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March 10, 2025

Will Seuffert
Executive Secretary via eDockets only
Public Utilities Commission
121 E 7th Place, #350
St. Paul, MN 55101

RE: **Xcel's 2024 Peak Demand DROPS 409MW from 2023 Peak Demand**
Integrated Resource Plan E-002/RP-24-67
Xcel Rate Case GR-24-320;GR- 24-321
MISO Tranche 2: CN-25-117 Brookings - Lakefield
CN-25-118 Lakefield - Adair
CN-25-121 DPC's North Rochester – Columbia
CN-25-122 Xcel's North Rochester – Columbia
CN-22-532 and TL-23-157 Wilmarth – North Rochester – Tremval
CN-22-131 and TL-22-132 Xcel's Minnesota Energy CON
CN-23-200 and TL-08-1474 Brookings – Lyon Co. and Helena – Hampton

Dear Secretary Seuffert, et al:

This comment is made on behalf Carol A. Overland, No CapX2020, and Legalectric for consideration in IRP, rate case, and so many transmission dockets. Why? Because Xcel's demand is DOWN, still not up to Xcel's highest peak, 9,859 MW in 2006.

From Xcel Energy's SEC 10-K filing[1], the peak of 2024:

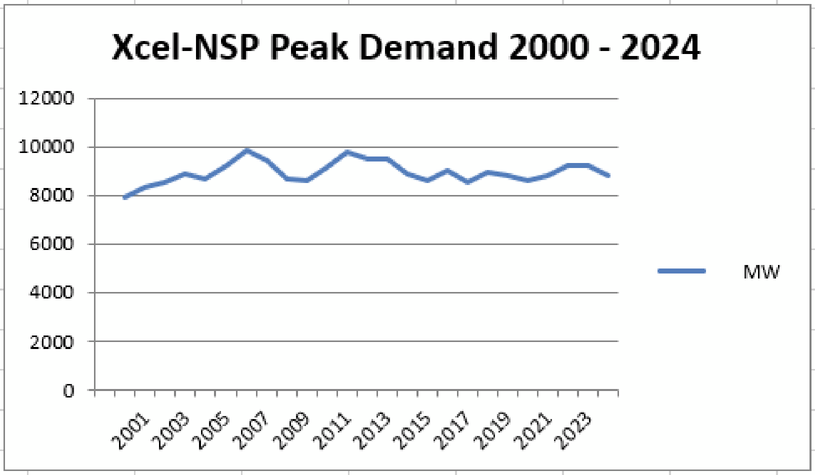
Capacity and Demand

Uninterrupted system peak demand and occurrence date:

	2024		2023	
Utility Subsidiary	**MW**	**Date**	**MW**	**Date**
NSP System	8,822	Aug. 26	9,231	Aug. 23
PSCo	7,084	Aug. 1	6,909	July 24
SPS	4,437	Aug. 19	4,372	Aug. 17

[1] Xcel's 2024 SEC 10-K: https://legalectric.org/f/2025/02/Xcel-Peak-Demand-2024_0000072903-25-000029-e2853810-9fe1-4df5-89d1-e14f11e5c841.pdf

This is important because at 8,822 MW, Xcel's peak demand is down 409 MW from last year. More importantly, at 8,822 MW, Xcel's peak demand has not reached the all time high peak demand of 9,859 MW in 2006! Why is this important? Xcel is now crying that "demand will go UP, UP, UP!" What does Peak Demand look like over the last 25 years?



2000	7,936
2001	8,344
2002	8,529
2003	8,868
2004	8,665
2005	9,212
2006	9,859
2007	9,427
2008	8,697
2009	8,615
2010	9,131
2011	9,792
2012	9,475
2013	9,524
2014	8,848
2015	8,621
2016	9,002
2017	8,546
2018	8,927
2019	8,774
2020	8,571
2021	8,837
2022	9,245
2023	9,231
2024	8,822

In 2006, if you recall, or if you'll do homework, as many of you were not around then, Xcel was saying, as the basis for its CapX 2020 transmission expansion, that demand would go UP, UP, UP at an astronomical rate of 2.49% ANNUALLY! Really. And buying into that notion, the Commission granted a Certificate of Need[2] for the CapX 2020 transmission projects. From the CapX 2020 Vision Study, p. 5[3]:

Control area	2009 load level (2004 MAPP Series) (MW)	Yearly growth rate (%)	Calculated 2020 load level (MW)
ALT (West)	3265.3	1.60	3888.2
Xcel Energy (North)	9632.6	2.68	12885.1
MP	1507.3	1.70	1814.4
SMMPA/RPU	330.0	2.70	442.4
GRE	2833.5	3.27	3943.2
OTP/MPC	1677.2	2.70	2248.3
DPC	954.7	2.60	1266.2
Total	20200.6	Ave. = 2.49%	26487.8

Table 1 – CapX 2020 Anticipated Area Growth

Table 1 shows an anticipated load growth of approximately 6300 megawatts (MW) in the CapX 2020 region for the period from 2009 to 2020. The technical team also studied historical loads for Great River Energy, Minnesota Power, Missouri River Energy Services, Otter Tail Power Company, and Xcel Energy to determine whether anticipated load growth was consistent with historical load growth in the region. Load growth for these companies averaged 2.64 percent during the period 1980 to 2004. Diagram 2 shows the variability of load growth as well as the continuing upward growth in load for the region. The technical team's forecast from 2009 through 2020 is a slower growth curve than the actual growth in the early 2000's (2.49 percent vs. 2.64 percent).

[2] PUC Docket CN-06-1115

[33] https://nocapx2020.info/wp-content/uploads/2012/02/capxvisionstudy20120214-515026913743.pdf

Suffice it to say, that was an overstatement. OAG-RUD noted Xcel's tendency to overstate demand in a Rate Case comment.

History… that 2006 Peak Demand of 9,859 MW was BEFORE the many transmission additions greatly expanded transmission capacity. For example, the $2 billion CapX 2020 transmission expansion of over 700 miles provided a lot of transmission capacity. That 2006 Peak Demand of 9,859 MW was also BEFORE the ITC MVP projects across southern Minnesota and the top of Iowa and BEFORE Cardinal-Hickory Creek transmission from southern Minnesota into Wisconsin. The 9,859 Peak Demand of 2006 was also before coal plants started to be closed, also providing significant transmission capacity.

All that transmission capacity was added, many coal plants shut down, yet Peak Demand remains BELOW what it was in 2006 before that massive transmission build-out.

Attached is a little light reading: A presentation by the MISO Independent Market Monitor from Summer 2024, and predictive testimony of George C. Loehr from 2008.

Is MISO Tranche 2 needed? It's surprising that this is even a question, given the conflation of transmission reliability and security need with economics. How much excess capacity is available? How many dollars of this massive transmission capacity build-out have been foisted on ratepayers in Minnesota and other jurisdictions in pursuit of utility dreams? How much of the higher rate recovery allowed by FERC is the driver for the transmission build-outs?

