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Independent System Operator

Economic Planning: Process Improvement Proposals

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Agenda

- **Objectives & Timeline**
- **Proposed Improvements**
  - Energy Deliverability
  - Economic Planning Process Phase 1: System Study Report
  - Economic Planning Process Phase 2: Solution Evaluation
- **Next Steps**
- **Q & A**

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> “Quality comes not from inspection, but from improvement of the production process”

- W. Edwards Deming

Early Pioneer of Process Improvement Methods

Objectives & Timeline

- Discussion of potential areas for improvement in the economic planning process — 8/20 ESPWG
- **Discussion of ideas on process improvements to resolve inefficiencies** — Today
- Strawman proposal of tariff changes to NYISO OATT Attachment Y § 31.3 — 9/24 ESPWG
- Tariff revision review — Oct-Nov
- BIC & MC vote on tariff amendments to be implemented through a Federal Power Act Section 205 filing — Dec

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Improvement Categories

Based on comments received, the improvement proposal is structured into two categories:

- **Economic Planning Process Phase 1**
  - Steer the Economic Planning Process to provide more information to guide understanding of system constraints
  - Incorporate energy deliverability concepts
- **Economic Planning Process Phase 2**
  - Expand “Additional Study” scope and purpose
  - Revise transmission project process, such as evaluation metrics, study period, and voting criteria

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Energy Deliverability Concepts

Why Include Energy Deliverability?

- Transmission expansion needs driven by the changing outlook of the system
- Generator owners, especially intermittent resources, seeking transmission expansion beyond Minimum Interconnection Standard and capacity Deliverability Interconnection Standard
- Generators in a vicinity looking for an efficient and cost effective way to deliver their power without transmission restrictions
- Production cost simulation tools used in Economic Planning Process are the best way to assess energy deliverability over any period of time
- NYISO has the databases and the technical ability

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Concept

The percentage of energy produced by a resource that can be injected into the NYISO transmission system versus what the resource is capable of producing.

$$Energy\ Deliverability\ (\%) = \frac{Projected\ Energy\ Production}{Potential\ Available\ Energy\ Production}\ x\ 100$$

Projected Energy Production = actual or simulated plant annual energy production subject to curtailment caused by transmission congestion

Potential Available Energy Production = actual or simulated potential annual energy production based only on projected fuel resource availability and plant characteristics

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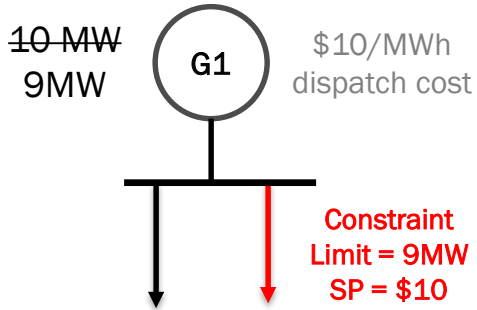
Simplified Example Background

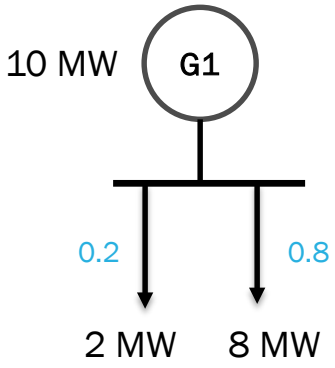
Shadow Price

- Economic impact of transmission constraint on system
- For example, a $10 shadow price (SP) would imply an increase in system cost of $10 due to generator re-dispatch



Generation Shift Factor (GSF)

- Incremental impact of a generator on a transmission line
- For example, a 0.2 GSF implies that 10 MW generator output, 2 MW flows on the referenced transmission line



