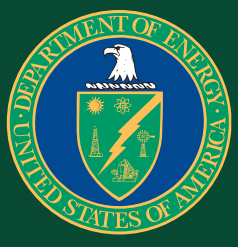
National Electric Transmission Congestion Study

Executive Summary

August 2006



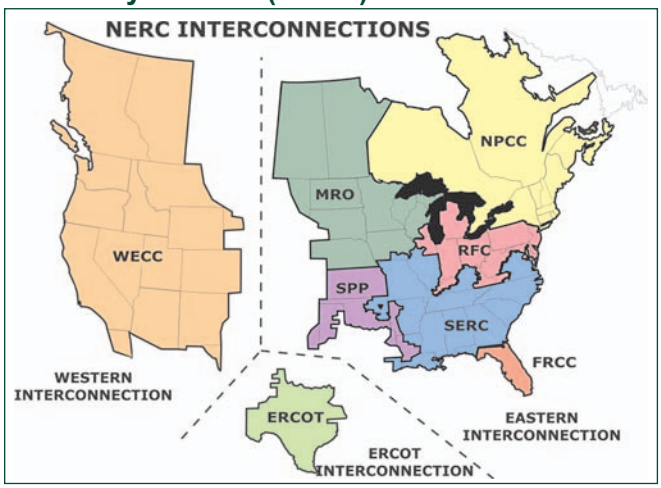
U.S. Department of Energy

Executive Summary

Section 1221(a) of the Energy Policy Act of 2005 amended the Federal Power Act (FPA) by adding a new section 216 to that Act. FPA section 216(a) directed the Secretary of Energy to conduct a nationwide study of electric transmission congestion[1] by August 8, 2006. Based upon the congestion study, comments thereon, and considerations that include economics, reliability, fuel diversity, national energy policy, and national security, the Secretary may designate "any geographic area experiencing electric energy transmission capacity constraints or congestion that adversely affects customers as a national interest electric transmission corridor." The national congestion study is to be updated every three years.

This document is the Department of Energy's first congestion study in response to the law. It examines transmission congestion and constraints and identifies constrained transmission paths in many areas of the Nation, based on examination of historical studies of transmission conditions, existing studies of transmission expansion needs, and unprecedented region-wide modeling of both the Eastern and Western Interconnections. (See Figure ES-1 for a map showing these interconnections.)

Figure ES-1. Map of North American Electric Reliability Council (NERC) Interconnections



Source: NERC, 2006.

With the publication of this study, the Department of Energy (Department, or DOE) expects to open a dialogue with stakeholders in areas of the Nation where congestion is a matter of concern, focusing on ways in which congestion problems might be alleviated. Where appropriate in relation to these areas, the Department may designate national interest electric transmission corridors ("National Corridors" or "Corridors").

Transmission congestion occurs when actual or scheduled flows of electricity across a line or piece of equipment are restricted below desired levels—either by the physical or electrical capacity of the line, or by operational restrictions created and enforced to protect the security and reliability of the grid. The term "transmission constraint" may refer either to a piece of equipment that limits electricity flows in physical terms, or to an operational limit imposed to protect reliability.

Power purchasers look for the least expensive energy available to ship across the grid to the areas where it will be used ("load centers"). When a transmission constraint limits the amount of energy that can be transferred safely to a load center from the most desirable source, the grid operator must find an alternative (and more expensive) source of generation that can be delivered safely, and re-instruct the owners of generators on how they should schedule electricity production at specific power plants. Further, if a large portion of the grid is very tightly constrained—as when demands are very high and local generation is limited—grid operators may have to curtail service to consumers in some areas to protect the reliability of the grid as a whole. All of these actions have adverse impacts on electricity consumers.

