Center for Energy Economics and Public Policy

Estimating the Impact of State Taxation Policies on the Cost of Wind Development in the West

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Motivation

Many states and local governments have identified wind development as a potential means of diversification and economic growth

- In the west this is particularly true in rural and energy producing communities impacted by the energy transition

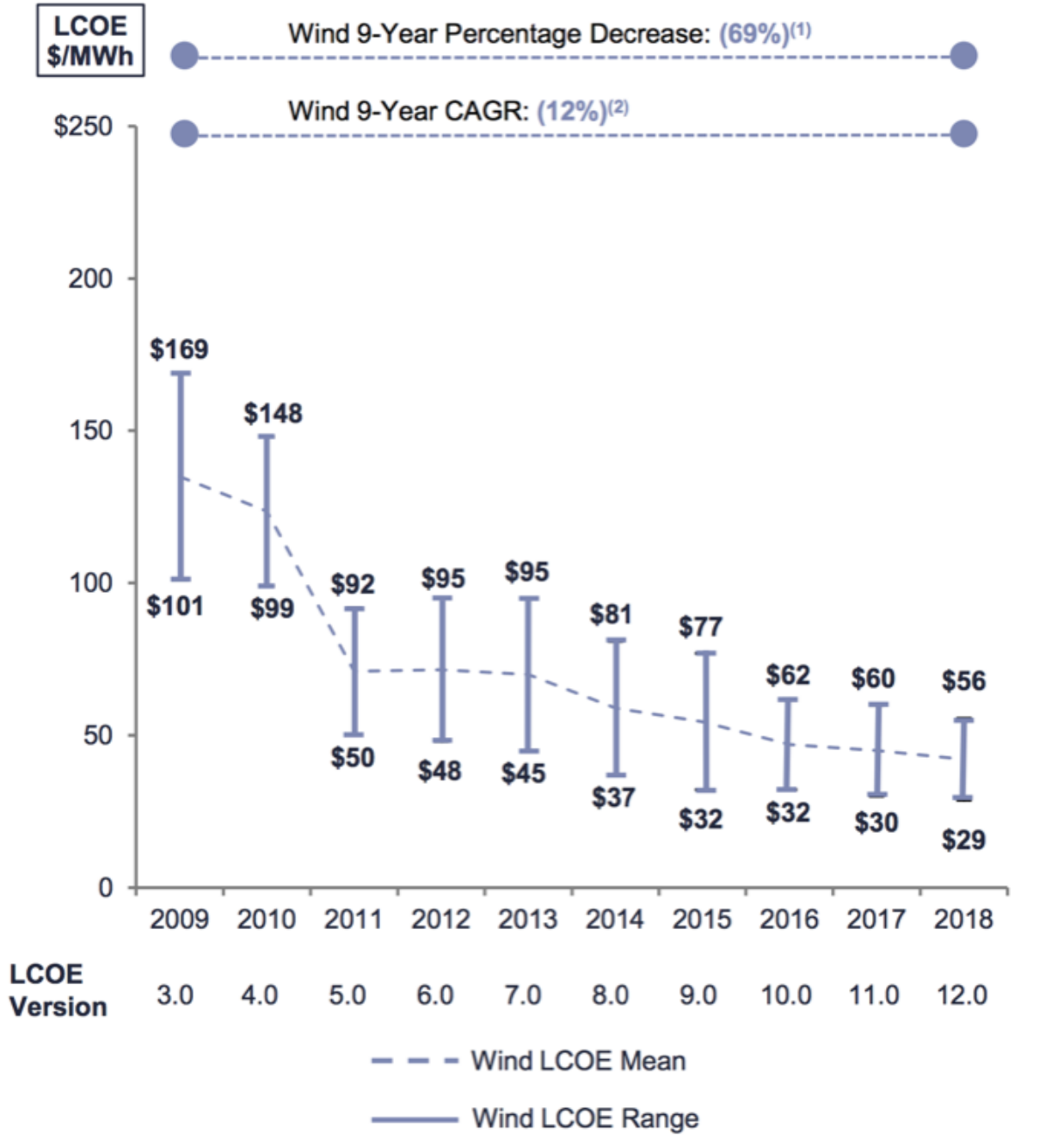
The development market for wind may be thought of as competitive in the west (Godby, Taylor and Coupal, 2018).

- State and local governments are/have considered incentives and tax policy as a means of affecting development.

No recent estimates in the literature on tax or incentive elasticities

- Most recent work that may be relevant: Hitaj (2013)

Unsubsidized Wind LCOE



Motivation

Using tax incentives or incentives to attract wind development creates a potential policy tradeoff.

