

PENNSYLVANIA WIND ENERGY SYMPOSIUM

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TRANSMISSION AND DISTRIBUTION WIND GENERATION INTERCONNECTION



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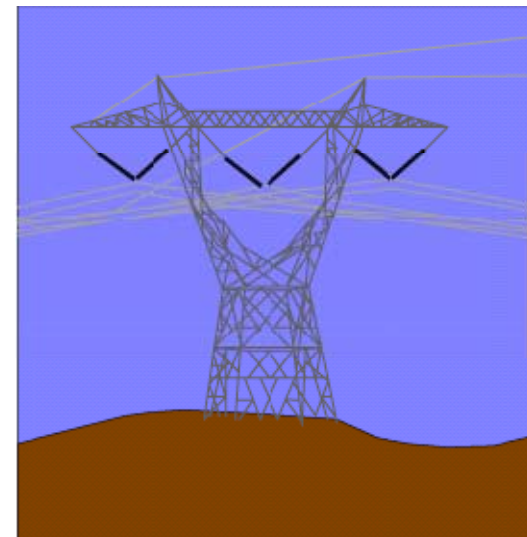
**TRANSMISSION PLANNING
ALLEGHENY POWER**

WIND GENERATION INTERCONNECTION

ISSUES

- ELECTRIC INFRASTRUCTURE
- STUDY PROCESS
- FACILITIES
 - DIRECT CONNECT
 - NETWORK UPGRADES
- PROPERTY RIGHTS
- PERMITTING

11/13/2008



WIND GENERATION INTERCONNECTION – INTENT OF GENERATION

NET METERING

- STATE SPECIFIC TARIFFS**
- TO SPECIFIC TECHNICAL REQUIREMENTS**

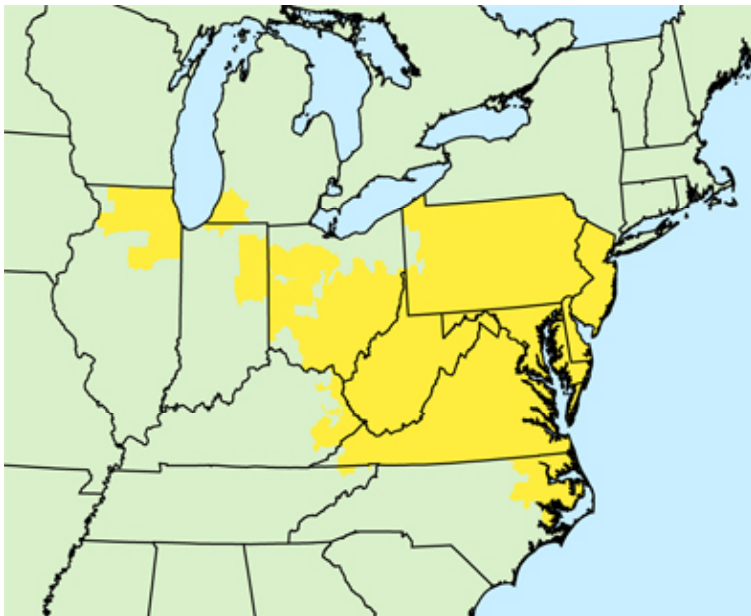
MARKET PARTICIPATION

- PJM REGULATIONS**
- TO SPECIFIC TECHNICAL REQUIREMENTS**

WIND GENERATION INTERCONNECTION – REGIONAL TRANSMISSION ORGANIZATION

PJM IS RESPONSIBLE FOR:

- THE RELIABILITY OF THE ELECTRIC SYSTEM,
- THE OPERATION OF COMPETITIVE WHOLESALE ELECTRIC MARKETS, AND
- ENSURING THAT NO MEMBER HAS UNDUE INFLUENCE



WIND GENERATION INTERCONNECTION – INFRASTRUCTURE

ELECTRIC INFRASTRUCTURE

- TRANSMISSION, SUBTRANSMISSION,
DISTRIBUTION**
- HISTORICAL DEVELOPMENT**
- OPEN ACCESS**
- WIND GENERATION NEEDS**

WIND GENERATION INTERCONNECTION – STUDY PROCESS

PJM STUDY PROCESS



- **FEASIBILITY STUDY - 3 MONTHS, \$10K**
- **SYSTEM IMPACT STUDY ~ 4+ MONTHS, \$50K**
- **FACILITY STUDY ~ 6 - 12+ MONTHS, \$100K+**

WIND GENERATION INTERCONNECTION – STUDY PROCESS

MODELING PARAMETERS

– CAPACITY VS. ENERGY VALUE

- **CLASS AVERAGE CAPACITY FACTOR**

- **WIND = 13%**

- **SOLAR = 38%**

– COST RESPONSIBILITY

- **REQUIRED NETWORK UPGRADES**

- **OPTIONAL NETWORK UPGRADES**

WIND GENERATION INTERCONNECTION – FACILITIES

TRANSMISSION OWNER FACILITIES

- DIRECT CONNECT FACILITIES**
 - **SUBSTATION**
- NETWORK UPGRADES**
 - **RECONDUCTOR LINE**
 - **UPGRADE EQUIPMENT**

GENERATOR FACILITIES

- SUBSTATION, LINES, ETC**

OTHER SUPPORTING FACILITIES CHARGE

- GENERATORS AND WHOLESALE CUSTOMERS**

WIND GENERATION INTERCONNECTION – PROPERTY RIGHTS

DIRECT CONNECT FACILITIES

– SUBSTATION

- **PERPETUAL LEASE OR DEED REQUIRED**
- **GENERATOR RESPONSIBILITY**
- **TRANSMISSION SYSTEM**

GENERATOR FACILITIES

– SUBSTATION, LINES, ETC

- **AT THE DISCRETION OF THE GENERATOR**

WIND GENERATION INTERCONNECTION – PERMITTING

PERMITTING

– STATE AND LOCAL

- **CPCN**
- **PLANNING COMMISSION**
- **DEP, USACE, DOT, ETC**

– PUBLIC OPPOSITION - NIMBY

- **GENERATION PLANT AND TRANSMISSION LINES**

WIND GENERATION INTERCONNECTION – CONCLUSION

ISSUES

- ELECTRIC INFRASTRUCTURE**
- STUDY PROCESS**
- FACILITIES**
 - DIRECT CONNECT**
 - NETWORK UPGRADES**
- PROPERTY RIGHTS**
- PERMITTING**

WIND GENERATION INTERCONNECTION – OUTLOOK

EVOLUTION AND CONTINUOUS IMPROVEMENT

– JOINT COORDINATED SYSTEM PLANNING (JCSP)

- 20% AND 30% WIND ENERGY PENETRATION SCENARIOS
- WWW.JCSPSTUDY.ORG

– PJM EMERGING ENERGY RESOURCES (PEER)

- STAKEHOLDER PROCESS

– INTERMITTENT RESOURCES WORKING GROUP (IRWG)

- FOCUSED ON MARKET AND/OR OPERATIONAL ISSUES