

Economics for EHV Overlay

Mike Proctor
Chief Economist
Missouri PSC

March, 2008

Basic Concepts

- Economics can be as simple as answering the question “*what is this project going to cost?*”
- However, economics on a specific project should also include the benefits from the project.
 - In a typical analysis, the benefits are compared to the cost required to go forward with the project.
 - EHV overlay is not a typical SPP project where benefits are calculated based on incremental impacts.

How Are Benefits Calculated?

- Benefits from a project are typically calculated by **comparing** either revenues, costs or profits **with and without the project**.
- If there are alternative projects being considered, then benefits and costs are compared across the various alternatives.
- Key Concept: in order to calculate BENEFITS there must be an ALTERNATIVE case.
- “Do Nothing” is an ALTERNATIVE case that does have an associated cost.

Basic EHV Drivers

- The need for an EHV overlay is driven by the level of wind power assumed to be generated within the SPP and delivered to markets.
- The level of wind power generated with the SPP is driven by Renewable Portfolio Targets (RPTs) for:
 - Within the SPP region
 - Exports from the SPP region

What Alternative Should EHV Be Compared To?

- Does the alternative have a different level of wind power? If the EHV case assumes more wind than is needed internally to the SPP footprint, would the alternative be to eliminate this excess?

Alternative 1: Lower Wind Power to Meet Current RPTs in SPP

- This alternative would be based on current resource plans of the load-serving entities within SPP

Alternative 2: Lower the wind power to meet Future RPTs in SPP

- This alternative would substitute wind power for other forms of generation based on expected increases in RPTs.

EHV Compared to an Export Alternative

- The case is somewhat unusual in that the comparisons have different assumptions regarding wind power generation in the SPP footprint.
 - Building a system that will deliver power with significant exports.
- The benefit calculation would answer the question: are there additional benefits within SPP from building a larger system than is needed to meet SPP RPTs.
 - How do these additional benefits compare to the added costs?
 - While, expected added benefits are not likely to totally cover the expected added cost, the added benefits will help to reduce the **risk of assumed exports not showing up** and SPP rate payers bearing the cost of going to a higher voltage system.

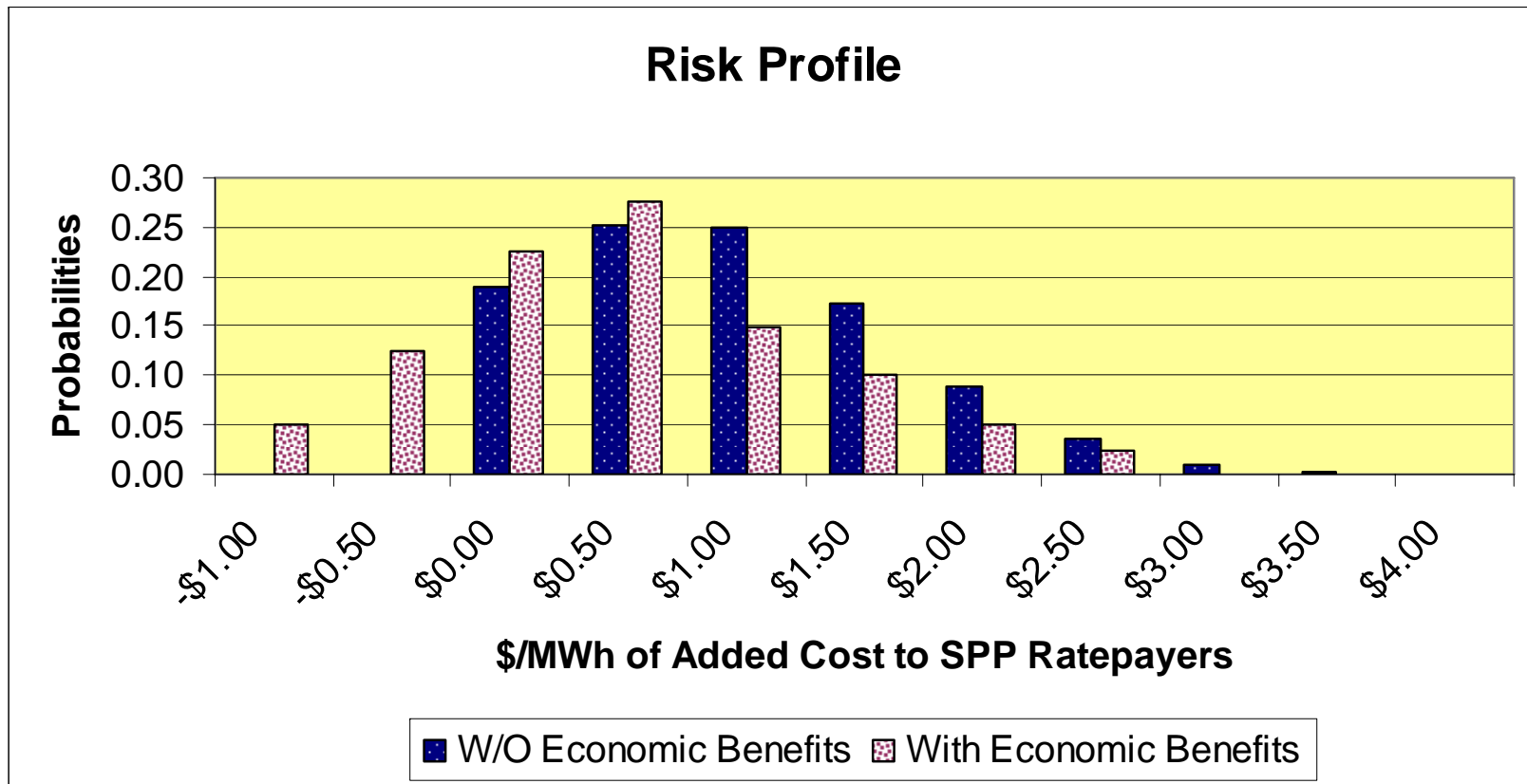
What Are the Economic Benefits?

