Center for Energy Economics and Public Policy

Estimating Tradeoffs Between Tax Cost and Wind Development in Wyoming

Presentation to Wyoming Joint Revenue Committee

Cheyenne, WY

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Wyoming: Policy Concerns

Some Wyoming policymakers have advocated raising the wind production tax from $1/MWh up to $5/MWh

Concerns:

- Uncertainty regarding future costs
  - Will taxes continue to rise on wind making future development unprofitable
- Impact on development cost could lead to less development in Wyoming
  - Lower revenues to state
  - Less economic benefit from construction and operation activity
  - Eliminates a source of economic diversification

Considerations when increasing Taxes

- Higher taxes on specific sectors will reduce activity in those sectors
- Attempt to increase revenues can reduce economic activity in affected sectors
  - (reduced incomes, business activity in affected sectors)

  $\Rightarrow$Tradeoff between taxes and economic activity

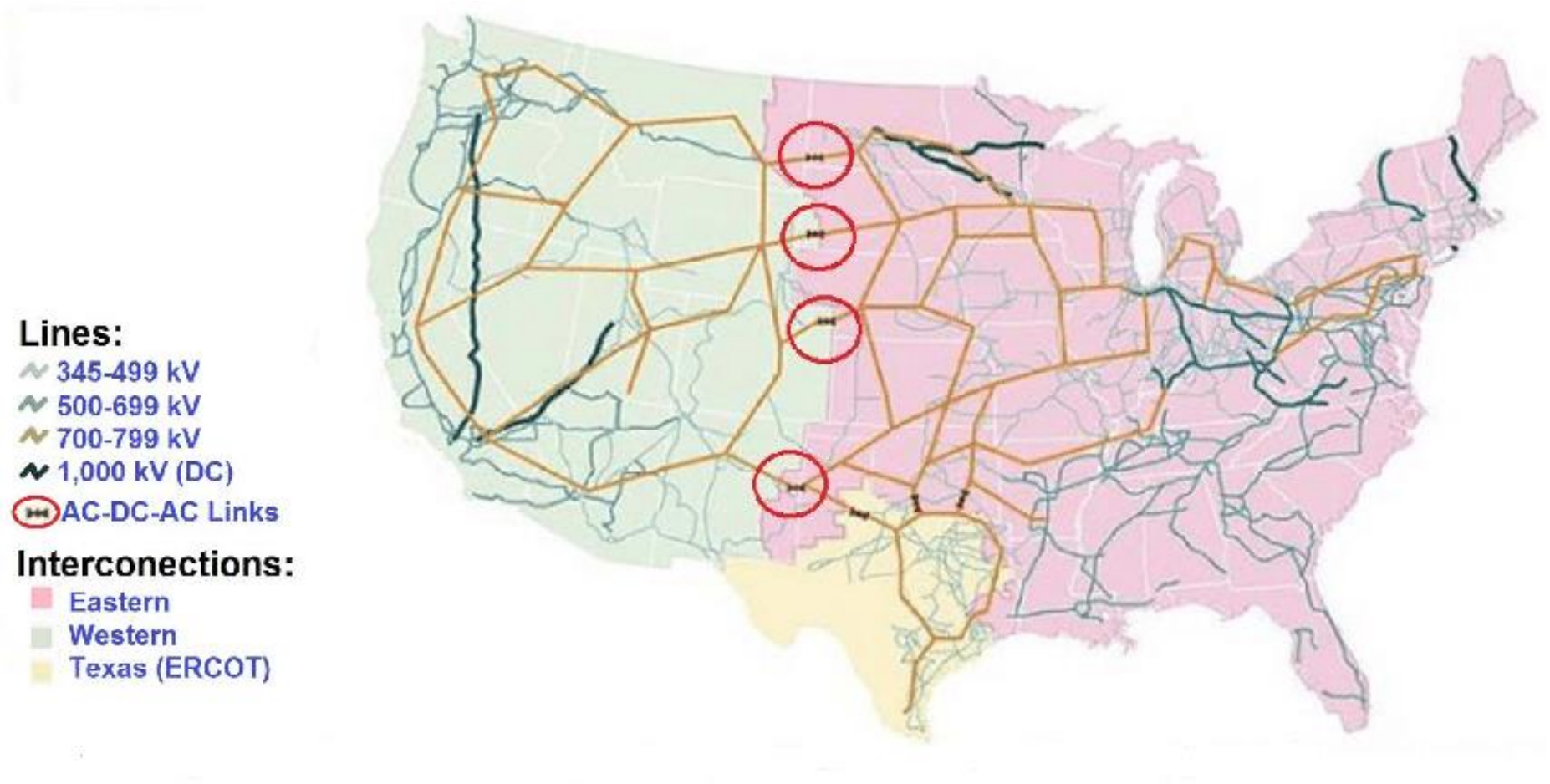
  $\Rightarrow$Must assess the potential tradeoff between benefits of a new tax policy and its effects.
- Worst case scenario: reduced economic activity can also reduce tax revenues such that they are lower than before new tax was implemented.

Considerations when taxing a sector

- How sensitive is that sector to higher taxation?
  - Are there other locations a sector can operate in as profitably or sales can “leak” to?
  - How much does the tax increase affect a firm’s profitability?

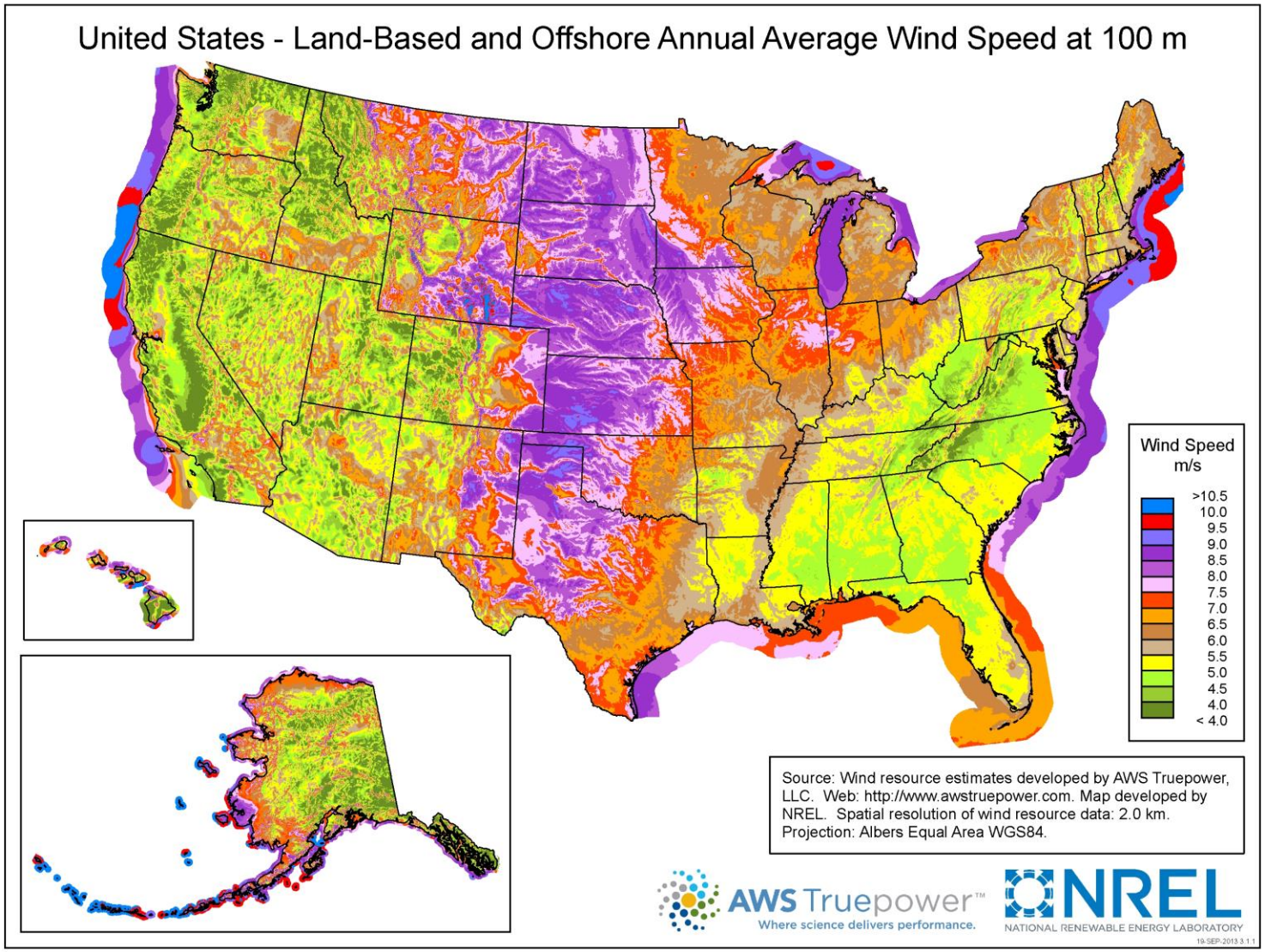
- The Powder River Basin as a lesson:
  - Coal taxation: Wyoming versus Montana

What States does Wyoming compete against for wind development? Defining the Market.



