AIDA

AFFIRMATIVE INTEGRATED ENERGY DESIGN ACTION

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EURAC research

"Experiences of integrated design and nZEB from the European project AIDA“

WP3
Integrated Energy Design in municipal Practice

Gothenburg 23/05/2013

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European Academy of Bozen / Italy.

Supported by INTELLIGENT ENERGY EUROPE

AIDA project objective

The AIDA project aims at stimulating and accelerating the market entry of nearly zero-energy buildings (nZEB), which means to increase the energy efficiency and the use of renewable energy source.

The objective of *WP3 'Integrated Energy Design in municipal Practice'* is to provide a methodological approach based on integrated energy design process, for public authorities, to introduce energy requirements into public design tenders.

The final objective of WP3 is the development of guidelines on **how to require the nZEB energy target into public design tenders**.

The guidelines will include:

- tender requirements development through an integrated approach
- technical, legislative, financial etc. barriers overcoming
- case studies and lessons learned

Design tender layout + NZEB or nZEB concept

Analysis of public tenders typologies and tenders structures:

- Tender parts required by law
- Architectural rules (design, function)
- National/local laws and standard accomplishment
- …

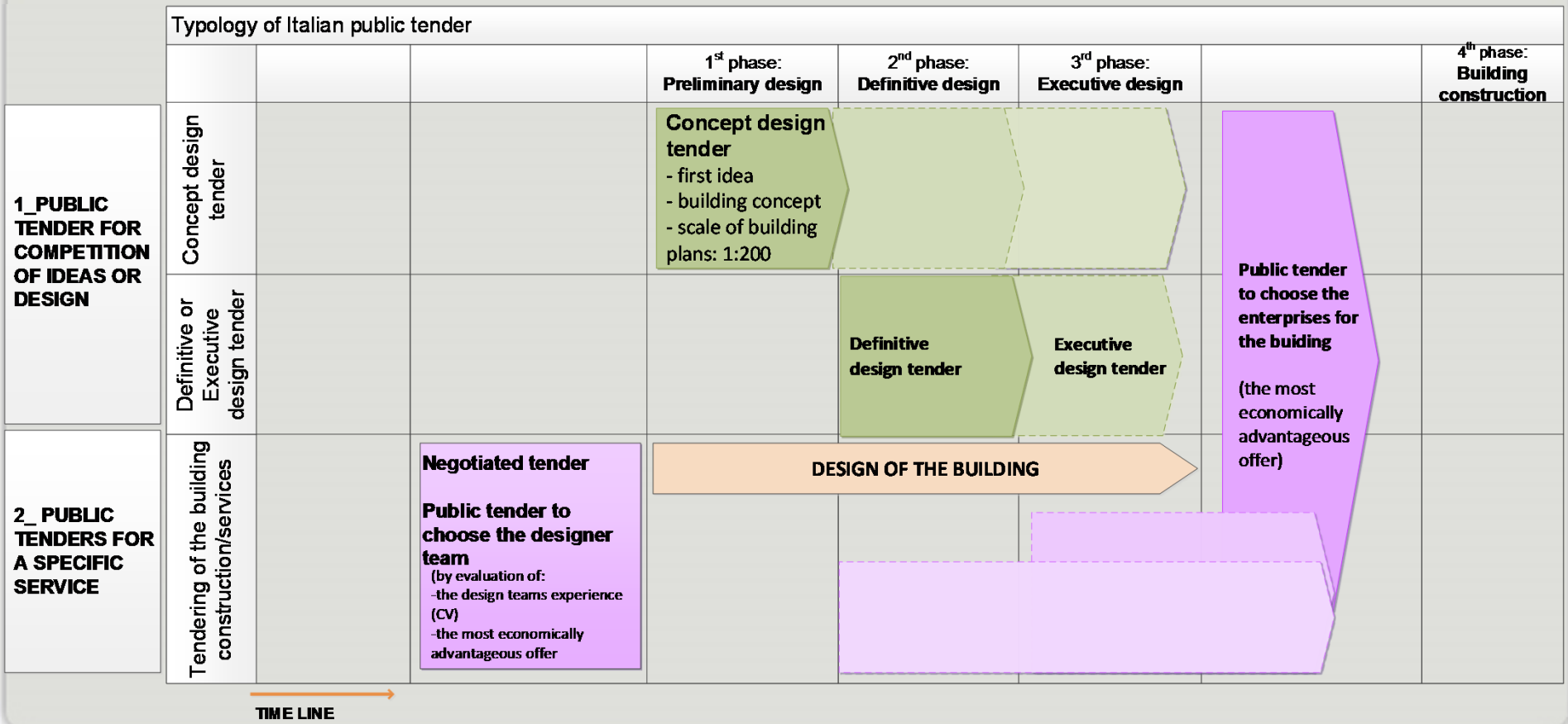
- nZEB definition
- Energy balance calculation method
- Tools
- Building system boundary
- RES
- Weighting system

Integrated Energy Design (IED)

To understand when and how to support Municipalities in nZEB design tender development

