DRAFT MEMORANDUM

To: Bruce Schillo
   U.S. Environmental Protection Agency

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Re: Increased Competition In the U.S. Electric Generation Sector
    Scoping Analysis of Potential Environmental Impacts
    EPA 353-104

INTRODUCTION

The purpose of this memorandum is to provide a scoping analysis of the potential environmental impacts which may occur as a result of increased competition in the electric utility sector. Specific goals of this memorandum are:

- To identify those laws and regulatory policies which are likely to affect the structure of the electric utility industry and increase competition. Included here are changes in law and policy which have already occurred (e.g., the Energy Policy Act) and those which may be forthcoming (i.e., changes in transmission pricing policies at the Federal Energy Regulatory Commission).

- To identify the direct implications of these changes in law and policies, for the operation of the electric utility industry. For example, how might access and pricing policies affect short-term generation system dispatch and transmission system operations, as well as the longer-term structure of the industry (i.e., investment decisions).

- To identify the possible environmental impacts resulting from these potential changes in operations and structure. In this scoping analysis, we do not attempt to quantify the level of operational and environmental impacts. In many cases, the direction of the impacts is highly uncertain and arguments can be made for negative as well as positive environmental impacts. Moreover, attempting to quantify these benefits would require a much greater level of effort. In many cases, it may not be possible to estimate the level of impacts. The overall goal is to identify the important issues and to provide a framework for potential future analyses.

- The focus of this review is also limited with respect to the environmental impacts considered. Only changes in air emissions are considered and these are limited to NOx and CO2 emissions. There could, however, be other environmental impacts resulting from changes in the industry, including those resulting from expansion of the transmission grid, changes in the siting patterns of generating facilities, and other such factors. These latter issues are not addressed here but could be substantial.
RECENT AND POTENTIAL FUTURE EVENTS

There have been several recent legislative and regulatory changes which would increase competition in the electric utility sector. In addition, there are other polices being debated which would affect the structure of the industry. These past and potential future changes are summarized below. The most significant of these changes was the passage of the Energy Policy Act of 1992 which is aimed at stimulating competition in the electricity generation market, primarily by amending key provisions of the Public Utilities Holding Company Act of 1935 (PUHCA) and the Federal Power Act.

The Creation of Exempt Wholesale Generators

The new legislation provides for several specific reforms including the creation of a new class of power suppliers (termed "exempt wholesale generators," or EWGs) that are exempt from PUHCA regulation, similar to the way in which PURPA exempted qualifying cogeneration facilities and small power producers from the requirements of PUHCA. Unlike the requirements of PURPA, however, EPACT does not create an obligation for utilities to purchase the output of EWGs.

EPACT's changes will now allow independent power producers (IPPs), power producers affiliated with utilities and other non-traditional suppliers (e.g., fuel suppliers, engineering and construction firms) to compete in the U.S. generation market. Previously, power suppliers ineligible for status under PURPA found they needed to use complicated corporate structures to avoid the burdensome regulation of PUHCA. Alternatively, to qualify under PURPA they sought a steam host, or limited the size of their project, even if it was uneconomic to do so.

The law also allows existing rate-based facilities (or portions thereof) to receive EWG status, provided the states which have jurisdiction over the affiliates or associates of the EWG grant their approval. Rates charged by EWGs for sales in interstate commerce are still subject to FERC under the Federal Power Act. Since the Act's passage, numerous requests have been made to FERC for EWG status.

Transmission Access

Without access to the transmission grid, it was unlikely that competition in the wholesale generation market could be increased substantially. Section 721 of EPACT addresses this concern by amending Section 211 of the Federal Power Act to require that any electric utility or other person generating energy for resale may apply to FERC for an order requiring a transmitting utility to provide transmission services to the applicant. This service might include expansion of transmission capacity required to provide such service. The Act provides that FERC can order this service provided it does not

imperiori hing and it is in the public interest.\textsuperscript{24} EPACT requires that the utility be allowed to recover all cost incurred in connection with providing the transmission services. FERC is prohibited from issuing an order which would compel retail wheeling (although the Act preserves the authority of states to do so).

