



Green
Building
Council
Italia

18 luglio 2023

La decarbonizzazione dell'ambiente costruito: strumenti e buone pratiche

Andrea Costa

Modellazione energetica dinamica strumento per la progettazione di una città Net Zero Carbon

www.gbitalia.org

IN COLLABORAZIONE CON

R2M
RESEARCH TO MARKET
SOLUTION

IN COLLABORATION WITH

esa



R2M Solution



Founded
2012

People
100
5 branches

Offices
9
4 Countries

Research
82
R&D projects

Funds raised
423 M
Total R&D
Portfolio

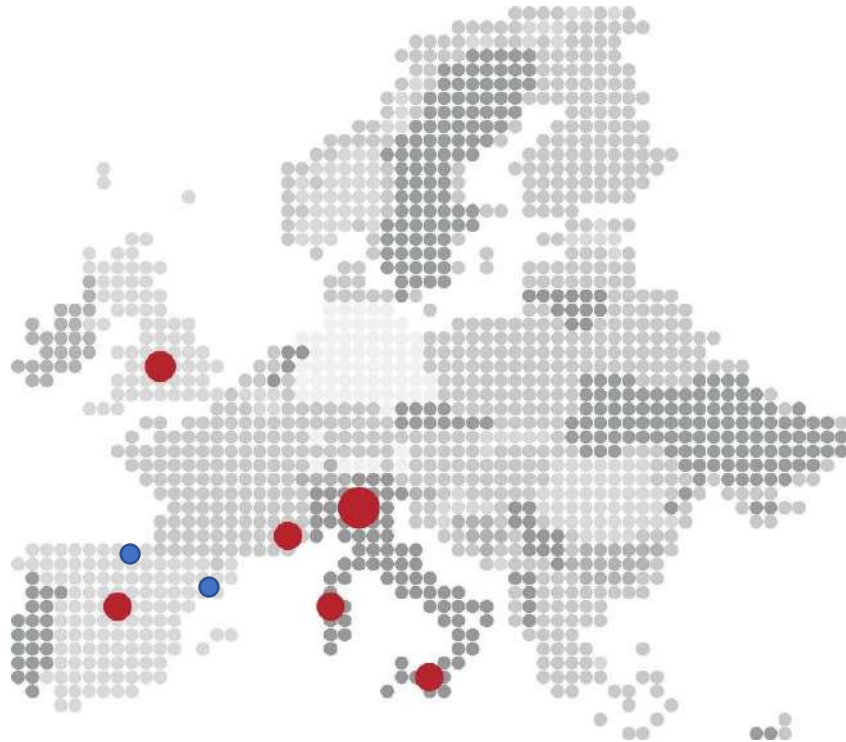
First time EU
39
Organizations



Turnover: **€8 Million (2022)**



|
Our Branches



Italy

R2M Solution s.r.l.
R2M Energy s.r.l.
Via F.lli Cuzio 42
27100 Pavia, Italy
P.IVA: IT04998380879

France

R2M Solution SAS
Les Galeries de Beaumont
06330 Roquefort-les-Pins, France
VAT: FR11828579367

Spain

R2M Solution Spain, S.L.
Calle Villablanca 85
28032 Madrid, España
VAT: ES B87348470

United Kingdom

R2M Solution Ltd.
Flat 4, 74 Holland Park
London, W11 3SL
VAT: GB259731081

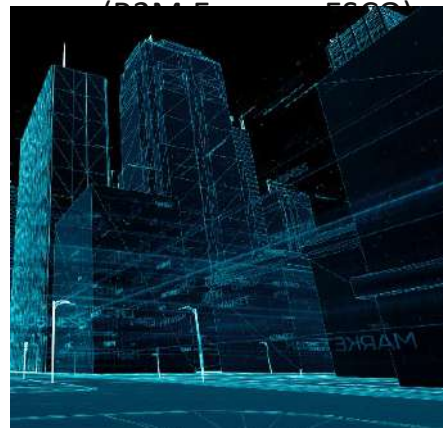
Our Journey

• Innovation

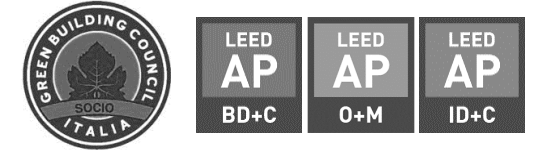


• Innovative Products & Services

- Real Estate
- Digitalization
- Sustainability
- Smart Grid and Local Energy Communities



• Sustainability Consulting



Our Journey

- Innovation



+CITYXCHANGE

iBECOME



Auto-DAN



energy
poverty 0

by energie
sprong

- Innovative
Products &
Services



A BuildData Group Company

BRAINBOX AI

- Sustainability
Consulting

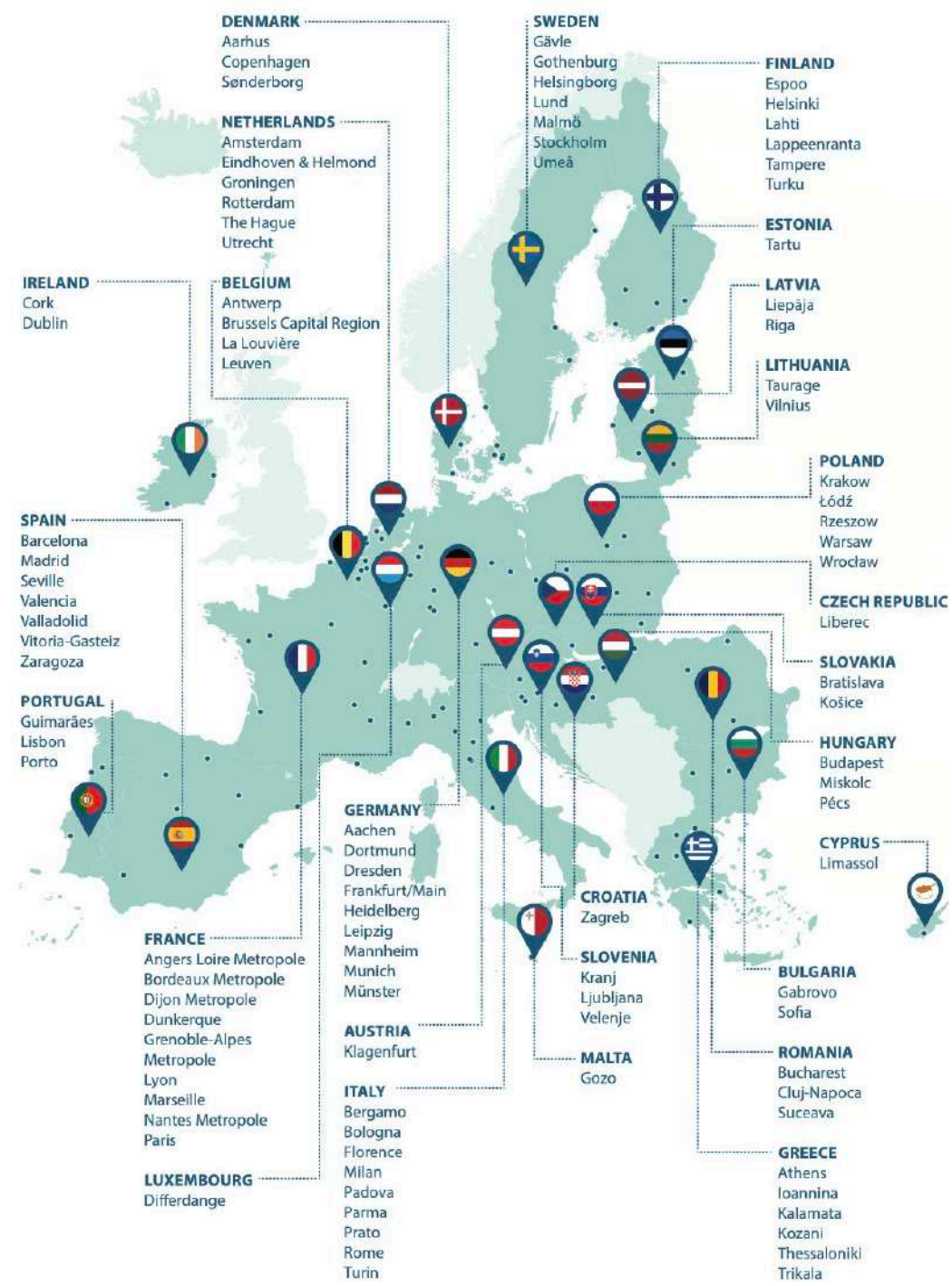


Green Deal, Taxonomy, nuova EPBD, SRI, DBL



Il contesto

Piano EU 100 città



Missione Città intelligenti e a impatto climatico zero

100 città a impatto climatico zero entro il 2030, dai cittadini e per i cittadini

