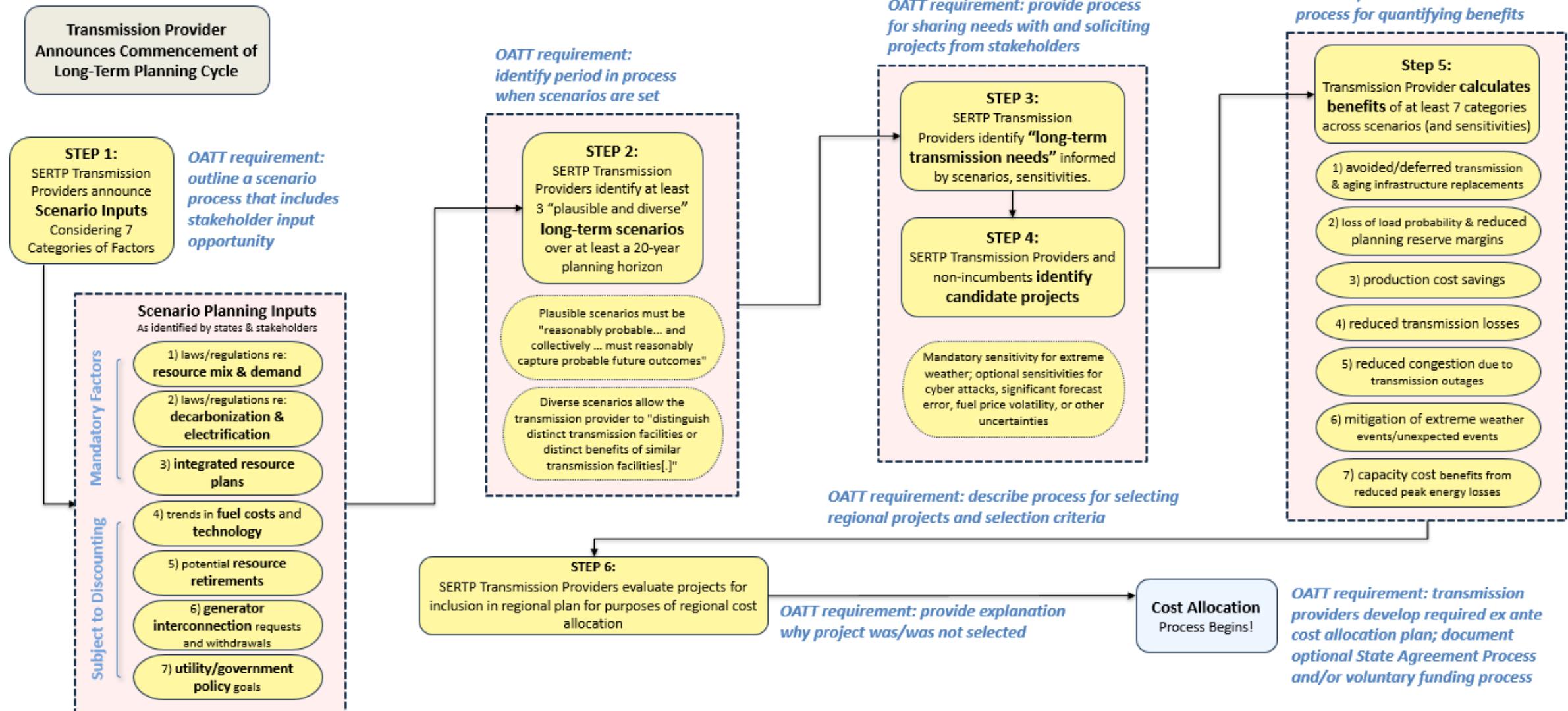
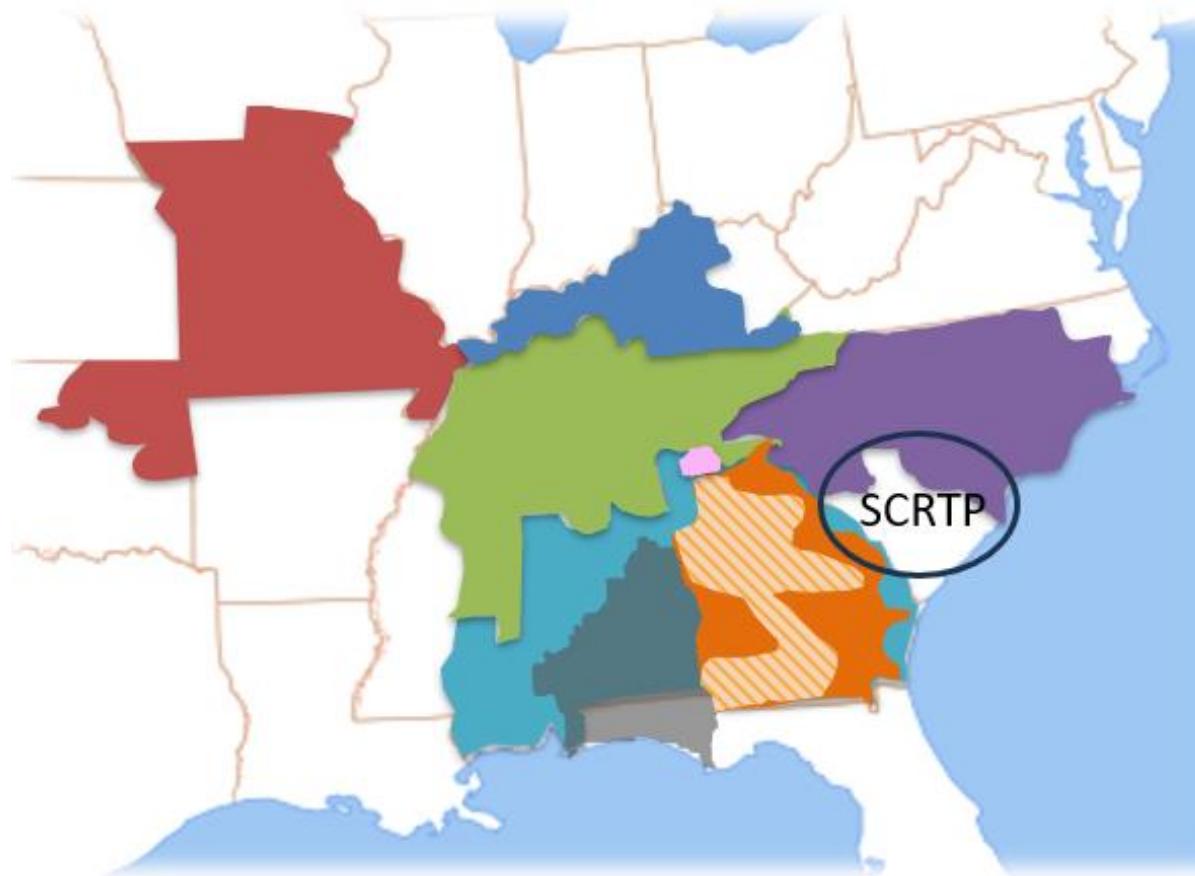


FERC Order 1920: Measuring the Benefits of Long-Term Regional Transmission Facilities and Selection Criteria

Long-Term Regional Transmission Plan Overview





SERTP

- Associated Electric Cooperative Inc.
- Dalton UTILITIES
- DUKE ENERGY.
- GeorgiaTransmission
- I.GE KU
- MEAGPOWER
- POWER SOUTH ENERGY COOPERATIVE
- Southern Company
- IV.A

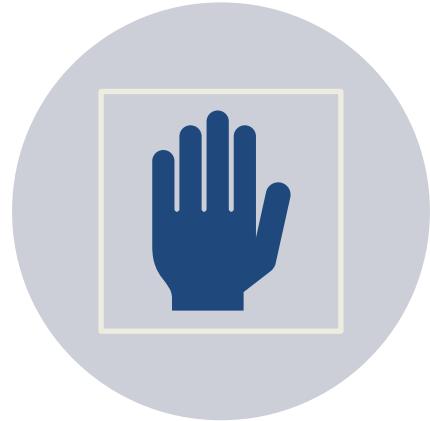
SCRTP

- santee cooper*
- Dominion Energy*

HOUSEKEEPING



PARTICIPANTS



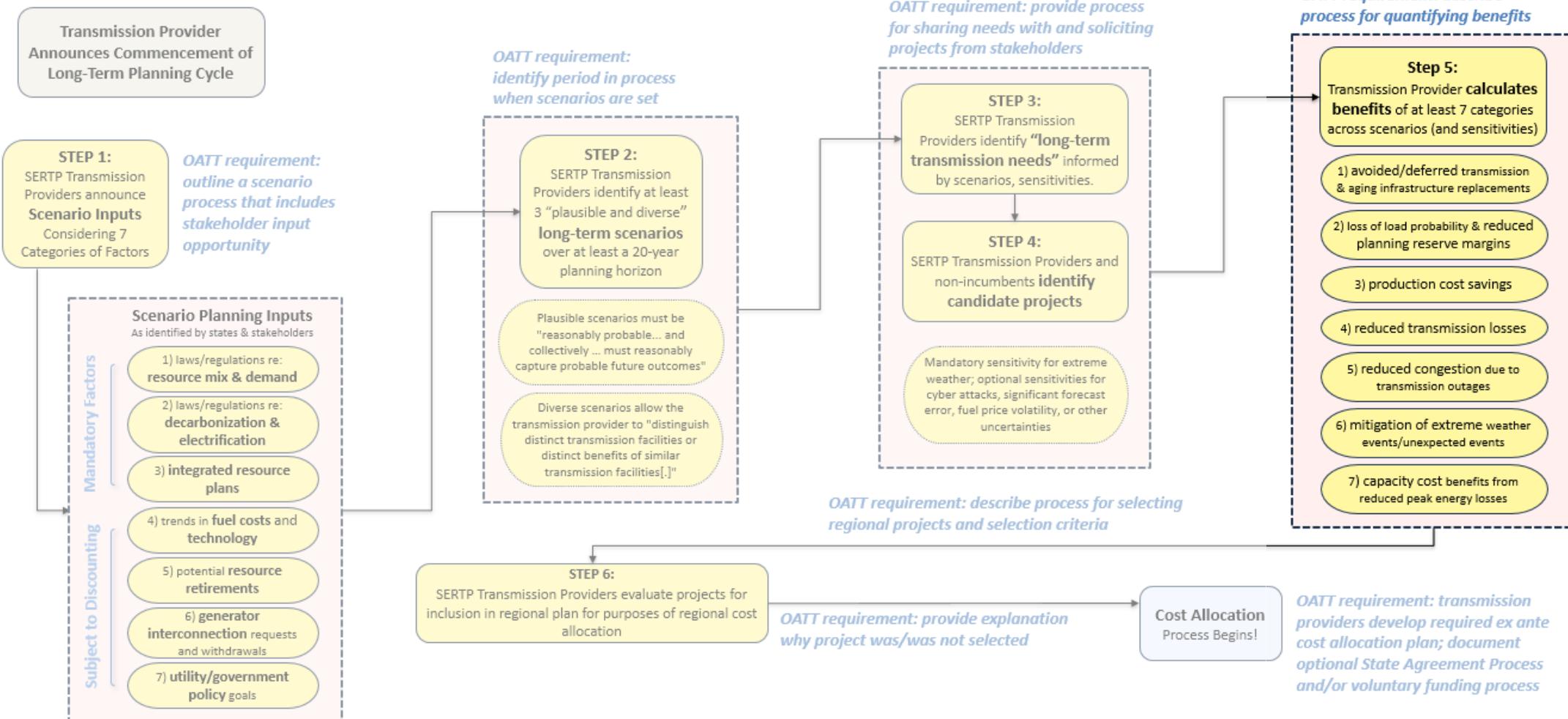
ATTENDANCE



PROTOCOLS

Measuring the Benefits of Long-Term Regional Transmission Facilities

LTRTP Overview



Glossary of terms/acronyms

- BCR: Benefit-to-Cost Ratio
- LTRTP: Long Term Regional Transmission Planning
- LTTN: Long Term Transmission Need(s)
- LTRTF: Long Term Regional Transmission Facility
- EUE: Expected Unserved Energy
- VoLL: Value of Lost Load
- Reference Case: a case/model that does NOT include the LTRTF(s)
- Change Case: a case/model that does include the LTRTF(s)
- APC: Adjusted Production Cost
- PRM: Planning Reserve Margin

Benefits of What?

