WPSP
WORLD PORTS SUSTAINABILITY PROGRAM

ESI

ENVIRONMENTAL SHIP INDEX

Website transition manual for Incentive Receivers

ANNEX TO ESI WEBSITE MANUAL 2020

1 June 2024

Contents

Introduction

The transition period

The new era ESI will replace the current ESI and go live by 2026. During the transition period, before 2026, the data input process will change by 1st July 2024. The formulae also have changed and with the new ESI Core will have four subscores: SOx, NOx, GHG, Innovation. There is a new methodology for calculating GHG emissions. The innovation and the application of zero-emissions technics onboard vessel will be rewarded.

General features for incentive receivers

Data input will increase during the Transition period of May 2024 - January 2026 to help develop incentive schemes. This data input is due to new sources that haven't previously been used, for example, electricity delivery notes for onshore power. This will significantly help ports develop.

Engines & Fuels

For existing score and data input please see FILE A-1 - ESI instruction 2020 v.1.1

ESI from 2026 will use a broader range of fuels and power sources to make the calculations therefore in transition there will be more options within the data input fields.

ESI Formula

From January 2026 the ESI revised module is the sum of four sub scores for NO_X, SO_X, GHG, and Innovation. The new ESI formula introduces innovation and removes reward for OPS capability while use of OPS is rewarded. SOx and GHG consider the mix of energy usage using the new Energy Composition weighting factors. GHG focuses on the well-to-wake CO_2e intensity of energy types used. Inclusion of Innovation will stimulate new technology deployments. ESI remains capped at 100 Sub scores - up to 100 points each.

$$\mathbf{ESI = 0.4\ ESI_{NOx} + 0.2\ ESI_{SOx} + 0.4\ ESI_{GHG} + 0.2\ ESI_{Innov}}$$

For 2024-2025 the existing ESI score calculation will be presented on the system and used in incentives by ports. Please refer to FILE A-1 - ESI instruction 2020 v.1.1 for the score calculations currently in place until 2026.

Principles

ESI score

During the transition the current score will be active and used while the data input starts for the creation of evidence-based incentives and scores from the new data fields required.

ESI score validation

The current score will be validated in the same way during the transition period until 2025. Green Award will be trialling verification on the new data sets as they are provided by Incentive receivers from July 2024.

User Registration

There are no changes to the login process during transition please refer to FILE A-1 - ESI instruction 2020 v.1.1.

Ships

After clicking on ships, you have to read the updated terms of use before you continue.

Update ship master data

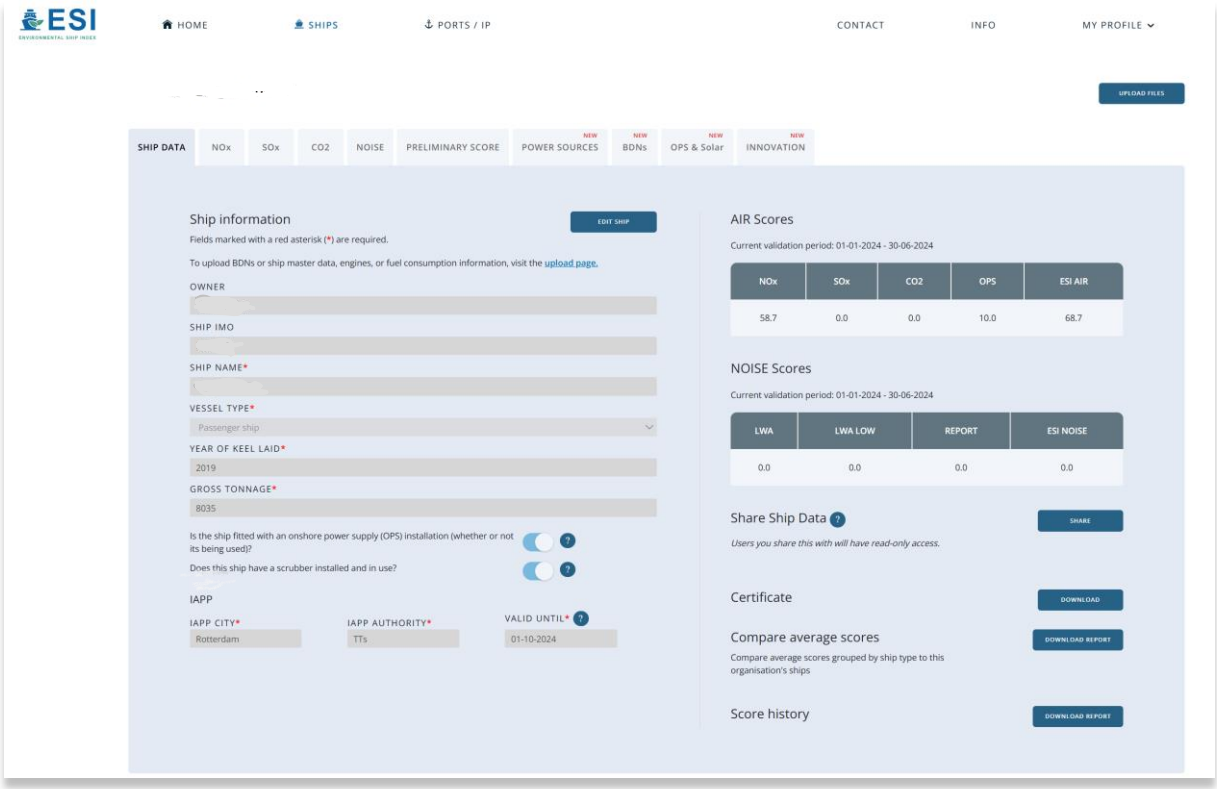
There are no changes to the ship master data during transition please refer to FILE A-1 - ESI instruction 2020 v.1.1.