There are many ways to measure transmission congestion. This study developed congestion metrics related to the *magnitude and impact* of congestion (for example, the number of hours per year when a

[1]The law excludes the area covered by the Electric Reliability Council of Texas (ERCOT) from this requirement. In peforming the analysis reported on here, the Department also excluded Alaska and Hawaii because they are not part of the Eastern or Western Interconnections.

transmission constraint is loaded to its maximum safe operating level; and the number of hours when it is operated at or above 90% of the safe level) and the *cost of congestion* (such as the cost of the next MWh of energy if it could be sent across a facility already at its safe limit). Because no one metric captures all important aspects of congestion, the analysts identified the most constrained transmission paths according to several different congestion metrics and then identified those paths that were most constrained according to a combination of metrics.

The cost of congestion varies in real time according to changes in the levels and patterns of customers' demand (including their response to price changes), the availability of output from various generation sources, the cost of generation fuels, and the availability of transmission capacity. Transmission constraints occur in most areas of the Nation, and the cost of the congestion they cause is included to some degree in virtually every customer's electricity bill. Although congestion has costs, in many locations those costs are not large enough to justify making the investments needed to alleviate the congestion. In other locations, however, congestion costs can be very high, and eliminating one or more key constraints through some combination of new transmission construction, new generation close to a major load, and demand-side management can reduce overall electricity supply costs in the affected areas by millions of dollars per year and significantly improve grid reliability.

The Department finds that three classes of congestion areas merit further Federal attention:

- **Critical Congestion Areas.** These are areas of the country where it is critically important to remedy existing or growing congestion problems because the current and/or projected effects of the congestion are severe. As shown in Figures ES-2 and ES-3, the Department has identified two such areas, each of which is large, densely populated, and economically vital to the Nation. They are:
  - The Atlantic coastal area from metropolitan New York southward through Northern Virginia, and
  - Southern California.
- **Congestion Areas of Concern.** These are areas where a large-scale congestion problem exists or may be emerging, but more information and analysis appear to be needed to determine the magnitude of the problem and the likely relevance of transmission expansion and other solutions. As shown in Figures ES-2 and ES-3, the Department has identified four Congestion Areas of Concern:
  - New England
  - The Phoenix – Tucson area
  - The Seattle – Portland area
  - The San Francisco Bay area.

Figure ES-2. Critical Congestion Area and Congestion Area of Concern in the Eastern Interconnection