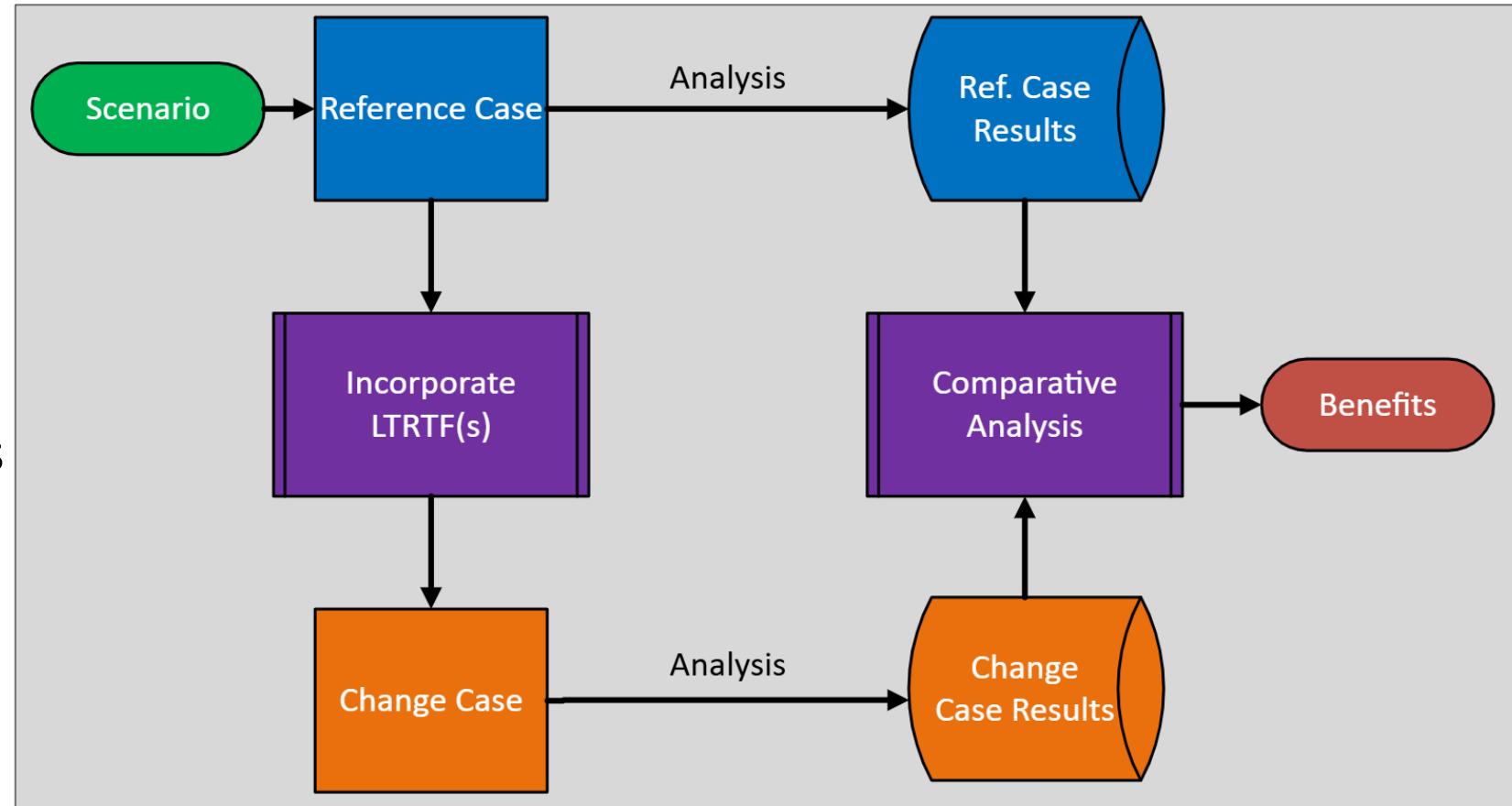
- Evaluate LTRTFs as portfolios
 - LTRTFs may be grouped together based on how they work together to solve LTTN(s)

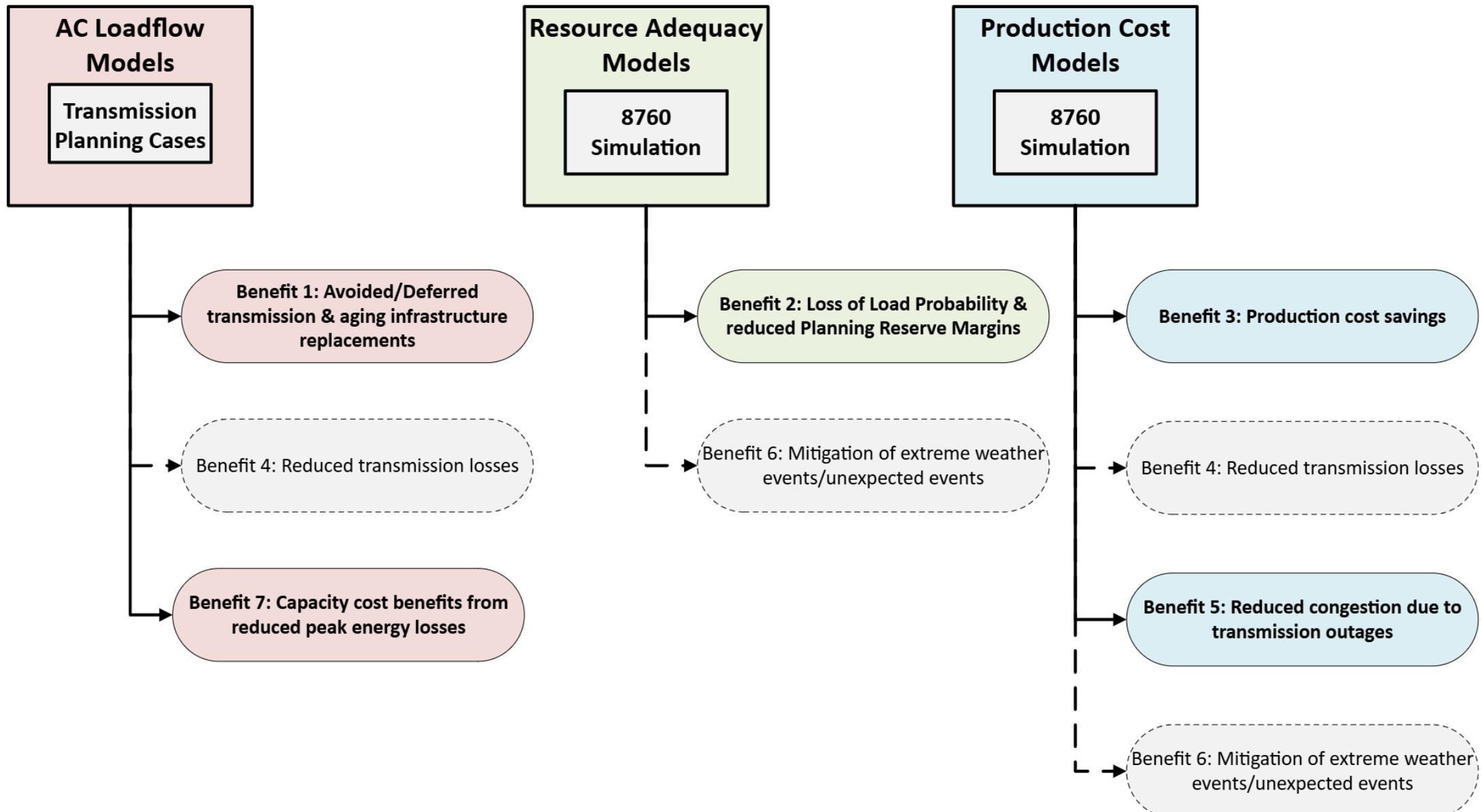
Benefits to Whom?

- Benefits will be calculated on a per-sponsor basis
 - Increased transparency for cost allocation

Benefit Measurement is Comparative Analysis

- Benefits measurements are comparative in nature
 - Isolating the benefit of the LTRTF
 - Change case will have avoided/deferred projects removed
- Reference and Change cases will need to be created for each scenario





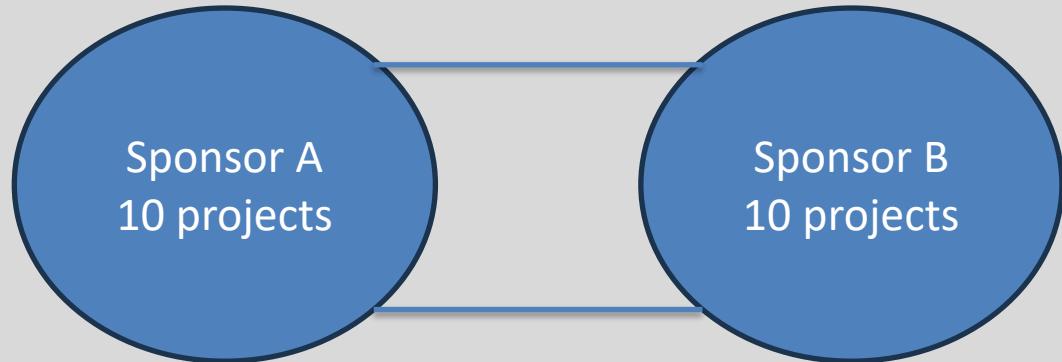
Benefit 1 Overview

Benefit	Description	Model Used
Avoided/Deferred Transmission & Aging Infrastructure Replacements	Reduced transmission expenditures achieved when LTRTF(s) avoid or defer local transmission projects* that are otherwise needed for system reliability.	AC Loadflow

