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DUBLIN PORT - OPS STUDY - REPORT

IE000678-RPS-01-XX-RP-E-RP0001
OPS Study - Report
A1 P01
04 October 2024

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
S3 / P01	Draft for Review	GK	AE	DF	2024.05.08
A1 / P01	Finalised Issue	GK	AE	DF	2024.10.04

Approval for issue

DF	4 October 2024

Prepared by:

RPS

Prepared for:

Marine Institute – Irish Maritime Development Office

Dublin | Cork | Galway | Sligo | Kilkenny
rpsgroup.com

RPS Group Limited, registered in Ireland No. 91911
RPS Consulting Engineers Limited, registered in Ireland No. 161581
RPS Engineering Services Limited, registered in Ireland No. 99795
The Registered office of each of the above companies is West Pier Business Campus, Dun Laoghaire, Co. Dublin, A96 N6T7

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1 INTRODUCTION

1.1 Background

This report has been prepared at the request of the Irish Maritime Development Office (IMDO) which is a statutory office within the Marine Institute and operates under the aegis of the Department of Transport.

The report reviews the key considerations in the provision of OPS at Dublin Port.

1.2 Scope

This report will look at the following:

a. Current and expected regulatory requirements relating to the provision and use of OPS
b. Electrical load associated with the use of OPS
c. The impact of OPS provision on the existing electrical infrastructure
d. The impact of OPS provision on the existing civil infrastructure
e. Capital cost associated with the deployment of OPS
f. Operating cost associated with the deployment of OPS
g. Conclusions and recommendations

1.3 Benefits Resulting from the use of OPS

The 'fit for 55' package, presented by the EU in July and December 2021, is designed to realise the European Climate Law objectives: climate neutrality by 2050 and a 55 % reduction of net greenhouse gas (GHG) emissions by 2030, compared with 1990 levels.

The use of OPS in port settings is one of a number of measures put forward for the maritime transport sector to help meet the aforementioned objectives. These measures are summarised as follows:

- Measures to ensure that the greenhouse gas intensity of fuels used by the shipping sector will gradually decrease over time, by 2% in 2025 to as much as 80% by 2050.
- A special incentive regime to support the uptake of the so-called renewable fuels of non-biological origin (RFNBO) with a high decarbonisation potential.
- An exclusion of fossil fuels from the regulation's certification process
- An obligation for passenger ships and containers to use onshore power supply for all electricity needs while moored at the quayside in major EU ports as of 2030, with a view to mitigating air pollution in ports, which are often close to densely populated areas.
- A voluntary pooling mechanism, under which ships will be allowed to pool their compliance balance with one or more other ships, with the pool as a whole, having to meet the greenhouse gas intensity limits on average.
- Time limited exceptions for the specific treatment of the outermost regions, small islands, and areas economically highly dependent on their connectivity.
- Revenues generated from the regulation's implementation ('Fuel EU penalties') should be used for projects in support of the maritime sector's decarbonisation with an enhanced transparency mechanism.
- Monitoring of the regulation's implementation through the Commission's reporting and review process.

While the primary objective of utilising OPS is to assist in the drive for climate neutrality, their use has the following additional benefits.

- The improvement of air quality within and around the port through reduction in ship-generated pollutants including carbon dioxide (CO_2), nitrogen oxides (NO_X), sulphur oxides (SO_X), particulate matter (PM) or other substances associated with onboard combustion processes.
- Reduction in CO_2 emissions (if the OPS electricity is mostly sourced from blue / green electrical production sources (including biomass, hydro or renewables).
- Noise reduction onboard, within the port and the surrounding area.
- Improved working conditions both onboard and within the port area.
- Competitive advantage towards sustainable shipping and ports.

2 REGULATORY REQUIREMENTS

2.1 OPS Regulations

The following is a summary of the regulations and directives relating to the provision and use of OPS.

- Regulation (EU) 2023 / 1805 of the European Parliament and of the Council of 13 September 2023 on the Use of Renewable and Low-Carbon Fuels in Maritime Transport, and Amending Directive 2009/16/EC.
- Fit for 55 Package (Dec. 2021): Incorporating 13no Interlinked Proposals to Revise Existing EU Climate and Energy Laws, and 6no Proposals for New Legislation
- 2014/94/EU (Oct. 2014): Directive of the European Parliament and of the Council on the Deployment of Alternative Fuels Infrastructure.
- MSC.1/Circ. 1675 (June 2023): International Maritime Organisation – Interim Guidelines on Safe Operation of Onshore Power Supply Service in Ports for Ships Engaged on International Voyages
- IEC/IEEE 80005-1 (2019): Utility Connections in Port – Part 1 – High Voltage Shore Connection Systems – General Requirements
- IEC/IEEE 80005-2 (2016): Utility Connections in Port – Part 2 – High and Low Voltage Shore Connection Systems – Data Communication for Monitoring and Control

2.2 Current Regulations – Summary of OPS Related Requirements

The following are the key requirements of the current regulations in relation to OPS.

a. FuelEU Maritime Initiative: Provisional Agreement to Decarbonise the Maritime Sector

The FuelEU maritime initiative is part of the Fit for 55 package. Presented by the European Commission on 14 July 2021 and finalised on 13 September 2023, the package aims to enable the EU to reduce its net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels and to achieve climate neutrality in 2050.

The new rules will apply from 1 January 2025, apart from articles 7 (Monitoring Plan) and 8 (Modifications to the Monitoring Plan) which will apply from 31 August 2024.

The initiative notes "*an obligation for passenger ships and containers to use on-shore power supply for all electricity needs while moored at the quayside in major EU ports as of 2030, with a view to mitigating air pollution in ports, which are often close to densely populated areas".*

b. Regulation (EU) 2023/1805: Regulation of the European Parliament and of the Council on the Use of Renewable and Low-Carbon Fuels in Maritime Transport, and Amending Directive 2009/16/EC

The following paragraphs relating to OPS are copied from Regulation (EU) 2023/1805. Where applicable, exemptions from the requirement to use OPS are shown high-lighted.

(37) *The obligation for ports to provide on-shore power supply (OPS), laid down in Regulation (EU) 2023/1805, should be matched by a corresponding obligation set out in this Regulation for ships to connect to OPS infrastructure while moored at the quayside, in order to ensure the effectiveness of that infrastructure and avoid the risk of stranded assets.*

(38) *The use of OPS abates air pollution produced by ships and reduces the amount of GHG emissions generated by maritime transport. OPS represents an increasingly clean power supply available to ships, in view of the growing shares of renewables and fossil-free energy sources in the Union electricity mix. While only the provision on OPS connection points is covered by Directive 2014/94/EU, the demand for, and as a result the deployment of, that technology have remained limited. Therefore, specific rules should be established to mandate the use of OPS by containerships and passenger ships, since those are the ship categories that produce the highest amount of emissions per ship while moored at the quayside, according to the data collected within the framework of Regulation (EU) 2015/757 in 2018.*

(39) *In addition to OPS, other technologies might be capable of offering equivalent environmental benefits in ports.* ***When the use of an alternative technology is demonstrated to be equivalent to the use of OPS, a ship should be exempted from the obligation to use OPS****.*

(40) *Different OPS projects and solutions have been tested for ships at anchorage, but there is currently no mature and scalable technical solution available. For that reason,* ***the obligation to use OPS should be, in principle, limited to ships moored at the quayside.*** *Nevertheless, the Commission should regularly reassess the situation, with a view to extending that obligation to ships at anchorage, when the necessary technologies are sufficiently mature. In the meantime, Member States should be allowed to impose, in certain cases, the obligation to use OPS on ships at anchorage, for example in ports that are already equipped with such technology or are located in areas where any pollution should be avoided.*

(41) ***Exceptions from the obligation to use OPS should also be provided for a number of objective reasons,*** *subject to verification by the competent authority of the Member State of the port of call or any duly authorised entity, after consulting relevant entities where appropriate.* ***Such exceptions should be limited to unscheduled port calls, which are not made on a systematic basis, for reasons of safety or saving life at sea, to short stays of ships moored at the quayside of less than two hours as this is the minimum time required for connection, to cases of unavailability or incompatibility of OPS, to the use of onboard energy generation under emergency situations and to maintenance and functional tests.***

(42) *In ports falling under the requirements of Article 9 of Regulation (EU) 2023/1805, exceptions applicable in the event of unavailability or incompatibility of OPS should be limited after shipowners and port operators have had sufficient time to make the necessary investments, in order to provide the necessary incentives for those investments and avoid unfair competition. Ship operators should plan carefully their port calls to make sure that they can carry out their activities when moored at the quayside without emitting air pollutants and GHG, in order to protect the environment in coastal areas and port cities. A limited number of exceptions applicable in the event of unavailability or incompatibility of OPS should be provided for to cater for situations where OPS was not provided, for reasons beyond the control of the ship operator. In order to mitigate the risk of stranded assets, incompatibility of OPS infrastructure on board and at berth as well as alternative fuel demand and supply imbalances, frequent consultation meetings between relevant stakeholders should be organised to discuss and take decisions on requirements and future plans.*

