SUSTAINABLE BUSINESS COP30

# Energy Transition Working Group

## Booklet of Cases

OCTOBER 2025

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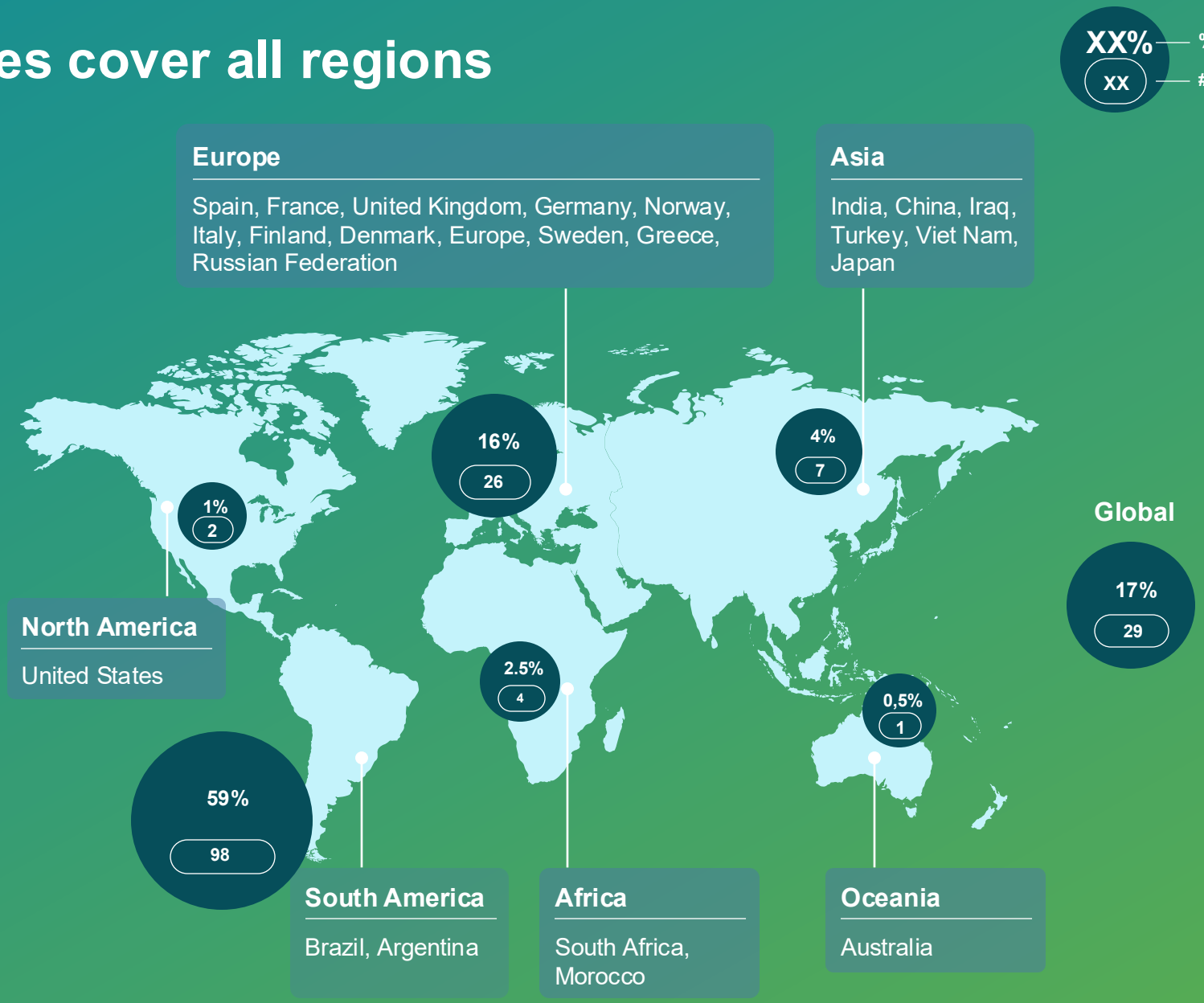
# Introduction & Methodology

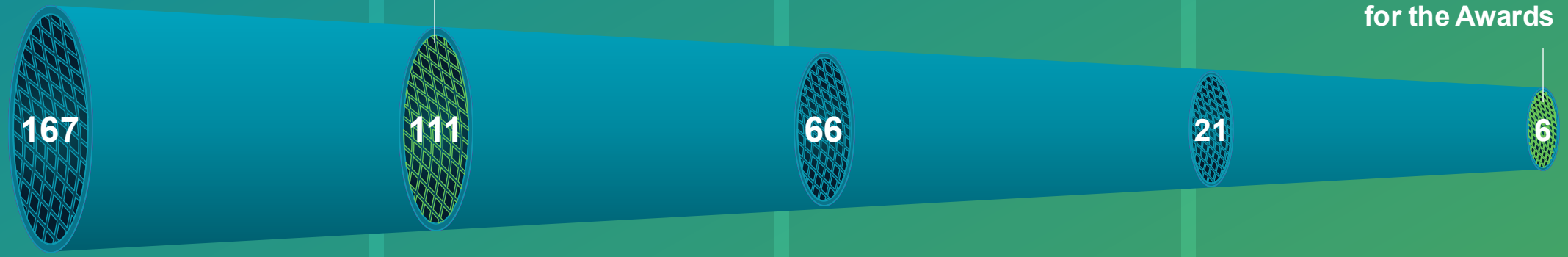
# ~170 cases

received from 23 countries to support the Working Group with tangible action examples

## Cases cover all regions



# A funnel methodology was adopted for the cases selection




CRITERIA

## Screening

Completion of information requested

Cases with all the main information requested in the form

## Assessment

Classification based on 6 criteria

- Emissions impact
- Scalability
- Short-to-medium term implementation (maturity)
- Economic impact
- Innovation
- Alignment with SB COP positioning

## Shortlist

Prioritization based on WG priorities

Degree of alignment with the Energy Transition Working Group priorities in Energy Efficiency, Renewables and Sustainable Fuels

## Voting

Co-Chairs voting on best cases[1]

- Geographical and sector balance
- Relevant economic and emissions impact already in place
- Scalable innovation

1. 2 cases per priority topic

# Top 6 cases selected for the SB COP Awards demonstrate high environmental and economic impact and scalability potential

## Energy Efficiency

### Biomass gasification at new facility
SUZANO

Gasification of black liquor and biomass residues to produce syngas for lime kilns

**+20%** pulp capacity

**~97%** GHG reduction

### VESTA – Energy efficiency in a petrochemical complex
BRASKEM

Redesign of the thermoelectric system with high-efficiency motors and new cogeneration concept

**-15M USD/yr** energy cost

**-100 kt/year** $CO_2e$

## Renewables

### Gralha Azul power transmission line
ENGIE

Federal concession delivering ~1,000 km of transmission lines and 5 substations

**27** municipalities

**-1390 kt/year** $CO_2e$

### Kenhardt hybrid (dispatchable renewable energy facility)
SCATEC

540 MW solar PV plant paired with 225 MW battery system

**+100-120** permanent jobs

**-900 kt/year** $CO_2e$

## Sustainable fuels

### De-risking & scaling waste-to-methanol plant (Ecoplanta)
REPSOL

Treatment of non-recyclable MSW (municipal solid waste) via molecular carbon recycling

**+70%** carbon recovery

**-340 kt/year** $CO_2e$*1

### Hybrid flex-fuel vehicle technology
TOYOTA

First ever hybrid-flex technology merging electrification and biofuel (ethanol)

**+100 k** units sold

**-70%** *2 $CO_2$ emissions

*1 Considering a straight-line of reduction throughout 10 years (-3,4 Mt $CO_2$ e over first 10 years of operations) ; *2 Compared to the same traditional combustion model using gasoline

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# Overview of Cases

# This booklet consolidates the information of all the selected cases

**6**

**Selected cases for the SB COP Awards**

**20**

**Cases of energy Efficiency**

**46**

**Cases of Renewables**

**39**

**Cases of Sustainable Fuels**

In the next pages, we bring more details about each case: overview, maturity and impact

# 1. Top 6

| Case name | Company | Sector | Page |
|---|---|---|---|
| Biomass gasification plant at Suzano's new facility | Suzano S.A. | Energy Efficiency | 19 |
| Improving energy efficiency in a petrochemical complex through a pioneering approach | Braskem | Energy Efficiency | 20 |
| Gralha Azul Power Transmission Line | Engie Brazil | Renewables | 21 |
| Kenhardt Hybrid (Dispatchable Renewable Energy Facility) | Scatec; Partners: H1 Holdings; Lenders: Standard Bank (lead arranger); DFIs: Norfund, BII | Renewables | 22 |
| De-risking and scaling up of a first-of-a-kind (FOAK) waste to methanol project (Ecoplanta) | Repsol | Sustainable Fuels | 23 |
| Hybrid-Flex Fuel Vehicle Technology | Toyota Brazil and Toyota Motor Company | Sustainable Fuels | 24 |

# 2. Energy efficiency cases (1/2)

| Case name | Company | Sector | Page |
|---|---|---|---|
| Automa | GEF Capital, Automa | Energy Efficiency | 26 |
| Commitment to the Logistics of the Future – Sustainable Transition at Serpa Transportation | Serpa Transportation; Grupo Serpa; CQ Circular Consulting; FETCEMG - Federation Of Freight Transport Companies Of Minas Gerais | Energy Efficiency | 27 |
| Decarbonization Pathway: From Extraction to Pellet Feed Production | Itaminas Mining Company S.A. | Energy Efficiency | 28 |
| Decarb Fast Track Programme | METRON (with support from Dalkia, BNP Paribas, and AWS) | Energy Efficiency | 29 |
| Decarbonization Pathways of the Aviation Sector | LATAM Airlines | Energy Efficiency | 30 |
| Driving decarbonization in automotive component production | Gestamp | Energy Efficiency | 31 |
| Energize: Accelerating Renewable Electricity Adoption in the Healthcare Supply Chain | PSCI, Schneider Electric, Amgen, AstraZeneca, Bayer, Bristol Myers Squibb, Chiesi Group, GSK, Johnson & Johnson, MSD; Novartis; Novo Nordisk; Pfizer; Sanofi; Takeda; Teva Pharmaceuticals; Sandoz; Schott; Almirall; Kenvue; United Health Group | Energy Efficiency | 32 |
| Energy Efficiency in Industry | Alfa Laval; Energy Efficiency Movement; 603 Movers | Energy Efficiency | 33 |
| Energy efficiency step-change for air conditioning with SKF magnetic bearings | SKF; HVAC Industry; Users Of Process Or Commercial Cooling | Energy Efficiency | 34 |
| Heat reuse in Data Centers - Sector coupling providing energy efficiency on a system level | Alfa Laval; Fernwärme Fyn; Data Center | Energy Efficiency | 35 |

# 2. Energy efficiency cases (2/2)

| Case name | Company | Sector | Page |
|---|---|---|---|
| A digital tool for Carbon Footprint Calculator (Houston) | Symrise; $CO_2$ AI | Energy Efficiency | 36 |
| Internal investment frame driving mandatory decarbonization | SKF | Energy Efficiency | 37 |
| Investment in electrical mobility and operational fleet electrification | CPFL Energia | Energy Efficiency | 38 |
| ISA Energia Brazil's climate adaptation plan | ISA Energia Brazil | Energy Efficiency, Energy Transition[1] | 39 |
| Particolare Gelateria \| PotencializEE | GIZ, Particolare Gelateria | Energy Efficiency | 40 |
| Process Improvement Teams (PIT) | Solvay | Energy Efficiency | 41 |
| Safety and Sustainability: Innovation in leak detection guaranteeing leak-tightness in SF6 circuit breakers. | Siemens Energy; EHS Decarbonization Committee | Energy Efficiency | 42 |
| Silvertown, Newham | E.ON | Energy Efficiency | 43 |
| TripleE / Excellence in Energy Efficiency project in BASF Brazil and South America | BASF Brazil, BASF Argentina And BASF Chile; São Paulo State University (UNESP) | Energy Efficiency | 44 |
| Vale Mega Hubs | Vale; Steelmakers and local companies where projects are being developed; Local Governments; Banks | Energy Efficiency | 45 |

[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

# 3. Renewables (1/3)

| Case name | Company | Sector | Page |
|---|---|---|---|
| "Sol do Para" Hybridization for remote areas | Siemens Energy | Renewables | 47 |
| 10 years of the BASF Camaçari Acrylic Complex on the path to decarbonization | BASF S.A. | Renewables | 48 |
| Biogas Enrichment via Advanced Separation Techniques | DG Impianti Industriali; University Of Chieti Pescara; University Of Messina | Renewables | 49 |
| Biocharger: Energy & Biochar | Green Farm $CO_2$FREE; AirBurners | Renewables | 50 |
| Biomass Steam in Alagoas -Large-scale renewable energy production | Braskem S.A.; Veolia Environmental Services Brazil Ltda. | Renewables | 51 |
| Caieiras Carbon Credits Project – Largest Waste Treatment Facility in Latin America | Solvi Essencis Ambiental S.A. | Renewables | 52 |
| Cipla's Renewable Energy Transition for Sustainable Manufacturing | Cipla Limited, AMP Solar Power Systems Pvt. Ltd.; AMP Energy Green Eleven Pvt. Ltd.; Clean Max Auriga Power LLP; Juniper Green Cosmic | Renewables | 53 |
| Claro's Energy Program | Claro S.A.; Engie; GDSUN; Solargrid; Green Yellow | Renewables | 54 |
| Clean Modes, iFood Pedal and Emissions | iFood | Renewables | 55 |
| Combating Energy Poverty through the Democratization of Solar Energy in Low Income Communities | Neoenergia Coelba; Municipal Government Of Salvador | Renewables | 56 |
| Contribution to the Renewable Energy Matrix | Grupo Iquine | Renewables | 57 |
| Coya BESS Project | Engie Energia Chile; CEN - Chilean National Energy Coordinator; City Of Maria Elena | Renewables | 58 |
| DAC.SI Project | Pontifical Catholic University Of Rio Grande Do Sul; Repsol Sinopec Brazil | Renewables | 59 |
| Decarbonization Due Diligence Assessment (DDA) | Siemens Energy | Renewables, Energy Transition[1] | 60 |
| Decarbonization of industrial manufacturing facility through waste heat recovery | SLB; Fuel Sustainability; ANP; MME | Renewables | 61 |
| Decarbonx | Angara Global Ltd. | Renewables | 62 |
| Defy Solar Off-Grid Refrigerator Project | Beko; Accredited Solar Installers; Defy Appliances (South Africa) | Renewables | 63 |



[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

# 3. Renewables (2/3)

| Case name | Company | Sector | Page |
|---|---|---|---|
| Driving the Energy Transition: Carbon Footprint and Decarbonization Pathways in the Brazilian Coatings Industry | ABRAFATI - Brazilian Coatings Manufacturers Association ; ATA Environmental Consulting; Akatu Institute | Renewables, Energy Transition[1] | 64 |
| Drought Free World Crisis | Partimer Inc.; Global Economic Impact Forum; Lakshmi LLC | Renewables | 65 |
| Electrification of Boilers | Alcoa, Industrial Transition Accelerator (ITA) / Mission Possible Partnership (MPP) | Renewables | 66 |
| Electrolux Group Climate Leadership | Electrolux Group | Renewables, Energy Transition[1] | 67 |
| Energia do Amanhã Program | Grupo Boticário | | 68 |
| Eoliennes Flottantes du Golfe du Lion (EFGL) | Engie, Ocean Winds; Engie; EDP Renewables; Banque Des Territoires; ECOCEAN; Gulf Of Lion Marine Natural Park; University Of Perpignan; Marine Ecosystem Research Center; Principle Power | Renewables | 69 |
| Fighting methane emissions: Italgas Strategy to contain GHG | Italgas; CIG - Italian Gas Committee; ARERA - Italian Energy Regulatory Authority; UNEP OGMP 2.0 | Renewables | 70 |
| Full decarbonization in the manufacturing of the API for Aspiring | Bayer Hispania | Renewables | 71 |
| Golden Valley Wind Energy | Engie; Thebe | Renewables | 72 |
| Key for a Net-Zero Future - Unlocking Africa's potential in clean hydrogen and sustainable food systems | OCP Nutricrops; Hydrojeel | Renewables | 73 |
| Green Hydrogen Value Chain Development Program in Rio Grande do Sul (H2V-RS) | InvestRS; Department Of Environment And Infrastructure - State Government Of Rio Grande Do Sul; Governor's Office - State Government Of Rio Grande Do Sul; Civil House - State Government Of Rio Grande Do Sul | Renewables | 74 |
| Harnessing tidal power with robust drive train solutions | SKF; Local Government Organization; European Union Organization For Financial Support (Cf Green Deal) | Renewables | 75 |
| Hazelwood Rehabilitation Project | Engie; Mitsui & Co. Ltd.; Fluence; Eku Energy; Local Aboriginal Representation (GLAWAC); Community Groups; Local Council; Australian Minister For Environment; Victorian Minister For Environment, Minister For Resources, Minister For Water | Renewables | 76 |
| Huaneng "Yellow Sea No.1": China's First Wave-Resistant Floating Offshore Photovoltaic Platform | World Economic Forum, China Huaneng Group | Renewables | 77 |
| Industrial Heat Pumps with Ceramic and Magnetic Bearings - a way to decarbonize operations | SKF in collaboration with research institutes | Renewables | 78 |
| Innovation and sustainability for a Net Zero future: The role of new technologies and regulatory challenges | Siemens Energy (SE) | Renewables | 79 |
| Jirau Hydropower Plant. | Engie (40%); Eletrobras (40%); Mitsui (20%) | Renewables | 80 |



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# 3. Renewables (3/3)

| Case name | Company | Sector | Page |
|---|---|---|---|
| New e.Solvay soda ash manufacturing process | Solvay | Renewables | 81 |
| Noronha Verde Project | Neoenergia | Renewables | 82 |
| Northern Lights | Equinor | Renewables, Hard to abate, Energy Transition[1] | 83 |
| Rotor Sails | VALE | Renewables | 84 |
| Solar project in Turkey | UK Export Finance; KUKE; Kalyon Enerji; Standard Chartered Bank | Renewables | 85 |
| Sustainability is to innovate: eutectic plates | Mondelez Brazil; Tecpet | Renewables | 86 |
| Technology Reduces Emissions in the LNG Sector: Innovations for Sustainability | Petrobras; Excelerate Energy; Wärtsilä Gas Solutions (WGS) | Renewables | 87 |
| Ternium´s first wind farm (Vientos Olavarria) | Ternium Argentina S.A.; Tecpetrol (Energy Transition Division); Vestas; Techint Engineering And Construction | Renewables | 88 |
| The world's first non-oil based jet fuel, compatible with existing aircraft | LanzaTech | Renewables | 89 |
| Transition from natural gas boiler to a biomass boiler, reducing by 40% the current $CO_2$ emissions of Solvay Paulínia Site in Brazil. | Solvay; Combio | Renewables | 90 |
| Tractors 100% electric | YAK Electric Tractors | Renewables | 91 |
| Uberaba Green Fertilizer (UGF) | Atlas Agro Brasil Fertilizantes, Industrial Transition Accelerator / Mission Possible Partnership; Brazilian Investment Platform (BIP); ABIHV - Brazilian Hydrogen Industry Association; SInprifert - Fertilizer Raw Material Producers Association; Macquarie Asset Management; National Council For Fertilizers And Plant Nutrition | Renewables | 92 |