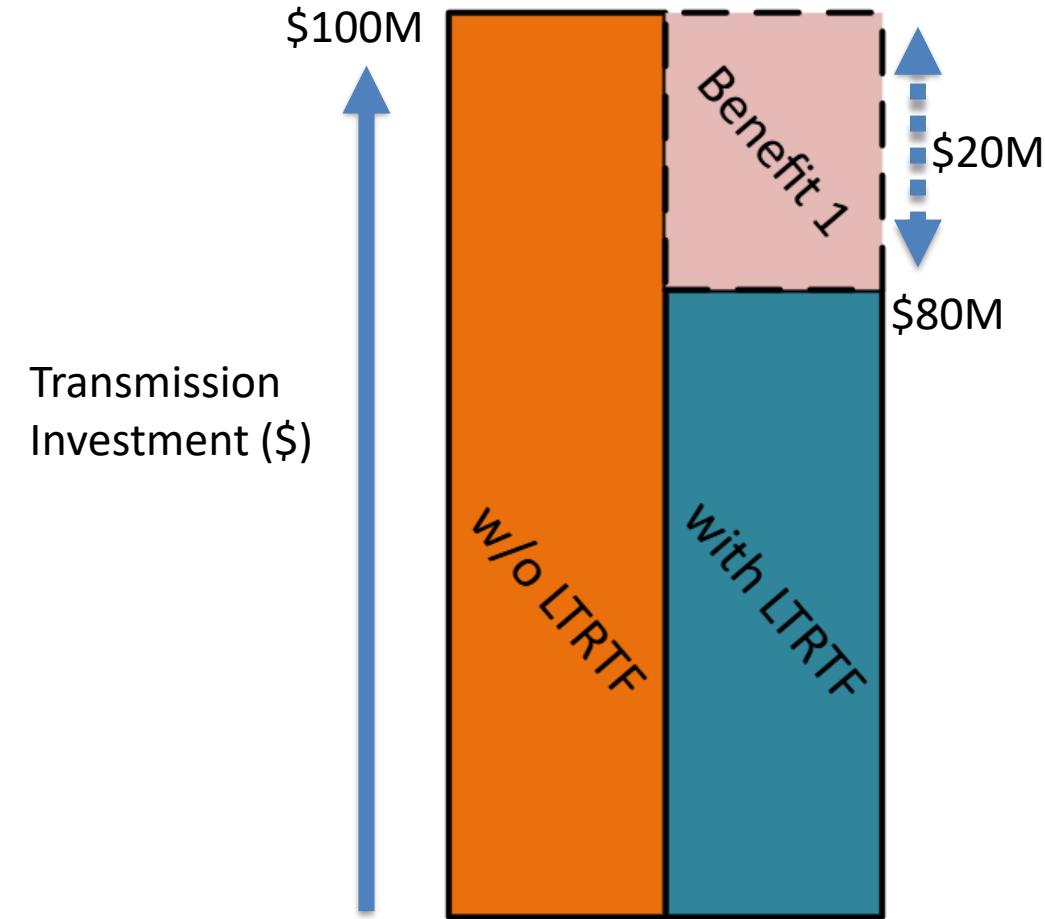
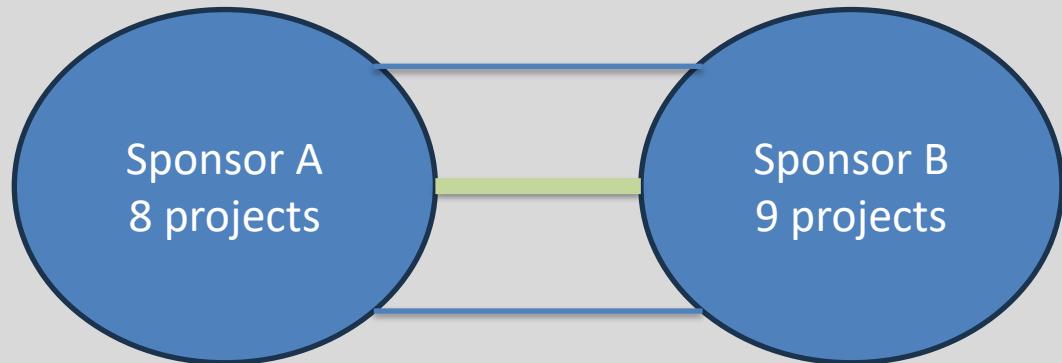
* Local Transmission Projects are projects proposed or planned by individual sponsors within the 20-year horizon that are NOT regional in nature

Benefit 1: Avoided/Deferred Transmission & Aging Infrastructure Replacements

Without LTRTF



With LTRTF



Benefit 1: Measurement

“...the reduced costs due to avoided or delayed transmission investment otherwise required to address reliability needs or replace aging transmission facilities.”

- (Par. 745 of 1920)

$$\textit{Benefit}_1 = \textit{Avoided/Delayed_Tx_Projects}(\$) - \textit{New_Reliability_Tx_Projects}(\$)$$

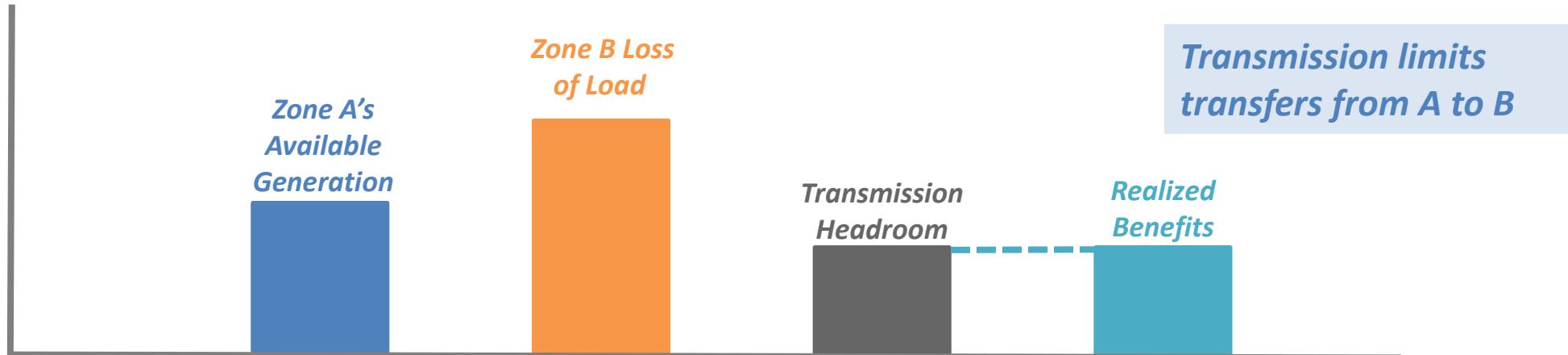
Notes:

- “New_Reliability_Tx_Projects” are projects that would be required to facilitate the LTRTF to maintain transmission reliability criteria
- Credited as annualized avoided cost of identified project in Reference case; not embedded in production-cost savings

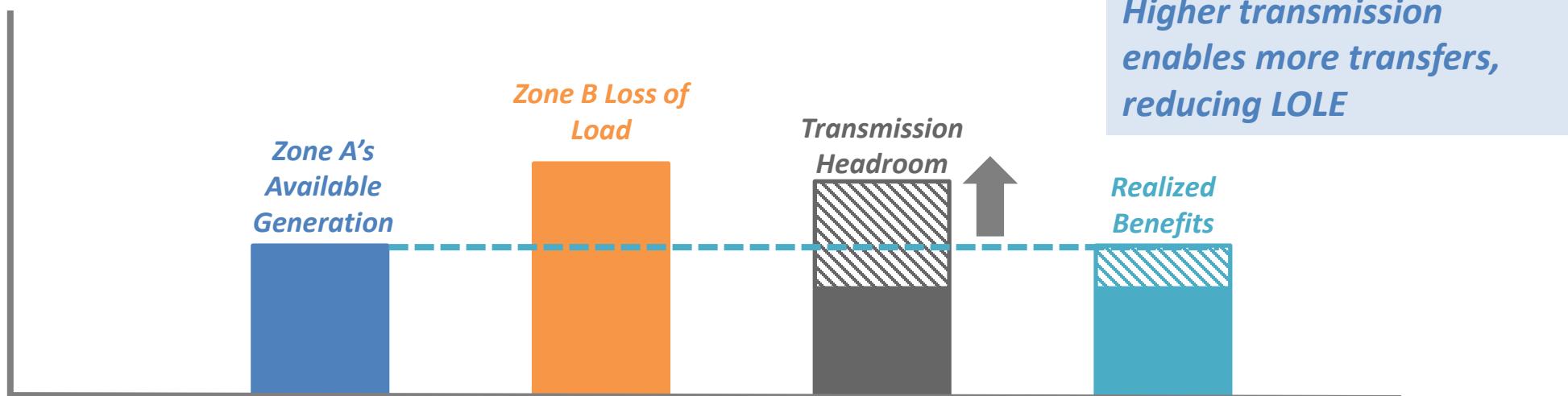
Benefit	Description	Model Used
Loss of Load Probability & Reduced Planning Reserve Margins	Enhanced system reliability associated with LTRTF(s) that result in increased transmission transfer capability during times of need.	Resource Adequacy

Benefit 2: Reduced Loss of Load Probability...