Transmission Pricing

One of the key policy issues which will affect the development of open access transmission is the development of a sensible transmission pricing policies which are consistent with the desire to increase competition in the generation segment of the market and increase efficiency of the entire system. EPACT's transmission access provisions did not address pricing issues. The Act's only pricing directives to FERC were that rates must be just and reasonable and the details of the pricing debate were left to FERC. As a result, the Commission has opened an inquiry into transmission pricing issues.

At the core of the pricing debate is whether prices should be based on a traditional, embedded cost-basis, or on the basis of incremental costs, or some combination of both. Historically, FERC has based its approach to transmission pricing on the basis of rolled-in, embedded average costs of the transmitting utility. Recently, the FERC has modified its pricing policy to address the possibility that addition of new capacity will increase average costs (i.e., that incremental cost exceed embedded costs) and native load customers might bear the burden.\textsuperscript{25}

The resulting modified pricing policy allows a transmitting utility to charge the higher of embedded costs or incremental expansion costs which relieve a constraint. Where no expansion is made, the utility may charge the higher of embedded costs or legitimate and verifiable opportunity costs (i.e., the costs of re-dispatching or foregoing off-system transactions), but not the sum of the two. Some call for higher levels of compensation such as allowing transmitting utilities to charge the existing embedded cost rate (without the expansion) and specifically assign any additional incremental costs associated with the service. The Commission has invited comment on these and a number of other transmission pricing issues including the appropriateness of reforms which address:

* Transmission constraints. Pricing policies which recognize transmission constraints and scarcity costs in the case of a bottleneck. A new transmission flow may require the

\textsuperscript{24} EPACT provides that no order shall be rendered unless the applicant has requested service and the parties have negotiated for 90 days.

\textsuperscript{25} The Commission's recent policies have been based on three principles developed in the Northeast Utilities merger case and the Penelec case. These principles include: holding native load customers harmless, providing the lowest reasonable cost-based price to third party transmission customers, and preventing the collection of monopoly rents by transmission owners and promoting efficient transmission decisions. See Northeast Utilities Service Company, Opinion No. 364, 58 FERC 61, 070 (1992) Opinion No. 364-B, 59 FERC 61,042 (1992) and 59 FERC 61, 089 (1992), and Northeast Utilities Service Company v. FERC, Nos. 92-1165, et al. (1st Cir. May 19, 1993), and Pennsylvania Electric Company, 58 FERC 61,278 (1992), 60 FERC 61, 024 (1992), 60 FERC 61, 244 (1992), appeal pending, No. 92-1408 (D.C. Cir. Filed Sept. 11, 1992).
transmitting utility to run uneconomical units or forego other transactions to free up transmission capacity for third parties.

- **Actual power flows.** Currently, trades between control areas are scheduled by arranging for a fictional contract path along some physical connection between the buyer and seller's control areas. The flow of power is accomplished by the buyer reducing its output, while the seller increases its output. The path followed in not directed and the energy flows along available paths in accordance with the laws of physics. Some lines actually used during scheduled transfer may not be owned by any of the parties involved in the transaction and those owning the lines involved may not be compensated for the service. Sometimes parallel flow has no ill effect on the system, but sometimes it may cause unintentional overloading of particular interties. Within a control area a utility re-dispatches so as to minimize costs subject to the line loading restrictions.

Historically, there has been little concern over this issue because the effects (and associated costs) were thought to cancel out over time. However, there is a concern that flows are becoming more uni-directional and the issue should be addressed. Expansion of the grid, regional imbalances in resources, and increased competition may increase the problem of parallel path flows.

- **Distance and location of service required.** Until now, most transmissions rates are "postage stamp" rates which are the same regardless of whether the electricity is transferred 10 or 100 miles. Alternatively, rates could reflect the distance of actual or contract electricity flows.