[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

# 4. Sustainable fuels (1/3)

| Case name | Company | Sector | Page |
|---|---|---|---|
| 100% Sustainable Route | Binatural; Catto Transportes; DAF | Sustainable fuels | 94 |
| Andalusian Green Hydrogen Valley | Moeve | Sustainable fuels | 95 |
| Be8 BeVant®: Renewable Biofuel for a Low-Carbon COP30 | Be8 | Sustainable fuels | 96 |
| BECCS FS Project | Fueling Sustainability | Sustainable fuels | 97 |
| Biofuels in Alagoas: the potential of local energies in the decarbonization of industries | Veolia; Braskem; Grune Energies By Veolia | Sustainable fuels | 98 |
| Biogás RS Program: boosting biogas production and waste-to-energy solutions through biodigesters in Rio Grande do Sul | InvestRS; Department Of Economic Development - State Government Of Rio Grande Do Sul; Department Of Environment And Infrastructure - State Government Of Rio Grande Do Sul | Sustainable fuels | 99 |
| Biomethane for the Energy Transition: Zeg Biogás & Aroeira Case | Zeg Biogas e Energia S.A.; Zeg Biogás Aroeira SPE Ltda; Bioenergética Aroeira S.A.; BDMG | Sustainable fuels | 100 |
| Biomethane implementation in a stamping automotive plant | General Motors | Sustainable fuels | 101 |
| BP bioenergy Regenerative Agriculture Program | BP Bioenergy | Sustainable fuels | 102 |
| Building trust in the transition to clean transport to reduce $CO_2$ emissions | Energy Distributors; Charging Point Manufacturers; Charging Point Operators | Sustainable fuels | 103 |
| Cemvita FermWorks : Turning Waste Into Low-Carbon Value | Cemvita Inc.; InvestRS | Sustainable fuels | 104 |
| $CO_2$CHEM – Development of Technological Alternatives for Production of Green Hydrocarbons from $CO_2$ | Repsol Sinopec Brazil; Senai Firjan; University Of São Paulo (USP); Hytron (Neuman & Esser Group) | Sustainable fuels | 105 |
| De-risking and scaling up of synthetic fuel production | Repsol, Several Private Companies | Sustainable fuels | 106 |

# 4. Sustainable fuels (2/3)

| Case name | Company | Sector | Page |
|---|---|---|---|
| Decarbonization mining and railroad at Vale trough Biodiesel | Vale | Sustainable fuels | 107 |
| Decarbonizing Aviation with e-SAF | SAF+ INTERNATIONAL GROUP | Sustainable fuels | 108 |
| Decarbonizing Steel industry – Green HBI hub Brazil | BNDES - National Bank For Economic And Social Development; Vale; Green Energy Park | Sustainable fuels | 109 |
| Elephant grass as alternative to recover degraded lands and mitigate $CO_2$ emissions through the substitution of fossil fuels in Cement Production | Ciplan; EMBRAPA - Brazilian Agricultural Research Corporation | Sustainable fuels | 110 |
| Energy Transition \| How the cement industry is transforming and becoming a solution for waste mng | All Cement Companies In The Sector; Brazilian Portland Cement Association | Sustainable fuels | 111 |
| Ethanol Reformer: Development and technological upscaling to produce 500 Nm3/h of Low Carbon Hydrogen | Hytron - Energy And Industrial Gases Ltda.; Shell Brazil Petroleum Ltda.; ANP - National Petroleum, Gas And Biofuels Agency; FIRJAN - Federation Of Industries Of The State Of Rio De Janeiro; Raízen Energia S.A. | Sustainable fuels | 112 |
| France KerEAUzen | Engie; Air France - KLM; Haropa Port; Normandy Region; Just Transition Fund | Sustainable fuels | 113 |
| From Pilot to Impact: Scaling HVO for a Low-Carbon Future | Ferrovial; Repsol; Massachusetts Institute Of Technology (MIT) | Sustainable fuels | 114 |
| From Waste to Energy - Autonomous and Affordable Energy for our Communities | Engie Brazil; Brazilian Association Of Biogas And Biomethane; Engie Foundation; Biomovement; Energy Assistance France | Sustainable fuels | 115 |
| Fueling the Future: Biofuel Integration from the Ground Up | Volkswagen Truck & Bus; Vibra Energia | Sustainable fuels | 116 |
| Green Puffs: Green Inhalers with Near-Zero Climate Impact | Lupin Limited | Sustainable fuels | 117 |
| Greenbound - Decarbonizing our operations | L'Oréal | Sustainable fuels | 118 |
| Harvesting the Future: Ethanol-Powered Agricultural Machinery | CNH Latin America | Sustainable fuels | 119 |

# 4. Sustainable fuels (3/3)

| Case name | Company | Sector | Page |
|---|---|---|---|
| Intermediate Corn Crop Ethanol | Fueling Sustainabiliy | Sustainable fuels | 120 |
| Macauba, from seed to fuel, an innovative and sustainable energy solution | Acelen Renewables | Sustainable fuels | 121 |
| Macrofuel - Energy use of pyrolytic bio-oil from aquatic macrophytes for biofuel production | Senai Institute Of Innovation In Biomass; CTG Brazil | Sustainable fuels | 122 |
| MDC Energia and its biomethane projects: transforming waste into sustainable fuel for the future | MDC Energia | Sustainable fuels | 123 |
| Natural gas replacement using biomethane from a landfill at stationary combustion sources at Ternium´s integrated steel plant | Ternium Brazil; Gas Verde | Sustainable fuels | 124 |
| New Holland Biomethane Tractor and Ecosystem | CNH - New Holland; Sebigas Cotica; Air Liquide; Gas Futuro; Geoenergética; 3DI; Master Biogas; PlanET | Sustainable fuels | 125 |
| P2X Solutions Harjavalta | P2X Solutions Oy | Sustainable fuels | 126 |
| Pelletizing decarbonization at Vale through Biomethane | Vale | Sustainable fuels | 127 |
| Reduction in the Use of Fossil Fuels | Grupo Iquine | Sustainable fuels | 128 |
| Scaling up renewable fuels production to allow progressive substitution of conventional fuels for transport. | Repsol | Sustainable fuels | 129 |
| Technical-Scientific Studies for $CO_2$ Geological Storage in Deep Saline Aquifers of the Paraná Basin | Geological Survey Of Brazil; Petrobras; Fundação De Apoio Ao Desenvolvimento Da Computação Científica (FACC) | Sustainable fuels, Energy Transition[1] | 130 |
| Volkswagen Meteor Hybrid Truck – Sustainable technology | Volkswagen Truck & Bus; Suspensys | Sustainable fuels | 131 |
| Volkswagen Truck Fuel Flex: moved by 100% Brazilian Biofuel | Volkswagen Truck & Bus; JBS; Be8; MWM; Vibra Energia | Sustainable fuels | 132 |



[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

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# Portfolio of Cases

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# Portfolio of Cases

## Awards

Suzano

# Biomass gasification plant at Suzano's new facility

**Energy Transition case selection**

Brazil

**Energy Efficiency**

**TOP 6**

## Overview

### Case objectives

Suzano's new facility in Ribas do Rio Pardo was engineered to utilize syngas from biomass gasification, reducing GHG emissions by up to 97% and advancing SBTi, efficiency, and clean energy goals.

### Institutions Involved

Suzano S.A.

### WG Alignment

Energy Efficiency, Sustainable Fuels, Biogas

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Biomass supply and ROI uncertainty may impact performance and scalability

### Scalability

The biomass gasification model is scalable to other industrial units, enabling significant GHG reductions, energy self-sufficiency, and circularity

## Impact

### Innovative Drive

The project leverages large-scale biomass gasification to replace fossil fuels with renewable syngas. It integrates GHG emissions reduction, reinforces the role of biomass as an important renewable fuel, and applies cutting-edge technology to drive sustainable industrial innovation

### Economic Impact

Boosts Suzano's pulp capacity by 20%, strengthens local supply chains, and enhances logistics efficiency

### $CO_2$ Impact

Reduced fossil emissions from lime kilns by ~97%

Vesta

# Improving energy efficiency in a petrochemical complex through a pioneering approach

**Energy Transition case selection**

Brazil

**Energy Efficiency**

**TOP 6**

## Overview

### Case objectives

Redesign of the thermoelectric system at the ABC Petrochemical Complex, replacing low-efficiency steam turbines with high speed and high-efficiency motors, supported by a new cogeneration concept

### Institutions Involved

Braskem

### WG Alignment

Energy Efficiency and Heat ,Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Techno risks due to burning high H2 content fuel (>60% vol.) in a cogeneration, and complexity of electrification projects

### Scalability

project design can be applied in all replacements of low to high efficiency thermal systems

## Impact

### Innovative Drive

The cogeneration counts on a partnership between Siemens and Braskem resulting in an integrated plant design running on residue gas w/ high concentrations of H2. The motorizations implemented by GE use high speed motors to solve old assets challenges

### Economic Impact

According to Braskem´s financial metrics, the project has a low payback, positive NPV and ensures a reduction of more than 15 MMUS$/year in the energy cost of the Complex

### $CO_2$ Impact

The project aims to reduce 100kt/year of $CO_2e$ in the site's GHG emissions by decreasing natural gas and grid electricity consumption, and replacing old generation technologies with more efficient ones

**External Links**

Link 01 Link 02

Engie

# Gralha Azul Power Transmission Line

**Energy Transition case selection**

Brazil

**Renewables**

**TOP 6**

## Overview

### Case objectives

Federal BOOT concession with 1,000 Km and 5 new Substations. Part of the Brazil National Interconnected System – improving renewable energy supply in Paraná State (including from Itaipú)

### Institutions Involved

Engie Brazil

### WG Alignment

Renewables, Energy Efficiency, Transpass cost barrier and Public-private collaboration

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Regulatory and financing assumptions mismatches; socio-environmental concerns. Comment: The concession scheme for transmission lines concessions n Brazil allows experienced investors-operators to prepare reliable business plans before concession auctions

### Scalability

Federal Transmission Lines Concession Program, which grants investors 30-year BOOT contracts for greenfield projects through public auctions

## Impact

### Innovative Drive

The launching of cables through drones allowed the decrease of trees suppression in 50%, in comparison with the amount approved in the Environmental License

### Economic Impact

The concession scheme is attractive for private investor-operators, as all lots in every auction are successfully granted. The scheme allows long term financing through BNDES and debentures. It promotes power security, tariffs moderateness and reduce the risk of curtailments in the System

### $CO_2$ Impact

Estimated 1.39 $MtCO_2eq$/year avoided, through the connection of 27 municipalities to the National Interconnected System

Scatec

# Kenhardt Hybrid (Dispatchable Renewable Energy Facility)

**Energy Transition case selection**

South Africa

**Renewables**

**TOP 6**

## Overview

### Case objectives

Installed solar PV of 540 MW and BESS capacity of 225MW, this project delivers 150 MW of dispatchable power from 5 am to 9.30 pm, year-round, on 20-year PPA

### Institutions Involved

Scatec; Partners: H1 Holdings; Lenders: Standard Bank (lead arranger); DFIs: Norfund, BII

### WG Alignment

Renewables, PV, BESS

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Operational Risk (e.g. battery dispatch and degradation challenges, weather variation, HSSE requirements, etc.)
Environmental Risk (e.g. soiling, dust, waste, weather events, HSSE requirements, etc.)
Social Risk (e.g. site disruptions, mismatch of project expectations, etc.

### Scalability

Impact grows with widespread adoption – first utility scale dispatchable (renewable) solar facility in Africa, LATAM and Europe

## Impact

### Innovative Drive

Kenhardt leads as Africa's first and largest utility scale solar-battery dispatchable hybrid facility, delivering baseload renewable capacity. Delivered in 18 months from financial close, this project was won in a technology agnostic tender

### Economic Impact

Strong returns via 20-year PPA, with a healthy IRR and positive NPV. Job creation (3100 peak construction – 13% women; permanent 100 – 120, approx. 39% women), supply chain development, and skills development.

### $CO_2$ Impact

Estimated 900 000 tons of $CO_2$ avoided annually

**External Links**

Link 01 Link 02

Repsol

# De-risking and scaling up of a first-of-a-kind (FOAK) waste to methanol project (Ecoplanta)

**Energy Transition case selection**

Spain

**Sustainable Fuels**

**TOP 6**

## Overview

### Case objectives

The ECOPLANTA project will manage non-recyclable municipal solid waste (and also forestry and agricultural waste) to produce circular chemicals and advanced biofuels, recovering over 70% of the carbon and reducing GHG emissions

### Institutions Involved

Repsol

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Variability in feedstock supply and quality, technology immaturity, risks of not achieving yields and product quality, higher than expected CAPEX and market risk

### Scalability

The ECOPLANTA project proposes a scalable and replicable methanol production plant from waste

## Impact

### Innovative Drive

Ecoplanta will recover large amounts of MSW rejects, reducing $CO_2$ emissions, and enabling low-carbon production of circular methanol and bio-methanol. It is the next step in demonstrating the waste-to-chemicals process at commercial scale as the first waste-to-fuel plant in Europe to implement molecular carbon recycling

### Economic Impact

Ecoplanta aligns with private sector goals through solid returns and cost-effective implementation. Efficiency, market demand, scalability, financing options, government incentives, and turnkey solutions make it financially attractive and sustainable

### $CO_2$ Impact

Based on the Innovation Fund methodology, the project will achieve 3.4 Mt $CO_2$eq of GHG emissions reductions over the first ten years of operation

**External Links**

Link 01

Toyota

# Hybrid-Flex Fuel Vehicle Technology

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

**TOP 6**

## Overview

### Case objectives

Creation of a scalable hybrid-flex technology for light vehicles that merge electrification and biofuel (ethanol), cutting transport $CO_2$ with a drop in solution while helping countries to achieve Paris Climate Agreement

### Institutions Involved

Toyota Brasil and Toyota Motor Company

### WG Alignment

Sustainable Fuels, Energy Efficiency

## Case Maturity

### Case Stage

Mature, generating stable results with more than 100k units sold

### Risks Involved

Duty-free access for imported and subsidized electrified vehicles represent an unfair competition to local production and could slow local scale-up

### Scalability

Other companies announced investments in the same technology in Brazil and other countries

## Impact

### Innovative Drive

World's first-ever hybrid-flex-fuel system combines BEV-like efficiency with no chargers, developed in Brazil and tested in countries like India, Indonesia, and Colombia, adapting to local infrastructure and income without altering customer habits

### Economic Impact

For the customers themselves it's possible to save 20%-40% of fuel. Besides that, no public investment in automotive chargers, transmission lines, energy generation is necessary

### $CO_2$ Impact

The hybrid-flex vehicle on ethanol reduces up to 70% $CO_2$ comparing to the same traditional combustion model using gasoline. Considering the whole vehicle cycle (cradle to grave), it brings a strong and real decarbonization impact

**External Links**

Link 01 | Link 02

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# Portfolio of Cases

## Energy Efficiency

GEF Capital

# Automa

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Deploy digital solutions that improve efficiency across renewable-energy generation, transmission, and distribution systems

### Institutions Involved

GEF Capital, Automa

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Mature, generating stable results

### Scalability

Digital solutions reduce emissions and improve efficiency in grids, scalable across utilities and geographies

## Impact

### Innovative Drive

Developed for Brazil's clean matrix, Automa's tech is now exported to Europe, proving global relevance of Brazil as a climate tech leader.

### Economic Impact

Automa tripled in size since investment, with strong margins and no debt, proving financial resilience.

### $CO_2$ Impact

Automa helped avoid 31,696 $tCO_2e$ in 2024 through grid optimization and efficiency improvements across 44.9?GW of monitored renewable energy capacity

**External Links**

Link 01 | Link 02

Serpa

# Commitment to the Logistics of the Future – Sustainable Transition at Serpa Transportation

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Reduce carbon emissions and advance sustainable logistics through energy transition, digitalization, and environmental certification by 2030

### Institutions Involved

Serpa Transportation; Grupo Serpa; CQ Circular Consulting; FETCEMG - Federation Of Freight Transport Companies Of Minas Gerais

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Regulatory fluctuations, high costs of new technologies, weak electrification infrastructure, resistance to change, and remote logistics challenges

### Scalability

The methodology can be replicated by other carriers, reducing $CO_2$ emissions through fleet certification, renewable energy, and digitalization, aligned with the Paris Agreement

## Impact

### Innovative Drive

Pioneering integration of the Despoluir Seal in the fleet, large-scale use of solar energy, and operational digitalization, advancing sustainable practices in the logistics sector

### Economic Impact

Positive returns through operational cost reductions and reputational gains; costs are controlled and aligned with the budget, with potential for expansion

### $CO_2$ Impact

Certified fleet with the Despoluir Seal, with an estimated 30% emissions reduction in the diesel fleet, based on internal inventory methodology, renewable energy, and CNT protocols

**External Links**

Link 01 | Link 02

Itaminas

# Decarbonization Pathway: From Extraction to Pellet Feed Production

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Expand Itaminas' plant to produce high-grade pellet feed, reducing consumption and $CO_2$ emissions per ton in the steel value chain

### Institutions Involved

Itaminas Mining Company S.A.

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Licensing delays, construction operational challenges, and market fluctuations

### Scalability

The process route can be replicated by several mining companies with small adjustments, helping reduce $CO_2$ emissions and optimize natural-resource use at scale

## Impact

### Innovative Drive

Technology that combines high-pressure grinding rolls (HPGR) with two separation methods to better utilize low-grade ores, increasing recovery and reducing energy consumption

### Economic Impact

Higher iron content and increased pellet-feed production add product value and reduce costs in the steel chain; NPV US$3.334M, margin 55%, payback 5.0 years after the last investment phase

### $CO_2$ Impact

$CO_2$ reduction in the steel value chain by increasing ore grade, which improves steel mill efficiency; measurement performed using a recognized emissions inventory

METRON

# Decarb Fast Track Programme

**Energy Transition case selection**

France

**Energy Efficiency**

## Overview

### Case objectives

Accelerate industrial decarbonization: Save 100,000 tons of $CO_2$ by equipping industrial sites with energy management and optimization solutions, expert support, and a community to exchange best practices

### Institutions Involved

METRON (with support from Dalkia, BNP Paribas, and AWS)

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Low use of software, CAPEX investment funding, low digital maturity (difficult to reduce $CO_2$ emissions on site with low digital maturity), energy price volatility, change/culture management

### Scalability

DFT Institute expands community, implements solutions on more sites, and replicates programs in different regions

## Impact

### Innovative Drive

First European community for industrial decarbonization through efficient energy management

Accessibility to advanced energy management and optimization tools and expert support thanks to subsidies

### Economic Impact

Energy savings translated into financial savings.
Saved time thanks to intelligent solution and improved efficiency can be invested into more ROI projects.
More production with less energy consumption

### $CO_2$ Impact

63, 000 $tCO_2$ of 100, 000 target saved so far through 100 projects, improved energy management and optimization in real-time, reduced energy consumption, faster reaction time: improved efficiency and reduced energy waste (e.g. alerts)

**External Links**

Link 01 | Link 02

LATAM Airlines

# Decarbonization Pathways of the Aviation Sector

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Apply operational and fleet measures to reduce $CO_2$ and fuel intensity, in line with ICAO/CORSIA and national climate targets

### Institutions Involved

LATAM Airlines

### WG Alignment

Energy Efficiency, Sustainable Fuels, Aviation Sector

## Case Maturity

### Case Stage

Mature, delivering stable and progressive outcomes

### Risks Involved

Over uncertain regulation limited local SAF supply, and lack of regulatory harmonization may restrict carbon credits, hinder the 5% SAF target by 2030, and increase costly aviation compliance burdens

### Scalability

The case outlines a modular approach adaptable to different airline contexts through SAF adoption and operational levers

## Impact

### Innovative Drive

It integrates efficiency measures such as more efficient fleets and routes, the use of electric ground support equipment, and intelligent fuel management systems

### Economic Impact

Aircraft fuel costs decreased by 10.6% compared to the same period in 2024, driven by a 16.1% reduction in the average price of jet fuel (including hedges) and a 6.5% increase in fuel consumption associated with the expansion of operations

### $CO_2$ Impact

Since 2010, the Fuel Efficiency Program has helped LATAM avoid over 5.6 million tons of $CO_2$. In 2024, operational improvements reduced 98,000 tons of $CO_2$. LATAM enhanced the program by implementing fleet-wide performance monitoring software, targeting an additional annual reduction of 8,000 tons of $CO_2$

**External Links**

Link 01 | Link 02

Gestamp

# Driving decarbonization in automotive component production

**Energy Transition case selection**

Spain

**Energy Efficiency**

## Overview

### Case objectives

Advancing the energy transition in component manufacturing by reducing emissions through efficiency, electrification, and renewable energy

### Institutions Involved

Gestamp

### WG Alignment

Energy Efficiency, Renewables, Renewable Heat and Public-Private Collaboration

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Regulatory changes and energy price volatility

### Scalability

The case can be replicated across the automotive sector, driving significant emissions reductions and resource efficiency

## Impact

### Innovative Drive

It integrates advanced technologies for furnace and boiler electrification, biofuel feasibility study, on-site renewables, and energy management systems.