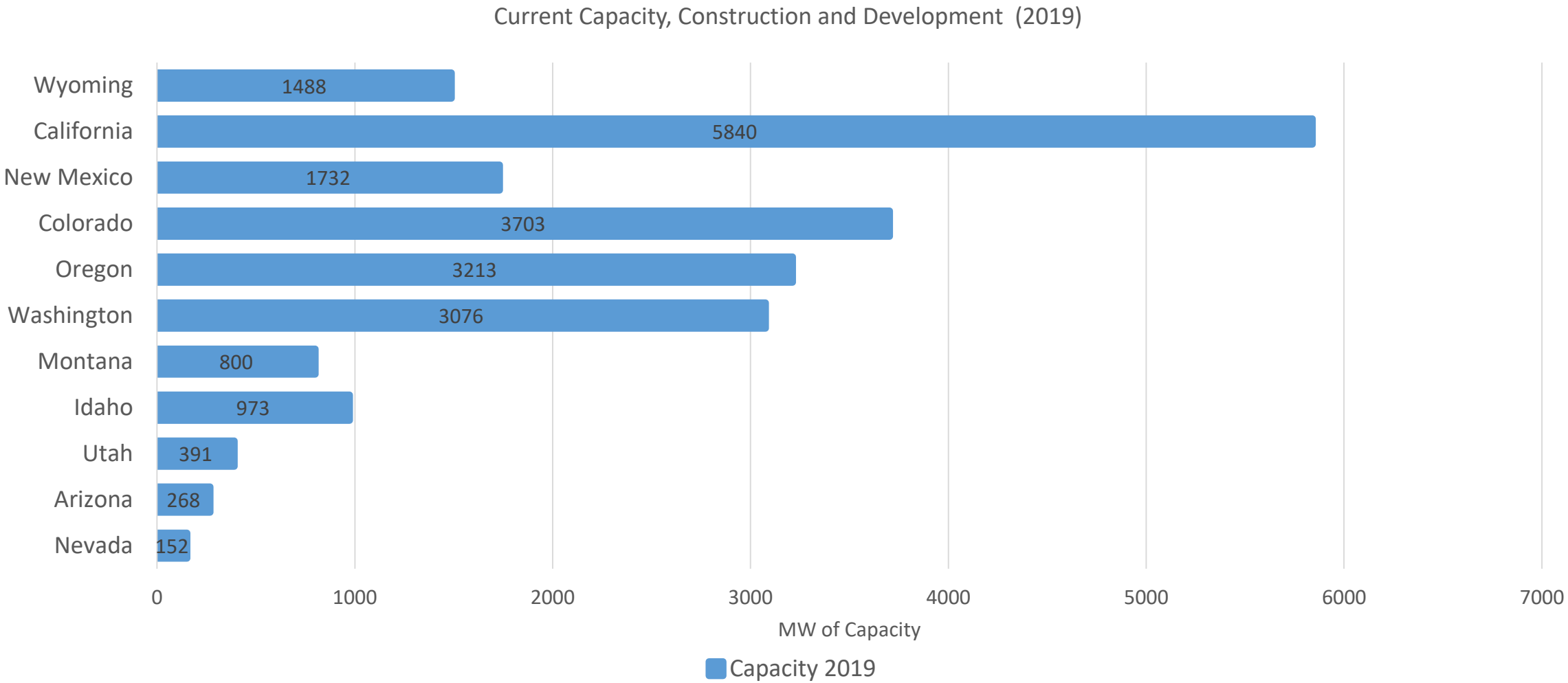
Source: Yōshin Ulianov, Mei, Yu (2016)

Defining the Resource Quality by state:



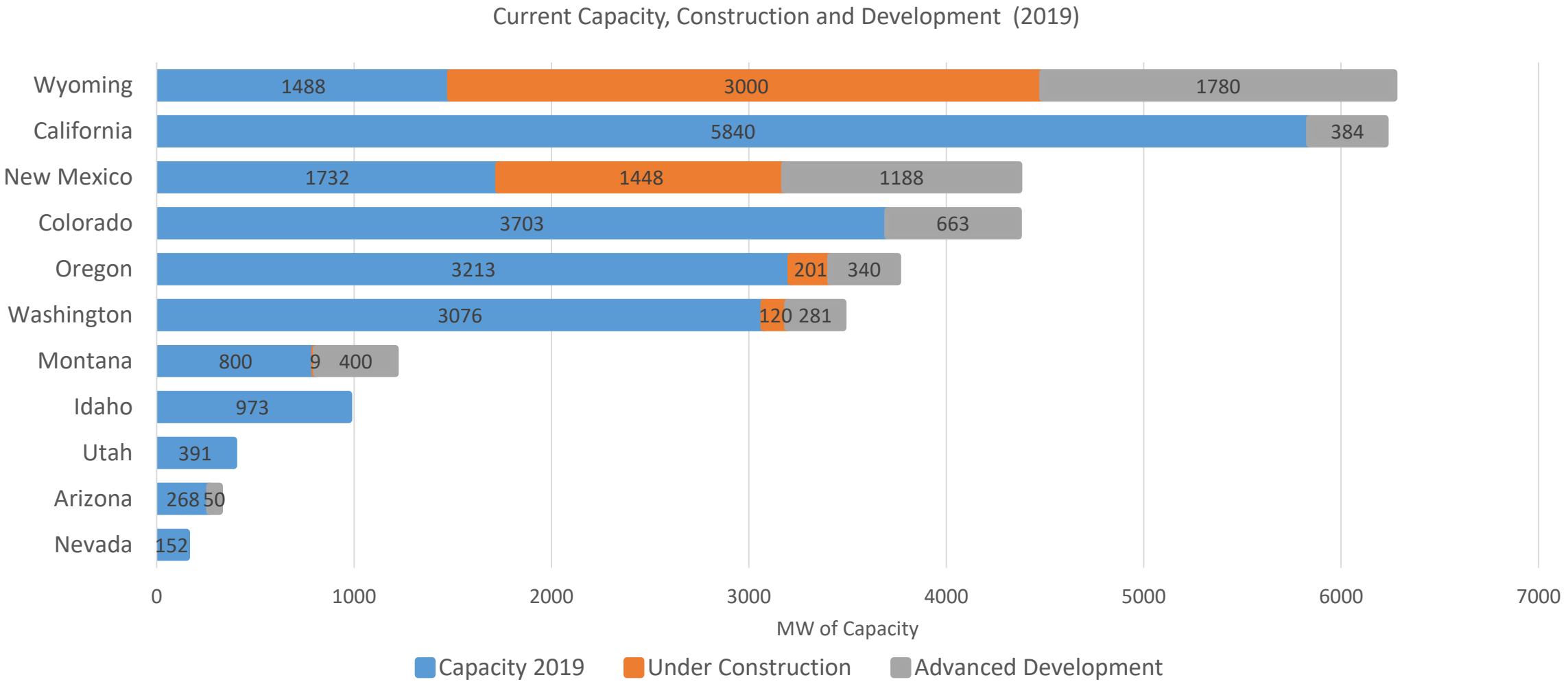
Source: NREL, 2018 https://www.nrel.gov/gis/wind.html

Looking ahead, what states are in play and why?



Source: AWEA (2019)

Looking ahead, what states are in play and why?



Source: AWEA (2019)

Wyoming Development Possible

Project name	Owner	Capacity (MW)	County	Status
Choke Cherry/Sierra Madre	Power Company of Wyoming	3000	Carbon	Construction
Viridis Eolia	Viridis Eolia	1870	Carbon	Planning
Ekola Flats	Invenergy/PacifiCorp	250	Carbon	Permitting
TB Flats I and II	Invenergy/PacifiCorp	500	Carbon	Permitting
Uinta Wind Energy	Invenergy	161	Uinta	Permitting
Cedar Springs	NextEra	400	Converse	Permitting
Two Rivers	Intermountain Wind	280	Carbon/Albany	Planning
Lucky Star	Intermountain Wind	500	Albany	Planning
Boswell Springs	Alterra Power Corp	400	Albany	Construction
Roundhouse Renewable Energy Project	Enyo/NextEra/Platte River Power Auth.	150	Laramie	Planning
	ConnectGen	500	Albany	Planning
	ConnectGen	400	Laramie	Planning
Corridale Wind Energy Project	Black Hills Energy	40	Laramie	Planning
	Total	**8451 MW**		
Repowering Projects				
PacifiCorp EV2020	PacifiCorp	TBA	TBA	Construction
Foote Creek Rim I	PacifiCorp	41.6		permitting

Tradeoff Analysis (Godby, Taylor, Coupal, 2016, 2018)

