Strategy for Shore Power in the Port of Rotterdam

Introduction

The port of Rotterdam is working on the transition from fossil to sustainable energy. Power-to-ship (also known as shore power) is an important element. Tens of thousands of vessels visit our international port every year. When berthed, most of them use generators for their energy requirements on board, with emissions as nitrogen and CO_2 as a result. Shore power now gives us the opportunity to reduce those emissions by providing vessels with a clean source of energy.

In the past, we have already made major advances in Rotterdam with shore power for inland shipping. This Shore Power Strategy from the City of Rotterdam and the Port of Rotterdam Authority takes the next step, with the arrival of shore power for other types of vessels. That is needed because the switch from marine diesel to clean shore power from solar and wind allows us to achieve major environmental benefits: less noise, better air quality in the city and a significant reduction in carbon emissions in our port.

With this joint strategy, the port of Rotterdam is preparing for the transition to cleaner shipping. That is a wonderful challenge that we are eager to tackle together with our partners.

Arno Bonte - Vice Mayor for Sustainability, Clean Air and Energy Transition
Allard Castelein – CEO, Port of Rotterdam Authority

Background

The Rotterdam Climate Agreement states that carbon emissions in Rotterdam will be halved in 2030 compared with 2017. The City of Rotterdam and the Port of Rotterdam Authority are working together on achieving and realising the climate goals *and* to establish a climate-neutral port. At the same time, international shipping also has a sustainability challenge: the International Maritime Organisation (of the United Nations) has adopted the goal of reducing carbon emissions from all shipping by fifty percent.

A wide range of measures will contribute to making shipping more sustainable. Of that package of measures, shore power is one of the most promising *and* technically feasible options in the short term. Shore power supplies berthed vessels with sustainably produced energy, allowing them to turn off their auxiliary engines. Not only does that result in major carbon reductions, it also ensures that berthed vessels no longer emit nitrogen and particulate matter. Furthermore, it also reduces noise levels in the vicinity. Sustainable shore power therefore helps to achieve the climate objectives, it helps to reduce nitrogen deposition in Natura 2000 areas and it improves the living environment in the area around the port of Rotterdam. These are three important reasons to encourage the development of shore power. That is why the Port of Rotterdam Authority and the City of Rotterdam have decided to develop a joint strategy. The aim is to accelerate the development of shore power and position Rotterdam as the European leader in this field.

The total electricity consumption of stationary seagoing vessels in Rotterdam is estimated at between 700 GWh and 840 GWh annually, the approximate equivalent of 250,000 to 300,000 households. Total carbon emissions associated with berthed ships are estimated at over 600,000 tonnes annually and nitrogen emissions at up to 8,000 tonnes a year.

Current situation in Rotterdam

A good start has been made in recent years in and around Rotterdam on the development and installation of shore-power facilities. For example, almost all moorings for inland shipping have a shore-power connection. The ferries of the Stena Line in the Hoek van Holland also use shore power.
Work is currently in progress on the Caland Canal near Rozenburg on one of the largest shore-power installations in Europe. In addition, several studies are being conducted. They include the feasibility of shore power at various locations in the port area and the practicality of mobile shore-power concepts.

Shore power: development in recent years

Until now, shore-power installations throughout the world have generally been put into place in response to political initiatives and been fully subsidised, often with the aim of improving local air quality and noise levels. That also applies to the shore-power connections in Rotterdam for inland shipping and Stena Line's shore-power installation in the Hook of Holland. In other countries, installations mainly supply shore power for cruise ships and ferries. These completed projects demonstrate the importance and feasibility of the shore-power concept.

Despite the positive results, the fundamental uncertainties among market players have not yet been resolved. At the same time, the technical potential of shore power for the shipping industry is still being developed and integration in existing terminals represents the main challenge. Although shore power is being encouraged, there is still no uniform policy requiring its use for shipping. The European Commission is running a range of initiatives that will affect both the development of shore-power infrastructure and the use of climate-neutral fuels (including shore power). European policy conditions for shore power are therefore expected to change over the next five years.

Acceleration and scaling up

The acceleration in the wider roll-out of shore power in and around Rotterdam requires a joint development programme, including the associated learning process with stakeholders. During the development programme, we will be encouraging both technical and commercial innovation. At the same time, this innovative development programme will allow us to make a leap in scale with shore power and therefore to eliminate the primary obstacles and objections facing market parties. The increased availability of the relevant installations will make it more appealing for shipping companies to switch to shore power.