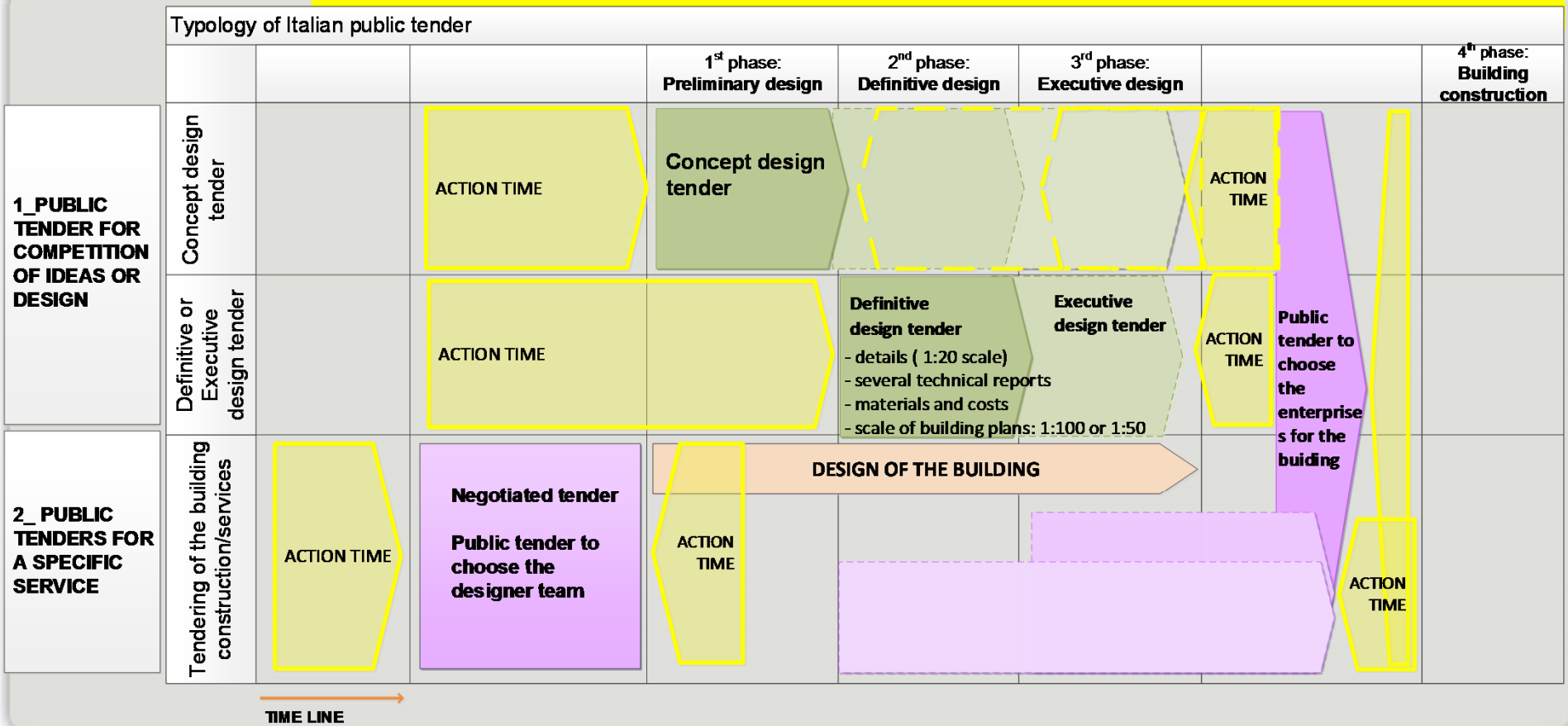
Analysis of Italian public tenders typologies

- Public tenders for ideas or design competition ➔ to elect the best design project
- Public tenders for a specific service (Negotiated tender) ➔ to elect the most economically advantageous offer or a 'service'



Action time means the AIDA partners effort to support municipalities in:

- writing the public design tender (energy performance requirements part)
- implementing the IDP
- Developing simplified tools for energy demand and generation from RES estimation
- supporting the Jury in projects evaluation



Structure of the public design tender

Structure of standard tenders Necessary paragraphs	Energy requirements section
Objective of the project - description of the state of the art (urban issues, connected to the transport network, etc.). - theme of the project - description of the aims of the project	Target nZEB target
Guidelines for the design project - urban laws - legislative rules (acustic, static,....) - other laws specific for the use of the builsign (school, office, residence legislative rules...)	National/regional energy laws about nZEB rules
Technical requirements - construction requirements - plant requirements - energy requiremnts	Describe the methodology for the energy balance calculation
Functional and architectonical concept - description of the functions - functional diagram of summary	Describe the **energy strategy**: - passive and active solutions - orientation, form, S/V... - day lighting - integration of the energy production systems - heating plans -....
Design team - architects - engineers (mechanic, elctric, structural...) - builder	Figure specialized in energy efficiency of the building and RES.
General requirements - costs for the building construction - operating costs	National/regional energy laws
Award scoring criteria System of comparing different aspect of the design proposals. The ranking list usually is based on the main specific variants, such as aesthetic value, functional aspect, costs of the building and assigns different weight to each aspect. The result with the highest number is the winner.	Add into the raking list a point about energy balance. Higer score will be assigned to design building which energy balance is close to zero (NEZB).
Jury composition The commission is usually set up by figures with different specialization (architects, engineers, Municipality representatives, owners, tenants...)	Figure specialized in: • energy efficiency of the building • RES.