### Economic Impact

Investments show strong returns, boosted by government incentives and the CAEs program.

### $CO_2$ Impact

41.8% $CO_2$ emissions reduction* *2024 vs. 2018 data for Scopes 1&2

**External Links**

Link 01

Schneider Electric

# Energize: Accelerating Renewable Electricity Adoption in the Healthcare Supply Chain

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Accelerate renewable electricity adoption in the healthcare supply chain to reduce Scope 3 emissions and support the goals of the Paris Agreement through supplier education and collaboration.

### Institutions Involved

PSCI, Schneider Electric, Amgen, AstraZeneca, Bayer, Bristol Myers Squibb, Chiesi Group, GSK, Johnson & Johnson, MSD; Novartis; Novo Nordisk; Pfizer; Sanofi; Takeda; Teva Pharmaceuticals; Sandoz; Schott; Almirall; Kenvue; United Health Group

### WG Alignment

Energy Efficiency; Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Market availability of renewable electricity, regulatory uncertainty in some regions, supplier creditworthiness, complexity of PPA contracts, voluntary participation limits uptake

### Scalability

Designed for replication across industries/geographies. Education is on-demand via Zeigo Hub platform. Live webinars available in 60+ languages. Suppliers can purchase renewable energy as solo buyer or combine electricity demand to buy as group.

## Impact

### Innovative Drive

Pioneer a multi-buyer PPA model for supply chains, combining digital education, aggregated procurement, and expert support. It bridges access gaps for SMEs and accelerates Scope 3 decarbonization through scalable collaboration.

### Economic Impact

Energize enables cost-effective renewable electricity procurement through aggregated buying power, reducing costs for suppliers. Group PPAs improve contract terms and mitigate credit risk, aligning with private sector ROI and decarbonization goals.

### $CO_2$ Impact

435,543 $tCO_2$/year avoided over 10 years. Considering contracted energy volume + Spain's location-based emissions factor (170.4 g $CO_2$/kWh converted to metric tons $CO_2$/GWh; IEA, Emissions Factors 2024).

**External Links**

Link 01 | Link 02 | Link 03 | Link 04

Alfa Laval

# Energy Efficiency in Industry

**Energy Transition case selection**

**Energy Efficiency**

## Overview

### Case objectives

Accelerate industrial energy efficiency to cut $CO_2$ by one-third, boost investments to $1.8T by 2030, and drive innovation through global collaboration with 600+ movers in the Energy Efficiency Movement

### Institutions Involved

Alfa Laval, Energy Efficiency Movement; 603 Movers

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Very low risks involved

### Scalability

The Energy Efficiency Movement is highly scalable and works hands-on with energy efficiency in industry

## Impact

### Innovative Drive

Systematic way to work with energy efficiency

### Economic Impact

We must double the speed of energy-efficiency improvements to above 4% and triple efficiency-related investments to USD 1.8 trillion by 2030 by working across the value chain, fostering public-private collaboration, and raising awareness

### $CO_2$ Impact

The industry accounts for about 40% of global energy use and one-third of global carbon dioxide ($CO_2$) emissions. 15% of industry costs can be decreased through energy efficiency within two years

**External Links**

Link 01 Link 02

SKF

# Energy efficiency step-change for air conditioning with SKF magnetic bearings

**Energy Transition case selection**

**Energy Efficiency**

## Overview

### Case objectives

More than 10% of global $CO_2$ emissions are from the use of HVAC systems; up to 30% energy savings can be made by shifting away from conventional compressor technology to high-speed magnetic bearings

### Institutions Involved

SKF; HVAC Industry; Users Of Process Or Commercial Cooling

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

No significant risks as this is now a mature technology

### Scalability

Fully scalable and will lead to significant emission reductions

## Impact

### Innovative Drive

High-speed magnetic-bearing technology enables a shift away from conventional compressors to achieve much higher efficiency

### Economic Impact

This case aligns well with private-sector ROI requirements

### $CO_2$ Impact

Since 2015, magnetic chillers have avoided 2.9 $MtCO_2e$ due to energy efficiency; projections show a further 12 $MtCO_2e$ can be avoided by 2030 with wider adoption

**External Links**

Link 01

Alfa Laval

# Heat reuse in Data Centers - Sector coupling providing energy efficiency on a system level

**Energy Transition case selection**

Denmark
**Energy Efficiency**

## Overview

### Case objectives
Reusing heat from data centers cuts $CO_2$ emissions, saves energy, and supports sustainable heating—turning waste into a valuable resource for greener cities and greater energy efficiency

### Institutions Involved
Alfa Laval; Fernwärme Fyn; Data Center

### WG Alignment
Energy Efficiency

## Case Maturity

### Case Stage
Mature, generating stable results

### Scalability
The data center sector is growing rapidly due to AI and digitalization; according to the IEA, global electricity use by data centers is expected to more than double by 2026, rising from 460 TWh in 2022 to over 1,000 TWh in 2026

## Impact

### Innovative Drive
Proven solution to reuse heat; Kemira Kemi in Helsingborg has delivered heat to the city since 1974

### Economic Impact
Reuse heat is a business case for the data center, energy company and the city

### $CO_2$ Impact
2 million metric tons of $CO_2$ emissions avoided between 2011 and 2017

**External Links**

Link 01 | Link 02

Symrise

# A digital tool for Carbon Footprint Calculator (Houston)

**Energy Transition case selection**

**Energy Efficiency**

## Overview

### Case objectives

Houston supports carbon-reduction decisions with data for efficiency across the value chain. Together toward net zero by 2045: source, design, produce, and transport better

### Institutions Involved

Symrise; $CO_2$ AI

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Data quality issues, organizational changes, and added feature requests may create extra work beyond scope

### Scalability

As more companies use the tool, it boosts carbon transparency across supply chains, enabling better decisions, real data use, and progress tracking toward Paris-aligned net-zero goals

## Impact

### Innovative Drive

With CCF and PCF integration, the tool enables automated, traceable, auditable carbon data in a standard format; hosted in a secure, single-tenant cloud, it is operated by $CO_2$ AI; the software and supporting infrastructure serve only Symrise

### Economic Impact

Ongoing quantitative evaluation includes time savings vs manual calculation, protecting share of business by reducing churn risk, boosting reputation and investor credibility, and avoiding fines through regulatory compliance

### $CO_2$ Impact

Houston follows top global standards for emissions: GHG Protocol, ISO, PEF, TfS, and will align with PACT to harmonize data and ease sharing across stakeholders (e.g., via SiGreen)

SKF

# Internal investment frame driving mandatory decarbonization

**Energy Transition case selection**

**Energy Efficiency**

## Overview

### Case objectives
Slow uptake of decarbonization investments puts objectives at risk. A pragmatic approach to estimating the cost of decarbonization sets the investment frame for which the organization is accountable to spend

### Institutions Involved
SKF

### WG Alignment
Energy Efficiency

## Case Maturity

### Case Stage
Implemented, generating first results

### Risks Involved
Risk of overspending instead of cutting emissions that can be addressed with clear approval criteria; use of unproven tech requires strict technical review

### Scalability
This is scalable and necessary for large industries to phase out fossil fuels at speeds aligned with the Paris Agreement

## Impact

### Innovative Drive
Delegated operating-unit responsibility combined with strong corporate commitment, with progress on spend tracked as a leading KPI

### Economic Impact
We have shown that payback times align with IRR for decarbonization and energy measures; energy investments show better profitability, ensuring the investment frame's profitability

### $CO_2$ Impact
The investment frame will take us to decarbonized operations; the part dedicated to decarbonization (phase-out of fossil fuels) will give annual emissions reductions close to 60,000 tonnes

**External Links**

Link 01

CPFL

# Investment in electrical mobility and operational fleet electrification

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

The main objective of the case is to gradually increase the proportion of electric vehicles within CPFL's fleet, especially heavy operational vehicles, known as "aerial lift trucks".

### Institutions Involved

CPFL Energia

### WG Alignment

Energy efficiency; Other

## Case Maturity

### Case Stage

Under implementation

### Scalability

The case is scalable, and when adopted widely, can cut scope 1 $CO_2$ emissions, aligning with Paris Agreement goals. It also promotes efficient energy use and infrastructure for sustainable mobility, enhancing demand for heavy electric vehicles.

## Impact

### Innovative Drive

CPFL's case is unique for prioritizing heavy fleet electrification—unlike most companies that focus on light vehicles. It also pioneers a 675 km green corridor and an Electric Mobility Lab, combining innovation, infrastructure, and real-world testing

### Economic Impact

The project aligns with profitability by reducing fuel costs (R$1.3M saved in 2024), lowering maintenance expenses, and requiring affordable phased investments.

### $CO_2$ Impact

1138 tons of $CO_2$eq from 2021 and 2025. The methodology considered GHG Protocol's emission factors for heavy and light vehicles, and the total distance (kilometers) traveled by the electric vehicles.

**External Links**

Link 01

ISA Energia

# ISA Energia Brasil's climate adaptation plan

**Energy Transition case selection**

Brazil

**Energy Efficiency[1]**

## Overview

### Case objectives

Integrate climate-risk and opportunity analysis for extreme weather into company strategy, strengthening transmission-sector resilience against climate change

### Institutions Involved

ISA Energia Brazil

### WG Alignment

Energy Efficiency, Energy Transition

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Extreme weather could damage operations and raise rebuilding costs for assets in construction or operation

### Scalability

Developing solutions to increase resilience and reduce the vulnerability of energy transmission to climate threats requires coordinated actions between government, the private sector, and academia for the resilience of electrical infrastructure

## Impact

### Innovative Drive

The combination of technology and climate modeling provides a pioneering contribution to the sector's adaptability, enabling it to anticipate more severe climate events, develop mitigation measures, and act more effectively.

### Economic Impact

Economic impact comes from higher reliability and lower recurring costs, reduced exposure to extreme events and penalties, stronger grid resilience, regulatory modernization, and alignment with the energy transition by preparing assets for a cleaner, more reliable power system

### $CO_2$ Impact

Not applicable for projects related to climate adaptation (physical risks)

**External Links**

Link 01

[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

GIZ

# Particolare Gelateria | PotencializEE

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Particolare Gelateria joined PotencializEE to boost energy efficiency. Actions may cut energy use by 47% and GHG emissions by 63%, while improving process performance and competitiveness

### Institutions Involved

GIZ, Particolare Gelateria

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Under implementation

### Scalability

Energy-efficiency upgrades at Particolare—mainly equipment replacements and process improvements—will reduce GHG emissions by 1,350.87 $tCO_2e$ over their lifetime

## Impact

### Innovative Drive

The proposed cooling system uses chillers with advanced control and monitoring technology and an electronic expansion valve, which reduces energy consumption and mitigates high annual maintenance costs

### Economic Impact

With 6.6 million kWh saved and NPV of R$3.3 million, the project proves that energy efficiency delivers high returns

### $CO_2$ Impact

The project achieved a projected 63% reduction in greenhouse gas emissions, showcasing the power of energy efficiency to drive climate action in small industries

**External Links**

Link 01

Solvay

# Process Improvement Teams (PIT)

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Process Improvement Teams boosts short-to-medium term industrial performance by providing expertise and methods to drive cost reduction, capacity growth, quality gains, innovation and sustainability

### Institutions Involved

Solvay

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Performance risks, mainly for technological innovations

Economic risks related to engineering projects: investment higher than expected or lower return

### Scalability

PIT aims to reduce resource use and emissions by managing raw materials, energy, water, and packaging efficiently across all industries and production scales

## Impact

### Innovative Drive

PIT drives technological innovation in production processes through incremental improvements that lead to effective gains in performance, productivity, quality, process safety and sustainability, resulting in greater competitiveness in the market

### Economic Impact

High economic impact on the competitiveness of products, as it directly and continuously improves the variable cost of production

### $CO_2$ Impact

Reduction of 1 - 5 kt $CO_2$e/year

Siemens Energy

# Safety and Sustainability: Innovation in leak detection guaranteeing leak-tightness in $SF_6$ circuit breakers

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Detect $SF_6$ gas leaks in circuit breakers to ensure system integrity, enhance efficiency, and reduce emissions for environmental protection and regulatory compliance

### Institutions Involved

Siemens Energy; EHS Decarbonization Committee

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

Contribution to global climate targets: many countries and organizations have set targets for reducing greenhouse gases, including SF6; meeting these targets is essential to achieving Paris Agreement goals

## Impact

### Innovative Drive

High sensitivity: ultrasonic methods can detect leaks at very low concentrations, allowing early identification of problems before they become critical

### Economic Impact

Cost reduction: early leak detection can prevent major damage and costs associated with operational failures, resulting in long-term savings

### $CO_2$ Impact

Reduced SF6 emissions by 18.53 kg, equivalent to 435,455 kg $CO_2$, through ultrasonic technology and improved calculations (1 kg SF6 = 23,500 kg $CO_2$)

E.ON

# Silvertown, Newham

**Energy Transition case selection**

United Kingdom

**Energy Efficiency**

## Overview

### Case objectives

Silvertown is the UK's first large-scale 5th Generation District Heating network. This decentralized, bidirectional system enables energy sharing between buildings.

### Institutions Involved

E.ON

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Traditional systems couldn't meet the project's high sustainability ambitions, and the need to preserve the historic docks created restricted routes for utilities.

### Scalability

Silvertown ectogrid™ isn't just an innovative technical solution it's a model for how cities can decarbonize at scale while delivering tangible benefits for society and the environment.

## Impact

### Innovative Drive

Digital, ectocloud, smart control, predictive algorithms, power market mechanisms

Heat recovery from industry via Data Centers

Hydraulics - A 2-pipe bidirectional ambient loop that provides both heating and cooling, saving crucial space

### Economic Impact

By harvesting ambient and waste heat and balancing thermal loads across the network, ectogrid™ dramatically reduces primary energy consumption by 50%. Because heating and cooling are generated close to the point of use with minimal thermal losses <2%

### $CO_2$ Impact

At full deployment, ectogrid™ will achieve up to 88% lower carbon emissions compared to traditional gas systems, saving approximately 4,000 tons of $CO_2$ per year.

**External Links**

Link 01 | Link 02 | Link 03

BASF

# TripleE / Excellence in Energy Efficiency project in BASF Brazil and South America

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Launched by BASF in 2015, the Triple E program aimed to boost energy efficiency, reduce environmental impact, and cut operational costs through targeted sustainability initiatives developed by the team

### Institutions Involved

BASF Brazil, BASF Argentina And BASF Chile; São Paulo State University (UNESP)

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

The project involved no relevant risks

### Scalability

Replicated and implemented in seven BASF production sites across South America, TripleE has also been used as a benchmark by other companies and academic institutions in the region; the methodology is available to whoever is interested

## Impact

### Innovative Drive

As a sign of its innovative approach, with 400+ new opportunities identified and detailed by a multidisciplinary team of experts, BASF was the first ISO 50001-certified chemical industry in Brazil and Chile

### Economic Impact

Overall results for BASF South American sites: US$7.6 million/year cost savings; 133.9 GWh/year energy reduction; 33.2 kt/year $CO_2$ reduction

### $CO_2$ Impact

Project enabled the elimination of 33.2K tons of $CO_2$/year across 7 South American sites since its launch in 2016

**External Links**

Link 01 Link 02

Vale

# Vale Mega Hubs

**Energy Transition case selection**

Brazil

**Energy Efficiency**

## Overview

### Case objectives

Enable the production of low-carbon HBI using renewable energy and low emission reductant (Hydrogen or Natural Gas), enabling steelmakers to reduce emissions at scale.

### Institutions Involved

Vale; Steelmakers and local companies where projects are being developed; Local Governments; Banks;

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under planning

### Risks Involved

Permitting delays, fluctuations in green H2 availability and cost, uncertainties about $CO_2$ pricing, infrastructure bottlenecks (port, energy, natural gas, water)

### Scalability

Mega Hubs enable up to 85% emission reductions on steel production by supplying low-carbon HBI to multiple global steelmakers. The model can be replicated across regions, aligned with the Paris Agreement.

## Impact

### Innovative Drive

Integrate low carbon metallics (reduced by hydrogen or natural gas) and Vale's new briquette tech for decarbonized steelmaking.

### Economic Impact

Each hub targets multi-billion USD investment with positive NPV and competitive IRR, supported by CBAM, HBI Premiums and potential off-take contracts.

### $CO_2$ Impact

Each Mega Hub enables up to 85% $CO_2$ reduction per ton of steel compared to traditional blast furnace routes.

SUSTAINABLE
BUSINESS
COP30

# Portfolio of Cases

## Renewables

Siemens Energy

# "Sol do Pará" Hybridization for remote areas

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Hybridization of the current generation in the isolated system, including solar and battery, in four cities until interconnection with the SIN—date still uncertain—without deforestation

### Institutions Involved

Siemens Energy

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under planning

### Risks Involved

Government disapproval, licensing delays, loss of solar components in transport, and battery malfunction

### Scalability

The model can be adopted in any isolated power-generation system or integrated into the SIN and applied by any power company; a 30% Renewable Factor corresponds to eight hours of light per day, reducing $CO_2$ emissions from fossil fuels

## Impact

### Innovative Drive

Hybridizing an existing system without deforestation, using natural or recovered areas, bringing greater security of energy supply to the community, usable in an isolated system or in the SIN as ancillary functions

### Economic Impact

Hybridization will reduce diesel purchase costs, bringing returns that offset the investment, enabling a 5% reduction in community energy bills, and placing a clean-energy seal on operations

### $CO_2$ Impact

32,000 tons per year of $CO_2$ avoided directly through reduced diesel consumption via solar energy; other $CO_2e$ avoided could reach 70,000 tons per year

BASF S.A.

# 10 years of the BASF Camaçari Acrylic Complex on the path to decarbonization

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

BASF's production site in Camaçari achieved in 2024 a 61% reduction of its $CO_2$ emissions, overcoming and anticipating BASF's global goal of 25% reduction by 2030, with a 29% production increase

### Institutions Involved

BASF S.A.

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

No relevant risks involved in this project

### Scalability

BASF's ISO 50001 expertise enabled a replicable benchmark already adopted by other companies; BASF also certified its South American sites, adapting the model to each operation, so it can be scaled globally across similar industries

## Impact

### Innovative Drive

Since 2015, BASF's Acrylic Complex has focused on sustainability; it developed a decarbonization strategy that achieved savings and earned important certifications, becoming a pioneering chemical plant in Bahia

### Economic Impact

With payback under four years, the 16 projects reduced 18 GWh/year and 11 kt $CO_2e$, bringing strong economic and environmental gains; emissions dropped while production rose 29% in the same period

### $CO_2$ Impact

In 2024 the BASF Camaçari industrial complex surpassed BASF's global target to reduce $CO_2$ emissions by 25% by 2030, cutting emissions by 61%, ahead of schedule and 144% above the goal

**External Links**

Link 01 | Link 02 | Link 03 | Link 04

BEAST

# Biogas Enrichment via Advanced Separation Techniques

**Energy Transition case selection**

Italy

**Renewables**

## Overview

### Case objectives

Develop an innovative and scalable biogas-upgrading technology to selectively capture $CO_2$ under mild conditions, enabling the production of low-cost, high-purity biomethane

### Institutions Involved

DG Impianti Industriali; University Of Chieti-Pescara; University Of Messina

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

The process is easily scalable as it only requires increasing the gas feed and vessel volume

## Impact

### Innovative Drive

The use of innovative organic solvents, which are safer and operate at lower temperatures, opens a new frontier in terms of CCUS capability

### Economic Impact

Biomethane can be sold on the free market or used on site for heat generation; saved emissions allow savings on carbon-emission tokens

### $CO_2$ Impact

The system allows cutting emissions caused by biogas, making it both ecologically and economically viable | Carbon impact — captures more than 95% of $CO_2$ from biogas at 30 °C while consuming 264 kJ less than conventional solvents for every kilogram of $CO_2$ captured, saving 13% of total energy

# Green Farm $CO_2$FREE
# Biocharger: Energy & Biochar

**Energy Transition case selection**

Brazil
**Renewables**

## Overview

### Case objectives
Biomass removals and carbon storage toward improved forest management, harvesting lesser-known species, and collecting wood residues to produce energy and biochar using Biocharger technology

### Institutions Involved
Green Farm $CO_2$FREE; AirBurners

### WG Alignment
Renewables

## Case Maturity

### Case Stage
Under planning

### Risks Involved
Lack of investment to purchase biocharger plant, lack of carbon credits buyers for expensive BiRCS/CDR credits

### Scalability
All biomass can be used to produce energy and biochar by Biocharger, one of PACM's priority areas with CDR solutions

## Impact

### Innovative Drive
Use of biomass to produce electricity to feed machinery in off-grid situations or supply energy to the grid when available; produces energy, reduces biomass residues, and produces biochar for soil amendment

### Economic Impact
The estimated ROI is around 4 to 7 years with the Biocharger, and the system's lifespan is projected to reach 25 years

### $CO_2$ Impact
Each Biocharger unit reduces up to 1,000 $tCO_2e$ in biochar credits, plus another 100 $tCO_2e$ from energy production and 2,500 $tCO_2e$ from AR or IFM

**External Links**

Link 01

Braskem

# Biomass Steam in Alagoas - Large-scale renewable energy production

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Decarbonize Alagoas's Vinyl Complex by replacing the natural-gas steam generation process with a biomass-based one, supported by electrification of equipment

### Institutions Involved

Braskem S.A.; Veolia Environmental Services Brazil Ltda.

