Préalable

Goerge C. Loehr présente une interview tantôt humoristique, tantôt sarcastique relative à l'effondrement du réseau Nord-Est américain qui s'est produit le 14 août 2003.
Il y fait apparaître les raisons probables de l'effondrement et les manquements des mondes politique et économique qui prennent des décisions sans avoir les compétences pour le faire.
Il y fait aussi le procès des abus d'application des critères de sécurité du réseau américain.
Dr Mégavar (c'est le surnom de Mr Loehr) déclare que ce n'est pas le système électrique qui a été défaillant le 14 août mais bien le système de régulation qui a placé les lois économiques au-dessus des lois physiques.

J'invite le lecteur à lire l'article jusqu'à la fin et à en tirer les conclusions qui s'imposent. ASSEZ de défaillances du réseau tant européen (voir le dernier en date: l'Italie) qu'américain. Le monde politique doit être conscient que demain risque d'être pénible pour lui si de tels événements se répètent. Des solutions existent: il suffit d'en appeler aux ingénieurs.

Victor Berlemont, SRBE/KBVE

Voorafgaand

George C. Loehr stelt een humoristisch dan weer sarcastisch interview voor over de instorting van het Noordoostelijk Amerikaans net dat zich op 14 augustus 2003 voordeed.
Hij brengt er de waarschijnlijke redenen van de instorting aan het licht alsook de mankementen van de politieke en economische wereld die beslissingen nemen waar ze niet de nodige kennis van zaken voor hebben.
Hij heeft het ook over het misbruik van de toepassing van de veiligheidscriteria van het Amerikaanse net.
Dr. Mégavar (dit is de bijnaam van Dhr. Loehr) verklaart dat het niet het elektrische systeem is dat op 14 augustus machteloos was maar wel het regelsysteem dat de economische wetten boven deze van de natuurkunde geplaatst heeft.

Ik nodig de lezer uit om het artikel te lezen tot het eind en er de nodige conclusies uit te trekken. Genoeg defecten aan het net zowel in Europa (cfr de recentste: Italië) als in Amerika. De politieke wereld moet er zich bewust van zijn dat hij het morgen lastig zal krijgen indien zich dit nog voordoet. De oplossingen bestaan: het volstaat beroep te doen op de ingenieurs.

Victor Berlemont, SRBE/KBVE

Dr. Megavar Explains It All

Note: The following interview took place in a dark, candle-lit bistro, somewhere in a large, eastern metropolis.

Question: I'm pleased to meet you, Doctor Megavar. I understand that you're one of the few people in the country who can clarify some of the misinformation we've heard in the media since the August 14, 2003 blackout.

Dr. Megavar: You better believe it. Of course, Dr. Megavar could be facetious and just say that everything you've heard is totally wrong, but that would be begging the issue. Though, basically, that's pretty nearly the case.

Question: Well, I'm hoping that, by discussing the errors we've read and heard, we might see our way through to real solutions.

Dr. M: Okay, let's give it a try. Fire away.

Question: First of all, why do they call you "Dr. Megavar?"

Dr. M: Well, there are two kinds of power, watts and vars. They're both components of the total power, which is a complex number. Watts are real and vars are imaginary.

Question: You're pulling my leg.

Dr. M: Nope. Dr. Megavar is not a leg man. It's like the real and imaginary numbers you learned in algebra – complex numbers. You do remember algebra, don't you? High school math? Dr. Megavar gets very frustrated with the way math is taught today. But that's another subject. Complex numbers are. . . . You don't understand a word I'm saying, do you.

Question: Not really.

Dr. M: (Sigh) Nobody remembers high school math. Let's make it real simple. Watts do work, and vars don't. Watts make the lights glow and the machines work – vars don't, but they hold the voltage up so the watts can do the work. Vars are like your brother-in-law – they do no work. But, unlike your brother-in-law, they're absolutely essential. Get it?

Question: Well. . . .

Dr. M: Never mind. It's not important right now. Let me just say this: ask all the people who claim to be power system "experts" to explain vars. If they can't, they're frauds.

Question: I'll try to remember that. But what's your doctorate in? And why is it Dr. Megavar?

Dr. M: Dr. Megavar's degree is "Doctor of Imaginary Power." And it's Megavar because he has trouble maintaining his youthful, girlish figure. Dr. Megavar was born just a var, and later on was just a little kilovar. But that was before deregulation.