- Pits potential foregone revenue against greater economic activity
- Revenue-strapped communities raising taxes risk losing development

Given the lack of tax elasticity estimates, there is a demand to understand how tax policy affects ***relative*** development costs in specific locations.

This project attempts to develop such after-tax cost estimates across states in the western United States

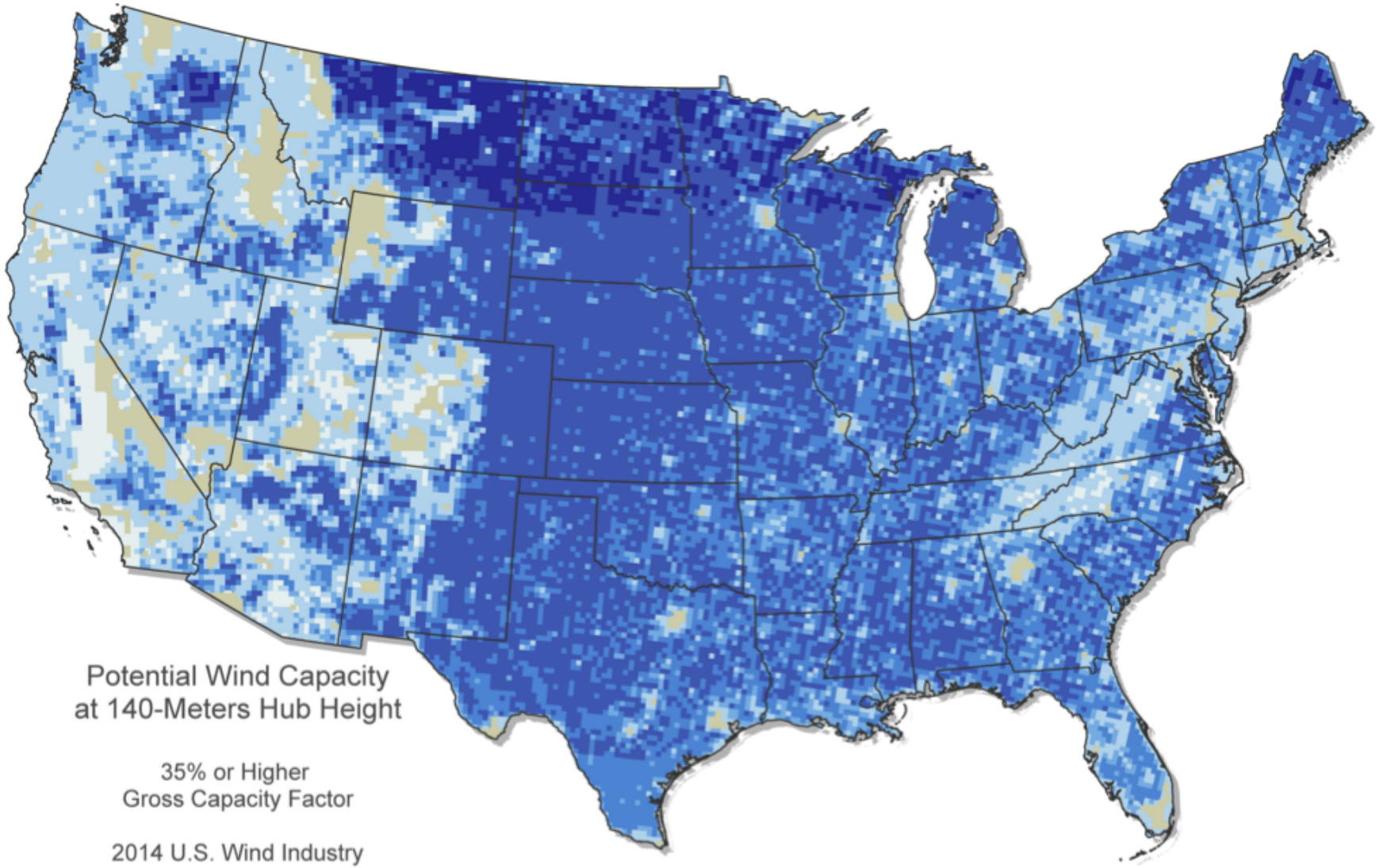
Contribution

The study documents state tax differences in wind taxation across the western United States WECC region.

Estimates how these differences affect relative wind development costs by state.

Develops a detailed capital structure model to understand how different types of taxes and tax composition affect cost of wind development

Considers whether it may be possible for states to avoid a tax/development tradeoff by changing the way they tax, and then how much they tax.



