**SDG7 Energy Compact of Electrochaea GmbH**
**A next Decade Action Agenda to advance SDG7 on sustainable energy for all, in line with the goals of the Paris Agreement on Climate Change**

## SECTION 1: AMBITION

**1.1. Ambitions to achieve SDG7 by 2030.** *[ Please select all that apply, and make sure to state the baseline of each target]*
(Member States targets could be based on their NDCs, energy policies, national five-year plans etc. targets for companies/organizations could be based on their corporate strategy)

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| ☒ **7.1.** By 2030, ensure universal access to affordable, reliable and modern energy services. | Target(s): By 2030 Electrochaea will provide technology for its partners to capture 9 million tons of CO2 and recycle the CO2 to make renewable methane using renewable hydrogen produced from 90TWh of renewable electricity.<br>Time frame: 2023-2030<br>Context for the ambition(s): Renewable power is a fluctuating resource, therefore there is a need for storing renewable power made at the time/place of production and providing it at the time/place of use. The gas grid is the largest available resource for storing and redistribution renewable energy. When renewable power is used to convert CO2 into renewable methane it displaces fossil methane from the gas grid, and the current gas infrastructure can be used to store and distribute renewable energy. This process is enabled by generation of renewable hydrogen from renewable electricity and could become one of the initial large markets for renewable hydrogen production. |
| ☒ **7.2.** By 2030, increase substantially the share of renewable energy in the global energy mix. | Target(s): Replace fossil natural gas in the global gas grid by producing methane from captured CO2 and renewable energy<br>Time frame: 2023-2030<br>Context for the ambition(s):<br>The use of fossil based natural gas should be reduced and eventually completely exchanged with renewable gas. |
| ☒ **7.3.** By 2030, double the global rate of improvement in energy efficiency. | Target(s): Utilize surplus heat from electrolysis and biological methanation and thereby ensure better energy efficiency in the methanation processes and at the same time replace fossil-based heat production. Both methanation and electrolytic hydrogen production produce heat that can be used in local heating, and low heat processed, improving displacing fossil fuel based heating while simultaneously improving the overall energy efficiency of renewable methane production by up to 50%.<br>Time frame: 2023-2030<br>Context for the ambition(s):<br>Converting renewable power to other forms of energy will always result in a loss of energy. In the case of biological methanation, the main loss is as heat from electrolysis and methanation units. By utilizing the excess heat, the energy efficiency can be dramatically improved and for some uses, such as wastewater treatment or anaerobic digestion, can be used on the same site as the methanation process. |
| ☒ **7.a.** By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology. | Target(s): Expand research cooperation with Universities in Europe, North America and globally<br>Time frame: 2021-2030.<br>Context for the ambition(s):<br>Electrochaea´s technology originates from research at the University of Chicago and was demonstrated at commercial scale in project in Denmark and Switzerland. Electrochaea has already engaged in several research projects with universities in Europe and North America to further strengthen the technology within biological methanation. It's the ambition to further strengthen research cooperation by engaging in research programmes and projects. |
| ☒ **7.b.** By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in | Target(s): expand application of biological methanation technology developed by Electrochaea amongst developing countries<br>Time frame: 2025-2030 |

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| developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programs of support. | Context for the ambition(s): availability of the renewable energy such as wind and sun in many developing countries is a major resource due to their geographical position. Electrochaea´s technology is based using renewable energy to capture and store CO2 for usage in energy storage and redistribution, an ideal opportunity for 'island economies' and distributed microgrids.. Production of renewable methane in developing countries would make renewable energy accessible when fluctuating wind and solar is not available. In addition, conversion of renewable power to green methane can could be stored using well known technology or even liquified for export.<br>Climate gas emissions in developing countries are deriving from many sources like biogas, power production, industry and landfills waste sites. Electrochaea can process captured CO2, biogas or gases from landfill waste and thereby reduce harmful climate emission and ensure developing countries access to reliable renewable energy or create direct income from export of renewable energy to areas with lower solar and wind resources and/or higher demand for energy. |

**1.2. Other ambitions in support of SDG7 by 2030 and net-zero emissions by 2050.** ***[Please describe below e.g., coal phase out or reforming fossil fuel subsidies etc.]***

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| Target(s):<br>Time frame:<br>Context for the ambition(s): |

## SECTION 2: ACTIONS TO ACHIEVE THE AMBITION

2.1. Please add at least one key action for each of the elaborated ambition(s) from section 1. *[Please add rows as needed].*

