Further Discussions on Highway Rate Design

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Topics For Discussion

I. The New Paradigm

II. One-Part Highway Rate Alternative

III. Access Rate to Highway

I. The New Paradigm

A.1 The Old (current) Paradigm

- Responsive (upon request) Sequential Planning
  - Reliability upgrades over next 10 years
  - GI from new generation needed to meet resource adequacy upon request
  - Transmission service from new generation to load upon request
- Economic Upgrades are viewed as projects that result in a more economic efficient use of the transmission grid.
  - Economic reduction of congestion
  - Substitution of coal fired generation for natural gas fired generation
  - Adjusted Production Cost Savings occurred on a zonal basis (not region wide)

Basic Principles for Economic Upgrades

1. **All economic upgrades must prove to be cost beneficial: Benefits > Costs**
   - Missouri Commission will **not** approve transmission upgrades whose allocation of costs exceed the expected benefits for Missouri Customers.
   - In a broader context, upgrades that do not provide more benefits to SPP than cost should **not** be included as priority projects.
2. **Benefits must be measurable in dollars to be included**.
   - Qualitative benefits may play a role on upgrades that are on the margin, but in general, benefits must be measurable in dollars in order to be comparable to the costs of the upgrades.
3. **Benefits from upgrades should be measured as ones that are added to system under the old paradigm.**
   - Difficulty with adding market-based resources that don't meet the old paradigm.

Uphill Battle: Economic Upgrades in Priority Projects using a Highway Rate

- Missing context of ITP
  - Priority Projects are being evaluated outside of a broader context of ITP.
  - Don't know what the future economics for these projects will be.
- Missing context of a portfolio of projects
  - Priority projects are selected upgrades characterized as "low hanging fruit," but low hanging fruit for whom?
  - Under the old paradigm benefits from single project are narrow (sub-regional), not region wide
- Missing context of a "no losers" mechanism
  - Allocating costs region wide without a "no losers" mechanism raises fundamental issues about having to pay costs that exceed expected benefits.
  - Don't know how this will be accepted by other State Commissions, but Missouri Commission will not support

Outside the Context of ITP How Should Economic Upgrades as Priority Projects Be Allocated?

- Economic Upgrades that are truly “low hanging fruit” should be Project Sponsored.
  - Project Sponsors would be eligible for revenue credits from future use.
  - Project Sponsors would obtain state approval of upgrades prior to inclusion in STEP plan.

A.2 The New Paradigm - ITP

- Possible Futures for Cost-Effective, Long-term Planning
  - Renewable Energy Mandates (RPS/RES)
    - Wind Generation, Solar, Bio-Mass, Kinetic Hydro
    - Energy Efficiency and Demand Response
  - Carbon Legislation
    - Carbon Capture and Sequestration
    - Nuclear Generation
    - Distributed Generation
  - Air Quality
  - Smart Grid
  - Price Sensitive Demand
  - Electric Transportation
  - Electric Storage
- Proactive Planning
  - Focus on Deliverability of Energy to the Market
    - Benefits are Regional and Not Local
  - Deliverability to Load in other Markets vs. Renewable Energy Credits (REC's)
  - Need to know states' plans under alternative futures

Impact of New Paradigm on Economic Upgrades

- Currently, economic upgrades provide very specific benefits as measured by adjusted production costs.
- Should these types of upgrades be thought of in a different way in order to be considered within the context of a highway rate; i.e., within the context of ITP?

  Do economic upgrades improve deliverability from a set of potential resources to the market?

Economic Upgrades Within Deliverability of Resources?

- Deliverability to the SPP Market
  - An upgrade can improve deliverability from generation resources to the SPP market.
    - Generally this means that lower cost power whose dispatch is restricted because of transmission constraints is now able to be dispatched more fully.
  - However, the cost-beneficial principle implies:
    - If the cost of the transmission upgrades exceed the savings from expanded dispatch, the result should be called “uneconomic deliverability.”

