High-Precision Solution for Croatian Energy Management System

Overview

Croatia has considerably lower economic activity per capita than most EU countries. Its energy balance significantly depends on oil, gas, and electricity imports.

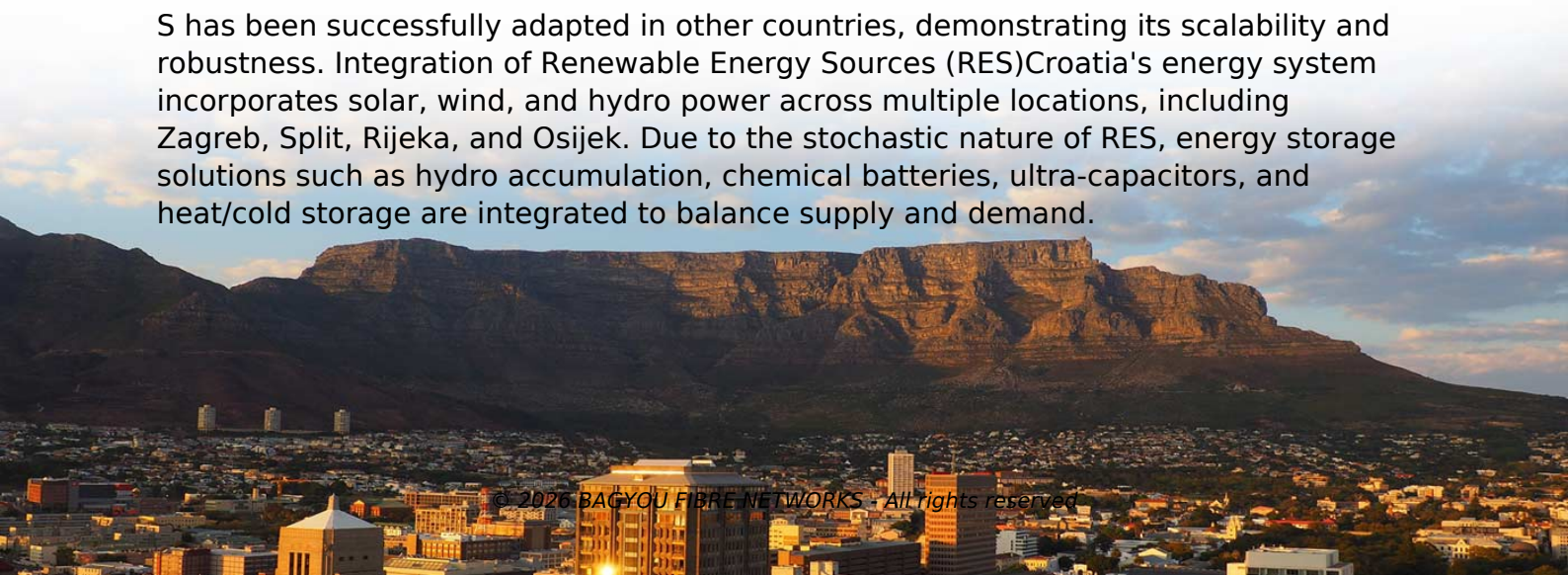
Key Takeaways

Croatia's high-precision energy management relies on an integrated EMIS, advanced modeling of renewable energy sources, and multi-objective optimization for system flexibility and efficiency. Energy Management Information System (EMIS)The EMIS is the cornerstone of Croatia's energy management strategy, enabling continuous data collection, monitoring, and analysis of energy and water consumption in public sector buildings. It automates reporting, reduces administrative burden, and ensures data credibility and accuracy.

The system allows disaggregation of energy consumption by building type, providing real-time insights into energy usage patterns and enabling targeted efficiency measures.

EMI

S has been successfully adapted in other countries, demonstrating its scalability and robustness. Integration of Renewable Energy Sources (RES)Croatia's energy system incorporates solar, wind, and hydro power across multiple locations, including Zagreb, Split, Rijeka, and Osijek. Due to the stochastic nature of RES, energy storage solutions such as hydro accumulation, chemical batteries, ultra-capacitors, and heat/cold storage are integrated to balance supply and demand.



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Electric vehicles (EVs) are also leveraged in Vehicle-to-Grid (V2G) mode, providing additional storage capacity and enhancing system flexibility.

Multi-

Objective Optimization and System PlanningHigh-precision solutions employ a two-level multi-objective optimization approach to design the Croatian Energy System (CES) for 2015–2050. This method considers both temporal and geographical dimensions: Temporal dimension: Balances energy production and consumption across daily, seasonal, and annual cycles, accounting for surplus and shortages. Geographical dimension: Optimizes energy transmission from production sites to demand centers, requiring robust high-voltage networks and potential AC-to-DC conversion for long-distance transfer.

The optimization ensures efficient use of conventional and renewable energy sources, maintaining reliability under variable weather conditions and fluctuating demand. Regulatory and Strategic AlignmentCroatia's energy management aligns with the Integrated National Energy and Climate Plan (NECP), targeting decarbonization, energy efficiency, and increased RES share by 2030. The system supports greenhouse gas reduction, compliance with EU regulations, and preparation for carbon neutrality by 2050.

EMIS and CE

S planning tools provide the analytical basis for achieving these targets, enabling data-driven decision-making and continuous performance monitoring.

Key Benefits of High-

Precision Solutions

Enhanced energy efficiency through real-time monitoring and analytics.

Optimized RE

S integration with storage and V2G capabilities. Robust system flexibility to handle variability in supply and demand. Regulatory compliance with EU energy and climate objectives.

Scalable and transferable framework for regional energy management initiatives. By combining EMIS, advanced modeling, and multi-objective optimization, Croatia achieves a high-precision energy management system capable of supporting sustainable, reliable, and efficient energy operations.

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Article Content

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A two-level approach in which multi-objective optimization was used on the global level to design a complex Croatian Energy System (CES), where electric vehicles (EVs) that are integrated to serve

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Croatia has considerably lower economic activity per capita than most EU countries. Its energy balance significantly depends on oil, gas, and electricity imports.

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In February 2020, the Energy Development Strategy of the Republic of Croatia for 2030 with an outlook to 2050 was adopted, which is focused on the EU''s goals of reducing greenhouse gas emissions,

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Our goal is to further enhance the Croatian power system by integrating smart solutions and developing advanced cloud platforms. As part of the Klimaoprema legacy, KOER brings decades of experience

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HOPS ensures and provides system services and ancillary services, prepares reports and archives data about system operation, and analyzes the performance of the Croatian power system. HOPS is

Long-term energy planning of Croatian power system using multi ...

A proposed two-level approach with multi-objective optimization on the global level, was used to design a Croatian Energy System (CES), where electric vehicles (EVs) are integrated to

Energy Management Information System in Croatia

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We know who, how, why, when and where consumes what energy in public sector buildings in Croatia.

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Other research showed it was possible to scale the dimensions of the system for even larger systems, such as national energy systems, with a higher number of power plants and optimize

Challenges of High Renewable Energy Sources Integration in Power

This paper presents a high-level overview of the integration of renewable energy sources (RES), primarily wind and solar, into the electric power system (EPS) in Croatia. It presents

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It provides an overview of the current energy system and the energy and climate policy. It also provides an overview of the national targets for each of the five key dimensions of the Energy Union and the

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This study analyzes the record electricity consumption in Croatia during the July 2024 heatwave and evaluates how the increased deployment of onshore wind and solar photovoltaics

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