Potential Wind Capacity at 140-Meters Hub Height

35% or Higher
Gross Capacity Factor

2014 U.S. Wind Industry
Average Turbine

Area (sq km)

- 0
- < 100
- 100 - 200
- 200 - 300
- 300 - 400
- > 400
- Land exclusions

This map illustrates general wind resource potential only and is not suitable as a siting tool. More detailed site and wind speed data, as well as coordination with relevant authorities, are needed to thoroughly evaluate appropriate wind energy development at any given location.

Data sources: AWS Truepower, National Renewable Energy Laboratory

This map was produced by the National Renewable Energy Laboratory for the Department of Energy. February 2015

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

AWS Truepower

State Wind Taxation 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	

Methodology

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.

LCOE Methodology

We assume a competitive market for wind development

We do NOT assume Power Purchasing Agreement (PPA) levels.

Instead – consistent with other methods of LCOE estimation (e.g. Lazard) we assume "cost" of energy in each state achieves industry standard required levels of return to investors.

- 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).

Cost Assumptions Across all States

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

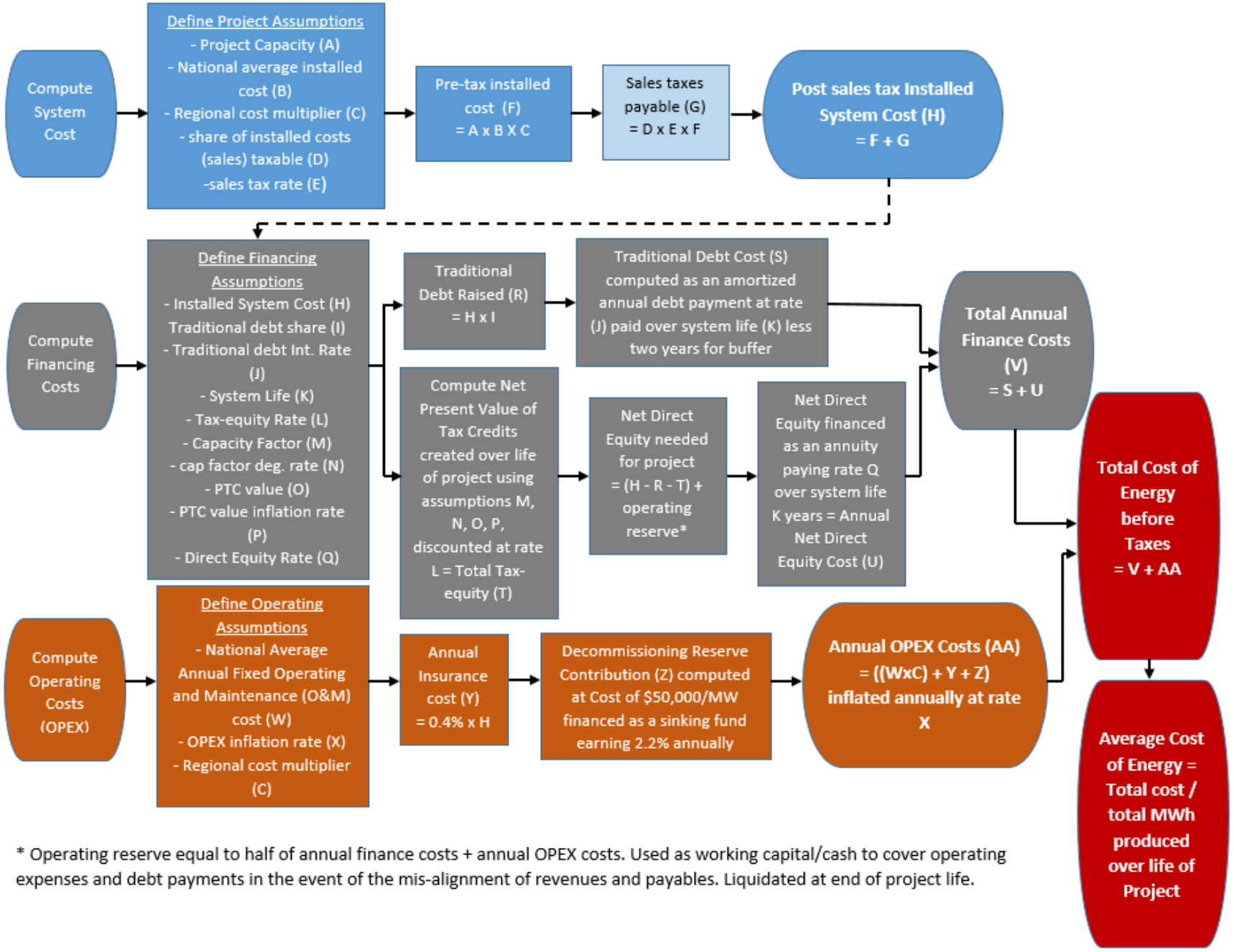
Range: Maximum = modeled value at top 5% of WECC wind sites
Minimum = 35% constant across all states

