Kamer van Koophandel Antwerpen-Waasland Alfaport

Antwerp Port community supports an effective approach to shore-side electricity supply

15.03.2022

1 Introduction

Alfaport Voka is the platform by and for companies and professional associations in the port of Antwerp, Belgium. Alfaport Voka is aiming for an accessible, facilitative, cost-competitive and sustainable port of Antwerp with a view to embedding sustainable employment and added value at the port.
The proposals under the Fit for 55 define the path towards a zero emission shipping. The transition to alternative fuels, electrification and shore-side electricity supply is on the top of the agenda for shipping and terminals. In the port, shore-side electricity is an important option to improve the air quality and increasingly more ports are investigating and implementing shore-side electricity supply installations (https://sustainableworldports.org/wpcap/wg-3/).
Terminals and shipping lines support the rollout of shore-side electricity supply but the uptake of shore-side electricity supply in the Port of Antwerp has not yet started due to some hurdles. Implementing shore-side electricity is complex with several challenges and the port community needs to work together with well-defined roles and responsibilities. The ports of Antwerp, Bremen, Hamburg, Haropa and Rotterdam signed a Memorandum of Understanding to provide shore power for the largest container vessels by 2028 (Ports of Antwerp, 2021).
In this position paper, Alfaport Voka stipulates the main issues and challenges for installing shore-side electricity in the Port of Antwerp. The analysis is drawn up in consultation with terminals and shipping lines and is based on several publications (Iven Krämer, 2020) (ESPO, 2021), (CENIT).

2 Regulatory Framework

The **Directive 2014/94/EU on Alternative Fuel Infrastructure (AFID)** stipulates the need for shore-side electricity supply for inland waterway vessels and seagoing ships in maritime and inland ports. Such shore-side electricity supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits.
The Fit for 55 proposal (14.07.2021) for a **Regulation on the deployment of alternative fuels infrastructure (AFIR)** (repealing Directive 2014/94/EU) requires that Member States provide a minimum shore-side electricity supply for seagoing container and passenger ships in maritime ports by 1 January 2030.

There is an increasing pressure to deal with problem of air pollution in Flanders, especially in the Antwerp area. The **Flemish Air Policy Plan 2030** was approved by the Flemish Government on 25 October 2019. This plan contains measures for improving air quality in Flanders with objectives on the short, medium (2030) and long (2050) term.
Two general actions are included in the Flemish Air Policy Plan 2030 for shipping:

- monitoring and supporting international initiatives for greening shipping
- encourage the use of shore power and alternative fuels

Minister Zuhal Demir is currently investigating additional air quality measures to achieve the objectives of the Flemish Air Policy Plan 2030, the actions for shipping are under revision. MINARAAD-SERV-SALV advises in this context a Flemish Shorepower strategy and measures for roll-on roll-off, ferry, cruise and large container ships

The key factors for success will be a coherent regulatory framework with legal certainty for private investments and financial instruments to implement the ambitious action plan.

For a sector like the port, which has an especially global impact and outreach, a level playing field with other regions of the world is the basic requirement where cost effective actions are taken at the right - European or global – level, and a cost-benefit analysis and interests of port stakeholders are taken into account.
The market is driven by regulations, an effective regulatory environment shall accelerate the green transition.

➢ *Challenges*

The several EU proposals under FIT for 55 should be aligned and coherent, especially the FuelEU Maritime, energy Taxation Directive, inclusion of shipping sector in the ETS system and AFIR. At this moment, it is not clear if shore-side electricity really is a solution or if shipping lines will find even better options to reduce air emissions with alternative fuels to zero emission shipping
The use of shore-side electricity will not always be feasible, especially when container ships are occasionally handled at for example a multipurpose terminals. These installations will be underused, too expensive and inefficient. In order to avoid penalties, this ships should be automatically exempted when calling those terminals without OPS connection points. These terminals should thereto be specifically mentioned in the ports OPS availability plan.

