



Energy+Environmental Economics

Wind Costing Model

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Prepared for:

State of Wyoming

Revenue Committee of the State Legislature

Governor's Office

Wyoming Infrastructure Authority

Presented by:

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July 1, 2010

Background

- The Wyoming state government is interested in understanding how state policy initiatives may affect the cost-competitiveness of Wyoming wind resources.
- Wyoming has recently enacted an excise tax on energy production at wind farms in the state.
- Wyoming is 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.



About E3

E3's expertise has placed us 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 load center
- Understand the impact of Wyoming's tax structure on cost competitiveness on Wyoming wind



Tasks

- E3 has completed the following tasks:
 - Investigated tax treatments by state
 - Researched statewide performance parameters
 - Examined cost assumptions by state
 - Developed the *pro forma* costing model
 - Finalized input assumptions to the model



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 has 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 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.
- ❑ 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 1st 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.





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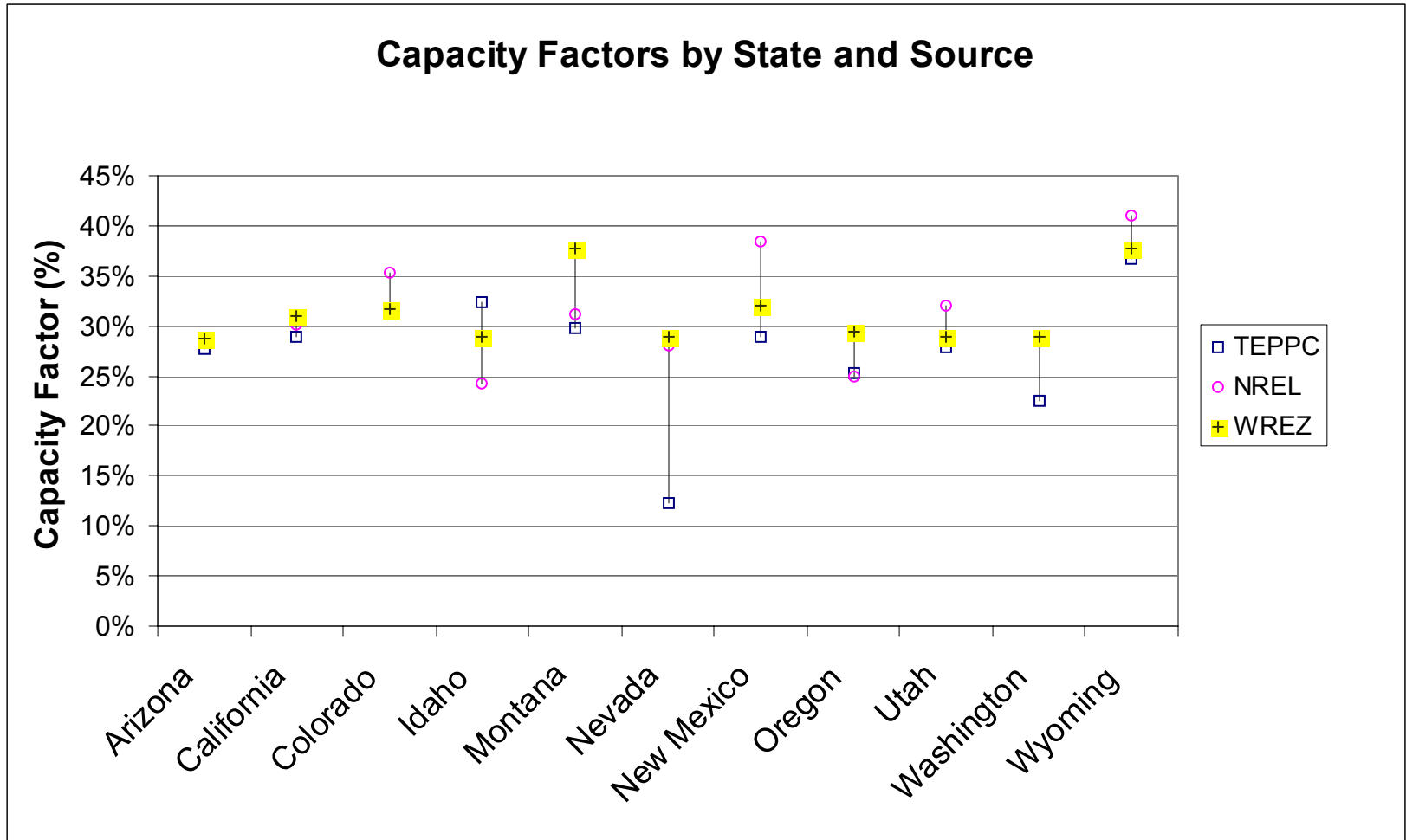
Statewide Performance Parameters

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)





