



Zero Carbon

Investor Profile

Zero Carbon Capital

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Through Investor Profiles, investors in the Frame community articulate their impact strategies in a consistent structure.

Over time, we expect these Profiles will help us develop methodological guidance that is inclusive and based on collective wisdom. They'll also help us understand why and how methodologies shift according to organizational characteristics, such as fund size.

In the spirit of Frame's values of integrity and transparency, we design, review, and manage profiles with these goals:

Decisions that drive towards impact are what matter.

The purpose of impact assessment is to help improve the choices investors make to steer capital towards innovations and strategies that reduce global GHG emissions over time. All profiles demonstrate how assessment shapes investment decisions.

All profiles must be consistent in structure and content.

Profiles are based on common structure and questions that all investors follow. For example, rather than excluding responses to questions that an investor may not have answers to, they share progress, wherever it is. Profiles will also increasingly apply Frame's terminology and taxonomy, rather than language that any individual investor uses on its own. As we learn by doing, we'll add questions and refine structure.

Audiences must understand how the theory of change affects methodological decisions.

Investors clearly articulate the reasoning for assessment processes:— what they are looking for in assessment and why.

Assessment and decision-making continue after initial investments are made.

Investors share how they continue steering companies toward impact after initial investments are made and how ongoing analysis affects their investment and assessment strategies overall.

Evolution is embraced. No process is perfect! In the spirit of transparency and modeling how we learn by doing, we publish work in progress and welcome investors to define what and when they plan to update over time.

Project Frame (Frame) is a nonprofit program, convened by Prime Coalition, built to organize investors around forward-looking emissions impact methodology and reporting best practices.

Our aim is to improve Impact Measurement and Management (IMM) standards for climate-driven investments and to galvanize a network of leadership around transparency and collaboration.

Project Frame is not a regulatory body, nor should its content be considered financial advice. Investor Profiles produced by Project Frame represent the investor's self-reported contributions and should also not be considered financial advice. Our work is intended for readers to review and use their best judgment to accelerate GHG mitigation with transparency and accountability.

Learn more about
Project Frame

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Case Study

Overview





Overview
Dashboard > Impact Assessment Capacity > Funds

Types or Asset Classes of Investments	Venture Capital
Asset Sub-Type or Stage(s) Served	Pre-seed, Seed, Series A (follow-on only)
Geography Where We Invest	Europe
Sector	Built Environment, Electricity, Food and Agriculture, Industry, Land, Transport, Waste Management
Description of Investment Firm	We seek to provide market or above market rate returns and specifically invest in climate.
Impact Assessment Capacity	1 FT, and all investment team members are involved in assessing impact
Total Assets Under Management	£19 million GBP
Percent of Assets Assessed	100%
Methodology Alignment	Potential Impact, Total addressable market for CO2e emissions reduction potential
Time Frame of Assessment	2050
Alignment with Frame's Values and Principles	Partial Alignment
Reporting Realized Impact	No
Carried Interest Tied to Impact	No



Overview

Dashboard > **Impact Assessment Capacity** > Funds

Team Name

Science Team

Number of Team Members

1 FT, and all investment team members are involved in assessing impact (5, as of June 2023)

Scope

The team's key responsibilities

Emissions Reduction Potential calculations and documentation

Governance

The team's reporting structure, such as to whom they report and who reports to them.

Managing partner

Impact Expertise

The kind(s) or type(s) of impact on which the team focuses.

GHG emissions reduction is our main focus, but we also qualitatively evaluate non-GHG impact of a new technology using the UN Sustainable Development goals as a rubric.

Decision Rights

The power this team has in pre- and post-investment decisions.

GHG emissions reduction impact acts as an investment decision gate, implemented by all team members.



Overview

Dashboard > Impact Assessment Capacity > Funds

Fund Name

Zero Carbon Capital 2022

Date of Fund Open

April 2022

Fund Assets Under Management to Date

£15m GBP

Number of Portfolio Companies to Date

9

Asset Sub-Type or Stage(s) Served

Pre-seed, Seed, Series A (follow-on only)

Kinds or Terms of Capital Provided

UK limited partnership with 10 year duration and 4 year investment period.

How Fund Design Serves Impact

How capital provided applies terms different from investing norms in order to serve impact goals, such as if it is a blended fund or uses catalytic capital.

