TRUST EPC South benchmarking and assessment tools for energy efficiency investments

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INTRODUCTION

GREPCon

GREPCon - Green Rating for Energy Performance Contracts

A service that provides a standardized and certified approach to the technical and financial assessment of EPC and other energy efficiency projects, fostering a common understanding of project risks and benefits among all investment stakeholders.

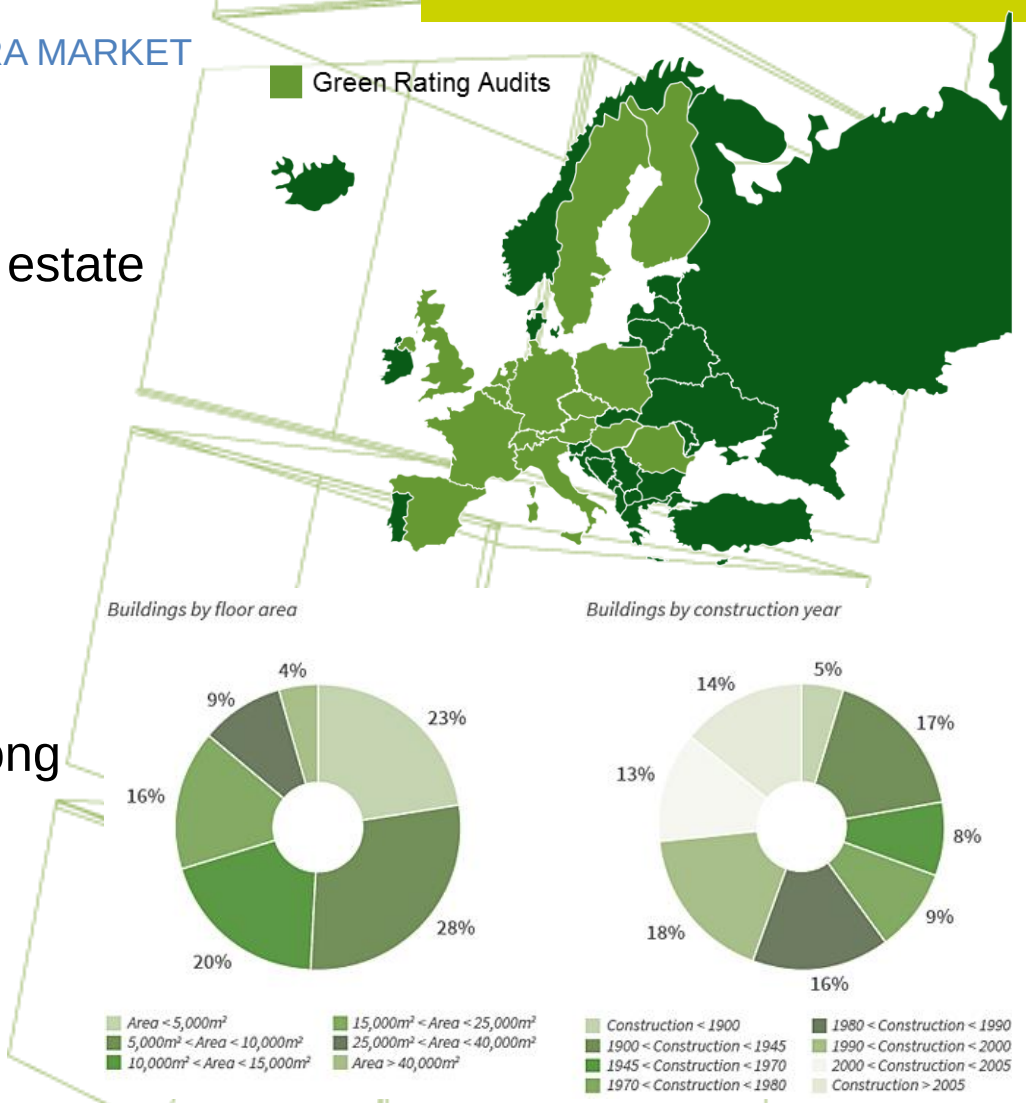
GREPCon has been developed within the Trust EPC South European initiative, building on Bureau Veritas' Green Rating™ methodology. It is being tested on 40+ pilot projects in 6 countries (Croatia, France, Greece, Italy, Portugal and Spain)

Supported building types:

TOOL APPROACH

GRA MARKET

- More than **650** properties with **10** million sqm of commercial real estate assessed in Europe
- Office, logistics and retail assets in more than **100 cities in more than 14 countries rated**
- **20 participating companies** among leading European property and auditing companies



GREPCon TOOL

THE APPROACH

Identification of standardised energy efficiency measures scenarios

Building and Equipment Technical Models

Consumption and Costs Data

Financial data

GreenRating™
Sustainable value for your assets

Financial Assessment

Feasibility assessment
Profitability projection
Risk assessment

Independent EPC Assessment and Verification

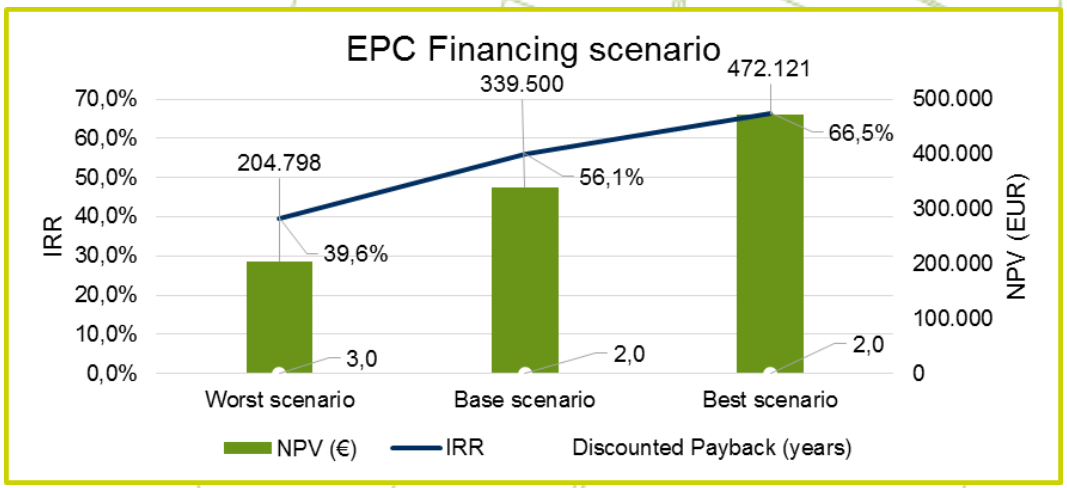
Certified by

BUREAU VERITAS 1828
BUREAU VERITAS

GREPCON ASSESSMENT

RISK ASSESSMENT SCENARIOS

- In order to allow for risk assessment, each financial scenario is considered under three scenarios: **best, base** and **worst case**
- Such cases, utilising a **Ceteris Paribus analysis**, take into account 7 different factors that can influence the cash flows of the investment such as income, costs, inflation and interest rates
- For instance, the worst case takes into account the possibility that the generated incomes are lower than forecast or that the interest rates are higher than initially assumed
- The best case works on opposite assumptions



