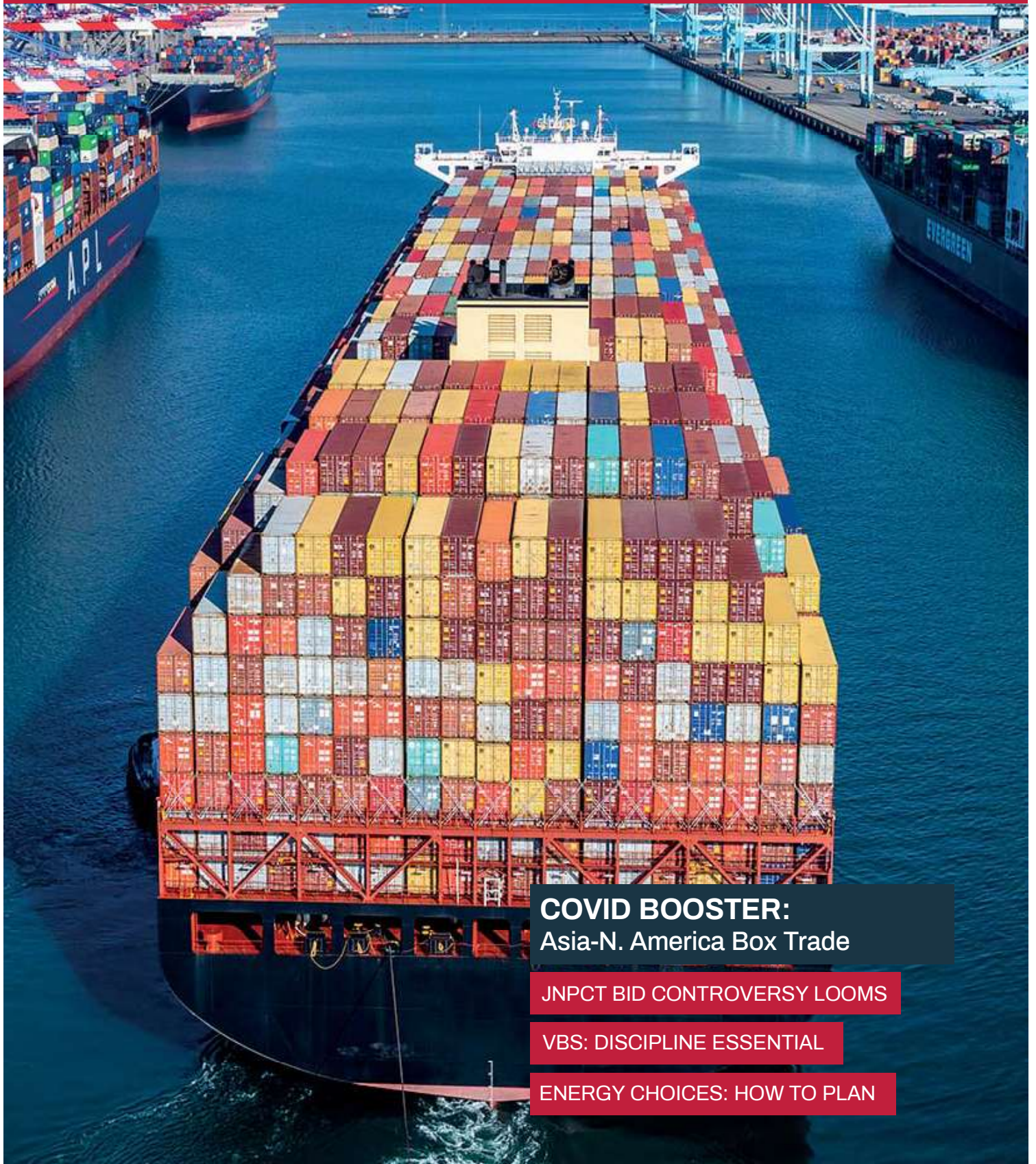


PORTSTRATEGY

INSIGHT FOR PORT EXECUTIVES

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VBS: DISCIPLINE ESSENTIAL

ENERGY CHOICES: HOW TO PLAN

ENERGY CHOICES, HOW TO PLAN

Gridmaster, a consortium of energy interests, is developing a multi-layered model to assist diverse port of Rotterdam businesses make complex energy investment decisions



■ A model developed for diverse businesses in the port of Rotterdam, Europe's biggest port, represents a pioneering approach to making the best energy investment decisions

As ports and industries strive towards decarbonisation, a dramatic transition in energy demand and supply is ahead of us. That much we know. But what shape will the new world take? Who will use what type of energy (and how much) and how will it be provided? How can we plan if we don't know?

The 'many worlds' interpretation of quantum physics suggests that there may be multiple copies of us all living in multiple worlds. Determining and planning for the future power demands and associated infrastructure requirements in Rotterdam, amounts to almost the same thing!

There are more than 40 industrial sites/users across the port area, all of which will have increased or different needs for electricity, hydrogen, methane, natural gas, and so on, in the coming years. Making investment decisions can be just as challenging for them as for the energy infrastructure providers, due to the uncertainties about, for example, market and grid capacity developments.