- Wind operates at around a 40% capacity factor. If transmission is built to deliver 100% of wind turbine capacity, this means that when wind is operating at a lower level than 100%, there will be additional transmission capacity available for substituting other lower cost generation (e.g., coal-fired) for higher cost generation (e.g., gas-fired).
- Comprehensive wind data sets that include both the correlation of wind with temperature and the diversity of wind and temperature across the SPP footprint.
 - An assumed wind pattern that is the same throughout the SPP footprint and is not correlated to day-to-day changes in temperature (load), but only to various seasons will not generate a right answer.
 - If you don't get this right, the calculation of economic benefits will not be reliable.

Risk Analysis for SPP Rate Payers

- Probability distribution of wind power associated with SPP exports is applied assuming an associated payment at each level of wind power (e.g., out rate * MW).
- For each probability state (level of exports) Payments are subtracted from EHV costs to calculate costs for SPP ratepayers.
- The probability distribution of economic benefits is subtracted from probability distribution of costs carried by SPP ratepayers to see the impact on reducing the risk of carrying those costs.

Risk Analysis Illustrated



Note: This risk analysis profile can be performed for both alternatives.

The Long-Term EHV Economic Process

- First, be straight-forward about the risks and who will likely bear these risks. Similar efforts are needed to quantify and assign benefits.
- Second, start with a simple 1 year analysis and make sure everyone understands the economics before getting complicated with multi-year analyses.
 - Multi-year analysis will require additional assumptions about the timing of wind power for both SPP internal RPTs, as well as for exports.
- Third, complete the work on seams agreements or federal legislation that has the risks shared or absorbed by a larger group of ratepayers.

Allocation of Costs Across Seams

- While the allocation of costs across seams is of some interest for reliability upgrades, the interest level increases with the addition of economic upgrades.
 - Initial benefit studies for alternative portfolios indicate a not insignificant benefit going to first tier transmission systems.
- The interest level *significantly* increases with the consideration of an EHV overlay.
 - “BUT FOR” exports of wind power, the SPP would not be seriously considering an EHV overlay at the 765 kV level. This adds considerable costs that are unlikely to be covered by added benefits.

Bottom Lines

- You can ask state regulators to approve the sharing of costs for delivering wind power throughout the SPP footprint. This is a relevant cost allocation issue.
 - Sharing these costs on a postage stamp basis will be highly dependent on states within the SPP having the same RPTs.
 - Alternatively, some type of adjustment mechanism will be required to balance benefits among the states.
- You cannot ask state regulators to adopt a policy that asks rate payers to bear a significant level of the risks associated with building an EHV overlay to export wind power on a “speculative” basis.
 - This is not a cost allocation issue.
 - It is primarily a seams issue.

Implications for the SPP Planning Process

- The question addressed here is how does the economic analysis previously discussed for EHV fit within SPP's total planning process that includes:
 - √ SPP Transmission Expansion Plan (STEP) for reliability needs and economic opportunities
 - √ Tariff Studies
 - √ Generation Interconnections
 - √ Aggregate Studies - Deliverability
 - √ Economic Portfolio Studies – Benefits via Lower Costs
 - √ EHV Overlay Studies – EHV Overlay and its Alternatives

Interconnection Studies

Relationship to DRs

- While interconnection is a separate SPP study, it is based on the assumption that sooner rather than later, the generator that is connected will become a new Designated Resources, with a few exceptions.
- Interconnections for proposed generation as well as their designation as resources by loads need to be included in both the economic portfolio and the EHV economic studies.

Reliability and Deliverability Upgrades Relationship to Economic Portfolios

- STEP (reliability) or Aggregate Study (deliverability) upgrades can be recommended for enhanced upgrades based on greater regional benefit.
 - We can now consider the regional benefit of enhanced upgrades based on their benefit as a part of an economic portfolio.
 - If the economic portfolio displaces any of the reliability or deliverability upgrades in STEP, the costs of the displaced upgrades are allocated via BPF and only the incremental costs are included in the economic portfolio with its associated allocation of costs.

Economic Portfolio Studies

Relationship to EHV Studies

1. Given current internal SPP RPTs, what is the transmission delivery system required to deliver that power over the next 5 to 15 years?
 - Requires inputs from utilities regarding plans for RPTs as well as other types of generation and demand response additions.
 - This transmission delivery system should be the basis against which economic portfolio upgrades are measured.

2. Within the next 10 years how are SPP RPTs likely to change and how will those changes impact the design of the transmission delivery system ?
 - Also requires inputs from utilities regarding how their plans will change.
 - This enhanced transmission delivery system should be one of the inputs used by the SPP staff for developing alternative economic portfolios.
 - The concept here is to determine whether or not economics, absent increased RPTs within SPP can justify moving to these enhanced upgrades.

3. 20 years out, what exports of wind power are expected from the SPP region, and how will those exports impact the design of the transmission delivery system?
 - Seams agreements should be required before this EHV transmission delivery system becomes an input used by the SPP staff for developing alternative economic portfolios.
 - While there has been discussion concerning using the EHV overlay as a design map for current upgrades (both reliability and economic), before this can be implemented, we will need “buy in” from non-SPP beneficiaries.

4. Expansion Plans must be robust and continually reassessed periodically to validate assumptions and conclusions/recommendations.