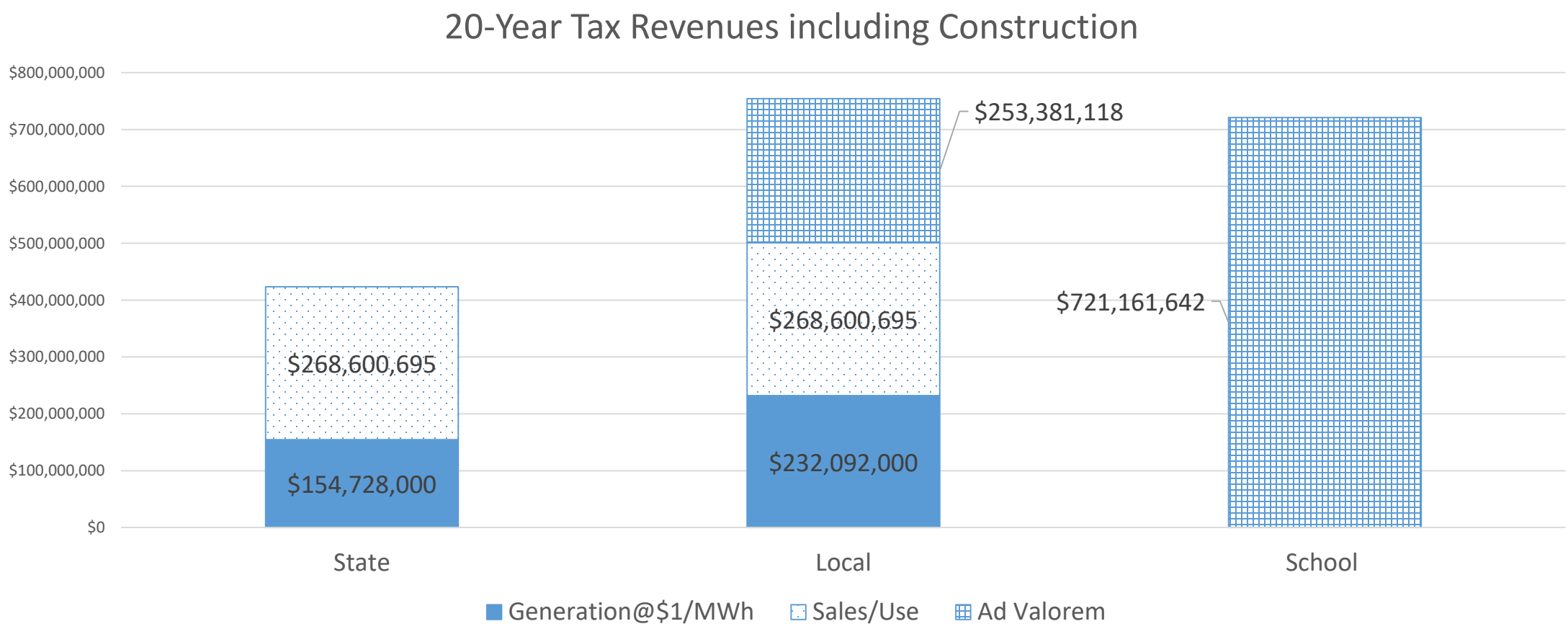
- We assumed that 6140 MW of wind projects currently would be developed in Wyoming based on projects proposed at the time.
- Currently over 4700 MW of projects are under initial construction or in the permit process
- Approximately 4100 MW in planning phase

6140 MW assumption still a reasonable number – assumes majority of projects in permitting and under construction would proceed absent tax changes, while a third of planned projects eventually develop.

Economic Impacts of New Development
(Assuming 6140 MW)

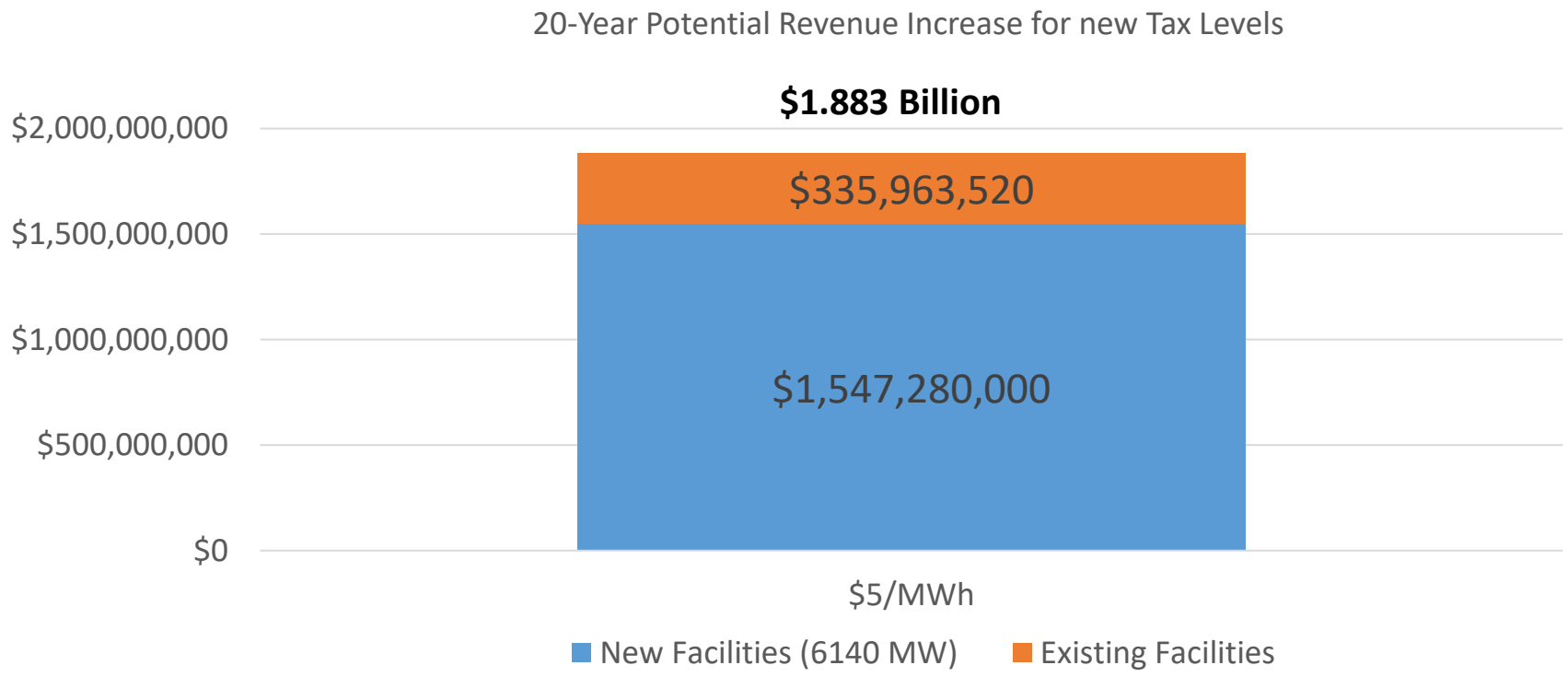
- Total economic activity created in Wyoming: $7.1 billion.
  - $3.5 Billion during 5-year construction period
  - $3.6 Billion during 20-year operation period
- Total new labor income in Wyoming: $3.0 billion during construction and operation.
- New Jobs:
  - >3300 annually in construction
  - >1400 annually during operation

Total Tax Revenues at Current Rates: $1.9 billion over 20 years.



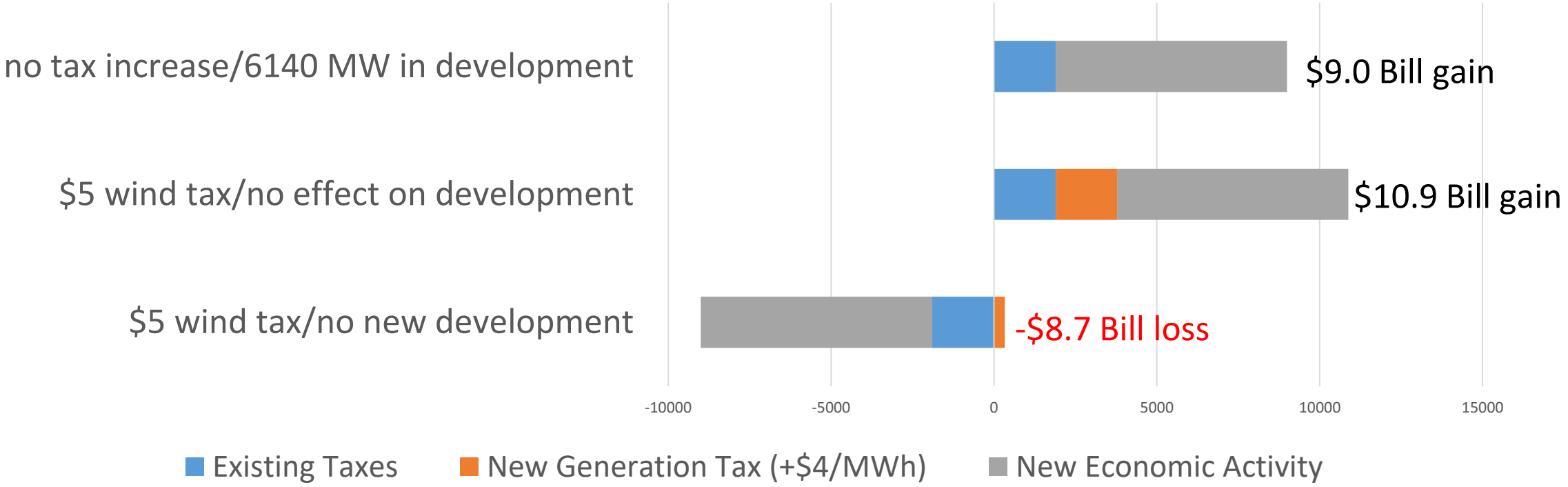
Source: Godby, Taylor and Coupal (2016, 2018)

$4 Increase in taxes: Additional Revenues
(Assuming no impact on development or existing facilities)
$1.9 billion



Source: Godby, Taylor and Coupal (2016)