- **Direction of the flow.** Current pricing policies do not distinguish between flows which are counter to the prevailing flow and those which are with the prevailing flow. Incremental costs of a reverse flow could be smaller than those associated with a prevailing flow or even negative (resulting in a beneficial effect on the system) because it relieves constraints and reduces capacity costs.

Over the longer-term increased competition could lead to a number of other policy changes in the electric utility industry. The most important of these long term issues is whether open access will ultimately lead to retail wheeling. In fact a number of states have recently passed or have pending

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The one exception is the case of PJM which reached a settlement with New York utilities and agreed to use phase shifters to address loop flow problems. Phase shifters are devices that redirect electrical current on an AC grid and correct the mismatch between contract path and parallel path flows. (See p. 64, Task Force report).
legislation to allow retail wheeling. Other utilities have announced their intent to pursue retail loads in others franchised service territories.\textsuperscript{54}

**Overview of Potential Impacts**

There are several "avenues" through which the environmental impacts of generation and transmission could be affected by the laws and policies discussed above. There are two types of potential issues addressed here -- short-term impacts and longer-term changes. Short-term impacts would include changes in the operation of the existing generation and transmission system, including changes in dispatch which would in turn result in (1) changes in the fuel used for generation, (2) changes in the efficiency of the units dispatched, or (3) changes in transmission losses.\textsuperscript{54}

The second type of impact would occur over the longer-term and include changes in the characteristics of the electric generation and transmission electric generation and transmission system and include (1) changes in the fuel used for generation, (2) change in the nature of the technologies used to meet future loads, and (3) changes in the location of generation (which might affect the use of the transmission system and associated losses). There might also be indirect effects, particularly over the longer-term, which come about as a result of increased competition such as effects on technological innovation in generation technologies.

The following section examines each of the changes in law and/or policy discussed above, and identifies what potential changes might occur and the resulting impacts. Exhibit 1 summarizes this discussion.

**Creation of Exempt Wholesale Generators**

Increased ease of entry into the electric generation market could increase the reliance on natural gas as a fuel for new generating sources as a greater share of new capacity is provided by EWGs. Historically, independent power producers have relied on natural gas-fired generation. This has been driven in part by the much shorter lead time associated with gas-fired facilities (typically combined cycle) relative to that required for a coal-fired facility. Natural gas has been available recently under favorable terms and long-term contracts. In 1993, NERC estimates that non-utility generators (NUGs) will add about 2,600 MW to the U.S. electric system, of which about 65 percent will be gas-fired. In 1994, about 4,100 MW will be added by NUGs, of which about 85 percent will be gas-fired.\textsuperscript{54}

\textsuperscript{54} Nevada, Arizona and Massachusetts have proposed legislation; Michigan has ongoing experiments; and LG&E has made an announcement that it intends to pursue retail loads of other Kentucky utilities.

\textsuperscript{54} Currently, about 7 percent of total energy generation in the U.S. is lost in transmission and distribution.

# Exhibit 1

## Summary of Potential Environmental Affects of Increased Competition

<table>
<thead>
<tr>
<th>Potential Change in Policy or Law</th>
<th>Primary Implication for the Market and System Operation and Development</th>
<th>Mechanism for Environmental Impact and the Expected Direction</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation of EWGs</td>
<td>Greater competition in the wholesale generation market and greater share of new additions met by EWGs</td>
<td>Positive</td>
<td>Increased use of gas-fired combined cycle for new additions</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Greater incentive to develop more efficient and cleaner technologies</td>
<td>Increased dispersion of new generation</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Increased repowering and/or life extension</td>
<td>Increased use of coal for new additions</td>
<td></td>
</tr>
<tr>
<td>Consolidation of the industry through mergers and acquisitions</td>
<td>Positive</td>
<td>Increased and more efficient use of hydro reserves</td>
<td>Reduced fuel use</td>
<td></td>
</tr>
<tr>
<td>Elimination of &quot;PURPA Machines&quot;</td>
<td>Negative</td>
<td>Increased use of coal resources with more efficient operations</td>
<td>Increased electricity demand</td>
<td>Uncertain</td>
</tr>
<tr>
<td>Falling Electricity Prices</td>
<td>Positive</td>
<td>Reduced fuel use</td>
<td>Increased electrification</td>
<td></td>
</tr>
<tr>
<td>Transmission Access</td>
<td>Negative</td>
<td>Increased use of coal-based resources</td>
<td>Increased electricity demand</td>
<td>Uncertain</td>
</tr>
<tr>
<td></td>
<td>Positive</td>
<td>Increased use of hydro resources</td>
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<td></td>
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<td></td>
<td>Increased efficiency</td>
<td>Increased efficiency</td>
<td>Increased electrification</td>
<td></td>
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</tbody>
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# Exhibit 1

