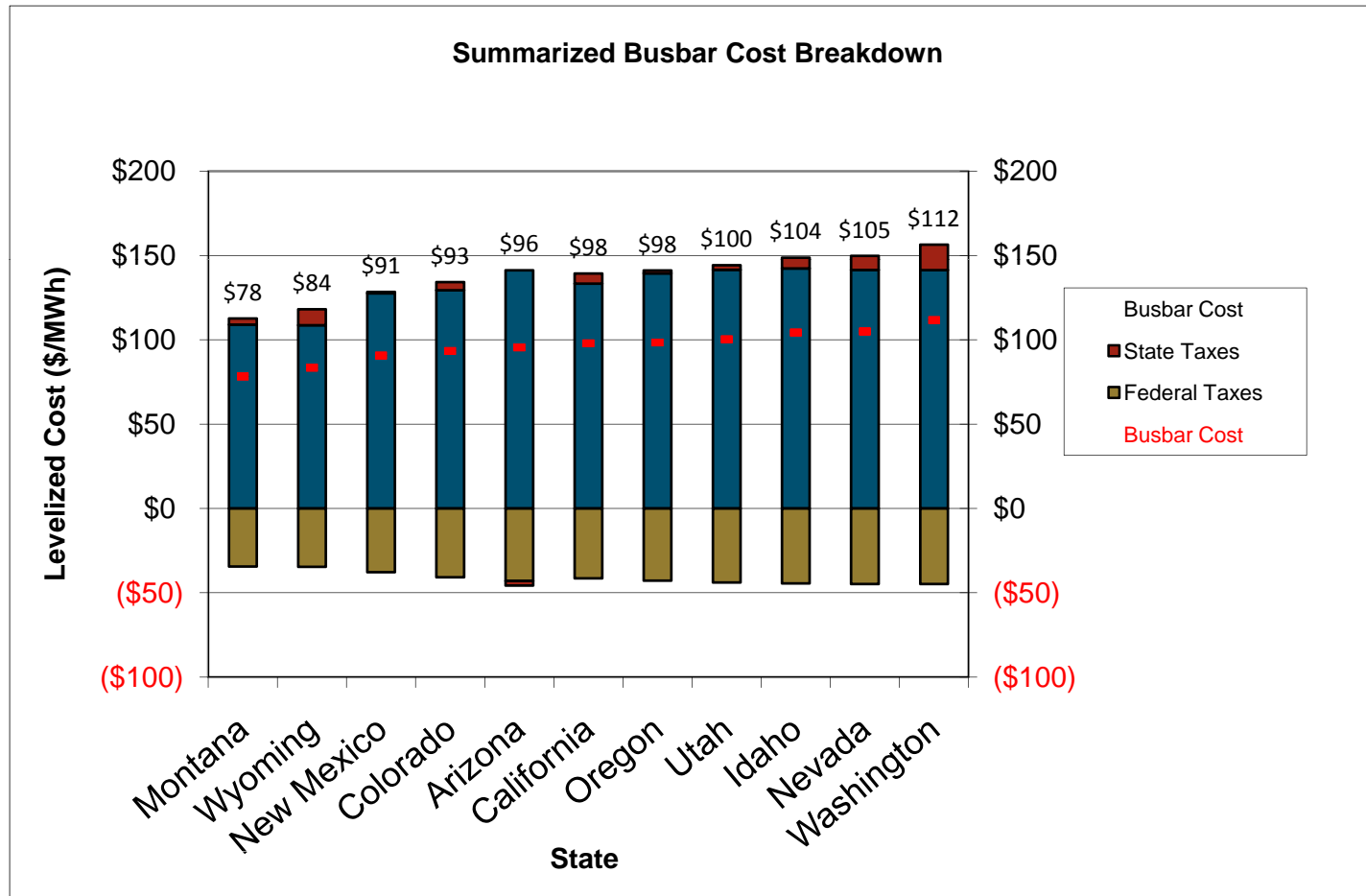
# Scenario 1a: Base Case

## Detailed Cost Breakdown



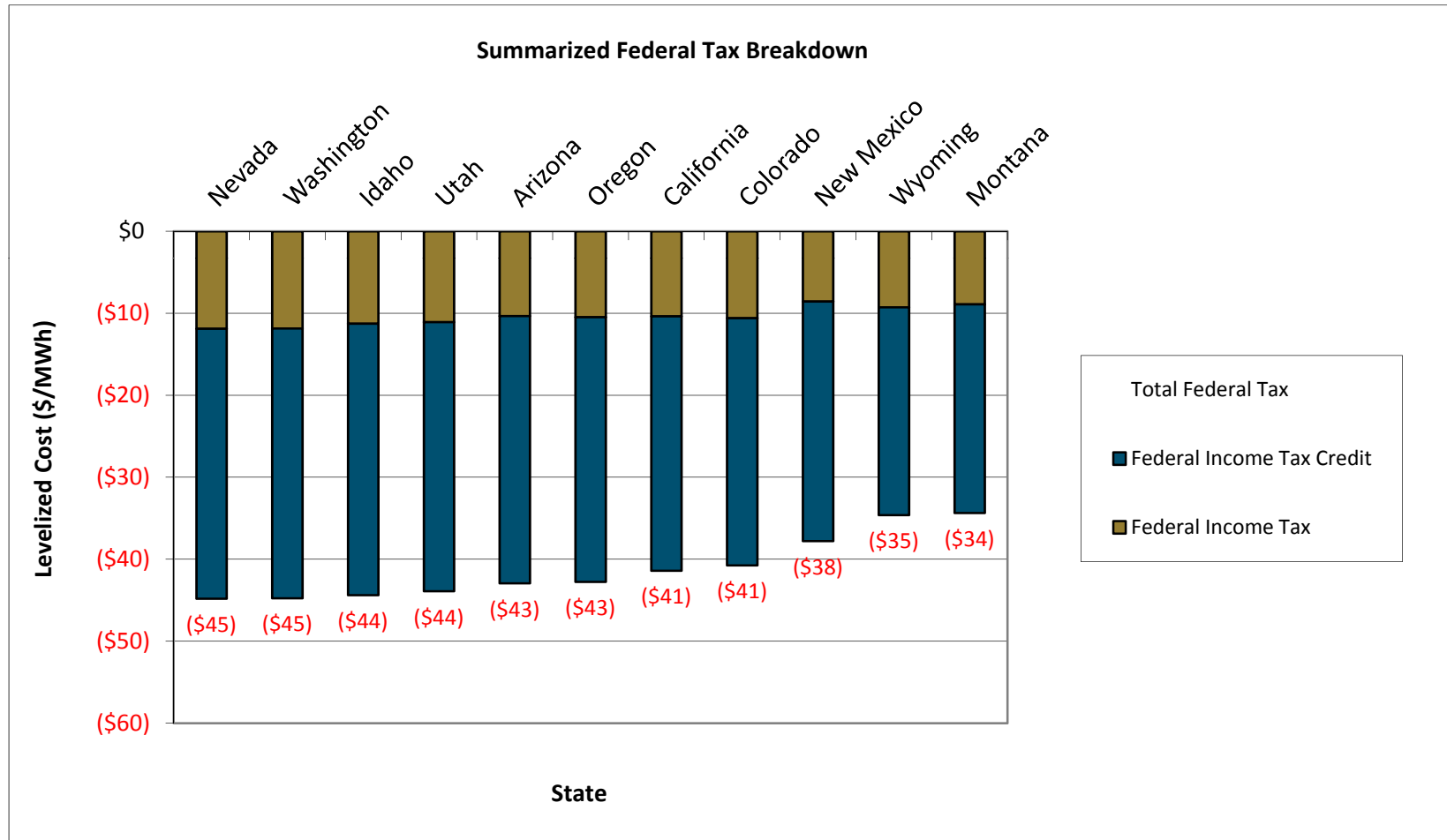
# Scenario 1a: Base Case

## Summarized Cost Breakdown



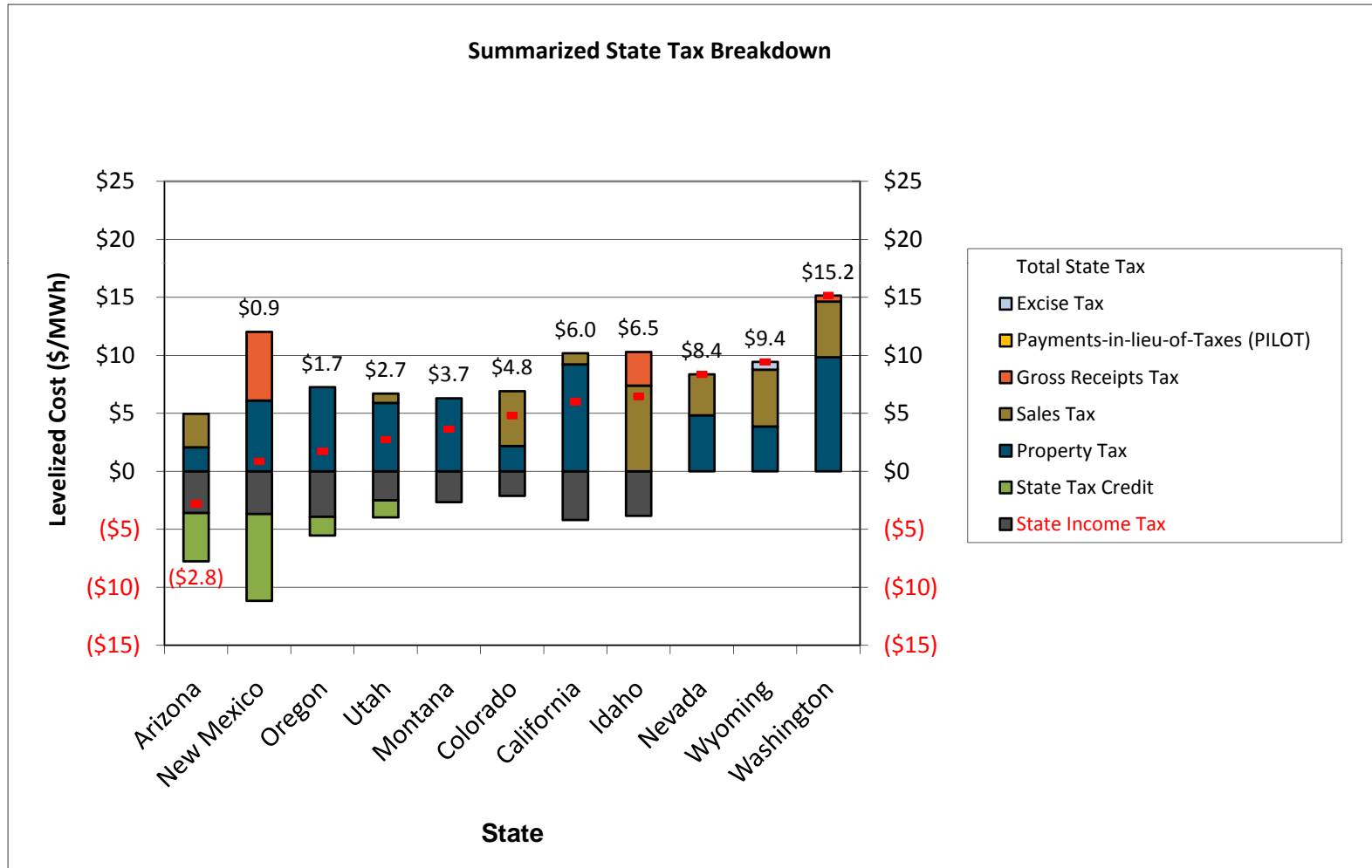
# Scenario 1a: Base Case

## Breakdown of Federal Taxes



# Scenario 1a: Base Case

## Breakdown of State Taxes (Ranked)



# Scenario 1b: Delivered Costs

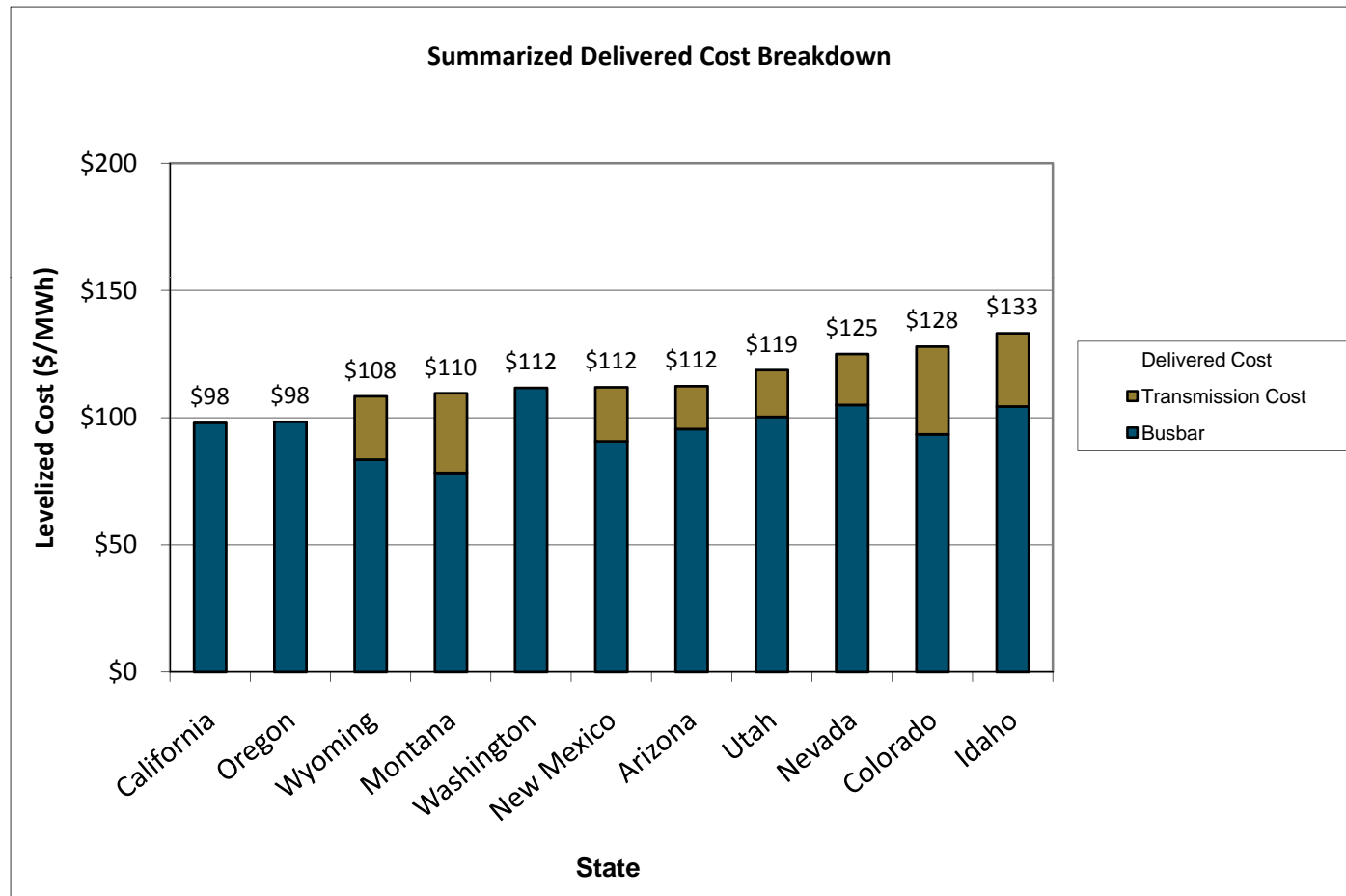
## Transmission Specs

- California, Oregon and Washington wind assumed to be used for local delivery
- Transmission for Utah wind projects use the Intermountain Power Project (IPP) DC transmission tariff rate for long term point-to-point service:
- TransWest Express Transmission Project Assumed for Wyoming
- Other states deliver to Las Vegas as depicted:



