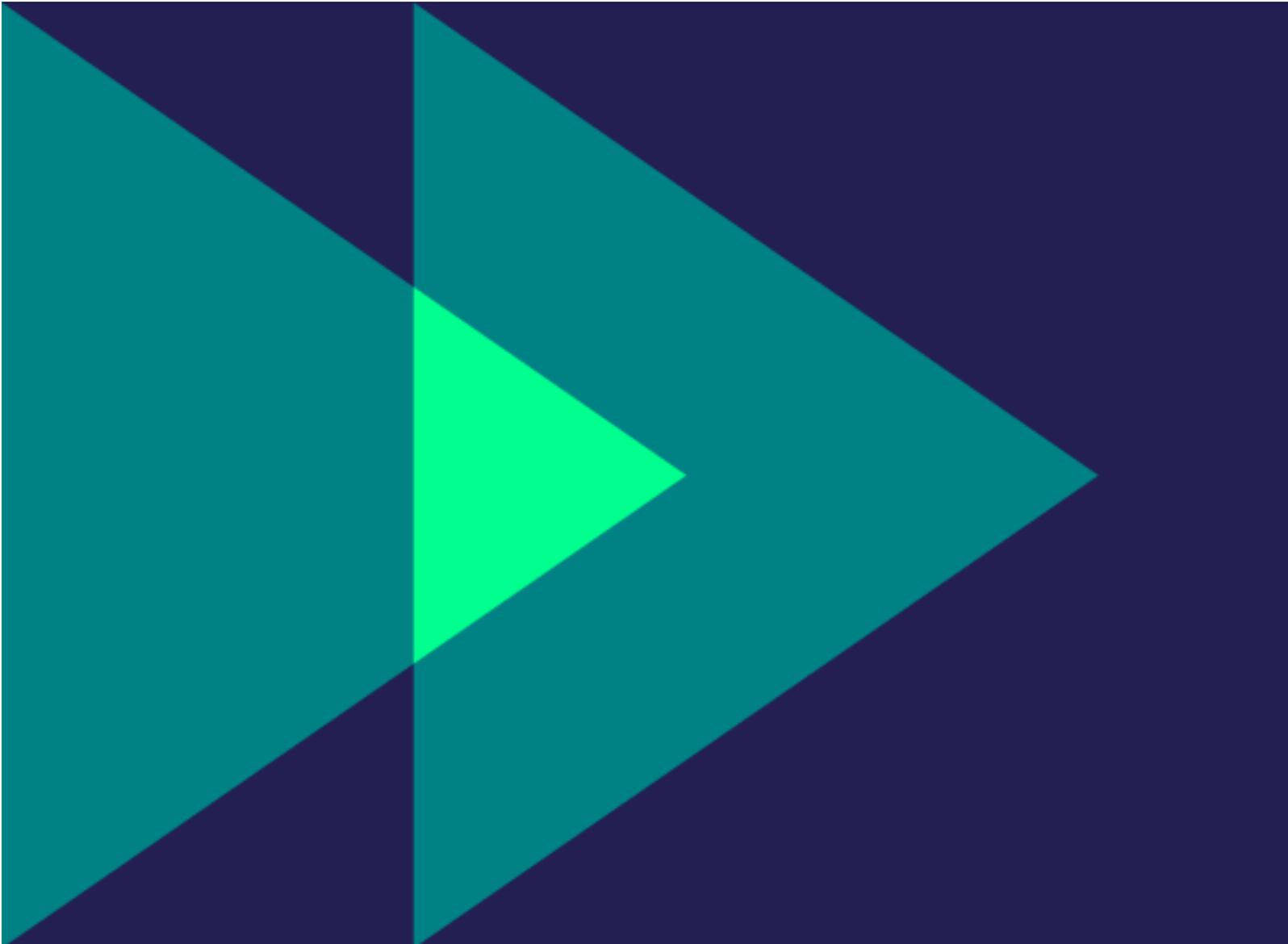


VALIDATION REPORT

Synaptec
2022 JW0006



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Details of the validation process

Synaptec	Validation request	First review	Feedback call	Hand-in revisions	Final review	Wrap-up call
Date	14/02/22 18h20	19/02/22 16h36	23/02/00 16h30	23/02/22 17h32	27/02/22 14h09	08/03/22 14h30
Result	Improbable, positive and significant			Valid, positive and significant		

Colofon

Author/ validator: Julia Weber
Project name: Synaptec
Project CIF lead: Philip Orr, Managing Director
Validation ID JW0006
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More information: [Impact-forecast.com](https://www.impact-forecast.com)

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Introduction and definitions

This Validation report documents the Validation of a Climate Impact Forecast:

Validation is a review process performed by an impartial impact expert to determine if a CIF is Valid, Positive and Significant.

The **Validation process** usually takes two weeks and includes a first review, a first feedback call between the team and validator, time for revisions if needed, a final review and a final results call. For a detailed description see www.impact-forecast.com/cif-validations

The **review** comprises a structured check using our CIF Validation tool, a sensitivity analysis and the writing of an Impact story. CIF trainers with LCA expertise are trained to perform this process in a uniform and objective way.

