

THE EUROPEAN ENERGY EFFICIENCY FUND

ADVANCING SUSTAINABLE ENERGY FOR EUROPE

IMPACT REPORT 2023

FOREWORD FROM GIORGIO CHIARION CASONI, CHAIRMAN OF THE BOARD OF DIRECTORS

Dear Reader,

Investment in clean energy capacity is growing fast. According to the IEA, global investments in clean energy in 2023 rose nearly 40% compared to 2020 and renewable capacity increase in 2023 was the largest ever, reaching more than 440 GW. At the same time, progress in energy efficiency, being the single most important policy to avoid energy demand in the net-zero scenario, encountered a set back and fell below the long-term upward trend to 1.3% compared to 2% in 2022. Despite some progress, a lot more needs to be done to reach European Union (EU) and global climate goals.

Since 2011, the European Energy Efficiency Fund (“eeef” or “the Fund”) has been supporting EU’s climate goals and promoting clean energy investments by leveraging private and public funds into energy efficiency, renewable energy and clean urban transport measures in the EU Member States. Increasing accessibility to capital and suitable financial instruments, combined with necessary technical assistance, is key for the success of improved energy efficiency in the Member States. And this is what eeef can provide.

During 2023, the Fund continued to expand the geographic coverage of its activities and started cooperating with two financial partner institutions in Latvia and Estonia by providing subordinated loan facilities for total amount of 25 million euros. Cooperation with partner institutions will not only increase access to capital for smaller scale energy efficiency and renewable energy projects, but also give those institutions the opportunity to tap into the Fund’s expertise in sustainable investing and to expand their sustainable loan portfolios beyond the limits of financial resources provided by the eeef.

Last year, the Fund also provided a corporate loan of around 16 million euros to an Italian energy services and efficiency upgrade compa-

ny. This loan was used to finance high efficiency cogeneration systems for district heating in the municipalities of Bardonecchia and Valtour-nenche, and efficiency measures in building retrofitting in the regions of Piedmont, Liguria and the Aosta Valley. Projects will immediately result in lower energy costs and CO₂ footprint after implementation of the investment programme.

The eeef is continuing to support public authorities in developing ambitious and innovative sustainable energy investment programmes through its Technical Assistance (TA) Facility. Since its inception, the eeef’s TA Facility has supported twelve public authorities from Spain, Italy, Lithuania, and Latvia to realise their

energy and infrastructure upgrade programmes. In October 2023, eeef and EIB’s ELENA Facility signed a new collaboration agreement of up to 1.9 million euros over three years, allowing eeef to expand the TA Facility and provide support to more public authorities.

During 2023, the Barcelona Metropolitan Area and the University of Oviedo joined the TA facility programme to receive technical support in preparing for street lighting and building efficiency upgrade projects, and in assessing the feasibility of expanding renewable energy capacity for district heating. Early in 2024, several more public authorities have reached out to eeef looking for TA support, including from Latvia, Lithuania, Romania and Spain, and active collaboration with the authorities will commence later this year.

We will continue to support projects and initiatives that make a positive difference to and the energy efficiency and renewable energy efforts of communities throughout EU. The eeef will build on the success of the projects already financed while seeking to expand its project pipeline in new regions.

Our diverse financing instruments and resources derived from combining public and private funding are vital for rolling out measures to reach EU climate goals and will continue to facilitate the energy transition in the EU.

Giorgio Chiarion Casoni
Chairman of the Board of Directors
Director, InvestEU and financial institutions
European Commission




TABLE OF CONTENTS

01

eeef in 2023

02

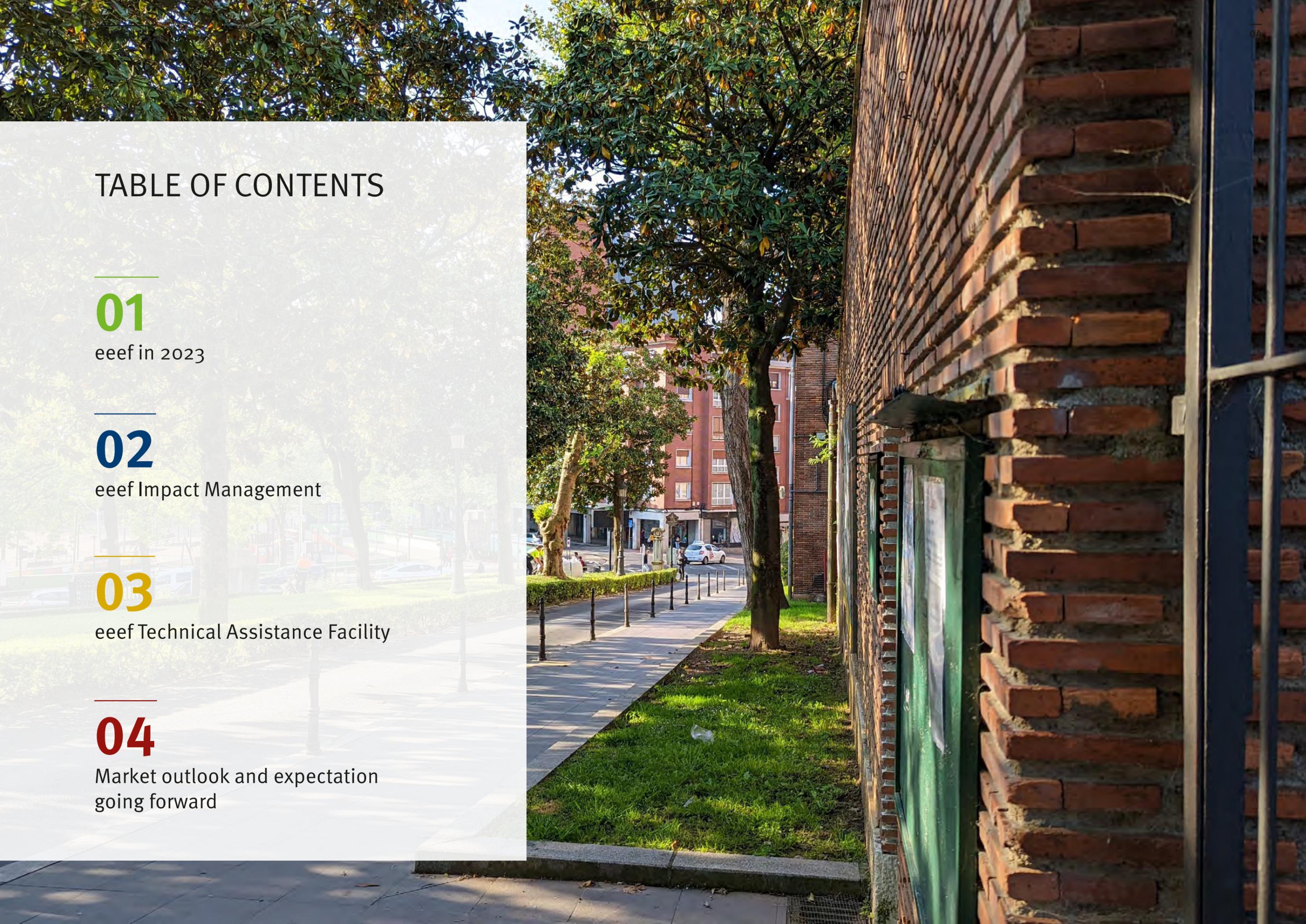
eeef Impact Management

03

eeef Technical Assistance Facility

04

Market outlook and expectation
going forward





235



million euros raised from investors

17

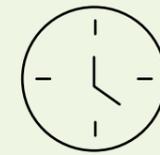


active investments in 9 Member States and the UK



tonnes of carbon dioxide equivalents, cumulative carbon savings from Fund inception to Q4 2023

740,460



megawatt hours cumulative primary energy savings from Fund inception to Q4 2023

1,318,029

167



million euros currently committed to projects

227



million euros committed to projects since inception

4



matured investments



investments are taxonomy aligned

15*

public authorities benefited from the eeef's investments since the Fund's inception

56

eeef TAF projects in 4 Member States

12

HIGHLIGHTS

2023

*Since two new investments – Signet Bank and Coop Pank – were signed in the fourth quarter of 2023 and no sub-loan disbursements were made by the end of 2023, there is no analysis on taxonomy alignment.

INVESTMENT ACTIVITY REPORT

VENLO, THE NETHERLANDS

€ 8.5 m senior debt facility to the city of Venlo for smart public lighting

CARDENDEN, SCOTLAND, THE UNITED KINGDOM

€ 2.2 m senior debt facility to the Ore Valley Housing Association via the SPV Cardenden Heat and Power

ORLÉANS, FRANCE

€ 5.1 m shareholder loan and equity investment for the city of Orléans' CHP plant

RENNES, FRANCE

€ 6.9 m shareholder loan and equity investment for the city of Rennes' CHP plant

MADRID, SPAIN

€ 2.5 m forfeiting facility to the Universidad Politécnica de Madrid via Enertika

SANTANDER, SPAIN

€ 9.2 m forfeiting facility to the city of Santander via Elecnor to upgrade existing street lighting

GIJÓN, SPAIN

€ 19.5 m forfeiting facility to Gijón via Acciona ESCO to renovate lighting points on public streets and buildings

ALENTEJO REGION, PORTUGAL

€ 12.1 m forfeiting facility to CIMAC via I Quatro to upgrade existing street lighting

VILA DO CONDE, PORTUGAL

€ 5.1 m forfeiting facility to Vila do Conde via the Consortium ISETE/AMENER/I-TRES to upgrade existing street lighting

BERLIN, GERMANY

€ 0.9 m forfeiting facility to the Jewish Museum Berlin Foundation via the ESCO of Johnson Controls

ESTONIA

€ 15 m subordinated loan to Coop Pank to finance energy efficiency, renewable energy, and clean urban transport projects in Estonia

LATVIA

€ 10 m subordinated loan to Signet Bank to finance energy efficiency, renewable energy, and clean urban transport projects in Latvia

KLAIPĖDA, LITHUANIA

€ 4.9 m shareholder loan and equity investment in the JV "Dancer Mobility" with Lithuanian electric bus manufacturer UAB "Vejo projektai"

VILNIUS, LITHUANIA

€ 10 m equity investment in the investment platform TIPS with the Public Investment Development Agency Invega

BARDONECCHIA, PIEDMONT, VALTOURNENCHE, AOSTA VALLEY, ITALY

€ 15.7 m senior debt investment to Energetica S.p.A. to implement energy efficiency upgrades in northern Italy

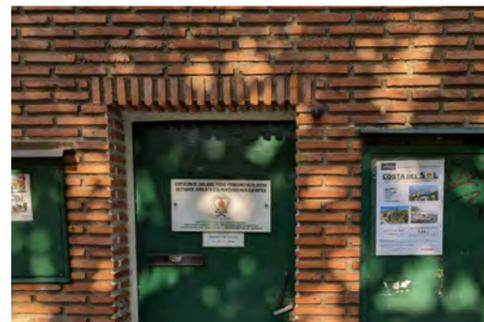
BOLOGNA, ITALY

€ 30.2 m senior debt and VAT facility to Progetto ISOM for the upgrade of the University Hospital Sant'Orsola-Malpighi

ROZZANO, NOGARA AND CONCORDIA SAGITTARIA, ITALY

€ 8.7 m shareholder loan and equity investment in the JV Illuminated Cities with Siram by Veolia for a portfolio of investments

Investments to Banca Transilvania and the University of Applied Sciences have been fully repaid by the end of 2023.



GERMANY

JEWISH MUSEUM BERLIN

The Jewish Museum Berlin and the energy service company (ESCO) Johnson Controls entered into an energy performance contract (EPC) for the museum to provide optimisation of the heating, ventilation and

air conditioning and an efficient energy management system. The eef's investment totalled EUR 0.9 m in the form of a forgoing facility. The annual primary energy savings for 2023 equated to 11,779 MWh.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

FORFAITING FACILITY

TERM:

13 YEARS

TOTAL PROJECT SIZE (€M):

1.4

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:

2,667

ITALY

ENERGETICA

The eef signed a corporate loan agreement of EUR 15.7 m with Energetica S.p.A. (Energetica) with maturity until December 2030. The loan will be used by Energetica to finance energy efficiency works in building retrofitting and upgrading activities for cogeneration district heating projects. The district heating projects are located in the Municipalities of Bardonecchia and Valtourneche, whereas the retrofitted buildings are in Piedmont, Liguria and Aosta Valley. Energetica plans to implement three projects by mid-2025, during which it will fully utilize the loan amount. The projects will deliver on an average 45.59 % savings in primary energy and on an average 44.62 % savings in CO₂e emission annually compared to the current baseline.