Add a ship

There are no changes to the ship adding process during transition please refer to FILE A-1 - ESI instruction 2020 v.1.1

Ship data

Once you have added the ships, you can click the ship name to add ship data. Below data tabs will pop up. You can then click on each tab to input corresponding data.



The existing requirement that all vessels need a valid IAPP certificate to receive an active ESI score remains in place.

Sulphur Oxides (SOx)

SOx tab

ESI existing data should be inputted as per FILE A-1 - ESI instruction 2020 v.1.1.

For transition you can add your fuel consumption per BDN and click on “Add BDN”. The preliminary SOx subscore will be shown immediately as well as the actual SOx sub score.

i. *Days outside SECA*

ESI existing data should be inputted as per FILE A-1 - ESI instruction 2020 v.1.1.

ii. Scrubber

ESI existing score requires existing please refer to FILE A-1 - ESI instruction 2020 v.1.1.

Virtual BDN

ESI existing score requires existing please refer to FILE A-1 - ESI instruction 2020 v.1.1.

LNG or other alternative fuels

The use of LNG or other alternative fuel instead of very and ultra-low Sulphur Oil or scrubbed High Sulphur oil is highly appreciated. During the transition, there are further additional fuels that you can input information on via your BDNs.

These include Fossil HF, Fossil VLSFO, Fossil LFO, Fossil MGO, BioDiesel, eDiesel, Fossil LPG, Fossil LNG, BioLNG, eLNG, Fossil Methanol, BioMethanol, eMethanol, Ammonia and Hydrogen.

Nitrogen Oxides (NO_X)