## Summary of Potential Environmental Affects of Increased Competition (Continued)

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<tr>
<th>Potential Change in Policy or Law</th>
<th>Primary Implication for the Market and System Operation and Development</th>
<th>Mechanism for Environmental Impact and the Expected Direction</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
</table>
| Transmission Access (continued)   | Increased access to buyers (decoupling buyer seller link) for new and existing resources and loads | Negative/Uncertain  
- Potential increased losses as the distance of contract paths and perhaps power flows increases.  
- Uncertain/Neutral  
- Change in fuels for all requirements as they seek new suppliers |           | Positive  
- Increased unit size and attendant scale economies |
|                                   | Heightened emphasis on economics of siting decisions and local environmental permitting requirements |               | Positive  
- Increased use of renewable resources at economic sites  
- Negative  
- Increased use of mine-mouth resources |
| Increased congestion on the transmission network | Negative  
- Increased losses  
- Lower efficiencies  
- Uncertain  
- Movement away from economic dispatch (lower efficiencies and/or fuel changes) |               | Positive  
- Increased coordination  
- Negative  
- Increased use of coal resources |
| Expansion of the transmission network |             |               | Negative/Neutral  
- Increased use of coal resources, displacing coal or oil/gas |           | Positive  
- Decreased losses (due to decreased congestion and more efficient power flows) |
| Retail Wheeling                   | Change in siting due to pricing which reflects congestion, direction and path |             |           |           |

<p>| Transmission Pricing              | | | | |</p>
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| Transmission Pricing (continued) | More rapid expansion of the transmission network                     | Positive
                                             |                                                     | ■ Reduced congestion and losses                  |
                                             |                                                     | ■ Negative                                       |
                                             |                                                     | ■ Greater use of coal resources                   |
To the extent that in the absence of the EPACT reform (i.e., the creation of EWGs) utilities would build a greater share of new capacity and utilities would be more inclined to build coal-fired generation, there would be an environmental benefit from EPACT. Emissions of CO₂ and NOₓ would decline due to fuel type differences. There would be no effect on SO₂ emissions under a national cap; any gains would simply be traded or banked. However, there could be cost savings if more expensive compliance options are displaced. There could also be some environmental benefits from efficiency gains as gas-fired combined cycle generators have lower heat rates than most alternative technologies.  

The NERC data indicates that of the approximately 3,000 MW of new capacity to be added by U.S. utilities in 1993, about 50 percent of it is expected to be gas-fired; in 1994, about 65 percent of the approximately 4,000 MW of utility capacity additions is expected to be gas-fired. The NERC data therefore indicates that NUGs are relatively more likely to add gas-fired additions. Moreover, the gas-fired additions by utilities are more likely to be gas-fired turbines with very low capacity factors.

EPACT reform may lead to a greater share of all new generation additions being gas-fired, regardless of who constructs the capacity. In response to increased competition, utilities may seek increased flexibility in new resource acquisitions. As a result, they will want to choose resources which can be added in small increments and which have short lead times. This requirement would favor gas-fired combined cycle units resulting in environmental benefits from both fuel choice and efficiency effects. However, with smaller units, economies of scale would be lost — smaller units tend to be less efficient. For example, halving the size of a combined cycle unit results in about a 5 percent increase in heat rate.