KEY FIGURES

TYPE OF INVESTMENT:

CORPORATE LOAN

TERM:

7 YEARS

TOTAL PROJECT SIZE (€M):

19.2

ESTIMATED TCO₂E EMISSION SAVINGS IN A YEAR:

5,366

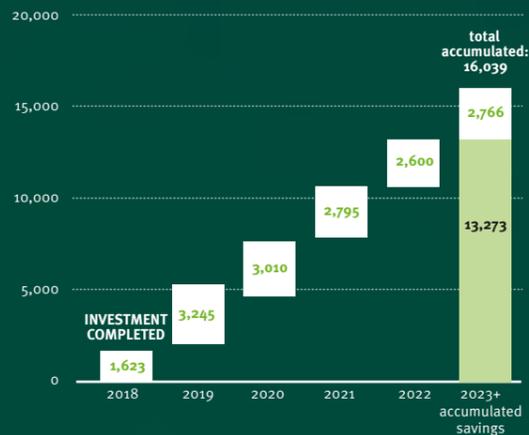
ITALY

ILLUMINATED CITIES

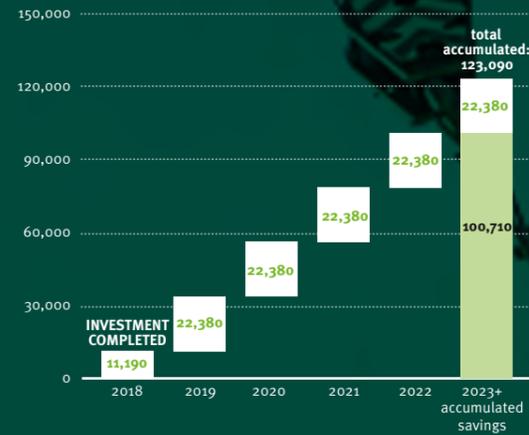
The Città Illuminate S.r.l. (Illuminated Cities) is a Joint Venture (JV) between the eef and Siram by Veolia, targeting a portfolio of street lighting projects in Italy, mainly benefitting small to medium-sized municipalities. The JV realised three projects in the Municipalities of Rozzano, Nogara and Concordia Sagittaria, in the provinces of Milano, Verona Venice, respectively. These projects aim to enhance public infrastructure whilst reducing public energy consumption. The eef's investment totalled EUR 8.7 m via equity and shareholder loan.



Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

EQUITY AND SHAREHOLDER LOAN

TERM:

12 YEARS

TOTAL PROJECT SIZE (€M):

10

ESTIMATED TCO₂E EMISSION SAVINGS IN 2023:

2,766

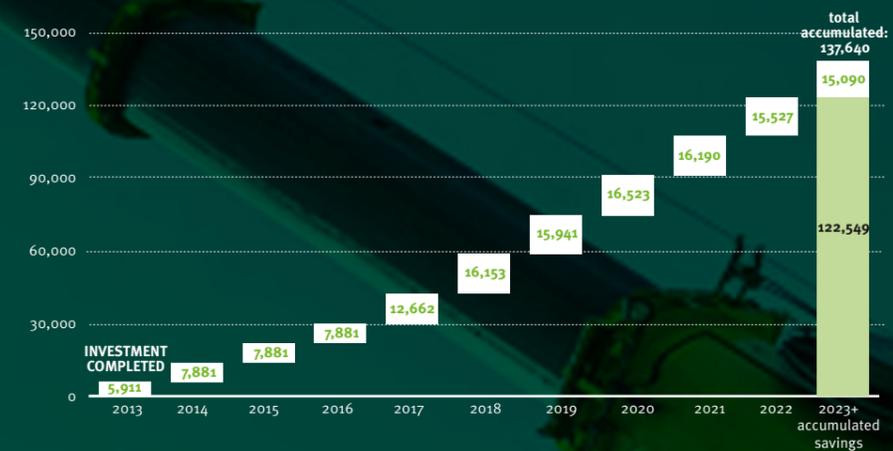
ITALY

UNIVERSITY HOSPITAL SANT'ORSOLA-MALPIGHI

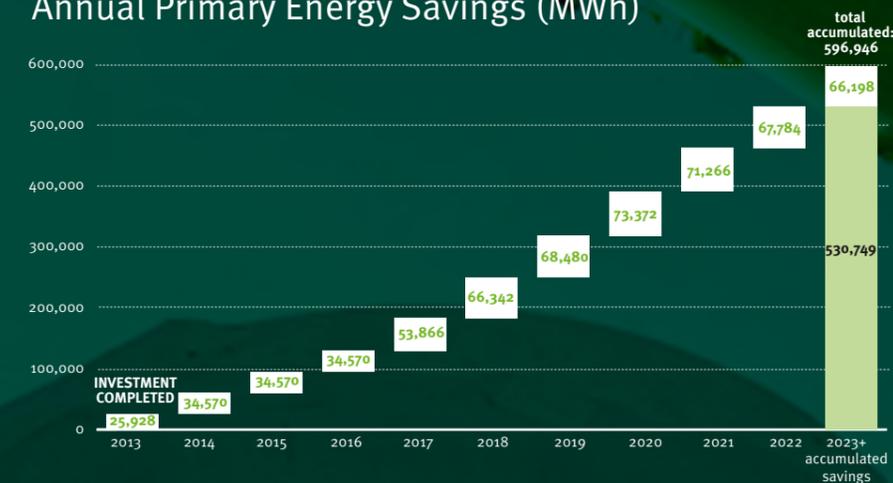
The project entity, Progetto ISOM (SPV), signed a concession agreement with the University Hospital. eef provided a project and VAT bond facility of EUR 30.2 m. The initiatives aim to improve the energy efficiency of the entire fluid production, distribution system and reduce energy consumption of the hospital facility through the adoption of

energy-efficient equipment such as centrifugal chillers and absorbers, the reconstruction of the heat distribution networks, the renovation of heat exchange substations and the inclusion of an underground tri-generation plant for the combined production of cooling, heat and power.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

SENIOR DEBT AND VAT FACILITY

TERM:

20 YEARS

TOTAL PROJECT SIZE (€M):

41

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:

15,090

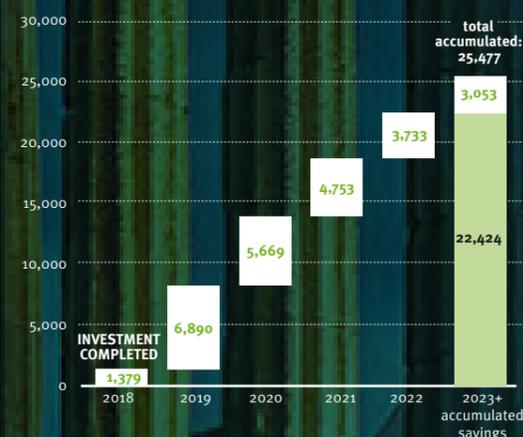
PORTUGAL

CIMAC

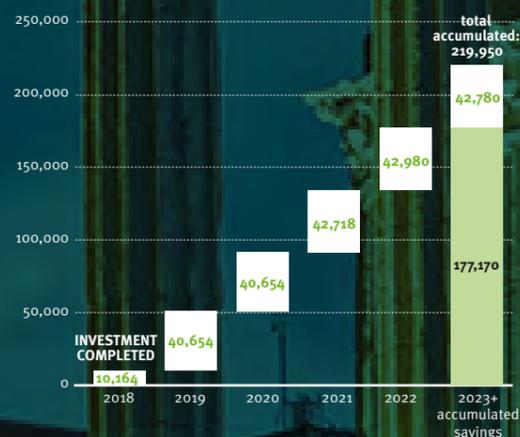
The eef signed the 12-year forfating facility of EUR 12.1 m with I-Quatro LDA (ESCO) to implement the aggregated street lighting infrastructure transaction, with the mission to upgrade over 56,000 luminaires within 14 municipalities, including the UNESCO World Heritage site of Évora, represented by Comunidade Intermunicipal do Alentejo Central (CIMAC).



Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



PORTUGAL

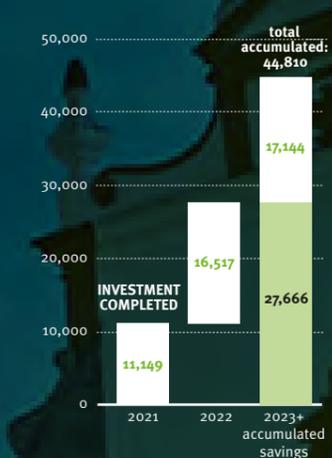
VILA DO CONDE

eef signed the 12-year forfating facility of EUR 5.1 million with the consortium ISETE/AMENER/I-TRES (ESCO) to finance renovation of the street lighting infrastructure in the municipality of Vila do Conde in Portugal. The project completed the replacement of 18,547 sodium vapour lamps with energy-efficient LED luminaires throughout Vila do Conde.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

FORFAITING FACILITY

TERM:

12 YEARS

TOTAL PROJECT SIZE (€M):

16.6

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:

3,053

KEY FIGURES

TYPE OF INVESTMENT:

FORFAITING FACILITY

TERM:

12 YEARS

TOTAL PROJECT SIZE (€M):

7.7

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:

1,223

SPAIN

UNIVERSIDAD POLITÉCNICA DE MADRID

eeef provided financing of EUR 2.5 million for the replacement of existing oil boilers supplying hot water and heating to the Universidad Politécnica of Madrid (“UPM”). The project aimed to improve the heat and water supply systems across the campus and

to reduce CO₂e emissions by switching to a cleaner fuel source. It replaced 63 gas oil boilers, consuming on average of 946,479 litres of gas oil per year, with 66 natural gas boilers in all 32 campus buildings.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

FORFAITING FACILITY

TERM:

9 YEARS

TOTAL PROJECT SIZE (€M):

2.5

ESTIMATED TCO₂E EMISSION SAVINGS IN 2023:

1,042

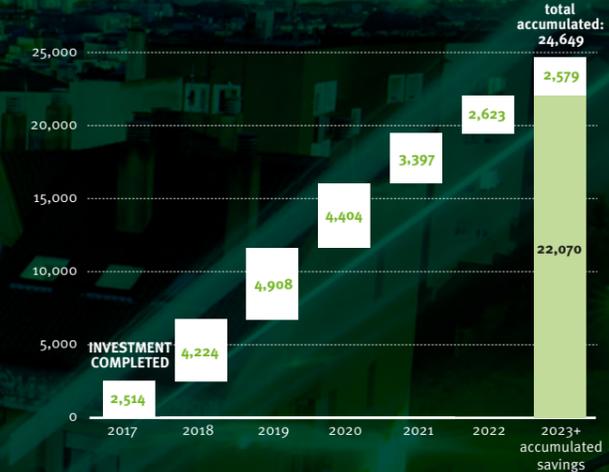
SPAIN

MUNICIPALITY OF SANTANDER

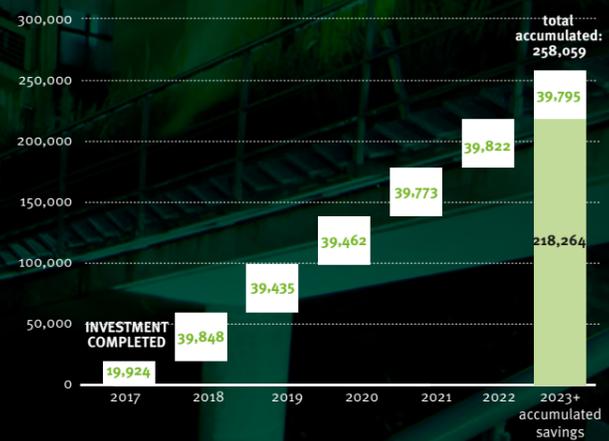
The project involved an upgrade of the existing street lighting luminaires from predominantly high-pressure sodium vapour lamps to the last generation PHILIPS LEDs. 22,300 units of lighting points were replaced. A system of UVEX wireless sensors

connects the whole infrastructure point by point with the city’s digital communication network and the remote CEMILUX control system. The eeef provided a forfaiting facility with EUR 9.2 million to finance the project.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

FORFAITING FACILITY

TERM:

14 YEARS

TOTAL PROJECT SIZE (€M):

9.2

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:

2,579

ENERGY EFFICIENCY

SPAIN

GIJÓN

eeef and Acciona ESCO S.L. signed a forfailing facility of EUR 19.5 million with a term of 11 years to finance the renovation of lighting points on public streets and buildings in the Municipality of Gijón, Spain, in alignment with a prepared investment programme within the eeef Technical Assistance Facility. The project involves the replacement of 42,000 luminaires on streetlights and in public buildings.

As per conservative estimates, the project is expected to deliver at least 48.02% in primary energy and CO₂ savings annually compared to the current baseline, representing 37,005 MWh and 2,446 tCO₂e, respectively.

By the end of 2023, the construction work has been completed and full disbursement was made to the project.



Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:
FORFAITING FACILITY

TERM:
11 YEARS

TOTAL PROJECT SIZE (€M):
23.6

ESTIMATED TCO₂E EMISSION SAVINGS IN 2023:
2,201

THE NETHERLANDS

CITY OF VENLO

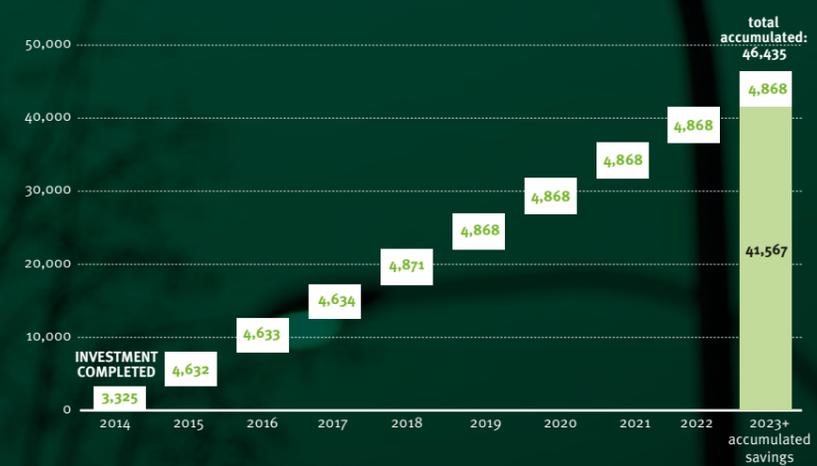
The city of Venlo and the eeef signed a long-term financing contract for EUR 8.5 m. The project upgraded the city's street lighting to reduce energy consumption and CO₂e emissions, as well as saving the public

budget, as the city's existing public lighting was the largest energy consumer in its electricity bill. In total, 1,674 lighting poles were replaced and 17,270 luminaires were exchanged with LED technology.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:
SENIOR DEBT

TERM:
15 YEARS

TOTAL PROJECT SIZE (€M):
8.6

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:
654

FRANCE

CITY OF ORLÉANS

Dalkia France and eef invested in the Orléans Biomasse Énergie, the project's special purpose vehicle (SPV), which operates a combined heat and power (CHP) plant with an installed capacity of 7.5 MW in electricity and 17 MW in thermal heat. The

plant supplies heat to one of the districts in the City of Orléans and sells electricity to Électricité de France (EDF). The project enables a decentralised energy supply using an existing district heating network. The Fund invested EUR 5.1 million in the SPV.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

EQUITY AND SHAREHOLDER LOAN

TERM:

19 YEARS

TOTAL PROJECT SIZE (€M):

36.0

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:

14,813

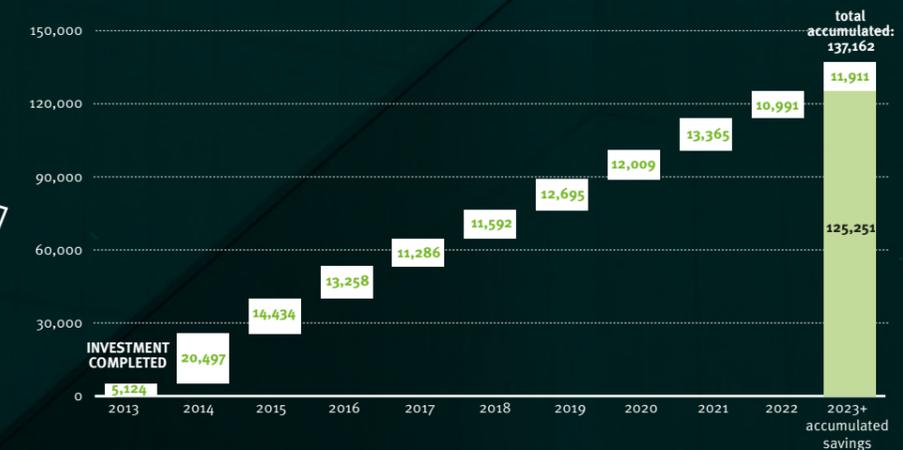
FRANCE

CITY OF RENNES

Dalkia France and eef invested in the Rennes Biomasse Énergie, the project's SPV, which operates a CHP facility with an electrical output of 10.4 MW and a thermal output of 22 MW over 20 years. The project

enables a decentralised energy supply for the City of Rennes using an existing district network. The Fund invested EUR 6.9 million in the SPV.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

EQUITY AND SHAREHOLDER LOAN

TERM:

20 YEARS

TOTAL PROJECT SIZE (€M):

47.6

ACTUAL TCO₂E EMISSION SAVINGS IN 2023:

11,911

LITHUANIA

DANCER MOBILITY

eeef and UAB “Vejo Projektai”, a Lithuanian manufacturer of electric buses, established a Joint Venture “Dancer Mobility” to provide all-inclusive operational lease services of electric buses manufactured in Lithuania to public authorities. Dancer Mobility will finance the purchase of e-buses and their

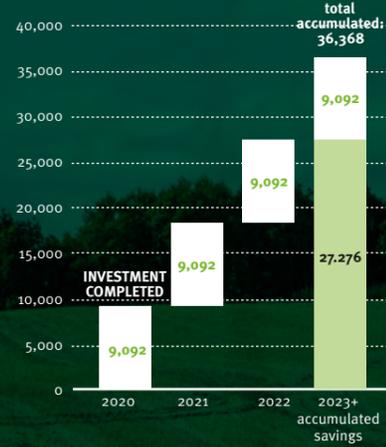
operation in the framework of all-inclusive operational leases provided by the company to public authorities and covering the bus usage, charging infrastructure, green energy supply and full maintenance. The eeef investment totalled EUR 4.9 million.



Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



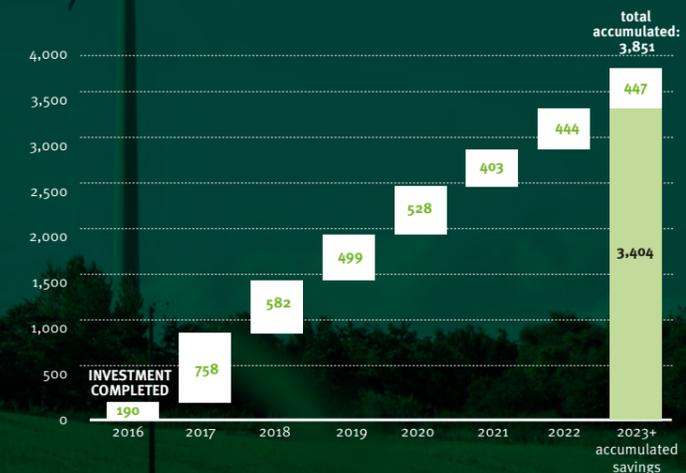
UNITED KINGDOM

ORE VALLEY HOUSING ASSOCIATION

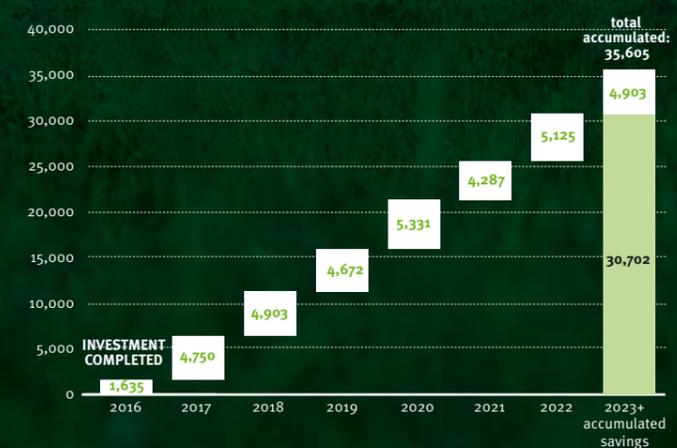
The eeef provided a loan of EUR 2.2 million to Cardenden Heat and Power (CHAP), a subsidiary of the Ore Valley Housing Association (OVHA), for the development of a project scope for an onshore wind turbine and the replacement of over 170 outdated gas

boilers in residential buildings owned by the housing association in the Fife council area in Scotland. The boilers were leased to OVHA, and the wind plant benefits from the national Feed in Tariff.

Annual Carbon Emission Savings (tCO₂e)



Annual Primary Energy Savings (MWh)



KEY FIGURES

TYPE OF INVESTMENT:

EQUITY AND SHAREHOLDER LOAN

TERM:

UP TO 10 YEARS

TOTAL PROJECT SIZE (€M):

6.2

ESTIMATED T CO₂E EMISSION SAVINGS IN 2023:

1,344

KEY FIGURES

TYPE OF INVESTMENT:

SENIOR DEBT

TERM:

16 YEARS

TOTAL PROJECT SIZE (€M):

4.3

ACTUAL T CO₂E EMISSION SAVINGS IN 2023:

447

CLEAN URBAN TRANSPORT

ENERGY EFFICIENCY/RENEWABLE ENERGY

ROMANIA

BANCA TRANSILVANIA

Banca Transilvania (BT), one of the leading banks in Romania, has received green lending of EUR 25 million from eef to support energy efficiency and renewable energy investments in Romania. BT is using eef funding to give financial support to public and private building owners, home-owner/condominium associations, municipalities, public sector entities and private sector companies acting on behalf of the public sector.

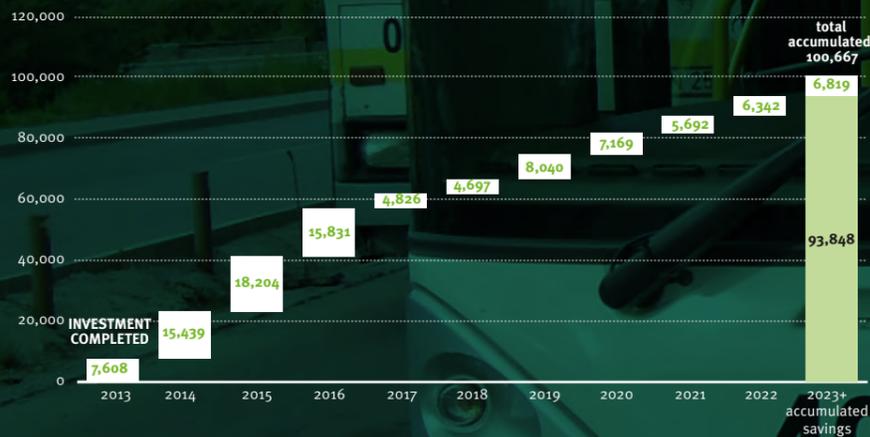
At the end of 2023, BT had financed and enabled 94 projects with cumulative savings of 438,391 MWh in primary energy. The loan has been fully repaid by the end of 2023.



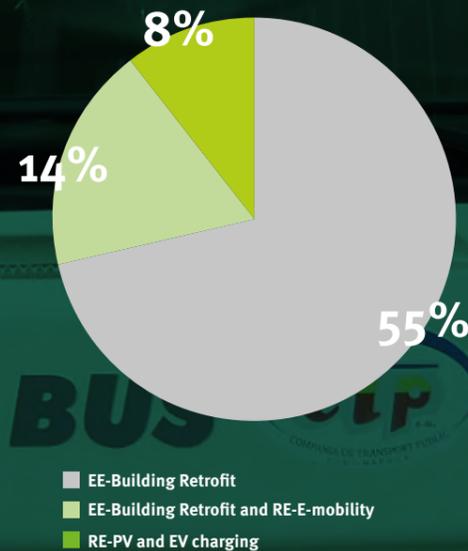
Annual Primary Energy Savings (MWh)



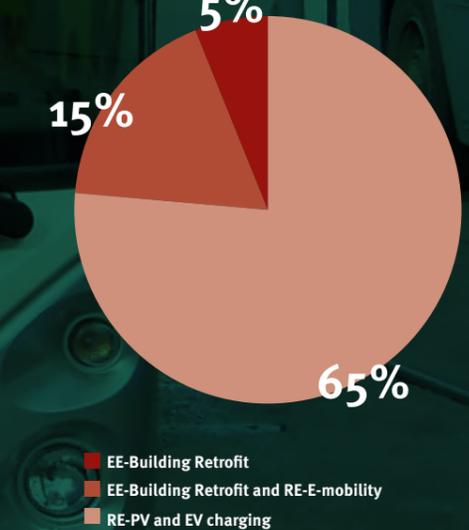
Annual Carbon Emission Savings (tCO₂e)



2023 Primary Savings Contribution from Invested Sub-project Type



2023 CO₂e Savings Contribution from Invested Sub-project Type



KEY FIGURES

TYPE OF INVESTMENT:
SUBORDINATED DEBT

TERM:
10 YEARS

TOTAL PROJECT SIZE (€M):
25.0

ESTIMATED T CO₂E EMISSION SAVINGS IN 2023:
6,819

PORTFOLIO FACTS

ACTIVE SUBLOAN PROJECTS BY THE END OF 2023:
87

TONS OF CUMULATIVE CO₂E SAVINGS FOR ALL FUNDED PROJECTS:
100,667

TECHNOLOGIES FUNDED IN THE 87 ACTIVE SUBLOAN PROJECTS:
3

MEGAWATT HOURS OF CUMULATIVE PRIMARY ENERGY SAVINGS FOR ALL FUNDED PROJECTS:
438,391



LATVIA

SIGNET BANK

The eef signed a subordinated loan facility of EUR 10 m with Signet Bank with the aim of financing energy efficiency and smaller-scale renewable energy projects in Latvia, primarily through the provision of financing to public sector entities and private sector companies acting on behalf of the public

sector. The facility will be disbursed in 2 steps: the first EUR 5 m was invested upon signing and the remaining EUR 5 m in the course of 2024 subject to utilisation of the 1st disbursement. The duration of both tranches is 10 years, with maturity in 2033 and 2034 respectively.



