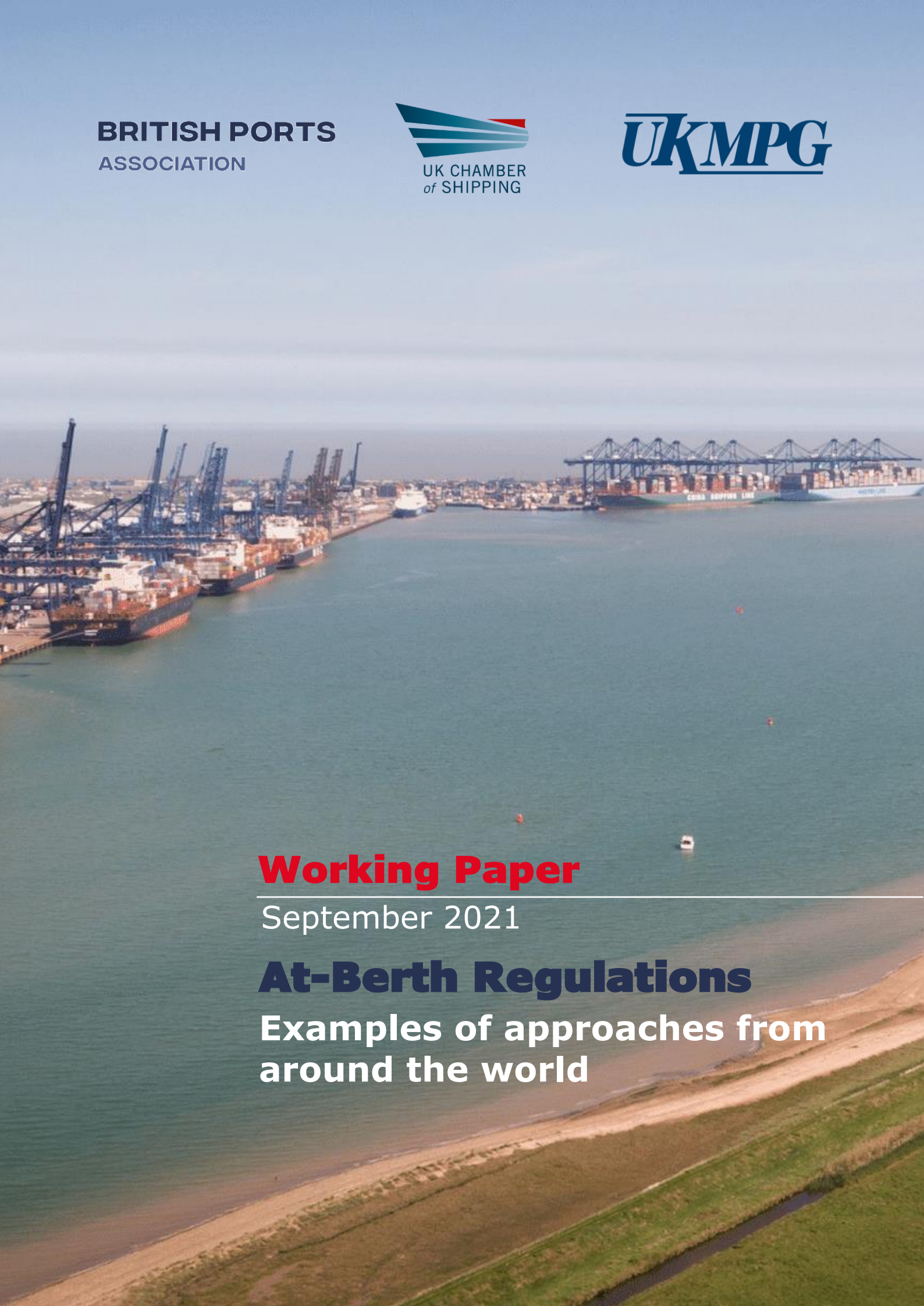
BRITISH PORTS ASSOCIATION

UK CHAMBER of SHIPPING

UKMPG



Working Paper

September 2021

At-Berth Regulations

Examples of approaches from around the world

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The British Ports Association

The British Ports Association is a national membership body for ports. We represent the interests of operators that handle 86% of all UK port traffic.

The UK Major Ports Group

The UK Major Ports Group is the trade body for the UK's major port operators and represents nine of the top ten port operators in UK.