Another factor may force utilities in the opposite direction. Utilities, seeing a need to be the low cost generator and to compete in the bulk power market, may rely on larger, baseload coal-fired generation for new resource additions. EWGs facing a competitive procurement may well reach a similar conclusion. Moreover, as all-requirements wholesale customers, and potentially retail customers, began to shop around for new suppliers, utilities will seek ways to minimize the risk of stranded investment. This will favor extending the lives of and repowering existing coal-fired units. Life extending units will have a negative environmental impacts where gas would have been constructed in place of the extended unit. Repowered units remaining on coal will have some efficiency gains. Units repowered to natural gas will benefit both from efficiency gas and the fuel switch.

Many believe that PURPA imposed unnecessary costs on consumers because entities structured their projects to maintain their PUHCA exemptions and sought inefficient steam hosts to maintain QF status. To the extent that the passage of the Act eliminates so-called "PURPA machines", it should have positive environmental benefits from reduced fuel consumption.

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2/ A new gas-fired combined cycle units have a full load heat rate of about 7500 Btu/kWh as compared to about 9,800 Btu/kwh for a coal unit, a 23 percent efficiency gain. Gas has about half the carbon content of coal on a Btu input basis.
A greater share of new additions being provided by EWGs could lead to smaller size units and more widely dispersed generation. A greater dispersion of generating sources and remote siting of plants could lead to air quality benefits with respect to SO₂ and NOₓ even if total emissions remain unchanged.

Increased consolidation of the industry may result as increased competition would tend to favor larger utilities systems. It might be expected that utilities would seek mergers where synergies and benefits exist, such as diversity in loads, differences in reserve levels, or large differences in marginal costs. In coal-based regions, this might lead to increased use of coal-fired generation. In the some regions, it could lead to more efficient and increased use of hydro reserves. However, there would only be an environmental benefit (or cost) from increased use of these low cost resources to the extent that these exchanges were not already taking place between separate companies. We expect that for the most part, contiguous utilities are already taking advantage of these opportunities within the limits of the transmission system, particularly in those regions where utilities operate in tight pools or under a brokering system.

The creation of EWGs could also lead faster technological innovation in generation. The creation of EWGs may concentrate the market for new generation, such that the majority of new additions are made by only a few players who have established expertise in generating unit construction and operation. This might lead to a greater incentive to invest in research and development into new generation and environmental control technologies and lead to more rapid innovation. The result would be reduced environmental impact. Another argument is that eliminating the need to meet PURPA’s requirements could bring forth innovative technologies by EWGs.

Transmission Access

In general, increased transmission access will enhance economic efficiency in the short-term by increasing coordination and economy transactions. In many regions of the country there are substantial differences in short-run marginal energy costs between neighboring systems or pools. Increased transmission access will facilitate these transactions. Increased economic efficiency does not necessarily translate into environmental benefits. In fact, to the extent that economy transactions lead to less expensive coal displacing more expensive oil or natural gas, CO₂ emissions will increase. NOₓ emissions may also likely increase assuming older, uncontrolled units displace new units with more expensive variable operating costs.

Emissions could decrease if trades occurred due to differences in the efficiency (i.e., Btu/kWh) of the marginal units in the two trading areas. However, one would expect that the cost savings from efficiency savings are much smaller than the associated transmission costs which would be incurred. Therefore these types of trades may not occur.

24 A 10 percent improvement in efficiency (i.e., increasing the heat rate from 10,000 Btu/kWh to a 9000 Btu/kWh) would save only about 1.5 to 2 mills/kWh. Associated transmission costs are likely to be on the order of 1 to 2 mills/kWh (non-firm). (See the Task Force report).
The extent of any environmental impact from increased coordination and trading in the short-term depends on the degree to which there are additional opportunities for these transactions. In the U.S., the electric system has evolved into three major interconnected grids: the Eastern, Western and Texas interconnections, which are not synchronized with each other. Within the three interconnections are about 160 control areas. A control area can be a single utility or a power pool of several utilities (including the "tight power pools" of New England and New York) and the interconnected holding company pools, such as AEP. Where pools have not been formed to take advantage of short-term efficiencies, brokerage systems have evolved. In 1989, over 70 percent of all capacity was in a centrally dispatched pool or in a brokered pool. This suggests that opportunities for short-term efficiencies gains from increased coordination and trading within control areas are probably already taking place within the limits of the transmission system. Any potential for additional efficiency gains from increased transactions are limited to those within each of the three interconnections between control areas.