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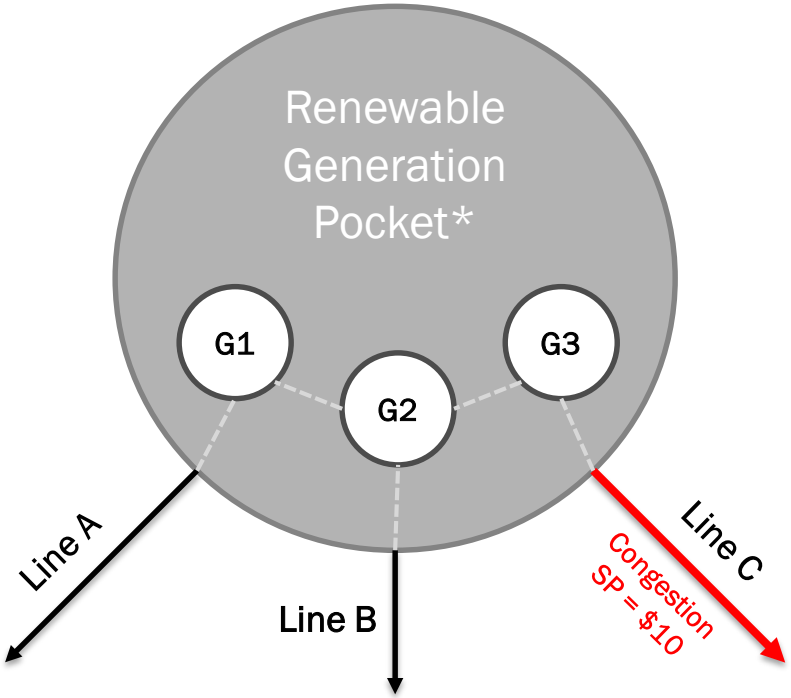
Simplified Example



- Curtailment
  - G1 = 44 GWh (10%)
  - G2 = 66 GWh (15%)
  - G3 = 88 GWh (20%)
- Energy Deliverability
  - = *Actual Energy/Potential Energy x 100*
  - G1 = 90% G2 = 85% G3 = 80%
- Potential LBMP Impact of Upgrade
  - = *Shadow Price x GSF*
  - Generation Shift Factors (GSF)
  - G1 = (0.5)($10/MWh) = $5/MWh
  - G2 = (0.6)($10/MWh) = $6/MWh
  - G3 = (0.7)($10/MWh) = $7/MWh

G1 = 0.5
G2 = 0.6
G3 = 0.7

Assume all generators capacity = **200 MW @ 25% annual capacity factor, potential annual energy production = **438 GWh***

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Example of Energy Deliverability Results

- Identifies energy deliverability of each generator for each scenario evaluated

Generator*	Base	Scen 1	Scen 2	…
1	%	%	%	%
2	%	%	%	%
3	%	%	%	%
…	%	%	%	%

**Note: Generators will be aggregated for public view but will be available for specific generators upon request*

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Example of Curtailment Results

- Identifies annual curtailment for each generator for each scenario evaluated

Generator*	Base	Scen 1	Scen 2	…
1	GWh	GWh	GWh	GWh
2	GWh	GWh	GWh	GWh
3	GWh	GWh	GWh	GWh
…	GWh	GWh	GWh	GWh

**Note: Generators will be aggregated for public view but will be available for specific generators upon request*

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Simplified Example (cont.)

- **LBMP impact applies to <u>both:</u>**
  - Energy produced and cleared during congested hours
  - Curtailed energy not cleared during congested hours

- **Looking at a single hour from our example…**
  - Assume G3 produced 160MW, curtailed 40 MW, and constraint Shadow Price = $10 before upgrade then the potential upgrade benefit is:
  - G3 Potential Benefit = (160 MWh + 40 MWh) * (0.7 * $10/MWh) = $1,400

LBMP Impact

Cleared Energy | Curtailed Energy | GSF | Shadow Price

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Example of LBMP Impact Results