Improving Deliverability

- Basic Deliverability is the deliverability required in the Aggregate Study process to obtain long-term firm transmission service.
  - SPP applies contractual dispatch to determine base case power flows.
  - A new DR is then input into the power flow analysis and the "most expensive" DR of the load in the contractual dispatch is backed down.
  - This analysis is performed in an Aggregate Study context that applies this basic analysis to all transmission service requests.
  - Upgrades required by violations are then determined and must be added in order for the DR to be deemed deliverable to the load.
- Improved Deliverability can be thought of in terms of the ability of the transmission system to deliver energy from a Resource to a Load in such a way that the differences in the LMP at the Resource and at the Load (congestion costs) are lower when compared to basic deliverability.
  - The closer the LMPs at the Resource and Load, the more improved is the delivery

Note: Improved Deliverability can also be thought of as deliverability to the market: G→M.

Relationship to GI→L

(Generation Interconnection + Delivery to Load)

Step 1: Provide GI→Load (interconnection combined with basic deliverability) analysis as a foundation.

Step 2: (G→M) Add to basic deliverability a set of upgrades that will improve deliverability, subject to a cost benefit test; e.g., (see Appendix)

$$CC_{AU} - CC_{BU} > \text{Cost of Upgrades}$$

Step 3: Include these economic upgrades in the total package of upgrades that are funded through the Highway/Byway mechanism.

- This could include a Priority Project committed to by Project Sponsor if it meets the cost-benefit test.

B. GI→L

(Generation Interconnection plus Delivery)

- Clear benefit when state is subject to renewable energy mandate (e.g., RPS).
  - Economics will play a significant role as to what renewables are used to meet RPS.
  - Need inputs from each state as to range of SPP wind power to include in design of GI→L
- Two-part Highway rate to meet:
  - Differences in state use of G→L
  - Use of Renewable Energy Credits (RECs)

G→L in Priority Projects

- GI Cluster Study
  - Which of the upgrades in this study is most likely to remain at 345 kV?
  - Those eliminated
    - Hitchland to Woodward appears to require a 765 kV line, therefore not a good priority project candidate
    - Comanche Co to Wichita appears to need the 765 kV leg from Woodward to Comanche Co to provide a looped system, therefore not a good candidate.
    - Woodward to Northwest is already committed to as a reliability upgrade by OG&E.
    - Remaining 765 kV upgrades
  - Those remaining
    - Grapevine to Anadarko appears to intersect the approved BP Tuco to Woodward upgrade and feeds into a an existing loop of 345 structure – could be a likely candidate, but not clear what additional deliverability to SPP loads would be required.
    - Mingo to Knoll with a possible extension to Summit for deliverability along with the BP Spearville-Knoll-Axtel upgrades could be a likely candidate.
  - What wind groupings would interconnect to that upgrade?
    - Grapevine to Anadarko
    - Mingo to Knoll
  - How many MW of wind would be added?
- Added Analysis
  - SPP should run G→L for Grapevine to Anadarko and Mingo to Summit to determine what additional upgrades are needed for basic deliverability
  - SPP should evaluate economic upgrades as cost beneficial; i.e., moving to G→M: improved economic deliverability

C. Other Projects

- Priority Projects Also Include

  Transmission Service Requests – Any project that repeatedly appears in the Aggregate Study process as a known and needed upgrade to deliver transmission service for multiple parties will be considered.

  - At or above 345 kV upgrades will likely show up in G→L upgrades needed to deliver to Load.
  - Below 345 kV does not impact Highway rate.

  West – East 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 strongly connected to the rest of the system. Stronger transmission connections to deliver these resources could provide significant benefit to the region and beyond.

  - At or above 345 kV upgrades will likely show up in G→L upgrades needed to deliver to Load.
  - Below 345 kV does not impact Highway rate.

II. One-Part Highway Rate

A. Highway Rate for GI and Deliverability Upgrades

- Recall Proposal: SPP to develop upgrades required to meet Waxman proposal (20% renewable energy by 2020)
- 345 kV and above into a region-wide Highway rate.
- Focus here is on a one-part rate that would be either paid by loads, generators or by both.

