

New Energy Solutions Optimised for Islands



EUROPEAN ISLANDS FACILITY

D6.1: Definition of Assessment KPIs

WP6, T6.1





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 864266



Technical references

Project Acronym	NESOI
Project Title	New Energy Solutions Optimized for Islands
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Project Duration	October 2019 - September 2023

Deliverable No.	D6.1
Dissemination level*	PU
Work Package	WP 6 - NESOI Exploitation and Replication
Task	T6.1 - Monitoring of the Assessment Framework
Lead beneficiary	CERTH
Contributing beneficiary/ies	CERTH, SINLOC, E.ON, DELOITTE
Due date of deliverable	30 September 2020
Actual submission date	02 October 2020

- * PU = Public
 PP = Restricted to other programme participants (including the Commission Services)
 RE = Restricted to a group specified by the consortium (including the Commission Services)
 CO = Confidential, only for members of the consortium (including the Commission Services)

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ACKNOWLEDGEMENT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 864266.



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Executive Summary

This deliverable describes the monitoring assessment framework of the NESOI project. To monitor the NESOI impact, a great number of Key Performance Indicators were developed as the core metrics for the NESOI assessment. NESOI success is strongly dependent on the projects that will receive technical assistance. In this respect, a bottom-up approach was developed, that examines 63 KPIs (5 domains) at a supported project level (bottom) and then through a simple process, these KPIs will become representative for the whole NESOI project (up). Additionally, 42 KPIs, that can be derived from the various proposals and supported projects metadata have been developed. Each of the KPIs has a specific information sheet that provides details for its estimation, the applicable cases, and the information that is required.

To assist the KPIs estimation that will take place during the Technical Assistance periods, two chapters have been dedicated in this deliverable:

- In chapter 4, four relatively common energy transition examples projects have been developed to be used as guides for their KPI estimations.
- In chapter 5, data collection guidelines are provided for seven categories of data.

The estimation dates of each KPI and when they are going to be published are presented in the last chapter of the present document. The estimated KPIs will be published every six months with the updated values.



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List of Acronyms

DH	District Heating
RES	Renewable Energy Sources
V2G	Vehicles to Grid
EV	Electric Vehicles
KPI	Key Performance Indicator
BEB	Battery Electric Bus
TA	Technical Assistance
CHP	Combined Heat and Power
LCA	Life Cycle Assessment
LCOE	Levelized Cost of Energy
NPV	Net Present Value
IRR	Internal Rate of Return



1 Introduction

The EU Island Facility NESOI (New Energy Solutions Optimised for Islands) is a four-year Horizon 2020 project funded under call topic LC-SC3-ES8-2019 (European Islands Facility -Unlock financing for energy transitions and supporting islands to develop investment concepts). It began on 1 October 2019, it will finish on 30 September 2023 and is made up of a multi-disciplinary consortium consisting of 10 partners from 7 EU member states. It has a total budget of €10 million of which approximately €3 million is dedicated to a cascade funding mechanism to provide direct financial support to the EU Islands. Coupled to consortium capacity building activities, the facility aims to mobilise more than 100 M€ of investment in sustainable energy projects to an audience of 2400 inhabited EU islands by 2023, giving the opportunity to test innovative energy technologies and approaches in a cost-competitive way and leading to an expected 440 GWh in annual primary energy savings.

1.1 Scope and Objectives of the Deliverable

One of the main goals of the NESOI facility, is to activate a regular and efficient monitoring process on the supported projects portfolio. In this respect, the aim of this deliverable is to define the appropriate Key Performance Indicators (KPIs) in order to: a) evaluate the success level and suitability of the various types of interventions in the EU Islands; b) monitor the impacts of the NESOI assistance to energy transition; and c) to assess the progress of the NESOI project towards the expected impact targets. NESOI's main expected impact targets are:

- Primary Energy Savings: 440 GWh/yr
- GHG Emission Savings: 160 MtonneCO₂/yr
- Mobilized Investments: Greater than 100 M€

The KPIs that will assess the afore-mentioned main targets and key objectives are referenced as **Pillar KPIs**. Nevertheless, a number of other impacts are expected, as for example:

- LCOE reduction by 8 c€/kWh;
- 250 direct jobs and 1000 jobs along a 10 years period;
- Improvement of the environment for action plans development and decarbonization;
- Improvement of capacity and skills of the technicians;
- Increased quality of life on EU islands;
- New or enhanced sustainable energy plans >20;
- Average annual economic savings of 8 M€/yr;
- Number of retrofitting approaches > 15 and
- RES production in the islands of 20% minimum.

The KPIs that are going to be analytically presented in Section 3 have been selected, appropriately and after several internal discussions, to present the following key characteristics:

- To be representative and scalable for most of the (expected) NESOI energy transitions projects (**meaningful**);



- To have a clear definition (**understandable**);
- To be easy and effortless to estimate/calculate (**technical validity**) and
- To be adaptable for the whole NESOI project (**adaptability**)

In addition, this deliverable aims to provide, useful statistics for all the aspects of energy transition and its positive effects in all domains. The selected KPIs will be the core for the assessment framework of the NESOI project.

1.2 Structure

The deliverable is structured as follows:

- In **chapter 2**, the methodology for KPIs' estimation is described and analysed. The domains of interest are defined and the general rules which govern the KPIs selection are outlined.
- In **chapter 3**, the KPIs per domain are provided using an information sheet template.
- In **chapter 4**, representative examples for KPI estimation are given for typical projects, to provide guidelines for future use by the applicants and to validate the easiness of use.
- In **chapter 5**, data collection guidelines are provided, as well as available public repositories and tools for the KPIs estimation.
- In **chapter 6**, the conclusions from this deliverable are summarized and the next steps are prescribed regarding the NESOI assessment activities.

1.3 Relation to Other Tasks, Deliverables and WPs

Considering this deliverable is dealing with the definition and the selection of the KPIs used for the monitoring and evaluation of NESOI solutions interventions, this is strongly related to WP2 and the NESOI Facilitating Platform, where the required datasets for the KPIs calculation will be collected.

There is a strong relation also with WP3 (Islands' project selection process and criteria) and specifically Task 3.3 (Definition of the selection criteria of submitted projects), since some KPIs will be acting as proposal evaluation criteria. There is strong relation with Tasks 4.5 (Monitoring activities) and 5.2 (Monitoring of grant spending and support to grantees), since the related monitoring activities will make use of the developed KPIs. Finally, in deliverable 6.2, the calculated values of KPI every quarter will be published.

The deliverables that are related to the current deliverable are presented in Table 1.

Table 1: Deliverables related to D6.1.

Nº	Title
D4.5	Monitoring report on on-site TA
D5.2	Monitoring report on Grantees Spending
D6.2	NESOI Assessment framework



2 Methodology

2.1 Methodology Description

Evaluating the effectiveness of a project is of great importance, especially when it comes to meet specific goals during a given period of time. KPIs are representing performance indicators, used to express to what extent these goals have been reached/achieved [1], as quantifiable as possible. Moreover, they can serve the goal of acting as metrics upon which various proposals can be compared on a fair and equity basis. This section presents the approach followed towards the selection of the appropriate KPIs, also used to evaluate the NESOI's assistance impact.

NESOI's assistance impact is related to the impact of each one of funded/supported projects. This statement obligates to define two categories of KPIs. The KPIs **per project** (Category A) and the KPIs used for assessing the development and the targets set for the **whole NESOI project** (Category B).

The KPIs per project represent the set of KPIs, which is related to a **single and specific project**, and their estimated values are derived according to each of the project proposals and progress reports, submitted. With these KPIs it will be able to quantify the impact of the proposed set of interventions, usually by estimation of the energy transition state before the interventions and the state after the interventions, using absolute and/or relative values, if this is needed. An important aspect of the per project KPI selection is that the **projects are not known in advance**; leading to the requirement that the selection of the representative KPIs, needs to be made in a way, to **assess a wide range of energy transition projects**.

The KPIs for the whole NESOI project are **the set of KPIs that will be used to assess the progress and the impact of the NESOI project**. This set of KPIs consists of two subsets. The **1st subset** includes the same KPIs as in Category A, but in an **aggregated form**, which in this case, their estimation/aggregation will be achieved using **summation or averaging process** from the estimated per project KPIs. The **2nd subset** includes KPIs that are going to be estimated from the metadata derived from the projects supported by NESOI. The projects that will be used to estimate Category B KPIs will be included in a well-defined pool of projects. The pool of projects will be updating accordingly, as the NESOI progress towards the next phases/calls.

Category A KPIs (and consequently the 1st subset of Category B), are grouped into the following domains:

- Technical
- Environmental
- Social
- Economic
- Legal

The characteristics of each domain are described in Section 2.2

A visual representation of the described KPI estimation methodology and structure is given in Figure 1.



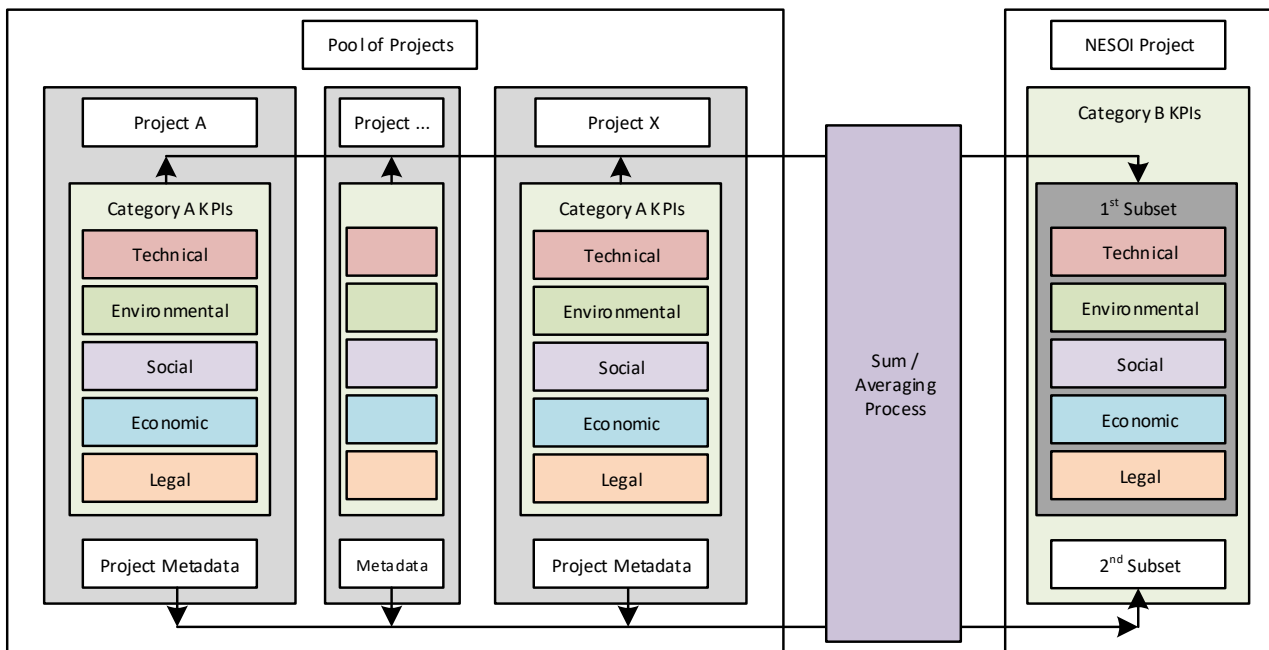


Figure 1: Estimation methodology, relation and structure of the KPIs.

In general, the first and one of the most significant steps for KPIs selection, is to define the orientation of the project. In this respect, the main question is: **“What is the commitment we need to support within this project?”** The answer regarding the orientation and the specific objectives of the NESOI project is clear: **“The EU Islands energy transition and decarbonization”**. Based on this, a review on similar deliverables of related initiatives like CITYkeys [2] and SCIS [3], projects like SMILE [4], INSULAE [5], [6] and IRIS [7], Standards such as the BS ISO 37120:2014 [8] (Sustainable development of communities: Indicators for city services and quality of life) and relevant scientific publications was conducted, which led to an initial list of KPIs included in the repository. Although a wide spectrum of KPIs was found in the aforementioned sources, taking into account the need to collect a manageable dataset for the NESOI facilitating platform from the EU Islands to calculate/estimate the appropriate KPIs, it was considered appropriate to limit the selection into a smaller set of KPIs for each domain of interest (technical, environmental, etc.). During this “filtering” process **four** key characteristics were evaluated, i.e. a) the extent to which the KPIs are:

- a) **meaningful**, which means that a KPI relates with one or several expected innovation impacts, and therefore makes sense;
- b) **understandable**, which means that each KPI’s definition and purpose is clear to all the stakeholders;
- c) **technically valid**, which means that they must be quantifiable either as quantitative indicators (e.g. energy or economic figures), or as qualitative which can be quantified (e.g. using Likert scale) [9]; and
- d) **adaptable** which means that the KPIs have to be able to be used for most energy transition projects, possible of different natures, and to estimate the impact for the whole NESOI.

Many of KPIs have been formulated, as the difference between an old state KPI advancing to a new state as a result of the interventions. This has been done for two reasons: a) to have KPIs as generic as possible and b) to emphasize the transition results.

Finally, during the development of KPI lists, the status of maturity of each project proposal (e.g. project development stage) was considered in relation with the technical assistance menu options. The feasible combinations of technical assistance menus and project development stages are presented in green colour in Table 4. Technical assistance menus have been discussed and agreed among the consortium although specific terms of reference will be defined in WP4, which be conceptually coherent with what it is presented in this document.

Table 2: Technical Assistance Matrix.

		Technical Assistance Menu			
		Energy transition roadmap/iSEAP	Feasibility study and due diligence	Support to LAs for tendering procedures	Business planning and fund matchings
Project development stages	Entry level	EN1	EN2		
	Conceptual design level		CON2	CON3	CON4
	Deployment level			DEP3	DEP4

Technical assistance for a project of an Energy Transition Roadmap requires special treatment as has significant differences from the other technical assistance menu options. All the other options are referring to a specific set of interventions and specific technological solutions that are known during the proposal phase. Energy Transition Roadmaps have as a goal to identify the appropriate interventions for achieving a specific energy transition goal (e.g. 20% CO₂ reduction). Consequently, due to the nature of the EN1 technical assistance, the estimation of Category A KPIs could not be realised before the end of the assistance, as the impact of the proposed interventions will be estimated during the roadmap creation.

Usually, the energy transition roadmaps (such as SEAPs) include, per proposed intervention, the following estimations outcomes:

- Estimation of Energy Savings;
- Estimation of CO₂ emission reduction;
- Estimation of Intervention Cost;
- Funding Source

These outcomes are related to some of the Category A KPIs as, due to large number of the proposed interventions, might not be feasible to estimate all the KPIs, as the impact justification cannot be detailed enough. To conclude, KPIs that are related to the abovementioned outcomes, for EN1 projects, will be compulsory to be provided by the end of the technical assistance, while the rest of the Category A KPIs, will be optional.

As mentioned, a critical and challenging aspect regarding the KPI selection is the high variability of expected eligible projects and heterogeneity of technologies participating into the energy transition projects, each one having a different impact on NESOI metrics. To ensure that all the technologies' impact could be traced in each domain, the various



technology clusters have been identified using results that have been found within Task 1.3 (Technology Scouting) and Task 7.1 (Survey to collect islands' needs).

The major types of technology clusters/solutions that have been identified are:

- Renewable Energy Production Systems (RE)
- Energy Efficiency (EF)
- Mobility Systems (MOB)
- Energy Management (EM)
- Storage Systems (SS)
- Cogeneration Systems (CoGen) and Cogeneration with RE fuel (RE CoGEN)

All these technologies are responding to various energy vectors and final energy uses such as heat, electricity, lighting, transportation etc.

In general, each KPI may be valid for estimating the expected impact of one or more technological solutions; nevertheless, one should keep in mind that an energy transition project may include more than one type of technology, for example a Public Building renovation with shell insulation and BIPV is a project that enables energy efficiency and renewable energy production, simultaneously. When evaluating KPIs, the synergies between the different technologies involved in a project must be taken into account.

The results of this methodology led to the selection of the representative KPIs for each category.

A 1st list of KPIs was distributed along NESOI partners for feedback and comments (February 2020 - M05). Important additions into the KPIs lists have been provided by the partners and useful remarks have been taken into account and a 2nd list has been established. This updated KPI list has been distributed among the partners along with a brief description of the methodology and KPI categorization (June 2020 - M09) and the received feedback consolidated and after a draft review of the deliverable, the proposed KPI list finalized. The KPI selection procedure diagram is displayed in Figure 2.

All the KPIs are provided in brief in Section 3 and comprehensively in the Annex (Chapter 7) along with description and evaluation guidelines.



