

# Chapter 12

## Analysis of the Intelligent Energy Resource Management Strategy Applied to the ENICarthage Building

**Hamza Wertani**

*Research Laboratory Smart Electricity and ICT, SEICT, LR18ES44 National  
Engineering School of Carthage, University of Carthage, Tunisia*

**Jihen El Khaldi**

*Research Laboratory Smart Electricity and ICT, SEICT, LR18ES44 National  
Engineering School of Carthage, University of Carthage, Tunisia*

**Jamel Ben Salem**

*Research Laboratory Smart Electricity and ICT, SEICT, LR18ES44 National  
Engineering School of Carthage, University of Carthage, Tunisia*

**Mohamed Najeh Lakhoua**

*Research Laboratory Smart Electricity and ICT, SEICT, LR18ES44 National  
Engineering School of Carthage, University of Carthage, Tunisia*

### **ABSTRACT**

*This chapter explores comprehensive approaches for managing energy resources in individual buildings connected to the electrical grid, integrating local renewable energy production and storage systems. It addresses diverse constraints such as geographical, climatic, physical, and socio-cultural factors. The proposed strategies aim to optimize energy production and consumption while considering economic*

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*costs, occupants' comfort, and environmental impact. The objective is to enhance energy self-consumption, minimize reliance on the grid, and maximize renewable resource utilization. Performance criteria encompass comfort, economic and environmental costs, and renewable energy utilization, ensuring a holistic approach to microgrid management.*

## **INTRODUCTION**

Among the objectives of this chapter's work is to propose solutions for managing energy resources at the scale of a microgrid. In the first part of this chapter, the considered microgrid will be presented: an individual building connected to the electrical grid and incorporating local production. The objectives of the energy resource management strategy will also be described.

In a second part, performance criteria will be defined. These will enable the evaluation of economic and environmental costs, as well as the utilization of renewable energy resources. The interaction of the building with the electrical grid will be considered.

A third part will describe the various resource management solutions. A comprehensive, multi-criteria strategy for managing energy resources at the scale of an individual building connected to the electrical grid and incorporating production and storage systems will be proposed. It will take into account decentralized production, load, battery status, and the electrical grid's condition at each moment.

In order to test the different scenarios of this strategy, it is necessary to have models of the various components of the microgrid. Thus, in a fourth part, an application of an individual building incorporating a PV production system will be modeled and tested using PVsyst software.

## **ENERGY MANAGEMENT IN THE BUILDING SECTOR**

With the development of Renewable Energy Sources (RES) and the adoption of increasingly stringent regulations regarding the energy efficiency of buildings, the concept of a mini or microgrid has emerged. This simply refers to a network at the scale of a building (house, building, offices), a group of buildings, or at most, a neighborhood, within which multiple production systems coexist with different types of loads and storage means. These different elements communicate with each other and are mostly controllable (Tuballa, M. L., & Abundo, M. L. 2016), (Keykha, A. 2022). These microgrids offer several advantages:

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