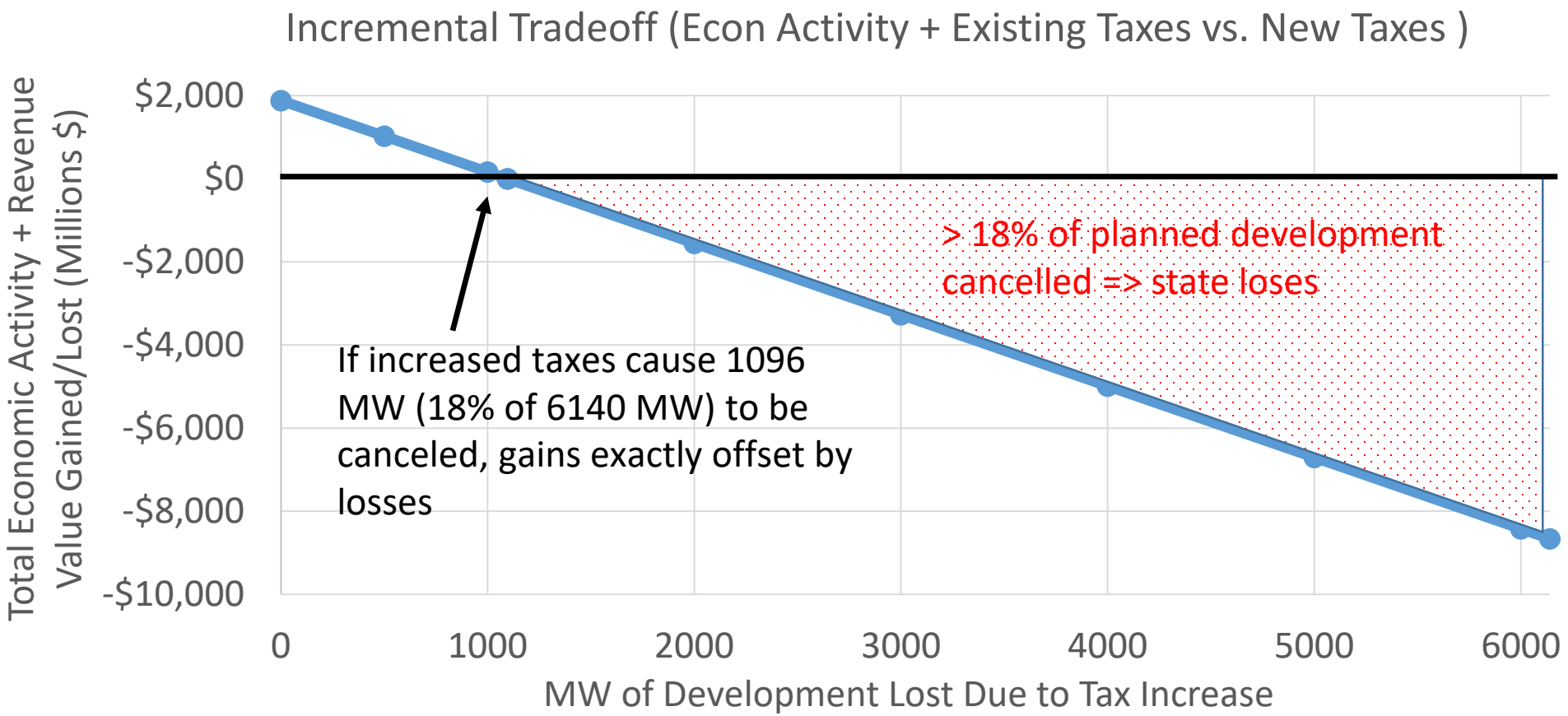
Range of Outcomes Possible:



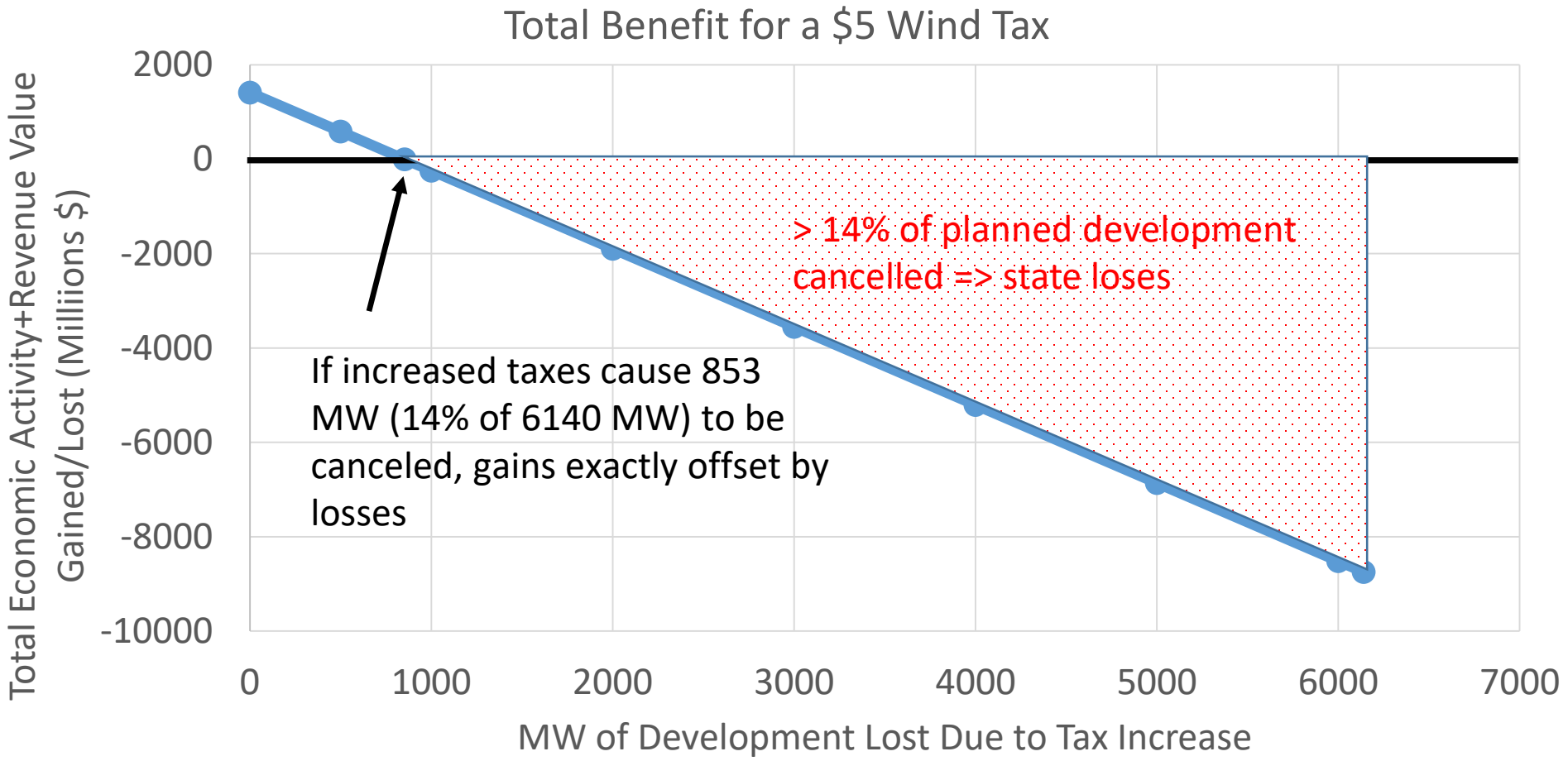
6140 MW of new Wind development would bring the state $9.0 Billion ($7.1 Bill econ activity + $1.9 Bill revenue)

- Increasing Wind Tax to $5/MWh could increase gain by $1.9 Billion if development not affected
- Increasing Wind Tax to $5/MWh could lose the state $8.7 Billion if causes cancellation of new development ($9 Billion lost vs. $336 million gain from existing taxes gained assuming no existing wind shut down early)

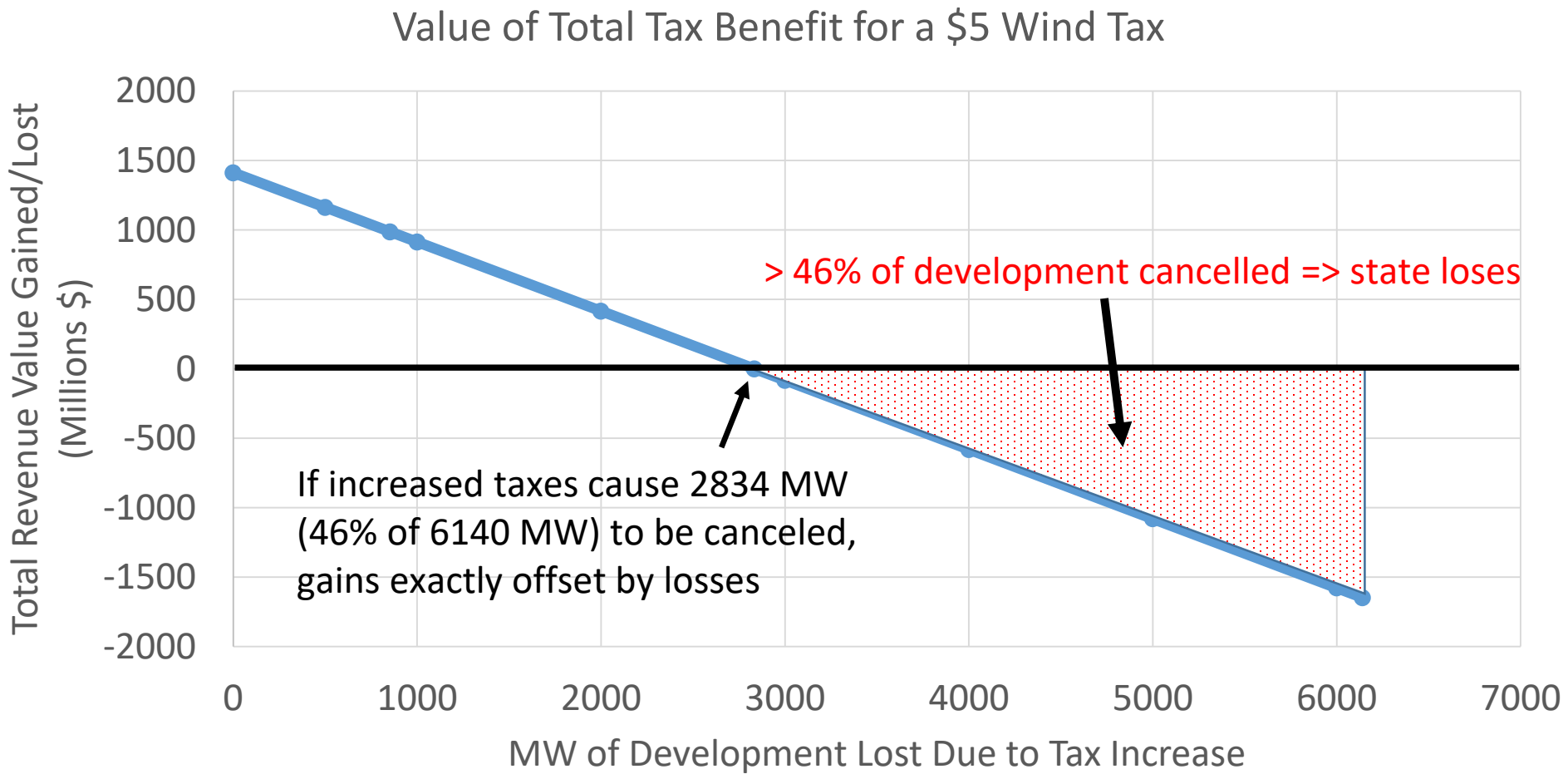
Incremental Tradeoff (including econ activity)



