Destination Renewable Energy: Renewable energy solutions using DESP data and tools

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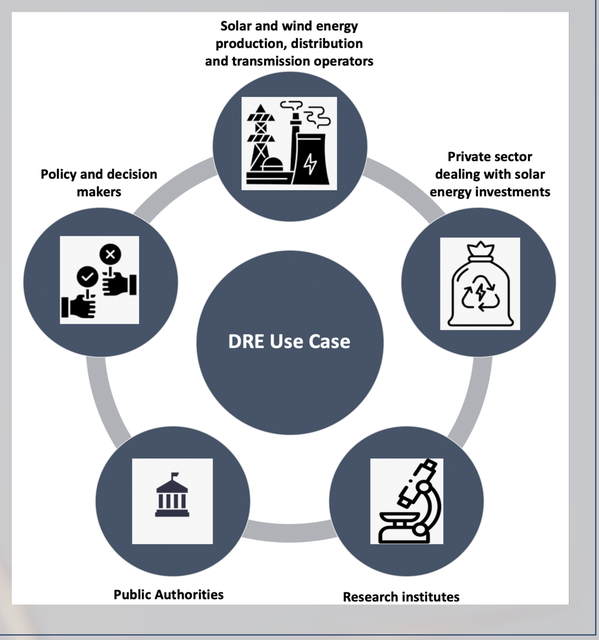
Introduction

Destination Renewable Energy (DRE) is one of the Use Cases to be implemented as part of the Destination Earth Service Platform (DESP). Energy is at the heart of the challenge of achieving both the 2030 Agenda for Sustainable Development and the Paris Agreement on climate change. Renewable energy systems (solar and wind) are **weather and climate dependent**, so the transition to clean energy requires improved climate information and services for the energy sector. Climate services and satellite data are means that can be used to develop applications to **ensure the resilience of energy systems to climate-related shocks and inform energy efficiency measures.**

The main objective of the Destination Renewable Energy (DRE) Use Case is to develop the **Hybrid Renewable Energy Forecasting System (HYREF)**, a hybrid (solar and wind) application that could provide renewable energy forecasts in different time scales. HYREF will act as a decision support system, aiming at **maximising the use of DESP data and tools to provide actionable and meaningful information for policy and decision making in support of the green and digital transformation,** using applications in the field of energy and climate change. The application will be developed and include a demonstration of end-user portfolio benefits optimization, based on existing or planned solar and wind energy infrastructure. Furthermore, the final application will provide spatial upscaling options based on the DESP data coverage.