NZEB or nZEB concept

- NZEB definition
- Energy efficiency requirements
- Energy balance calculation method
- Building system boundary
- Balance metric (primary energy, emission..)
- Energy generation system from RES
- Weighting system

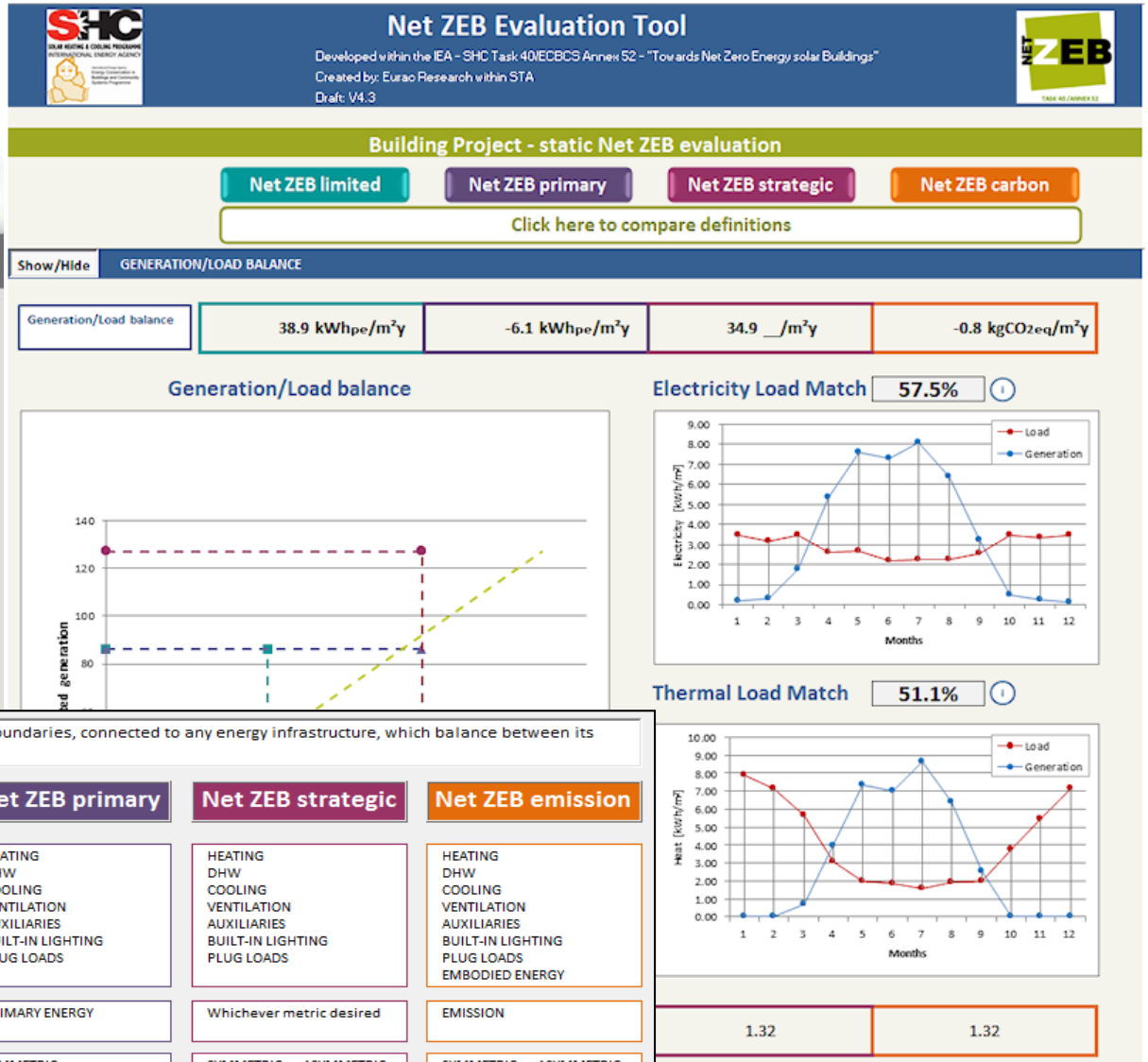
NET ZEB TASK 40 / ANNEX 52

International project
IEA SHC Task 40/ECBCS Annex 52

SHC SOLAR HEATING & COOLING PROGRAMME INTERNATIONAL ENERGY AGENCY
International Energy Agency Energy Conservation in Buildings and Community Systems Programme

National-local energy laws
Exploiting the existing energy performance evaluation tools

International project
IEA SHC Task 40/ECBCS Annex 52



A Net Zero Energy Building is the "building system" delimited by set physical boundaries, connected to any energy infrastructure, which balance between its weighted energy loads and supplies is zero.

