All congestion are bad. Mitigating congestion brings economic benefits. However, there are costs associated with mitigating congestion. Economic assessment weighs investment (costs) and return (benefits).
Long-Term Transmission Planning
Costs vs. Benefits

- Congestion relieved to some extent
  - Moderate benefit
  - Economic

- Congestion relieved almost completely
  - Large benefit
  - Economic

- Congestion relieved completely
  - More benefit
  - Economic

- Build even more transmission
  - Hardly more benefit
  - Uneconomic

Cost (Investment)
Benefit (Return)

Build more transmission

Costs vs. Benefits

C3ETP Stakeholder Mtg on Feb 6, 2008 / Economic Assessment
### Reliability Study vs. Economic Study
Each Has Its Unique Value

<table>
<thead>
<tr>
<th>Reliability Study</th>
<th>Economic Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addresses thermal, voltage and stability issues</td>
<td>Addresses thermal issues, but not voltage and stability issues</td>
</tr>
<tr>
<td>Typically computes two or three seasonal scenarios for a study year</td>
<td>Typically computes 8760 consecutive scenarios for the whole study year</td>
</tr>
<tr>
<td>Makes assumptions on major path flows between different areas</td>
<td>Determines path flows automatically as a result of economic dispatch</td>
</tr>
<tr>
<td>Dispatches generation manually according to experience and assumptions</td>
<td>Dispatches thermal generation automatically according to their costs</td>
</tr>
<tr>
<td>Identifies congestion under stressed conditions</td>
<td>Identifies congestion for all hours in a year. Summarizes congestion costs and duration</td>
</tr>
<tr>
<td>Identify reliability needs</td>
<td>Quantifies economic benefits of congestion mitigation measures</td>
</tr>
</tbody>
</table>
Central California Clean Energy Transmission Project (C3ETP) - Economic Assessment -

- General Concepts
- Methodology and Study Assumptions
- Expected Deliverables
Transmission Economic Assessment Methodology (TEAM)

Generation and load assumptions:
- CEC 1-in-2 load forecast
- Gas price $7/MMBtu at Henry Hub
- CA renewable scenarios 26.5% (2015) and 33% (2020)

Production simulation tool PROMOD™:
- SCUC and SCED optimization algorithms
- Nodal LMP with a detailed network model
- Simulation for 8760 hours in a year

Economic evaluation parameters:
- Project lifespan 45 years
- Benefits real escalation rate 1% and inflation rate 2%
- Benefits discount rate 10%

C3ETP Stakeholder Mtg on Feb 6, 2008 / Economic Assessment
Project’s Economic Benefits
In CAISO Ratepayers’ Perspective

System with congestion
Congestion relieved by a mitigation plan (i.e. “the project”)

<table>
<thead>
<tr>
<th>Pre-Project</th>
<th>Post-Project</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>$17,360M</td>
<td>$17,300M</td>
<td>$60M</td>
</tr>
<tr>
<td>$4,002M</td>
<td>$4,000M</td>
<td>-$2M</td>
</tr>
<tr>
<td>$530M</td>
<td>$500M</td>
<td>-$30M</td>
</tr>
</tbody>
</table>

→ Change of consumer benefits
→ Change of producer benefits
→ Change of congestion revenue

Energy benefits

LCR and system RA benefits

Any other benefits

Total economic benefits in year 20xx

$46M

The dollar numbers presented here are examples.
Central California Clean Energy Transmission Project (C3ETP) - Economic Assessment -

- General Concepts
- Methodology and Study Assumptions
- Expected Deliverables
Congestion Evaluation
Congestion Costs ($M) and Duration (Hrs)

Year 2015

Year 2020

# $M Hrs
1
2
3
4

# $M Hrs
1
2
3
4
5
6
7
Economic Benefits of Different Alternatives
Compute and Compare

Production Simulation
Economic Analysis

Alternatives $i = 1, 2, \ldots, n$

Alternative 1: $\$1$

Alternative 2: $\$2$

Alternative $n$: $\$n$

Note: This slide is just an illustration of study Deliverables. Nothing shown in this example implies study results.
In this study, sensitivity analysis will be performed for two selected alternatives.
Central California Clean Energy Transmission Project (C3ETP) - Economic Assessment -

Your comments and questions are welcome

For written comments, please send to: RegionalTransmission@caiso.com