

Chapter 8


Renewable Energy Integration in Supply Chain Operations: Case Studies and Strategic Insights

Suriya Ponnambalam

 <https://orcid.org/0000-0002-8775-0474>

Bharath Institute of Higher Education and Research, India

M. K. Ilampoornan

 <https://orcid.org/0000-0002-6233-8141>

Bharath Institute of Higher Education and Research, India

ABSTRACT

The adoption of renewable energy within supply chain operations is accelerating as businesses aim to enhance sustainability, achieve carbon neutrality, and reduce costs. This research investigates the application of renewable sources—such as solar, wind, and bioenergy—across different phases of supply chains. Representation on multiple case studies from sectors including manufacturing, retail, and logistics, the study highlights key implementation strategies, challenges encountered, and resulting performance impacts. Findings suggest that effective integration depends on factors like technological capability, interdisciplinary cooperation, and strategic long-term investments. The study concludes with a proposed framework to help organizations incorporate renewable energy into their supply chains while supporting global sustainability initiatives.

DOI: 10.4018/979-8-3373-3790-6.ch008

Copyright © 2026, IGI Global Scientific Publishing. Copying or distributing in print or electronic forms without written permission of IGI Global Scientific Publishing is prohibited. Use of this chapter to train generative artificial intelligence (AI) technologies is expressly prohibited. The publisher reserves all rights to license its use for generative AI training and machine learning model development.

1. INTRODUCTION

Operating managers were only marginally involved in the early phases of environmental management and stayed somewhat out of the way. Traditionally, specific departments were in charge of monitoring environmental performance in a number of domains, such as waste management, operations, logistics, marketing, product development, process design, and regulatory compliance. But this strategy has changed. It is now commonly acknowledged that leading practices necessitate environmental management to be completely integrated into daily operational processes, much like the changes witnessed during the quality and supply chain revolutions.

Operations and supply-chain management scholars and practitioners are becoming more interested in Renewable supply-chain management, or RSCM. The increasing environmental degradation, such as depleting raw material resources, overflowing waste sites, and rising pollution levels, is the primary driver of RSCM's expanding significance. Being environmentally sustainable is important, but so are sound business practices and increased revenue. It is not a cost center, but rather a driver of company value. RSCM is also being driven by consumer pressures and regulatory obligations. Therefore, the scope of RSCM includes more proactive measures through the numerous Rs (Reduce, Re-use, Rework, Refurbish, Reclaim, Recycle, Remanufacture, Reverse logistics, etc.) as well as reactive monitoring of general environment management programs.

1.1 Fundamental Components of Renewable Supply-Chain Management

Renewable Supply Chain Management (RSCM) is a concept that emphasizes the integration of environmental sustainability into all stages of the supply chain. It emphasizes three essential elements: the significance of RSCM (Fontes et al., 2018), green operations, and green design. To reduce the product's environmental impact from the start, green design uses techniques like Environmentally Conscious Design (ECD) and Life Cycle Assessment (LCA). Reverse logistics, waste management, and green manufacturing and remanufacturing are examples of green operations. Reducing, reusing, recycling, remanufacturing, and effective inventory and production planning are the main goals of these initiatives. While waste management deals with source reduction, pollution avoidance, and responsible disposal, reverse logistics makes sure that used goods are collected, sorted, and redistributed in an efficient manner.

RSCM design can be examined from the perspective of environmentally conscious design, taking into consideration the product/process life-cycle assessment. The same is true for green manufacturing and remanufacturing (reduce; recycle;

24 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/renewable-energy-integration-in-supply-chain-operations/396362

Related Content

Application of Support Vector Network for Power System Static Security Evaluation

Ashok Kumar Mehta, Kesab Bhattacharya and Dipak Ray (2015). *International Journal of Energy Optimization and Engineering* (pp. 55-67).

www.irma-international.org/article/application-of-support-vector-network-for-power-system-static-security-evaluation/124746

Impact of Dust for Solar PV in Indian Scenario: Experimental Analysis

Rashmi Chawla, Poonam Singhal and Amit K. Garg (2021). *Research Anthology on Clean Energy Management and Solutions* (pp. 1869-1890).

www.irma-international.org/chapter/impact-of-dust-for-solar-pv-in-indian-scenario/286547

Optimal Design of Modified Power System Stabilizer Using Multi Objective Based Bio Inspired Algorithms

Dasu Butti, Siva Kumar Mangipudi and Srinivasarao Rayapudi (2018). *International Journal of Energy Optimization and Engineering* (pp. 17-55).

www.irma-international.org/article/optimal-design-of-modified-power-system-stabilizer-using-multi-objective-based-bio-inspired-algorithms/210124

Introduction to Advanced Nuclear Systems

M. D. Mathew and Bhanu Sankara Rao (2025). *Pathways to a Carbon-Free Future Through Advanced Nuclear Systems* (pp. 63-92).

www.irma-international.org/chapter/introduction-to-advanced-nuclear-systems/383013

Robust Decentralized Voltage Tracker of Islanded Multi-DG AC Microgrids Using Invariant Ellipsoids

Ehab Hassan Eid Bayoumi, Hisham Soliman and Farag El-Sheikhi (2022). *Modeling and Control of Static Converters for Hybrid Storage Systems* (pp. 1-35).

www.irma-international.org/chapter/robust-decentralized-voltage-tracker-of-islanded-multi-dg-ac-microgrids-using-invariant-ellipsoids/287181