

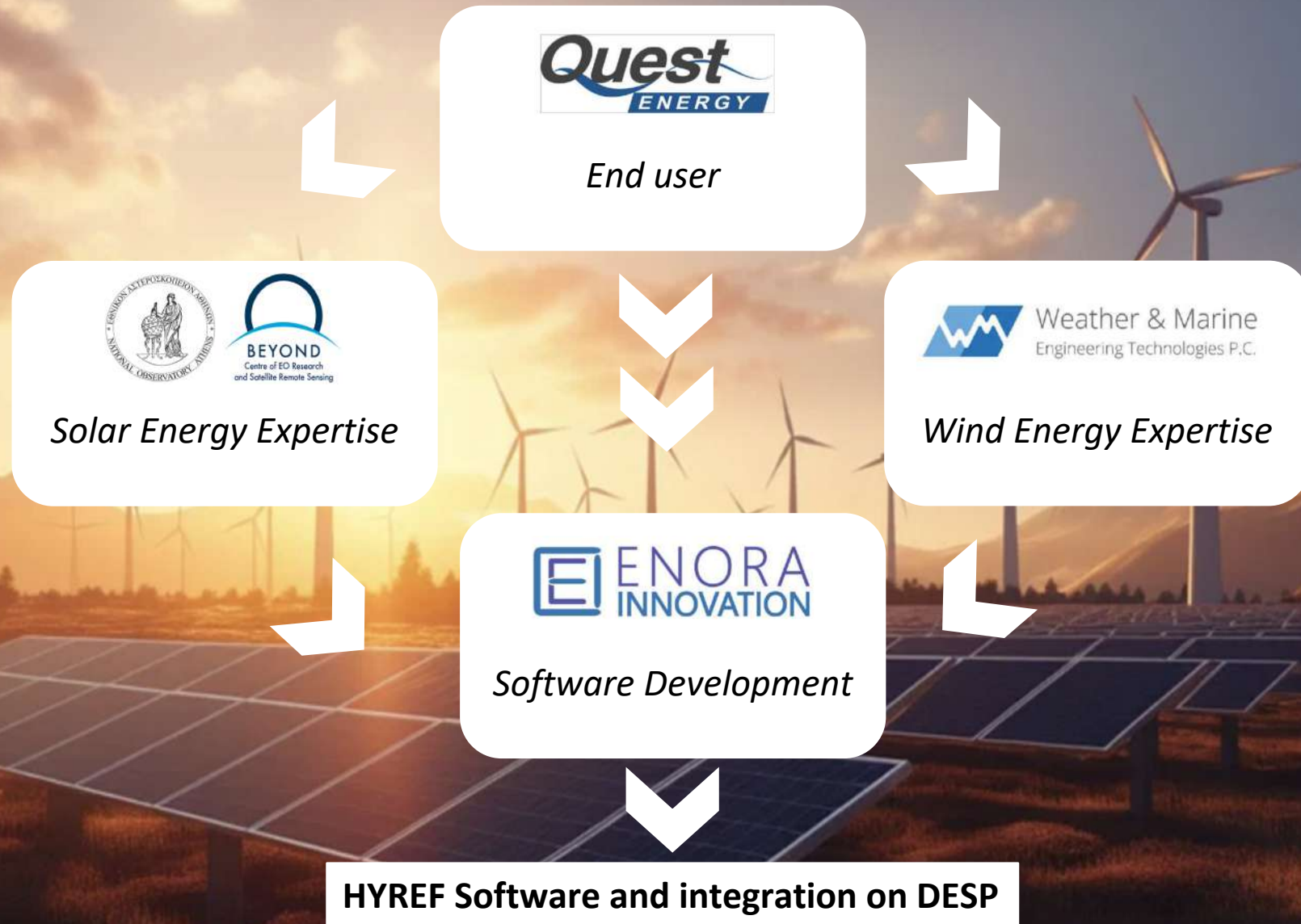


Destination Renewable Energy: Renewable energy solutions using DESP data and tools