High threshold for impact: we only invest in companies where their solution has the potential to reduce CO₂e emissions by 0.5 GtCO₂e per year by 2050. We assess their technology as having the potential to beat other incumbent or emerging technologies in terms of cost, quality or other key decision-making criteria (e.g. energy demand).



Overview

Dashboard > Impact Assessment Capacity > **Funds**

Fund Name

Zero Carbon Fund

Date of Fund Closed (or Estimated)

July 2020

Date of Final Investment Made (or Estimated)

March 2022

Fund Assets Under Management to Date

£4m GBP

Number of Portfolio Companies to Date

8

Asset Sub-Type or Stage(s) Served

Pre-seed, Seed, Series A

Kinds or Terms of Capital Provided

UK EIS fund with 1 year investment horizon

How Fund Design Serves Impact

How capital provided applies terms different from investing norms in order to serve impact goals, such as if it is a blended fund or uses catalytic capital.

High threshold for impact: we only invest in companies where their solution has the potential to reduce CO₂e emissions by 0.5 GtCO₂e per year by 2050. We assess their technology as having the potential to beat other incumbent or emerging technologies in terms of cost, quality or other key decision-making criteria (e.g. energy demand).

Impact Goals & Process





Impact Goals & Process

Theory of Change > Impact Goals

Overall vision, why that vision has not yet been achieved, and how the design of interventions or programs get you closer.

Goals or Vision

Our vision for 2050 is a world in which humans can thrive on a healthy planet with healthy ecosystems. In this 2050 world we have reached as close to zero GHG emissions as technically possible, and we employ some CO₂ capture for the remaining and historic emissions.

Path to Goals

How your intervention helps achieve the goals.

We target companies that have the potential to reduce emissions by 0.5 GtCO₂e/yr at scale at least by 2050. We prioritise opportunities where the investment is needed to be truly transformational—where there is no current solution and where the current level of investment does not look likely to produce one.

We invest at the early stage (pre-seed preferred) in deep science startups that are focussed on the big, unsolved problems of climate (responsible for >0.5 GtCO₂e emissions, with no current viable path to fix it). It is our view that the most effective way to reduce emissions is with hard tech. We look for:

- **Deep science** - deep scientific understanding of a complex problem and solution space, such that replication of the company's solution is non-trivial.
- **Hard tech** - innovation is of a physical basis i.e. output of the company is a physical thing
- **Scientific innovation** - founders have a transformative idea focussed on the big, unsolved problems of climate (responsible for >0.5 GtCO₂e emissions, with no current viable path to fix it i.e. remove the green premium)



Impact Goals & Process

Theory of Change > Impact Goals

Barriers or Challenges

What is stopping us from reaching the goals and how your intervention addresses them.

- **Need for new solutions.** Wind & solar power have been through a rapid deployment/improvement curve leading to cheaper, cleaner energy forming an increasing percentage of our mix. Yet even with full deployment and optimisation of existing technologies we're not on track to reach net zero in 2050. Areas like cement and steel manufacture, food production, industrial heat and cooling, and the full decarbonisation of electricity production are still largely unsolved. We need to discover, optimise & commercialise fundamentally new science to address this challenge.
- **Private interests:** Massive corporations with vested interests pervert gov't and consumer decisions; lack of innovation/ risk-taking from incumbents (amongst others).
- **Ineffective government policy**
- **Relatively lower cost of fossil-fuels and resulting GHG emissions.** We can best tackle this with innovation and venture investment. By providing early-stage capital to scale alternative hard-science technologies, we are helping to bring down the 'green premium' so that companies, governments and consumers can choose the lower-carbon option every time. Our view is that the if the decarbonised option is also the cheapest, fastest, highest- quality option then it makes it much harder to block.

Values/Principles

We apply principles outlined by Project Frame, in particular:

- **Transparency** - we state our assumptions and data sources
- **Conservatism** - we don't want to overestimate the potential impact (nor do we want to miss investing in an opportunity that would have a big impact)
- **Robustness** - we go back to first principles and aim to find multiple data sources for a given value where possible, as well as using the best available projections (for future demand/energy requirements etc.).



Impact Goals & Process

Theory of Change > **Impact Goals**

*This section describes **classification systems** used to organize or analyze investments and the quantitative or qualitative **impact criteria** that gate or influence investment decisions.*

Impact Criteria

ZCC's focus and main impact criterion is potential for decarbonisation. We invest in companies with a solution that has the potential to reduce CO₂e emissions by 0.5 GtCO₂e per year by 2050.