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| *1. Description of action (please specify for which ambition from Section 1)* ***Ambition 7.1-7.3***<br>*Action:*<br>***7.1 Capture 9*** **million tons of CO2 and store it together with 90 TWh of renewable electricity:**<br>*Make the Electrochaea technology and its unique biocatalyst (archaea) available to project owners wishing to upgrade excess CO2 and renewable power to green e-methane. Electrochaea will also enable the construction of commercially viable methanation plants based on the expertise from demonstration plants. The ambition is to scale the technology to 10, 50, 100+ MW installations that can upgrade 0,8 ton of CO2 per MWh renewable energy consumed. Electrochaea plans to license its technology in worldwide markets. In 2025 Electrochaea plans to enable upgrading of 0.3 million tons of CO2 per year and increase this conversion capacity to more than 3 million tons per year in 2030.*<br>***7.2.*** **Replace fossil natural gas in the global gas.**<br>*By converting 9 million ton of CO2 into renewable methane before 2030, the Electrochaea biocatalyst will produce 54 TWh of green e-methane that will replace fossil natural gas from global energy supply, reducing the release of fossil CO2 into the atmosphere. As productivity from electrolysis is further increased before 2030 the productivity of biological methanation will also increase and thereby enabling even further production of green e-methane with the same renewable energy input to accelerate replacement of fossil based natural gas in the global energy supply*<br>**7.3 Utilize surplus process heat**<br>*Biological methanation requires green hydrogen from electrolysis combined with the methanation. Both processes generate byproduct heat that can be utilized in district heating and -cooling or industrial processes. The usage of excess heat is dependent on site conditions, and Electrochaea expects that half of the excess heat can be utilized. The annual production of 18 TWh/year of renewable gas anticipated for 2030 would also generate 9.7 TWh renewable heat which can be utilized to displace heat generated at low efficiency from fossil gas or directly from electricity and thereby increasing overall energy efficiency.* | *2021-2030* |
| *2. Description of action (please specify for which ambition from Section 1)* ***Ambition 7a***<br>*Action: enable new international research projects*<br>**Expand research cooperation**<br>*Electrochaea is already engaging in research projects in North America and Europe to further improve efficiency and usage of its core technology. The research cooperation will be further strengthened in coming years though engagement in research programmes. These research and innovation activities can follow several tracks from scaling of technology though testing of high pressure installation to conversion of the green e-methane to other product, e.g. plastic, protein or lubricants.* | *2021-2030* |
| *3. Description of action (please specify for which ambition from Section 1)* ***Ambition 7b*** | *2025-2030* |

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| *Action: execute in our international partnerships to spread the technology worldwide*<br>**Make biological methanation accessible in developing countries**<br>As an SME Electrochaea is presently operating in Europe and North America. But it's the ambition to engage further with development agencies, indigenous companies and international development banks to make the unique technology available globally and with a specific focus on developing countries. Electrochaea is primarily a technology provider that rely on leading project partners to develop project and make use of the biological methanation technology. Therefore, partnership with companies and individuals who have experience in developing clean-energy projects in developing countries is essential for Electrochaea to spread its technology in this geographical area. It is a matter of identifying the right specialists who know all the possible hurdles and peculiarities of leading projects in those regions and have great interest in bringing new technologies to these countries. With our participation in the Energy Compact we hope that it will make Electrochaea more visible for potential partners in developing countries. | |

## SECTION 3: OUTCOMES

3.1. Please add at least one measurable and time-based outcome for **each** of the actions from section 2. *[Please add rows as needed].*

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| 1. *Successful realization of first commercial projects resulting in construction of 10 plants by 2025 with the total capacity of 450 MW converting 0.36 million tons of CO2*<br>2. *Scaling of the technology and construct numerous biological methanation plants with a capacity of 4 GW converting annually 3.8 million tons of CO2* | *Date*<br>*2025*<br>*2030* |
| 3. *Replace 3.6 TWh of fossil natural gas from gas grids in Europe and North America*<br>4. *Replace 54 TWh of fossil natural gas from global gas infrastructures* | *2025*<br>*2030* |
| 5. *Utilyze 1 TWh of surplus heat from renewable methanation systems*<br>6. *Utilyze 15 TWh of surplus heat from renewable methanation systems* | *2025*<br>*2030* |
| 7. *Establish the first two biological methantion plants in developing countries for renewable gas production, training and knowledge dissemination with assistance and finance from development agencies and international development banks. The biological methanation from these plants is expected to reduce CO2 emission from developing countries annually by a total of 100 tons of CO2 by displacing fossil fuel sources such as coal, petroleum and natural gas and by recycling CO2 from biological sources for methane production.*<br>8. *Establish commercial viable methanation plants throughout developing countries with a total capacity of 500 MWe to produce 2.1 TWh renewable gas and directly recycle 400,000 tons of CO2 in the production of renewable methane. The biological methanation from these plants is expected to further reduce the CO2 emissions from developing countries by up to 800 million ton of CO2 via displacement of lower efficiency and high emission fossil fuels* | *2025*<br><br><br>*2030* |