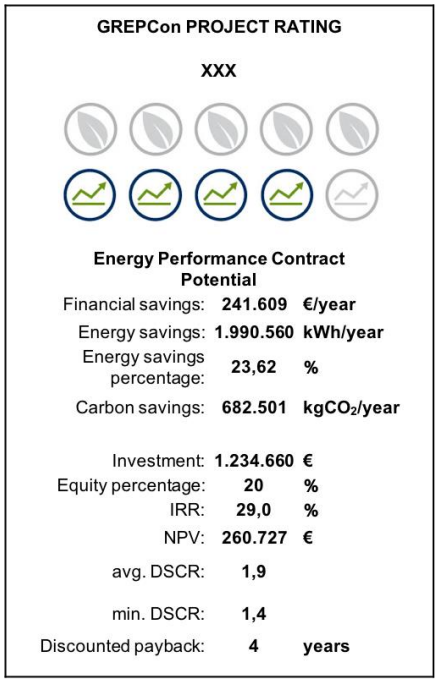
	Best	Base	Worst
Income - energy and water savings	+	=	-
Income - energy production	+	=	-
Investment overcost	N/A	=	+
O&M overcost	N/A	=	+
Energy inflation rate	+	=	-
General inflation rate	+	=	-
Interest rate	-	=	+

Legend:
+ : increase **=** : unchanged **-** : decrease **N/A** : non-applicable

GREPCON ASSESSMENT

PROJECT RATING

- For each financial scenario, based on the analysis discussed in the previous slide, the GREPCon tool elaborates its rating based on a 5 levels scale, outlined in the table below.
- A standard label is also presented to the user, graphically representing the rating with the labelling
- The environmental labelling will be available once a sufficient number of pilots within the same building category are assessed.



LABEL	DESCRIPTION
A	High Profitability, low likelihood of bad performance, very robust structure, short payback time, with a high level of security in the loan
B	Medium-High Profitability, medium-low likelihood of bad performance, medium-short payback time, with a medium-high level of security in the loan
C	Medium Profitability, medium likelihood of bad performance, medium payback time, with a medium level of security in the financing
D	Medium-Low Profitability, medium-high likelihood of bad performance, medium-long payback time, with a medium-low level of security in the financing
E	Low Profitability, high likelihood of bad performance, long payback time, with a low level of security in the financing

GREPCON ASSESSMENT

INDICATIVELY EXPLOITATION STRATEGY

CLIENT

- Project opportunity

AUDITOR

- Auditor must be accredited with GREPCon
- Auditor sets a price freely
- GREPCon assessment
- Auditor must pay a QA fee

LOCAL QUALITY CONTROL BODY

- It certifies that the project meets with pre-defined quality requirements
- Provision of a quality certificate – GREPCon stamp

BUREAU VERITAS

- Global projects database

AUDITOR

- End of the assessment

CLIENT

- gets the GREPCon certificate and the final report

INTRODUCTION

Why GREPCon Tool? What is different?

- Provides a standardized approach to calculation of energy saving measures based on Green Rating methodology.
- Able to calculate the cross-effects between the selected energy saving measures and their economic impact.
- Comparable results, trusted by the market and financial institutions.
- Provides comparability of project on pan-European scale, adding further levels of confidence to all aspects of setting up an Energy Performance Contract (EPC).

Source: Trust EPC South, EEFIG

INTRODUCTION

Why this is different from other tools available?

The tool is different, because currently, there is no Tool **to standardize Energy Performance Contracting (EPC) technical calculations,** put them under a common framework and feed them all into a fully operational tool, which is designed to be used by accredited experts and to provide fully comparable results. **Regardless of the building; a client, energy service company (ESCO) or bank is looking at Energy Performance Contracting**.

Source: Trust EPC South, EEFIG

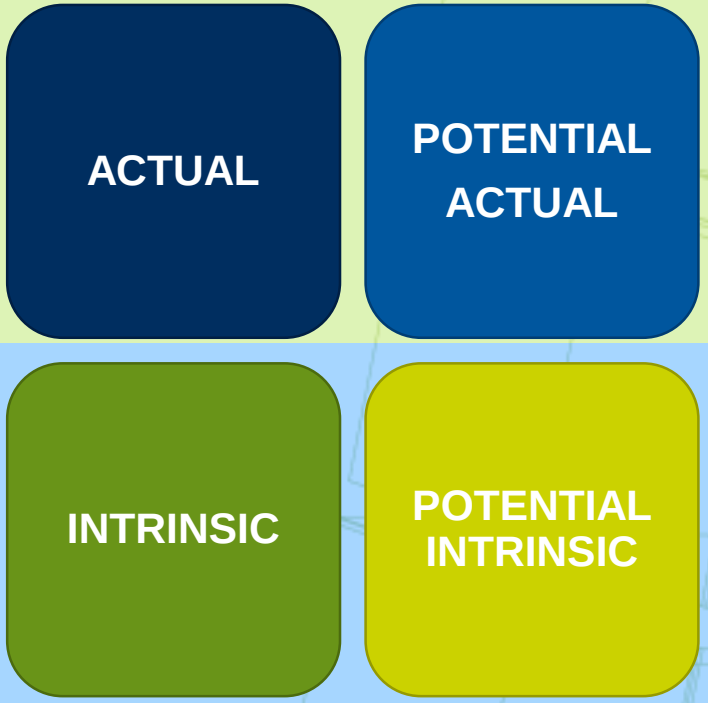
TOOL APPROACH

GREEN RATING™ METHODOLOGY

Four levels of performance

ACTUAL
Covers the building as it is, with its operation and tenants' behavior

POTENTIAL ACTUAL
Achievable through implementation of operational and behavioural recommendations