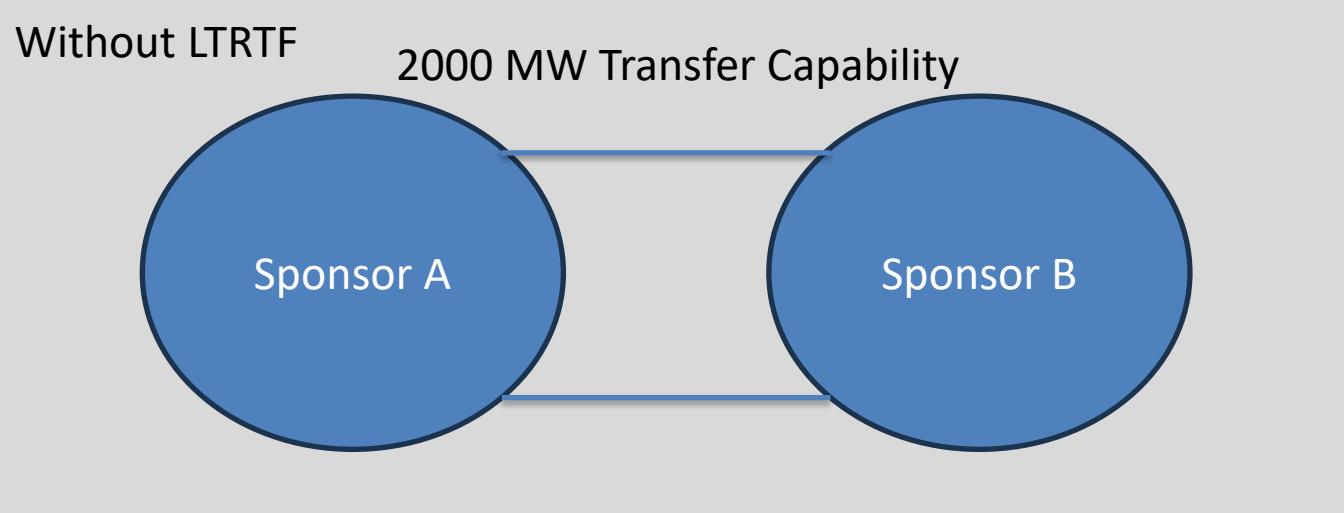
Reference Case



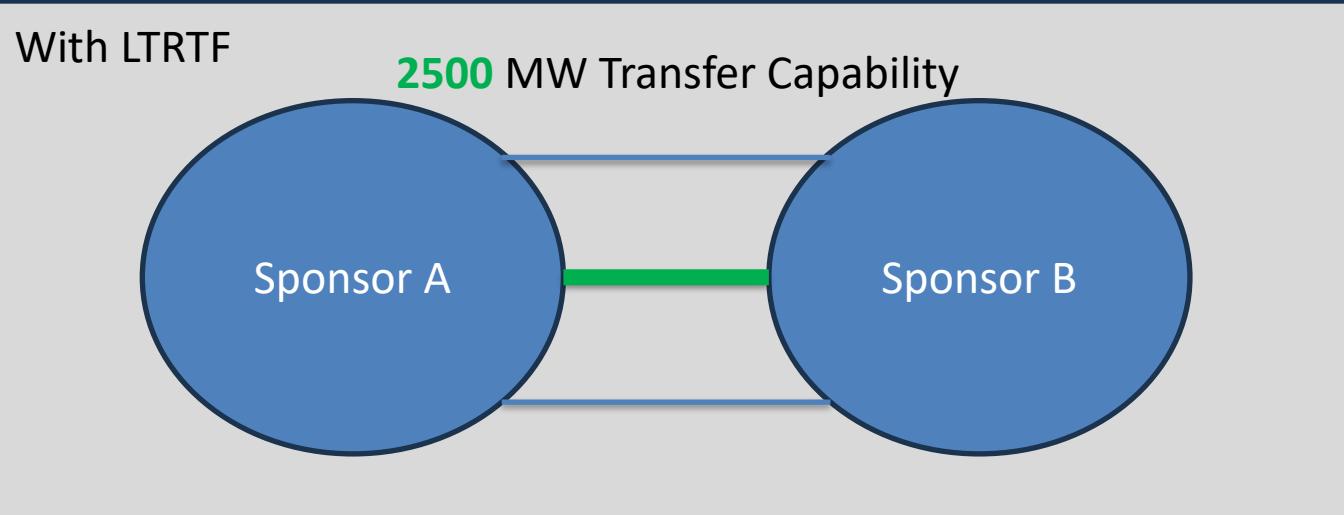
Change Case



Benefit 2: Reduced Loss of Load Probability...



Sponsor	Loss Of Load Expectation	EUE (MWh)
A	1 event in 10 years	6,000
B	1 event in 10 years	7,000



Sponsor	Loss Of Load Expectation	EUE (MWh)
A	1 event in 15 years	3,000
B	1 event in 12 years	5,000

Benefit 2a: Measurement

“One method of measuring a reduction in loss of load probability benefit is to quantify the incremental increase in system reliability by determining the reduction in expected unserved energy between the base case and the change case, determining the value of lost load, and multiplying these two values to obtain the monetary benefit of enhanced reliability associated with a Long-Term Regional Transmission Facility or a portfolio of Long-Term Regional Transmission Facilities.”

- (Par. 756 of 1920)

$$\textit{Benefit}_{2a} = \Delta EUE (MWh) * VoLL(\frac{\$}{MWh})$$

Notes:

EUE = Expected Unserved Energy

VoLL = Value of Lost Load

Benefit 2b: Measurement

“...the reduction in capital costs of generation needed to meet resource adequacy requirements (i.e., planning reserve margins) while holding loss of load probability constant.”

- (Par. 758 of 1920)

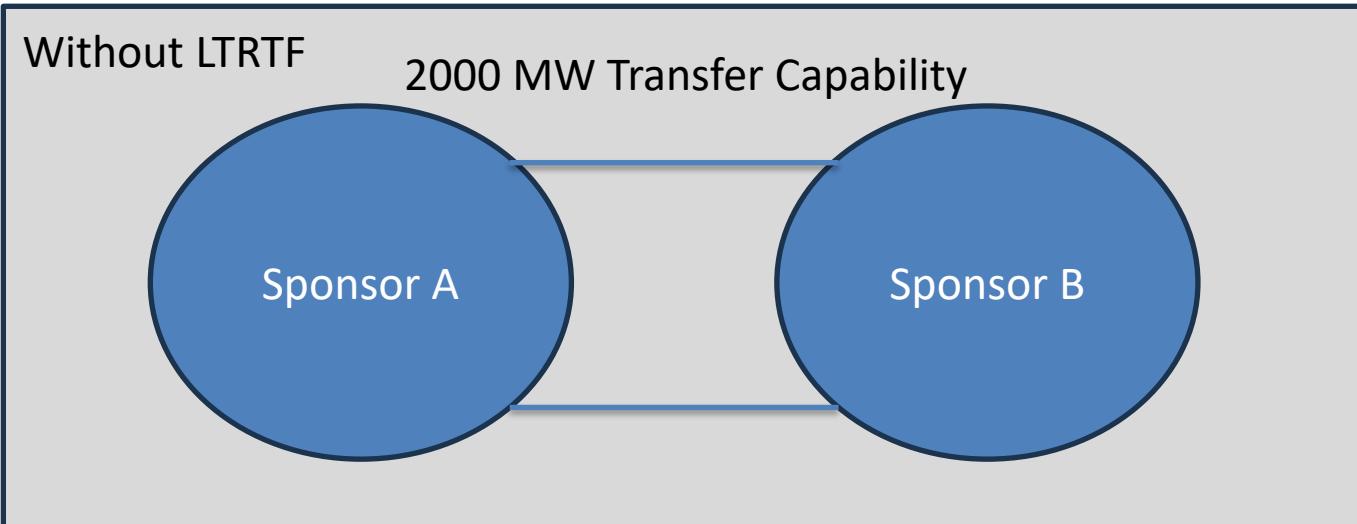
$$Benefit_{2b} = Avoided_Capacity(kW) * Capacity_Cost \left(\frac{\$}{kW - yr} \right)$$

Note: “Avoided_Capacity” is the Capacity required to get Reference Case LOLE equal to Change Case LOLE

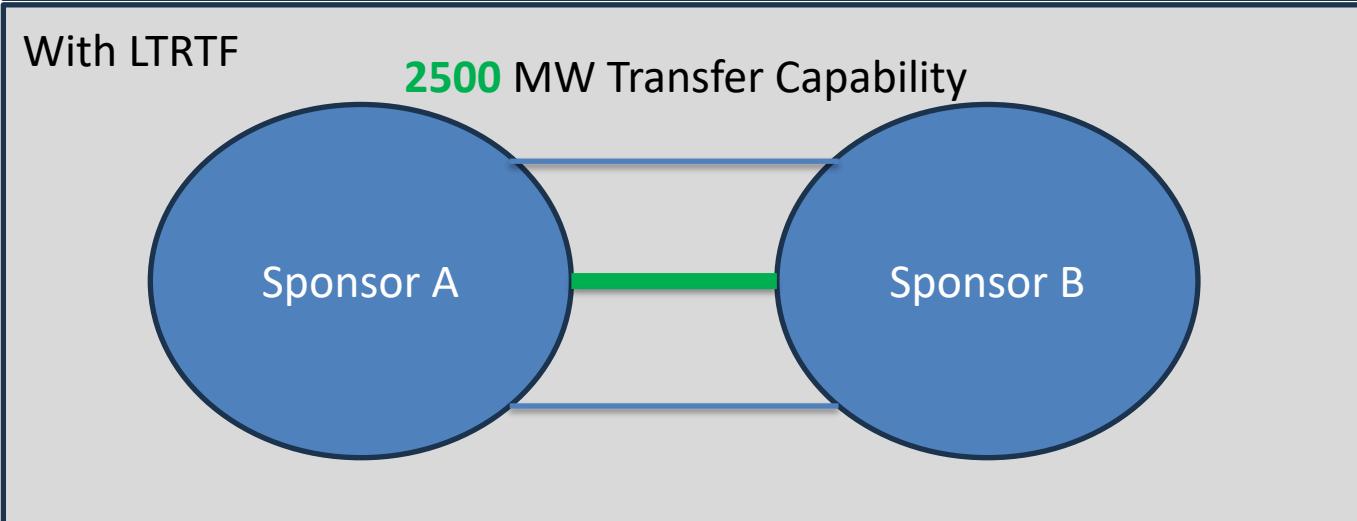
Benefit 3 Overview

Benefit	Description	Model Used
Production Cost Savings	Fuel & variable O&M cost savings associated with LTRTF(s) that enhance the ability to dispatch generation units more economically.	Production Cost

Benefit 3: Production Cost Savings



Flow	Average Savings (\$/MWh)	Power Traded (MWh)	Total Savings (\$k)
A → B	5	3,000,000	15,000
B → A	10	5,000,000	50,000



Flow	Average Savings (\$/MWh)	Power Traded (MWh)	Total Savings (\$k)
A → B	5	5,000,000	25,000
B → A	10	8,000,000	80,000

Benefit 3: Measurement

“...savings in fuel and other variable operating costs of power generation that are realized when transmission facilities allow for displacement of higher-cost supplies through the increased dispatch of suppliers that have lower incremental costs of production, as well as a reduction in market prices as lower-cost suppliers set market clearing prices.”

- (Par. 767 of 1920)

$$\mathbf{Benefit_3} = \Delta \mathit{Adjusted_Production_Cost}(\$)$$

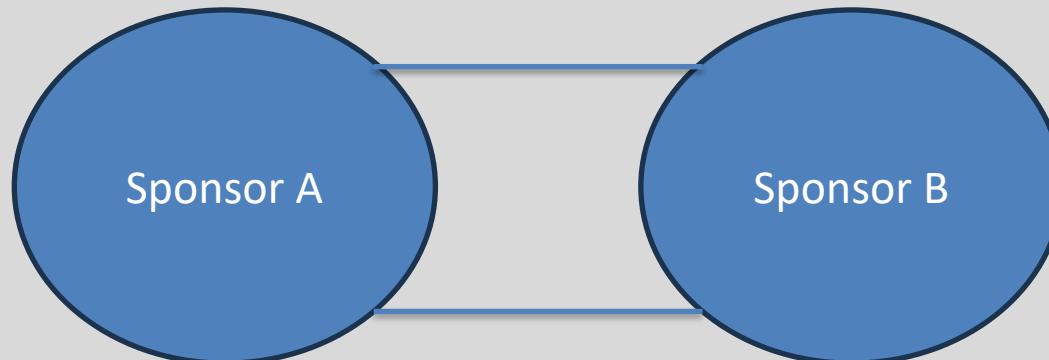
Note: Normal-conditions hours only; excludes transmission outage and extreme-event hours (see Benefits 5 & 6)

Benefit 4 Overview

Benefit	Description	Model Used
Reduced transmission losses	Fuel & variable O&M cost savings associated with LTRTF(s) that reduce total energy generation needed to meet demand by reducing transmission losses.	AC Loadflow or Production Cost

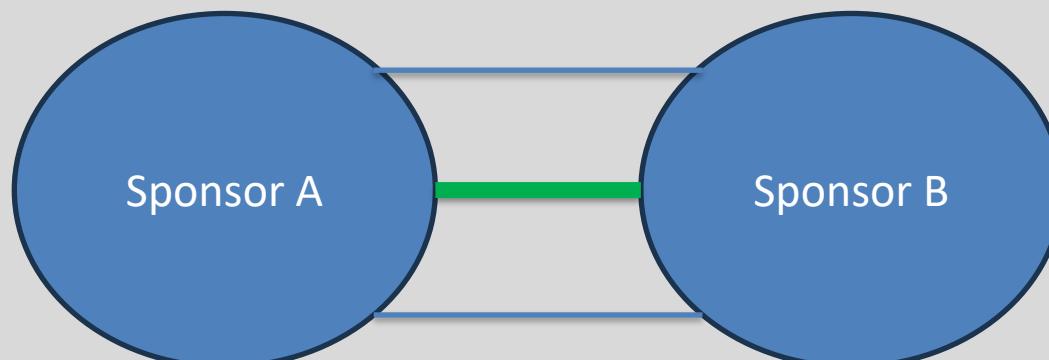
Benefit 4: Reduced Transmission Losses

Without LTRTF



Sponsor	System Load (GWh)	System Loss Factor (%)	Energy Losses (GWh)
A	100,000	4	4,000
B	150,000	5	7,500

With LTRTF



Sponsor	System Load (GWh)	System Loss Factor (%)	Energy Losses (GWh)
A	100,000	3	3,000
B	150,000	4	6,000

Benefit 4: Measurement

“...the reduced total energy necessary to meet demand stemming from reduced energy losses incurred in transmittal of power from generation to loads.”