Incremental Tradeoff (incl. econ activity)



Incremental Tradeoff (taxes only)



Is a loss of 13% (or 46%) of potential development due to new taxes likely?

- We don’t know!
- look at the change in cost of wind development due to tax changes to see if cost affected significantly.
  - Cost study conducted to determine relative costs of wind development across states considering all taxes and subsidies by state to answer this question.

Cost Modeling (Cook and Godby, 2019)

- Compute the estimated *Levelized Cost of Energy* (LCOE) for a specific wind farm configuration.
- Levelized cost of energy: required revenue necessary per MWh to break even over the lifetime of a facility.
- The modeling framework estimates the LCOE for a wider variety of factors, including
  - State tax policy,
  - Wind resource quality assumed
  - Financing and other cost factors.

Cost Modeling (Cook and Godby, 2019)

- We assume a competitive market for wind development
- We do NOT assume a PPA (Power Purchase agreement price to begin modeling (as E3 model did)
- Instead – consistent with other methods of LCOE estimation (e.g. Lazard) we assume required levels of return to investors are met
  - Owners receive 10% return on investment
  - Tax-equity investors receive 8.5%

=> Modeled LCOE cost outcomes are the prices needed to ensure investors get their required rate of return (but not more).

Constant Assumptions:

- Size: 300 MW Wind farm site
- Lifetime: 20 or 30 years, begins operation 2019
  - Construction assumed to begin in 2018, receiving the $19/MWh PTC, which applies for the first 10-years of service life.
- In all cases no transmission costs are assumed.
- Assumed same financing model across all states
  - 50% traditional debt (6% cost)
  - Direct and tax-equity create remainder (10% and 8.5% cost respectively)

Constant Assumptions (Table 4):

Cost Factor	Assumed Value
Output Capacity	300 MW
Total Cap costs*	1610 $/MW
Share of System Costs subject to sales tax	67%
Fixed O&M Annual Cost	28 $/kW
Fixed O&M inflation	1.5%
Variable Cost	0
Cap Factor degradation rate	1%
Construction time	12 months
Facility Life	20 or 30 years
Share of Financing using traditional debt	50%
Cost of Debt	6%
Cost of Tax-Equity	8.5%
Cost of Direct Equity	10%
Year of construction start	2018
Year of operation start	2019
Federal PTC value	19 $/MWh
PTC inflation	1.1%

Sources: DoE (2018), and expert solicitation. Values are in current dollars.

State-Specific cost assumptions:

- Regional costs of construction and Operation (O&M) vary by state –
  - Inflate or deflate equipment, construction, O&M by the following values

AZ	96%
CA	122%
CO	94%
ID	98%
MT	96%
NM	92%
NV	104%
OR	105%
UT	96%
WA	106%
WY	94%

Source: U.S. Army Corps of Engineers (USACE, 2017)

State Specific Capacity Factors

Range: Maximum = modeled value at top 5% of WECC wind sites

Minimum = 35% constant across all states

} Both degrade at a rate of 1% per year.

	Maximum Capacity Factor (CF)		Minimum Capacity Factor (CF)	
State	Estimated Net CF Possible yr. 1 (top 5% of land)	Net CF Yr. 20 using 1% Degradation Rate	Constant CF Yr. 1	Net CF Yr. 20 using 1% Degradation Rate
WY	50.5%	41.7%	35%	28.9%
NM	50.5%	41.7%	35%	28.9%
MT	50.5%	41.7%	35%	28.9%
CO	49.6%	41.0%	35%	28.9%
CA	41.5%	34.3%	35%	28.9%
OR	40.6%	33.5%	35%	28.9%
WA	40.6%	33.5%	35%	28.9%
ID	40.6%	33.5%	35%	28.9%
UT	37.9%	31.3%	35%	28.9%
AZ	37.0%	30.6%	35%	28.9%
NV	34.3%	28.3%	35%	28.9%

Source of Estimates: NREL, AWS Truepower estimates, https://windexchange.energy.gov/maps-data

Actual CF's reported

- Checked modeled capacity factors with levels experienced in past years with modern equipment by state in WECC region.

State	Best Capacity Factor Reported 2017	Equipment Vintage
WY	38.4%	2016
NM	45.3%	2005
MT	39.7%	2012
CO	42.6%	2017
CA	37.7%	2015
OR	34.2%	2017
WA	32.6%	2012
ID	33.9%	2012
UT	28.2%	2016
AZ	27%	2012
NV	27.5%	2012

Source: Calculated from EIA data, 2017 from wind facilities at least 40MW in size Located in WECC region

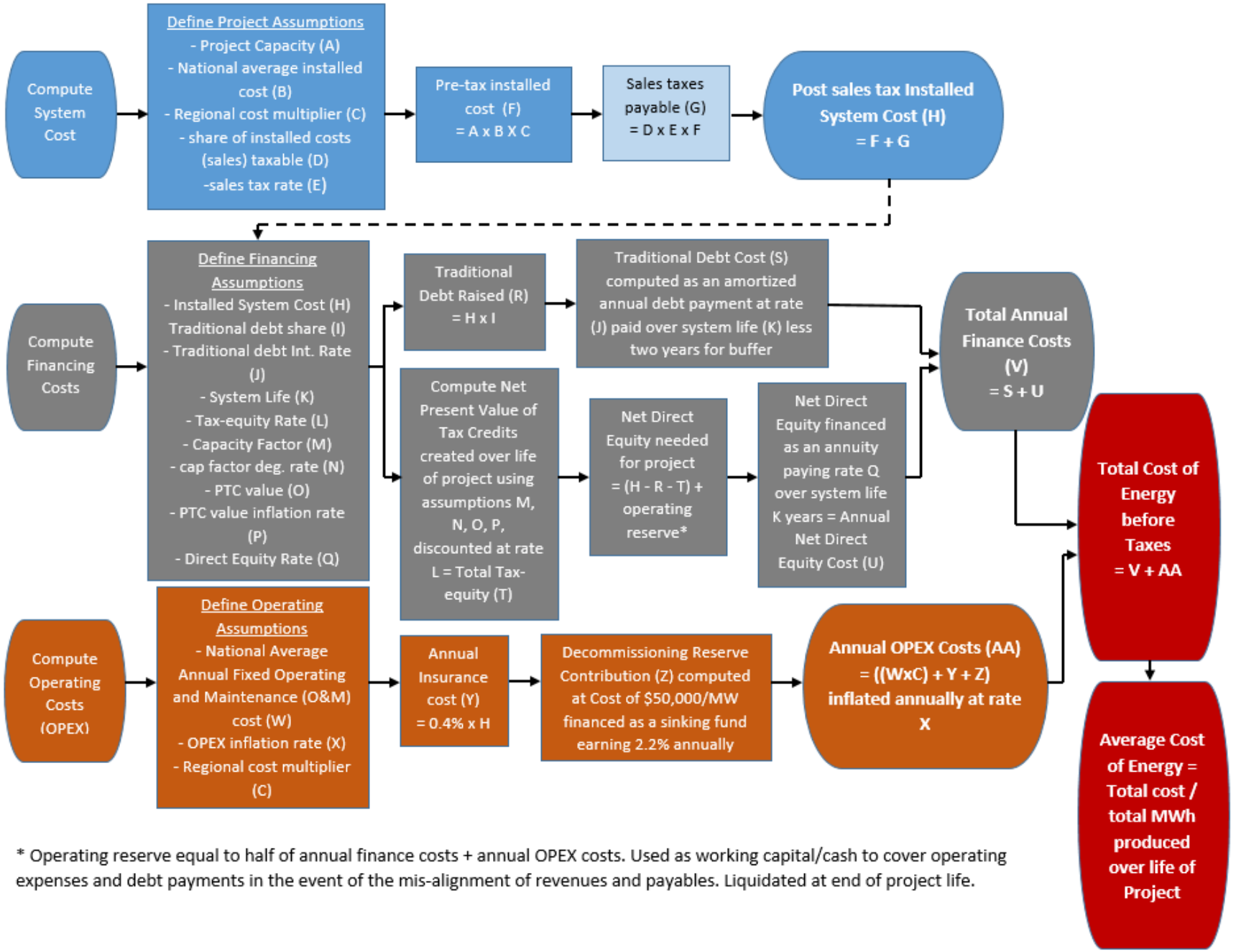
Tax and other State Policy Assumptions

- Identified tax policies applicable to wind in each western state
  - E.g. Wyoming includes a $1/MWh wind tax, applicable two years after system initially operating, sales taxes on equipment, current property tax rates.
- Identified incentive programs for wind/renewables in each western state.
  - Wyoming has no sales tax exemption (Colorado, Utah and New Mexico exempt sales taxes while Montana and Oregon have no sales tax).
- New Mexico computed two ways: at applicable tax rates and using industrial revenue bonding with negotiated taxes.
- Wyoming shown at current tax rates and if wind tax raised to $5/MWh.