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



Other Input Assumptions

- 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



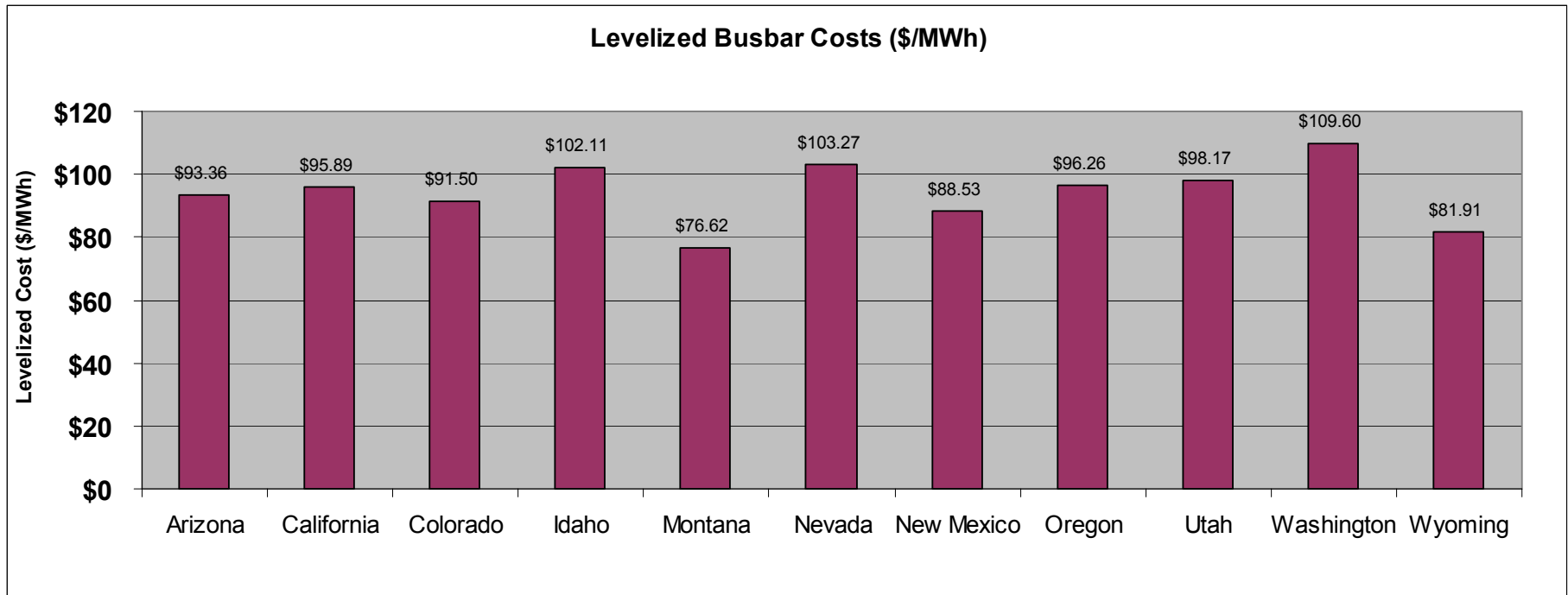


Scenario 1: Base Case

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

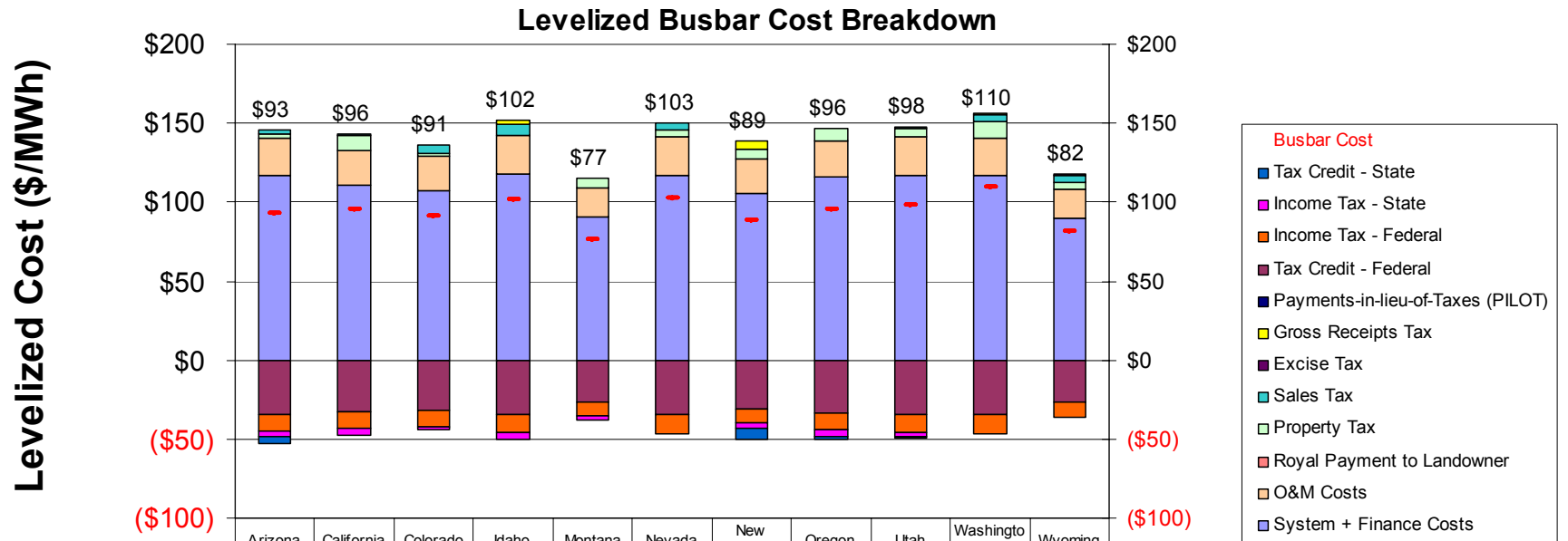
Scenario 1a: Base Case

Levelized Busbar Costs



Scenario 1a: Base Case

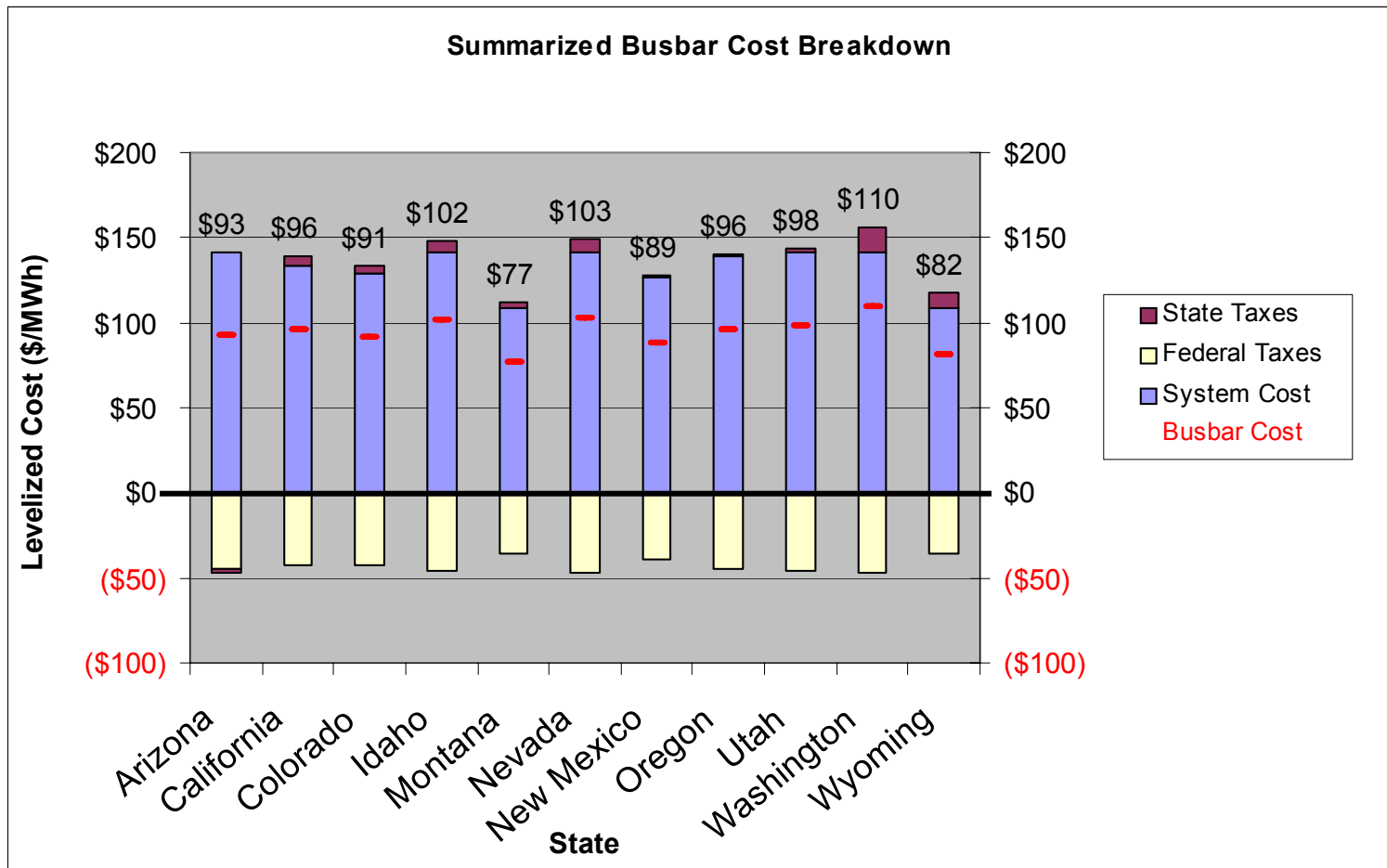
Detailed Cost Breakdown



	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Busbar Cost	\$93.36	\$95.89	\$91.50	\$102.11	\$76.62	\$103.27	\$88.53	\$96.26	\$98.17	\$109.60	\$81.91
■ Tax Credit - State	(\$4.16)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$7.45)	(\$1.60)	(\$1.46)	\$0.00	\$0.00
■ Income Tax - State	(\$3.65)	(\$4.25)	(\$2.14)	(\$3.89)	(\$2.68)	\$0.00	(\$3.74)	(\$3.98)	(\$2.54)	\$0.00	\$0.00
■ Income Tax - Federal	(\$10.63)	(\$10.64)	(\$10.84)	(\$11.53)	(\$9.11)	(\$12.18)	(\$8.84)	(\$10.75)	(\$11.36)	(\$12.14)	(\$9.48)
■ Tax Credit - Federal	(\$34.01)	(\$32.34)	(\$31.46)	(\$34.54)	(\$26.53)	(\$34.36)	(\$30.49)	(\$33.67)	(\$34.25)	(\$34.32)	(\$26.45)
■ 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	\$2.84	\$0.00	\$0.00	\$5.78	\$0.00	\$0.00	\$0.51	\$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	\$2.90	\$0.97	\$4.72	\$7.39	\$0.00	\$3.95	\$0.00	\$0.00	\$0.81	\$4.80	\$4.90
■ Property Tax	\$2.07	\$9.22	\$2.19	\$0.00	\$6.28	\$4.83	\$6.10	\$7.27	\$5.90	\$9.84	\$3.86
■ 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	\$23.76	\$22.26	\$21.66	\$23.77	\$18.18	\$23.79	\$21.57	\$23.37	\$23.75	\$23.78	\$18.27
■ System + Finance Costs	\$117.07	\$110.67	\$107.36	\$118.08	\$90.47	\$117.24	\$105.61	\$115.62	\$117.32	\$117.14	\$90.14