# Scenario 1b: Delivered Costs

## Busbar Costs + Transmission





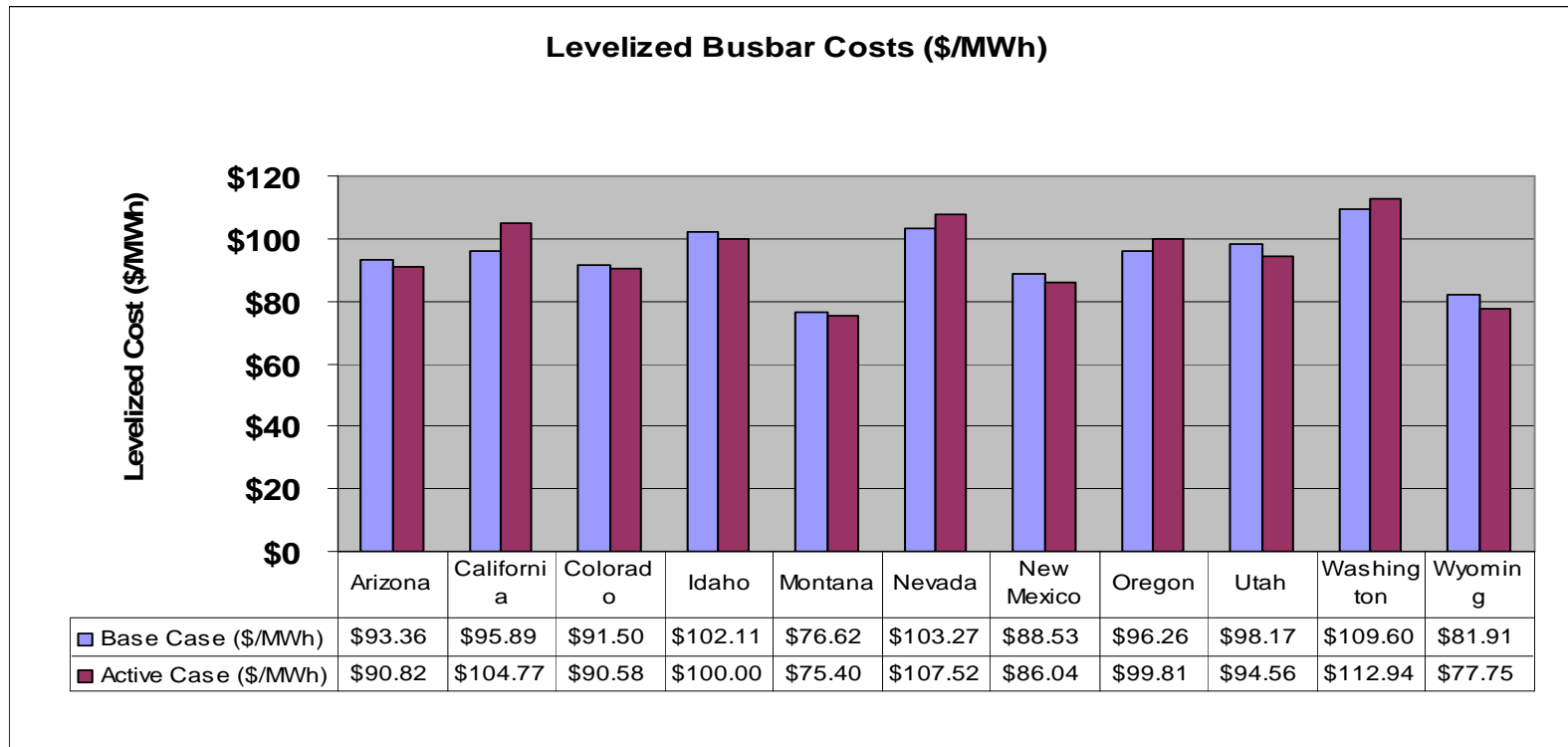
# Scenario 2

Applying regional cost multipliers

# Scenario 2: Regional Multipliers

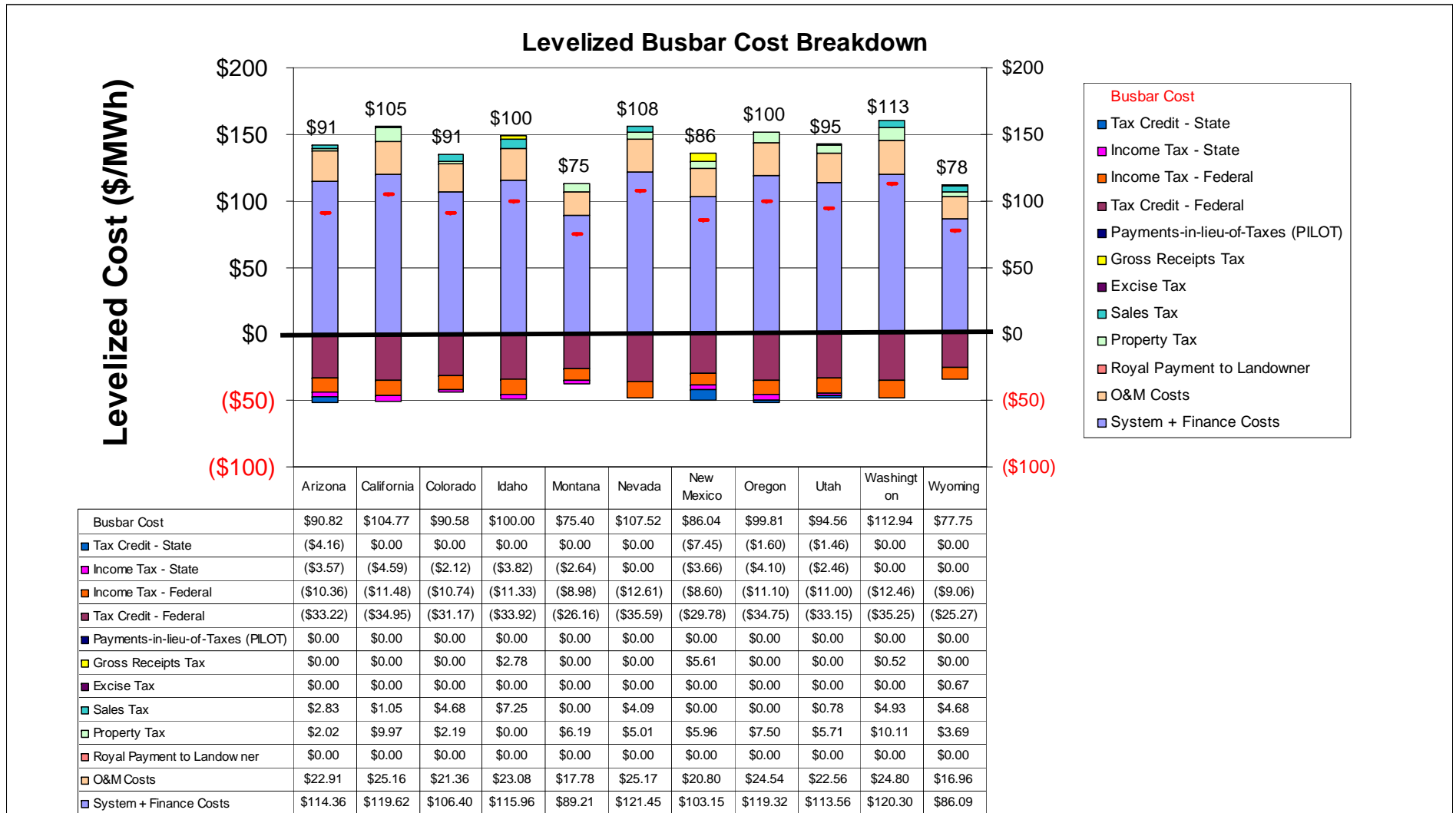
## Compared to Original Base Case

- Aside from California, not very different than base case
- California, Nevada, Oregon and Washington become more expensive.