CIF Validations are made on the request of the project team, and possibly commissioned by an impact organisation. The results are used by teams and organisations to compare and communicate the climate impact of projects.

A **Climate Impact Forecast** or CIF is an LCA based calculation of the GHG reduction or climate adaptation potential of a project. Using our CIF tool, the project team found the net climate impact of the key differences between business as usual and their innovative solution.

The **Impact data** in this report, and in CIF in general, is calculated with information from the project team and from the CIF tool. Technical details, amounts and assumptions in the calculation are provided by the project team. Impact factors (LCI data), impact equivalents and the calculation itself are provided by the CIF tool.

The **CIF tool** is used by teams to improve their impact and support design and business decisions with impact data.

CIF results are the project's potential or actual avoided emissions in tCO₂eq.

Every CIF Validation result consists of three independent outcomes:

Valid

A CIF is valid if it is representative of the project, using appropriate data and well justified assumptions. Therefore, the CIF and its results are representative of the potential for the project to mitigate, enable or adapt to climate change.

Detailed requirements for validity are specified on www.impact-forecast.com/cif-validations. A CIF can be Valid, Plausible, Improbable and Invalid.

Positive

A CIF is positive when it shows that the project has a lower climate impact than business as usual, or improved climate resilience in the case of adaptation. A positive mitigation or enabler CIF shows the avoided GHG emissions in -tCO₂eq.

This outcome depends on a sensitivity assessment. CIF results can be Positive, Positive within limits, Unclear, Sensitive and Negative.

Significant

A CIF is significant when the project has a climate impact (positive or negative) greater than 5 tonnes of CO₂eq per year. This is roughly the global average annual CO₂ emissions per person, and the mass of a male African Elephant.

The threshold for significant impact can be set to a higher amount for a particular organisation or occasion. The result can be Significant or Marginal.

Impact story

An impact story is a summary of how a project makes a positive climate impact. It is written by the validating impact expert and contains the key impact data from the Climate Impact Forecast.

Synaptec enables wind farm operators to be more efficient and save CO₂ eq

Synaptec enables offshore wind farm operators to produce sustainable energy more efficiently and save even more CO₂ eq. Synaptec supports their client to streamline offshore maintenance based on true asset health by providing high-fidelity monitoring throughout each turbine string (approximately 6 turbines).

According to Synaptec's business plan, they expect to reach 10 wind farm operators in 2022. Businesswise, it makes sense for users to change their behavior completely. Nevertheless, some of their clients might not initially wish to completely eliminate manual inspections of their cables. This is the reason why Synaptec predicts users to change their behavior in 85% of all (planned and unplanned) maintenance cases.

Per user, Synaptec has to install hardware to measure the true asset health of the wind turbines. However, the positive climate impact of changing their clients behavior to more efficient maintenance operations outweighs the hardware input required per user by far.

Synaptec is supposed to reduce turbine inspection twice a year by 25%, unplanned maintenance once a year by 50% as well as shortening the duration of the yearly campaign for detailed cable inspections by 50%. All in all, they expect to reduce the fuel by approximately 50% compared to the baseline behavior. These assumptions come from the first internal

models of Synaptec and have to be proven by data of a higher number of clients.

Synaptec achieves a reduction of -76395 kg CO₂ eq per fully changed user. This saves 688t CO₂ eq at a scale of 10 users reached in one year. This is equivalent to the combined carbon sequestration of more than 31252 trees.

In the sensitivity analysis for this forecast we explored that even if the fuel will not be reduced by 50% (22 t) but only 0,57% (248 kg), the impact of Synaptec is still significantly positive. Even in a worst case scenario the hardware input required multiplies a hundredfold and Synaptec is able to enable their users to reduce their fuel input by 50%, the impact is significantly positive.

Synaptec enables wind farm operators to produce sustainable energy not only more efficiently but also to reduce even more CO₂ while maintaining their systems. This has a direct impact but also has a systemic impact by making wind farms more competitive.

Crucial for Synaptec is to measure the actual percentage of changed behavior as well as still needed vessel inspections. To maximize their climate impact, I recommend them to focus on reducing vessel inspections as much as possible and not focussing too much on optimizing their material input for their hardware as this has a minor impact.