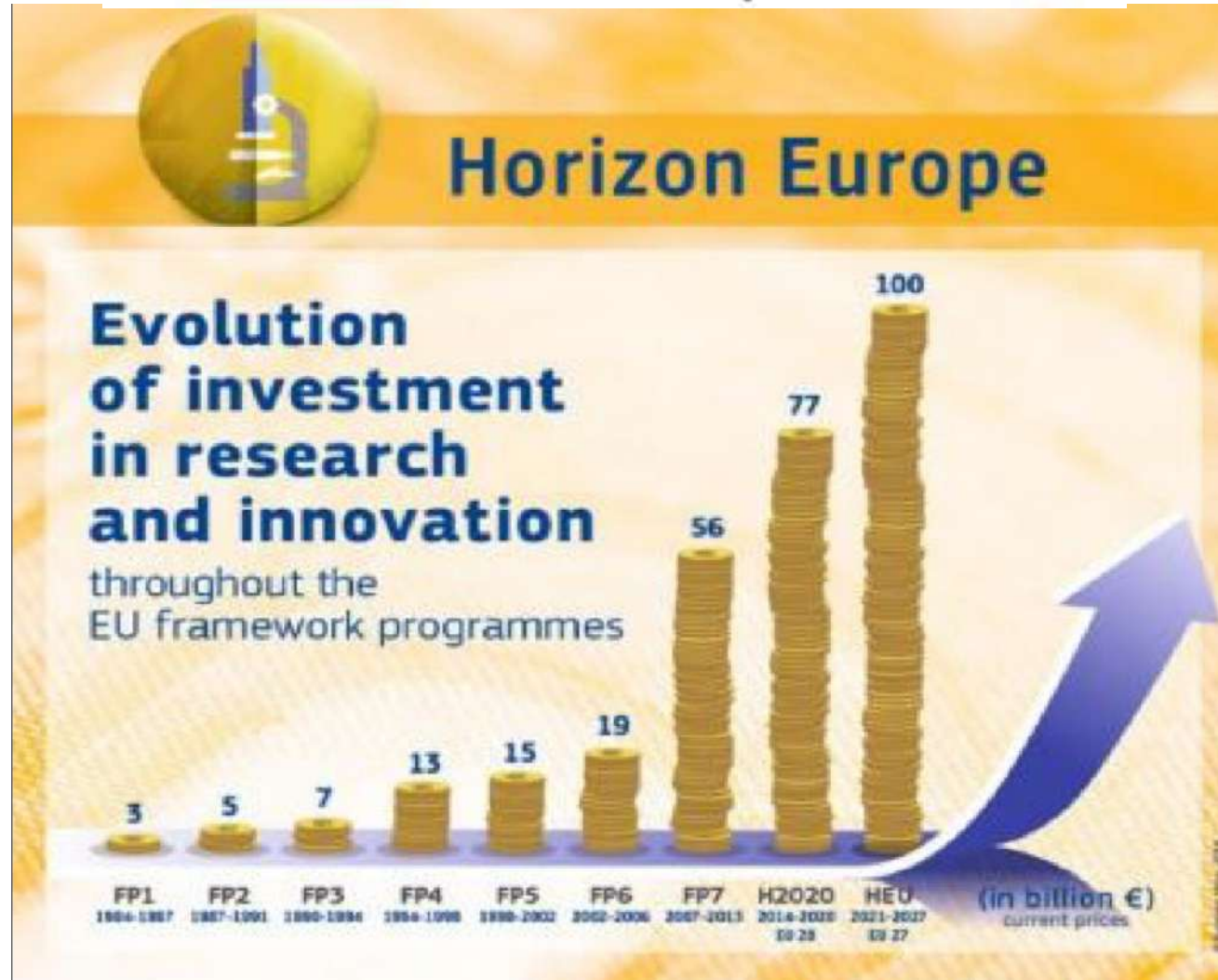


Il contesto

Horizon EU



Commissione europea



Le tecnologie



ESG Digital Twin





Modelli spaziali ad alta precisione con nuvola di punti

ESG DIGITAL TWIN ECOSYSTEM

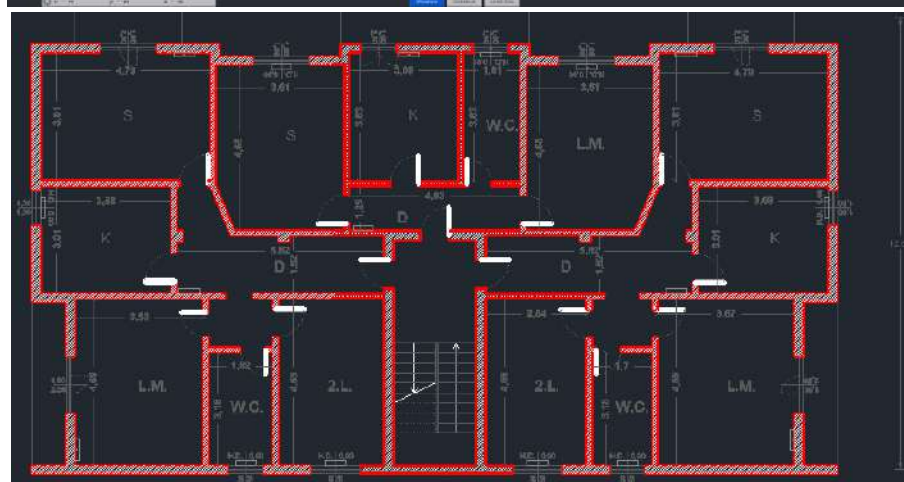
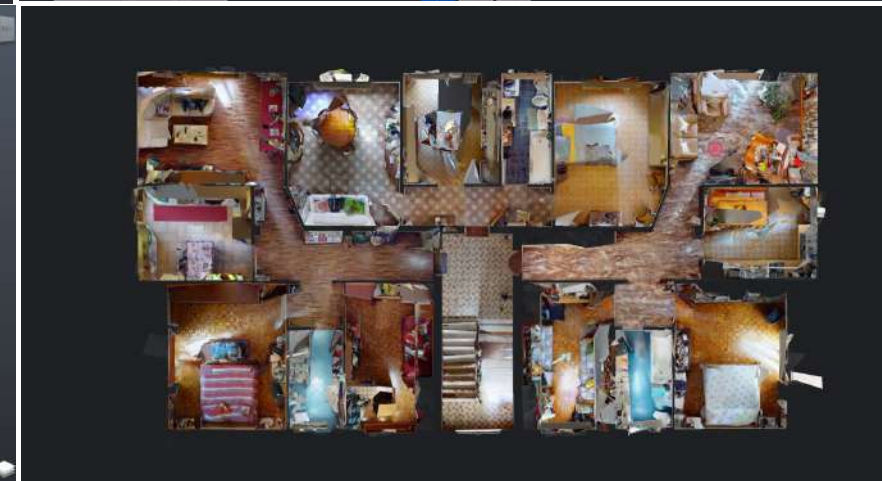
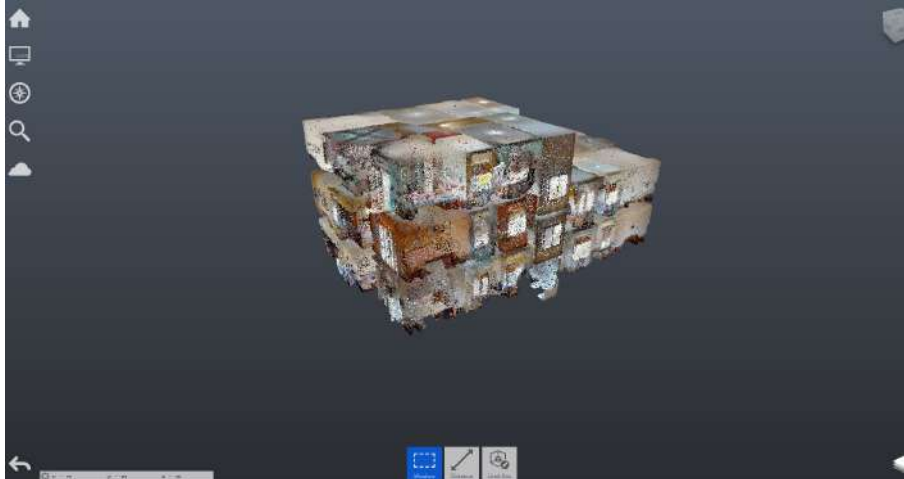


- Dalle scansioni si ottengono dei modelli navigabili
- Si possono eseguire misure
- Si possono aggiungere dei tag («smart tag»)

CASO DI STUDIO CONDOMINIO 110%



Matterport™



Torre
UnipolSai
ASSICURAZIONI



Matterport™

MC A
mario cucinella architects



Le tecnologie

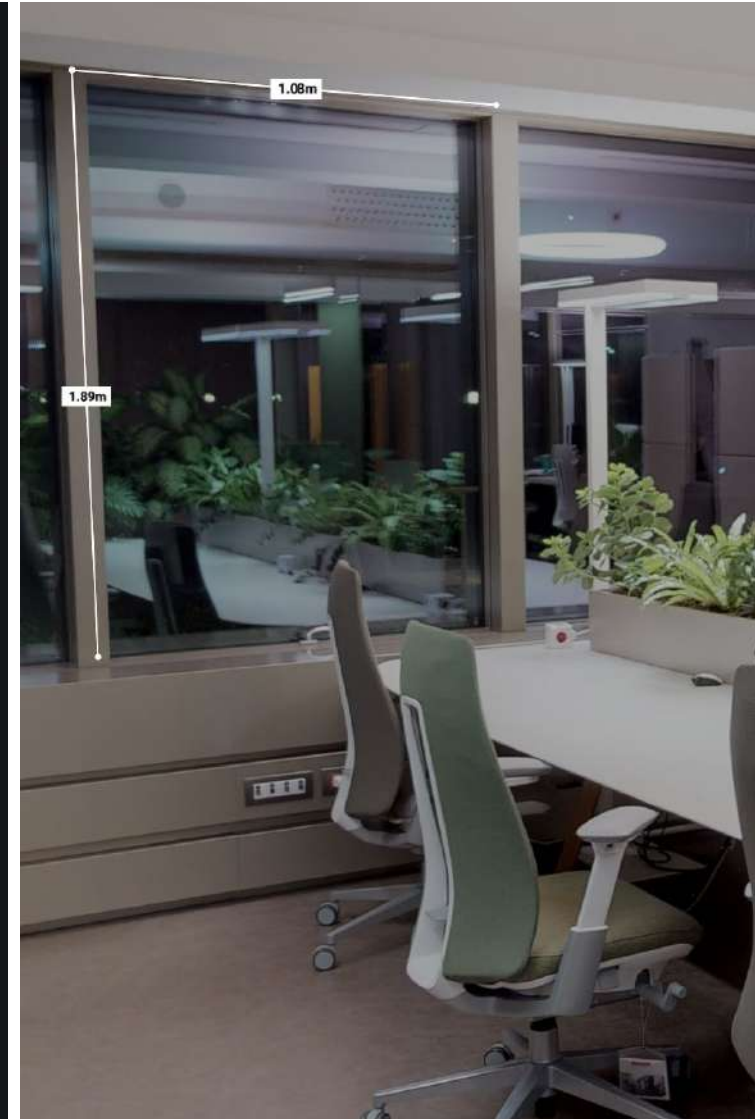
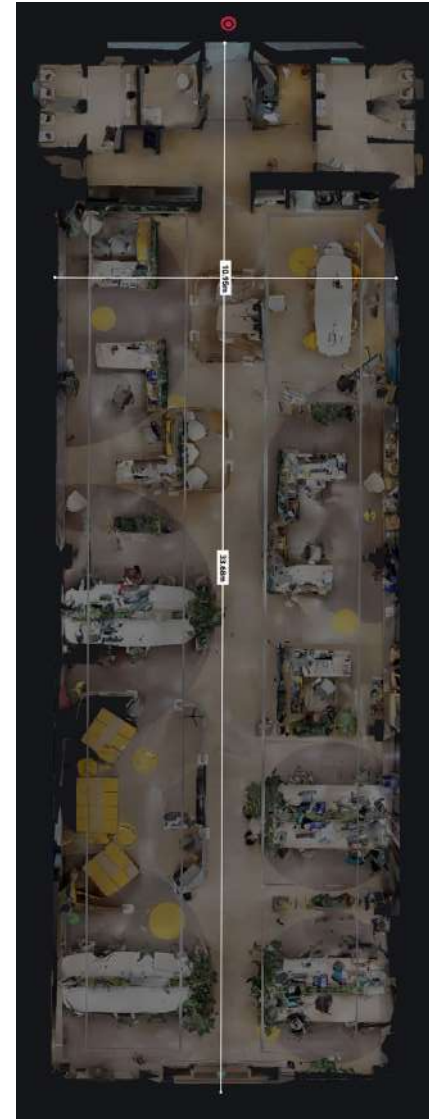
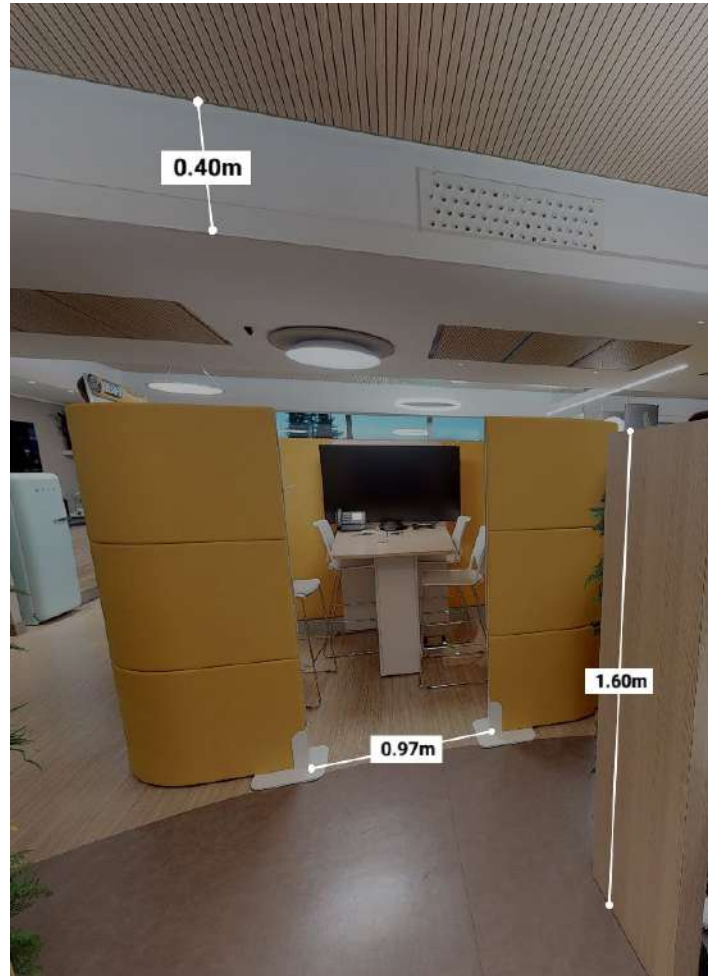
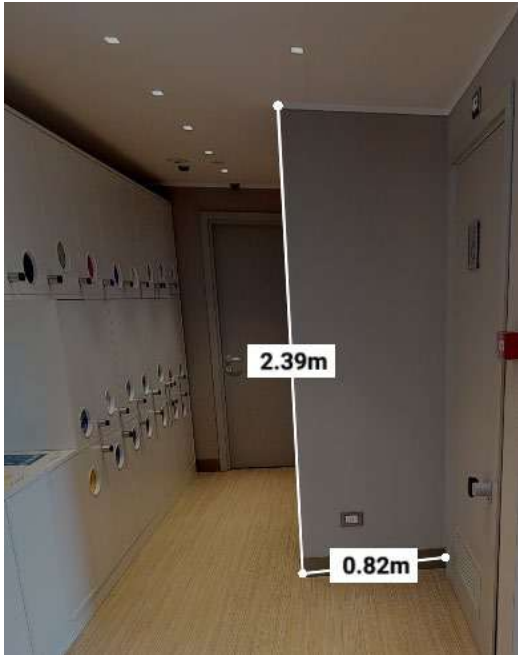
Modello digitale con Matterport – B12