The UK Chamber of Shipping

The UK Chamber of Shipping is the trade association and voice of the UK shipping industry. With a growing membership of 200 member companies through the UK, made up of shipowners, professional organisations, and service companies, it seeks to raise to raise awareness of shipping, create an understanding of it and ensure that member companies' commercial objectives are at the heart of the government process.

Image attribution

Summary

The UK Government's Transport Decarbonisation Plan includes a commitment to consider "regulatory interventions" to support the deployment of shore power. This short paper examines the different existing regulatory approaches to at-berth emissions that have been proposed or implemented around the world: California, China and the European Union. It also sets out the position of the ports and commercial shipping industry on potential UK approaches.

This is to help inform industry, government, and others ahead of a potential regulatory intervention and set out an initial view from industry as to what works and our view on how a regulatory approach might work in the UK.

> "We will consult in winter 2021 on how government can support the wider deployment of shore power, including consideration of regulatory interventions, for both vessels and ports, that could drive deployment as we transition to a net zero world, and bring forward appropriate measures."
>
> **Transport Decarbonisation Plan, Department for Transport 2021**

Our view is that the most successful approaches to reducing emissions at berth combine **public funding support** with a **technology neutral**, **goal-based** approach. We note also that the most successful approaches to incentivising shore power include taking steps to support it through the tax and energy planning frameworks as well. We strongly believe that regulation for ships and ports must be equitable and should address both supply and demand, including risk bearing. Whilst shore power is likely to play an important role in reducing emissions from ships at berth, it is not the only solution to reducing emissions and may not be the most viable option in the medium or long-term. The regulatory framework should support that and encourage innovative approaches.

The BPA, UKMPG and UK Chamber of Shipping looks forward to engaging with government on what a regulatory approach to shore power might look like in the UK. Our initial starting position can be found in our reports examining the barriers to shore power, published in 2020, and expanded on in this paper.

After examining some existing and proposed approaches around the world, our initial position on the elements for a successful UK framework are summarised in Table 1.

Table 1. Industry position on a UK at-berth emissions framework

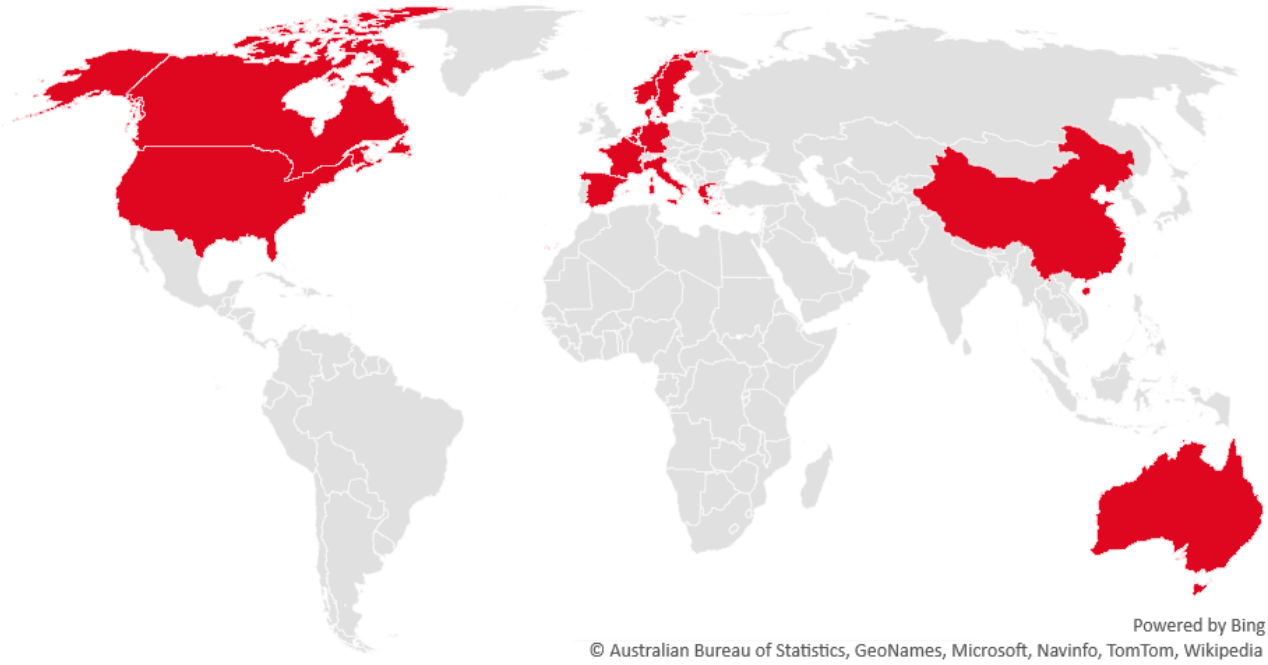
Element	UK Industry Position
Public funding?	Critical. We are not aware of any commercial shore power projects that have been undertaken without public support, given costs, demand uncertainty and infrastructure availability. Public funding must be allocated on a competitive and transparent basis
Goal or technology based?	A goal-based approach will encourage innovation and is at the heart of any successful at-berth emission regulation to some extent
Applicability	It is important that both ships and ports are treated equitably. Government should consider the role of terminals early in the process and the burden of risk
Segments	It is best to begin with shipping segments that have characteristics and interest conducive to adopting shore power before regulating other segments, as is the case everywhere else that at-berth emissions are regulated
Sensible exemptions	The UK should consider exemptions for some ports or circumstances such as those not connected to the grid, and not penalise ships when infrastructure is not available
Fleet-based?	Taking a "fleet"-based approach could stimulate innovative new approaches to reducing emissions and is worth exploring if it can be done in a way that is not overly burdensome
Protecting competitiveness	A holistic, cross-modal approach is important to avoid unintentionally increasing GHG emissions through reverse modal shift
Planning support	Given the timelines and costs associated with securing new energy capacity, Government should consider some accelerated process if shore power (and other energy-intensive emission reduction technologies) is to be required in the short term
Energy market rules	Some parts of current energy market regulation present barriers to roll out. Energy market regulation should be examined alongside the development of any at-berth regulations likely to result in a significant increase in shore power
Timeframe	There should be a sensible lead-in time for at-berth regulations, reflecting the significant costs and planning involved. A stepped approach would be appropriate and encourage innovation as ports are not forced quickly into existing solutions in a short timeframe