Selected by RHEA under the ESA regulations and Best Practice processes



Consortium

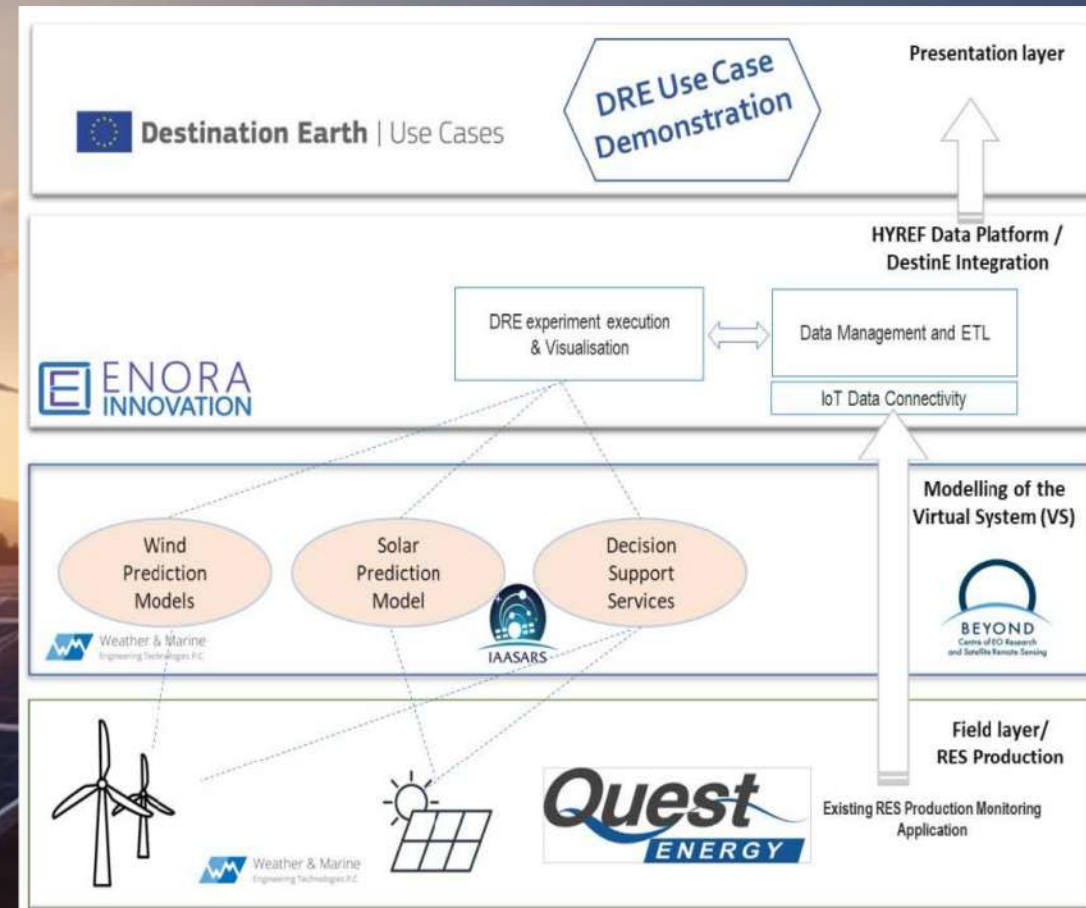


DRE Use Case in a nutshell

Main objective: Build a fully functional use case of DestinE for wind and solar energy forecasting from zero to two days ahead with high-temporal detail

Key points about the DRE Use Case:

- **Demonstrates the use of DESP functionalities and data sources**
- **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
- **Combines solar and wind energy** to maximise the potential production and use of green electricity
- 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
- Final solution based on **open-source** frameworks
- **Uses DestinE 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**
- **Flexible, scalable and user-driven**

