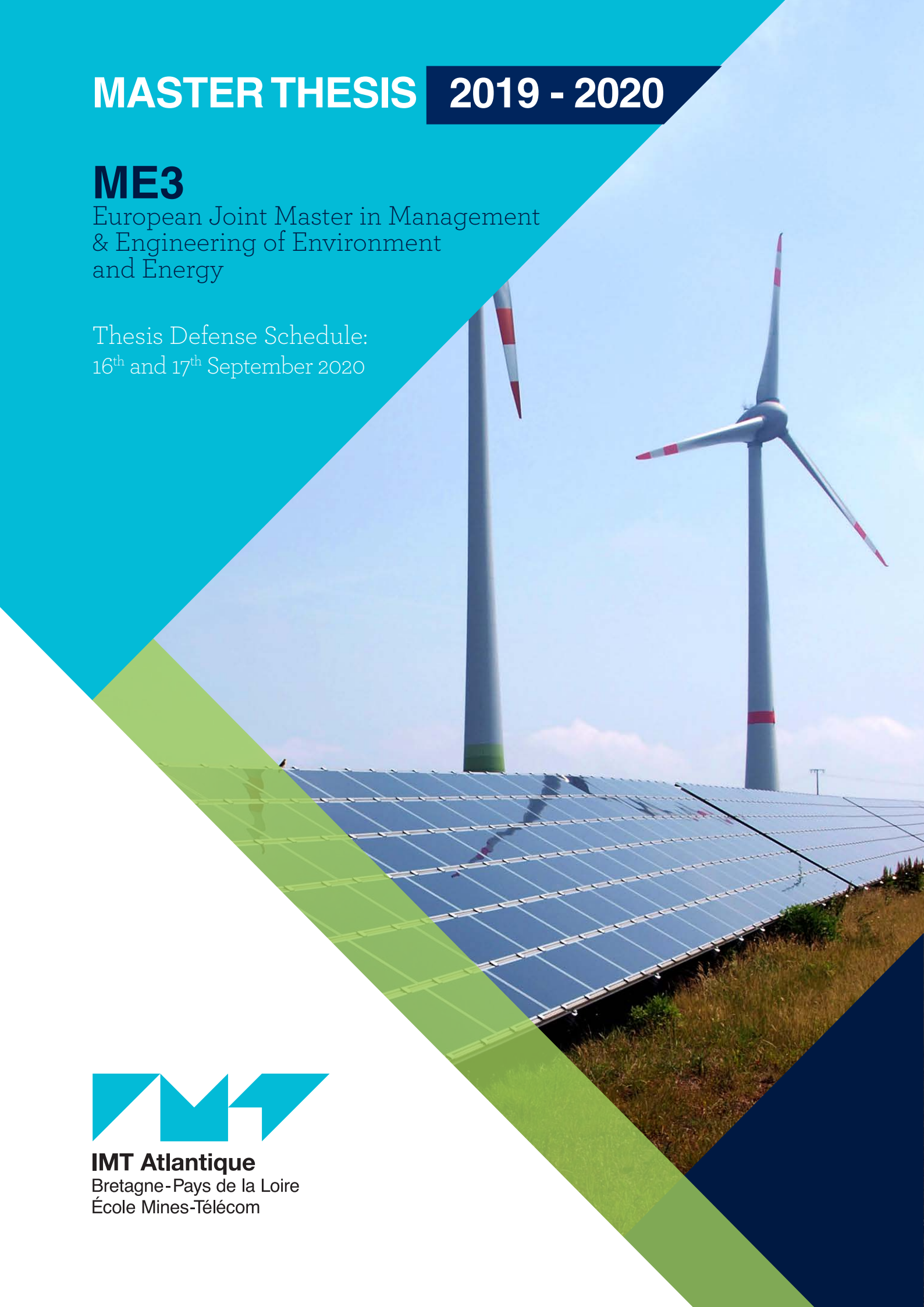
MASTER THESIS 2019 - 2020

ME3

European Joint Master in Management & Engineering of Environment and Energy

Thesis Defense Schedule:
16th and 17th September 2020



IMT Atlantique
Bretagne-Pays de la Loire
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Joseph ANTONY - *India*

Renetech (Stockholm, Sweden)

Techno-economic assessment of Pyrolysis of Waste Plastics to Diesel fuel in Ghana.