We take a top-down approach to identify the biggest unsolved problems of decarbonisation. For a particular company and solution, we develop a robust theory of change about how their solution will lead to emissions reduction. We assess their technology as having the potential to beat other incumbent or emerging technologies in terms of cost, quality or other key decision-making criteria (e.g. energy demand). We think that this means that they will be able to address a large chunk of the Emissions Reduction Potential when operating at scale.

ZCC invests in companies with direct emissions reduction technologies as well as facilitating technologies. We define a facilitating technology as one that is critical for the decarbonisation of a particular activity. One where the counterfactual scenario (i.e. the technology is not deployed) results in limited (or no) emissions reduction.

For a solution with a direct impact it is straightforward to estimate Emissions Reduction Potential per unit deployment. We follow the methodology for Potential Impact outlined by Project Frame.

In evaluating facilitating technologies it is more challenging to attribute a direct per unit emissions reduction. Instead we identify the key barriers to adoption of a decarbonised solution beyond cost e.g. hydrogen leaks (safety and GWP) or fast-charging unlocking adoption for electric vehicles (by relieving range anxiety). Although Emissions Reduction Potential is our main focus, we identify other environmental risks using the UN's Sustainable Development Goals.

Pre-Investment





Stage 1 Solution Seeking & Screening

Seeking

We have mapped out the most important sources of GHG emissions across all sectors of the economy and perform deep dives on specific problems so that we can identify and catalyse solutions in those areas.

Screening

- 0.5 GtCO₂e problem space - the Emissions Reduction Potential
- Hard science innovation - the most challenging to decarbonise will need scientific innovation
- Theory of Change - clear theory of change to achieve impact
- Geography - Europe/Israel
- Stage - pre-seed/seed

Stage 2 Meet Founders

Vision alignment
Review screening criteria for accuracy

Stage 3 Pre-Due Diligence/Initial Review

- **Team review**
- **Science Review**
- **Red flag review**
- **0.5 GtCO₂e Emissions Reduction Potential**
 - **Direct impact technology**
 - **Facilitating technology**, which we define as: one that is critical for the decarbonisation of a particular activity. One where the counterfactual scenario (i.e. the technology is not deployed) results in limited (or no) emissions reduction. Our evaluation of facilitating technologies requires identifying the key barriers to adoption of a decarbonised solution beyond cost e.g. hydrogen leaks (safety and GWP), charging speed for EVs. A technology that removes one or more of these is a facilitating technology.



Stage 4 Term Sheet/Due Diligence

Scientific due diligence, includes the evaluation of:

- What is/are the technology, technical risk factors, patent protection, regulatory issues, IP pathway, novelty, defendability.
- Scientific viability - basic concept, does it check out. Existing understanding of the scientific space.
- Other pathways to the same impact - scientific comparison of other options e.g. electrochemical, thermal etc. What are relative benefits in terms of energy flows, etc.
- Level of skill and experience on the founding team - looking for a deep understanding of the problem space and chosen solution.

Technoeconomic analysis

- Does this have the potential to be the best/cheapest solution?
- Product roadmap - key scientific and technical risk inflection points

Identify other commercial, market, regulatory, team, technical risks that might affect the company's ability to succeed and have the desired impact.

Stage 5 Closing

Not applicable



Pre-Investment

Workflow > **Methodology**

This section refers to [Frame's pre-investment methodology guidance](#). Visit the [Project Frame website](#) and view other related to resources, such as the [Frame glossary](#), to expand your understanding.

Methodologies That Best Align

Frame currently articulates two approaches to assessing impact: [planned](#) and [potential](#) impact.

Potential Impact

Time Frame of Assessment

By 2050

Alignment with Frame's [Values & Principles](#)

Partial Alignment

[Differences with Frame's pre-investment methodology guidance](#)

Our process and metrics are very closely aligned with Frame's pre-investment methodology. In our pre-investment assessment we do not include in-depth LCAs or planned impact calculations. The majority of our investments are in pre-seed companies that are pre-revenue and do not have a finalised product. We do require technoeconomic analysis (TEAs).