Question: Let's get on to the errors, shall we?

Dr. M: Sure. There's one that really sticks in my mind – or in my craw. It was pronounced by a state governor who used to be Secretary of Energy. He said that there are no reliability standards in the electric power industry. It's amazing to me that a former Secretary of Energy could know so little. The Regional Reliability Councils have had standards, or "criteria," for planning and operating their systems for more than thirty years. And the North American Electric Reliability Council has had overall, national standards for almost as long. Dr. Megavar was on the committee that drafted the first standards for the northeastern US and eastern Canada in 1966. All these standards are applied uniformly to all players – all the companies involved in electric generation, transmission, distribution, operation and marketing.

Question: Is that right? I think the governor also said that present standards are voluntary, and they need to be made mandatory.

Dr. M: Well, see? He contradicted himself right there. If he says present standards are voluntary, then he must acknowledge that standards do exist!

Question: I think he'd say they weren't really sophisticated. Anyway, what about this voluntary/mandatory thing?

Dr. M: That's a lot of . . . horsefeathers. The standards or criteria were just as sophisticated 30 years ago as they are today. And, believe me, they are not voluntary. All of the reliability organizations monitor compliance with their standards. And they all have well-defined sanctions for violators. Dr. Megavar is Chairman of the group that monitors compliance in New York, by the way. We've issued several sanctions in the last year. If an organization wants to do business in a given region, it must sign a contract to abide by the standards of that region. And that's enforceable.

Question: Aren't there some industry people who are saying the same thing, that the standards need to be made mandatory?

Dr. M: Yes. There will always be those who will try to bend things to their own advantage.

Question: I've heard some people complain that there are different standards in different parts of the country. Shouldn't they all be the same?

Dr. M: Absolutely not! Would you apply the same reliability standards you use in South Dakota or New Mexico to Chicago or New York? A few years ago, the entire state of New Mexico suffered a blackout. Everyone – everyone – was out for several hours. What happened? Nothing. Hardly anyone even raised an eyebrow. But try that in New York City . . . well, you know the result. No, it's quite proper for major metropolitan centers to have more stringent criteria than most other parts of the country.

Question: Are you saying there should be no nation-wide reliability standards?

Dr. M: No. I'm saying there should be minimum standards for the whole country. But not one-size-fits-all standards. Any state or reliability organization that wants to have higher standards should be permitted to do so.

Question: Doesn't this make it difficult for people who want to wheel power over, say, several regions?

Dr. M: Not at all. All they have to know are the transmission capabilities – they do not have to know the basis for their determination.

Question: Okay. Let's move on. The most common thing we've heard since the blackout is that the existing bulk power transmission system is "antiquated" – a "third world grid," as one governor said.

Dr. M: The President himself said "antiquated," and the governor was the same one we talked about earlier. Dr. Megavar really takes offense at this. For most of his professional life, Dr. Megavar worked at planning a strong bulk power system in this country, and making sure that it was operated in a reliable manner. Then, about ten years ago, along came "deregulation". Dr. Megavar and a few others tried to warn that the way it was being accomplished would lead to blackouts, but no one wanted to listen. Including the governor when he was Secretary of Energy; funny, but the grid didn't seem very "third world" to him then. Reliability, the industry's top priority since the 1965 Northeast Blackout, was replaced by Competition and Economic Use. It wasn't the electric system that failed August 14; it was a regulatory system that valued the Laws of Economics above the Laws of Physics.

Question: Are you saying more transmission isn't needed?

Dr. M: No. I'm saying more transmission hasn't been built in recent years because the changing regulatory climate discouraged it. You know, we could have introduced competition, had true deregulation, had it been done in accordance with sound scientific principles and good engineering. But no one wanted to hear that. We have more regulation today with "deregulation" than we ever had under regulation. Go figure.

Question: So what was the problem with transmission expansion?

Dr. M: The way deregulation was implemented required that the old utilities had to sell off their power plants to separate, independent generating companies. In the words of the former CEO of a large publicly-owned utility, "separating generation from transmission makes about as much sense as separating the head from the body." But that's what they've done to Ted Williams, isn't it?

Question: Let's stay on the point, okay? You agree that more transmission needs to be constructed.

Dr. M: Absolutely. But there are major problems.

Question: Like NIMBY – Not in My Back Yard?