Nitrogen Oxides (NOX)/ Power Sources tab

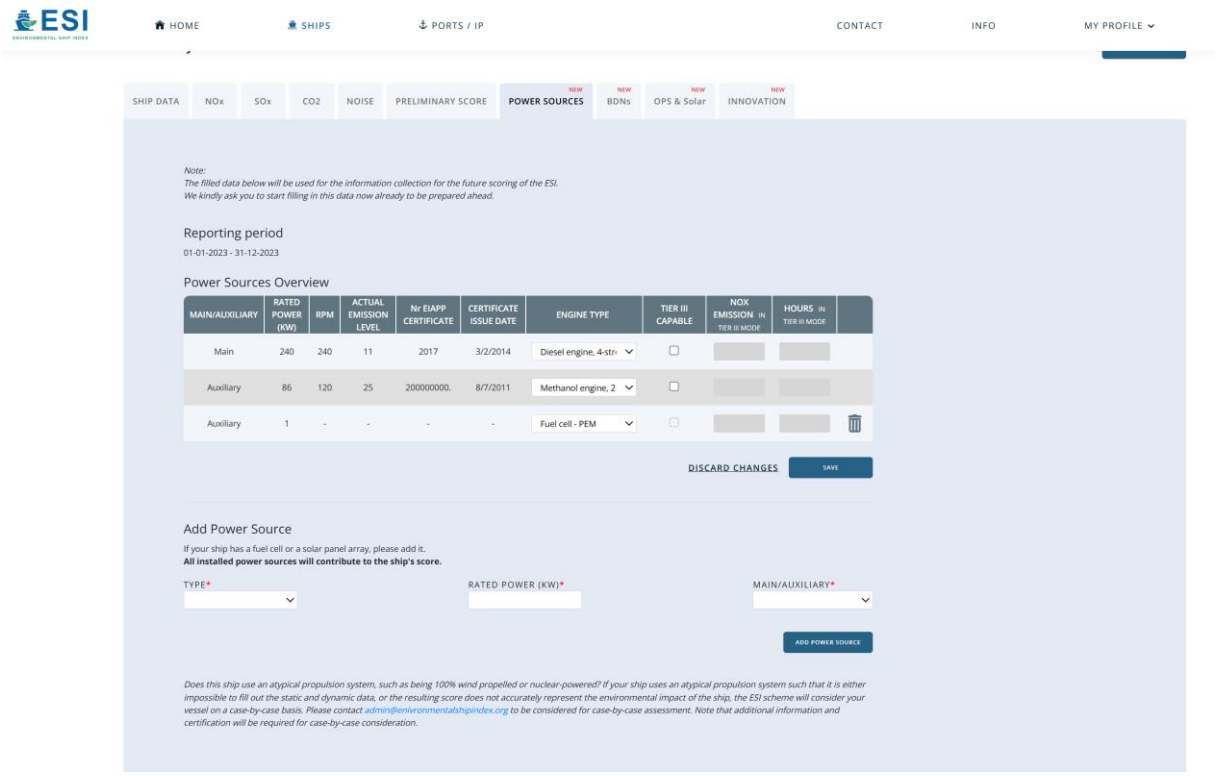
ESI existing data should be inputted as per FILE A-1 - ESI instruction 2020 v.1.1.

Please refer to the Power Sources section below for the transitional guidance related to NOx.

As part of the transition for future score purposes the following additional power sources are possible to input using the EIAPP certification data, RPM and rated power. The period in which the equipment runs in Tier III mode must be recorded to create a beneficial score. This value for the year is in hours and can be derived from the ship's engine running mode log.

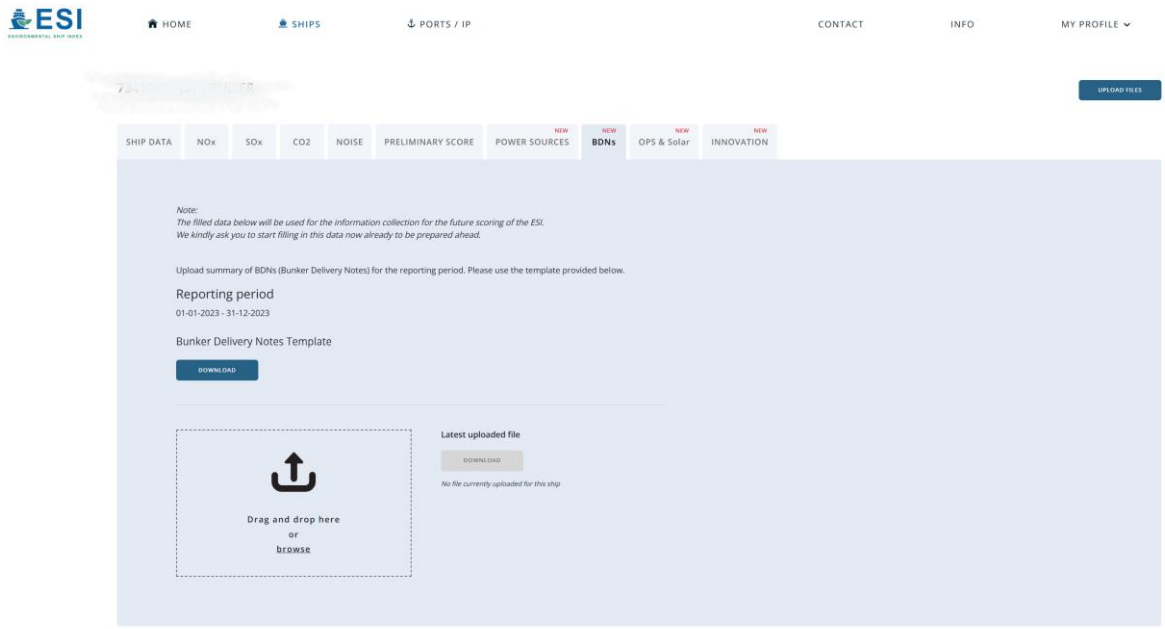
Installed Power Sources
Diesel engine, 2-stroke
Diesel engine, 4-stroke
Diesel electric engine
LNG engine, Otto Medium
LNG engine, Otto Slow
LNG engine, Diesel Slow
LNG engine, LBSI
LNG, Steam Turbine
LNG Otto electric
LPG engine, 2-stroke
Ammonia engine, 2-stroke
Ammonia engine, 4-stroke
Methanol engine, 2-stroke
Methanol engine, 4-stroke
Hydrogen engine, 4-stroke
Solar panels
Fuel cell - PEM
Fuel cell - SOFC