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Electrification project complexity and delays due to unpredictable impacts on structural changes in old existing assets

### Scalability

Such project design can be applied in ventures that aim to competitively decarbonize assets from higher-carbon fuels to lower-carbon ones

## Impact

### Innovative Drive

The project integrates electrification with the use of biomass in a partnership between Braskem and Veolia; it uses renewable sources and technology, promoting a circular economy and decarbonization

### Economic Impact

The investment presents a short payback and positive NPV, ensuring an energy cost reduction of 4.3 MM USD per year

### $CO_2$ Impact

Reduction in emissions of 115 kt $CO_2$e/y at the Alagoas plant in 2024, reaching 150 kt $CO_2$e/y annually from 2025 onward according to GHG Protocol standards

**External Links**

Link 01

Solvi

# Caieiras Carbon Credits Project – Largest Waste Treatment Facility in Latin America

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Capture landfill biogas from organic-waste decomposition to generate renewable electricity and high-integrity carbon credits

### Institutions Involved

Solvi Essencis Ambiental S.A.

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Scalability

The technology for biogas capture and utilization has been replicated in 11 other landfills within the group, helping companies reduce emissions, generate renewable energy, and contribute to reducing global GHGs

## Impact

### Innovative Drive

We were the first company in the world to issue landfill biogas carbon credits with the UN, combining methane capture, renewable energy generation, and continuous tracking with international certification

### Economic Impact

Biogas capture generates continuous revenue through certified credits and energy sales, guaranteeing solid returns; the model has viable costs and economic results aligned with sector profitability

### $CO_2$ Impact

Estimated reduction of 13.9 million $tCO_2e$ (Mar/06–Feb/25)

**External Links**

Link 01 | Link 02

Cipla Limited

# Cipla's Renewable Energy Transition for Sustainable Manufacturing

**Energy Transition case selection**

India

**Renewables**

## Overview

### Case objectives

Achieve 50% of total power consumption from renewable sources and reduce absolute Scope 1 (energy-related) and Scope 2 emissions by 80% from the FY20 baseline by December 2025 for India operations

### Institutions Involved

Cipla Limited; AMP Solar Power Systems Pvt. Ltd.; AMP Energy Green Eleven Pvt. Ltd.; Clean Max Auriga Power LLP; Juniper Green Cosmic Pvt. Ltd.

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Changes or uncertainties in electricity regulations, Delays or complexities in obtaining necessary permits & approvals, Potential revisions in incentives such as electricity banking

### Scalability

Our renewable-energy initiative is inherently scalable, demonstrating a replicable model for reducing GHG emissions through a diversified portfolio of captive solar projects, rooftop solar, and virtual PPAs/IRECs

## Impact

### Innovative Drive

The hybrid approach combining captive solar and wind, rooftop solar across multiple sites, and virtual PPAs represents a pioneering and integrated model within the Indian pharmaceutical sector

### Economic Impact

We ensure cost-effective, stable energy through captive models and virtual PPAs, backed by state and central incentives that lower implementation costs and enhance investment appeal

### $CO_2$ Impact

Through these efforts, we secured a total of 189,797 MWh of renewable electricity during FY 2024–25, which helped avoid/reduce 137,982 $tCO_2e$ Scope 2 emissions

**External Links**

Link 01

Claro

# Claro's Energy Program

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

It focuses on the self-production of renewable energy through partnerships via distributed generation and PPA contracts, aiming to supply 80% of the company's energy and reduce carbon emissions

### Institutions Involved

Claro S.A.; Engie; GDSUN; Solargrid; Green Yellow

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Connection problems with local providers, lack of specialists, unstable weather, political shifts, and policy uncertainty

### Scalability

Energy use represents more than half of our carbon footprint; we created PMBoK-based guidelines and shared knowledge with other companies and countries where Claro operates, including competitors

## Impact

### Innovative Drive

Two of the largest distributed-generation power plants in Brazil operate for Claro using biogas; this technology serves regions near large cities and provides a better destination for organic waste in landfills

### Economic Impact

Before adopting carbon credits, there is ample room for energy-efficiency projects to meet the 2030 Agenda; this became our policy, leading to more than 30% energy-cost reduction

### $CO_2$ Impact

Claro's energy program has avoided more than 450,000 tons of $CO_2e$ since its inception through direct initiatives without the use of carbon credits

**External Links**

Link 01 | Link 02 | Link 03

iFood

# Clean Modes, iFood Pedal and Emissions

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Decarbonize urban delivery operations through fleet electrification, reducing GHG emissions and generating positive impact through the expansion of deliveries and couriers using clean modes

### Institutions Involved

iFood

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Limited charging infrastructure, high EV costs, weather conditions, and restrictive urban regulations for micromobility

### Scalability

With a US$7.5 million contribution to the YvY Fund, established partnerships (Tembici), and proprietary investment, the model is easily replicated in new cities; our base of 380,000 couriers enables rapid expansion throughout the ecosystem

## Impact

### Innovative Drive

Ecosystem with Pedal and YvY creates smart cities; the system is pioneering and pays couriers per km pedaled, combining sustainability and inclusion

### Economic Impact

Sector transformation: fuel savings and creation of a market for 600,000 electric motorcycles per year; the model generates sustainable revenue and reduces operational costs

### $CO_2$ Impact

Methodology used: GHG Protocol; estimated reduction of emission intensity by 63.8% by 2035

Neoenergia

# Combating Energy Poverty through the Democratization of Solar Energy in Low-Income Communities

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Promote sustainability and democratize access to clean energy by installing 13 solar power plants in a low-income housing complex, aiming to reduce electricity bills for low-income families

### Institutions Involved

Neoenergia Coelba; Municipal Government Of Salvador

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Scalability

With a photovoltaic solar power plant, the project contributes to Paris Agreement goals by increasing the share of renewables in the energy mix and, consequently, reducing greenhouse gas emissions

## Impact

### Innovative Drive

The initiative not only promotes energy efficiency but also fosters social inclusion and sustainable development by democratizing access to clean and renewable energy sources through a public-private partnership

### Economic Impact

The project delivered tangible benefits for the energy distributor by reducing commercial losses, evidenced by a significant drop in overdue bills; the cumulative collection index increased from 82% (Feb 2024) to 94% (Mar 2025)

### $CO_2$ Impact

Estimated reduction of 28.36 tons of $CO_2$ based on the generation of 278 MWh and a carbon intensity of 102.03 grams of $CO_2$e/kWh (source: Our World in Data)

**External Links**

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Grupo Iquine

# Contribution to the Renewable Energy Matrix

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

From 2025, have I-REC in place—a tracking system that certifies the consumption of energy from renewable sources—at all manufacturing plants

### Institutions Involved

Grupo Iquine

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Increase in I-REC certification costs

### Scalability

Scope 2 $CO_2$ emissions neutralized with I-REC certification; commitment to SDG 7; commitment to ABRAFATI sector targets; compliance with best practices for the Sectoral Sustainability Program (PSS) indicator

## Impact

### Innovative Drive

With the abundance of Brazil's renewable energy matrix, the use of exclusively renewable sources is a differentiator that drives best practices, and the most innovative aspect is tracking the sources with certified verification

### Economic Impact

Affordable cost set for 2025; kWh cost: R$1.50 (with certificate)

### $CO_2$ Impact

In the last year we avoided about 838 tons of $CO_2$ by purchasing electricity on the free market from renewable sources without source traceability; methodology: government $CO_2$ emission factors

**External Links**

Link 01

Engie

# Coya BESS Project

**Energy Transition case selection**

Chile

**Renewables**

## Overview

### Case objectives

The Coya Project is the largest BESS project in Latin America. It consists of implementing a 139 MW/638 MWh battery-storage capacity at the Coya PV park. This lithium battery facil

### Institutions Involved

Engie Energia Chile; CEN - Chilean National Energy Coordinator; City Of Maria Elena

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

The project contributed to the economic dynamics of the Antofagasta Region

## Impact

### Innovative Drive

The BESS Coya can store about 5 hours of electricity and inject it into the grid, which represents 200 GWh of clean electricity for local households every year (about 100,000 households)

### Economic Impact

Total implementation fits an 18-month schedule (announced December 2022, commercial operation March 2024)

### $CO_2$ Impact

Project expected to save 65,000 $tCO_2$ annually, equal to removing 22,000 combustion vehicles from circulation

Pontifical Catholic University Of Rio Grande Do Sul

# DAC.SI Project

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Establish a national DAC(Direct Air $CO_2$ capture) infrastructure and Center of Excellence in R&D for testing and validating $CO_2$ removal technologies and support Brazil's energy transition and climate leadership through global decarbonization efforts

### Institutions Involved

Pontifical Catholic University Of Rio Grande Do Sul; Repsol Sinopec Brazil

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Technical scalability, climate variability, high energy use, regulatory uncertainty, and market acceptance may affect DAC deployment

### Scalability

The DAC.SI project demonstrates a modular experimental DAC system tested under Brazilian conditions, with potential to scale from 300 tons/year to megaton levels, contributing to climate goals, the energy transition, and net-zero targets

## Impact

### Innovative Drive

DAC.SI is the first Brazilian and largest Latin American initiative to validate DAC under local conditions; it integrates modeling, renewables, and sorbent testing in an open-innovation DAC platform that supports the future energy transition

### Economic Impact

The initiative uses ANP-regulated RD&I funding, lowering investment risk; its modular design enables gradual cost optimization, supporting future commercial viability and private-sector interest through reasonable capture costs and carbon credit

### $CO_2$ Impact

The DAC.SI project can remove up to 300 tons of $CO_2$ per year via modular direct air capture, is under validation for Brazil's climate, and has the potential to scale to megatons annually

**External Links**

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Siemens

# Decarbonization Due Diligence Assessment (DDA)

**Energy Transition case selection**

Brazil

**Renewables**[1]

## Overview

### Case objectives

Decarbonization of the Supply Chain by at least 30% by 2030 based on the annual calculation of supplier emissions. It reduces $CO_2$ (environmental), strengthens suppliers with data and support (social) and improves efficiency and productivity in the supply chain (economic).

### Institutions Involved

Siemens Energy

### WG Alignment

Energy Efficiency, Energy Transition

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

A change in the mindset and culture of companies can lead to lower-than-expected supplier engagement and a potential need for investment, cost increases and process improvements on their part.

### Scalability

The project works directly with decarbonization, reducing the $CO_2$ footprint in scope 3, also encouraging efficient resource management and other sustainable actions for suppliers.

## Impact

### Innovative Drive

By using digital platforms such as “supplier+s” for personalized $CO_2$ mgmt., encouraging and giving transparency to all projects that involve reducing emissions in the Supply Chain, which turn environmental goals into practical, replicable and scalable.

### Economic Impact

The project supports profitability by reducing waste, increasing efficiency and preparing for global requirements. With digital tools and the use of existing systems, it is low cost and improves the company's image in the ESG market.

### $CO_2$ Impact

From FY18 to FY24, Siemens Energy’s Brazilian suppliers cut 117.5 thousand tons of Scope 3 $CO_2e$, with emissions intensity down 41%. Globally, carbon intensity fell from 0.508 to 0.408 kg $CO_2e$/EUR—over 19% lower.

[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

Private Company

# Decarbonization of industrial manufacturing facility through waste heat recovery

**Energy Transition case selection**

United States

**Renewables**

## Overview

### Case objectives

Project's objective is to capture and permanently store $CO_2$ from ethanol production, advancing carbon removal and supporting sustainable energy solutions in Brazil creating carbon negative ethanol.

### Institutions Involved

SLB; Fuel Sustainability; ANP; MME

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation. Injection well being drilled as per Sep 2025

### Risks Involved

Infra legal regulations, but already under experimental regulations by ANP (pilot). Challenges on MMV as a new usage of technology. Market adoption of carbon credits

### Scalability

This project model can be replicated by companies or industries belonging to the free energy market. We are even moving forward with implementing this concept in our operations in the United States.

## Impact

### Innovative Drive

This case pioneers $CO_2$ for capture from bioenergy in LATAM. Most technologies are mature enough, but business model and the perspective are different. More innovation comes on the MMV plan after injection. This would be the first $CO_2$ injection for permanent storage in Brazil.

### Economic Impact

This case proves decarbonization drives profitability. The project delivered $55K in energy savings in one season. Our "efficiency first" approach reduced capital costs for Phase 2, proving sustainability is good for business.

### $CO_2$ Impact

With a 60% boost in heating efficiency, Scope 1 emissions were cut by 364 tons in the first year of operation. Phase 2 will eliminate gas-fired steam boilers, reducing Scope 1 emissions by another 270 tons annually.

**External Links**

Link 01

Angara Global

# Decarbonx

**Energy Transition case selection** Renewables

## Overview

### Case objectives

DecarbonX has developed an innovative approach to managing fouling-degradation risks in heat exchanger equipment—Decarbonization-Centered Maintenance (DCM)

### Institutions Involved

Angara Global Ltd.

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

The Decarbonization-Centered Maintenance approach and risk orchestration platform helps transition to proactive fouling management, prioritizing efficiency and $CO_2$ abatement

### Scalability

400,000,000 tons per year—emission-reduction potential confirmed by DNV, an independent provider of quality assurance and risk management services operating in more than 100 countries; DNV also confirmed technology readiness level 8–9

## Impact

### Innovative Drive

The technology uses an AI-powered solution to integrate decarbonization into maintenance practices, emphasizing sustainability and environmental efficiency; it won first prize at the Asian Downstream Summit in 2024

### Economic Impact

The technology addresses energy-efficiency issues, so $CO_2$ abatement comes “for free” with fuel savings; additionally, we improve reliability and product yields; typical IRR is 70%+

### $CO_2$ Impact

400,000,000 tons per annum — DNV has confirmed the total abatement potential of this technology; DNV also rated the technology at TRL level 8–9

**External Links**

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Beko

# Defy Solar Off-Grid Refrigerator Project

**Energy Transition case selection**

South Africa

**Renewables**

## Overview

### Case objectives

The Defy Solar Off-Grid Refrigerator Project provides reliable, affordable cooling in South Africa with solar, battery, and smart energy to cut spoilage, improve food security, and reduce grid reliance

### Institutions Involved

Beko; Accredited Solar Installers; Defy Appliances (South Africa)

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Panel theft or damage, battery degradation, affordability and adoption barriers, weather dependence, and installation certification needed for warranty

### Scalability

Scalable solar-powered refrigeration addresses unreliable grids for 600M+ people, reduces spoilage, supports clinics and agri-chains, empowers rural enterprises, and enables cost-efficient, low-carbon adoption

## Impact

### Innovative Drive

The Defy Solar Off-Grid Fridge pioneers appliance-centered energy autonomy with Smart Control Box, Endura Chill insulation, hybrid operation, and a lithium battery, enabling reliable, efficient off-grid refrigeration for underserved communities

### Economic Impact

The fridge cuts energy costs up to 44%, needs minimal solar setup, avoids costly inverters, boosts food security, reduces spoilage, and supports small businesses through donations, offering affordable, profitable off-grid refrigeration

### $CO_2$ Impact

60cm saving: 285 kWh/yr; CF300 saving: 310 kWh/yr; grid factor 1.013 $kgCO_2/kWh$; at 1,000 units: 289k + 323k $tCO_2e$ avoided; total annual avoidance = 612k $tCO_2e$

**External Links**

Link 01

ABRAFATI

# Driving the Energy Transition: Carbon Footprint and Decarbonization Pathways in the Brazilian Coatings Industry

**Energy Transition case selection**

Brazil

**Renewables**[1]

## Overview

### Case objectives

The main objective is to present the carbon footprint of the coatings industry in Brazil and the sectoral strategies, including energy transition, to achieve decarbonization by 2030, based on a GHG inventory

### Institutions Involved

ATA Environmental Consulting; Akatu Institute; ABRAFATI - Brazilian Coatings Manufacturers Association

### WG Alignment

Renewables, Energy efficiency

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Low company adherence, limited investment capacity, data gaps, technological barriers, and regulatory or market changes

### Scalability

The strategy engages 26 companies and targets 25% GHG cuts by 2030; it's scalable across the sector as more members join, supporting Paris goals via the energy transition and efficient resource use

## Impact

### Innovative Drive

The innovation lies in a sector-specific approach, integrating GHG reduction with energy transition, fuel switching, and advanced cooling systems; this scalable model addresses industry gaps and pioneers sustainability in the coatings sector

### Economic Impact

The strategy includes cost-effective actions like energy efficiency and cleaner fuels, lowering operational costs; early pilots show positive NPV and IRR, proving financial viability and alignment with private-sector profitability goals

### $CO_2$ Impact

The sector's baseline GHG emissions were calculated for 2023 using the GHG Protocol; reduction impacts will be measured in 2027 through a midpoint inventory and in 2030 based on the same method | Target to reduce carbon footprint by 25% by 2030, equivalent to an average reduction of 0.007 kg $CO_2e$ per kg of product

[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

Partimer

# Drought Free World Crisis

**Energy Transition case selection** Renewables

## Overview

### Case objectives
Provide clean water through renewable-powered desalination and produce green hydrogen to combat drought, support clean energy, and promote sustainable development in water-scarce regions

### Institutions Involved
Partimer Inc.; Global Economic Impact Forum; Lakshmi LLC

### WG Alignment
Renewables

## Case Maturity

### Case Stage
Under planning

### Risks Involved
Customers may resist paying 15% more than fossil diesel, showing low awareness of transition urgency

### Scalability
Adoption by multiple companies can cut emissions by replacing fossil-fuel water and hydrogen systems, support Paris goals through green hydrogen, and ensure efficient water use with renewable-powered desalination across sectors

## Impact

### Innovative Drive
This project uniquely combines renewable-powered desalination with green hydrogen production, using smart energy systems and brine recovery; it pioneers a dual-use, zero-emission model tackling both water scarcity and climate change

### Economic Impact
The project offers dual revenue from water and hydrogen sales, with IRR of 12%–16% and NPV of $35–50M over 20 years; modular design and falling tech costs ensure affordability, aligning with private-sector profit and sustainability goals

### $CO_2$ Impact
Renewable-powered desalination and green hydrogen cut ~210,000 $tCO_2$/yr, with ~280 GWh/yr of clean electricity replacing fossil desalination and grey H2—about 45,000 cars off the road or $CO_2$ absorbed by 3.5M trees. Brine-disposal efficiency protects marine ecosystems. Scalable impact: 1 plant 210k $tCO_2$/yr; 10 plants 2.1 Mt; 100 plants 21 Mt

Alcoa

# Electrification of Boilers

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Decarbonize the Alumar refinery by replacing oil- and coal-fired boilers with electric boilers

### Institutions Involved

Alcoa, Industrial Transition Accelerator (ITA) / Mission Possible Partnership (MPP)

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under planning

### Risks Involved

High CAPEX, need for new electrical infrastructure, and current grid stability problems

### Scalability

Project will have a significant impact on the refinery's decarbonization, reducing current emissions by 50%

## Impact

### Innovative Drive

The project will replace the current oil and coal boilers with new electric boiler technology.As part of the path forward, we are introducing a new business model possibility, where investment will be made by a third party and project profits will be shared