[Additionality](#)

We apply additionality. We consider the technology to be additional where we think it will be a better solution than other alternatives. We start with the theory of change for a company/technology— what are the outputs of the technology and how does this lead to emissions reduction? Then we consider what emissions might look like in 2050 in the absence of this technology, taking into consideration changes in market demand and alternative technologies that might partially reduce emissions by 2050. This provides the baseline ensure that additional emissions reductions result from scaling the new technology, as opposed to total emissions reduction including changes in demand / energy efficiency / alternative technology. We acknowledge that our projection is an educated guess and state assumptions, data sources and best available projections.

[Attribution](#)

We do not apply attribution.

Portfolio Stewardship





Portfolio Stewardship

Monitoring > Reporting > Engaging

Summary

How and what is collected from portfolio companies to understand whether they are meeting impact-related expectations.

We do not yet collect impact-related data from portfolio companies. Most of our companies are at the pre-seed, seed stage and so their operational emissions are usually negligible in the early stages of their development.

Evolving Process

How methodology has changed over time and it might still change.

Our process is constantly evolving as our companies mature and grow in size and impact. We plan to do annual reviews to evaluate how portfolio companies are progressing towards impact (green, amber, red grading of progress):

1. We review our Emissions Reduction Potential calculations and assumptions within:
 1. Has the market changed in such a way that would change the impact of Company X's technology.
 2. New competitors
 3. New regulation
 4. Change in baseline assumptions / theory of change
 5. Is the company strategy consistent with achieving the impact outlined in the Emissions Reduction Potential?
 6. Theory of change
 7. Technology
2. How well are the company executing on achieving their impact?
 1. Technical milestones
 2. Team progress/hiring

At a portfolio level we do not have a threshold. in the future we would like to consider portfolio effects and have a portfolio-level goal.



Portfolio Stewardship

Monitoring > **Reporting** > Engaging

Summary

How impact-related information shared with external and internal audiences, and how often.

We share portfolio progress with LPs, and impact-related information where relevant.

How often, if at all, reporting audited by an independent party?

Not audited yet.



Portfolio Stewardship

Monitoring > Reporting > **Engaging**

How we help portfolio companies reach, sustain, or exceed impact expectations.

1. Board seat if lead investor. We will seek a board seat if other co-investors are generalist investors with less of a focus on climate impact so that we can be a voice for climate impact.
2. Introductions to impact-aligned later stage investors who share vision for future emissions reduction. We recognise that the impact of the company will be best preserved by maintaining an aligned climate voice in a position of strength on the cap table as the company grows.

Impact-linked compensation

Tying portfolio manager compensation to impact actions, performance, or specific activities they take to engage companies on impact.

We do not apply impact-linked compensation.

Exit Spotlight





Exit Spotlight

Exit strategy summary

- Seek next stage that have shared values and will carry climate impact as a priority.
- Use voice and that of other investors to maintain impact.

Impact-linked carried interest

Tying carried interest to impact actions, performance, or specific activities taken to engage companies on impact.

We do not apply impact-linked carried interest. We believe that our investment thesis and process means that financial and impact returns are deeply and inextricably interlinked. Our companies will only have the scale of impact we want if they are successful. So, we have chosen not to implement a dual carry hurdle to avoid additional audited reporting which we think is not required. We will continue to evaluate this and monitor the perceived risks.

Lessons Learned





Lessons Learned

Realized Impact

Results and findings to date

None at this time.

Characteristics of Practice or Resources We're Proud Of

We aim to share our thoughts and learning on wider impact (e.g. [diversity](#)), and well as internal research on climate technologies (e.g. [energy storage](#)) on our [website](#).

Case Study





Case Study

NitroFix

Solution Electrochemical ammonia production

Company Name NitroFix

High Emissions Status Quo Replaced Haber-Bosch process ammonia production, which relies on hydrogen, which is primarily produced from fossil fuels through steam methane reforming (SMR).

Direct component; Direct product; Facilitating Direct component

Contributions to GHG Emissions Reductions Lower energy used; less heat required

Use Cases/Applications Fertilizer; Carbon-free fuel

GHG Impact Estimated 0.5 Gt CO₂e

Methodology Used Potential Impact

Company Summary

NitroFix are an Israel-based startup that use a low-energy, low-temperature electrochemical process (inspired by ammonia-synthesising bacteria found in nature). We estimate that the major source of emissions from this process will come from the carbon intensity of the energy used to power the process.