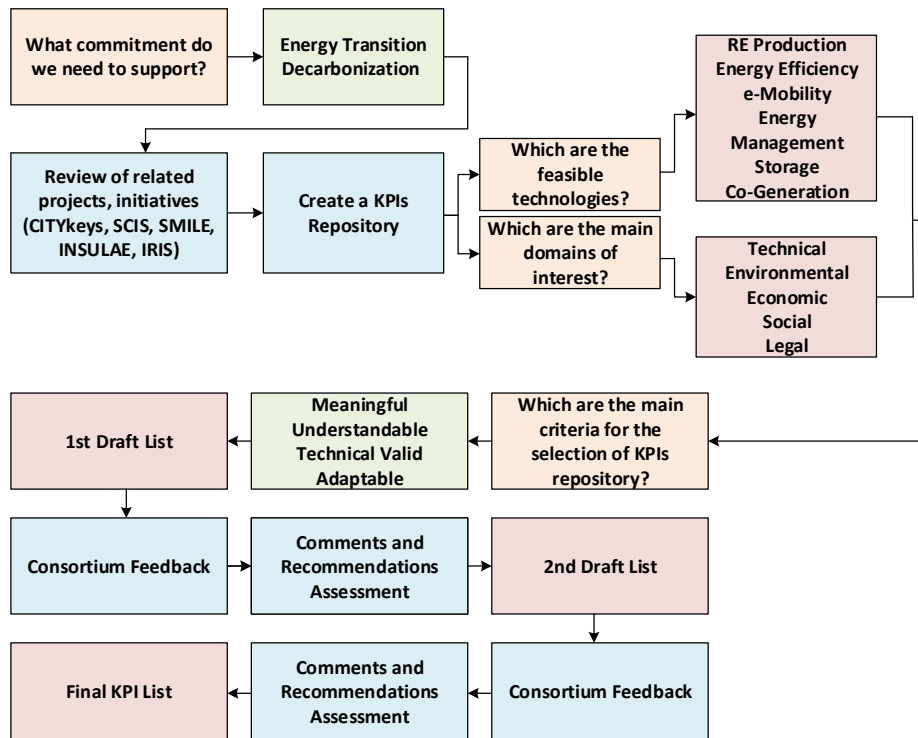


Figure 2: Information flow diagram for KPIs selection.

2.2 Domains of Interest

2.2.1 Technical Domain

KPIs belonging in this domain, aim to assess the technical interventions effectiveness, according to each submitted project’s specific objectives. They can be used to provide analytic results with respect to operating parameters in terms of final energy demand, for example, or they can be more generic. For the purpose of NESOI, technical KPIs can be used to quantify the benefits in terms of energy transition, gained with the deployment of high-efficient systems, RES technologies, energy management sustainable mobility technologies, CHP and storage systems.

2.2.2 Environmental Domain

Environmental KPIs aim to assess the environmental impact of the primary energy savings for each of the solution interventions, proposed in each project. Consequently, reducing the primary and/or the final energy, emissions are reduced as well. These KPIs are used to evaluate the efficiency of the energy systems in environmental terms and the associated expected benefits gained with the deployment of RES technologies and/or the increase in energy efficiency.

2.2.3 Economic Domain

The KPIs in this domain assess the economic efficiency of investments materialized within the NESOI project duration and the economic benefits of the various stakeholders’ groups. Mobilizing more than 100 M€ (10 € for each 1 € funded by the EU) in sustainable energy is



one of the most significant goals of NESOI. In this respect, it is of great importance for the proposed solutions to be viable enough, to achieve replication of energy-related investments. Business stakeholders and investors are obviously related to economic KPIs. The attractiveness of investments is commonly measured with indicators as the payback period, net present value,, targeting at low and high values, respectively. From the consumers' point of view, the expectation of lowering the cost of energy is another parameter that can give valuable information about the economic assessment of the interventions.

2.2.4 Social Domain

One of the objectives of NESOI is to provide coaching, to train and empower the Islands staff to develop investible energy transition projects. Thus, taking into account the close interaction with local communities, the evaluation of NESOI impact on some social factors, as the Local Community involvement/engagement and capacity building, during the implementation phase of a RES-based project for example, is essential. Furthermore, from the consumers' side, it is important for them to be satisfied with the implementation of new strategies/solutions. Of course, as in all relevant actions, the local job creation is also a critical aspect, which needs to be considered. The only problem that is often met in social KPIs, is their quantification considering that they are commonly evaluated using primarily qualitative driven indicators (Likert scale).

2.2.5 Legal Domain

KPIs belonging in the Legal Domain, mainly monitor and aim to assess the legislative background, underpinning the application of the proposed solutions. The specific domain is not commonly used, but it is of great importance since law-making bodies are often not flexible enough to follow the progress of technology. This is a serious barrier, currently experienced among EU member states, since most innovative and customized solutions cannot be actually implemented and operate in real -life conditions because current legislation does not allow it. Therefore, the selected Legal KPIs are chosen to be limited in size and mostly related, with duration of licensing procedures and clarity of the framework.

2.3 Metadata needed for KPIs

For the estimation of the Category B KPIs, specific data will be needed for each proposal. These data are related to the participating islands, the participant entities and their legal form, participating technologies and assistance needed in each proposal. All of these data will be indispensable and essential in each proposal. For clarification, the following will be needed for the purposes of Task 6.2:

- Name of Island / or islands as project location
 - Population per island
 - Area per island
 - Total number of municipalities per island
 - Connection/Interconnection status per island
- Proposal consortium composition (Names)



- Energy Communities participating in the project
- Municipalities (or municipality own companies) participating in the project
 - Population and area the of the municipalities participating
- Public entities
- Private companies
- Technology categories included in proposal for actual projects (multiple choice: Renewable, Storage, Mobility, Efficiency, Co-Gen, Energy Management)
- Technical Assistance Matrix Position
 - Technical Assistance Menu Option
 - Project Development Stage



3 NESOI KPIs List

In this section, the final KPI lists for each domain are presented.

In the first part of this section, the **KPIs of Category A per domain are presented**. The **1st subset of Category B KPIs** is the same as for Category A and no separate KPI list will be presented. In the second part, the **2nd subset of category B KPIs** is presented.

For each KPI, an analytic information sheet has been created and presented in Annex. The information sheets' template is presented in Table 3, with explanatory texts for each field. More specific, for each field of Table 3:

- The **KPI NAME** provides all the identification characteristics, namely the name followed by a unique code and a symbol. Symbols are used in mathematical equations / expressions;
 - The **Main Object** field describes in brief the KPI objective;
 - The **KPI Description** provides an insight into the purpose of the KPI;
 - The **KPI Estimation** provides guidance for the estimation of the KPI;
 - The **KPI Formula** provides a mathematical expression most commonly used for its estimation (if applicable);
 - The **KPI Unit** shows the physical SI units that the result of the KPI should be published in the various reports. Other units are Likert, if a KPI has to be estimated by “Likert Scale” [10]; “#” is used if a KPI is in a natural number and “%” if the indicator is relative;
 - The term **Prerequisites** describes, which quantities should be known in order to estimate this KPI, according to the equation provided. The first field provides a unique symbol for each quantity, the second field provides the name and the third field gives indication for its estimation or its source. More details regarding the source's types are provided in Chapter 5. In any case, the use of the proposed formula/equation is strongly suggested, but as long as the a KPI has been estimated with another method and proper justification is required, then it is acceptable. In many KPIs there are no prerequisites, as no equation for KPI estimation is given;
 - The term **Provided** gives information about the frequency and the first estimation of the KPI. The first field describes the original publication/estimation of this KPI. The valid options are:
 - At **proposal stage**, meaning that this KPI estimation will be included in the proposal. For most KPIs their estimation at the proposal phase will be optional;
 - After **evaluation stage**, meaning that this KPI will be estimated when the evaluation (selection of the beneficiaries) has been finished. This is a valid option for Category B KPIs;
 - At the **End of Technical Assistance or earlier**, meaning that this KPI will be estimated at the end of technical assistance or at an earlier point as part of the work conducted during NESOI assistance; and
 - At the **End of NESOI Project**, is an option valid for Category B KPIs.
- The second field states if the value of this KPI is updatable or not. If it's not updatable then this KPI should not change during the progress of the technical support. If is updatable, then the third option provides its last estimation event.
- The term **Valid for** provides information for the applicability of this KPI. The first field indicates the technology **clusters** in which the proposed intervention has to



be included in order for this KPI to be estimated¹. The clusters' abbreviations have been defined in Section 2.1. The second field indicates for which cases in the technology assistance matrix this KPI has to be estimated. The third field indicates if this KPI, is going to be estimated with an average or a summation method, when upscaled in the Category B KPIs.

Table 3: Template of the KPI Information Sheet

KPI Information Sheet			
KPI NAME	<i>Unique KPI Name</i>	<i>Unique KPI Code</i>	<i>Unique KPI Symbol</i>
Main Object	<i>To provide the object of the KPI in brief</i>		
KPI Description	<i>To describe the applicability and the purpose of this KPI</i>		
KPI Estimation	<i>To provide guidance for the estimation of this KPI</i>		
KPI Formula	<i>Equation or formula for the KPI estimation (where this is applicable)</i>		
KPI Unit	<i>The unit that the KPI value will be provided</i>		
Prerequisites	<i>The symbol of the prerequisite entities</i>	<i>The name of the prerequisite entities</i>	<i>The source/origin of the prerequisite entities</i>
Provided	<i>Original Publication</i>	<i>Updatable</i>	<i>Last Estimation</i>
Valid for	<i>Technology Cluster</i>	<i>Matrix Position</i>	<i>CAT B Aggregate Method</i>

To facilitate the presentation of the KPIs sheet, frequently used terms are presented in Table 4.

Table 4: Frequently used terms in the KPI information sheets

Project	A specific energy transmission project which requests NESOI's technical assistance
Intervention	An intervention is the set of technologies that accomplish project goals. A project may incorporate one or more interventions.
Technology	The technologies that governs the main equipment that have been installed or implemented during the actions.

¹The compatible energy vector (Heat or Electrical Energy) is provided in the name of the KPI.



PART A: CATEGORY A KPIs

3.1 Technical KPIs - Category A

Table 5 Summary of the proposed technical KPIs.

No	KPI Name	Units
T1	RES-Based Electrical Energy Production	MWh/yr
T2	RES-Based Heat Production	MWh/yr
T3	RES Electricity Exported to Grid	MWh/yr
T4	RES Heat Exported to District Heating	MWh/yr
T5	RES-Based Electrical Installed Power	MW
T6	RES-Based Heating Installed Power	MW
T7	Storage Capacity - Electrical Energy	MWh
T8	Storage Capacity - Heat	MWh
T9	Expected Life of Project	yr
T10	Self-Consumption Rate Increase (Island Level - electricity)	%
T11	Degree of Self Supply (Project Level - electricity)	%
T12	LED Lamps Power	kW
T13	Number of Smart Meters	#
T14	Number of EV chargers (incl V2G)	#
T15	Number of V2G Chargers	#
T16	EV chargers (incl V2G) installed power	kW
T17	Buildings Served by District Heating	#

3.2 Environmental KPIs -Category A

Table 6: Summary of the proposed environmental KPIs.

No	KPI Name	Units
E1	Reduction in Annual Final Energy Consumption (energy savings) - Electrical Energy	MWh/yr
E2	Relative Reduction in Annual Final Energy Consumption (energy savings) - Electrical Energy	%



E3	Reduction in Annual Final Energy Consumption (energy savings) - Heat	MWh/yr
E4	Relative Reduction in Annual Final Energy Consumption (energy savings) - Heat	%
E5	GHG Saved per year	tonneCO _{2eq} /yr
E6	Reduction in Annual Fossil Fuel Consumption (Primary)	MWh/yr
E7	Relative Reduction in Annual Fossil Fuel Consumption (Primary)	%
E8	Increase in Annual local Renewable (non-Biomass) Energy Generation (Primary)	MWh/yr
E9	Increase in Annual Local Renewable (Biomass-only) Energy Generation (Primary)	MWh/yr
E10	Reduction in Annual Primary Energy Consumption	MWh/yr
E11	Relative Reduction in Annual Primary Energy Consumption	%
E12	Energy Return on Energy Investment	
E13	Reduction in Annual Municipal or Agricultural Wastes	Tonne/yr
E14	Land Use	m ²
E15	Annual Water Consumption	m ³ /yr

3.3 Social KPIs - Category A

Table 7: Summary of the proposed social KPIs.

No	KPI Name	Units
S1	Consumers' Engagement	Likert scale
S2	Social Compatibility	Likert scale
S3	Ease of Use for End-Users of the Solution	Likert scale
S4	Advantages for End-Users	Likert scale
S5	Increased Environmental Awareness	Likert scale
S6	Local Job Creation in Implementation Phase	PM
S7	Local Job Creation in Operating Phase per year	PM/yr
S8	Local Community Involvement in the Implementation Phase	Likert scale



S9	Local Community Involvement in the Planning Phase	Likert scale
S10	Tourist/Visitors Benefit	Likert scale
S11	Used for Educational Purposes	Likert scale

3.4 Economic KPIs - Category A

Table 8: Summary of the proposed economic KPIs

No	KPI Name	Units
EC1	Payback Period	yr
EC2	Annual Financial Benefit for the End-User	€/yr
EC3	Maintenance Cost per year	€/yr
EC4	Term of the loan financing	Months
EC5	Levelized Cost of Energy	€/kWh
EC6	Capacity Factor	%
EC7	Reduction in Transportation Cost	€/passenger-km
EC8	Net Present Value	€
EC9	Internal Rate of Return	%
EC10- EC16	Funding Breakdown	€

3.5 Legal KPIs - Category A

Table 9: Summary of the proposed legal KPIs

No	KPI Name	Units
L1	Licensing Process Duration	Months
L2	Possibility of Legal Problems (council of state)	Likert scale
L3	Legal Framework Clarity (licensing process)	Likert scale
L4	Number of Decree/Amendments are needed for project implementation	#



PART B: CATEGORY B KPIs

3.6 Consortium Scheme KPIs - Category B

Table 10: Summary of the proposed consortium scheme KPIs - Category B

No	KPI Name	Units
OS1	Energy Communities Activated - Proposal	#
OS2	Energy Communities Activated - Funded	#
OS3	City Administrators Activated - Proposal	#
OS4	City Administrators Activated - Funded	#
OS5	Other Public Sector Entities Activated - Proposal	#
OS6	Other Public Sector Entities Activated - Funded	#
OS7	Private Sector Entities Activated - Proposal	#
OS8	Private Sector Entities Activated - Funded	#
OS9	Public Sector Only Projects - Proposal	#
OS10	Public Sector Only Projects - Funded	#
OS11	Private Sector Only Projects - Proposal	#
OS12	Private Sector Only Projects - Funded	#
OS13	Private - Public Sector Projects - Proposal	#
OS14	Private - Public Sector Projects - Funded	#
OS15	Energy Communities - with Public/or Private Sector Projects - Proposal	#
OS16	Energy Communities - with Public/or Private Sector Projects - Funded	#

3.7 Funding KPIs - Category B

Table 11: Summary of the proposed funding related KPIs - Category B

No	KPI Name	Units
OEC1	Total Investment Mobilized	€
OEC2- OEC11	Expected Mobilized Investment (2021-2030)	€
OEC12- OEC17	Funds for each project category	€



3.8 Other Statistical KPIs - Category B

Table 12: Other Statistical KPIs - Category B

No	KPI Name	Units
OST1	Number of Projects Received Technical Assistance	#
OST2	Number of Projects Requested Technical Assistance	#
OST3	Funds for Support Received by Project Beneficiaries	€
OST4	NESOI Erasmus Support Received	#
OST5	NESOI Erasmus Support Requested	#
OST6	NESOI Erasmus Support Funds	€
OST7	Size of Islands (Area)	km ²
OST8	Size of Islands (Population)	#
OST9	Geographical dispersion (Number of Countries)	



4 KPI Estimations- Project Examples

To estimate the KPIs for each project, there are 3 main steps.

Step One - Data Gathering

To estimate each KPI, an great number of input data is required. The input data might originate from:

- Various Statistics Repositories
- Market Analysis
- Technical Characteristics
- Common Practice/Assumptions
- Technical Study/Decision Variables

Step Two - Intermediate Outputs

To estimate the KPIs, intermediate outputs may be needed before the final estimation. These outputs might be able to be estimated using a simple spreadsheet or using more sophisticated software. Some KPIs might be used in order to estimate other intermediate outputs or other KPIs.

Step Three - KPI Estimation

The KPIs estimation is based on the KPI information sheets that have been provided.

In the next sections, four representative and common projects are presented to be used as examples for the KPI calculations.

- A Renewable Energy Production Project
- A Public Building Retrofit
- A District heating system coupled with biomass CHP
- Public Transportation with Electric Buses

Not all the intermediate calculations will be performed analytically as some need a lot of intermediate outputs (cashflows etc.) which is out of scope but all the KPI's estimated values will be presented.

In the last section of this chapter, the category B KPIs are calculated based on the small set of project/examples.

4.1 RE Example - 100kWp PV Park in Ikaria

In this example it is presented the KPIs estimation for the simple and common case of a renewable electrical energy production plant based on the photovoltaic technology. The rated installed power of the system will be 100 kWp and the installed area will have the characteristics of the Greek island of Ikaria.

The island of Ikaria is an autonomous island, covering its electrical power needs with a mix of Oil and RES.

For the KPI's estimation a number of inputs are needed from various sources and various types.



Island Electrical Energy Consumption		
Energy Consumption	E_cons_el_isl (GWh/yr)	4.5
Island Electrical Mix		
Oil Penetration	f_oil (%)	82.7%
RES Penetration	f_res (%)	17.3%
Conversion Efficiency		
Oil Conversion Efficiency	η_{oil} (%)	35%
PV Conversion Efficiency	η_{pv} (%)	100%
Grid Data		
Grid Efficiency	η_{grid} (%)	92%
Expected Curtail	η_{curt} (%)	1%
Emission Factors		
Oil Emission Factor	em_oil (tonneCO ₂ /MWh)	0.267
PV Emission Factor	em_pv (tonneCO ₂ /MWh)	0
Fuels Properties		
Oil Heating Value	HV_oil (GJ/tonne oil equivalent)	41.868
Energy Invested (kWh/m ²)		
PV investment	EI_pv (kWh/m ²)	1300
Market Related Data		
Project Cost	C_o (€)	70,000
Tariff	(€/kWh)	0.07
Common Practice / Assumption Data		
Project Duration (yr)	T_pr (yr)	25
Spacing	f_pv_space (%)	100%
Technical Characteristics		
STC Efficiency	η_{STC} (%)	15%

The energy production from PV can be estimated from specialized software (e.g. Retscreen) or well-established websites (e.g. [Renewable Ninja](#)). In this case, the energy



produced from the PV system is estimated for a year (no panel degradation has been considered).

