

# Gerhard Salge



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**Chief Technology Officer**  
at Hitachi Energy

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Interview with **Gerhard Salge**

**Alan Ross:** My guest today is Gerhard Salge. Gerhard is the Chief Technology Officer of Hitachi Energy. Gerhard, I feel like I know you even though we've only met once. Thank you for joining us. Welcome!

**Gerhard Salge:** Thanks, Alan, for having me. I'm really looking forward to this discussion with you today.

**AR** I want to start off with something that I don't know if you wrote or somebody from the company, but it's in your LinkedIn profile, and it says, "Ensuring the timely build-out of power grid infrastructure will be a key enabler in accelerating the global energy transition. This urgent transformation will ensure effective integration of renewables and drive resiliency and flexibility of the power system." You're the first person that I've talked to who really talks about *flexibility* rather than *resiliency* and *reliability*. Let's start there. When you say *flexibility*, what do you mean?

**GS** Yes, I think that's a very good starting point, Alan. What we have been seeing is that the term flexibility is used more and more, across the world in various variants. We wanted to bring clarity into that as much as possible. There are also aligned discussions in CIGRE, IEEE, and other organizations on that. What we call *flexibility* is any operational timeline, from milliseconds to years, but also any normal operation and any hypothetical situation that you are planning for, which is usually the reliability part, as you just mentioned. *Resilience* is that part that you don't naturally plan for as a potential operational extreme situation. We have recently seen more and more examples of those resiliency situations. The pandemic was definitely one such situation, but also the recent extreme weather events that are unfortunately becoming more and more frequent. These are not the norm from a power system operational perspective.

That is when the active reaction of a power system is tested in terms of resilience.



**TenneT's 2GW Platform.**  
Photo credit: TenneT

As such extreme events are becoming more and more frequent, we have actually started discussions on whether some of the resiliency topics have now become part of the reliability topics because they are unfortunately becoming the norm. Flexibility is the answer for the power system - either to prevent or limit the consequences of those situations under normal operation and planned disturbances.

**AR** That is the best description of where we are in the world today that I've heard so far. We are now adjusting to chaos: Extreme weather events, a pandemic, a war. We're adapting to those things and we're taking creative steps to adapt to the chaos. We're trying to anticipate and adapt to the extent that we can. That seems to be the biggest difficulty for the utility engineer, the planning department, or the development department. In these circumstances, how do you plan for flexibility in the grid?

**GS** Flexibility has four dimensions: Generation, demand, storage, and an active transmission and distribution system. That's important. Not just a passive system, but an active controllable system. When you want to create the best possible flexibility, you need to have all these four dimensions in balance. If you create one weaker dimension, you have defined the bottleneck of the total system. It means that on the power generation side, you can create flexibility through the complementarity of power generation types, locations, and so on. On the demand side, it's the same. You can create flexibility by having the consumers become "prosumers" where you can deal with them in a flexible way by either ramping up and down the demand profiles or even by completely disconnecting and reconnecting them after some time without losing the power/electricity supply to those customers.

Then, you have this combination of the controllable transmission and distribution





system, including storage. Here, the controllability in the distribution and transmission system comes with digital technologies to a large extent. This is the foundation, especially in combination with most modern power electronics, where you can control power flow, and contribute to inertia, by actively working in the system involving the fourth dimension, which is storage. And here again, the flexibility comes with complementarity. You have batteries all over the place, sometimes more centralized, sometimes decentralized, providing from very short injections of seconds to minutes to even several hours of support to the power system. But you also have other types of long-term energy storage like pumped hydro, where all of this together creates total system flexibility.

**AR** In September, I was at the RE+ conference doing live interviews. That event was primarily about solar and storage coming together. There I really saw for myself how all of the renewable energy affects the

generation side. Storage in turn (positively) affects renewable energy.

On the demand side, you mentioned the “prosumer”. My son has an electric car and solar on his roof, and as soon as he can talk me into giving him the money, we’re going to put in a power wall. So, he is becoming flexible. You have flexibility at the generation side and at the prosumer side, with storage being some of the common denominators along the way. You mentioned storage briefly earlier, but where does it play a role, as you see it, in this whole flexibility/ sustainability/ resilience?