# Scenario 2: Regional Cost Mult.

## Detailed Cost Breakdown





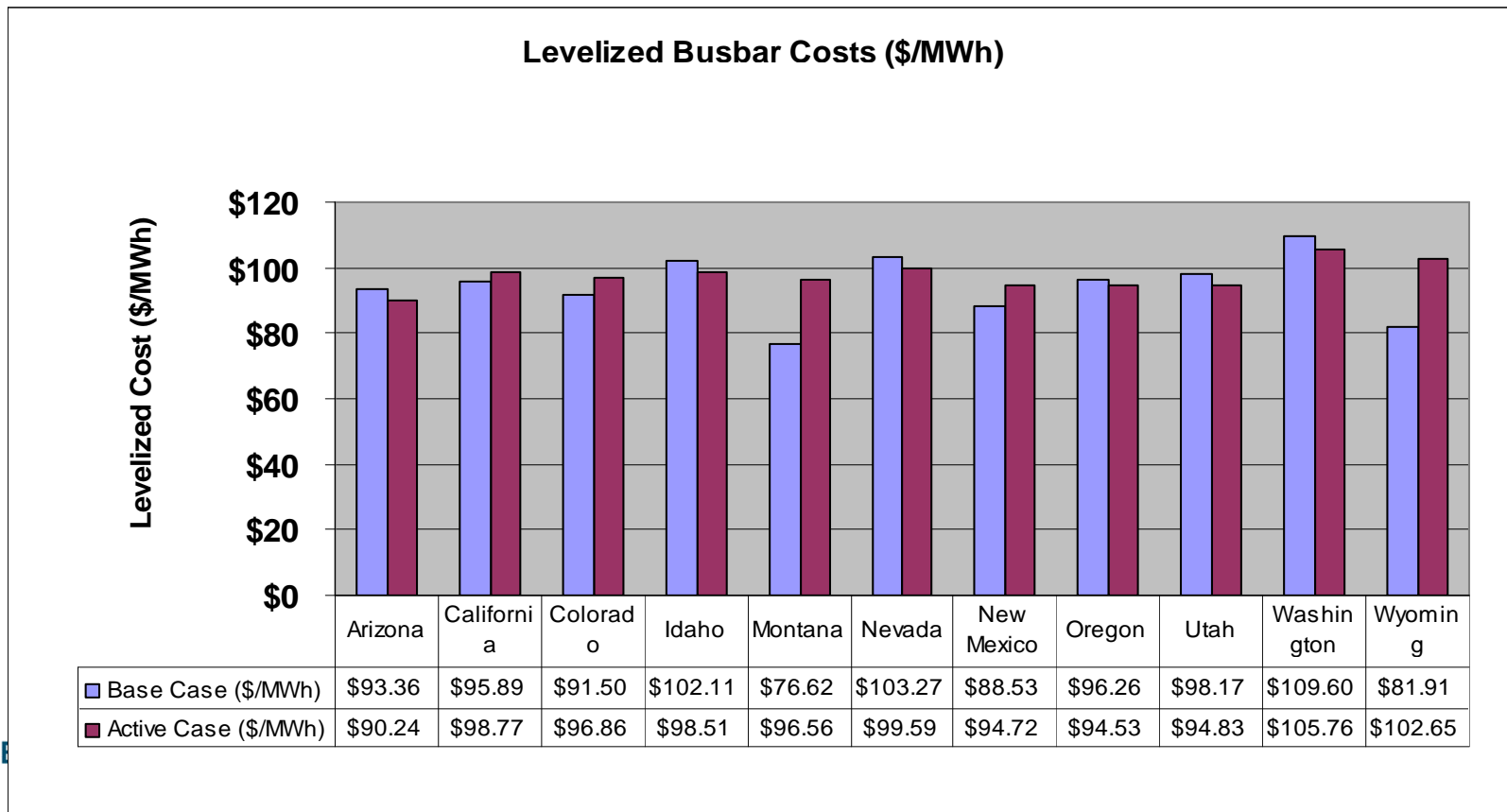
# Scenario 3

Keeping the capacity factor constant

# Scenario 3: Same Cap. Factor

## Comparison to Original Base Case

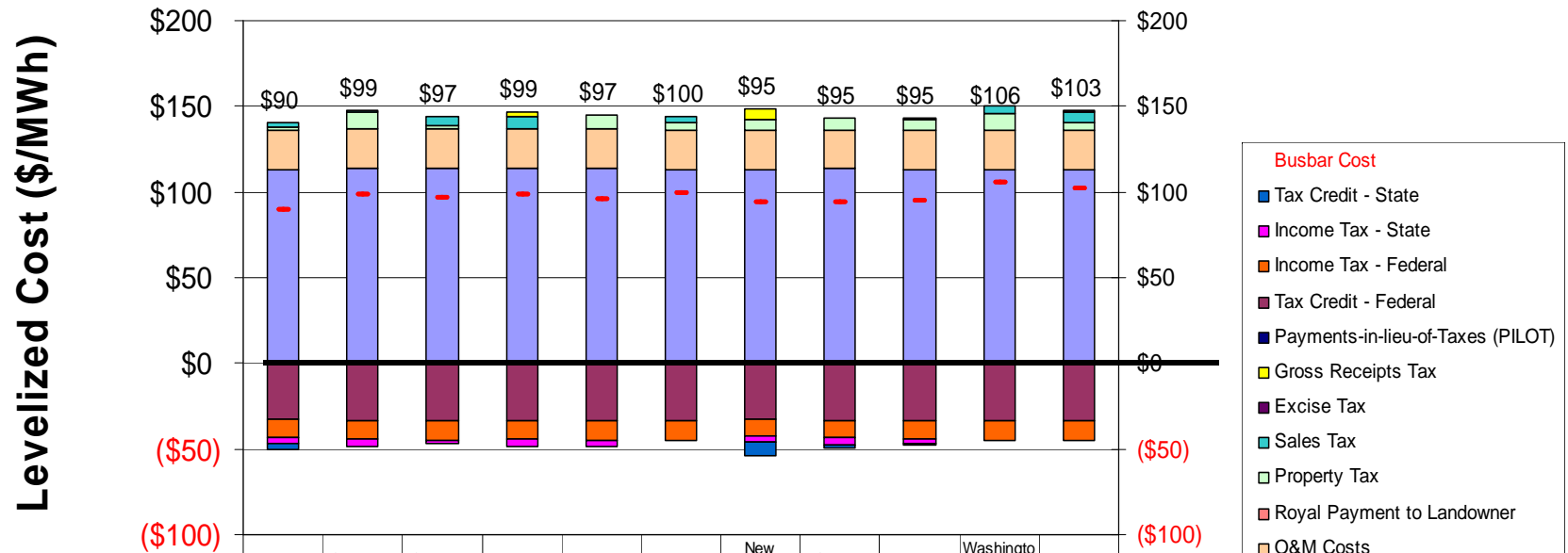
- States with highest capacity factors in base case become more costly
- Wyoming is the least cost competitive state



# Scenario 3: Same Cap. Factor

## Detailed Cost Breakdown

■ System cost and federal taxes don't vary much by state, major driver for ranking is state taxes



	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Busbar Cost	\$90.24	\$98.77	\$96.86	\$98.51	\$96.56	\$99.59	\$94.72	\$94.53	\$94.83	\$105.76	\$102.65
■ Tax Credit - State	(\$4.02)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$7.61)	(\$1.57)	(\$1.46)	\$0.00	\$0.00
■ Income Tax - State	(\$3.53)	(\$4.38)	(\$2.26)	(\$3.75)	(\$3.38)	\$0.00	(\$3.98)	(\$3.90)	(\$2.45)	\$0.00	\$0.00
■ Income Tax - Federal	(\$10.27)	(\$10.96)	(\$11.47)	(\$11.12)	(\$11.48)	(\$11.75)	(\$9.50)	(\$10.56)	(\$10.97)	(\$11.72)	(\$11.91)
■ Tax Credit - Federal	(\$32.88)	(\$33.31)	(\$33.30)	(\$33.32)	(\$33.44)	(\$33.13)	(\$32.55)	(\$33.07)	(\$33.09)	(\$33.12)	(\$33.21)
■ Payments-in-lieu-of-Taxes (PILOT)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
■ Gross Receipts Tax	\$0.00	\$0.00	\$0.00	\$2.74	\$0.00	\$0.00	\$6.18	\$0.00	\$0.00	\$0.49	\$0.00
■ Excise Tax	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.67
■ Sales Tax	\$2.80	\$1.00	\$5.00	\$7.13	\$0.00	\$3.81	\$0.00	\$0.00	\$0.78	\$4.63	\$6.15
■ Property Tax	\$2.00	\$9.50	\$2.31	\$0.00	\$7.92	\$4.66	\$6.51	\$7.14	\$5.70	\$9.50	\$4.85
■ Royal Payment to Landowner	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
■ O&M Costs	\$22.97	\$22.93	\$22.93	\$22.93	\$22.92	\$22.95	\$23.00	\$22.95	\$22.95	\$22.95	\$22.94
■ System + Finance Costs	\$113.17	\$113.99	\$113.66	\$113.91	\$114.02	\$113.06	\$112.67	\$113.54	\$113.36	\$113.04	\$113.17

- Busbar Cost
- Tax Credit - State
- Income Tax - State
- Income Tax - Federal
- Tax Credit - Federal
- Payments-in-lieu-of-Taxes (PILOT)
- Gross Receipts Tax
- Excise Tax
- Sales Tax
- Property Tax
- Royal Payment to Landowner
- O&M Costs
- System + Finance Costs