Table 14: Energy Production Estimation - RE Example

Name	Symbol	Equation or Software	Value
RES-based elect Production (KPI T1)	RE_el (MWh/yr)	(Renewable Ninja)	175.76
RES electricity exported to Grid (KPI T3)	RE_el-gr (MWh/yr)	$RE_el * (1 - n_curt)$	174

A significant number of intermediate outputs can be estimated. The index *old* refer to the state before the intervention and the index *new*, refer to the expected state after the intervention.

Table 15: Intermediate outputs of the RE Examples

Name	Symbol	Equation	Value
Elec Energy from Oil (old)	E_oil_old (MWh/yr)	$E_el_com * f_oil$	3722
Elec Energy from RES (old)	E_res_old (MWh/yr)	$E_el_com * f_res$	779
Elec Energy from Oil (new)	E_oil_new (MWh/yr)	$E_oil_old - RE_el_gr$	3554
Elec Energy from RES (new)	E_res_new (MWh/yr)	$E_el_com - E_oil_new$	525
Oil Penetration (new)	f_oil_new (%)	E_oil_new / E_el_com	79
RES Penetration (new)	f_res_new (%)	E_res_new / E_el_com	21
Oil consumption (old)	m_oil_old (tonne/yr)	$E_oil_old / (HV_oil * \eta_oil) * 3600$	914.26
Oil consumption (new)	m_oil_new (tonne/yr)	$E_oil_new / (HV_oil * \eta_oil) * 3600$	871.51
Oil consumption primary (old)	E_p_ff_oil_old (MWh/yr)	E_oil_old / η_oil	10,633
Oil consumption primary (new)	E_p_ff_oil_new (MWh/yr)	E_oil_new / η_oil	10,163

Table 16: Technical KPIs of the RE Example

KPI	Value	Unit	KPI #	Value	Unit
T1	175.76	MWh/yr	T10	3.91%	%



T2	0	MWh/yr	T11	0	%
T3	174.00	MWh/yr	T12	0	W
T4	0	MWh/yr	T13	0	#
T5	0.1	MW	T14	0	#
T6	0	MW	T15	0	#
T7	0	MWh	T16	0	kW
T8	0	MWh	T17	0	#
T9	25	yr			

Table 17: Environmental KPIs of the RE Example

KPI	Value	Unit	KPI #	Value	Unit
E1	0	MWh/yr	E9	0	MWh/yr
E2	0	%	E10	497.15	MWh/yr
E3	0	MWh/yr	E11	4.68%	%
E4	0	%	E12	4.7	
E5	120.53	tonneCO _{2eq} /yr	E13	0	tonne/yr
E6	497.18	MWh/yr	E14	1333	m ²
E7	4.676%	%	E15	2	m ³
E8	175.8	MWh/yr			

Table 18: Social KPIs of the RE Example

KPI	Value	Unit	KPI #	Value	Unit
S1	2	Likert scale	S7	2	PM/yr
S2	4	Likert scale	S8	2	Likert scale
S3	5	Likert scale	S9	2	Likert scale
S4	5	Likert scale	S10	3	Likert scale
S5	5	Likert scale	S11	4	Likert scale
S6	20	PM			

Table 19: Economic KPIs of the RE Example

KPI	Value	Unit	KPI #	Value	Unit
EC1	6.4	yr	EC9	16.46%	%



EC2			EC10	0	
EC3	400	€/yr	EC11	0	
EC4	0	Months	EC12	70,000	€
EC5	0.023	€/kWh	EC13	0	
EC6	20.06	%	EC14	0	
EC7	0	€/passenger-km	EC15	0	
EC8	159,988	€	EC16	0	

Table 20: Legal KPIs of the RE Example

KPI	Value	Unit	KPI #	Value	Unit
L1	5	Months	L3	5	Likert scale
L2	1	Likert scale	L4	0	#

Table 21: Metadata for the RE Example

Partnerships					
Partnerships		Island Size	254.4	km ²	
Energy communities	0	Population ₂₀₁₁	8,423		
City administration	0	Country	Greece		
Other public authorities	0	Fund requested	7000	€	
Private organizations	1	Technical assistance Code	EN2		
		Technology Cluster	RE		

4.2 Building Retrofit Example - Public Building in Aegina

In this example the KPIs estimation will take place for the case of a public building retrofit in the island of Aegina, Greece. The technologies that will be used in this project are:

- Insulation Upgrade
- Heat Pump Installation
- Building Integrated PV
- LED Lamps



The building has 1 floor (ground floor) and a total area of 104 m². Before the interventions, it covers its heating needs with an oil boiler and its cooling needs with a conventional chiller. After the interventions, the building will use a 16 kW_{th} heat pump for heating and cooling needs. The insulation will be made of 5 cm polystyrene with thermal conductivity of 0.035 W/(m·K). For the lighting upgrade, 30 LED lamps will be applied of 6 Watt each. The solar PV will be installed in the roof, on optimal plane and orientation and they will have installed power of 6 kW, for covering the building needs, using net-metering.

The insulation upgrade will reduce the heating and cooling losses, and consequently the heating needs and cooling needs. The effect of this intervention is presented in Table 23 and have been accomplished by an external software using the method of Heating and Cooling Degree Days. The heat pump installation will cover the heating and cooling needs with electrical energy, that partially, or in total might have been produced by the installed PV system. The building lighting will be upgraded with low consumption LED bulbs, reducing the electrical consumption by a considerable amount of energy.

Table 22: Input Data - Building Retrofit Example

Interconnected Electrical Mix		
Fossil Share in Energy Mix	f_fossil	67.86%
Conversion Efficiency		
Oil Conversion Efficiency (burner)	η_{oil} (%)	90%
PV Conversion Efficiency	η_{pv} (%)	100%
Grid Data		
Grid Efficiency	η_{grid} (%)	92%
Emission Factors		
Oil Emission Factor	em_oil (tonneCO ₂ /MWh)	0.267
PV Emission Factor	em_pv (tonneCO ₂ /MWh)	0
Grid Factor	em_grid (tonneCO ₂ /MWh)	0.634
Fuels Properties		
Oil Heating Value	HV_oil (GJ/tonne oil equivalent)	41.868
Oil density	ρ_{oil} (kg/L)	0.910
Energy Invested (kWh/m ²)		
PV investment	EI_pv (kWh/m ²)	1300
Market Related Data		
Project Cost	C_o (€)	26,260



Tech 1 Cost (Lamps)	C_o_1 (€)	150
Tech 2 (PV)	C_o_2 (€)	9000
Tech 3 (HP)	C_o_3 (€)	10000
Tech 4 (Insulation)	C_o_4 (€)	7110
Cost of Energy		
Oil Cost	UC_oil (€/L)	0.9
Electricity Cost	UC_el (€/MWh)	180
Common Practice / Assumption Data		
Project Duration (yr)	T_pr (yr)	25
Technical Characteristics		
STC Efficiency	η_{STC} (%)	15%
HP COP heat	COP_th	3
HP COP cool	COP_cl	2.5
Chiller COP cool	COP_chiller	2.5

Table 23: Insulation Effect on Heating and Cooling Needs - Building Retrofit Example

Name	Symbol	Value
Heating needs (old)	E_fe_th_old (MWh/yr)	32.28
Heating needs (new)	E_fe_th_new (MWh/yr)	6.52
Cooling needs (old)	E_fe_cl_old (MWh/yr)	24.11
Cooling needs (new)	E_fe_cl_new (MWh/yr)	21.84

Table 24: Intermediate outputs of the Building Retrofit Example

Name	Symbol	Equation	Value
Oil for Heating (old)	m_oil (kg/yr)	$E_{fe_th_old} * 3600 / (HV_{oil} * \eta_{oil})$	3084.5
Emissions from oil (old)	GHG_oil_old (tonneCO _{2eq} /yr)	$em_{oil} * E_{fe_th_old} / \eta_{oil}$	9.57
Elec for Cooling (old)	E_el_cl_old (MWh/yr)	$E_{fe_cl_old} / COP_{chiller}$	9.64
Elec for Lighting (old)	E_el_lght_old (MWh/yr)	Approximation	3



Total Electricity (old)	$E_{el_grid_old}$ (MWh/yr)	$E_{el_cl_old}$ $E_{el_lght_old} +$	12.64
Emissions from Elect (old)	GHG_{el_old} (tonneCO _{2eq} /yr)	$E_{el_grid_old} * em_{grid} / \eta_{grid}$	8.71
Total Emissions (old)	GHG_{old} (tonneCO _{2eq} /yr)	GHG_{el_old} $GHG_{oil_old} +$	18.29
Fossil Fuel Consumption (Primary) (old) - Elec	$E_{p_ff_el_old}$ (MWh/yr)	$E_{el_grid_old} * 2.5 * f_{fossil}$	21.45
Fossil Fuel Consumption (Primary) (old) - Heat	$E_{p_ff_th_old}$ (MWh/yr)	$m_{oil} * HV_{oil} / 3600$	35.87
Total Fossil Fuel Consumption (Primary) (old)	$E_{p_ff_old}$ (MWh/yr)	$E_{p_ff_el_old}$ $E_{p_ff_th_old} +$	57.32
RES-based elect Production (KPI T1)	RE_{el} (MWh/yr)	(Renewable Ninja)	9.15
Elec for Cooling (new)	$E_{el_cl_new}$ (MWh/yr)	$E_{fe_cl_new} / COP_{cl}$	2.18
Elec for Heating (new)	$E_{el_th_new}$ (MWh/yr)	$E_{fe_th_new} / COP_{th}$	8.74
Elec for Lighting (new)	$E_{el_lght_new}$ (MWh/yr)	Approximation	0.225
Total Elect Demand (new)	$E_{cons_el_pr_new}$ (MWh/yr)	$E_{el_cl_new}$ $E_{el_th_new}$ $E_{el_lght_new} +$	11.19
Elec from Grid (new)	$E_{el_grid_new}$ (MWh/yr)	$E_{cons_el_pr_new}$ $RE_{el} -$	1.99
Emissions from Elect (new)	GHG_{el_new} (=GHG _{new}) (tonneCO _{2eq} /yr)	$E_{el_grid_new} * em_{grid} / \eta_{grid}$	1.4
Total Fossil Fuel Consumption (Primary) (new)	$E_{p_ff_new}$ (MWh/yr)	$f_{fossil} * 2.5 * E_{el_grid_new}$	3.37
Cost of Electricity (old)	$Cost_{el_old}$ (€/yr)	$E_{el_grid_old} * UC_{el}$	2276.1
Cost of Oil (old)	$Cost_{oil_old}$ (€/yr)	$m_{oil} * UC_{oil} * p_{oil}$	2526.2



Total Cost of Energy	$\text{Cost}_{en_old}(\text{€}/\text{yr})$	$\text{Cost}_{el_old} + \text{Cost}_{oil_old}$	4802.3
Cost of Electricity (new)	$\text{Cost}_{el_new}(\text{€}/\text{yr})$	$E_{el_grid_new} * UC_{el}$	357.6
Cost Reduction ²	$\text{Cost}_{red}(\text{€}/\text{yr})$	$\text{Cost}_{en_old} - \text{Cost}_{el_new}$	4294.63
Degree of Self Supply (KPI T11)	F_{ss}	$\frac{RE_{el}}{E_{cons_el_pr_new}}$	82.16
RES based heat Production (KPI T2)	$RE_{th}(\text{MWh}/\text{yr})$	$E_{fe_th_new} * F_{ss}$	5.37
Reduction in annual final energy consumption - Elec (KPI E1)	$\Delta E_{f_el}(\text{MWh}/\text{yr})$	$E_{el_grid_old} - E_{el_grid_new}$	10.66
Reduction in annual final energy consumption - Heat (KPI E3)	$\Delta E_{f_th}(\text{MWh}/\text{yr})$	$E_{fe_th_old} - E_{fe_th_new}$	25.8
Emissions Reduction (KPI E5)	$\Delta GHG(\text{tonneCO}_{2eq}/\text{yr})$	$GHG_{old} - GHG_{new}$	16.92
Fossil Fuel Consumption Reduction (Primary) (KPI E6, E11)	$\Delta E_{p_ff}(\text{MWh}/\text{yr})$	$E_{p_ff_old} - E_{p_ff_new}$	53,95
Energy Lifetime from RE ³	$RE_{el_lf}(\text{MWh}/\text{yr})$	$RE_{el} * (T_{pr-10}) * RE_{el} * (T_{pr-15}) * 0.8$	210
Energy invested	$EI_{pv_sys}(\text{MWh})$	$EI_{pv} * P_{pv} / \eta_{STC}$	52
EROI (KPI E12)	EROI	RE_{el_lf} / EI_{pv_sys}	4

Table 25: Technical KPIs of the Retrofit Example

KPI	Value	Unit	KPI #	Value	Unit
T1	9.2	MWh/yr	T10	0	%
T2	5.4	MWh/yr	T11	82.16%	%

² Is considered as a source of income.

³ 80% of Panel Degradation has been assumed after 15 years.



T3	0	MWh/yr	T12	250	W
T4	0	MWh/yr	T13	0	#
T5	0.006	MW	T14	0	#
T6	0	MW	T15	0	#
T7	0	MWh	T16	0	kW
T8	0	MWh	T17	0	#
T9	25	yr			

Table 26: Environmental KPIs of the Retrofit Example

KPI	Value	Unit	KPI #	Value	Unit
E1	10.66	MWh/yr	E9	0	MWh/yr
E2	84.3	%	E10	53.95	MWh/yr
E3	25.8	MWh/yr	E11	94.12	%
E4	79.8	%	E12	4.0 ⁴	
E5	16.9	tonneCO _{2eq} /yr	E13	0	tonne/yr
E6	54	MWh/yr	E14	0	m ²
E7	94.1	%	E15	0	m ³
E8	0	MWh/yr			

Table 27: Social KPIs of the Retrofit Example

KPI	Value	Unit	KPI #	Value	Unit
S1	1	Likert scale	S7	0	PM/yr
S2	5	Likert scale	S8	1	Likert scale
S3	1	Likert scale	S9	1	Likert scale
S4	4	Likert scale	S10	3	Likert scale
S5	3	Likert scale	S11	2	Likert scale
S6	10	PM			

Table 28: Economic KPIs of the Retrofit Example

KPI	Value	Unit	KPI #	Value	Unit
EC1	6.7	yr	EC9	15.95	%

⁴ For RE/PV only

EC2	0.329 ⁵	€/yr	EC10	0	€
EC3	150	€/yr	EC11	26,260	€
EC4	0	Months	EC12	0	€
EC5	0.02	€/kWh _e	EC13	0	€
EC6	17.41	%	EC14	0	€
EC7	0	€/passenger-km	EC15	0	€
EC8	57586	€	EC16	0	€

Table 29: Legal KPIs of the Retrofit Example

KPI	Value	Unit	KPI #	Value	Unit
L1	2	Months	L3	1	Likert scale
L2	1	Likert scale	L4	1	#

Table 30: Metadata for the Retrofit Example

Partnerships					
Energy communities		0	Island Size	87.4	km ²
City administration		1	Population ₂₀₁₁	13,056	
Other public authorities		0	Country	Greece	
Private organizations		0	Fund requested	2000	€
			Technical assistance Code	EN2	
			Technology Cluster	RE, EF	

4.3 CHP with DH Example - 2MW_{th} / 0.7 MW_e in Samsø

In this example it is presented the KPIs estimation for the case of a combined heat and power plant providing heat to a number of households, through a small district heating network and selling electricity to the grid. The CHP system will be operating using biomass (straw) and will produce heat to cover the needs of 260 buildings. Its peak thermal power will be 2 MW_{th} and the electrical 0.7 MW_e. Currently, these premises use oil to meet their heating needs. The island is connected to the mainland.