Dr. M: Well, sure. But you also have to get an extraordinary amount of cooperation and coordination to decide just what transmission lines should be built. And then agree on who's going to pay for it. But there's an even more important problem.

Question: Yes?

Dr. M: Well, first of all, it isn't the size or transfer capability that makes a grid reliable. It's the standards you use and whether you observe them.

Question: You mean a larger grid with more transmission lines might be less reliable than a smaller one with fewer lines?

Dr. M: Definitely. All over the developed world, the most basic standard for planning and operating power systems is "first contingency design". It means that you have to be able to sustain the worst single event that can happen – like loss of a critical transmission line or the largest generating unit – without any overloads, low voltages, cascading outages, instability, or loss of customer load. It's sort of the power system's equivalent of Star Trek's "Prime Directive". You with me?

Question: So far.

Dr. M: Good! Now – suppose you had a grid with thousands of miles of transmission lines, capable of moving 3,000 megawatts from one end to the other. If it's operated to something less than single contingency criteria, it's less reliable than a much weaker grid with only 200 megawatts of capability that uses proper criteria. Similarly, even if both use the same criteria or standards, the larger one would be less reliable if it's frequently pushed beyond the calculated limits.

Question: That's hard to believe.

Dr. M: But it's true. And I'll tell you something else. Even if we overcame the NIMBY and the cost and all the other problems, and we used proper criteria and never violated them, there would still be a big problem.

Question: And that is?

Dr. M: The two big grids, the Eastern Interconnection and the Western Interconnection, are getting too complicated. They worked okay before deregulation, when we had a limited number of players, but now, with a vast increase in new players, they're just too big.

Question: Couldn't we just add a lot of new transmission lines? I've seen estimates ranging from $50 to $100 billion needed to reinforce the present systems. That would pay for a lot of transmission.

Dr. M: Yes. And what you'd be doing is making the grids electrically tighter – geo-electrically smaller. The more lines you add, the closer Kansas City gets to New York, for example. Electrically speaking. The 1965 blackout took out New York and Toronto. The 2003 blackout brought down a much larger area, including New York, Toronto, Detroit, Cleveland, and more. One of the reasons might be that the grid in 2003 is much tighter than it was in 1965. Suppose we invest in all this new transmission – the grid becomes still tighter, electrically smaller. So, when the next major disturbance happens, maybe we'll lose, not just those cities, but Chicago, St. Louis, Kansas City – and Philadelphia, Washington, Atlanta – maybe the entire Eastern Interconnection, from the Atlantic Ocean to the Rockies, northern Manitoba to the Gulf of Mexico.

Question: What about the "smart grid" technologies some people have been talking about?

Dr. M: Dr. Megavar could be a wise guy and ask if you'd like to have a blackout as often as your server goes out, or crash the electric system as often as your computer crashes or you get a worm or virus. But Dr. Megavar wouldn't say that.

Question (somewhat exasperated): Then what would you say, Doctor?

Dr. M: Dr. Megavar says a system shouldn't have to depend on lots of extra equipment operating properly in order to remain stable every time there's a contingency. Dr. Megavar prefers a system that is naturally stable – and doesn't have to depend on a lot of instrumentation to keep it from collapsing. It's like the difference between a Stealth fighter and a Cessna. The Stealth fighter, because of the requirements of its mission, is designed to be inherently unstable – it relies extensively on computer controls to fly. The Cessna, though, is inherently stable – the pilot can let go of the controls, or even give the stick a pretty good smack, and it will remain in or return to normal trim.

Question: Then there's nothing we can do? No solution?

Dr. M: Trust Dr. Megavar – there's always a solution. What we need to do is break up the two gigantic grids into a number of smaller ones. Then we reconnect them, but with high voltage direct current lines in place of the present alternating current ties. Direct current, or d.c., isn't subject to the same physical laws as a.c.. With a.c., what happens in one place on the grid affects everywhere else. So a major disturbance in Ontario is felt as far away as Oklahoma, Florida and Maine. This doesn't happen with d.c. – it would insulate one small grid from the others.

Question: But wouldn't these smaller grids just create a bunch of local or regional markets instead of the larger market economists would like?

Dr. M: Not at all. Power could still be exchanged over the d.c. ties. In fact, it could be controlled completely – something impossible with a.c.. Existing a.c. lines could even be used, without modification, for d.c.. But converters would have to be built at each end.

Question: Is that expensive?