- Identifies economic impact of congested elements on individual generators

Generator*	Line A	Line B	Line C	…
1	$	$	$	$
2	$	$	$	$
3	$	$	$	$
…	$	$	$	$

**Note: Generators will be aggregated for public view but will be available for specific generators upon request*

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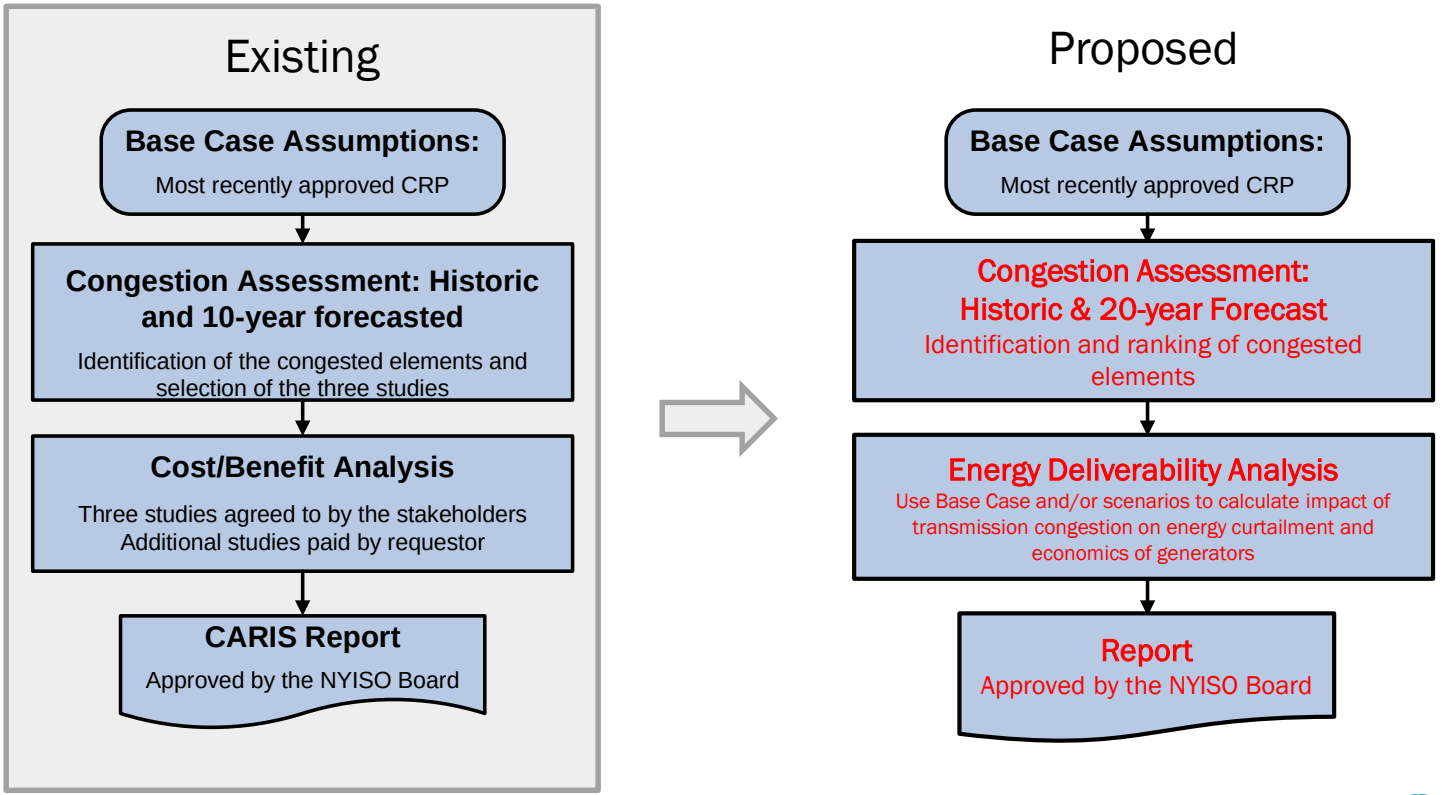
Economic Planning Process – Phase 1

High Level Proposal – Phase 1



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Review of Phase 1 Improvement Areas

- Base Case Study Period
- Base Case Inclusion Rules
- Scenario Analysis
- Base Case Reliability Screening
- # of Transmission Paths Evaluated
- Generic Solutions
- ICAP Metric
- Public Information Session
- Economic Planning Process Name
- Energy Deliverability