## SECTION 4: REQUIRED RESOURCES AND SUPPORT

4.1. Please specify required finance and investments for **each** of the actions in section 2.

1. The estimated Capex for deployment of electrolyzers, methanation systems and balance of site is anticipated to be $1.2bio by 2025 and $6.2bio by 2030; financing costs are anticipated to increase these amounts by as much as 2X depending on the rate of return and payback periods anticipated by investors. Much larger facilities would require less capital investment per unit gas production through economies of scale.
2. Site improvements, gas storage and grid injection, and compression would require approximately 25% of the costs anticipated for the renewable hydrogen and methanation facilities; while liquification for renewable LNG production is anticipated to require 50% of the cost of the basic renewable gas production facilities.
3. No additional support needed
4. No additional support needed
5. No additional support needed
6. No additional support needed
7. 50 million USD
8. No additional support needed

* The support needed is dependent on framework conditions. The present figure is based on the difference between the 2021 price for fossil based natural gas and the price needed to produce green e-methane. With an expected increased premium for CO2 recovery, the support needed is expected to decline accordingly.

4.2. [For countries only] In case support is required for the actions in section 2, please select from below and describe the required support and specify for which action.

*[Examples of support for Member States could include: Access to low-cost affordable debt through strategic de-risking instruments, capacity building in data collection; development of integrated energy plans and energy transition pathways; technical assistance, etc.]*

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| ☐Financing | *Description* |
| ☐ In-Kind contribution | *Description* |
| ☐ Technical Support | *Description* |
| ☐ Other/Please specify | *Description* |

## SECTION 5: IMPACT

5.1. Countries planned for implementation including number of people potentially impacted.

Electrochaea technology will first be rolled out in EU and North America, but the technology is suitable for implementation world wide. Required resources are renewable electricity and a CO2 source, which are available globally. CO2 emission reduction will have a global impact on society.

5.2. Alignment with the 2030 Agenda for Sustainable Development – Please describe how **each** of the actions from section 2 impact advancing the SDGs by 2030.
*[up to 500 words, please upload supporting strategy documents as needed]*

Electrochaea will engage in building renewable gas/biological methanation plants where low-cost electricity is available and supply high quality methane across the sectors. This will establish biological methanation as a key component of the renewable energy.
The highly flexible operability of Electrochaea's bio-methanation technology is a key advantage in meeting the SDG's.
Rolling out of Electrochaea´s technology worldwide will increase substantially the share of renewable energy in the global energy mix.
Continuous international research cooperation will create partnerships for achieving SDGs. It will also improve access to technology and knowledge. Will attract attention of potential investors worldwide to support clean energy technologies.
Expanded application of methanation technology developed by Electrochaea amongst developing countries will help making clean energy accessible and affordable. It will create new jobs and profits what will reinforce the economic growth and create possibilities for decent work. The production of renewable energy on the territory of developing countries can also increase their export capabilities and reduce the national debt.

5.3. Alignment with Paris Agreement and net-zero by 2050 - Please describe how **each** of the actions from section 2 align with the Paris Agreement and national NDCs (if applicable) and support the net-zero emissions by 2050.
*[up to 500 words, please upload supporting strategy documents as needed]*

For Electrochaea, CO2 is a resource that is to be reutilized as much as possible. Hence, by providing the technology to large CO2 emitters (e.g., cement producers, waste incineration, power plants and industry) Electrochaea will be able to reach true scale and at the same time take a critically sized role in global efforts to reutilize CO2 and achieve net-zero goals.
Electrochaea is supporting such goals as increasing climate mitigation and/or adaptation ambition, supplying clean, affordable and secure energy, accelerating the shift to sustainable and smart mobility.

Electrochaea:
• uses CO2 as a resource and thereby prevents CO2 to be released into the atmosphere. The process is very carbon efficient as it converts > 98% of all carbon processed in the system.
• uses renewable electricity that otherwise potentially would be sold at low value or have to be curtailed. It thereby supports faster conversion of the energy system.
• adds a technology path to produce renewable methane that can be used as an alternative to fossil gas or further processed into renewable plastic, protein or lubricants

## SECTION 6: MONITORING AND REPORTING

6.1. Please describe how you intend to track the progress of the proposed outcomes in section 3. Please also describe if you intend to use other existing reporting frameworks to track progress on the proposed outcomes.

The Electrochaea business model is based on royalties on produced e-methane and CO2 credits. Thus, Electrochaea is through its accounting capable of monitoring progress.

## SECTION 7: GUIDING PRINCIPLES CHECKLIST

Please use the checklist below to validate that the proposed Energy Compact is aligned with the guiding principles.