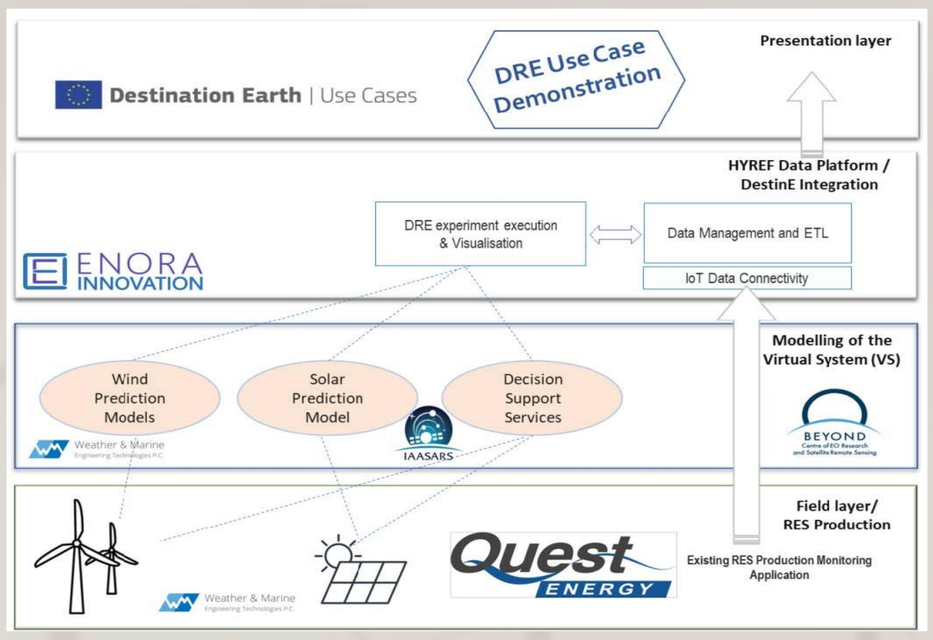
Use Case

The DRE Use Case builds upon two operational solutions developed and demonstrated in various EU-funded projects focusing on renewable energy **and in relation to the actual energy market.** It **combines solar and wind energy** to maximise the potential production and use of green electricity. Such a solution provides a **decision-making tool for alternative use, possible storage and possible trading potential** based on the availability of renewable energy from wind and solar resources. DRE prioritises to **demonstrate the use of DESP functionalities and data sources.**



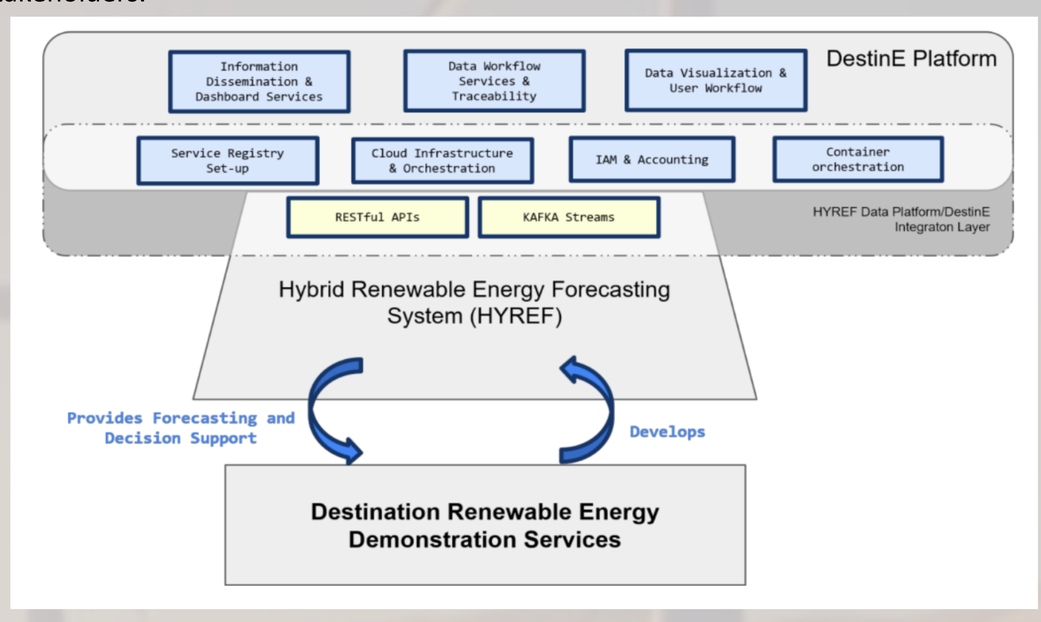
Destination Renewable Energy System

The main application of DRE is the Hybrid Renewable Energy Forecasting System (HYREF) which will act as a decision support system for Renewable Energy Sources (RES) producers. HYREF is aiming at maximising the use of DESP data and tools, to provide actionable and meaningful information for policy and decision making in support of the green and digital transformation of the energy sector.
The unified DESP/DestinE system consolidates previously scattered data for applications, offering real-time, state-of-the-art information. DESP's data pools enhance the accuracy of forecasts for solar and wind RES production sites.



The main inputs to the system will be various DESP data to be used as initial conditions to numerical weather prediction model, ERA5 data, CAMS global atmospheric composition forecasts (atmospheric data for real time solar prediction) and solar radiation time series, elevation (DEM) and surface albedo data.
DRE uses DESP data and in-house models for solar radiation and wind forecasts. The system uses DESP data, ERA5 data, CAMS atmospheric forecasts for real-time solar prediction, solar radiation time series, elevation (DEM), and surface albedo data as main inputs. Outputs are categorized into levels: L1 offers specific area forecasts; L2 provides high-frequency solar and wind data co-designed with end-users; L3 includes decision-making data, considering various end-user infrastructures and solar/wind technologies.