One-Part Highway Rate

- Loads Pay:
  - Issue: Does not resolve the problems associated with deliverability of wind power.
    - Timing of upgrades and availability of deliverability to loads
    - Disproportionate delivery of wind power to loads
    - Ability of loads to purchase RECs without deliverability
- Generators Pay
  - Issue: Creates problems for
    - Existing contracts: No good way for loads to be charged by generators under existing contracts
    - Existing Market-Based Generators: Places a retroactive charge on these generators

Generators Included in Highway Rates

- All Generators serving loads as designated SPP resources – HOWEVER – the loads pay the charge, not the generators.
  - Alternative to 12 CP (load ratio share) method
- Any new generators interconnecting to the SPP grid.
  - Rate would be included as a part of the GI costs
  - If a transmission customer takes long-term transmission service from a generator, then the charge is included in the cost for that transmission service.
    - Rate would be added to any other costs from Aggregate Study
- For any existing transmission customer or generator that was directly assigned 345 kV costs, is eligible to receive revenue credits, and is paying this rate:
  - Directly assigned 345 kV and above costs would forgiven and rolled into the highway rate

What About Other Situations?

- Existing Market-Based Generation?
  - No highway rate charge to existing Market-Based Generation
  - When a Load designates an existing market-based generator as a resource, the load will be charged the highway rate in addition to its costs in the Aggregate Study process.
- Existing generation in SPP designated as a resource by external load?
  - Load is paying a PTP rate.
    - No change in this rate structure
    - These PTP revenues **would be used** as an offset to costs going into the Highway rate.
- Existing load in SPP designating generation external to SPP?
  - Load is paying a PTP rate to another TP for delivery to SPP
    - Load with already approved long-term firm SPP transmission service would not pay Highway charge
    - Load seeking to obtain long-term firm SPP transmission service would have the Highway charge which would be included in its Aggregate Study costs

Rate Impacts

Equal New Generation Added to Internal Users

	Load	Designated Resources	New Gen	Total	$1.136 Highway Rate Revenues	Average Rate
User A	5,000	5,700	750	6,450	$87,955	$1.466
User B	5,000	5,700	750	6,450	$87,955	$1.466
M-B Gen			**200**	**200**	**$2,727**	
PTP			**100**	**100**	**$1,364**	
	10,000	11,400	1,800	13,200	$180,000	

Unequal New Generation Added to Internal Users

	Load	Designated Resources	New Gen	Total	$1.136 Highway Rate Revenues	Average Rate
User A	5,000	5,700	500	6,200	$84,545	$1.409
User B	5,000	5,700	1,000	6,700	$91,364	$1.523
M-B Gen			**200**	**200**	**$2,727**	
PTP			**100**	**100**	**$1,364**	
	10,000	11,400	1,800	13,200	$180,000	

Advantages Of One-Part Rate

- Includes existing 345 kV upgrades that have been directly assigned through Aggregate Study
- Simple to administer for SPP
  - Include highway rate charges in GI study or Aggregate Study
    - The cost from any 345 kV and above upgrades from the GI or Aggregate Study process would be rolled into the highway rate
    - This charge would be subtracted from the total costs when applying the safe harbor limit
  - Highway Rate changes as more investment in Highway facilities takes place
    - Don’t have to estimate the rate based on expected future costs
    - Easy to determine the denominator in the rate = generation designated as resource in SPP + new generation

Comparison to Two-Part Rate

- Also not difficult to administer
  - Access charge applies to all new generation connecting to SPP System
  - Set rate to equal average rate paid by load (see section III of presentation) with rate changing as more costs are rolled into Highway rate over time.
- Don’t have to be concerned with “exceptions”
  - Could include an option for directly assigned 345 kV Cost; i.e.,
    - Directly assigned costs are tolled into Highway Rate
    - TC is forgiven directly assigned costs and pays access fee

III. ACCESS CHARGE TO HIGHWAY

Previous Two-Part Rate Proposal

- Highway = 345 kV and above upgrades required for interconnection and delivery of 20% renewable energy by 2020 to all load in SPP.
  - Funded by a region-wide postage stamp rate (PSR)
- Generator Access Charge (GAC) to Highway equal to 50% of total cost divided by total renewable capacity.
  - Levied on all new generation interconnections
  - Approximately the same as the region-wide postage stamp rate on a $/kW-month

Previous Issue

Issue: Should the GAC be established at a fixed rate or allow it to decrease with the PSR (postage stamp rate)

- Fixed Rate results in GAC above the average rate paid by Internal Load
- Equal to PSR results in GAC below the average rate paid by Internal Load
- Third alternative: set GAC equal to the average rate paid by internal SPP load.

