Merchant Transmission

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Transmission Development in the Northeast: Major Challenges

- **New England**
  - SW CT -- immediate
  - Vermont – soon
  - NEMA – 2007

- **New York**
  - NYC – immediate
  - LI – immediate
  - E – W interface – soon
  - Potential issue with Indian Point?

- **PJM**
  - DelMarVa
Transmission vs Generation

- Load Pockets are challenging because merchant generation development is at stand-still
- Thus, “LSE’s are in charge” and will have to contract for capacity. RFPs will elicit:
  - “Generation solution” – but building in-city CCGTs is very very difficult
  - “Transmission solution” – either:
    - bring distant capacity into city (DC model)
    - Reduce city’s electrical isolation (AC model)
Transmission Development in the Northeast: Current Plans by ISOs

- **Nepool**
  - $880 Million RTEP
  - Of that, $600 million for SW CT
    - Reliability
    - Economic benefit?

- **NYCA**
  - No real RTEP
  - Best document is NYISO’s “The X-factor”
  - $900 million/yr congestion cost

- **PJM**
  - RTEP in place
  - $400 million
  - $200 by TOs
  - $200 by generators
  - fragile
Transmission Development in the Northeast: Clarity of “Who Pays?”

Nepool
- If PTF, cost is “regionalized”
- Specific identification of which projects are PTF forthcoming
- SW CT $600MM should not be PTF

NYCA
- Under development

PJM major challenges
- Pending... “economic Performance Upgrades” process
- Criteria yet to be determined
- “Transmission Enhancement Rate Schedule”
Transmission Development in the Northeast: Status of Merchant Transmission

**Nepool**
- As Source, Cross Sound Cable

**NYCA**
- As sink:
  - CSC
  - Neptune I
  - TEUS PJM
  - El Paso
- Intra-RTO
  - Conjunction 2000 MW

**PJM**
- As sink:
  - TEUS Erie
  - As source
    - CSC
    - Neptune I
    - TEUS PJM
    - El Paso
MERCHANT TRANSMISSION PROJECTS

- DC PROJECTS
- AC PROJECTS
Neptune Regional Transmission System™

FIGURE 2-1
PROJECT NEPTUNE: PROJECT AREA MAP
(REVISED 03/29/02)

- Existing Substation
- Converter Station
- Primary Route

SUBSTATIONS
- SAYREVILLE SUBSTATION - 2 River Rd
- W 48TH STREET SUBSTATION - W 48th St 12 Ave
- NEWBRIDGE SUBSTATION - Newbridge Rd

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The Neptune RTS™ NJ-NY Project Participants

ECOLAY and environment, Inc.
PERMITTING AND ENVIRONMENTAL ENGINEERS

Alpine Ocean Seismic Survey
MARINE SURVEYOR

Société Générale
FINANCIAL ADVISOR

SIEMENS
EPC CONTRACTOR

Nexans
Cable Subcontractor

Energy Initiatives Group
“EIG”
OWNER’S ENGINEER

PriceWaterhouseCoopers
PROJECT ACCOUNTING

Skadden, Arps, Slate, Meagher & Flom LLP & Affiliates
REGULATORY AND FINANCING COUNSEL

TSR Owner

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Existing and Proposed North American HVDC Applications

- **Major Existing Systems**
  - HQ and BC Hydro lines into US markets

- **New Proposals**
  - Transenergie Cross Sound Cable
  - Neptune RTS
  - TEUS PJM-NYCA connection
  - Trans America Grid
Neptune Project Update

- Neptune RTS™ timeline
  - Received FERC approval in July 2001
  - EPC contract in advanced negotiation with Siemens for entire HVDC system.
    - Nexans’ design of the cable system is also advanced
  - Project is in advanced stages of NY Article 7
    - Permitting to be completed by the third quarter of 2003
  - Completed Interconnection feasibility studies with both PJM and NYISO
    - Some system impact studies are complete, others underway
NeptuneRTS™ Project Update

- Has completed detailed marine survey of the complete cable route.
  - Survey allows cable to be routed around environmentally and commercially sensitive areas and provides basis for cable installation pricing
- Has Converter sites under control for environmental permitting at all locations
- Is in negotiations with load serving entities that are considering contracting for TSRs
The Neptune RTS™ NJ-NY Overview

Avoids some of the problems that make transmission routing and permitting challenging

- Replaces need to site generation in urban markets
- Deploys state-of-the-art, well-proven, environmentally benign HVDC cable
  - HVDC is preferred technology for moving bulk power
  - Avoids fluctuating electromagnetic field ("EMF")
  - Avoids pumping of oil through conduit for cooling of cable
  - Fully controllable flow of power
  - Provides voltage support, enhanced system stability, and related ancillary services and system benefits