Regulatory Regimes: Common Themes

Public funding

Research by the BPA finds that there are no shore power projects anywhere in the world that have gone ahead without an element of public funding, having looked at nearly 100 shore power projects, covering every significant scheme we are aware of around the world. The EU, California and China have all provided significant funds for shore power infrastructure. Several EU member states with large ports have also removed taxes on electricity when used as a marine fuel – something the ports industry has been calling for in the UK for several years given the relatively high cost of business electricity. This may soon put UK ports at a competitive disadvantage. Any public funding must be allocated fairly.

Figure 1: Countries offering public funding for shore power



Source: BPA research (apologies to New Zealand who do not appear on Bing maps)

Goal-based approach

All of the emission regulations we looked at allowed vessels to take alternative approaches to achieving the same result – effectively a goal-based approach – to a greater or lesser degree. It is our strongly held view that shore power is a means not an end and, whilst it is likely to play a significant role in at-berth emissions reduction, any regulatory approach should be flexible enough to allow and encourage alternative means of reducing emissions. It should also take an equitable approach to these common goals, ensuring that costs are shared fairly.

Segment-specific approach

Each approach we looked at differentiated its rules by type and size of vessel. This is sensible. BPA research suggests that large container ships and large cruise ships are both more likely to be shore power ready and it tends to be ports and terminals catering to these sectors that have installed shore power connections. These vessels do however draw significant loads at berth, meaning capital costs and technical challenges are higher.

Sensible exemptions, timelines and de minimis rules

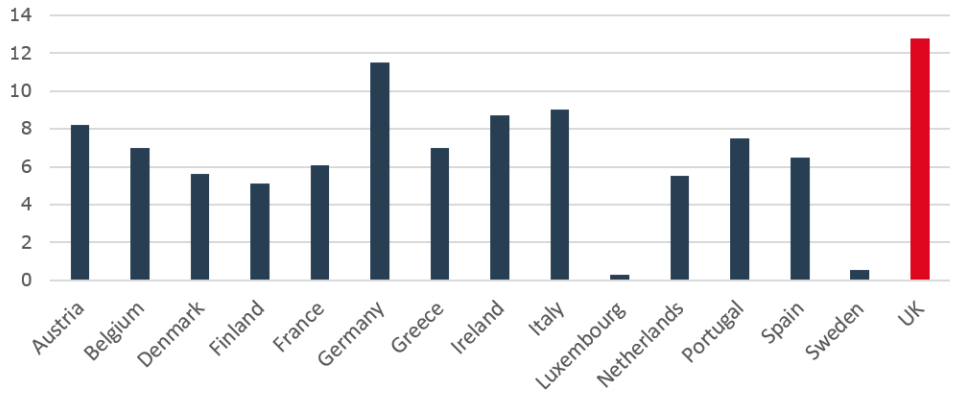
All regulatory regimes have reasonable exemptions, for example for emergencies or where shore power is not available or where a port is not connected to the grid. All approaches allow time at berth before regulations apply, which is sensible as connecting and disconnecting can take time. All three frameworks also built-in sensible lead-times: an initial 12 year "escalator" in California, nine years in the EU and grandfather rights in China.