Dr. M: As Shakespeare said, "Ah, there's the rub." The converter equipment is pretty expensive. But Dr. Megavar has done a rough cost estimate, and you could break the two huge North American grids into a series of smaller grids, with d.c. ties matching or equaling the transfer capability of today's a.c. ties, for between $ 7 and $ 8 billion. That seems like a lot, but compared to your $ 50 to $ 100 billion, it may be a bar-

gain. I'm reading that the August 14 blackout by itself cost about $ 6 billion.

Question: How would you propose paying for this plan?

Dr. M: There are lots of possibilities, but Dr. Megavar would recommend a surcharge on electric bills based on the amount of energy each customer uses. For the typical residential consumer, less than $1 a month for two years would be required. It would let us have our cake and eat it too. We'd have simpler grid management, less bureaucracy, and fewer price spikes and blackouts.

Question: Are there any precedents for this kind of operation?

Dr. M: You bet! Two small grids are presently operating successfully in North America, with ample d.c. tie capacity with their neighbors. One is the Electric Reliability Council of Texas, or ERCOT, which encompasses about 80 % of that state. The other is the Hydro-Quebec system in the Canadian Province of Quebec. They've been like that for decades, and they work just fine.

Question: We're running short of time, but I have a few other questions about statements to the press. I heard the Chairman of the Federal Energy Regulatory Commission say that the PJM Independent System Operator stopped the blackout and kept it from spreading further.

Dr. M: That's ridiculous. Blackouts don't ooze out from a starting place, slowly spreading like that '50s sci fi flick, The Blob. From start to finish, it happens in a few seconds. No organization, PJM or any one else, could act fast enough to stop it. Whether your system gets caught up or not is a matter of mathematics – the original configuration of the system, the exact nature of the disturbance, the electrical characteristics of all the transmission lines, etc. In other words, dumb luck.

Question: I saw a guy from the Cato Institute on a cable network say that New York City wasn't connected to the grid when the '65 blackout happened.

Dr. M: Nonsense! It's disgraceful that a person can represent himself as an expert on national TV, and be so totally ignorant of facts. And this is an easily checked fact, too.

Question: An anchorman said that no one ever figured out what caused the '65 blackout.

Dr. M: More horsefeathers! Dr. Megavar has in his possession a three-volume report issued June and July of 1967 called "The Prevention of Power Failures – An Analysis and Recommendations Pertaining to the Northeast Failure and the Reliability of U.S. Power Systems." Among other things, it describes the exact sequence of events of that blackout. It's still well worth reading. Dr. Megavar is proud that, though just a young kilovar at the time, he chaired the Computer Committee that performed the digital simulation of that event – the first time such a computer simulation had ever been accomplished successfully.

Question: Well, Doctor, thank you very much. This has been a most illuminating interview.

Dr. M: Ugh! That's a terrible pun.

Question: Will you be doing any more work on this, Doctor?

Dr. M: Don't you remember what I told you? Vars, even Megavars, don't do any work!

Question: I'm sorry. I'd forgotten.

Dr. M: And they're imaginary, too.

And with that he disappeared.

End

The Author

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. Following the 1965 Northeast Blackout, he was actively involved in a wide range of follow-up activities, and chaired the committee which did the first computer simulation of that event. Mr. 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. Mr. Loehr now 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 serves as Vice President and member of the Board of Directors of the American Education Institute, a not-for-profit organization. He is an "unaffiliated member" of the Executive Committee of the New York State Reliability Council, which works in conjunction with the New York ISO, and chairs its Reliability Compliance Monitoring Subcommittee. He is a recognized national expert on electric power system reliability. Mr. Loehr has given expert testimony in the states of New York, Vermont, Kentucky, New Mexico, Mississippi, and in Washington, DC. He has done TV interviews with BBC, CNN, WPIX and CBC, and is a frequent lecturer, keynote speaker, and/or chair at professional conferences all over the U.S. and Canada. In addition, he does audio tape lectures for various organizations, including the IEEE, "Professional Development Options," "Red Vector," and AEI. Mr. Loehr's articles 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, and elsewhere. He is co-editor of and a contributor to the IEEE book, The Evolution of Electric Power Transmission Under Deregulation: Selected Readings. 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. One of his art photographs was used as the cover for Sandra Brown's best-selling novel, Fat Tuesday. He recently completed his first novel, Blackout!, and is active in church and civic affairs.
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