A 1981 Power Pooling study conducted by FERC examined the issue of the extent to which additional short-term efficiency gains could be made. The conclusions was that in aggregate, the industry was doing a good job of achieving short term efficiencies and that "[t]he aggregate unrealized economies available through further coordination to approach single system regional planning and operation are probably not large - perhaps of the order of 1 or 2 percent of electric revenues on a national basis." Gains to be made by smaller utilities were estimated to comprise the bulk of potential gains.

One area where open access may bring increased coordination and trades is between non-adjacent control areas. For example, currently, the only way to reach Florida utilities is through the Southern Company’s system. Similarly, the only direct route from the PJM pool to NEPOOL is through New York Power Pool or Canada. Transmission access may facilitate trades if it was the case that an intermediary utility was reluctant to provide services to an area for which it was formerly the only potential supplier. However, the costs to wheel power across multiple systems can be prohibitive (so called “pancaked” wheeling charges), and unless pricing reforms address this issue, feasible trades are those which occur over a single system.

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10/ Within a control area, operators dispatch generating units to minimize variable operating costs while meeting established reliability criteria. Operators also monitor and control flows over transmission tie lines with other control areas by adjusting the output of generators, sometimes departing from economic dispatch.

11/ Brokerage systems provide a clearinghouse to post bids and offers for short-term energy. Brokers are used in the Mid-America Continent Power Pool (MAPP) and the Western Systems Power Pool (WSPP) and Florida.


Transmission access may encourage some all-requirements customers of a single utility to seek lower cost suppliers. These relatively small purchases may not justify expansion of the transmission system. To the extent that there is existing transmission capacity and all requirements customers simply change one supplier for another, emissions of CO$_2$ and NO$_x$ will probably remain unchanged where lower cost coal is substituted for higher cost coal. Only when non-coal is displaced will there be an impact. There may, however, be an increase in losses (with associated increase in fuel consumption and emissions) if power is transmitted a greater distance.

Increased access could increase congestion on the transmission network, at least in the short-run. The environmental cost or benefits are difficult to determine. Environmental costs may be incurred as a result of losses in operating efficiency (i.e., higher fuel consumption) or increased losses. However, benefits could also occur where coal-fired units are "constrained off" due to transmission limits, while gas-fired intermediate and peaking units are "constrained on." In this case, emissions of carbon and perhaps NO$_x$, would decrease.

Some argue that increased transmission access could reduce the degree of regional control over tie lines. Open transmission access is likely to increase the number of transactions over control area tielines, with associated increases in line losses, resulting in increased emissions.

Increased transactions will also tighten the electrical coupling between adjacent areas. Currently, flows across tie lines are small relative to the amount generated within each area, and control areas are only mildly affected by changes in the volume of tie-line activity. Increased electrical coupling will decrease the capacity available for accommodating unplanned tie-line flows after a disturbance. With open access, it may be more difficult to maintain economic dispatch due to increased electrical coupling and increased requirement for network controls, such as voltage support and frequency control. This movement away from economic dispatch could have uncertain environmental effects -- decreased thermal efficiency would increase fuel consumption. However, any unexpected move away from coal to other less carbon intensive fuels could result in environmental benefits. If these effects and their associated costs are reflected in transmission pricing, these effects could be mitigated.