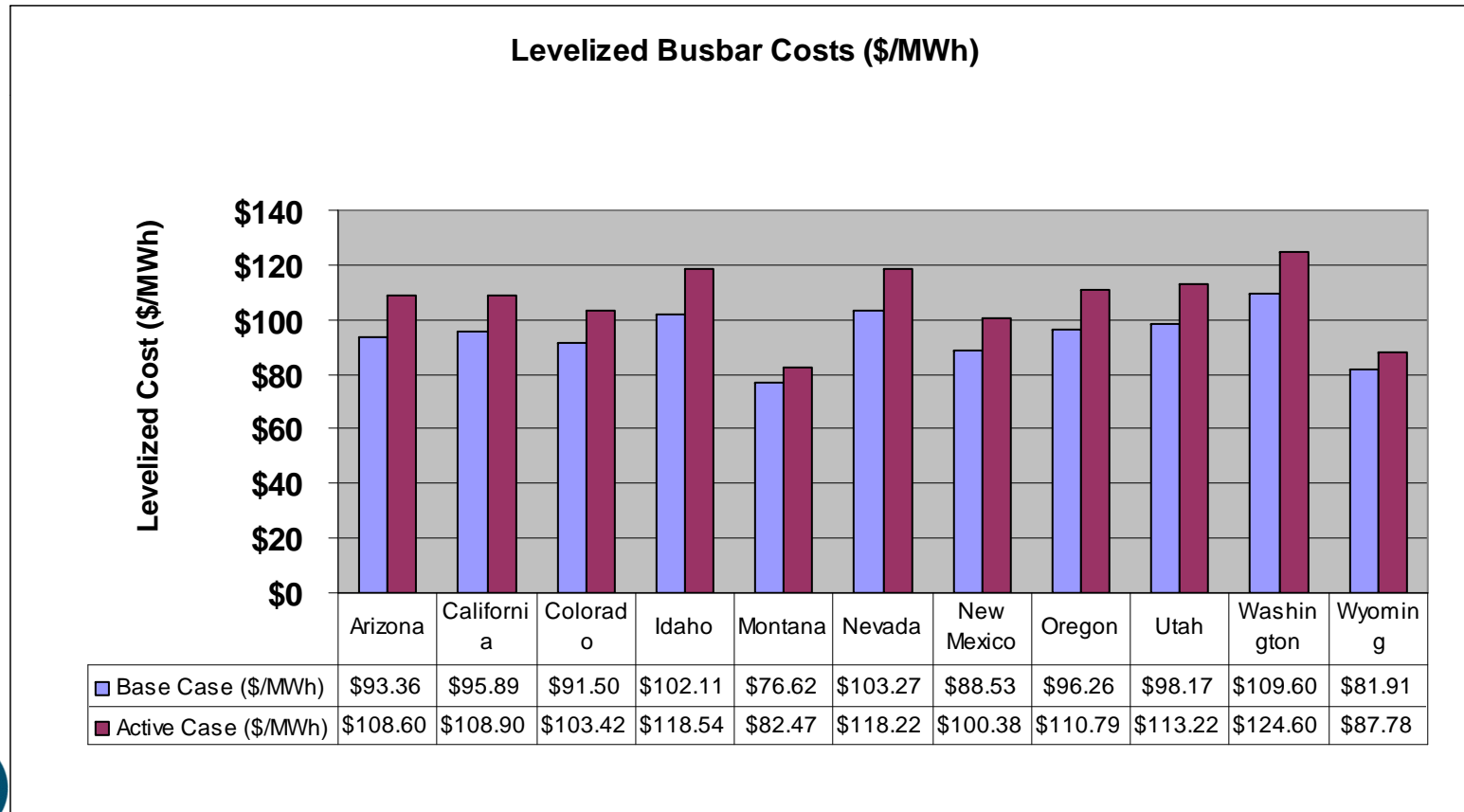
# Scenario 4

PTC instead of the ITC

# Scenario 4: PTC instead of ITC

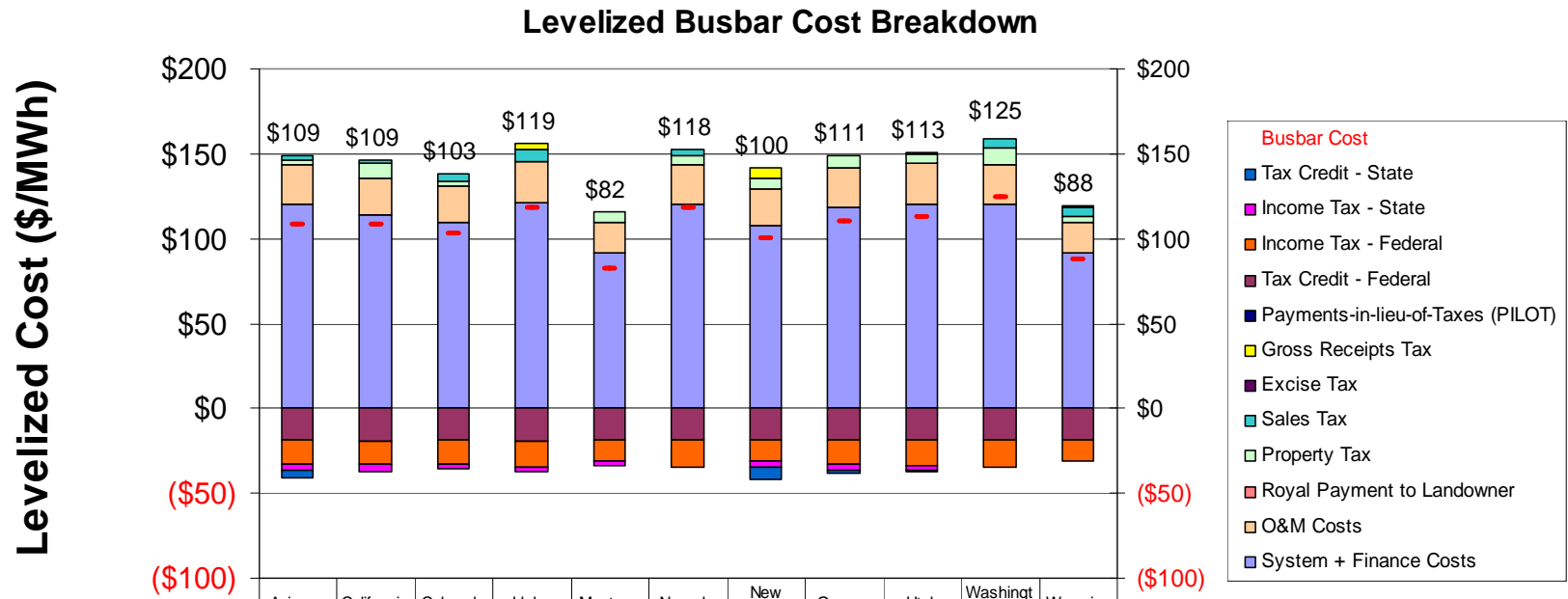
## Comparison with Original Base Case

- PTC is worse than the ITC for every state.
- States with highest capacity factors are affected the least



# Scenario 4: PTC instead of ITC

## Detailed Cost Breakdown



	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Busbar Cost	\$108.60	\$108.90	\$103.42	\$118.54	\$82.47	\$118.22	\$100.38	\$110.79	\$113.22	\$124.60	\$87.78
■ Tax Credit - State	(\$4.27)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$7.60)	(\$1.67)	(\$1.54)	\$0.00	\$0.00
■ Income Tax - State	(\$3.33)	(\$3.92)	(\$1.98)	(\$3.56)	(\$2.57)	\$0.00	(\$3.46)	(\$3.63)	(\$2.32)	\$0.00	\$0.00
■ Income Tax - Federal	(\$14.07)	(\$14.16)	(\$14.29)	(\$15.17)	(\$12.40)	(\$15.67)	(\$12.07)	(\$14.22)	(\$14.86)	(\$15.62)	(\$12.72)
■ Tax Credit - Federal	(\$18.89)	(\$18.96)	(\$18.92)	(\$19.02)	(\$18.77)	(\$18.94)	(\$18.70)	(\$18.93)	(\$18.94)	(\$18.93)	(\$18.71)
■ Payments-in-lieu-of-Taxes (PILOT)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
■ Gross Receipts Tax	\$0.00	\$0.00	\$0.00	\$3.32	\$0.00	\$0.00	\$6.55	\$0.00	\$0.00	\$0.58	\$0.00
■ Excise Tax	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.66
■ Sales Tax	\$3.07	\$1.03	\$5.00	\$7.83	\$0.00	\$4.16	\$0.00	\$0.00	\$0.85	\$5.04	\$5.17
■ Property Tax	\$2.11	\$9.19	\$2.22	\$0.00	\$6.34	\$4.82	\$6.19	\$7.18	\$5.88	\$9.81	\$3.90
■ Royal Payment to Landowner	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
■ O&M Costs	\$23.54	\$22.06	\$21.48	\$23.52	\$18.10	\$23.57	\$21.42	\$23.15	\$23.52	\$23.56	\$18.19