} 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%

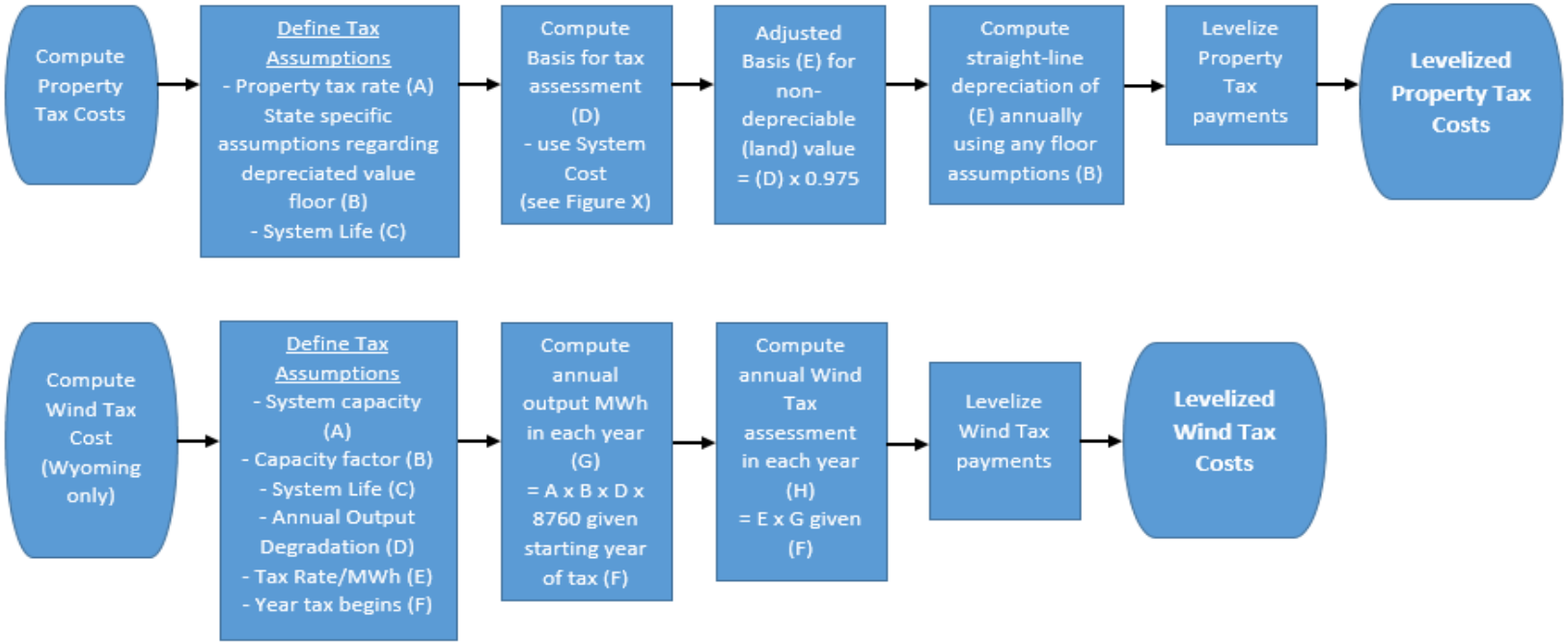
Source of Estimates: NREL, AWS Truepower estimates, https://windexchange.energy.gov/maps-data