With a global perspective, it is Renetech's mission to be a developer of sustainable and environmentally adapted renewable energy projects. Since its formation in 2005, Renetech has been engaged in project development, research, and consultancy in large and smaller scale projects, mostly in the EU and SSA (Sub Saharan Africa). The demand for sustainable energy recovery, development of a circular economy and a need for reduction in plastic discarded into nature and the environment is ever increasing. Currently, Renetech AB is collaborating with designers, suppliers, and financial stakeholders to develop a solution to facilitate a waste processing plant in Ghana that converts 30 tons per day of waste plastic to vehicle grade Diesel. The Diesel produced from the process is much cleaner than conventional Diesel. The client is the local waste management company in Ghana. The task will be to align the needs of the processing unit (waste plastic) with what is produced by the waste management company and also support the development of the Waste processing plant in Ghana in collaboration with suppliers, colleagues and the client. The main objectives of the thesis are (1) Understanding how much post-consumer waste plastics are generated in Ghana and their polymer composition; (2) Identifying feasible ways for pretreatment of feedstock such as waste collection, sorting, cleaning etc.; (3) Understanding the PtL (Plastic to Liquid) technology for a commercial scale system and (4) Creating a business model and understand the economic viability surrounding the whole process.

Double Degree from Universidad Politécnica de Madrid (Spain) and KTH Royal Institute of Technology, Stockholm (Sweden).

Pratima DESHMUKH - *India*

Volvo Penta (Gothenburg, Sweden)

Simulating hydrogen combustion characteristics in 13L heavy duty engine using CFD (Computational Fluid Dynamics) tool.

Volvo Penta, one of the nine business areas of Volvo Group, is a world leading manufacturer and supplier of diesel engines for marine and industrial applications. Their engines mainly use diesel and gasoline as a fuel for robust heavy duty off-road vehicles as well as in powerboats and sailboats. With the increasing awareness on use of alternative fuels in engines, a need for the shift to clean energy sources has been realized and hence a lot of study with the use of natural gas in engines is currently going on in the industry. Use of hydrogen in Internal Combustion Engines (ICE) is a new area for Volvo Penta and this thesis is performed with a motivation to analyze the possibility of implementation of hydrogen fuel in ICE´s. The presented work is an important step towards use of clean and sustainable energy source in order to achieve carbon neutral emissions. The aim of the master thesis is a detailed computational fluid dynamical (CFD) study on hydrogen combustion in the in-house 13L heavy duty engine. The preliminary aim is to develop a computational configuration so as to analyze the basic combustion characteristics of hydrogen fuel. Later, the abnormal combustion behavior such as backfire, knocking arising due to auto ignition characteristics of hydrogen fuel are investigated in detail for different operating conditions. The entire work is carried out with engine specialized CFD tool, CONVERGE Version 3.0. Conclusions regarding normal and abnormal hydrogen combustion along with the possibility of use of hydrogen in Volvo Penta Engines, specifically in the genset application are presented at the end.

Double Degree from Universidad Politécnica de Madrid (Spain) and Budapest University of Technology and Economics (Hungary).

Juan Andres ESTRADA WALKER - *Colombia*

IRENA (Abu Dhabi, United Arab Emirates)

The role of intergovernmental organisations in the mitigation of Climate Change in Latin America and The Caribbean.

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future. The Paris Agreement, the main outcome of COP21 in 2015, commits all signatory parties to pursue their best efforts to reduce emissions through Nationally Determined Contributions (NDCs), and to maintain the global temperature increase well below two degrees Celsius, or even further at 1.5 degrees Celsius, above pre-industrial levels. The contributions are revised every five years, but as of 2020, studies highlight that the aggregate effects of NDCs are not on the right course to meet these key climate goals. Hence, the purpose of this Master Thesis is to highlight how intergovernmental organisations, are summing efforts to support countries in achieving the objectives of international agreements. As a case study, this work summarises different aspects of the regional and country engagement from IRENA, towards the enhancement of the energy-related content in the NDCs and their potential on raising the ambition for countries in Latin America and The Caribbean. Part of the expected results of this research are related to identifying challenges, opportunities, and potential impacts of the Agency's involvement in the NDCs revision process in the region.

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Flurina HEUBERGER - *Switzerland*

University of Stuttgart (Stuttgart, Germany)

Analysis of the State of the Art in Energy Audits from an Energy Flexibility Perspective.

The Universität Stuttgart is a leading technical university in Germany with worldwide reputation. The Institute for Energy Efficiency in Production (EEP) conducts research on topics aimed at reducing energy consumption in production, such as applying energy-efficient technologies and intelligent control of energy use. It is one of the lead partners in the Kopernikus Projekt SynErgie, which aims to synchronize the energy demand of industrial production processes with the fluctuating power supply from renewable sources without compromising the product quality. The ability of an energy-consuming system to change its energy intake over time is known as demand-side Energy Flexibility and it represents a solution to accommodate to the variable renewable power supply. The master thesis objective consists of conducting a collection and analysis of standards and guidelines for industrial Energy Audits. Furthermore, the methods that can be extracted to determine the Energy Flexibility must be identified. Characteristics which have to be further investigated, considering research efforts in the field of Energy Flexibility, have to be singled out. Additionally, a procedure to determine the Energy Flexibility Potential of an industrial system will be provided.