You can add the type of power source you use by clicking on the down arrow on the 'type' to select the power source.



Bunker Delivery Notes

From May 2024 BDNs can be uploaded in the excel template for the following fuels: Fossil HF, Fossil VLSFO, Fossil LFO, Fossil MGO, BioDiesel, eDiesel, Fossil LPG, Fossil LNG, BioLNG, eLNG, Fossil Methanol, BioMethanol, eMethanol, Ammonia and Hydrogen.



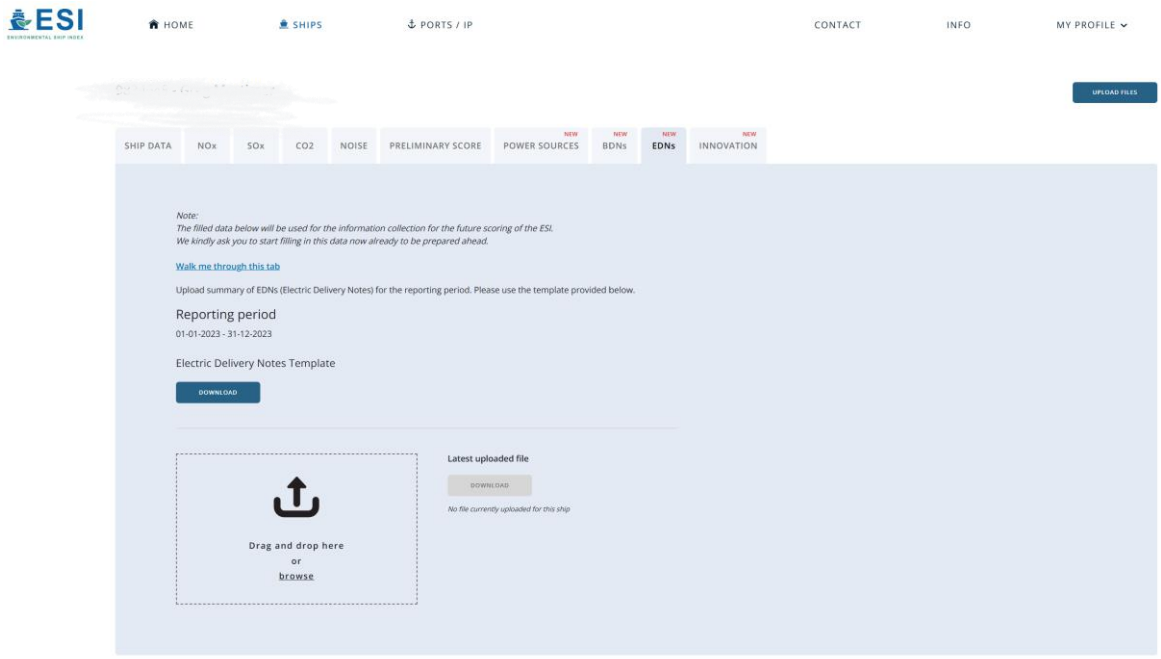
If you have any other alternative fuels or 100% wind, please email the ESI administration team to discuss your profile.