What we ask:

- Coordinated approach with coherent legislation and full alignment between the different EU proposals, taking into account the international level playing field.
- Consider a benchmark at terminal level in the AFIR directive. Define the scope on a minimum level per terminals instead of per port. Terminals without OPS should be clearly indicated in the port OPS availability plan. An automatic exemption should be allowed at these terminals for container vessels and passenger vessels, which would normally need to connect to OPS, in order to avoid penalties.
- A permanent tax exemption in all EU member states for shore-side electricity under the Energy Taxation Directive

3 Infrastructure at berth

Two main technical options exist for the provision of seagoing vessels with power supply: fixed and mobile installations. The fixed installations have two types, depending if there is a direct connectivity to the overall public electricity network or if the electricity is produced local, preferable from renewables. Mobile installation like a power pack or power generator in a container or a floating power barge are also on the market and further investigated, preferably based on zero emission fuels. Also dual fuel solutions (with hydrogen and HVO (biodiesel), as a reliable transition technology, are already available with a significant reduction of greenhouse emissions. Such applications could also help controlling the peak demands.

➢ *Challenges*

In a port, the locations where to install the shore-side electricity installation is crucial. The berth size, particular layout of the shore-side electricity installation, limited size of a terminal in combination with the call size, time needed to connect or disconnect, tidal range, operational needs of the terminal, frequency of the call and time at berth is a challenging puzzle. The new infrastructure for onshore power supply has an impact on the terminals in the port, the extra investments have an impact on the layout and operations on the terminal. The operational aspects with a focus on safety and who takes which role with regard to plugging in, require the necessary attention. The requirements for the biggest container terminals are not always suitable for other terminals. A distinction should also be made between installations that allow flexibility in mooring. Not all "fixed" installations allow this, while it is crucial for operations. A lack of overall standardization interferes the uptake of shore power.
Technical challenge between shore-side electrical grids (50 Hz) and on-board electrical network (60hz), investment in frequency and high voltage converters is necessary.

The investment cost at terminal site is very high with no return on investment if the terminal is the investing party. Terminal operators have their own investments into greening of their equipment, it is not their role to invest into shore-side electricity installation needed by other actors. Furthermore, the cost effect ratio for reducing nitrogen by shore-side electricity is high =13,0 – 17,0 €/kg NOx current situation, 13 à 15 €/kg NOx prognosis 2030. The

Flemish Air Policy Plan 2030 applies a cost-effectiveness thresholds of 8.6€/kg for NOx, which means that shore-side electricity is too expensive according this plan. The largest cost in the development of shore power is the conversion of the ships themselves, which is not included in this calculation.
It is not clear who will pay for this capital-intensive investment and there is no guarantee that the installation is used once provided. Terminal operators are investigating at the same time into electrical equipment (cranes, stackers, carriers,...), leading to extra energy consumption

What we ask:

- Define a cost-sharing formula for the infrastructure investment
- The capital-intensive investment is the responsibility of the government and Port Authorities. To stimulate private investment in shore-side electricity, private parties should benefit from financial support of the Port Authority, Flemish authority and the EU funding with an ensured return on investment. A strong capital support from the Port Authority as facilitator of the port is indispensable. Only through the support of the Port Authority in the installation and operation of shore-based power can this project be successful. Take also the operational costs at the terminals in account.
- Investigate the role of Public Private Partnerships and the service provider business model
- International standardization is necessary to the accelerated uptake of shore power, this will ensure a worldwide compatibility
- Not every solution is appropriate for every terminal and not all quay walls are suitable. A distinction must be made between new and existing terminal. With new terminals it is easier to apply the latest technology and integrate the use of shore-side electricity installation in the operational planning.
- There is no overall solution, every terminal has its individual needs and requirements. A cost-benefit analysis should be made to define the best deployment of shore-side electricity. Flexibility in mooring is crucial for the operations.
- A technology neutral approach is crucial

4 Role of shipping lines

The shipping sector investigates several options to reduces their emissions. First of all, the design of the vessels themselves and slow steaming already leads to less fuel consumption and emissions. The shift from fossil to alternative fuels is a second option, but at this moment the technological readiness is at an early stage . Furthermore, the bunker facilities of these alternative fuels are not fully deployed yet. Finally, using shore-side electricity will have a positive impact on the emissions during docking periods.
The design of the vessels, use of fuels and way of sailing are the responsibility of the shipping lines. The installation and use of shore-side electricity is a shared responsibility with other port stakeholders. The use of shore power can be an opportunity to reduce the exposure to highly fluctuating bunker prices.