Favorable Tax Treatment and Incentives

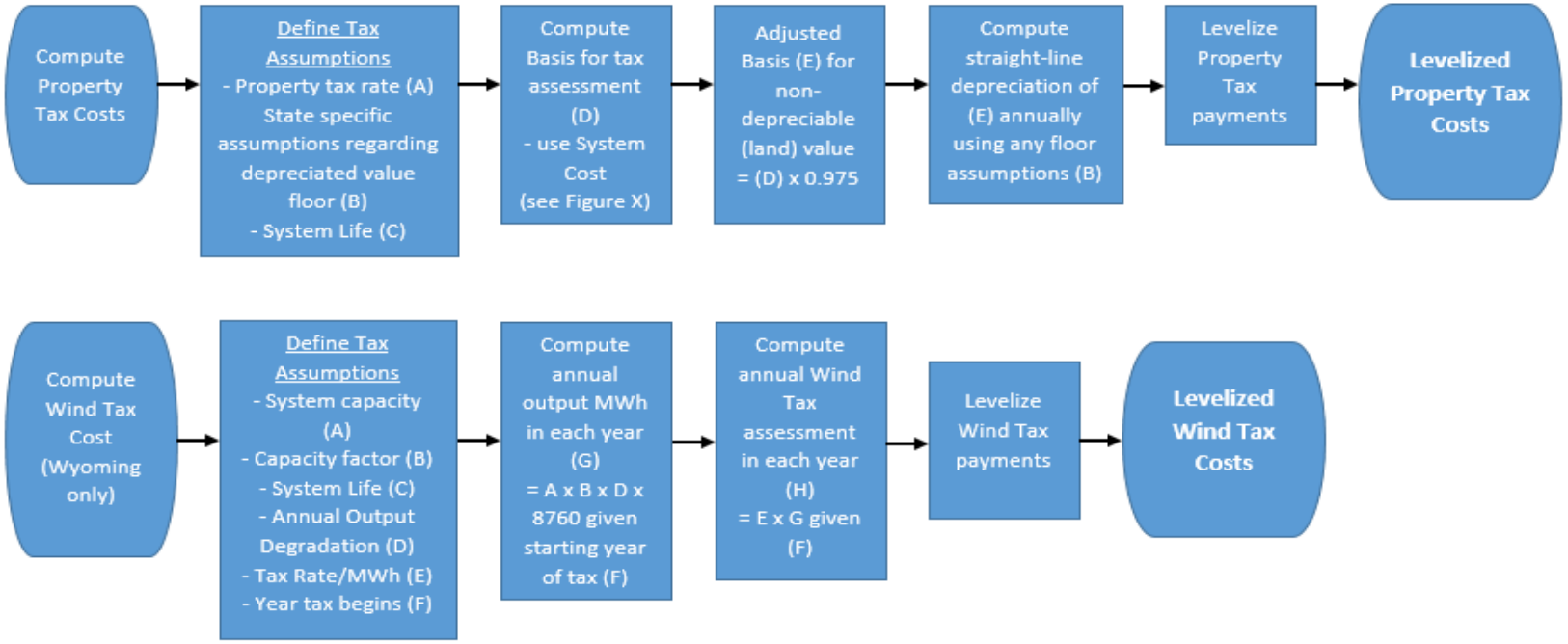
State	No Sales Taxes/ Exempt	No Wind-Specific Taxes	Property Tax Incentives	State Incentives (credits)	No Gross Revenue Tax	No Income Tax/ Exempt/ Credit	Other Incentives
WY					X	X	
NM	X	X	X	X		X	IRBs
MT	X	X	X		X	X	
CO	X	X	X		X		
CA	X	X			X		
OR	X	X	X		X		
WA		X				X	
ID		X	X		X		Financing
UT	X	X	X	X	X		
AZ		X	X		X	X	
NV	X	X	X			X	

Modeling:



* Operating reserve equal to half of annual finance costs + annual OPEX costs. Used as working capital/cash to cover operating expenses and debt payments in the event of the mis-alignment of revenues and payables. Liquidated at end of project life.

Tax modeling:



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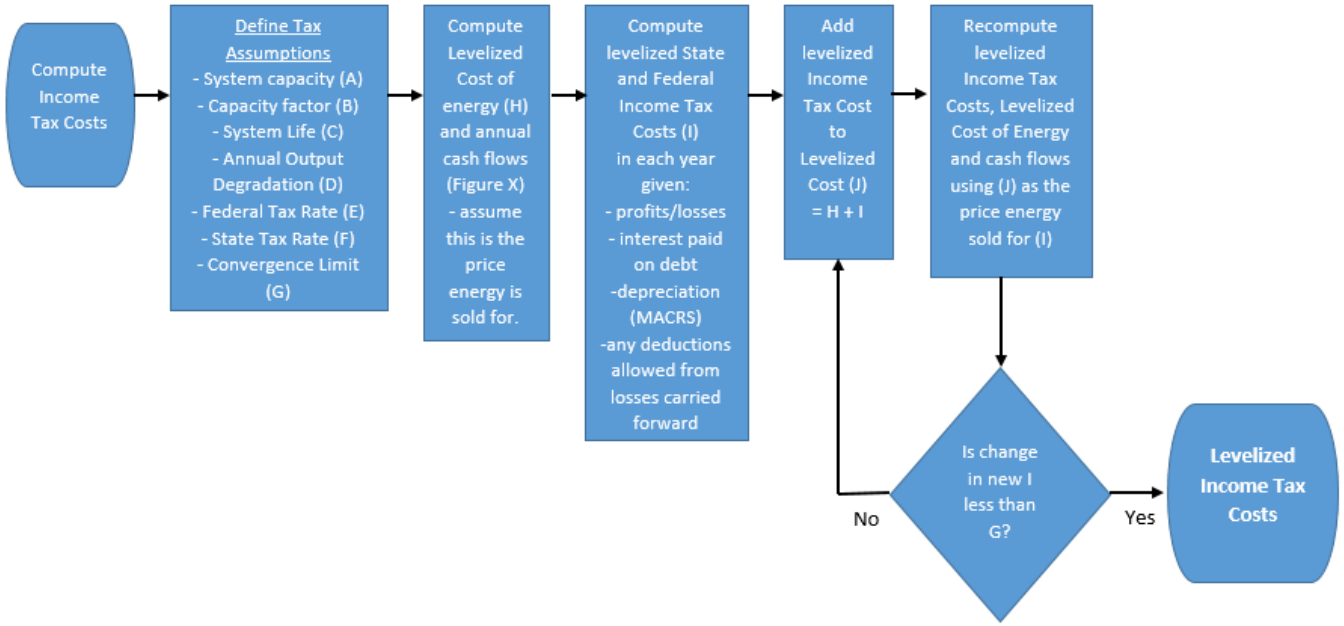
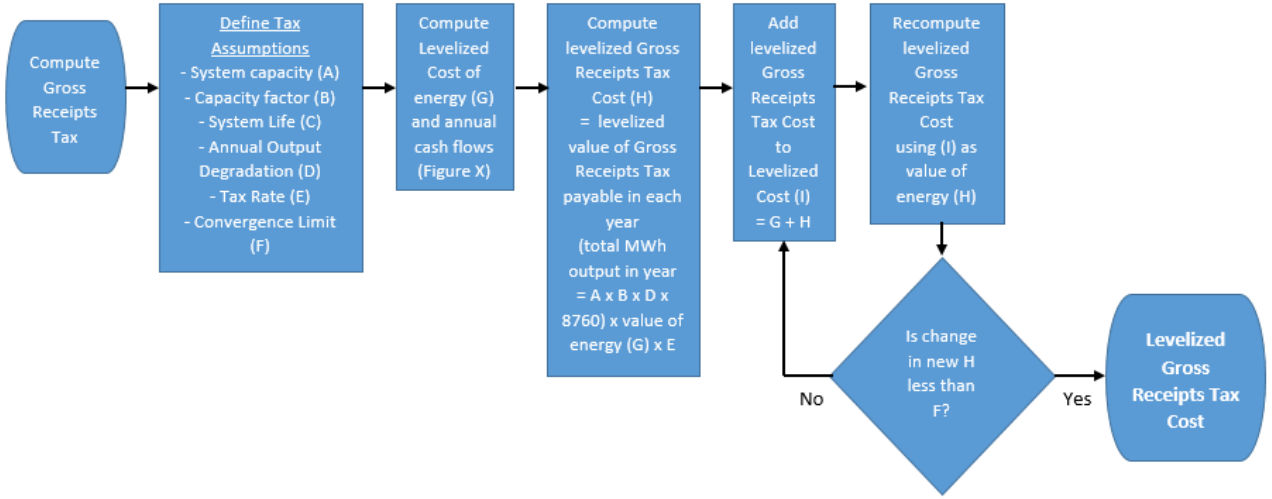
Tax modeling:



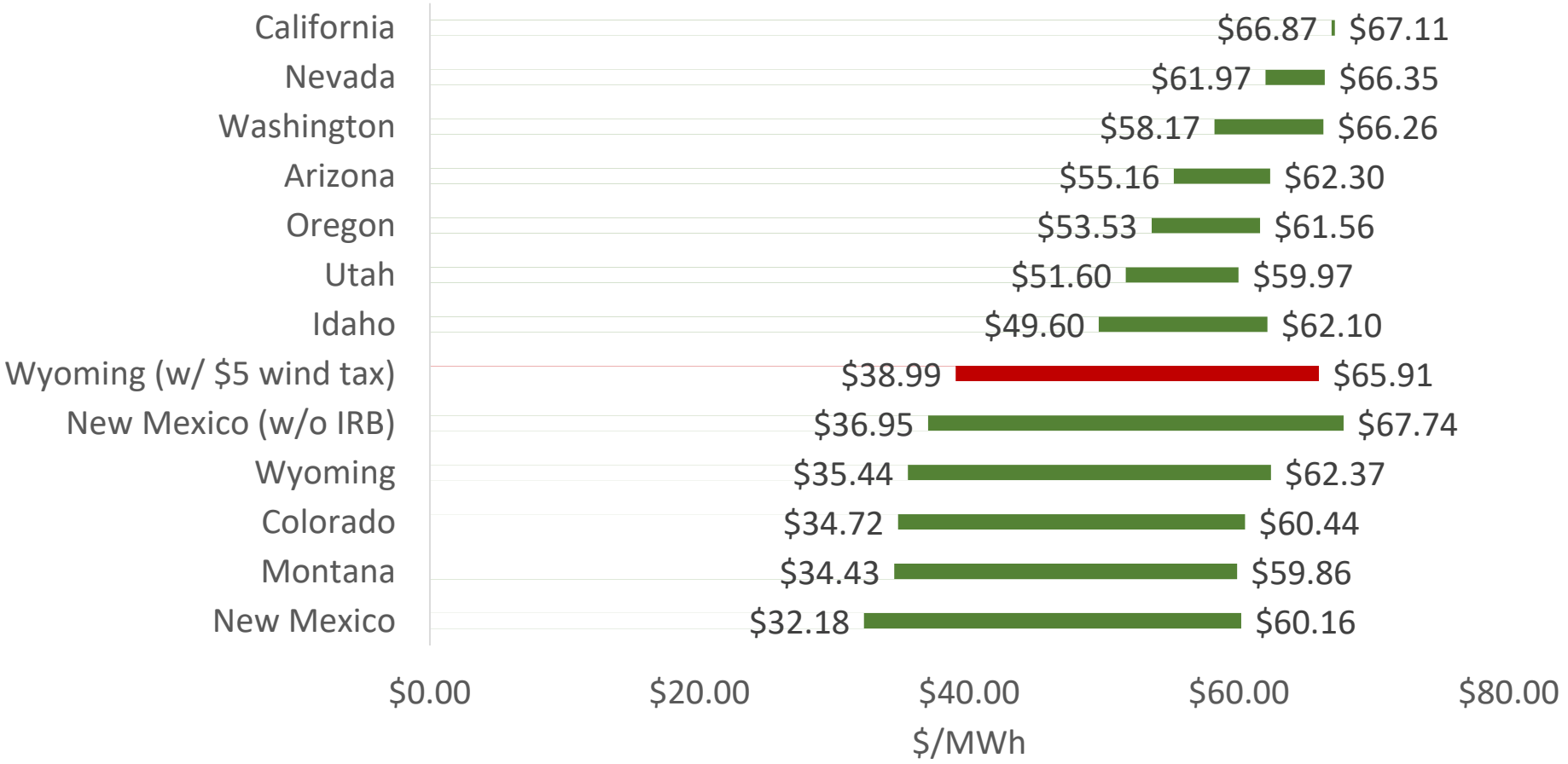


Presentation Methodology

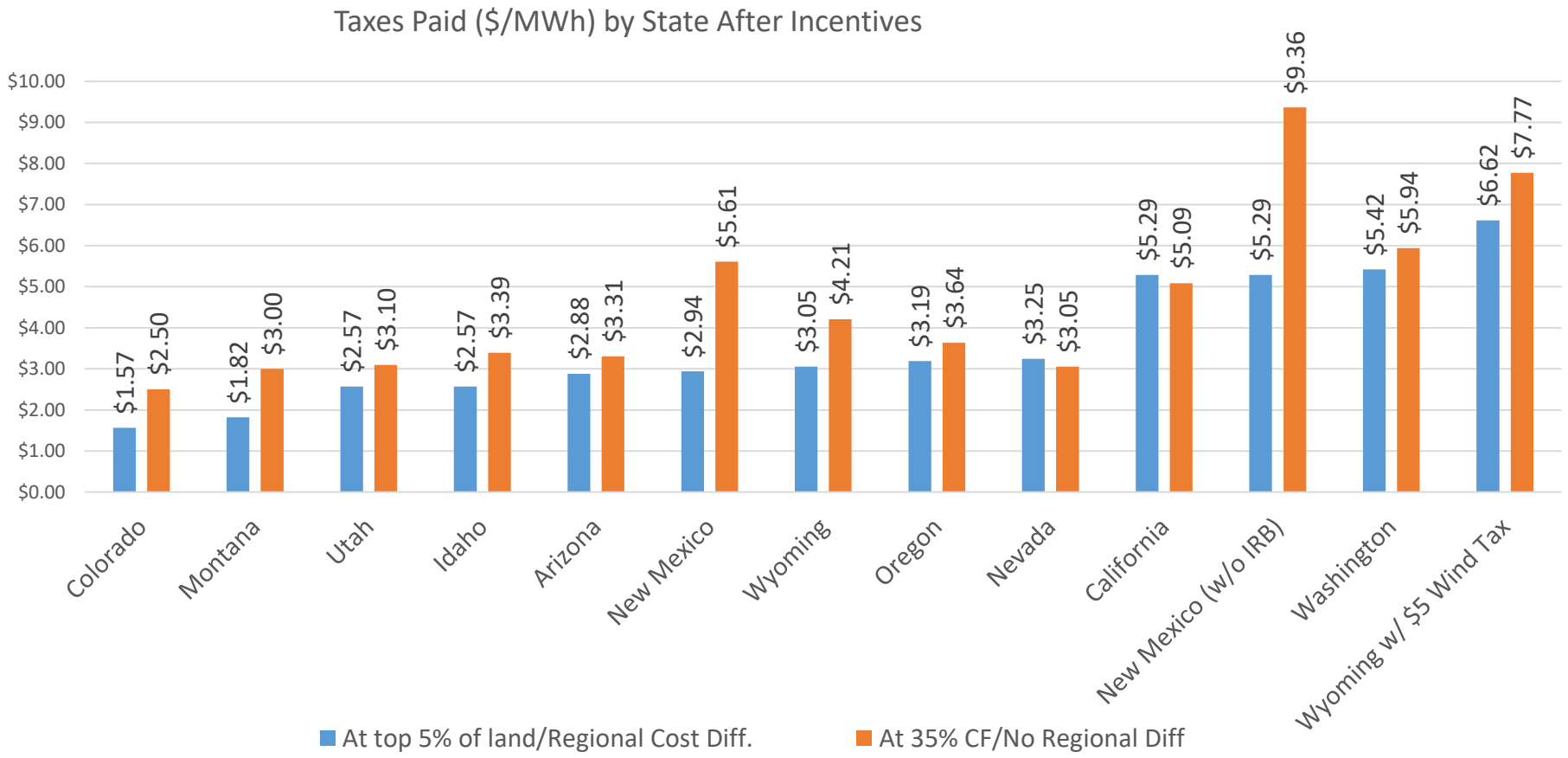
Cost estimates presented as a range for each state

- Each bar shows cost where only taxes differ (right end of figure)
  - state capacity factors are set to 35%
  - Regional construction/O&M cost differences ignored.
- Each bar shows cost when taxes, wind quality and construction/operations costs included (left end of figure)
  - state capacity factors are set to estimated values shown
  - Regional construction and O&M cost differences included

Estimated Western Wind Costs with Taxes



Comparison of tax costs by state per MWh*



*Assumes 20-year life

Results Summary

- Wyoming wind development costs are 4th lowest in the west
  - Wyoming costs are about 10% higher than New Mexico when industrial bonding is used in that state.
  - Wyoming costs are about 3% higher than the second and third lowest cost states (Montana and Colorado).
    - Unique production tax responsible for this wedge.
- Increasing the wind tax to $5/MWh raises the cost of developing Wyoming wind by 10%, leaving Wyoming costs 21% greater than New Mexico and 12-13% greater than costs in Colorado or Montana.
- Overall tax burden in Wyoming is currently greater than three lower cost state it competes with