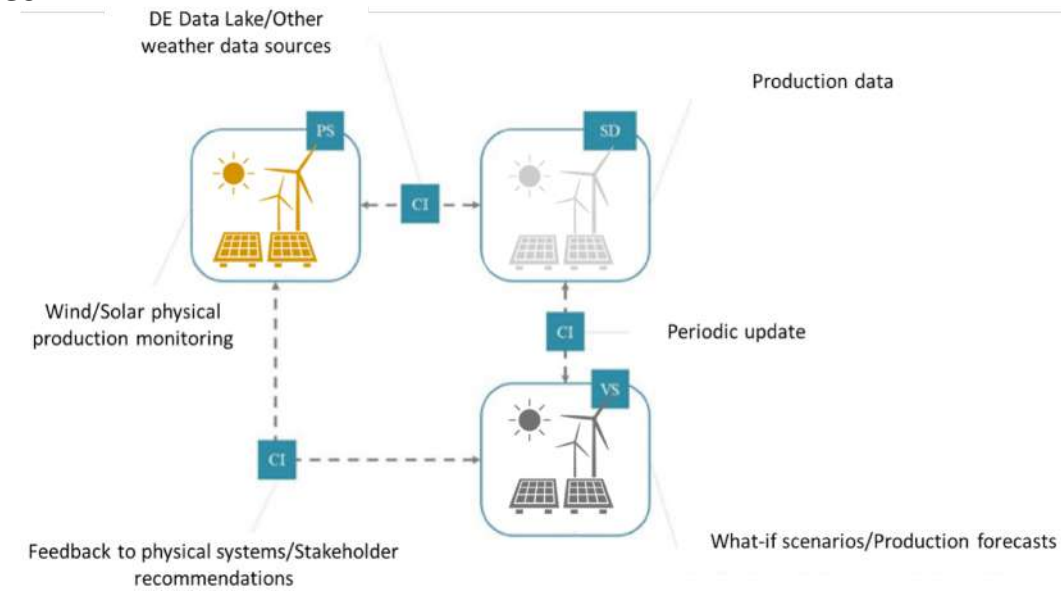
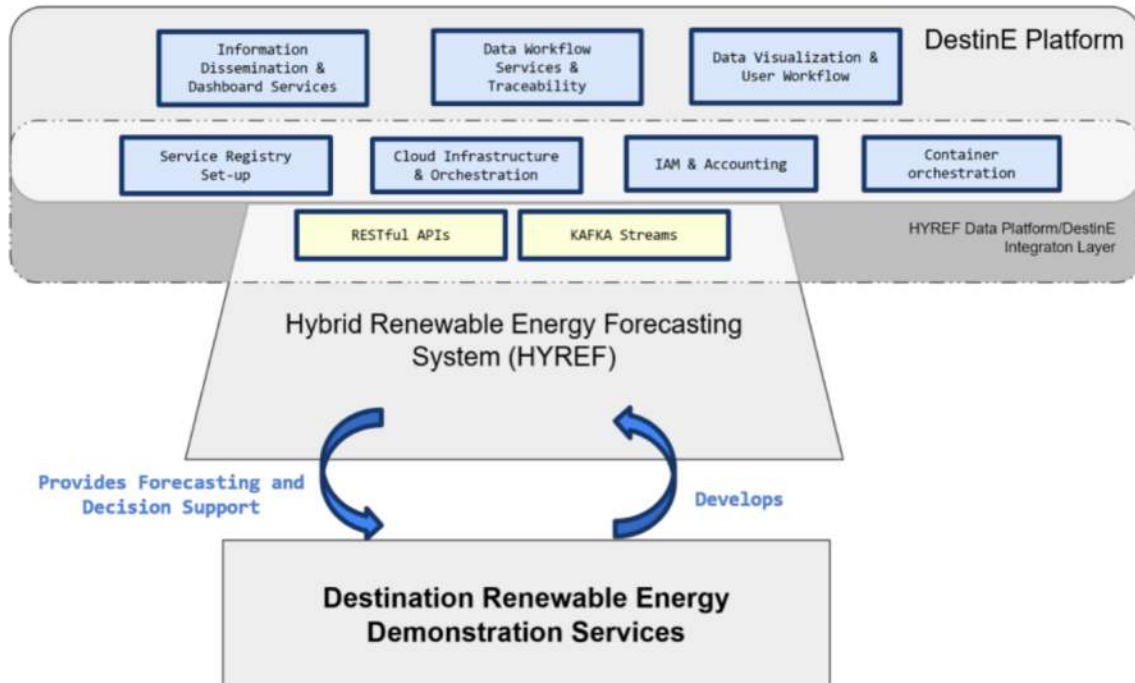