KEY FIGURES

TYPE OF INVESTMENT:

SUBORDINATED DEBT

TOTAL PROJECT SIZE (€M):

10.0

TERM:

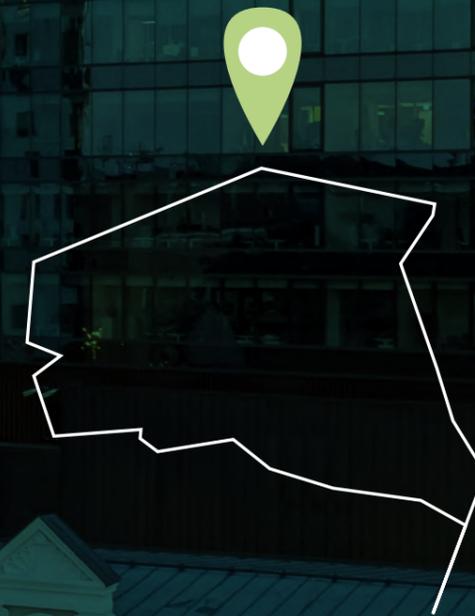
10 YEARS

ESTONIA

COOP PANK

The eef signed a subordinated loan of EUR 15 m with Coop Pank AS, Estonia with the aim of financing energy efficiency and smaller-scale renewable energy projects in Estonia, primarily through the provision of financing to public sector entities and private sector companies acting on behalf of the public sector.

The facility was disbursed in a single payment by 29 February 2024. Duration of the facility is 10 years with maturity in 2034. Before expiration of the first 5 years of the facility, parties may agree to extend the duration of the facility by another 5 years (up to 15 years in total).



KEY FIGURES

TYPE OF INVESTMENT:

SUBORDINATED DEBT

TOTAL PROJECT SIZE (€M):

15.0

TERM:

10 YEARS



PROJECT ASSESSMENT AND MONITORING

Eligible projects

The eeef can invest in a range of energy efficiency, clean urban transport and small-scale renewable energy technologies, providing the carbon or primary energy savings investment criteria are met. Each project must achieve at least 30% primary energy and/or carbon savings compared to baseline. The Fund may only invest when savings and other investment criteria are fulfilled.

Project Assessment and Monitoring

As the eeef can finance a variety of technologies, the initial technical assessment and ongoing monitoring of investments must strike the correct balance between accuracy and practicality of implementation.

How the eeef evaluates technical eligibility is based on the project's technology and loan size; for example, small standard (e.g. street lighting) project savings can be calculated using validated calculations from the Investment Manager's carbon environment impact management (CEIM) tool, greenstem™ (greenstem). For projects with higher investment volumes and/or more complex technologies, detailed energy analyses are required in the form of third-party validated reports.

As part of the Fund's due diligence process and for the duration of the loan, the eeef evaluates and monitors the project's savings performance in alignment with the International Performance Monitoring and Verification Protocol (IPMVP), which requires every project to establish a baseline energy consumption and then conduct a post-project implementation assessment.

The Investment Manager's CEIM team reviews the technical details of all eeef investments and works with project managers to enter relevant data points into greenstem. The Fund provides guidance to project partners on how to conduct project analysis via third-party-validated annual audit templates. This ensures the entire portfolio reports using a consistent methodology.

greenstem™

All of the eeef portfolios-reported impact indicators are tracked in greenstem™, a proprietary web-based tool from the Investment Manager that automatically and consistently calculates anticipated and realised energy, primary energy, and carbon savings. As of the end of 2023, greenstem™ is in the process of migrating its platform to provide a more resilient, secure and functional solution. To ensure data compatibility and avoid data loss, the eeef aims to include the impact metrics for the years under review in the new platform until the platform transfer is safely completed. For small loans and standard technologies, greenstem™ completes calculations based on project-specific data inputs and project location/technology conversion factors. The tool stores up-to-date energy and emission conversion factors to ensure a consistent reporting approach across the portfolio. Factor sources include the Chartered Institution of Building Services Engineers for technology benchmark data and the Intergovernmental Panel on Climate Change for the conversion of energy data into greenhouse gas emissions. Electricity emission factors are sourced from the International Energy Agency and are updated annually in line with ISO 14064-2, the carbon accounting standard followed. All calculations and data sources used within the tool have been validated by a third-party engineering company.

greenstem™ should provide comprehensive, timely and accurate reporting charts and dashboards that have been configured specifically for eeef user groups. The tool is flexible and can be customised to include additional technologies in the portfolio.

SOCIAL AND ENVIRONMENTAL MANAGEMENT SYSTEM (SEMS)

The eeef aims to conduct its operations in line with the highest expectations regarding social and environmental responsibility. The eeef's social and environmental management system (SEMS) defines the respective roles and responsibilities of the Fund and its partner institutions in promoting social and environmental sustainability. eeef's SEMS also outlines the performance requirements and procedures, and assesses and manages the Social and Environmental adverse risks in relation to eeef investments.

In general, these shall be in accordance with the European Investment Bank ("EIB") Statement on Environmental and Social Principles and Standards, EU Directives on Environmental Impact Assessment ("EIA"), and IFC Performance Standards¹. Regarding impact management strategy, eeef is aligned to Operating Principles for Impact Management. For both types of investments – direct and financial institution investments – the eeef SEMS has specific performance requirements and procedures that are applied.

Compliance with these is assessed during the due diligence process and monitored later on throughout the lifetime of the project.

The SEMS also serves as a mechanism to ensure the investment does no significant harm (DNSH) to any environment and social objective and follows good governance practices. Adherence to the DNSH is derived by matching the IFC Performance Standards with the targets defined in Art. 17 of Regulation (EU) 2020/852. eeef considers the principal adverse impacts (PAIs) of its investment decisions on sustainability factors defined by the Sustainable Finance Disclosure Regulation (SFDR)². For a detailed description of eeef's SEMS policy, please refer to our webpage: <https://www.eeef.lu/social-environmental-standards.html>

The environmental and social (E&S) screening checks areas such as the following, as well as other E&S issues and reputational risk:

1. GENERAL ENVIRONMENTAL AND SOCIAL ISSUES:

EU policy, legal context and compliance, environmental impact assessment process, E&S principles and standards

2. ENVIRONMENT, BIODIVERSITY AND CLIMATE CHANGE:

Environmental/transboundary impacts, protected areas, critical habitats, biodiversity, forestry, cultural heritage, vulnerability to climate change, climate change mitigation, resource efficiency and pollution prevention

3. SOCIAL:

Social assessment, involuntary resettlement, vulnerable groups, indigenous people, labour standards, etc.



¹ IFC Performance Standards: https://www.ifc.org/wps/wcm/connect/co2c2e86-e6cd-4b55-95-a2-b3395d204279/IFC_Performance_Standards.pdf?MOD=AJPERES&CVID=ktJHbZk

² Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector

Going forward for the new investments closed in 2023 onwards, analysis of the new projects in the due diligence phases will allow the Fund to assess actual and potential areas of impact with more precision, as well as provide comparability across various investments and reporting periods. As a visualisation tool to depict the five impact dimensions, the “impact spider” will be reverted to. Following is an example of such an “impact spider” for a sample direct investment project under construction.



PRIMARY ENERGY AND GREENHOUSE GAS EMISSIONS SAVINGS 2023

The eef’s projects aim to achieve at least 30 % primary energy savings on an annual basis (higher for the building sector) and a 30 % reduction in CO₂ equivalents for transport and renewable energy projects. The quality of the methodology used to calculate the expected savings of projects is crucial. This allows the eef to ensure its projects satisfy international standards regarding CO₂e and primary energy savings reporting. Due to the wide variety of technologies included in the eef’s portfolio, the Investment Manager has developed a standardised approach to calculating the project energy, primary energy and carbon savings for the eef’s most common project technologies.

Carbon emission savings and primary energy savings were reported for the entire portfolio of investments/signed commitments for a range of energy efficiency and renewable technologies, including including CHP biomass, small-scale wind and electric vehicles. Once a project has been in operation for a full year, the eef receives annual audits stating its actual energy consumption.

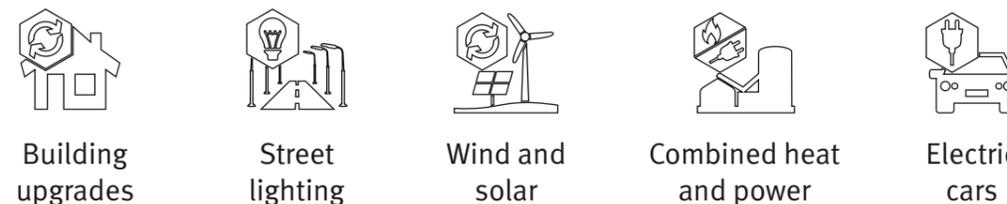
Year-on-year consumption variances are expected due to a number of factors, such as weather advances in static data, and therefore project savings can change annually. As shown below, these projects achieved total accumulated savings of 687,682 t CO₂e and 1,246,378 MWh of primary energy savings through the end of 2023.

All project savings are calculated following the International Performance Measurement and Verification Protocol (IPMVP) for energy accounting and ISO 14064 for carbon accounting. All methodologies used by the eef are vali-

dated by a global engineering company. Currently, all projects with concrete data are reporting in alignment with these guidelines, and all new projects are aligned with these frameworks. Project savings represent the savings amount contributed from total project investment size, i.e. from eef investment stake and remaining investor(s) stake into the respective project. The eef uses up-to-date and project-specific conversion factors from sources including the International Energy Agency and the Greenhouse Gas Protocol. Therefore, there is a reduction in annual carbon emission savings in some projects (i.e. Santander, Venlo) due to the annual project-specific conversion factors used by the eef. For some projects within the portfolio, factors cannot be updated due to project specifics, so they continue to report on factors issued within the loan documentation. All cumulative numbers are based on investments loan maturity. EE means energy efficiency, CUT means clean urban transport, RE means renewable energy. The entire project portfolio covers EE,

KEY TECHNOLOGIES

CURRENTLY UNDER CONSTRUCTION/FINALIZED IN THE PORTFOLIO:



Project Name	Reporting as of Q4 2023			
	Cumulative Primary Energy Savings (MWh)	Primary Energy Savings (%)	Cumulative CO ₂ e Savings (t CO ₂ e)	Carbon Savings (%)
Banca Transilvania	438.391	50	100.667	50
CIMAC	219.950	77	25.477	77
City of Orléans	-356.671	-37	179.840	62
City of Rennes	-457.799	-20	137.162	50
City of Venlo	46.435	60	8.285	60
Dancer Mobility	36.368	92	5.376	100
Gijón	42.556	48	2.813	48
Illuminated Cities	123.090	56	16.039	56
Jewish Museum Berlin	119.719	72	27.112	75
Municipality of Santander	258.059	80	24.658	80
Ore Valley Housing Association	35.605	99	3.851	96
Universidad Politécnica de Madrid	15.068	15	8.297	36
University Hospital S. Orsola Malpighi	596.946	30	137.640	32
Vila do Conde	44.810	69	4.547	69
TIPs platform	83.851	100	5.919	100
Total (all projects)	1.246.378	53	687.682	66
Total (EE & CUT only)	2.060.848	65	-	-

CUT and RE projects. The cumulative Banca Transilvania savings represent 87 subprojects. The cumulative TIPs platform savings entail approved 10 subprojects. The respective portfolio’s percentage savings are calculated based on all active (completed) subproject savings. Projects contribute to cumulative savings until the sub-loan has matured from the portfolio – i. e. at loan maturity.

For carbon savings, cumulative and percentage savings are based on the entire portfolio, percentage savings use the average. For primary energy, cumulative and percentages saving are presented for projects from the portfolio which provide primary energy savings, ie. Energy efficiency and clean urban transport projects. For the sake of completeness, the cumulative and percentage primary energy savings are also provided for all projects. Cumulative data include calculations from financial close to loan maturity. Savings are for total project investment volume (ie. eef and non-eef investments). Savings are based on

estimations for projects under construction and with less than one year of operations and actual data for projects, which have been in operation for over one year. For example, as of end of 2023, Illuminated Cities projects are still within one year operation after the approved project completion; project Gijón was under construction almost until the end of 2023. Therefore, we also use estimation here. As for Universidad Politécnica de Madrid savings are based on preliminary data, which are subject to changes once the finalized readings are available.

The savings of two new investments with Signet Bank and Coop Pank, signed in 2023, are not yet included in the above table. Since there has been no disbursement to sub-loans by the end of 2023. The savings of newly signed Energetica project is not included, as the project construction did not start as of the end of 2023.

EU TAXONOMY ALIGNMENT ASSESSMENT

The European Union Regulation 2020/852 – better known as “EU Taxonomy for sustainable activities” (“Taxonomy”) – is a regulation in the context of environmentally sustainable investments and an important tool for market transparency. The instrument enables investors to classify economic activities more easily and to decide whether economic activities are environmentally sustainable and, thus, worth investing in from an environmental perspective. As an ex-post study, the Taxonomy has the potential to determine to what extent the active eeef-investments to date have been channeled into sustainable activities, and ultimately to guide eeef to continue and enhance its previous impact creation.

For this reason, eeef has engaged an external consultant with experience in evaluating sustainable activities – Arcadis Italia S.r.l. (“Arcadis”). Arcadis supports its clients for the entire life cycle of natural and built assets, specialising in urban regeneration, land reclamation design, water treatment, and sustainable buildings and industrial settlements design. Building on its extensive market experience since 2008, the firm was commissioned by eeef to conduct an independent Taxonomy alignment assessment for its portfolio of current investments. More specifically, eeef wanted to know which activities within its portfolio contribute substantially to climate change mitigation and, at the same time,

to determine whether that economic activity causes no significant harm to any of the other environmental objectives as defined within the Taxonomy. In addition, the analysis should categorise the activities into transitional and enabling activities as well as identify mitigation measures about potential risks regarding climate change, pollution, biodiversity, among others, to reach the activities’ impact targets by utilising a more sustainable and climate friendly way of operating.