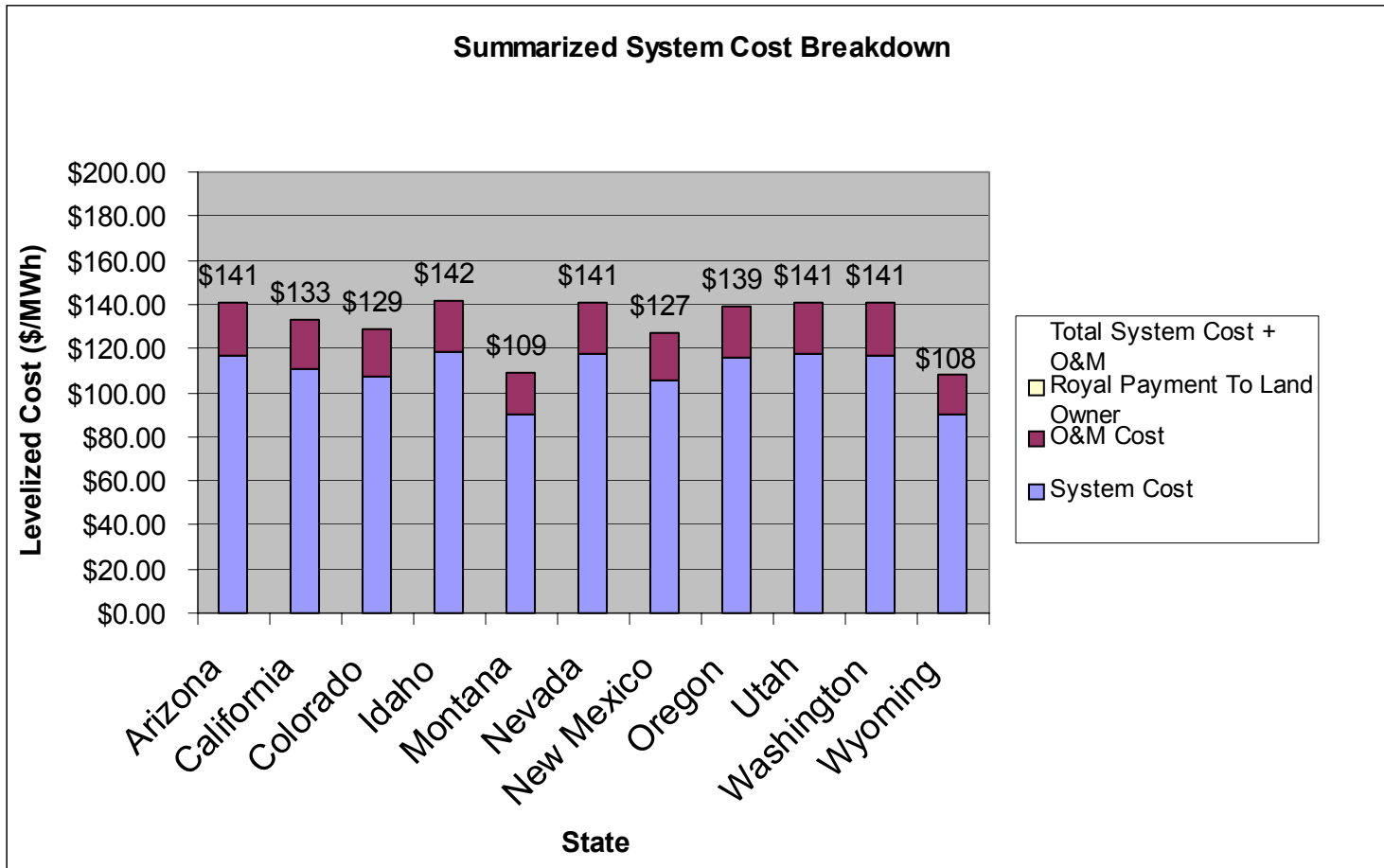
Scenario 1a: Base Case

Summarized Cost Breakdown



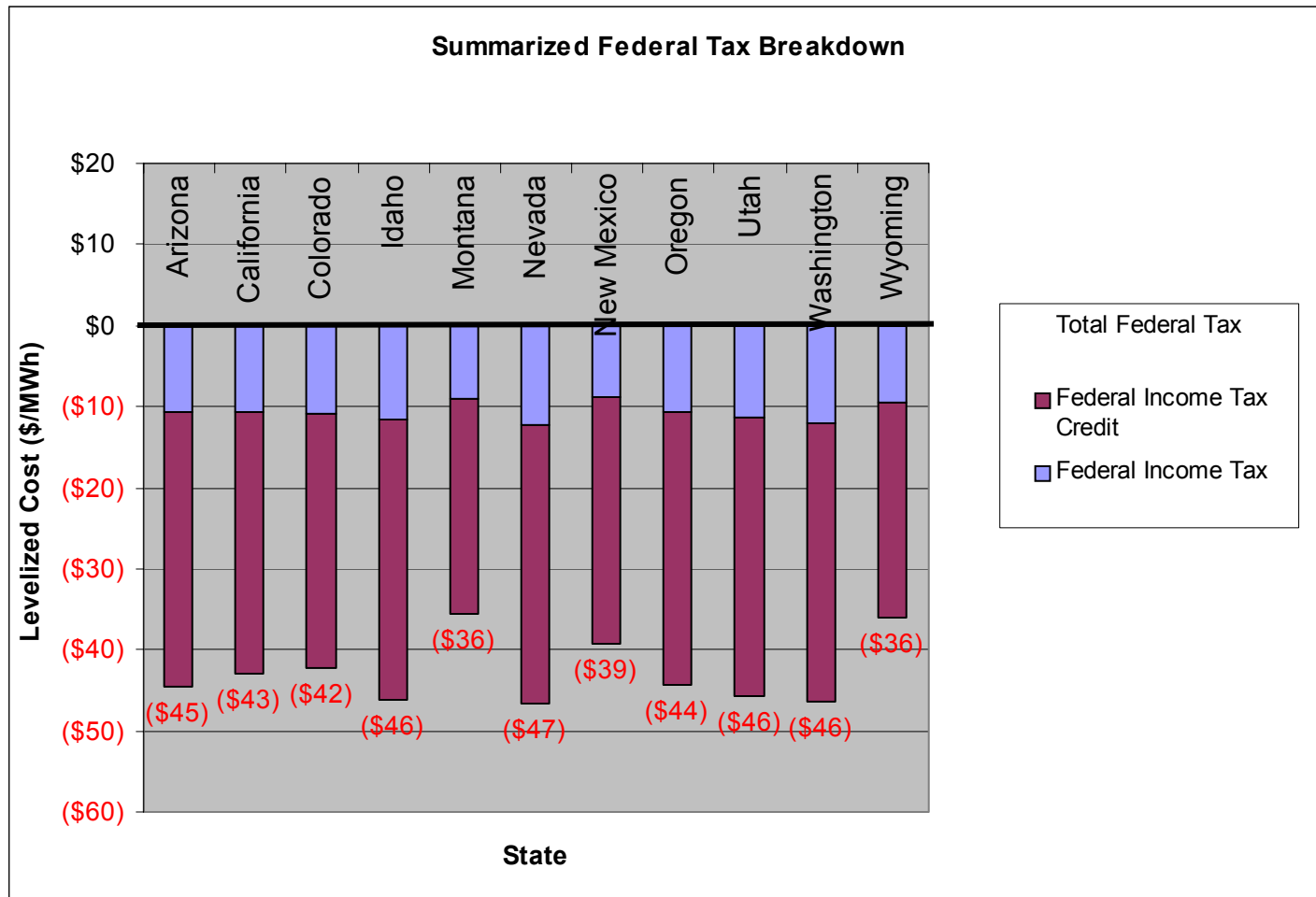
Scenario 1a: Base Case

Breakdown of System Cost



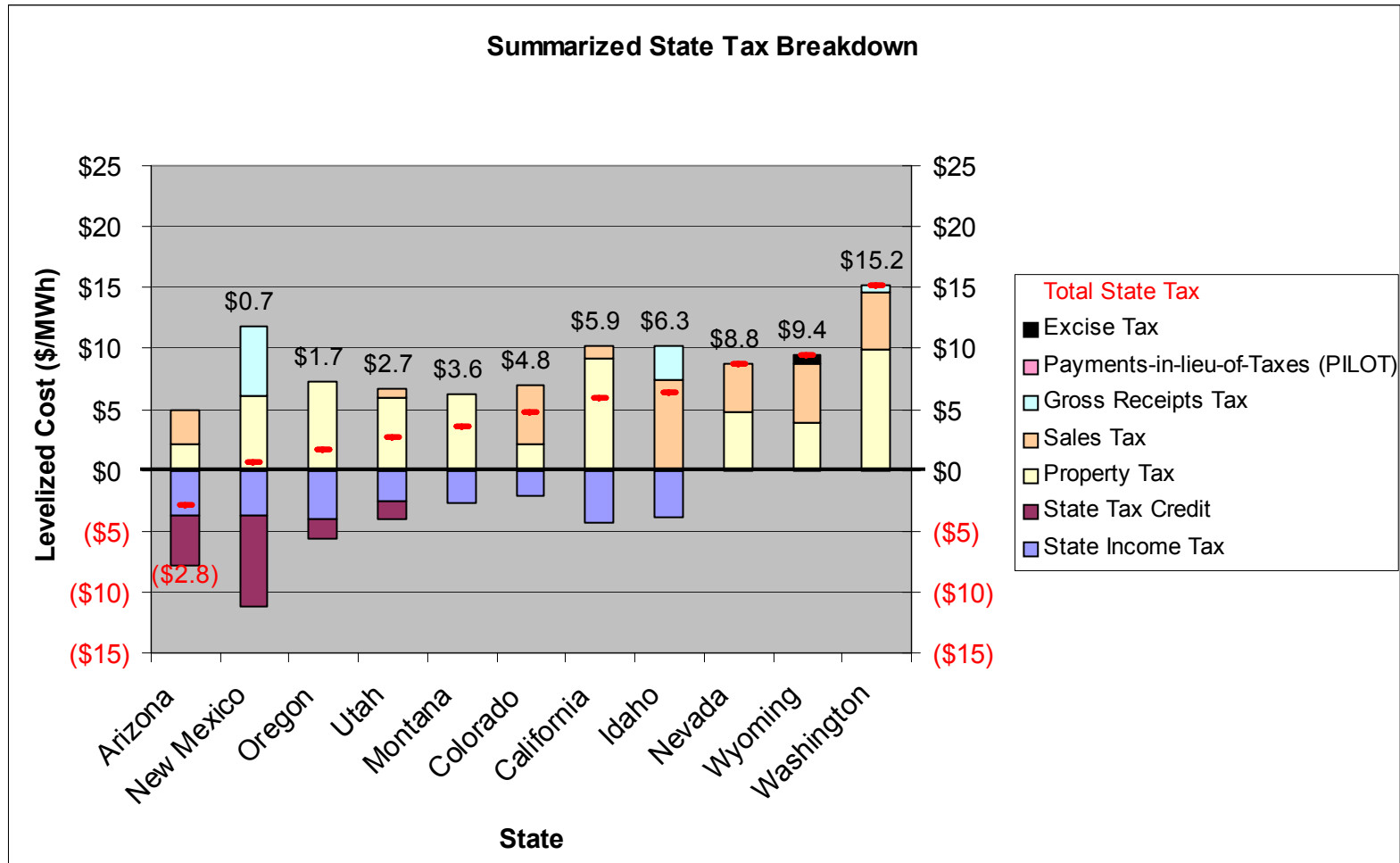
Scenario 1a: Base Case

Breakdown of Federal Taxes



Scenario 1a: Base Case

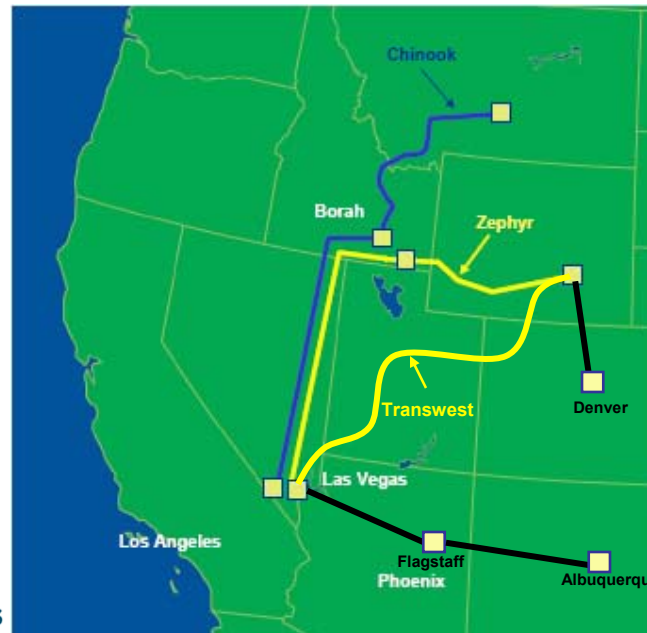
Breakdown of State Taxes (Ranked)