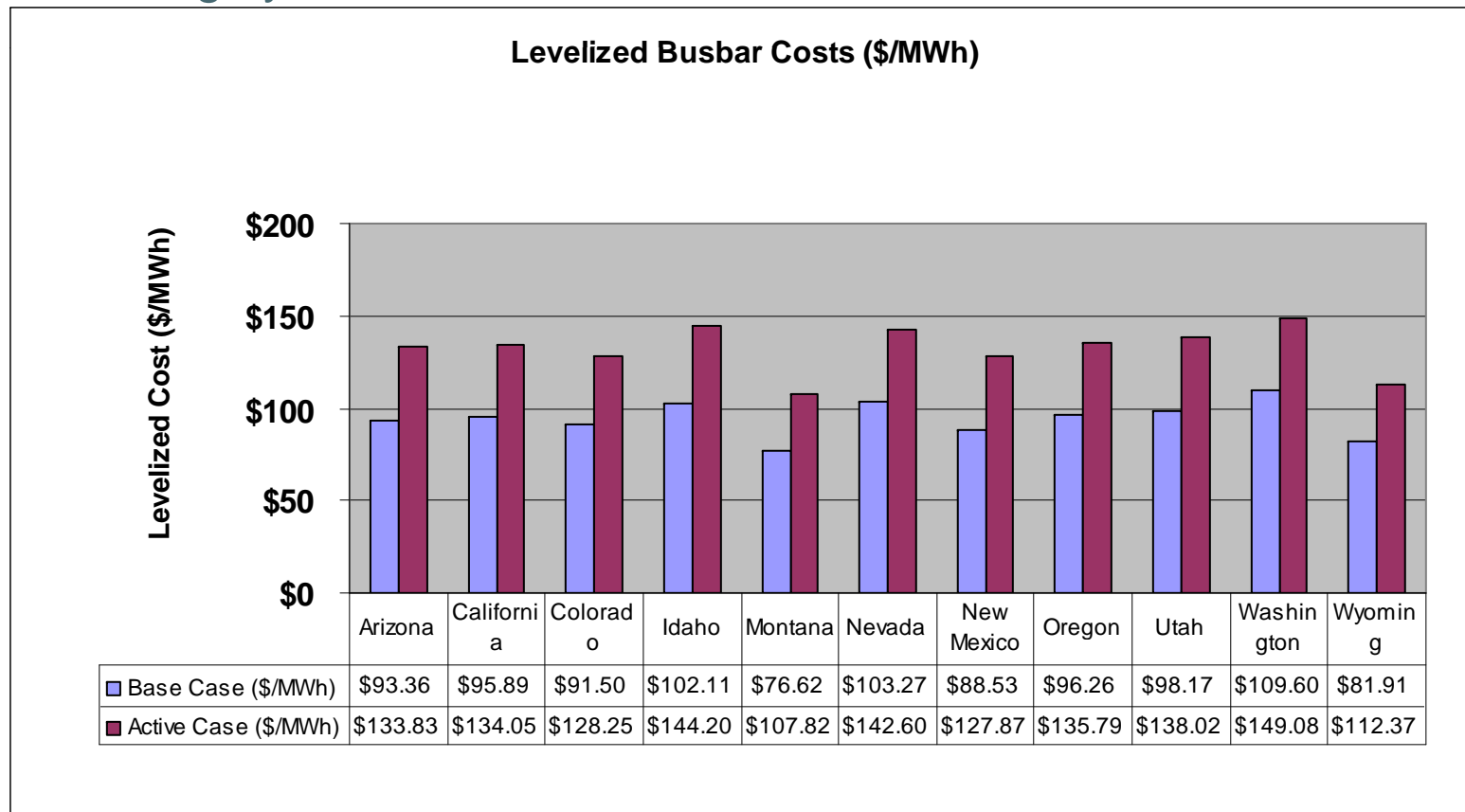
# Scenario 5

Neither the ITC or the PTC

# Scenario 5: No PTC or ITC

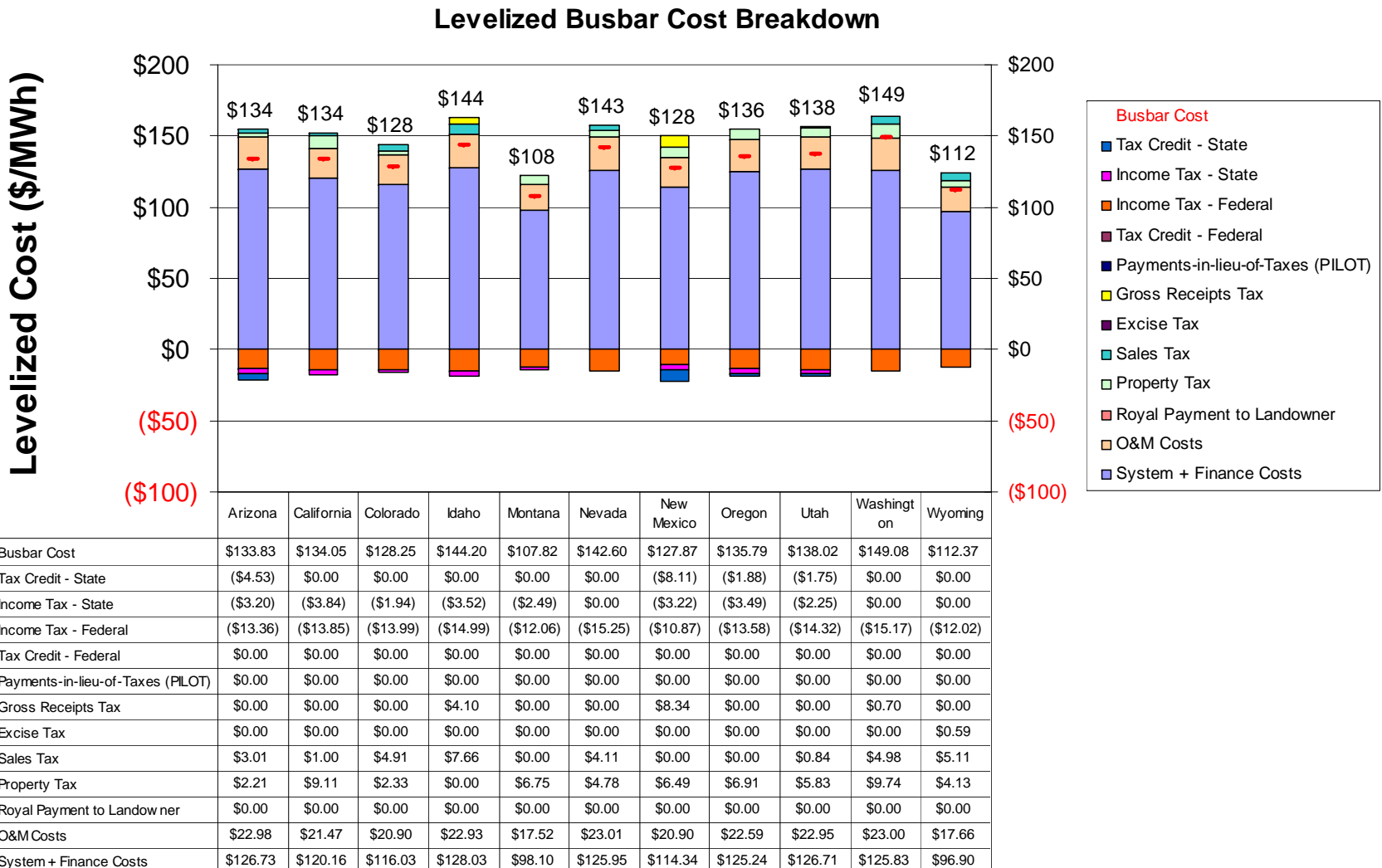
## Comparison to Original Base Case

- Significant cost increases without PTC nor ITC
- Roughly a ~30-40\$/MWh decrease from base case (with ITC)
- Roughly ~25\$/MWh decrease from case with PTC



