



The Secretary  
Federal Energy Regulatory Commission  
825 N Capitol St NE  
Washington DC 20426

24 July 1995

Dear Secretary:

I write to comment on two aspects of the Commission's 29 March 1995 Notice of Proposed Rulemaking on open-access transmission: namely, the treatment of demand-side options (end-use efficiency and load management) and the potential for new dispersed generators whose total cost undercuts the short-run marginal wholesale power cost.

*Seeking symmetry between supply- and demand-side resources in valuing grid decongestion*

Historically, the Commission has dealt with the flow of electrons, not the provision of end-use services (torque, light, comfort, hot showers, cold beer). Yet electrons are only a means to an end, or in economic terms, an intermediate good; the final demand they are to meet is for the end-use services. The Commission's commendable effort to increase competition and transparency in the wholesale market for electrons should take account of the need to avoid creating asymmetries when market actors, at all levels, are choosing whether to buy more electrons or to use existing electrons more productively or at more optimal times. Indeed, such a duty is consistent with the spirit of the Energy Policy Act of 1992's emphasis on least-cost Integrated Resource Planning (*e.g.*, §111, §11).

A key principle of the Commission's approach to transmission pricing appears to be that wholesale power generation should attract an appropriate locational and temporal rent that reflects the real-time value of grid congestion and of the consequent costs and losses. This sound principle should reward dispersed generation, located at or near load centers, with an economic credit for "decongesting" the grid, thereby avoiding grid capacity enhancements and freeing up existing grid capacity for other worthwhile transactions. So far, so good.

However, it is not clear whether the Commission has considered how *demand*-side resources can in practice receive commensurate economic credit for the corresponding "grid Dristan" value *they* create by dispatching "negative loads" already delivered to the point of end-use. In general, well-designed demand-side investments cost far less than any currently available supply-side investments, and provide a precisely equivalent "decongestant" effect that should attract the same economic reward. That reward should be available to bidders, either as principals or as contractors to principals. If the Commission provides no mechanism for doing this, then the cheaper demand-side resources will be put at an artificial disadvantage, and this distortion will cause major misallocations of societal capital. Actors in the electron market will receive a due economic reward for generating electrons at times and places that unburden congested grids, but will receive no corresponding reward for *saving* electrons at times and places that do exactly the same thing (while providing the same end-use services). This asymmetry would be inconsistent with the correct principle of comparability, under which all users who impose burdens on the grid should pay a fair and uniform price for that usage, while conversely and symmetrically, all users (or, literally, *non*-users of electrons) who *relieve* burdens on the grid should reap an identical, fair, and uniform reward for the capacity they free up. Grid decongestion by demand-side services can also be usefully thought of as equivalent to the potentially unbundlable and generation-flavored ancillary services addressed in LG&E's comparability tariff filing with the Commission, such as loss compensation, load following, energy imbalance services, and even VAR support. If such services can and should be provided by anyone at market prices through watts, why not equally through negawatts?

The Commission should consider ways to correct this problem with some actual transactional mechanism, such as entitling providers of demand-side resources to be compensated for their "decongestant" services at the same value discovered in the market for equivalent decongestion by supply-side resources. This would help to ensure efficient allocation of capital between supply- and demand-side resources, no matter who provides either. At the very least, state utility commissions and other decisionmakers should be encouraged or required to include that decongestant value as a shadow price when choosing or approving the allocation of resources.

*Is the emerging wholesale market sufficiently compatible with the "distributed utility"?*

The NOPR and its companion NOPR on stranded costs are important steps toward the efficient wholesale power market that EPAct requires and that will clearly benefit the country. Yet I do have an uneasy feeling that we are fighting the previous war. About the time we get good at wholesale competition, we may no longer need it: the elaborate arena being prepared for the wholesale gladiators may have become a wasteland populated by the ghosts of economic theorists who yet again got blindsided by technology. Trigeneration with off-the-shelf MW-range gas turbines can already provide electricity at *net* (of heat credit) costs around 0.5-2.0¢/kWh at many industrial sites, with system efficiencies up to 90+% (data from Tom Casten, Trigen, White Plains NY). Proton-exchange-membrane fuel cells show strong promise of yielding 1-2¢/kWh electricity at *any* scale, at any site with natural gas, *before* taking credit for their valuable ~40% @ 80°C waste heat (data from Jeff Bentley, A.D. Little, Cambridge MA). (The PEM fuel-cell developments also seem likely to be radically accelerated by their potential early application to the ultralight-hybrid "hypercars" devised at this Institute and now being commercialized by a couple of dozen capable firms worldwide.) Even without the further breakthroughs now plausible in renewables, these demonstrated technologies can easily beat short-run marginal cost from the best imaginable combined-cycle turbine.

Such supply-side technological developments imply that *all* central thermal power plants, even including the newest combined-cycle plants, may become uncompetitive and have to be written off. This possibility becomes even stronger when the new generating technologies are *combined* with demand-side resources (which are undergoing a revolution of their own, with big savings turning out to be often cheaper than small savings) and with rapidly emerging onsite power storage technologies such as superflywheels, now expected to enter the market within the next year (data from Bill Howe, E SOURCE, Boulder CO). Both those advances are also synergistic with renewables.

Such a shift toward Carl Weinberg's vision of the "distributed utility"—only more so, with very little economic role left for existing thermal power stations—would not only affect the Commission's consideration of stranded costs; it could also ultimately disintermediate the entire utility as we know it. As the "utility" moved from a remote network of grid-connected major facilities to a smallish box at each retail customer's basement, backyard, or rooftop, the need for the grid and even for the retail meter could disappear: if we didn't have an electric grid, we might not absolutely need it, but only a gas grid. (In practice the grid would probably persist, especially locally, if only to help balance fluctuating thermal and electric loads. Happily, the wires should be around for long enough for a transition that gracefully handles stranded costs and benefits, preferably through the sort of universal system benefits charge suggested to you by PG&E and NRDC.) The utility could turn into the sort of decentralized provider of end-use services—in the form of leasing, finance, operation, etc. of onsite generators and associated end-use, storage, and control devices—envisaged by Thomas Edison a century ago. This would precisely fit PG&E/NRDC's sensible *functional* definition of "distribution" as providing "electricity that is used by any utility customer to provide enduse services (as distinguished from electricity that is purchased for resale to end-use customers)."

Such possible leapfrogs are not at all far-fetched; the main question about their large-scale deployment is less whether than how fast. The Commission's deliberations on both of its 29 March NOPRs should seek a framework that still makes sense under, and does not prevent or distort, such radically decentralizing, "supercompetitive" technical and economic conditions. The NOPRs must be carefully tested for consistency with such a world.

I would therefore propose not merely that the stranded costs which so vex the competitive-restructuring debate *would not have been incurred* in an environment with either effective IRP or its competitive market equivalent, so that the Commission is seeking to solve a problem which on the margin no longer exists; I would further suggest that in doing so within the conventional context of large central stations and bulk transmission, the Commission is at risk of creating new conditions that could inhibit the even more economically efficient *next* stage of the electric system's evolution. The very dynamism and the inexorable competitive logic of the market forces now being unleashed, and especially of the market-driven technological imperative, may lead in time to the virtually complete "withering away of the state" that the Commission now regulates.

Sincerely,  
Amory B. Lovins  
Vice President and Director of Research