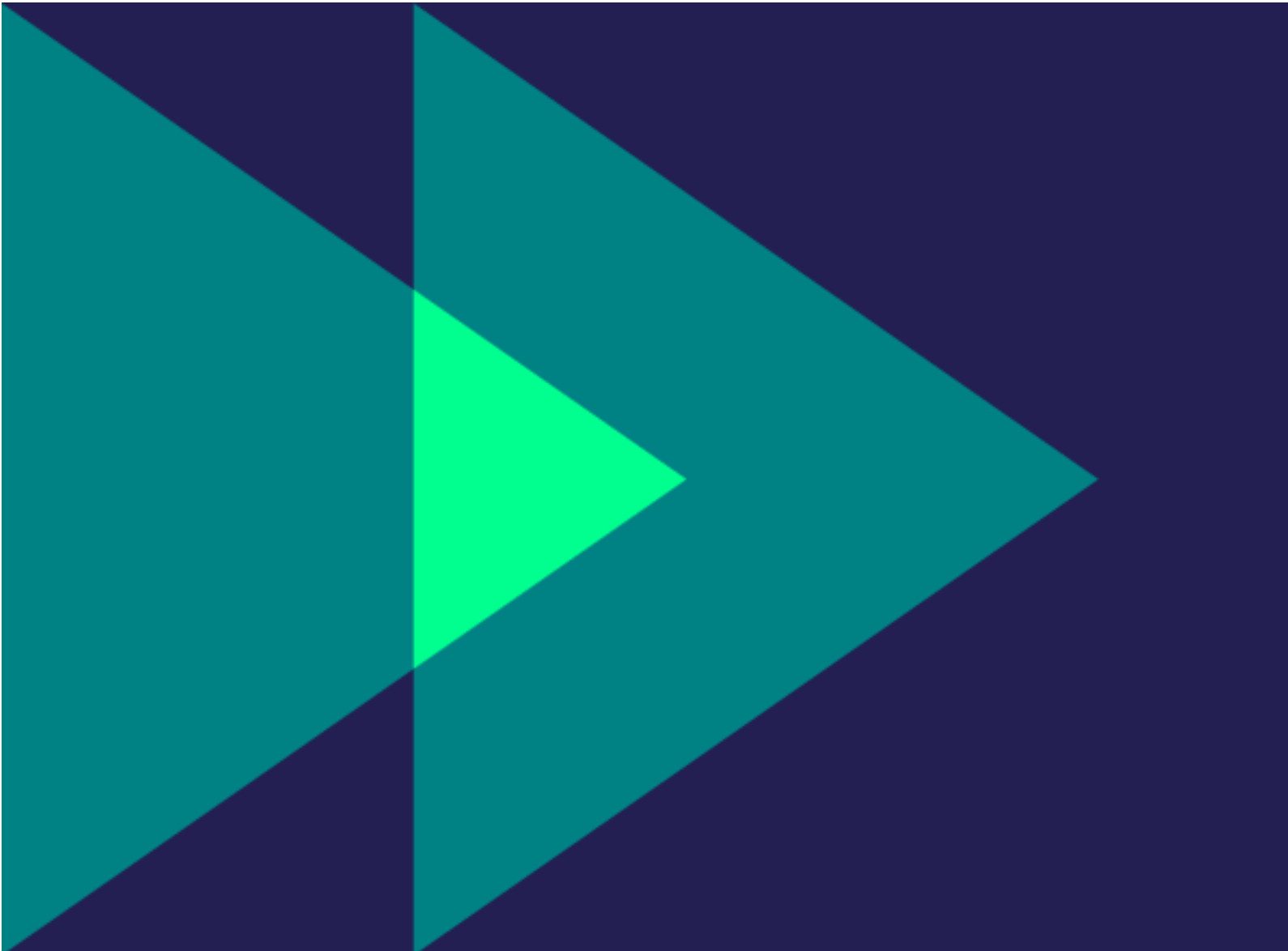


VALIDATION REPORT

Reusable Technologies
2022 CDA049



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Details of the validation process

	Validation request	First review	Feedback call	Hand-in revisions	Final review	Wrap-up call
Date	17/11/22 23h17	25/11/22 23h21	28/11/22 11h00	06/12/22 15h17	09/12/22 21h00	TBA
Result	Invalid, positive and significant			Valid, positive and significant		

Colofon

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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

For mitigation and enabler projects, 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.