CO_2

Input ESI existing data as per FILE A-1 - ESI instruction 2020 v.1.1.

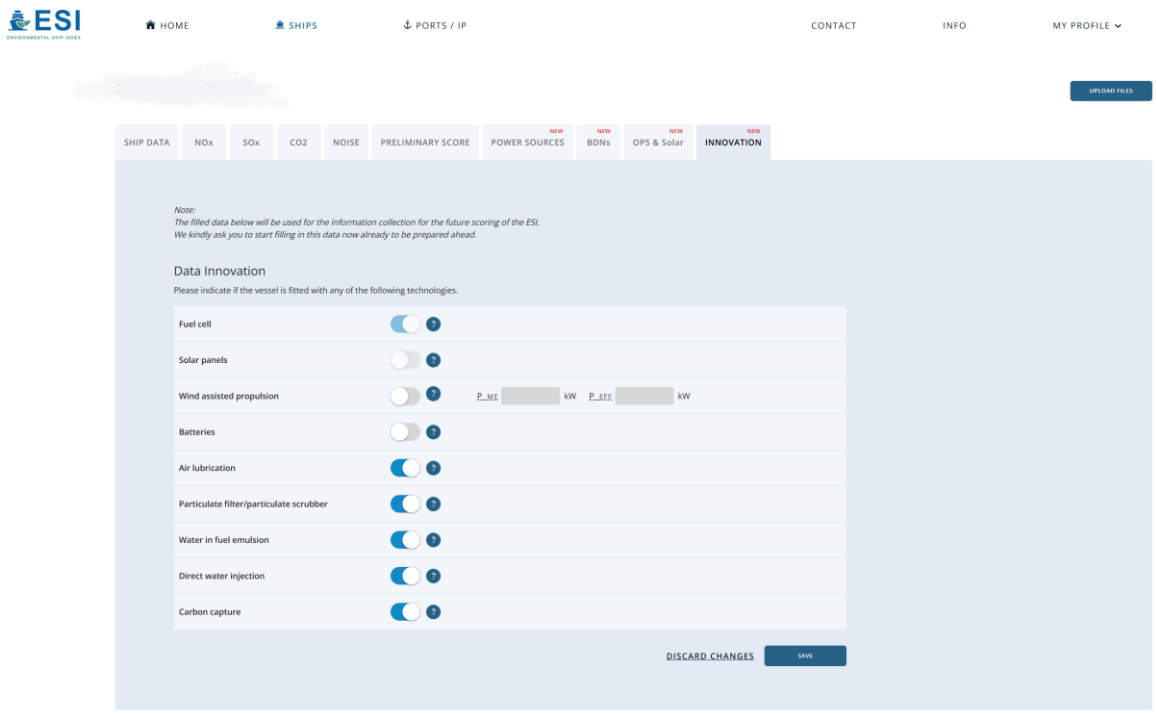
EDNs

From Transition as soon as available to the shipping companies, electrical delivery notes for the kWh for the onshore power and solar generation on board can be added. The EDNs should be uploaded in an Excel template.



Innovation

Under innovation, you will find the list of innovative technologies. Click to turn on the innovative technology that you have. Once you turn on the ‘Wind assisted propulsion’, you must add the value of P_{ME} and P_{EFF}. After turning on all the technologies you have, click save.



Noise

ESI existing data for Noise should be inputted as per FILE A-1 - ESI instruction 2020 v.1.1.

Preliminary score

Under “Preliminary Score” you will see your preliminary ESI score. This is a summary of the preliminary scores shown in the different tabs. THIS IS THE CURRENT ESI SCORE NOT NEW ESI CORE SCORE. The new ESI Core score will not be available during the initial transition period.

Formulas

General

The new ESI Score will be comprised of four sub-scores for each module: NOX, SOX, GHG, and Innovation. The inclusion of innovation by removing the benefit for OPS capacity while rewarding OPS use.

The new Energy Composition weighting factors consider the balance of energy usage for calculating SOx and GHG. GHG focuses on the well-to-wake CO2e intensity of energy sources. The inclusion of Innovation will encourage new technology deployments. The new ESI (ESI Core) has a maximum of 100 sub-scores, each worth 100 points.