All the 15 active investments in the eeef portfolio are taxonomy aligned as of 31 December 2023.

The projects of the partner institutions TIPs platform (4 taxonomy activities) and Ore Valley Housing Association (2 taxonomy activities) were individually analysed on sub-project level before being grouped into the respective taxonomy activity. For VIPA, the active sub-loan projects were respectively examined as of the end of December 2023.

Generally, the Taxonomy alignment analysis is based on a tool known as “EU Taxonomy Compass”, which aims to make the Taxonomy contents easier to access through a visual representation of sectors, activities and criteria included in the Taxonomy. Following this tool and on the basis of the documentation provided by eeef, Arcadis has conducted each project examination in five steps:

1.

IDENTIFICATION OF ELIGIBILITY BY ACTIVITY

NACE (Statistical Classification of Economic Activities in the European Community) codes describing the economic activities related to the project have been identified. Furthermore, the correct alignment path for indications provided by the EU Taxonomy Compass, with identification of the sector and the economic activity, has been defined.

The activities can be categorised into three different types:

› Activities that in and of themselves contribute substantially to one of the six environmental objectives as described in step 2.

› Transition activities: Activities for which there are no technologically and economically feasible low-carbon alternatives but that support the transition to a climate-neutral economy.

› Enabling activities: Activities that enable other activities to make a substantial contribution to one or more of the environmental objectives.

2.

THRESHOLD CRITERIA FOR SUBSTANTIAL CONTRIBUTION

The alignment with the requirements of the Substantial Contribution Criteria, which are specific for each economic activity as defined by the EU Taxonomy Compass, has been confirmed. The contribution is categorised into six environmental objectives: (i) climate change mitiga-

tion, (ii) climate change adaptation, (iii) sustainable use and protection of water and marine resources, (iv) transition to a circular economy, (v) pollution prevention and control, (vi) protection and restoration of biodiversity and ecosystems.

3.

“DO NO SIGNIFICANT HARM” DUE DILIGENCE

The alignment with the requirements of all DNSH criteria, which are specific for each economic activity as defined by the EU Taxonomy Compass has been confirmed. This analysis

should confirm that the assets’ targets and way of operating do not cause any significant harm to the other environmental objectives defined by the Taxonomy.

4.

MINIMUM SOCIAL SAFEGUARD

The alignment with the requirements of the Minimum Social Safeguards has been confirmed.

5.

CALCULATION OF PERCENTAGE ALIGNED

The proportion of turnover aligned with the Taxonomy has been calculated.

Results:

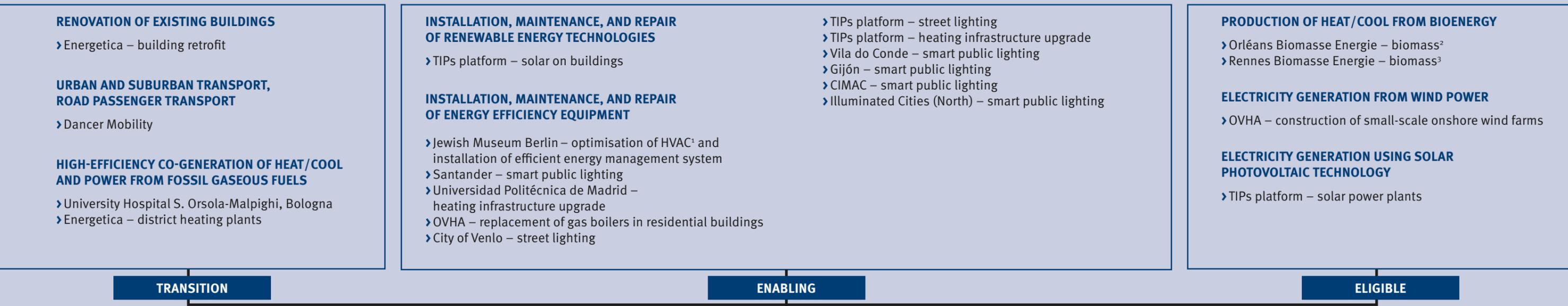
The analysis concluded that out of the 15 investments analysed, all projects are fully aligned with the Taxonomy. More concretely, all analysed projects contribute to the 1st EU environmental objective (climate change mitigation) through an eligible activity while causing no significant harm to any of the other five EU environmental objectives. Most project activities can be classified as either enabling

or transitional. Moreover, the projects comply with minimum social safeguards laid down in the Taxonomy and fulfil the Technical Screening Criteria. According to the Taxonomy alignment assessment carried out by Arcadis, the current eeef investment portfolio can be certified as being environmentally sustainable in terms of the Taxonomy.

EVALUATION WORKFLOW AND RESULTS

15 EEEF-INVESTMENTS GROUPED INTO 8 TAXONOMY ACTIVITIES

1. IDENTIFICATION OF ELIGIBILITY



2. THRESHOLD CRITERIA FOR SUBSTANTIAL CONTRIBUTION



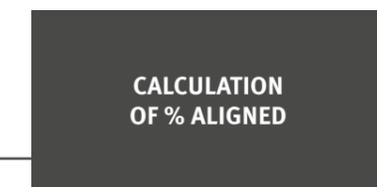
3. “DO NO SIGNIFICANT HARM” DUE DILIGENCE



4. MINIMUM SOCIAL SAFEGUARD



5.



100% AS ALL 15 INVESTMENTS ARE TAXONOMY ALIGNED⁴

¹ Heating, Ventilation and Air Conditioning

² The use of biomass is subject to the requirements of Article 29 of Directive (EU) 2018/2001 and the greenhouse gas emission savings from the use of biomass in co-generation installations are at least 80% in relation to the GHG emission saving methodology and fossil fuel comparator set out in Annex VI to Directive (EU) 2018/2001. There is not a clear declaration for the compliance of the biomass to Article 29 of Directive (EU) 2018/2001, but from the positive opinion released by the “PREFECTURE DE LA REGION CENTRE ET DU LOIRET” of 06/07/2009 and the DALKIA Biomass Supply plan summary Arcadis has found data which confirm compliance with Article 29 of Directive (EU) 2018/2001.

³ The use of biomass is subject to the requirements of Article 29 of Directive (EU) 2018/2001 and the greenhouse gas emission savings from the use of biomass are at least 80% in relation to the GHG emission saving methodology and fossil fuel comparator set out in Annex VI to Directive (EU) 2018/2001. But these requirements are not applied to heat generation installations with a total rated thermal input below 2 MW.

⁴ Signet Bank and Coop Bank are not included under this workflow, since no investments have been made into sub-loans by the end of 2023.

EU TAXONOMY ALIGNMENT | EVALUATION OVERVIEW BY PROJECT STUDIED

INVESTMENT	DESCRIPTION	ALIGNED	TAXONOMY ACTIVITY	TPOLOGY	MEASURES	DNSH ¹
	City of Orléans	combined heat and power plant on biomass ²	production of heat/cool from bioenergy	neither on the list of the enabling nor transitional activity for climate change mitigation and adaptation, but considered an eligible activity	Dalkia won a public tender realised under a French Regulation Commission Tender (“CRE3”) for electricity/heat generation fired by biomass	
	City of Rennes	combined heat and power plant on biomass ³	production of heat/cool from bioenergy	not on the list of the enabling nor transitional activity for climate change mitigation and adaptation, but considered an eligible activity	combined heat and power CHP biomass plant achieving significant carbon savings whilst still generating heat aligned with baseline requirements. The project enables a decentralised energy supply for the City of Rennes using an existing district network. The biomass required is locally sourced within a 100 km radius of the plant.	
	OVHA	gas boilers upgrade	installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	gas boiler upgrade of more than 170 homes owned by the local housing association	
		onshore wind farms	electricity generation from wind power	neither on the list of the enabling nor transitional activities for climate change mitigation and adaptation, but considered an eligible activity	construction of small-size onshore wind farms in the Fife region	

¹ DNSH: “Do no significant harm”. See Step 3 of the Taxonomy alignment analysis for more information.

² The use of biomass is subject to the requirements of Article 29 of Directive (EU) 2018/2001 and the greenhouse gas emission savings from the use of biomass in co-generation installations are at least 80 % in relation to the requirements of Article 29 of Directive (EU) 2018/2001 and the greenhouse gas emission savings from the use of biomass in co-generation installations are at least 80 % in relation to the GHG emission saving methodology and fossil fuel comparator set out in Annex VI to Directive (EU) 2018/2001. There is not a clear declaration for the compliance of the biomass to Article 29 of Directive (EU) 2018/2001, but from the positive opinion released from the “PREFECTURE DE LA REGION CENTRE ET DU LOIRET” of 06/07/2009 and the DALKIA Biomass Supply plan summary Arcadis has found data which confirm compliance with Article 29 of Directive (EU) 2018/2001.

³ The use of biomass is subject to the requirements of Article 29 of Directive (EU) 2018/2001 and the greenhouse gas emission savings from the use of biomass in co-generation installations are at least 80 % in relation to the GHG emission saving methodology and fossil fuel comparator set out in Annex VI to Directive (EU) 2018/2001.

Aligned:

DNSH (do no significant harm):

 fully aligned

 no significant harm

 partially aligned

 significant harm

 not aligned

EVALUATION OVERVIEW BY PROJECT STUDIED

	INVESTMENT	DESCRIPTION	ALIGNED	TAXONOMY ACTIVITY	TPOLOGY	MEASURES	DNSH ¹
	Jewish Museum Berlin	energy efficiency upgrade of the Jewish Museum Berlin		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	replacement of the building management system and lighting management system. installation of the metering system. reconciliation of heating system hydraulics. optimisation of the ventilation system	
	S. Orsola-Malpighi Hospitals	energy efficiency upgrade of the S. Orsola-Malpighi Hospital		high-efficiency co-generation of heat/cool and power from fossil gaseous fuels	transitional activity for climate change mitigation	upgrade of entire fluids production and distribution system of the hospital trigeneration plant with a district heating and cooling network of 15 km and two new thermal plants	
	Illuminated Cities	portfolio of street lighting upgrades with smart city features		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	upgrade of the public lighting infrastructure to LED technology according to a fully smart city approach. lighting integrates multiple services, including applications such as remote control and management systems, video surveillance, wi-fi and charging stations for electric vehicles	
	City of Venlo	street lighting upgrade of the City of Venlo		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	The City of Venlo upgrades the existing street lighting network of the city with energy-efficient LED lamps. The existing O&M contract for the street lighting network with a private service company stays in place and includes the upgraded lighting points	

¹ DNSH: "Do no significant harm". See Step 3 of the Taxonomy alignment analysis for more information.

Aligned:  fully aligned  partially aligned  not aligned
DNSH (do no significant harm):  no significant harm  significant harm

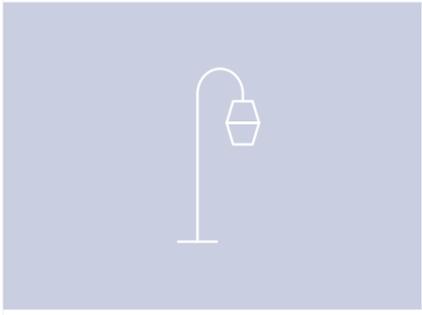
EVALUATION OVERVIEW BY PROJECT STUDIED

	INVESTMENT	DESCRIPTION	ALIGNED	TAXONOMY ACTIVITY	TPOLOGY	MEASURES	DNSH ¹
	Municipality of Santander	street lighting PPP for the City of Santander		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	conversion of existing streetlights to energy-efficient LEDs (22,300)	
	Universidad Politécnica de Madrid	new heating infrastructure for Universidad Politécnica de Madrid		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	energy efficiency measures in 32 buildings of the university. substitution of 63 oil-based boilers with gas-based. installation of 6,800 thermal valves in the heating system and solar panels. Installation of global management service	
	CIMAC	street lighting upgrade in 14 municipalities via inter-municipal entity		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	replacement of existing street lights with ca. 56,000 energy-efficient LED lighting points to upgrade, among others UNESCO World Heritage site of Évora	
	Vila do Conde	street lighting upgrade in Vila do Conde municipality		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	replacement of existing streetlights with ca. 18,972 energy-efficient LED lighting points	

¹ DNSH: "Do no significant harm". See Step 3 of the Taxonomy alignment analysis for more information.

Aligned:  fully aligned  partially aligned  not aligned
DNSH (do no significant harm):  no significant harm  significant harm

EVALUATION OVERVIEW BY PROJECT STUDIED

	INVESTMENT	DESCRIPTION	ALIGNED	TAXONOMY ACTIVITY	TPOLOGY	MEASURES	DNSH ¹
	TIPs platform	new heating infrastructure for public buildings		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	financing “green” investments that generate energy savings, reduce CO ₂ emissions, and promote renewable energy use in Lithuania	
		street lighting in Kaunas		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	financing “green” investments that generate energy savings, reduce CO ₂ emissions, and promote renewable energy use in Lithuania	
		renewable energy sources (solar on buildings)		installation, maintenance and repair of renewable energy technologies	enabling activity for climate change mitigation	financing “green” investments that generate energy savings, reduce CO ₂ emissions, and promote renewable energy use in Lithuania	
		renewable energy sources (solar power plants)		electricity generation using solar photovoltaic technology	neither on the list of the enabling nor transitional activities for climate change mitigation and adaptation, but considered an eligible activity	financing “green” investments that generate energy savings, reduce CO ₂ emissions, and promote renewable energy use in Lithuania	

¹ DNSH: “Do no significant harm”. See Step 3 of the Taxonomy alignment analysis for more information.