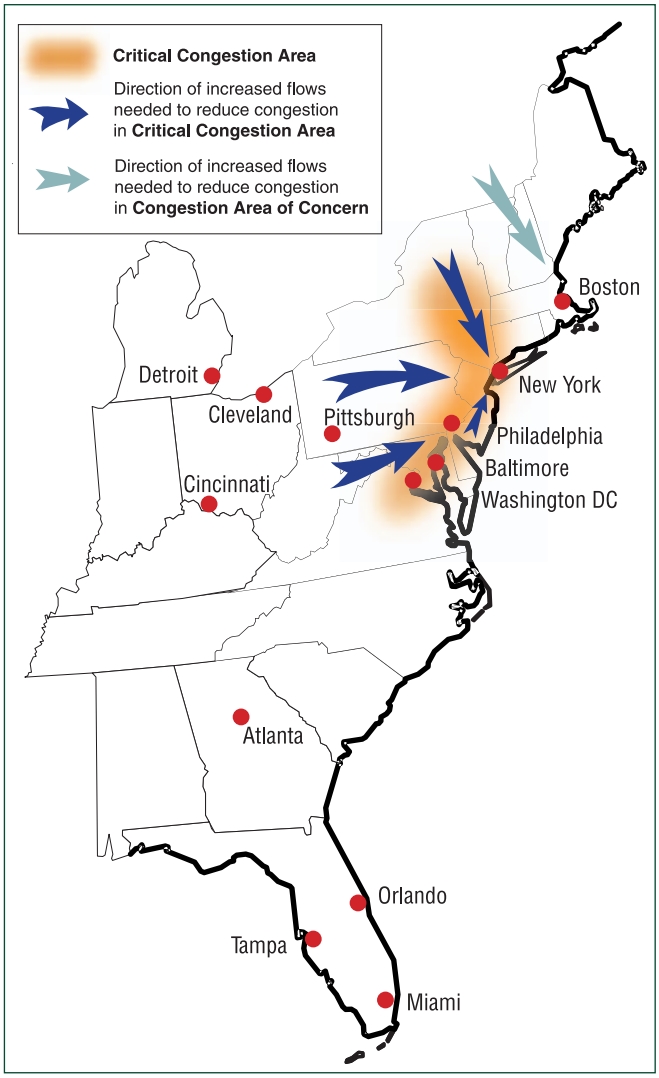
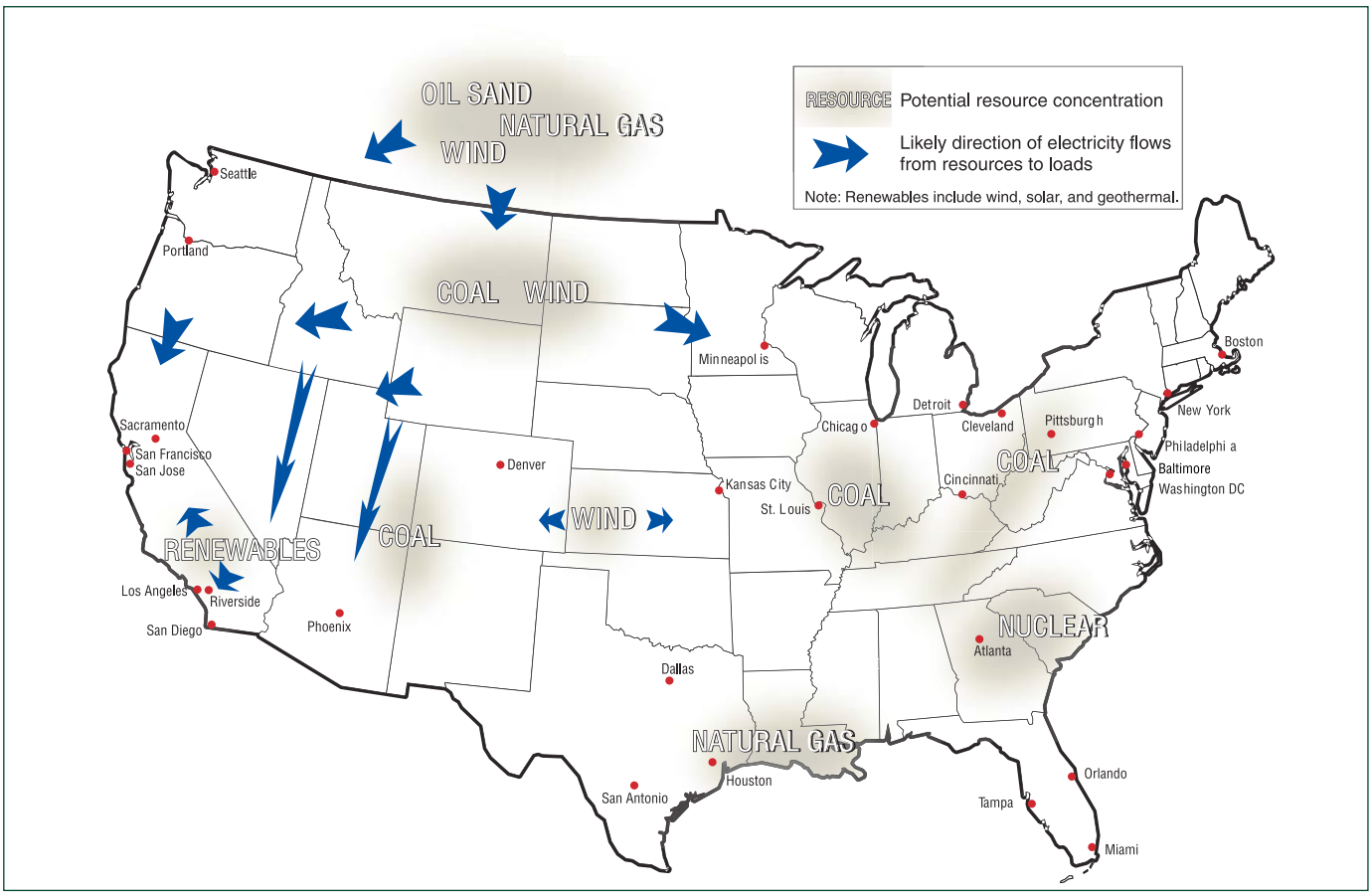