43) *The requirement for ports to provide OPS, laid down in Regulation (EU) 2023/1805, takes into account the types of ships served and the respective traffic volumes of maritime ports. The requirement for ships to connect to OPS should not apply to ships when calling at ports that are not covered by the OPS requirement set out in that Regulation, unless the port has OPS installed and available at the visited quayside, in which case the ship should be required to connect to OPS from 1 January 2035.*

(44) *Considering the positive effects of the use of OPS on local air pollution and the need to incentivise the uptake of that technology in the short term, the carbon intensity of the production of the electricity supplied at berth should be counted as zero. The Commission should envisage the possibility to take into account the actual GHG emissions related to the electricity delivered through OPS at a later stage.*

(45) *The implementation of this Regulation should take due account of the diverse governance models for ports across the Union, in particular as regards the responsibility for issuing a certificate exempting a ship from the obligation to connect to OPS.*

(46) *Coordination between ports and ship operators is crucial to ensure smooth connection procedures to OPS in ports. Ship operators should inform the ports they call at about their intention to connect to OPS and about the amount of power needed during the given call, in particular when it exceeds the estimated needs for that ship category.*

47) ***From 2035, the number of exceptions granted under this Regulation from the obligation to connect to OPS, which apply to certain cases where the ship is unable to connect to OPS, should be limited per ship during a reporting period. To ensure fair treatment of ships and to reflect the differences in their operating profiles, the number of exceptions should reflect the frequency of their port calls but should never amount to more than ten port calls per reporting period****. However, a ship should not be penalised and port calls should not be counted against the maximum number of exceptions where, prior to arrival to a port, the ship has requested to connect to OPS and that request has been accepted by the port or the duly authorised entity, but*

the ship is unable to connect to OPS, and it is able to demonstrate that it could not have reasonably known it would be unable to connect to OPS.

(48) *A robust and transparent monitoring, reporting and verification system should be put in place by this Regulation in order to trace compliance with its provisions. Such system should apply in a non-discriminatory way to all ships and require third party verification in order to ensure the accuracy of the data submitted within that system. In order to facilitate achieving the objective of this Regulation, any data already reported for the purposes of Regulation (EU) 2015/757 should be used, when necessary, for verifying compliance with this Regulation in order to limit administrative burden imposed on companies, verifiers and competent authorities.*

(61) *A FuelEU penalty should be imposed also for each non-compliant port call. That FuelEU penalty should be proportionate to the cost of using the electricity at sufficient level, should have a dissuasive effect as regards the use of more polluting energy sources and should be expressed in a fixed amount in EUR, multiplied by the established total electrical power demand of the ship at berth and by the total number of hours, rounded up to the nearest whole hour, spent at berth in non-compliance with OPS requirements.*

Chapter 1 - General Provisions - Article 1 - Subject Matter and Objective

This Regulation lays down uniform rules imposing:

(a) *a limit on the greenhouse gas (GHG) intensity of energy used on board by a ship arriving at, staying within or departing from ports under the jurisdiction of a Member State; and*

(b) *an obligation to use on-shore power supply (OPS) or zero-emission technology in ports under the jurisdiction of a Member State.*

Its objective in doing so is to increase consistent use of renewable and low-carbon fuels and substitute sources of energy in maritime transport across the Union, in line with the objective of reaching Union-wide climate neutrality at the latest by 2050, while ensuring the smooth operation of maritime transport, creating regulatory certainty for the uptake of renewable and low-carbon fuels and sustainable technologies and avoiding distortions in the internal market.

Chapter 1 - General Provisions - Article 3 – Definitions

For the purposes of this Regulation, the following definitions apply:

(10) *'port of call' means a port where ships stop to load or unload cargo or to embark or disembark passengers with the exclusion of stops for the sole purposes of refuelling, obtaining supplies, relieving the crew, going into dry-dock or making repairs to the ship, its equipment or both; stops in port because the ship is in need of assistance or in distress; ship-to-ship transfers carried out outside ports; stops for the sole purpose of taking shelter from adverse weather or rendered necessary by search and rescue activities; and stops of containerships in a neighbouring container transhipment port listed in the implementing act adopted pursuant to Article 2(2);*

Chapter II – Requirements for Energy Used on Board by Ships - Article 6 – Additional Zero-Emission Requirements for Energy Used at Berth

1. *From 1 January 2030, a ship moored at the quayside in a port of call which is covered by Article 9 of Regulation (EU) 2023/1805, and which is under the jurisdiction of a Member State shall connect to OPS and use it for all its electrical power demand at berth.*

2. *From 1 January 2035, a ship moored at the quayside in a port of call which is not covered by Article 9 of Regulation (EU) 2023/1805, which is under the jurisdiction of a Member State and where the quay is equipped with available OPS, shall connect to that OPS and use it for all its electrical power demand at berth.*

3. *From 1 January 2030 and until 31 December 2034, and after consulting relevant stakeholders, including, where appropriate, the managing body of the port, a Member State may decide that a ship moored at the quayside in a port of call under its jurisdiction which is not covered by Article 9 of Regulation (EU) 2023/1805, or in certain parts of such port, shall connect to OPS and use it for all its electrical power demand at berth. The Member State shall notify its decision imposing such requirement to the Commission a year prior to the application thereof. Such decision must apply from the beginning of a reporting period. The Commission shall publish the information in the*

Official Journal of the European Union and make publicly available an updated list of the ports concerned. Such list shall be easily accessible.

4. *Paragraphs 1, 2 and 3 shall apply to:*

   (a) *containerships.*

   (b) *passenger ships.*

5. *Paragraphs 1, 2 and 3 shall not apply to ships that:*

   (a) *are moored at the quayside for less than two hours, calculated on the basis of time of arrival and time of departure monitored and recorded in accordance with Article 15;*

   (b) *use zero-emission technologies which comply with the general requirements for such technologies provided for in Annex III and are listed and specified in the delegated and implementing acts adopted in accordance with paragraphs 6 and 7 of this Article, for all their electrical power demand at berth, while moored at the quayside;*

   (c) *due to unforeseen circumstances beyond the control of the ship, have to make an unscheduled port call, which is not made on a systematic basis, for reasons of safety or saving life at sea, other than those already excluded under Article 3, point (10);*

   (d) *are unable to connect to OPS due to the unavailability of OPS connection points in a port;*

   (e) *are unable to connect to OPS because exceptionally the electrical grid stability is at risk, due to insufficient available shore-power to satisfy the ship's required electrical power demand at berth;*

   (f) *are unable to connect to OPS because the shore installation at the port is not compatible with the onboard on-shore power equipment, provided that the installation for shore-connection on board the ship is certified in accordance with the technical specifications set out in Annex II to Regulation (EU) 2023/1805 for the shore-connection systems of seagoing ships;*

   (g) *for a limited period of time, require the use of onboard energy generation, under emergency situations representing immediate risk to life, the ship or the environment or for other reasons of force majeure;*

   (h) *while remaining connected to OPS, for a period of time limited to what is strictly necessary, require the use of onboard energy generation for maintenance tests or for functional tests carried out at the request of an officer of a competent authority or the representative of a recognised organisation undertaking a survey or inspection.*

Chapter VI – Delegated and Implementing Powers and Final Provisions – Article 30 – Reports and Review

2. *By 31 December 2027, and every five years thereafter at the latest, the Commission shall report to the European Parliament and the Council the results of an evaluation as regards the functioning of this Regulation, including possible impacts of market distortions or port evasion; as regards the evolution of the zero-emission technologies in maritime transport and their market, as well as the evolution of the technologies and market for renewable and low-carbon fuels and for OPS, including at anchorage; as regards the use of revenue generated by the FuelEU penalties; and as regards the impact of this Regulation on the competitiveness of the maritime sector in the Union.*

c. 2021/0223 (COD): Proposal for a Regulation of the European Parliament and of the Council on the Deployment of Alternative Fuels Infrastructure, and repealing Directive 2014/94/EU of the European Parliament and of the Council

1.2 For waterborne transport, this initiative delivers on the clear requirement of the European Green Deal to oblige docked ships to use shore-side electricity. It is fully complementary to Fuel EU maritime initiative by ensuring that sufficient shore-side electricity supply is installed in ports to provide electricity while passenger ships (including ro-ro passenger ships, high speed passenger craft and cruise ships) and container vessels are at berth and accommodating the demand for decarbonised gases (i.e. bio-LNG and synthetic gaseous fuels (e-gas). For the case of passenger ships, the different ship categories vary in their power demand characteristics while at berth, which leads to different investment needs at port. This needs to be combined with the different

operational characteristics of ports, including layouts and terminals. For this reason, a further distinction is made on passenger ships compared to the FuelEU maritime initiative in identifying two categories, that of ro-ro passenger ships and high-speed passenger vessels, and that of other passenger ships, notably cruise ships. Together with the FuelEU maritime initiative it therefore contributes to overcoming the current "chicken-and-egg" issue, which has meant that the very low demand for ship operators to connect to the electric grid while at berth has made it less attractive for ports to invest in shore-side electricity. Limited introduction of On-shore power supply OPS in ports risks disturbing the level playing between ports, in particular for early investors, as not OPS equipped vessels could shift their traffic. It is therefore important that minimum requirements be set for maritime ports across the whole TEN-T network.