Results Summary

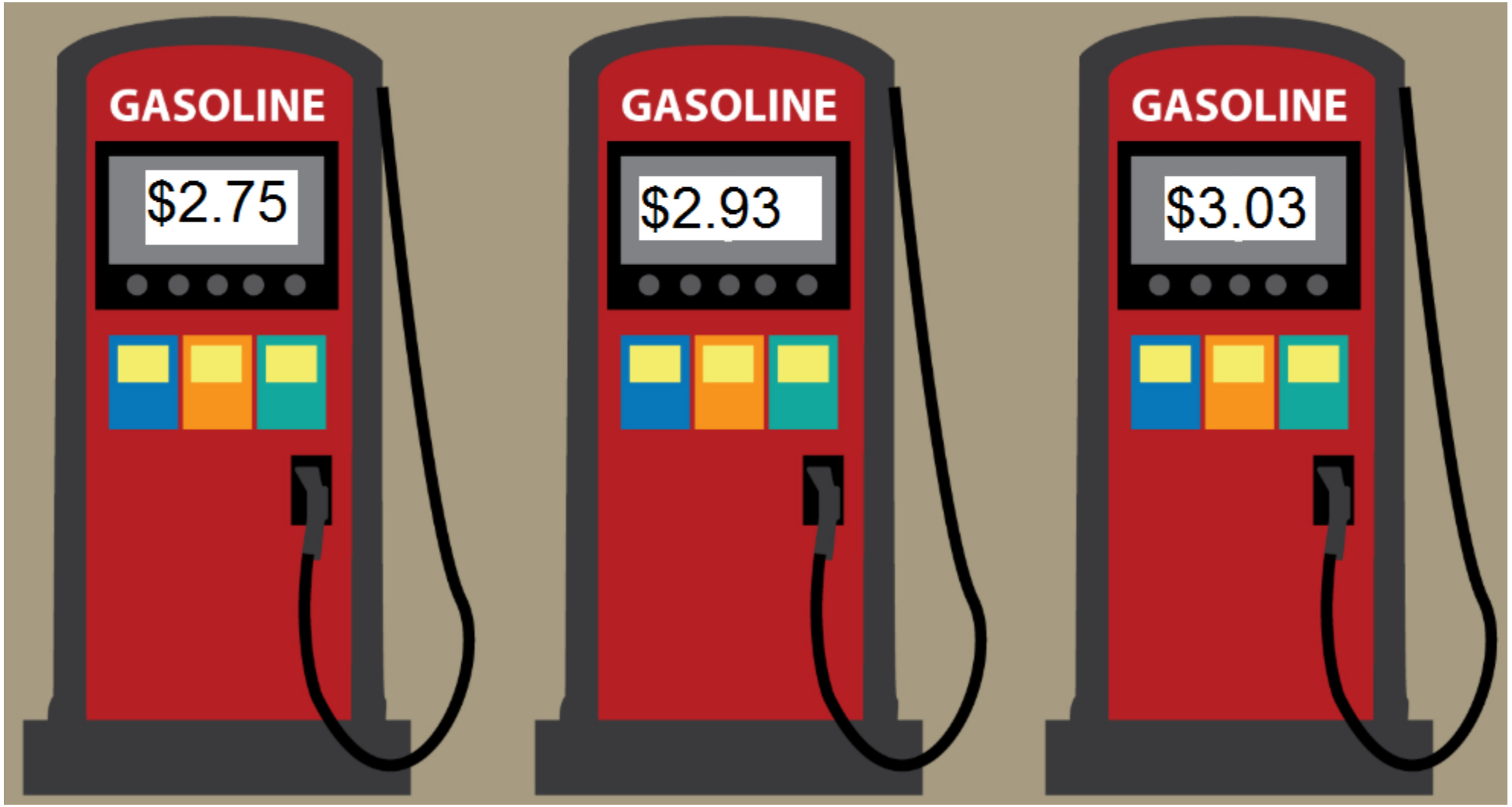
- Wyoming's lack of an income tax has little effect on cost of wind
  - Wind facilities have very little income tax liability
- Note: costs presented are not presented as present values
  - Consistent with Lazard estimates
  - Increases transparency
    - Discounting makes taxes paid earlier in project life more important

    => exaggerates effect of sales tax (Wyoming costs would worsen if this convention observed, MT, CO, NM would not).
  - Addresses fact that governments often prefer revenue flows over early one-time payments.

Results Summary

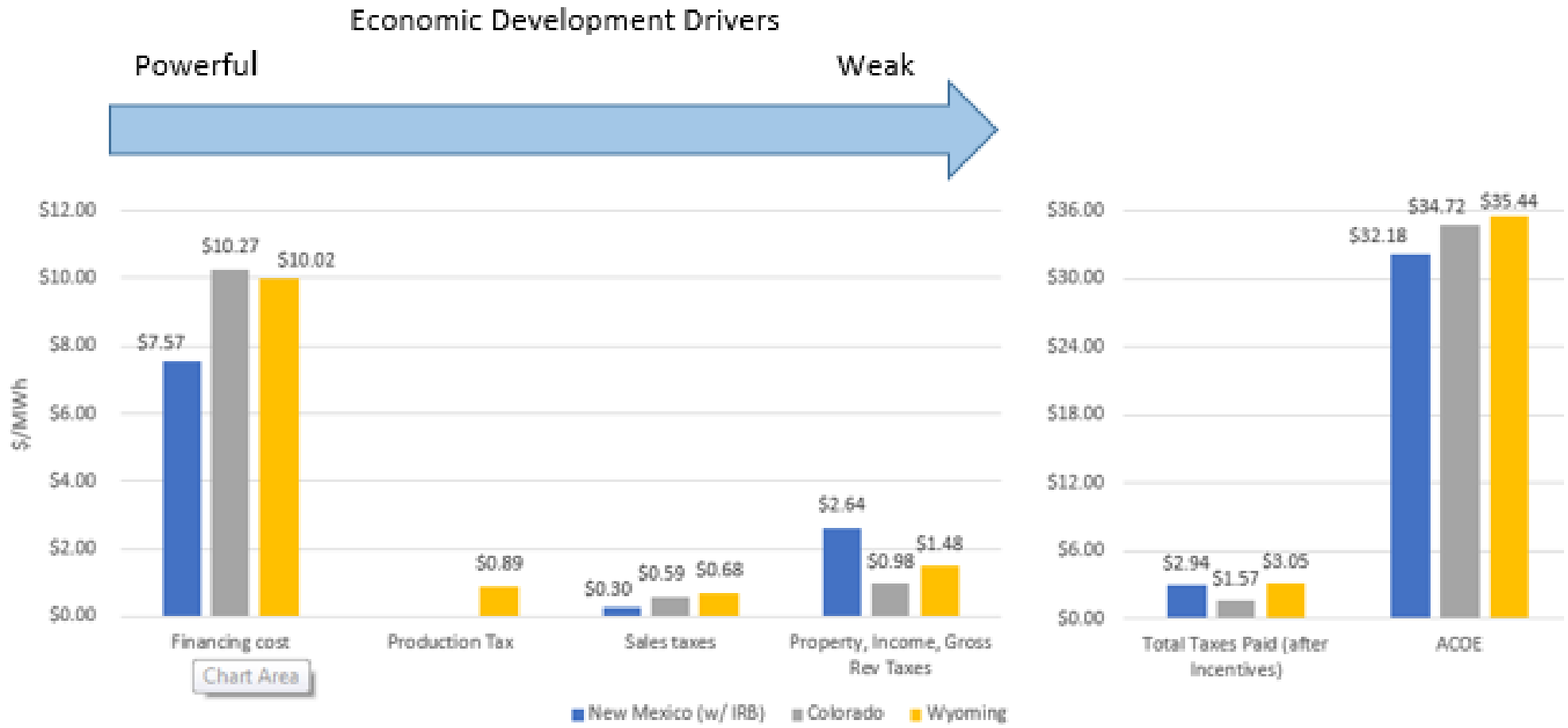
- Overall tax burden in Wyoming is currently greater than three lower cost state it competes with (NM, MT and CO) at $3.05/MWh at best wind sites.
  - Increasing the wind production tax to $5/MWh increases the tax burden to $6.52/MWh, the highest rate among western states.
  - Each $1 increase in the wind production tax causes the cost of wind development to increase by $0.89/MWh (increases costs relative to three competitor states NM, MT and CO by approximately 2.5%).
- We conclude the western wind environment is very competitive on a cost basis and therefore a significant increase in wind taxation could be expected to reduce wind development occurring in the state.

Which would you choose?



Which would you choose?

Can we Tax “Smarter”?



Reducing the Economic Development/Taxation Tradeoff

1) The Lesson from New Mexico: lowest cost to develop, high tax revenues

- The most important cost consideration to a wind developer is financing costs.
  - If efforts were made to reduce the cost of financing for a developer in Wyoming, state attractiveness for development could be increased.
  - Also could allow taxes and tax revenues to be increased without increasing total wind cost.

=> Create industrial revenue bonding similar to NM's, and allow PILOT negotiations to share resulting cost savings.

Reducing the Economic Development/Taxation Tradeoff

2) Tax differently.

- Avoid using taxes that
  - Impose a fixed cost component on developers (production tax)
  - Impose an upfront cost that requires financing/increases overall project cost (sales taxes).
- Use taxes that create a more certain revenue stream
  - Use of a royalty on gross receipts could replace sales and production taxes, creating predictable revenue streams that are not subject to economic or energy cycles.

Reducing the Economic Development/Taxation Tradeoff

- An Example:
  - Using the revenue model developed here we evaluated
    - Elimination of the sales tax
    - Elimination of the production tax
    - Maintain current property tax rules
    - Replace these taxes with a 6% royalty charged on value of electricity sold (wholesale value – same as oil and gas severance rate) .
  - Result:
    - Cost of wind development for a 20-year project falls from $35.44 to $34.93 (1.5% decline), halving cost difference between Wyoming and MT and CO.
    - Taxes collected per MWh rise from $3.05 to $3.31/MWh on an LCOE basis (8.3% increase)
    - Reliable revenue stream created over life of project.

Takeaways

- Wind development offers significant development and revenue opportunities to the state.
- Increasing taxes could undermine this opportunity significantly.
  - Wind industry is very cost-competitive
  - Major tax increases would significantly change Wyoming cost-competitiveness.
- Tradeoff between development and revenue can be overcome if you change how you tax, then how much you tax.
  - There is potential to have your cake and eat it too = Raise revenues over time while lowering cost of wind development if changes made carefully.