### Economic Impact

The FEL 2 project is still under development, with completion expected by the end of the year. For FEL 1, we've already defined the technological path and are now conducting pre-engineering to perform the feasibility analysis.The project aims to decarbonize Alumar's steam generation by eliminating the use of coal and fuel oil. This will reduce emissions by over 1 million $tCO_2e$

### $CO_2$ Impact

The project aims to reduce emissions from the refinery by 50% (from 0.6 $tCO_2e$/talumina to 0.3 $tCO_2e$/talumina), reducing more than 1 million $tCO_2e$/year

Electrolux Group

# Electrolux Group Climate Leadership

**Energy Transition case selection**

Brazil

**Renewables**[1]

## Overview

### Case objectives

Electrolux Group met its first SBTi-approved climate target in 2022, three years early. Now pursuing net-zero by 2050 under a second SBTi target, aligned with the UN net-zero pledge signed in 2018

### Institutions Involved

Electrolux Group

### WG Alignment

Renewables, energy transition

## Case Maturity

### Case Stage

Under implementation

### Scalability

The strategy—based on identifying key impacts and improving processes—has proven to reduce emissions and is scalable to companies aiming to meet Paris Agreement goals

## Impact

### Innovative Drive

By embedding science-based goals, sustainable materials, and digital innovation, Electrolux sets a new standard in climate leadership with a consumer-focused, scalable decarbonization strategy

### Economic Impact

Electrolux's Net Zero strategy lowers operational costs, attracts green financing, and boosts brand value—enhancing NPV and IRR through efficient resource use, risk mitigation, and long-term financial resilience

### $CO_2$ Impact

From 2021–2024, the Electrolux Group cut scopes 1 and 2 emissions by 36% and scope 3 by 31%, using clean energy, recycled materials, efficient products, and $CO_2$-reduction strategies company-wide

**External Links**

Link 01 | Link 02 | Link 03

[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

Grupo Boticário

# Energia do Amanhã Program

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Focused on reducing GHG emissions from electricity consumption in retail, the program accelerates the transition to renewable energy sources in Grupo Boticário's beauty ecosystem

### Institutions Involved

Grupo Boticário

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

No operational risks

### Scalability

Grupo Boticário's Energia do Amanhã Program contributes directly to Paris Agreement goals, especially regarding greenhouse gas reduction and the energy transition for the retail ecosystem

## Impact

### Innovative Drive

As an innovative differential, the program allocates a percentage of each invoice paid by franchisees to the Movimento Viva Água, which develops water security and climate adaptation projects, creating a virtuous cycle of value generation

### Economic Impact

Stores that join the program can reduce electricity costs by up to 20% without investing in infrastructure; cheaper, more stable energy improves participating stores' profit margins

### $CO_2$ Impact

The Energia do Amanhã Program can reduce an average of 30 $tCO_2e$ per year for each point of sale, indicating an additional 70,000 $tCO_2e$ avoided by 2030

**External Links**

Link 01

Engie

# Eoliennes Flottantes du Golfe du Lion (EFGL)

**Energy Transition case selection**

France

**Renewables**

## Overview

### Case objectives

The objective of the EFGL project is to demonstrate the technical and environmental feasibility of floating offshore wind in the French Mediterranean through a 30 MW pilot farm with innovative, biodiversity-friendly solutions.

### Institutions Involved

Engie, Ocean Winds; Engie; EDP Renewables; Banque Des Territoires; ECOCEAN; Gulf Of Lion Marine Natural Park; University Of Perpignan; Marine Ecosystem Research Center; Principle Power

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Sensitive marine environment needs biodiversity safeguards, offshore ops depend on stable wind/waves; turbulence is high but not harsh, new infrastructure in the region requires strong coordination

### Scalability

EFGL is a 30 MW pilot, and its success paves the way for larger floating farms —such as our EFLO project (250 MW). Floating wind unlocks clean energy in deep waters and supports climate goals

## Impact

### Innovative Drive

EFGL combines advanced floaters, eco-design, and regional teamwork—setting a global model for sustainable marine energy. EFGL proves WindFloat® works in deep waters, expanding offshore wind to new zones

### Economic Impact

EFGL shows floating wind is scalable and bankable. Backed by Ocean Winds, Banque des Territoires, ADEME, and global banks, it proves financial viability through public-private partnership

### $CO_2$ Impact

Avoided $CO_2$ emissions – 50 000 tons annually

**External Links**

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Italgas

# Fighting methane emissions: Italgas Strategy to contain GHG

**Energy Transition case selection**

Italy

**Renewables**

## Overview

### Case objectives

Since 2020, Italgas has developed an advanced model to cut CH4 emissions, optimize network maintenance, and improve its ESG rating

### Institutions Involved

Italgas; CIG - Italian Gas Committee; ARERA - Italian Energy Regulatory Authority; UNEP OGMP 2.0

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Scalability

Italgas cut methane emissions by 43%, supporting the 1.5°C target, optimizing costs, improving safety (−60% odor calls since 2017), and extending its model to Greece; easily replicable in other urban gas networks if resources are available

## Impact

### Innovative Drive

The Italgas model leverages advanced CRDS technology, 1000× more sensitive than traditional methods, enabling direct quantification and prioritization of major leaks; the company is continuing scouting activities—satellites, drones, OGI cameras

### Economic Impact

Since 2020, the reduction in the social cost of $CO_2$ has been estimated at €6.6 million, and community savings from raw material not emitted at ~€2.6 million

### $CO_2$ Impact

Italgas Group achieved a −43% reduction that corresponds to 66.8 kton of $CO_2e$ avoided; Italgas has adopted a transition plan aligned with the Paris Agreement and validated by Carbonsink

**External Links**

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Bayer

# Full decarbonization in the manufacturing of the API for Aspiring

**Energy Transition case selection**

Spain

**Renewables**

## Overview

### Case objectives

In the production of acetylsalicylic acid (API for aspirin), a lot of energy in the form of electricity and heat is used. In 2026 the goal is to have both types of energy coming from renewable sources

### Institutions Involved

Bayer Hispania

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Innovative technology for acummulation of heat is a chalenge

### Scalability

Use of green electricity to provide green heat is a challenge in industry; this would serve as an example for other industries to follow

## Impact

### Innovative Drive

Use of heat storage in a molten-salt tank with electrical resistances that put in heat during hours of excess renewable electricity production (solar, wind, hydro)

### Economic Impact

Implementation costs are currently higher than fossil fuels (gas); however, via a long-term HPA (Heat Purchase Agreement) with the steam provider, we guarantee price stability and obtain the “Aspirin green label”

### $CO_2$ Impact

Goal is to achieve zero $CO_2$ Scope 1 emissions | goal of “full decarbonization,” with $CO_2$ figures in Bayer reports (30% reduction by 2030 globally, applicable to the site)

Engie

# Golden Valley Wind Energy

**Energy Transition case selection**

South Africa

**Renewables**

## Overview

### Case objectives

Golden Valley Wind Energy facility is a 120 MW onshore wind project which consists of 48 2.5 MW Goldwind permanent-magnet direct-drive turbines

### Institutions Involved

Engie; Thebe

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Grid access limitations, wind availability, bird collisions, and turbine supply chain delays (turbine spares and repairs)

### Scalability

By displacing fossil-fuel electricity with renewable wind power, the project directly reduces greenhouse gas emissions and supports South Africa's Nationally Determined Contributions (NDCs)

## Impact

### Innovative Drive

The Observer-Led Shut Down on Demand (SDOD) Programme is a groundbreaking programme implemented at Golden Valley Wind Energy as part of the project's commitment to no net loss of priority bird species

### Economic Impact

The total project cost of ~ZAR 3.2 billion for 120 MW of installed capacity reflects competitive implementation costs; electricity is sold under a 20-year PPA, ensuring predictable long-term revenue

### $CO_2$ Impact

Golden Valley generates about 477.6 GWh per annum, supplying an estimated 163,995 households with clean, sustainable energy; in 2024 the avoided $CO_2$ emissions were approximately 421,583 tonnes

**External Links**

Link 01 | Link 02 | Link 03

Green Ammonia

# Key for a Net-Zero Future - Unlocking Africa's potential in clean hydrogen and sustainable food systems

**Energy Transition case selection**

Morocco

**Renewables**

## Overview

### Case objectives

Accelerate green-ammonia deployment, leveraging Africa's renewable-energy potential and OCP Nutricrops' leadership to scale green hydrogen, green ammonia, and derivatives for a sustainable transition

### Institutions Involved

OCP Nutricrops; Hydrojeel

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Carbon credit price fluctuations and environmental law changes may impact certification, revenue, and viability

### Scalability

More than 95% of ammonia is made using fossil fuels, primarily through natural gas or coal; conventional ammonia is a major $CO_2$ emitter, with each ton typically releasing 2–4 tons of $CO_2$ depending on the process; fertilize

## Impact

### Innovative Drive

The project adopts a pioneering approach by combining new and mature technologies to integrate large-scale green ammonia production into the fertilizer sector; this innovative approach stems from the possibility of replacing fossil fuels

### Economic Impact

Producing fertilizers with green ammonia meets CBAM and green-hydrogen certification standards, unlocking access to premium regulated markets

### $CO_2$ Impact

Carbon impact — OCP Nutricrops imports ~1.8–2 Mt of ammonia annually; large-scale renewable-ammonia production in Morocco is expected to reach 3 Mt by 2032, enabling a yearly reduction of 6–8 million tons of $CO_2$ using >3 GW of clean mixed capacity (solar and wind) plus ~2.7 GWh of BESS in early phases *Using McKinsey's conventional ammonia emission range (1.9–2.6 t $CO_2$/t NH3)

InvestRS

# Green Hydrogen Value Chain Development Program in Rio Grande do Sul (H2V-RS)

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Boost H2V production and its value chain in Rio Grande do Sul through public policies, incentives, and subsidies, promoting the transition to a low-carbon economy

### Institutions Involved

InvestRS; Department Of Environment And Infrastructure - State Government Of Rio Grande Do Sul; Governor's Office - State Government Of Rio Grande Do Sul; Civil House - State Government Of Rio Grande Do Sul

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

The program can be replicated in multiple Brazilian cities and states, prioritizing local energy production and allocating output to offtakers and local value chains, ultimately reducing $CO_2$ emissions

## Impact

### Innovative Drive

Funding calls often encourage R&D consortia, startups, and pilot projects, fostering innovation ecosystems; spillovers into adjacent sectors (fuel cells, synthetic fuels, carbon capture, industrial process optimization) add up to the project

### Economic Impact

The program impacts local value chains by mobilizing capital toward R&D and innovation, industrial competitiveness, job creation, infrastructure development, and positioning the region as a competitive hub in the global energy transition

### $CO_2$ Impact

RS Government: program estimated to reduce up to 8.4 million tons of $CO_2$ by 2040

**External Links**

Link 01 | Link 02 | Link 03

SKF

# Harnessing tidal power with robust drive train solutions

**Energy Transition case selection** Renewables

## Overview

### Case objectives
Estimates show 100 GW of near-shore tidal power is harnessable globally, but harsh underwater conditions remain a challenge. SKF supports tidal firms with durable, holistic rotating solutions

### Institutions Involved
SKF; Local Government Organization; European Union Organization For Financial Support (Cf Green Deal)

### WG Alignment
Renewables

## Case Maturity

### Case Stage
Implemented,

### Risks Involved
Risk is related to permits and leases for seabed use - not getting approval or significant delays

### Scalability
SKF's proven six-year turbine reliability supports global deployment; scaling from 6 MW to 59 MW+ shows strong potential to cut emissions and meet Paris goals through predictable, renewable ocean energy

## Impact

### Innovative Drive
SKF set a world record with 6+ years of uninterrupted turbine operation; its integrated 3 MW drivetrain and subsea-ready components offer a pioneering, low-risk solution for harsh marine environments

### Economic Impact
Tidal stream energy is projected to add £17B to the UK economy by 2050; SKF's low-maintenance systems reduce lifecycle costs, supporting profitability and lowering LCOE

### $CO_2$ Impact
SKF's powertrain technology reduces $CO_2$ lifecycle emissions by 30%

**External Links**

Link 01 Link 02

Engie

# Hazelwood Rehabilitation Project

**Energy Transition case selection**

Australia

**Renewables**

## Overview

### Case objectives

The project involves the demolition of the former Hazelwood coal mine and coal power plant in Victoria, Australia, and the establishment of new energy infrastructure, notably a BESS facility

### Institutions Involved

Engie; Mitsui & Co. Ltd.; Fluence; Eku Energy; Local Aboriginal Representation (GLAWAC); Community Groups; Local Council; Australian Minister For Environment; Victorian Minister For Environment, Minister For Resources, Minister For Water

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Fire risk mitigation is one of the key issues of the rehabilitation project given the exposed coal

### Scalability

BESS are central to grid sustainability and decarbonization objectives; they help reduce $CO_2$ emissions by bypassing the intermittency of renewable electricity such as wind and solar

## Impact

### Innovative Drive

The BESS implementation supports the rehabilitation of Hazelwood's former coal power plant and mine site; from this perspective, the development and design of this BESS facility is quite unique

### Economic Impact

The battery's innovative design and the site's unique location provide potential to scale storage capacity quickly and cost-effectively to respond to network and market demand

### $CO_2$ Impact

About 10% of the initial 1,600 MW capacity was re-deployed through a 150 MW BESS, while the former coal-fired power plant would emit 1.56 $tCO_2$ per MWh generated and accounted

**External Links**

Link 01 | Link 02 | Link 03

World Economic Forum

# Huaneng “Yellow Sea No.1”: China’s First Wave-Resistant Floating Offshore Photovoltaic Platform

**Energy Transition case selection**

China
**Renewables**

## Overview

### Case objectives

To validate the floating offshore PV platform's endurance, power efficiency, maintenance, and weather resilience in hybrid wind-PV setups, establishing a technological pathway for scalable offshore renewable expansion.

### Institutions Involved

World Economic Forum, China Huaneng Group, China Huaneng Clean Energy Research Institute

### WG Alignment

Energy Efficiency, Renewables, Wind,

PV, Cost reduction

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Structural failure under extreme weather; significantly higher than anticipated LCOE

### Scalability

A single floating PV platform generates ~472,000 kWh annually. When deployed at scale with proportional capacity allocation to co-located offshore wind, the integrated system will yield 1.29 billion kWh yearly, reducing over 1million tons $CO_2$

## Impact

### Innovative Drive

This PV-wind hybrid cuts CAPEX/OPEX by sharing infrastructure, features a honeycomb-inspired hexagonal wave-resistant steel-plastic floater while enhancing modular scalability, and includes multi-system monitoring

### Economic Impact

Reduces steel weight by 25% while the mooring system cuts anchor usage by >50%, collectively lowering total array CAPEX by ~3%

### $CO_2$ Impact

1.29 billion kWh yearly for integrated PV-wind hybrid – effectively replacing 387,000 tons of standard coal while reducing $CO_2$ emissions by over 1million tons.

SKF

# Industrial Heat Pumps with Ceramic and Magnetic Bearings - a way to decarbonize operations

**Energy Transition case selection**

Sweden

**Renewables**

## Overview

### Case objectives

Industrial heat pumps can reduce emissions by more than 90% but with major challenges in reliability and efficiency due to demanding operation. Ceramic and magnetic bearings are the solutions

### Institutions Involved

SKF in collaboration with research institutes

### WG Alignment

Renewables, Energy Efficiency and Renewable Heat

## Case Maturity

### Case Stage

Implemented, generating first results, and mature for medium/high temperatures

### Risks Involved

Termination of governmental funding and higher operational and maintenance cost

### Scalability

Experience clearly show very good scalability and high $CO_2$ reductions are made

## Impact

### Innovative Drive

R&D needed to reach ultra-high temperatures

### Economic Impact

Well aligned with private sector goals and IRR

### $CO_2$ Impact

$CO_2e$ emission reduction are in the order of 60% to 90%

**External Links**

Link 01 Link 02

SKF

# Innovation and sustainability for a Net Zero future: The role of new technologies and regulatory challenges

**Energy Transition case selection** Renewables

## Overview

### Case objectives
Siemens Energy created the Blue Portfolio to replace SF6 with zero-carbon tech like vacuum interruption and Clean Air, showing its commitment to sustainability and innovation

### Institutions Involved
Siemens Energy (SE)

### WG Alignment
Renewables

## Case Maturity

### Case Stage
Mature, generating stable results

### Risks Involved
Critical supply chain, market and price development, shortage of key personnel, and ESG requirements

### Scalability
Impact of replacing SF6 equipment with clean, low-maintenance energy solutions aligned with global $CO_2$-reduction and sustainability goals

## Impact

### Innovative Drive
RThere are several initiatives to replace SF6 to reduce GWP impact, but they do not eliminate it completely; SE proposes a technology in which Global Warming Potential (GWP)= 0 and Ozone Depletion Potential (ODP) = 0

### Economic Impact
Vacuum tech has higher initial CAPEX, but SF6 OPEX surpasses it by year three; in countries lacking sustainability incentives, utilities are still not encouraged to adopt “zero-impact” solutions like the Blue line

### $CO_2$ Impact
Impact: ~8,300,000 tons of $CO_2$-equivalent saved; 1 kg of SF6 = 24 tons of $CO_2$; methodology: calculation of the SF6 emission rate based on the balance of SF6 usage in the factories to manufacture equi

**External Links**

Link 01

Engie

# Jirau Hydropower Plant.

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Demonstration that it is possible to implement infrastructure in the Amazon in a responsible way, following the highest, world-class social, economic, and environmental standards

### Institutions Involved

Engie (40%); Eletrobras (40%); Mitsui (20%)

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Climate Change risk proved not to be an issue, after the testing of the plant with the Hydropower Resilience Guideline, demonstrating resilience for the 5 scenarios of the IPCC for the region

### Scalability

Brazil should develop pumped-storage hydro, which can provide long-duration storage and flexibility for the interconnected system, enabling intermittent renewables such as solar and wind

## Impact

### Innovative Drive

Pumped-storage hydro plants also decrease the risk of curtailment

### Economic Impact

Investment in pumped-storage hydro plants is a competitive way to provide long-duration storage for the system

### $CO_2$ Impact

Jirau is registered in the UNFCCC's Clean Development Mechanism since 2012, avoiding 6 million tons of $CO_2$e/year

Solvay

# New e.Solvay soda ash manufacturing process

**Energy Transition case selection** Renewables

## Overview

### Case objectives

The e.Solvay process is Solvay's technological breakthrough to produce more sustainable and competitive soda ash, reducing $CO_2$ emissions by 50% compared to the current process

### Institutions Involved

Solvay

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Scalability

We aim to start industrial scale-up before 2030 and roll out until 2050

## Impact

### Innovative Drive

Electrochemistry is leveraged

### Economic Impact

Process electrification protects local competitiveness in the EU ETS; local sourcing of green electricity brings security of supply, long-term price visibility, and freight-cost savings versus imported fossil fuels; the new process will increase reaction yield, reducing raw-material usage and energy consumption

### $CO_2$ Impact

−50% compared to the current process

Neoenergia

# Noronha Verde Project

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Noronha Verde Project is an initiative aimed at decarbonizing the energy matrix of Fernando de Noronha by expanding renewable energy generation

### Institutions Involved

Neoenergia

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Fernando de Noronha faces licensing, logistics, weather, port limits, weak infrastructure, tourism pressures, and labor shortages

### Scalability

It's a replicable project that reduces emissions by transitioning from diesel thermal generation to solar; if adopted by other companies in off-grid locations, it will contribute to Paris Agreement goals

## Impact

### Innovative Drive

First utility-scale off-grid solar plant with a battery storage system in Brazil

### Economic Impact

Minimize environmental impacts from thermal generation and reduce average cost per MWh; strengthen sustainable tourism driven by decarbonization and ESG principles; develop diverse economic activities

### $CO_2$ Impact

Considering that the Tubarão power plant, a diesel-based energy generator on Fernando de Noronha Island, emitted 21,433 $tCO_2$ in 2024, and that the project aims to reach 85% renewable energy on the island, we estimate an annual emissions reduction of 18,218 $tCO_2$; this is an estimate based on 2024 energy generation

Equinor

# Northern Lights

**Energy Transition case selection**

Norway

**Renewables**[1]

## Overview

### Case objectives

First ever cross-border, open-source $CO_2$ transport and storage infrastructure network, offers companies across Europe the opportunity to store their $CO_2$ safely and permanently underground

### Institutions Involved

Equinor; Shell; TotalEnergies; Yara; Ørsted; Heidelberg Materials; Hafslund Celsio; Stockholm Exergi; Norwegian state (Gassnova); Norwegian Ministry of Petroleum and Energy; Research Institutions

### WG Alignment

Renewables, Hard to Abate, Energy transition

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

The Northern Lights project demonstrates scalability by providing a replicable model for $CO_2$ transport and storage. Its success in Norway/Europe can inspire similar CCS projects globally, supporting emissions reductions and Paris Agreement goals

## Impact

### Innovative Drive

Northern Lights is the first open-access, cross-border $CO_2$ transport and storage network. Its pioneering offshore storage in geological reservoirs sets a global benchmark for CCS innovation and scalability

### Economic Impact

In its first phase, Northern Lights required government support to reduce the risks of launching CCS value chain, but as the project matures and scales, costs are expected to fall, making later phases more commercially attractive for European industries

### $CO_2$ Impact

Cut emissions by storing at least 5 Mt$CO_2$/year (vs. 1.5 Mt initially), equal to ~2.5 million fossil-fuel cars. First $CO_2$ volumes already injected in 2025

**External Links**

Link 01 | Link 02

[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

VALE

# Rotor Sails

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Conduct a pilot test of Rotor Sails technology on a Valemax vessel to evaluate its effectiveness in reducing $CO_2$ emissions and fuel consumption.

