

1) Reframing questions

| Raw data | Second-order codes: First- order codes | Aggregate code |
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| <p>“Since 2021, reliability is no longer the top KPI... we now have a complete flexibility department, exploring new market rules and incentives for efficient energy use.” (Int#1)</p> <p>“We have refocused our strategy to expand the network more, be flexible, and emphasize customer communication.” (Int#2)</p> <p>“So I think within all of the grid operators, but also in our DSO, 10–20 years ago, we were just the person who would come to your house, put a cable in the ground, and everything would be fine. Now we’re moving more towards a distributing service operator. That means being more in control of our grid.” (Int#4)</p> <p>“The board decided to prioritize grid expansion over maintenance. We’ll do the minimum to avoid worsening issues, but we’re not investing in improved maintenance. Our focus is on adding new customers and expanding the grid, due to the waiting list and energy transition needs.” (Int#11)</p> | <p>Changing KPIs & Strategy: shifting organizational priorities- KPI; refocusing the strategy, moving away from passive expansion to active control</p> | <p>Reframing questions</p> |
| <p>“Now we have to get insight into our grid and steer our grid, and that is the biggest transition that our organization is facing right now. We have to put measurements in the ground because we have to steer based on measurements. First of all, the customer interaction was always: customer asks for a cable, we deliver. Now, we ask the customer to reduce something—it’s a different communication scheme.” (Int #4)</p> <p>“Now, instead of asking ‘Do you need a 25-amp, 50-amp, or 80-amp connection?’ we now have to ask, ‘What’s your production process? Do you have any flexibility in your operations?’” (Int#9)</p> | <p>Rethinking, Adapting Communication Scheme: Different ways of engaging with customers</p> | |
| <p>“A couple of years ago, we reorganized our organization, creating a new department called System Operations. This department builds grid and capacity management for future operations.” (Int#11)</p> <p>“This is a new team, which I started managing two months ago, and our goal is to create new capabilities, functions, and products to support the grid and integrate customers on waiting lists.” (Int#11)</p> | <p>Reorganising Internally: building new departments for future operations; new capabilities; new functions internally</p> | |
| <p>“I always say that the last 150 years were very busy under the ground, and now it becomes more important to build up correlation above the ground.” (Int#1)</p> <p>“I feel that the congestion problems we face today will actually help us reach this goal because everyone understands the problem and realizes we need to act.” (Int #9)</p> | <p>Common Awareness: recognizing the ‘grid congestion’ as new normal; acknowledging constraints; shifting mindsets</p> | |

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| <p>“We need to scale up and operate differently. Previously, we made sure to stay ahead of capacity requests, but now we’re facing the reality that long-term grid reinforcement alone won’t solve everything.” (Int#7)</p> <p>“So if we overload it two times with 10% a year, maybe then the transformer will only last 100 years instead of 500. But do we really care? Those kinds of questions we’re asking right now. So I think the risk appetite of the DSO has grown.” (Int#4)</p> <p>“I think it’s a very valid question. I think people just didn’t dare to believe that it could really happen—that it could grow that quickly—because for a long time, it didn’t. It was like waiting for something to take off, but it just remained flat. Renewable energy development in the Netherlands was a good example; we were very late compared to Germany and Spain. I think, for a long time, there was this idea that things wouldn’t change that fast or that we would always be slow. That mindset made it harder to act with urgency when things did start moving.” (Int#8)</p> | <p>Organisational Urgency: reality check; risk appetite; need for fast decisions; unexpected consequences from the energy transition</p> | <p>Reframing Questions</p> |
| <p>“So, companies contract capacity for future growth, but now that capacity shortages are becoming more common, this model is becoming problematic. We can’t take back the unused capacity or give it to someone else without affecting the company’s future plans.” (Int#6)</p> <p>“It is economically beneficial for us because we know that the grid will be used at 100% capacity. There are no underused connections, and having clients on a waiting list is actually good for business because we can be sure that all our assets will be fully utilized.” (Int#6)</p> <p>“The biggest problem with congestion is that it’s always about expectations for the future. Now we get a lot of customer requests for a connection or extra transport capacity. At the moment they’re asking, there’s no physical congestion on the grid, but we have to consider what they will do in the future with this connection.” (Int#10)</p> | <p>Raising New Questions on Capacity: challenging grid access; capacity allocation norms; tensions between future planning and current constraints</p> | |

