



EIB Project Carbon Footprinting Buildings EE Renovation

Carbon Footprint in Buildings

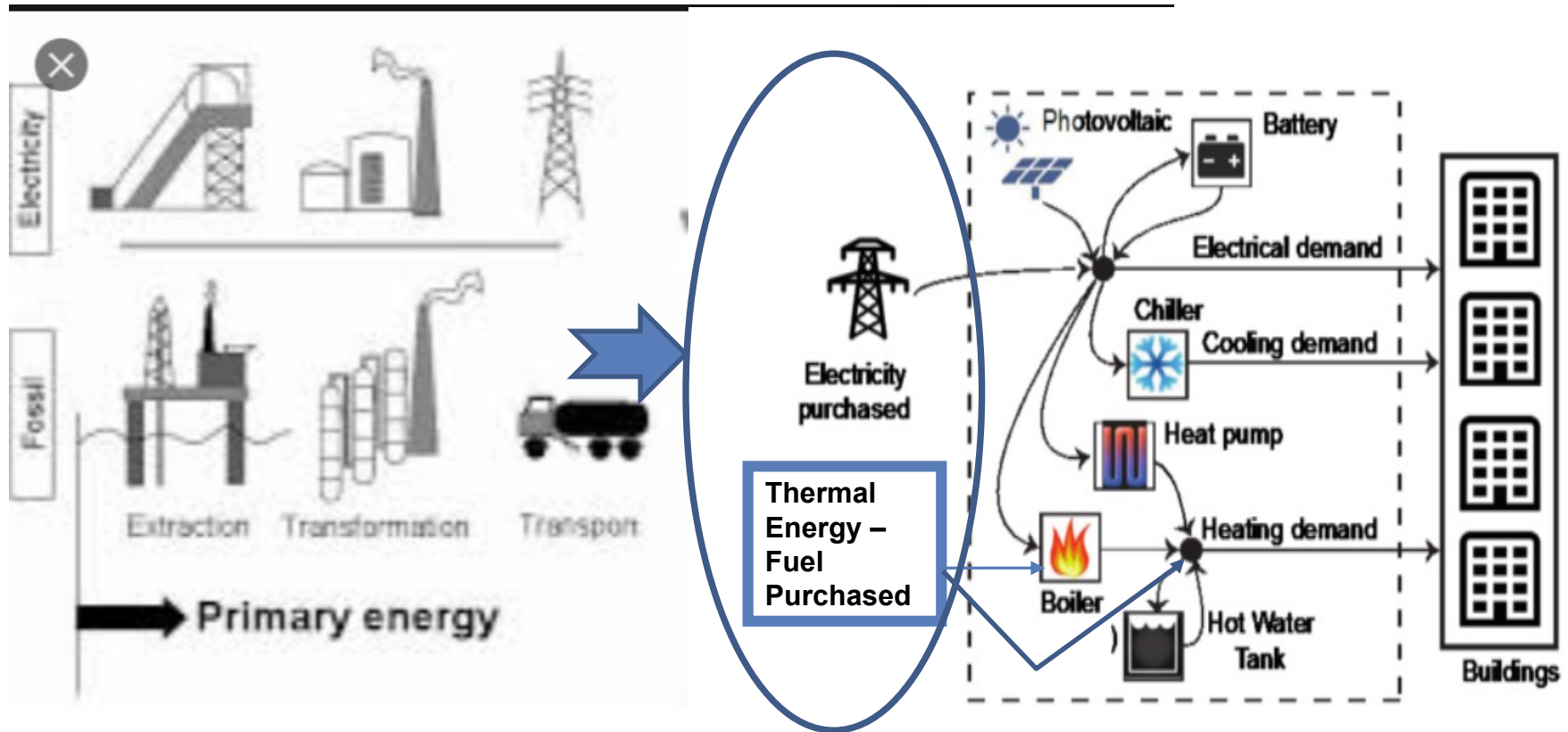


- $CO_2 e(t) = \text{electric energy use (i)} * \text{country specific emission factor for elec consumption (iv)} + \text{heat energy use (ii)} * \text{project specific heat emission factor (iii)}$
 - (i) Electric Energy Purchased for use in the building
 - (ii) Thermal Energy/ fuel purchased for use in the building
 - (iii) Project specific heat emissions factor (District Heating, fossil fuel boilers at building or apartment level)
 - (iv) Country specific electricity grid factor (see table A1.3)

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(i)(ii) Electricity and Thermal Energy purchased – Not primary energy or energy demand.