### Institutions Involved

VALE

### WG Alignment

Renewables, Sustainable Fuels, Wind and Maritime sector.

## Case Maturity

### Case Stage

Implemented, generating first results.

### Risks Involved

RTS can be limited by technical and environmental conditions.

### Scalability

Currently, there are 5 vessels with Wind Assisted Propulsion on the fleet transporting Vale's products. The technology can be applied to most of market bulk carriers and iron ore carriers.

## Impact

### Innovative Drive

Vale was the first company to install Rotor Sails in very large ore carrier vessel in the world. The latest project includes the largest Rotor Sails in the largest ore carrier.

### Economic Impact

Fuel and cost savings, boosting competitiveness in a carbon-constrained market.

### $CO_2$ Impact

On average 6% reduction on fuel consumption, equivalent to approximately 3,000 tons of $CO_2$eq. per year.

**External Links**

Link 01

UK Export Finance

# Solar project in Turkey

**Energy Transition case selection**

Turkey

**Renewables**

## Overview

### Case objectives

Construction and operation of solar power plants at seven separate sites, with aggregate power-generating capacity of 390 MWp—the second-largest solar project in Turkey to date

### Institutions Involved

UK Export Finance; KUKE; Kalyon Enerji; Standard Chartered Bank

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation: Two of the three project sites are completed and in operation, the third project site is ongoing and partially in operation at the moment.

### Scalability

Turkey's second-largest solar project to date entails building and operating solar plants at seven sites with an aggregate capacity of 390 MWp

## Impact

### Innovative Drive

The reinsurance agreement between UK and Polish export credit agencies highlights the importance of risk-sharing, which creates the ability to support larger facilities

### Economic Impact

Financing is guaranteed by UKEF with €122 million reinsured by Poland's ECA; the deal supports UK jobs in the renewable-energy supply chain and creates opportunities for Polish companies in Turkey; the project created 4,800 direct and indirect jobs during construction and 35 permanent operational staff

### $CO_2$ Impact

The project has to date led to 450,000 tons of avoided emissions through 700,000 MWh of renewable electricity generated to date

**External Links**

Link 01

Mondelez Brazil

# Sustainability is to innovate: eutectic plates

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Eliminate the traditional use of diesel in the truck air-conditioning process and reduce our carbon emissions in the transportation of refrigerated products through the use of eutectic plates

### Institutions Involved

Mondelez Brazil; Tecpet

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

Eutectic trucks can reduce emissions and promote efficient management aligned with the Paris Agreement; wide adoption drives sustainability in refrigerated transport

## Impact

### Innovative Drive

In summary, the Mondelez eutectic-plate truck case highlights innovation and differentiation through an alternative refrigeration technology that offers significant benefits in reduced emissions, noise, and energy consumption

### Economic Impact

This project aligns with objectives by enabling $CO_2e$ reductions without impacting costs; it ensures product quality, reduces emissions, and strengthens partnerships with logistics partners and customers

### $CO_2$ Impact

We estimate that adopting this technology contributes to reducing greenhouse gas emissions by up to approximately 25% per truck, depending on the model, route, and other factors

**External Links**

Link 01 | Link 02 | Link 03

Petrobras

# Technology Reduces Emissions in the LNG Sector: Innovations for Sustainability

**Energy Transition case selection**

Brazil
**Renewables**

## Overview

### Case objectives

Reduce $CO_2$ and NOx emissions generated by FSRU operations through installation of onboard reliquefaction technology. This system captures excess boil-off gas (BOG) and converts it back into LNG

### Institutions Involved

Petrobras; Excelerate Energy; Wärtsilä Gas Solutions (WGS)

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Risk is managed iteratively across all project phases. As engineering evolves, new system integration may reveal unexpected needs, addressed via strict change control and clear scope alignment

### Scalability

This scalable case targets offshore assets to cut emissions from excess BOG burn during idle periods; equipment can be added to FSUs or FSRUs with long idle profiles and no regas or cargo sendout

## Impact

### Innovative Drive

This pioneering case applies compact reliquefaction tech to an FSRU—first of its kind; instead of burning BOG in idle mode, excess gas is recovered as reusable LNG, offering a scalable, low-emission solution for LNG vessel design

### Economic Impact

For Excelerate, this project boosts daily charter rates via a fixed-value model, shielding revenue from market swings; it aligns with Petrobras' goals, enhancing efficiency and gas recovery and strengthening the long-term partnership

### $CO_2$ Impact

$CO_2$ reduction depends on vessel mode—regas (gas sendout) or idle (no sendout); reliquefaction runs in idle mode; the table shows historical data from idle periods with zero gas sendout

Ternium Argentina S.A

# Ternium´s first wind farm (Vientos Olavarria)

**Energy Transition case selection**

Argentina

**Renewables**

## Overview

### Case objectives

Reduce Ternium Argentina's Scope 2 emissions by replacing up to 90% of grid electricity with a competitive renewable source (the first wind farm in Ternium's strategy)

### Institutions Involved

Ternium Argentina S.A.; Tecpetrol (Energy Transition Division); Vestas; Techint Engineering And Construction

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Climate-related risks during construction, such as floods and temperature extremes which are critical on cement pouring timeline

### Scalability

The case is 100% replicable across other energy-intensive industries, promoting cleaner energy sources where capacity factors are good, such as central and southern Argentina, Mexico, and Brazil

## Impact

### Innovative Drive

The case developed state-of-the-art wind-generation technology from a world-class provider (Vestas); owned renewable-energy generation in the steel sector is an innovative approach, especially in Latin America and the Global South; 100% of blades have noise minimization

### Economic Impact

Estimated ROI of ~7%; this allows substituting a projected market electricity price of USD 70/MWh (conservative scenario) with a considerably lower internal cost of ~USD 15/MWh

### $CO_2$ Impact

Vientos Olavarría Wind Farm is generating a significant environmental impact by directly reducing $CO_2$ emissions associated with the electricity consumption of Ternium Argentina's industrial operations

**External Links**

Link 01 | Link 02 | Link 03 | Link 04 | Link 05

LanzaTech

# The world's first non-oil based jet fuel, compatible with existing aircraft

**Energy Transition case selection** Renewables

## Overview

### Case objectives
LanzaJet is pioneering the development of the ethanol-to-jet (EtJ) production pathway, representing the world's next viable aviation fuel capable of facilitating the industry's energy-transition goal

### Institutions Involved
LanzaTech

### WG Alignment
Renewables

## Case Maturity

### Case Stage
Implemented

### Risks Involved
Aviation fuel carbon intensity reduced 70% on average, with potential for carbon-negative outputs in future projects, leveraging methane and nitrous oxide feedstocks

### Scalability
Funded exclusively on balance sheet over the last 15 years via strategic partnerships with shareholders across the SAF supply chain (LanzaTech, Suncor Energy, Mitsui & Co., British Airways/IAG, Microsoft Climate Innovation Fund, Breakthrough Energy, ANA, Shell, MUFG, Southwest Airlines, Airbus, Groupe ADP); also received grants from the US FAA, the UK Department for Transport, and Queensland State Government in Australia, among others

## Impact

### Innovative Drive
Our Freedom Pines US facility will create more than 250 total jobs and generate an estimated $70 million in annual economic activity for the local economy

### Economic Impact
Beyond Freedom Pines in the US, we aim for four more projects advancing beyond FID toward production across the UK, Australia, Japan, and India, each at 3× the scale of the US facility

### $CO_2$ Impact
Repurposes waste and by-products from agricultural and food sectors, which otherwise are incinerated or landfilled, thereby delivering a circular and renewable fuel with positive ecological impact

Solvay

# Transition from natural gas boiler to a biomass boiler, reducing by 40% the current $CO_2$ emissions of Solvay Paulínia Site in Brazil

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Installation of a biomass boiler at Solvay's Paulínia site by 2027 to supply two-thirds of its steam consumption, cutting the site's GHG emissions by 40% vs 2021 and reducing reliance on fossil-fuel use

### Institutions Involved

Solvay; Combio

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Potential lack of availability of economic feasible biomass due to supply-demand market imbalance

### Scalability

Adoption of a biomass model can cut GHG emissions, reduce fossil-fuel use, and foster local supply chains, supporting Paris targets and efficient resource use through renewable energy and sustainable biomass sourcing

## Impact

### Innovative Drive

Use of an energy-as-a-service model, with the consumer (Solvay) as steam off-taker and a leading sustainable biomass partner as investor, minimizing CAPEX required from the consumer

### Economic Impact

Biomass available in Brazil is a more competitive energy source than natural gas and is sustainably accessible across regions, allowing operational-cost reduction

### $CO_2$ Impact

Reduction of 140 kilotons of $CO_2$ emissions per year

**External Links**

Link 01

YAK Electric Tractors

# Tractors 100% electric

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Develop and manufacture 100% electric tractors to replace combustion machines in the field, reducing emissions and promoting the energy transition in the agricultural sector

### Institutions Involved

YAK Electric Tractors

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Adoption resistance, battery supply constraints, high upfront costs, poor rural charging infrastructure, and regulatory instability

### Scalability

Electric tractors can replace millions of diesel machines globally; broad adoption enables significant $CO_2$ reduction and energy-efficiency gains, especially in small to mid-sized farms with low access to clean tech

## Impact

### Innovative Drive

First Brazilian company to develop 100% electric tractors; combines modular battery tech, lightweight design, and local production to deliver clean, affordable, autonomous-ready machinery

### Economic Impact

Electric tractors reduce fuel and maintenance costs by up to 70%, offering 30–50% lower total cost of ownership; the model ensures profitability for both the manufacturer and end users

### $CO_2$ Impact

Each electric tractor avoids ~32.4 tons of $CO_2$ per year vs diesel (9 L/h, 1,500 h/year), based on GHG Protocol emission factors (2.4 kg $CO_2$/L)

**External Links**

Link 01 | Link 02 | Link 03 | Link 04

Atlas Agro Brasil Fertilizantes

# Uberaba Green Fertilizer (UGF)

**Energy Transition case selection**

Brazil

**Renewables**

## Overview

### Case objectives

Atlas Agro is building Brazil's first green nitrogen fertilizer plant in Uberaba, using renewable energy and green hydrogen to serve the domestic agriculture market sustainably

### Institutions Involved

Atlas Agro Brasil Fertilizantes, Industrial Transition Accelerator / Mission Possible Partnership; Brazilian Investment Platform (BIP); ABIHV - Brazilian Hydrogen Industry Association; SInprifert - Fertilizer Raw Material Producers Association; Macquarie Asset Management; National Council For Fertilizers And Plant Nutrition

### WG Alignment

Renewables

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Construction delays, CAPEX deviations due to tariffs, fertilizer price drops, and risks of not securing adequate funding

### Scalability

The plant will have a production capacity of 530 kilotons of ammonium nitrate per year, configured as a medium-scale plant; it will supply almost 3% of Brazil's nitrogen-fertilizer demand and avoid 1 million tons $CO_2e$ per year

## Impact

### Innovative Drive

UGF will be one of the first vertically integrated green-hydrogen-to-green-nitrogen fertilizer plants in the world and the first in Brazil; Atlas Agro has filed two patent applications for process improvements that significantly reduce CAPEX and OPEX

### Economic Impact

The plant's business case aligns with similar public projects; returns are confidential; the company obtained funding from Macquarie Asset Management at market conditions, demonstrating solid expected returns

### $CO_2$ Impact

2 $tCO_2e$ avoided per ton of final product; at full capacity, the plant will produce 530 kilotons of ammonium nitrate per year, resulting in 1.03 million $tCO_2e$ avoided per year

**External Links**

Link 01 | Link 02 | Link 03 | Link 4

SUSTAINABLE
BUSINESS
COP30

# Portfolio of Cases

## Sustainable Fuels

Binatural

# 100% Sustainable Route

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Prove B100's viability in heavy logistics by cutting GHGs by 90% on a real route and enabling circularity by transporting raw materials with the same biodiesel

### Institutions Involved

Binatural; Catto Transportes; DAF

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

90% reduction in $CO_2$ emissions achieved by replacing fossil diesel with B100, measured using full life cycle assessment (LCA) methodology aligned with RenovaCalc and ISCC standards

### Scalability

The project proves B100 is viable today; scalable to fleets, it cuts emissions, supports Paris goals, reduces diesel use, and leverages Brazil's existing infrastructure

## Impact

### Innovative Drive

Brazil's first fully B100-powered logistics route uses biodiesel to transport its own feedstock; it disproves engine myths and offers a scalable, local alternative to imported electric trucks

### Economic Impact

The B100 route cut fuel and maintenance costs, boosted local value chains, avoided imports, and supported jobs; projected payback is under two years from fuel savings and RenovaBio tax benefits

### $CO_2$ Impact

Switching heavy-duty transport from fossil diesel to 100% biodiesel (B100) cuts emissions by 99.4% per 330-km trip (0.3807 → 0.0023 $tCO_2e$). Replacing 52,335 L of diesel with 57,857 L of B100 avoids ~190.3 $tCO_2e$/year, a 99.7% fossil-emissions reduction. About 96.25 $tCO_2$ from biodiesel are biogenic, so they don't add to long-term atmospheric $CO_2$

Moeve

# Andalusian Green Hydrogen Valley

**Energy Transition case selection**

Spain

**Sustainable Fuels**

## Overview

### Case objectives

The main objective is to become a major green-hydrogen production hub in Europe, preventing the emission of 6 million tons of $CO_2$ per year, which will accelerate the ecological transition

### Institutions Involved

Moeve

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under planning

### Scalability

The project is based on what Moeve calls “The H2 Ring,” in the “bass balance system,” allowing injection of different H2 types (electrolytic—the main one—BIO and RCF H2) to supply, in a base profile, different consumers (an energy park producing

## Impact

### Innovative Drive

The project received the maximum score when evaluated for EU Innovation Fund support; the H2 Ring concept and the way alkaline and PEM electrolyzers will be installed are the most innovative features

### Economic Impact

With a €3 billion investment to boost energy autonomy and reduce emissions, the project promises considerable economic impact, with up to 10,000 jobs expected to be created

### $CO_2$ Impact

The project avoids the emission of 6 million tons of $CO_2$ per year

Be8

# Be8 BeVant®: Renewable Biofuel for a Low-Carbon COP30

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Deploy Be8 BeVant, a 100% renewable biofuel, to decarbonize logistics and mobility at COP30, demonstrating a scalable energy transition in Brazil

### Institutions Involved

Be8

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

Be8 BeVant® is a 100% renewable drop-in fuel for diesel engines requiring no adaptation; when scaled, it enables up to 99.3% fossil $CO_2$ reduction (tank-to-wheel), aligned with Paris goals

## Impact

### Innovative Drive

Be8 BeVant® is a patented, 100% pure-use biofuel for diesel engines; it introduces a pioneering tank-to-wheel fossil $CO_2$ emissions methodology and holds innovative product and process patents

### Economic Impact

Be8 BeVant® delivers a socio-environmental return ~15× higher than diesel, based on a macroeconomic model linking environmental gains to GDP; it is cost-effective and requires no engine adaptation

### $CO_2$ Impact

Up to 99.3% GHG reduction (tank-to-wheel), low emissions, job creation, training, and a cost-effective, scalable solution that strengthens Brazil's bioeconomy

**External Links**

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Fueling Sustainability

# BECCS FS Project

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Capture and store biogenic $CO_2$ from second-crop corn ethanol fermentation in deep geological reservoirs, ensuring safe and permanent storage

### Institutions Involved

Fueling Sustainability

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Credit monetization, licensing delays, operational failures, engineering integration, and regulatory uncertainties

### Scalability

Captures biogenic $CO_2$ from second-crop ethanol and stores it permanently, creating real removals aligned with the Paris Agreement without expanding farmland

## Impact

### Innovative Drive

First BECCS in LatAm: breaks technical and regulatory ground in geology, licensing, engineering, and removal credits, bridging energy-sector gaps

### Economic Impact

Despite limited incentives, aims for revenue via the voluntary market; synergy with ethanol helps reduce capture and storage costs over the long term

### $CO_2$ Impact

The BECCS project avoids 423,000 $tCO_2$ annually through the capture and permanent storage of biogenic $CO_2$, equivalent to 55,000 trips around the Earth in a typical gasoline-powered car

**External Links**

Link 01 | Link 02

Veolia

# Biofuels in Alagoas: the potential of local energies in the decarbonization of industries

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Implement the decarbonization roadmap of an E&C leader by ensuring the availability of 900 kton/y steam via eco-efficient biofuels: sustainable biomass, energy efficiency, and a green-hydrogen solution

### Institutions Involved

Veolia; Braskem; Grune Energies By Veolia

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Scalability

A renewable mix of solutions reduces industrial emissions by replacing fossil fuels with biofuels and efficiency alternatives, promoting efficient resource use, creating new low-carbon local economies, and promoting sustainable synergies

## Impact

### Innovative Drive

Integrates green steam generation from biomass, advanced energy efficiency through turbine motorization, and onsite green hydrogen production, creating a pioneering, synergistic approach to bridge existing implementation gaps for low-carbon industry

### Economic Impact

Concrete solution that meets competitiveness-sustainability-reliability criteria while guaranteeing heat availability to keep production running with achievable decarbonization goals and without increasing production costs for industry

### $CO_2$ Impact

In 2024, the first full year of operation, 130,910 t $CO_2$e were erased according to GHG Protocol measurements; the amount is expected to grow with the new two phases

**External Links**

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InvestRS;

# Biogás RS Program: boosting biogas production and waste-to-energy solutions through biodigesters in Rio Grande do Sul

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Promote the biodigester chain, manage organic/agricultural waste, reduce GHG emissions, and generate biogas, biomethane, $CO_2$, and fertilizers—harnessing the economic potential of circular energy conversion

### Institutions Involved

InvestRS; Department Of Economic Development - State Government Of Rio Grande Do Sul; Department Of Environment And Infrastructure - State Government Of Rio Grande Do Sul

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Scalability

By combining standardized processes, modular technologies, policy incentives, cooperative business models, and secured offtake markets, the program can be replicated in other Brazilian cities and states

## Impact

### Innovative Drive

This program creates scale and demand, lowering technology costs and valorizing agroindustrial waste—fostering investments in innovation and R&D, cross-sector innovation, digitalization, new bio-based products, and novel business models

### Economic Impact

The program stimulates the creation of qualified jobs, lowers energy costs, generates new revenues for farmers and industries, and stimulates domestic manufacturing; over time, it positions the economy for export opportunities and rural development

### $CO_2$ Impact

Although difficult to measure, this program avoids potent greenhouse gas emissions through capture and cuts relevant $CO_2$ emissions as it replaces fossil fuels and can substitute chemical fertilizers | Carbon impact — implementation of the 16 projects will contribute to an annual reduction of 118,300 tons of $CO_2$ through biogas generation, equivalent to 26,300 kWh/day of clean electric power

**External Links**

Link 01 Link 02

Zeg Biogas e Energia S.A

# Biomethane for the Energy Transition: Zeg Biogás & Aroeira Case

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

A breakthrough solution cutting GHG emissions by producing biomethane from vinasse — replacing fossil fuels while promoting circular economy, renewable energy, and sustainable waste management.

