FINANCIAL FEASIBILITY ANALYSIS OF LITHIUM-ION BATTERY RECYCLING FACILITIES: A COMPARATIVE STUDY OF THE NETHERLANDS, JAPAN, AND INDONESIA

BACHELOR THESIS

To complete Bachelor Program at the Undergraduate Program (S1) of the Faculty of Economics and Business, Diponegoro University

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STATEMENT OF BACHELOR THESIS ORIGINALITY

The undersigned, Salsabila Rizqyana Herlambang, declares that the bachelor thesis entitled: Financial Feasibility Analysis of Lithium-Ion Battery Recycling Facilities: A Comparative Study of The Netherlands, Japan, and Indonesia, is the result of my writing. I hereby declare that in this bachelor thesis there is no whole or part of other people's writings that I took by copying or imitating in the form of a series of sentences or symbols that show the ideas or opinions or thoughts of other authors, which I admit as if they were my writing, and/or there is no part or all of the writing that I copy, imitate, or take from other people's writings without giving acknowledgment of the original author.

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ABSTRACT

The rapid growth of electric vehicle (EV) adoption has substantially increased global demand for lithium-ion batteries (LIBs), generating a growing volume of end-of-life batteries and raising urgent concerns about sustainable critical mineral supply chains. Battery recycling has emerged as a strategically important solution for recovering valuable materials including lithium, nickel, cobalt, manganese, and copper while supporting circular economy objectives. However, the financial feasibility of LIB recycling facilities varies considerably across countries due to differences in industrial maturity, cost structures, financing conditions, and market dynamics.

This study compares the financial feasibility of hypothetical LIB recycling facilities each with an annual processing capacity of 5,000 tonnes in the Netherlands, Japan, and Indonesia. Benchmark financial and operational data are drawn from Umicore (Netherlands) and DOWA Holdings (Japan), while assumptions for Indonesia are calibrated using percentage proxies derived from Huayou to reflect regional industrial conditions. Investment appraisal methods Net Present Value (NPV), Internal Rate of Return (IRR), and Weighted Average Cost of Capital (WACC) are applied across conservative, base case, and optimistic scenarios. Sensitivity analysis is conducted to identify the variables with the greatest impact on project feasibility.

***Keywords**: Lithium-ion battery recycling, financial feasibility analysis, Net present value (NPV), Circular economy*

ABSTRAK

Pesatnya adopsi kendaraan listrik (EV) telah meningkatkan permintaan global terhadap baterai lithium-ion (LIB) secara signifikan, menghasilkan volume baterai yang habis masa pakainya dalam jumlah yang terus bertambah, sekaligus menimbulkan kekhawatiran mendesak mengenai keberlanjutan rantai pasok mineral kritis. Daur ulang baterai telah muncul sebagai solusi yang strategis untuk memulihkan material bernilai tinggi termasuk litium, nikel, kobalt, mangan, dan tembaga sekaligus mendukung tujuan ekonomi sirkular. Namun, kelayakan finansial fasilitas daur ulang LIB sangat bervariasi antar negara, dipengaruhi oleh perbedaan kematangan industri struktur biaya, kondisi pembiavaan, dan dinamika pasar.

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***Kata kunci**: Daur ulang baterai lithium-ion, Analisis kelayakan finansial, Nilai bersih (NPV), Ekonomi sirkular*

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TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1
INTRODUCTION

1.1 Background of study

The global transition toward cleaner and more sustainable transportation has accelerated the adoption of electric vehicles (EVs), resulting in a significant increase in demand for lithium-ion batteries (LIBs). As governments and industries intensify efforts to reduce carbon emissions, EVs have become an important solution for achieving climate targets. According to the International Energy Agency, global electric vehicle sales surpassed 17 million units in 2024, reflecting the rapid growth of the EV market worldwide. While this growth creates opportunities for sustainable mobility, it also raises concerns regarding the future management of end-of-life batteries, which are expected to increase substantially in the coming years. IEA Global EV Outlook 2025

Lithium-ion batteries contain valuable critical materials such as lithium, nickel, cobalt, manganese, and copper, which are essential for battery production. However, when batteries reach the end of their useful life, improper disposal can create environmental problems and lead to the loss of valuable resources. As a result, battery recycling has emerged as an important strategy to support a circular economy, where materials can be recovered and reused instead of discarded. In addition to reducing waste, recycling helps decrease dependence on virgin mining activities and supports a more sustainable battery supply chain. Previous studies have shown that battery recycling can reduce environmental impacts while also creating economic value through the recovery of metals contained in spent batteries (Harper et al., 2019).