		Nearly Net ZEB	Net ZEB primary	Net ZEB strategic	Net ZEB emission
Building system boundary	Balance boundary	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING (only non residential buildings)	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING PLUG LOADS	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING PLUG LOADS	HEATING DHW COOLING VENTILATION AUXILIARIES BUILT-IN LIGHTING PLUG LOADS EMBODIED ENERGY
Weighting system	Metric	PRIMARY ENERGY	PRIMARY ENERGY	Whichever metric desired	EMISSION
	Symmetry	SYMMETRIC	SYMMETRIC	SYMMETRIC or ASYMMETRIC	SYMMETRIC or ASYMMETRIC
	Time dependent accounting	STATIC	STATIC	STATIC	STATIC
Net ZEB balance	Energy efficiency	NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS ARE FULFILLED	NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS ARE FULFILLED	ANY NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS HAS TO BE FULFILLED	ANY NATIONAL/LOCAL ENERGY EFFICIENCY REQUIREMENTS HAS TO BE FULFILLED
	Energy supply	ON SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES	ON SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES	ON/OFF SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES	ON SITE GENERATION DRIVEN BY ON/OFF SITE SOURCES

National-local laws concerning building energy performance

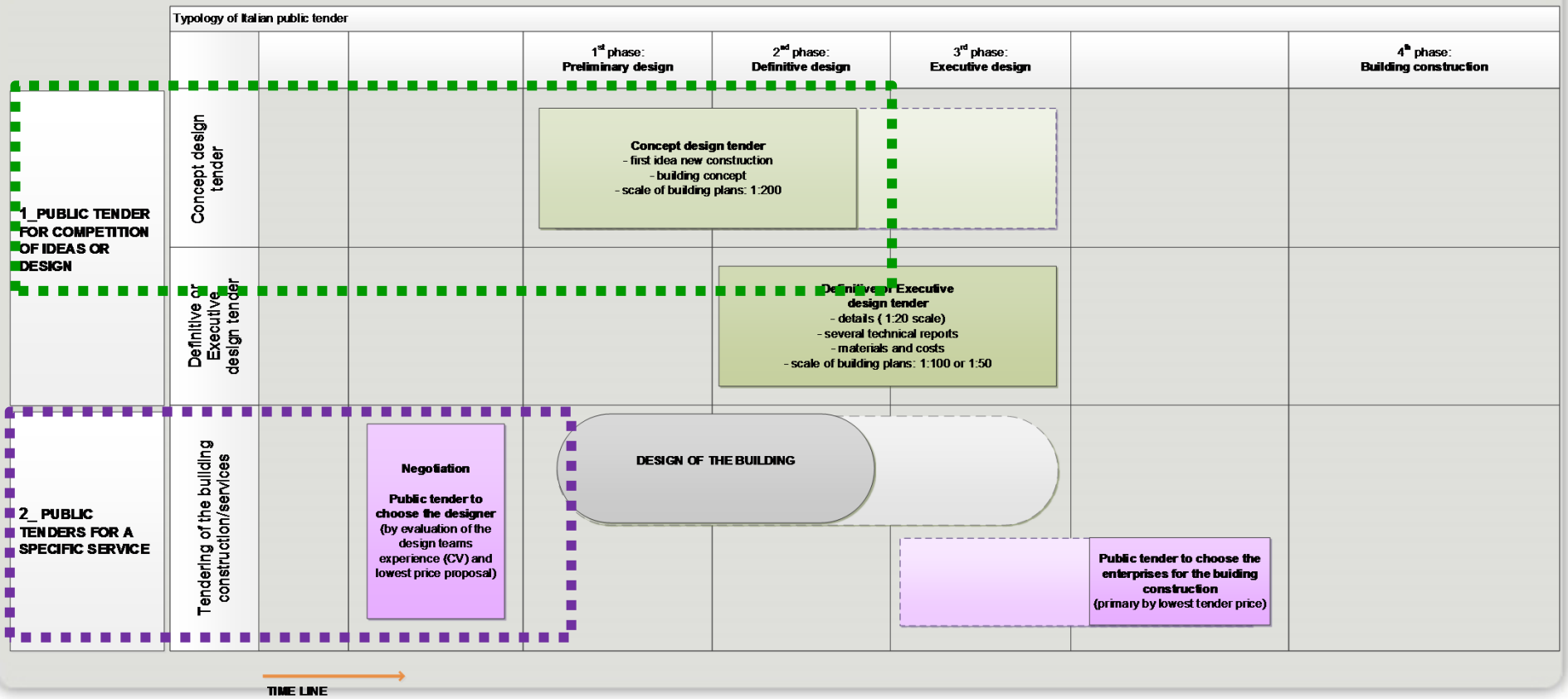
		SOURCE (law)	Weighting factors equivalent for Primary Energy Factor and CO2 emissions. Source:	Method for energy calculation	Envelope	Load		Final Energy demand			Primary energy demand				Energy Prodution	
					Indexes and energy requirements for the envelope	Space Heating kWh/(m²year)	Space Cooling kWh/(m²year)	Space Heating kWh/(m²year)	Space Cooling kWh/(m²year)	Total (DHW, Heating, Cooling, Auxiliary and Household Electricity) kWh/(m²year)	Space Heating kWh/(m²year)	Space Cooling kWh/(m²year)	Total (DHW, Heating, Cooling, Auxiliary and Household Electricity) **EP or EP value**, (kWh/(m²y))	Total (DHW, Heating, Cooling, Auxiliary and Household Electricity) **CO2emission** (Kg/(m²year))	Minimum thermal Renewable Energy Generation	Minimum electric Renewable Energy Generation
ITALY	National	UNI/TS 11300-1:2008		X												
	National	UNI/TS 11300-2:2008		X												
	National	UNI/TS 11300-3:2010		X												
	National	UNI/TS 11300-4:2012		X												
	National	DPR59/09			X	X (Limit values depends on GG and ratio S/V)	X (Limit values depends on GG and ratio S/V)	X (Limit values depends on GG and ratio S/V)	X (Limit values depends on GG and ratio S/V)		X (Limit values depends on GG and ratio S/V)	X (Limit values depends on GG and ratio S/V)	X (Limit values depends on GG and ratio S/V)			
	National	DECRETO LEGISLATIVO 3Marzo 2011 , n. 28													X (Define minimum values)	X (Define minimum values)
	National	ISTAT: Energy balance, 2009	X													
	Province of Bolzano	Resolution decree of the Province of Bolzano n.362 of 4th March 2013	X		X	X (Limit values depends on GG and ratio S/V)		X	X	X (Limit values depends on GG and ratio S/V)			X (Define calsses of values)	X (Define calsses of values)	X (Define minimum values)	X (Define minimum values)