Climate Impact Forecast and Validation result

Synaptec enables offshore windfarm operators to streamline offshore maintenance based on true asset health by providing high-fidelity monitoring throughout each turbine string. The difference in impact of Synaptec per year is calculated assuming that 10 offshore windfarm operators are reached, of whom 100% are expected to change on average 86% of their current scheduled asset inspection regimes. That is equivalent to 9 fully changed users.

per reached user | These numbers capture the materials related to the supplied Synaptec hardware. Per turbine string, there are about 30 sensors required. This would normally require one measurement system, power transformer, and telecoms unit per turbine, which creates a poor business case. Instead, we require only one system. The aluminium and PCB quantities represent the bill of materials of our sensor interrogator unit. The glass fibre represents short runs of new optical fibre installed near the 30 sensors. The piezoelectric actuators and quantities of iron and copper represent the materials comprising the 30 sensor elements.

per changed user | These numbers capture the savings related to the implementation of condition-based maintenance offshore, and the power savings for operating sensors. Road transport will be used by operators to get to port and board vessels. 50 km is an estimate of the total road travel to/from office/port over the course of one year - this is probably a conservative estimate. Offshore wind turbines are typically 1.5 km spaced apart. Normally there are 6 turbines in a string. Crew Transfer Vessels (CTVs) are used to move personnel between turbines and idle stably during maintenance and inspection. CTVs consume 400 litres of diesel per hour at standard speeds and idling. One litre of diesel fuel is approximately 0.85 kg, so CTVs consume 5.31 kg / km. For turbine inspection: The CTV is steamed for around 2 hours per turbine, and inspects all turbines twice per year. This consumes a total of 8160 kg diesel from idling. The CTV travels an 18 km round trip during inspection, consuming 95.63 kg diesel. Total diesel consumed: 8,255 kg. Synaptec estimates it can reduce inspections by 25%; a saving of 2063 kg. For unplanned maintenance: On average, the distance covered for unplanned maintenance will be 9 km (to the middle turbine). Idle time during work is estimated at 3 hours. Total diesel consumed is 1067 kg. Synaptec estimates it can save 50% of unplanned maintenance events through live condition monitoring; a saving of 533.9 kg. Yearly ROV campaigns: Remote Operated Vehicals (ROVs) are used once per year for detailed cable inspections. Larger ship is required for this, consuming 4 tons of diesel per hour. The ship is offshore for 10 hours per campaign, consuming 40 tons of diesel. Synaptec estimates it can reduce the scope of campaigns by 50%; a saving of 20 tons diesel per year. Total saved per year is 22.59 tons of diesel fuel through mitigation of conventional inspection and maintenance campaigns. No option available for particular vessel used offshore - Crew Transfer Vessel. Using production of equivalent diesel fuel used.

our overhead | Overhead savings or carbon efficiencies are not considered.

Validation	By: Julia Weber, Started: Sat Feb 26 2022 18:36:12 GMT+0100 (Mittleuropäische Normalzeit), Completed: Sun Feb 27 2022 14:09:20 GMT+0100 (Mittleuropäische Normalzeit)
Strong points	Well explained impact model and assumptions made transparent as well as conservative.
Weak points	Source for piezoelectric was missing but the data was accurate and the source has been added by the validator.
Sensitivity	In the sensitivity analysis for this forecast we explored that even if the fuel will not be reduced by 50% (22 t) but only 0,57% (248 kg), the impact of Synpatec is still significantly positive. Even in a worst case scenario the hardware input required multiplies a hundredfold and Synaptec is able to enable their users to reduce their fuel input by 50%, the impact is significantly positive.

per reached user	kgCO ₂ eq.	quantity per reached user	kgCO ₂ eq. per 10 reached users
+ AlMn1 (3003)	11.97 per kg	750 g	89.78
+ PCB = Printed Circuit Board (including ICs)	475 per kg	300 g	1425
+ Glass fibre*	2.162 per kg	250 g	5.405
+ Piezoelectric actuator	44.4 per kg	0.45 kg	199.8
+ GGI5	1.633 per kg	60 kg	979.9
+ Copper (European Copper Instituut)	3.237 per kg	5 kg	161.9

per changed user	kgCO ₂ eq.	quantity per changed user	kgCO ₂ eq. per 9 fully changed users
- Middle petrol car (950-1350 kg, 80-110 hp) trav	0.2189 per vkm	50 vkm	-93.03
- Diesel low-sulphur including combustion CO ₂	3.692 per kg	22 tons	-690320

our overhead	kgCO ₂ eq.	quantity per Synaptec	kgCO ₂ eq. per Synaptec
		0	

Synaptec's total impact per year

eco-costs of human health euro	unknown
eco-costs of eco-toxicity euro	unknown
eco-costs of resource depletion euro	unknown
eco-costs of carbon footprint euro	unknown

Impact per changed user
Impact of Synaptec in total

Carbon footprint CO ₂ eq.
-76395 kg
-688t

Equivalent to

Impact validation

VALID, POSITIVE AND SIGNIFICANT



All data and assumptions are approved



31252 trees

141 Average humans



85

times driving a car around the world



694

passengers flying London-New York



1335

barrels of oil burnt



289

EU households annual electricity



138

elephants mass (5t) of CO₂



124

hot air balloons (2800 m³) of CO₂

validated in February 2022
validation id

JW0006

Verifyable at
www.impact-forecast.com

SYNAPTEC

Has the potential to enable a climate impact reduction of

-688

tCO₂eq / year

Validity of forecast

Valid

Impact compared to baseline

Positive

Magnitude of impact

Significant

Validation quality mark can be checked on: www.impact-forecast.com

More information

We help companies to know, show and grow their climate impact. More information about the validation process you can find on our website: www.impact-forecast.com