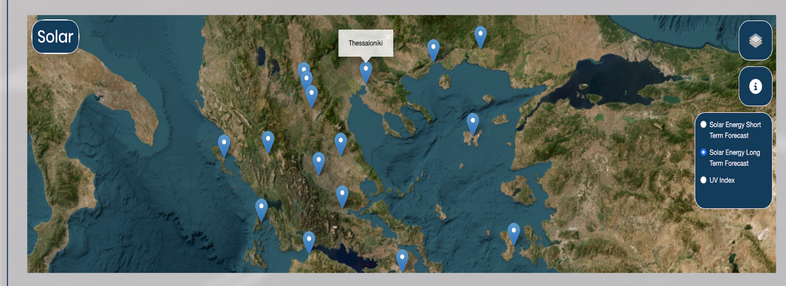
DRE utilises **DestinE Digital Twin forecast data and Data Lake data** such as Global Ocean 1/12° Physics Analysis and Forecast, Vegetation Indices, CORINE Land Cover, and Global 10-daily Fraction of Vegetation Cover, data from the **Weather -induced extremes Digital Twin**, among others. **The Use Case and the respective HYREF software are flexible, scalable and user-driven**, evolving gradually following continuous interactions and feedback by end-users with direct engagement of market stakeholders.



The DRE development process involves four primary axes: 1) Early engagement with DRE case users, particularly energy producers, for recommendations and feedback. 2) Agile software development methods to encompass component and data integration with DESP; to craft the software data aggregation infrastructure; and, to develop and validating the HYREF application. 3) Collaborative design and development of use-case scenarios tailored for HYREF features. 4) Promoting awareness of DRE and the emerging DestinE platform, engaging with pivotal user and stakeholder groups to disseminate project outcomes.

Expected Outputs

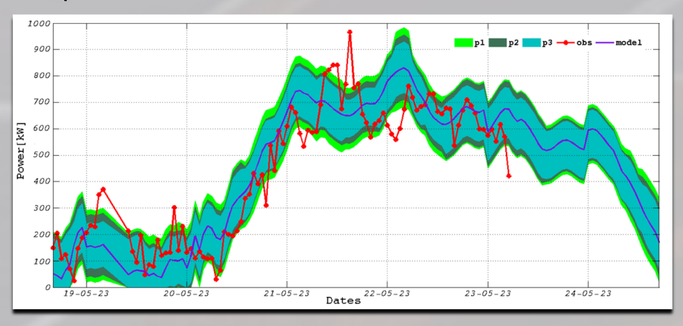
Solar energy: Forecast of solar radiation and user site adaptation techniques. Outputs directly related with user infrastructure and characteristics.



https://solar.beyond-eocenter.eu/#solar_long

Scalability Assessment: A set of best practices and guidelines for adapting the HYREF model to varying regional data characteristics and infrastructure capabilities.

Wind energy: Wind power prediction based on combination of numerical and statistical methods. From time-series to probabilistic forecasting and ramps detection.



Dashboards: An interactive dashboard prototype that integrates forecasted energy production and historical data visualization features.

User Engagement

Leveraging on existing partnerships, the consortium targets various types of end-users and stakeholders.

Direct engagement:

QUEST ENERGY, TERNA ENERGY (Clean Energy production and leading investors in the renewable energy sector in Greece), members of the Pleiades IoT Innovation cluster, etc.

Added Value and Impact

- **Demonstrates and exploits the value and potential of the DestinE DESP** for accurate and reliable energy forecasting services
- Empowers policymakers and decision-makers with crucial insights for **informed energy trade strategies, enhanced energy security measures, and optimized resource allocation**
- **Outputs align with the EU Green Deal** Supporting directives, such as the promotion of renewable energy outlined in DIRECTIVE (EU) 2018/2001, and the REPowerEU Plan
- **Contributes significantly in achieving the goals** outlined in both the **2030 Agenda for Sustainable Development*** and the **Paris Agreement** on climate change.

**Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all/Target 7.3 By 2030, double the global rate of improvement in energy efficiency.*

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