Scenario 1b: Delivered Costs

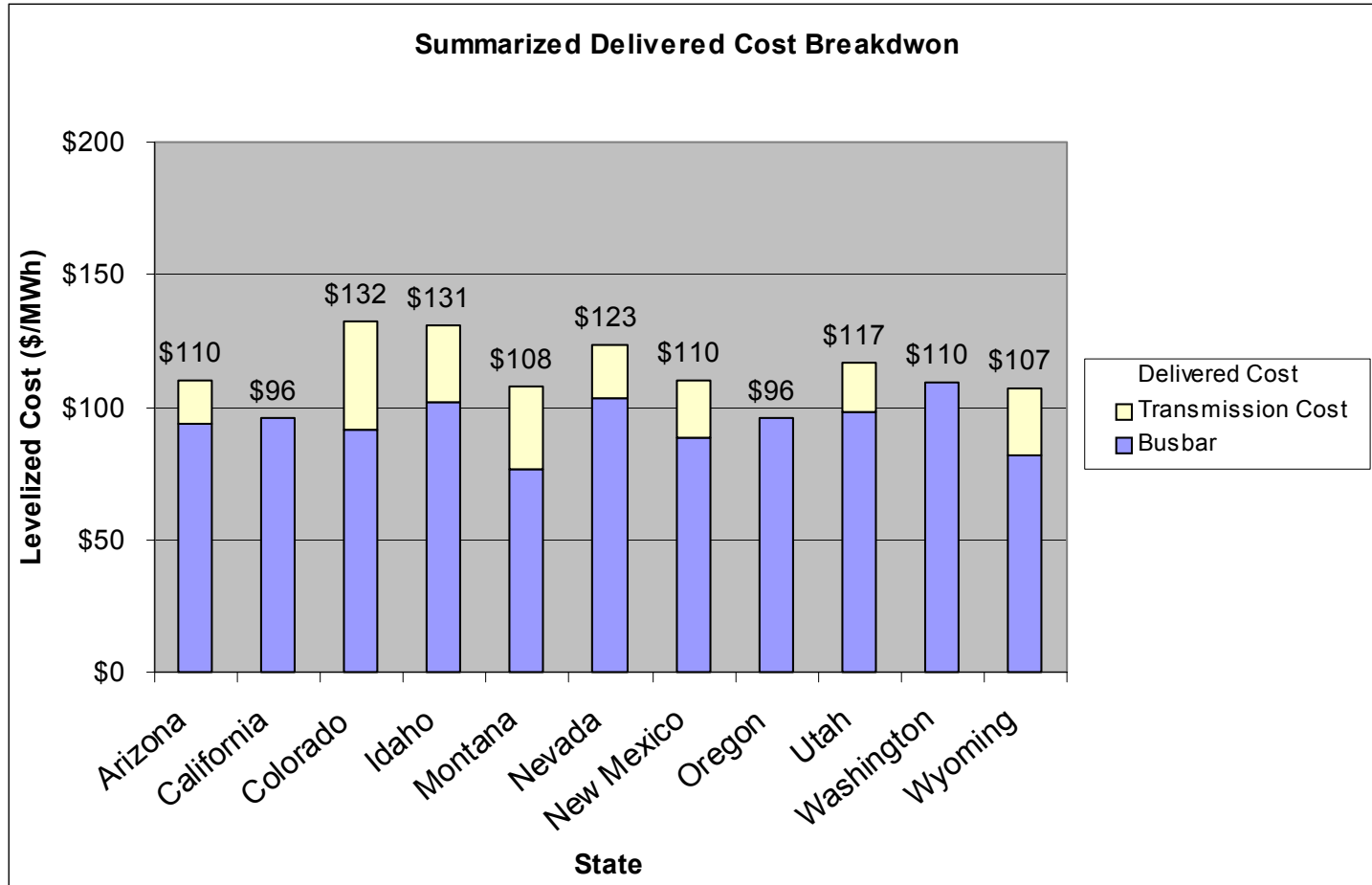
Transmission Specs

- 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:
- Base case assumes TransWest Express Transmission Project for Wyoming
- Other states deliver to Las Vegas as depicted:



Scenario 1b: Delivered Costs

Busbar Costs + Transmission





Scenario 2

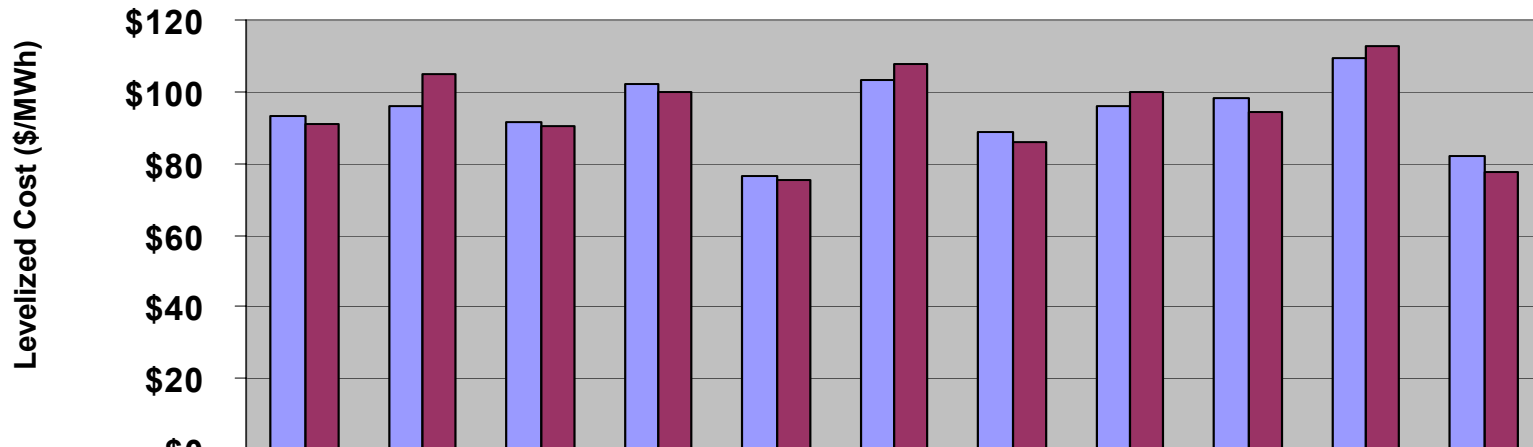
Applying regional cost multipliers

Scenario 2: Regional Multipliers

Compared to Base Case

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

Levelized Busbar Costs (\$/MWh)



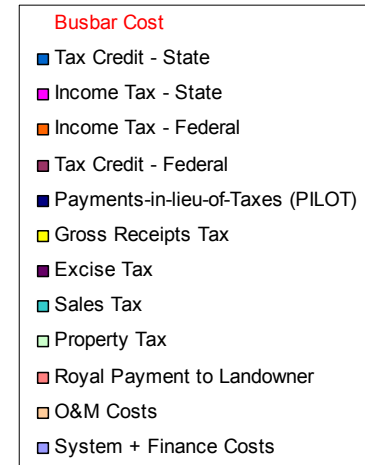
■ Base Case (\$/MWh)	\$93.36	\$95.89	\$91.50	\$102.11	\$76.62	\$103.27	\$88.53	\$96.26	\$98.17	\$109.60	\$81.91
■ Active Case (\$/MWh)	\$90.82	\$104.77	\$90.58	\$100.00	\$75.40	\$107.52	\$86.04	\$99.81	\$94.56	\$112.94	\$77.75

Scenario 2: Regional Cost Mult.

Detailed Cost Breakdown

Levelized Busbar Cost Breakdown

Levelized Cost (\$/MWh)



	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Busbar Cost	\$90.82	\$104.77	\$90.58	\$100.00	\$75.40	\$107.52	\$86.04	\$99.81	\$94.56	\$112.94	\$77.75
■ Tax Credit - State	(\$4.16)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$7.45)	(\$1.60)	(\$1.46)	\$0.00	\$0.00
■ Income Tax - State	(\$3.57)	(\$4.59)	(\$2.12)	(\$3.82)	(\$2.64)	\$0.00	(\$3.66)	(\$4.10)	(\$2.46)	\$0.00	\$0.00
■ Income Tax - Federal	(\$10.36)	(\$11.48)	(\$10.74)	(\$11.33)	(\$8.98)	(\$12.61)	(\$8.60)	(\$11.10)	(\$11.00)	(\$12.46)	(\$9.06)
■ Tax Credit - Federal	(\$33.22)	(\$34.95)	(\$31.17)	(\$33.92)	(\$26.16)	(\$35.59)	(\$29.78)	(\$34.75)	(\$33.15)	(\$35.25)	(\$25.27)
■ 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	\$2.78	\$0.00	\$0.00	\$5.61	\$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	\$0.67
■ Sales Tax	\$2.83	\$1.05	\$4.68	\$7.25	\$0.00	\$4.09	\$0.00	\$0.00	\$0.78	\$4.93	\$4.68
■ Property Tax	\$2.02	\$9.97	\$2.19	\$0.00	\$6.19	\$5.01	\$5.96	\$7.50	\$5.71	\$10.11	\$3.69
■ 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	\$22.91	\$25.16	\$21.36	\$23.08	\$17.78	\$25.17	\$20.80	\$24.54	\$22.56	\$24.80	\$16.96
■ System + Finance Costs	\$114.36	\$119.62	\$106.40	\$115.96	\$89.21	\$121.45	\$103.15	\$119.32	\$113.56	\$120.30	\$86.09