2) Reorienting Synergies

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| <p>“We’re very dependent on our customers, and they have a lot of freedom in how they cooperate with us. Recently, we’ve started shifting toward a more enforceable approach. The regulator is also recognizing the issue and is beginning to support more enforcement, but the shift is still challenging ” (Int#7)</p> <p>“So, we’ll need to change the rules as well. The public discussion we mentioned about electric vehicle charging that spiralled out of control is important... If we motivate that carefully, people will see it’s about dealing with emergency situations.” (Int#8)</p> <p>“I understand. So regarding the regulatory side, you may need to interact more with customers and potentially change their behaviour to address congestion.” (Int#9)</p> <p>“It’s complete shift from the internal focus to an external, customer- centric view.. how we connect with them, building connections with them” (Int#9)</p> | <p>Reconnecting Customer-DSO Governance: Increasing regulatory flexibility for congestion management, Strengthening enforcement in customer cooperation, Addressing grid use constraints through rule changes for customers</p> | <p>Reorienting Synergies</p> |

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| <p><i>"But we also have to educate our customers. And that's also what operation is facing. And if you educate them and if you they became more ready and maybe they won't ask for this additional electricity, but we also said that economic growth and this industries needs to function and so on. (Int#4)</i></p> | | |
| <p><i>"How we interact with companies, housing associations, municipalities, and provinces—these are completely new challenges." (Int#2)</i></p> | <p>Strengthening Multi-Actor Engagement: Enhancing interactions between DSOs, industries, contractors, suppliers</p> | |
| <p><i>"I think we need to move towards a system that incorporates the TSO and DSOs... we need to work closer together and move towards real-time system operations." (Int#4)</i> <i>"So, right now there are a few areas where TSO says we are out of any additional capacity. So, the DSOs are not allowed to influence customer behaviour... because that's going to affect the high-voltage grid." (Int#5)</i> <i>"The grid is layered, with low voltage, medium voltage, high voltage, and extra high voltage, which is operated by TSO. Sometimes a problem in the high-voltage grid can limit what we can do at a lower level." (Int#6)</i> <i>"The grid is layered, with low voltage, medium voltage, high voltage, and extra high voltage, which is operated by TSO. Sometimes a problem in the high-voltage grid can limit what we can do at a lower level. So dependent on each other more on that issue (Int#6)</i> <i>"In the current situation, there's congestion on the high-voltage network. To provide non-firm capacity, we need to know when spare capacity is available, and right now, we don't have a clear answer, to offer these kind of contracts we need more open dialogue, predictable answers from the TSO" (Int#10)</i> <i>"Yeah, it could be solved, but it will probably take a few years because historically, the TSO and DSO haven't worked together on this. They've operated as separate entities, but now collaboration is beginning. Everyone is learning and trying to understand each other." (Int#10)</i> <i>"Right now, TSO has large areas with congestion, and they request us not to do anything that influences the profile or peak load. But we feel more might be possible, we can't keep our customers on waiting lists for 10 years because TSO has a problem there... so we are more and more involved in active discussions in risk propositions of each other" (Int#5)</i> <i>"Stronger collaboration with other DSOs and TSO is essential" (Int#9)</i></p> | <p>Redefining TSO-DSO (high voltage- low voltage) Coordination : Increasing integration between TSO and DSOs for real-time operations; different grid levels redefining interaction; congestion conflict between actors; historical lack of collaboration shifting; active discussions; common uncertainties</p> | <p>Reorienting Synergies</p> |
| <p><i>"The main problems are the urban planning issue, and we are a very complicated country with a lot of legal proceedings. That's the main reason for the delays we are facing , so we need to find a way of more integrated dialogue with the spatial planning side" (Int#1)</i> <i>"Wind and solar farms are placed in rural areas with little grid capacity, requiring energy to be transported across the country. So energy transition need to consider the grid capacity planning too" (Int#10)</i> <i>"Why can't we expand the grid as fast as demand grows? It's because we face legal processes, spatial challenges, and the sheer complexity of coordinating large-scale infrastructure projects. When expanding the grid, we need permits to dig and install new cables, which must comply with local planning rules. This process is tedious and time-consuming. We also need to acquire land for substations, which is a major challenge in</i></p> | <p>Reintegrating Spatial& Energy Planning: land scarcity forcing integration; institutional spaces getting closer to the legal proceedings; timely clarity on plans with collaboration</p> | |