**GS** I’ll start with the tremendous rise of solar in combination with storage, and in many cases, battery storage which you just described. Everyone understands that solar comes with a mid-day peak, and together with storage can be used in the best possible way at the lowest cost. On the generation side, such combinations help avoid curtailments and can be used as a buffer in case of an oversupply during



peak times, and it can delay the up-and-down ramping in the power system of all the solar-based generation. It allows for that harvested energy to be distributed over a much longer timescale, also hours after sundown.

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A really effective solar utilization only comes together with a strong connection to the total power system. In order to integrate that amount of power and energy into the system, and distribute it to the demand locations, which can be close or far away, you need a well-functioning and controllable transmission and distribution system. Without such a strong backbone grid, you cannot make use of time zone shifts, for example, where you have different peak times of solar generation, but also demand. And that is maybe the most prominent and illustrative example where you see the importance of the combination of solar generation with embedded HVDC transmission, which we are doing more and more across the world in power systems. So, you are basically enabling the power system to shift across time zones, potentially across climatic zones, the effective utilization of the best solar places, providing power and clean energy to the demand centers, and as previously described, in combination with storage over a much longer time throughout the day than just the mid-day peak.

**A really effective solar utilization only comes together with a strong connection to the total power system.**

Wind power must also be mentioned here, as wind and solar usually complement each other very well. So, inside a power system, a renewable generation mix of solar and wind gives a very healthy complementation. With the combination of battery storage plus other types of longer-term storage (e.g., pumped hydro), you have a fantastic combination that the power system can leverage. You have this well-balanced controllable transmission and distribution system across the flexibility parameters.

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**AR** Everything that you're talking about, if we could just implement it all, I think we would all feel better about where we are. You and I are going to do another interview soon because I realized something as you were talking about where we are. I see that as a strategy. This is what we need to do. I think we need to also look at some of the implementation. So, there's strategy, then there's tactical implementation. I'd love to get deeper into that with you now, but it will have to wait until next time.

Before we say goodbye now, I'd like to quickly go back to something. You used the term "the hardening of the grid". I need you to talk about the hardening of the grid in terms of how it relates to everything that you just mentioned.

**GS** Now, the grid really needs to be resilient and not just against what has been

planned for, but also the unplanned. Those unplanned factors differ across the world. That's why we need to have hardening. We also need equipment that is resilient against potential unplanned attacks, weather conditions, or anything that may physically challenge the assets.

Additionally, all digital technology must also be hardened or made resilient against cyber threats and anything that may come in terms of a physical threat, such as an intrusion into substations. Hence, it's important that we always look at a combination of physical and digital aspects when talking about hardening and resilience. That is crucial. That's why we at Hitachi Energy develop those concepts with our customers and partners together. We are always looking at the holistic picture, the same as we do at the power system.

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When we plan the installation of HVDC lines, STATCOM, and other solutions and services with our partners and customers around the world we look at it holistically in order to make the designs fit for the future. Because I think that is really one critical consideration that should be applied in the power system. What you invest in today will see a lot of changes in the next years and next decades. Take the most modern, most future-fit design, equipment, systems, and services so that you are equipped as best as possible for all the changes, which will come over the next years.

**AR** I'm going to give you a new title. I'm going to call you the Doctor of Holistic Grid Flexibility. You have avoided the idea of fixes to this and fixes to that and have looked at a holistic solution. I'm glad Hitachi Energy is doing the same thing.

This has been a brilliant interview. I appreciate it.

**GS** Thank you very much, Alan. It's the same on my side. It was a pleasure to be here. Since electricity is becoming the



backbone of the entire energy system, we cannot do enough to make this as secure, reliable, flexible, and affordable as possible.

**AR** That's our next interview right there: "Why electricity is the backbone of

the entire energy system". We've got to come back on that one, Gerhard. Thank you so much for being here today, I appreciate it.

**GS** Thank you, Alan, it was a great pleasure!