⁵ (=4295 €/yr/13056). 13056 is the number of municipality/island residences



Table 31: Input Data - CHP with DH Example

Interconnected Electrical Mix		
Oil Penetration	f_oil (%)	0.87%
Natural Gas Penetration	f_ng (%)	6.3%
Coal Penetration	f_coal (%)	23.6%
Waste (non-RES)	f_waste (%)	2.3%
RES Penetration	f_res (%)	68.9%
Conversion Efficiency		
Oil Conversion Efficiency	η_{oil} (%)	90%
Biomass Burner Efficiency	η_{boiler} (%)	83%
Steam Turbine Efficiency	η_{steam} (%)	40%
Grid / DH Data		
Grid Efficiency	η_{grid} (%)	92%
DH transfer efficiency	η_{DH} (%)	70%
Emission Factors		
Oil Emission Factor	em_oil (tonneCO ₂ /MWh)	0.267
Grid Emission Factor	em_grid (tonneCO ₂ /MWh)	0.332
Fuels Properties & Cost		
Oil Heating Value	HV_oil (GJ/tonne oil equivalent)	41.87
Straw Heating Value	HV_straw (GJ/tonne)	15.89
Oil Cost	UC_oil (€/L)	1.4
Oil density	ρ_{oil} (kg/L)	0.910
Straw Cost	UC_straw (€/kg)	0.08
Heat Load		
Annual Heat Demand (average per house)	Q_house (MWh/yr)	17.85
Market Related Data		
Project Cost	C_o (€)	2,200,000



Tariffs	TR _{el} (€/kWh _e) and TR _{th} (€/kWh _{th})	0.08 & 0.09
Common Practice / Assumption Data		
Project Duration (yr)	T _{pr} (yr)	20

Table 32: Intermediate outputs of the CHP with DH Example

Name	Symbol	Equation	Value
House Heating Needs (KPI T4)	E _{therm_needs} (MWh/yr)	Q _{house} *N _{house}	4641
Primary energy from Oil (old)	E _{p_ff_oil_old} (MWh/yr)	E _{therm_needs} /η _{oil}	5156.7
Oil mass (old)	m _{oil} (kg/yr)	E _{p_ff_oil_old} / (HV _{oil} *3600)	443,393
Primary energy from Straw (new)	E _{p_BM_straw_new} (MWh/yr)	Q _{therm_needs} /(η _{DH} *η _{boiler})	7987.95
RES based elect Production (KPI T1, T3)	RE _{el} (MWh/yr)	Heating Load Following Method (Software)	1268
Heat produced CHP (new) (KPI T2)	E _{fe_th_CHP_new} (MWh/yr)	E _{therm_needs} / *η _{boiler}	6630
GHG Emissions (old) - heat	GHG _{old_th} (tonneCO _{2eq} /yr)	E _{p_ff_oil_old} *em _{oil}	1376.8
GHG Emissions (old) - elect	GHG _{old_el} (tonneCO _{2eq} /yr)	RE _{el} *em _{grid}	420.7
GHG Emissions (old)	GHG _{old} (tonneCO _{2eq} /yr)	GHG _{old_el} + GHG _{old_th}	1792.6
GHG Emissions (new)	GHG _{new} (tonneCO _{2eq} /yr)	Approximation	0
TPE from Fossil Fuel - Elect in Denmark	TPE _{ff_el} (GWh/yr)	(f _{oil} + f _{ng} + f _{coal})* E _{el_com} *2.5	21895.8
TPE coefficient	TPE _{el} (MWh _{tpe} /MWh _e)	TPE _{ff_el} / E _{el_com}	0.7208
Fossil Fuel Consumption Reduction (Primary) Electricity	ΔE _{p_ff_el} (MWh/yr)	TPE _{el} * RE _{el}	914.01



Fossil Fuel Consumption Reduction (Primary) (KPI E6)	ΔE_{p_ff} (MWh/yr)	$\Delta E_{p_ff_el} + E_{p_ff_oil_old}$	6070.7
Reduction in annual primary energy consumption	ΔE_{p_C} (MWh/yr)	$\Delta E_{p_ff} - E_{p_BM_straw_new}$	-1917.27
Relative reduction in annual primary energy consumption	$\Delta E_{p_C_r}$ (%)	$\frac{\Delta E_{p_ff} - Q_{E_{p_BM_straw_new}}}{\Delta E_{p_ff}}$	-31.58
Municipal or Agricultural Waste Reduction	m_{straw} (kg/yr)	$\frac{E_{p_BM_straw_new} * 3600}{HV_{straw}}$	1,809,731
Water Use ⁶	Q_{water} (m ³ /yr)	$RE_{el} * f_{wc}$	240
Capacity Factor Elect	CF_{el} (%)	$RE_{el} / (8760 * P_{RE_el})$	20.68%
Capacity Factor Heat	CF_{th} (%)	$RE_{th} / (8760 * P_{RE_th})$	37.84%
Cost for End-User (old)	$Cost_{EU_old}$ (€/yr)	$\frac{Q_{house} * 3,600,000 * UC_{oil} * \rho_{oil}}{(\eta_{oil} * HV_{oil})}$	2623.6
Cost for End-User (new)	$Cost_{EU_new}$ (€/yr)	$Q_{house} / (1000 * TR_{el})$	1606.5
Annual Financial Benefit for the End-User	FBE (€/yr)	$Cost_{EU_old} - Cost_{EU_new}$	1017.1

Table 33: Technical KPIs of the CHP with DH Example

KPI	Value	Unit	KPI #	Value	Unit
T1	1268	MWh/yr	T10	0	%
T2	6630	MWh/yr	T11	0	%
T3	1268	MWh/yr	T12	0	W
T4	4641	MWh/yr	T13	0	#
T5	0.7	MW	T14	0	#
T6	2.0	MW	T15	0	#

⁶ Assumption: $f_{wc} = 0.189$ L/kWhe. For CHP subsystem only.



T7	0	MWh	T16	0	kW
T8	0	MWh	T17	260	#
T9	20	yr			

Table 34: Environmental KPIs of the CHP with DH Example

KPI	Value	Unit	KPI #	Value	Unit
E1	0	MWh/yr	E9	7987.95	MWh/yr
E2	0	%	E10	-1917.27	MWh/yr
E3	0	MWh/yr	E11	-31.58%	%
E4	0	%	E12	9.5 ⁷	
E5	1797.5	tonneCO _{2eq} /yr	E13	1810	tonne/yr
E6	6070.7	MWh/yr	E14	2000	m ²
E7	100%	%	E15	240	m ³
E8	0	MWh/yr			

Table 35: Social KPIs of the CHP with DH Example

KPI	Value	Unit	KPI #	Value	Unit
S1	5	Likert scale	S7	36	PM/yr
S2	4	Likert scale	S8	2	Likert scale
S3	3	Likert scale	S9	4	Likert scale
S4	5	Likert scale	S10	32	Likert scale
S5	5	Likert scale	S11	3	Likert scale
S6	200	PM			

Table 36: Economic KPIs of the CHP with DH Example

KPI	Value	Unit	KPI #	Value	Unit
EC1	8	yr	EC9	11.5%	%
EC2	1017.1	€/yr	EC10	0	€
EC3	10000	€/yr	EC11	0	€
EC4	40	Months	EC12	500,000	€
EC5	0.281/0.077	€/kWh _e /	EC13	500,000	€

⁷ Approximation

	or -0.049/0.055 ⁸	€/kWh _{th}			
EC6	20.28 & 37.84	%	EC14	1,200,000	€
EC7	0	€/passenger- km	EC15	0	€
EC8	2,945,716 ⁹	€	EC16	0	€

Table 37: Legal KPIs of the CHP with DH Example

KPI	Value	Unit	KPI #	Value	Unit
L1	30	Months	L3	3	Likert scale
L2	3	Likert scale	L4	1	#

Table 38: Metadata for the CHP with DH Example

Partnerships		Island Size	114.3	km ²
Energy communities	1	Population ₂₀₁₁	3724	#
City administration	0	Country	Denmark	
Other public authorities	0	Fund requested	60,000	€
Private organizations	1	Technical assistance Code	EN2	
		Technology Cluster	RE CoGEN	

4.4 EV's Example - 4 BEB in Chios

In this example it is presented the KPI estimation for the procurement of 4 Battery Electric Buses (BEB) for public transportation, replacing 4 similar buses using diesel engine. The buses are considered to be 12 m long with capacity of 80 persons. Additionally, 2 chargers will be installed. As the bus fare is not known, for the estimation of the financial parameters a 10% was added in the levelized cost of transportation (€/km*passenger)

⁸ The second set of values are based on [11]

⁹ No loan cost has been taken into account



Table 39: Input Data - BEB Example

Island Electrical Energy Consumption		
Energy Consumption	E_cons_el_isl (MWh/yr)	206,335
Grid Efficiency	η_{grid} (%)	92%
Island Electrical Mix		
Oil Penetration	f_oil (%)	86.41%
RES Penetration	f_res (%)	13.59%
Project Parameters		
Number of Buses	N_bus (#)	4
Average Daily Distance	ADD (km/day)	400
Average Occupancy per km	Occ_av	30%
Fuel Properties		
Oil density	ρ_{oil} (kg/L)	0.910
Oil Emission Factor	em_oil (tonneCO ₂ /MWh)	0.267
Oil Heating Value	HV_oil (GJ/tonne oil equivalent)	41.868
Conversion Efficiency		
Oil Conversion Efficiency	η_{oil} (%)	35%
Market Related Data		
Purchase Cost per bus - BEB	C_beb (€)	650,000
Cost for one charger	C_chrg (€)	50,000
Purchase Cost per bus - Diesel	C_dsl (€)	350,000
Common Practice / Assumption Data		
Project Duration (yr)	T_pr (yr)	12
Maintenance cost - BEB	MC_beb (€/km)	0.2
Maintenance cost - Diesel	MC_dsl (€/km)	0.4
Technical Characteristics		
Fuel Consumption - Diesel	EC_dsl (L/km)	0.6
Energy Consumption - BEB	EC_beb (kWh/km)	1.5



	Energy Cost	
Electricity Cost	UC_el (€/kWh)	0.2
Diesel / Oil Cost	UC_oil (€/L)	0.9

Table 40: Intermediate outputs - BEB Example

Name	Symbol	Equation	Value
Fuel Consumption	m_oil_old (tonne/yr)	$EC_{dsl} * N_{bus} * ADD * 365 / \rho_{oil}$	318.86
Electricity Consumption	E_fe_el_new (MWh/yr)	$EC_{beb} * N_{bus} * ADD * 365 / 1000$	876
GHG Emissions (old)	GHG_old (tonneCO _{2eq} /yr)	$m_{oil_old} * em_{oil} * HV_{oil} / 3600$	990.13
GHG Emissions (new)	GHG_new (tonneCO _{2eq} /yr)	$E_{fe_el_new} * em_{oil} * HV_{oil} * f_{oil} / \eta_{grid}$	219.67
Fossil Fuel Consumption Reduction (Primary) (old)	E_p_ff_old (MWh/yr)	$m_{oil_old} * HV_{oil} / 3.6$	3708.3
Fossil Fuel Consumption Reduction (Primary) (new)	E_p_ff_new (MWh/yr)	$E_{fe_el_new} * f_{oil} / (\eta_{grid} * \eta_{oil})$	2350.8
Fossil Fuel Consumption Reduction (Primary) (KPI E6)	ΔE_{p_ff} (MWh/yr)	$E_{p_ff_old} - E_{p_ff_new}$	1357.6

Table 41: Technical KPIs of the BEB Example

KPI	Value	Unit	KPI #	Value	Unit
T1	0	MWh/yr	T10	0	%
T2	0	MWh/yr	T11	0	%
T3	0	MWh/yr	T12	0	W
T4	0	MWh/yr	T13	0	#
T5	0	MW	T14	2	#
T6	0	MW	T15	0	#
T7	0	MWh	T16	100	kW



T8	0	MWh	T17		#
T9	12	yr			

Table 42: Environmental KPIs of the BEB Example

KPI	Value	Unit	KPI #	Value	Unit
E1	0	MWh/yr	E9	0	MWh/yr
E2	0	%	E10	1356.6	MWh/yr
E3	0	MWh/yr	E11	36.61%	%
E4	0	%	E12		
E5	770.5	tonneCO _{2eq} /yr	E13	0	tonne/yr
E6	1356.6	MWh/yr	E14	0	m ²
E7	36.61%	%	E15	0	m ³
E8	0	MWh/yr			

Table 43: Social KPIs of the BEB Example

KPI	Value	Unit	KPI #	Value	Unit
S1	3	Likert scale	S7	0	PM/yr
S2	5	Likert scale	S8	3	Likert scale
S3	5	Likert scale	S9	3	Likert scale
S4	5	Likert scale	S10	5	Likert scale
S5	5	Likert scale	S11	4	Likert scale
S6	20	PM			

Table 44: Economic KPIs of the BEB Example

KPI	Value	Unit	KPI #	Value	Unit
EC1	7.3	yr	EC9	9.19	%
EC2	50 ¹⁰	€/yr	EC10	0	€
EC3	116,800	€/yr	EC11	1,350,000	€
EC4	40	Months	EC12	0	€

¹⁰ Approximate benefit for passenger (average distance 4km for 200days/yr) comparing with a Diesel Bus.



EC5	0.1 ¹¹	€/passenger-km	EC13	0	€
EC6	0	%	EC14	1,350,000	€
EC7	0.058	€/passenger-km	EC15	0	€
EC8 ¹²	1,584,593	€	EC16	0	€

Table 45: Legal KPIs of the BEB Example

KPI	Value	Unit	KPI #	Value	Unit
L1	0	Months	L3	3	Likert scale
L2	5	Likert scale	L4	2	#

Table 46: Metadata for the BEB Example

Partnerships		Island Size	842	km ²
Energy communities	0	Population ₂₀₁₁	51,930	#
City administration	1	Country	Greece	
Other public authorities	0	Fund requested	60,000	€
Private organizations	0	Technical assistance Code	EN2	
		Technology Cluster	MOB	

4.5 NESOI Assessment Example

In this paragraph, the Estimated KPIs and the metadata of the presented examples will form the Category B set of KPIs.

Table 47: Technical KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
T1	1451.2	MWh/yr	T10	3.91	%

¹¹ For 30% average occupancy

¹² No loan cost has been taken into account



T2	6635.4	MWh/yr	T11	82.16	%
T3	1443.8	MWh/yr	T12	250	W
T4	4641.0	MWh/yr	T13	0	#
T5	0.806	MW	T14	2	#
T6	2.000	MW	T15	0	#
T7	0	MWh	T16	100	kW
T8	0	MWh	T17	260	#
T9	20.5	yr			

Table 48: Environmental KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
E1	10.66	MWh/yr	E9	7987.95	MWh/yr
E2	84.3	%	E10	-8.54	MWh/yr
E3	25.75	MWh/yr	E11	26.0%	%
E4	0.80	%	E12	6.23	
E5	2705.41	tonneCO _{2eq} /yr	E13	1809.7	kg/yr
E6	7979.45	MWh/yr	E14	3333.3	m ²
E7	58.85%	%	E15	242.0	m ³
E8	184.91	MWh/yr			

Table 49: Social KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
S1	2.75	Likert scale	S7	38	PM/yr
S2	4.5	Likert scale	S8	2	Likert scale
S3	3.5	Likert scale	S9	2.5	Likert scale
S4	4.75	Likert scale	S10	3.25	Likert scale
S5	4.5	Likert scale	S11	3.25	Likert scale
S6	250	PM			

Table 50: Economic KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
EC1	7.1	yr	EC9	13%	%



EC2	267.2	€/year	EC10	0	€
EC3	127350	€/year	EC11	344,065	€
EC4	40	Months	EC12	142,500	€
EC5	0.108 / 0.077	€/kWh _e / €/kWh _{th}	EC13	125,000	€
EC6	19%	%	EC14	637,500	€
EC7	0.058	€/passenger- km	EC15	0	€
EC8	4,747,884	€	EC16	0	€

Table 51: Legal KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
L1	9.25	Months	L3	3	Likert scale
L2	2	Likert scale	L4	0.75	#

Table 52: Consortium Scheme KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
OS1	1	#	OS9	1	#
OS2	-	#	OS10	-	#
OS3	2	#	OS11	1	#
OS4	-	#	OS12	-	#
OS5	0	#	OS13	0	#
OS6	-	#	OS14	-	#
OS7	2	#	OS15	1	#
OS8	-	#	OS16	-	#

Table 53: Funding KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
OEC1	4,996,260	€	OEC10	0.0	€
OEC2	2,179,593	€	OEC11	0.0	€
OEC3	2,083,333	€	OEC12	0.0	€
OEC4	733,333	€	OEC13	959000.0	€



OEC5	0.0	€	OEC14	457260.0	€
OEC6	0.0	€	OEC15	0.0	€
OEC7	0.0	€	OEC16	2700000.0	€
OEC8	0.0	€	OEC17	880000.0	€
OEC9	0.0	€			

Table 54: Other Statistical KPIs - Category B

KPI	Value	Unit	KPI #	Value	Unit
OST1	0	#	OST6		€
OST2	4	#	OST7	1298.1	km2
OST3	129,000	€	OST8	77,133	#
OST4		#	OST9	2	#
OST5		#			



5 Data collection guidelines

In general, for the KPI estimation the data needed, can be grouped under the following categories:

- Statistical
- Market
- Technical Characteristics
- Software/Modelling Estimation
- Common Practice / Assumptions / Rule of Thumbs
- Technical Study Results / Decision Variable / Energy Audit
- Environmental Data

It is advisable to perform all the KPI estimations using as a reference the same base year, for which data exists. This refers to all statistics, market and environmental related quantities.

If SEAPs/SECAPs exists, data can be acquired from these studies, but if they are outdated to be used carefully.

5.1 Data from statistics

Data derived from statistical analysis are very useful and essential in KPI estimations. These data are stored in structured databases, maintained, and updated by relevant agencies at National or European level and the methodologies for the analyses and measuring are well established and open to everyone.

These data repositories may contain Energy Consumption and Production data, Emission factors, CO₂ emissions, population characteristics etc. The content of the databases is frequently updated. Some data entities might focus on smaller geographical regions than countries.

- Eurostat
- National Statistics Agency
- IEA/IRENA
- Covenant of Mayors: Technical Annex to SEAP templates, especially the emission factor document
- IPCC Emission Factor Database

5.2 Data from Market

Real data from the market are very important inputs for the financial/economic KPIs' estimations. The most common mistake when data from the market are used, lies on selection of the spatial factor, meaning that the components procurement, installation, services and transportation costs are very different in each country and even in each region of the same country. In NESOI, the spatial factor is even more critical since all the components and services have to be materialized in islands which makes, in general, the transportation cost higher than mainland. To avoid errors in this critical factor, local



prices need to be considered in equipment, fuels and services or if transportation is needed then ex works prices are recommended to be used.

