



Studies

**Overview of studies for
DG Research & Innovation
- Clean Energy Transition**

Clean Energy Innovation Index (2021 - ongoing)

- *Development of Clean Energy Innovation Index to Track Clean Energy Innovation Performance of EU and Mission Innovation Members, in support of fifth pillar of EU Energy Union and Insights module of Mission Innovation Platform*
- *Three dimensions includes: patents, publications and trade with the development of sub-indexes for each dimension*
- *First preliminary results for the time-frame 2015-2017 point to strong leadership of some EU member states: Denmark tops the ranking of clean energy innovators in 2017, followed by the Republic of Korea, Finland, Sweden and United States.*
- *Amongst 'World Players', EU-27 ranks fourth in clean energy innovation performance in 2017 after Rep. of Korea, United States and China and before Japan.*

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Study on 'Solar Fuels Research & Invest: Defining and developing the global solar fuel value chain: techno-economic analysis and pathways for sustainable pathways for sustainable implementation' (2021)

- *techno-economic analysis of global solar fuel value chains and pathways for sustainable implementation*
- *identifying key technological bottlenecks that need to be overcome to allow for large-scale industrial production of solar fuels*
- *Assessment of cost competitiveness of solar fuel technologies; time-to-market to replace comparable fossil fuels*
- *outlook on what role solar fuels could play in future energy systems; investments required to build capacity to meet demand*
- *analysis of external factors that could impact the development and uptake of solar fuels worldwide*

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Study on Research and Innovation international cooperation in the field of renewable energy technologies (2020)

- *Analyses on how international cooperation efforts of Member States complement EU initiatives and efforts in the field of energy research collaboration*
- *Assessment of which actions at EU level and additionally between the EU and Member States would improve synergies*
- *Research methods:*
 - *Examination of current cooperation mechanisms*
 - *Specific focus on funding entities in order to profile implementation approaches*
 - *Incorporating Horizon 2020 and Horizon Europe perspective through a review of relevant Horizon 2020 actions*

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Study on Geothermal plants and applications emissions: overview and analysis (2020)

- *Provides a consistent and harmonized life cycle based assessment on the release of air pollutant emissions in the deep geothermal sector in Europe, in response to existing fragmented information and debate.*
- *full analysis developed at scale of clusters (representative groups of different plants), identified based on geological and technological parameters, through the application of Life Cycle Assessment methodology*
- *a set of recommendations is presented to support future decision-making and at addressing a fair and sustainable development of the deep geothermal sector in Europe*

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Study on energy technology dependence (2020)

- *Study to better understand the dependence of the European Union on energy technologies and to specifically consider the impact of this dependence on the security of energy supply in the EU and on the EU objective of becoming a world leader in renewable energy technologies*
- *clear link with the Energy Union dimensions 'Security, solidarity and trust' and 'Research, innovation and competitiveness'*
- *aims to provide relevant inputs to ongoing policy developments under the Energy Union strategy*

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Study on research needs on the use of earth observation data for the benefit of renewable energy exploitation and deployment (2019)

- *in-depth analysis of how Earth Observation data are being used in the six Renewable Energy sectors identified: Solar energy, Geothermal energy, Wind energy, Bioenergy, Ocean energy, Hydropower*
- *identifies possible research and development paths that would significantly improve Earth Observation*
- *provides a cost-benefit analysis of introducing such R&D outcomes associated to Earth Observation in the renewable energy sector*
- *Main activities: evaluation of the State of Play, assessment of the R&D needs and provision of a cost/benefits analysis*

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Study on US-EU Integrated Power and Water Systems Modelling (2019)

- *investigating the interdependence between the future water availability and the power system*
- *analyses the possibilities for flexibility both on the energy and water side*
- *quantifies interdependences as well as their economic and environmental impacts*
- *analyses of four different case studies within the European territory*
- *creation of soft-integration framework based on existing water and energy models operating at different spatiotemporal scales*

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Study on impacts of EU actions supporting the development of renewable energy technologies (2019)

- *Assessment of the impact that the EU Research & Innovation Framework Programmes funding has had on renewable energy technologies over the past twenty years (1995- 2015)*
- *Eight renewable energy sectors: bioenergy, biofuels, geothermal, hydropower, ocean, solar PV, solar thermal and wind*
- *quantitative and qualitative assessment based on interviews, case studies, a questionnaire and stakeholder workshops*

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Study on challenges in the commercialisation of airborne wind energy systems (2018)

- *provides an overview of the technological state of the art, assesses market potential and barriers, and outlines measures and a pathway towards commercialisation*
- *technology is still immature; it remains unclear whether the technology can ultimately reach cost competitiveness and contribute to EU energy security and decarbonisation targets*
- *from the perspective of EU, industrial leadership is strong*
- *sufficient potential to continue exploring the technology*
- *A framework is proposed to facilitate discussions about appropriate incentives and public support at various development stages*

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Opportunities and barriers for opening of research databases in low-carbon energy research (2018)