Terminology

MW_E = MWs of new generation connected in SPP but not designated by loads Internal to SPP

MW_I = MWs of new generation designated by load INTERNAL to SPP

ARR = levelized annual revenue requirement for transmission upgrades

L = MWs of Load

Proposal

Set the GAC so that it is equal to the Average Rate paid by Internal Load

Rate Formulas	
$GAC = \frac{[ARR/(L + MW_E)]}{1{,}000}$	GAC = Generator Access Charge ARR = Annual Revenue Requirement L = Annual Load (12 CP)*(12 MO) MW_E = (Generator MW External)*(12 MO)
$PSR = GAC*[1-(MW_I/L)]$	PSR = Postage Stamp Rate MW_I = (Gemerator MW Internal)*(12 MO)

RATE CALCULATIONS		
ARR		$188,400,000
L	10,000	120,000
MW_E	300	3,600
MW_I	1,500	18,000
GAC		$1.524
PSR	0.85	$1.296

Example Calculations

Equal Internal Usage with External Use: GAC = LOAD AVG RATE

		$1.524	$1.296			
	Gen MW	Usage Fees	12 CP Load	Postage Stamp	Total Payments	Average Rate
User A	750	$13,718,447	5,000	$77,737,864	$91,456,311	$1.524
User B	750	$13,718,447	5,000	$77,737,864	$91,456,311	$1.524
M-B Gen	200	$3,658,252	0	$0	$3,658,252	$1.524
PTP	100	$1,829,126	0	$0	$1,829,126	$1.524
Total	1,800	$32,924,272	10,000	$155,475,728	$188,400,000	$1.570