5.3 Technical Characteristics

Technical characteristics are needed for the estimations of energy, social, and environmental KPIs. These might be used as inputs to the KPIs or as inputs to software or other computing tools, which will perform complex or more sophisticated calculations using models for energy production or other quantities. Technical characteristics that are provided in the various components manual/leaflets are, usually, sufficient for rough estimations. If specific components are not included in a study, then typical values from the literature can be used.

5.4 Software/Modelling Estimation

As mentioned, specialized software tools will be used to estimate some KPIs or intermediate outputs. These tools usually use simple but validated models from literature with simulation methods (hourly) or use average monthly approximations. They can assess KPIs such as the energy production from various technologies, building efficiency measures, storage impact etc. Commercial tools that perform such calculations are:

- Retscreen
- Homer Pro and Homer Grid
- Energy Plan

Nevertheless, the use of own-built tools or methodologies are allowed, as long as there is a reference to the methodology and thus, proving their credibility and validity.

5.5 Common Practice / Assumptions / Rule of Thumb

During the procedure of the estimation of some KPIs, logical assumptions can be made in order to export the required results. These assumptions are based on experience and they are used as a rule of thumb by the majority of technical experts. These rules of thumb can be used in prefeasibility studies as assumption (meaning that, there is not yet a solid technical study to finalize/optimize the value of the assumption) or they can be treated as final. For example, the needed area to develop a PV plant (e.g. with spaces avoiding shades) can be estimated using rules of thumb, but this number can be revised and finalized during the technical study, on the other hand, the expected life of a project is a common practice and usually will not be changed.

5.6 Technical Study / Decision Variable

In each project, many parameters are exported after analytical technical studies, which may include optimization or parametric analysis. If these data exist, then they should be used. Other data needed for KPI estimation such as the capacity of a battery or the amount



of PV power, or the thickness of an insulation can be treated as decision variables and no further explanation is needed.

5.7 Environmental Data

For the various estimations of the KPIs or for Intermediate Outputs (with or without using tools), environmental data such as wind speed, solar irradiation or ambient temperature will be needed. For these data, public and validated databases can be used.

Some public databases that can be used, among others (proprietary or public) for retrieving this kind of data are:

- [Renewable Ninja](#)
- [Copernicus](#)
- [EU Photovoltaic Geographical Information System](#)



6 Conclusions and Next Steps

The next steps of the task T6.1 (Assessment framework) is based on the effective and efficient estimation of the KPIs based on each information sheet. Towards this direction, to summarize the next steps, the time of the estimation of each KPI is provided.

The KPIs (Category A) that have to be **estimated at the proposal phase** are provided in Table 56, the KPIs (Category B) that have to be **estimated at the proposal and after the evaluation** are provided in Table 57 and the KPIs that will be **estimated at the end of the technical assistance (or earlier)** are provided in Table 58.

The Category A KPIs that will have to be estimated at the proposal phase have been discussed and agreed with the partners responsible for proposal submission and their estimation will be explicitly asked to be included in the proposal document. All the other Category A KPIs have to be estimated as part of the work done during NESOI technical assistance by the beneficiaries and be provided afterwards¹³. In general, the monitoring tasks 4.5 and 5.2 will make sure that the requested KPIs will be evaluated. Estimations for both subsets of the Category B KPIs (initial estimations and updates) will be processed from CERTH based on the collected Category A KPIs and metadata.

The estimated KPIs will be published in Deliverable 6.2. This deliverable will be updated in 6-month intervals. An indicative schedule for the publication is presented in Table 55. If a KPI for Category A or B has updates, then its new value is expected in the new editions.

Table 55: Deliverable D6.2 expected updates.

	Date of Publication (Expected Month)	Context
1 st Edition	3 Months after the initiation of the 1 st round of technical assistance (M21)	KPIs that have been estimated at proposal and after the evaluation
2 nd Edition	9 Months after the initiation of the 1 st round technical assistance (M27)	KPIs that have been estimated at proposal phase and KPIs that have been updated/estimated as a part of the technical assistance
3 rd Edition	3 Months after the end of the 1 st round technical assistance (M33)	All the KPIs for the project that have been participate in the 1 st call technical assistance
4 th Edition	3 Months after the initiation of the 2 st round technical assistance (M36)	KPIs that have been estimated at proposal phase and after the evaluation
5 th Edition	9 Months after the initiation of the 2 st round technical assistance (M42)	KPIs that have been estimated at proposal phase and KPIs that have

¹³ The projects that belongs in the EN1 matrix have a smaller set of Category A as has been analyzed in Section 2. These compulsory KPIs are: T1, T2, E1, E3, E5, E10.



Final		been updated/estimated as a part of the technical assistance
	3 Months after the end of the 2 st round technical assistance (M48)	All the KPIs for all the projects (Both calls) that have received technical assistance
	<i>3rd and 4th editions might be merged due to their proximity</i>	

Table 56: Category A KPIs that have to be estimated at the proposal phase

Environmental		Social	
E1	Reduction in annual final energy consumption (energy savings) - Electrical Energy	S1	Consumers' engagement
E3	Reduction in annual final energy consumption (energy savings) - Heat	S2	Social compatibility
E5	GHG saved per year		
E10	Reduction in annual primary energy consumption		

Table 57: Category B KPIs that have to be estimated at the proposal and after the evaluation phase

Funding		Consortium Scheme	
OEC 1	Total investment mobilized	OS1	Energy Communities Activated - Proposal
Other Statistical		OS2	Energy Communities Activated - Funded
OST1	Number of Projects Received Technical Support	OS3	City Administrators Activated - Proposal
OST2	Number of Projects Requested Technical Support	OS4	City Administrators Activated - Funded
OST3	Funds for Support Received by Project Beneficiaries	OS5	Other Public Sector Entities Activated - Proposal
OST4	NESOI Erasmus Support Received	OS6	Other Public Sector Entities Activated - Funded
OST5	NESOI Erasmus Support Requested	OS7	Private Sector Entities Activated - Proposal



OST6	NESOI Erasmus Support Funds	OS8	Private Sector Entities Activated - Funded
OST7	Size of Islands (Area)	OS9	Public Sector Only Projects - Proposal
OST8	Size of Islands (Population)	OS10	Public Sector Only Projects - Funded
OST9	Geographical dispersion (Number of Countries)	OS11	Private Sector Only Projects - Proposal
		OS12	Private Sector Only Projects - Funded
		OS13	Private - Public Sector Projects - Proposal
		OS14	Private - Public Sector Projects - Funded
		OS15	Energy Communities - with Public/or Private Sector - Proposal
		OS16	Private Sector Entities Activated - Proposal

Table 58: KPIs that have to be estimated at the end of the Technical Assistance (or earlier).

Technical		Environmental	
T1	RES-based electrical energy Production	E2	Relative reduction in annual final energy consumption (energy savings) - Electrical Energy
T2	RES-based heat Production	E4	Relative reduction in annual final energy consumption (energy savings) - Heat
T3	RES electricity exported to Grid	E6	Reduction in Annual Fossil Fuel Consumption (Primary)
T4	RES heat exported to DH	E7	Relative reduction in annual fossil fuel consumption (Primary)
T5	RES-based electrical installed Power	E8	Increase in Annual local Renewable (non-Biomass) Energy Generation (Primary)
T6	RES-based heating installed Power	E9	Increase in annual local renewable (Biomass-only) energy generation (Primary)
T7	Storage Capacity - Electrical Energy	E11	Relative reduction in annual primary energy consumption
T8	Storage Capacity - Heat	E12	Energy Return on Energy Investment
T9	Expected Life of Project	E13	Municipal or Agricultural Waste Reduction per year



T10	Self-Consumption Rate Increase (Island Level - electricity)	E14	Land Use
T11	Degree of Self Supply (Project Level - electricity)	E15	Annual Water Consumption
T12	LED Lamps Power	Social	
T13	Number of Smart Meters	S3	Ease of use for end-users of the solution
T14	Number of EV chargers (incl V2G)	S4	Advantages for end-users
T15	Number of V2G Chargers	S5	Increased environmental awareness
T16	EV chargers (incl V2G) installed power	S6	Local job creation in Implementation Phase
T17	Buildings Served by DH	S7	Local job creation in Operational Phase per year
		S8	Local community involvement in the implementation phase
	Economic	S9	Local community involvement in the planning phase
EC1	Simple Payback Period	S10	Tourist/Visitors Benefit
EC2	Annual Financial Benefit for the End-User	S11	Used for Education purposes
EC3	Maintenance Cost per year	Legal	
EC4	Term of the loan financing	L1	Licensing Process Duration
EC5	Levelized Cost of Energy	L2	Possibility of Legal Problems (council of state)
EC6	Capacity Factor	L3	Legal Framework Clarity
EC7	Reduction in Transportation Cost	L4	Number of Decree/Amendments are needed for project implementation
EC8	NPV	Funding	
EC9	IRR	OEC2-11	Expected Mobilized Investment (2021-2030)
EC10-16	Funding Breakdown	OEC12-17	Funds for Each Tech Cluster



7 Annex

PART A: CATEGORY A KPIs

7.1 Technical KPIs - Category A

7.1.1 RES-Based Electrical Energy Production

KPI Information Sheet			
KPI NAME	RES-based electrical energy production	T1	RE_el
Main Object	To estimate the electrical energy produced by RE in a year.		
KPI Description	This KPI counts the amount of electrical energy produced by renewable energy technologies included in an energy transition project.		
KPI Estimation	The energy produced in an annual basis can be estimated by specialized software, using the appropriate technical characteristics , and appropriate meteorological data . For each technology, widely adopted methods can be used as well e.g. using Weibull distribution for wind energy etc.		
KPI Formula	-		
KPI Unit	MWh/yr		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN	EN1, EN2, CON, DEP	SUM

7.1.2 RES-Based Heat Production

KPI Information Sheet			
KPI NAME	RES-based heat production	T2	RE_th
Main Object	To estimate the heat produced by RE in a year.		
KPI Description	With this KPI the heat produced by RE is estimated. Only the produced heat for final use will be included in this KPI estimation (meaning heat produced from burners for steam production to be used in a steam turbine will not be included). Heat vector of CHP systems is included. Heat produced from curtailed energy will also be included (using heat pumps or resistors). Heat from pumps working with RES will be included as well.		
KPI Estimation	This KPI can be estimated by using appropriate software or simple equations with fuel heating values and the biomass and or the appropriate COP values in the case of a heat pump.		
KPI Formula	-		
KPI Unit	MWh/yr		



Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN	EN2, CON, DEP	SUM

7.1.3 RES Electricity Exported to Grid

KPI Information Sheet			
KPI NAME	RES electricity exported to grid	T3	RE_el-gr
Main Object	To estimate the electrical energy exported to the grid for a year.		
KPI Description	This KPI counts the amount of energy exported to the grid by a renewable energy technology. This technology will be part of a renewable power plant or to be installed as a supporting technology to another project (e.g. BIPV in Building Efficiency upgrades).		
KPI Estimation	The energy exported to the grid might be different from the energy production as self-consumption or curtailment might be reducing this value. If no self-consumption, other losses, or curtailment exist, then the energy exported to the grid from RES is the same as the energy production. Curtail might have been already considered, meaning that in some cases, electrical energy will have not been produced during a curtailed event. Storage solutions, can reduce curtail and increase export to the grid.		
KPI Formula	$RE_el-gr = RE_el - RE_cur - RE_self$		
KPI Unit	MWh/yr		
Prerequisites	RE_el	Electrical energy production from RE	Provided by KPI T1
	RE_cur	Electrical energy curtail from RE	Modelling/Assumption
	E_el_self	Electrical energy self-consumption	Modelling/Assumption
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN, ST	EN1, EN2, CON, DEP	SUM

7.1.4 RES Heat Exported to DH

KPI Information Sheet			
KPI NAME	RES heat exported to DH	T4	RE_th-dh
Main Object	To estimate the heat that is exported to a district heating network in a year.		
KPI Description	This KPI counts the amount of heat exported to a district heating network by RES-driven heat production systems. Technologies that can be used in this project may use biomass or biogas as fuel or they can use Heat Pumps (feeding by RE electricity) or solar		



	thermal technologies. Heat may be obtained by CHP technologies as well.		
KPI Estimation	The heat exported to a DH will be exported straight from the production component or it will be exported from heat storage (e.g. water tanks). The KPI can be estimated by assuming that all the heat production is infused into the DH network reduced by the storage losses due to temperature difference.		
KPI Formula	$RE_{th-dh} = RE_{th} - ST_{th_losses}$		
KPI Unit	MWh/yr		
Prerequisites	RE_th	Heat produced by Renewable sources	Estimated by software (KPI T2)
	ST_th_losses	Heat storage losses	Modelling/Assumption
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN	EN2, CON, DEP	SUM

7.1.5 RES-Based Electrical Installed Power

KPI Information Sheet			
KPI NAME	RES-based electrical installed Power	T5	P_RE_el
Main Object	To record the electrical installed power.		
KPI Description	This KPI records the installed power of each technology producing electrical energy. In the case of CHP using RE as fuel, the electrical generator power will be considered.		
KPI Estimation	Is given by the manufacturer sheets, usually is the nominal power produced under certain circumstances.		
KPI Formula	P_RE_el		
KPI Unit	MW (MWp)		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN	EN2, CON, DEP	SUM

7.1.6 RES-Based Heating Installed Power

KPI Information Sheet			
KPI NAME	RES-based heating installed Power	T6	P_RE_th
Main Object	To record the heating installed power.		
KPI Description	This KPI records the installed power of each technology producing useful heat. This might include solar thermal technologies for heating or biofuel heating boilers, or heat pumps producing heat with electrical power from RE. In any case, the final use has to be heat.		
KPI Estimation	Is given by the manufacturer sheets, usually is the nominal power produced under certain circumstances.		



KPI Formula	P_RE_th		
KPI Unit	MW		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN	EN2, CON, DEP	SUM

7.1.7 Storage Capacity - Electrical Energy

KPI Information Sheet			
KPI NAME	Storage Capacity - Electrical Energy	T7	C_el
Main Object	To record electrical energy storage.		
KPI Description	This KPI records the installed capacity of all the electrical storage technologies This includes the electrochemical batteries, flywheels, supercapacitors, hydrogen storage and hydro-storage.		
KPI Estimation	In the case of electrochemical batteries, the capacity is given by the manufacturer sheets for C20, in flywheels and supercapacitors, their nominal values, and for hydro-storage, the capacity is provided by a technical study taking into account the water reservoir levels, discharge efficiency, and reservoir capacity. Heat storage that is intended to be used for electrical generation (e.g. molten salts) will have to be transformed to electrical storage.		
KPI Formula	-		
KPI Unit	MWh		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ST	EN2, CON, DEP	SUM

7.1.8 Storage Capacity - Heat

KPI Information Sheet			
KPI NAME	Storage Capacity - Heat	T8	C_th
Main Object	To record heat storage.		
KPI Description	This KPI records the installed capacity of all the heat storage technologies. This includes hot water storage, PCM, and TCM technologies. The final use of heat storage technology, has to be heat.		
KPI Estimation	Is given by the manufacturer sheets for each technology.		
KPI Formula	-		
KPI Unit	MWh		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ST	EN2, CON, DEP	SUM



7.1.9 Expected life of Project

KPI Information Sheet			
KPI NAME	Expected life of Project	T9	T_PR
Main Object	To record the expected life of a Project.		
KPI Description	This KPI will record the expected life of a project.		
KPI Estimation	This KPI will be defined by the submitted proposal. This should be the same as the expected life of the project as was used in the financial analysis. If separate technologies included in a project and have a lower life than the project (e.g. batteries), then extra cost for their replacement has to be considered in the appropriate financial studies.		
KPI Formula	-		
KPI Unit	yr		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN2, CON, DEP	AVERAGE

7.1.10 Self-Consumption Rate Increase (Island Level - electricity)

KPI Information Sheet			
KPI NAME	Self-Consumption Rate Increase (Island Level - electricity)	T10	ΔF_{sc}
Main Object	To identify the impact of each project on the island's energy system.		
KPI Description	This KPI will be used to identify the increment in the autonomy level in each island by the project interventions.		
KPI Estimation	<p>This KPI will be used in projects where the following interventions / technology clusters exist:</p> <ul style="list-style-type: none"> • Renewable energy systems & CoGen RE systems • Energy efficiency • Storage <p>Renewable energy production systems contribute to energy production, increase self-consumption reducing the electrical demand, and energy efficiency projects reducing the demand even further. Both actions have a positive impact on the self-consumption increment.</p> <ul style="list-style-type: none"> • Total Electrical Energy Consumption of the Island • RE Electrical production exported to the local Grid (KPI T1) <p><u>This indicator is valid only for non-interconnected / autonomous island.</u></p>		
KPI Formula	$\Delta F_{sc} = \frac{(RE_{el_isl} + RE_{el})}{(E_{cons_el_isl} - \Delta E_{cons_el_gr})} - RE_{el_isl} / E_{cons_isl}$		
KPI Unit	%		