Improved transmission access could ease siting constraints and increase options for EWGs. Prior to open access, IPPs were most likely to site their facilities within the service territory of the utility requiring capacity, thereby avoiding the need to negotiate transmission access. Guaranteed transmission access may make the EWGs siting decisions more economic. Transmission access could lead to a general change in siting patterns. Currently, most generation is located relatively close to the load served (with the exception of inexpensive hydro electric power and in areas with environmental restrictions such as Southern California). Transmission access could increase the level of generation which is remotely sited. More remote siting would have environmental benefits due to the reduced impacts of NO$_x$ and SO$_2$ emission on air quality. Remote siting may also increase the contract path for power; the effect on actual

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For a detailed discussion of these issues see Graves, et al., Comments to the FERC in Docket No. RM-19-000.
power flows, and therefore losses, is uncertain. Pricing policies that recognize congestion costs and actual power flows and their direction would lead to overall reduction in losses.

Increased flexibility in siting could lead to increased reliance on indigenous resources. Increased use of mine mouth coal plants would result in an increase in emissions where gas-fired capacity would have been built, but lower emissions where coal-fired generation would have been built and the coal transported by rail, barge, and/or truck. Less constrained siting may also lead to increased development of economic renewable resources (e.g., wind, geothermal, hydrop) with the developer choosing the best site regardless of whether the utility in that area being willing to buy the output. In other words, the effect that increased flexibility would have on the mix of resources (and hence emissions) is uncertain and would depend, in part, on the type of competitive procurement practices implemented by individual states.

With open access and EWG status, participants in the generation market will have greater latitude in selecting which states they site their facilities in. As a result, EWGs may then have incentives to site their facilities in states where environmental permitting and siting requirements are less stringent. For example, if an EWG were attempting to sell to a New York utility, it may find it easier and more economic to construct its facility in western Pennsylvania or Ohio, perhaps as a mine-mouth plant. To the extent that there are "coal-friendly" states, there may be an increase in the number of coal-fired facilities constructed due to EPAct and open access.

In FERC's previous proceeding on the bidding and IPP NOPRs there was a fair amount of concern raised over the issue of whether IPPs would escape environmental and siting regulation at the state level. The Draft Environmental Impact Statement on the NOPRs concluded that the environmental regulation at the state level was as stringent for IPPs as for regulated utilities. Some states do have siting regulations which do have minimum size requirements which some IPPs may fall under. However, the siting function in many states is a "determination of need proceeding" which is separate from the environmental permitting process. So while in some states there may be no specific certification for smaller facilities, resource planning, bidding systems and utilities' own decisions making should provide sufficient checks and balances with respect to need and duplication of facilities.

Increasingly, state commissions and utilities are instituting competitive bidding schemes to select new generation and non-generating resources. Usually, these schemes include price and non-price selection criteria. The non-price criteria typically includes environmental factors. To the extent that bidding systems do not incorporate fully environmental externalities, there may be some room for potential bidders to affect their ranking by their siting decisions. For example, if an bidding scheme does not account for environmental externalities outside the state of the purchasing utility, there could be some increase in the construction of coal-fired generation in remote locations relative to what would have occurred in the absence of EPAct and open access.

Improved transmission access will give EWG's access to multiple buyers, potentially resulting in increased size of generating units, improved scale economies, and better operating efficiencies and reduced environmental impacts.
If retail wheeling should evolve, it may lead to increase use of less costly resources, which are most likely to be coal-fired, thereby increasing emissions when it displaces oil or some other less carbon intensive fuel. Decisions by customers to seek lower costs supplier are likely to be driven by the suppliers high fixed costs, and the pattern in most of the country will be for customers of one supplier of predominantly coal-fired generation to seek another supplier of coal-fired generation. There are instances where high embedded costs result from nuclear generation (such as is the case with Commonwealth Edison) where all-requirements and retail customers may seek lower cost coal-based suppliers.