Matterport™

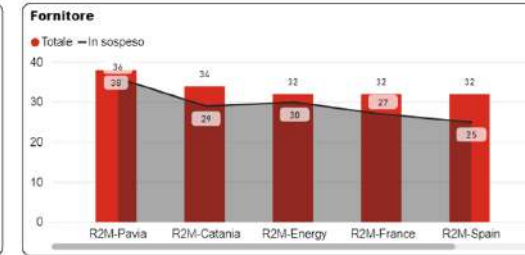
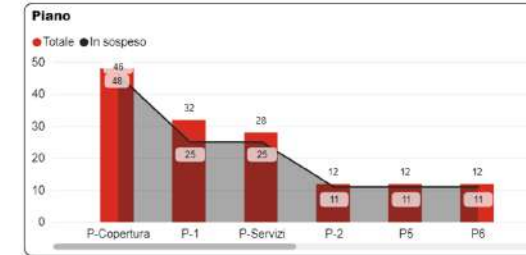
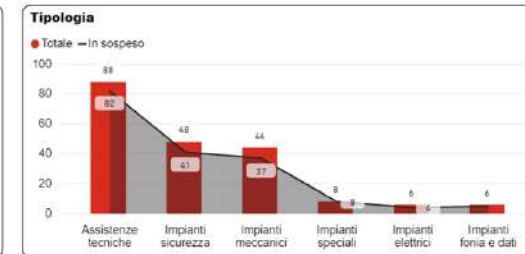
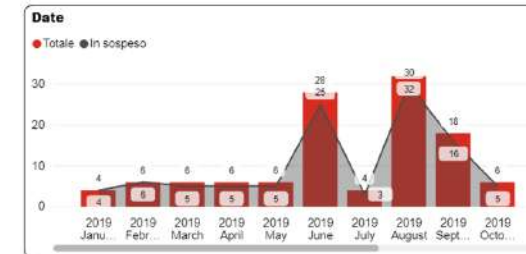
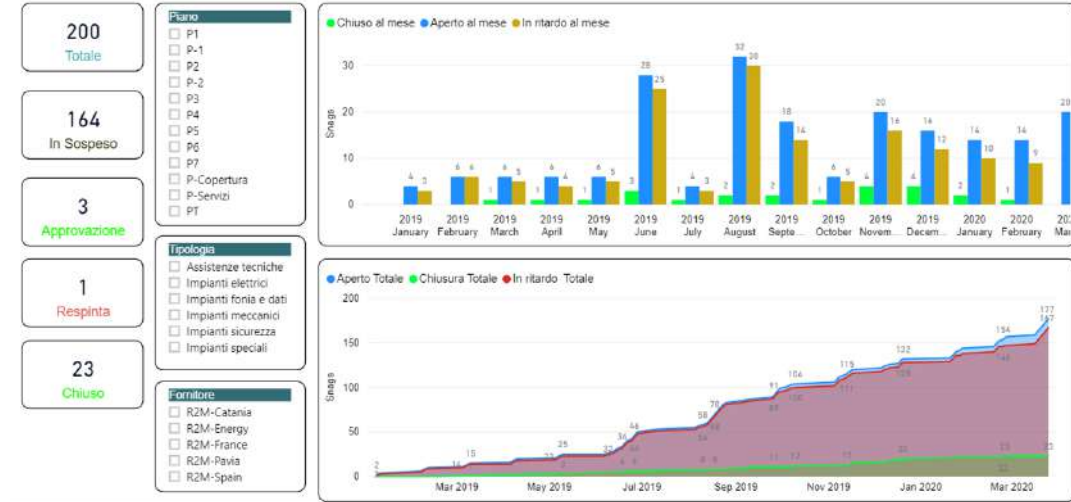
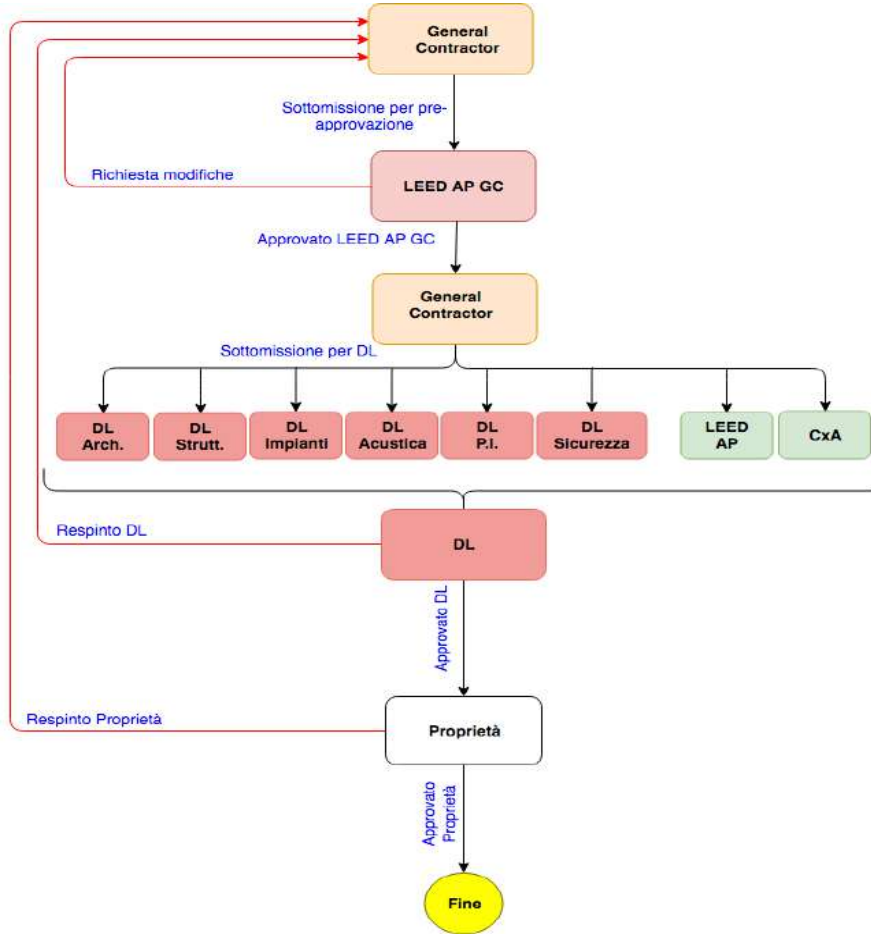


Gemello digitale con Matterport – B12



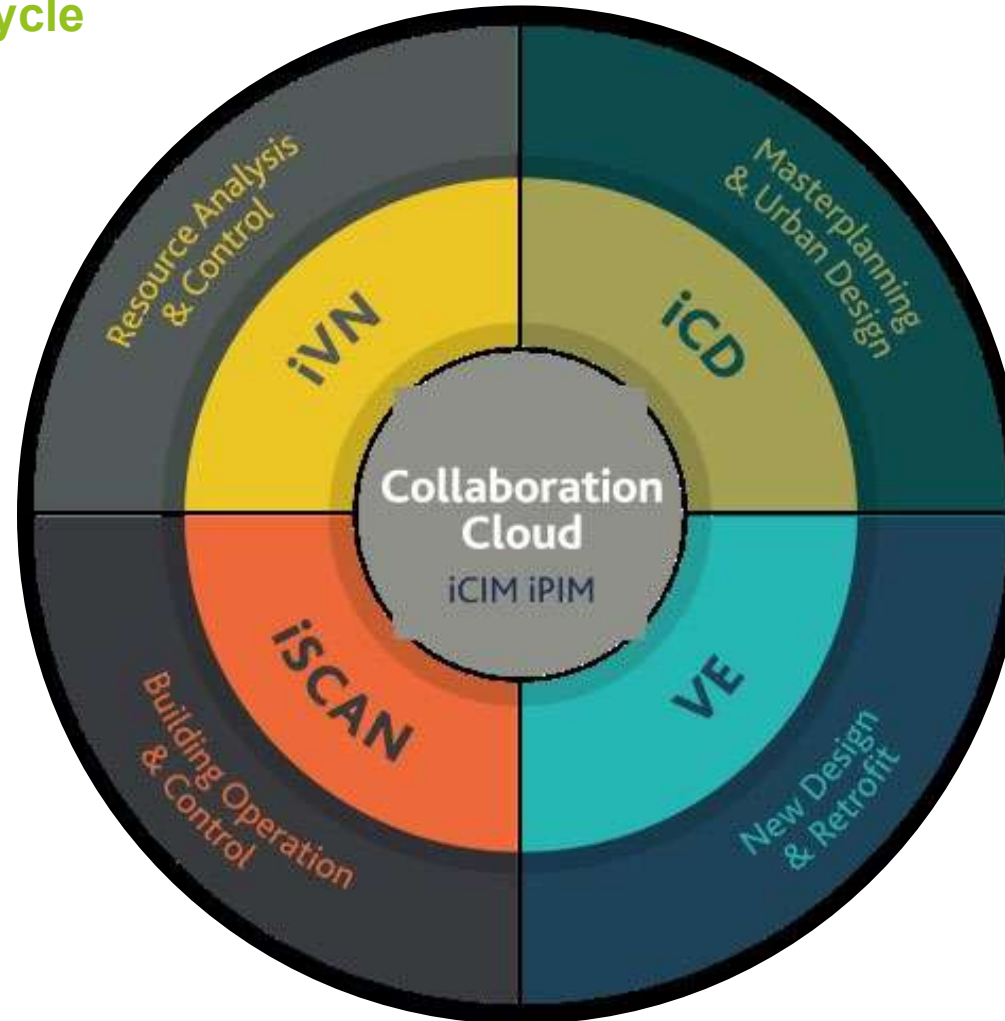
Le tecnologie

Gestione digitale del cantiere e fascicolo del fabbricato

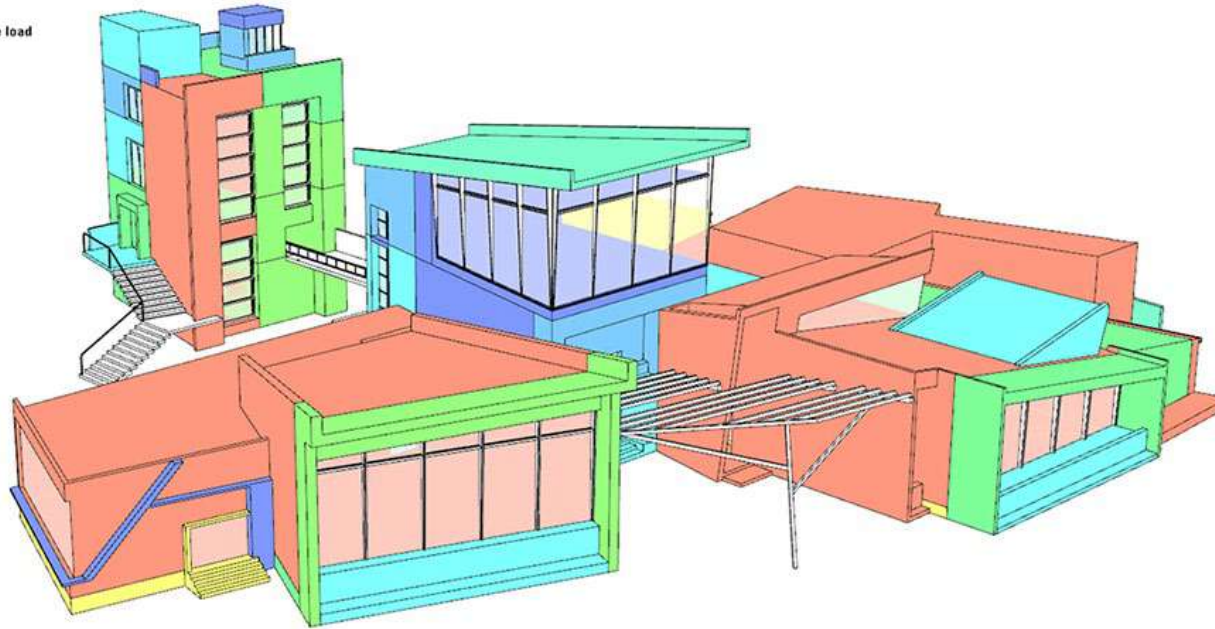
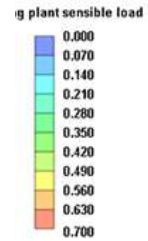


Le tecnologie

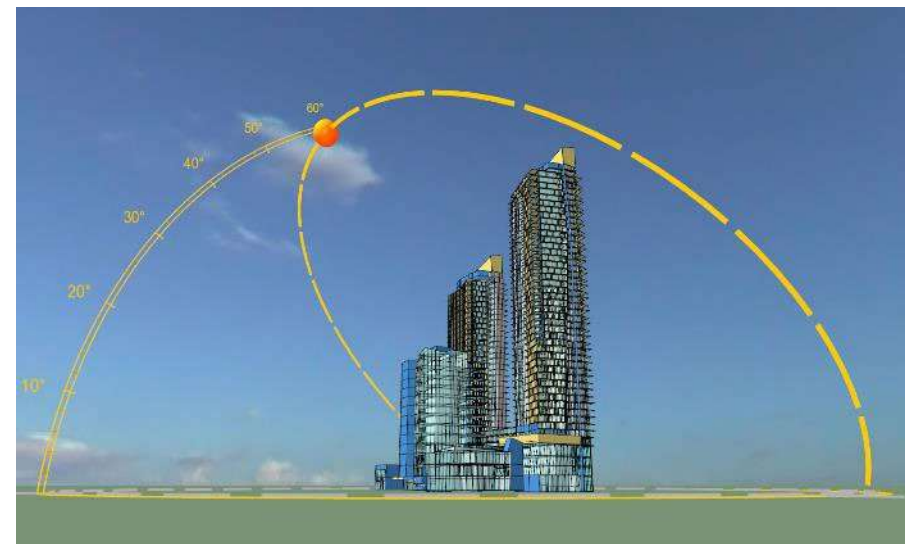
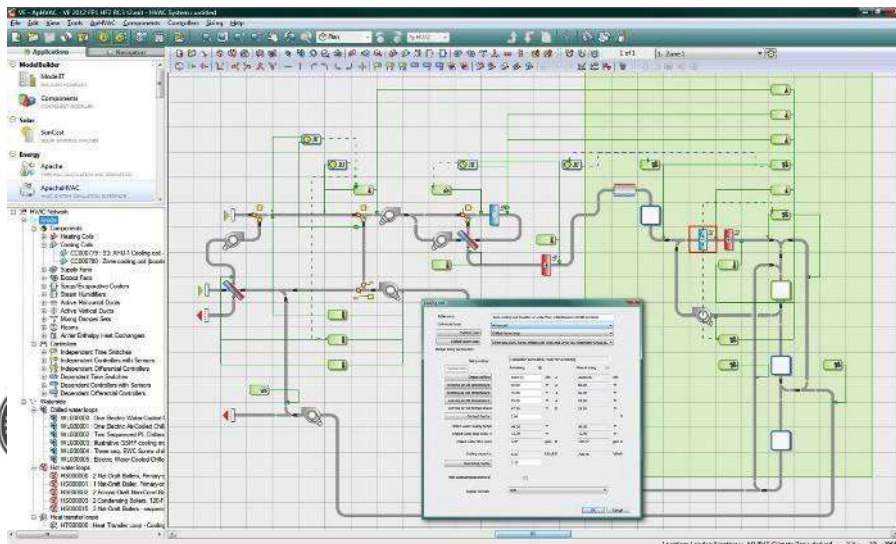
Intelligent Community Lifecycle