Aligned:  fully aligned  partially aligned  not aligned
DNSH (do no significant harm):  no significant harm  significant harm

EVALUATION OVERVIEW BY PROJECT STUDIED

	INVESTMENT	DESCRIPTION	ALIGNED	TAXONOMY ACTIVITY	TPOLOGY	MEASURES	DNSH ¹
	Dancer Mobility	sustainable mobility in European cities		urban and suburban transport, road passenger transport	transitional activity for climate change mitigation	all-inclusive operational lease services of electric buses manufactured in Lithuania to public authorities	
	Gijón	smart energy in Gijón: energy efficiency and smart management		installation, maintenance and repair of energy efficiency equipment	enabling activity for climate change mitigation	energy audit of public street lighting. energy audit of public buildings. implementation of renewable energy sources projects	
	Energetica	building retrofit		renovation of existing buildings	transitional activity for climate change mitigation	the energy efficiency and building retrofitting of several buildings in condominiums in Bardonecchia and Sauze d'Oulx.	

¹ DNSH: "Do no significant harm". See Step 3 of the Taxonomy alignment analysis for more information.

Aligned:  fully aligned  partially aligned  not aligned
DNSH (do no significant harm):  no significant harm  significant harm

EVALUATION OVERVIEW BY PROJECT STUDIED

INVESTMENT	DESCRIPTION	ALIGNED	TAXONOMY ACTIVITY	TPOLOGY	MEASURES	DNSH ¹
	district heating plants in Cervinia		high-efficiency co-generation of heat/cool and power from fossil gaseous fuels	transitional activity for climate change mitigation	installation of highly efficient cogeneration unit and heat pumps to power a district heating system in the Municipality of Cervinia.	
	district heating plant in Bardonecchia		high-efficiency co-generation of heat/cool and power from fossil gaseous fuels	transitional activity for climate change mitigation	installation of highly efficient cogeneration units and heat pumps to power a district heating system in the Municipality of Bardonecchia	

¹ DNSH: "Do no significant harm". See Step 3 of the Taxonomy alignment analysis for more information.

Two new investments Signet Bank and Coop Pank are not yet included under this table, since there has been no disbursement to sub-loans by the end of 2023.

Aligned:

DNSH (do no significant harm):

fully aligned

no significant harm

partially aligned

significant harm

not aligned

CARBON EMISSIONS AND SAVINGS MONITORING

The Taxonomy generally supports the Sustainable Finance Disclosure Regulation (SFDR) – an EU regulation on the disclosure of information on the sustainability of investment decisions. Among other requirements, the SFDR requires financial advisors and financial market participants to publish information about negative environmental and social impacts caused by the investments. These negative impacts are known as “Principal Adverse Impacts” (PAIs).

In this context, eef endeavours to provide more transparency and a deeper understanding of the carbon emissions generated by its investments, which is also part of 14 mandatory PAIs. The following is an illustration of the carbon emissions (Scope 1 and Scope 2) per project, with further explanation.

Scope 1 carbon emissions are emissions generated from sources that are controlled by the company issuing the underlying assets¹. In eef’s case, Scope 1 refers to emissions directly generated from our invested asset. For our projects biomass Cogeneration (Combined Heat and Power – CHP) plants in the City of Orléans and City of Rennes, the scope 1 emissions are from the carbon emissions during the process where the CHP Plant is fueled by recycled wood chips and transform the input fuel into the electricity and heat as output. For eef’s project of University Hospital S. Orsola Malpighi, the tri-generator (Heat, Power and Cooling) plant also consumes natural gas in the process of different forms of energy production. The carbon emission by the tri-generator attributed to natural gas as a fuel is considered here as scope 1 emissions. As for the project in Universidad Politécnica de Madrid, the upgraded boiler is fueled by the natural gas in order to generate heating, the scope 1 carbon emissions in this process are from the natural gas consumption in the boiler.

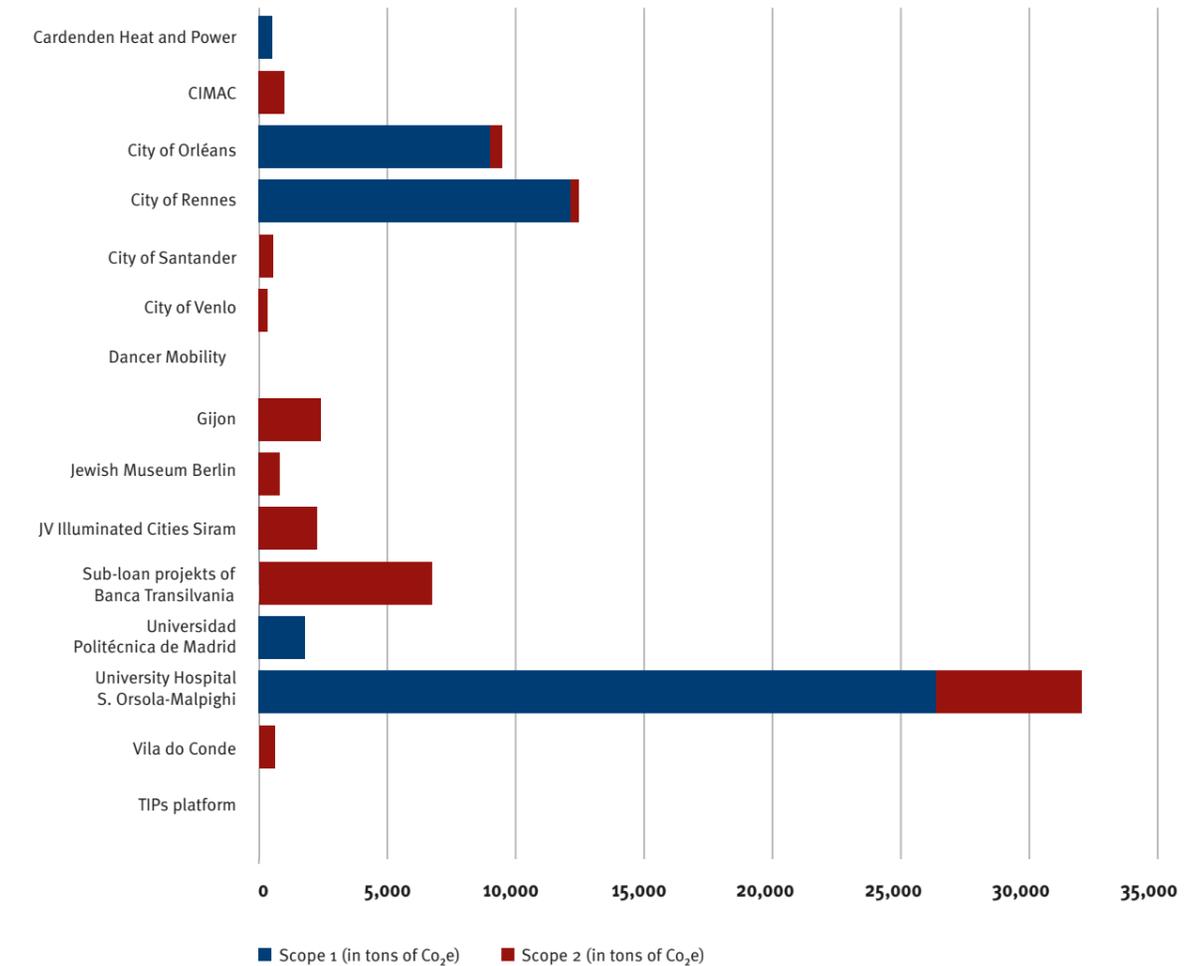
Scope 2 carbon emissions are “purchased” emissions through energy usage (electricity, heat, steam cooling), including purchased energy used for production of goods, namely emissions from the consumption of purchased electricity, steam, or other sources of energy generated upstream from the company that issues the underlying assets. In eef’s case, Scope 2 refers to the emission from the energy (electricity, heat for instance) purchased for and consumed by our invested asset itself. For our streetlights upgrading projects, like City of Santander and Vila do Conde, the scope 2 emissions are from the emissions from the electricity itself which is purchased from corresponding Spanish and Portuguese national grid. For Jewish Museum Berlin, the scope 2 emissions are from purchased district heating and the electricity from the German national grid.

eef deduced the Scope 1 and Scope 2 Carbon emissions of each investment from the respective annual project’s energy savings summary and report received. Projects Signet Bank, Energetica and Coop Bank are not included in the chart, as the projects are yet to commence the construction/implementation or deploy the called capital as of end of 2023. There is no available emission data from the underlying projects. We expect to report its carbon emission when the project is finalized and in operation.

Scope 3 carbon emissions are all indirect emissions that occur in the value chain of the reporting asset and are not covered under Scope 1 and Scope 2, including both upstream and downstream emissions, in particular for sectors with a high impact on climate change and its mitigation. In eef’s case, Scope 3 is currently not available.

¹ Scope 1,2 and 3 emissions classification here are according to GHG Protocol Corporate Standard (<https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf>)

SCOPE 1 AND SCOPE 2 CARBON EMISSION OF THE INVESTED PROJECTS IN 2023



BLUEMARK VERIFICATION

In 2020, eef engaged in the annual public disclosure of its alignment with Operating Principles for Impact Management (Impact Principles). Impact Principles support the development of the impact investing industry by establishing a common discipline around the management of impact investments, and promote transparency and credibility by requiring annual disclosures of impact management processes with independent verification. In 2021, eef's impact management system was independently verified by BlueMark, a leading provider of impact verification services in the impact investing market. BlueMark was incubated and launched in January 2020 by Tideline, a leading women-

owned impact investing consultancy, with a mission to strengthen trust in impact investing and to help bring more accountability to the impact investment process. Going forward, the Fund is committed to bringing its impact management process to close to the best practice and most recognisable industry standards. With the independent assessment from BlueMark, eef is eager to improve its impact management in the coming year. The chart below summarises findings using four ratings: advanced, high, moderate and low.

This next verification is expected to be performed in 2024.

	OPERATING PRINCIPLES FOR IMPACT MANAGEMENT	ALIGNMENT*
Strategic Intent	1. Define strategic impact objective(s), consistent with the investment strategy	HIGH
	2. Manage strategic impact on a portfolio basis	HIGH
Origination & Structuring	3. Establish the Manager's contribution to the achievement of impact	MODERATE
	4. Assess the expected impact of each investment, based on a systematic approach	HIGH
	5. Assess, address, monitor, and manage potential negative impacts of each investment	ADVANCED
Portfolio Management	6. Monitor the progress of each investment in achieving impact against expectations and respond appropriately	HIGH
Impact at Exit	7. Conduct exits considering the effect on sustained impact	LOW
	8. Review, document, and improve decisions and processes based on the achievement of impact and lessons learned	MODERATE

* Advanced – limited need for enhancement at present
 High – a few opportunities for enhancement
 Moderate – several opportunities for enhancement
 Low – substantial enhancement required



CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS

The European Energy Efficiency Fund works actively to contribute to the internationally recognised United Nations (UN) goals for sustainable development, the so-called Sustainable Development Goals (SDGs). The Fund registered its partnership for UN SDGs and mapped its impact against the following SDGs 7, 11, 13 at the beginning of 2020. The sustainable progress of each goal is now measured with eef defined indicators, which are closely aligned to the SDGs framework.

7 AFFORDABLE AND CLEAN ENERGY



SDG 7 is mapped against the amount of eef's renewable energy and energy efficiency projects contributing to doubling the global rate of improvement in energy efficiency

14 PROJECTS
in Energy Efficiency

2 PROJECTS
in Renewable Energy

1 PROJECTS
Clean Urban Transport

11 SUSTAINABLE CITIES AND COMMUNITIES



SDG 11 is mapped against the annual number of people impacted through all eef's projects

2 MILLION
people are reached

13 CLIMATE ACTION



SDG 13 is mapped against the number of countries and public authorities in which eef has been engaged via its projects since inception (all eligible due to public link)

10 COUNTRIES
9 Member States and the UK

56 PUBLIC AUTHORITIES

POPULATION REACHED THROUGH EEEF INVESTMENT ACTIVITIES

eef investment projects	City/region	Annual population reached	Notes on population reached
Jewish Museum Berlin	Berlin	700,000	Average number of visitors per year who have visit the Jewish Museum Berlin since its opening in 2001.
City of Orléans	Orleans	57,120	Part of population benefiting from either heat or power of the CHP project in the City of Orleans.
University Hospital S. Orsola-Malpighi	Bologna	20,000	The total number of academic staff (professors, lectures), students, patients and non-academic staff.
City of Rennes	Rennes	85,680	Part of population benefiting from either heat or power of the CHP project in the City of Rennes.
City of Venlo	Venlo	100,536	The total population of city of Venlo (census 2015) is considered as reached population.
Universidad Politécnica de Madrid	Madrid	46,000	The total number of students, academic and non-academic staff working on the campus of UPM.
Ore Valley Housing Association	Cardenden	6,533	The total number of residents and tenants who live in the project area (based on the reported figures from OVHA).
Municipality of Santander	Santander	572,044	The total population of the city of Santander, including the average number of tourists visiting the city of Santander each year.
Illuminated Cities	Rozzano	42,557	The total population living in the municipality included the pipeline at the closing date.
CIMAC Portugal	CIMAC Region	167,000	The total population living in 14 municipalities (census 2011) that are located in the Alentejo Central Region in Portugal where the upgrade of luminaires would be performed.
Dancer Mobility	Klaipėda	0	People reached will be estimated based on the number of the population using public transport. The project seeks to replace 10 diesel buses in Klaipėda. There are no busses used from the project yet.
Vila do Conde	Vila do Conde	79,533	The total population of Vila do Conde as of census 2011.
VIPA	Multiple regions in Lithuania	1,033	The first project approved by the Investment Platform has reached 474 households. To reach the number of beneficiary people, this number has been multiplied by the average household size of 2.18 persons.
Gijón	Gijón population	269,311	The total population of the city of Gijón (census 2021) is considered as reached population.
Signet Bank	Latvia	N/A	No population reached yet, since the Funds have not been fully disbursed to the projects.
Energetica	Italy	N/A	No population reached yet, since the Funds have not been fully disbursed to the projects.
Coop Pank	Estonia	N/A	No population reached yet, since the Funds have not been fully disbursed to the projects.
Total		2,147,347	

The population reached through eef investment projects is an annualised figure and is estimated using a prudent approach. Each figure is derived from the estimate considered for each individual project based on the population of the city and/or the region achieved as a result of eef activities (e.g., calculation number of staff, students, professors, patients, etc.) as reported in the investment committee proposal.