5.2 Articles 9 and 10 set out provisions for Member States to ensure installation of a minimum shore-side electricity supply for certain seagoing ships in maritime ports and for inland waterway vessels. The articles also define further the criteria for exempting certain ports and set requirements to ensure a minimum shore-side electricity supply.

(32) Shore-side electricity facilities can serve maritime and inland waterway transport as clean power supply and contribute to reducing the environmental impact of seagoing ships and inland waterway vessels. Under the FuelEU maritime initiative, ship operators of container and passenger ships need to comply with provisions to reduce emissions at berth. Mandatory deployment targets should ensure that the sector finds sufficient shore-side electricity supply in TEN-T core and comprehensive maritime ports to comply with those requirements. The application of these targets to all TEN-T maritime ports should ensure the level playing field between ports.

(33) Container ships and passenger ships, being the ship categories, which are producing the highest amount of emissions per ship at berth, should as a priority be provided with shore-side electricity supply. In order to take into account power demand characteristics while at berth of different passenger ships, as well as port operational characteristics, it is necessary to distinguish between the passenger ship requirements for ro-ro passenger ships and high-speed passenger vessels, and those for other passenger ships.

(34) These targets should take into account the types of vessels served and their respective traffic volumes. ***Maritime ports with low traffic volumes of certain ship categories, should be exempted from the mandatory requirements for the corresponding ship categories based on a minimum level of traffic volume, so as to avoid underused capacity being installed. Similarly, the mandatory targets should not aim to target maximum demand, but a sufficiently high volume, in order to avoid underused capacity and to take account of port operational characteristics.*** *Maritime transport is an important link for the cohesion and economic development of islands in the Union. Energy production capacity in these islands may not always be sufficient to account for the power demand required to support the provision of shore-side electricity supply. In such a case, islands should be exempted from this requirement unless and until such an electrical connection with the mainland has been completed or there is a sufficient locally generated capacity from clean energy sources.*

Article 9 – Targets for Shore-Side Electricity Supply in Maritime Ports

1. Member States shall ensure that a minimum shore-side electricity supply for seagoing container and passenger ships is provided in maritime ports. To that end, Member States shall take the necessary measures to ensure that by 1 January 2030:

(a) TEN-T core and TEN-T comprehensive maritime ports whose average annual number of port calls over the last three years by seagoing container ships above 5000 gross tonnes, in the previous three years, is above 50 have sufficient shore-side power output to meet at least 90% of that demand;

(b) TEN-T core and TEN-T comprehensive maritime ports whose average annual number of port calls over the last three years by seagoing ro-ro passenger ships and high-speed passenger craft above 5000 gross tonnes, in the previous three years, is above 40 have sufficient shore-side power output to satisfy at least 90% of that demand;

(c) TEN-T core and TEN-T comprehensive maritime ports whose average annual number of port calls over the last three years by passenger ships other than ro-ro passenger ships and high-speed passenger craft above 5000 gross tonnes, in the previous three years, is above 25 have sufficient shore-side power output to meet at least 90% of that demand.

2. *For the determination of the number of port calls the following port calls shall not be taken into account:*

   (a) port calls that are at berth for less than two hours, calculated on the basis of hour of departure and arrival monitored in accordance with Article 14 of the proposal for a Regulation COM(2021)562;

   (b) port calls by ships that use zero-emission technologies, as specified in Annex III of the proposal for a Regulation COM(2021)562;

   (c) unscheduled port calls for reasons of safety or saving life at sea.

3. *Where the maritime port of the TEN-T core network and the TEN-T comprehensive network is located on an island which is not connected directly to the electricity grid, paragraph 1 shall not apply, until such a connection has been completed or there is a sufficient locally generated capacity from clean energy sources.*

2.3 OPS Regulations – Summary of Key Dates

The following is a summary of the key dates to be met to comply with current OPS directives and regulations.

Reference Document	Requirement	Due Date
FuelEU Maritime Initiative	Passenger ships and container ships **(over 5,000 GT)** to use OPS for all electricity needs while moored at the quayside in major EU ports as of 2030.	2030
Regulation (EU) 2023/1805 – Clause 43	The requirement for ships to connect to OPS should not apply to ships when calling at ports that are not covered by the OPS requirement set out in that Regulation, unless the port has OPS installed and available at the visited quayside, in which case the ship should be required to connect to OPS from 1 January 2035.	Jan. 1st 2035
Regulation (EU) 2023/1805 – Article 6	From 1 January 2030, a container ship or passenger ship moored at the quayside in a port of call which is covered by Article 9 of Regulation (EU) 2023/1805 and which is under the jurisdiction of a Member State shall connect to OPS and use it for all its electrical power demand at berth.	Jan. 1st 2030
Regulation (EU) 2023/1805 – Article 6	From 1 January 2035, a container ship or passenger ship moored at the quayside in a port of call which is not covered by Article 9 of Regulation (EU) 2023/1805, which is under the jurisdiction of a Member State and where the quay is equipped with available OPS, shall connect to that OPS and use it for all its electrical power demand at berth.	Jan. 1st 2035
Regulation (EU) 2023/1805 – Article 6	From 1 January 2030 and until 31 December 2034, and after consulting relevant stakeholders, including, where appropriate, the managing body of the port, a Member State may decide that a container ship or passenger ship moored at the quayside in a port of call under its jurisdiction which is not covered by Article 9 of Regulation (EU) 2023/1805, or in certain parts of such port, shall connect to OPS and use it for all its electrical power demand at berth.	Jan. 1st 2030
2021/0223 (COD) – Article 9	Member States shall ensure that a minimum shore-side electricity supply for seagoing container and passenger ships is provided in maritime ports. To that end, Member States shall take the necessary measures to ensure that by 1 January 2030: (a) TEN-T core and TEN-T comprehensive maritime ports whose average annual number of port calls over the last three years by seagoing container ships above 5000 gross tonnes, in the previous three years, is above 50 have sufficient shore-side power output to meet at least 90% of that demand;	Jan. 1st 2030

Reference Document	Requirement	Due Date
	(b) TEN-T core and TEN-T comprehensive maritime ports whose average annual number of port calls over the last three years by seagoing ro-ro passenger ships and high-speed passenger craft above 5000 gross tonnes, in the previous three years, is above 40 have sufficient shore-side power output to satisfy at least 90% of that demand; (c) TEN-T core and TEN-T comprehensive maritime ports whose average annual number of port calls over the last three years by passenger ships other than ro-ro passenger ships and high-speed passenger craft above 5000 gross tonnes, in the previous three years, is above 25 have sufficient shore-side power output to meet at least 90% of that demand.	

Table 1: Summary of Key Dates

2.4 OPS Regulations – Summary of Exemptions

The following is a summary of the exemptions applicable to current OPS directives and regulations.

Reference Document	Exemptions / Exceptions
Regulation (EU) 2023/1805 – Clause 39	When the use of an alternative technology is demonstrated to be equivalent to the use of OPS, a ship should be exempted from the obligation to use OPS.
Regulation (EU) 2023/1805 – Clause 40	The obligation to use OPS should be, in principle, limited to ships moored at the quayside.
Regulation (EU) 2023/1805 – Clause 41	Exceptions from the obligation to use OPS should also be provided for a number of objective reasons, subject to verification by the competent authority of the Member State of the port of call or any duly authorised entity, after consulting relevant entities where appropriate. Such exceptions should be limited to unscheduled port calls, which are not made on a systematic basis, for reasons of safety or saving life at sea, to short stays of ships moored at the quayside of less than two hours as this is the minimum time required for connection, to cases of unavailability or incompatibility of OPS, to the use of onboard energy generation under emergency situations and to maintenance and functional tests.
Regulation (EU) 2023/1805 – Clause 47	From 2035, the number of exceptions granted under this Regulation from the obligation to connect to OPS, which apply to certain cases where the ship is unable to connect to OPS, should be limited per ship during a reporting period. To ensure fair treatment of ships and to reflect the differences in their operating profiles, the number of exceptions should reflect the frequency of their port calls but should never amount to more than ten port calls per reporting period.
Regulation (EU) 2023/1805 – Article 3 - Clause 10	'Port of call' means a port where ships stop to load or unload cargo or to embark or disembark passengers with the **exclusion** of stops for the sole purposes of refuelling, obtaining supplies, relieving the crew, going into dry-dock or making repairs to the ship, its equipment or both; stops in port because the ship is in need of assistance or in distress; ship-to-ship transfers carried out outside ports; stops for the sole purpose of taking shelter from adverse weather or rendered necessary by search and rescue activities; and stops of containerships in a neighbouring container transhipment port listed in the implementing act adopted pursuant to Article 2(2).