Prerequisites	RE_el_isl	Electrical energy production from RE in the island	Statistical data
	E_cons_el_isl	Electrical energy consumption in the Island	Statistical data
	RE_el-gr	RES electricity exported to Grid	Estimation (KPI T1)
	$\Delta E_{\text{cons_el-gr}}$	Electrical energy consumption reduction from the grid	This is equal to RE_el-gr if RE is the only technology in interventions
Provided	End of Tech Assistance		
Valid for	RE, RE CoGEN, Eff, ST	EN2, CON, DEP	AVERAGE

7.1.11 Degree of Self Supply (Project Level - electricity)

KPI Information Sheet			
KPI NAME	Degree of Self Supply (Project Level - electricity)	T11	F_ss
Main Object	To identify the energy self-supply of a project.		
KPI Description	This KPI will be used to identify the degree of RE self-supply of a specific project.		
KPI Estimation	To estimate this KPI, electrical energy production and electrical energy consumption had to exist in a project. The energy produced is a result of the project interventions to the total electrical energy demand of the project.		
KPI Formula	$F_{ss} = RE_{el} / E_{\text{cons_el_pr}}$		
KPI Unit	%		
Prerequisites	E_cons_el_pr	Electrical energy consumption of the project	Estimation
	RE_el	Electrical energy production from RE	Estimated by software (KPI T1)
Provided	End of Tech Assistance		
Valid for	RE, EF, ST	EN2, CON, DEP	AVERAGE

7.1.12 LED Lamps Power

KPI Information Sheet			
KPI NAME	LED Lamps Power	T12	P_led
Main Object	To count the combine power of all the LED lamps installed in the context of the project.		
KPI Description	This KPI will refer to accumulated power of all the LED lamp installed in the context of the project. It may include existing		



	lamps replacement or brand-new lamps (in previously unlighted areas or buildings).		
KPI Estimation	To estimate this KPI a simple summation of all the LED lamps power included in the project even if they are for public/street lighting or used inside buildings.		
KPI Formula			
KPI Unit	kW		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	EF	EN2, CON, DEP	SUM

7.1.13 Number of Smart Meters

KPI Information Sheet			
KPI NAME	Number of Smart Meters	T13	N_sm
Main Object	To count the number of smart meters for electrical energy.		
KPI Description	This KPI will be used to count the number of demand-side smart meters installed in the context of a project. The smart meters will have to be certified as smart meters and using the accepted (by EU) technologies and communication protocols.		
KPI Estimation	To estimate this KPI all the energy demand smart meters that are going to be installed in the context of the project have to be summed.		
KPI Formula			
KPI Unit	-		
Provided	Proposal Optional	Non-Updatable	End of Tech Assistance
Valid for	EF, EM	EN2, CON, DEP	SUM

7.1.14 Number of EV Chargers (Incl V2G)

KPI Information Sheet			
KPI NAME	Number of EV chargers (incl. V2G)	T14	N_ch_ev
Main Object	To count the number of all the EV chargers.		
KPI Description	This KPI will be used to count the number of the electric vehicle chargers installed in the context of the project.		
KPI Estimation	To estimate this KPI all the EV chargers that are installed in the context of the project have to be summed up.		
KPI Formula			
KPI Unit	#		
Provided	Proposal Optional	Non-Updatable	End of Tech Assistance
Valid for	MOB	EN2, CON, DEP	SUM



7.1.15 Number of V2G Chargers

KPI Information Sheet			
KPI NAME	Number of V2G Chargers	T15	N_ch_ev
Main Object	To count the number of all the V2G chargers.		
KPI Description	This KPI will be used to count the number of the electric vehicle chargers that are V2G capable and will be installed in the context of the project.		
KPI Estimation	To estimate this KPI, all the V2G capable EV chargers that are installed in the context of the project have to be summed up.		
KPI Formula			
KPI Unit	#		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	MOB, ST	EN2, CON, DEP	SUM

7.1.16 EV chargers (incl V2G) installed power

KPI Information Sheet			
KPI NAME	EV chargers (incl. V2G) installed power	T15	PV_ch_v2g
Main Object	To count the total maximum rated power of EV chargers.		
KPI Description	This KPI will estimate the total available power of the EV chargers that are going to be installed in the context of the proposed project.		
KPI Estimation	To estimate this KPI, the rated power of all the EV charges participating in a single project has to be summed up.		
KPI Formula			
KPI Unit	kW		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	MOB	EN2, CON, DEP	SUM

7.1.17 Buildings Served by DH

KPI Information Sheet			
KPI NAME	Buildings Served by DH	T17	N_bld_DH
Main Object	To estimate the number of buildings served by a district heating system.		
KPI Description	With this KPI the number of the connected buildings with a district heating network is estimated. All kinds of buildings (residential, commercial, and industrial) covering their heat demand from the DH will be included.		
KPI Estimation	To estimate this KPI, the estimation of connected buildings in the DH has to be summed. The project might be relevant to the construction of a new DH, the update of the power source, or its		



	expansion. This KPI refers to the expected number of connected buildings after all the project interventions have been realized.		
KPI Formula			
KPI Unit	#		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	EF	EN2, CON, DEP	SUM

7.2 Environmental KPIs - Category A

7.2.1 Reduction in Annual Final Energy Consumption (energy savings) - Electrical Energy

KPI Information Sheet			
KPI NAME	Reduction in annual final energy consumption (energy savings) - Electrical Energy	E1	ΔE_{f_el}
Main Object	To estimate the reduction in final electrical energy consumption		
KPI Description	<p>To estimate the annual reduction in final energy consumption from the project. This would be applied in a project implementing energy efficiency technologies, storage, or energy management. Final energy reduction due to self-consumption from RE is included as well.</p> <p><u>The effects of electric mobility in this KPI are not going to be taken into account.</u></p> <p><u>Electrification actions (heat pumps) will be taken into account, which may result in energy incensement.</u></p>		
KPI Estimation	<p>To estimate this KPI, the energy consumption in all the participating entities before the project's technological interventions and the energy consumption of the same entities after the interventions have to be known. The difference between the old and the new electrical energy consumption is the value of this KPI.</p> <p>This KPI is related to SDG-7_10 for final energy consumption.</p>		
KPI Formula	$\Delta E_{f_el} = E_{fe_el_old} - E_{fe_el_new}$		
KPI Unit	MWh/yr		
Prerequisites	$E_{fe_el_old}$ or $E_{el_grid_old}$	Final energy electrical consumption before interventions	Estimated after an energy audit
	$E_{fe_el_new}$ or $E_{el_grid_new}$	Final energy electrical consumption after interventions	Estimated after an energy audit
Provided	Proposal	Updatable	End of Tech Assistance
Valid for	RE, EFF, EM, RE CoGEN,	EN1, EN2, CON, DEP	SUM



7.2.2 Relative Reduction in Annual Final Energy Consumption (energy savings) - Electrical Energy

KPI Information Sheet			
KPI NAME	Relative reduction in annual final energy consumption (energy savings) - Electrical Energy	E2	$\Delta E_{f_el_r}$
Main Object	To estimate the annual relative reduction in final electrical energy consumption.		
KPI Description	To estimate the relative reduction in final energy consumption from the project in a year. This would be applied in projects implementing energy efficiency technologies. Final energy reduction due to self-consumption from RE is included as well.		
KPI Estimation	The KPI is estimated as the KPI E1 but divided with the old value to show the relative difference from the previous state.		
KPI Formula	$\Delta E_{f_el_r} = ([E_{fe}]_{old} - [E_{fe}]_{new}) / [E_{fe}]_{old}$		
KPI Unit	%		
Prerequisites	E_fe_el_old	Final energy electrical consumption before interventions	Estimated after an energy audit
	E_fe_el_new	Final energy electrical consumption after interventions	Estimated after an energy audit
Provided	Proposal	Updatable	End of Tech Assistance
Valid for	RE, EF, EM, RE CoGEN	EN2, CON, DEP	AVERAGE

7.2.3 Reduction in Annual Final Energy Consumption (energy savings) - Heat

KPI Information Sheet			
KPI NAME	Reduction in Annual Final Energy Consumption (energy savings) - Heat	E3	ΔE_{f_th}
Main Object	To estimate the annual reduction in final heat consumption.		
KPI Description	With this KPI, the annual reduction of heat consumption is estimated. This reduction occurs due to energy efficiency measures that may take place in a project. Heat reduction due to self-consumption is included. This KPI is related to SDG-7_10 for final energy consumption.		
KPI Estimation	This KPI is estimated by the difference of the final heat consumption before the intervention and the final heat consumption, after the intervention.		



KPI Formula	$\Delta E_{f_th} = E_{fe_th_old} - E_{fe_th_new}$		
KPI Unit	MWh/yr		
Prerequisites	$E_{fe_th_old}$	Final heat consumption before interventions	Estimated after an energy audit
	$E_{fe_th_new}$	Final heat consumption after interventions	Estimated after an energy audit
Provided	Proposal	Updatable	End of Tech Assistance
Valid for	RE, EF, EM, RE CoGEN	EN1, EN2, CON, DEP	SUM

7.2.4 Relative Reduction in Annual Final Energy Consumption (energy savings) - Heat

KPI Information Sheet			
KPI NAME	Relative reduction in annual final energy consumption (energy savings) - Heat	E4	$\Delta E_{f_th_r}$
Main Object	To estimate the annual relative reduction in final heat consumption.		
KPI Description	This KPI provides the relative difference between the final heat consumption before and after the intervention, as it's a measure to estimate the relative reduction in final heat consumption.		
KPI Estimation	The KPI is estimated as the KPI E3 but divided with the old value to show the relative difference from the previous state.		
KPI Formula	$\Delta E_{f_th} = (E_{fe_th_old} - E_{fe_th_new}) / E_{fe_th_old}$		
KPI Unit	%		
Prerequisites	$E_{fe_th_old}$	Final heat consumption before interventions	Estimated after an energy audit
	$E_{fe_th_new}$	Final heat consumption after interventions	Estimated after an energy audit
Provided	Proposal	Updatable	End of Tech Assistance
Valid for	RE, EF, EM, RE CoGEN	EN2, CON, DEP	AVERAGE

7.2.5 GHG Saved per year

KPI Information Sheet			
KPI NAME	GHG saved per year	E5	ΔGHG
Main Object	To estimate the reduction in greenhouse gases emissions.		
KPI Description	All the supported projects in NESOI, should have a positive impact on the reduction of Green House Gases. Renewable energy sources producing CO _{2eq} in their life cycle but reduce CO ₂ during		



	<p>their operation due to the avoidance of using other sources emission from combustion or grid equivalent emissions. This KPI is one of the Pillar KPIs. This KPI is related to SDG-13_10 for Greenhouse gas emissions indicator.</p>		
KPI Estimation	<p>To estimate this KPI, a lot of data have to be known. The most important are:</p> <ul style="list-style-type: none"> • Fuel specific emissions and mass of fuel; • Electrical grid emissions per kWh; • Specific emissions of renewable energy systems during their life cycle 		
KPI Formula	$\Delta\text{GHG}=\text{GHG_old}-\text{GHG_new}$		
KPI Unit	tonneCO _{2eq} /yr		
Prerequisites	GHG_old	Emissions before the intervention	Technical Study / Modelling
	GHG_new	Emissions after the intervention	Technical Study / Modelling
Provided	Proposal	Updatable	End of Tech Assistance
Valid for	ALL	EN1, EN2, CON, DEP	SUM

7.2.6 Reduction in Annual Fossil Fuel Consumption (Primary)

KPI Information Sheet			
KPI NAME	Reduction in annual fossil fuel consumption (Primary)	E6	ΔE_{p_ff}
Main Object	To estimate the relative primary energy consumption reduction attributed to fossil fuel.		
KPI Description	Fossil fuel primary energy is closely related to decarbonization and for this reason, its reduction has to be measured independently.		
KPI Estimation	To estimate this parameter, the electrical grid mix has to be known before and after the interventions and their respective efficiencies, before and after the interventions. Additionally, all the fuels that are used to provide heat, or electricity before and after an intervention have to be known. The total energy consumption from all the sources is added for the time before the interventions and for the time after the interventions. The KPI is the difference between the primary energy before and the primary energy after the interventions.		
KPI Formula	$\Delta E_{p_ff}=E_{p_ff_old}-E_{p_ff_new}$		
KPI Unit	MWh/yr		
Prerequisites	E_p_ff_old	Primary energy from fossil fuels before the intervention	Technical Study / Modelling



	E_p_ff_new	Primary energy from fossil fuels after the intervention	Technical Study / Modelling
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN2, CON, DEP	SUM

7.2.7 Relative Reduction in Annual Fossil Fuel Consumption (Primary)

KPI Information Sheet			
KPI NAME	Relative reduction in annual fossil fuel consumption (Primary)	E7	$\Delta E_{p_ff_r}$
Main Object	To estimate the primary energy relative consumption reduction attributed to fossil fuel.		
KPI Description	The relative reduction of the primary energy provides a good indication regarding the specific project impact.		
KPI Estimation	This KPI is estimated as the KPI E6 but divided with the old value to show the relative difference from the previous state.		
KPI Formula	$\Delta E_{p_ff_r} = (E_{p_ff_old} - E_{p_ff_new}) / E_{p_ff_old}$		
KPI Unit	%		
Prerequisites	E_p_ff_old	Energy from fossil fuels before the intervention (Primary)	Technical Study / Modelling
	E_p_ff_new	Energy from fossil fuels after the intervention (Primary)	Technical Study / Modelling
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN2, CON, DEP	AVERAGE

7.2.8 Increase in Annual Local Renewable (non-Biomass) Energy Generation (Primary)

KPI Information Sheet			
KPI NAME	Increase in Annual local Renewable (non-Biomass) Energy Generation (Primary)	E8	ΔE_{p_RE}
Main Object	To estimate the increase in renewable energy use.		
KPI Description	Renewable energy sources play an important role in energy transition as they are having low to zero CO ₂ emissions. The primary energy is the only way to assess their contribution to the total energy mixture.		
KPI Estimation	This KPI estimates the increment of renewable energy production (non-biomass) before the project and after the project. If this is a new project, then there is no use of RES before the project. To use estimate this KPI a method based on Primary Energy Factors		



	can be used. The estimation methodology can be based on technical standards such as EN 15603 or ISO 13790.		
KPI Formula	$\Delta E_{p_RE} = E_{p_RE_new} - E_{p_RE_old}$		
KPI Unit	MWh/yr		
Prerequisites	E_p_RE_new	Local renewable (non-Biomass) energy generation after the intervention (Primary)	Technical Study / Modelling
	E_p_RE_old	Local renewable (non-Biomass) energy generation before the intervention (Primary)	Technical Study / Modelling
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN	EN2, CON, DEP	SUM

7.2.9 Increase in Annual Local Renewable (Biomass-only) Energy Generation (Primary)

KPI Information Sheet			
KPI NAME	Increase in annual local renewable (Biomass-only) energy generation (Primary)	E9	ΔE_{p_BM}
Main Object	To estimate the increase in the biomass-based renewable energy use.		
KPI Description	Biomass-based renewable energy sources play an important role in energy transition as they are having low to zero CO ₂ emissions. The primary energy is in indicator to assess their contribution to the total energy mixture.		
KPI Estimation	To estimate the increment of biomass-based renewable energy before the project and after the project. If this is a new project, then there is no use of RES before the project. To estimate this KPI a method based on Primary Energy Factors can be used. The estimation methodology can be based on technical standards such as EN 15603 or ISO 13790.		
KPI Formula	$\Delta E_{p_BM} = E_{p_BM_new} - E_{p_BM_old}$		
KPI Unit	MWh/yr		
Prerequisites	E_p_BM_new	Local biomass-based renewable energy generation after the intervention (Primary)	Technical Study / Modelling
	E_p_BM_old	Local biomass-based renewable energy generation before the intervention (Primary)	Technical Study / Modelling
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	RE, RE CoGEN	EN2, CON, DEP	SUM



7.2.10 Reduction in Annual Primary Energy Consumption (Primary Energy Savings)

KPI Information Sheet			
KPI NAME	Reduction in annual primary energy consumption (Primary energy savings)	E10	ΔE_{p_C}
Main Object	To estimate the total reduction in primary energy consumption from all the participating technologies in a project.		
KPI Description	Even the smallest intervention in a project will have an impact on the reduction of primary energy consumption. With this KPI, all the individual interventions will be added into a single KPI. This KPI is one of the Pillar KPIs This KPI is related to SDG-7_10 for primary energy consumption		
KPI Estimation	This KPI is estimated by the difference in primary energy consumption before the project interventions and after the project interventions. In some cases, where the primary energy consumption before the interventions is not known, then this KPI can be estimated in avoidance energy terms. Although RES is considered having zero primary energy in accounts, biomass related sources usually are not consider to have zero primary energy.		
KPI Formula	$\Delta E_{p_C} = E_{p_C_old} - E_{p_C_new}$		
KPI Unit	MWh/yr		
Prerequisites	$E_{p_C_new}$	Primary energy consumption after the interventions	Technical Study / Modelling
	$E_{p_C_old}$	Primary energy consumption before the interventions	Technical Study / Modelling
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN1, EN2, CON, DEP	SUM

7.2.11 Relative Reduction in Annual Primary Energy Consumption

KPI Information Sheet			
KPI NAME	Relative reduction in annual primary energy consumption	E11	$\Delta E_{p_C_r}$
Main Object	To estimate the relative total reduction in primary energy consumption from all the participating technologies in a project.		
KPI Description	This KPI estimates the relative impact of all the project interventions to the primary energy consumption.		
KPI Estimation	This KPI is estimated as the KPI E10 but divided with the primary energy consumption of the previous state.		
KPI Formula	$\Delta E_{p_C_r} = (E_{p_C_old} - E_{p_C_new}) / E_{p_C_old}$		
KPI Unit	%		



Prerequisites	E_p_C_new	Primary energy consumption after	Technical Study / Modelling
	E_p_C_old	Primary energy consumption before	Technical Study / Modelling
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN2, CON, DEP	AVERAGE

7.2.12 Energy Return on Energy Investment

KPI Information Sheet			
KPI NAME	Energy Return on Energy Investment	E12	EROI
Main Object	To estimate the ratio of energy needed to produce or save energy.		
KPI Description	With this KPI the efficiency of the project intervention in LCA terms is provided.		
KPI Estimation	The ratio of the sum of all the final (usable) energy delivered from energy production interventions in the project (during its lifetime) to the amount of primary energy that has been provided to deliver the final energy.		
KPI Formula	$EROI = (RE_{el_lc} + RE_{th_lc}) / E_{p_lc}$		
KPI Unit			
Prerequisites	RE_el_lc	Electrical energy produced by all the interventions during their life	Can be estimated by KPI T1 for all the years of operation
	RE_th_lc	Heat produced by all the interventions during their life	Can be estimated by KPI T2 for all the years of operation
	E_p_lc	Primary energy that has been provided to install and construct systems and interventions	From Literature / Databases
Provided	End of Tech Assistance		
Valid for	RE, CoGen RE	CON, DEP	AVERAGE

7.2.13 Municipal or Agricultural Waste Reduction per year

KPI Information Sheet			
KPI NAME	Reduction in Annual Municipal or Agricultural Wastes	E13	Δm_w
Main Object	To estimate the reduction in municipal or agricultural waste.		