### Institutions Involved

Zeg Biogas e Energia S.A.; Zeg Biogás Aroeira SPE Ltda; Bioenergética Aroeira S.A.; BDMG

### WG Alignment

Sustainable Fuels, Renewables, Biogas and Biomethane

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Regulatory delays, substrate supply variability, tech performance uncertainty, market demand fluctuations, and logistics/ infrastructure limitations for biomethane distribution

### Scalability

Can be easily replicated in any mill processing over 1M tons/year

## Impact

### Innovative Drive

First biomethane-from-vinasse project to fuel cane trucks in Brazil. Also the first to develop national technology for sulfur removal in biogas purification

### Economic Impact

Diesel is among the top 3 costs in ethanol production. Replacing it with biomethane improves margins, boosts resilience during price crises, and helps secure jobs and income in local communities

### $CO_2$ Impact

$CO_2$ emissions reduced by 86% versus diesel, based on ANP/Finep data using Well-to-Wheel LCA. São Paulo case: 2,600 $tCO_2$/year avoided per 100 trucks fueled with biomethane.

**External Links**

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General Motors

# Biomethane implementation in a stamping automotive plant

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Implementation of biomethane at GM's stamping plant cut Scope 1 & 2 emissions by over 99%, replacing LPG used in the paint process. Gas from the Caieiras landfill is trucked using biomethane

### Institutions Involved

General Motors

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Supply shortages and process interruptions

### Scalability

Exchanging fossil fuel for renewable biomethane can be applied in other contexts if gas is available

## Impact

### Innovative Drive

First site with biomethane in manufacturing operations; construction done 100% by the biomethane supplier and diluted in the tariff

### Economic Impact

The implementation of biomethane in Mogi das Cruzes, in the energy matrix of the paint shop ovens, generates estimated annual savings of US$31,000 and a reduction of 838 metric tons of $CO_2$, contributing to energy cost stability and lower emissions

### $CO_2$ Impact

Energy matrix using LPG transitioned to biomethane, resulting in −838 t $CO_2$e/year

BP Bioenergy

# BP bioenergy Regenerative Agriculture Program

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Our ambition is to position bp bioenergy as a global reference in sustainable sugarcane, improving productivity, sugar content, irrigation, cost efficiency, and implementing Agriculture 4.0

### Institutions Involved

BP Bioenergy

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Mature, generating stable results

### Scalability

Its expansion could transform agribusiness by reducing dependence on mineral fertilizers, cutting carbon intensity, improving yields, and setting a benchmark for sustainable resource use

## Impact

### Innovative Drive

The case stands out by scaling nitrogen-fixing and P-solubilizing biologicals, localized vinasse use, digital agriculture 4.0 tools, and integrated composting, pioneering sustainable cane production

### Economic Impact

With reduced input costs, higher productivity, and efficient resource use, the case delivers strong margins; financial analysis with NPV and IRR validates affordable, profitable implementation

### $CO_2$ Impact

−47% carbon intensity of bp bioenergy's ethanol, using gasoline as reference (base 100)

E.ON

# Building trust in the transition to clean transport to reduce $CO_2$ emissions

**Energy Transition case selection**

**Sustainable Fuels**

## Overview

### Case objectives

The mobility sector is a key contributor to global $CO_2$ emissions. A functioning charging infrastructure is a mandate to accelerate the transition to e-mobility. Available is the powerful AI platform f

### Institutions Involved

E.ON; Energy Distributors; Charging Point Manufacturers; Charging Point Operators

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

No risks beyond normal business risks

### Scalability

Available uses a standardized protocol and is compatible with most charge-point models and management systems; there are no technical limits to global expansion, and benefits multiply with each new charging station

## Impact

### Innovative Drive

Available uses AI in the form of a self-trained neural network, built initially on data from 20,000+ charge points, to analyze behavior patterns, detect anomalies, and predict failures up to a week in advance

### Economic Impact

We predict failures before they happen, fix issues automatically, and give charging point operators the insights needed to boost successful sessions by up to 12.5%; the result: higher uptime and reduced time and service costs

### $CO_2$ Impact

Available improves EV charging to lower $CO_2$ by: (1) avoiding driver detours via fewer outages, (2) boosting charger utilization to cut $CO_2$ per kWh, and (3) reducing service visits with predictive maintenance. Savings: ~28 $tCO_2$/yr from detours, ~20–25 from efficiency, ~140 from fewer service calls (>170 $tCO_2$/yr total)

**External Links**

Link 01 | Link 02

CEMVITA

# Cemvita FermWorks™: Turning Waste Into Low-Carbon Value

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives
Transform residual biomass into sustainable oils and fuels, accelerating decarbonization and building resilient, circular value chains

### Institutions Involved
Cemvita Inc.; InvestRS

### WG Alignment
Sustainable Fuels

## Case Maturity

### Case Stage
Under implementation

### Risks Involved
Feedstock volatility, regulatory uncertainty, financing delays, and risks in technology scale-up

### Scalability
The FermWorks model is modular and replicable, enabling rapid adoption by multiple companies, reducing lifecycle emissions, supporting sustainability goals, and promoting efficient, circular use of resources

## Impact

### Innovative Drive
The world's first industrial plant using engineered microbes to convert waste into low-carbon oils and fuels, FermWorks sets a global precedent with its modular, co-location model for circular decarbonization

### Economic Impact
The project delivers strong returns with expected IRR above 25% and competitive CAPEX; its modular design lowers implementation costs while creating jobs and attracting private and public investment

### $CO_2$ Impact
Projected annual abatement under ISCC/EPA pathways, validated by LCA models

**External Links**

Link 01 | Link 02 | Link 03

Hytron

# $CO_2$CHEM – Development of Technological Alternatives for Production of Green Hydrocarbons from $CO_2$

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Build, commission, and operate a pilot plant using intensified unit operations to convert $CO_2$ into hydrocarbons—mainly diesel—via PEM, RWGS, PSA, and Fischer-Tropsch

### Institutions Involved

Repsol Sinopec Brazil; Senai Firjan; University Of São Paulo (USP); Hytron (Neuman & Esser Group)

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Uncertainties in process efficiency, system integration, and potential operational challenges in $CO_2$ conversion to sustainable fuels

### Scalability

The project has strong scaling potential to cut emissions by converting $CO_2$ into sustainable fuels; it boosts resource efficiency by using $CO_2$ as feedstock and supports the circular economy and clean energy

## Impact

### Innovative Drive

The project is innovative due to the scale of its pilot plant in Brazil, aiming to assess the potential of $CO_2$ conversion technology; it provides valuable insights into scaling up and refining processes for future commercial applications

### Economic Impact

The project's economic impact lies in creating new markets for sustainable fuels, reducing carbon-capture costs, and driving innovation, aligning with private-sector profitability by enhancing green-technology adoption

### $CO_2$ Impact

The project uses 1 ton of $CO_2$ per year to produce 20 L/day of syncrude, with carbon balance and capture efficiency assessed, using renewable energy to ensure a carbon-neutral fuel

**External Links**

Link 01 | Link 02 | Link 03

Repsol

# De-risking and scaling up of synthetic fuel production

**Energy Transition case selection**

**Sustainable Fuels**

## Overview

### Case objectives

Boost the production of synthetic fuels through technology development and scaling of the different technologies, reducing investment risk and applying lessons learned

### Institutions Involved

Repsol, Several Private Companies

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Technological risks in electrolyzers and synthetic fuel production, integration issues, high EU energy prices, and regulatory inconsistencies across sectors

### Scalability

A large-scale implementation of synthetic fuels reduces GHG emissions, meets climate goals, leverages infrastructure, and boosts innovation and the green economy

## Impact

### Innovative Drive

The process scheme and the integration of the novel technologies selected have never been implemented at this scale, converting this demo plant into a first of a kind and one of the biggest plants to produce synthetic fuel using $CO_2$ as a raw material

### Economic Impact

Although costs are currently high, industrialization and economies of scale should reduce them over the next decade; abundant raw materials and declining renewable-energy costs support long-term sustainability

### $CO_2$ Impact

Replacing fossil fuels with synthetic fuels results in net-zero $CO_2$ emissions from vehicle use and an 80–95% reduction in $CO_2$ emissions across the entire production chain

VALE

# Decarbonization mining and railroad at Vale trough Biodiesel

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Mining industry uses 8% of Brazil's diesel. Vale aims to cut Scope 1 emissions by 33% by 2030, using biodiesel blends above the mandatory specifications in the diesel used to fuel its trucks and locomotives.

### Institutions Involved

Vale

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Adjustments to current legislation with ANP, competitive pricing, consistent fuel availability and quality near sites, stability of biodiesel in large volumes, potential impacts on engine performance

### Scalability

By using higher biodiesel blends, Vale cuts $CO_2$ (2.34 kg/l), aligns with the Paris Agreement, and leads mining's energy shift, setting an example for large-scale sustainable practices.

## Impact

### Innovative Drive

Vale, OEMs and Research Centers drive innovation by using high biodiesel blends in mining and rail, linking agriculture and mining to boost sustainability, tech, and social impact in Brazil's energy transition.

### Economic Impact

Preliminary results show that a regulated carbon market in Brazil is crucial to achieving economic viability. Furthermore, it will be necessary to mitigate the cost impact of high-biodiesel-content Type B diesel.

### $CO_2$ Impact

Burning one liter of diesel releases approximately 2.9 kg of $CO_2$. Biodiesel, however, can reduce these emissions by up to 90%, depending on factors such as the feedstock used, production process, and logistics involved.

**External Links**

Link 01 | Link 02

SAF

# Decarbonizing Aviation with e-SAF

**Energy Transition case selection**

Canada

**Sustainable Fuels**

## Overview

### Case objectives

e-SAF is a synthetic drop-in fuel substitute to conventional fossil-based fuel. It offers a remarkable 90%+ carbon footprint reduction to conventional jet fuel and is a crucial pathway to decarbonizing aviation

### Institutions Involved

SAF+ INTERNATIONAL GROUP

### WG Alignment

Sustainable Fuels, Renewables and Aviation

## Case Maturity

### Case Stage

Under planning

### Risks Involved

Risk of not getting funding for FEED studies of first plant

### Scalability

Typical plant is reproducible in many sites and countries to yield SAF that is ICAO-CORSIA compliant

## Impact

### Innovative Drive

SAF+ IG's conversion process uses industrial or ocean-captured $CO_2$ to produce e-SAF. Thanks to its compatibility with existing jet fuel infrastructure, much less investment is required, and a proprietary digital twin allows a 10% CAPEX reduction on future plants

### Economic Impact

Based on Refuel EU mandate projected pricing, potential for 588M$ NPV at 3.2 years payback for 781M$ CAPEX

### $CO_2$ Impact

According to LCA analysis, CI reduction of 89g$CO_2$e/MJ to less than 9g$CO_2$e/MJ of jet fuel. Since e-SAF is not based on fossil crude, the carbon remains in the crust of the earth by a substitution effect

**External Links**

Link 01

Green Energy Park

# Decarbonizing Steel industry – Green HBI hub Brazil

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Our hydrogen-based DRI with SOEC electrolyzer offers a breakthrough to decarbonize hard-to-abate sectors, particularly steel. Green iron is a gateway to scale net-zero beyond hydrogen as fuel

### Institutions Involved

BNDES - National Bank For Economic And Social Development; Vale; Green Energy Park

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under planning

### Risks Involved

Conceptual study highlights risks tied to large-scale hydrogen-based DRI technology and Brazil's evolving regulatory framework

### Scalability

Potential 80% cut in EU steel emissions: new route emits 0.4 $tCO_2$/t vs 2 $tCO_2$/t today; fully aligned with the Paris Agreement, it offers a scalable solution for a hard-to-abate sector responsible for 7% of global GHG emissions

## Impact

### Innovative Drive

Unlike hydrogen-as-fuel uses, green iron production employs hydrogen as a chemical reductant; heat recovery boosts SOEC efficiency, making it up to 30% higher than conventional alkaline electrolyzers

### Economic Impact

Preliminary estimates: NPV US$171M (full equity), 11-year payback, and 18.2% IRR; with tax benefits and financing, NPV reaches US$414M and IRR 31.3%, based on future market prices and expected ETS carbon-credit valuation

### $CO_2$ Impact

In 2024, EU-27 steel emits ~200 Mt $CO_2$/year (~5% of the EU total). This project aims to cut 80% of that — reducing emissions by 160 million tons annually

**External Links**

Link 01 | Link 02

Ciplan

# Elephant grass as alternative to recover degraded lands and mitigate $CO_2$ emissions through the substitution of fossil fuels in Cement Production

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Partner with small farmers to convert degraded land into elephant grass biomass production, increasing rural income and substituting fossil fuels to mitigate $CO_2$ emissions in cement production

### Institutions Involved

Ciplan; EMBRAPA - Brazilian Agricultural Research Corporation

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Risks include low productivity of small farmers and volatile fertilizer prices

### Scalability

Ciplan cement company demands more than 1,500,000 Gcal of thermal energy; just 10% of it needs more than 1,000 hectares of elephant grass, impacting more than 100 local families

## Impact

### Innovative Drive

Currently the main biomass comes from wood; elephant grass produces more biomass per area and is not used in cement production; Ciplan established a partnership with Embrapa (elephant-grass developers) to ensure a reliable analysis and methodology

### Economic Impact

The case aligns with the Vicat Group Decarbonization Plan by substituting fossil fuels with biomass to reduce $CO_2$ in cement production; land 20 km from the plant: NPV USD 3,946/ha, IRR 75%, payback two years

### $CO_2$ Impact

The quantification of $CO_2$ emissions mitigation is under analysis to certify the numbers according to international standards | Carbon Impact – Annual reduction of 55.858 tons of $CO_2$ through the partial substitution of Petcoke by Elephant Grass biomass in the burning process of cement production

All Cement Companies In The Sector

# Energy Transition | How the cement industry is transforming and becoming a solution for waste mng

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Drive the level of thermal substitution in the cement sector through alternative fuels, promoting environmental sustainability by reducing $CO_2$, improving cost efficiency, and enabling proper waste management

### Institutions Involved

All Cement Companies In The Sector; Brazilian Portland Cement Association

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Operational, technical, regulatory, economic, and social risks considered

### Scalability

When adopted by multiple cement plants, coprocessing waste can cut $CO_2$ emissions by almost 15%, reduce reliance on fossil fuels, and optimize natural-resource use, supporting Paris Agreement goals

## Impact

### Innovative Drive

The initiative pioneers the use of diverse alternative fuels in cement production, combining waste management, energy efficiency, and emission reduction, with innovative monitoring ensuring consistent performance and scalability

### Economic Impact

The initiative supports cement-sector profitability by reducing fuel costs and import dependence; efficiency gains generally offset implementation costs, with NPV and IRR showing positive financial returns

### $CO_2$ Impact

Reduce ~3 Mt of $CO_2$ annually, measured by the GHG Protocol, supporting large-scale sustainability goals

HYTRON

# Ethanol Reformer: Development and technological upscaling to produce 500 Nm3/h of Low Carbon Hydrogen

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Manufacture the 50 Nm3/h ethanol reformer for vehicle refueling and, in a second phase, upscale to 500 Nm3/h of H2 for an industrial plant and develop an engineering project for 5000 Nm3/h

### Institutions Involved

Hytron - Energy And Industrial Gases Ltda.; Shell Brazil Petroleum Ltda.; ANP - National Petroleum, Gas And Biofuels Agency; FIRJAN - Federation Of Industries Of The State Of Rio De Janeiro; Raízen Energia S.A.

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Risks inherent to technological development

### Scalability

The technology produces renewable H2 with low emissions using bioethanol, reducing dependence on natural gas in H2 production; it also values local biomass, promoting a circular economy and sustainable resource management

## Impact

### Innovative Drive

The main innovation of the project is the development of a steam-reforming reactor to use ethanol through a multitubular, convective technology utilizing computational optimization

### Economic Impact

The bioethanol reforming system adds value by replacing fossil H2 with low-carbon H2, encouraging agricultural chains to expand biomass use; bioethanol acts as a hydrogen carrier, reducing logistics costs

### $CO_2$ Impact

Using bioethanol instead of natural gas for H2 can reduce emissions by 50% or more, with great potential to achieve net-negative emissions

**External Links**

Link 01 | Link 02

Engie

# France KerEAUzen

**Energy Transition case selection**

France

**Sustainable Fuels**

## Overview

### Case objectives

France KerEAUzen is a low-carbon e-kerosene production platform in Normandy, France. 70,000 tons of e-kerosene destined for civil aviation will be produced annually

### Institutions Involved

Engie; Air France - KLM; Haropa Port; Normandy Region; Just Transition Fund

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Thanks to the very limited footprint of the e-kerosene, the project is expected to save 230 000 $tCO_2$ a year

### Scalability

The project is mostly privately funded, with contributions from the Normandy Region and the EU's Just Transition Fund

## Impact

### Innovative Drive

Project turnover is projected to be €450M annually; moreover, European legislation on SAF (sustainable aviation fuels) will increase profitability prospects in the coming years

### Economic Impact

Construction of the total facility should not exceed three years (2027–2030)

### $CO_2$ Impact

The e-kerosene production process relies on transforming recycled $CO_2$ from the Le Havre industrial area; total saved emissions should represent 230,000 $tCO_2$ a year

Ferrovial

# From Pilot to Impact: Scaling HVO for a Low-Carbon Future

**Energy Transition case selection**

**Sustainable Fuels**

## Overview

### Case objectives

Ferrovial is making progress in decarbonizing its value chain by using HVO to reduce emissions on construction sites. A transformative strategy that accelerates the path to net zero

### Institutions Involved

Ferrovial; Repsol; Massachusetts Institute Of Technology (MIT)

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Reluctance of subcontractors to use this type of fuel, fuel price and availability, and lack of subsidies or incentives

### Scalability

Ferrovial has created an expert group studying HVO adoption, seeking synergies across key regions and suppliers, and advising the supply chain (including subcontractors and customers)

## Impact

### Innovative Drive

The project is innovative due to its scalability across regions and its short-term impact; HVO's compatibility with all machinery enables fast emission reductions, making it a key tool for sustainable construction

### Economic Impact

HVO's cost impact varies by region, but its main value lies in decarbonization and meeting investor sustainability demands, making it a strategic choice despite uncertain direct economic returns

### $CO_2$ Impact

In Madrid, a 93.1% reduction in $CO_2$ emissions compared to the use of fossil fuels; in Heathrow, a 91% reduction compared to the use of fossil fuels

**External Links**

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Engie Brazil

# From Waste to Energy - Autonomous and Affordable Energy for our Communities

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Promote energy transition and autonomy in schools by installing biodigesters that convert organic waste into biogas and biofertilizer. It also works as a tool for environmental education

### Institutions Involved

Engie Brazil; Brazilian Association Of Biogas And Biomethane; Engie Foundation; Biomovement; Energy Assistance France

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Local engagement gaps, technical maintenance challenges, and limited funding mitigated through training, monitoring, and partnerships

### Scalability

The project uses simple, low-cost technology and can be easily expanded to other communities, institutions, and countries, supporting global climate goals and SDGs 2, 7, 11, 12, and 13; nationwide it could potentially avoid around 110,000 $tCO_2$/year

## Impact

### Innovative Drive

The project's innovation lies in its plug-and-play biodigester—low-cost, modular, and easy to install without specialized labor; combined with corporate volunteering and education, it creates a scalable model for clean energy and community impact

### Economic Impact

With R$25,400 investment (including installation), each biodigester generates daily biogas and biofertilizer; payback can be one year if selling biofertilizer, or ~5.5 years via gas savings; it reduces costs and fosters local entrepreneurship

### $CO_2$ Impact

Each unit avoids 1 ton $CO_2$ per year by replacing LPG with biogas and avoiding transport emissions normally from diesel trucks; the method follows HomeBiogas' GHG offset model using caloric value

**External Links**

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Volkswagen Truck & Bus

# Fueling the Future: Biofuel Integration from the Ground Up

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Increase the volume of biofuel through HVO addition in the first fill of Volkswagen Truck & Bus vehicles during the production process, before delivering them to retail/dealers

### Institutions Involved

Volkswagen Truck & Bus; Vibra Energia

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented

### Risks Involved

Filling truck and bus fleets with 10% HVO diesel reduces about 253 $tCO_2e$ per year, supporting cleaner and more sustainable transport

### Scalability

Own funding

## Impact

### Innovative Drive

With HVO in the first fill, VWTB delivers trucks that cut emissions and add immediate value—lower environmental costs, a competitive edge in bids, and a sustainable example; savings and business opportunities right from the company

### Economic Impact

VWTB maintains a plan to gradually increase HVO in its first fill beyond legislation, ensuring compliance with decarbonization goals and policies

### $CO_2$ Impact

HVO diesel reduces emissions, promotes public health, and drives the green economy; its adoption in Brazil combines environmental sustainability, job creation, and reduced dependence on fossil fuels

Lupin Limited

# Green Puffs: Green Inhalers with Near-Zero Climate Impact

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Driving healthcare decarbonization with near-zero inhalers that cut emissions, fight global warming, and deliver safe, effective, accessible, and green respiratory care to millions of patients.