$ESI = 0.4\ ESI_{NOx} + 0.2\ ESI_{SOx} + 0.4\ ESI_{GHG} + 0.2\ ESI_{Innov}$

Total score 120 capped at 100

ESI_{NOx}: NOx subscore up to 100, 0.4 of total score

ESI_{Sox}: SOx subscore up to 100, 0.2 of total score

ESI_{GHG}: GHG subscore up to 100, 0.4 of total score

ESI_{Innov}: Innovation subscore up to 100, 0.2 of total score

Energy proportion calculation

The **$Energy_{elec}$** and **$Energy_{fuel}$**, which are used in SOx and GHG score calculations, is defined as follows,

$Energy_{fuel}$ = fuel energy / total energy

$Energy_{elec}$ = electrical energy / total energy

Where **$Energy_{fuel}$** – the proportion of energy associated with all bunkered fuels, unitless.

$Energy_{elec}$ - the proportion of energy used from all OPS & solar, unitless.

fuel energy – sum of all fuel energy bunkered during reporting period provided on BDNs, kWh or MJ.

electrical energy – sum of all energy provided/generated by OPS and/or solar on EDNs, kWh or MJ.

total energy – sum of fuel energy & electrical energy, kWh or MJ

ESI NOx sub score

NOx points are out of 40 and are scored by using fuel consumers which emit less NOx emissions than the Tier II required levels which are calculated in g/kWh. If a NOx After Treatment mechanism (such as Selective Catalytic Reduction (SCR) or Exhaust Gas Recirculation (EGR)) is used to reach Tier III requirements for some periods of time, then extra points are scored in line with the level of NOx emissions while using the NOx After Treatment and in line with the proportion of time the After Treatment is in use.

For combustion engines, the NOx emissions values in the IAPP are used. For alternative fuel consumers such as steam turbines, or fuel cells, which do not have NOx emission certifications, default values are used. For the instances of fuel cells, the standard value is 0 NOx emissions. Auxiliary engines must be included.

The baseline for the NOx emissions changes based on engine RPM, so the improvement from the baseline needs to be calculated first and then averaged to produce the score.

The NOx Score is calculated as follows:

ESI_{NOx} = 100x [$\sum_{ICE}$ (time wgt NOx vs Tier II) x rated power + $\sum_{FCS}$ (NOx vs Tier II) x rated power] /total power

Where for each fuel consumer the Average Improvement is defined as:

time wgt NOx vs Tier II – time weighted Tier II & III NOx vs applicable Tier II, g NOx/kWh.

Rated power – power source rated power, kW.

Total power – rated power of all power sources

For fuel cells & solar power sources, we assume 0 g NOx/kWh.

Fuel consumers with actual NOx emissions higher than the baseline are not penalized with a negative score. The use of onshore power or solar panels does not affect the NOx score. However, if a vessel is fully electrified running only on battery power from onshore power, then there are no power sources on board so the NOx Score would be 40/40.

ESI SOx sub score.

SOx points are out of 20 and are gained by using fuel with less than 0.1% sulphur content. The calculation is performed as follows.

ESI_{sox} = 100 x [($Energy_{fuel}$ x (1 – (weight avg S% / 0.1 S%)) + $Energy_{elec}$]

With **$Energy_{fuel}$** – the proportion of energy associated with all bunkered fuels, unitless.

weighted avg S% - the mass weighted average sulfur content of all bunkered fuels, %

$Energy_{elec}$ - the proportion of energy used from all OPS & solar, unitless.

Note that if the BDN %S > 0.1%, then 0.1% is used. That is to say that bunker delivery notes where sulphur content is over 0.1% are not penalized by negative scores.

This means that the electricity from shore power and solar panels, which replaces the energy from using a fuel is taken into account in the SOx score. It is assumed that energy used from shore power has no SOx emissions associated with it, so the average sulphur content of fuel is reduced in line with the proportion of energy used from shore.

Unlike the SOx score from the current ESI ~~1~~, no scrubber information is required as the baseline for the score is 0.1% regardless of where geographically the fuel is used. However, there is no penalisation of using fuels with sulphur content higher than 0.1%. If a vessel is fully electrified and takes energy only from OPS to charge batteries, then the **$Energy_{elec}$** is 1 and the **$Energy_{fuel}$** is 0 and therefore the SOx score is 20/20.