Roles of Port Authority and City Authority

The Port of Rotterdam Authority and the City of Rotterdam have opted for a pragmatic approach. We are acting as reliable partners who are also taking on an intermediate role as a joint developer. A good example is the installation of a shore-based power facility near the Caland Canal. Several parties in the value chain have been working on the development of shore power here, with the Port of Rotterdam Authority and the City of Rotterdam playing an active role. Our role will change as the shore-power market matures and financial viability improves. From then on, our efforts will be focused more on the ongoing development of international support and the standardisation of shore power.

Approach in the years to come

Various shipping segments already have the technical facilities required for a straightforward transition to shore power and for scaling it up. But there are also segments where this is a lot more difficult, or where shore-power connections are not yet possible for technical reasons. Innovation and standardisation will therefore be needed in these segments. In order to improve air quality, reduce nitrogen deposition and make shipping more sustainable, we are deliberately opting for broad development based on three pillars:

Pillar 1
Quality of the living environment is central
Berthed vessels close to inhabited areas or Natura 2000 areas cause noise, poorer air quality and nitrogen deposition. That must, and can, change:

- Our aim is to fit out public quays in the urban area with shore power by 2030 and for shore power to be used for at least 90% of ship visits.
- In the case of the private quays that are not listed under pillar 2 and where shore power can help to improve the living environment, we are investigating the options of providing private moorings with shore power more quickly. These studies will include the effect of shore power on the living environment and nitrogen deposition, and look at commercially scalable shore-power solutions.
- In the case of both public and private quays, we are investigating a wide range of incentives to install shore-power facilities in order to achieve the desired effect.

Pillar 2
Large steps forward where possible
Roll-on/Roll-off, ferry, cruise and large container vessels have the technical systems that put shore-power solutions for these segments within easy reach. Moreover, these large vessels require large supplies of energy in predictable patterns and that makes shore power an appealing *and* feasible solution. To make investments in shore power, it is necessary to bring together the stakeholders in the value chain for each shipping segment and to arrive at a joint investment decision. The formation of international coalitions furthers the feasibility of shore power worldwide.

Depending on the availability of subsidies, our targets for 2030 are:
• shore power for at least 90 percent of the visits of Roll-on/Roll-off, offshore, ferry and cruise vessels;
• at least 50 percent of the visits of the largest container vessels (ULCS: >10,000 TEU nominal capacity) will be connected to shore power.

Pillar 3
Encouraging innovation and standardisation where necessary
We will provide active support in the field of innovation and standardisation for more complex shipping segments and areas where the technical facilities for shore power are not yet available. Complex shipping segments include liquid bulk and dry transhipment.

- *International collaboration*
  International collaboration and the establishment of a policy for standardisation are crucially important for developments in this area. That is why we are also focusing on working with international partners to establish international technical standards for the shore-power market.
- *Stricter policy*
  In some cases, for example when shore-power facilities are introduced to improve noise levels and air quality, encouraging the use of shore power or even making it mandatory are appropriate.

The ultimate deployment of shore power in the port of Rotterdam depends on several factors, examples being technological developments and the required investments. In the more complex shipping segments where the technical systems required for shore power are not available, other sustainable technologies may ultimately prove to be applicable and desirable. In the end, the goal is to have a climate-neutral port for the lowest social cost. Shore power is a means and not an end in itself.

<u>Development programme</u>
In order to achieve our ambition, we are opting for an integrated approach and a development programme in which we acquire experience in partnerships with the commercial and operational implementation of shore-power projects. Efforts over the next five years should be sufficient

to break through the market deadlock (the 'chicken and egg dilemma'), so that market investment takes shape in the context of the strategy and ambitions of the City and Port authorities.

Our focus in the programme will be on:
• collaboration with a range of partners in the chain;
• developing incentive policies;
• eliminating obstacles.

The expectation is that this will result in feasible business cases in the longer term for both vessels and the shore. This does not alter the fact that subsidies will be required over the next five years to compensate the non-profitable upper echelon of the 'first movers'. The availability of adequate European, national and local subsidy resources is therefore a precondition for the ambitions and the role that the Port and City Authorities of Rotterdam can adopt in this programme. The joint programme is expected to include, among others, the following activities:

- Establishing alliances with parties such as Stedin, Rotterdam Shore Power B.V. and other energy and technology suppliers;
- Entering into international coalitions with ports, terminals and shipping companies (for example in the context of the World Port Climate Action Programme) for a range of shipping segments;
- Contributing to policy-making at the national and European levels;
- Surveying the electricity demand profiles of vessels and bringing them together in a portfolio analysis for the port of Rotterdam;
- Conducting feasibility studies for shore-power installations, both for individual locations and as part of an area solution;
- Developing draft system designs and business cases for shore-power installations, and exploring market approach concepts;
- Co-investment in shore-power installations;
- Implementing innovative pilot projects;
- Examining possible policy measures and instruments that could further the use of shore power;
- Working towards new or improved international standards for shore power;
- Identifying subsidy and funding opportunities in the national and European contexts;
- Precisely because the development of shore-power projects is technically and commercially complex, we are opting for an open development programme:
- In collaboration with the grid manager, we are making plans for the expansion of the required network;
- Working jointly with the shipping companies and the terminals, we are looking at cost-effective shore-power technologies and opportunities for operational and spatial integration;
- With the providers of shore power, we are studying ways of making the solutions affordable and broadening the service model.