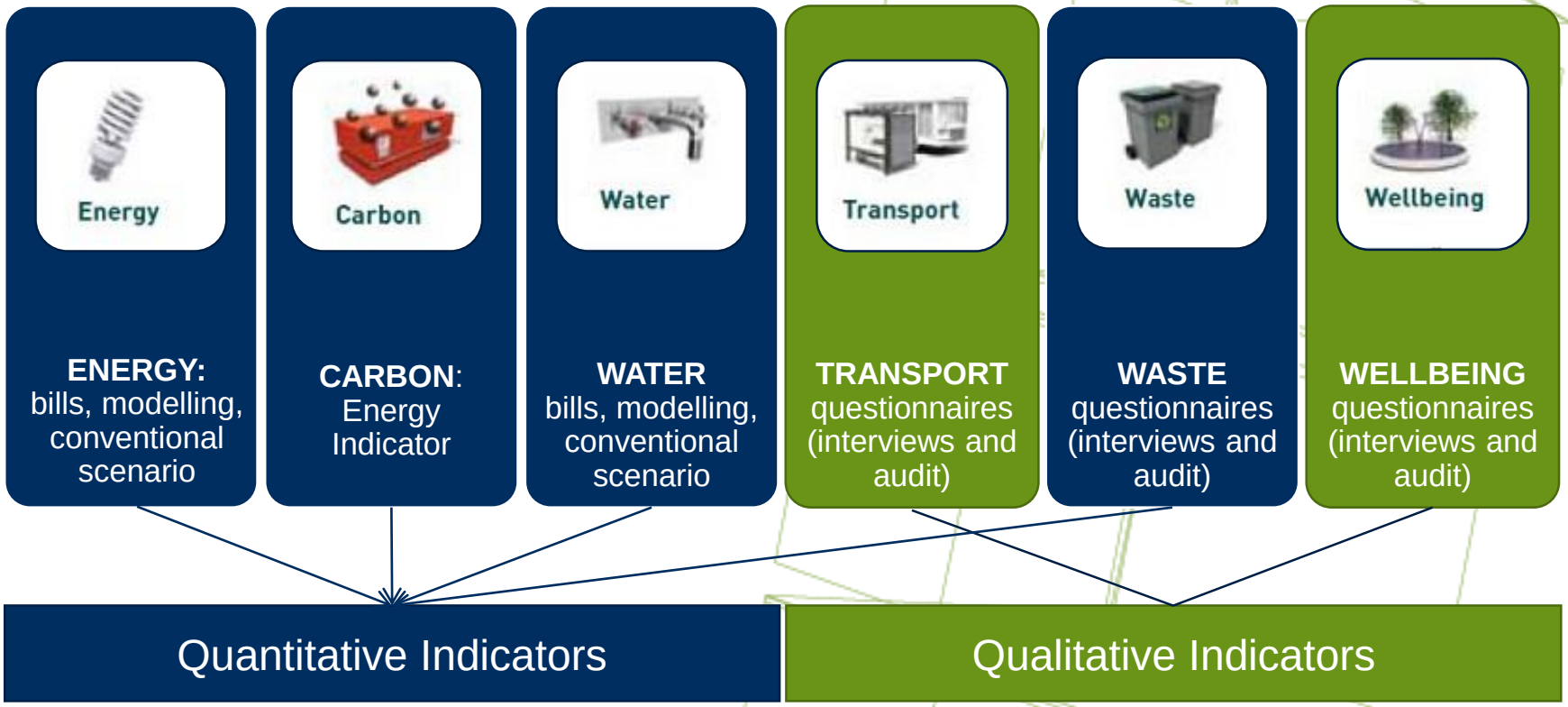


INTRINSIC
Related to building design, equipment and physical provisions

POTENTIAL INTRINSIC
Achievable through implementation of tech. recommendations covering the building design & equipment

TOOL APPROACH

KEY INDICATORS



GREEN RATING FOR EPC

The process

Building input data

- Building typology specific calculations
- Standardized Energy Efficiency measures
- Standardized building data entry
- Standardized recommendation calculation

Integration of EE measures

- 46 measures identified and described
- Each measure independently identified and calculated
- Limited auditor flexibility
- Independent calculation sheet for each measure

Tool adjustments

- New entry tabs data
- New data entry fields
- New calculations

GREEN RATING FOR EPC

INTERFACE

GREPCon - AUDIT TOOL v1.4.4 - REPORTING IN ENGLISH

Building Name *	
Building Type *	Office
Green Rating Details *	

Building code *	#N/A	00000	
Visit Date *			

Client Company*	
Client First Name*	
Client Last Name*	
Client E-Mail*	
Client Address*	
Client City*	
Client Country*	

Auditing Company *	
Auditor First Name *	
Auditor Last Name *	
Auditor E-Mail*	
Auditor Phone No.*	

Contacts during Green Rating Audit

Name	Function	Company

General building information

Address of site*	
City*	
Country*	
Zip code*	
Gross Internal Area (m²)*	
Area of reference from modelling (m²)*	
Areas excluded from modelling*	
Year of construction (YYYY) *	

GREEN RATING FOR EPC

INTERFACE

GreenRating™ Sustainable value for your assets

GENERAL INFORMATION - Office SCHEME

Building Occupancy Information

Number of occupiers (staff)*	
Vacancy during audit (%)*	
Number of opening weeks per year*	
Average workers per day (% of occupiers)*	

WHOLE BUILDING

Please complete this schedule *

Time slot	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
0-01h	0%	0%	0%	0%	0%	0%	0%
1-2 h	0%	0%	0%	0%	0%	0%	0%
2-3 h	0%	0%	0%	0%	0%	0%	0%
3-4 h	0%	0%	0%	0%	0%	0%	0%
4-5 h	0%	0%	0%	0%	0%	0%	0%
5-6 h	0%	0%	0%	0%	0%	0%	0%
6-7 h	0%	0%	0%	0%	0%	0%	0%
7-8 h	50%	10%	10%	10%	10%	0%	0%
8-9 h	75%	75%	75%	75%	75%	10%	0%
9-10 h	90%	100%	100%	100%	100%	10%	0%
10-11 h	90%	100%	100%	100%	100%	10%	0%
11-12 h	80%	100%	100%	100%	100%	10%	0%
12-13 h	80%	75%	75%	75%	75%	0%	0%
13-14 h	80%	75%	75%	75%	75%	0%	0%
14-15 h	45%	50%	50%	50%	50%	0%	0%
15-16 h	45%	75%	75%	75%	75%	0%	0%
16-17 h	60%	100%	100%	100%	100%	0%	0%
17-18 h	60%	100%	100%	100%	100%	0%	0%
18-19 h	60%	75%	75%	75%	75%	0%	0%
19-20 h	30%	75%	75%	75%	75%	0%	0%
20-21 h	20%	10%	10%	10%	10%	0%	0%
21-22 h	0%	0%	0%	0%	0%	0%	0%
22-23 h	0%	0%	0%	0%	0%	0%	0%
23-24 h	0%	0%	0%	0%	0%	0%	0%

Results

Number of opening hours per week	74
Number of opening days per week	6
Number of opening hours per year	0
Average occupancy ratio (from schedule)	61%
Occupancy ratio (occup/m²)	

Please complete Building Occupancy Tab*

	Building Occupancy
Monday to Friday	08:00
	19:00
Saturday	08:00
	16:00
Sunday	No
	No

Occupancy, internal heat gains and ventilation zoning

Zone numbe	DSM zone name	Zone area (m²)	Zone volume (m³)	Number of occupiers	Zone ventilated?
Zone 1					
Zone 2					
Zone 3					
Zone 4					
Zone 5					

Zone checks

Number of zones	0
Total area of defined zones	0
Reference floor area	0

AREA ZONE CHECK OK!