➢ *Challenges*

The cost of using shore power is higher than the own energy produced on board, even if bunker prices are high. So far, electricity produced onboard is tax exempted, use of energy of onshore power is not tax exempted.
A lack of overall standardization and differences between America, Asia en Europe interfere the uptake of shore power.
Depending on the ship type and readiness of the vessels, time at berth, frequency and repetition of the calls by the same vessel, shore power can be a viable option when available in the port.
Container vessels, ferry & RoRo and cruise ships are the frontrunners for the use of shore power. Other shipping sectors are under investigation.
The shipping lines are dealing with some technical issues:

- Retrofitting not easy or feasible, the largest cost in the development of shore power is the conversion of the ships themselves
- Lots of extra cabling on the ship
- Extra maintenance of shore power container on ship
- Location of shore power container on ship on starboard or port (not on both sides). This has consequences when mooring the ship

- Distance of the connection ship/shore: if too far, it is not possible

Shore side electricity is not the solution to an overall zero emission shipping, this applies only during the time the vessel is at berth. Due to its capital-intensive investment, it may not be installed in all ports. Or shipping lines can find in the future even better alternatives towards a zero emission shipping. Shore power risks being underutilized with a high financial risk for the investors.
Also for the shipping line it is a capital-intensive investment and there is no guarantee that there is shore-side electricity available at berth.

What we ask

- Cost competitive supply and price of electricity, develop a transparent rate structures that incentivize ships to plug in
- standardization can contribute to the accelerated uptake of shore power.
- Stability of the connection should be guaranteed, preferable from renewable energy sources. Electricity shortage will not be tolerated.
- The objective is a cost-effective path to zero-emission shipping. An open mind and technology neutral approach, taking into account that the shipping industry investigates also other solutions towards zero emission. Allow to make an assessment between the several options.
- Capital-intensive investments should benefit from subsidies. Therefore, to stimulate private investment in shore-side electricity, private parties should also benefit from the EU funding with an ensured return on investment.
- Use of shore-side electricity supply should benefit from EU tax exemptions.
- Flexible cable management system that allows ships to connect in multiple configurations

5 Energy Supply and connection

The use of shore power requires a great deal of energy, preferably green energy. The electrification of industry and port connected activities is one of the top priorities towards decarbonization. Electricity will become the main carrier for port activity.
The average power demand depends on the size of the ship and the number of reefer containers. It varies between 0.2-6 MW and can peak to 7.5 MW during a limited amount of time.
The connection to the public grid is, in accordance with the legislation, a relationship between the grid operator and the user, but this is impossible to implement in practice for the shipping sector. The Flemish legislation provides an exception: the operation of a private electricity distribution network is possible if the actor connecting to the public network is delivering a service. The various shore-side connection points on a terminal can be clustered in one private distribution network. In the port area, several private networks can be operated by different terminals or 1 port-wide private network operated by the Port Authority is among the possibilities.

➢ *Challenges*

With this fast-growing electrical energy consumption of port equipment and industrial activities, it is not clear whether the electricity supply will be sufficient and whether the peak load can be absorbed.
A smart grid in the port is essential, a good connectivity with sufficient electrical infrastructure and substations & converters.
The role of the terminal, where the electricity is delivered, should be clear and well defined. Operating a private electricity distribution network does not seem to be one of the responsibilities of a terminal.

The energy needed for shore-side electricity supply should be based on renewable green sources, otherwise the emissions shift to the location of the powerplant.
The government, VREG and other players in the energy landscape should take their responsibility to meet these challenges. Clarification is needed who is responsible for the private electricity distribution network.

What we ask

- The availability of energy must be guaranteed, taking into account peak loads and transition process to electrification in other sectors. Map the energy consumption and requirement in the port area.
- Sufficient grid capacity is essential, the electrical network and substation in the port must deliver the extra energy consumption
- Ensure clean and renewable energy.
- When the alternative fuel, used by the ships, causes less emission than the energy the ship has to take from the grid, ships should be allowed to use its own energy supply
- Define a cost model for the extra infrastructure investment if needed
- Clarify who is responsible for the private electricity distribution network: terminal/port authority or third party.
- Define a transparent cost model for the energy price with roles and responsibilities, taking into account the consequences of a private electricity distribution network.

6 Role of Port authorities

The port community needs to work together with well-defined roles and responsibilities as the shore-side electricity supply case is complex. Port authorities have an important role in the deployment of shore side electricity. ESPO pleads that shore-side electricity is only installed where it makes sense ((ESPO, 2021).

