Benefit Metrics -

This document is an attempt to categorize benefit metrics used in economic analysis. For the purpose of discussion, these items have been divided into three categories:

- **Quantitative** - a list of benefit metrics that can readily be measured and quantified as a numerical value for benefit cost analysis.

- **Possible Additional Quantitative -** metrics that may possibly be quantified, but require more consideration to determine the proper analysis techniques

- **Complex –** benefit metrics that are more complex and not as fundamentally accessible to calculate as the previous two categories.

Benefit Metric per Process (Quantitative only)

Metric	Integrated Transmission Planning	Priority Projects	Balanced Portfolio
Adjusted production cost	√	√	√
Impact on losses	√	√	
Environmental impacts	√	√	
Increased reliability	√	√	
Local economic benefits	√	√	
Deliverability of capacity and energy to load	√	√	
Capacity margin	√		
Operating reserves	√		

Quantitative:

- **Adjusted production cost -** A measure of the impact on Production Cost savings, by zone, accounting for purchases and sales of economic energy interchange. This benefit metric is typically simulated by a production cost modeling tool accounting for 8760 yearly hourly profiles of commitment and dispatch modeling, taken over the course of the study period.
- **Impact on losses** – Lower impedance transmission lines provide a loss savings to the transmission grid. The energy component of the loss savings can be captured as part of a production cost analysis tool. Capacity savings associated with a loss reduction can be determined by looking at the select hourly models to determine loss reduction.
- **Environmental impacts** – SO_2, NO_X, CO_2 and mercury can be modeled for the fuel type used in the generating units for a study. The cost of emissions can be calculated for the units once a value per ton for the emission is determined by

stakeholders. Transmission upgrades can then be used to determine the net impact on emission pricing.

- **Increased reliability –** Economic transmission upgrades can have an impact on reliability. This benefit can be seen in the deferral of reliability projects through construction of more efficient, regional projects. Additionally, the advancement of reliability projects must also be considered for a total overall impact of a collection of economic expansions.
- **Local economic benefits** – Local economic development, job creation, etc. This benefit will tend to reside in the state that the construction of each project.
- **Deliverability of capacity and energy to load** – Projects that provide or act as enablers for power to be delivered from firm designated resources to respective loads. These projects are typically associated with transmission service requests for new designated resources, but can also be bulk EHV projects for regional transfer capability.
- **Capacity margin –** A strong backbone transmission system can lower the needed capacity margin. By having a stronger transmission system to deliver power across the grid, then fewer new plants are needed. Additionally, a stronger transmission system can act as enabler for utilities to access more remotely located designated resources that are not local to their zone.
- **Operating reserves –** A robust backbone transmission system can provide support for lowering operating reserve requirements and provide access to lower costs operating reserves.

Possible Additional Quantitative:

- **Congestion relief –** Transmission upgrades are capable of addressing key flowgates with high congestion profiles. This impact can be documented through multiple methodologies.
- **Interconnection improvements –** Systems on the SPP are often not interconnected between neighboring utilities. Transmission improvements can help facilitate the integration of the system.
- **Energy, capacity and ancillary service market facilitation** – Cost benefit calculations related to market facilitation will likely need to wait until formal markets develop for energy, capacity, and ancillary services within the SPP footprint.
- **Storm hardening and black start capability** - It is possible to use security constrained production cost programs and insurance valuation techniques to estimate the economic value of storm hardening for alternatives.
- **Backbone loop metric –** Transmission components that facilitate the integration of a backbone loop system for the SPP footprint.

Complex:

- **Renewable credits –** Credits associated with the production of renewable energies. These are credits received for additional wind power produced with transmission as an enabler for that production.
- **Reactive reserve margins –** Reactive reserve margins can be measured and a strong backbone transmission system has a strong impact on the delivery of those margins.
- **Critical infrastructure/homeland security** - Generally, as transmission elements are added to a network, redundancy is added and the network becomes more robust. This has a direct relationship to the proposed CIP-002 standard in the use of contingency sets to identify critical infrastructure on the US electric system. Transmission alternatives may add different levels of "robustness" to the network with the varying level of ability to prevent the spread of events to a regional level. The more robust alternatives may be able to reduce or possibly eliminate the designation of critical infrastructure. If combinations of contingencies are defined and used for the CIP-002 analysis, then these combinations can be modeled in the security constrained dispatch program similar to the method proposed for storm hardening.
- **Facilitation of consolidated BA –** Transmission elements that provide support for a consolidated BA and the commitment of resources on a single BA level.
- **Operational efficiency –** Transmission projects can provide support for real time operations of the grid. For example, this can provide support for plants to be taken off reliability must run status or enable plants that are difficult to take offline for maintenance more
- **East to West Transfer Capability –** Much of the renewable resource supply for the SPP footprint is located in the western part of the region. These areas are not strong connected to the rest of the system. Stronger transmission connections to deliver these resources could provide significant benefit to the region and beyond.