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Improvement

Base Case Study Period

- **Preliminary Idea for Consideration**
  - Expand Phase 1 to 20-year study period
- **Rationale**
  - Consistency: Phase 2 already a 20 year database
  - A 10-year study period does not sufficiently capture the long term system trends and project impacts
  - Transmission projects would typically be built towards the end of the 10-year study period

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Improvement

Base Case Inclusion Rules

- **Preliminary Idea for Consideration**
  - Adjust inclusion rules to allow more flexibility
  - Move specific inclusion rules from tariff to manual
- **Rationale**
  - Overly rigid inclusion rules create unrealistic and quickly outdated assumptions
  - Existing state laws and mandates need to be considered
  - Incorporating state policies in the Base Case could eliminate the need for extensive scenario evaluations, such as the 70x30 scenario which required significant additional time to accomplish

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Improvement

Scenario Analysis

- **Preliminary Idea for Consideration**
  - Allow scenario to be alternative base case
  - Expand scenario simulations to simulate several futures
- **Rationale**
  - Enables more robust 20-year simulations by capturing the impact of potential future uncertainty

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Improvement

Base Case Reliability Screening

- **Preliminary Idea for Consideration**
  - Set load and capacity assumption thresholds for reliability screening
- **Rationale**
  - Setting minimum thresholds for system changes could reduce the amount of screening analysis

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Improvement

of Transmission Paths Evaluated

- **Preliminary Idea for Consideration**
  - Expand number of transmission paths included in analysis
  - Adjust metrics for ranking projects
- **Rationale**
  - Currently only evaluating 3 paths with the highest production cost benefits may miss lower benefit but lower cost projects with higher B/C ratios (“low hanging fruit”)
  - Ranking on production cost requires extra simulations

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Improvement

Generic Solutions

- **Preliminary Idea for Consideration**
  - Eliminate generic solution evaluation
- **Rationale**
  - Transmission project benefits already estimated during current “relaxation” process, which can be applied to more paths in new process
  - Generation, EE, and DR solutions cannot be evaluated as specific projects
  - High variability and uncertainty in cost estimates can lead to unrealistic B/C ratios
  - Large analytical time requirement with limited benefit

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Improvement
Energy Deliverability Assessment

- **Preliminary Idea for Consideration**
  - Include an energy deliverability calculation to be performed to identify transmission elements adversely impacting new and existing generation energy curtailment and economics
- **Rationale**
  - NYISO is uniquely positioned to provide useful data and analysis to inform policymakers and developers to meet State energy targets
  - Analysis can be extended beyond Phase 1 to evaluate specific generators, generator projects, and transmission projects

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Improvement
ICAP Cost Metric

- **Preliminary Idea for Consideration**
  - Eliminate ICAP cost metric set forth in Att. Y 31.3.1.3.5.6, specific to Economic Planning Process
- **Rationale**
  - Informational only
  - May be misleading; does not align with other capacity market evaluation methods
  - Burdensome calculation process