Existing energy performance evaluation tools

AIDA Parteners	Country	Tool name	Is an Energy certification tool?	Is the certification mandatory?	Calculation approach	OUTPUT							InterOperability (file format)
				if yes, for each country?	(static-dynamic)	Heating energy demand and DHW	Cooling energy demand	Electric energy demand	Lighting	Primary energy demand	RES	Total CO2	
						(kWh/m^{2}year)	(kWh/m^{2}year)	(kWh/m^{2}year)	(DA,DF, UDI, glare)	(kWh/m^{2}year)			
EURAC	IT	XClima (CasaClima)	x	Province of Bolzano (IT)	Static simulation	x				x	Contribution of PV-Solar pannel-Geothermal	x	web
EURAC	IT	DOCET	x	Italy	Static simulation	x	x			x	Contribution of PV-Solar pannel-Geothermal	x	.xml
EURAC	IT	PHPP			Static simulation	x	x	x		x	Contribution of PV-Solar pannel-Geothermal..	x	.xls
EEG, TU Wien	AT	Gebäudeintegration			Static & Dynamic simulation parts	x		x		x	PV, Solar thermal, heat pump, wood pellets, district heat	x	.xlsm
AEE INTEC	AT	GEQ	x	Austria	Static simulation	x	x	x		x	Contribution of PV-Solar pannel-Geothermal..	x	
AEE INTEC	AT	PHPP			Static simulation	x	x	x		x	Contribution of PV-Solar pannel-Geothermal.	x	.xls
IREC	ES	LIDER/CALENER	X	Spain	Static simulation	x	x	x	no	x	solar thermal for hot water and PV contribution. Other RES are difficult to introduce	x	none
IREC	ES	TRNSyS (sketchup + tranbuild, type 56)			Dynamic simulation	x	x	x	no	x	none	x	.xls, graphic...
IREC	ES	Dialux			Dynamic simulation				x				