- Needs only sub sea and short landfall pathway, no need for lengthy terrestrial transmission rights-of-way
## PJM Merchant Xmission Queue

<table>
<thead>
<tr>
<th>Queue Position</th>
<th>Project Status</th>
<th>Terminals / Voltage Level</th>
<th>Nominal MW Capability</th>
<th>Project Type</th>
<th>If DC, Rights Elected</th>
<th>If AC, Rights Elected</th>
<th>Facilities Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>G00</td>
<td></td>
<td>Erie West 345 kV</td>
<td>1000</td>
<td>DC</td>
<td>C/TIR/1000, F/TWR/1060</td>
<td>N/A</td>
<td>Lake Erie HVDC</td>
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<tr>
<td>G22</td>
<td></td>
<td>Linden 230 kV</td>
<td>300</td>
<td>AC/VFT</td>
<td>C/TIR/300, F/TWR/330 **</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>G32</td>
<td></td>
<td>Linden 230 kV, 138 kV</td>
<td>1000</td>
<td>DC</td>
<td>C/TIR/1000, F/TWR/1050</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>G32</td>
<td></td>
<td>Sayreville 230 kV</td>
<td>1500</td>
<td>DC</td>
<td>E/TIR/1200, F/TWR/1500</td>
<td>N/A</td>
<td>Sayreville HVDC 1200</td>
</tr>
</tbody>
</table>
PJM Merchant Xmission Queue

- Queue G – where the action is
- 3000 MW of proposed export from PJM East
- But... beware the “fog of development”
  - As with generation, where “many were called but few were chosen”
  - At most, 1200MW will be exported in the near to medium term
PJM: Merchant Xmission Development Process

- FERC approved PJM’s merchant transmission OATT revisions March 12, 2003
  - New merchant xmission rights (TWRs, TIRs, IDR)
- PJM process:
  - Feasibility and system impact studies:
    - TO’s can do their own Feasibility and SIS; Non-TOs (in PJM) must ask PJM to conduct these studies
    - Feasibility studies are usually posted on web site as soon as completed
    - True and final interconnection costs are obscured by “fog of development”
    - Final numbers will come out in facilities study stage; don’t take what you see posted literally
PJM: Merchant Xmission Development Process

What’s Missing?

- PJM does not have any “wicked” load pockets, so it has not developed “special” load pocket measures
- NY and NE do have wicked load pockets; NY responses
  - A locational capacity requirement
    - NYC must be able to generate 80 percent of its peak load with in-city generation
  - A “capacity demand curve”
NY-ISO Transmission Development Process

Locational ICAP + Capacity Demand Curve + “LSE” Sponsorship =

One Working Mode of Transmission Development
NY-ISO Transmission Development Process

Relevant NY-ISO Policies

- Locational ICAP
  - Acknowledges that load pockets have higher capacity costs
  - Create a “capacity value spread” that merchant transmission can use to finance a project
    - Essential math: cost of an in-city CCGT = $1200/kw while cost of “rural capacity” is $400/kw

- “Capacity Demand Curves”
  - The recent NY-ISO filing to FERC
NYCA “Capacity Curves”

### In-City Curve Parameters
(represented in ICAP; must be adjusted to UCAP)*

<table>
<thead>
<tr>
<th>NYC</th>
<th>$/kW/Year at the Locational Requirement (80%)</th>
<th>Equivalent $ after S/W DMNC Adjustment</th>
<th>Aggregate Shaped Summer and Winter Caps</th>
<th>Point at Which Curve Crosses $0 (118% of Locational Requirement)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>$110</td>
<td>$127.89</td>
<td>$10.61-S; $6.37-W</td>
<td>94.40%</td>
</tr>
<tr>
<td>Year 2</td>
<td>$130</td>
<td>$151.14</td>
<td>$10.61-S; $6.37-W</td>
<td>94.40%</td>
</tr>
<tr>
<td>Year 3</td>
<td>Z</td>
<td>$</td>
<td>Note 1</td>
<td>94.40%</td>
</tr>
</tbody>
</table>

* The factor used to translate from the $105/kW/year ICAP cap to a UCAP figure shall be fixed through and including December 31, 2004, at the rate currently approved by FERC, regardless of the outcome of any pending litigation concerning this issue.