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| <p>densely populated areas like the Netherlands—every square meter is already taken, making it very difficult to find space. “So we need to create integration between development and grid” (Int#6)</p> | | |
| <p>“One discussion we should have is the value of trading and exchanging electricity on the high-voltage grids. Is it more valuable to supply 1,000, 2,000, or 10,000 small companies or just one or two large ones? We may need to assess the value of high-voltage grid capacity and what benefits it has for industries versus smaller clients.” (Int#6)</p> <p>“The impact may be larger for our clients compared to TSO. Unfortunately, this question remains unsolved—it’s politically charged and hard to quantify or communicate.” (Int#6)</p> | <p>Aligning Value Priorities for Grid Capacity: Reassessing stakeholder roles in grid access; balancing grid access between industries and smaller consumers;</p> | <p>Reorienting Synergies</p> |

3) Rediscovering Solutions

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| <p>“Our grid isn’t fully utilized—like a highway, it’s congested at peak hours but empty at night. Instead of expanding infrastructure, we aim to shift usage, encouraging customers to charge cars at night when capacity is available. This shift requires better grid insights and steering, as businesses facing long wait times often find creative solutions.” (Int#4)</p> <p>“On high-voltage grids, congestion impacts many customers, but that also means there are more opportunities to contract flexibility—often from larger consumers.” (Int#5)</p> <p>“When the grid is congested and there’s a waiting list for capacity, we ask existing clients if they still need their full reservation. Can they reduce it at certain times, within fixed time frames, or on demand? For example, can they lower their demand from 2 megawatts to 1.5? They would be compensated for it. Some companies are able and willing to do this, which creates room for others on the waiting list.” (Int#6)</p> <p>“We contribute by helping customers who need more capacity in times of scarcity, working to use the existing grid efficiently—through peak shaving, for example.” (Int#7)</p> | <p>Using the Existing Grid More Effectively: Demand shifting to maximize grid use; Enhancing real-time grid control; Peak shaving as a congestion solution; Using waiting lists as an incentive for innovation</p> | <p>Rediscovering Solutions</p> |
| <p>“There are developments, like the flexibility systems we believe in, and one of them is optimized EV charging. We’re seeing that in more warehouses and central locations, and I think that’s a positive trend. Another aspect is peak reduction for PV installations. With a bit of peak reduction in solar panel installations, we can reduce peaks with minimal financial loss.” (Int#3)</p> <p>“We’re developing smart solutions to improve grid access, like TCT—a time-based contract for clients. Some only need to charge at night, so if congestion is during the day, we offer tailored products with monitoring, specific tariffs, and the necessary setup to help them connect. ” (Int#9)</p> | <p>Smart Charging & Smart Demand Control Solutions: Using time-based contracts for grid flexibility; Optimizing EV charging strategies;</p> | |

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| <p>"Using EVs as energy storage to support the grid seems logical." (Int#11) "With storage solutions like batteries, it seemed we could offer flexibility, but we're limited because of TSO's constraints." (Int#6) "The question will be where storage should be located, how to leave maximum capacity for the market within grid limits." (Int#7)</p> | <p>Storage Solutions: Using EVs decentralized storage; strategic storage solutions for optimizing existing grid</p> | <p>Rediscovering Solutions</p> |
| <p>"Customers, especially generators, are already familiar with changing their operations based on electricity market prices." (Int#5) "Many small-medium scale companies don't realize how big the congestion issue is, or even understand what flexibility markets are." (Int#9) "One possibility is tariff differentiation: if you use 2 kilowatts, you get a lower tariff than someone using 10 or 15 kilowatts." (Int#6) "Congestion management works well for production—it's a simple economic transaction. But for consumption, it's more complex. A factory might reduce energy use for a few hours, but we may need flexibility 24/7, which isn't always feasible... That's why alternatives like non-firm capacity agreements or transport rights are more suitable. They allow businesses to plan investments within limits, rather than relying on congestion management, which only activates existing flexibility rather than creating new capacity." (Int#10)</p> | <p>Regulatory & Market-driven Solutions: Using the familiarity with the energy markets; knowledge on flexibility markets; familiarity with the price signals</p> | |
| <p>"We're running various pilot programs with customers, experimenting with different contracts and methods for integrating customers onto the grid." (Int#11) "Congestion creates the necessity for innovation and experimentation." (Int#5) "A company planning a factory could try to consider these new contract types, factoring in tariff savings over 10 years." (Int#10)</p> | <p>Experimentation & Pilot Programs: Experimenting with contract-based demand flexibility; Running real-world pilot projects with customers;</p> | |