KPI Description	This KPI estimates the reduction of the municipal or agricultural waste masses due to their use in energy or fuel production (combustion, gasification, etc).		
KPI Estimation	This KPI is estimated by the sum of the masses of all the expected waste or agricultural wastes expected to be consumed in a year for energy production.		
KPI Formula	-		
KPI Unit	Tonne/yr		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	SUM

7.2.14 Land Use

KPI Information Sheet			
KPI NAME	Land Use	E14	A_use
Main Object	To estimate the Land Use of all the project's interventions.		
KPI Description	This KPI sums the area required for all the interventions that require land for exclusive by the installations due to the project (e.g. PV power plant, transformers, storage of biomass, etc).		
KPI Estimation	This is the sum of all the interventions' needed area.		
KPI Formula	-		
KPI Unit	m ²		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	SUM

7.2.15 Annual Water Consumption

KPI Information Sheet			
KPI NAME	Annual water consumption	E15	Q_water
Main Object	To estimate the total water production per year.		
KPI Description	With this KPI the total water production is estimated. This consumption might be attributed to water cooling activities, pv panel cleaning, or for watering energy crops. Water used in hydro systems is not considered as consumption.		
KPI Estimation	It is the sum of each interventions' water consumption.		
KPI Formula	-		
KPI Unit	m ³ /yr		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	SUM



7.3 Social KPIs - Category A

7.3.1 Consumers' Engagement

KPI Information Sheet			
KPI NAME	Consumers' engagement	S1	ConEng
Main Object	To estimate the consumer (end-user) engagement in the project.		
KPI Description	Consumer / end-user engagement is an important aspect of all energy projects during its construction and operational phase. With this KPI their expected engagement in the project is estimated. As each type of consumer might have a different engagement in each type of project, this KPI will be focused on residential consumers' engagement.		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - strongly engaged).		
KPI Formula	-		
KPI Unit	Likert Scale		
Provided	Proposal	Updatable	End of Tech Assistance
Valid for	ALL	ALL	AVERAGE

7.3.2 Social Compatibility

KPI Information Sheet			
KPI NAME	Social compatibility	S2	SocComp
Main Object	To estimate the social compatibility of the project interventions.		
KPI Description	To estimate the extent to which the project's interventions fit with people's frame of "mind". If innovation requires people to significantly think differently, and challenge assumptions or the ways how we normally are accustomed to doing things, its implementation in society will be more difficult [2].		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - very High Social compatibility).		
KPI Formula	-		
KPI Unit	Likert Scale		
Provided	Proposal	Updatable	End of Tech Assistance
Valid for	ALL	ALL	AVERAGE

7.3.3 Ease of Use for End-Users of the Solution

KPI Information Sheet			
KPI NAME	Ease of use for end-users of the solution	S3	EaseUse
Main Object	To provide an indication of the complexity of the project solutions for end-users.		
KPI Description	Each project has a different interaction with the end-users and many projects don't demand interactions at all. For example,		



	there is no interaction with the end-user when a PV power plant is installed, but there is interaction with the end-users when a new heat pump or EV chargers are installed [2].		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 -Very Easy to the user or no Interaction).		
KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.3.4 Advantages for end-users

KPI Information Sheet			
KPI NAME	Advantages for end-users	S4	AdvUser
Main Object	To provide an indication for the advantages of the proposed interventions.		
KPI Description	Each project interventions might offer advantages to the end-users comparing with the state before the project's implementation. These advantages might be cost savings, improved quality, or increased comfort [2].		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 -Very High advantage).		
KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.3.5 Increased Environmental Awareness

KPI Information Sheet			
KPI NAME	Increased environmental awareness	S5	EnvAw
Main Object	To identify the extent the project will use opportunities for increasing environmental awareness.		
KPI Description	Some of the project interventions might trig environmental awareness to the local communities via supplementary educational actions or by promoting the benefits in the environment by its operation. The number of opportunities to communicate the project will reflect the impact on environmental awareness.		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 -Very High Increase in Awareness).		



KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.3.6 Local Job Creation in Implementation Phase

KPI Information Sheet			
KPI NAME	Local job creation in Implementation Phase	S6	JC_Imp
Main Object	To identify the resources that will be allocated in the implementation phase of the project.		
KPI Description	All proposed projects (technical or planning activities) require human effort to be completed. This KPI sums the total effort needed for the project implementation regardless of the position, salary, and responsibility of each job. The person month (PM) will be estimated with a typical 8 hours/day and 20 working days/month.		
KPI Estimation	This KPI will be estimated by the summation of the effort of all the people involved in the project implementation.		
KPI Formula			
KPI Unit	PM		
Provided	End of Tech Assistance		
Valid for	ALL	EN2, CON, DEP	SUM

7.3.7 Local Job Creation in Operating Phase per year

KPI Information Sheet			
KPI NAME	Local job creation in Operating Phase per year	S7	JC_Op
Main Object	To identify the resources that will allocate in the operating phase of the project per year.		
KPI Description	The proposed project will need human effort in order to smoothly operate. This human effort might be for everyday operations or for maintenance activities in scheduled intervals. In this KPI, all the operation and maintenance human effort will be included regardless the position, salary and responsibility of each job. The person month (PM) will be estimated with typical 8 hours/day, and 20 working days/month. For one-person full-time job, the KPI is 12 PM.		



KPI Estimation	This KPI will be estimated by the summation of the effort of all the people involved in the project operation.		
KPI Formula			
KPI Unit	PM/yr		
Provided	End of Tech Assistance		
Valid for	ALL	EN2, CON, DEP	SUM

7.3.8 Local Community Involvement in the Implementation Phase

KPI Information Sheet			
KPI NAME	Local Community Involvement in the Implementation Phase	S8	CE_imp
Main Object	To identify in what extend residents/users have been involved in the implementation process of the project.		
KPI Description	It is important for societies and communities to participate during the implementation phase in energy transition projects. Specific projects might lead to higher participation compared to other projects, due to their nature or higher promotion [2].		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - Very High Involvement).		
KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.3.9 Local Community Involvement in the Planning Phase

KPI Information Sheet			
KPI NAME	Local Community Involvement in the Planning Phase	S9	CE_plan
Main Object	To identify in which extend residents/users have been involved in the planning process of the project.		
KPI Description	During project planning, many decisions take place that might affect the daily life of people in local communities. Local communities must feel and must be in the center of the decision-making process as certain problems might emerge.		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - Very High Involvement).		
KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		



Valid for	ALL	CON, DEP	AVERAGE
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7.3.10 Tourist/Visitors Benefit

KPI Information Sheet			
KPI NAME	Tourist/Visitors Benefit	S10	TourBen
Main Object	To estimate the benefit of tourists/visitors by the project.		
KPI Description	Some projects might directly benefit not only the local residents but the visitors as well. For example, the installation of EV chargers is beneficial for visitors. Other projects such as a PV power plan will not directly benefit the visitors.		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - Very High Benefit).		
KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.3.11 Used for Educational Purposes

KPI Information Sheet			
KPI NAME	Used for educational purposes	S11	EdPurp
Main Object	To provide an indication for the educational capabilities that might emerge from the project.		
KPI Description	The project might be used from local or remote authorities and institutions for educational purposes. Innovative and complex projects with high impact are more likely to be used for education purposes.		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - Very High Use).		
KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.4 Economic KPIs - Category A

7.4.1 Payback Period

KPI Information Sheet			
KPI NAME	Payback Period	EC1	t_{pp}
Main Object	To estimate the payback period of the project / investment		



KPI Description	It measures the elapsed time between the time of initial investment and the point in time at which accumulated savings or income are sufficient to repay the initial investment [12]. The payback period is estimated always in techno-economical or feasibility studies [4].		
KPI Estimation	The value of t that satisfies the KPI equation is the payback period.		
KPI Formula / Equation	$0 = \sum_{t=1}^{T_{pr}} \frac{C_t}{(1+i)^t} - C_o$		
KPI Unit	yr		
Prerequisites	C_o	Investment Initial Cost	Techno economical Study
	C_t	Net cash flow of the year t	Techno economical Study
	T_pr	Expected Life of Project	KPI E9
	i	Discount rate	Market/Common Practice/Statistics
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN2, CON, DEP	AVERAGE

7.4.2 Annual Financial Benefit for the End-User

KPI Information Sheet			
KPI NAME	Annual financial benefit for the end-user.	EC2	FBE
Main Object	To estimate the annual financial benefit for the end-user		
KPI Description	A lot of projects have a positive and direct financial impact to the end-users/citizens. This benefit might be due to the installation of RE systems in the members of an energy community, Electric mobility, (cheaper fares) or lower municipal taxes due to efficiency upgrades. In any case, the costs of energy services become lower. In general, the end-user is not related to the investor, only in the case of an energy community. Reciprocally benefits that can be shared among citizens, are included here as well. The benefits of the public investments are shared among the municipality residences.		
KPI Estimation	To estimate this KPI typical values and assumptions have to be used, regarding the costs that the final users will pay for energy services.		
KPI Formula	Cost_EU_old - Cost_EU_new		
KPI Unit	€/yr		
Provided	End of Tech Assistance		
Valid for	ALL	EN2, CON, DEP	AVERAGE



7.4.3 Maintenance Cost per year

KPI Information Sheet			
KPI NAME	Maintenance Cost per year	EC3	MC
Main Object	To estimate the total maintenance cost per year		
KPI Description	To keep the equipment of the project in an efficient and operational state an important amount of money is needed in order to perform regular or unpredictable maintenance. For example, cleaning PV panels or adding cooling fluids are maintenance actions.		
KPI Estimation	To estimate this KPI, all the single maintenance actions have to be known. Usually, they are included in feasibility studies.		
KPI Formula			
KPI Unit	€/yr		
Provided	End of Tech Assistance		
Valid for	ALL	EN2, CON, DEP	SUM

7.4.4 Term of the Loan Financing

KPI Information Sheet			
KPI NAME	Term of the loan financing	EC4	TLF
Main Object	To estimate the term of loan financing.		
KPI Description	Loan period is a very important parameter for project viability as it has to assure that the current earning/savings are enough to cover the expenses of loan repayment.		
KPI Estimation	The KPI is estimated as the result of the technical assistance or provided by the project beneficiary in the financial plan.		
KPI Formula			
KPI Unit	Months		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.4.5 Levelized Cost of Energy

KPI Information Sheet			
KPI NAME	Levelized Cost of Energy ¹⁴	EC5	LCOE
Main Object	To estimate the cost of energy during its project life		
KPI Description	LCOE is the minimum price at which energy must be sold for an energy project to break even the total cost.		
KPI Estimation	There are various methods to estimate the LCOE and there are significant differences. In NESOI, the NREL definition will be used [13], [14]. In CHP systems, LCOE for electricity and heat can be estimated separately as described in [11] (page 5).		

¹⁴ For Transportation projects, the specific KPI can be applied with the same equation but instead of E_x , the total number of the passenger-km will be used.



KPI Formula	$LCOE = \frac{IC \cdot R + OC + MC}{E_x}$ <p>Given NESOI's broad geographical reach and wide range of technologies that might be implemented, different discount rates might be determined for each supported project. To ensure comparability, for the purpose of this KPI, NESOI will adopt to all supported projects the <u>same discount rate</u> based as an estimated average of the European area and technology risk factor.</p>		
KPI Unit	€/kWh		
Prerequisites	IC	Investment Initial Cost	Equal to the investment mobilized of the project
	R	Capital Recovery Factor	$R = i \cdot \frac{(1+i)^{T_{pr}}}{(1+i)^{T_{pr}} - 1}$
	i	Discount Rate	Market/Common Practice/Statistics
	E_x	Final Energy Produced/Sold/Exported	KPI T1 or T2 or T3 or T4
	OC	Annual Operational Cost (including fuel)	Estimated in feasibilities study
	MC	Annual Maintenance Cost	KPI EC3
Provided	End of Tech Assistance		
Valid for	RE, RE CoGEN	EN2, CON, DEP	AVERAGE

7.4.6 Capacity Factor

KPI Information Sheet			
KPI NAME	Capacity Factor	EC6	CF
Main Object	To estimate the usability of an energy project.		
KPI Description	Capacity factor is the ratio of the energy production of a power unit over a period of time versus the energy that this equipment can produce if it was operating in its nominal/maximum point for the same period of time.		
KPI Estimation	The produced energy and the nominal power of the equipment are needed. Usually, the period of time refers to a calendar year. If many RE systems/technologies are present then combine for the same final form of energy e.g. Heat and Electricity: CF_th and CF_el.		
KPI Formula	$CF = \frac{E_x}{P_{nom} * 8760 \text{ hr}}$		
KPI Unit			
Prerequisites	E_x	Final Energy Produced/Sold/Exported	KPI T1 or T2 or T3 or T4
	P_x	Nominal/Max Power of the equipment	KPI T5 or T6
Provided	End of Tech Assistance		



Valid for	RE, RE CoGEN	EN2, CON, DEP	AVERAGE
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7.4.7 Reduction in Transportation Cost

KPI Information Sheet			
KPI NAME	Reduction in EC7 Transportation Cost		ΔC_{tr}
Main Object	To identify the reduction in transportation cost.		
KPI Description	This KPI will be used to identify the reduction in transportation costs enabled by the intervention. This intervention is mostly enabled by the introduction of EVs for public transportation or other alternative fuels such as CNG. Can be used also for sea transport. Not to be used for Cargo. Not to be used for new transportation routes.		
KPI Estimation	To estimate this indicator the following data are needed: <ul style="list-style-type: none"> • Cost of fuel (Electricity, Gas, Diesel); • Specific consumption of Vehicle at full capacity; • Capacity (in persons); If the intervention for transportation is about a new line and not replacing existing transportation infrastructure, then this KPI should be zero.		
KPI Formula	$\Delta C_{tr} = [C_{tr}]_{old} - [C_{tr}]_{new}$		
KPI Unit	€/passenger-km		
Prerequisites	C_{tr_old}	Transportation Cost per passenger per 100 km before the intervention	Technical Characteristics/Market
	C_{tr_new}	Transportation Cost per passenger per 100 km after the intervention	Technical Characteristics/Market
Provided	End of Tech Assistance		
Valid for	MOB	EN2, CON, DEP	AVERAGE

7.4.8 Net Present Value

KPI Information Sheet			
KPI NAME	Net Present Value	EC8	NPV
Main Object	To estimate the Net Present Value.		
KPI Description	Net present value is the most common financial indicator of an investment/project, that provides projected earnings generated by a project or investment.		
KPI Estimation	It the discounted cash flow sum for all the years of operation of the project.		
KPI Formula	$NPV = \sum_{t=1}^{T_{pr}} \frac{C_t}{(1+i)^t} - C_o$ <p>Given NESOI's broad geographical reach and wide range of technologies that might be implemented, different discount rates</p>		



	should be determined for each supported project. To ensure comparability, for the purpose of this KPI, NESOI will adopt to all supported projects the <u>same discount rate</u> based as an estimated average of the European area and technology risk factor.		
KPI Unit	€		
Prerequisites	C_o	Investment Initial Cost	Techno economical Study
	C_t	Net cash flow of the year <i>t</i>	Techno economical Study
	T_pr	Expected Life of Project	KPI E9
	i	Discount rate	Market/Common Practice/Statistics
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN2, CON, DEP	SUM

7.4.9 Internal Rate of Return

KPI Information Sheet			
KPI NAME	Internal Rate of Return	EC9	IRR
Main Object	To estimate the internal rate of return		
KPI Description	The internal rate of return is a metric used in financial analysis to estimate the profitability of potential investment		
KPI Estimation	The calculation of the IRR is based on numerical methods due to its complex formula. In any case, the IRR value has to satisfy the KPI formula.		
KPI Formula	$0 = \sum_{t=1}^{T_{pr}} \frac{C_t}{(1 + IRR)^t} - C_o$		
KPI Unit			
Prerequisites	C_o	Investment Initial Cost	Techno economical Study
	C_t	Net cash flow of the year <i>t</i>	Techno economical Study
	T_pr	Expected Life of Project	KPI E9
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	EN2, CON, DEP	AVERAGE