THE EEFF'S TECHNICAL ASSISTANCE FACILITY

AN OVERVIEW

- › EUR 389,500 approved for the Province of Ferrara
- › EUR 400,000 approved for the City of Gijón
- › EUR 340,000 approved for the Italian Ministry of Defence (MoD), Modena
- › EUR 180,000 approved for Kaunas District Municipality
- › EUR 400,000 approved for the Autonomous Province of Bolzano
- › EUR 160,000 approved for Ukmergė District Municipality
- › EUR 195,000 approved for Šilutė District Municipality
- › EUR 195,000 approved for the Klaipėda University Hospital (KUH)
- › EUR 199,500 approved for the City of Sestao
- › EUR 180,000 approved for the Daugavpils City Municipality
- › EUR 160,000 approved for the University of Oviedo
- › EUR 160,000 approved for Barcelona Metropolitan Area (AMB)

159.2



million euros envisaged total project investment volume supported by the eeef TAF

85,935



MWh per year estimated primary energy savings

53.32



potential total leverage factor (weighted average)

27,368



tCO₂e per year estimated carbon equivalent emission savings

The Fund has set up the eeef Technical Assistance Facility (eeef TAF) to catalyse investments in public entities (EU Member States) in the energy efficiency sector, small-scale renewable and/or public urban transport. The TAF directly allocates consultancy services to the TA beneficiaries. Some of the services provided are e.g., energy audits, feasibility studies, public procurement assistance, and preparing tendering process to realise investment programmes.

From 2017 to date, the eeef approved twelve Technical Assistance (TA) projects, embracing 27 public and municipal authorities across Spain, Italy, Lithuania, and Latvia. These TA projects have received and/or are currently receiving consultancy services in various forms with the common aim of realising the investment programmes to improve their CO₂ footprint.

By 2023, the eeef TA support expects to deliver over €159.2 m worth of commercially viable investments compared to the initial assumption of €179.3 m. The initial number was based on the assumed investment portfolio from the twelve signed TA projects. In comparison, the current envisaged investment volume is the outcome after evaluating the actual situation of three TA projects in Lithuania, which are expected not to materialise. During the project development, the Ukmergė and Šilutė District Municipalities published the tender for their respective investment projects, resulting from the TA services. Due to the price increase (i.e., inflation and the Ukraine war), Ukmergė received two offers over their budget, and Šilutė did not receive any. Although the possibility of re-launching the tender was under evaluation from the public authorities' perspective, it did not seem economically feasible to proceed with the projects. Furthermore, the Klaipėda University

Hospital (KUH) underwent a merger, which caused a delay in the procurement process. A new administration took over, which might not continue with the project as it was initially planned by the former management.

Even though the TAF's scope of work ends once the public beneficiary has launched the tender, the Fund's support is not limited to providing the technical assistance services; it also aims to offer financing with various financial instruments to ensure that the investment projects materialise. It is the eeef's intention that the TAF remains active for the foreseeable future, with the mission to turn public sector climate mitigation projects into reality. By 2023, seven of the eeef TAF programmes have already published tenders to select a company to implement the investment programme (Province of Ferrara, Italian Ministry of Defence, Kaunas, City of Gijón, Šilutė, Autonomous Province of Bolzano and Ukmergė). The Province of Ferrara, Kaunas District Municipality and Italian Ministry of Defence have selected the company to go ahead with the investment programme as outlined in the TA studies, the external financing was not used. The investments for the City of Gijón were completed and financed by eeef.

4



countries involved

27



public and municipal authorities involved

IMPACT OBJECTIVES (2017–2023)

Joining the efforts of the EU 2030 framework for climate and energy and the 2050 climate-neutral objectives, the Fund increased the primary energy savings and greenhouse gas emissions (CO₂ equivalents) reduction of all its TA projects from 20% to a 30% target. Overall, the cumulative primary energy savings expected from the nine TA projects will save energy to nearly 85,935 MWh (equivalent to 47.3%) and reduce CO₂ emissions to 27,368 tCO₂e (50.1%)¹. The following table for the impact objective analysis does not include Ukmergė, Šilutė, and KUH TA projects, as these are expected not to materialise due to external circumstances.

The table below shows the objectives as included in requests for the Technical Assistance:

TABLE: IMPACT MEASUREMENT

#	TA Projects	Country	Tender published, Yes (Y)/Not (N)	Sector	Building (B)/lighting points (LP), in numbers	Annual population reached	Expected energy saved, (%) per year	Expected emission avoided, tCO ₂ e (%) per year	Leverage factor, (x)
1	City of Gijón	ES	Y	EE (street lighting/building), RE (PV)	42,960 (LP)/ 85 (B)	271,780	30	30	57.54
2	Province of Ferrara	IT	Y	EE (street lighting/building)	26,557 (LP)/ 9 (B)	345,691	ca. 40	48	79.07
3	MoD – Ducal Palace of Modena	IT	Y	EE (thermal systems & building)	5 (B)	186,741	51	51	26.47
4	Province of Bolzano	IT	N	EE (building)	62 (B)	533,373	58	48	100.25
5	Kaunas	LT	Y	EE (street lighting)	8,989 (LP)	96,441	63	63	20.55
6	City of Sestao	ES	N	EE (street lighting, building, e-mobility)/RE (energy communities using PV)	2,586 (LP)/ 13 (B)/	27,533	55	55	68.84
7	Daugavpils	LV	N	EE (street lighting)	9,000 (LP)	79,120	60	60	43.35
8	University of Oviedo	ES	N	EE (building/digitalization program), RE (energy communities using PV/district heating)	58 (B)	25,000 ²	32	48	38.57
9	Barcelona Metropolitan Area (AMB)	ES	N	EE (street lighting/building), RE (energy communities using PV/biomass district heating)	7,778 (LP)/ 77 (B)	3,239,337	37	48	29.45
TOTAL					97,870 (LP)/309 (B)	4,805,016	47.33	50.1	53.32

¹ The Province of Ferrara and the Italian Ministry of Defence have completed their projects preparations and selected the company to proceed with the investment programme as outlined in the TA studies. Currently, eeef is not able to provide actual final data regarding the impact of these two projects, as the implementation phase has not been financed by eeef. Please note the data provided is based on the completed TA project studies.

² Almost 22,000 students attend the Oviedo, Gijón y Mieres Campus. More than 2,000 teachers and researchers and approximately 1,000 administrative staff comprise the educational institution.

³ Actual data regarding the impacts of the Province of Ferrara and the Italian Ministry of Defence TA projects is not currently available, as the implementation phase has not been financed by eeef. Please note the data provided is based on the completed TA project studies.

From 2017 to 2023, the TAF programme has been supporting (i) energy efficiency measures, such as street lighting upgrades (i.e., installation of green technology, the replacement of luminaires and traffic lights, IoT nodes, digital platforms to manage and monitor the energy flow acting as a small smart grid solution, etc.), public buildings renovation and retrofit, (ii) renewable energy solutions, including the development of energy communities using PV programs, building-integrated PV systems, the installation of aerothermal and hydrothermal systems, biomass district heating, etc., and (iii) urban transportation, including e-mobility programmes. According to the energy measures supported along the TAF programmes, results show a total of 97,870 lighting points to be upgraded and 309 buildings to be renovated. Additionally, 41 public buildings/structures are expected to be reserved for the development of energy communities.³

So far, 27 public and municipal authorities will benefit from the TAF programme i.e., (i) the City of Gijón, (ii) the Province of Ferrara, which includes the municipalities of Ferrara and Mesola, (iii) the Italian Ministry of Defence for the Ducal Palace in Modena, (iv) the Autonomous Province of Bolzano, which includes the municipalities of Bolzano, Brunico, Bressanone, and Merano, (v) the Kaunas District Municipality, (vi) the City of Sestao, (vii) the Daugavpils City Municipality, (viii) the University of Oviedo, and (ix) the Barcelona Metropolitan Area, which includes 15 of its municipalities that seek to increase their energy efficiency levels through the TA programme (Badia del Vallès, Barberà del Vallès, Cervelló, El Papiol, Montcada i Reixac, Montgat, Pallegà, Ripollet, Sant Andreu de la Barca, Sant Climent de Llobregat, Sant Cugat del Vallès, Sant Feliu de Llobregat, Sant Vicenç dels Horts, Tiana and the Torrelles de Llobregat). The population reached through its energy-related activities will be around 4,805,016 inhabitants.

Generally, it takes up to 3 years for public authority to complete the preparation of the investment programme. After completing the TA programme, each project goes into implementation phase (estimated 10 – 15 years). It

comprises the construction phase, which takes up to two years for each project, and continues with the operational phase of ca. 12 years. Therefore, it is expected that the benefits of the TAF programme will continue to be leveraged after two to three years of completing the project preparation.

eeef expects to expand its support to more regions. Currently, it is in preliminary discussions with further public authorities in Latvia, Romania, Bulgaria and Lithuania for potential projects.

Funding

Following the successful completion of the first collaborative project with the European Investment Bank ('EIB') under the eeef's Technical Assistance Facility (TAF) programme, eeef signed a new collaboration agreement in 2023 that will allow the Fund to expand the TA Facility and support an even greater number of public authorities within the EU.

On October 4th 2023, the Fund and the EIB – European Local Energy Assistance ('ELENA') TA Facility signed a contract ('ELENA Contract' 2020-177) under the Horizon 2020 Programme of the European Union for funding new project development services ('PDS'). ELENA is expected to allocate up to €1.9 m to the eeef TA programme within a timeframe of three years (11/2023 – 10/2026). By October 2023, a first pre-financing of €770,400.00 was disbursed, building the eeef's TA Facility available for new projects to over €770,400.00.

Embarking on a new journey, on 26 January 2024 eeef launched a public call for proposals for public authorities within the EU. Due to the high demand and interest from public authorities in Latvia, Lithuania, Italy, Romania, and Spain, the deadline was extended to 15 April 2024. Active collaboration with these authorities is expected to begin by H1/2024.

By Q4/2023, the Fund has approved a new TA project from a public authority in Catalonia, Spain. More information about TA projects are regularly provided also on the eeef's website – www.eeef.eu.

NEW EEEF TAF PROGRAMMES

THE BARCELONA METROPOLITAN AREA (AMB) JOINS THE EEEF TECHNICAL ASSISTANCE FACILITY TO INCREASE ENERGY EFFICIENCY LEVELS IN 15 OF ITS MUNICIPALITIES FROM THE CATALONIA REGION

The AMB is located in the city of Barcelona, Spain, in the autonomous community of Catalonia. It is made up of 36 municipalities, from which 15 (i.e., Badia del Vallès, Barberà del Vallès, Cervelló, El Papiol, Montcada i Reixac, Montgat, Pallejà, Ripollet, Sant Andreu de la Barca, Sant Climent de Llobregat, Sant Cugat del Vallès, Sant Feliu de Llobregat, Sant Vicenç dels Horts, Tiana and the Torrelles de Llobregat) presented themselves as candidates for the TA project. All of them are Members of the Covenant of Mayors and are committed to the EU's climate and energy policy framework.

The Barcelona Metropolitan Area (AMB) is the public administration of Barcelona's metropolitan area, the largest metropolitan conurbation in the Western Mediterranean, and the source of half of 'Catalonia's GDP. It has a population of circa 3,239,337 inhabitants and an area of 636 km².

On 19 June 2023, the eef and the AMB signed a TA Agreement to develop the project "Energy Efficiency and Maintenance Service for Public Buildings and Street Lighting of the Metropolitan Area of Barcelona." The objective of this TA is to increase overall energy efficiency levels and create energy communities in the 15 municipalities of the metropolitan area by providing upgrades to 77 public buildings, developing energy communities with solar PV systems, installing 12 new biomass district heating systems, and retrofitting street lighting using LED technology.