Reference Document	Exemptions / Exceptions
Regulation (EU) 2023/1805 – Article 6 - Clause 5	The requirement for container ships and passenger ships to use OPS shall not apply to ships that: (a) are moored at the quayside for less than two hours, calculated on the basis of time of arrival and time of departure monitored and recorded in accordance with Article 15; (b) use zero-emission technologies which comply with the general requirements for such technologies provided for in Annex III and are listed and specified in the delegated and implementing acts adopted in accordance with paragraphs 6 and 7 of this Article, for all their electrical power demand at berth, while moored at the quayside; (c) due to unforeseen circumstances beyond the control of the ship, have to make an unscheduled port call, which is not made on a systematic basis, for reasons of safety or saving life at sea, other than those already excluded under Article 3, point (10); (d) are unable to connect to OPS due to the unavailability of OPS connection points in a port; (e) are unable to connect to OPS because exceptionally the electrical grid stability is at risk, due to insufficient available shore-power to satisfy the ship's required electrical power demand at berth; (f) are unable to connect to OPS because the shore installation at the port is not compatible with the onboard on-shore power equipment, provided that the installation for shore-connection on board the ship is certified in accordance with the technical specifications set out in Annex II to Regulation (EU) 2023/1805, for the shore-connection systems of seagoing ships; (g) for a limited period of time, require the use of onboard energy generation, under emergency situations representing immediate risk to life, the ship or the environment or for other reasons of force majeure; (h) while remaining connected to OPS, for a period of time limited to what is strictly necessary, require the use of onboard energy generation for maintenance tests or for functional tests carried out at the request of an officer of a competent authority or the representative of a recognised organisation undertaking a survey or inspection.
2021/0223 (COD) – Clause 34	Maritime ports with low traffic volumes of certain ship categories, should be exempted from the mandatory requirements for the corresponding ship categories based on a minimum level of traffic volume, so as to avoid underused capacity being installed. Similarly, the mandatory targets should not aim to target maximum demand, but a sufficiently high volume, in order to avoid underused capacity and to take account of port operational characteristics.
2021/0223 (COD) – Article 9 – Cl. 34	For the determination of the number of port calls the following port calls shall not be taken into account:
	(a) port calls that are at berth for less than two hours, calculated on the basis of hour of departure and arrival monitored in accordance with Article 14 of the proposal for a Regulation COM(2021)562;
	(b) port calls by ships that use zero-emission technologies, as specified in Annex III of the proposal for a Regulation COM(2021)562;
	(c) unscheduled port calls for reasons of safety or saving life at sea.

Table 2: Summary of Exemptions

3 PORT USAGE

The following table summarises the annual average number of vessels using Dublin Port over the four-year period 2019 to 2023 (2020 excluded due to Covid impact).

Vessel Type	Vessel Size (GT)	Average Number of Visits per Year	Average Time Spent in Port (Hours)
Oil Tankers			
Oil Tankers	<5,000	222	18
Oil Tankers	<10,000	35	24
Oil Tankers	>10,000	218	48
Gas Tankers			
Gas Tankers	>5,000	32	24
Bulk Carriers			
Bulk Carriers	<50,000	291	56
General Cargo			
General Cargo	<25,000	11	30
Container Vessels	**(Note 1)**		
Container Vessels	<10,000	773	30
Container Vessels	<50,000	183	48
Cruise Ships	**(Note 1)**		
Cruise Ships	<50,000	37	18
Cruise Ships	<100,000	11	18
Cruise Ships	<150,000	6	18
RoRo Pax Vessels	**(Note 1)**		
RoRo Pax Vessels	<20,000	293	4
RoRo Pax Vessels	>20,000	2,846	7
RoRo Freight Vessels			
RoRo Freight Vessels	<20,000	1,526	8
RoRo Freight Vessels	>20,000	738	18

NOTES

1. The average annual total number of container vessels, cruise ships and RoRo Pax vessels which berthed in Dublin Port in the four-year period 2019 to 2023 was 4,149. All of these vessels were >5,000GT and therefore falling within the requirement to use OPS as of Jan. 1st 2030.

Table 3: Port Usage

4 OPS LOAD ESTIMATE

Note: *This section should be read in conjunction with* ***Appendix A*** *– Dublin Port – OPS Study – Load Estimate.*

4.1 Overview of Existing Medium Voltage Distribution Network

Dublin Port is served by an extensive 10kV medium voltage (MV) ESB network incorporating the following:

- Primary substation: Located at East Wall Road
- Secondary substations: 40+ substations located across the port
- Ring main distribution network: 3no MV ring-main loops serving the secondary substations

The existing MV network has a number of significant shortcomings which are summarised hereafter.

- The network is operating at capacity will little scope to serve new / additional load.
- 10kV distribution doesn't have the capacity required to serve the increased load which will result from the increased electrification of the site (OPS, heat pumps, electric RTG's, EV charging of straddle carriers, port vehicles etc.) in the transition away from fossil fuel based energy.
- While some of the more recent MV upgrades incorporated the use of dual 10kV / 20kV equipment (switchgear and transformers) and 20kV rated distribution cables, most of the existing equipment and distribution cable is rated at 10kV and therefore incapable of supporting a higher voltage network.
- Much of the existing MV switchgear is obsolete with some equipment dating back to the 1940's, 1950's and 1970's.
- Many of the existing MV distribution cables have exceeded their design life.
- Many of the existing MV distribution cables are direct buried with the consequence that cable ducting is not available to facilitate the pulling in of new, upgraded cables.

4.2 Berthing Facilities Requiring OPS Provision

Current legislation will require Dublin Port Company (DPC) to have OPS provision in place to serve container vessels, cruise ships and RoRo Pax vessels from January 2030.

In this context, DPC have commenced a sitewide review of the existing MV installation with a view to implementing a phased replacement of the installation in the coming years.

The following existing and proposed future substations will be directly impacted by the requirement to provide OPS equipment:

a. Container Vessels:

Currently berths 39, 50, 50N, 50S, 50A, 42, 44 and 45 are used for container vessel berthing.

The '3FM Project' currently at design stage by DPC includes for the provision of a new container terminal within the Plot N area on the Poolbeg peninsula. This facility will include a 600m quay with berthing provision for 2no container vessels. It is envisaged that this facility will be available by 2035.

- Transport Ferries Substation : Serving berth 39
- Firemain Dublin Port Substation : Serving berths 50, 50N, 50S & 50A
- South Dock Quay Substation : Serving berths 42, 44 & 45
- Plot N Substation (future - 2035) : Serving 2no Plot N berths

b. Cruise Ships:

Currently berth 18 on the North Quay Extension is used for cruise ship berthing purposes.

The DPC 2040 Masterplan proposes that cruise ship berthing facilities be consolidated at this location.

It is proposed for the purposes of this study, that OPS outlets be provided at berth 18. Additionally, it is proposed that the cable management (ducting and cable draw chambers) required to serve berth 18 be extended eastwards along the North Quay Extension to facilitate the future provision of OPS outlets at 2no future berths; berths 18A & 18B.

- Freight Terminal Substation : Serving berth 18

c. RoRo Pax Vessels:

Currently berths 49, 51 and 51A are used for RoRo Pax vessel berthing.

The DPC 2040 Masterplan includes for the provision of 2no additional RoRo Pax vessel berths within the Terminal No. 5 area. It is envisaged that one of the two additional berths will be complete by 2026 with the second complete by 2030.

- Firemain Dublin Port Substation : Serving berths 51 & 51A
- Ferry Terminal No.5 Substation : Serving berth 49
- British Rail Terminal Substation : Serving 2no future RoRo Pax vessel berths

4.3 OPS Load – Impact on Existing ESB Supplies

The findings of the OPS Study load schedule included at Appendix A are summarised in the following table.

Scenario	Description	Existing MIC (MW)	Existing Max Demand (MW)	Diversified OPS Load (MW)	Projected Max Demand (MW)
DUBLIN PORT COMPANY – CURRENT BERTH CAPACITY					
1.00	**Typical Berthing Scenario**				
1.01	Container Vessels: 5no of 8no berths in use	TBC	TBC	5.10	?
1.02	RoRo Pax Vessels: 2no of 3no berths in use	TBC	TBC	4.20	?
1.03	Cruise Ships: 1no berth in use (<100,000 GT)	TBC	TBC	5.40	?
	Sub-Total			**14.70**	
2.00	**Worst Case Berthing Scenario**				
2.01	Container Vessels: 8no of 8no berths in use	TBC	TBC	8.10	?
2.02	RoRo Pax Vessels: 3no of 3no berths in use	TBC	TBC	7.20	?
2.03	Cruise Ships: 1no berth in use (<150,000 GT)	TBC	TBC	7.20	?
	Sub-Total			**22.50**	
DUBLIN PORT COMPANY – FUTURE BERTH CAPACITY (Note 2)					
3.00	**Typical Berthing Scenario**				
3.01	Container Vessels: 6no of 10no berths in use	TBC	TBC	6.30	?
3.02	RoRo Pax Vessels: 3no of 5no berths in use	TBC	TBC	7.20	?
3.03	Cruise Ships: 1no berth in use (<100,000 GT)	TBC	TBC	5.40	?