Unequal Internal Usage with External Use: GAC = LOAD AVG RATE

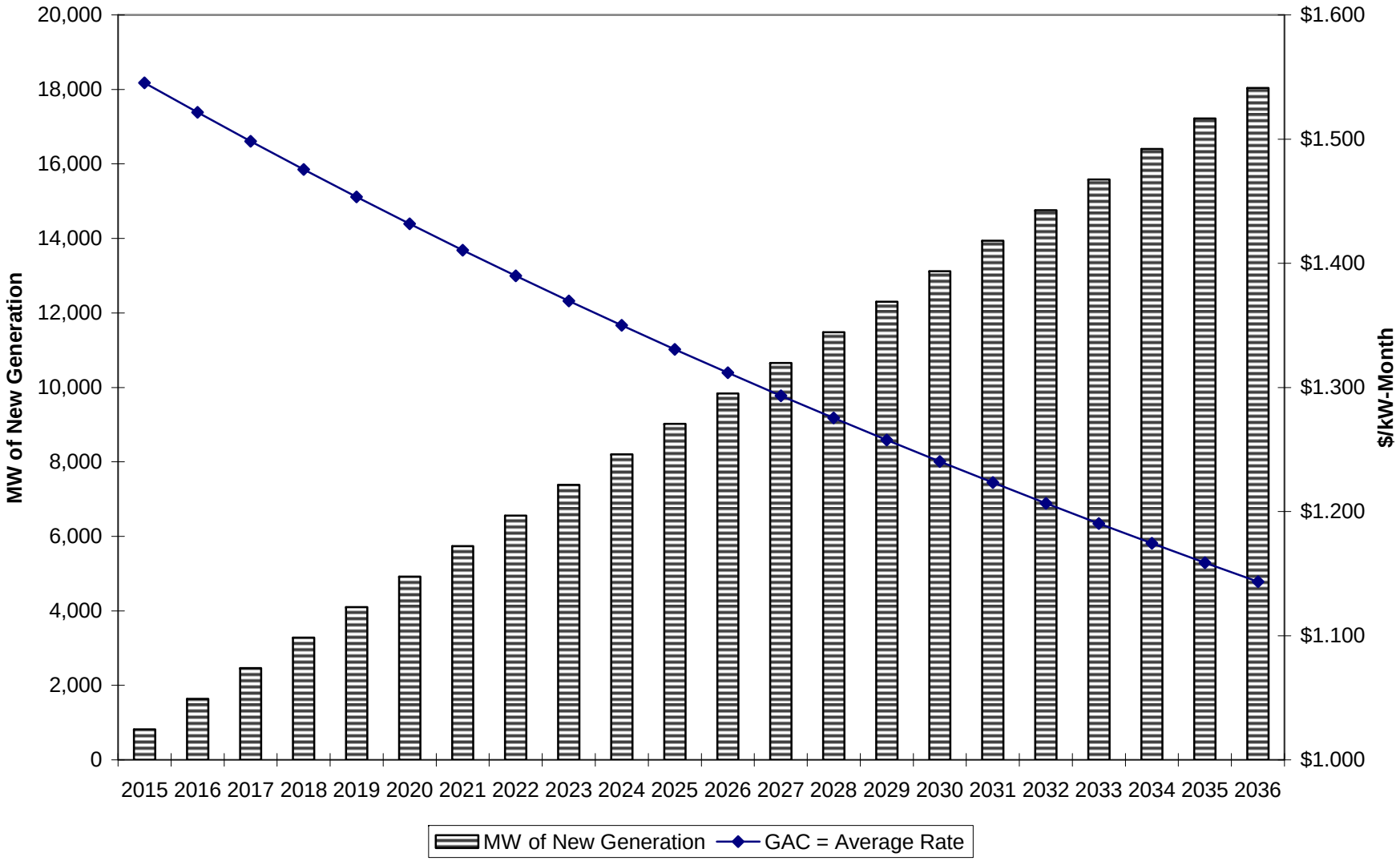
		$1.524	$1.296			
	Gen MW	Usage Fees	12 CP Load	Postage Stamp	Total Payments	Average Rate
User A	500	$9,145,631	5,000	$77,737,864	$86,883,495	$1.448
User B	1,000	$18,291,262	5,000	$77,737,864	$96,029,126	$1.600
Internal	1,500	$27,436,893	10,000	$155,475,728	$182,912,621	$1.524
M-B Gen	200	$3,658,252	0	$0	$3,658,252	$1.524
PTP	100	$1,829,126	0	$0	$1,829,126	$1.524
External	300	$5,487,379	0	$0	$5,487,379	$1.524
Total	1,800	$32,924,272	10,000	$155,475,728	$188,400,000	$1.570