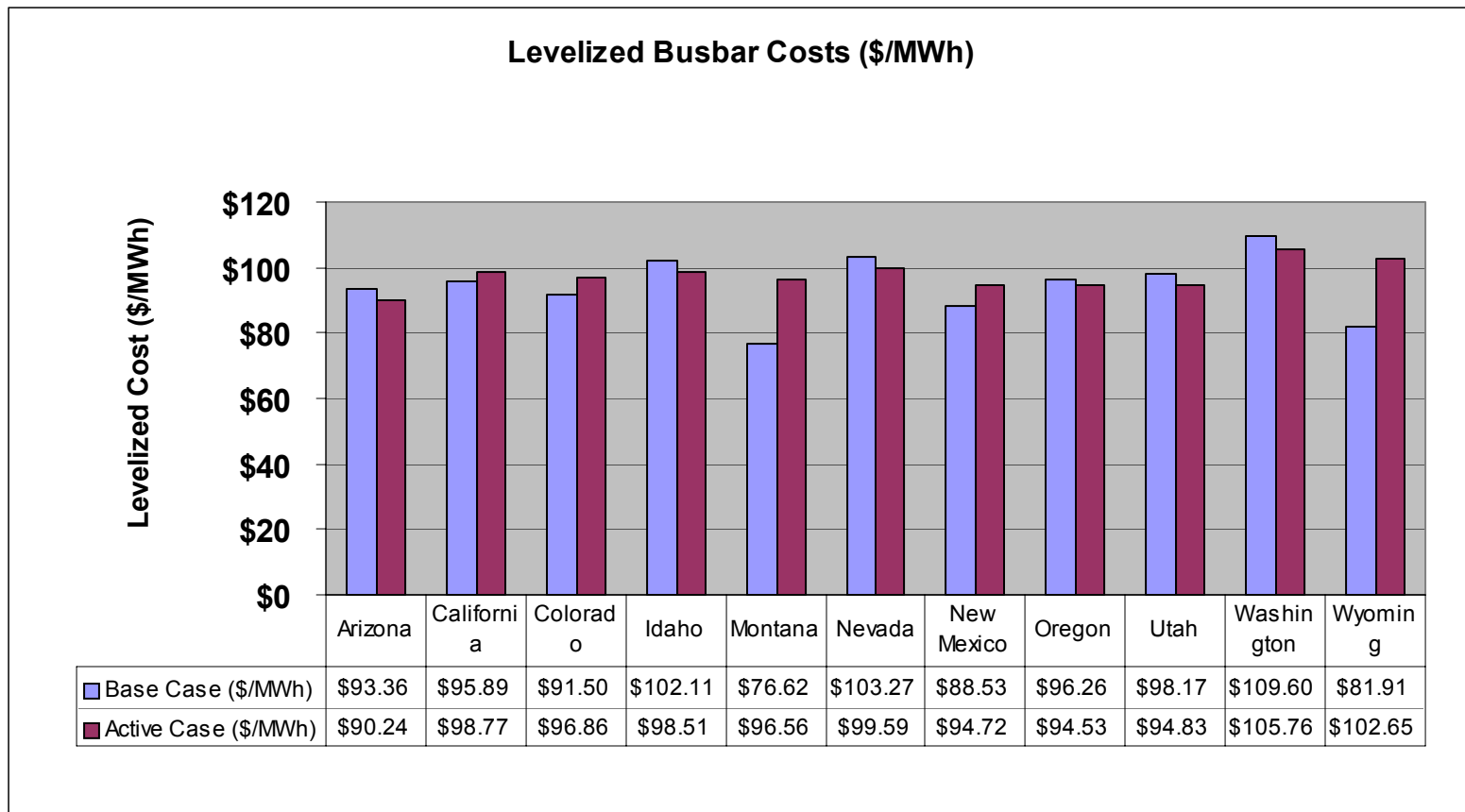
Scenario 3

Keeping the capacity factor constant

Scenario 3: Same Cap. Factor

Comparison to Base Case

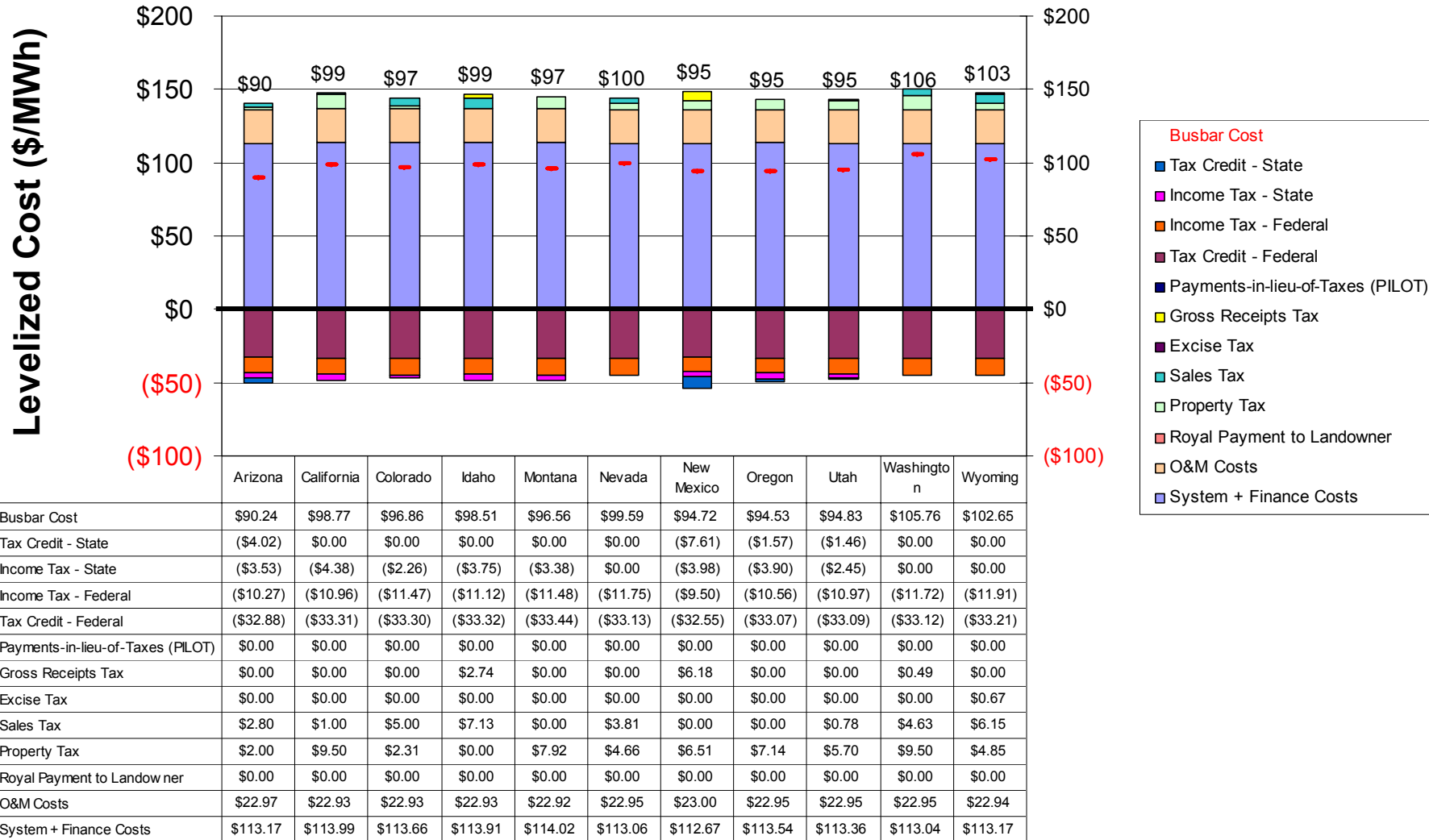
- States with highest capacity factors in base case become more costly
- Wyoming is the least cost competitive state



