Minimum Separation Distance Between High Voltage Transmission Lines

Presented to:
Environment, Energy Security & Sustainability Symposium

June 17, 2010
Denver, Colorado
Introduction

- Public company on NASDAQ with symbol “ICFI”
- Founded in 1969; more than 3,500 employees
- End-to-end management, technology, and policy services – advise, implement, improve
- Diverse client base – 78% U.S. federal, state, and local agencies; 17% U.S. commercial; and 5% international
- Global presence with more than 50 offices, headquartered in the Washington, D.C. area
Presentation Content

• Background for Study
• Connecting Supply and Demand
• Relevance to Conference
• Study Goals and Limitations
• Transmission Export Lines and Hubs
• Conclusions
Background for Study

- Wyoming has abundant **supply** of wind
- Other States have **demand** (RPS) for renewable energy
- Wyoming’s transmission system is **limited**
- Multiple transmission export lines are **proposed**
- No prescribed minimum separation distance between transmission lines leads to questions about reliability, energy security, and environmental impacts
Abundant Wind Resources = Supply
Wyoming: 1st in Wind Speed (Class 6 & 7)
Renewable Portfolio Standards Drive Demand

Minimum solar or customer-sited RE requirement

- **WA**: 15% by 2020
- **OR**: 25% by 2025
- **NV**: 25% by 2025
- **CA**: 20% by 2020
- **AZ**: 15% by 2025
- **CO**: 20% by 2020
- **UT**: 20% by 2025
- **MT**: 15% by 2015
- **ND**: 10% by 2015
- **MN**: 25% by 2025
- **SD**: 10% by 2015
- **WI**: 10% by 2015
- **IL**: 25% by 2025
- **MI**: 10% by 2015
- **NY**: 24% by 2013*
- **VT**: 10% of 2005 load by 2013*
- **ME**: 30% by 2000; 10% new by 2017
- **NH**: 23.8% by 2025
- **MA**: 4% by 2009, 15% by 2020
- **RI**: 16% by 2019
- **VT**: 20% by 2020
- **DE**: 20% by 2019
- **MD**: 20% by 2022
- **DC**: 20% by 2020
- **NJ**: 22.5% by 2021
- **VA**: 12% of 2007 load by 2022
- **WV**: 25% by 2025
- **NC**: 12.5% by 2021

* **WI** – Mandate is for 6% above baseline (approx 8%) by 2015; goal is for 10% by 2015
* **IA** – Goal is for 1000 MW new renewable generation by 2010
* **VT** – Goal to meet 2005-2012 incremental load growth; becomes mandate if a total of 10% of 2005 demand is not met by 2013. Additional goal for 25% by 2025.
* **TX** – Goal for 10,000 MW by 2025.
Load Centers and Projected Peak Growth with Existing Transmission Capacity

Transmission Projects Proposed in Wyoming to Transfer Abundant Supply to Distant Load Centers

Projects

- Wyoming-Colorado Intertie
- Energy Gateway (West & South)
- TransWest Express
- High Plains Express
- Zephyr
- Overland Intertie

Routes shown are for illustrative purposes only and will be finalized following a comprehensive review process.
## Proposed Transmission Export Lines - Capacity

<table>
<thead>
<tr>
<th>Transmission Project</th>
<th>Capacity (Megawatts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gateway South <em>(PacifiCorp)</em></td>
<td>1,500</td>
</tr>
<tr>
<td>Gateway West <em>(PacifiCorp)</em></td>
<td>1,500</td>
</tr>
<tr>
<td>Overland Intertie <em>(LS Power Development, LLC)</em></td>
<td>2,000</td>
</tr>
<tr>
<td>Wyoming–Colorado Intertie <em>(LS Power Development, LLC)</em></td>
<td>900</td>
</tr>
<tr>
<td>Trans West Express <em>(Anschutz Corporation)</em></td>
<td>3,000</td>
</tr>
<tr>
<td>Zephyr <em>(TransCanada)</em></td>
<td>3,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11,900</strong></td>
</tr>
</tbody>
</table>

**NOTE:** Capacities are based on thermal ratings and do not represent simultaneous system rating. Capacity for each project provided by transmission proponents. Capacities are representative values which may change based on final path rating.
Separation Distance – How Much is Enough?
Separation Distance and Reliability - Example

• Dependent Factors (19-24%)
  – Lightning
  – High Winds
  – Tornadoes
  – Storms (ice/hail/snow)
  – Fire
• Independent Factors (75-81%)
  – Human error
  – Equipment failure
  – Sabotage
  – Vegetation
  – Other Misc.
  – Unknown

Photo credit: Darrell Gerrard, PacifiCorp

WECC 2006-2007 outages for 500–600-kV
Separation Distance: Reliability Vs. Costs/Impacts

- Line de-rating risk
- Future need for new transmission
- Ease of adherence to environmental and land-use constraints
- Need for Remedial Action Scheme

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<th>Installation/Maintenance Cost</th>
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<tr>
<td>Environmental Permitting Time</td>
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<tr>
<td>Public Opposition</td>
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<tr>
<td>Visual Impact Concern</td>
</tr>
</tbody>
</table>
Example Minimum Separation Distances\(^1\) (feet) for Typical 500-kV Transmission Lines

\[
\text{Minimum Separation Distance} = 1,500
\]

\[
\text{AB-MIN} = 260 \quad + \quad \text{CASE-MIN} = 0 \quad + \quad \text{REG-MIN} = 1,240
\]

\(^1\) Invalid without application of associated assumptions and mitigation
Thank You

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(www.wyia.org)

Report available online: www.icfi.com/collector
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