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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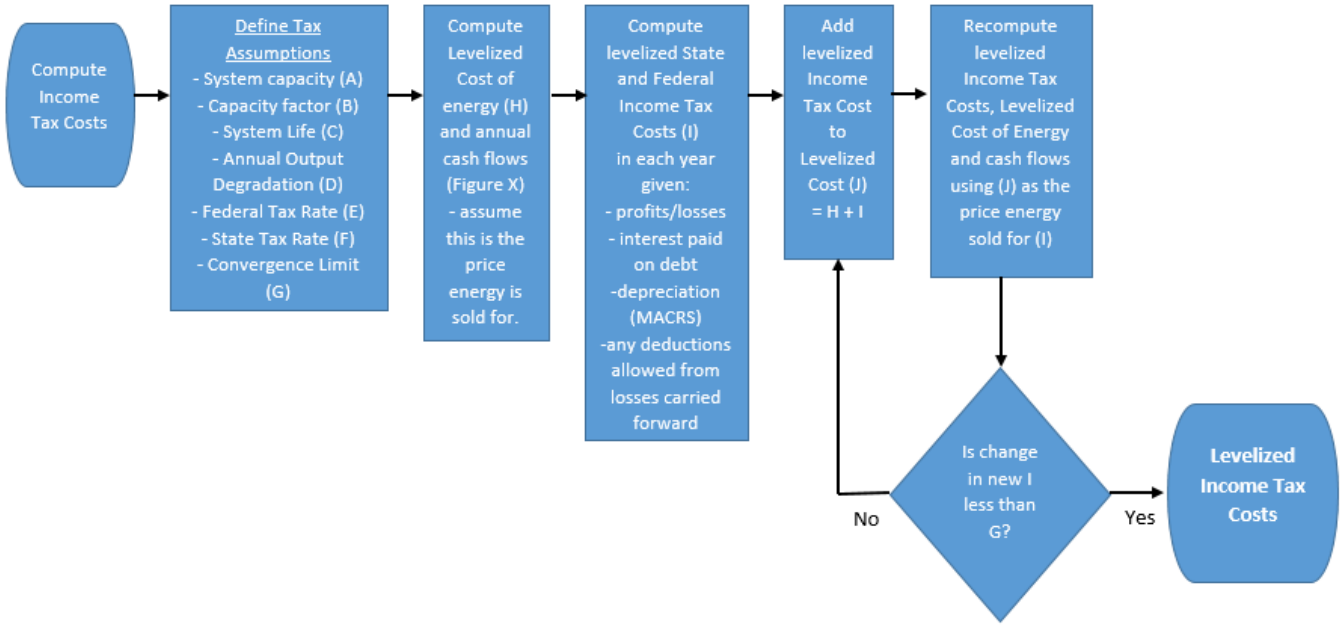
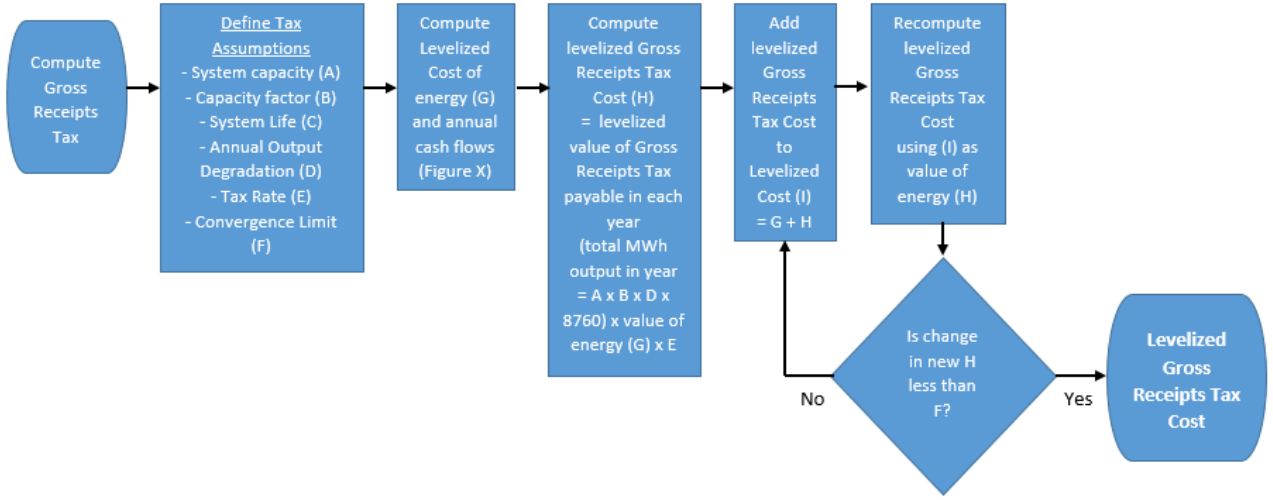
Tax modeling:





Note on discounting…

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).
    - Implies a time preference exists

Addresses fact that governments often prefer revenue flows over early one-time payments.

- There are political and legal constraints local and state governments face that make dealing with one-time payments difficult.