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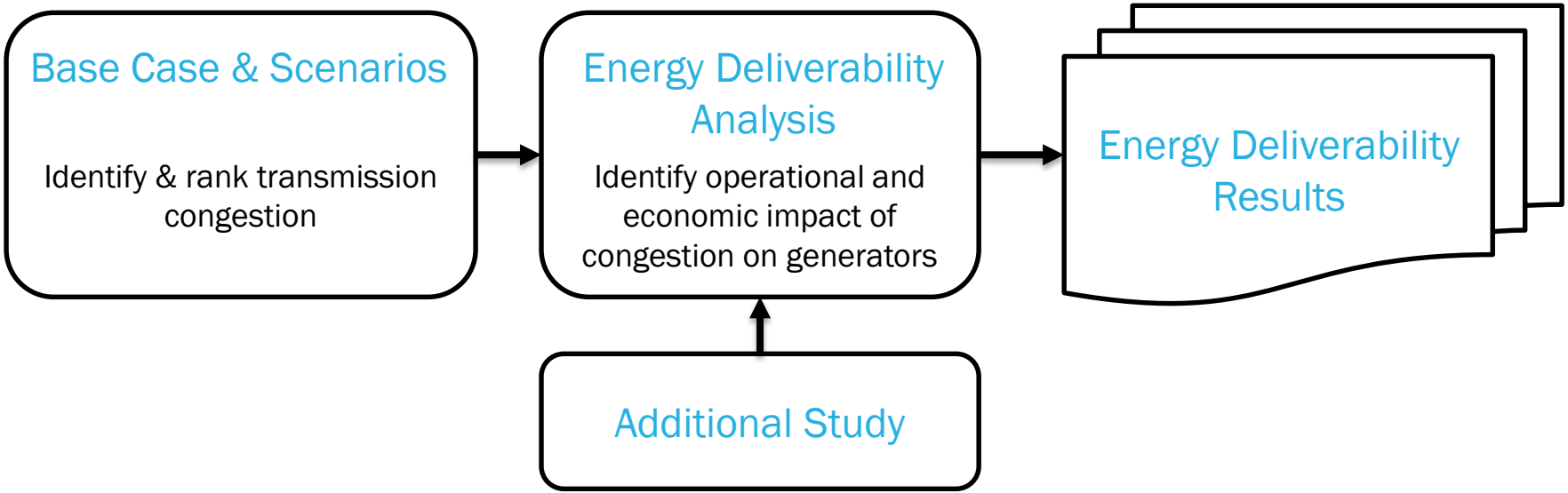
Improvement
Energy Deliverability Process Proposal



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Improvement

Economic Planning Process Name

- **Preliminary Idea for Consideration**
  - Rename Congestion Assessment and Resource Integration Study (CARIS)
- **Rationale**
  - Current name does not best reflect the purpose and the value of the study being performed
  - Work product of economic planning has expanded to include public policy concepts informed by reliability issues

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Improvement
Process Alignment

- **Preliminary Idea for Consideration**
  - Adjust economic planning study start time to align with finalization of reliability analysis findings
- **Rationale**
  - Delay between reliability and economic processes results in mis-aligned assumptions
  - Mis-aligned assumptions necessitate “reliability checks” during economic planning study

