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Flexibility Exploitation for residential, tertiary and industrial buildings

Deliverable Fact Sheet

D2.2 – Advanced Forecasting Tools

Objective

This deliverable presents the advanced forecasting framework developed within FlexBIT to predict photovoltaic generation and electricity demand in real time. The forecasting layer provides the predictive intelligence required by the FlexBIT platform to optimize flexibility resources, improve renewable energy utilization and support decentralized energy management across residential, tertiary and industrial demonstrators.

Methodology

The forecasting framework combines heterogeneous data sources with advanced Artificial Intelligence models.

The methodology consists of six main stages:

- Collection of SCADA, IoT and weather data
- Feature engineering and preprocessing
- AI-based forecasting of PV generation and electrical demand
- Continuous model validation
- Edge deployment on industrial hardware
- Integration into the FlexBIT optimization platform

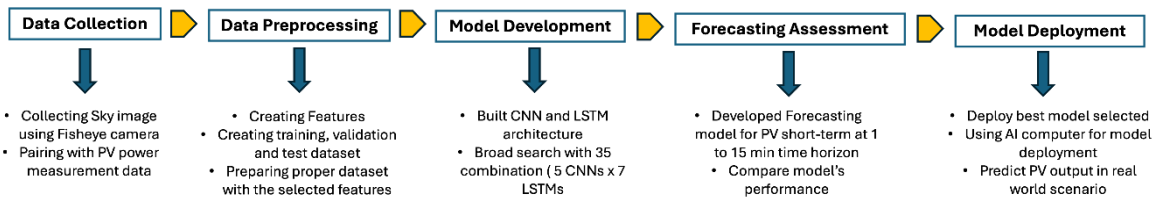

Figure 1 Forecasting methodology

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Key Findings

The FlexBIT forecasting framework introduces a scalable prediction layer capable of supporting real-time flexibility management.
Main achievements include:

- One-minute resolution forecasting for operational decision support
- Simultaneous prediction of PV generation and electrical demand
- Integration of heterogeneous data sources (SCADA, IoT, weather and sky images)
- Combination of time-series and computer vision approaches
- AI models deployable on cloud and edge devices
- Direct integration with the optimization and advisory modules developed in WP2
- Support for residential, tertiary and industrial demonstrators

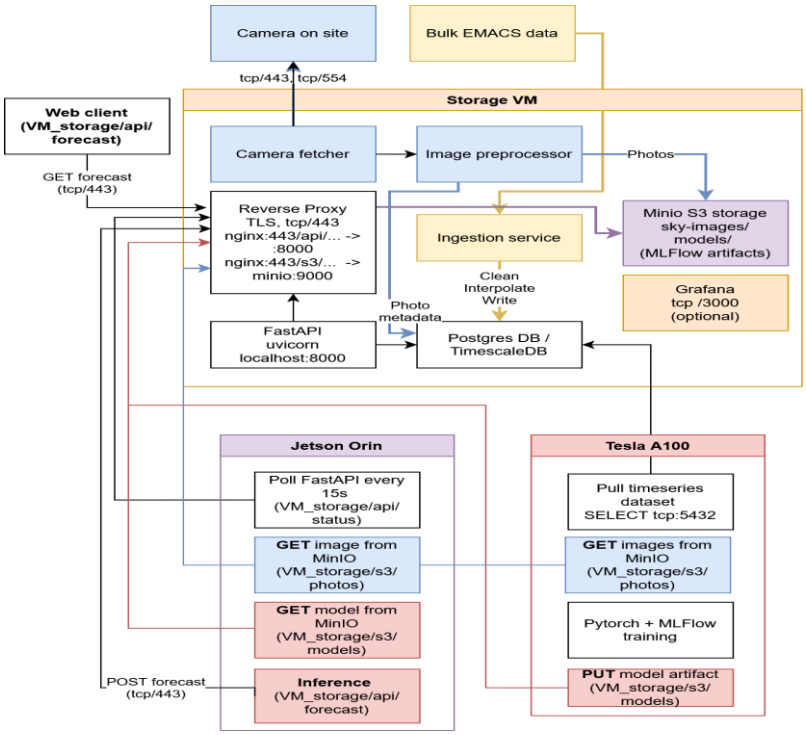

Figure 2 Forecasting pipeline

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Recommendations

Future forecasting services for energy communities should:

✓ Combine operational data with weather and image-based information.

✓ Adopt AI models capable of supporting rolling short-term forecasts.

✓ Deploy forecasting services close to the energy assets using edge computing.

✓ Integrate forecasting directly with optimization and flexibility management services.

✓ Ensure secure and interoperable communication between AI services and energy management systems.

✓ Continuously retrain forecasting models as new operational data become available.

✓ Design scalable forecasting services that can be transferred to different demonstrators and energy communities

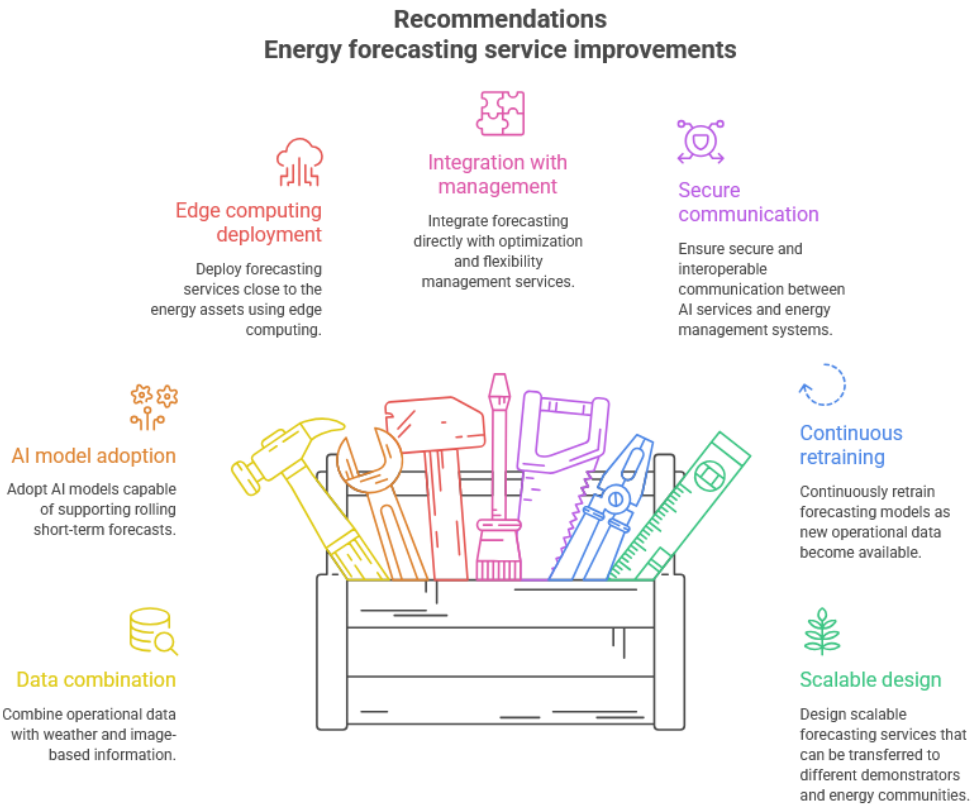

Figure 3 FlexBIT's recommendations

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