15 October 2015
Issue 431

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Source: Winkel, R., Weddige, U., Johnson, D., Hoen, V., & Papaefthimiou, S. (2015). Shore Side Electricity in Europe: Potential and environmental benefits. *Energy Policy*. DOI: 10.1016/j.enpol.2015.07.013

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1. Regulation (EU) 2015/757. See: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015R0757

2. Commission Recommendation of 8 May 2006 on the promotion of shore-side electricity for use by ships at berth in Community ports: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006H0339

3. New Energy Externalities Development for Sustainability (NEEDS). See: http://www.needs-project.org

European Commission

Science for Environment Policy

Shore side electricity: key policy recommendations for uptake

A new study quantifies the economic and environmental potential of powering docked ships in European ports using local electricity networks. The authors give key recommendations on policy actions to enable implementation in European harbours.

Shipping is a large and growing source of greenhouse gas emissions. One billion tonnes are emitted each year worldwide and they comprised 4% of total EU emissions in 2010. As a first step towards including maritime transport emissions in greenhouse gas commitments, the European Commission (EC) has sought to establish a system[1] for monitoring, reporting and verifying emissions from large ships using EU ports.

When anchored in ports, ships usually use their auxiliary engines to generate electrical power for communications, lighting, ventilation and other on-board equipment. However, this fuel burning is associated with the emission of a range of pollutants including greenhouse gases like carbon dioxide (CO_2), sulphur dioxide (SO_2), and nitrogen oxides (NO_x), and other pollutants like particulate matter (PM).

Shore Side Electricity (SSE) involves connecting ships to the port electricity network while they are at berth. In the vast majority of locations, the energy mix used to produce SSE results in fewer emissions than burning fuel on the ships themselves. SSE can also benefit health as air pollutants are emitted at remote onshore electricity facilities, as opposed to ports near highly populated areas. For example, 85% of emissions from cruise ships are produced while the ship is docked.

A non-binding recommendation[2], published by the EC in 2006, declared that Member States are responsible for establishing instruments and regulations for SSE.

Current legislation such as the Sulphur Directive clearly recognises the use of SSE as an alternative to the requirement of using low-sulphur marine fuel, while the 2014 Directive on the Deployment of an Alternative Fuel Infrastructure requires Member States to ensure that SSE supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025.

The study quantified the economic and environmental impacts of SSE in European ports by combining estimates of emitted air pollutants and energy demand with measures of fuel consumption and ship movements. In order to assess the market potential of SSE in all EU ports, an analysis used for 'typical' port types, representing cargo and passenger handling, was extended to all EU ports based on the types of traffic handled there.

The authors found that if all seagoing ships in European harbours used SSE by 2020, they would consume 3342 GWh annually — approximately 0.1% of Europe's electricity consumption in 2012. This corresponds to almost 620 kilotons of fuel being burnt by ships at berth. Importantly, cruise ships, which can use very large amounts of energy to power leisure and 'hotel' facilities while docked, would make up almost 40% of this consumption.

The anticipated health benefits of using SSE in Europe were calculated to be €2.94 billion for 2020, using results from the NEEDS[3] project covering all major pollutants and all EU Member States and European sea territories. However, as marginal damage costs for PM were rated much lower in comparison to NO_x, and it is now known that PM is more dangerous for human health, the NEEDS methodology even underestimates the potential effects of air emissions and PM.

Continued on next page.

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Shore side electricity: key policy recommendations for uptake *(continued)*

The authors outline several key messages for policymakers:

- Start-up financing for SSE should be actively supported by governments or the EU, and the business case for investment made. One potential model could be for port operators to invest in the power supply infrastructure and then to sell electricity to the berthing ships, particularly ships with high energy demands such as cruise and ferry ships.
- One major barrier to investment is that taxes are imposed on SSE, but not on fuels used in shipping. This could be addressed either by a tax reduction on electricity used for SSE or by added taxes on maritime shipping fuels. Some Member States have already used this possibility to promote SSE.
- Investing in SSE — accessible to all ships — would be more efficient than installing costly emissions abatement technology on individual ships, such as onboard exhaust gas desulphurisation equipment (scrubbers), an alternative to low-sulphur fuel chosen by some ship owners.
- The potential of SSE production through renewables should be investigated, and funding developed to encourage use of smart-grids and renewable energy generators.
- SSE systems must be user-friendly and allow easy connection and disconnection. Only minor technical issues remain for implementation. For example, 99% of the world's ships operate at a frequency of 60 Hz, while European mains electricity uses 50 Hz. Converters must therefore be available to allow European ports to support ships' different systems.