Scenario	Description	Existing MIC (MW)	Existing Max Demand (MW)	Diversified OPS Load (MW)	Projected Max Demand (MW)
	Sub-Total			**18.90**	
4.00	**Worst Case Berthing Scenario**				
4.01	Container Vessels: 10no of 10no berths in use	TBC	TBC	10.50	?
4.02	RoRo Pax Vessels: 5no of 5no berths in use	TBC	TBC	13.20	?
4.03	Cruise Ships: 1no berth in use (<150,000 GT)	TBC	TBC	7.20	?
	Sub-Total			**30.90**	
	NOTES				
1	Existing MIC and max demand values are currently being collated by DPC.				
2	The DPC 2040 Masterplan includes for the addition of 2no new container vessel berths in the vicinity of Poolbeg on the south bank of the port and 2no new RoRo pax vessel berths at Terminal No.5 on the north bank. The 'future berth capacity' details include for the use of these additional berths.				
3	MIC refers to maximum import capacity which is the maximum amount of power which the ESB are contracted to supply to a customer's site.				
4	Max demand refers to the maximum amount of power drawn by a customer from the ESB network over a given period. The max demand figure would be expected to be less than the MIC.				

Table 4: OPS Impact on ESB Supply

4.4 ESB Supply

As outlined in Table 4 above, the requirement to provide OPS for use by container vessels, RoRo pax vessels and cruise ships from January 2030, will add a very significant electrical load to the Dublin Port distribution network.

Typically, 10kV distribution networks such as the existing are used to serve loads of the order of 5MW. Given the scale of the projected increase in electrical load across the port, it is likely that the required upgrade will necessitate the following:

- Provision of a new HV 110kV ESBN substation within the port.
- Existing ESBN 10kV ring-main distribution network replaced with a 38kV ring-main distribution network
- Existing and future local substations provided with 38kV supplies
- 38kV to 20kV transformers provided at existing and future local sub-stations

The scope of work noted above is such that the transition from the existing 10kV distribution network to a new network capable of providing the local substations across the DPC site with 20kV supplies will need to be carried out on a phased basis over a multi-year implementation programme.

This scope of work will necessitate substantial investment by both ESB Networks and DPC and will entail extensive civil works (trenching, cable ducting, sub-stations, MV switchrooms etc.) and electrical works (MV cable, MV switchgear, MV / LV transformers etc.).

DPC have initiated preliminary discussions with ESB Networks with the objective of establishing what needs to be done, how best to achieve it and what it will cost. This is likely to be a lengthy process taking several months.

In the meantime, we would suggest that an order of magnitude cost allowance of €5,000,000 (indicative only) be included for the ESB Networks element of the works.

5 ELECTRICAL INFRASTRUCTURE

5.1 Existing MV Switchgear - Overview

Note: *This section should be read in conjunction with MV schematic IE000678-RPS-01-XX-DR-E-ED0001.*

The existing MV distribution network is rated at 10kV. This will need to be replaced with a new MV distribution network capable of providing the local substations across the DPC site with 20kV supplies sized to serve the anticipated load increase resulting from the addition of OPS, EV charging, heat pumps etc.

While there are approximately 40no MV substations located across the port, those that are expected to be used to serve the required OPS infrastructure are as follows:

a. Freight Terminal Substation
b. Transport Ferries Substation
c. Firemain Dublin Port Substation
d. Ferry Terminal No.5 Substation
e. British Rail Terminal Substation
f. South Dock Quay Substation
g. 3FM Project - Area 'N' Substation (future quay area incorporating 2no new container vessel berths)

5.2 Freight Terminal Substation - Existing MV Switchgear

Note: *This section should be read in conjunction with the existing MV schematic IE000678-RPS-01-XX-DR-E-ED0001.*

Record drawings are not available for this substation and in the absence of same, it is assumed based on similar substations elsewhere, that the following existing equipment is accommodated within the substation:

a. RMU (Ring Main Unit): Three cubicle, 10kV RMU as follows:
    - Incoming network switch
    - Outgoing network switch
    - Circuit breaker to MV / LV transformer T1
b. MV / LV Transformer TI: 10kV / 400V transformer serving LV main distribution board MDB
c. MDB

5.3 Freight Terminal Substation – Works Required to Facilitate OPS Provision

Note: *This section should be read in conjunction with the proposed MV schematic IE000678-RPS-01-XX-DR-E-ED0002.*

Due to its age and voltage rating (10kV), the existing MV switchgear and the associated MV cables will need to be replaced.

The following is a summary of the electrical works necessary to accommodate the provision of OPS.

a. Switchgear:
    - 1no 20kV rated, five cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 3no circuit breakers (MV/LV transformer T1, Berth 1 (18) OPS equipment & 1no spare)
    - MV/LV transformer T1
    - Berth 18 OPS switchgear

- Berth 18 OPS outlets

b. Cable:
   - 20kV rated cable serving transformer T1
   - 20kV rated cable serving Berth 18 OPS switchgear
   - 20kV rated cable serving Berth 18 OPS outlets

Note: It is assumed that a 20kV supply will be provided to the substation within the scope of a separate MV upgrade project required to replace the existing 10kV network.

5.4 Transport Ferries Substation - Existing MV Switchgear

Note: *This section should be read in conjunction with the existing MV schematic IE000678-RPS-01-XX-DR-E-ED0001.*

Record drawings are not available for this substation and in the absence of same, it is assumed based on similar substations elsewhere, that the following existing equipment is accommodated within the substation:

a. RMU: Four cubicle, 10kV RMU as follows:
   - Incoming network switch
   - Outgoing network switch
   - Circuit breaker to MV / LV transformer T1
   - Circuit breaker to STS crane (10kV supply to existing crane assumed)

b. MV / LV Transformer TI: 10kV / 400V transformer serving LV main distribution board MDB

c. MDB

5.5 Transport Ferries Substation - Works Required to Facilitate OPS Provision

Note: *This section should be read in conjunction with the proposed MV schematic IE000678-RPS-01-XX-DR-E-ED0002.*

Due to its age and voltage rating (10kV), the existing MV switchgear and the associated MV cables will need to be replaced.

The following is a summary of the electrical works necessary to accommodate the provision of OPS.

a. Switchgear:
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (MV/LV transformer T1, STS crane, Berth 39 OPS equipment & 1no spare).
   - MV/LV transformer T1
   - 20kV/10kV transformer T2 to STS crane (10kV supply to existing crane assumed)
   - Berth 39 OPS switchgear
   - Berth 39 OPS outlets

b. Cable:
   - 20kV rated cable serving transformer T1
   - 20kV rated cable serving transformer T2
   - 20kV rated cable serving Berth 39 OPS switchgear
   - 20kV rated cable serving Berth 39 OPS outlets

Note: It is assumed that a 20kV supply will be provided to the substation within the scope of a separate MV upgrade project required to replace the existing 10kV network.

5.6 Firemain Dublin Port Substation - Existing MV Switchgear

Note: *This section should be read in conjunction with the existing MV schematic IE000678-RPS-01-XX-DR-E-ED0001.*

The following is a summary of the existing equipment accommodated within the substation:

a. RMU: Six cubicle, 10kV / 20kV RMU (2013) as follows:
   - Incoming network switch
   - Outgoing network switch
   - Circuit breaker to MV / LV transformer T1
   - Circuit breaker to STS Crane No.1 (10kV supply to existing crane assumed)
   - Circuit breaker to STS Crane No.2 (10kV supply to existing crane assumed)
   - Circuit breaker to STS Crane No.3 (10kV supply to existing crane assumed)

b. MV / LV Transformer TI: 10kV/20kV to 400V transformer (2013) serving LV main distribution board MDB

c. MDB

5.7 Firemain Dublin Port Substation - Works Required to Facilitate OPS Provision

Note: *This section should be read in conjunction with the proposed MV schematic IE000678-RPS-01-XX-DR-E-ED0002.*

The proposed works will necessitate the replacement of the existing RMU as it doesn't incorporate any spare circuit breakers to serve the proposed OPS switchgear.

The existing transformer can be retained on the assumption that the substation will be provided with a 20kV supply from the upgraded MV network.