*Geo-Cradle, e-shape, IRPWIND, WAUDIT, MARINA Platform Project, EMODNET-Medsea, EMODNET-Blacksea, and more

Hybrid Renewable Energy Forecasting System (HYREF) & integration on DESP

The DRE plans to implement **the Hybrid Renewable Energy Forecasting System (HYREF)** software:

- Based on the concept of digitizing the physical systems of solar and wind production to support simulation and projection services that are part of the RES digital transformation ecosystem
- The existing RES energy production systems are merged with their digital model representations
- New software components will be designed based on the existing and planned functionalities of the DESP Core Services, during the deployment of the DESP backbone
- Final software will provide what-if scenarios and production forecasts
- Conceptual architecture is based on existing and planned DESP Core Services



HYREF components

DESP

Digital Twin Engine Data Lake Data Sources

DESP

DT Data forecasts

- Solar fields
- Cloud fields
- Wind Speed
- Wind Direction
- Air Density
- Other meteorological fields

Data Lake

- CAMS air quality forecasts
- Land cover (albedo)
- Solar data (historical)
- DEM
- Data for initialization and boundary conditions (DEM, Veg, SST and etc.) and climatology (ERA5)

User historical and real time data
 PV production
 Area characteristics – orography
 Ren. Energy infrastructure



Probabilistic model and site adaptation

Assimilation Co-design

Solar radiation forecasting



Tailor-made Solar Energy forecasting adapted to end-user needs

Synergy towards decision making actions

HYREF software



Weather forecasting



Statistical post-process model and site adaptation

Assimilation Co-design

Tailor-made Wind Energy forecasting adapted to end-user needs

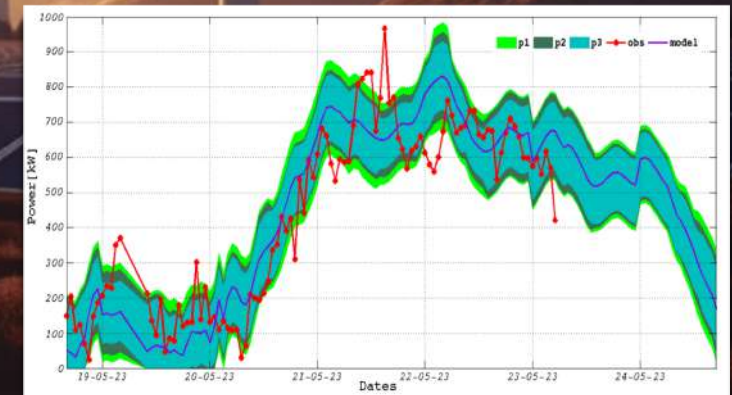


User historical and real time data
 Wind park specifications
 Wind power & wind speed and direction relation
 Area characteristics – orography
 Ren. Energy infrastructure



DRE outputs & benefits

- ❖ Solar energy: Forecast of solar radiation and user site adaptation techniques. Outputs directly related with user infrastructure and characteristics
- ❖ Wind energy: Wind power prediction based on combination of numerical and statistical methods. From time-series to probabilistic forecasting and ramps detection
- ❖ Scalability Assessment: A set of best practices and guidelines for adapting the HYREF model to varying regional data characteristics and infrastructure capabilities.
- ❖ Dashboards: An interactive dashboard prototype that integrates forecasted energy production and historical data visualization features.



User community engagement and Impact

User community engagement

Leveraging on existing partnerships, the consortium targets the following end-users:

- Solar and wind energy production, distribution and transmission operators
- Private sector dealing with solar energy investments
- Policy and decision makers in the energy digital transformation sector
- Public authorities
- Research institutes

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.

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*



Weather & Marine
Engineering Technologies P.C.