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TRUST EPC SOUTH

GREEN RATING FOR EPC

INTERFACE

Heating Plant

	Description	Heating 1	Heating 2 (if any)	Comments
PRODUCTION	Production type*			
	Number of boilers (or other heating equipment)*			
	Output power boiler (set) 1 (kW)*			
	Output power boiler (set) 2 (kW)*			
	Output power boiler (set) 3 (kW)*			
	Output power boiler (set) 4 (kW)*			
	Input power boiler (set) 1 (kW)*			
	Input power boiler (set) 2 (kW)*			
	Input power boiler (set) 3 (kW)*			
	Input power boiler (set) 4 (kW)*			
	Boiler burner*			
	Boiler and pipework insulation			
	Manufacture date of boiler			
	Supply water temperature set-point (°C)			
	Carbon emission conversion factor ($kgCO_2/kWh$) - DISTRICT HEATING*			if district heating network
	Conversion factor between delivered and primary energy (kWhp/kWh) - DISTRICT HEATING*			if district heating network
	Carbon emission conversion factor ($kgCO_2/kWh$) - BIOMASS*			if biomass boiler
	Conversion factor between delivered and primary energy (kWhp/kWh			if biomass boiler

Total heating power of system 1: 0 kW
Total heating power of system 2: 0 kW

Carbon emission factor: [0,004 - 0,9

Conversion (primary/delivered) : [0,7 - 3]

Auxiliaries

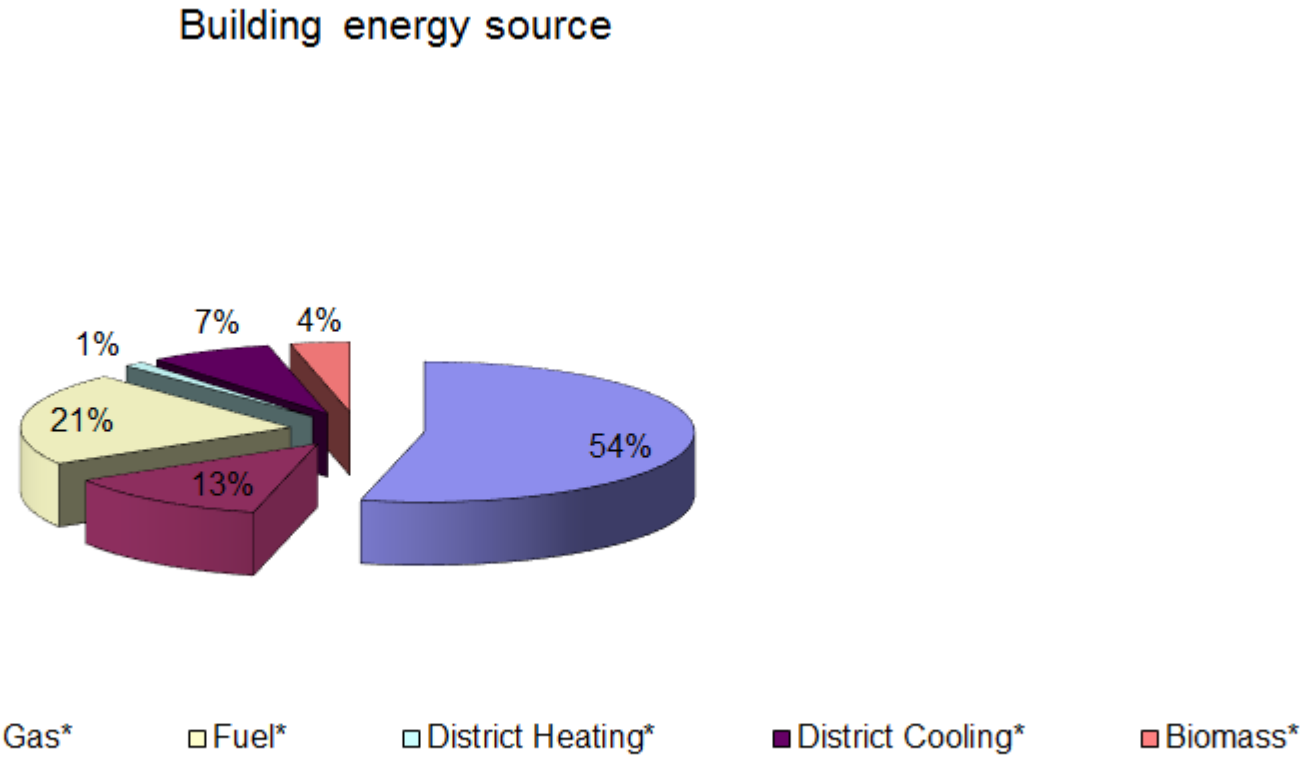
	Type of Equipment	Number	Power (W)	Average running hours/day	Average running days / week	Average running weeks / year	Low mode Power (W)	VSD?	Area	Intrinsic scenario?
HEATING										
COOLING										
OTHER										