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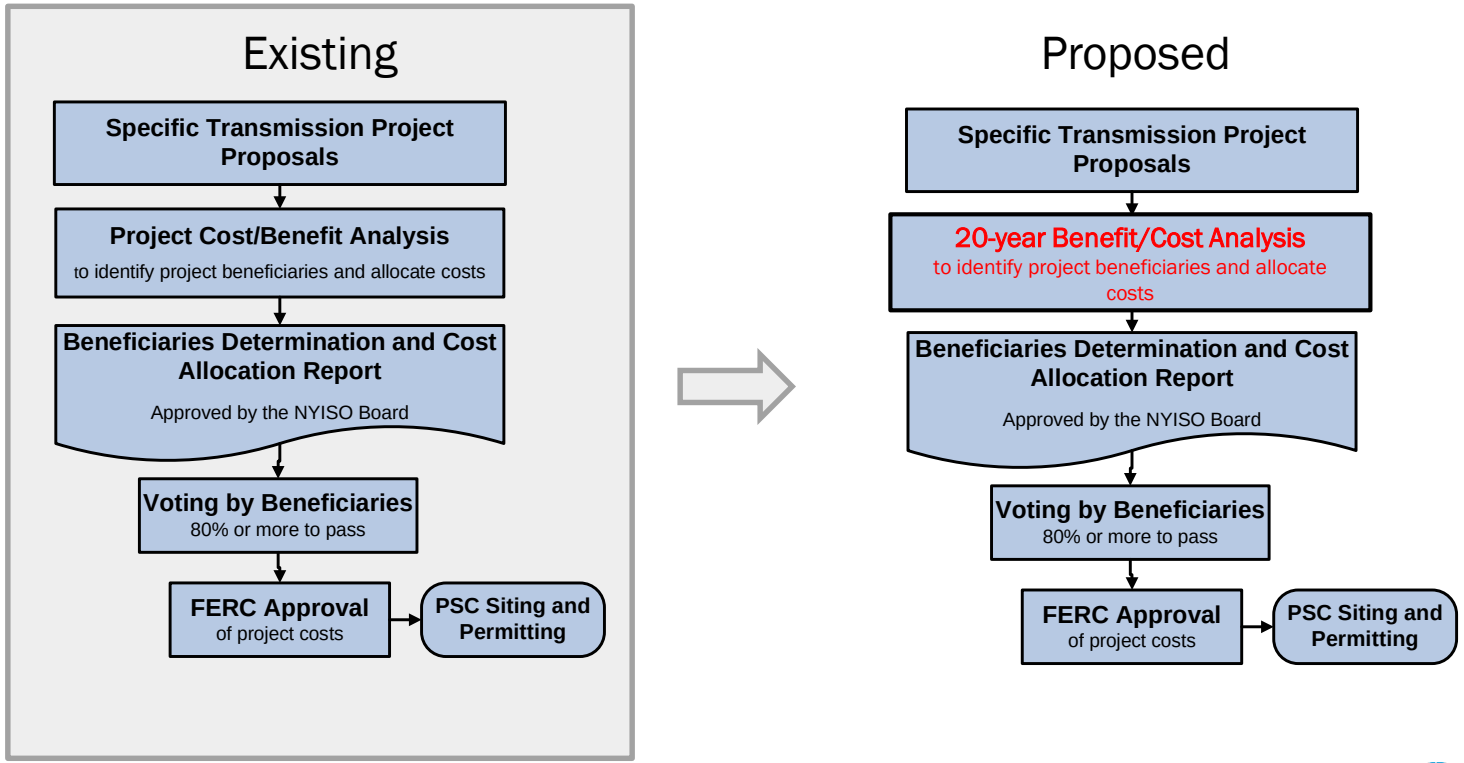
Economic Planning Process – Phase 2

High Level Proposal – Phase II



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Review of Phase 2 Improvement Areas

- Energy Deliverability
- Voting Criteria by Project Beneficiaries
- Scenario Analysis
- Planning Process Alignment
- Database Availability

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Improvement
Energy Deliverability

- **Preliminary Idea for Consideration**
  - Include an energy deliverability calculation to be performed and reported on for the base case and specific project studies
- **Rationale**
  - Energy deliverability metrics for specific projects will be informative for project beneficiaries