- (Par. 781 of 1920)

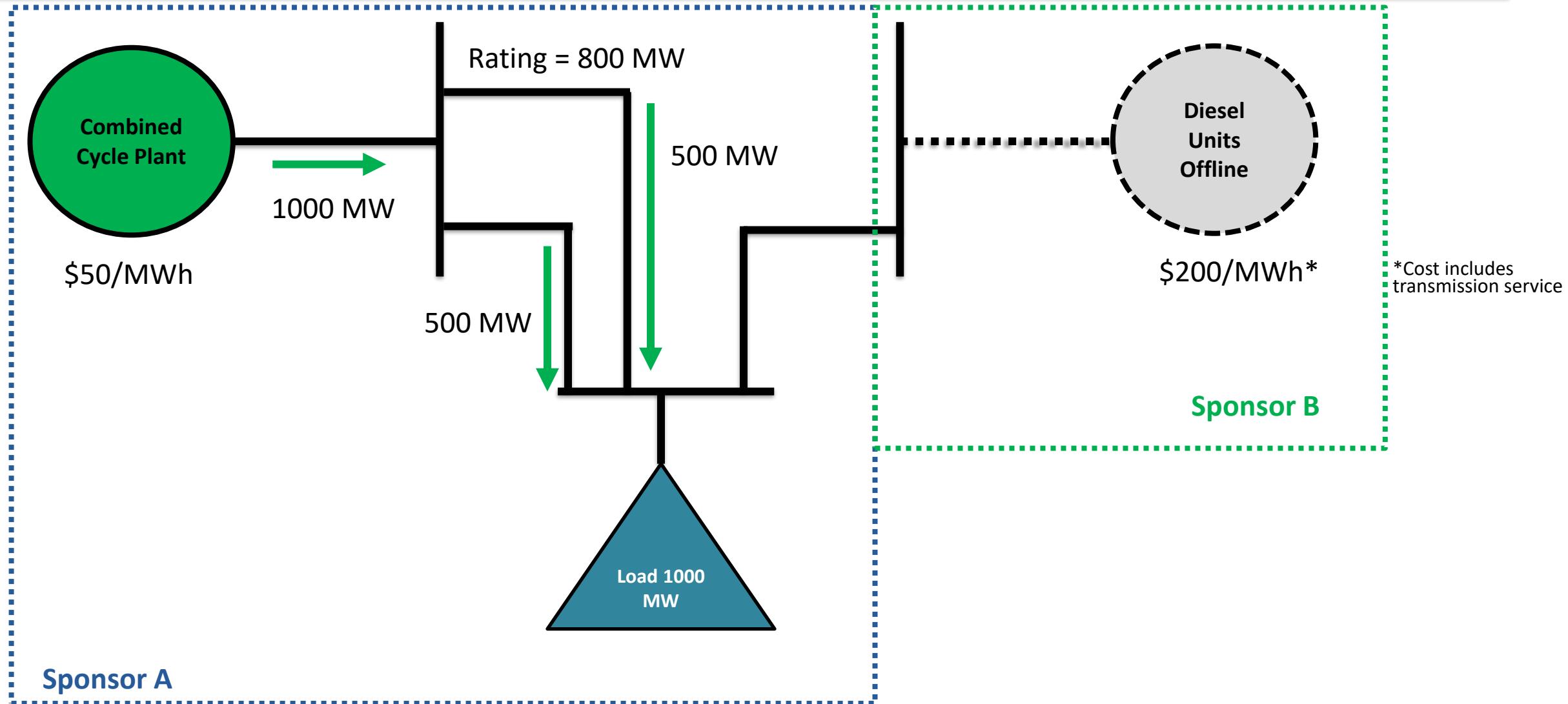
$$\text{Benefit}_4 = \Delta \text{Losses}(\text{MWh}) * \text{Marginal Dispatch Cost}(\frac{\$}{\text{MWh}})$$

Note: Counted separately from production-cost savings

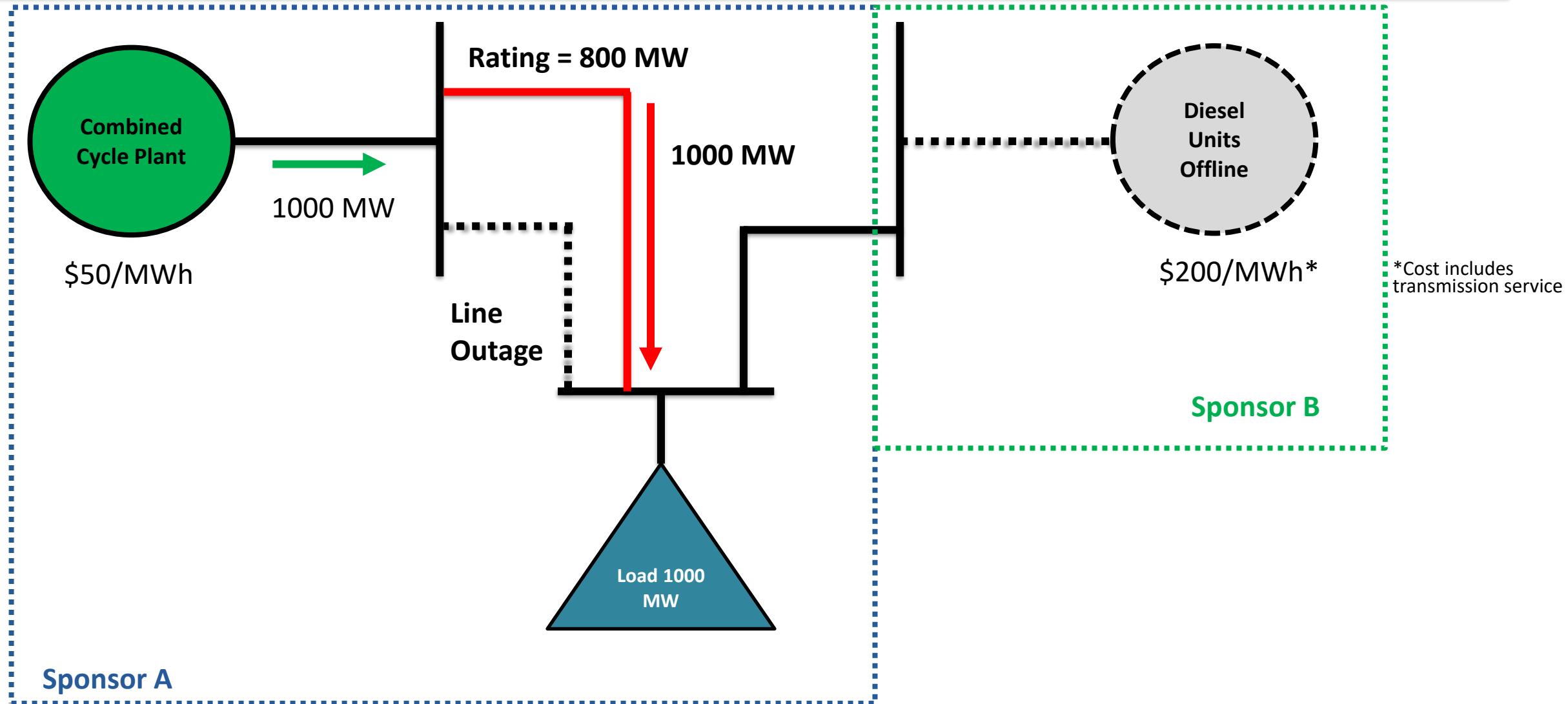
Benefit 5 Overview

Benefit	Description	Model Used
Reduced Congestion Due to Transmission Outages	Fuel & variable O&M cost savings associated with LTRTF(s) that reduce the extra cost incurred during periods of transmission outages that constrain economic dispatch.	Production Cost

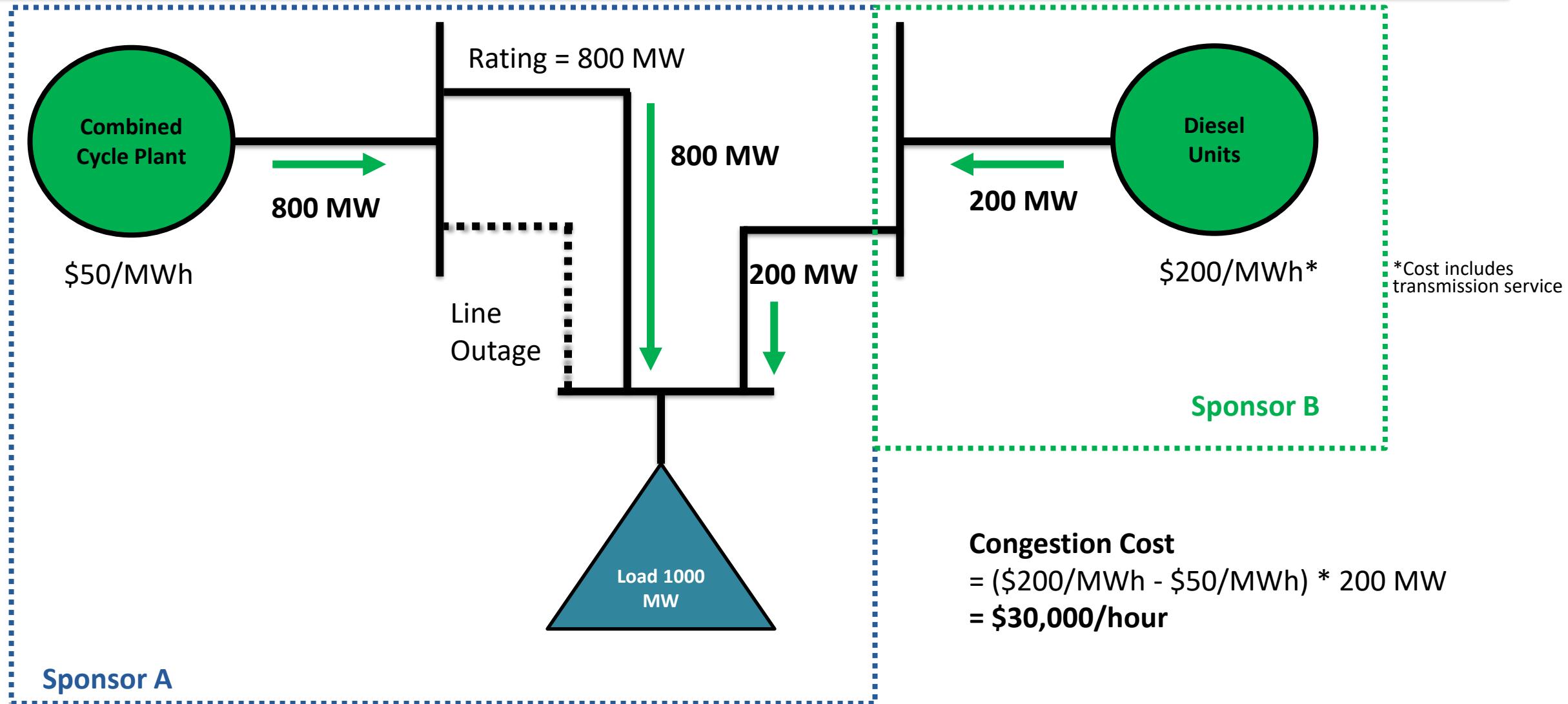
Benefit 5: Reduced Congestion Due to Transmission Outages (EXAMPLE)