Action on maritime energy capacity and taxation

Most governments recognise the need for wider support to enable ports and terminals to provide shoreside electrical infrastructure. In California, terminals are required to report the estimated energy needs required to meet demand for shore power to public authorities. In the EU, several countries have exemptions from energy taxation rules allowing them to minimise costs of electricity at berth and the EU is considering a blanket exemption. Electricity for industrial consumers is already more expensive in the UK than other European countries. Long-term planning and consideration of how both capital and operational costs to ports and shipping can be minimised are necessary for a holistic approach.

Figure 2: Electricity prices for large industrial consumers*

(including taxes, p/kwh, July-December 2020)



* Costs of power delivered to a vessel at berth in the UK will be higher than the figure shown, given the additional costs of on-port network infrastructure investment and operation which are increasing as network charging approaches are evolving in the UK.

Source: UK Government (BEIS survey of energy prices across OECD nations)

Table 2: Summary of some common elements in different at-berth emission regulations

		Country/State		
		European Union	**California**	**China**
Who is regulated?	**Ships**	Yes	Yes	Yes
	Ports	To be determined, some ports exempted	Yes	N/A
	Terminals		Yes	?
Public funding?	**Ships**	Yes, amount unknown. At least €325m of investment so far	$1bn air quality fund includes shore power schemes. At least $300m of shore power infrastructure funding so far	?
	Ports			Yes
	Approach to vessels	Container, passenger	2007: Container, reefer, cruise	Rules differ depending on flag, age of vessel and type. Cruise ships included regardless. Liquid bulk vessels excluded.
			2025: Container, reefer, cruise, tankers, car carriers	
	Fleet or individual vessels?	Individual for at-berth emissions	Fleet	Individual
	Goal-based approach?	Partially	Yes	Partially
	Tax Support?	Yes, in most states with shore power	No	No
	Action on maritime energy capacity?	Yes	Yes	Yes

Proposed European Union Approach

The EU's 'Fit for 55' package proposes a dual approach to mandating the use of shore power at berth: regulating vessels through the proposed new FuelEU Maritime Regulation[1] and regulating the provision of shore power at ports through an updated Alternative Fuels Infrastructure Regulation[2].

FuelEU Maritime Regulation: Regulating vessels

The proposed FuelEU Maritime Regulation will require container and passenger vessels to connect to shore power when in port by 2030. Alternative zero-emission options will be accepted as alternatives. It will also set greenhouse gas emissions reductions targets from 2025 for eligible voyages.

The FuelEU Regulation sets out a goal-based approach for maximum greenhouse gas (GHG) intensity targets to be met for energy used onboard, which applies to all vessels above 5000 GT calling at EU ports. It takes a fleet-based approach to GHG reduction on voyages meaning that shipping companies can pool fleet performance, transferring credits from over-achieving ships to under-performing ones. The regulation requires containerships and passenger ships to connect to shore power by 2030 and ships cannot trade credits to avoid this requirement. Ships will be required to pay a penalty of €250 per megawatt of installed power per hour spent at berth to a 'Marine renewable and low carbon fuels fund'.

Exemptions are proposed for vessels that use an equivalent zero-emission technology (see Table 4) or are at berth for less than two hours. There are also exemptions on safety grounds and to a limited extent where shore power is not available.

The EU Commission estimates that this regulation will cost ship operators €25.8bn in capital costs and €63.9bn in fuel costs. Funding will be made available from the EU for the 'green transformation'.

