Chapter 3
Smart Grids for Governments: Strategy, Technology, and Energy Transition

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ABSTRACT

This chapter presents a comprehensive overview of Smart Grid implementation from a governmental perspective, structured into five thematic modules. These modules range from the technical diagnosis of legacy electricity grids to the assessment of technological maturity levels, and they include enabling tools such as AMI, SCADA, and VPPs. The chapter also examines the integration of renewable energy sources, the emergence of new actors such as prosumers and electric vehicles, and the importance of appropriate regulatory frameworks and incentives. Overall, it articulates strategy, technology, and governance to support governments in the transition toward smarter, more resilient, and more sustainable electricity systems.

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1. INTRODUCTION

The transition to sustainable and resilient energy systems has become a challenge for governments in the 21st century. In this context, Smart Grids or smart grids emerge to achieve the objectives of decarbonisation, energy efficiency, security of supply and citizen participation. Far from being a mere technological modernization, Smart Grids represent a change in the way electricity is generated, distributed and consumed, allowing a more flexible, dynamic energy ecosystem adapted to future needs.

For governments, adopting a strategic vision on Smart Grids not only implies investing in sensors, smart meters or advanced control software, but also in public policies, updated regulatory frameworks, collaborative governance models and green financing instruments. The implementation of smart grids requires the articulation of multiple dimensions: from territorial and energy planning to the development of institutional and citizen capacities, including technological interoperability, cyber-security and social equity. Smart Grids offer the possibility of integrating variable renewable energies, enabling prosumers and energy communities, reducing technical and non-technical losses, improving resilience to extreme events and facilitating the automation of electricity management at all levels. In addition, they allow the energy transition to be addressed with an inclusive and territorially differentiated perspective: rural microgrids, digital urban platforms, distributed energy industrial hubs, among others.

This chapter provides a comprehensive view of how governments can plan, implement, and scale smart grids as part of their national energy strategy. Through thematic modules, they explore everything from technical bases to governance frameworks, from maturity models to public policy instruments, based on scientific evidence, international cases and emerging regulatory frameworks. The aim is to provide decision-makers with a robust, adaptable and informed roadmap to move towards smarter, cleaner and more democratic electricity systems.

2. DIAGNOSING THE POWER GRID AND PUBLIC CHALLENGES

Many countries, especially in Latin America and other emerging regions, face ageing, fragmented, and poorly automated electricity infrastructures, designed for a centralized and passive energy reality. In this first section, it is proposed to carry out a technical, institutional and regulatory analysis of the current network, as a starting point for planning its modernization. Diagnosis is an exercise that reveals bottlenecks, identifies opportunities for improvement, and informs investment and