Increased competition would be expected to lead to falling electricity prices. As a result, it might be expected that (1) increased market share for electricity where gas and electricity compete (i.e., increased electrification) and (2) increased use of electricity overall in existing markets. The environmental impact of the former effect would be end-use specific, primarily space and water heating where gas and electricity, and oil in some regions compete for new loads. Where primary fuel input is more carbon-efficient, emissions would decline. For NOX, one would expect that increased electrification would reduce NOX emissions, as utility plants are more likely to be controlled for NOX. However, NOX emissions at the end-use site may have less of an air quality impact due to their distribution over a larger area.

**Transmission Pricing**

Incremental pricing (as opposed to embedded costs pricing) may cause a more rapid expansion of the transmission system than would occur without pricing reform. It is argued that embedded cost pricing reduces a utility's incentives to add transmission capacity for third-party wheeling because in most cases, they are unable to recover the incremental costs associated with the services. Therefore, when expansion occurs, existing customers would need to subsidize new wheeling loads. Under incremental pricing, the utility may be more willing to expand rather than re-dispatching and accepting congestion cost. Reduced congestion costs may mean increased efficiency in dispatch and reduced environmental costs.

Concentration-based pricing (recognizing cost of re-dispatching to relieve transmission constraints), distance-based rates, and pricing based on parallel path flows (as opposed to contract paths) would all be expected lead to more efficient use of the transmission system. In the short-run, transactions would reflect these costs and those transactions which incur transmission system costs (resulting from re-dispatching or increased losses) exceeding the production costs savings would not occur. This would increase overall system efficiency, and could reduce environmental impacts as a result of higher efficiencies and lower losses.

Over the longer-term, transmission pricing which reflect the actual power flows and their direction may be expected to lead to siting decisions which minimize these system costs. This would result in an overall reduction in losses. However, the benefits to be gained by siting a plant to minimize transmission costs could be outweighed by the siting and permitting costs, particularly in high density areas. As a result, there may be little real benefits from the pricing schemes impact on siting decisions.

**Conclusions**
In general the recent changes and pending proposals would lead to increased economic efficiency, although some argue that there will be some costs, at least in the short-run, while operating procedures are reevaluated. In any case, increased economic efficiency does not necessarily result in environmental benefits. Benefits will occur whenever losses are reduced, when development and use of renewables resources increase, and operating efficiencies increase. Benefits may also occur if future generating additions are more likely to be gas-fired. However, negative impacts will occur when policies shift production from oil or gas to coal in the short-run. When losses increase, and when the effect of the policies are to favor the construction of coal-fired generation.

The extent of each of these impacts is difficult to determine. Impacts will vary over the short and long run. For example, short-term effects of open access may be increased congestion, which as noted earlier could decrease some emissions. However, in the longer run, impacts could change as transmission systems are expanded and optimized in response to open access. Moreover, for every impact attributable to a change in policy, there is often an offsetting effect. For example, environmental benefits resulting from increases in efficiency of the operation of the generation system resulting may be offset by changes in fuel sources used.

It seems that the most important potential impact the policy changes will have is on (1) what type of capacity is built and (2) under what conditions (i.e., environmental permitting requirements) this new capacity is constructed. One area which may warrant further examination is the requirements for siting of new generation facilities at the state level, as well as the "rules of the game" of electric procurement policies implemented at the state level. In siting, issues related to emissions of criteria air pollutants are important; however, other environmental impacts may be decisive (i.e., waste water discharge issues, visibility issues). The goal of this examination would be to determine the extent of the disparities between states in environmental permitting and procurement requirements which might influence future EWG siting and fuel/technology choice decisions.

Another analysis that could provide further insight into the potential impact of these market changes on the environment would be one in which the effect of a change in siting and/or fuel choice on dispatch of a power pool is examined. A good illustrative case might be that of the PJM power pool. PJM has three distinct regions (west, east and south) with transmission constraints which limit the flows between regions. This analysis could examine the effect of alternative siting and fuel choice decisions (e.g., coal in the west versus gas in the east) on the dispatch and emissions of the system. PJM is also a good choice for this type of analysis because of the detailed data we have developed for IPM on the operations of PJM generation and transmission systems.
Sources and Background Material