Indirect costs for the ports will relate to the provision of the necessary bunkering infrastructure and are estimated at €5.7bn. Ports are also expected to carry out

[1] https://ec.europa.eu/info/sites/default/files/fueleu_maritime_-_green_european_maritime_space.pdf
[2] This is currently a Directive, allowing for member states to interpret its implementation, whereas the EU propose the revision should be a Regulation, which would apply directly across all member states. Article 5 of the proposed new regulation relates to shore power in ports: https://ec.europa.eu/info/sites/default/files/revision_of_the_directive_on_deployment_of_the_alternative_fuels_infrastructure_with_annex_0.pdf

some monitoring regarding use of shore power by ships, meaning that there could be additional costs related to this responsibility.

Alternative Fuels Infrastructure Regulation: Regulating infrastructure

The proposed new Alternative Fuels Infrastructure Regulation (AFIR) would require member states to ensure a minimum supply of shore power across the 'TEN-T' network of core and comprehensive ports. Ports would be in scope of this regulation if they handle a set amount of container, ro-ro and cruise ships (see Table 3). Port calls that are at berth for less than two hours and vessels using zero-emission technologies would be exempt from the calculation, as would emergency calls. Islands not connected to the grid would also be exempt. Ports would be required to provide a minimum of 90% of vessels' "power output". It is not clear to us whether this requirement would fall on harbour authorities, terminal operators, or both.

The EU Commission estimates that capital costs of up to €6.5bn for shore power. This is based on the assumption of shore power CAPEX ranging from around €1m – €25m per MW of capacity installed, although the average cost in the EU is between €1m and €1.5m, depending on the type of ships served.

Table 3: TEN-T Ports in scope of AFIR

Vessel type (over 5000GT)	Annual vessel calls (over previous three years)*
Container	50
Ro-ro passenger or high-speed passenger craft	40
Cruise	25

* However, we would note that annual vessel call numbers can vary considerably and this variability needs to be factored into any guidelines.

Table 4: Zero-emission technologies accepted as alternatives in AFIR

Zero-emission technology	Criteria for use
Fuel cells	Fuel cells used on board for power generation while at berth should be fully powered by zero/low-carbon fuel.
On-board electricity storage	The use of on-board electricity storage is allowed irrespective on the source of energy that produced it.
On-board renewable electricity production	Any ship that is capable to sustain energy needs at berth through the use of wind and solar energy.

California's Approach

Port authorities in the United States are state-owned and operated. They mostly operate as landlord ports with private concessionaires operating cargo and passenger handling terminal operations, with some exceptions. Navigational dredging is done by the US Army Corps of Engineers and funded by a 'harbor maintenance tax', an ad valorem tax at 0.125% of a shipments value. California's nine ports collectively handle an estimated 200 million tonnes of cargo a year, around two-fifths of the UK's port tonnage.

California has one of the most advanced shore power programmes in the world, driven largely by significant air quality issues in cities such as Los Angeles. The California Air Resources Board (CARB) has been regulating at-berth emissions[3] since 2007 at the ports of Los Angeles, Long Beach, Oakland, San Diego, San Francisco, and Hueneme. The 2007 regulation required fleet operators[4] of certain types of vessels to reduce at-berth emissions from its vessels' auxiliary engines at berth by 80 percent by 2020. From 2020, 80% of a fleet's visits to a port must meet the regulatory requirements to plug in or reduce the auxiliary engine power generated by a fleet by 80% each quarter. They can use alternative control techniques to achieve these requirements.

Container, cruise and reefer vessels are currently in scope if their fleets make a certain number of annual visits to a port. This is being extended in stages from 2023 to more vessel types, including tankers from 2027.[5] Recent extreme weather has seen the regulation suspended as energy supplies were stretched.[6]

Table 5: Known public investment in shore power in Californian ports

Port	Estimated Shore Power Investment
Long Beach	$180m
Los Angeles	$42m
Hueneme	$3m
Oakland	$70m
San Diego	$5m
Total	**$300m**

[3] The regulation applies to emissions of NOx and diesel PM

[4] A fleet is defined in the regulation as owned or chartered vessels of one vessel type that visit the same port and are under the direct control of the same company. More details and examples, here: At Berth FAQs | California Air Resources Board

[5] California approves updated "At-Berth" regulation, expanding efforts to cut pollution from ships in California ports

[6] California's ports suspend shore power usage to conserve electricity amid heatwave

Terminal operators are required to report power requirements for shore power to the Port Authority. California has spent approximately $1bn on projects related to reducing air emissions, including Shore-to-Ship Power infrastructure. Our research suggests that ports and local and state authorities have spent at least $300m on shore power connections in five ports in the past 15 years.