VE – Virtual Environment



Virtual Environment (VE)
Piattaforma di simulazione del sistema edificio impianto.
Software leader mondiale per le certificazioni LEED and BREEAM



iCD - Intelligent Community design

IES

R2M
RESEARCH TO MARKET
SOLUTION

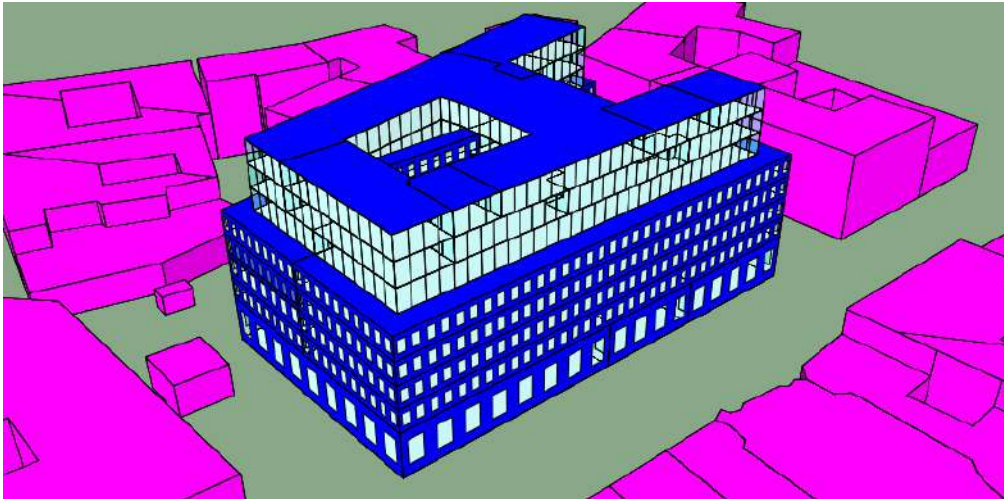


Intelligent Community Design (iCD)
Simulazione energetica 3D a livello urbano per masterplan e studi di fattibilità e progettazione di massima di quartieri ed intere città e i loro relativi distretti energetici

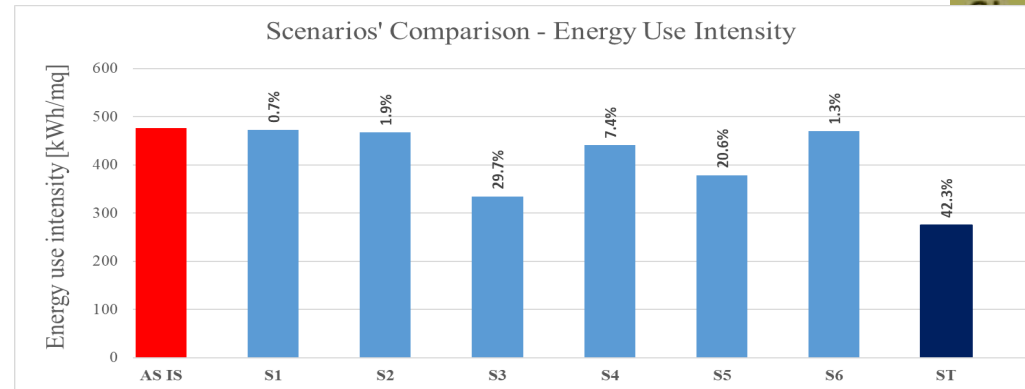
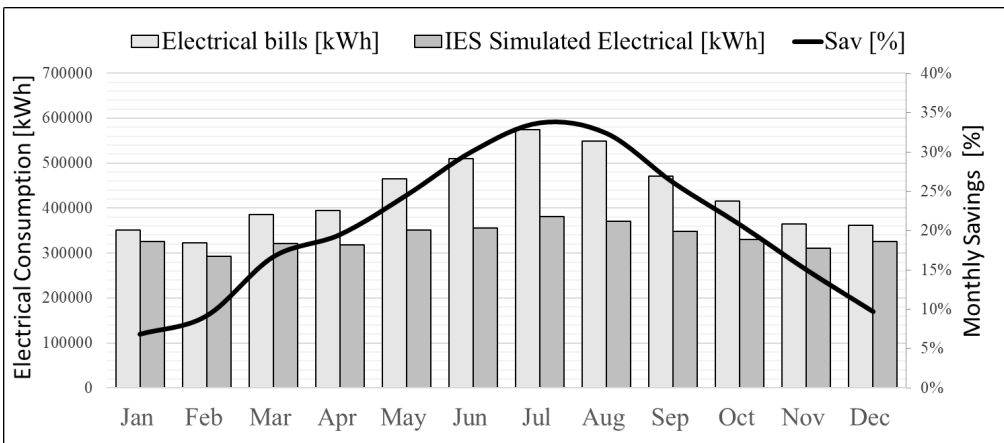




Scenari di decarbonizzazione e ottimizzazione su edifici esistenti



KPIs		Description	Annual Consumption [GWh]	CO2 Emissions [tonCo2e]	Energy Use Intensity [KWh/mq]	Total Energy Use Intensity [KWh/mq]	Total CO2 Emissions [tonCo2e]
SCENARIOS							
AS IS	<i>Electrical</i>	Baseline	5,12	80,81	216,88	475,95	406,55
	<i>Natural Gas</i>	Model	4,66	325,74	197,46		
S1	<i>Electrical</i>	Application of anti-UV films	5,03	79,49	213,33	472,54	406,19
	<i>Natural Gas</i>		4,67	326,70	198,05		
S2	<i>Electrical</i>	Replacement of fancoils	5,08	80,27	215,41	466,88	395,39
	<i>Natural Gas</i>		4,51	315,13	191,03		
S3	<i>Electrical</i>	Replacement of AHUs	4,71	74,39	199,66	334,55	225,47
	<i>Natural Gas</i>		2,16	151,08	91,58		
S4	<i>Electrical</i>	Replacement of cooling groups	4,54	71,76	192,60	440,67	386,89
	<i>Natural Gas</i>		4,51	315,13	191,03		
S5	<i>Electrical</i>	Replacement of boilers	5,00	79,04	212,12	378,01	271,97
	<i>Natural Gas</i>		2,76	192,93	116,96		
S6	<i>Electrical</i>	Photovoltaic System	5,14	81,21	217,94	469,78	396,33
	<i>Natural Gas</i>		4,51	315,13	191,03		
ST	<i>Electrical</i>	All previous scenarios	4,03	63,68	170,89	274,68	176,23
	<i>Natural Gas</i>		1,61	112,55	68,23		



Intelligent Community Design (ICD)
 Simulazione energetica
 a livello urbano per
 masterplan e studi di
 fattibilità e
 progettazione di
 massima di quartieri
 e intere città e i loro
 relativi distretti
 energetici



iCD - Intelligent Community design

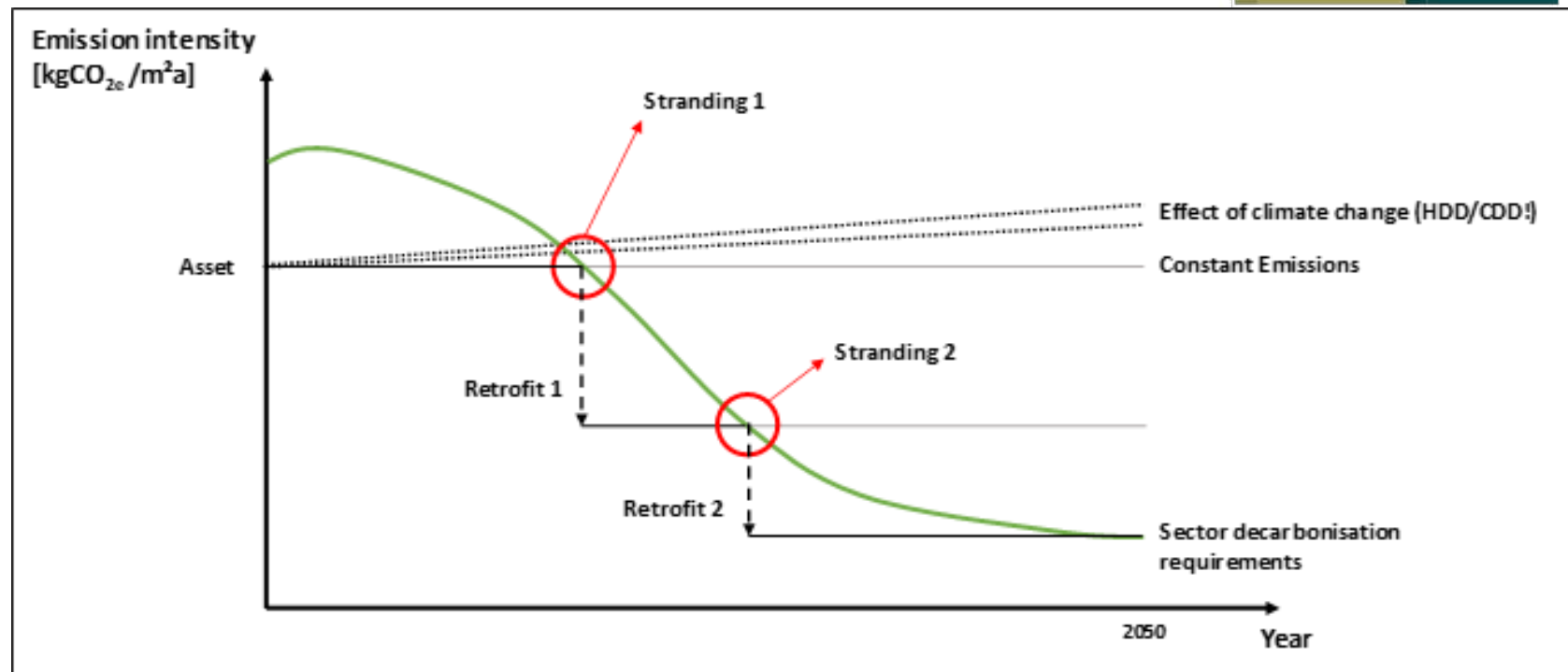


Scenari di decarbonizzazione e Carbon Risk Real Estate Monitor (CRREM)

Il CRREM è uno strumento che consente agli investitori immobiliari di **allineare gli investimenti di efficienza energetica delle loro proprietà agli obiettivi dell'accordo di Parigi (limitare il global warming a 2°C / 1,5°C)** ed evitare quindi investimenti che potrebbero rivelarsi sbagliati a causa di politiche ambientali più rigorose



CRREM



iCD - Intelligent Community design



Milano – Reinventing Cities



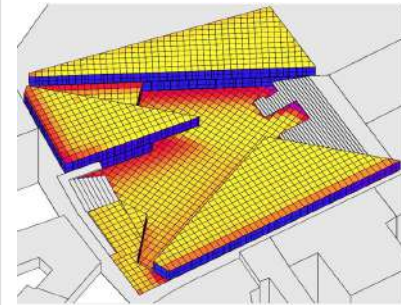
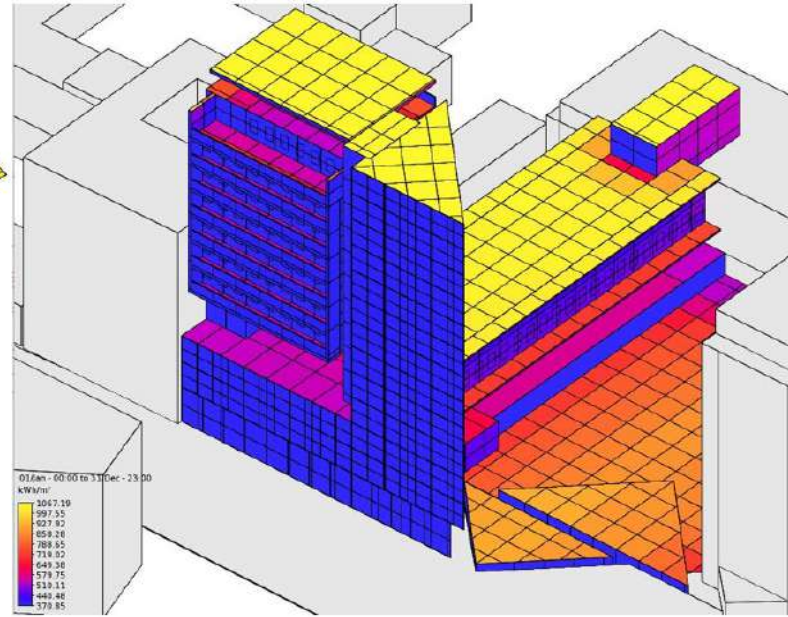
C40
CITIES
Reinventing
Cities Milan



Radiation Analysis

iCD - Intelligent Community design

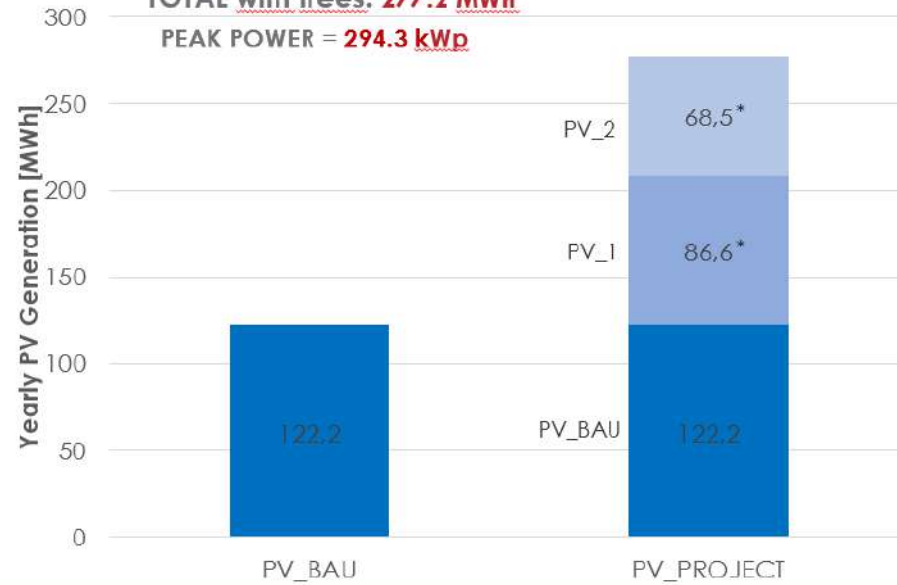
Milano – Reinventing Cities



Yearly On-Site PV Energy Generation

TOTAL with trees: 277.2 MWh

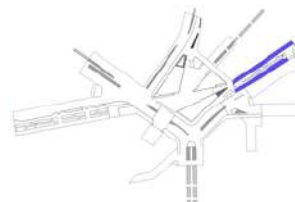
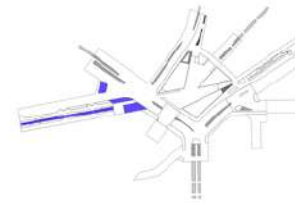
PEAK POWER = 294.3 kWp