Auxiliaries = Pumps, Fans, … included in the scope of Intrinsic

If Equipment with Variable Speed Drive --> Power - 20%

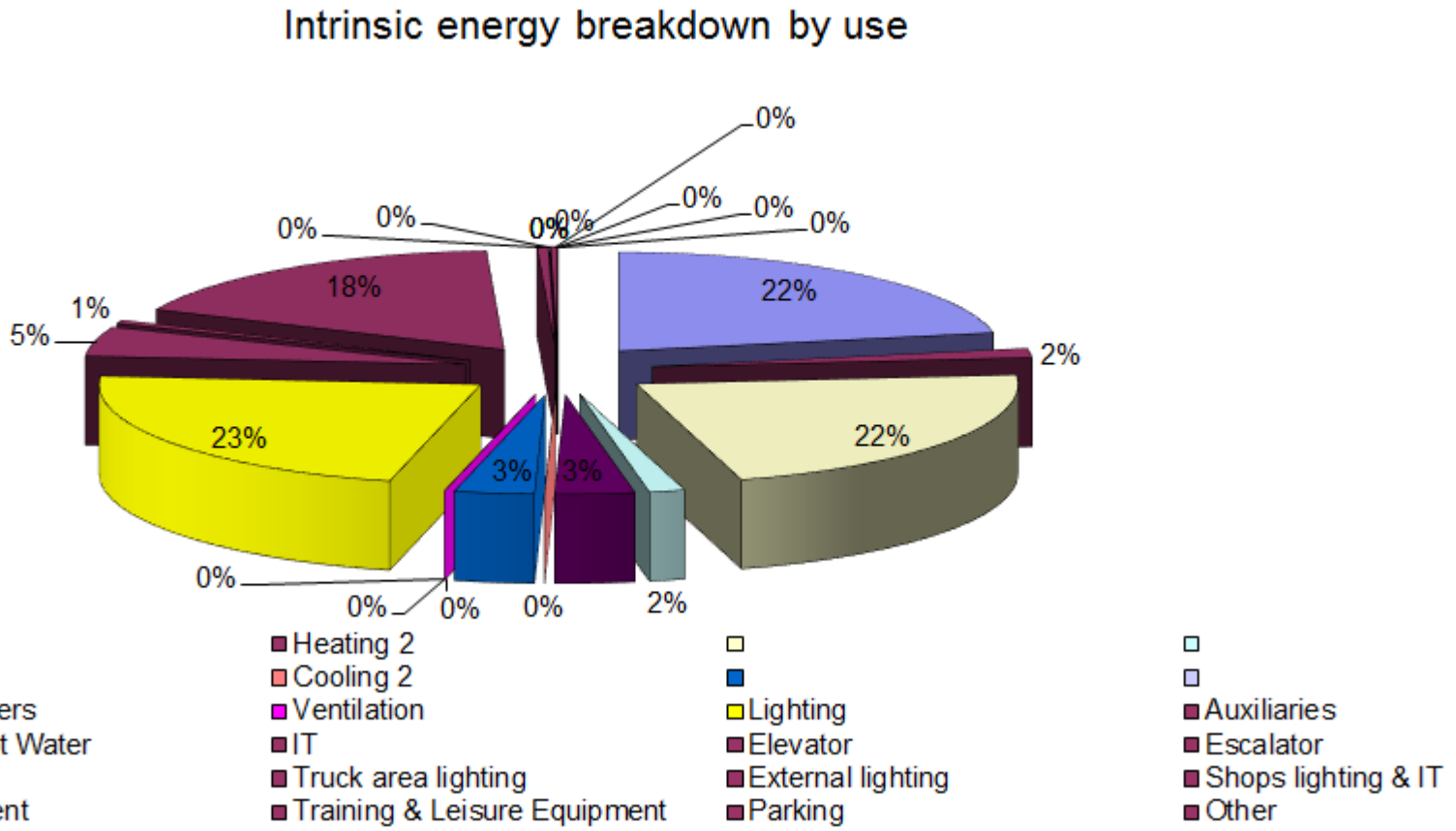
GREEN RATING FOR EPC

RESULTS – Energy assesment



GREEN RATING FOR EPC

RESULTS – Energy assesment



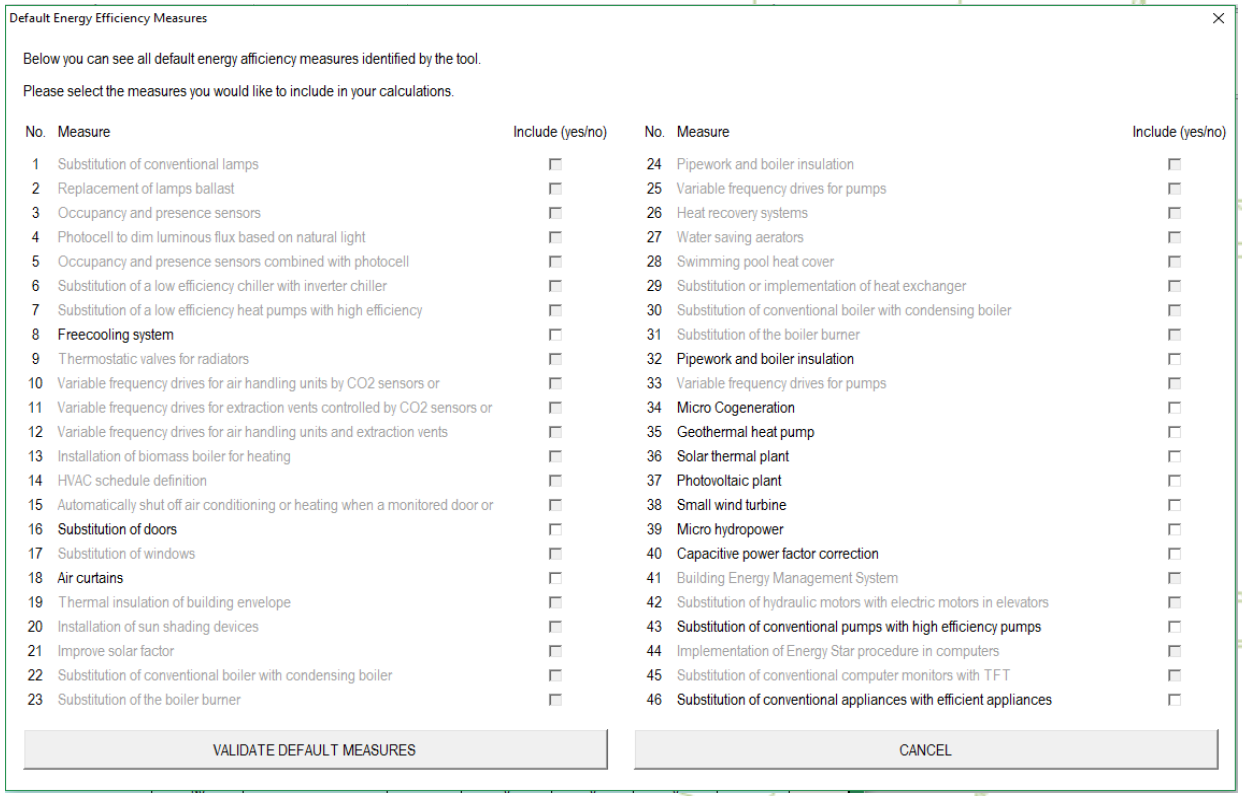
GREEN RATING FOR EPC

UPDATED GR METHODOLOGY

Identification of Energy Efficiency Measures:

By the Tool, based on building data provided

By the Auditor, from the default list



GREEN RATING FOR EPC

THE PROCESS

Identification and calculation of EE and RES measures

Each EE and RES Measure calculation is based on the data provided by the auditor

Measure n.º	Title	Criterion 1
9	Thermostatic valves for radiators	No

Gas	**Heating 1**	**1,500,000**	***kWh/year***	**34%**
Electricity	**Heating 2**	**456,000**	***kWh/year***	**10%**
Electricity	**Cooling**	**500,000**	***kWh/year***	**11%**

Heating system	Number of radiators	Current consumption (kWh/year)	Introduce TRV's?	Number of TRV's to be installed	TRV unitary cost (€)
Heating system 1	75	1,500,000.00	Yes	75	128
		1,500,000			

Total cost (€)	New consumption (installed) (kWh)	New consumption (total) (kWh)	Savings (kWh/year)	Savings (€)	Simple payback time (years)
9,600	1,425,000	1,425,000	75,000	1,875	5.1
9,600	1,425,000	1,425,000	75,000	1,875	5.1