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





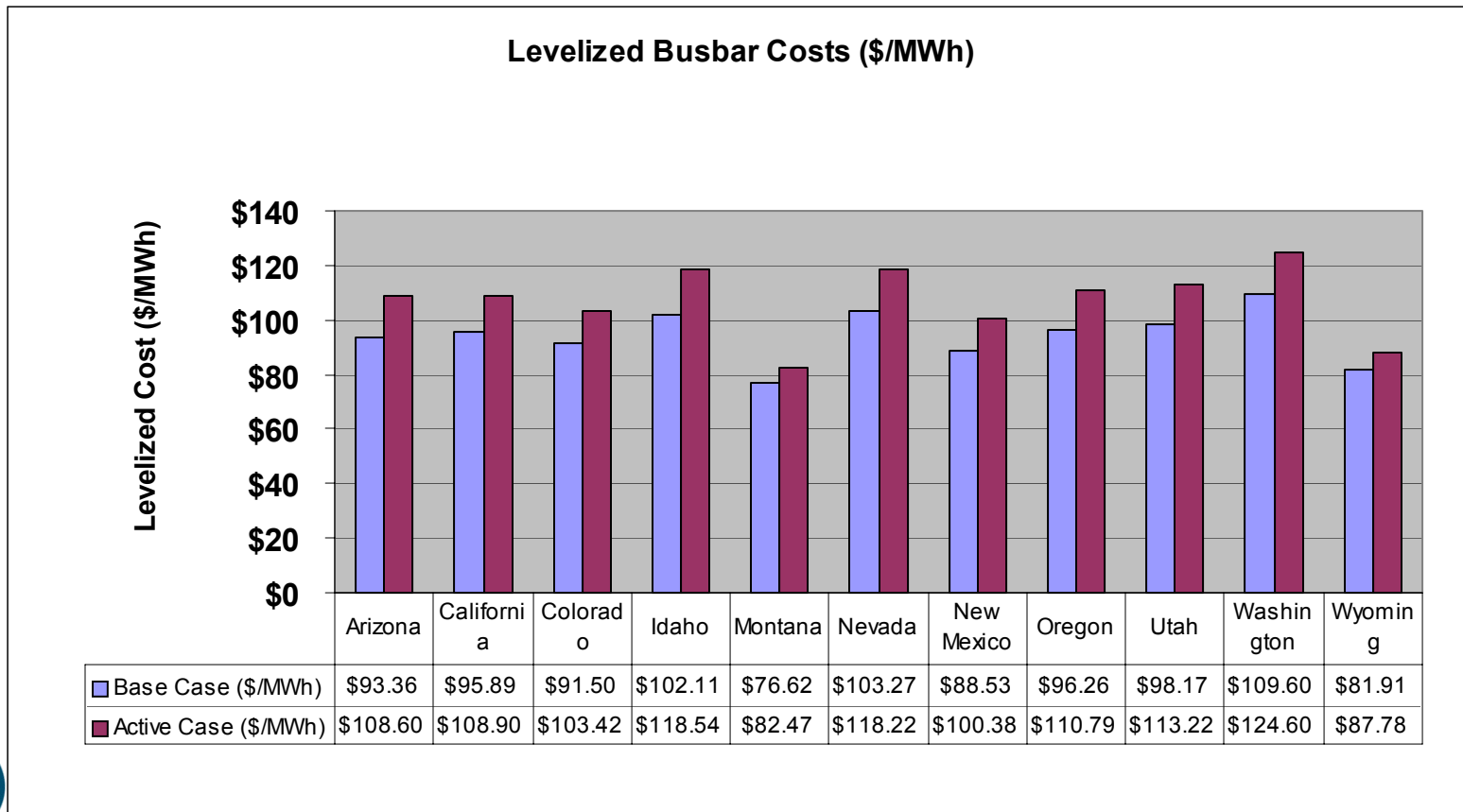
Scenario 4

PTC instead of the ITC

Scenario 4: PTC instead of ITC

Comparison with Base Case

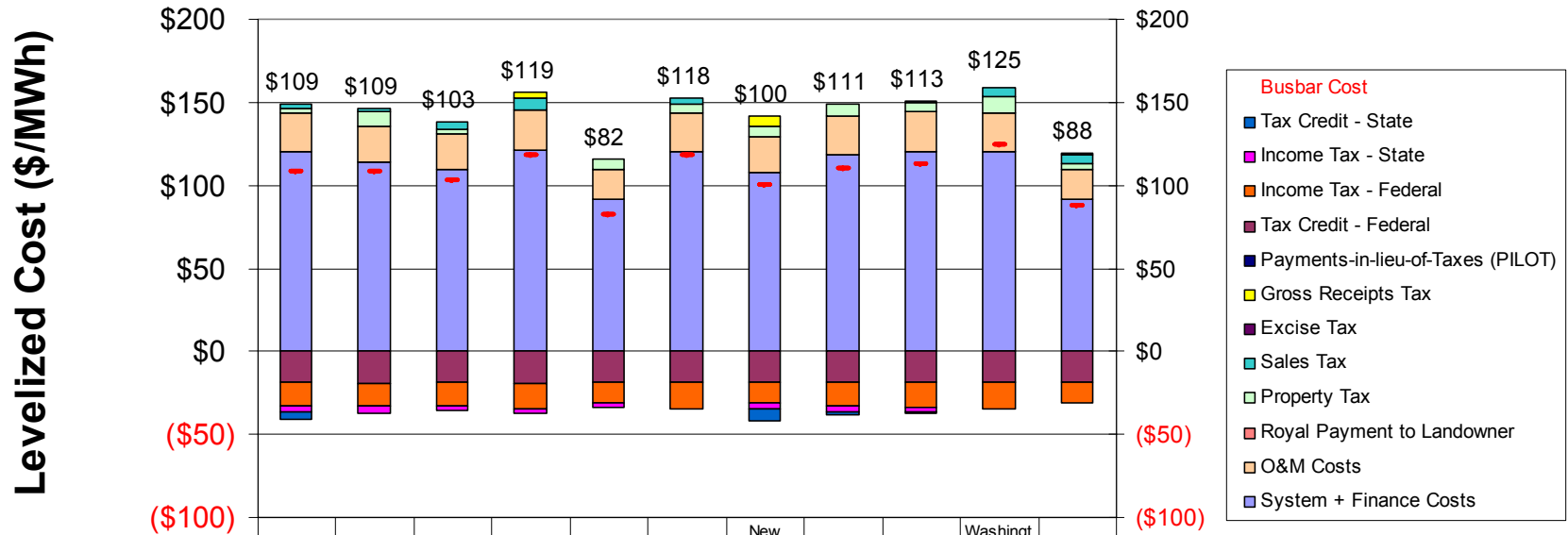
- PTC is worse than the ITC for every state.
- States with highest capacity factors are affected the least



Scenario 4: PTC instead of ITC

Detailed Cost Breakdown

Levelized Busbar 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
■ System + Finance Costs	\$120.43	\$113.66	\$109.91	\$121.62	\$91.78	\$120.28	\$108.05	\$118.92	\$120.62	\$120.17	\$91.28



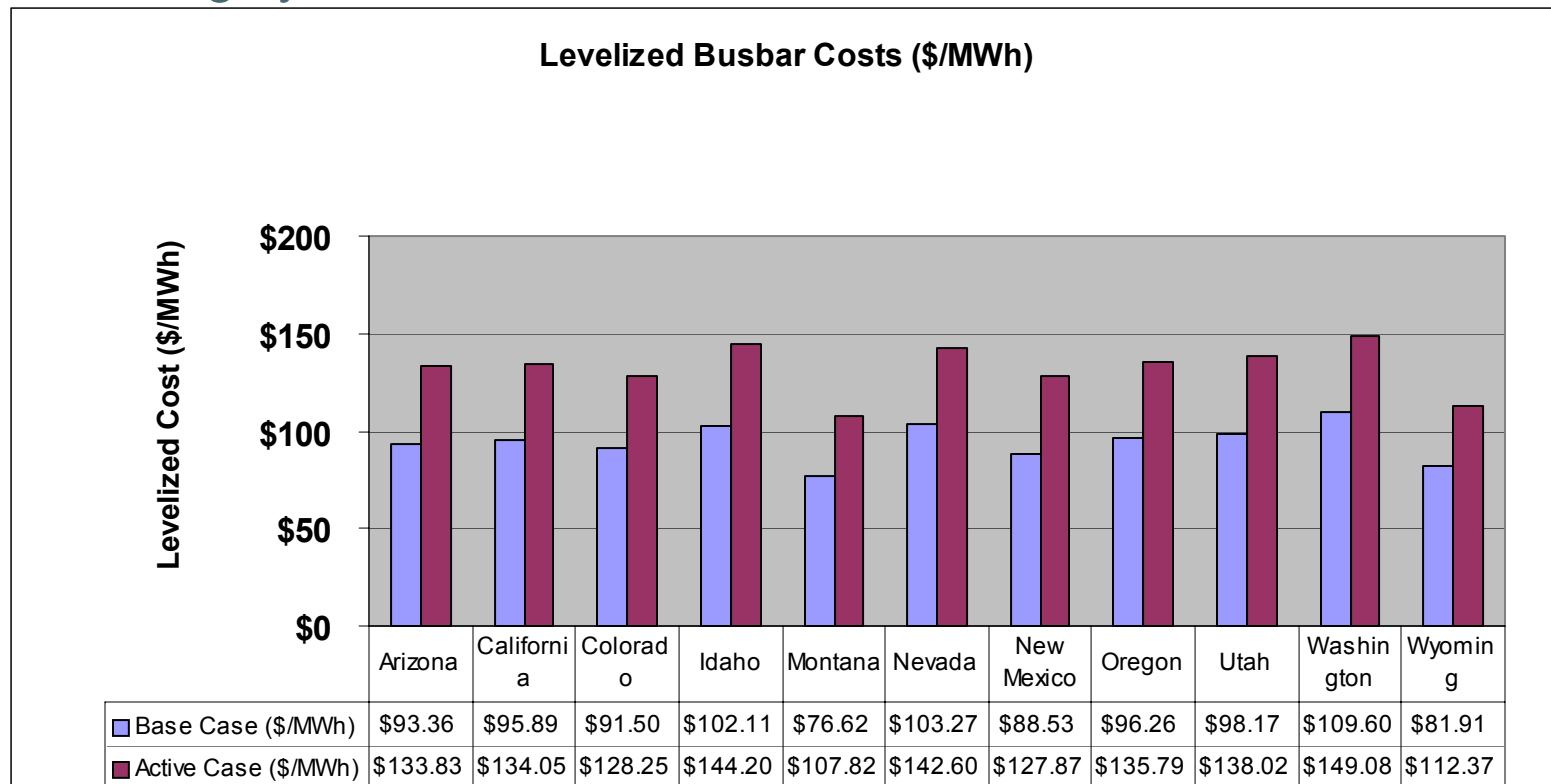
Scenario 5

Neither the ITC or the PTC

Scenario 5: No PTC or ITC

Comparison

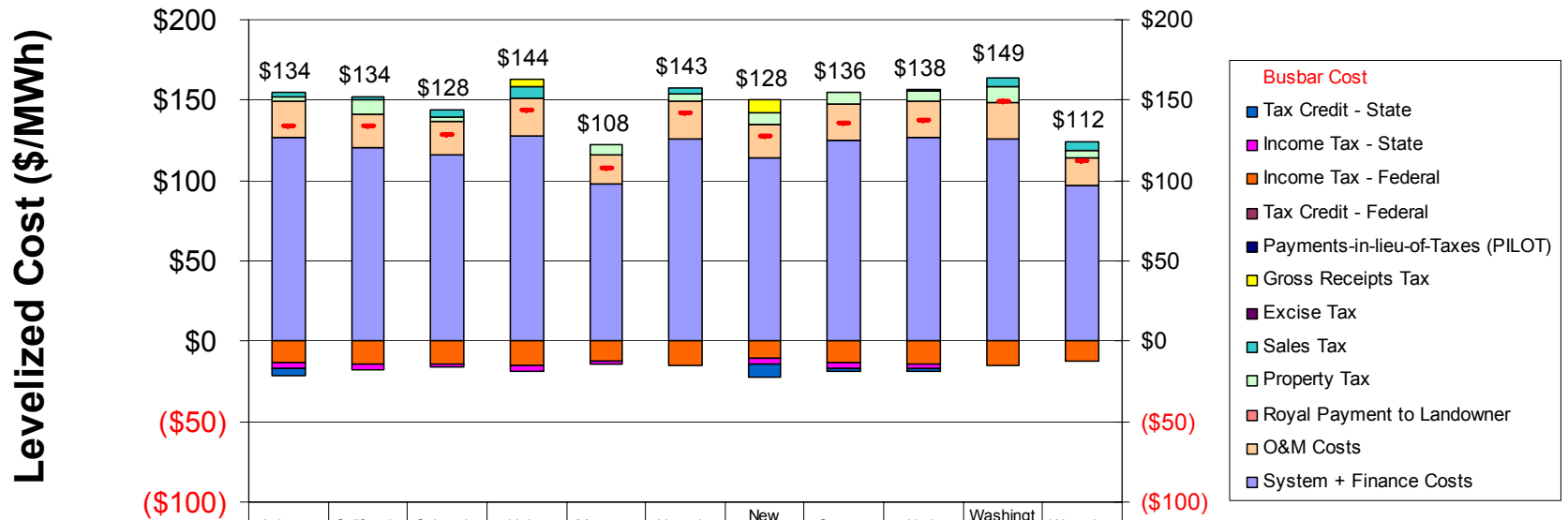
- Significant cost increases without PTC nor ITC
- Roughly a ~30-40\$/MWh decrease from base case (with ITC)
- Roughly ~25\$/MWh decrease from case with PTC



Scenario 5: No PTC or ITC

Detailed Cost Breakdown

Levelized Busbar Cost Breakdown



	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Busbar Cost	\$133.83	\$134.05	\$128.25	\$144.20	\$107.82	\$142.60	\$127.87	\$135.79	\$138.02	\$149.08	\$112.37
■ Tax Credit - State	(\$4.53)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$8.11)	(\$1.88)	(\$1.75)	\$0.00	\$0.00
■ Income Tax - State	(\$3.20)	(\$3.84)	(\$1.94)	(\$3.52)	(\$2.49)	\$0.00	(\$3.22)	(\$3.49)	(\$2.25)	\$0.00	\$0.00
■ Income Tax - Federal	(\$13.36)	(\$13.85)	(\$13.99)	(\$14.99)	(\$12.06)	(\$15.25)	(\$10.87)	(\$13.58)	(\$14.32)	(\$15.17)	(\$12.02)
■ Tax Credit - Federal	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
■ 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	\$4.10	\$0.00	\$0.00	\$8.34	\$0.00	\$0.00	\$0.70	\$0.00
■ Excise Tax	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.59
■ Sales Tax	\$3.01	\$1.00	\$4.91	\$7.66	\$0.00	\$4.11	\$0.00	\$0.00	\$0.84	\$4.98	\$5.11
■ Property Tax	\$2.21	\$9.11	\$2.33	\$0.00	\$6.75	\$4.78	\$6.49	\$6.91	\$5.83	\$9.74	\$4.13
■ 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	\$22.98	\$21.47	\$20.90	\$22.93	\$17.52	\$23.01	\$20.90	\$22.59	\$22.95	\$23.00	\$17.66
■ System + Finance Costs	\$126.73	\$120.16	\$116.03	\$128.03	\$98.10	\$125.95	\$114.34	\$125.24	\$126.71	\$125.83	\$96.90