# Scenario 5: No PTC or ITC

## Detailed Cost Breakdown





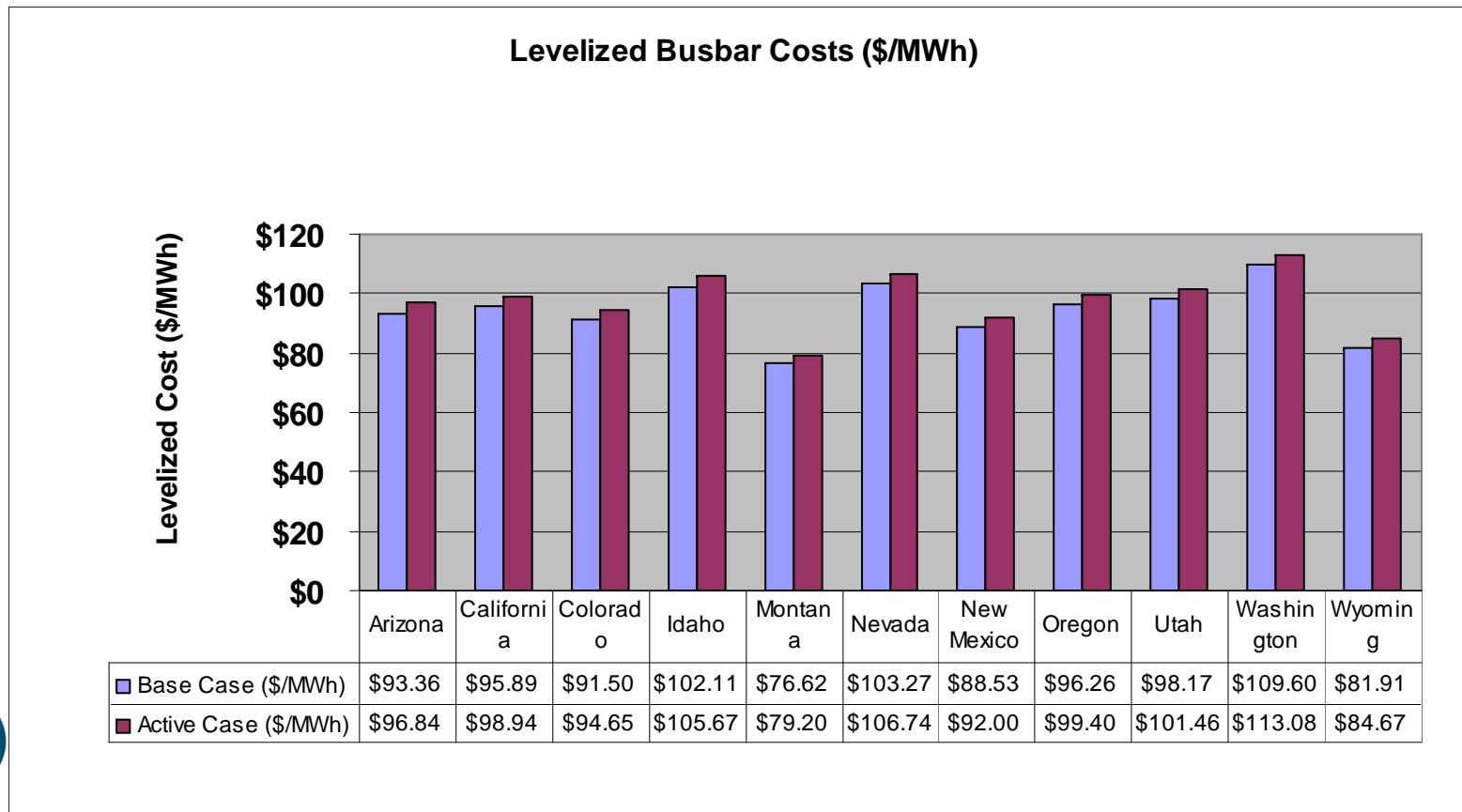
# Scenario 6

Increase in WACC

# Scenario 6: Increased WACC

## Comparison to Original Base Case

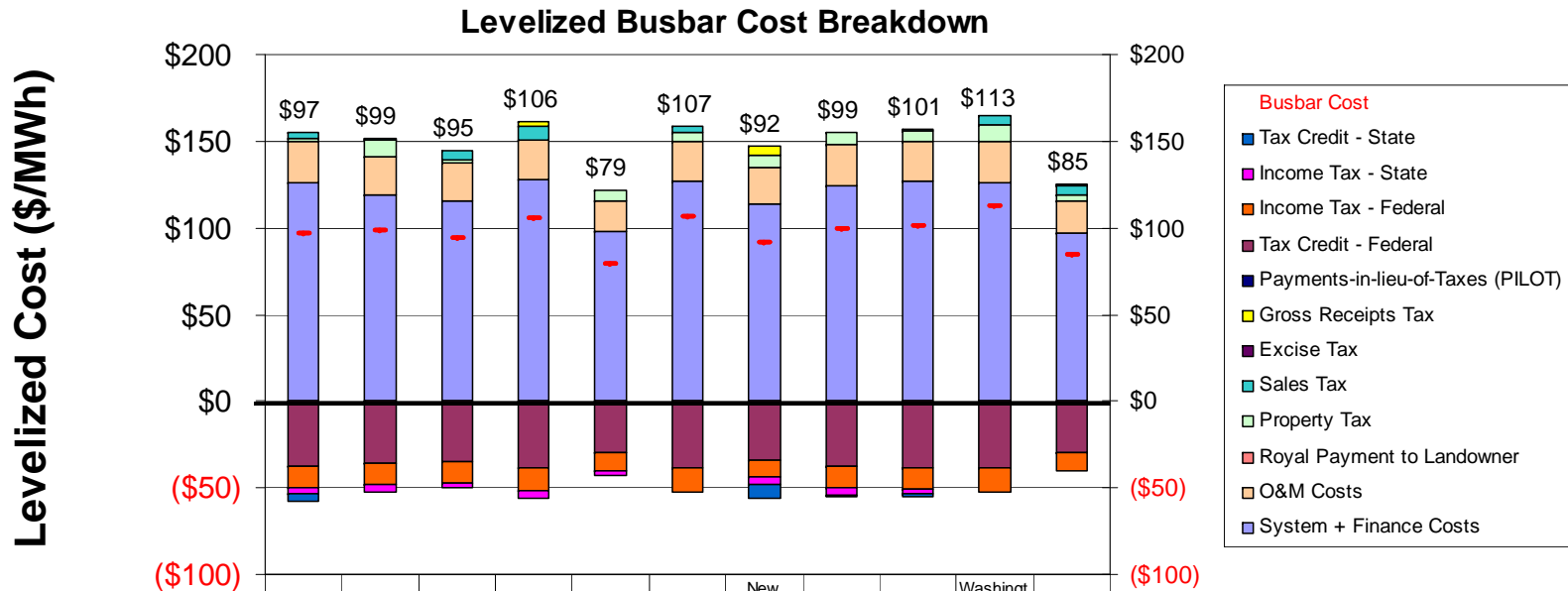
- Increasing the WACC by 100 basis points increases the cost by ~\$3/MWh for all states
- Rankings stay the same



# Scenario 6: Increased WACC

## Detailed Cost Breakdown

- Rankings are the same as the base case



	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Busbar Cost	\$96.84	\$98.94	\$94.65	\$105.67	\$79.20	\$106.74	\$92.00	\$99.40	\$101.46	\$113.08	\$84.67
Tax Credit - State	(\$4.32)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$7.75)	(\$1.71)	(\$1.58)	\$0.00	\$0.00
Income Tax - State	(\$4.04)	(\$4.73)	(\$2.39)	(\$4.34)	(\$3.00)	\$0.00	(\$4.11)	(\$4.40)	(\$2.82)	\$0.00	\$0.00
Income Tax - Federal	(\$12.00)	(\$11.99)	(\$12.30)	(\$13.02)	(\$10.34)	(\$13.87)	(\$9.97)	(\$12.08)	(\$12.84)	(\$13.83)	(\$10.83)
Tax Credit - Federal	(\$37.72)	(\$35.91)	(\$35.00)	(\$38.37)	(\$29.53)	(\$38.29)	(\$33.75)	(\$37.34)	(\$38.04)	(\$38.24)	(\$29.50)
Payments-in-lieu-of-Taxes (PILOT)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Gross Receipts Tax	\$0.00	\$0.00	\$0.00	\$2.94	\$0.00	\$0.00	\$6.00	\$0.00	\$0.00	\$0.52	\$0.00
Excise Tax	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.64
Sales Tax	\$2.98	\$1.00	\$4.85	\$7.58	\$0.00	\$4.07	\$0.00	\$0.00	\$0.83	\$4.93	\$5.04
Property Tax	\$2.13	\$9.18	\$2.25	\$0.00	\$6.47	\$4.81	\$6.27	\$7.13	\$5.87	\$9.80	\$3.98
Royal Payment to Landowner	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
O&M Costs	\$23.43	\$21.94	\$21.34	\$23.42	\$17.92	\$23.44	\$21.27	\$23.04	\$23.41	\$23.43	\$18.00
System + Finance Costs	\$126.38	\$119.44	\$115.91	\$127.45	\$97.68	\$126.58	\$114.02	\$124.77	\$126.64	\$126.47	\$97.34