Figure ES-3. One Critical Congestion Area and Three Congestion Areas of Concern in the Western Interconnection

- **Conditional Congestion Areas.** These are areas where there is some transmission congestion at present, but significant congestion would result if large amounts of new generation resources were to be developed without simultaneous development of associated transmission capacity. As shown in Figure ES-4, these areas are potential locations for large-scale development of wind, coal and nuclear generation capacity to serve distant load centers. Some of the areas of principal interest are:
  - Montana-Wyoming (coal and wind)
  - Dakotas-Minnesota (wind)
  - Kansas-Oklahoma (wind)
  - Illinois, Indiana and Upper Appalachia (coal)
  - The Southeast (nuclear)

DOE believes that affirmative government and industry decisions will be needed in the next few years to begin development of some of these generation resources and the associated transmission facilities.

Figure ES-4. Conditional Constraint Areas



Next Steps

Notice of Intent to Consider Designation of National Corridors

For the two areas identified above as Critical Congestion Areas, the Department believes it may be appropriate to designate one or more National Corridors to facilitate relief of transmission congestion in these areas. The Department will also consider designating National Corridors to relieve constraints or congestion in Congestion Areas of Concern and Conditional Congestion Areas. The Department requests comments from stakeholders on three questions by October 10, 2006:

- Would designation of one or more National Corridors in relation to these areas be appropriate and in the public interest?
- How and where should DOE establish the geographic boundaries for a National Corridor?
- To the extent a commenter is focusing on a proposed transmission project, how would the costs of the facility be allocated? (Although the question of cost allocation for a transmission project is not directly related to the designation of a National Corridor, DOE recognizes the criticality of cost allocation issues and is interested in how they might be resolved.)

Chapter 6 provides additional discussion of these questions and information on where comments should be filed. After evaluating the comments received, the Department may proceed to designate some areas as National Corridors, seek additional information, or take other action.

Role of regional transmission planning organizations in finding solutions to congestion problems

DOE expects that regional transmission planning organizations will continue to show leadership in working with stakeholders and transmission experts to develop solutions to the congestion problems identified above in their respective areas. DOE expects these planning efforts to be inter-regional where appropriate, because many of the problems and likely solutions cross regional boundaries. In particular, the Department believes that these analyses should encompass both the congestion areas and the areas where additional generation and transmission capacity are likely to be developed. The Department will support these planning efforts, including convening meetings of working groups and working with the Federal Energy Regulatory Commission and congestion area stakeholders to facilitate agreements about cost allocation and cost recovery for transmission projects, demand-side solutions, and other subjects.

DOE anticipates that regional—and inter-regional, where appropriate—congestion solutions will be based on a thorough review of generation, transmission, distribution and demand-side options, and that such options will be evaluated against a range of scenarios concerning load growth, energy prices, and resource development patterns to ensure the robustness of the proposed solutions. Such analyses should be thorough, use sound analytical methods and publicly accessible data, and be made available to industry members, other stakeholders, and Federal and state agencies.

Annual congestion area progress reports

Each of the congestion areas identified above involves a somewhat different set of technical and policy concerns for the affected stakeholders. The Department will work with FERC, affected states, regional planning entities, companies, and others to identify specific problems, find appropriate solutions, and remove barriers to achieving those solutions.

The Department intends to monitor congestion and its impacts in these areas, and publish annual reports on progress made in finding and implementing solutions. The Department plans to issue its first progress report by approximately August 8, 2007, the second anniversary of the enactment of the Energy Policy Act of 2005.