The following is a summary of the electrical works necessary to accommodate the provision of OPS.

a. Switchgear:
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (MV/LV transformer T1, Berth 50, 50N, 50S & 50A OPS equipment, STS crane No.1 & 1no spare)
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (Berth 51 & 51A OPS equipment, STS crane No.2, STS crane No.3 & 1no spare)
   - 20kV/10kV transformer T2 to STS Crane No.1 (10kV supply to existing crane assumed)
   - 20kV/10kV transformer T3 to STS Crane No.2 (10kV supply to existing crane assumed)
   - 20kV/10kV transformer T4 to STS Crane No.3 (10kV supply to existing crane assumed)
   - Berth 50, 50N, 50S & 50A OPS switchgear
   - Berth 51 & 51A OPS switchgear
   - Berth 50, 50N, 50S & 50A OPS outlets
   - Berth 51 & 51A OPS outlets

b. Cable:
   - 20kV rated cable serving transformer T1
   - 20kV rated cable serving transformer T2

- 20kV rated cable serving transformer T3
- 20kV rated cable serving transformer T4
- 20kV rated cable serving Berth 50, 50N, 50S & 50A OPS switchgear
- 20kV rated cable serving Berth 51 & 51A OPS switchgear
- 20kV rated cable serving Berth 50, 50N, 50S & 50A OPS outlets
- 20kV rated cable serving Berth 51 & 51A OPS outlets

Note: It is assumed that a 20kV supply will be provided to the substation within the scope of a separate MV upgrade project required to replace the existing 10kV network.

5.8 Ferry Terminal No.5 Substation - Existing MV Switchgear

Note: *This section should be read in conjunction with the existing MV schematic IE000678-RPS-01-XX-DR-E-ED0001.*

The following is a summary of the existing equipment accommodated within the substation:

a. RMU: Three cubicle, 20kV RMU as follows:
   - Incoming network switch
   - Outgoing network switch
   - Circuit breaker to MV / LV transformer T1

b. MV / LV Transformer TI: 10kV/20kV to 400V dry-type transformer serving LV main distribution board MDB

c. MDB

5.9 Ferry Terminal No.5 Substation - Works Required to Facilitate OPS Provision

Note: *This section should be read in conjunction with the proposed MV schematic IE000678-RPS-01-XX-DR-E-ED0002.*

The proposed works will necessitate the replacement of the existing RMU as it doesn't incorporate any spare circuit breakers to serve the proposed OPS switchgear.

The existing transformer is a dry-type unit which would suggest that it is of recent vintage and would therefore be expected to have a dual 10kV / 20kV MV rating. On this basis, the transformer can be retained on the assumption that the substation will be provided with a 20kV supply from the upgraded MV network.

The following is a summary of the electrical works necessary to accommodate the provision of OPS.

a. Switchgear:
   - 1no 20kV rated, five cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 3no circuit breakers (MV/LV transformer T1, Berth 49 OPS equipment & 1no spare)
   - Berth 49 OPS switchgear
   - Berth 49 OPS outlets

b. Cable:
   - 20kV rated cable serving transformer T1
   - 20kV rated cable serving Berth 49 OPS switchgear
   - 20kV rated cable serving Berth 49 OPS outlets

Note: It is assumed that a 20kV supply will be provided to the substation within the scope of a separate MV upgrade project required to replace the existing 10kV network.

5.10 British Rail Terminal Substation - Existing MV Switchgear

Note: *This section should be read in conjunction with the existing MV schematic IE000678-RPS-01-XX-DR-E-ED0001.*

The following is a summary of the existing equipment accommodated within the substation:

a. RMU: Six cubicle, 10kV RMU (1970's) as follows:
   - Incoming network switch
   - Outgoing network switch
   - Circuit breaker to MV / LV transformer T1
   - Circuit breaker to MV / LV transformer T2 (out of service)
   - Circuit breaker to MV / LV transformer T3 (out of service)
   - Circuit breaker – spare (out of service)

b. MV / LV Transformer TI: 10kV to 400V transformer (1970's) serving LV main distribution board MDB

c. MV / LV Transformer T2: 10kV to 400V transformer (1970's)

d. MV / LV Transformer T3: 10kV to 400V transformer (1970's)

e. MDB

5.11 British Rail Terminal Substation - Works Required to Facilitate OPS Provision

Note: *This section should be read in conjunction with the proposed MV schematic IE000678-RPS-01-XX-DR-E-ED0003.*

The DPC 2040 Masterplan includes for the provision of two new RoRo Pax vessel berths within the Terminal No.5 area of the port.

The proposed works will necessitate the replacement of both the existing RMU and the in-service transformer T1 as they are both rated at 10kV.

The following is a summary of the electrical works necessary to accommodate the provision of OPS.

a. Switchgear:
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (MV/LV transformer T1, OPS equipment to proposed new berths & 2no spare)
   - MV/LV transformer T1
   - OPS switchgear to proposed new berths
   - OPS outlets to proposed new berths

b. Cable:
   - 20kV rated cable serving transformer T1
   - 20kV rated cable serving OPS switchgear to proposed new berths
   - 20kV rated cable serving OPS outlets to proposed new berths

Note: It is assumed that a 20kV supply will be provided to the substation within the scope of a separate MV upgrade project required to replace the existing 10kV network.

5.12 South Dock Quay Substation - Existing MV Switchgear

Note: *This section should be read in conjunction with the existing MV schematic IE000678-RPS-01-XX-DR-E-ED0001.*

The following is a summary of the existing equipment accommodated within the substation:

a. RMU: Seven cubicle, 10kV/20kV RMU (1999) as follows:
   - Incoming network switch
   - Outgoing network switch
   - Circuit breaker to MV / LV transformer T1
   - Circuit breaker to MV / LV transformer T2
   - Circuit breaker to STS Crane No.1 (10kV supply to existing crane assumed)
   - Circuit breaker to STS Crane No.2 (10kV supply to existing crane assumed)
   - Circuit breaker to STS Crane No.3 (10kV supply to existing crane assumed)

b. MV / LV Transformer TI: 10kV / 20kV to 400V transformer (1999) serving LV main distribution board MDB.1A

c. MV / LV Transformer T2: 10kV / 20kV to 400V transformer (1999) serving LV main distribution board MDB.1B

d. MDB.1A & MDB.1B

5.13 South Dock Quay Substation - Works Required to Facilitate OPS Provision

Note: *This section should be read in conjunction with the proposed MV schematic IE000678-RPS-01-XX-DR-E-ED0003.*

The exiting RMU (1999) has reached the end of its design life (25 years) and doesn't incorporate any spare circuit breakers. It is proposed therefore that the existing RMU be replaced and supplemented with an additional RMU to provide capacity to serve the required OPS switchgear.

The existing transformers being dual 10kV / 20kV rated units can be retained.

The following is a summary of the electrical works necessary to accommodate the provision of OPS.

a. Switchgear:
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (MV/LV transformer T1, STS crane No.1, STS crane No.2, & 1no spare)
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (MV/LV transformer T2, STS crane No.3, Berth 42, 44 & 45 OPS equipment & 1no spare)
   - 20kV/10kV transformer T3 to STS Crane No.1 (10kV supply to existing crane assumed)
   - 20kV/10kV transformer T4 to STS Crane No.2 (10kV supply to existing crane assumed)
   - 20kV/10kV transformer T5 to STS Crane No.3 (10kV supply to existing crane assumed)
   - Berth 42, 44 & 45 OPS switchgear
   - Berth 42, 44 & 45 OPS outlets

b. Cable:
   - 20kV rated cable serving transformer T1
   - 20kV rated cable serving transformer T2
   - 20kV rated cable serving transformer T3

- 20kV rated cable serving transformer T4
- 20kV rated cable serving transformer T5
- 20kV rated cable serving Berth 42, 44 & 45 OPS switchgear
- 20kV rated cable serving Berth 42, 44 & 45 OPS outlets
- LV cable serving MDB.1A
- LV cable serving MDB.1B

Note: It is assumed that a 20kV supply will be provided to the substation within the scope of a separate MV upgrade project required to replace the existing 10kV network.

5.14 Area 'N' Substation (3FM Project) - Existing MV Switchgear

The '3FM Project' currently at design stage by DPC includes for the provision of a new container terminal within the Plot N area on the Poolbeg peninsula. This facility will include a 600m quay with berthing provision for 2no container vessels.

There is no existing switchgear of relevance to the provision of OPS, within the Plot N area.

5.15 Area 'N' Substation (3FM Project) - Works Required to Facilitate OPS Provision

Note: *This section should be read in conjunction with the proposed MV schematic IE000678-RPS-01-XX-DR-E-ED0003.*

The following is a summary of the electrical works necessary to accommodate the provision of OPS.

c. Switchgear:
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (MV/LV transformer T1, STS crane No.1, STS crane No.2, & 1no spare)
   - 1no 20kV rated, six cubicle RMU with 2no switches (incoming and outgoing connections to MV ring main network) and 4no circuit breakers (MV/LV transformer T2, STS crane No.3, OPS equipment for future berths & 1no spare)
   - MV/LV transformer T1 to LV MDB
   - MV/LV transformer T2 to LV MDB
   - OPS switchgear for future berths (2no)
   - OPS outlets at future berths (2no)

d. Cable:
   - 20kV rated cable serving transformer T1
   - 20kV rated cable serving transformer T2
   - 20kV rated cable serving STS crane No.1
   - 20kV rated cable serving STS crane No.2
   - 20kV rated cable serving STS crane No.3
   - 20kV rated cable serving OPS switchgear for future berths (2no)
   - 20kV rated cable serving OPS outlets at future berths (2no)

Note: It is assumed that a 20kV supply will be provided to the substation within the scope of a separate MV upgrade project required to replace the existing 10kV network.