All this requires substantial investment and a good balance between public and private interests and risks. This multi-faceted process with the various parties makes the development of shore power particularly valuable because it can serve as a springboard for further steps in the energy transition. For example, the construction of shore-power facilities can also play an important role in the development of hybrid or electric sailing or the further electrification of the port industrial complex.

<u>Projects and investments</u>
Both the Port of Rotterdam Authority and the City of Rotterdam are contributing financially to the achievement of the joint ambition. In addition to that financing, a subsidy of at least 50 million euros will be required over the next five years to implement the shore-power projects in the programme and to achieve the ambition of being the European leader.

The Port of Rotterdam Authority and the City of Rotterdam are committed to meeting this subsidy requirement by drawing on funding from a range of government authorities, whether local, national or European. In doing so, we will cover the non-profitable upper echelon - or give the required guarantees - for an expected eight to ten market projects with a total installed capacity of 120MW. This represents a total investment of approximately 125 million euros, with subsidies accounting for approximately 40 percent. This percentage is in line with the international public contribution to shore-power projects (which varies between 20 percent and 100 percent of the investment costs). Depending on the development of the project portfolio, it is likely that at least 2500 tonnes of nitrogen and 200 ktonnes of CO_2 can be saved annually by 2030. The ultimate saving also depends on the policy pursued with regard to encouraging (or obliging) shipping to use shore-power connections.

Re-assessment after five years

International developments are expected to contribute to the establishment of an adequate level of commitment to shore power by shipping and therefore to a higher rate of utilisation of the Rotterdam facilities. Once the market impasse has been resolved, the Port and City authorities will be able to focus more on the role of local manager, area developer and promoter by helping to establish the necessary international cooperation and standardisation. After the completion of the five-year development programme, then, the expectation is that there will be enough market certainty and a clearer policy framework, allowing for a precise reassessment of the strategy pursued and the level of ambition for 2030. This reassessment will also look at the extent to which local, national and international policy measures for the further acceleration of short-power development are adequate. In addition, the question of providing certainty for the market and safeguarding a level playing field will also be taken into consideration.

SUPPLEMENT

Different types of vessels in the port

Container

Container vessels transport containers all over the world with all kinds of consumer goods or semi-finished products. Developments are driven by international legislation and regulations, which means that shore-power connections are mainly to be found in the newest and largest vessels. Container vessels are a promising type of vessel for the further development of shore power.

Roll-on/roll-off

Roll-on/Roll-off vessels are used to import or export cars or transport loaded trucks to and from other European destinations. Vessels with line services are more suited to shore power than vessels which only visit Rotterdam a few times a year. Roll-on/Roll-off is a promising category for the further development of shore power.

Ferries

Ferries are mainly used to transport trucks and people with cars to and from European destinations. Ferries are a promising category for the further development of shore power.

Dry bulk

Dry bulk carriers are used to transport large quantities of dry cargo (grains, ores, coal, etc.). There are hardly any dry bulk carriers with a shore-power connection at the moment.

Liquid bulk

Liquid bulk tankers are used to carry large quantities of liquid cargo (crude oil, oil products, vegetable oil, etc.). There are virtually no liquid bulk carriers with a shore-power connection. Innovative solutions are needed to install shore power safely on liquid bulk vessels.

Offshore

Offshore vessels are used for work at sea (installing wind turbines, installing or removing oil platforms, etc.). Shore power is growing in the offshore industry.

Cruise

Passengers on cruise vessels visit Rotterdam and the surrounding area. Shore power also has benefits for the passengers (or guests) on board. Cruise vessels are a promising category for the further development of shore power.

General cargo

General cargo vessels carry goods that do not fit in a container, are not transported in bulk and are not on wheels, such as different kinds of crude metals, or large and heavy cargoes. At present, there are a few general cargo vessels with a shore-power connection.

Inland shipping

Virtually all types of cargo can be transported by inland shipping. These vessels sail the European rivers and canals, and they are therefore a lot smaller. Virtually all inland vessels can be connected to shore power.