Note 1: If the $105 cap remains in effect, the numbers will be those above. If it is raised or eliminated, these numbers will change or be eliminated.
Merchant Xmission Prospects in NYCA

Marriage of Locational ICAP and “capacity demand curves”

- The “capacity spread” between source and sink markets provides a de facto payment for a DC merchant transmission line
  - Example: suppose a NYC CCGT would cost $1200/kw to build;
  - A DC xmission line tied to PJM baseload (with capacity commitments from PJM Genco), would be cost effective if the combined cost $\leq$ $1200/kw
Merchant Xmission Prospects in NYCA

Financing the DC xmission line

- The “contract” model:
  - LSE issues 20-year capacity payment ($xxx/kw-y) for 80% of the merchant xmission line
  - Transmission line owner takes energy market spread risk
    - Debt vs equity
      - Investors are interested
Merchant Xmission Prospects in NYCA

- Alternative solutions to in-city capacity problem
  - Build in-city CCGT:
    - huge construction risks (eg: Mystic)
    - Natgas commodity price risk
  - AC connection from outside (PSEG Bergen)
    - Not really infrastructure for city
  - The “NRG” solution
    - Pay owners of out-of-date generators to keep plants open
      - NRG needs $100-kw/yr to keep old plants open
      - Raises LBMP
Challenges to AC Merchant Transmission Projects

- It is widely believed that DC is the only likely merchant transmission development
  - Controllable line = controllable revenue?
  - DC lines can be used to earn capacity revenues
- How can AC merchant investment be developed?
  - “FTRs” by themselves have never financed a project
  - What form of “baseload” revenue can an AC project have?
A Potential AC Project: CT

- SW CT Congestion
  - Identified as a potential cost of $00s million/yr
  - A 345KV from Plumtree to Norwalk significantly reduces congestion
  - Model runs on left
Economics of AC Project

Effects of a 1000MW AC Line on Plumtree-Norwalk Spread

$/MWh

Without New Line

With New Line

Nepool Load in 000MW
## Energy Market Economics of AC Project

### Simple economics from Energy Transactions (a.k.a., FTRs)

<table>
<thead>
<tr>
<th></th>
<th>16000</th>
<th>16000</th>
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</thead>
<tbody>
<tr>
<td>average load</td>
<td>16000</td>
<td>16000</td>
<td>16000</td>
<td>16000</td>
<td>16000</td>
</tr>
<tr>
<td>Nodal Price Difference</td>
<td>$1.00</td>
<td>$2.00</td>
<td>$3.00</td>
<td>$4.00</td>
<td>$5.00</td>
</tr>
<tr>
<td>Size of line (MW)</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
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<td>1000</td>
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<tr>
<td>&quot;Spread&quot; revenue (mm)</td>
<td>$9</td>
<td>$18</td>
<td>$26</td>
<td>$35</td>
<td>$44</td>
</tr>
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<td>&quot;Auction&quot; discount</td>
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<tr>
<td>Realized gross revenues</td>
<td>$4</td>
<td>$9</td>
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<td>$18</td>
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<tr>
<td>Assumed project cost (mm)</td>
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The Merchant AC Challenge

Potential Solution

- Add one more right to PJM’s bundle of merchant transmission right:
  - The “Locational Capacity Reduction Payment Right” (LCRPR!)
The Merchant AC Challenge

- The “Locational Capacity Reduction Right” allows merchant projects to capture the value of their contribution to the capacity markets.
  - NYCA has taken a step towards this by implementing a “UDR” – but it applies to controllable lines only.
- In addition, the AC merchant line should be allocated FTRs, which are monetized in the energy (not the capacity) market.
The Merchant AC Challenge

Notional ProFormas for a merchant AC project

- Assume a 1000MW AC expansion from Plumtree to Norwalk CT costing $185 million
  - Assume it reduces UI’s locational capacity requirement by 300MW and that UI’s “capacity spread” with RI is $60-kwy
  - Assuming a 10-year project life, the $60/kw payment would provide $18 million of the required cash flow to finance the project on a merchant basis
  - The remainder would be “FTR revenues” which would be “at risk” money suitable for equity investors
## Energy Market Economics of AC Project

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<tr>
<td>Net</td>
<td>$(6)</td>
<td>$(1)</td>
<td>$3</td>
<td>$8</td>
<td>$12</td>
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Final Thoughts on Merchant Transmission

- There will be some big merchant transmission projects
  - Stranded Energy
  - Urban load pockets
- There will be very few merchant transmission developers
  - Takes years and $millions to develop a single project
  - RTO rules may “tilt” the playing field
- But... merchant transmission will be the only catalyst for significantly reshaping the Grid
Keys to Successful Merchant Transmission

- An Enduring Energy Spread
- A Locational Capacity Requirement
- A Capacity Demand Curve
- An LSE with a Capacity Problem
- A Merchant Transmission Developer
- Merchant Transmission Investors
- A Supplier With an Edge
Merchant Transmission Development

Merchant Xmission Risk Abatement

- Construction risk
- US state and local environmental approval risk
- US federal environmental approval risk
- Permanent equity risk
- Debt finance risk
- Customer selection risk
- ISO "Study Risk"
- FERC approval risk
- Project design risk