The project volume for the programme is circa EUR 11.29 m. This will facilitate the AMB reaching the required renovation and energy levels to contribute to the local and national targets.

Supported services include the preparation of energy audits for 77 public buildings (16 of these buildings will be selected for the development of energy communities and/or PV system installation), energy audits for public street lighting, and completion of technical studies for biomass district heating. Additionally, the evaluation of the economic viability of the investment, structuring of the tender documents to align with the PPP/ESCO model, external advisors, and legal analysis will be included.

Recent developments

On 14 December 2023, the TA Agreement for Consultancy Services was signed.



THE UNIVERSITY OF OVIEDO JOINS THE EEEF TECHNICAL ASSISTANCE FACILITY TO PROMOTE SMART ENERGY IN ITS THREE CAMPUSES (GIJÓN, MIERES AND OVIEDO)

The University of Oviedo is a public institution of higher education and research of the Principality of Asturias. It is located in the north of Spain, bordering the Cantabrian Sea from the North and Castilla y Leon from the South. It extends its campuses through the cities of Oviedo, Gijón, and Mieres (in addition to offering different university services in Avilés), with nearly 22.000 students, more than 2.000 professors and researchers, and almost 1.000 people in staff of administration and services.

With more than 400 years of history, the University of Oviedo offers degrees adapted to the European Higher Education Area (EHEA) in all branches of knowledge, bilingual itineraries, double degrees with international universities, and postgraduate programs in collaboration with more than 250 companies.

On 2 June 2023, the eef and the University of Oviedo signed a TA Agreement to develop the project "Smart Energy at the University of Oviedo: Energy Efficiency and Smart Management." The university seeks to increase energy efficiency levels in public buildings located on its three campuses (Gijón, Mieres, and Oviedo) by renovating 58 public buildings, which includes several measures, i.e., the envelope and insulation improvements in 14 old buildings, installation of remote management systems and renovation of buildings lighting systems,

etc., developing energy communities with solar PV systems and/or installing PV panels in 37 buildings, developing a district heating network in 3 zones located in Oviedo and Gijón Campuses, and a digital platform for monitoring electric and thermal consumptions.

The project volume for the programme is circa EUR 19.8 m. This will enable the University of Oviedo to significantly contribute to achieving the various ambitious carbon reduction goals that it has set for itself.

Recent developments

On 19 December 2023, the eef and TA Consultant signed the TA Agreement for Consultancy Services. The TA works are expected to start in January 2024.





AI UPRAISE – ANOTHER CHALLENGE ON THE WAY TO ENERGY TRANSITION?

by Didzis Berzins

A wide range of industries are adapting artificial intelligence (AI) solutions attempting to improve productivity. Increase of demand for IT load capacity and graphic processing units (GPUs) and rapid rise of electricity consumption associated to the data centres is evident. According to the Citi Research global data centre IT load demand in 2024 is expected to grow by 25% compared to 2023 reaching 41.1 GW and by 2030 will reach 100.3 GW representing compound annual growth rate (CAGR) of 20% for the forecasting period. Fortune Business Insights reported that the global GPU market in 2024 will grow by 27% compared to 2023 reaching EUR 56 billion and by 2032 will reach more than EUR 400 billion, exhibiting CAGR of 29%.

AI may be critical and part of the solution to manage rapidly increasing decentralised renewable energy sources and eventually reach net zero emission world. Major electric power companies have reported that AI is already used for:

- 1 adjusting operations of renewable energy plants in real-time based on weather conditions and market demand,
- 2 managing Virtual Power Plants, which aggregate distributed energy resources and optimise operations as a single, flexible energy source,
- 3 managing operation of energy storage systems, ensuring efficient energy use and grid stability,
- 4 wind turbine and solar park performance optimisation and predictive maintenance, reducing downtime and maintenance costs,
- 5 smart meter data analysis to optimise energy distribution, tailor services and improve energy efficiency.

National Grid (UK) uses AI to predict electricity supply and demand more accurately assisting in grid balancing. AI algorithms are employed to monitor grid stability and predict potential disruptions, allowing for proactive measures to maintain reliable electricity supply.

Other application of AI in electric power industry includes dynamic pricing, optimising and balancing renewable and non-renewable sources reducing carbon emissions, and grid frequency and load management.

AI solutions will also play important role in improving productivity in other industries. However, AI technologies not only bring benefits, but also create additional challenges to the energy sector and in particular electric power industry.

Data centres that service training and operating AI models consume more and more electricity. Vast majority of energy is used for computing power and cooling. According to IEA, OpenAI's ChatGPT uses 2.9 Wh per request which is almost 10 times more than a typical Google search, and with 9 billion searches daily, this requires almost 10 TWh of electricity per annum. Global electricity demand from data centres in 2022 was estimated to be 460 TWh. IEA expects that the demand could double by 2026 reaching to up to 1 050 TWh, which is roughly equal to current electricity demand of Germany and France combined. IEA estimates that by 2026 in EU data centre electricity consumption will reach over 150 TWh per annum (up from about 100 TWh in 2022) or nearly 5.5% of the total consumption. Ireland and Denmark, where data centre market is developing rapidly, associated electricity consumption in 2026 will reach 32% and 20% of the total country's demand respectively.

Rise of hyperscale data centres will also exert additional pressure on power grids and in some countries this may be extreme. To accommodate all electric power demand needs in Europe, Goldman Sachs estimate that nearly EUR 800 billion

will be required for modernising transmission and distribution networks.

Europe and the world need to prepare for data centre electric power demand and take it into consideration, when forecasting required renewable power production capacity to reach previously set transition targets. EC has already added a section on data centres in the recast Energy Efficiency Directive and adopted a new delegated regulation on the first phase for establishing EU-wide scheme to rate the sustainability of EU data centres. According to the delegated act the aim of the rating scheme is to allow for comparisons between data centres and promote new designs or appropriate efficiency interventions in new or existing data centres that can result not only in a considerable reduction of energy and water consumption, but also in the promotion of the use of renewable energy, an increase in the efficiency of the grid, or in the reuse of waste heat in nearby facilities and heat networks.

Management of decentralised renewable energy facilities, grid balancing and automation of sophisticated processes require complex algorithms, application of AI and immense computing power and thus require a lot of electric power. To continue and accelerate energy transition, additional power, that was not previously accounted in projections even few years ago, needs to come from renewable sources. Uprise of AI is an example and proof that human energy consumption habits are constantly changing, this implies that reliance on fossil fuels might be longer than anticipated and that primary energy savings focus should be stronger, as transition to renewables is not keeping pace. In future there may be other rising intense energy consuming sectors that we may now not be aware of. Energy efficiency measures and scope should therefore also change and adopt considering new circumstances. AI may help to deploy more sophisticated energy efficiency solutions, but we must make sure that the benefits outweigh the indirect harm to the environment.

EVOLUTION OF THE ENERGY EFFICIENCY LANDSCAPE IN EUROPE SINCE RUSSIA'S INVASION OF UKRAINE

by Rahul Pratap Singh

The unexpected invasion of Ukraine by Russia triggered profound implications to Europe's energy landscape which for decades had relied heavily on energy from Russia, in particular on natural gas. This geopolitical shift forced political leaders across Europe to rethink their energy strategies, emphasizing energy security and accelerating the push towards energy efficiency and renewable energy sources. Two and a half years from the onslaught, allow me to reflect on a few trends impacting the energy sector.

Buildings, for example, account for approximately 40% of Europe's energy consumption and 36% of CO₂ emissions. Since 2022, the focus on energy efficiency in buildings has renewed. Significant funds have been allocated from the "Recovery and Resilience Facility" that catalyzed a surge in both public and private investments directed toward building renovations. Countries such as Spain and Poland introduced incentives for households to adopt energy-saving measures - installing better insulation, energy efficient windows, heat pumps, among others. Likewise, Italy launched the "Superbonus 110%" scheme that was followed by "Ecobonus" scheme to offer tax incentives for energy-efficient renovations thereby increasing local appetite for building upgrade projects. As Europe intends to renovate 35 million buildings by 2030, the ongoing "Renovation Wave" is likely to continue into the near future and will significantly lower their carbon footprint.

Another significant trend is rising investments in renewable energy - solar, wind, hydro and biomass - to reduce reliance on fossil fuels such as natural gas and oil. Germany, which traditionally relied heavily on Russian gas, saw itself in a highly vulnerable state and had to expedite the shift towards cleaner solutions such as wind and solar energy. Another example would be France, which conventionally relied on nuclear energy,

has lately increased deployment of renewable energy sources. By 2030, it aims to produce 14-22TWh of biomethane annually, which would account for about 7-10% of the national gas consumption. Europe is projected to produce 45% of total energy from renewable sources by 2030 under the "RePowerEU" plan. This plan is a reinforcement of Europe's commitment to the European Green Deal and aims for climate neutrality of Europe by 2050. Based on electricity demand in 2020; projected demand growth; and assuming a suitable policy framework to support deployment of renewable energy, approximately 2,080 TWh of new installed renewable energy capacity will need to be added by 2030.

To manage the intermittency of renewable energy sources, smart grid technologies and energy storage solutions will observe increased investments and deployments across Europe. Smart grids allow for more efficient distribution & consumption of electricity and optimize flow of energy across networks. They are crucial for balancing supply & demand, especially as renewable sources get integrated into the energy mix. Likewise, energy storage solutions and technologies, particularly battery storage, help store excess renewable energy generated during periods of low demand and release it when needed thereby enhancing grid stability, reliability and provide a buffer against sudden supply disruptions. A large-scale implementation of battery storage project in Ireland with 100MWh capacity at Moneypoint is a good case in point. This project aims to enhance resilience of Ireland's grid power and integrates higher levels of renewable energy capacity. On the other end of the spectrum, Germany's 15MWh capacity project in Wittenberg is a smaller scale implementation of battery storage solution to support local SMEs in balancing energy needs with renewable generation and in delivering grid stabilization.

In the last years, many European countries, especially Germany, witnessed an abrupt shortage in natural gas supplies and increased energy prices, that triggered a noticeable shift toward electrification of heating systems. Heat pumps which are generally more energy efficient than traditional gas boilers have emerged as a popular alternative. Unlike Sweden, where electric-powered heat pumps are dominantly present for space heating since many decades, some of the other member countries in Europe had to fast track heat-pump adoption. For example, the "MaPrimeRenov" initiative of the French Government, offers subsidies to promote energy efficiency in residential buildings. The outcome is a significant surge in heat pump installations across urban and rural areas in France. Likewise, cities of Lyon and Marseille focused on projects to retrofit public buildings namely, schools, hospitals and government offices, and benefited with substantial improvements in energy efficiency due to heat pump installations. Europe has set itself a target to install 10 million heat pumps over the next five years as part of its broader energy strategy. It shouldn't be surprising in the near future that heat pumps are a frequent item in the capital budgets for energy efficiency projects.

The drive for energy efficiency also includes the transportation sector. Most European countries have accelerated the rollout of EV charging infrastructure and incentivized its adoption. On similar lines, the public transportation networks are being electrified and expanded. Countries such as Spain and France are investing heavily in high-speed rail and urban transit systems to reduce reliance on private cars that drive on fossil fuels. Likewise, France's "Bonus-Malus" system provides financial incentives for purcha-



sing low-emission vehicles while imposing penalties on those with high-emission. This ties well with its “Advenir” program that provides EV charging infrastructure. Furthermore, the “National Platform for the Future of Mobility” supports Germany’s commitment to reducing transport emissions by 40% by 2030. The platform takes a holistic approach to the transformation of the transport sector by considering not only electric vehicle, but also alternative fuels, digital infrastructure, smart mobility solutions and integration with renewable energy. Owing to the lower emissions imperative, the Europe’s “Fit for 55” package includes measures to promote sustainable mobility and aims to reduce net GHG emissions by at least 55% by 2030. The push for electric vehicles, the expansion of public transportation networks and implementing stricter emissions will stay strong into the coming years.

In the meantime, Europe’s political think tanks are strengthening the regulatory framework around energy efficiency and correspondingly, revising the Energy Efficiency Directive and the Energy Performance of Buildings Directive for ensuring stringent energy efficiency standards. These standards and regulations are designed to ensure that Europe meets its energy and climate goals while enhancing energy security and reducing demand. Hand in hand, there is a strong push towards adjusting behavioral patterns which are a critical component of reducing energy consumption. Several European governments have launched public awareness campaigns to promote energy-saving habits. These campaigns encourage citizens to reduce their energy usage by adopting simple measures, such as lowering heating temperatures, using energy-efficient appliances, and reducing unnecessary lighting. In some countries, such as the Netherlands, there have been governmental initiatives to encourage energy-saving practices in both homes and businesses. These efforts have been complemented by subsidies and tax incentives for consumers who invest in energy-efficient appliances and retrofitting.

We all know that the energy crisis precipitated by Russia’s invasion of Ukraine has still not ended. It has very much served as a wakeup call to whole of Europe to become energy resilient and dovetails with the need to transition toward climate neutrality. The combination of policy initiatives, technological advancements, and behavioral changes has set Europe on a path toward greater energy security and sustainability. This shift will continue to require substantial investment and dedicated efforts from all stakeholders. In essence, the trends so far is positive and signals a commitment across the continent to reduce energy dependency, cut emissions, and build a more resilient energy system in order to have a long lasting impact.



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