Case Study



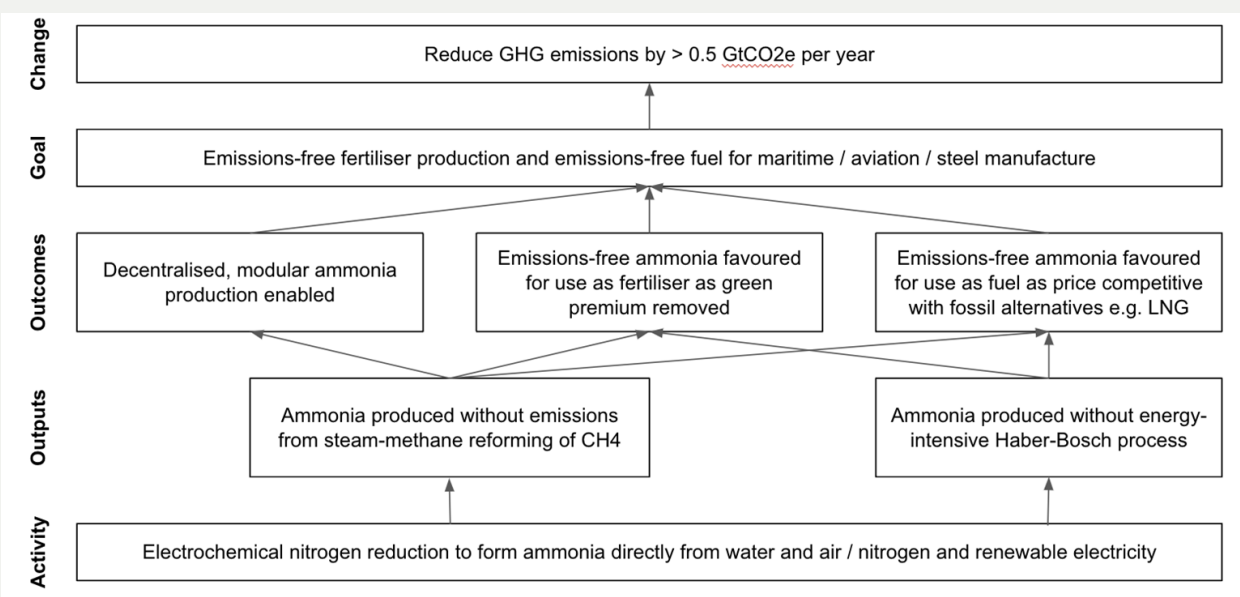
Solution Electrochemical ammonia production

Solution Summary

Direct emissions reduction via electrochemical ammonia production Ammonia (NH₃) holds immense significance as an industrial chemical, primarily used in fertiliser production. While the use of ammonia-based fertilisers is expected to decrease due to associated emissions, ammonia itself can serve as a carbon-free fuel, making it a promising solution for decarbonising critical sectors like cargo shipping and steel furnaces. Because of this demand is expected to more-than-double by 2050.

Currently, ammonia production relies on the Haber-Bosch process, which involves combining hydrogen (H₂) and nitrogen (N₂). This process has a substantial emissions footprint as hydrogen is primarily produced from fossil fuels through steam methane reforming (SMR). Approximately 2.9 kg of CO₂ released for every kilogram of ammonia produced. Using best available technology, that value can be reduced to 1.6 kgCO₂e/kgNH₃.