Presentation Methodology

Cost estimates presented as a range for each state

Each bar shows cost where only taxes differ (right end of figure)

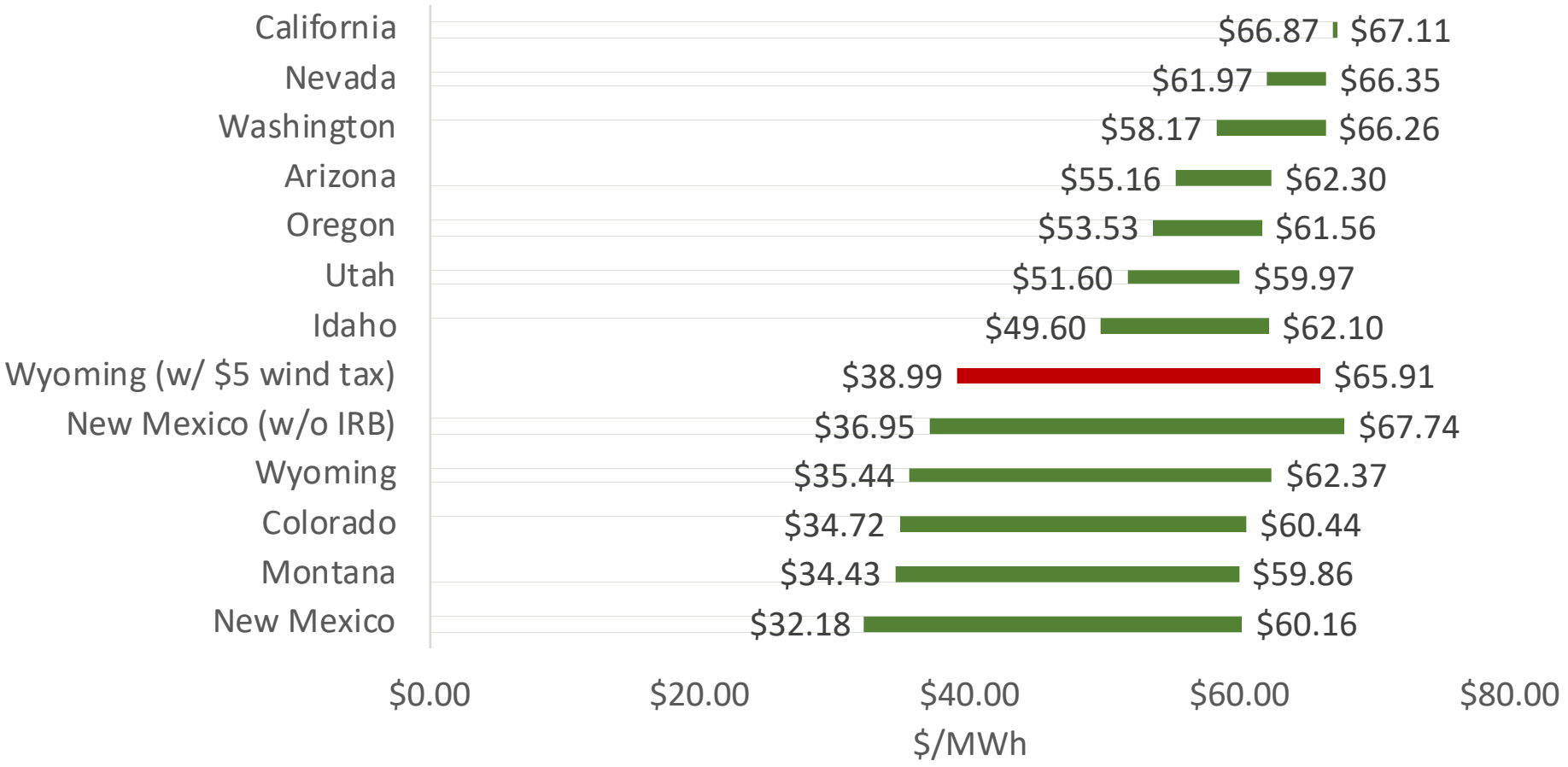
- state capacity factors are set to 35%
- Regional construction/O&M cost differences ignored.