ESI GHG Sub score

GHG points are out of 40 and are scored by using fuel with a lower well-to-wake greenhouse gas intensity than the 2020 average from the MRV, this baseline will be updated to be in line with the IMO global fuel standard when it is launched.

For fossil fuels, default fuel intensity values will be used for the whole well-to-wake calculation. For bio or RFNBO fuels the well-to-tank fuel intensity values can be found in

the certificate of sustainability provided on purchase of the fuel, the tank-to-wake values are standard values which are based on engine type and the chemistry of the fuel burnt.

The intensity is measured in gCO_2eq/MJ, meaning the well-to-wake grams of greenhouse gases in CO_2 equivalent units per mega joule of fuel. This means that the warming effect of emission of other non-CO_2 greenhouse gases, namely N_2O and CH_4, are included in the calculation in terms of their impact relative to CO_2. The standard IPCC 100-year global warming potential conversions are used.

The calculation is performed as follows:

ESI_{GHG} = 100 x [($Energy_{fuel}$ x (1 – (weight avg GHG / 91.16)) + $Energy_{elec}$]

where:

$Energy_{fuel}$ – the proportion of energy associated with all bunkered fuels, unitless.

weighted avg GHG - the mass weighted average CO_2e fuel intensity of all bunkered fuels minus any CO_2 captures when the verification process for carbon capture is sufficient to include its input in the calculation, g CO_2e/MJ

$Energy_{elec}$ - the proportion of energy used from all OPS & solar, unitless.

Note that if the Fuel Intensity> 91.16, then 91.16 is used. That is to say that bunker delivery notes where fuel intensity is over 91.16 gCO_2eq/MJ are not penalized with a negative score.

Innovation

ESI_{Innov} = ∑ Innovation points

Innovation points: points assigned for identified innovative technologies, capped at 100.

The Innovation module results in maximum of 20 score of totals (less than 20% overall), to acknowledge effort to utilise new technologies in the market following the existing guiding principles managed and led by the Technical Advisory Group to the Stakeholder Assembly; to *reward trial and/or deployment of innovative technology defined in ESI as*.

- *Innovative Technology which has a beneficial effect on the environmental performance, which is not yet measurable in ESI.*
- *Innovative removed from innovation list based on guiding principles. AG to explain the rationale for removal from the list.*
- *Annually review the listed technologies*

The calculation is proposed to be a simple addition of scores across a group of technologies capped at 100.

Wind Calculation

The ratio of P_{wind}:P_{Prop}, where $Peff_{(i)}$ - main engine power reduction due to individual energy efficiency technologies, kW **$P_{ME(i)}$** - individual main engine power, kW is used in Fuel EU Maritime Legislation and has been incorporated in the innovation points in ESI. Unlike the

other technology resulting from rewards for presence on board, this is rewarded differently depending on wind % contribution/ratio up to 99%. The values can be found on the EEDI or EEXI technical files.
Any vessels claiming for 100% must contact the ESI Administration for consideration.

Technologies	Points	Max Line points	Data input & criteria
Carbon Capture	10	10	y/n
Wind assist (all types) e.g. including Wings/Sails, Rotors/wind turbines, Kites.	No fixed points	up to 100	<10% propulsion MCR [25] points 10-<25% propulsion MCR [50] points 25%+ propulsion MCR [100] points
Air lubrication	20	20	y/n
Fuel Cell (all types)	20	20	Kw
Solar Minimum 5kw	10	10	y/n
Batteries Minimum 500kwh for score	10	10	y/n
Particulate Matter Filter (PM)	10	10	y/n
Water in Fuel Emulsification (WIFE)	10	10	y/n
Direct Water Injection	10	10	y/n

Verifications

Highlights for ESI core

General overview for “ESI Core”

- Trial verification period:

Well in advance of official implementation, starting Mid-2024 trial verification will be started on the new data, and again after indicative scores in place mid 2025.

Key changes

There is lot more data/information to check in each verification as scores will now be 1 year (instead current 6 months). As such, time onboard is expected to be longer. Changes related to more in-depth technical aspects of the verification will be monitored during the transition period.