(V. 9 May 2021, revised 14 Feb 2022)

SDG7 Energy Compact of BPP Technical Services Limited
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. (Member States may reference and build upon their NDC and/or 2030 agenda commitments)
[Please select all that apply]

☒Target 7.1. universal access	Time frame: 2021 – 2030 Elaboration of the ambition(s): The recent rapid expansion of renewable electricity from wind turbines has been important to tackle climate change and reduce carbon emissions, but its role will be primarily serve to decarbonise industrial and domestic sectors that can be easily electrified, whereas hydrogen will have an important role in areas that are not easily electrified. These includes heavy transport, shipping, aviation, heating and building in countries that are mainly heated by natural gas. The use of hydrogen across different sectors will ultimately facilitate the penetration and access of renewable energy into these sectors. Producing hydrogen (H2) offshore using Floating Wind Farm (FWF) power offers a possible solution to store and deliver energy onshore. This solution will result in investigating the commerciality of diversifying available energy sources whilst decreasing the industry's carbon footprint. The system designed by BPP-TECH will use oversized seawater desalination units to supply PEM electrolysis with freshwater and export the additional freshwater to shore. This intrinsic characteristic of the system aims to tackle water scarcity whilst increasing the share of Green energy in the global energy mix.
☒Target 7.2. Renewables	Time frame: 2021 - 2030 Elaboration of the ambition(s): Low-carbon H2 is forecasted to see a continued growth in demand, from 35-1,100 TWh/year in 2030 to 300-19,000 TWh/year [Committee on Climate Change, 2018]. Despite this interest, currently 99% of global H2 is produced with fossil-fuels (2,800 TWh/year [IEA, 2019]) producing significant greenhouse gases. Coupling FWF with Green H2 technology will substantially increase the installation of new FWFs and the share of Green H2 in the global energy mix. The UK targets deployment of 5GW of FWF for Green H2 production by 2030. BPP is collaborating with the key technology providers to develop an industrial feasibility study and assess the techno-economic viability of this new large-scale Green H2 production supply solution. After completion of the feasibility study,, the Consortium will design, build and test a physical demonstration of a pilot system to validate the system design. This initiative aims to accelerate the global energy transition by decreasing the use of fossil fuels and maximise the access to renewable energy. The lessons learned from this project will be widely shared with the intent to stimulate the hydrogen economy; both on the production and demand side. The system is designed to overcome the challenges facing developing countries., such as those with weak electric infrastructure, water scarcity and dependency on foreign aid. Hydrogen could be the vector of an energy and economic transformation for developing countries having abundant renewable energies. The produced hydrogen could be exported or used to stimulate the local economy, innovate the local infrastructures, such us ports and ultimately reduce the import of gas and electricity generated from fossil fuels.
☒Target 7.3. Energy Efficiency	Time frame: 2021 - 2030 Elaboration of the ambition(s): Producing Green H2 offshore using FWF has the advantage of increasing FWFs efficiency, by decoupling energy production, and reduce the overall CAPEX of the system by avoiding the expensive subsea cable needed to export the energy to shore. The system proposed by BPP-TECH will increase the FWF's load factor from 45% to ~ 50%.
☒Target 7.a. International Cooperation	Time frame: 2021 - 2030 Elaboration of the ambition(s): BPP-TECH will collaborate with international partners on a preliminary feasibility study to assess the performances of high TRL components when integrated to produce Green H2 offshore using FWF. The outcomes of this study will firm up the basis for international cooperation aimed at the future roll-out of the proposed technology.

☒ Target 7.b. Infrastructure and Technology	Time frame: 2021 - 2030 Elaboration of the ambition(s): BPP-TECH will develop the system definition along with the integration tools needed to combine high TRL components to demonstrate the design feasibility of producing Green H2 using FWF. Integrated H2 production with FWF is novel and BPP-TECH aims to use this knowledge to build a pilot system to test the performance, safety, reliability of the proposed Green H2 supply solution.