Each bar shows cost when taxes, wind quality and construction/operations costs included (left end of figure)

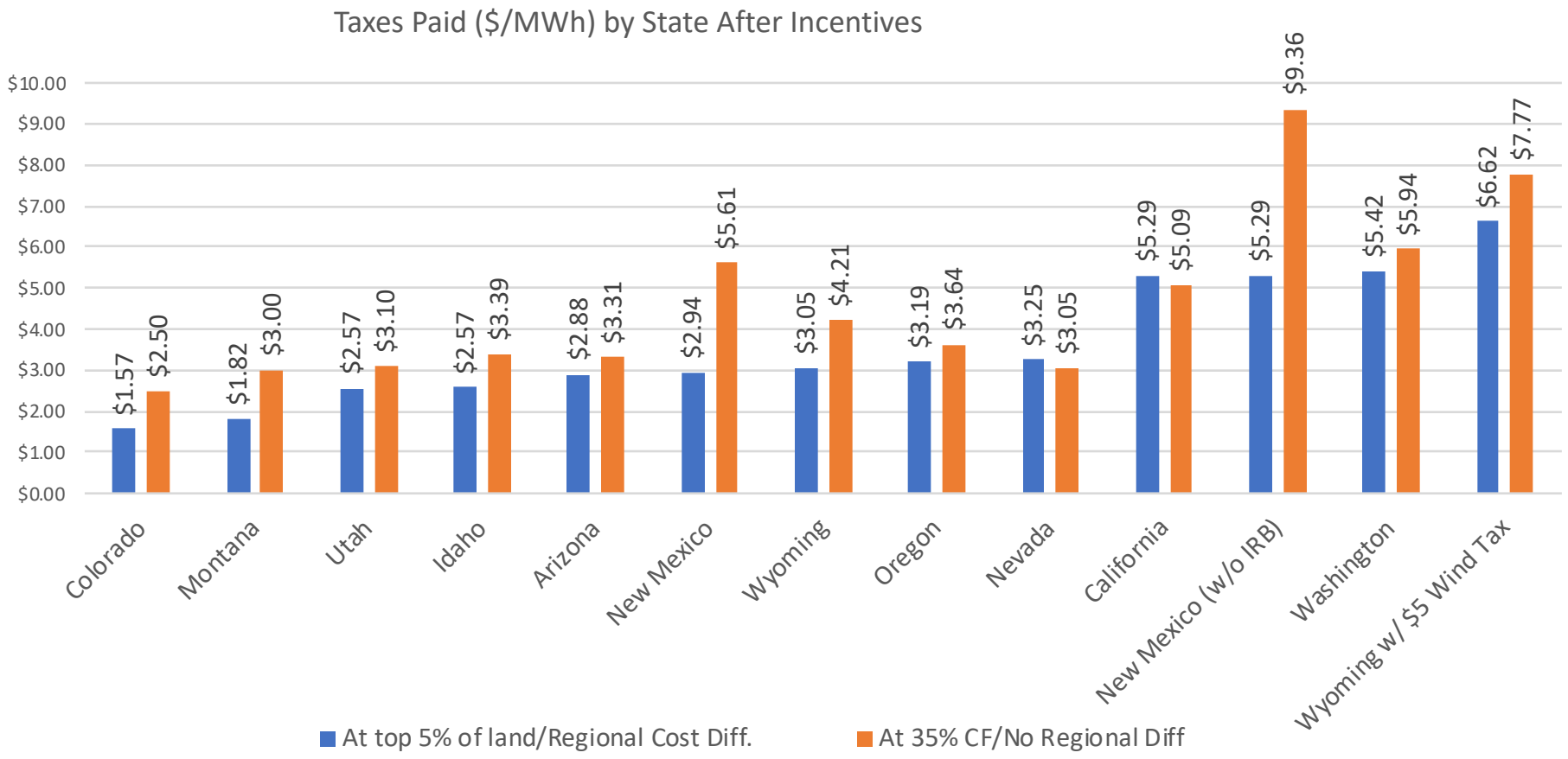
- state capacity factors are set to estimated values shown
- Regional construction and O&M cost differences included

Estimated Western Wind Costs with Taxes

(20-year project life)



Comparison of tax costs by state per MWh*



*Assumes 20-year life

Tax Insights

Lack of an income tax has little effect on cost of wind

- States without income taxes often argue this creates development advantages.
- Wind facilities have very little income tax liability.