GREEN RATING FOR EPC

THE PROCESS

Identification and calculation of EE and RES measures

Each EE and RES Measure can be implemented for the whole or only a part of its respective system / energy use

Measure n.º	Title	Criterion 1
9	Thermostatic valves for radiators	No

Gas	**Heating 1**	**1,500,000**	***kWh/year***	**34%**
Electricity	**Heating 2**	**456,000**	***kWh/year***	**10%**
Electricity	**Cooling**	**500,000**	***kWh/year***	**11%**

Heating system	Number of radiators	Current consumption (kWh/year)
Heating system 1	75	1,500,000.00
		1,500,000

Number of TRV's to be installed	TRV unitary cost (€)	Total cost (€)	New consumption (installed) (kWh)	New consumption (total) (kWh)	Savings (kWh/year)
50	128	6,400	950,000	1,450,000	50,000
		6,400	950,000	1,450,000	50,000

GREEN RATING FOR EPC

THE PROCESS

Identification and calculation of EE and RES measures

Each EE and RES Measure calculation is based on the data provided by the auditor

Measure n.º	Title	Criterion 1
9	Thermostatic valves for radiators	No

Heating*	Gas
Cooling*	Electricity

EPC RECOMMENDATION SHEET

Energy Efficiency Measure 9

Thermostatic valves for radiators

Measure automatically identified?	YES
Building system link:	Heating
Recommendation criterion type:	No TRV's
Number of possible criteria:	1
Number of criteria met:	1

Measure criteria

		Criterion met?
Criterion 1:	No Thermostatic Radiator Valves on radiators.	Yes

Description	Heating 1
Production type*	Normal boiler
Number of boilers (or other heating equipment)*	5
Output power boiler 1 (kW)*	125
Output power boiler 2 (kW)*	
Output power boiler 3 (kW)*	
Output power boiler 4 (kW)*	
Input power boiler 1 (kW)*	140

Emission type*	Wet radiators
Number of emitters*	75

Number of TRV's	0		**If TRV's present**

GREEN RATING FOR EPC

MEASURES

Energy Use	No.	Title
Lighting (5)	1	Substitution of conventional lamps
	2	Replacement of lamps ballast
	3	Occupancy and presence sensors
	4	Photocell to dim luminous flux based on natural light
	5	Occupancy and presence sensors combined with photocell
HVAC (20)	6	Substitution of a low efficiency chiller with inverter chiller
	7	Substitution of a low efficiency heat pumps with high efficiency
	8	Freecooling system
	9	Thermostatic valves for radiators
	10	Variable frequency drives for air handling units by CO2 sensors or occupancy sensors
	11	Variable frequency drives for extraction vents controlled by CO2 sensors or occupancy sensors
	12	Variable frequency drives for air handling units and extraction vents controlled by CO2 sensors or occupancy sensors
	13	Installation of biomass boiler for heating
	14	HVAC schedule definition
	15	Automatically shut off air conditioning or heating when a monitored door or window remains open for a period of time
	16	Substitution of doors
	17	Substitution of windows
	18	Air curtains
	19	Thermal insulation of building envelope
	20	Installation of sun shading devices
	21	Improve solar factor
	22	Substitution of conventional boiler with condensing boiler
	23	Substitution of the boiler burner
	24	Pipework and boiler insulation
	25	Variable frequency drives for pumps

GREEN RATING FOR EPC

MEASURES

Energy Use	No.	Title
HW (8)	26	Heat recovery systems
	27	Water saving aerators
	28	Swimming pool heat cover
	29	Substitution or implementation of heat exchanger
	30	Substitution of conventional boiler with condensing boiler
	31	Substitution of the boiler burner
	32	Pipework and boiler insulation
	33	Variable frequency drives for pumps
Reneweble energy sources (6)	34	Micro Cogeneration
	35	Geothermal heat pump
	36	Solar thermal plant
	37	Photovoltaic plant
	38	Small wind turbine
	39	Micro hydropower
Others (7)	40	Capacitive power factor correction
	41	Building Energy Management System
	42	Substitution of hydraulic motors with electric motors in elevators
	43	Substitution of conventional pumps with high efficiency pumps
	44	Implementation of Energy Star procedure in computers
	45	Substitution of conventional computer monitors with TFT
	46	Substitution of conventional appliances with efficient appliances
All (1)	47	Operation times redefinition

GREEN RATING FOR EPC

THE PROCESS: SUMMARY

Measure Generation

GR Tool Calculates the EE Measures

Measure Transfer

GR Tool generates one Financial Tool per Measure or Group of Measures	GR Tool transfers Measure Data to the Financial Tool

Iterative Financial Calculation

Each copy of the Financial Tool calculates its own set of measures	GR Tool extracts results from all copies of the Financial Tool and presents six top results

FINANCIAL ASSESSMENT

INTERFACE

DATA INPUT

Yellow cells: User input required

Green cells: GREPCon tool output

PROJECT GENERAL DATA

Project indexes

Macroeconomic variables	
Energy inflation rate	1,0%
General inflation rate	0,3%
Euribor	0,1%
Spread	5,0%
Interest rate	5,1%
Loan formalisation fee	0,5%
EBT tax rate	25%
Bank loan repayment term (years)	9
EPC features	
Overhead	5,0%
Client shared savings (%)	5,0%
EPC project duration (years)	10
EPC loan repayment term (years)	7

Financial project data input

(12)	Energy saving measures (ESM) investment	€ 450.000
(13)	% of additional expenses	0%
(14)	% of Grant (subsidies)	0%
	Total investment amount	€ 500.000
(15)	% debt	50%
	% equity	50%
	Debt	€ 250.000
	Equity	€ 250.000
	Grant	€ -
(16)	K asset (required return)	9%
(17)	K equity (required return)	10%
(18)	% of investment subject to depreciation	100%
	Investment subject to depreciation	€ 500.000
(19)	Working capital requirements (% of income)	10,0%
(20)	EPC depreciation period (years)	10
(21)	Asset depreciation period (years)	20
(22)	ESM project horizon (years)	20

PROJECT SPECIFIC DATA

Income & expenses (€)

	Annual income	€ 150.000
(23)	Energy savings	€ 145.000
(24)	Energy production	€ 2.000
(25)	Water savings	€ 1.000
(26)	Carbon credits trading	€ 1.000
(27)	O&M savings	€ 1.000
	Annual expenses	€ 30.000
(28)	Energy supply	€ 10.500
(29)	O&M	€ 19.500
	Other investment costs	€ 50.000
(30)	ESCO expenses	€ 40.000
(31)	Owner expenses	€ 10.000