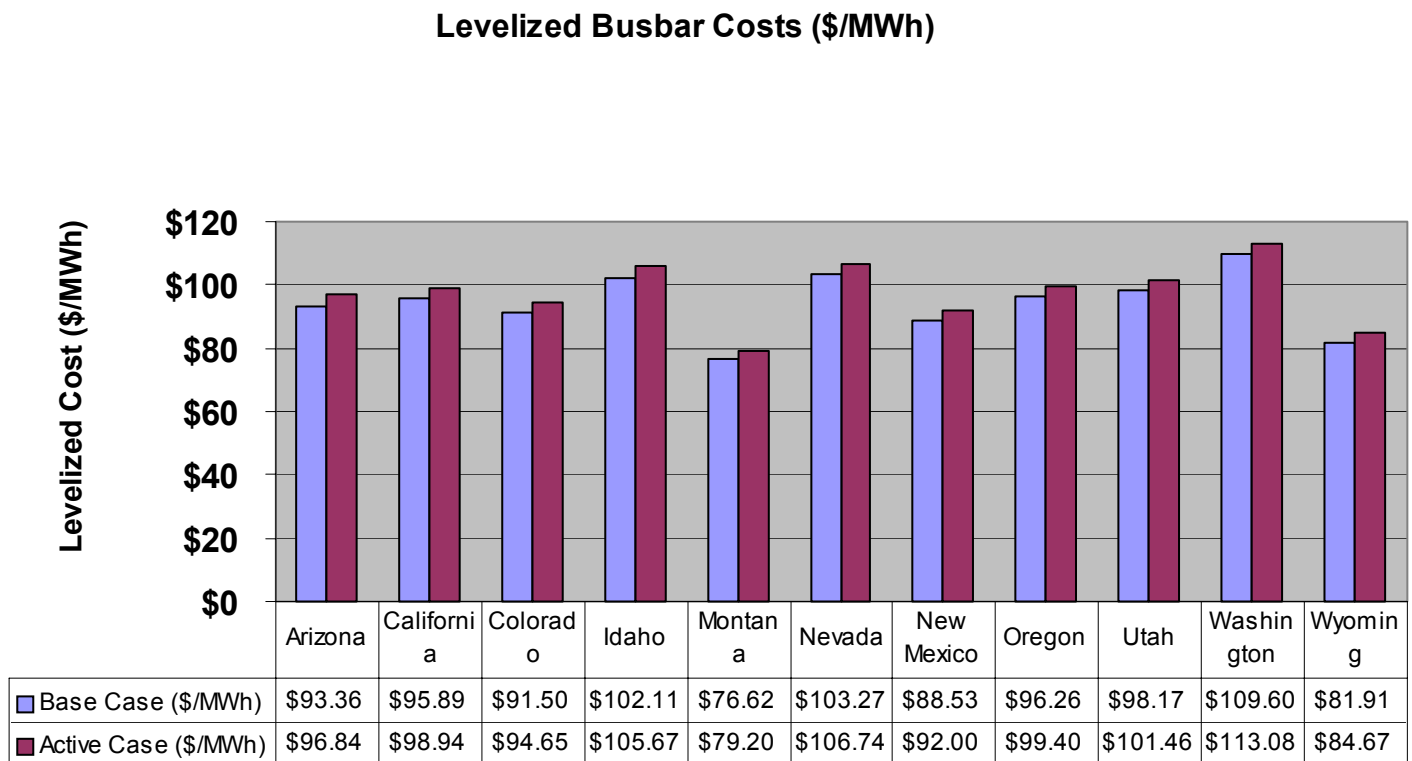
Scenario 6

Increase in WACC

Scenario 6: Increased WACC

Comparison

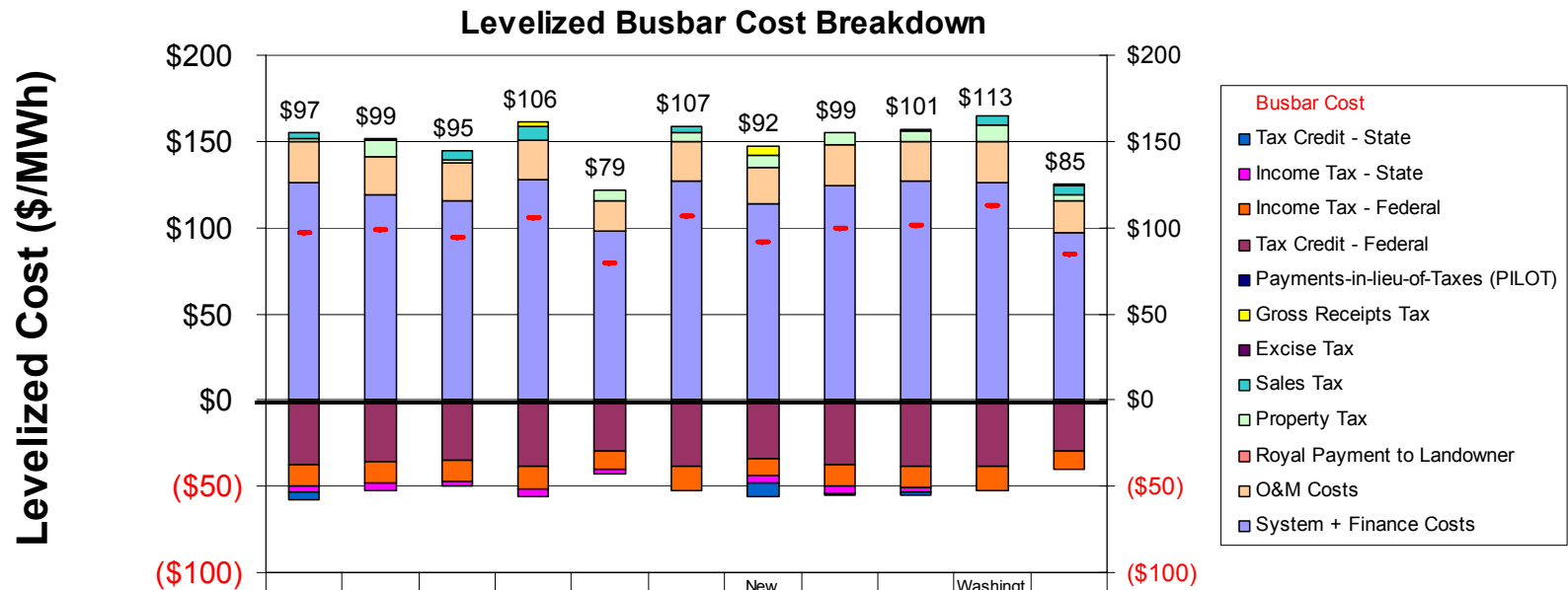
- Increasing the WACC by 100 basis points increases the cost by ~\$3/MWh for all states
- Rankings stay the same



Scenario 6: Increased WACC

Detailed Cost Breakdown

- Rankings are the same as the base case



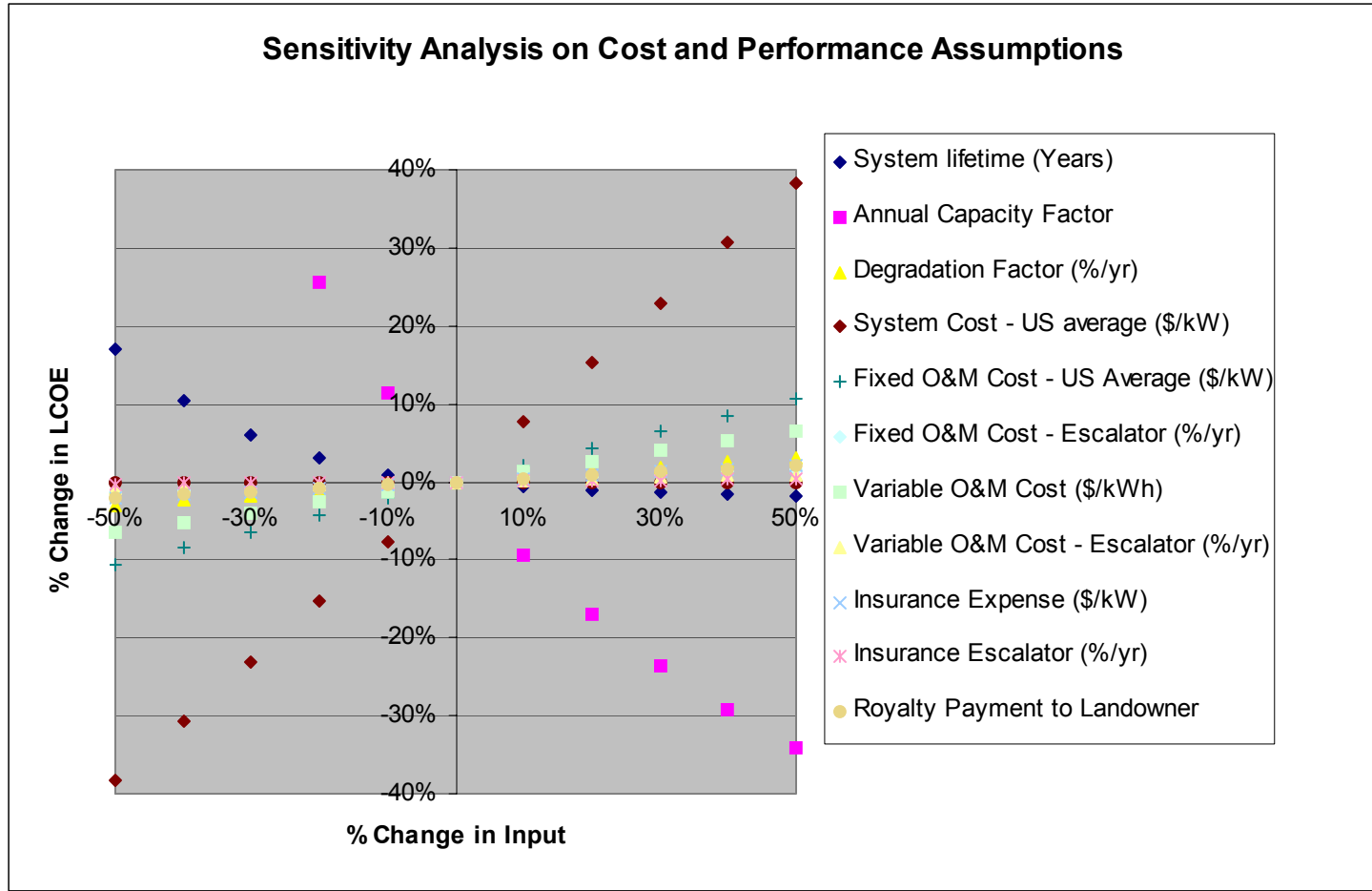
	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	Utah	Washington	Wyoming
Busbar Cost	\$96.84	\$98.94	\$94.65	\$105.67	\$79.20	\$106.74	\$92.00	\$99.40	\$101.46	\$113.08	\$84.67
■ Tax Credit - State	(\$4.32)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$7.75)	(\$1.71)	(\$1.58)	\$0.00	\$0.00
■ 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