Theory of Change





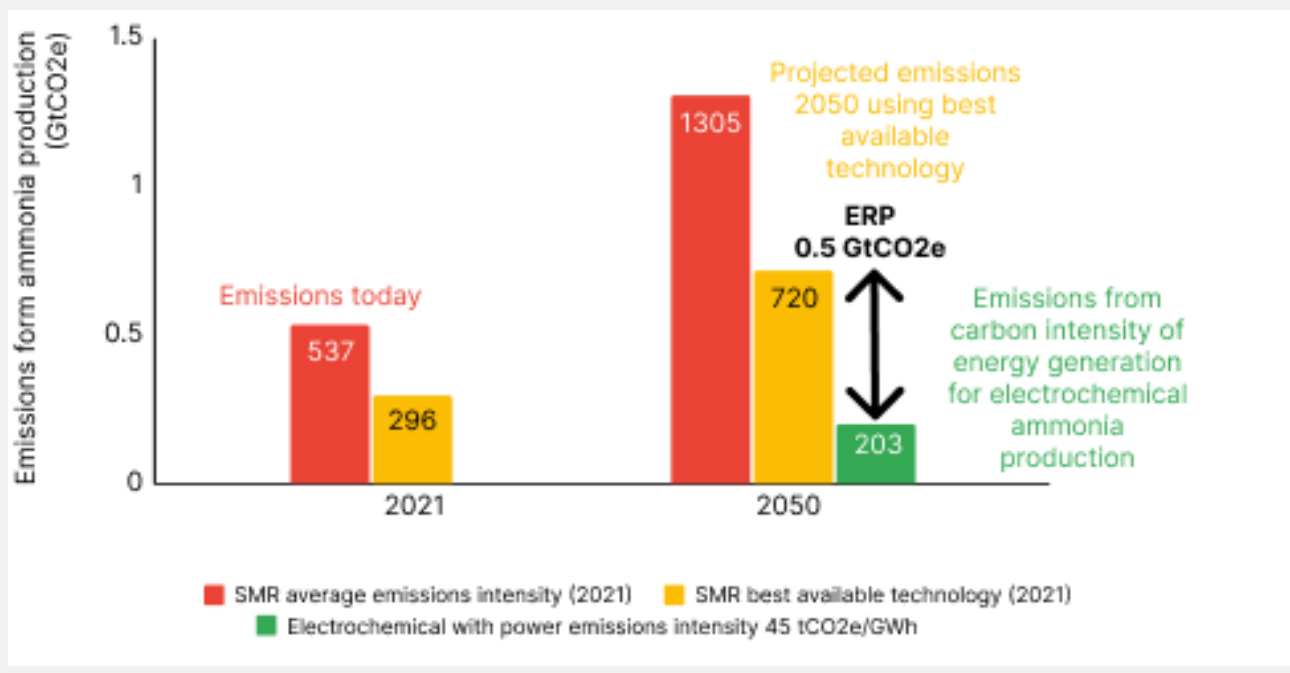
Case Study



Solution Electrochemical ammonia production

GHG Impact Potential

Using estimates for the projected increase in demand for 2050, we estimated the emissions using current best-available technology (yellow). Taking the emissions-intensity of the grid in Sweden (low, but non-zero) we estimate the indirect emissions from electrochemical ammonia production, based on the projected energy required to produce ammonia, resulting in approximately 203 MtCO₂e/year. If powered entirely by renewables, this number would decrease. Potential impact in this case is > 0.5 GtCO₂e/year.





Case Study



Solution

Electrochemical ammonia production

Background Work

Metric	Unit	Value
Ammonia demand 2021	Mt	185
Ammonia demand 2050 (IEA)	Mt	450
Emissions intensity ammonia production (BAT)	kgCO ₂ e/kgNH ₃	1.6
Emissions intensity ammonia production (average)	kgCO ₂ e/kgNH ₃	2.9
Carbon TAM minimum	MtCO ₂ e	296
Carbon TAM 2021	MtCO ₂ e	536.5
Carbon TAM 2050	MtCO₂e	720
Target energy intensity of ammonia production	kWh/kgNH ₃	10
Theoretical minimum	kWh/kgNH ₃	5.5
Grid emissions factor (Sweden)	kgCO ₂ e/kWh	0.045
Grid emissions factor (Europe)	kgCO ₂ e/kWh	0.278
Grid emissions factor (World)	kgCO ₂ e/kWh	0.436
Emissions electrochemical ammonia (Sweden)	MtCO ₂ e	203
Emissions electrochemical ammonia (Europe)	MtCO ₂ e	1251
Emissions electrochemical ammonia (World)	MtCO ₂ e	1962
Emissions intensity electrochemical ammonia (Sweden)	kgCO ₂ e/kgNH ₃	0.45
Emissions ammonia production 2050 (BAT)	MtCO ₂ e	720
Max grid emissions factor to achieve 0.5 GtCO₂e reduction	kWh/kgNH₃	0.05
Emissions from shipping 2022	MtCO ₂ e	667
Carbon TAM 2050 (fertiliser demand 2021 using BAT + shipping – emissions from electrochemical ammonia)	MtCO₂e	761



Case Study



Solution	Niobium anodes for use in Li-ion batteries
Company Name	Echion
High Emissions Status Quo Replaced	Internal combustion engine (ICE) vehicles
<u>Direct component; Direct product; Facilitating</u>	Facilitating
Contributions to GHG Emissions Reductions	Replace gasoline-powered ICE vehicles; accelerate EV adoption via fast-charging electric vehicles (relieving range anxiety)
Use Cases/Applications	Transport
GHG Impact Estimated	0.6 Gt CO ₂ e
Methodology Used	Potential Impact

Company Summary

Echion are developing niobium anodes for use in Li-ion batteries. The inclusion of niobium improves energy-density and charge-speed.