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(iii) Heat Emission factor

- District Heating the value should be provided by promoter
- for other fuels see Table A1.1 –page 26 and for residential heat boiler table A1.4 (i.e. natural gas 223 tCO₂e/GWh)

(iv) Electricity grid factor see Page 30 , LV Grid values

(i.e. EU 28 – 0.285 Kg CO₂/KWh)

Emission Factors in gCO ₂ /kWh (The impact of non-CO ₂ GHGs is negligible. For calculation purposes, the factors below can be considered as CO ₂ e.)					
Country / Territory / Island	Combined Margin Intermittent Electricity Generation	Combined Margin Firm Electricity Generation/ Electricity Consumption	Electricity Consumption/ Network Losses HV Grid +2%	Electricity Consumption/ Network Losses MV Grid +4%	Electricity Consumption/ Network Losses LV Grid +7%

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- Main Cases
 - Refurbishment of Buildings
 - Absolute – Energy Consumption of the building after the refurbishment (EPCs, energy simulations, energy audits, etc.)
 - Baseline – Energy Consumption of the building before the refurbishment (energy metered, EPCs)

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- Typical Information needed
 - Renovation of Buildings
 - Energy consumption before renovation (energy metered, proxies – EPCs, energy audits)
 - Energy consumption after renovation (energy simulation, EPCs, energy audits, etc.)
 - Split between electricity and thermal energy
 - Primary Factors (if values in primary energy)
 - Coefficient of performance (if values in demand)
 - Emissions factors (District Heating/Cooling)

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- **Example 1** –EE thermal refurbishment of existing residential buildings.
- The promoter provides the information of the targeted energy demand (heating/cooling) per square meter per building (and the current energy demand of the existing buildings (EPCs)).

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- **Refurbished buildings**– Absolute energy purchased and baseline energy purchased. **Step 1 – Analysis of available information** =Info from the EPC, no metered energy.

	SQM	EPC		Demand Thermal energy (KWht)		Demand Cooling (KWht)	
		EPC Before	EPC After	Baseline	Absolute	Baseline	Absolute
Building 1	3,854	E	B	175	27	9	6
Building 2	15,894	D	B	62	27	9	9
Building 3	650	E	B	144	27	12	9
Building 4	2,002	E	B	103	27	11	9
Building 5	24,011	D	B	45	27	13	9
Building 6	3,210	F	B	182	27	21	9
Building 7	3,633	E	B	144	27	12	9
Building 8	10,188	E	B	112	27	10	9

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- Example of thermal energy – Gas

	SQM	Baseline KWh/sqm	Absolute KWh/sqm	Demand KWh			Gas KWh	
		Current EPC	Expected EPC	Baseline	Absolute	Performance	Baseline	Absolute
Building 1	3,854	175.00	27.00	674,450	104,058	0.85	793,471	122,421

- $\text{KWh Absolute Thermal Demand} = (3,854 \text{ sqm} \times 27 \text{ KWht/sqm}) = \mathbf{104,058 \text{ KWht}}$ demand
- $\text{KWh Absolute Gas} = \text{Demand/Performance} = 104,058 \text{ KWht} / 0.85 \text{ KWht/KWh}_{\text{gas}} = \mathbf{122,421 \text{ KWht}_{\text{gas}}}$

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- Step 2 = Absolute energy purchase and baseline energy purchase.

	Thermal Energy (KWht)			Electricity	
	Baseline	Absolute		Baseline	Absolute
Building 1	674,832	104,057		33,915	21,968
Building 2	983,823	429,131		141,454	141,454
Building 3	93,665	17,550		7,800	5,785
Building 4	212,939	55,944		23,372	18,441
Building 5	1,074,505	648,305		321,031	213,700
Building 6	596,214	88,425		67,629	29,148
Building 7	520,633	97,551		43,356	32,156
Building 8	1,139,240	275,080		106,364	90,675
Total Demand	5,295,851	1,716,043		744,921	553,326
	Gas Baseline KWh	Gas Absolute KWh		Elec Baseline KWh	Elec Absolute KWh
Total Energy Purchased KWh	6,230,413	2,018,874		248,307	184,442

Total Energy Thermal= Total Energy Thermal Demand/Performance
 Total Energy Electricity= Total Cooling Demand/Performance

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- **Step 3 . Emissions Factors**
- Thermal Energy – Gas – 233 (gCO₂/KWh or ton/GWh)
- Electricity – EU LV – 285 (gCO₂/KWh or ton/GWh)

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• Step 4 . Template – Carbon Footprint calculation

Section 2 - Absolute Emissions

SCOPE 1, 2 or 3 EMISSIONS (AS APPLICABLE)				
Description of source	Activity data	Units/yr	Emissions factor* t CO2-eq/unit	Emissions kt CO2-eq/yr
Existing buildings after refurbishment gas	2.01887	GWh/yr	233	0.470
Existing buildings after refurbishment electricity	0.18444	GWh/yr	285	0.053
				0.000
(A)			Absolute Emissions	0.523

Section 3 - Baseline & Relative Emissions

BASELINE EMISSIONS				
Description of source	Activity data	Units/yr	Emissions factor* t CO2-eq/unit	Emissions kt CO2-eq/yr
Existing buildings before refurbishment gas	6.2304	GWh/yr	233	1.45
Existing buildings before refurbishment electricity	0.2483	GWh/yr	285	0.07
				0.00
(B)			Baseline Emissions	1.52
(A - B)			Relative Emissions	-1.00

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- Quick Estimation based on average energy savings

Emissions Reduction in Kton CO2	8.08
Emission Factor Electricity - tonCO2/GWh	285
Emission Factor Thermal Energy - tonCO2/GWh	233
SQM	400,000
Electricity Savings in GWh	12
Thermal Energy/Gas savings in GWh	20
Average Purchased Electricity Savings KWh per SQM	30
Average Purchased Thermal Energy/Fuel Savings KWh per SQM	50



Thanks

Q&A