The Commission has approved every projects "approved" by MISO, deferring and acquiescing to this transmission marketing entity, without a realistic demonstration by Xcel and the other utilities proposing projects. MISO is not the regulator. The Public Utilities Commission is the regulator, and the criteria for Commission approval versus MISO "approval" are not aligned.

There's a statutory demonstration of need required for approval of a Certificate of Need, and holding utilities to that standard is long overdue. That's the Commission's job as the regulator.

Very truly yours,

Carol A. Overland

Carol A. Overland
Attorney at Law

MISO IMM Comments on LRTP Tranche 2 Benefit Metrics

MISO Independent Market Monitor

David Patton, Ph.D.
Potomac Economics

May 29, 2024

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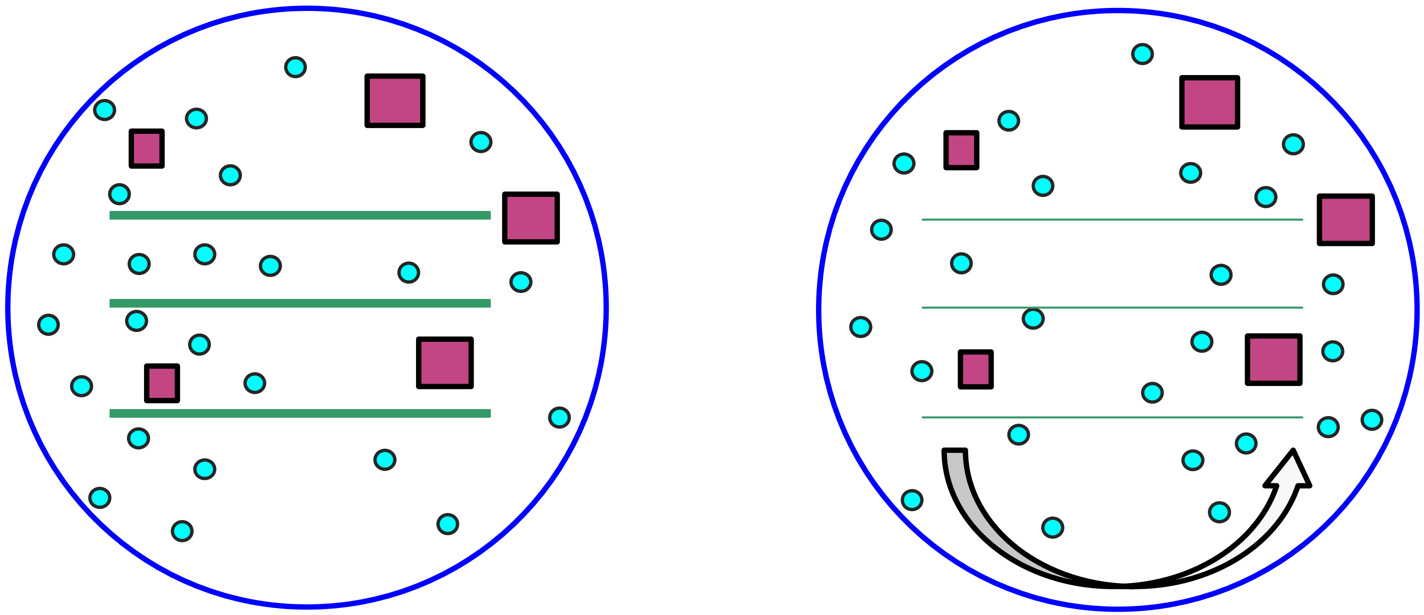
Comments on Analysis of Transmission Benefits

- Transmission investment will be a critical component of MISO’s evolution over the next 20 years.
- It is important that this investment be economic –
  - ✓ Uneconomic investment will raise costs and undermine investment in resources, storage and other alternatives to transmission.
  - ✓ We have previously expressed concerns about the unrealistic nature of Future 2A growth assumptions.
  - ✓ MISO has chosen not to attempt manual optimization (evaluating alternative siting impacts on individual projects or to resolve overloads).
  - ✓ The benefits methodologies are likely to lead to substantially over-estimated benefits, which we describe in this presentation.
- One of our primary concerns is related to the fact that the effects of MISO’s markets are not properly recognized as illustrated below.

Recognizing the Market Effects in the Benefit Analyses

With Tranche 2 | **Without Tranche 2**



- One of MISO's main responsibilities is to operate markets that provide key economic signals to guide generation investment and retirement decisions.
- Benefit analyses must recognize that new transmission will change energy and capacity market signals – less transmission will shift resources closer to load.
- This will reduce or eliminate many of the benefits (e.g., capacity savings and reduced losses).

Classes of Transmission Benefits

- MISO has proposed 9 classes of transmission benefits.
- Classes that are likely to be valid and reasonable, depending on the details:
  - ✓ Congestion and fuel costs savings
  - ✓ Reduced transmission outage costs
- Classes for which we have significant or fundamental concerns:
  - ✓ Avoided capacity costs
  - ✓ Decarbonization
  - ✓ Mitigation of reliability issues
- Classes that are may be overestimated depending on the methodology
  - ✓ Capacity savings from reduced losses
  - ✓ Energy savings from reduced losses
  - ✓ Avoided transmission investments
  - ✓ Reduced risks from extreme weather events
- This presentation discusses our comments on each class of benefits.

Congestion and Fuel Costs Savings

- This class of benefits is the most valid and represents the truest measure of the economic benefits of transmission
- **Concerns**: Although it is the most valid, it depends heavily on the input used to ensure the savings are accurate. Some factors that would tend to reduce these benefits may not be included in MISO's methodology.
- **Recommendations**:
  - ✓ Develop a reference case that modifies siting assumptions to simulate market responses without Tranche 2. Siting would locate new additions inside of congested areas (closer to load, in capacity import limited areas, at raise help locations).
  - ✓ Include the effects of AARs on the existing network facilities.
  - ✓ Model the contribution of storage in reducing peak transmission flows and congestion since mitigating congestion is a significant component of the business case for storage.

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Reduced Transmission Outage Costs

- **Comment**:
  - ✓ This benefit is a potentially valid class of benefits since the base production costs savings would not tend to include transmission outages that are experienced regularly.
  - ✓ However, the magnitude of this estimated benefit is highly uncertain.
- **Recommendation**:
  - ✓ MISO should adopt a conservative approach to estimating this benefit that reflects the historical effects of outages.