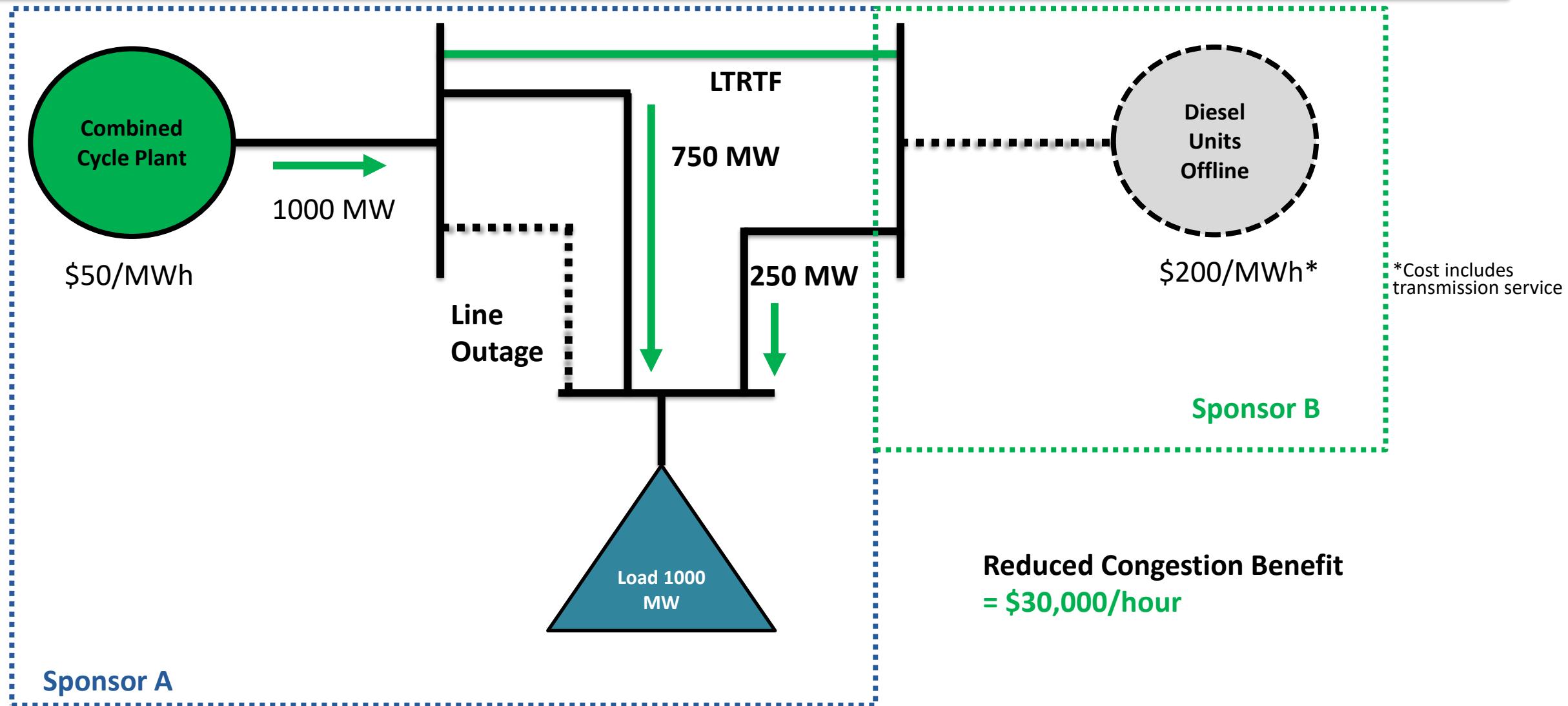
Benefit 5: Reduced Congestion Due to Transmission Outages (EXAMPLE)



Benefit 5: Reduced Congestion Due to Transmission Outages (EXAMPLE)



Benefit 5: Reduced Congestion Due to Transmission Outages (EXAMPLE)



Benefit 5: Measurement

“...reduced production costs resulting from avoided congestion during transmission outages.”

- (Par. 788 of 1920)

“Because Benefit 3, Production Cost Savings, as described in this rule does not capture production cost savings during transmission outages, we require transmission providers to measure and use Benefit 5 to ensure that they are accounting for reduced production costs during transmission outages as well.”

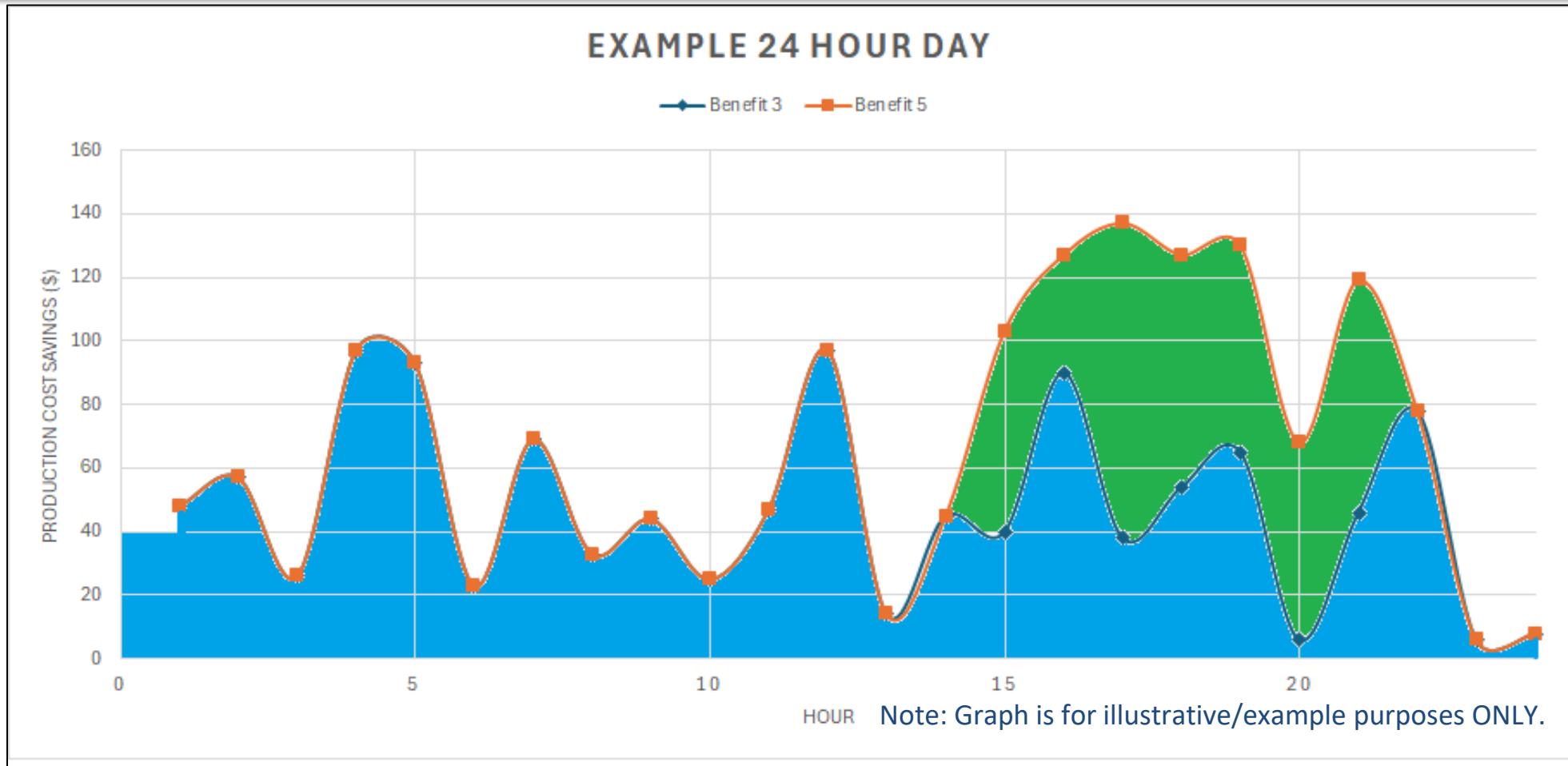
- (Par. 789 of 1920)

$$\textit{Benefit}_5 = \Delta \textit{Average_Congestion_Cost}$$

Notes:

- “Average” refers to the average results from outage simulations
- Outage-hour savings only

Benefit 3 & 5 Overlap Example and Mitigation



- Example of a 24-hour day with a 7-hour transmission outage causing congestion
- Same time period has been run without transmission outages for benefit 3.
- Benefit 5 is targeting the incremental value of the LTRTF during times of outages

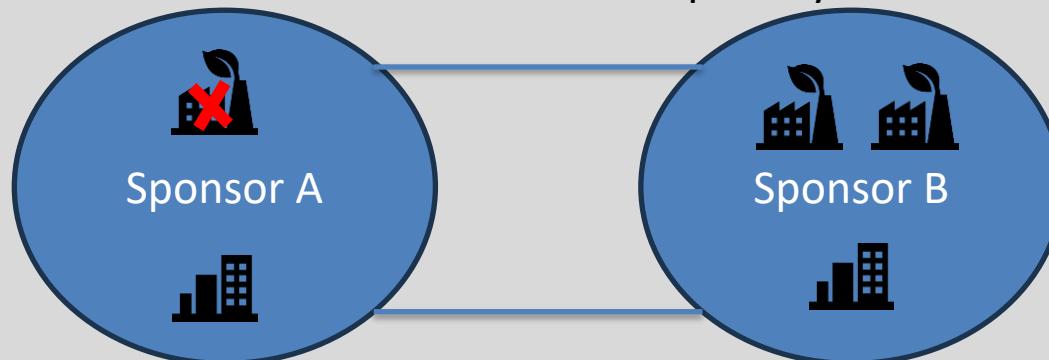
Benefit 6 Overview

Benefit	Description	Model Used
Mitigation of Extreme Weather Events /Unexpected Events	Fuel & variable O&M cost savings and reduced loss of load associated with LTRTF(s) that provide access to less expensive and available generation during extreme weather or other unexpected system conditions.	Resource Adequacy or Production Cost