PV_BAU

PV_1

PV_2



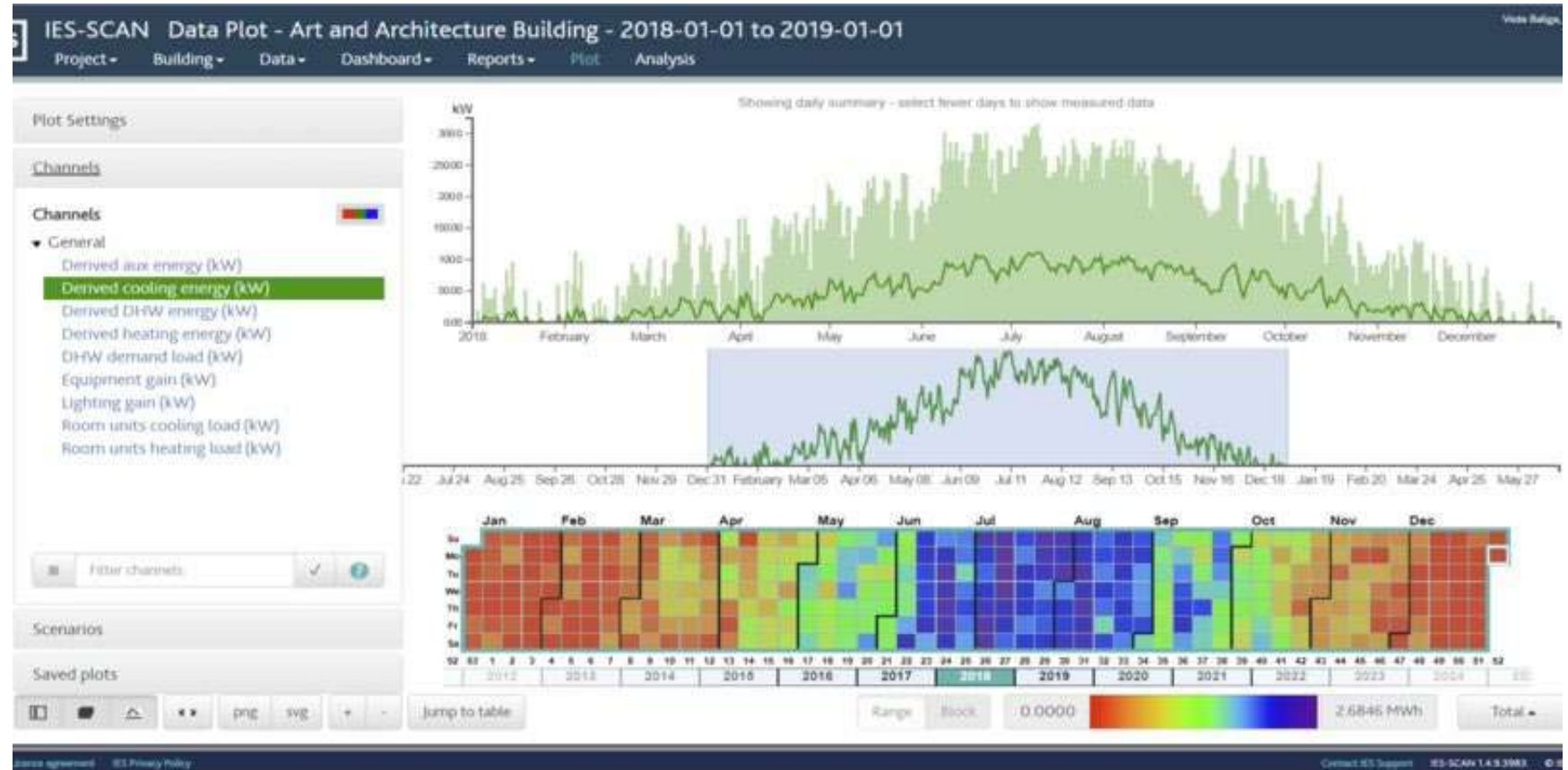
C40 CITIES Reinventing Cities Milan



* The efficiency of the PVs was reduced by 30% in order to consider the local

Intelligent Control and Analysis (iSCAN)

Piattaforma per l'integrazione e analisi dei dati prestazionali effettivi degli impianti e degli edifici a supporto della calibrazione dei modelli

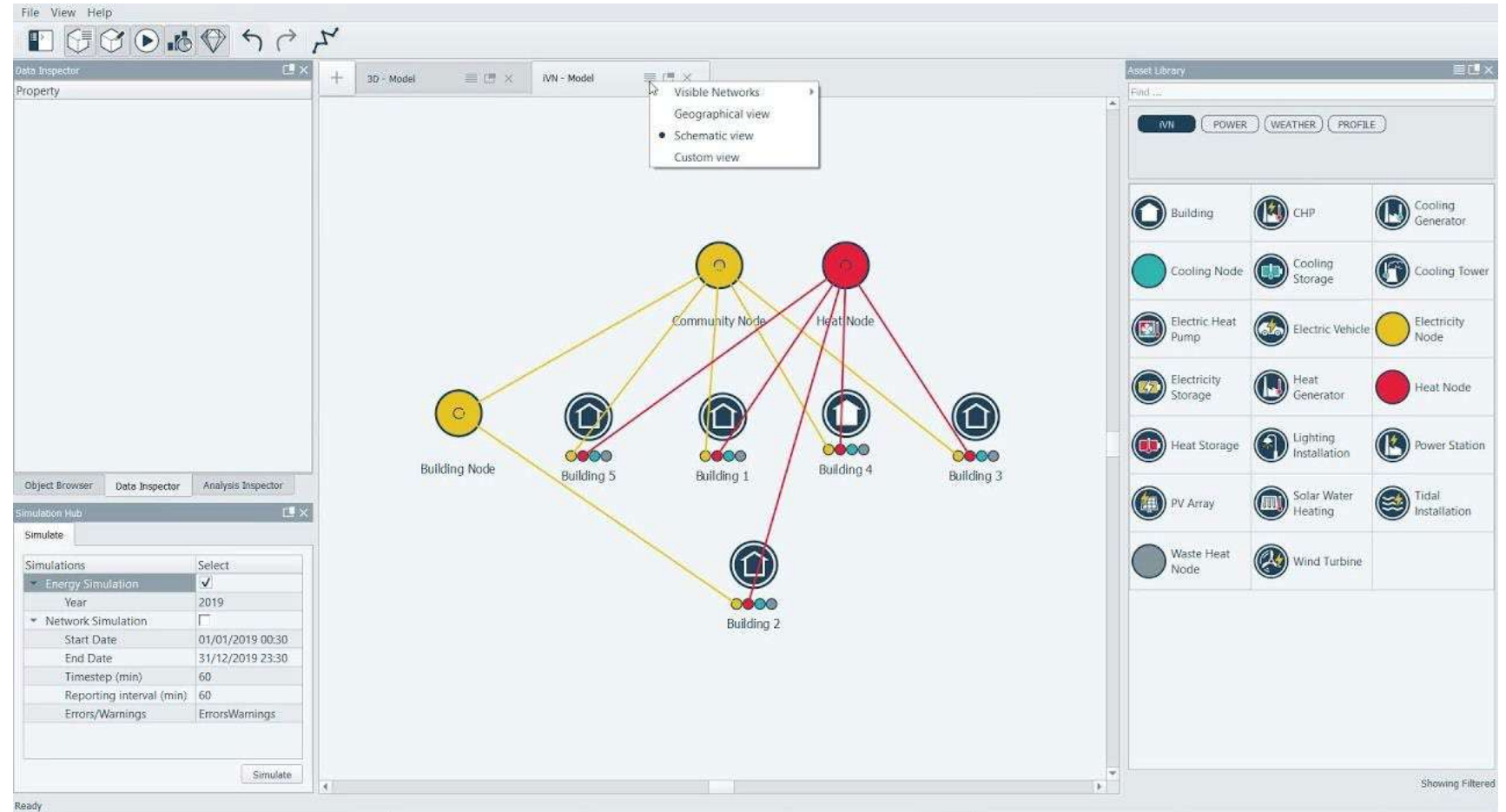


iVN – Intelligent virtual network



Intelligent Virtual Network (iVN)

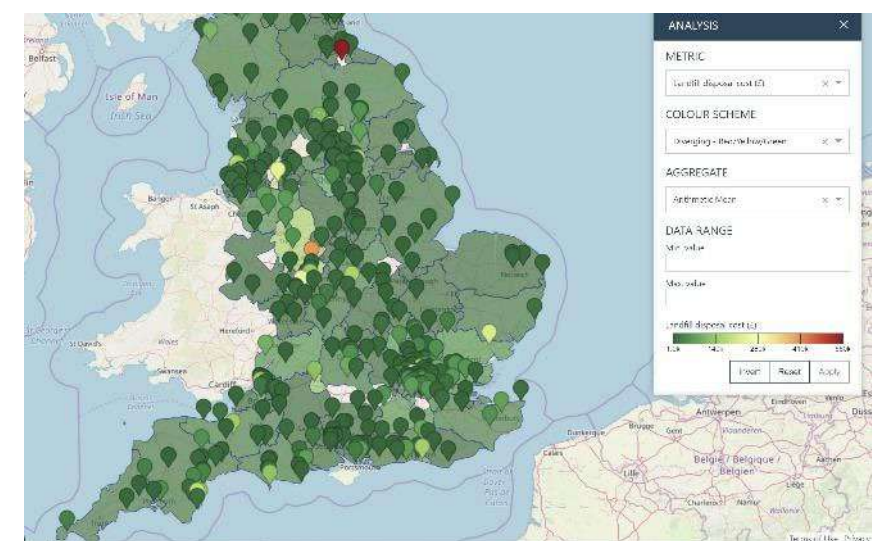
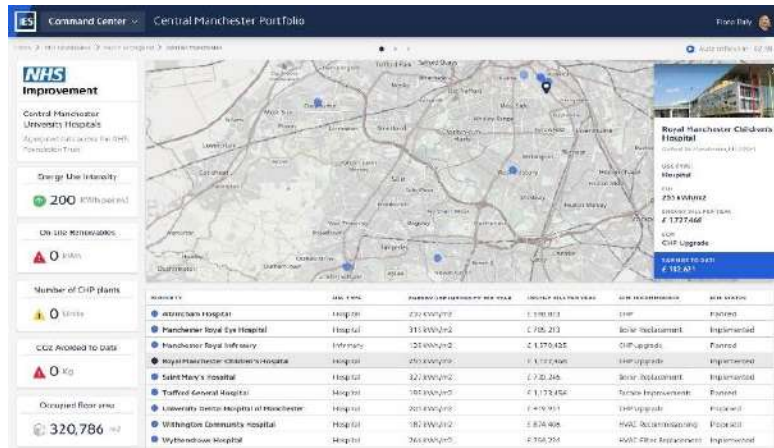
Permette l'astrazione di consumi dei singoli edifici per simulare reti di teleriscaldamento, tele raffreddamento e smart grid elettrica per scenari di scambio potenza e energia (Demand Response)



iCIM e iPIM – Collaboration cloud

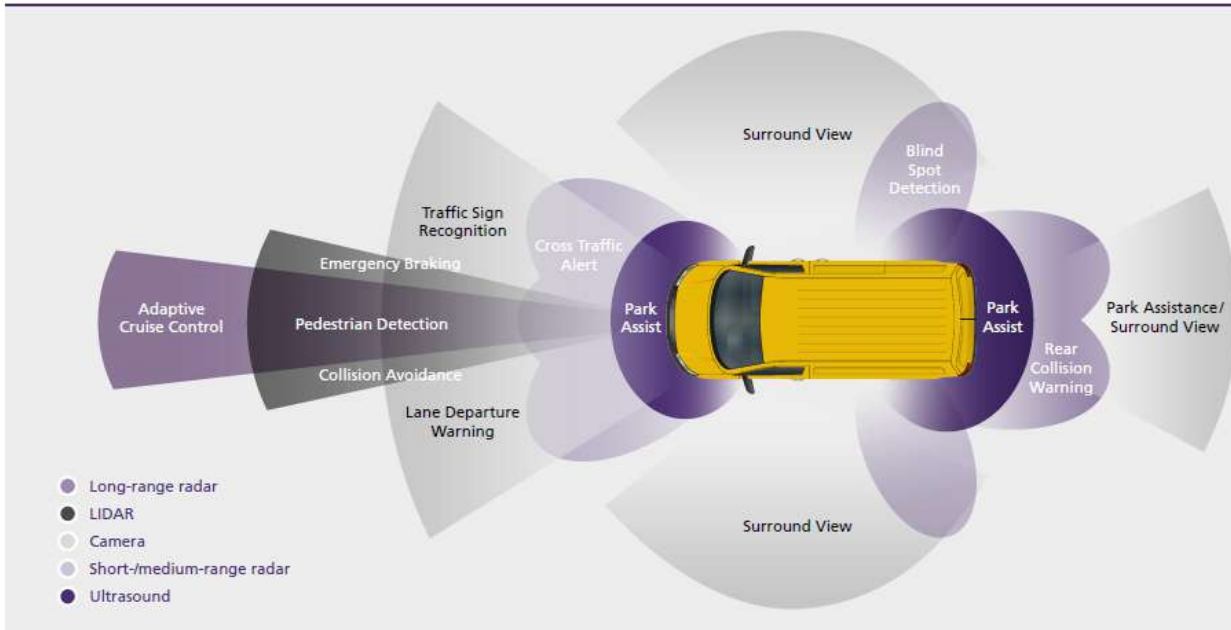


I tools di ICL sono inoltre connessi ad “**ICL Collaboration Cloud**”, una piattaforma di collaborazione per dare vita ai progetti attraverso la visualizzazione dei dati in una Community (**iCIM**) o in un Portfolio (**iPIM**).