Avoided Capacity Cost

- **Concern**: There is little basis to assume that transmission will affect MISO's capacity requirements.
- The extent to which resources are deliverable *will* affect the amount of capacity needed, but the markets provide incentives to be deliverable.
- However, the MISO methodology:
  a. Creates a base case with sufficient generation to meet 1-in-10 on a copper sheet, but the generation is not deliverable.
  b. Adding in the network makes it appear that more capacity is needed to meet 1-in-10 since the assumed generation is not fully deliverable.
  c. Tranche 2 makes the generation much more deliverable so capacity needs are lower than in (b).
- This is not a valid benefit because, absent the transmission, markets will motivate/require generation in deliverable locations closer to load.
- **Recommendation**: i. Eliminate this benefit or ii. Develop alternative case with modified siting assumptions and calculate cost of *moving* resources.

Decarbonization

- **Concern**: The congestion and fuel savings include the PTC values, which fully reflects the value of decarbonization, so calculating an additional benefit is double counting.
  - ✓ The PTC is the most reasonable benchmark for the value of carbon since it is law and represents what the government will actually pay.
  - ✓ The PTC corresponds to a carbon value of ~$50/ton. The Biden administration's value of carbon is $51/ton, which is being litigated.
  - ✓ EPA has proposed almost a 4-fold increase, almost all of which is based on lowering the discount rate from 3% to 2% percent based on falling interest rates up to 2021. Rates have been rising since then to > 4%.
  - ✓ MISO has no basis to impose a cost higher than the PTC on its customers when there is no consensus that the PTC undervalues carbon.
- **Recommendation**: Eliminate this benefit class as it is already captured in the production cost savings.

Mitigation of Reliability Issues

- **Concerns**:
  - ✓ Quantifying this benefit by assuming MISO will shed load to address voltage or other issues (without Tranche 2) is not realistic.
  - ✓ In reality, these issues are addressed by thermal proxies, reconfigurations, or by investments in other equipment that would be much less expensive than load shedding.
- **Recommendation**:
  - ✓ Eliminate this class of benefits; or
  - ✓ Quantify cost based on the next operating action to address the issues if transmission is not built (not load shedding):
    - – Congestion from modeling a thermal proxy; or
    - – The costs of equipment to address the issues (e.g., voltage support).

Capacity and Energy Savings from Reduced Losses

- **Concern**:
  - ✓ In principle we agree that new higher voltage transmission will reduce losses;
  - ✓ BUT, the loss reductions should reflect the fact that resources will relocate closer to load without the Tranche 2 projects.
- **Recommendations**:
  - ✓ Develop alternative reference case that modifies siting assumptions to reflect market responses without the portfolio.
  - ✓ Siting would locate new additions closer to load, in capacity import limited areas, and at raise help locations.

Avoided Transmission Investment

- **Concerns**:
  - ✓ Avoided transmission maintenance/replacement could be a valid benefit.
  - ✓ Avoided transmission investment that is hypothetically needed to address congestion would be inappropriate unless:
    - – Avoided benefits are quantified and deducted from the avoided capital costs.
- **Recommendation**:
  - ✓ Include only maintenance/replacement projects (age and condition) that would be avoided.

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Reduced Risks from Extreme Weather Events

- **Concern**:
  - ✓ This is one of the most uncertain and speculative benefits.
  - ✓ Each of the extreme weather events have resulted in extremely different patterns of flows so it is difficult to predict how transmission would help.
  - ✓ The benefits should be small because the probability of extreme weather events are low.
- **Recommendation**:
  - ✓ MISO should ensure that it does not implicitly increase the probability of extreme weather events in calculating the benefits.
  - ✓ Benefit = Potential Savings during Event * Probability of Event.

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Other Comments on Benefit Estimates

- We have additional recommendations to improve the benefit estimates.
- Divide the portfolio into groupings of projects that address separate issues to validate that each grouping passes a benefit-cost test.
  - ✓ Assessing the entire portfolio together would not allow MISO to pair it down so that it only includes the economic groupings.
- Adopt a sensitivity case similar to IMM-2A, which has more dispatchable/storage/hybrid resources than MISO's Future 1A.
  - ✓ Although Future 1A has substantially less intermittent renewables, it also understates the likely quantity of dispatchable resources that are key for managing congestion.
- Consider improving a) the siting of resources based on the location of congestion, and b) the modeling of battery storage to resolve congestion.
  - ✓ MISO should examine whether the congestion identified in reference case can be more economically be managed with storage to verify the robustness of the business case.

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Hearings of the Senate Energy and Natural Resources Committee
July 31, 2008

I wish to thank the members of the Energy and Natural Resources Committee for the privilege of speaking to you about several issues of great importance for the future of our nation, and of great concern to me personally. I especially want to express my thanks and appreciation to Senator Bingaman and Senator Dominici of my adopted state of New Mexico, and to Senator Casey of Pennsylvania – along with their staffs.

My name is George C. Loehr, and I'm an engineer with more than 45 years of experience in the electric power industry. My primary expertise is in bulk power transmission system planning and analysis, and electric power system reliability. I was deeply involved in various post-hoc studies following the major blackouts in 1965, 1977, and 2003.

I worked as Executive Director of the Northeast Power Coordinating Council (NPCC) from 1989 to 1997, and was very active in regional, national and international activities. I took early retirement from NPCC in 1997, and now do management consulting, appear as an expert witness, write, and teach a variety of courses on power systems.

I have been a Vice President and member of the Board of Directors of the American Education Institute (AEI), and a charter member of Power Engineers Supporting Truth (PEST). At present, I serve as Chair of the Executive Committee of the New York State Reliability Council (NYSRC), and as an Outside Director on the Board of Directors of the Georgia System Operations Corporation (GSOC).

I hold an advanced degree in English Literature along with my Bachelors in Electrical Engineering, and have been deeply involved in the arts for most of my life; for example, I recently published my first novel, *Blackout*, available through <lulu.com>.

A one-page bio is appended to this statement.

The opinions I express in my testimony are entirely my own, and do not necessarily reflect the views of any of my employers or clients, past or present.

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Arguably, nothing is more critical to the future of the United States and its citizens than a reliable electric power system. It can be said without exaggeration that electricity is the bloodstream that sustains our nation and allows it to live and prosper. As the major blackouts of the past have demonstrated, any interruption to power supply adversely affects our economy, our safety and comfort, and our national security. And the most vulnerable part of our power supply is the high voltage bulk power system – the grid. However, it is not the only critical part of a reliable electric system.

Actually, there are three separate "grids" in the continental U.S. – four, if we consider Canada as well. The Eastern Interconnection is the largest, stretching from the Atlantic Coast roughly to eastern Montana, Wyoming, Colorado, and New Mexico. It includes the Canadian Maritime Provinces, as well as Ontario, Manitoba, and Saskatchewan. The Western Interconnection runs from there to the Pacific Coast, and includes the Canadian provinces of Alberta and British Columbia, as well as a small portion of the northern Baja in Mexico. The ERCOT Interconnection comprises approximately 85% of the state of Texas, and the Quebec Interconnection consists of that province in its entirety.