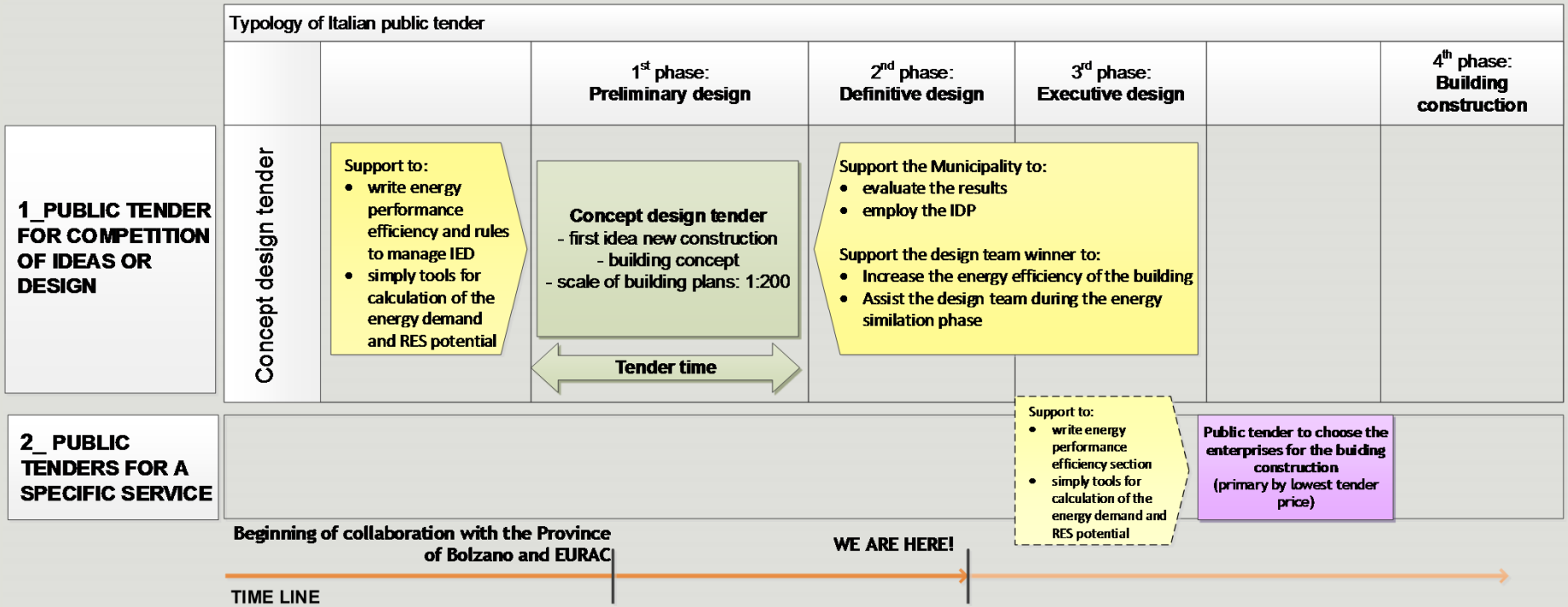
Cases Studies

- Public design tender for three new mountain huts ➔ Province of Bolzano
- Negotiated tender for a design service of the new elementary school ➔ Merano Municipality



Design tenders for three new mountain huts.

Owner: Province of Bolzano
Collaboration: Province of Bolzano, Tenants, EURAC



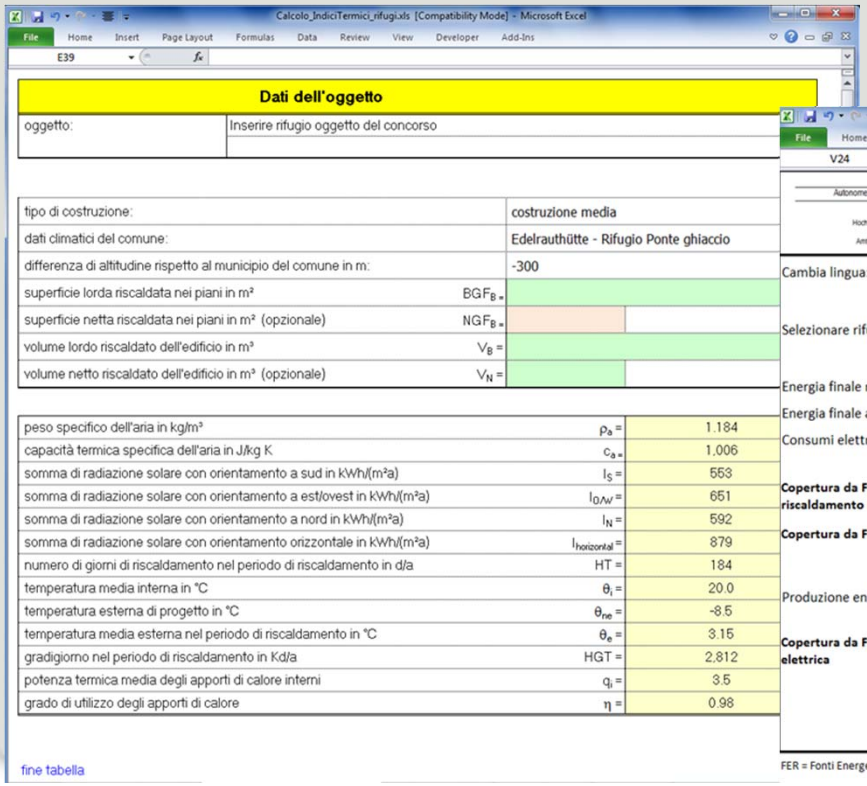
Elaboration of energy guidelines (to be included in the tender) about energy concept and minimum energy performance requirements.

Development of two simplified tools to quantify:

- energy performance (based on software KlimaHouse Pro for ECPs)
- the share of energy consumption covered by energy production from renewable sources (Excel spreadsheet created by EURAC).