6 CIVIL INFRASTRUCTURE

6.1 Civil Works Overview

Note: *This section should be read in conjunction with the indicative cable management layouts IE000678-RPS-01-XX-DR-E-EK0003 and IE000678-RPS-01-XX-DR-E-EK0004.*

The proposed transition from a 10kV ESBN distribution network to a 20kV distribution network will necessitate significant civil works as all existing and any new substation buildings and DPC switchrooms, will need to be interconnected with a proprietary cable duct network incorporating sufficient ducting to accommodate both the cables associated with the anticipated network upgrade and allowance for future works.

In the context of OPS provision, it is assumed that the cable ducting required between the ESBN primary substation and the 40+ substations located across the port will be provided under a separate network project by DPC.

The following is a summary of the civil works anticipated in respect of the provision of OPS units at the container vessel, RoRo pax vessel and cruise ship berths.

- Upgrading of existing substation buildings
- Extension of existing substation buildings
- Provision of garage / workshop to house cruise ship mobile connection units
- Provision of structural bases for new containerised substations (where the existing substations are of poor quality or don't lend themselves to extension)
- Provision of structural bases for containerised OPS equipment switchrooms (to accommodate the OPS switchgear, transformers, frequency converters etc.)
- Provision of flush formed pockets at the quay edge (to accommodate OPS JB's).
- Provision of cable draw chambers
- Provision of the cable ducting and cable draw chambers necessary to provide an interface between the substations and the associated OPS switchrooms
- Provision of the cable ducting and cable draw chambers necessary to provide an interface between the OPS equipment switchrooms and flush formed OPS JB pockets at the relevant berths.

The scope of the civil works is outlined in greater detail in the OPS cost estimate included at Appendix C.

7 OPS OPEX COST

7.1 OPS - Annual Electricity Use

There are 60+ businesses operating across Dublin Port with each being a tenant of DPC.

DPC are not currently in a position to confirm the following:

- MIC of each tenant (contracted level of supply from ESBN)
- Maximum demand of each tenant
- Annual energy usage of each tenant

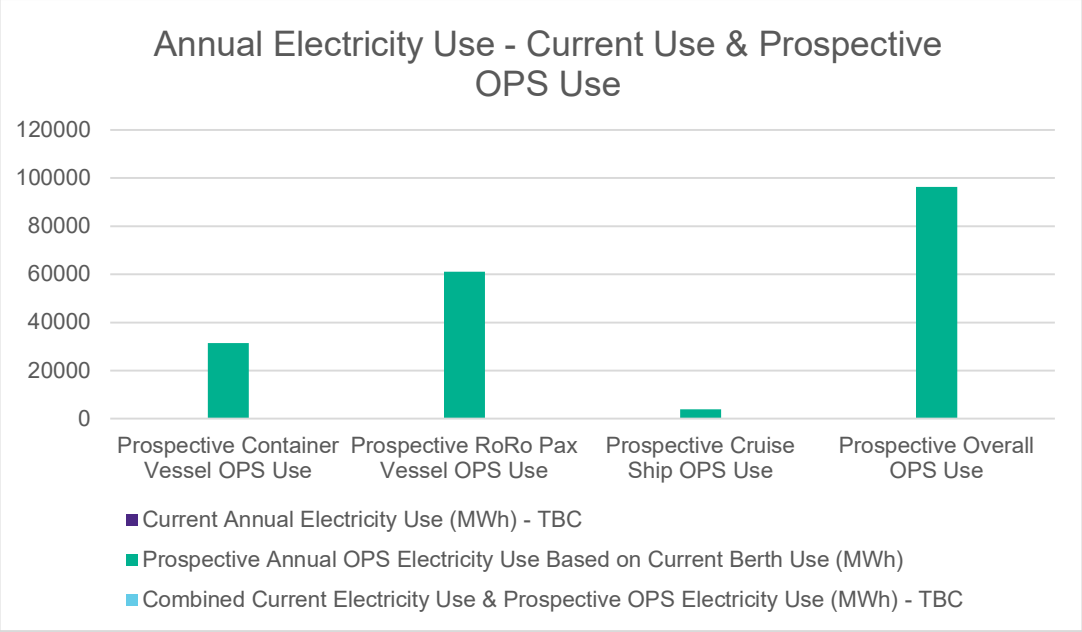
In the absence of the above information, it is not possible to establish what the overall MIC, max demand and annual energy use is for the site. These details will be required in order to progress the required MV network upgrade and in this regard, DPC will be engaging with ESBN, energy providers and tenants in the coming months to establish same.

The chart included below shows the prospective annual OPS electricity use associated with container vessels, RoRo pax vessels and cruise ships based on current average annual berth use.

It would be intended that the chart be updated to include current annual electricity use and a combination of current use and prospective OPS use once current use data has been confirmed.

All values are in megawatt hours.

Please refer to Appendix B for a breakdown of the figures used in the chart.

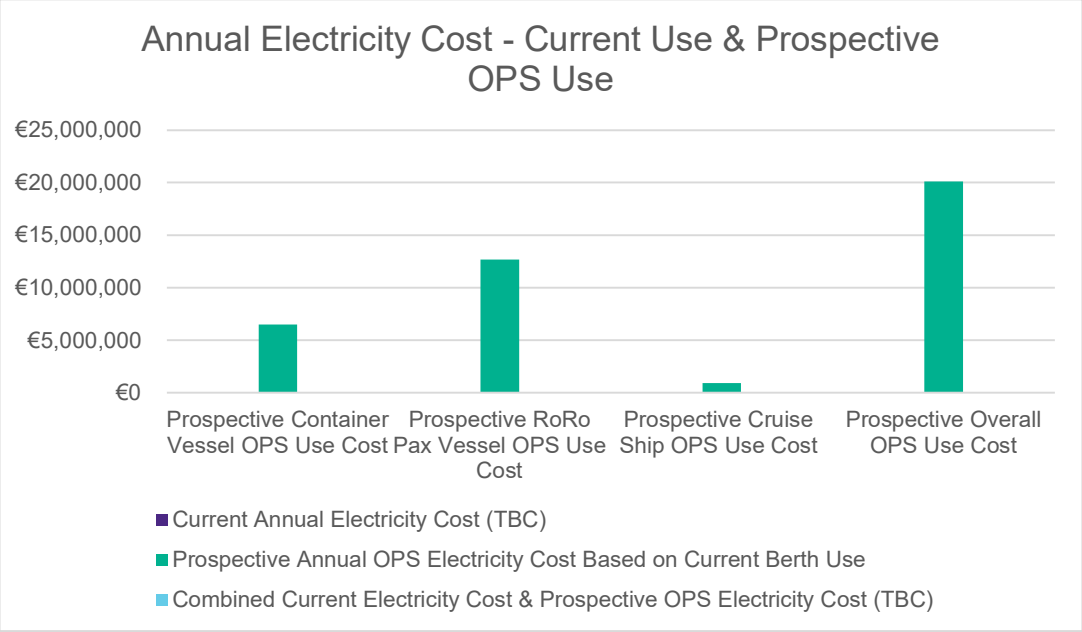


7.2 OPS - Annual Electricity Cost

The chart included below shows the prospective annual OPS electricity cost associated with container vessels, RoRo pax vessels and cruise ships based on current average annual berth use.

It would be intended that the chart be updated to include current annual electricity use cost and a combination of current cost and prospective OPS use cost once current electricity cost data has been confirmed.

Please refer to Appendix B for a breakdown of the figures used in the chart.



7.3 OPS - Annual Operating Costs

An indicative breakdown of the annual operating costs associated with OPS provision and use is included in Table 5 below.