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.]*

Time frame: Elaboration of 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].*

*1.Techno-economic assessment of a novel Green H2 supply solution: Green H2 from FWF (*Energy Efficiency*):* BPP-TECH will collaborate with international companies to assess the techno-economic viability of producing Green H2 from FWF. The study will deliver an initial technology and economic appraisal of large-scale FWF-H2 offshore production platform. The technical assessment, drawing on stakeholder's experience and integrator software will define the overall performances and cost of the system integration for offshore FWF-H2 production incorporating state-of-the-art technology.	*Start and end date: 2021-2022*
2.Joint Industry Project: (International Cooperation): BPP-TECH will validate the robustness of the proposed technologies encouraging the private sector to invest alongside the public sector in the innovation journey. BPP-TECH will use case-studies to optimize the design of the proposed system. The proven success of the proposed solution will be utilized to grow confidence in outside of existing network and create a Joint Industry Project (JIP) : an alliance of industrial partners involved in the production, transmission and distribution of energy, infrastructure financing and climate change services. Major stakeholders will include: • *Wind Farm Operators* • *Oil & Gas Companies* • *Electrical and Energy Companies* • *Electrolyzer and Fuel Cell Industries*	*Start and end date 2022- 2023*
3.Pilot Demonstration of the Green H2 system (Infrastructure and Technology): The JIP led by BPP-TECH will develop a pilot demonstration plant of the Green H2 system, that will be scaled for a near-shore application. The scope of the physical demonstration is to evaluate the availability of suitable equipment and work with suppliers to incorporate the procurement and installation of their equipment within the physical demonstrator. The lessons learnt in this phase will be used to provide a pilot facility to help the private sector beild similar facilities, promote the technological advancement needed to scale up hydrogen production and make it usable by the majority of the community. BPP will identify the technical challenges of integrating each equipment into the overall system, incorporating Green H2 and offshore technologies, while assessing the benefit of producing Green H2 from FWF, providing technical, marketing and political insights to increase the global awareness of the replicability of this solution in other countries.	*Start and end date 2024-2028*
	Start and end date 2028-2030

4.Demonstration at scale (Universal access & Renewables): Exploit the existing business traction to launch and showcase of the developed system design through direct participation in windfarm projects. The system will be suitable for application in other countries, such as Africa, Asia, Canada, Australia, in which the offshore sector is expected to play a key role for their energy transition. The size of the installed system will depend on the success of the previous phases of this project and on future demand for hydrogen.	

SECTION 3: TARGETS

3.1. Please add at least one measurable and time-based target for **each** of the actions from section 2. For sample targets please refer to [XXXX] *[Please add rows as needed].*

Target	*Date*
1. *Universal Access:*	
• **Renewable Share [MW] :** Renewable energy that will be installed for the offshore production of Green Hydrogen	2028-2030
• **Levelised cost of hydrogen [H2ton/day]:** Estimation of the levelised cost of the produced Green hydrogen, which is expected to be competitive and more accessible than it is nowdays.	2021-2022
2. *Renewables:*	
• **Increase capacity factor of the wind farm [%]:** Decoupling offshore wind farm to the grid for the Green H2 production will maximise capacity factor of the wind farm.	2021-2022
•	
3. *Energy Efficiency:*	
• **Energy Efficiency [%]:**Performance of the Green H2 system and of each components.	2021-2022
• **Power losses reduction [%]:** Optimisation of offshore wind farm will reduce power losses and cable failure.	2021-2022
4. *International Cooperation:*	
• NDAs and public announcements by interested companies.	2023-2024
5. *.Infrastructure and Technology:*	
• **Economic investment [£].** Investment for the Pilot Demonstration of the Green H2 system and for large-scale production plant.	2024-2028

SECTION 4: REQUIRED RESOURCES AND SUPPORT

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

1. Techno-economic assessment of a novel Green H2 supply solution: Green H2 from FWF:
BPP-TECH is an SME and lacks the financial reserves to develop the system definition and integration tools to assess the techno-economic viability of producing Green H2 from FWF at the speed required by the global sustainability agenda. Without public funding, BPP-TECH would not be able to continue to invest in the development of the solution as doing so would threaten its financial survival.
Implementing the project rapidly in the identified timeframe increases the likelihood of first-mover advantage, maximizing business opportunities whereas an incremental development risks losing the advantage to international competitors.

2. Joint Industry Project:
A Joint venture with potential customers will provide the required financial resource to promote the project.