- CasaClima pre-filled Excel sheet, to calculate the heating energy demand

Excel sheet to calculate the energy production from renewable sources (from PV and solar thermal panels)



Calcolo_IndiciTermici_rifugi.xls [Compatibility Mode] - Microsoft Excel

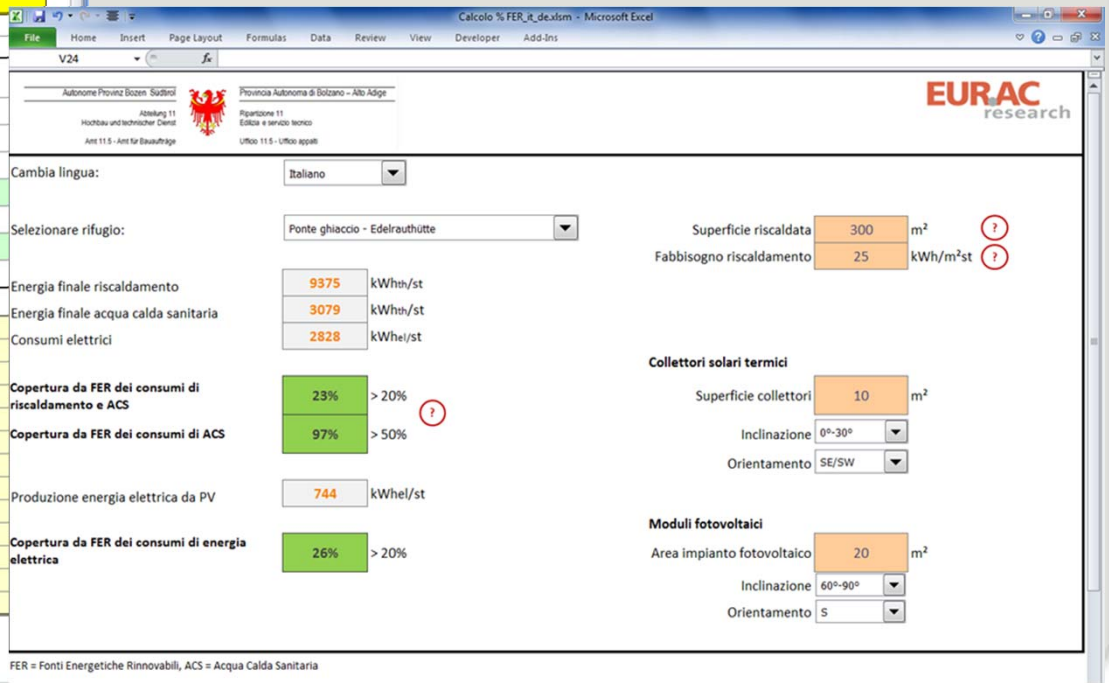
Dati dell'oggetto

oggetto:	Inserire rifugio oggetto del concorso

tipo di costruzione:		costruzione media
dati climatici del comune:		Edelrauthütte - Rifugio Ponte ghiaccio
differenza di altitudine rispetto al municipio del comune in m:		-300
superficie lorda riscaldata nei piani in m²	BGF_B =	
superficie netta riscaldata nei piani in m² (opzionale)	NGF_B =	
volume lordo riscaldato dell'edificio in m³	V_B =	
volume netto riscaldato dell'edificio in m³ (opzionale)	V_N =	

peso specifico dell'aria in kg/m³	ρ_a =	1.184
capacità termica specifica dell'aria in J/kg K	c_a =	1.006
somma di radiazione solare con orientamento a sud in kWh/(m²a)	I_S =	553
somma di radiazione solare con orientamento a est/ovest in kWh/(m²a)	$I_{O/W}$ =	651
somma di radiazione solare con orientamento a nord in kWh/(m²a)	I_N =	592
somma di radiazione solare con orientamento orizzontale in kWh/(m²a)	$I_{horizontal}$ =	879
numero di giorni di riscaldamento nel periodo di riscaldamento in d/a	HT =	184
temperatura media interna in °C	θ_i =	20.0
temperatura esterna di progetto in °C	θ_{ne} =	-8.5
temperatura media esterna nel periodo di riscaldamento in °C	θ_e =	3.15
gradigiorno nel periodo di riscaldamento in Kd/a	HGT =	2.812
potenza termica media degli apporti di calore interni	q_i =	3.5
grado di utilizzo degli apporti di calore	η =	0.98

fine tabella



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Autonome Provinz Bozen Südtirol — Abteilung 11 Hochbau und technischer Dienst — Amt 11.5 - Amt für Bauaufträge

Provincia Autonoma di Bolzano – Alto Adige — Ripartizione 11 Edilizia e servizio tecnico — Ufficio 11.5 - Ufficio appalti

EURAC research

Cambia lingua: Italiano

Selezionare rifugio: Ponte ghiaccio - Edelrauthütte

Energia finale riscaldamento	9375	kWhth/st
Energia finale acqua calda sanitaria	3079	kWhth/st
Consumi elettrici	2828	kWhel/st
Copertura da FER dei consumi di riscaldamento e ACS	23%	> 20%
Copertura da FER dei consumi di ACS	97%	> 50%
Produzione energia elettrica da PV	744	kWhel/st
Copertura da FER dei consumi di energia elettrica	26%	> 20%