Brainbox AI - Intelligenza Artificiale per guidate impianti HVAC ridurre consumi & emissioni

SENSING TECHNOLOGIES IN AUTONOMOUS VEHICLES



Brainbox AI - Intelligenza Artificiale per guidate impianti HVAC ridurre consumi & emissioni



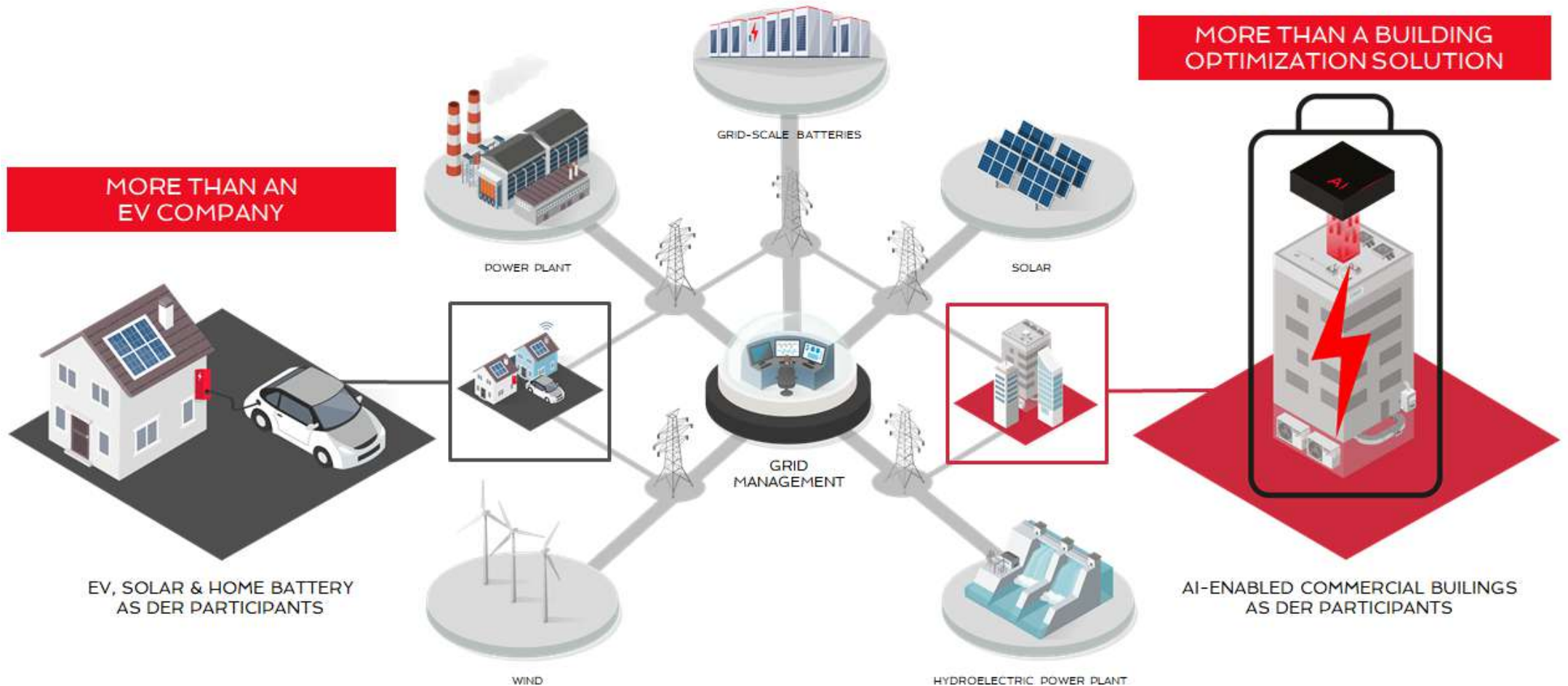
Usare l'Intelligenza Artificiale per cambiare la modalità di funzionamento degli impianti HVAC tramite BMS

Da comportamento reattivo a comportamento predittivo e auto-adattivo

Con riduzione di consumi, emissioni e bollette (fino al 25%) ed aumento del comfort (fino al 60%)

Servono i dati ovvero BMS condivisi e controllo centralizzato

Brainbox AI - Intelligenza Artificiale per guidate impianti HVAC ridurre consumi & emissioni



Esempi di progetti EU

R2M è partner



+CITYXCHANGE

iBECOME



Auto-DAN



energy
poverty 0

by energie
sprong



Esempi di progetti EU

Progetto iBECOME: finalità e servizi offerti

SITI PILOTA

iBECOME

progetto H2020:

- budget **5 milioni** di euro
- conclusione Maggio 2024;
- **10 partner** internazionali;
- applicazione di sistemi BMS innovativi in **4 siti pilota**;



SERVIZI BASE



Ottimizzazione del comfort termico / visivo e uso dell'energia attraverso il controllo predittivo



Rilevamento dei guasti e manutenzione predittiva



Misura e verifica (M&V) delle prestazioni



Sviluppo di scenari di possibili misure di efficienza energetica

SERVIZI AVANZATI / INTEGRAZIONI



Ottimizzazione della ricarica di EV e app di car pooling



Gestione dello stato di salute per i degenti



Demand Response per fornire servizi di flessibilità alla rete elettrica.



Country Crest, Ireland

Industria alimentare/
confezionamento patate



Helix Building, Glasgow (UK)

Ufficio di medie dimensioni



ASP di Venzone, Italy

Casa di riposo



World Trade Center, Grenoble (FR)

Business Center

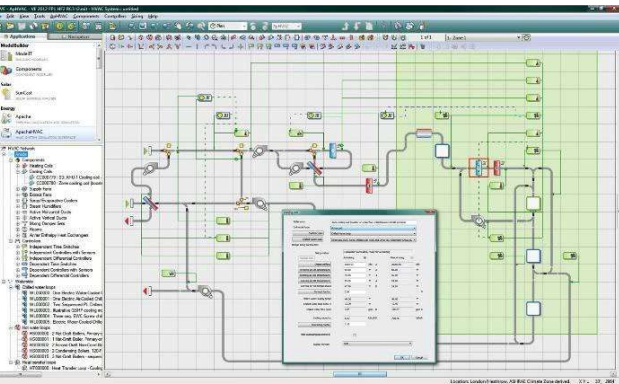


This project has received funding from the European Union's Horizon 2020 Programme under Grant Agreement no 894617

Esempi di progetti EU

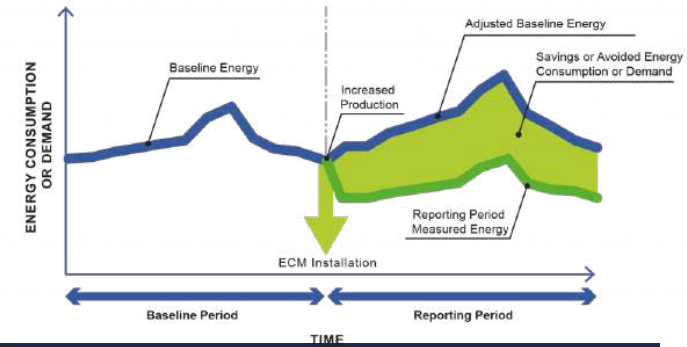
Progetto iBECOME: STRUMENTI UTILIZZATI

Studi di fattibilità per pianificare il processo di decarbonizzazione di un edificio attraverso l'utilizzo di gemello digitale e simulazione energetica dinamica.



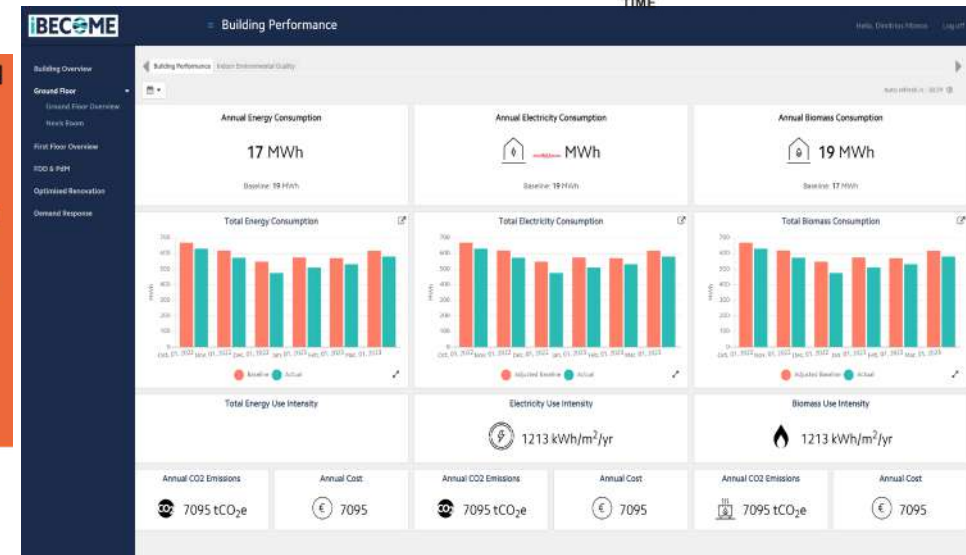
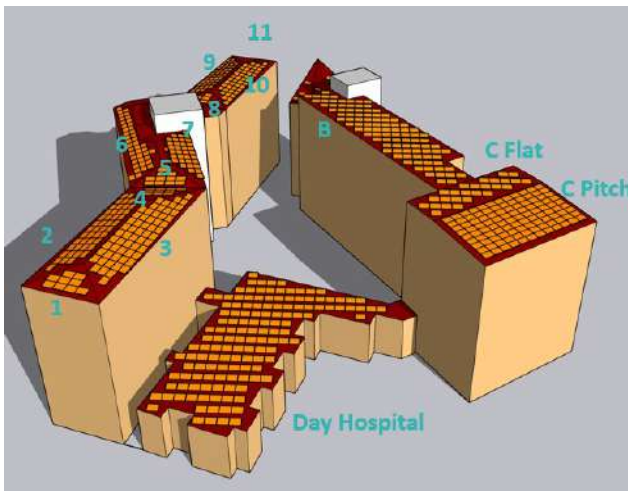
Virtual Environment (VE)
Piattaforma di simulazione del sistema edificio impianto.

Intelligent Control and Analysis (iSCAN)
Piattaforma per l'integrazione e analisi dei dati prestazionali effettivi degli impianti e degli edifici a supporto della calibrazione dei modelli



Analisi della capacità di PV installabile

Gemello digitale dell'edificio

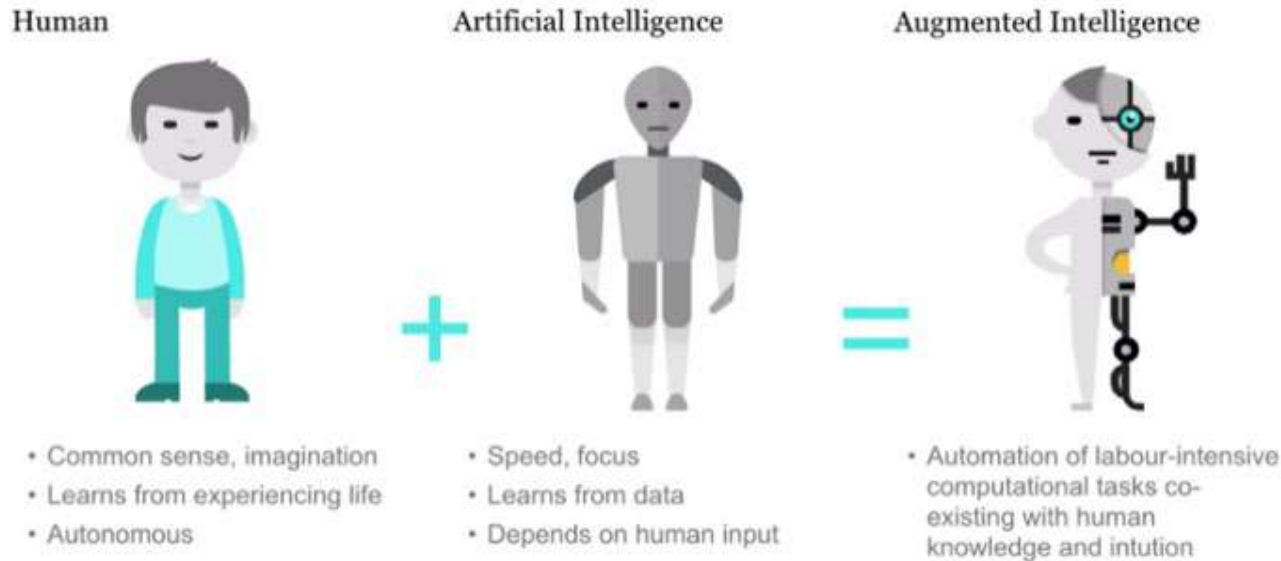


Esempi di progetti EU



Progetto Auto-DAN: finalità e servizi offerti

Ha l'obiettivo di fare risparmio energetico sfruttando l'intelligenza aumentata



L'intelligenza aumentata è un percorso di progettazione per un modello incentrato sull'uomo di partnership tra le persone e intelligenza artificiale (AI) che lavorano insieme per migliorare le prestazioni cognitive, tra cui l'apprendimento, il processo decisionale e le nuove esperienze.