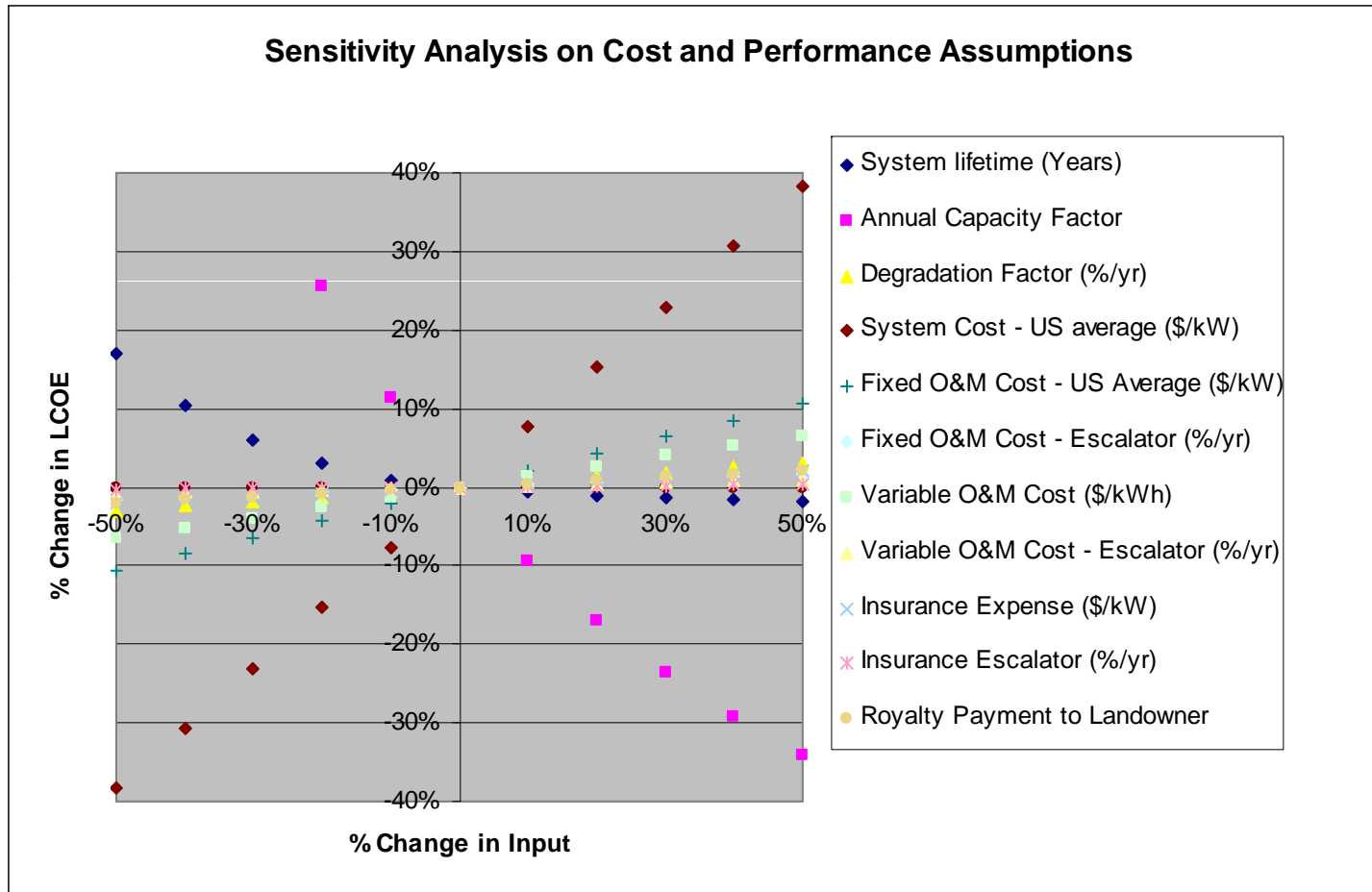


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# Sensitivity Analysis

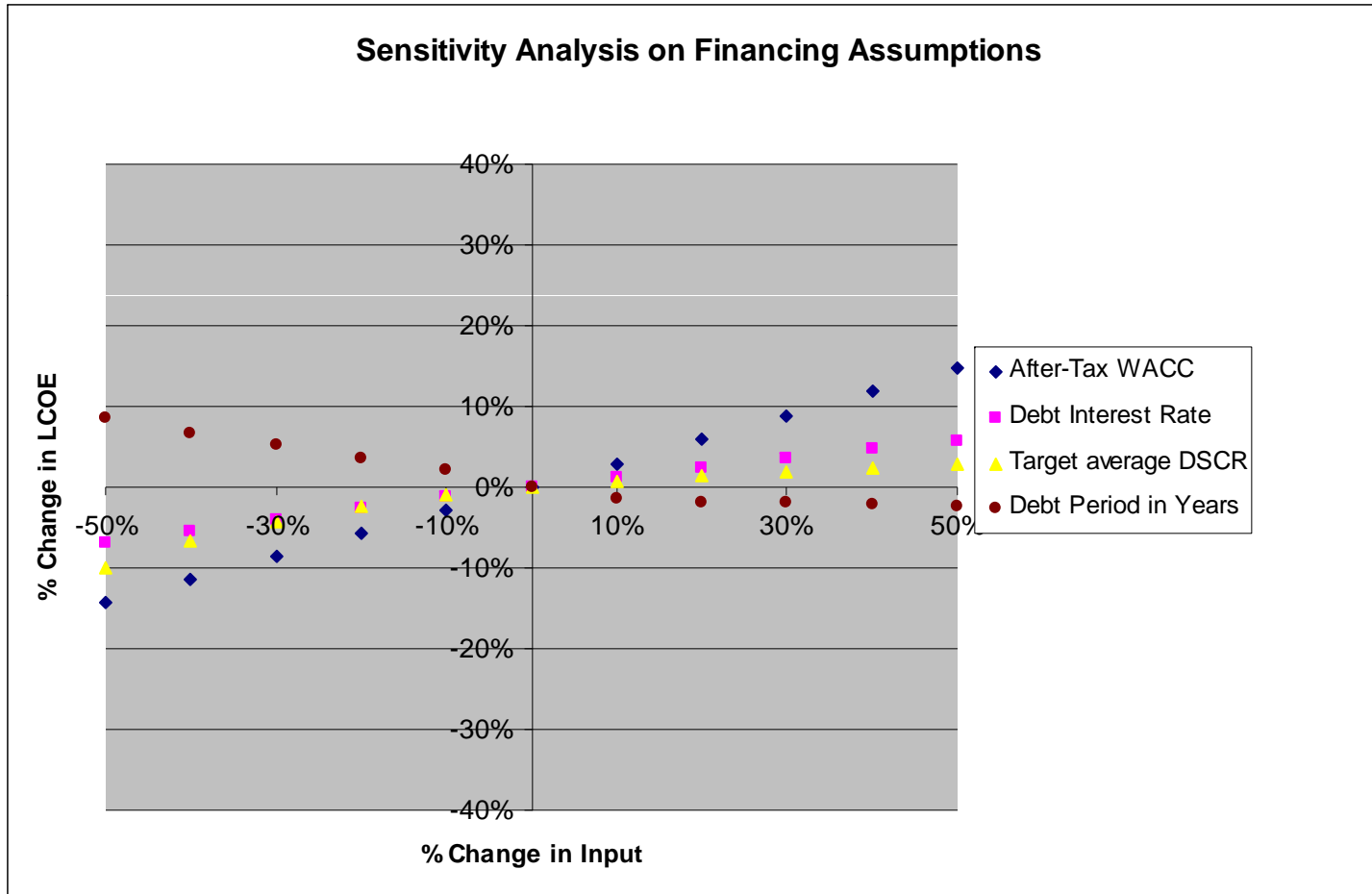
# Sensitivities

## Cost and Performance Inputs



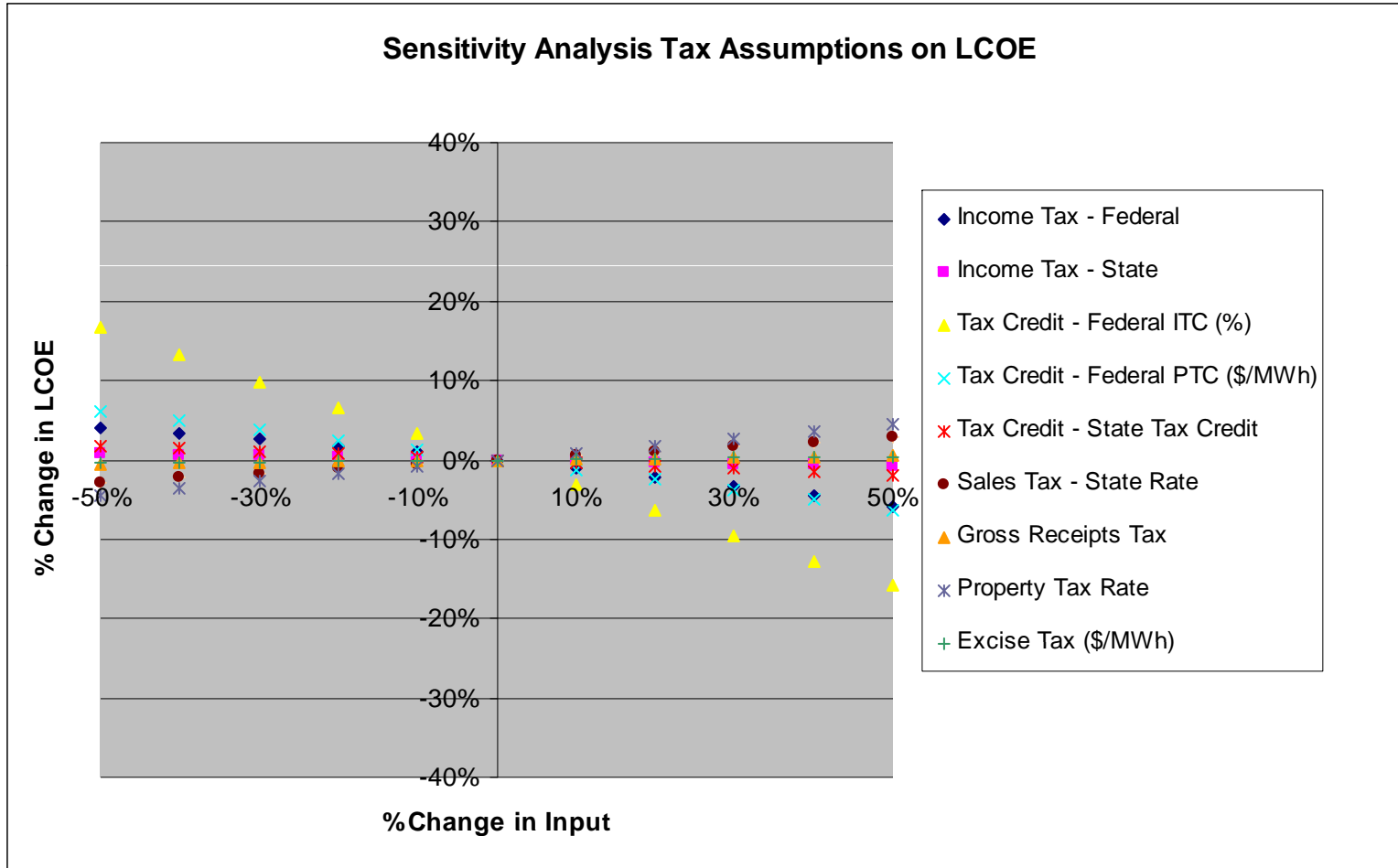
# Sensitivities

## Finance Inputs



# Sensitivities

## Tax Inputs





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# Summary

# General Findings

- Identified the major drivers of levelized cost
  - Capacity factor
  - Capital cost
  - Federal Tax treatments
- Identified the major differences among states
  - Capacity factor
  - State taxes
  - Transmission costs
- In all cases, ITC is preferable over the PTC
- Having a state income tax actually benefits the LCOE because of the effects of accelerated depreciation



# Findings Specific to Colorado, Montana, New Mexico and Wyoming Counties

- MT, WY, NM and CO are the four most cost competitive states in the WECC as measured by LCOE
  - ❑ High capacity factors in MT, WY and CO contribute to low LCOE. NM benefits from favorable tax incentives.
  - ❑ Wyoming's state tax structure results in the second 2<sup>nd</sup> biggest state tax burden (behind Washington)
  - ❑ Absence of a state income tax actually hurts the competitiveness of wind in Wyoming as projects can't take advantage of the accelerated depreciation at a state level.
- Adding in transmission, Wyoming and Montana have the 3<sup>rd</sup> and 4<sup>th</sup> LCOE, respectively, after California and Oregon.
- Sensitivity analyses highlight importance of federal subsidies, system cost and capacity factors.
- Local costs (e.g. property taxes and sales tax) have a small impact on economics of the project but likely large impact on local government budgets.



# Key Learnings Since Original Work Completed

- The model is useful, but it is only a model.
- Project developers are likely to evaluate projects not states. Highest capacity factor projects likely developed first. This model can be used to run scenarios for specific projects but the baseline is built on averages.
- Other externalities such as in-state preference and transmission location have not been factored into the model.
- Other costs such as integration, collector system, interstate transmission and ancillary services have not been included in the model but will reflect total costs of resource (presumably in a consistent way across the states).
- Use of IRBs in New Mexico remains a question.
- The model is available to all interested parties and is improved by your use and feedback about its functionality and assumptions.





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# Appendix

# Sources

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