California also regulates vehicles' air emissions through the Advanced Clean Trucks (ACT) regulation. We believe it is important that the competitiveness of moving freight by water is not undermined by significant additional costs resulting from it. Shipping is by far the most carbon-efficient way to move freight and regulating at-berth emissions must not result in 'reverse modal shift'. It is important that a holistic, cross-modal approach is taken to avoid increasing greenhouse gas emissions through less carbon-efficient modes.

China's Approach

Major ports in China are administered by local government, with separate entities responsible for port administration and commercial port operations. The Ministry of Transport has some competency over other ports and regulatory and planning at all ports. In the past 15 years Chinese ports have been opened to some private investment and private operations, albeit in partnership with the state as joint ventures.

In 2017 the Chinese Government published Port Shore Power Plan, stating that 145 of the total 322 container berths at major coastal ports needed to have shore power, with 20 already having been installed. The plan also set out plans for 62 addition dry bulk berth installations to complement the existing cruise berth installations. 17 passenger vessel berths had been upgraded with a further 48 planned. In total, the plan targeting the construction of 317 shore power connections.[7] Although it is not fully transparent how this has been funded, given the role of the State in these organisations, it seems likely that this was to a large extent publicly funded.

In 2019, China introduced a 'domestic emissions control areas' (DECA). As part of this, China introduced shore power requirements on vessels. New requirements introduced are being phased in on Chinese flagged vessels as well as cruise ships and non-Chinese flagged vessels equipped with shore connections.

The regulations also allow for alternative emission abatement or reduction options, as do the EU proposals and California regulation.

[7] (Ministry of Transport for the People's Republic of China, 2017)

Table 6: Summary of power requirements under the DECA[8]

Flag and ship use	Ship age	Effective date	Ship/engine types	Requirement
China-flagged ships, domestic navigation	Newbuild	Built after 1/1/2019	Applicable ship types: • Government vessels • River vessels • River-sea vessels	Need to install shore power
		Built after 1/1/2020	Applicable ship types: • Container ships • Cruise ships • RoRo pax ships • Pax ships >3000gt • Bulk carriers >50,000gt	
	Existing fleet equipped with shore power	Effective 1/7/2019	Applicable ship types: All except for liquid cargo carriers	Install & use shore power while berthing over 3 hours in coastal ports (or 2 hours in river ports) where shore power is available unless equivalent measures[b] are used
	Existing fleet without shore power	Effective 1/1/2022	Applicable ship types[a]: • Government vessels • River vessels • River-sea vessels • Container ships • Cruise ships • RoRo pax ships • Pax ships >3000gt • Bulk carriers >50000gt	Install and use shore power while berthing over 3 hours in coastal ports (or 2 hours in river ports) where shore power is available unless equivalent[b] measures are used
All ships berthing at Chinese ports	New build	Built after 1/1/2021	Applicable ship types: • Cruise ships	Need to install and use shore power while berthing over 3 hours in coastal ports where shore power is available unless equivalent[b] measures are used
	Existing ships without shore power	Effective 1/1/2021		
	Existing fleet equipped with shore power	Effective 1/7/2019	Applicable ship types: • All except for liquid cargo carriers	Need to use shore power while berthing over 3 hours in coastal ports where shore power is available unless equivalent[b] measures are used

[a] *Only applicable when these ships have >130kW engines that fail to meet with IMO Tier II regulations*

[b] *The official document lists suggestive measures, including using clean or new energy sources, onboard batteries, and auxiliary engine shutdown. However, it offers no guidance to demonstrate equivalency*

[8] (International Council on Clean Transportation, 2019). Original data from Ministry of Transport for the People's Republic of China (2018).

Concluding remarks

Shore power appears likely to be of the important elements of maritime decarbonisation and emissions reduction.

However, high investment costs, uncertain demand and questions over risk bearing mean that shore power is not commercially viable at present, unless it receives significant support.

The challenges of the vessel / port interface are compounded by issues in the wider environment – such as surrounding network capacity and energy market regulation.

There remain stranded asset risks. Vessel call patterns change. Other zero emissions energy source options will emerge and may displace the need for vessels to utilise shore power infrastructure.

Most of these issues are not unique to the UK. There are approaches proven to accelerate the deployment of shore power availability all around the world.

What is common to these successful models is a significant 'bridging' role for Government and commitment of public investment, alongside that of industry.

Any regulation will need to be carefully considered to avoid unintended consequences and the dis-incentivisation of moving goods by what is already the most energy and emission efficient form of transport per tonne moved.