- budget **5.67 milioni** di euro
- durata: da Ottobre 2020 a Settembre 2024;
- **13 partner** internazionali;

1. O Cualann
2. Greenogue and Aerodrome Business Park (MSEMICON)
3. Delta Ecopc
4. Palazzo Terragni (R2M)
5. Residencia Camino de Santiago (UBU)
6. 245 Promocion (UBU)





Progetto Auto-DAN: finalità e servizi offerti

Ha l'obiettivo di fare risparmio energetico sfruttando l'intelligenza aumentata

6 SITI PILOTA



O Cualann A-Rated Homes,
Dublin, Ireland



Palazzo Terragni, Lissone, Italy



VideBURGOS Foundation, Burgos,
Spain



Delta Ecopolis, Cooperative,
Milan, Italy



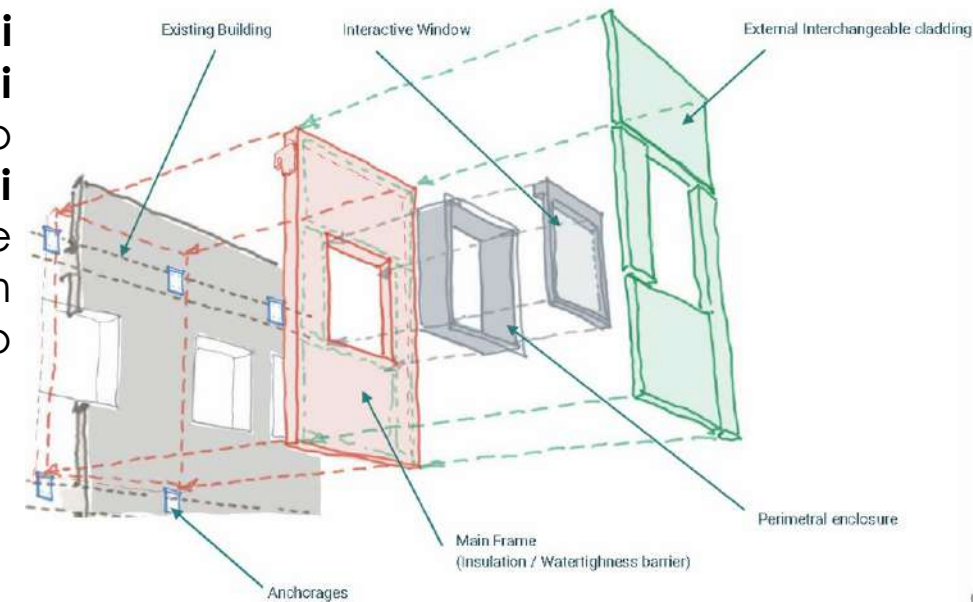
Residencia Camino de Santiago,
Burgos, Spain



Greenogue & Aerodrome Business
Park, Dublin, Ireland

Progetto ENSNARE

- Progetto: Finanziato dal Grant Agreement n° 958445 per oltre 10 M€
- Durata: 4 anni
- Partner: 19 partner di 12 Paesi europei: 11 PMI, 5 istituti di ricerca, 2 aziende, 1 ente pubblico.
- Scopo del progetto: l'obiettivo principale del progetto ENSNARE è quello di **promuovere l'implementazione di pacchetti di rinnovamento NZEB in Europa, con particolare attenzione agli edifici residenziali**. Per raggiungere questo obiettivo, il progetto sviluppa due tecnologie principali: **componenti edilizie e soluzioni digitali**. L'implementazione di queste due tecnologie si basa su due strutture chiave sviluppate all'interno di ENSNARE, la digital platform (piattaforma per gli stakeholder) e l'envelope mesh (elemento modulare).



Esempi di progetti EU



energy
poverty 0
by energie
sprong



Progetto ENERGY POVERTY 0

Mira a contrastare al povertà energetica attraverso la riqualificazione energetica a livello di distretto utilizzando soluzioni industrializzate secondo il modello ENERGIESPRONG

- budget **1.74 milioni** di euro
- durata: da Novembre 2022 a Ottobre 2025;
- **7 partner** internazionali;

4 private partners



3 non profit partners



Progetto ENERGY POVERTY 0

Ha l'ambizione di lavorare su 3 assi per accelerare la ristrutturazione nei quartieri vulnerabili

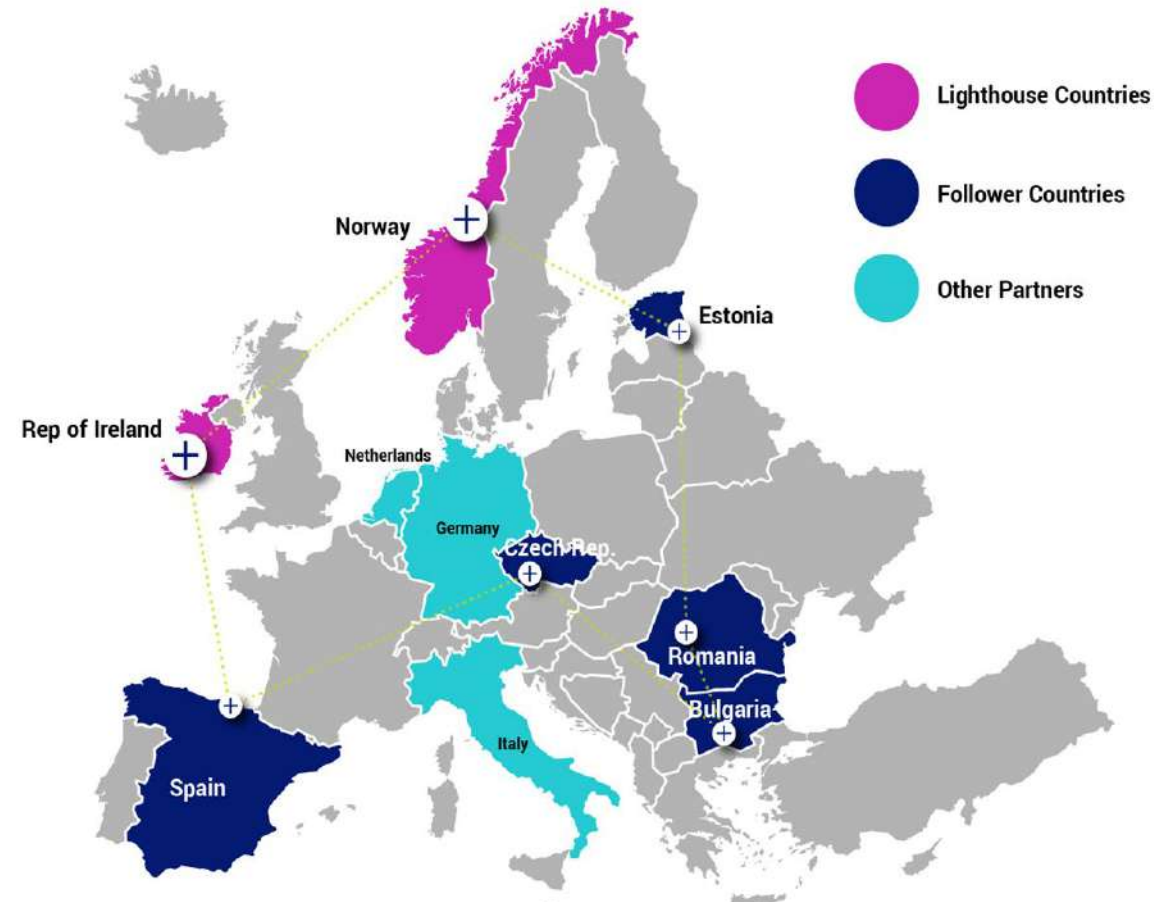


Esempi di progetti EU

Progetto +CityxChange

- Finanziato da H2020
- *Da Nov 2018 a Oct 2023*
- *32 partner*
- *7 paesi*
- *2 Lighthouse Cities – Trondheim & Limerick*
- *5 Follower Cites: Alba Iulia, Pisek, Võru, Smolyan & Sestao*

+CITYXCHANGE



Esempi di progetti EU

Progetto +CityxChange

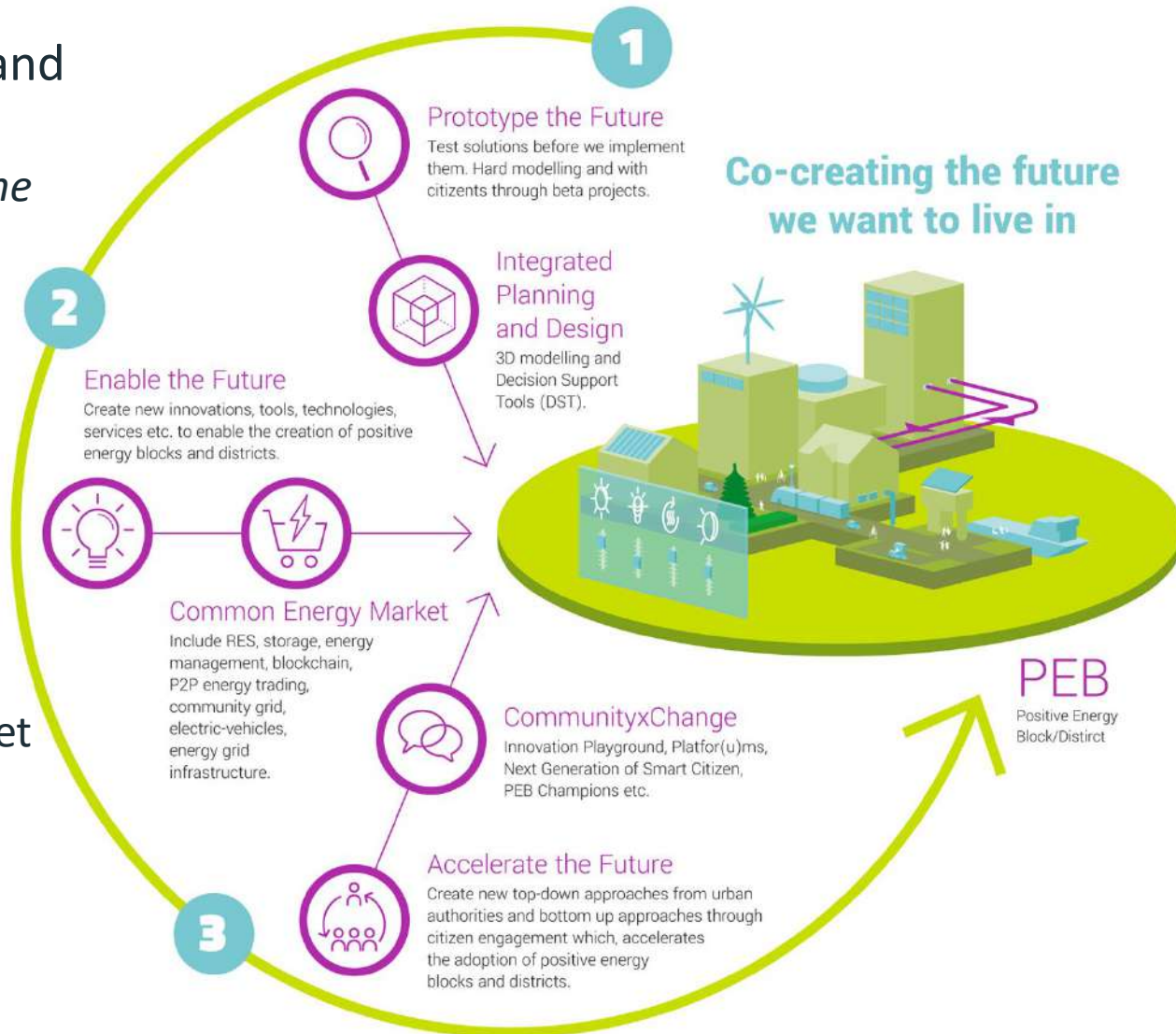
1- Supportare lo sviluppo di “Positive Energy Blocks and Districts”

Il Positive Energy Block (PEB) è un Gruppo di 3 o più edifici che produce più energia di quella che consuma in un anno.