Case Study

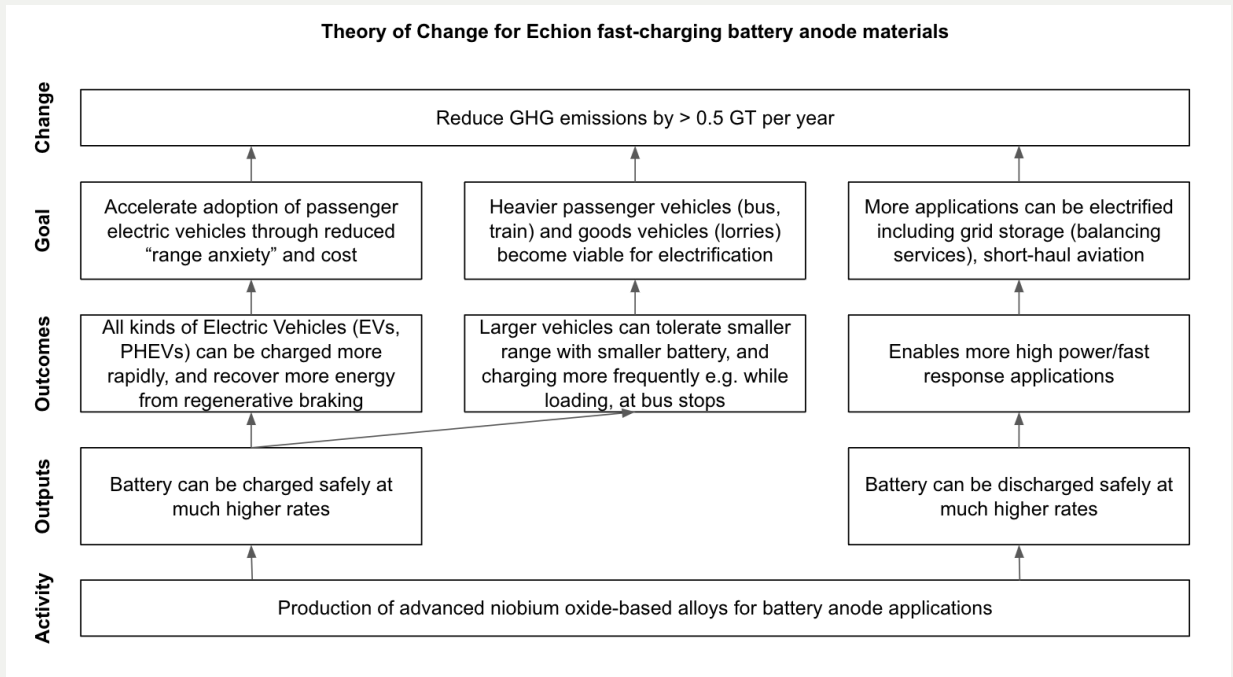


Solution Niobium anodes for use in Li-ion batteries

Solution Summary

EV adoption is already underway. With no further intervention, it will contribute to emissions reduction by 2050. But faster charging will accelerate adoption, and the faster we switch the entire fleet to EVs, the more emissions will be reduced. Including niobium anodes in batteries improves energy-density and charge-speed while maintaining high safety, putting them at a distinct advantage to current anode technologies.