The passage of the Energy Policy Act of 2005 (EPAct) was heralded as a major step forward in improving the grid and reducing the likelihood of large blackouts. One drawback, however, is its almost exclusive focus on transmission. It does not address generating capacity sited close to the load centers, or demand side management programs. These strategies are often preferable to transmission as a means of improving overall system reliability. They have the added benefit of adding to the system's installed reserve margin. My own experience over the years has indicated that a certain minimum amount of capacity – in the neighborhood of 80% of the peak demand – must be located within a load center to provide voltage/reactive power support, black start capability, network security, etc.

If we wish to address electric power energy issues, we must address them in a more comprehensive manner. At present, the EPAct, and policies adopted thereunder, encourages the construction of new transmission not needed for reliability. It subsidizes remote generators, discriminates against local and distributed generation and demand side resources, forces many customers to pay for someone else's benefits, increases the likelihood of blackouts, and makes our grids more vulnerable to terrorist attack.

I believe that decisions on whether particular transmission lines are needed for reliability are best addressed by the states and by the eight existing regional reliability councils. They have consistently done a good job on this in the past. I do not believe that either DOE or FERC has the experienced staff or other resources to do this as well as the regional reliability councils and the states.

Since the passage of EPAct, some misguided proposals have been made to advance corporate agendas rather than serve the well-being of ordinary customers – mainly by trying to get proposed high voltage transmission lines approved as essential to reliability. The most significant are:

- The <u>confusion of reliability with economics</u> – of reliability *needs* with economic *wants*;

• The <u>assumption that the mere addition of transmission will improve grid reliability. It won't.</u> In fact, more transmission can actually degrade reliability if it is used to accommodate higher power transfers over long distances;

• The <u>misapplication of national reliability standards</u> promulgated by the North American Electric Reliability Corp. (NERC), the organization designated by the Federal Energy Regulatory Commission (FERC) as the Electric Reliability Organization (ERO) mandated by EPAct;

• <u>Blackout "scare tactics</u>" intended to frighten customers and public officials, compelling them to endorse the construction of facilities or implementation of policies which are not required to preserve or enhance reliability.

Because of the confusion between economics and reliability, officials often commingle both inappropriately. A prime example is the 2006 Congestion Study conducted by the Department of Energy (DOE), as mandated by EPAct. [An updated 2009 Congestion Study is now under way.] As a result of its 2006 study, which did not properly consider non-transmission alternatives, the Department designated certain National Interest Electric Transmission Corridors where, according to DOE, consumers were adversely affected by transmission congestion or constraints. But the DOE's failure to properly consider non-transmission alternatives means that the congestion study has not even established economic congestion. In addition, congestion or constraints do not equal low reliability. Neither the 2006 study, nor the corridor designations, bear any resemblance to actual reliability problems. Economic *wants* were misrepresented as reliability *needs*. Reliability depends on standards, not the ability to move every megawatt from any generator anywhere on the system to any load center anywhere else on the system. Because the 2006 Congestion Study is fatally flawed, and does not draw a proper distinction between reliability and economics, it should not be used as the basis for approving new transmission lines that have been denied by the states.

In the deregulated electric power industry, the cost of new bulk power transmission facilities is often "socialized" if it can be shown that these facilities are needed to maintain reliability – to satisfy NERC reliability standards. "Socialization" means that the cost will be proportionally distributed among all customers within an Independent System Operator (ISO) or Regional Transmission Organization (RTO). If a reliability need cannot be proven, the cost will usually be assigned to those entities which will gain from the new facility. For example, if a new line is desired to allow the construction of new generating plants far removed from the load centers, and facilitate the transfer of their electrical output to the load centers, then clearly those generators will gain. But, if a reliability "need" could somehow be proven, the cost of the line would be borne by all customers in the region – an indirect but very real subsidy to the remote generators. Further, the skewing of costs and benefits would penalize resources located close to the load centers. It would also encourage the development of remote generating resources and discourage the development of more local or distributed generation, or demand side management programs.

The following points are generalizations derived from actual cases presented over the past several years.

In order to “prove” a reliability “need,” some have misrepresented and misapplied the national reliability standards promulgated by NERC and supported by FERC. This misrepresentation sometimes involves ignoring key provisions of a national standard. For example, one of the key NERC planning standards calls for testing the system for the outage of a critical facility, allowing time for manual system readjustments to compensate for the outage, and then applying a second critical outage. The system must be designed to survive this sequence of events. However, some parties seem to have deliberately ignored the provision for manual system adjustments. This has the effect of greatly overstating the adverse consequences of the contingencies, in effect subjecting the system to two simultaneous contingencies. This, in turn, can indicate a failure to meet reliability standards – requiring a transmission reinforcement which is not really needed.

An even simpler example is the manipulation of generating units in the ISO or RTO queue in such a way that some committed units are excluded from planning studies. In some cases, units well along in the process have been deliberately excluded from studies because they would solve a reliability problem, while others *at the same place in the queue* were included, precisely because they exacerbate a reliability problem. In my opinion, this makes absolutely no sense.

Similarly, some have ignored readily available techniques permitted by the standards and widely utilized throughout the industry. They resist simple, straightforward fixes such as the addition of reactive power support, correction of minor limitations on lower voltage facilities, modification of outdated configurations, redispatch of generation, or manual load shedding following a contingency – all of which are permitted by the NERC standards and widely used in the industry.

Another device used by some to allege a reliability need when none really exists is to base system simulation studies on extreme conditions vis-à-vis generation dispatch. They will stubbornly insist on economic dispatch as a kind of mantra, ignoring the simple expedient of transmission constrained dispatch – using “out of merit” generation – to essentially replace less expensive remote generation with generation or demand side resources closer to the load, in effect working around any alleged transmission bottleneck by replacing remote generation with slightly higher-priced local resources. Many U.S. systems routinely operate in this manner. But some who are intent on “proving” a reliability need in their planning studies will refuse to make even minor adjustments to their initial dispatch in order to solve apparent reliability problems.

Those who misapply the reliability standards will often argue that NERC standards *require* that each ISO, RTO and transmission owner establish procedures that “stress” the transmission system in its planning studies. That’s correct. But NERC standards do *not* require that the ISOs, RTOs and transmission owners use unrealistic base conditions, dismiss simple and obvious solutions to reliability problems, or ignore important provisions of the standards like manual system adjustments.

Some will maintain that the addition of new transmission facilities alone will inevitably increase reliability. This seems like common sense – but it's wrong. Addition of new transmission facilities will increase transfer capability, but reliability can only be improved by making the standards themselves more stringent. *Reliability is a function of the standards used, not the amount of wire in the air*. Further, transmission additions will not increase the reliability of the system if the increased transfer capability is used to accommodate increased power transfers. The same reliability standards would still be in place. The transmission transfer capabilities would be higher, but the higher transfer capability would simply be used to carry higher long-distance power flows.