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Spencer HOUCK - *USA*
Hinicio S.A. (Brussels, Belgium)
Relative Performance of Fuel Cell Electric Vehicles in Mountain Environments.

Hinicio, headquartered in Brussels with offices in Paris, Bogota, Buenos Aires, Santiago, and China, is a strategic consultancy specialized in the energy transition and sustainable mobility. Hinicio is recognized as a leading player in the hydrogen industry at the European level. For more than 12 years, Hinicio has been working across the entire value chain helping the industry overcome the challenges and unlock the emergence of hydrogen as an energy carrier. Hydrogen has great potential to decarbonize industries not able to be "greened" by renewable electricity such as manufacturing, refineries, chemical production, and transportation. Currently, the use of hydrogen as an energy carrier is gaining traction at both the member state and European level, where significant state funding is actively being considered. It is imperative to understand where funding should be allocated to facilitate scaling of the hydrogen value chain including where profitable business cases may be found in the short term. This thesis project presents a techno-economic study with wide-ranging applicability that models and analyzes the relative performance of hydrogen fuel cell vehicles compared to battery-electric and internal combustion engine vehicles in mountain environments. The scope of the analysis examines vehicle range, operating emissions, and total cost of ownership of vehicles considering the unique operating conditions present in mountain areas.

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Towani Chimphamaso MTONGA - *Zambia*
ENVISA (Paris, France)
Airport Carbon Emission Management.

Airports are important nodes in the air transport system, but also local sources of environmental impacts. Emissions of CO2 are among the most relevant because of their potential greenhouse effects. An important framework for airports to manage and demonstrate their reduction of carbon emissions is the Airport Carbon Accreditation (ACA) program. ENVISA is an international consultancy specialized in working on projects around the environmental and sustainability aspects of aviation and their relationship with local and global communities. It is currently providing assistance to one of its clients, VINCI Airports, to carry out a Scope 3 Emissions Calculations Project for twenty-four (24) VINCI Airports around the world. Contributing towards this project, this master's thesis aims at collecting maximum possible relevant airport data and using this data to calculate scope 3 emissions on a software called ACERT (Airport Carbon and Emissions Reporting Tool). This will be achieved by splitting emission sources into elementary segments in order to compute the environmental effects produced by each elementary source. These quantified results, after analysis, will be used to improve and develop better operational strategies to achieve environmental targets, efficient ground-level aircraft activities and air quality compliance.

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Zaira RENTERIA PALOMARES - *Mexico*

SweGreen (Stockholm, Sweden)

Corporate Sustainability Management Design.

SweGreen is an innovative and AgTech urban farming company with a focus on providing futuristic, smart, and circular solutions in a controlled growing system. Under its market brand Stadsbondens®, SweGreen produces and sells locally produced herbs and leafy greens all year round. By the usage of data management and circular solutions, it minimizes resources needed to grow vegetables profitably and sustainably, permitting retailers to grow food in their units. Food security for countries that depend on food imports, such as Sweden, is subjected to high risks when the global supply chains are affected by global crises and climate change. SweGreen addresses the need for climate transition and secure circular and resilient food supply chains. Smart Urban Farming ensures the availability and supply of fresh herbs and vegetables at the local level. Nowadays, quality standards are key to promote efficient business growth. From an environmental perspective, this thesis project, describes, analyzes, controls, and supports the company's methods and processes. By doing so, the resources are optimized efficiently, and natural resources are preserved. The ultimate goal is to ensure customers' satisfaction and business continuity under the umbrella of sustainability.

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Aakriti SAMAIYAR - *India*

ABB Power Grids (Baden, Switzerland)

An Impact Assessment of Electric Vehicle Charging on Grid Stability and Evaluation of Grid-Edge Solutions.

ABB's Power Grids division is a global leader in power technologies and serves to enable a stronger, smarter and greener grid. Its Grid Edge Solutions group leads energy innovation by providing services to meet the growing demand for electricity with minimum environmental impact. In response to the threat of climate change, there has been a worldwide campaign for green power generation and the electrification of transportation. So far, the adoption of electric-mobility fleets has been gradual and within the capacity of the existing power grid. While this transition is generally viewed positively, there are growing concerns as to how it may impact the electric grid. Entire fleets of vehicles need to be plugged in to charge, which may lead to an overload of existing power systems. If not properly managed, this could lead to blackouts or a decline in the quality of generated electricity. The purpose of this internship is to assess the impact of electric vehicle charging on grid operation limits and to evaluate an optimal mix of hardware and software solutions that can manage the system. This is done through supporting product management in portfolio development, customer business case development and strategic planning within Grid Edge Solutions.

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