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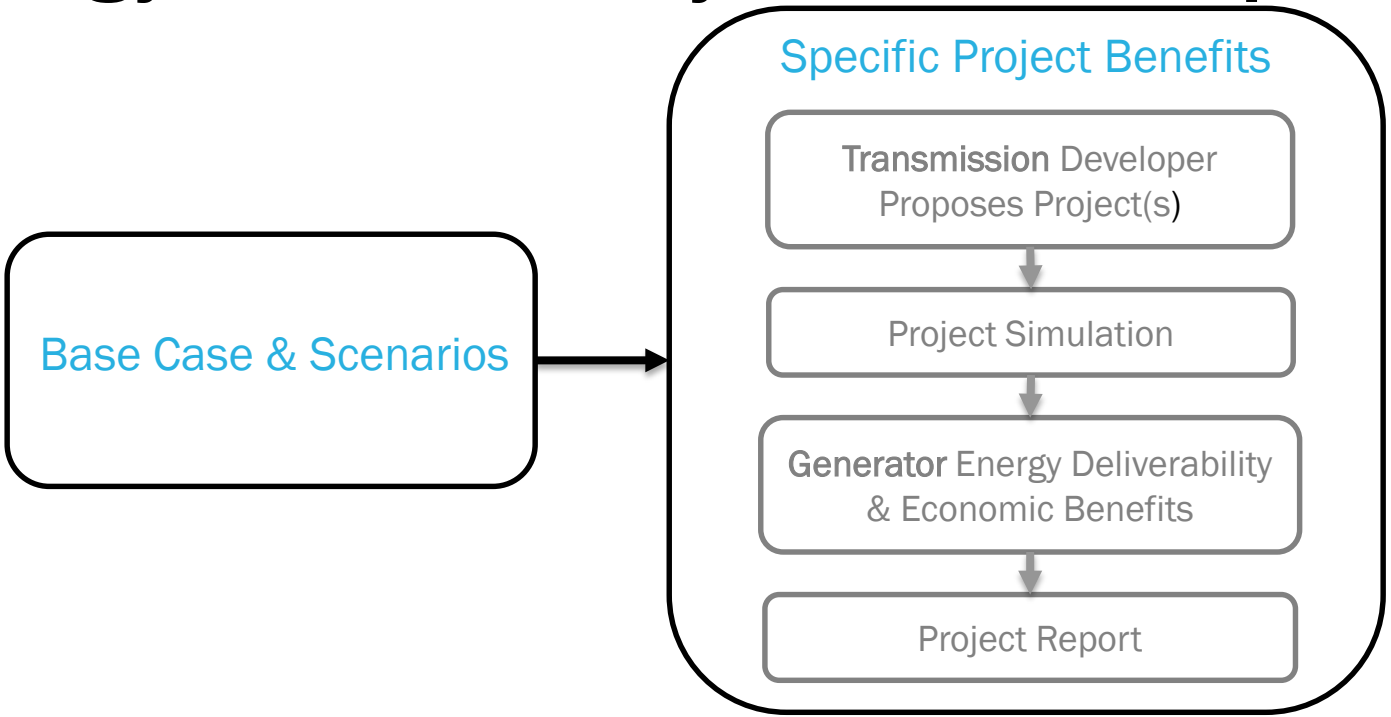
Energy Deliverability Process Proposal



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Voting Criteria by Project Beneficiaries

- **Preliminary Idea for Consideration**
  - Use 20-year NPV for project benefits
- **Rationale**
  - 10-year project evaluation period is unrealistic compared to actual project development and financing metrics

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Improvement

Scenario Analysis

- **Preliminary Idea for Consideration**
  - Include scenarios as part of benefit calculation
- **Rationale**
  - Currently informational only
  - Scenarios enable evaluation of project benefits outside of study assumption limitations and under an uncertain future

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Improvement

Resource Mix Assumptions

- **Preliminary Idea for Consideration**
  - For specific project solution simulations, re-calculate reliability buildout and/or capacity expansion to reflect impact of project
- **Rationale**
  - Specific projects will impact future buildout of system, which is ignored in current process

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Improvement

Database Availability

- **Preliminary Idea for Consideration**
  - Publish a more comprehensive set of production cost model assumption data
- **Rationale**
  - Production cost tools and databases are commercially available but need to be updated to align with NYISO models
  - Accurate modeling of NYISO system will allow developers to design more effective transmission solutions for Phase 2

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Questions?

Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system

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ISO Economic Study Benchmark

ISO	Economic Planning Process	Study Horizon (years)	Years Simulated	B/C Term (years)	B/C Threshold	Benefit Metric (s)	# Approved Projects
NYISO	Congestion Assessment and Resource Integration Study (CARIS)	10	10	10	1.0	Production Cost	0
ISO-NE	Regional System Plan – Economic Studies	10	1	-	-	-	-
PJM	Regional Transmission Expansion Plan (RTEP) Market Efficiency	10	4	15	1.25	Production Cost	12
IESO	Annual Planning Outlook (APO)	20	20	-	-	-	-
MISO	Market Congestion Planning Study (MCPS)	15	3	20	0.9/1.0	Production Cost	3
SPP	Integrated Transmission Plan (ITP10/ITP20)	10/20	2	40	1.0	Production Cost	3+
ERCOT	Regional Transmission Plan (RTP) & Long Term System Assessment (LTSA)	10	3	*	1.0	Production Cost	-
CAISO	Transmission Plan	10	1	40-50	1.0	Production Cost	-

**annual production cost savings are compared to the first-year annual revenue requirement of the proposed project*

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