There's another factor to consider. If more generation is built in remote areas, and less generation and other resources are built close to load centers, then the load centers will be increasingly dependent on distant generating capacity – located perhaps hundreds of miles away. It would be like running a long extension cord to a friend's house a block or two away to power your toaster, instead of plugging it into an electric outlet right in your own kitchen. The more major cities depend on long transmission lines, the more subject they will be to power outages and blackouts due to major contingencies on the transmission system. Indeed, this constitutes a national security problem, since these urban areas would be more at risk from terrorist attacks on transmission facilities.

Unfortunately, a lot of scare tactics have been used to justify proposed transmission lines. Perhaps the most egregious strategy used by those promoting new transmission when it really isn't needed for reliability involves raising the spectre of massive blackouts. The August 14, 2003 blackout has often been cited, for example. Even the California rotating blackouts of the 2000-2001 period have been mentioned. These incidents have *no bearing* on any of the cases I've seen. The 2003 blackout was the result of too many control areas (now known as "balancing authorities") in too small a geoelectrical area – so small, in fact, that none of them realized that a series of unrelated contingencies across a wide area over a four hour period was leading to a major interruption. In California in 2000-2001, poor state regulations, unscrupulous market manipulation, and unethical (sometimes illegal) activities by companies like Enron, all combined to manufacture an apparent shortage of generating capacity. No capacity shortage existed – nor was there a "blackout" *per se*. Brownouts and rotating feeder outages were necessary because of the market manipulation, but no widespread cascading outages occurred.

Let's think about how real-life systems would deal with situations involving overloaded transmission. System operators in real-time control centers act as balancing authorities over large geoelectrical areas, and would recognize any potential overload situation. More important, they would never operate the system in a mode where a first contingency would bring about overloads, low voltages, cascading outages, instability, system separation, or loss of firm customer load. That's the "Prime Directive" of every system operator. The bulk power system must always be operated such that, if any contingency specified in the applicable standards or criteria were to occur (e.g., a fault or short-circuit on a high voltage transmission line), the system would experience no overloads, low voltages, cascading outages, instability, system separations, or loss of firm customer load. In fact, to operate in any other way would be a violation or NERC's Operating Standards, subject to fines of up to $1 million per day.

Blackouts are usually caused by contingencies more severe than standards/criteria, by equipment failures, control system problems, human error, or by some combination of these. They always involve a break-up of the bulk power transmission system. Blackouts are not caused by shortages of generating capacity. Nor are they caused by an inability to transfer as much power as some might wish from remote locations to load centers. Blackouts can rarely be anticipated. They are almost always unexpected, and can happen at any time – few have occurred at or near peak load, for example, or coincident with a shortage of generating capacity. They develop in seconds or fractions of seconds rather than hours or days.

There's another important point. <u>The mere fact of adding transmission does not of itself increase reliability</u>. Consider two hypothetical transmission systems: one a system with a lot of transmission lines, but planned and operated to <u>less</u> stringent reliability standards; the other a system with very little transmission, but planned and operated to <u>more</u> stringent reliability standards. The first system would be less reliable than the second system, because it uses less stringent reliability standards. As I said earlier: *Reliability is a function of the standards used, not the amount of wire in the air*.

Even if both systems were planned and operated to the same reliability standards, the system with more transmission lines might still be less reliable than one with less. This is because the addition of new transmission lowers the equivalent electrical impedance across the grid, in effect making it electrically smaller. Thus a given contingency could have a more widespread effect. For example, if Philadelphia is electrically closer to Chicago, a major disturbance on the grid in the Chicago area is more likely to cause outages in Philadelphia – and *vice versa*. This may help explain why the Aug. 14, 2003 blackout affected a much larger area than the November 9, 1965 blackout.

Again, transmission additions will not increase the reliability of a system when the increased transfer capability is used to accommodate increased power transfers between remote generating units and load centers.

To ensure reliability of the bulk power system, Congress would need to comprehensively address electric power supply issues. Congress would need to encourage local power generation and distributed generation close to the demand, and create incentives for conservation and demand side resources. Any consideration of transmission issues should make a clear distinction between facilities needed for reliability and those desired for economic reasons. In particular, *economic wants* should not be permitted to camouflage themselves as *reliability needs*. Such an approach would help avoid blackouts, and make our grids less vulnerable to terrorist attacks.

However, as set forth above, I believe the states and the eight existing regional reliability councils are in the best position to ensure a reliable electrical grid.

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These are my major points. I would also like to briefly enumerate a few other problems I see, either on the horizon or already with us:

• The "deregulation" or "restructuring" of the electric power industry is part of the problem. In essence, it greatly increased the complexity of the power industry, and added thousands of pages of new regulations. (As a matter of fact, even the term "deregulation" itself is an Orwellian misstatement.) Most important, though, it replaced the former culture of *coordination and cooperation* with one of *competition and confrontation*.

• In some parts of the country, there are what I would term "overlapping footprints" among the various entities involved in the planning and operation of both the physical power system itself and its markets. This overlapping is a prescription for blackouts.

• Some control areas, or balancing authorities, are too small. As mentioned earlier, this was arguably the underlying cause of the August 14, 2003 blackout.

• The present growth rate of electric power demand and consumption is sometimes identified as the culprit. Actually, there's nothing exceptional about present growth rates. The *NERC 2006 Long-Term Reliability Assessment (October 2006)* reported a forecast U.S. annual growth rate for the period 2006-2015 of 1.9%. This is quite low by historical standards – for example, in the early 1960s, when I began my career, peak loads were growing nationally at a 7 to 7½% rate. That wasn't a short-term phenomenon, either. According to U.S. Energy Information Administration statistics, retail sales of electricity in 1970 were *five times higher* than in 1950 – a compound annual growth rate in excess of 7%. It doubled again between 1970 and 1990 – approximately a 3% growth rate – despite oil embargoes, hyper-inflation, recession, and conservation efforts. The only thing unusual about today's growth rate is that it's so low. This, I believe, reflects the efforts of many people – dedicated environmentalists, government officials at both the federal and state level, large commercial and industrial customers, and the general public – to achieve higher efficiencies and genuine conservation. We can all take credit for this significant accomplishment. Bottom line: nothing about current growth rates automatically requires a massive program of new transmission construction.

• People are often told that one "silver bullet" or another will solve all of our energy problems. Examples range from capacity auctions to mandatory standards, from renewable resources to the so-called "smart grid." While some of these may be valuable in their own right, none can be, as St. Paul might say, "All things to all men." Simply put, there is no silver bullet.

• Technical expertise – or at least competent, objective technical input – has become almost totally absent in decision making. Decisions are most often made on the basis of economic principles, with little or no consideration (or even knowledge) of the scientific laws that govern electric power systems. The Laws of Physics make electricity flow, not the Laws of Economics. No rules, no regulations or procedures, and no market protocols, can override Mother Nature and her laws. As I tell the students who take one of my courses or workshops: *When the Laws of Physics and the Laws of Economics collide, Physics wins … always*.