FINANCIAL TOOL SCENARIOS

- **EPC project**

the project is funded or participated by an Energy Performance Contract (EPC), which is an alternative financing mechanism designed to accelerate investment in cost effective energy savings. In this scenario, energy saving benefits can be shared with the client

- **Client financing through a loan**

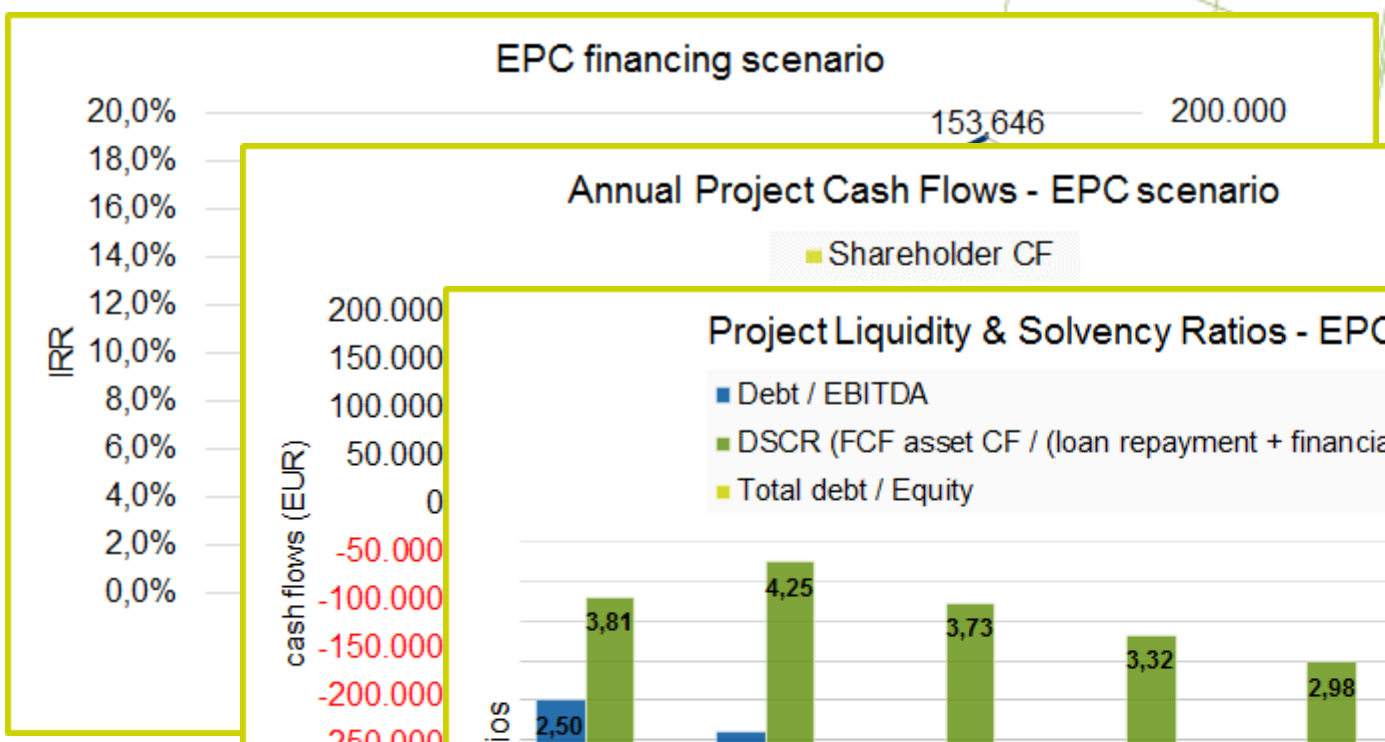
is the typical case of financing a project through a loan between the client and the bank directly

- **100% equity (no financing)**

when the client decides to implement the project through own funds.

FINANCIAL ASSESSMENT

FINANCIAL SCENARIOS



FINANCIAL ASSESSMENT

FINANCIAL ASSESMENT

Scenario	*Case*	*IRR*[1]	*NPV*[2] (€)	*Discounted Payback (years)*	*Minimum DSCR*[3]	*Average DSCR*[3]	*Negative FCF*[4] (years)	*Project rating*
EPC financing	Worst	5,2%	-67.005	9,0	1,7	3,2	0	**B**
	Base	12,6%	40.055	8,0	2,5	3,3	0	
	Best	19,0%	153.646	6,0	3,2	3,6	0	
Client financing	Worst	18,9%	204.619	6,0	2,9	8,0	0	**A**
	Base	25,9%	427.409	5,0	4,2	6,9	0	
	Best	31,6%	717.938	4,0	6,0	6,8	0	
Project (100% equity)	Worst	14,4%	154.885	7,0	-	-	0	**A**
	Base	18,8%	367.910	6,0	-	-	0	
	Best	22,8%	648.995	5,0	-	-	0	

GREPCON ASSESSMENT

GLOBAL RESULTS

OVERALL PERFORMANCE

QUANTITATIVE INTRINSIC VALUES

Indicator	Intrinsic Value
Energy	162 kWh/m^2/year
Carbon	46 kgCO$_2$eq/m^2/year
Water	0,18 m^3/m^2/year