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.

ECO-FRIENDLY POWER BANKS MADE OF REVIVED BATTERIES AND WOOD WASTE

Most power banks sold on the European consumer electronics market are manufactured in China, from virgin materials and components, with a high environmental burden. At the same time, an enormous amount of batteries get disposed of on the European market. The company Reusable Technologies connected the dots and came up with the concept of a stylish mini power bank, the rEbankMini, manufactured from revived batteries and wood waste.

How does Reusable Technologies make a positive impact? Compared to which baseline?

Reusable Technologies is a company based in Novo Mesto, Slovenia. The company finds innovative ways to recycle electronic waste and designs, manufactures and markets different electronic products made from e-waste. One of their current products – for which they created their climate impact forecast – is the rEbankMini. The rEbankMini is a 3000 mAh power bank that is made of revived battery cells and is covered with neatly finished walnut housing made of wood waste. Through these eco-friendly power banks, the company creates a positive climate impact in several ways compared to traditional power banks made in China (the baseline product of this forecast). First, the rEbankMini does not require the production of new battery cells as it contains reused ones (recovered from e-cars, e-bikes, hand tools, etc.), thereby elongating the useful life of the latter. Second, it does not require a housing made of plastic (usually ABS) and stainless steel (sometimes aluminium) as it uses walnut wood waste instead. And third, it

does not need to be transported from China all the way to the Slovenian market as it is locally produced and marketed in Slovenia which saves emissions on maritime transportation.

How much impact, and what does it depend on?

With their innovative power banks, Reusable Technologies has the potential to save around 5.3 kgCO₂eq. emission with each 3000 mAh power bank they produce and sell. This would result in a total carbon emission saving of 53 tCO₂eq. per year for the company, assuming 10000 pieces of power bank produced and sold per year. The impact of the company is going to depend mostly on the potential future changes in the most carbon-intensive component of the baseline product, the Lithium-ion batteries. In case the carbon footprint of the raw material extraction and the production of batteries decrease in the future, the relative climate advantage and the positive climate impact of Reusable Technologies will also decrease. However, it can be confidently stated that the forecast is robust, not sensitive – Reusable Technologies would have a positive and significant climate impact even in the case of a hypothetical 98% decrease in the cradle-to-gate carbon footprint of Lithium-ion batteries.

Validity

The forecast is valid, positive and significant. The conclusions of the validation procedure: All checks are approved, no questions or concerns remain. Any external information checks out, and the impact is robust; a more detailed LCA should give results in the same

range. The forecast shows that the innovation robustly reduces CO₂ impact. The impact is significant, meaning that it is greater than 5 tonnes per year, compensating for more than one average person.

Climate Impact Forecast and Validation result

Reusable Technologies LLC provides rEbankMini with eco-friendly materials and reusing e-waste instead of standard powerbank. The difference in impact is calculated per year and the total impact of Reusable Technologies LLC per year is calculated for 10000 times 1x 3000 mAh powerbank.