3&4 Pilot Demonstration of the Green H2 system & Demonstration at scale:
The following alternative funding options will be considered to provide additional economic resources to complete these actions:
- Debt funding
- Crowdfunding
- Equity

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.]

☒Financing	*Description:* BPP-TECH is an SME and lacks the financial reserves to develop a complete system design for the offshore production of Green H2 from FWF at the speed required to meet global sustainable targets. Without external funding, BPP-TECH would not be able to continue to invest in the development of the solution as doing so would threaten its financial survival. Implementing the project rapidly in the identified timeframe increases the likelihood of first-mover advantage, maximizing business opportunities whereas an incremental development risks losing the advantage to international competitors.
☐ In-Kind contribution	*Description*
☒ Technical Support	*Description:* BPP-TECH will collaborate with the principal stakeholders in the offshore and H2 sectors that will support the technical execution of the project
☐ Other/Please specify	*Description*

SECTION 5: IMPACT

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

UK, US, Asia, Africa

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]

This Energy Compact aligns with national, sectoral sustainable development plans, including SDG implementation roadmaps.

*Action 1: Techno-economic assessment of a novel Green H2 supply solution: Green H2 from FWF (*Energy Efficiency*):*
BPP-TECH aims to assess the environmental, commercial and technical feasibility of producing Green H2 offshore using FWF's power and design a technical solution for the next generation energy mix that is strongly aligned to 2030 Agenda for Sustainable Development. The Energy Compact proposed by BPP-TECH aims to tackle the following SDGs:

SDG3 **Good health and well-being**: A greater injection of free-carbon H2 into the market will massively reduce the carbon footprint of the transport, industry and home-heating sector improving the air quality and well-being of the society.
SDG6 Clean water and Sanitation: Clean freshwater is obtained by desalinating seawater at the offshore location and is used for the water electrolysis process. The system designed by BPP will produce additional freshwater that will be exported with the Green H2 to shore.
SDG7 Affordable and clean Energy: Producing H2 offshore decouples energy production (offshore wind) and consumption (grid demand), avoiding the grid integration challenges inherent in current offshore renewable energy systems. The FWF-H2 solution does not incur the costs of grid connections, avoids power transmission losses and manages the energy balance of excess wind energy
SDG13 Climate Action: The full potential of both onshore and offshore renewable energy sources is restricted by the intermittent nature of the energy source (wind and solar) and lack of practical energy storage. Producing Green H2 from FWF will allow to increase the efficiency of current FWFs while increasing the share of Green H2 in the global energy mix.
The flexibility of the FWF-H2 substation system will allow to scale the system in multiple offshore locations, with different environment condition and power requirements.

2.Joint Industry Project: (International Cooperation):

SDG17 Partnership for the goals: Both Government and industry see a clear role for green H2 alongside electrification, in moving towards a net-zero future,

3.Pilot Demonstration of the Green H2 system (Infrastructure and Technology):

SDG9 Industry, Innovation and Infrastructure: The application of innovative technologies is an important prerequisite to achieve the transition towards a clean, affordable, and reliable energy system.

4.Demonstration at scale (Universal access & Renewables):
SDG8 Decent work and economic work & 11 Sustainable cities and Communities:

Considering that offshore wind sector is facing significant growth and technical advances, H2 has potential when combined with FWF energy to overcome disadvantages including the high installation cost of subsea cable systems, transmission losses and loss of production.
FWF-H2 production can drive economic growth by creating new jobs, attracting further investment and reducing global emissions, moving towards the world's Net Zero targets. There are no commercialized offshore wind powered H2 production installations, let alone far-offshore. If successful this project will have a significant economic impact in the H2 supply chain, attracting investment and stimulating further innovations.

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]

Today, the vast majority of hydrogen is used in (petro-)chemical processes and produced through fossil pathways, such as steam methane reforming (SMR) or autothermal reforming (ATR) and gasification, with significant greenhouse gases emissions.
By 2030, wind and solar energy will account for almost 63% of energy demand, with the corresponding reduction of fossil fuels by more than a quarter. Green H2 will have a clear role, alongside electrification, in creating a greener and cleaner future by decarbonizing transport, home and industrial sectors.