Item	Description of Works	Nett Amount	Contingency	Total Amount
1.00	**Container Vessels**		**(Note 1)**	
1.01	OPS equipment electricity usage costs (Refer to Appendix B)	€6,505,383.00	20%	€7,806,460.00
1.02	OPS equipment depreciation allowance (@5% of €25,250,000 installed cost)	€1,262,500.00	20%	€1,515,000.00
1.03	OPS equipment maintenance cost (Maintenance contract based on quarterly visits)	€10,000.00	20%	€12,000.00
1.04	OPS equipment connection costs (Based on two electricians for two hours at €60/hr for each of 956no vessels berthing per year)	€229,440.00	20%	€275,328.00
1.05	OPS equipment disconnection costs (Based on two electricians for two hours at €60/hr for each of 956no vessels berthing per year)	€229,440.00	20%	€275,328.00
	Sub Total	**€8,236,763.00**		**€9,884,116.00**
2.00	**RoRo Pax Vessels**		**(Note 1)**	
2.01	OPS equipment electricity usage costs (Refer to Appendix B)	€12,668,804.00	20%	€15,202,565.00
2.02	OPS equipment depreciation allowance (@5% of €10,225,000 installed cost)	€511,250.00	20%	€613,500.00
2.03	OPS equipment maintenance cost (Maintenance contract based on quarterly visits)	€10,000.00	20%	€12,000.00
2.04	OPS equipment connection costs (Based on two electricians for two hours at €60/hr for each of 3,139no vessels berthing per year)	€753,360.00	20%	€904,032.00
2.05	OPS equipment disconnection costs (Based on two electricians for two hours at €60/hr for each of 3,139no vessels berthing per year)	€753,360.00	20%	€904,032.00
	Sub Total	**€14,696,774.00**		**€17,636,129.00**
1.00	**Cruise Ships**		**(Note 1)**	
1.01	OPS equipment electricity usage costs (Refer to Appendix B)	€919,393.00	20%	€1,103,272.00
1.02	OPS equipment depreciation allowance (@5% of €5,805,000 installed cost)	€290,250.00	20%	€348,300.00
1.03	OPS equipment maintenance cost (Maintenance contract based on quarterly visits)	€10,000.00	20%	€12,000.00
1.04	OPS equipment connection costs (Based on two electricians for two hours at €60/hr for each of 54no vessels berthing per year)	€12,960.00	20%	€15,552.00
1.05	OPS equipment disconnection costs (Based on two electricians for two hours at €60/hr for each of 54no vessels berthing per year)	€12,960.00	20%	€15,552.00
	Sub Total	**€1,245,563.00**		**€1,494,676.00**

	Total (Excl. VAT)	**€24,179,100.00**		**€29,014,921.00**

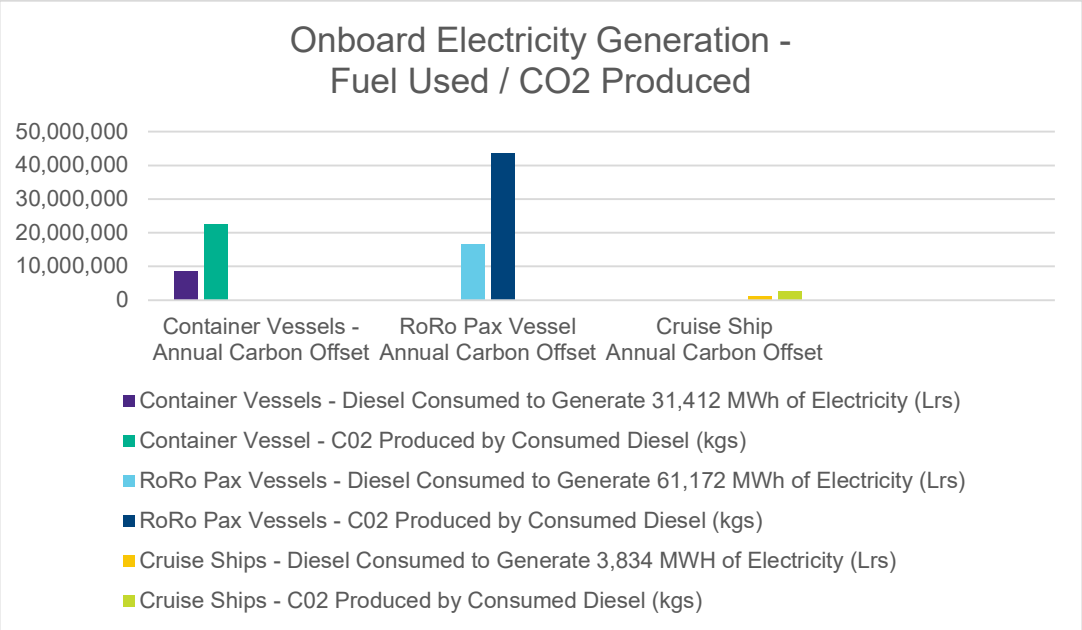
	NOTES
1	Contingency included to cover unforeseen items, price escalation etc.

Table 5: OPS – Annual Operating Costs

7.4 OPS - Annual Carbon Offset

The amount of diesel fuel used to produce one megawatt of electricity is of the order of 270L/hr with each litre producing 2.64kgs of CO_2, equating to 713kg of CO_2/MWh of electricity.

The chart included below shows both the amount of fuel consumed and the associated CO_2 released by vessel generators while at berth in Dublin Port over an average year.



8 OPS INSTALLATION - COST ESTIMATE

Note: *This section should be read in conjunction with Appendix C - OPS Study - Cost Estimate.*

Item	Description of Works	Nett Amount	Contingency	Total Amount
1.00	**Dublin Port**			
1.01	Civil Works	€5,847,836.00	20%	€7,017,404.00
1.02	Electrical Works	€4,662,100.00	20%	€5,594,520.00
1.03	OPS Equipment	€41,280,000.00	20%	€49,536,000.00
1.04	ESB Networks (Note 1)	€5,000,000.00	20%	€6,000,000.00
	Total (Excl. VAT)	**€56,789,936.00**		**€68,147,924.00**

NOTES

1	Order of magnitude cost associated with the provision of 20kV power supplies to each of the substations which will be used to serve OPS outlets. It is assumed that the upgrade of the ESB's primary MV distribution network upstream of the latter substations will be carried out under a separate MV upgrade project.
2	Contingency included to cover unforeseen items, price escalation etc.

Table 6: Cost Estimate Summary

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Medium Voltage Network Replacement

The existing DPC 10kV network is operating at capacity, incorporates obsolete equipment and both equipment and cable that has exceeded its design life.

In this regard, it will be necessary to replace the existing network on a phased basis over several years in order to serve anticipated business growth within the port (per the 2040 DPC Masterplan) and the provision of OPS. This requirement poses several significant challenges including the following.

- The ability of ESBN to serve a very significant increase in load (OPS load of the order of 30MW).
- Significant capital expenditure by DPC (including ESBN costs, and civil and electrical infrastructural costs).
- Phasing and management of network upgrade works to minimise disruption across the port.
- Tight timeline to implement a very significant scope of work (< 6 years).

DPC have had preliminary discussions with ESBN in relation to the noted upgrade works. This project will need to be progressed to design and construction stage without delay if the January 2030 deadline for the provision of OPS is to be achieved.

9.2 OPS Equipment

OPS equipment vendors have advised that with all major European ports facing the same 2030 deadline for the provision of OPS power, the lead time on OPS equipment is currently running at twelve to eighteen months depending on the complexity of the system proposed.

In the context of extended OPS equipment deliveries, it is recommended that a programme be prepared to detail the works that need to be put in place to achieve completion of an OPS installation at the container vessel, RoRo pax vessel and cruise ship berths, by 2030.

Once installed, the provision of OPS power will entail substantial operating cost (refer to Table 5) and associated challenges including the following:

- How will DPC tenants using OPS power be billed for its use ?
- How will DPC tenants bill their customers for the provision of OPS power ?
- Based on current port usage, the connection and disconnection of OPS will require an input of the order of 16,000 manhours by suitably qualified electricians with MV training. This level of input represents eight operatives averaging 2,000 hours per year.

9.3 Infrastructure Upgrades

As noted in preceding sections of this report, the introduction of OPS will have significant implications for the medium voltage network currently serving DPC facilities and tenants. The main impacts are summarised as follows:

a. Electrical
   - Replacement of the existing ESB Networks infrastructure
   - Replacement of the existing DPC MV infrastructure

b. Civil
   - Upgrading and extension of existing substation buildings (including local authority planning)
   - Provision of new substation buildings
   - Provision of structural bases for containerised OPS equipment switchrooms

- Extensive trenching works to accommodate cable ducts
- Provision of cable draw chambers, flush formed pockets for OPS outlets etc.

The items scheduled above represent a substantial body of work with associated substantial cost and will necessitate a multi-year, phased programme to implement.

10 ACKNOWLEDGEMENTS

RPS would like to thank the following Dublin Port personnel for their assistance in the preparation of this OPS FES Report.

- Ken Rooney
- Stephen Collier

Appendix A
OPS Study Load Estimate

Appendix B
Electrical Usage Summary

Appendix C
OPS Study Cost Estimate

Appendix D
Drawing Schedule

The following drawings are appended to this report:

Drawing No	Description	Status / Rev.
IE000678-RPS-01-XX-DR-E-ED0001	Dublin Port - Existing MV Schematic	A1 / P01
IE000678-RPS-01-XX-DR-E-ED0002	Dublin Port - Proposed MV Schematic - Sheet 1 of 2	A1 / P01
IE000678-RPS-01-XX-DR-E-ED0003	Dublin Port - Proposed MV Schematic - Sheet 2 of 2	A1 / P01
IE000678-RPS-01-XX-DR-E-EK0001	Dublin Port - Indicative OPS Layout - Sheet 1 of 2	A1 / P01
IE000678-RPS-01-XX-DR-E-EK0002	Dublin Port - Indicative OPS Layout - Sheet 2 of 2	A1 / P01
IE000678-RPS-01-XX-DR-E-EK0003	Dublin Port - Indicative Cable Management Layout - Sheet 1 of 2	A1 / P01
IE000678-RPS-01-XX-DR-E-EK0004	Dublin Port - Indicative Cable Management Layout - Sheet 2 of 2	A1 / P01