Sensitivity Analysis

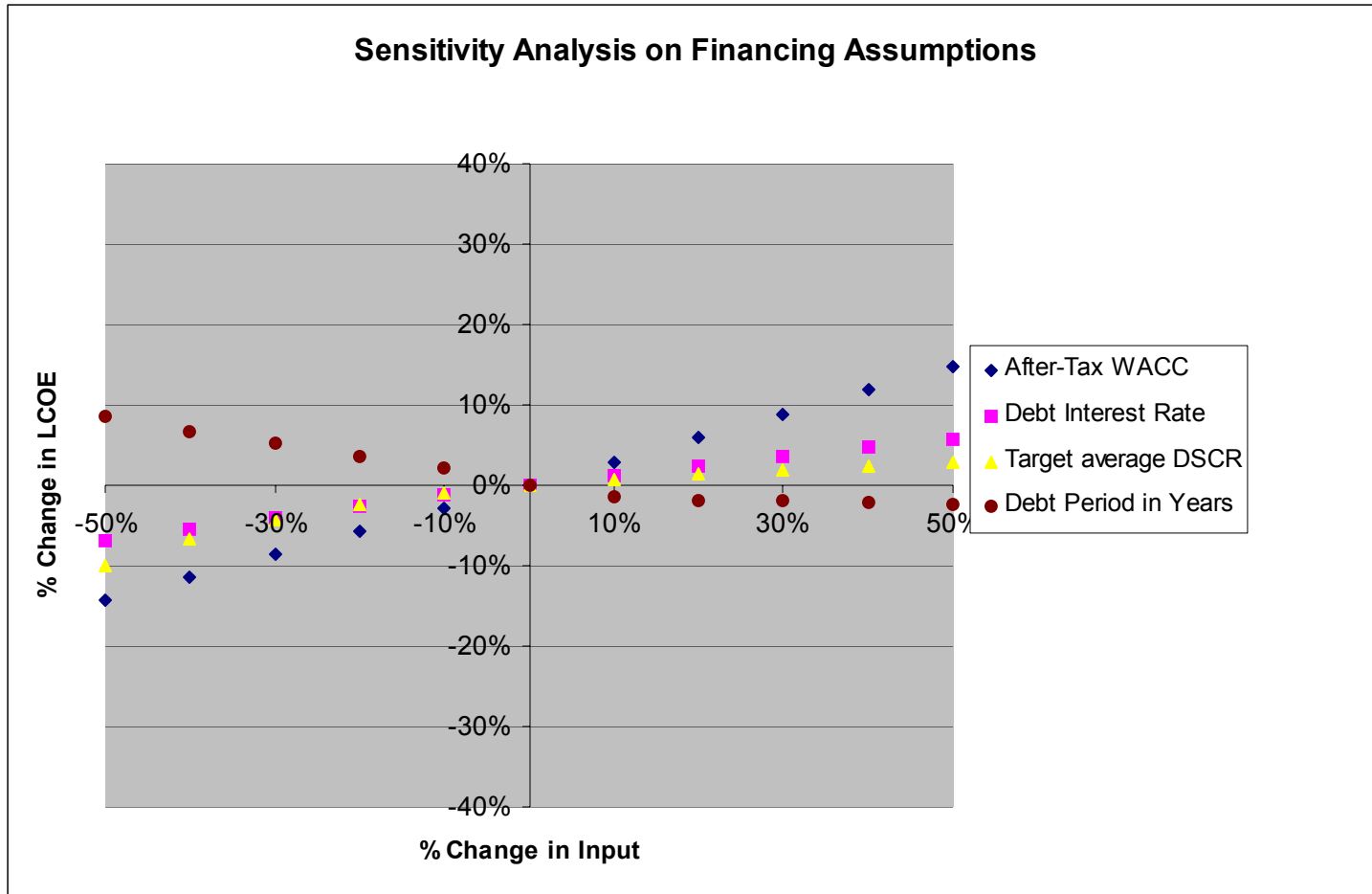
Sensitivities

Cost and Performance Inputs



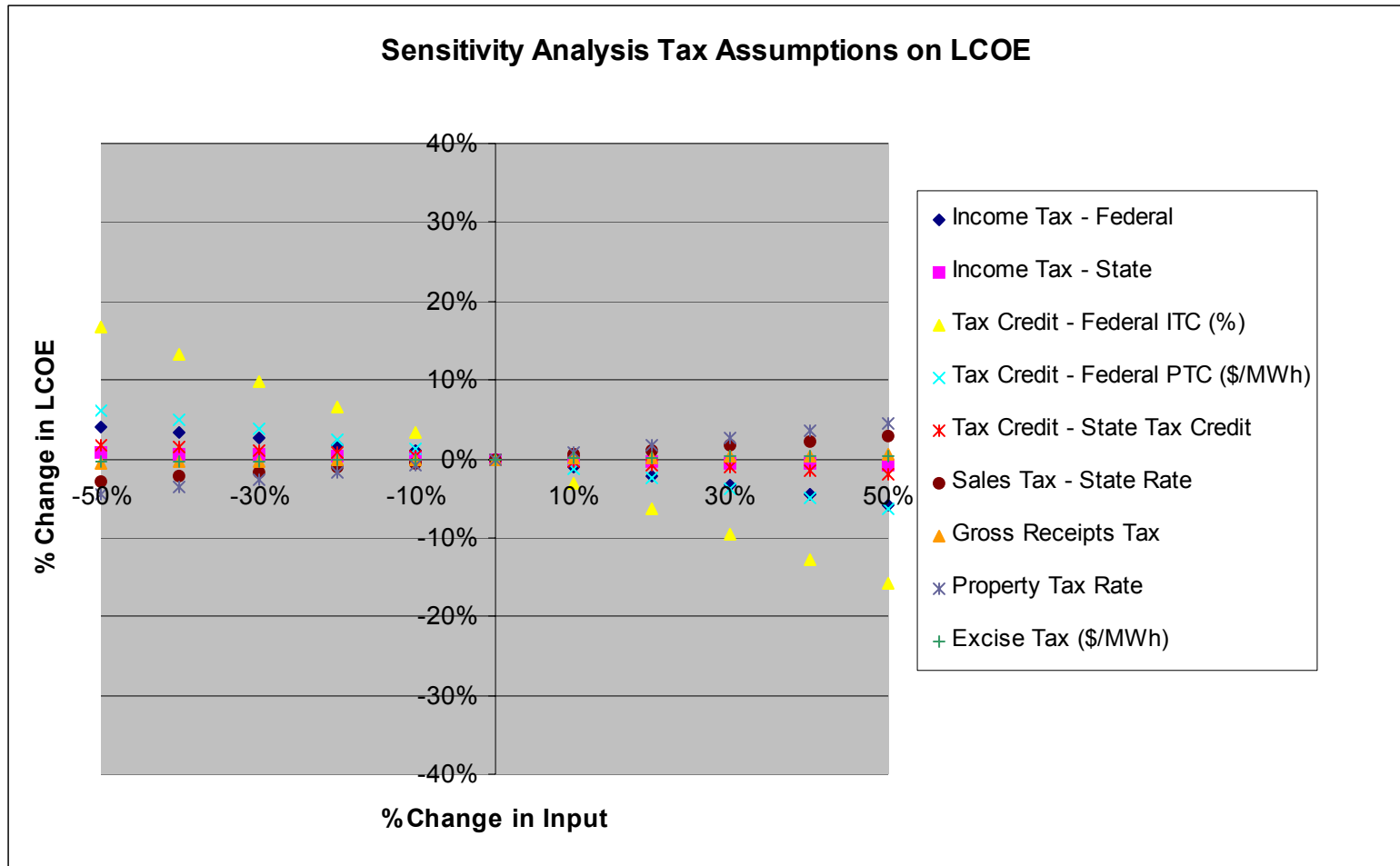
Sensitivities

Finance Inputs



Sensitivities

Tax Inputs





Summary

General Findings

- Identified the major drivers of levelized cost
 - Capacity factor
 - Capital cost
 - 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 Wyoming

- Wyoming currently ranks 2nd in levelized busbar costs (behind Montana)
 - Wyoming's state tax structure results in the second 2nd biggest state tax burden (behind Washington)
 - Without the federal Investment Tax Credit (ITC) Wyoming is even more competitive relative to states with lower capacity factors
- 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
- Sales tax accounts for roughly 5% of the levelized cost
- Property tax accounts for roughly 6% of the levelized cost
- Wyoming's wind excise tax accounts for roughly 1% of the levelized cost.





Appendix

Sources

- Database of State Incentives for Renewables and Efficiency (DSIRE). 2010.
(<http://www.dsireusa.org/>)
- EIA. Annual Electric Generator Report. 2008.
(<http://www.eia.doe.gov/cneaf/electricity/page/data.html>)
- NREL. Western Wind and Solar Integration Study. 2010.
(http://www.nrel.gov/wind/systemsintegration/pdfs/2010/wwsis_final_report.pdf)
- WECC. TEPPC 2009 TAS Planning Study. 2009.
(<http://www.wecc.biz/committees/BOD/TEPPC/TAS/SWG/Shared%20Documents/Forms/AllItems.aspx?RootFolder=/committees/BOD/TEPPC/TAS/SWG/>)
- WREZ. Phase 1: QRA Identification Technical Report. 2009
(<http://www.nrel.gov/docs/fy10osti/46877.pdf>)