Where should we go from here? Frankly, I believe EPAct is in need of an overhaul. Congress needs to address energy issues – even those energy issues focused on electric power supply – in a more comprehensive manner. At present, EPAct encourages the siting of new transmission not needed for reliability. By doing so, it subsidizes remote generators, discriminates against local and distributed generation and demand side resources, forces many customers to pay for someone else's benefits, increases the likelihood of blackouts, and makes our grids more vulnerable to terrorist attack.

I would like to conclude with a favorite and well-known quote from the 18th Century Anglo-Irish author, philosopher and politician, Edmund Burke: "All that is necessary for the triumph of evil is for good men to do nothing." Let's resolve *not* to "do nothing," but let's be sure that, whatever we do, we do the *right* thing.

George C. Loehr – July 2008

George C. Loehr
[bio]

George C. Loehr received a Bachelor of Electrical Engineering degree from Manhattan College in 1962, and a Master of Arts in English Literature from New York University in 1964. He began his engineering career in transmission planning with the Consolidated Edison Company of New York in 1962, and completed the GE Power Systems Engineering Course in 1965. Following the 1965 Northeast Blackout, he was actively involved in a wide range of follow-up activities, and chaired the committee which completed a computer simulation of the event – the first such successful simulation of a wide-spread power failure in North America.

Loehr joined the New York Power Authority as Chief Planning Engineer in 1969, and the Northeast Power Coordinating Council (NPCC) in 1972. He was very active in regional, national and North American Electric Reliability Council (NERC) activities, serving on numerous committees, subcommittees and task forces. He was named Executive Director of NPCC in 1989, and remained in that position until his retirement in 1997.

Now self-employed, Mr. Loehr does management consulting, appears as an expert witness, writes, and teaches a variety of courses on power systems to non-technical professionals. His clients have included organizations throughout the U.S., Canada and China. He has served as Vice President and member of the Board of Directors of the American Education Institute (AEI), and is a charter member of Power Engineers Supporting Truth (PEST). Loehr is presently Chair and an Unaffiliated Member of the Executive Committee of the New York State Reliability Council, which works in conjunction with the New York ISO, and previously chaired its Reliability Compliance Monitoring Subcommittee. He also serves as an Outside Director on the Board of Directors of the Georgia System Operations Corporation (GSOC). He is a recognized national expert on electric power system reliability.

Mr. Loehr has given expert testimony in the states of Pennsylvania, New York, Vermont, Kentucky, New Mexico, Mississippi, and in Washington, DC. He has done TV interviews with BBC, CNN, WPIX and CBC, and has been a lecturer, keynote speaker, and/or chair at professional conferences all over the U.S. and Canada. In addition, he has done audio tape lectures for various organizations, including the IEEE, "Professional Development Options," "Red Vector," and AEI.

Articles by Mr. Loehr have appeared widely in the trade press, including *Public Utilities Fortnightly, Electrical World, The Electricity Journal, Electricity Daily, Transmission & Distribution World, Energy Perspective, Restructuring Today, Energy Pulse, Natural Gas & Electricity*, *EnergyBiz*, and the Belgian magazine, *Revue E tijdschrift*. A recent op-ed piece was published in *The New York Times*. He is co-editor of and a contributor to the IEEE book, *The Evolution of Electric Power Transmission Under Deregulation*.

In addition to his engineering career, Mr. Loehr is a published author, has exhibited his art photographs at galleries in the New York metropolitan area, and has done stock photography for a world-wide photo agency. His photographs have appeared in numerous magazines, advertisements, business brochures, and several “coffee table” books, and one of his art photos was used as the cover for Sandra Brown’s best-selling novel, *Fat Tuesday*. He recently published his own first novel, *Blackout*.

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Answers to Questions from Sen. Domenici
Re: Testimony Before
Committee on Energy and Natural Resources Hearing - July 31, 2008

1. **What is the effect of a National Interest Electric Corridor designation? Does it usurp state authority to site transmission lines? Does it adversely affect historic, cultural, scenic or natural resources?**

   Designation makes the designated area subject to "backstop" federal authority to site transmission, and confers on an applicant eminent domain authority. The scope of that authority is in dispute. Most agree that section 216 of the Federal Power Act (added by the Energy Policy Act of 2005) conferred on the Federal Energy Regulatory Commission (FERC) "backstop" siting and eminent domain authority in cases where the state or local entity does not have authority to site an interstate transmission line, or where that entity has not acted within one year of an application to site an interstate transmission line. For its part, FERC has interpreted section 216 more broadly to empower it to reverse state or local decisions that are timely made (i.e., within one year) to deny an application to site an interstate transmission line. Various state regulatory bodies and other interests have challenged this interpretation.

   The National Interest Electric Transmission Corridor designations made by the DOE as a supplement to its 2006 Congestion Study do, in my opinion, usurp the authority of states in the siting of electric power transmission lines. Also, they could undercut the efforts of the Regional Reliability Councils to coordinate the plans of the various RTOs, ISOs, transmission owners, generating companies, and Electric Service Providers operating within their defined geoelectrical areas.

   As I said in my July 31, 2008 Senate testimony: "I believe that decisions on whether particular transmission lines are needed for reliability are best addressed by the states and by the eight existing regional reliability councils. They have consistently done a good job on this in the past. I do not believe that either DOE or FERC has the experienced staff or other resources to do this as well as the regional reliability councils and the states."

   The designation of "corridors" which encompass some entire states and major portions of others seems to violate Webster's definition. In such huge areas, there are undoubtedly more "historic, cultural, scenic or natural resources" than could possibly be listed here.

2. What are the implications for the grid if the U.S. changes climate change policy and commits to carbon reductions?

I do not have expertise in the areas of "climate change policy" and "carbon reductions;" hence I do not feel qualified to comment.

3. Does the Piedmont group support the development of renewable energy resources?

As I stated in both my written and oral testimony, the opinions I expressed at the hearings were entirely my own. Although I was listed as representing Piedmont Environmental Council, I was not acting on their behalf. I assume that Piedmont was involved in obtaining my invitation to testify, but my written and oral comments do not necessarily represent their views. In fact, I have never been an employee of Piedmont or a consultant for them. I appeared at the Senate hearings on July 31, 2008 *pro bono*, and did not receive a fee from Piedmont or from anyone else. Therefore, I cannot speak for Piedmont on this issue.

4. Do you realize that in the east the most abundant renewable resource is wind power, located in West Virginia? How do you get that wind to load centers in DC, Philadelphia and New York without interstate transmission?