- *Study aimed at taking stock of the situation and at providing insights into practices to accelerate the re-use and sharing of data in research on energy*
- *based on:*
 - *literature analysis to identify five research areas/topics with the most promising potential or the most advanced practices as regards data dissemination and data re-use*
 - *a survey to identify the mapping of current data practices and the main barriers within the organisations*
 - *case studies with the objectives of collecting qualitative information on data management strategy and practices*
- *Benefits of open data seen in faster project progress, lower project costs and better/easier replication in other markets*

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Study on Research and Innovation perspective of the mid - and long-term Potential for Advanced Biofuels in Europe (2018)

- *study contributing to future policy developments in the area of advanced biofuels: current and potential role of research and innovation for advanced biofuels*
- *three specific objectives:*
 - *to provide an assessment of the potential for research and innovation for biomass feedstock for energy for the time horizon of up until 2030 and 2050*
 - *to assess the potential contribution of advanced biofuels for achieving EU targets*
 - *to compare different fuel options for transport*
- *outcome of these three parts is integrated based on an analysis of the whole value chain for advanced biofuels in Europe for 2030 and 2050*
- *overall strategic implications are discussed and an overall strategy proposed*

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Design of a Horizon 2020 inducement prize for the promotion of renewable energy on islands (2018)

- *Study on the feasibility of a prize to create a fully renewable island in all sectors*
- *for islands to win the prize their electricity sector, heating & cooling, transport would need to be largely based on renewables.*
- *the report provided the design for a complete Horizon 2020 prize proposal*
- **Result:**
 - *both an inducement and a recognition prize are feasible, inspiring and attractive for islands*
 - *it should be possible for islands to achieve the close to 100% RE goal in all sectors*
- *the eligibility and award criteria for both prize schemes were defined*
- *The report proposes a communication plan which supports all phases of the prize*

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Design of a Horizon 2020 Inducement Prize for the Promotion of Renewable fuels in retrofitted container ships (2018)

- *study proposing a design for a potential Horizon 2020 inducement prize to promote the use of renewable fuels by retrofitting existing maritime ships, with a focus on advanced biofuels*
- *the prize is to demonstrate that a continuous large-scale use of advanced biofuels in commercial shipping is possible*
- *selection criteria shall ensure that large vessels are going to sail on 100% biofuels for at least 21,600 nautical miles for the purpose of this prize*
Additional award criteria reward contestants that go beyond the requirements
- *Result: this prize design presents a feasible challenge, which can contribute to the decarbonisation of maritime shipping*
 - *improving the level of knowledge on biofuel use*
 - *increasing the visibility of these solutions*
 - *stimulating the different stakeholders in the supply chain to work together*

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Design of a Horizon 2020 Inducement Prize for the development of Artificial Photosynthesis for the production of fuels (2018)

- *the report sets out the final proposals for the Rules of Contest for a European Commission Horizon Prize in the field of Artificial Photosynthesis*
- *the challenge is to build a fully functional, bench-scale prototype of an artificial photosynthesis based system which is able to produce a useable synthetic fuel*
- *the report presents a Communication Plan for the proposed Horizon Prize*
- *Selection criteria are technical ability, scalability and sustainability*

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Assessment of Photovoltaics - PV (2017)

- *develops a strategy for rebuilding the European photovoltaic (PV) manufacturing sector*
- *promising opportunities for reindustrialisation exist by deploying a strategy focused on tailored PV products, knowledge-intensive parts of the value chain and the commercialisation of novel technologies*
- *implementation through nine measures that target demand, supply, research, development and innovation (RD&I) and trade related aspects*
- *EC Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW), Directorate-General for Energy (DG ENER) and Directorate-General for Research and Innovation (DG RTD) would be best positioned to lead the strategy, with committed leadership from the industry and the financial sector*

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Technology Readiness Level: Guidance Principles for Renewable Energy technologies (2017)

- *assessment of the use of Technology Readiness Levels (TRLs) in the energy field at European level*
- *research showing that there is still a lack of common understanding around the concept of TRL and further guiding principles would be needed.*
- *development of guidance documents defining TRL in 10 renewable energy fields; a Guide of Guides to be made as backbone for any technology-specific definition and which may serve as a reference to develop guidance documents in any other energy technology field*

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Study on Lessons for Ocean Energy Development (2017)

- *review of failures, lessons learnt and good practices in wave and tidal technology*
- *revealed a consolidation in tidal technology, and a fragmentation in the wave segment*
- *main conclusion:*
 - *root causes and barriers to development are diverse and interrelated.*
 - *need for an integrated approach, involving all stakeholders*
 - *change of behaviour towards embracing good practices and learning from past experiences*
 - *need for a 'covenant' between the industry and public sector*

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Artificial Photosynthesis: Potential and Reality (2017)

- *possible public support should keep Europe's Artificial Photosynthesis technology options open*
- *a proposed roadmap for support for Artificial Photosynthesis technology development foresees actions to address current gaps in scientific knowledge and technology capabilities, while scaling-up the size of projects*
- *the proposed roadmap integrates actions to support improved networking and cooperation within Europe and possibly at a wider international-level*
- *improved coordination of national research efforts could be achieved through the elaboration of a common European Artificial Photosynthesis technology strategy aimed at positioning European industry as a leader in the Artificial Photosynthesis technology field*

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