Benefit 6: Mitigation of Extreme Weather Events /Unexpected Events

Without LTRTF

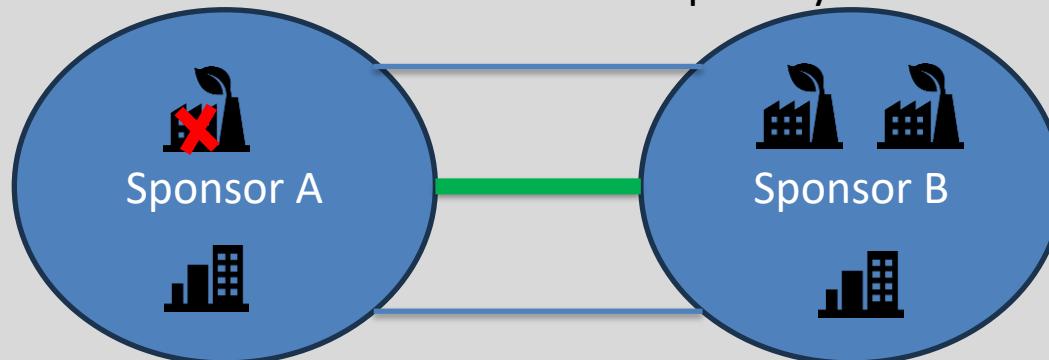
2000 MW Transfer Capability



Sponsor	EUE (MWh)	Prod Cost during event (\$k)
A	4,000	10,000
B	5,000	15,000

With LTRTF

2500 MW Transfer Capability



Sponsor	EUE (MWh)	Prod Cost during event (\$k)
A	2,000	8,000
B	3,000	11,000

Benefit 6: Measurement

“...reduced production costs and reduced loss of load (or emergency procurements necessary to support the system), including due to increased Interregional Transfer Capability, during extreme weather events and unexpected system conditions, such as unusual weather conditions or fuel shortages that result in multiple concurrent and sustained generation and/or transmission outages.”

- (Par. 800 of 1920)

$$\text{Benefit}_6 = \Delta \text{Adjusted_Production_Cost}(\$) + \Delta \text{EUE(MWh)} * \text{VoLL}(\frac{\$}{MWh})$$

Note: Adjusted Production Cost & EUE for Benefit 6 are only measured during the hours of extreme weather / unexpected system conditions and are incremental to the benefits seen for Benefit 3 for the same time period under normal conditions.

Benefit	Description	Model Used
Capacity Cost Benefits from Reduced Peak Energy Losses	Cost savings associated with LTRTF(s) that reduce peak system losses, thereby reducing the amount of reserve capacity needed on-peak.	AC Loadflow

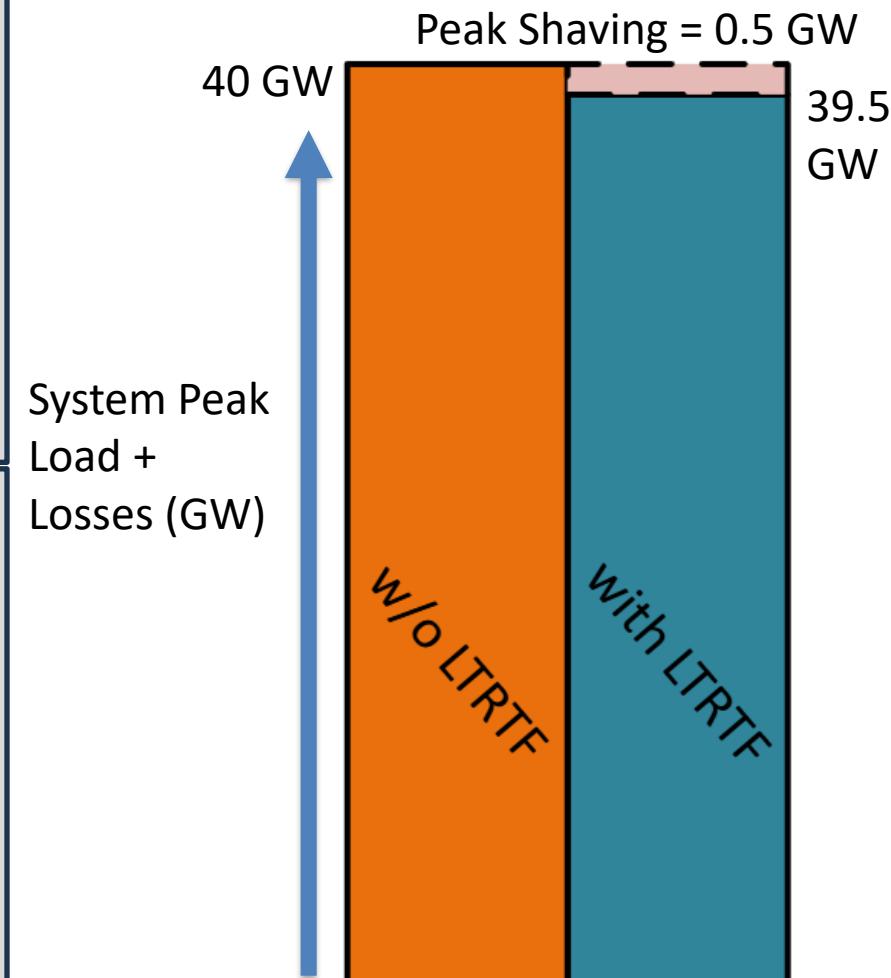
Benefit 7: Capacity Cost Benefits from Reduced Peak Energy Losses

Without LTRTF

Sponsor	System Peak Load + Losses (MW)	Gen Capacity needed for 20% Planning Reserve Margin (MW)
A	10,000	12,000
B	30,000	36,000

With LTRTF

Sponsor	System Peak Load + Losses (MW)	Gen Capacity needed for 20% Planning Reserve Margin (MW)
A	9,750	11,700
B	29,750	35,700



Benefit 7: Measurement

“...reduced generation capacity investment needed to meet peak load.”

- (Par. 817 of 1920)

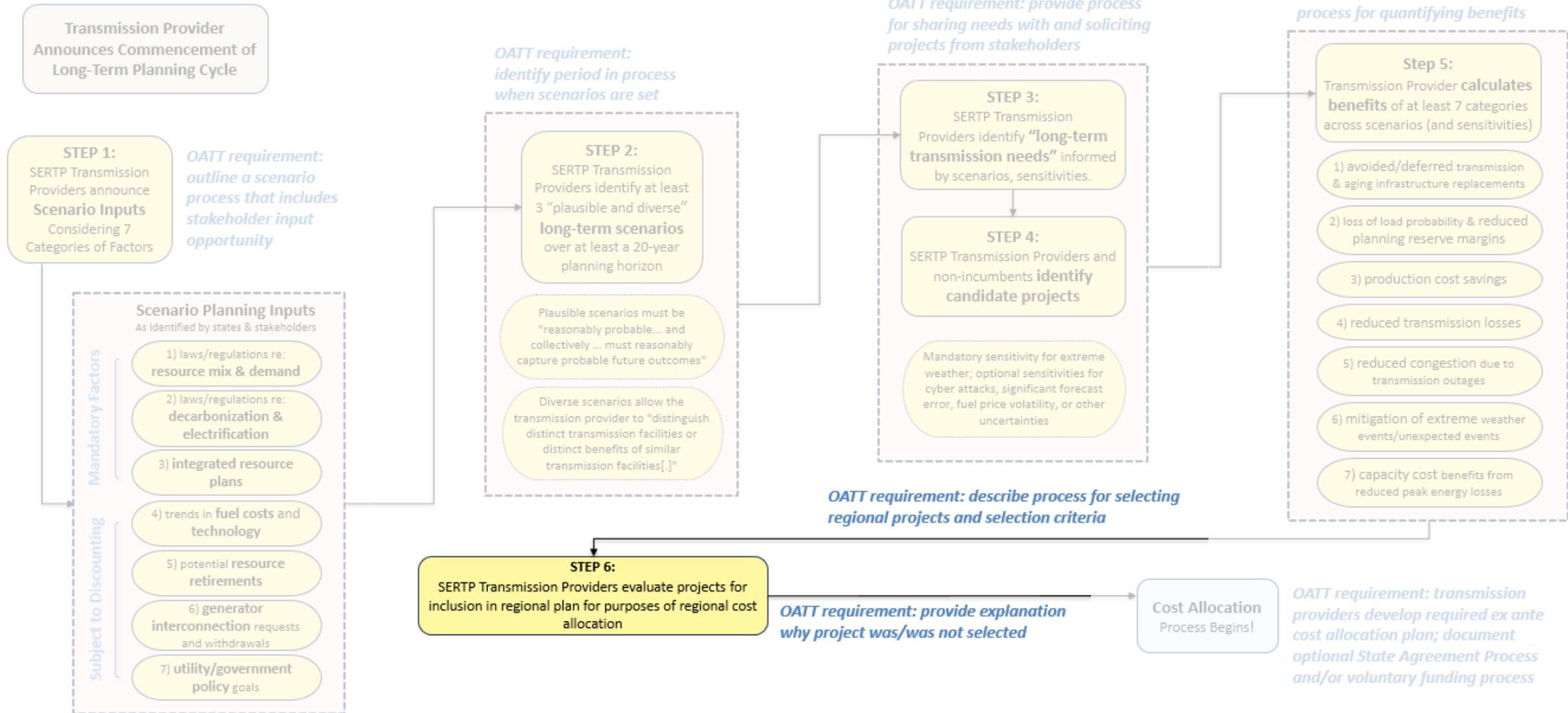
$$Benefit_7 = \Delta Peak_Gen_Capacity_Required * Capacity_Cost \left(\frac{\$}{kW - yr} \right)$$

$$BCR_{Scenario_n} = \frac{B1_n + B2_n + B3_n + B4_n + B5_n + B6_n + B7_n}{Cost\ Estimate}$$

10 Minute Break

Selection Criteria

Step 6: Evaluate and Select Projects



Example of Benefit Calculation

LTRTF 1

SCENARIO 1

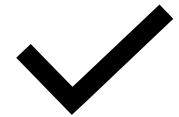
Sponsor	BENEFITS 1-7 (\$)
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
Total	

SCENARIO 2

Sponsor	BENEFITS 1-7 (\$)
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
Total	

SCENARIO 3

Sponsor	BENEFITS 1-7 (\$)
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
Total	