I cannot judge the accuracy of the statement, "in the east the most abundant renewable resource is wind power, located in West Virginia." But a casual glance at the Department of Energy's map of wind resources suggests, to my admittedly amateur eye, that it isn't. Rather, it appears that the East Coast from Maine to the Carolinas, Cape Cod and nearby islands, and the upper Great Lakes all have wind potential superior to West Virginia's.

Wind generation has a low capacity factor (approximately 30%), and an even lower effective capacity, or probability of being available at the time of system peak (in the range of 8-11%). Hence the viability and cost-effectiveness of building long distance transmission to deliver wind energy to distant load centers – e.g., from West Virginia to DC, Philadelphia and New York – is highly problematic. There's also the question of Transmission I^2R losses over such long distances, and the likely need for voltage/reactive support (VARs).

In any case, this question appears to be based on the mistaken assumption that I am opposed to interstate transmission lines, or to bulk power transmission in general. This assumption is totally false. I do not automatically oppose transmission construction for *any* generating resources – wind, solar, geothermal, hydro, nuclear, oil, gas, or coal. Or solely for reliability. I believe that each case should be presented honestly, and judged on its own merits.

At the July 31 hearings, in answering a question (I believe from Sen. Murkowski) during the Q&A, I said that, to me, the issue isn't whether or not we should add transmission infrastructure *per se*. It's really about considering all options – including transmission, local and distributed generation, and DSM. But, <u>more</u> important, it's about <u>HONESTY</u>, both in presenting the *reasons* for proposed transmission additions, and in *applying standards and criteria*. If we want to build transmission for new remote coal-fired generation, let's *say* that, and let the case be decided on its merits. Likewise, if we want to build transmission for renewables, let's say that, and let *that* case be decided on its merits. Finally, if we want to build transmission because it's needed to make the existing system reliable, let's say that, and let the case be decided on its merits. But let's *not* disguise what we want to build for coal or renewables or whatever as "needed for the reliability" of the existing system, if it really isn't. Let's not use blackout scare tactics for transmission additions that are really wanted so that new generation can be sited hundreds of miles from load centers. And, in our planning studies, let's apply standards and criteria correctly, not misrepresent them to indicate a "reliability violation" when there really isn't one.

5. You appear to advocate building more generation close to load centers. What kind of generation do you realistically think can be built close to load centers today?

As I said in both my written and oral testimony, all alternatives should be fully explored and carefully considered on a non-discriminatory basis – including local and distributed generation close to the load. Siting generation closer to the load centers it's intended to serve has the benefit of providing inherently higher reliability, greater protection from terrorist attack, as well as insuring local area protection, voltage support, and close-in black start capability.

There's no inherent limitation on the types of generating facilities that could be built close to load centers, but the US already has gas, oil and nuclear plants so located. Certainly gas, and renewables such as solar, could be sited even within large metropolitan areas. Gas-fired combined-cycle units which have very low emissions, and efficiencies on the order of 60%, are now feasible. DSM, of course, is a "natural" as a resource located within load centers.

6. Can you provide specific examples of where a NERC Planning Standard was misapplied by not allowing time for system readjustments? Who, where, when?

In my opinion, NERC Reliability Standard TPL-003, Category 3 (C3), was misapplied by TrAILCo in proceedings before the Pennsylvania Public Utilities Commission in the application of Trans-Allegheny Interstate Line Company (TrAILCo) regarding the proposed 500kV TrAIL project and associated facilities. I came to this conclusion, and testified to that opinion, as an expert witness for the

Energy Conservation Council, an intervener in the proceeding. This conclusion was based on my more than 45 years experience in bulk power system planning and reliability. (My bio is included with my written testimony.)

The C3 standard, sometimes referred to as "N-1-1," provides for imposition of a first contingency, followed by manual system adjustments, then imposition of a second contingency. The phrase "manual system adjustments" allows for a wide variety of possible adjustments between the occurrences of the two contingencies; e.g., changing the outputs of generating units, modifying schedules, switching transmission lines, changing transformer and phase angle regulator taps, activating generating reserves, and any other actions feasible within a specified time frame (usually at least 10 minutes).

A number of contingencies were cited by TrAILCo as violations of N-1-1 testing under this standard, but "manual system adjustments" were not attempted between the first and second contingencies. In my view, this is an egregious error or misapplication; it applies a test to the system which is much more stringent than NERC Standards require, indicates a reliability violation where none exists, and implies the need for reinforcements which are not required to maintain reliability in accordance with national standards.

7. Can you provide specific examples of where a NERC Planning Standard was misapplied by manipulating generation through the exclusion of committed units? Who, where, when?

I did not say in my testimony that "a NERC Planning Standard was misapplied by manipulating generation through the exclusion of committed units." I *did* say the following: "In some cases, units well along in the process have been deliberately excluded from studies because they would solve a reliability problem, while others *at the same place in the queue* were included, precisely because they exacerbate a reliability problem. In my opinion, this makes absolutely no sense." This approach was used by TrAILCo in the same Pennsylvania proceedings cited above. In my opinion, it violates the spirit of the NERC Standards process, and of the principle laid down by FERC, NERC, DOE and EPAct that all standards and criteria must be applied on a non–discriminatory basis.

Interveners in the Virginia TrAILCo case have alleged that compliance with the NERC Planning Standards was tested using load flow simulations that excluded significant existing and planned generating stations (including the existing Mirant Potomac station, and Dominion's proposed Possum Point #7 and Warren stations); also, the studies assumed that no new plants, beyond those already possessing PJM interconnection service agreements, would ever be built in eastern PJM.

8. Generation re-dispatch is allowed under NERC Operating Standards. Are you claiming that generation re-dispatch should also be allowed under

NERC Planning Standards? If so, doesn't this place the grid at greater reliability risk? If so, doesn't this take away one of the primary tools that transmission system operators now use when real-time conditions may have 15 to 20 transmission lines and generators out of service?

Generation re-dispatch *is* allowed under NERC Planning Standards. It is inconsistent and illogical for the initial dispatch, prior to the imposition of any contingencies, not to recognize the possibility that contingencies will occur. Sometimes system planners select initial dispatches which appear neutral but in fact bias the apparent vulnerability of the system.

Many systems utilize re-dispatch in their planning studies. Not to do so, in my opinion, ignores one of the methods available to solve reliability problems. It also ignores the reality of how systems are actually operated – something for which system operators have castigated planners since I began my career in 1962! I personally believe that planning procedures, in general, should try to replicate how the system is actually operated in the real world.

The underlying problem is how to determine the amount of transmission transfer capability needed in a system. In my opinion, a comprehensive planning procedure would use multi-area Loss of Load Expectation (LOLE) studies to determine required transfer capabilities for given installed generation assumptions. The result would not require that economic dispatch always be followed; rather, it would use probabilistic techniques to optimize the system and determine the minimum interface transfer capabilities necessary to meet an overall LOLE requirement of 1 day in 10 years. This would in turn suggest where reinforcements might be necessary.