A greater injection of free-carbon H2 into the market will massively reduce the carbon footprint of the transport, industry and home-heating sector improving the air quality and well-being of the society. Low-carbon H2 is forecasted to see a continued growth in demand, from 35-1,100 TWh/year in 2030 to 300-19,000 TWh/yea. A steady transition to 'Green' H2 is anticipated, and wind offers an outstanding opportunity, particularly for countries having the capacity of deploying new FWF for Green H2 production.

*Action 1: Techno-economic assessment of a novel Green H2 supply solution: Green H2 from FWF (*Energy Efficiency*):*

BPP-TECH aims to carry out a techno-economic study of a novel Green H2 system using remote wind turbines. The study aims to analyze and assess windfarm-electrolyzer technical configurations that deliver a reliable supply of low-cost renewable hydrogen.
BPP-TECH aims to increase the profile of decentralized independent H2 hubs, by demonstrating the technical and financial viability of Green H2 production using FWFs, by developing a real-case business study. This study will allow accurate quantification of the novel revenue streams and business models needed to support deployment at scale internationally of offshore green H2 production plants.

2.Joint Industry Project: (International Cooperation):

Industrial and commercial companies will be directly engaged for future developments of the project. These groups will be able to use and exploit the information and understanding generated by BPP-TECH and apply it for the future deployment of the system.
BPP-TECH will create an alliance of industrial partners involved in production, transmission and distribution of energy, infrastructure financing and climate change services that will work together to commercialize the solution proposed by BPP-TECH.

3.Pilot Demonstration of the Green H2 system (Infrastructure and Technology):

Considering the challenge to decarbonize the economy by 2050 reducing its dependence on fossil fuels, decision-makers and industry leaders must have a clear understanding of the feasibility and cost of the different options available. The increased production of Clean H2 is a fundamental building block for this transition. The pilot demonstration of the proposed system will define the cost and effort to deploy industrial H2 production. Despite political will and public opinion driving decarbonization and renewable energy, business decision requires critical financial intelligence.

4.Demonstration at scale (Universal access & Renewables):

The expected demand for secure, Green H2 in mainland Europe, will help secure a future for the extensive skills and assets of the UK offshore and H2 industry. BPP-TECH aims to be the market-leader in FWF-H2 analysis to enable the deployment of new FWFs globally.

SECTION 6: MONITORING AND REPORTING

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

BPP-TECH will be responsible for all management, coordination and project execution.

Target 1 System design definition. Performance of the system. Detailed costs of the long-term development plan.

BPP-TECH will produce a high-technical report describing the methodology, relevant assumptions, thermo-dynamic, electrical and mechanical interactions between all the technologies implemented in the system for the offshore hydrogen production from floating wind turbines.
The outcomes of this project will be presented through graphs, tables and schematic representation as most appropriate to facilitate the divulgation and the understanding of the methodology, analyses and results.

Target 2 Joint Industry Partnership

BPP-TECH aims to target the wind turbine and the offshore wind energy market, allowing developers to maximize FWF efficiency.
BPP already has a number of established commercial relationships in these markets, including firms such as Shell, SSE, Scottish Power, Xidao Wind Power, Copenhagen Infrastructure Partners and Keppel.
These companies are highly likely to drive the Green H2 market in the near to medium term and BPP intends to exploit these existing relationships.
BPP-TECH will approach these companies with capabilities in engineering, consulting and financial services to form a JIP.

Target 3 & 4: Pilot Demonstration of the Green H2 system & Integration of the Green H2 system with a FWF in an offshore location

All the JIP's partners will be able to use and exploit the information and understanding generated by the understanding of previous targets for the further validation of the proposed system in a real case scenario.

SECTION 7: GUIDING PRINCIPLES CHECK LIST

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

Green H2 from Floating Wind Farms

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)

BPP Technical Services Limited

8.3. Lead entity type

☐ Government ☐ Local/Regional Government ☐ Multilateral body /Intergovernmental Organization

☐ Non-Governmental Organization (NGO) ☐ Civil Society organization ☐ Academic Institution /Scientific Community

☒ Private Sector ☐ Philanthropic Organization ☐ Other relevant actor

8.4. Contact Information

m.patel@bpp-tech.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.

https://www.bpp-tech.com/archives/25768