Impact on GAC = Avg Rate from Adding New Generation

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
ARR	Input	Input	Input	([0]*1,000) ÷ ([1]+[3])	[4]*[2]/1,000 Millions	[4]*[3]/1,000 Millions	1-[2]/[4]	[7]*[4]	[8]*[1]/1,000 Millions	[5] + [9] Millions	1,000*[10] ÷ [1]	[6] + [10] or [5}+[6]+[9]
$663.250	Load (MW)	Gen (MW)	Gen (MW)	GAC	Internal	External		PSR		Total Load	Load	Total
Year	(12 CP)*12	Internal	External	$/kW-MO	Revenues	Revenues	%	$/kW-MO	Revenues	Revenues	Avg Rate	Revenues
2015	426,731	7,380	2,460	$1.545	$11.405	$3.802	98.27%	$1.52	$648.044	$659.448	$1.545	$663.250
2016	430,998	14,760	4,920	$1.522	$22.457	$7.486	96.58%	$1.47	$633.307	$655.764	$1.522	$663.250
2017	435,308	22,140	7,380	$1.498	$33.171	$11.057	94.91%	$1.42	$619.022	$652.193	$1.498	$663.250
2018	439,661	29,520	9,840	$1.476	$43.557	$14.519	93.29%	$1.38	$605.173	$648.731	$1.476	$663.250
2019	444,058	36,900	12,300	$1.453	$53.629	$17.876	91.69%	$1.33	$591.745	$645.374	$1.453	$663.250
2020	448,499	44,280	14,760	$1.432	$63.396	$21.132	90.13%	$1.29	$578.722	$642.118	$1.432	$663.250
2021	452,984	51,660	17,220	$1.411	$72.869	$24.290	88.60%	$1.25	$566.091	$638.960	$1.411	$663.250
2022	457,513	59,040	19,680	$1.390	$82.060	$27.353	87.10%	$1.21	$553.837	$635.897	$1.390	$663.250
2023	462,089	66,420	22,140	$1.370	$90.976	$30.325	85.63%	$1.17	$541.949	$632.925	$1.370	$663.250
2024	466,710	73,800	24,600	$1.350	$99.627	$33.209	84.19%	$1.14	$530.414	$630.041	$1.350	$663.250
2025	471,377	81,180	27,060	$1.331	$108.023	$36.008	82.78%	$1.10	$519.219	$627.242	$1.331	$663.250
2026	476,090	88,560	29,520	$1.312	$116.171	$38.724	81.40%	$1.07	$508.355	$624.526	$1.312	$663.250
2027	480,851	95,940	31,980	$1.293	$124.080	$41.360	80.05%	$1.04	$497.810	$621.890	$1.293	$663.250
2028	485,660	103,320	34,440	$1.275	$131.757	$43.919	78.73%	$1.00	$487.573	$619.331	$1.275	$663.250
2029	490,516	110,700	36,900	$1.258	$139.210	$46.403	77.43%	$0.97	$477.636	$616.847	$1.258	$663.250
2030	495,422	118,080	39,360	$1.240	$146.446	$48.815	76.17%	$0.94	$467.989	$614.435	$1.240	$663.250
2031	500,376	125,460	41,820	$1.223	$153.471	$51.157	74.93%	$0.92	$458.622	$612.093	$1.223	$663.250
2032	505,380	132,840	44,280	$1.207	$160.292	$53.431	73.71%	$0.89	$449.527	$609.819	$1.207	$663.250
2033	510,433	140,220	46,740	$1.190	$166.916	$55.639	72.53%	$0.86	$440.696	$607.611	$1.190	$663.250
2034	515,538	147,600	49,200	$1.174	$173.347	$57.782	71.37%	$0.84	$432.120	$605.468	$1.174	$663.250
2035	520,693	154,980	51,660	$1.159	$179.593	$59.864	70.24%	$0.81	$423.793	$603.386	$1.159	$663.250
2036	525,900	162,360	54,120	$1.143	$185.658	$61.886	69.13%	$0.79	$415.706	$601.364	$1.143	$663.250

Assumes 820 MW added per year for 20 years: Total 18 GW

Impact of New Generation on GAC = Average Rate



Appendix: Cost-Benefit for Economic Upgrades in the Context of Improved Deliverability

Possible Metric for Improved Deliverability

- Before the upgrades: Measure the LMPs at the sources and the sinks. Multiply the LMPs at the sources and sinks by the generation from the sources → Congestion Cost before upgrades: CC_{BU}
- After the upgrade: Same calculations → Congestion Costs after upgrades: CC_{AU}
- Benefit = $CC_{AU} – CC_{BU}$

Why Are Reduced Congestion Costs a Benefit?

- Basic deliverability from a new resource, even with firm transmission service, does not assure the load that it will not incur congestion costs from the resource to the load.
  - This will be particularly true if SPP goes to FTRs when it adds its day-ahead markets
  - Under current market, the amount of congestion costs that are truly “forgiven” will be difficult to calculate

What About Congestion Costs and Financial Transmission Rights?

- FTRs are granted to Transmission Customers based on their historical use of the transmission system related to firm transmission rights.
- New Resources (Transmission Service) must request FTRs, and are unlikely to receive any without funding additional upgrades.
  - MISO uses a simultaneous feasibility test based on FTRs that are already allocated and loop flow assumptions
- If the Market Participant is willing to fund upgrades, the FTRs allocated to new Transmission Service can be expanded.
  - Subject to the same simultaneous feasibility test
  - Economics for the Transmission Customer compares the present value of the stream of congestion costs incurred over time to the cost of the upgrade.