Theory of Change





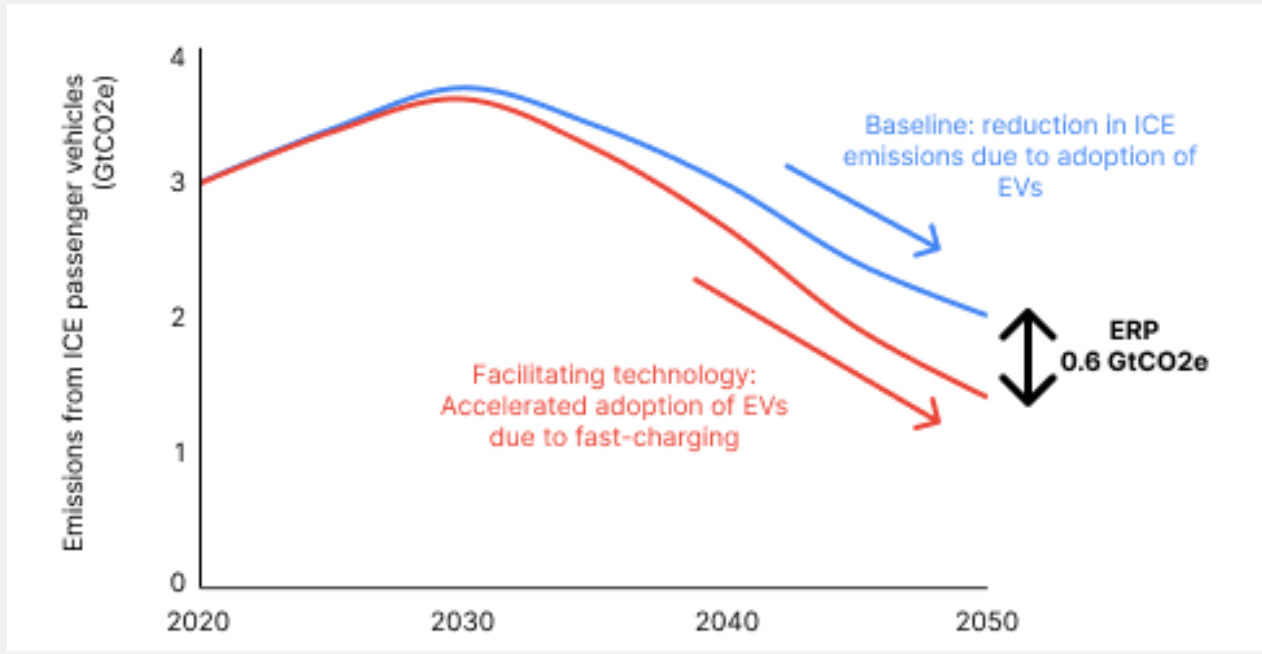
Case Study



Solution Niobium anodes for use in Li-ion batteries

GHG Impact Potential

We believe that EV adoption is already underway and with no further intervention will contribute to emissions reduction by 2050 (see blue line). However, we believe that faster charging will accelerate the adoption of electric vehicles, by relieving range anxiety and increasing the types of vehicles that would be suitable. And the faster we switch the entire fleet to EVs, the more emissions will be reduced. We believe that the accelerated adoption would have an Emissions Reduction Potential of at least 0.5 GtCO_{2e}.





Case Study



Solution Niobium anodes for use in Li-ion batteries

Background Work

Metric	Unit	Value
<u>2020 Emissions from Passenger vehicles</u>	GtCO2e	3
Baseline intensity	GtCO2e / tr miles	0.22
Improvement in fossil fuel efficiency per year	%	1%
Additional adoption	%	20%

Year	2020	2025	2030	2035	2040	2045	2050
<u>EV share distance travelled</u>	1%	3%	10%	20%	35%	50%	60%
<u>Passenger distance forecast (Tr m)</u>	14	17	21	23	26	28.6	31.5
EV Distance (Tr m)	0.14	0.51	2.1	4.6	9.1	14.3	18.9
Fossil distance (Tr m)	13.86	16.49	18.9	18.4	16.9	14.3	12.6
Intensity	0.22	0.21	0.20	0.19	0.18	0.17	0.16
Emissions from fossil fuel cars	3.00	3.39	3.70	3.43	2.99	2.41	2.01
Emissions from fossil fuel cars (accelerated adoption of EVs)	2.99	3.37	3.62	3.25	2.67	1.93	1.41
EV share distance travelled (accelerated adoption)	1%	4%	12%	24%	42%	60%	72%
Savings from accelerated adoption (Gt)	0.01	0.02	0.08	0.17	0.32	0.48	0.60

PROJECT
FRAME
Convened by Prime Coalition

Learn more at
projectframe.how