LTRTF COST



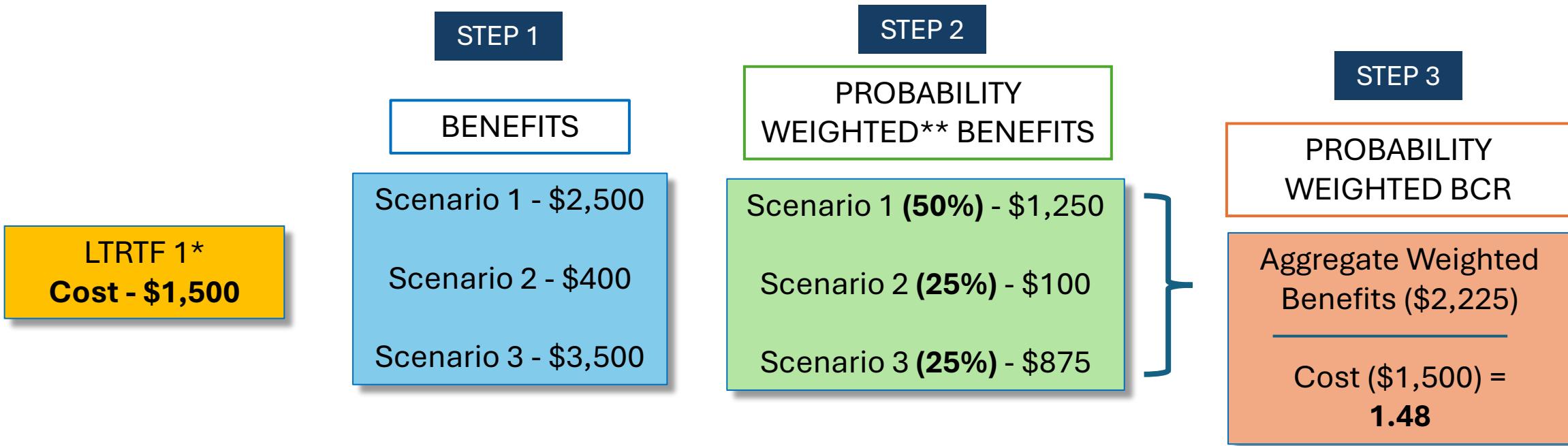
LTRTF BENEFITS



SELECTION
CRITERIA

Weighted Benefits Analysis

Whether the project meets or exceeds a 1.25 Benefit-to-Cost Ratio (BCR) based on its probability-weighted aggregate benefits, where probabilities have been assigned to each Long-Term Scenario studied.¹



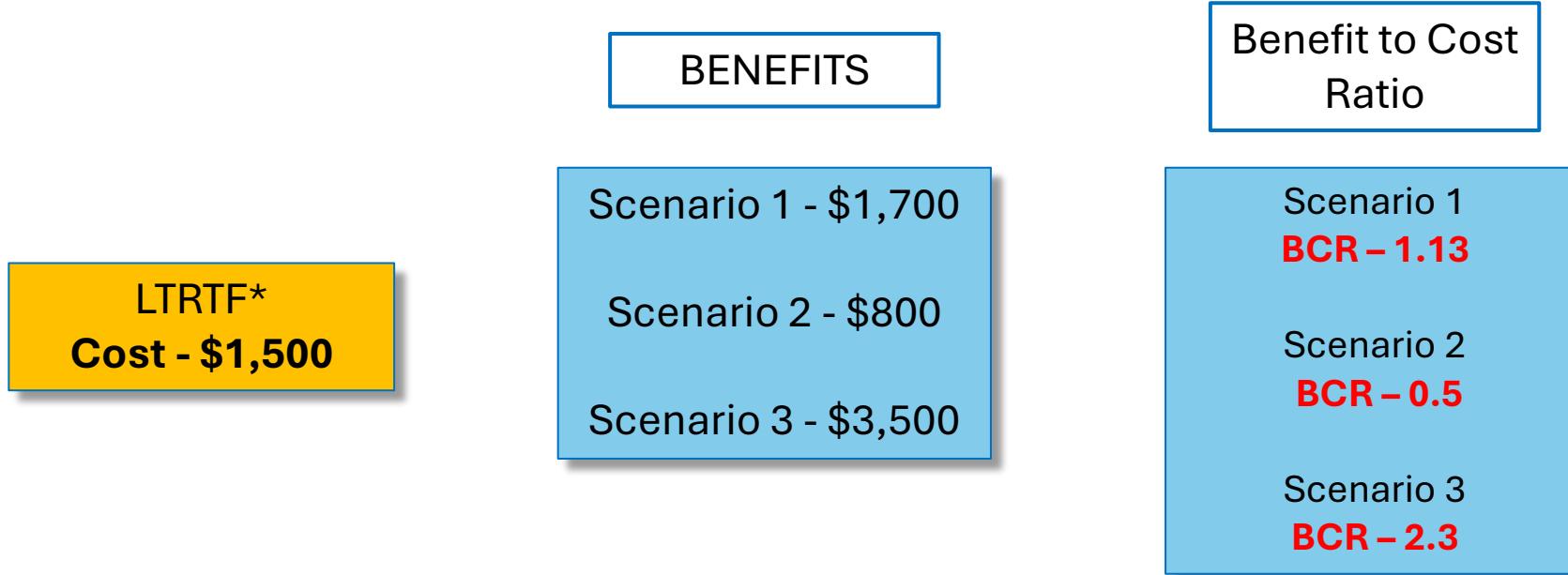
¹ Discussion of Weighted Benefits Analysis to address long-term planning uncertainty can be found in Order 1920 at ¶ 967; Order 1920-A at ¶ 424, 438.

*Example is for illustrative purposes only

**Probability to be assigned based on engineering judgment and other relevant factors; probability of all three Scenarios equals 100%

Least Regrets Analysis

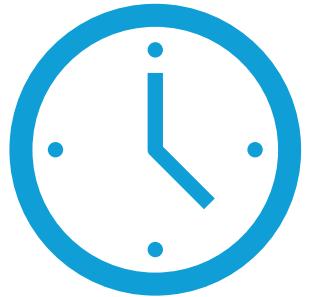
The extent to which an LTRTF is **net-beneficial in most or all Long-Term Scenarios**, even if other transmission facilities have more net benefits or a higher benefit-cost ratio in a single Long-Term Scenario.¹



¹ Discussion of Least Regrets Analysis to address long-term planning uncertainty can be found in Order 1920 at ¶ 967; Order 1920-A at ¶ 438.

*Example is for illustrative purposes only

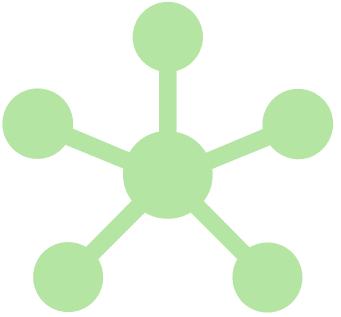
Timing of LTRTF



Whether the timeline for the LTRTF, considering the timing of the LTTN, permits consideration of the LTRTF in next long-term regional transmission planning cycle

Example: Long-term transmission need starts in 2040 and the construction/development timeline for the LTRTF is 5 years

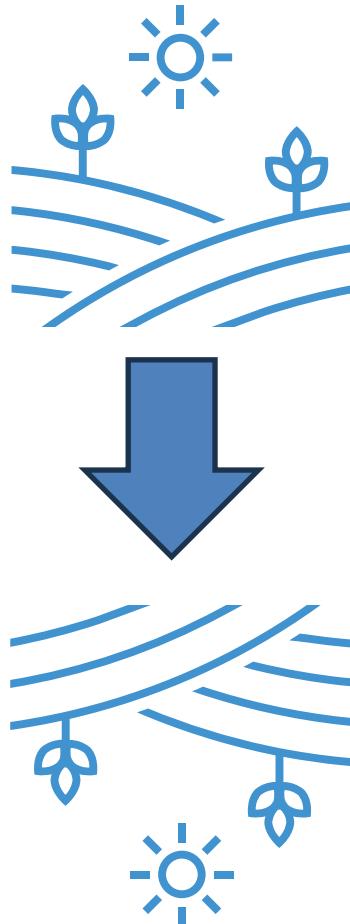
Disbursement of Benefits



The extent to which the benefits of the LTRTF are
dispersed among two or more Sponsors

Sponsor	% of Benefits
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
Total	100%

Resiliency to Potential Assumption Changes



The extent to which the outcome is resilient to potential changes in circumstances or underlying model data

Staleness of Model Data



The extent to which the model data supporting the benefit to cost ratio has become **stale** or **inaccurate** in a manner that would **materially impact the analysis**.

Executability



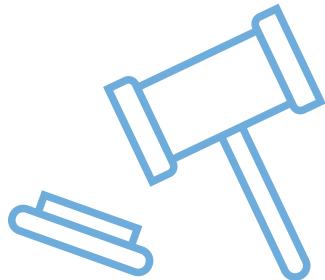
1. Is the developer **reasonably able to construct and tie-in the proposed transmission project** into the transmission system **by the required in-service date**, based on the timing for the identified transmission need(s) and the stages of project development.
2. Whether the **impacted Sponsor(s) will be able to construct and tie-in any additional facilities on their systems** located within the SERTP region that are necessary to reliably implement the proposed transmission project.

Financial Impact



Financial impact of the LTRTF to the impacted Sponsors and their customers

PSC/Government Authority



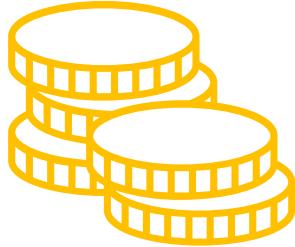
Any recommendation provided by state jurisdictional and/or governance authorities **including** whether the LTRTF is a viable project in the proposed jurisdiction(s).

Transmission Developer Qualification Information



Any updated qualification information regarding the transmission developer's finances or technical expertise.

No Unmitigated Costs



- No individual impacted Sponsor should incur increased, unmitigated costs from the LTRTF.
- An entity would incur increased, unmitigated costs should it incur more costs than displaced benefits as measured in the benefits calculation.

Selection Criteria

Factors considered in the selection determination include:

1. Weighted Benefits-to-Cost Ratio
2. Least Regrets Analysis (the extent to which benefits are present across all Scenarios)
3. Disbursement of benefits
4. Resilience to changes in circumstances or model data
5. Staleness of model data
6. Executability
7. Any recommendation provided by PSC/govt. authority
8. Whether timeline for project permits consideration in next LTRTP cycle
9. Financial impact
10. Updated transmission developer qualification information
11. No unmitigated costs to any Sponsor

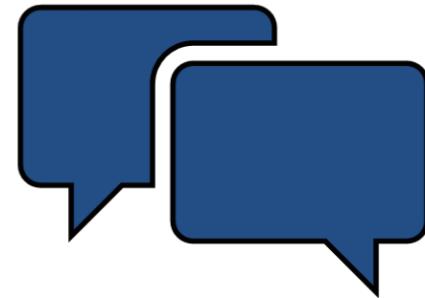
Order 1920 (Paragraph 969) states that qualitative and quantitative factors may be used.

Stakeholder Engagement: Future Events Schedule

Tentative Schedule of Engagement Sessions*:

- Spring 2026: Stakeholder requested discussion on Needs and Solutions
- Summer 2026: Stakeholder Coordination Engagement Process
- Fall 2026: Near-Final Long-Term Regional Transmission Planning Process

*Meeting topics and timeframes subject to change



Thank You!