Most important element of costs are those due to financing

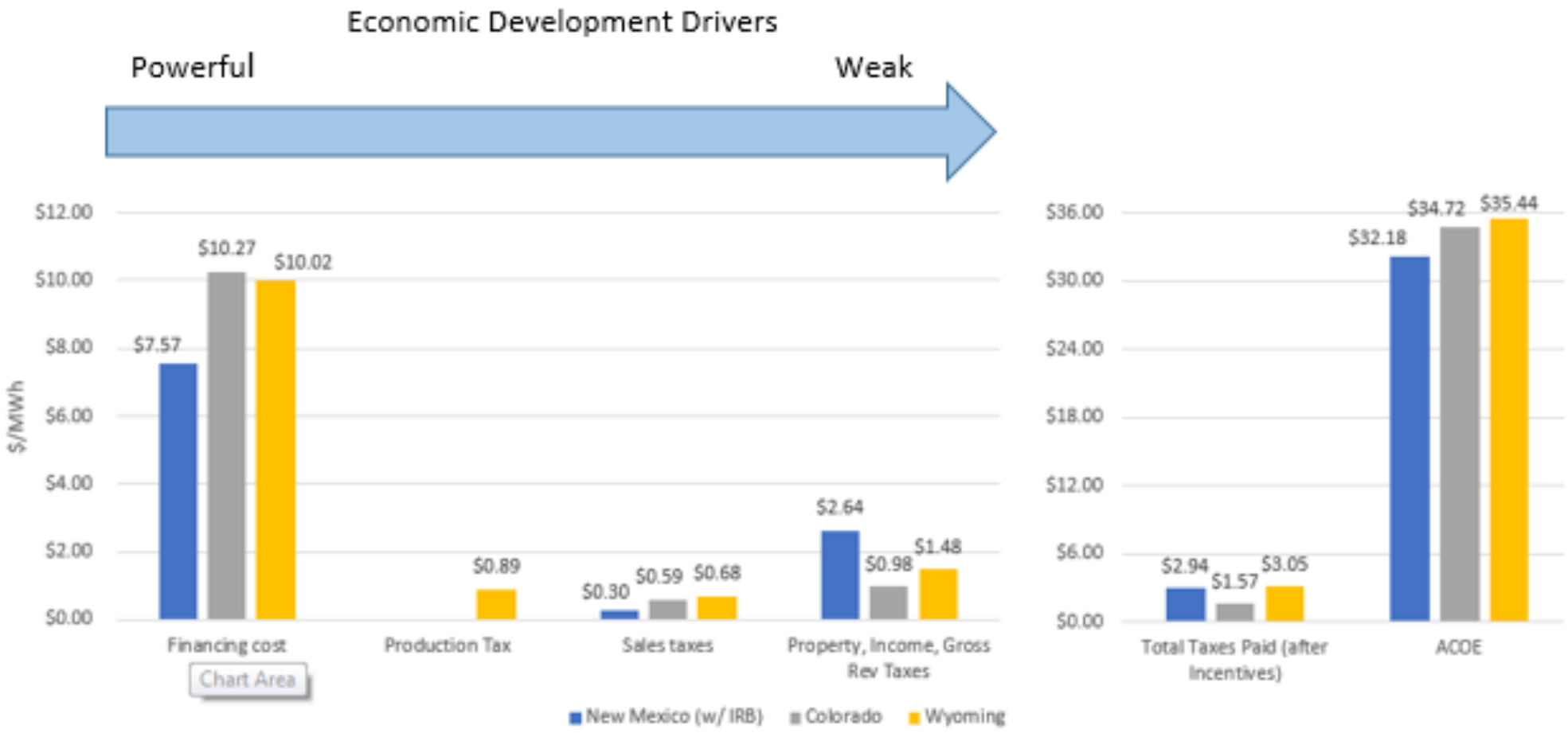
- Ability to reduce financing costs creates distinct cost advantages (e.g. bonding programs as used in NM).
- Sales taxes most costly form of tax due to fact these costs often need to be financed as they occur before operation occurs.

Production incentives/disincentives very important also – create potentially large cost and risk impacts

Annual taxes such as property, income, gross receipts or royalities likely less important

- Consistent with previous research (e.g. Hataj, 2013)

Can we Tax "Smarter"?



Reducing the Development/Taxation Tradeoff

1) Use strategies like NM's that reduce financing costs: lowest cost to develop, high tax revenues

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

Reducing the 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 (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.

Takeaways

Wind development offers significant development and revenue opportunities to the state.

Increasing taxes could undermine this opportunity significantly.

- Major tax increases could significantly change wind siting decisions.

Tradeoff between development and revenue may be overcome if you change how you tax, then how much you tax.

- There is potential to have your cake and eat it too

Potential to have your cake and eat it too…

- Evaluated a hypothetical tax change in Wyoming
  - Eliminate of the sales tax
  - Eliminate of the production tax
  - Maintain current property tax rules
  - Impose 6% royalty charged on value of electricity sold (same as state oil and gas severance rate).
- Result:
  - Cost of wind development for a 20-year project falls 1.5%, halving cost differences between Wyoming and MT and CO.
  - Taxes collected per MWh rise by 8.3%.
  - Reliable revenue stream created over life of project.