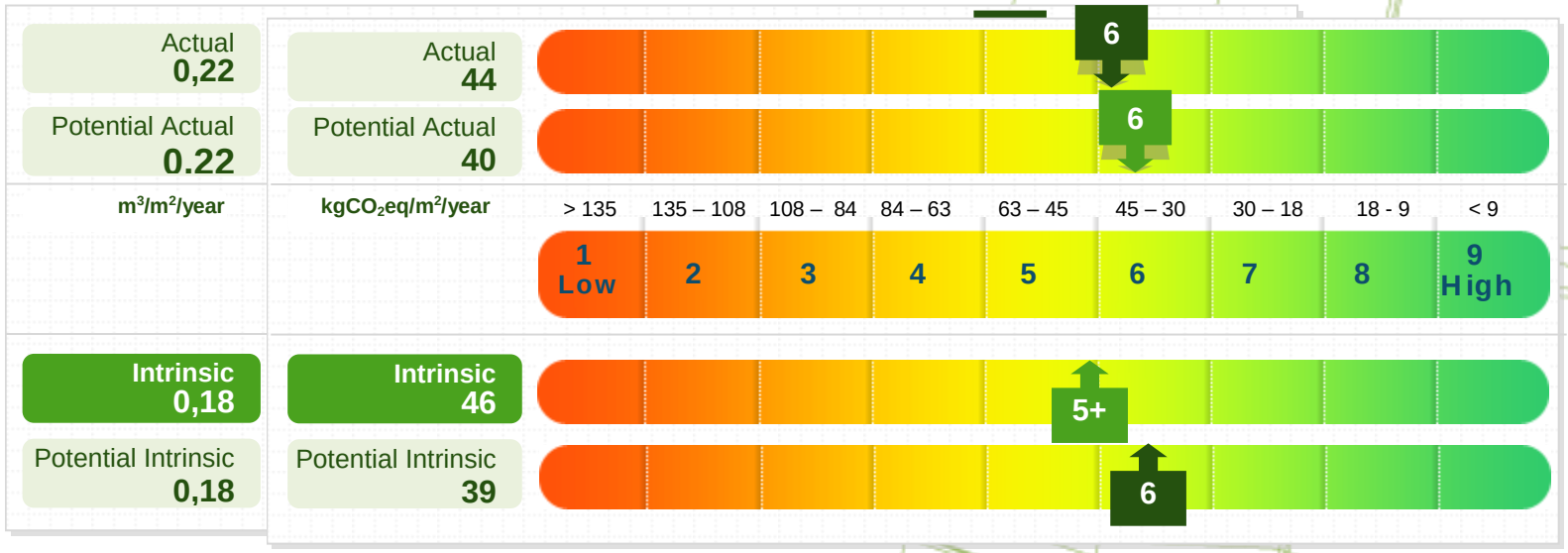
PERFORMANCE RATING SUMMARY

OVERALL RATING (from 1 to 9)		ACTUAL	POTENTIAL ACTUAL	INTRINSIC	POTENTIAL INTRINSIC
Overall Performance		**5,4**	**5,9**	**5,5**	**6,0**
	Weighting				
Energy	*30%*	*5+*	*6*	*5+*	*6*
Transport	*20%*	*4*	*5*	*4*	*4+*
Carbon	*15%*	*6*	*6*	*5+*	*6*
Water	*15%*	*7+*	*7+*	*7+*	*7+*
Wellbeing	*10%*	*4+*	*5*	*4+*	*5+*
Waste	*10%*	*3+*	*3+*	*3+*	*5*

GREPCON ASSESSMENT

GLOBAL RESULTS – Quality ratings

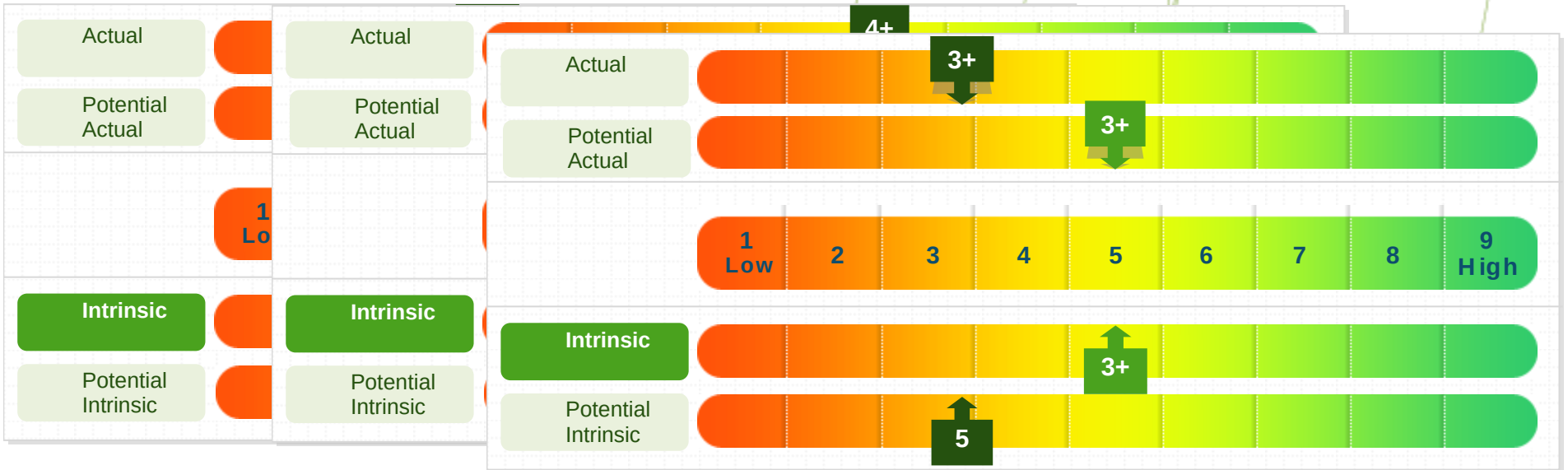
A. Water ***A. Carbon*** *(energy related CO_2 equivalent emissions)*



GREPCON ASSESSMENT

GLOBAL RESULTS – Quality ratings

A. Transport ***A. Wellbeing*** ***A. Waste***



GREPCON ASSESSMENT

GLOBAL RESULTS

Indicator	Improvement Potential: Intrinsic Performance
Energy	• Rec1: Substitution of conventional lamps • Rec3: Occupancy and presence sensors • Rec25: Variable frequency drives for pumps
Transport	• To reduce the number of parking places
Carbon	• Recommendations to improve carbon performance are shown in the Energy section
Water	• None
Wellbeing	• Replacement of standard ballasts by high frequency or electronic ballasts • Establishment of zoned controls • Establishment of disabled facilities
Waste	• Introduction of clearly labelled individual bulk recycling containers

No.	Energy saving measures to be implemented	Estimated Savings (kWh/year)	Estimated investments (€)	*Estimated Payback*
1	Thermostatic valves for radiators	35.030	6.300	< 3 years
2	Occupancy and presence sensors	32.760	9.357	< 4 years
3	Variable frequency drives for pumps - HVAC	16.450	4.200	< 4 years

GREPCON ASSESSMENT

PROJECT RATING

GREPCon PROJECT RATING

XXX

Energy Performance Contract Potential

Financial savings:	**241.609**	**€/year**
Energy savings:	**1.990.560**	**kWh/year**
Energy savings percentage:	**23,62**	**%**
Carbon savings:	**682.501**	**kgCO_2/year**
Investment:	**1.234.660**	**€**
Equity percentage:	**20**	**%**
IRR:	**29,0**	**%**
NPV:	**260.727**	**€**
avg. DSCR:	**1,9**	
min. DSCR:	**1,4**	
Discounted payback:	**4**	**years**

LABEL	DESCRIPTION
A	High Profitability, low likelihood of bad performance, very robust structure, short payback time, with a high level of security in the loan
B	Medium-High Profitability, medium-low likelihood of bad performance, medium-short payback time, with a medium-high level of security in the loan
C	Medium Profitability, medium likelihood of bad performance, medium payback time, with a medium level of security in the financing
D	Medium-Low Profitability, medium-high likelihood of bad performance, medium-long payback time, with a medium-low level of security in the financing
E	Low Profitability, high likelihood of bad performance, long payback time, with a low level of security in the financing

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SCHOOL OF ENVIRONMENTAL ENGINEERING
RENEWABLE AND SUSTAINABLE ENERGY
SYSTEMS LABORATORY

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