Adding transmission that really isn't needed for reliability acts as a magnet for remote generation. It's comparable to the way interstate highways radiating from an urban area attract new housing developments as each new section is opened. With interstates, housing developers are incented to build new subdivisions, and the ensuing growth often overwhelms the increased highway capacity. In power systems, generation developers are incented to locate generation more remote from load centers, making the system inherently less reliable. Adding transmission increases the transfer capability of the system, but does not in-and-of-itself enhance reliability. Reliability can only be improved by making the reliability standards themselves more stringent. As I said in my Senate testimony, *Reliability is a function of the standards used, not the amount of wire in the air*.

More important, increasing the amount of remote generation creates a reliability problem and a potentially devastating national security risk. With more generation sited at locations far from urban centers, those metropolitan areas become increasingly dependent on remote generation, and hence on long transmission lines. This in turn makes them more susceptible to transmission contingencies which go beyond normal planning and operating standards, and increasingly vulnerable to terrorist attack.

9. If there is a risk of having rolling blackouts unless more electrical transmission is added, do you believe someone has a responsibility to communicate that risk to the public?

This question presumes that "rolling blackouts" are the *ipso facto* consequence of not adding transmission. That simply is not the case. "Reliability" is of two types: "adequacy" (or "resource adequacy"), which means the sufficiency of resources to serve load; and "operating reliability" (a.k.a. "transmission reliability") which means the ability of the synchronous interconnection or "grid" to survive sudden contingencies without dire consequences – overloads, low voltages, cascading outages, instability, system separation, or loss of firm customer load. So-called "rolling blackouts" refer to the former, not the latter.

"Rolling blackouts" are not blackouts in the sense of November 9, 1965, or August 14, 2003. They involve rotating feeder outages, voltage reductions ("brownouts"), and public appeals; they do *not* involve instability, system separations, and total loss of power supply over large geoelectrical areas. Also, "rolling blackouts" are caused by inadequate generating and related resources (DSM etc.), not by a lack of transmission. Of course, insufficient transmission *can* sometimes contribute to a resource availability problem, but in recent years I have seen very few examples. Multi-area LOLE studies which include transmission constraints between the specified areas, as described in my answer to Question #8 above, are the most effective way to determine if this is the case. Unfortunately, these are not frequently performed nowadays. The TrAILCo application before the Pennsylvania PUC, for example, never mentioned them.

On a related subject, NERC Standards permit controlled load shedding for unlikely combinations of contingencies and operating conditions. Some refer to these as "rolling blackouts," a scare technique. The significant difference between controlled load shedding and a cascading failure (blackout) is that controlled load shedding is normally done for only short periods, after which service is restored. Restoration of service after a blackout, on the other hand, may take days.

I do believe that we *all* have an obligation to warn the public when there is a risk to power system reliability and national security for *any* reason – <u>that is precisely what I intended to accomplish in my testimony before the Senate Committee on Energy and Natural Resources</u>.

10. Do you oppose market-based generation dispatch (de-regulation)? Do you believe de-regulation financially benefits consumers or financially hurts consumers?

I have no objection to "market-based generation dispatch" in principle. However, in my view, the manner in which "de-regulation" was accomplished has greatly compromised the reliability of the bulk power systems in the US, as well as financially harming consumers. My views are well-represented in trade press articles I've written over the past ten years, as well as in the reports I've co-authored as a charter member of Power Engineers Supporting Truth (PEST). These may be viewed on the PEST web site at http://www.pest-03.org. Interestingly, our views were shared by the majority of the invited papers presented at the panel sessions in Washington and Toronto co-sponsored by the DOE and the National Energy Board of Canada during 2005.

One problem I've noted is that, under de-regulation, far fewer interregional studies have been performed. For example, a number of major 500kV transmission additions have been proposed within the PJM (Reliability*First*) area, but to my knowledge no comprehensive studies have been performed to assess their potential effect on the Ontario and New York (NPCC) systems, or vice versa. Such studies were routinely performed before "de-regulation." In fact, I was personally involved in many of them, serving on the MAAC-ECAR-NPCC (MEN) Study Committee and the Joint Interregional Review Committee.

History has shown that developments within one regional reliability council, RTO or ISO can have a profound effect on neighboring systems. For example, as early as the late 1960s, it was found that more than 40% of any transfer from the Ontario portion of NPCC to the southeast New York portion of NPCC would flow counterclockwise around Lake Erie, through Michigan, and then through PJM before entering New York from the south. It was a classic example of the laws of physics – Kirchhoff's Voltage Law, to be specific. Even a significant percentage of transfers from upstate New York to the New York City area were found to flow through PJM. This situation had become critical by the late 1970s, and the New York and PJM Power Pools finally agreed on a number of fixes.

In the 1980s, Hydro-Quebec and New England (both parts of NPCC) planned to build a 2,000 MW HVDC line between James Bay and the Boston area. A special MEN study was conducted; it determined that loss of the line could have a significant adverse impact on both PJM and New York. This led to an agreement whereby the capacity of the line was reduced, and its substation arrangements modified. More important, it was agreed that operation of the line (and the operation of all HVDC ties between Hydro-Quebec and its neighbors) would be coordinated with west-to-east power flows across both the PJM and New York systems.

These are just two examples of the importance of interregional studies – studies which have been conspicuous mostly by their absence in the post-deregulation industry.

11. Do you believe that more electrical transmission creates a less reliable grid?

There is no simple or generic answer to this question. But, all else being equal, a grid that increases reliance on remote sources of power generation is inherently less reliable than a grid that connects load to proximate local generation.

Sometimes a transmission addition will enhance the reliability of the grid, as when it is truly needed for reliability. Other times, a transmission addition will exacerbate an existing problem or lower reliability, as when the increased transfer capability it provides will be used to increase long-distance power transfers across the grid. As I said in my Senate testimony: "Addition of new transmission facilities will increase transfer capability, but reliability can only be improved by making the standards themselves more stringent. *Reliability is a function of the standards used, not the amount of wire in the air*. Further, transmission additions will not increase the reliability of the system if the increased transfer capability is used to accommodate increased power transfers. The same reliability standards would still be in place. The transmission transfer capabilities would be higher, but the higher transfer capability would simply be used to carry higher long-distance power flows."

Further, there's a national security risk. Quoting again from my testimony: "If more generation is built in remote areas, and less generation and other resources are built close to load centers, then the load centers will be increasingly dependent on distant generating capacity – located perhaps hundreds of miles away. It would be like running a long extension cord to a friend's house a block or two away to power your toaster, instead of plugging it into an electric outlet right in your own kitchen. The more major cities depend on long transmission lines, the more subject they will be to power outages and blackouts due to major contingencies on the transmission system. Indeed, this constitutes a national security problem, since these urban areas would be more at risk from terrorist attacks on transmission facilities."

George C. Loehr – August 2008