**I. Stepping up ambition and accelerating action** - Increase contribution of and accelerate the implementation of the SDG7 targets in support of the 2030 Agenda for Sustainable Development for Paris Agreement

*I. 1. Does the Energy Compact strengthen and/or add a target, commitment, policy, action related to SDG7 and its linkages to the other SDGs that results in a higher cumulative impact compared to existing frameworks?*

☒Yes ☐No

*I.2. Does the Energy Compact increase the geographical and/or sectoral coverage of SDG7 related efforts?* ☒Yes ☐No

*I.3. Does the Energy Compact consider inclusion of key priority issues towards achieving SDG7 by 2030 and the net-zero emission goal of the Paris Agreement by 2050 - as defied by latest global analysis and data including the outcome of the Technical Working Groups?* ☒Yes ☐No

**II. Alignment with the 2030 agenda on Sustainable Development Goals** – Ensure coherence and alignment with SDG implementation plans and strategies by 2030 as well as national development plans and priorities.

*II.1. Has the Energy Compact considered enabling actions of SDG7 to reach the other sustainable development goals by 2030?* ☒Yes ☐No

*II.2. Does the Energy Compact align with national, sectoral, and/or sub-national sustainable development strategies/plans, including SDG implementation plans/roadmaps?* ☒Yes ☐No

*II.3. Has the Energy Compact considered a timeframe in line with the Decade of Action?* ☒Yes ☐No

**III. Alignment with Paris Agreement and net-zero by 2050** - Ensure coherence and alignment with the Nationally Determined Contributions, long term net zero emission strategies.

*III.1. Has the Energy Compact considered a timeframe in line with the net-zero goal of the Paris Agreement by 2050?* ☒Yes ☐No

*III.2. Has the Energy Compact considered energy-related targets and information in the updated/enhanced NDCs?* ☒Yes ☐No

*III.3. Has the Energy Compact considered alignment with reaching the net-zero emissions goal set by many countries by 2050?* ☒Yes ☐No

**IV. Leaving no one behind, strengthening inclusion, interlinkages, and synergies** - Enabling the achievement of SDGs and just transition by reflecting interlinkages with other SDGs.

*IV.1. Does the Energy Compact include socio-economic impacts of measures being considered?* ☒Yes ☐No

*IV.2. Does the Energy Compact identify steps towards an inclusive, just energy transition?* ☒Yes ☐No

*IV.3. Does the Energy Compact consider measures that address the needs of the most vulnerable groups (e.g. those impacted the most by energy transitions, lack of energy access)?* ☒Yes ☐No

**V. Feasibility and Robustness -** Commitments and measures are technically sound, feasible, and verifiable based a set of objectives with specific performance indicators, baselines, targets and data sources as needed.

*V.1. Is the information included in the Energy Compact based on updated quality data and sectoral assessments, with clear and transparent methodologies related to the proposed measures?* ☒Yes ☐No

*V.2. Has the Energy Compact considered inclusion of a set of SMART (specific, measurable, achievable, resource-based and time based) objectives?* ☒Yes ☐No

*V.3. Has the Energy Compact considered issues related to means of implementation to ensure feasibility of measures proposed (e.g. cost and financing strategy, technical assistant needs and partnerships, policy and regulatory gaps, data and technology)?* ☒Yes ☐No

## SECTION 8: ENERGY COMPACT GENERAL INFORMATION

8.1. Title/name of the Energy Compact

Electrochaea

8.2. Lead entity name (for joint Energy Compacts please list all parties and include, in parenthesis, its entity type, using entity type from below)

Electrochaea

8.3. Lead entity type

☐ Government
☐ Local/Regional Government
☐ Multilateral body /Intergovernmental Organization
☐ Non-Governmental Organization (NGO)
☐ Civil Society organization/Youth
☐ Academic Institution /Scientific Community
☒ Private Sector
☐ Philanthropic Organization
☐ Other relevant actor

8.4. Contact Information

Phone: +49 89 3249 3670
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E-mail: info@electrochaea.com
www.electrochaea.com

8.5. Please select the geographical coverage of the Energy Compact

☐Africa ☐Asia and Pacific ☐Europe ☐Latin America and Caribbean ☐North America ☐West Asia ☒Global

8.6. Please select the Energy Compact thematic focus area(s)

☒ Energy Access ☒ Energy Transition ☐ Enabling SDGs through inclusive just Energy Transitions ☒ Innovation, Technology and Data ☐ Finance and Investment.

## SECTION 9: ADDITIONAL INFORMATION (IF REQUIRED)

Please provide additional website link(s) on your Energy Compact, which may contain relevant key documents, photos, short video clips etc.
www.electrochaea.com