Superficie riscaldata	300	m²
Fabbisogno riscaldamento	25	kWh/m²st

Collettori solari termici

Superficie collettori	10	m²
Inclinazione	0°-30°	
Orientamento	SE/SW	

Moduli fotovoltaici

Area impianto fotovoltaico	20	m²
Inclinazione	60°-90°	
Orientamento	S	

FER = Fonti Energetiche Rinnovabili, ACS = Acqua Calda Sanitaria

Winner projects

Benefits

Since the design concept phase the design teams have considered energy efficiency issues, in order to guarantee:

- Reduced heat losses (compact building envelopes)
- Use of renewable energy sources for the production of thermal and electric energy (wide roof surfaces)
- High integration of energy generation systems (landscape integration)

Ponte ghiaccio / Edelrauthütte
Arch. Matteo Scagnol
Arch. Sandy Attia

Vittorio Veneto / Schwarzensteinhütte
Arch. Helmut Stifter
Arch. Angelika Bachmann

Pio XI / Weisskugelhütte
Arch. Höller & Klotzner

Winner projects

Critical aspects

- Planning mistakes: orientation, misunderstanding of compact shape
- Localization of emission (generation) heating system.

- The energy concept development was no mandatory, because there were no award criteria for energy requirements achieved → some design proposals had no energy strategy.

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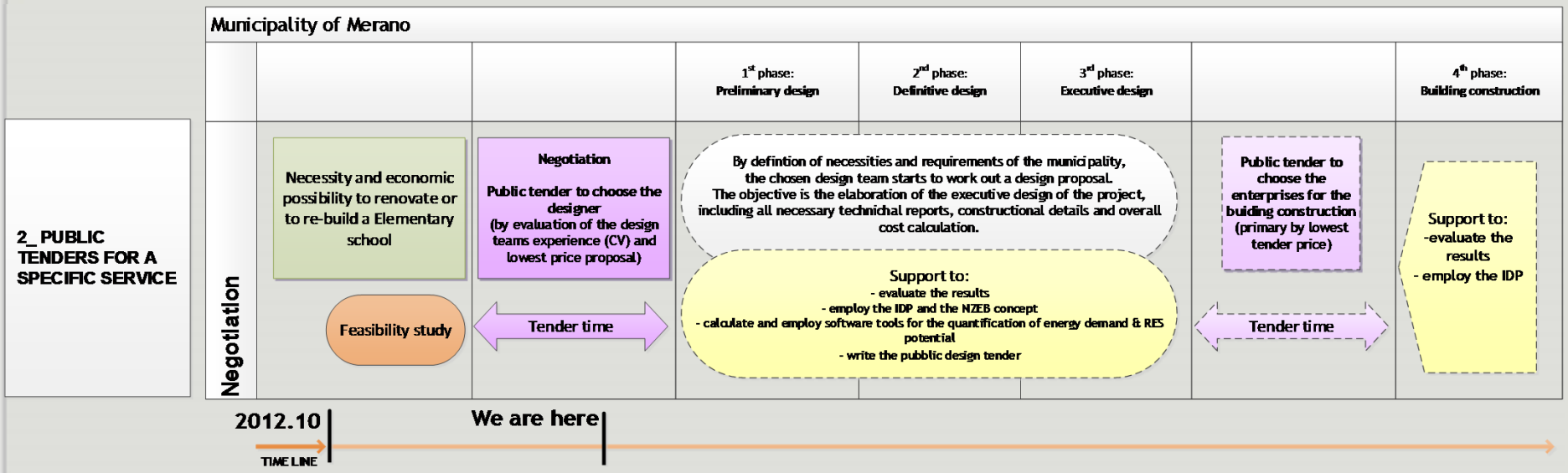
Pio XI / Weisskugelhütte
Arch. Höller & Klotzner

Negotiated tender for design service for a new elementary school in Sinigo.

Owner: Municipality of Merano
Collaboration: Municipality of Merano, Tenants, EURAC

State of the Art

The Municipality of Merano needs a new elementary school and will select the design team through a negotiated tender. The design team should be able to develop the preliminary, definitive, executive design and to manage the building construction phase.



The goal was to support the Municipality to introduce energy requirements in the public negotiated tender.

Done

Workshops to present the nZEB concept (definition, energy balance calculation method, building system boundary, weighing system…) to the municipality members involved into the project.

Result

A close collaboration with the Municipality team to develop:

- Guidelines on energy efficiency requirements of the new building
- Mandatory rules for IED approach application.

Energy concept guidelines to support design teams in developing energy strategies for the new school in Sinigo (IT)

Legislative framework towards zero energy buildings → DP 362/2013

Energy performance efficiency : building envelope with heating load lower than 30kWh/m²y (CasaClima A)

- nZEB definition
- Physical boundaries of the building system
- Balance items
- Balance calculation
- Balance metric and weighting factors
- Integrated Energy Design (IED)

Integrated Energy Design (IED)

Competitors requirements

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Thank you for your attention!!

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