➢ *Challenges*

The sense of reality, clear division of roles and a transparent policy are still lacking. The port authorities can take a leading role to tackle this problem where all stakeholders have to be involved. There is a need for a level playing field, especially when it comes to funding of shore side electricity supply.

What we ask

- The port authority has the responsibility to determine the need for OPS for each terminal. Provide the right framework to install and use shore side electricity, but only where it makes sense. Prioritise investments in shore side electricity based on cost-effectiveness and operational feasibility. First the new terminals are equipped and then the older ones are retrofitted if the cost benefit analysis is ok.
- Offer economics incentive to operators to use shore side electricity (discount on port dues)
- Encourage exchange of best practices between the terminals
- Map the expected electricity consumption in the port, including peak consumption
- it is not clear who will pay for this investment. Define a cost-sharing formula including a financial responsibility for the port authority and guard the level playing field with the neighbouring ports
- facilitate the development of a port energy infrastructure and production of renewable energies
- Inform authorities (local and EU level) about the challenges of installing shore-side electricity, where we refer to the position paper of ESPO ((ESPO, 2021). Underline the importance of financial support and sufficient availability of public local and EU funds and permanent EU tax exemption.

7 Financial considerations

The deployment of shore side electricity is capital intensive and is only possible by public financial support. But the EU member states have different approaches to support and accelerate the shore side electricity projects in their ports. In Germany, the federal government grants 176 million euro by 2023 for the implementation of shore power systems, funding up to 75% in 2020 en 2021 and up to 50% for 2022-2024. In the Netherlands, the government has reserved 150 million euro to fund the financial shortfall of shore power projects (REBEL, 2021).
The port of Barcelona has launched a shore power tender (with a tender price of €5.8 million) in 2022 for a pilot project to supply electricity to container vessels. This is part of Phase Zero of the Wharf Electrification Plan, a plan of nearly €90 million to halve CO_2 emission form port operation by 2030 and become carbon neutral by 2050.

Two different business models are valuable and presented in figure 1 (REBEL, 2021).

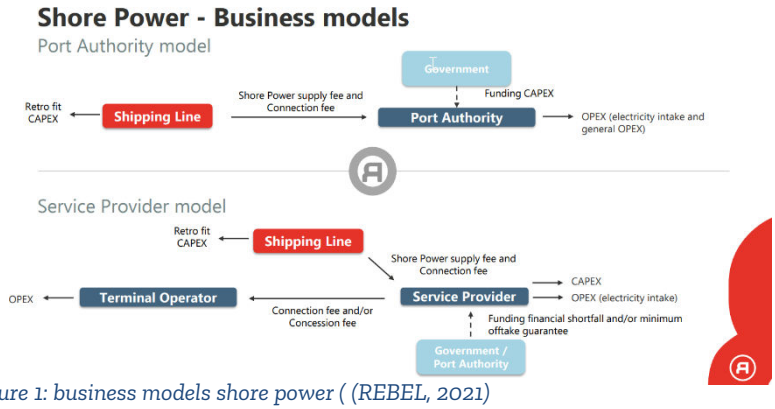

Figure 1: business models shore power ((REBEL, 2021)

In the service provider business model, the OPEX is for the Service provider but can also include the terminal operator. In the port authority model, the OPEX is for the port authority. The impact on the terminals is restricted to the installation of shore power substation(s) and civil works during the project implementation. During the operational period, arrangements are necessary for the (dis)connection of the vessels (the Port Authority, Service Provider or the terminal operator). In case the terminal agree to take the (dis)connecting responsibility, a compensation is required.
A service provider model could work well if the financial shortfall is covered by the Government/Port Authority

➢ *Challenges*

The implementation of different approaches and business models in the EU member states, will have an negative effect on the level playing field and may lead to a distortion of the competitivity of the terminals in the EU ports.
The level playing field relates to the shore power supply fee that either the Port Authority or Service Provider charges, which could either be (partly) regulated or alternative contract mechanisms could be introduced to ensure a fair shore power supply fee.

What we ask

- The investment of shore side electricity should be made by public stakeholders (government, municipality or port authority). It is not the role of terminals. But this may not lead to a distortion of the competitivity of the terminals in the EU ports.
- Subsidies are indispensable. Port Authorities and government have an import role to play.
- The MoU of the ports of Antwerp, Bremerhaven, Hamburg, Haropa Port and Rotterdam, should also take the level playing field of the shore power supply fee into account and launch a proposal to find a solution

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