7.4.10 Funding Breakdown

KPI Information Sheet			
KPI NAME	Funding Breakdown	EC10-EC16	FundBD_XX
Main Object	To analyse the funding sources per project.		
KPI Description	The funding breakdown includes 6 KPIs: These are:		



	<p>EC10: Own grant financing <i>Non-repayable funds provided to the initiative by the tendering entity/project promoter - Applicable to initiatives by public entities</i></p>		
	<p>EC11: Third-party grant financing <i>Non-repayable funds provided to the initiative by a third-party (e.g. EU, national or regional governments, charities, etc.) - Applicable to initiatives promoted by both public and private entities</i></p>		
	<p>EC12: Own equity financing <i>Risk capital provided to the initiative by the tendering entity/project promoter - For applicability see the bellow</i></p>		
	<p>EC13: Third-party equity financing <i>Risk capital provided to the initiative by a third-party equity investor (e.g. infrastructural equity funds, family offices, etc) - For applicability see the bellow</i></p>		
	<p>EC14: Loan financing <i>Debt provided to the initiative by financial intermediaries (e.g. commercial banks, merchant banks, infrastructural debt funds - For applicability see the bellow</i></p>		
	<p>EC15: Subsidised loan financing <i>Subsidised debts provided to the initiative by providers of subsidised loans (e.g. development banks, ESIF Financial Instruments, etc) - For applicability see the bellow</i></p>		
	<p>EC16: Guarantees <i>Guarantees provided to the initiative to reduce the risk exposure of the activated equity or debt financing (e.g. Smart Finance for Smart Building, EFSI etc) - For applicability see the bellow</i></p>		
	<p><i>EC12-EC16 are always applicable to initiatives promoted by private entities. Applicability to initiatives promoted by Public entities is limited to Public-Private Partnership schemes</i></p>		
KPI Estimation	The KPIs are estimated as the result of the technical support, or provided by the project beneficiary in the financial estimates.		
KPI Formula			
KPI Unit	€		
Provided	End of Assistance		
Valid for	ALL	CON, DEP	SUM



7.5 Legal KPIs - Category A

7.5.1 Licensing Process Duration

KPI Information Sheet			
KPI NAME	Licensing Process Duration	L1	T_lpd
Main Object	To estimate the licensing process duration.		
KPI Description	All the technical works require permits and licenses that are provided by public authorities and/or special agents.		
KPI Estimation	To estimate this KPI, the shortest path of all the licensing procedures has to be found. If two licenses (e.g. for construction and for operation) can be processed in parallel then the licensing duration is the longest one, not their sum.		
KPI Formula			
KPI Unit	Months		
Provided	Proposal Optional	Updatable	End of Tech Assistance
Valid for	ALL	CON, DEP	AVERAGE

7.5.2 Possibility of Legal Problems (council of state)

KPI Information Sheet			
KPI NAME	Possibility of Legal Problems (council of state)	L2	PLP
Main Object	To identify the possibility of legal problems during the licensing procedure.		
KPI Description	The project will enact small to large scale works (constructions, installation, etc). This might create various legal problems between the state and local people or the project owners and the dispute will be solved into court (usually the Council of State). Other legal problems might be related to the licensing process, the operation of equipment (pollution), and market regulations.		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - Very High Possibility of Legal Problems).		
KPI Formula	Likert Scale		
KPI Unit	-		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.5.3 Legal Framework Clarity

KPI Information Sheet			
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KPI NAME	Legal Framework Clarity	L3	LFC
Main Object	To estimate the clarity of the legal framework for the proposed project.		
KPI Description	This KPI will provide an estimation for the clarity of the legal framework. The licensing process, the technical studies, the implementation and operation rules, and the market instructions. Especially in innovative and early adopted technologies, the licensing process is not straight forward and, in some cases, there is no framework.		
KPI Estimation	This KPI will be estimated using the 1 to 5 Likert scale (5 - Very High Clarity of legal framework).		
KPI Formula			
KPI Unit	Likert Scale		
Provided	End of Tech Assistance		
Valid for	ALL	CON, DEP	AVERAGE

7.5.4 Number of Decree/Amendments are needed for project implementation

KPI Information Sheet			
KPI NAME	Number of Decree / Amendments issued for project implementation	L4	NDA
Main Object	To estimate the number of amendments issued for the project.		
KPI Description	It is possible during the project deployment a number of amendments in the legislation to be issued by the central government or resolutions by the local council that will facilitate the project's implementation.		
KPI Estimation	This will sum all the amendments and decrees until the project completion.		
KPI Formula			
KPI Unit	#		
Provided	End of Tech Assistance		
Valid for	ALL	DEP	AVERAGE

PART B: CATEGORY B KPIs

7.6 Consortium Scheme KPIs - Category B

7.6.1 Energy Communities Activated

KPI Information Sheet



KPI NAME	Energy Communities Activated	OS1 - OS2	ENCOM_PR ENCOM_FU
Main Object	To estimate the number of energy communities involved in NESOI.		
KPI Description	This KPI will count all the legally established energy communities (according to EU regulation) involved in NESOI.		
KPI Estimation	It will be calculated using the participation information metadata. OS1: will count the energy communities that participate in proposals. OS2: will count the energy communities that have been funded.		
KPI Formula			
KPI Unit	#		
Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.6.2 City Administrators Activated

KPI Information Sheet			
KPI NAME	City Administrators Activated	OS3 - OS4	CAA_PR CAA_FU
Main Object	To estimate the active involvement of the city authorities in the project.		
KPI Description	This KPI will count all the city authorities (Municipalities and companies controlled by the municipalities) involved in NESOI OS3: will count the City Administrators that participate in proposals. OS4: will count the City Administrators that have been funded.		
KPI Estimation	Will be calculated using project's proposal metadata.		
KPI Formula			
KPI Unit	#		
Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.6.3 Other Public Sector Entities Activated

KPI Information Sheet			
KPI NAME	Other Public Sector Entities Activated	OS5 - OS6	PUBS_PR PUBS_FU
Main Object	To estimate the active involvement of other public authorities than city administrators.		
KPI Description	This KPI will count the number of public entities (other than city administration authorities) e.g. ministry, regional government or other public-related authorities that involved in NESOI.		



	OS5: will count the other public sector entities that participate in proposals. OS6: will count the other public sector entities that have been funded.		
KPI Estimation	Will be calculated using project's proposal metadata.		
KPI Formula			
KPI Unit	#		
Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.6.4 Private Sector Entities Activated

KPI Information Sheet			
KPI NAME	Private Sector Entities Activated	OS7 - OS8	PRISP_PR PRISP_FU
Main Object	To estimate the active involvement of private sector companies.		
KPI Description	This KPI will count the number of private entities (companies) that are involved in NESOI. OS7: will count the private sector entities that participate in proposals. OS8: will count the private sector entities that have been funded.		
KPI Estimation	Will be calculated using project's proposal metadata.		
KPI Formula			
KPI Unit	#		
Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.6.5 Public Sector Only Projects

KPI Information Sheet			
KPI NAME	Public Sector Only Projects	OS9 - OS10	PUSOP_PR PUSOP_FU
Main Object	To estimate the composition of the projects' participant.		
KPI Description	This KPI will count the number of projects that <u>only</u> public sector entities are participating (Municipalities, Public Companies, Ministries, and Governments). OS9: will count the public sector-only projects in proposals. OS10: will count the public sector-only projects that have been funded.		
KPI Estimation	Will be calculated using project's proposal metadata		
KPI Formula			
KPI Unit	#		



Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.6.6 Private Sector Only Projects

KPI Information Sheet			
KPI NAME	Private Sector Only Projects	OS11 - OS12	PRSOP_PR PRSOP_FU
Main Object	To estimate the composition the proposals consortium.		
KPI Description	This KPI will count the number of projects that <u>only</u> private sector entities are participating OS11: will count the private sector-only projects that participate in proposals. OS12: will count the private sector-only projects that have been funded.		
KPI Estimation	Will be calculated using project's proposal metadata		
KPI Formula			
KPI Unit	#		
Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.6.7 Private - Public Sector Projects

KPI Information Sheet			
KPI NAME	Private - Public Sector Projects	OS13 - OS14	PPP_PR PPP_FU
Main Object	To estimate the composition the proposals consortium.		
KPI Description	This KPI will count the number of projects that <u>public and private</u> sector entities are participating (cooperation). OS13: will count the projects involving private and public entities in proposals. OS14: will count the projects involving private and public entities and have been funded.		
KPI Estimation	Will be calculated using project's proposal metadata.		
KPI Formula			
KPI Unit	#		
Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	



7.6.8 Energy Communities with Public/or Private Sector Projects

KPI Information Sheet			
KPI NAME	Energy Communities with Public/or Private Sector Projects	OS15 - OS16	ECPP_PR ECPP_FU
Main Object	To estimate the composition the proposals consortium.		
KPI Description	This KPI will count the number of projects that <u>energy communities</u> are participating on their own or with private or <u>public</u> sector entities. OS15: will count the projects involving EC (w or w/out other entities) in proposals. OS16: will count the projects involving EC (w or w/out other entities) that have been funded.		
KPI Estimation	Will be calculated using project's proposal metadata.		
KPI Formula			
KPI Unit	#		
Provided	Proposal / After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.7 Funding - Category B

7.7.1 Total Investment Mobilized

KPI Information Sheet			
KPI NAME	Total investment mobilized	OEC1	MobInvTotal
Main Object	To estimate the total investment mobilized by NESOI support		
KPI Description	The mobilized investment is estimated differently for each case of project maturity. For entry and conceptual levels of maturity, the mobilized investment is verified by a feasibility or conceptual design study. For deployment levels of maturity, the mobilized investment is verified by the tender documents and contracts. For EN & CON projects, the mobilized investment values can be updated. This KPI is one of the Pillar KPIs		
KPI Estimation	The total investment for each project will be acquired by the project metadata.		
KPI Formula	-		
KPI Unit	€		
Provided	Proposal	Updatable	End of NESOI Project
Valid for	ALL	ALL	



7.7.2 Expected Mobilized Investment (2021-2030)

KPI Information Sheet			
KPI NAME	Expected Mobilized Investment	OE2-OEC11	MobInvYear_XX
Main Object	To quantify the expected mobilized investments each year till 2030.		
KPI Description	This KPI will measure money spending for investments towards project implementation. Based on project proposal and monitoring, the projects' implementation time plan, the expected money spending for each year will be recorded.		
KPI Estimation	Each projects' annual money spending towards the implementation, will be summed for each year.		
KPI Formula			
KPI Unit	€		
	OE2 -> MobInvYear21 OE3 -> MobInvYear22 OE4 -> MobInvYear23 OE5 -> MobInvYear24 OE6 -> MobInvYear25	OE7 -> MobInvYear26 OE8 -> MobInvYear27 OE9 -> MobInvYear28 OE10 -> MobInvYear29 OE11 -> MobInvYear30	
Provided	End of Tech Assistance	Updatable	End of NESOI Project
Valid for	ALL	EN2, CON, DEP	

7.7.3 Funds for Each Tech Cluster

KPI Information Sheet			
KPI NAME	Funds for Each Tech Cluster	OE12-OEC17	FPC_XX
Main Object	To allocate the funding in each technology cluster.		
KPI Description	A project may contain a lot of interventions from various technology clusters. With these KPIs, the allocation of the total mobilized investment is evaluated.		
KPI Estimation	These KPIs will be estimated and provided by the project beneficiary based on the investment break-down.		
KPI Formula			
KPI Unit			
	EOC12 -> RE	EOC15 -> e-Mob	
	EOC13 -> Eff	EOC16 -> Co-Gen RE	
	EOC14 -> ST	EOC17 -> EM	
Provided	End of Tech Assistance	Updatable	End of NESOI Project
Valid for	ALL	EN2, CON, DEP	



7.8 Other Statistical KPIs - Category B

7.8.1 Number of Projects Received Technical Support

KPI Information Sheet			
KPI NAME	Number of projects received technical support	OST1	NumProReceiv
Main Object	To count the number of projects which receive technical support		
KPI Description	The number of projects that NESOI will support is limited by the available funds. As each project consortium will demand a different amount of funding support (for various reasons), then the number of supported projects will be different. As the available funding for support is 6.2 M€ and the maximum support per project is limited at 120,000€. Consequently, the supported projects will be at least 51.		
KPI Estimation	This KPI will count the projects that received the support (e.g. signed the contract). It will be equal to the sum of KPIs OS10, OS12, OS14 and OS16.		
KPI Formula			
KPI Unit	#		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.2 Number of Projects Requested Technical Support

KPI Information Sheet			
KPI NAME	Number of projects requested technical support	OST2	NumProReq
Main Object	To count the number of projects which request technical support		
KPI Description	This KPI will measure the success of NESOI project under various perspectives. Firstly, this KPI will show the participation in NESOI calls and reveal the success of dissemination and communication activities Secondly, it will provide a strong indication of the necessity of such projects as NESOI as important mechanism to support energy transition project. As a last perspective, if the number of projects which request technical support is very high, a new, similar project will be easier to justify.		
KPI Estimation	This KPI will count the projects that asked for technical support by submitting a proposal. It will be equal to the sum of KPIs OS9, OS11, OS13 and OS15.		
KPI Formula			
KPI Unit	#		



Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.3 Funds for Support Received by Project Beneficiaries

KPI Information Sheet			
KPI NAME	Funds for Support Received by Project Beneficiaries	OST3	FundsSupport
Main Object	To monitor the cash outflow from the NESOI project to the beneficiaries.		
KPI Description	The disbursement of the funds by the beneficiaries is a crucial step towards the kick-off of the technical support.		
KPI Estimation	Data for its estimation will be provided in the framework of task 5.2 as foreseen in the description of work.		
KPI Formula			
KPI Unit	€		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.4 NESOI Erasmus Support Received

KPI Information Sheet			
KPI NAME	NESOI Erasmus support received	OST4	ErasmReceiv
Main Object	To count the people that received Erasmus support.		
KPI Description	Technology related know-how exchange activities are a crucial aspect of the NESOI work plan.		
KPI Estimation	This KPI will count the individual people who received the NESOI Erasmus support.		
KPI Formula			
KPI Unit	#		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.5 NESOI Erasmus Support Requested

KPI Information Sheet			
KPI NAME	NESOI Erasmus support requested	OST5	ErasmusReq
Main Object	To count the people that requested Erasmus support.		



KPI Description	People that will ask for NESOI Erasmus support might be more than the allocated funds from the NESOI consortium for this purpose.		
KPI Estimation	This KPI will count the individual people who requested the NESOI Erasmus support.		
KPI Formula			
KPI Unit	#		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.6 NESOI Erasmus Support Funds

KPI Information Sheet			
KPI NAME	NESOI Erasmus Support Funds	OST6	ErasmusFunds
Main Object	To count the amount of money given to support NESOI Erasmus activities.		
KPI Description	NESOI consortium hasn't allocated a specific amount of money for Erasmus support. With this KPI, the funds provided to individuals/projects for Erasmus support will be registered.		
KPI Estimation	This KPI will sum the funds given for NESOI Erasmus support.		
KPI Formula			
KPI Unit	#		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.7 Size of Islands (Area)

KPI Information Sheet			
KPI NAME	Size of Islands (Area)	OST7	ArealIsl
Main Object	To count the total area of the islands that benefit from NESOI activities.		
KPI Description	Within this KPI, the total area of the islands that will benefit from NESOI support will be summed. Due to the remote nature of the islanding areas, all people inhabiting this area will be benefitted by the NESOI support.		
KPI Estimation	It is the sum of the area of all the islands that participate in NESOI. Even if the NESOI support is provided to a municipality of the island (given that the island includes more than one municipality), again the total area of the island will be included, not only the area of the municipality. If a project spreads its activities and/or installations in more than one island, all the islands are going to be included.		



	If the same island is affected by more than one project, then no double counts will be allowed.		
KPI Formula			
KPI Unit	km ²		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.8 Size of Islands (Population)

KPI Information Sheet			
KPI NAME	Size of Islands (Population)	OST8	Popullsl
Main Object	To count the total local populations of the islands that benefit from NESOI activities.		
KPI Description	Within this KPI the total number of the islanding population that will benefit from NESOI support will be summed. Due to the remote nature of the islanding areas, all people inhabiting in this area, will benefit from NESOI support.		
KPI Estimation	It is the sum of all the population of all the islands that participate in NESOI. Even if the NESOI support is provided to a municipality of the island (given that the island has more than one municipality), again the total population of island will be included, not only the population of the municipality. If a project spreads its activities and/or installations in more than one island, all the island's population is going to be included. If the same island is affected by more than one project, then no double counts will be allowed.		
KPI Formula			
KPI Unit	#		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	

7.8.9 Geographical dispersion (Number of Countries)

KPI Information Sheet			
KPI NAME	Geographical dispersion (Number of Countries)	OST9	GeoDis
Main Object	To count the dispersion of the NESOI support.		
KPI Description	NESOI targets to provide support in an equal and fairway. With this KPI, the number of countries that NESOI has provided technical support will be calculated.		
KPI Estimation	The country in which an island belongs will be counted and recorded. No double counts will be allowed.		



KPI Formula			
KPI Unit	#		
Provided	After Evaluation	Updatable	End of NESOI Project
Valid for	ALL	ALL	





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 864266



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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 864266

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