### Institutions Involved

Lupin Limited

### WG Alignment

Energy Efficiency

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Stakeholder adoption, regulatory delays, patient resistance, supply chain issues, higher initial costs may impact adoption and scalability of green inhalers.

### Scalability

With over 500 million inhaler users globally, green inhalers can cut carbon emissions by up to 90%, enabling pharma's contribution to Paris Agreement Goals and promoting sustainable respiratory care across health systems worldwide.

## Impact

### Innovative Drive

Use low-GWP tech to cut emissions by 90%, with sustainable lifecycle design. This innovation pioneer's high quality, climate-safe inhalers without compromising care, bridging healthcare and climate action.

### Economic Impact

Show medium-to-long-term ROI via efficiency, brand value, and global reach. They reduce regulatory risks and create market differentiation, tapping rising demand for climate-conscious healthcare.

### $CO_2$ Impact

Propellant accounts for 41% of Lupin's carbon footprint currently at >400,000 tons $CO_2$. Green inhalers have potential to reduce ~90% of these emissions.

**External Links**

Link 01 Link 02

L'Oréal

# Greenbound - Decarbonizing our operations

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

L'Oréal presents GREENBOUND case, aiming to reduce scope 3 absolute emissions in 28% by 2030 (vs 2019), using biogas to decarbonize its logistics operation, stimulating a renewable biofuel market

### Institutions Involved

L'Oréal

### WG Alignment

Sustainable Fuels, Renewables, Biomethane and Renewable Heat

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

The gap between biomethane demand, production and distribution network is a currently bottleneck to be developed trucks adapted to fuel

### Scalability

The scalability extends beyond Brazil's borders, allowing it to be a catalyst to a low-carbon economy

## Impact

### Innovative Drive

The disruptive nature comes from fostering circularity (waste to renewable fuel) and pioneer application on logistic fleet operation, creating the first dedicated fuel station and the use of technologies to monitor and optimize the emission reduction

### Economic Impact

The project provides economic benefits through greater price stability for biometane compared to fossil fuels, protecting against market fluctuations and providing long-term economic advantages

### $CO_2$ Impact

Biofuel generated by organic waste decomposition, belongs to a circular process by nature, has potential to reduce $CO_2$ emissions by 78% compared to fossil fuels as source (well-to-wheel) for logistic

**External Links**

Link 01

CNH Latin America

# Harvesting the Future: Ethanol-Powered Agricultural Machinery

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Develop ethanol engines for agri-machinery, starting with sugarcane harvesters, replacing diesel with crop-based fuel produced on-site, and expand to corn ethanol tractors as the next step

### Institutions Involved

CNH Latin America

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Field tests may show higher fuel use than diesel, which could affect adoption, but optimizations aim to ensure efficiency

### Scalability

Ethanol engines can cut emissions by 90% vs diesel; using ethanol from sugarcane mills in their own fleets creates a closed loop; CNH plans to expand this equipment, boosting adoption across crops

## Impact

### Innovative Drive

CNH pioneers ethanol engines in heavy agri-machinery; FPT's OTTO engines and adapted systems (fuel, exhaust, electronics) close a key gap in sustainable farming tech

### Economic Impact

Diesel accounts for 30% of bioenergy crop (sugarcane and corn) production costs; ethanol cuts fuel expenses, boosting mill profits

### $CO_2$ Impact

Ethanol reduces $CO_2$ emissions by at least 70% per km/hour; in cars it totals 500M tons since 2003; in agricultural machinery the potential is also huge and still needs to be calculated

**External Links**

Link 01 | Link 02 | Link 03 | Link 04 | Link 05

Fueling Sustainabiliy

# Intermediate Corn Crop Ethanol

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Scale second-crop corn ethanol production with full traceability and low-carbon footprint, supporting sustainable bioenergy growth without land expansion

### Institutions Involved

Fueling Sustainabiliy

### WG Alignment

Sustainable Fuels, use of degraded land and hard-to-abate sectors

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Potential regulatory changes affecting biofuel incentives; volatility in commodity prices (corn and ethanol) impacting margins; climate variability influencing second-crop yields; supply chain disruptions in feedstock logistics.

### Scalability

Its a replicable project that will Its a replicable project that will reduce emissions by making energy transition: from thermal power generation (diesel) to solar generation

## Impact

### Innovative Drive

Combines traceable supply chain, zero land expansion, low LUC risk, renewable cogeneration, and CORSIA certification — pioneering sustainable intensification for scalable low-carbon fuels.

### Economic Impact

Integrated model with diverse revenues, low feedstock costs, and strong EBITDA ensures high returns. Green Bonds confirm competitive NPV and IRR.

### $CO_2$ Impact

In eight years of operation, avoided 3,954,128 $tCO_2$

Acelen Renewables

# Macauba, from seed to fuel, an innovative and sustainable energy solution

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Integrated production of SAF/HVO at scale from macauba, a Brazilian feedstock produced on 180k ha of degraded land, enabling clean, cost-competitive fuels with fossil parity and full sustainability

### Institutions Involved

Acelen Renewables

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

High CAPEX, regulatory misalignment, feedstock limitation, low offtake predictability, and scarce incentives may hinder SAF financial viability

### Scalability

The scalable macaúba SAF/HVO integrated model restores degraded land, captures 60+ Mt $CO_2$, enables low-carbon aviation, promotes regenerative agriculture, and empowers rural livelihoods through inclusive agriculture

## Impact

### Innovative Drive

Backed by global R&D partners, Acelen Renewables drives a tech-powered, open-innovation ecosystem with local development of technology and agtech in a vertical model to produce SAF/HVO at scale

### Economic Impact

The project ensures returns via an integrated value chain using high-oil-productivity feedstock on degraded land and co-product commercialization, supporting a competitive SAF production cost of USD 40/bbl

### $CO_2$ Impact

Over 60M tons of $CO_2$ captured via Macauba cultivation on degraded land, based on life cycle analysis (LCA) aligned with international carbon accounting methodology for Improved Agricultural Land Manag

**External Links**

Link 01

Senai Institute Of Innovation In Biomass

# Macrofuel - Energy use of pyrolytic bio-oil from aquatic macrophytes for biofuel production

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Transform aquatic macrophytes into bioenergy, enabling the most appropriate destination of this biomass as a drop-in fuel in diesel engines

### Institutions Involved

Senai Institute Of Innovation In Biomass; CTG Brazil

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Aquatic plant overgrowth risks turbine integrity by blocking intakes, lowering hydraulic efficiency, inducing cavitation, and accelerating wear

### Scalability

Using the generated biofuel to power the companies' own generators strengthens economic viability; the pilot plant validated the concept and technologies, and the data obtained enables the design of larger-scale

## Impact

### Innovative Drive

It is based on the importance of minimum-impact management to maintain the aquatic ecosystem until its adequate reuse, through thermal conversion of these aquatic macrophytes into biofuel (for which a patent was granted in Brazil and the USA

### Economic Impact

The project investment was R$10 million, with break-even in month 59, payback in month 68, and operational profitability of 51%, with ROI of 1.38% per month after 120 months; the plant's estimated production is 12,000 liters per day

### $CO_2$ Impact

Approximate annual reduction of 2.8 million tons of $CO_2$, based on removing aquatic plants for conversion into bio-oil and converting 60–80% into renewable biofuels

**External Links**

Link 01 | Link 02 | Link 03 | Link 04 | Link 05 | Link 06 | Link 07 | Link 08 | Link 09

MDC Energia

# MDC Energia and its biomethane projects: transforming waste into sustainable fuel for the future

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

By upgrading biogas from landfills into biomethane, we prevent methane from being released into the atmosphere and foster a circular economy by transforming environmental waste into a renewable fuel

### Institutions Involved

MDC Energia

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Biogas output may fall in heavy rain or drought, affecting delivery; minor risk of flammable substance leaks posing health or environmental threats

### Scalability

By producing biomethane from residues, the company doesn't compete with raw materials used for food; given proven technology and replicability, it can scale nationally to become one of the most relevant producers globally

## Impact

### Innovative Drive

Since 2012, MDC Energia has been developing biomethane projects with a dedicated in-house engineering team; we adapt imported equipment and integrate different technologies in house, being the first in Brazil to produce biomethane at commercial scale

### Economic Impact

Considering the green premium in the biofuel price and natural gas prices, these projects can yield IRRs above 20% to shareholders, with sustainable long-term impact for all involved

### $CO_2$ Impact

In addition to reported emissions reductions, the projects generate environmental attributes such as carbon credits and renewable gas guarantees of origin (GAS-RECs)

**External Links**

Link 01

Ternium Brazil

# Natural gas replacement using biomethane from a landfill at stationary combustion sources at Ternium´s integrated steel plant

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Ternium Brazil started using biomethane to replace fossil natural gas in its stationary combustion sources, improving sustainability, reducing $CO_2e$ emissions, and adding value to waste management

### Institutions Involved

Ternium Brazil; Gas Verde

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Health fears from landfill origin and doubts on calorific value proved unfounded; information asymmetry was resolved

### Scalability

The project is applicable and can scale in any medium- to large-scale city landfill near any industry that consumes natural gas; distance should be under 50 km to be net-positive in GHG reductions

## Impact

### Innovative Drive

This was an unprecedented case introduced in a heavy-industry steel company in Latin America; it is an innovative project that could inspire many other industries worldwide with similar conditions, given close distance and high natural-gas prices

### Economic Impact

Ternium's negotiations achieved paying the same price as fossil natural gas (market)

### $CO_2$ Impact

83,872 $tCO_2e$ since operations began in 2019 until Dec 2024 (annually third-party verified), net GHG emission reduction

**External Links**

Link 01

CNH

# New Holland Biomethane Tractor and Ecosystem

**Energy Transition case selection**

**Sustainable Fuels**

## Overview

### Case objectives

Develop and scale the world's first 100% biomethane-powered tractor, supported by a robust ecosystem that connects producers to biodigestion, upgrading, logistics, and financial viability in the field

### Institutions Involved

CNH - New Holland; Sebigas Cotica; Air Liquide; Gas Futuro; Geoenergética; 3DI; Master Biogas; PlanET

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Financial incentives uncertain, Brazilian legislation under development, high project costs, and government bureaucracy

### Scalability

The biomethane tractor and its support ecosystem can be replicated across agricultural sectors; already expanding in Latin America, it has global potential in regions with agribusiness and organic waste

## Impact

### Innovative Drive

Reinforcing its position as a leader in clean energy, New Holland remains the only brand with a 100% biomethane-powered tractor already commercially available on the market

### Economic Impact

Saving up to R$5 per liter of diesel replaced, with direct impact shown by IRR, TCO, and payback from client-specific feasibility studies, and indirect impact on economic security vs oil-price volatility

### $CO_2$ Impact

With T6.180 Methane Power, up to 84% $CO_2$ reduction is achieved compared to Stage V diesel engine limits, and up to 216% considering total $CO_2$ saving with fugitive methane

**External Links**

Link 01

P2X Solutions Oy

# P2X Solutions Harjavalta

**Energy Transition case selection**

Finland

**Sustainable Fuels**

## Overview

### Case objectives

Open up the green hydrogen economy in Finland through an industrial-scale 20 MW production facility, alongside innovative European large-scale e-methane production

### Institutions Involved

P2X Solutions Oy

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

Funding uncertainty and challenges typical for an early-stage company, risks associated with deploying new, large-scale technologies, normal safety related risks, like explosion of hydrogen, as well as other hazards at the production site

### Scalability

Industrial scale and the target of the company is to scale up 100 MW modular production. One of the few European industrial-scale projects that have been materialized due to market demand

## Impact

### Innovative Drive

This pioneer project represents the first large scale e-methane production so far in Europe. It introduces a pioneering approach by integrating existing technologies into a commercially viable business cases

### Economic Impact

Demonstrate that green hydrogen economy can be viable, with first customer contacts already signed and delivered

### $CO_2$ Impact

Supports Finland's 10% emission reduction target

Vale

# Pelletizing decarbonization at Vale through Biomethane

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Vale plans to replace natural gas with biomethane in pellet plants, cutting $CO_2$ emissions with a renewable fuel that matches natural gas properties and supports carbon removal

### Institutions Involved

Vale

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation feasibility study

### Risks Involved

Ensuring competitive pricing compared to natural gas price. Securing consistent fuel supply and quality near operational facilities. GHG Protocol could not accept the use of origination certificates

### Scalability

Vale's use of biomethane cuts ~2 kg $CO_2/m^3$, aligns with the Paris Agreement, and leads mining's energy shift, inspiring large-scale adoption of low-carbon practices

## Impact

### Innovative Drive

Vale, with OEMs and partners, links mining and agriculture to drive Brazil's energy transition, delivering technical, economic, environmental, and social benefits

### Economic Impact

Preliminary results show that a regulated carbon market in Brazil is crucial to achieve economic viability. Furthermore, it will be necessary to mitigate the cost impact of using biomethane, which has a higher price than natural gas

### $CO_2$ Impact

Each cubic meter of natural gas emits approximately 2 kg of $CO_2$ when burned. Biomethane, on the other hand, can reduce about 99% of natural gas emissions, which means almost 2 kg of $CO_2$ avoided

**External Links**

Link 01 | Link 02

Grupo Iquine

# Reduction in the Use of Fossil Fuels

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Reduce fossil fuel consumption

### Institutions Involved

Grupo Iquine

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Mature, generating stable results

### Risks Involved

More refueling stops needed

### Scalability

Our initiative aims to reduce the carbon footprint, contribute to SDG 13 and sector goals (ABRAFATI), and help the Group meet its climate targets

## Impact

### Innovative Drive

We recognize that this is still little adopted and accepted in the corporate world, but we understand its relevance and high potential for positive impact, making it not only necessary but strategic for sustainable transformation

### Economic Impact

Our initiative involved variable investment based on refueling efficiency and the average ethanol price relative to gasoline; despite the change, there was no significant budget impact, demonstrating economic viability

### $CO_2$ Impact

The direct impacts on $CO_2$ emissions are already noticeable: we recorded a reduction of 118.54 tons of $CO_2$ equivalent, the result of a strategic guideline supported by Grupo Iquine

**External Links**

Link 01

Repsol

# Scaling up renewable fuels production to allow progressive substitution of conventional fuels for transport

**Energy Transition case selection**

Spain

**Sustainable Fuels**

## Overview

### Case objectives

Scale up renewable fuels to progressively replace conventional fuels in road, air, and maritime transport through technology development and industrial transformation

### Institutions Involved

Repsol

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Regulatory uncertainty, access to new feedstocks, technological challenges, cost competitiveness, and differences in international policy frameworks

### Scalability

Since 2011 co-processing projects have scaled up, enabling construction of a first-of-a-kind plant for 100% renewable fuels; another plant is under construction repurposing an existing facility; each plant cuts 750–900 kt/year of $CO_2$

## Impact

### Innovative Drive

They include advanced technologies that transform waste into high-quality renewable fuels, enabling immediate use in current engines and transport systems without infrastructure changes

### Economic Impact

This mature technology leverages modernization of existing assets (retrofit) to accelerate production and secure attractive raw materials, with IRR above 25% and payback under four years

### $CO_2$ Impact

We avoid up to 1.65 Mt $CO_2$/year: 900,000 t from Cartagena (operational) and 750,000 t from Puertollano (in progress), both calculated under RED Directive principles

**External Links**

Link 01 | Link 02

Geological Survey Of Brazil

# Technical-Scientific Studies for $CO_2$ Geological Storage in Deep Saline Aquifers of the Paraná Basin

**Energy Transition case selection**

Brazil

**Sustainable Fuels**[1]

## Overview

### Case objectives

Assess the potential of deep saline aquifers in the Paraná Basin for long-term $CO_2$ storage through reservoir characterization, modeling, and pilot-scale well drilling and testing

### Institutions Involved

Geological Survey Of Brazil; Petrobras; Fundação De Apoio Ao Desenvolvimento Da Computação Científica (FACC)

### WG Alignment

Sustainable Fuels, Energy transition

## Case Maturity

### Case Stage

Under implementation

### Scalability

Supports large-scale $CO_2$ storage near high-emission areas; methodology can be replicated in other sedimentary basins

## Impact

### Innovative Drive

It is the first in Brazil to assess real storage potential with physical data and pilot wells, moving beyond theoretical modeling

### Economic Impact

Enables CCS investment-readiness near industrial clusters; funded by Petrobras with potential to attract further private investment; NPV and IRR will be estimable after July 2026

### $CO_2$ Impact

Supports future CCS deployment with an estimated 462,000 Mt $CO_2$ theoretical capacity; mitigation depends on project expansion based on verified storage potential

[1] Disclaimer: This case fits within Energy Transition in a broader, cross-cutting way

Volkswagen Truck & Bus

# Volkswagen Meteor Hybrid Truck – Sustainable technology

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

The hybrid truck, developed by VWTB and Suspensys, combines a diesel engine and an electric axle with smart traction. It automatically manages power use based on route and battery, optimizing fuel consumption

### Institutions Involved

Volkswagen Truck & Bus; Suspensys

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Under implementation

### Risks Involved

Hybrid truck efficiency depends on smart traction; risks tied to route conditions and fuel optimization

### Scalability

This project can be developed by different OEMs and countries as another solution for long-distance decarbonization, especially in countries where long-distance road transport is a relevant option in the mix

## Impact

### Innovative Drive

Innovative technology enables fuel reduction in extra-heavy long-haul trucks, improving $CO_2$ footprint and performance—without requiring special charging infrastructure; it meets Brazil's demand for sustainable, efficient transport and boosts sales

### Economic Impact

New technology enables a 10% fuel-consumption reduction, improving vehicle performance and durability; it meets Brazil's demand for sustainable transport and drives sales by combining efficiency with environmental responsibility

### $CO_2$ Impact

This prototype can run for kilometers without recharging, with automatic energy management; it can cut $CO_2e$ emissions by up to 10% and features an upgraded aerodynamic package for greater efficiency

Volkswagen Truck & Bus

# Volkswagen Truck Fuel Flex: moved by 100% Brazilian Biofuel

**Energy Transition case selection**

Brazil

**Sustainable Fuels**

## Overview

### Case objectives

Development of Volkswagen commercial vehicles certified for B100 biodiesel operation, performance, durability, and emissions reduction, in partnership with biofuel producers and logistics operators

### Institutions Involved

Volkswagen Truck & Bus; JBS; Be8; MWM; Vibra Energia

### WG Alignment

Sustainable Fuels

## Case Maturity

### Case Stage

Implemented, generating first results

### Risks Involved

Development of Volkswagen commercial vehicles certified for B100 biodiesel operation, performance, durability, emissions reduction, in partnership with biofuel producers and logistics operators

### Scalability

The use of B100 can reduce $CO_2e$ emissions by up to 80% compared to fossil diesel; this can be used as a benchmark for other OEMs, consumers, and countries

## Impact

### Innovative Drive

The pioneering use of B100 in Brazil drives the energy transition, strengthens the national biofuel industry, and promotes sustainability; developing B100-compatible vehicles also supports climate goals and fosters innovation in transportation

### Economic Impact

Offering B100-certified commercial vehicles boosts sales by meeting growing demand for sustainable solutions in Brazil, while ensuring performance and durability with pure biodiesel

### $CO_2$ Impact

75–80% reduction on a well-to-wheel basis