Extraction	Our product consists of three main components: A li-ion battery, a wooden housing, and a PCB. Normally, all of the standard power banks are made of an aluminum/steel housing, a supportive plastic holder, and chemical adhesives. All of the before mentioned components are avoided in our power bank and that makes a difference between our power bank and a standard one. PCBs are the same for our product and standard one - there is no difference. The biggest impact is made by the battery. We do not need to extract any material for a battery since it is reused from other products (e-cars, e-bikes, hand tools, etc.). Processing of materials for a battery (lithium, copper, nickel, steel) makes a huge environmental impact. There are many types of batteries on the market. In this calculation, we took average values for calculating the impact. While a single battery can weigh from 42 up to 60 grams, we calculated the impact for 60g of battery (because we use 3000mAh - more material inside). Also, the composition of the battery can vary from manufacturer to manufacturer, but we still weighed our batteries and studied the most real values. That's why the most similar battery LiCoO2 was used in the calculation. We also reuse the nickel strips which were previously used on the scraped battery packs which are dismantled by our subcontractors. Aluminum/steel housing was in our case replaced by wooden housing, made of walnut. There is no need for any wood extraction because we use wood waste produced in a furniture manufacturing process and it would otherwise be burned as waste and not as firewood. As already mentioned, no extraction of raw materials (lithium, aluminum, copper) is needed as the battery is reused. Besides that, we do not need any steel and plastics processing but with the wooden housing, there is a little more wood processing.
Production	Our product is assembled in Slovenia, meaning that any production in China is avoided. The production takes place in Reusable Technologies headquarters in Slovenia and we are proud to expose that every product is a handmade product, assembled of green and sustainable components and we also aim to use as little energy as possible for production. One battery revival module can consist of 16 battery cells. When the 'reviving' process is on 100%, the module consumes 90W. So 5.6 W per cell. 5.6W for a duration of (approx.) 4 hours is 22.4Wh per cell.
Transport	The main difference in the transport section is due to the fact that our waste batteries are simply collected in waste centers in Slovenia, sent to us and after they are being regenerated and we can offer them back to the industry. For that reason, there is no need to import new batteries from Asia (China), so again, the transport is avoided. Our transport connections are set up since we have agreements and contracts with suppliers (waste handling centers). The process of handling the batteries is on a high level regarding the safety requirements. We pick Guangzhou port (China) as the start and Luka Koper (Slovenia) as the end destination. There are exactly 7847 nautical miles via the Suez Canal. 7847 nautical miles is 14532.644 km. One 3000 mAh power bank (non-eco) from China weighs approximately 200 grams. So we use the calculation 14532.644km x 200, which is equal to 2,906,528.800. Our coach advised us that we don't include the decimal digits in the gkm field.

Validation	By: Csaba Dudás, Started: Fri Dec 09 2022 19:54:04 GMT+0100 (Central European Standard Time), Completed: Fri Dec 09 2022 21:00:15 GMT+0100 (Central European Standard Time)
Strong points	Well-built impact model, well-collected LCI.
Weak points	No weak points.
Sensitivity	The forecast is robust, not sensitive - the company would have a positive and significant climate impact even in the case of a hypothetical 98% decrease in the cradle-to-gate carbon footprint of Lithium-ion (LiCoO2) batteries (the most carbon-intensive component of the baseline product).

Extraction						
		Lithium-ion LiCoO2 laptop battery (180 Wh/kg)	80.34 per kg	60 g	-4.82	
		Steel (21% sec = trade mix average) EU	0.9576 per kg	70 g	-0.06703	
		ABS (Acrylonitrile butadiene styrene)	3.1 per kg	90 g	-0.279	
		NiCr 80 20	17.25 per kg	5 g	-0.08626	
Production						
		Electricity Slovenia	0.08226 per MJ	22.4 Wh	0.00663	
Transport						
		Container ship (min weight/volume ratio 0,41 to	0.00478 per tkm	2906528 gkm	-0.01388	

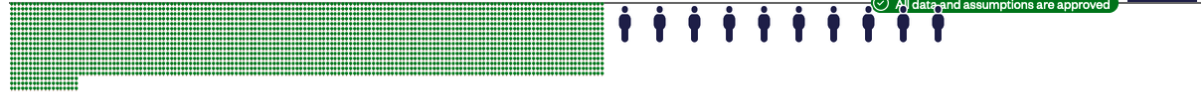
Reusable Technologies LLC's total impact per year

eco-costs of human health euro	-1985
eco-costs of eco-toxicity euro	-6909
eco-costs of resource depletion euro	-6682
eco-costs of carbon footprint euro	-15033

Impact per 1x 3000 mAh powerbank
Impact of 10000 times 1x 3000 mAh powerbank

Carbon footprint CO ₂ eq.
-5.26 kg
-53t

Equivalent to



2390 trees

10 Average humans

7	53	102	22	11	9
times driving a car around the world	passengers flying London-New York	barrels of oil burnt	EU households annual electricity	elephants mass (5t) of CO ₂	hot air balloons (2800 m ³) of CO ₂

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

validated in December 2022
validation id:

CDA049

Verifiable at
www.impact-forecast.com

REUSABLE TECHNOLOGIES

Mitigates climate change with an impact reduction potential of:

-53

tCO₂eq / year

Validity of forecast

Valid

Impact compared to baseline

Positive

Magnitude of impact

Significant

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

