

Guidelines for the Energy Assessment of INAF Structures

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Introduction

This document establishes directives for companies tasked with evaluating the overall efficiency of the structures of the National Institute for Astrophysics (INAF), in line with the guidelines set by the Green Group. The primary objective is to ensure a uniform and standardized approach to analyses, providing consistent and comparable assessments across all structures.

The evaluation activities will focus on a preliminary analysis of the structures (at time T0), providing a comprehensive snapshot of their energy, functional, and structural status. INAF structures, primarily historic buildings adapted over time to accommodate scientific research activities, require a rigorous methodology to monitor performance evolution and plan targeted interventions. This involves balancing the preservation of historical value with the adaptation to modern technological needs. For instance, installing thermal insulation systems compatible with architectural constraints can represent an effective solution. The methodological approach should treat interventions as part of a continuous and dynamic process. Subsequent constant monitoring, preferably automated, will be central to optimizing the efficiency process over time and maximizing the value of the resources employed.

Objectives and Guidelines for Energy Assessment

The evaluation activities are based on an in-depth analysis of the initial state (time T0) of the infrastructures to provide a solid foundation for planning efficiency measures. The following objectives and guidelines outline the main areas of intervention and methodology:

1. Pre-Rehabilitation Analysis

- **Initial Documentation:** Collect detailed data on the energy, structural, and functional status of the infrastructures, including energy classifications, characteristics of existing systems, thermal insulation (including windows), quality of the building envelope, and historical constraints. For areas that cannot be rehabilitated due to historical constraints, evaluate the logistical optimization of adjacent spaces to ensure operational continuity. In such cases, consider interventions that enhance neighboring areas while preserving historical features.
- **Systems and Functionality:** Analyze energy consumption, the wear level of systems, and operating conditions. Evaluate the livability of spaces (health, lighting, contamination), efficiency of external areas, including charging systems for electric mobility, and the distribution of internal and external information services. Strategically assess charging station locations to ensure accessibility and operational efficiency. Consider integrating systems that support innovative technological solutions, such as intelligent monitoring and automated energy load optimization. Pay particular attention to conditioned technical areas, such as computing centers, to minimize concentrated energy losses. The analysis should also include optimizing water usage for traditional purposes and rainwater reuse, as well as waste management and logistics.
- **Future Needs:** Consider the Institute's future needs, including staff expansion and new activities, to identify potential infrastructure or system adaptations. These may involve reconfiguring existing spaces or integrating advanced technologies to support future activities. For example, adopting modular systems could facilitate rapid adjustments to new

operational requirements.

2. Data Normalization and Comparability for Rehabilitation Planning

- **Standardization:** Ensure that collected data is uniform and comparable across structures and time periods, using interoperable formats and standard indices such as the Energy Performance Index (EPI). These formats should include open standards to facilitate data import and export between different platforms.
- **Centralized Management:** Organize data in centralized and accessible databases, ensuring flexibility for reorganization and updates by authorized personnel.
- **Consistent Methodology:** Apply common criteria to evaluate both historical and modern buildings, minimizing discrepancies between results. Provide a unified classification system that allows for an immediate understanding of the performance of the assessed structures.

3. Interoperability and Open System Design

- **Unrestricted Systems:** Design existing or future systems using open protocols (e.g., Modbus, BACnet) to avoid vendor-specific constraints, ensuring management by third parties or INAF personnel. Ensure INAF staff receive adequate training to manage and maintain systems based on open protocols. This training should include both technical and managerial aspects to foster full operational autonomy.
- **Maintenance and Integration:** Document systems in detail to facilitate maintenance, replacement, and technological integration, promoting interoperability among devices from different suppliers.

4. Compatibility Between Structures and Intervention Planning

- **Adaptive Evaluation:** Adopt methodologies that account for the specific characteristics of historical and modern buildings, ensuring analyses are useful for planning targeted interventions aligned with each structure's needs. Consider using advanced diagnostic tools to tailor strategies to each building's unique features.
- **Integrated Vision:** Promote strategies applicable to all structures, regardless of their nature, focusing on efficiency, sustainability, and flexibility.

5. Monitoring and Data Accessibility

- **User-Friendly Tools:** Provide intuitive monitoring dashboards to facilitate consultation and analysis of acquired data. These dashboards should include automated reporting and predictive analysis tools to support strategic planning. Additionally, they should be configurable to allow customization based on the Institute's specific needs.
- **Continuous Monitoring:** Implement a constant and automated monitoring system to track the evolution of energy performance and optimize the efficiency process. Integrate IoT technologies to enhance real-time data collection and processing while avoiding binding commercial systems. Open communication protocols ensure device replacement when necessary.

Conclusion

This document serves as a reference framework for companies tasked with conducting energy assessments of INAF structures. Adherence to these guidelines will:

- Ensure consistency and comparability among assessments of different structures.
- Provide a solid foundation for planning targeted efficiency interventions.

- Promote a sustainable and transparent approach to infrastructure management.

Companies are required to follow the provided instructions and produce detailed reports adhering to the outlined criteria. The Green Group Coordinator is available at [email address] for further clarifications.

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