All of these uncertainties are being taken on by Gridmaster, a consortium set up in 2020 which spans the entire spectrum of the Dutch energy infrastructure market. Its target – to develop a unique tool to support tough decisions on future-proof investments in energy infrastructure.

Siemens Nederland is a member of the consortium,

'Jeroen de Bruin, Siemens Nederland N.V., has authored this article on behalf of the Gridmaster consortium. Siemens Nederland is a member of the consortium, alongside TenneT (the operator of the Dutch national electricity grid), energy infrastructure company Gasunie, grid operator Stedin, Province of South Holland, the Port of Rotterdam Authority, Municipality of Rotterdam, Smartport, TU Delft, Quintel Intelligence and TNO.

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MULTI-LAYERED MODEL

In essence, a multi-layered simulation model of the energy system of the Port of Rotterdam is being developed, through which numerous possible future scenarios can be tested and analysed. The work, based on extensive research, data collection and consultation, is being project managed by Siemens on behalf of the consortium.

"The basic concept of Gridmaster is a tool that helps the grid operators in the Port of Rotterdam to make investment decisions that are more robust, in what is an uncertain future," says Jan van Dinther, Energy Transition Developer for Siemens.

He compares the model to a 'multi-layered digital twin', in which the base layer represents all the assets in the port – industrial sites, wind farms, solar parks, etc. – and considers how they are operated, how they exchange different forms of energy, etc. Subsequent layers represent the electricity market, the methane, hydrogen and electricity grids, how assets are operated in the port and how these assets are connected to the energy infrastructure.

"We plot the operation of all the assets, given the energy prices, and then we can calculate the power flows in the different grids and determine where capacity bottlenecks in energy infrastructure will occur. We are working with a rich set of building blocks; modelling these building blocks is a technical process but also a social process of bringing people together and defining strategy."

Alan Croes, responsible for System Outlook within Energy

System Planning at TenneT, says: "I use the parallel of building a new type of car. The intention is to drive somewhere to the future, which is a tight spot, but in the project we are still building the engine, putting the wheels together, designing the navigation system – different things have to come together to make it work. We have already shown that this 'car' is able to drive. The idea with Gridmaster is – are we able to drive it in the right direction, to do the right things?"

Industry is facing strategic uncertainty when it comes to investments and future power, he says: "It is not like a straightforward development plan. An industry site has to choose whether to stay, stop, go to hydrogen or use electricity. All those choices have huge impacts. Seeing these discussions with industry, we can't expect them to make the final decisions because the technology is still in development."

So instead of coming up with one story line or two, Gridmaster is considering all the possibilities. "What kind of grid would we need? We are taking all stakeholders into account – asking them, what do you think, what are your uncertainties? This adds up to thousands of possibilities. The engine of Gridmaster will make sense out of all that and present it in such a way that we are able to choose our investment path."

There will be preliminary results from the Gridmaster project by early 2022, demonstrating the modules created and how they work together for a real-life showcase. But the work is far from 'over'.

Croes points out that when you consider energy systems, the level of uncertainty, stakeholders' plans, current and future infrastructure, etc., the complexity is huge. "I haven't heard of anything similar being done and that makes it very interesting – the electricity and gas sector working together and trying to create one model to support the whole decision-making process."

INDUSTRY INTERACTION

Jan van Dinther (who was recently named Young Port Talent of the Year in Rotterdam) explains some of the work involved to date.

"We have had sessions with industry, gathering their strategies. We gathered information from research done in the port, for example, how fast will hydrogen grow, or

electrification; we build up a scenario for each site, making it very broad-ranging. We work with a broad spectrum, not with scenarios that are single lines or endpoints. This is what we call the scenario space.

"We are building," he continues, "a digital representation of what is happening in the port and what kind of energy flows through it. We have over 40 different sites and each of these has different assets – for example, boilers that provide heat in a process, an electricity need, potential hydrogen need. Every site has its own assets. Based on the trends in the scenario space, these assets are transformed – for example, from electric boiler to hydrogen-powered boiler. What is important about this vision, is that it's really a bottom-up way of analysing, considering the relation of the asset with other assets on the site and in the broader context of the industrial cluster."

Alan Croes says this is the biggest pilot project on decision support that he has ever been involved in. "The reason to make it big is if you don't do it properly, you will never know whether it works. You need to grasp the complexity.

"In principle, what will be delivered initially is a view of what kind of infrastructure is needed if you want to achieve a certain 'storyline'. If you assume there is very high electrification and high decarbonisation, that has a certain number of parameters; suddenly, you will see what that means, and what needs to be put in place to make it happen.

"Or, if looking at hydrogen-based power with CCS (carbon capture and storage) as an immediate step, what would you need then, and are there overlapping items where you don't have to choose? It is that kind of insight we expect to have visible soon."

None of this means that decisions will be easy, he says – but it does mean that decisions will be informed and, of course, continual updating of the model will continue as trends develop. "The uncertainties are there because we are looking at the future. But Gridmaster can help us to understand the inter-relation of different development scenarios and which uncertainties are more, or less, decision driven. This whole journey will not stop for the next ten years at least – by which time, we should have killed off at least some uncertainty! In the end, what we are trying to do is make sure our future customers have the infrastructure they need, when they need it," he concludes.



■ There are more than 40 industrial sites across the port of Rotterdam, all with different energy needs