2- Scalare questo approccio come parte del piano Europeo di Net Zero cities entro il 2050

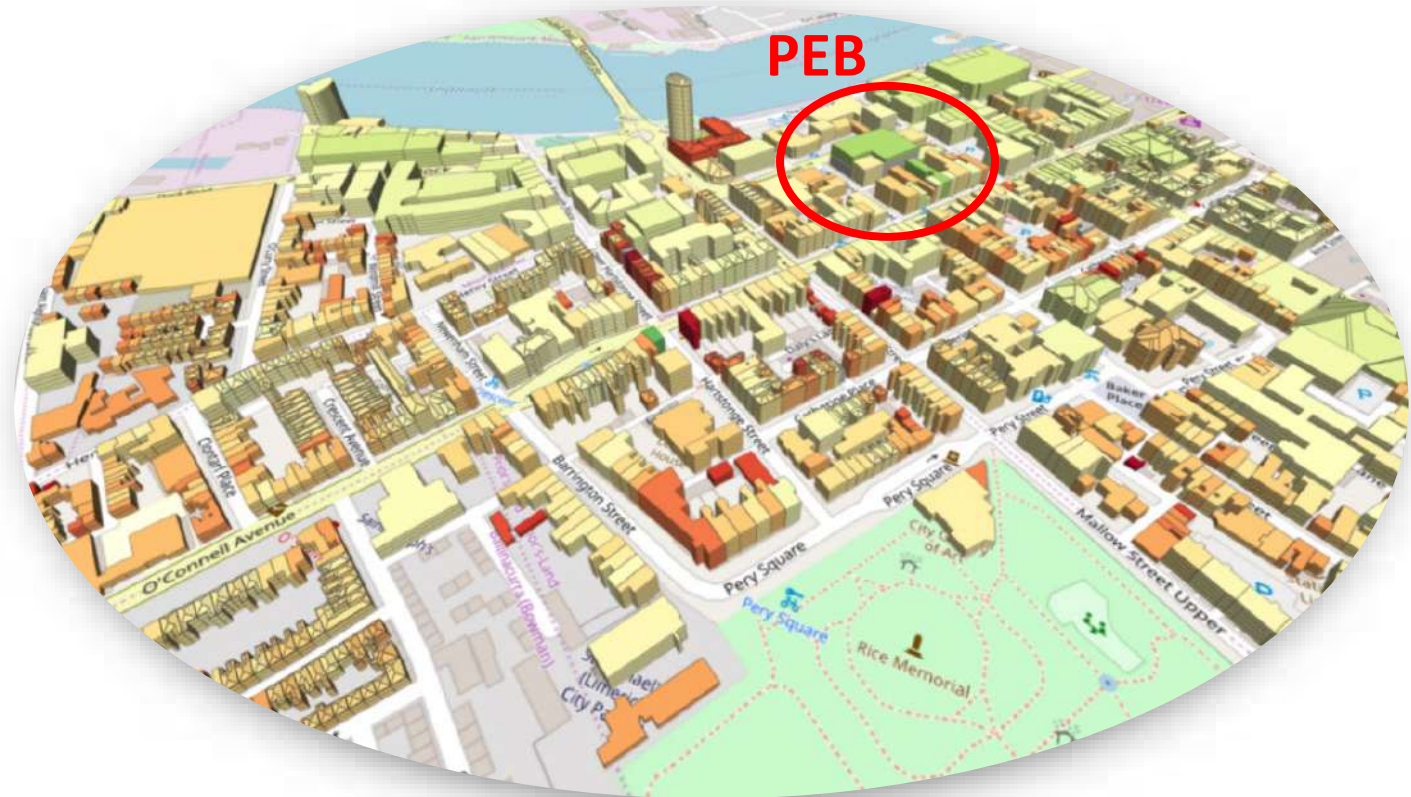
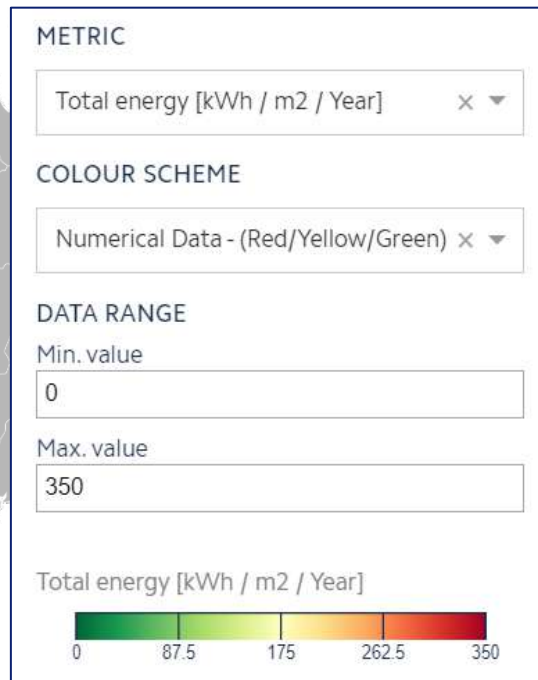
Questi obiettivi sono facilitati da un approccio che si basa su tre strategie:

1. Prototype the Future – Integrated Planning and Design
2. Enable the Future – Creation of a Common Energy Market
3. Accelerate the Future – CommunityxChange



Limerick:

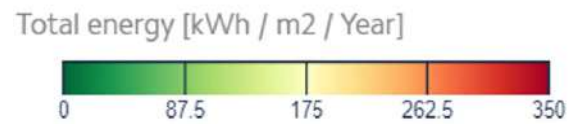
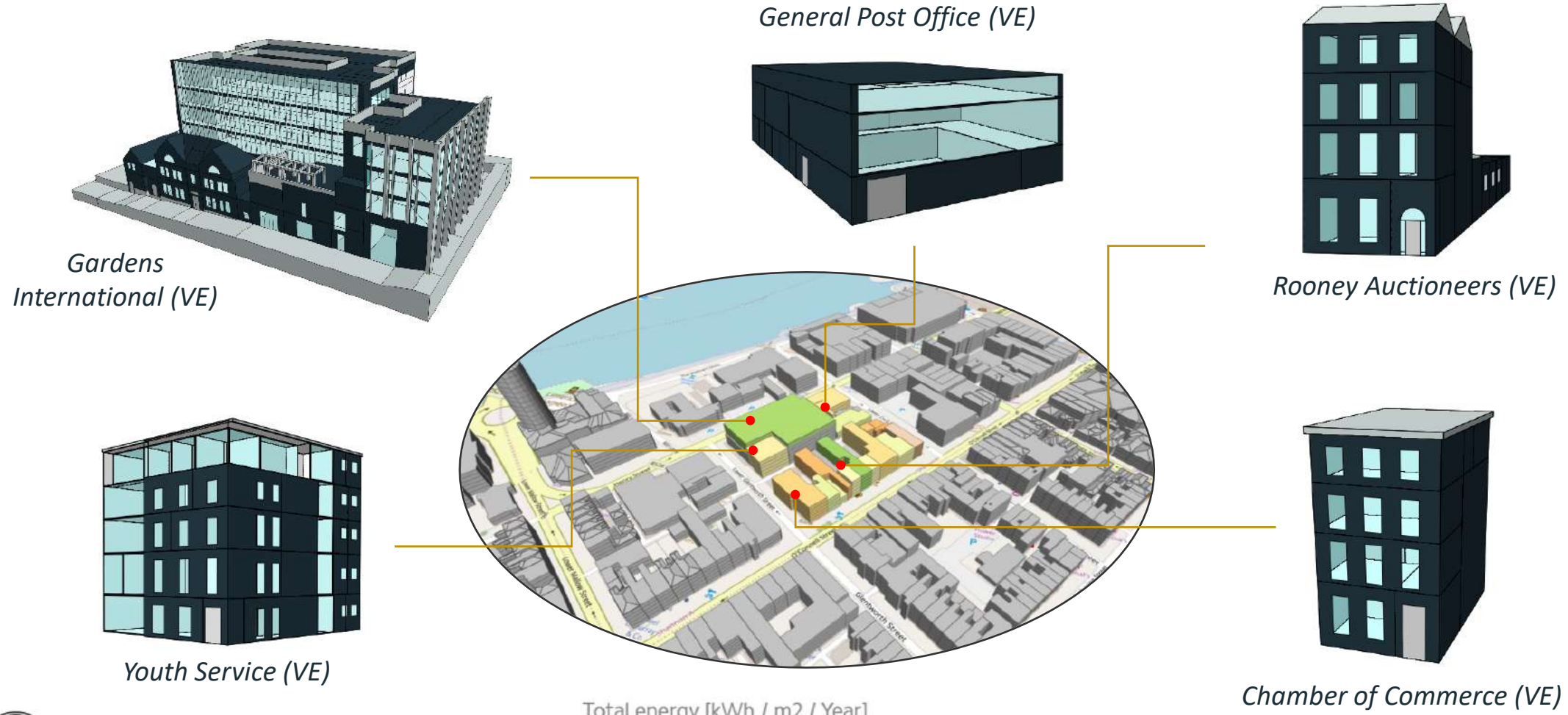
- Energy demand baseline for Limerick's Historic City Centre
- Energy demand baseline for Positive Energy Block (PEB)



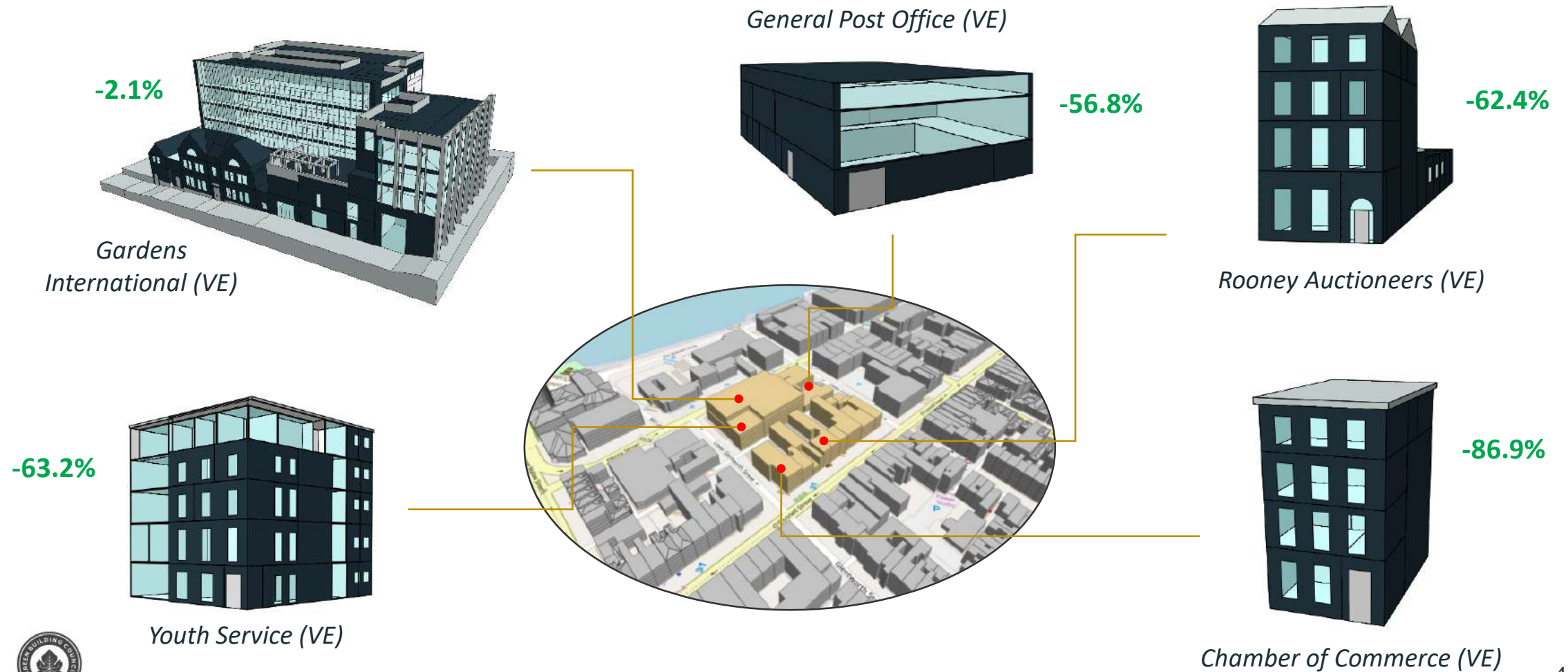
*Images shown in following slides are available in DST (IES ICL software)

Limerick: Positive Energy Block Energy Model Baselines

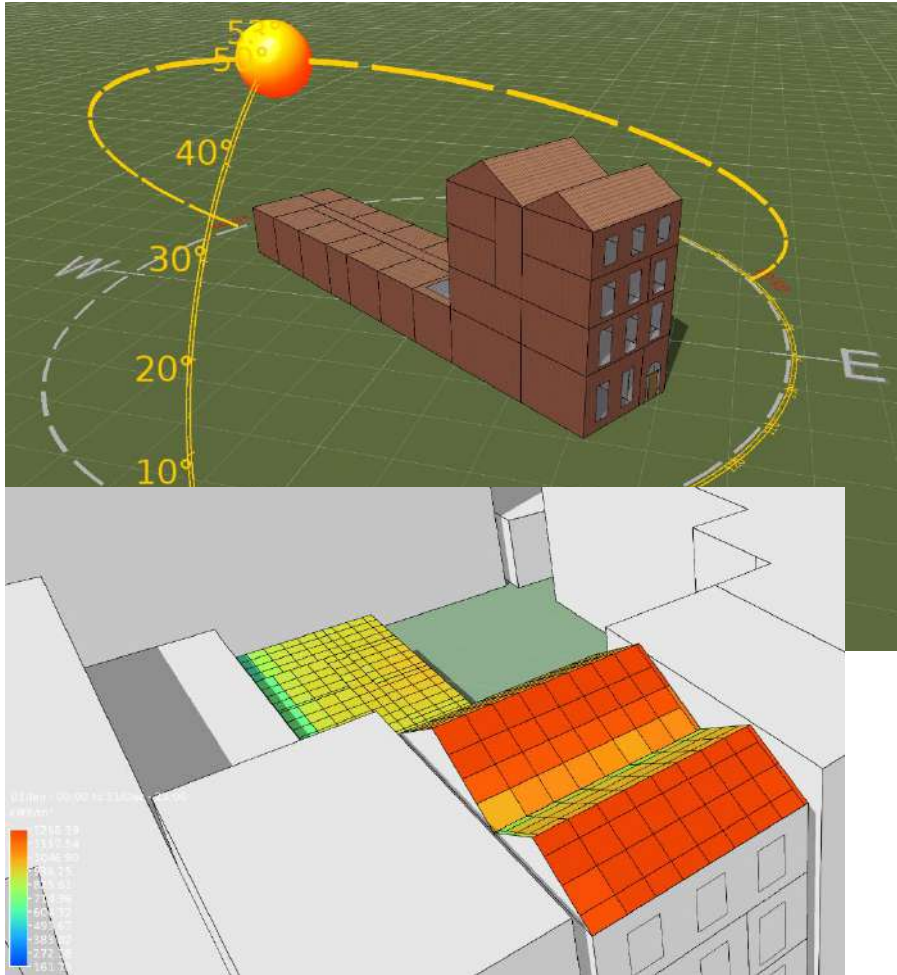
*Models calibrated against existing energy bills



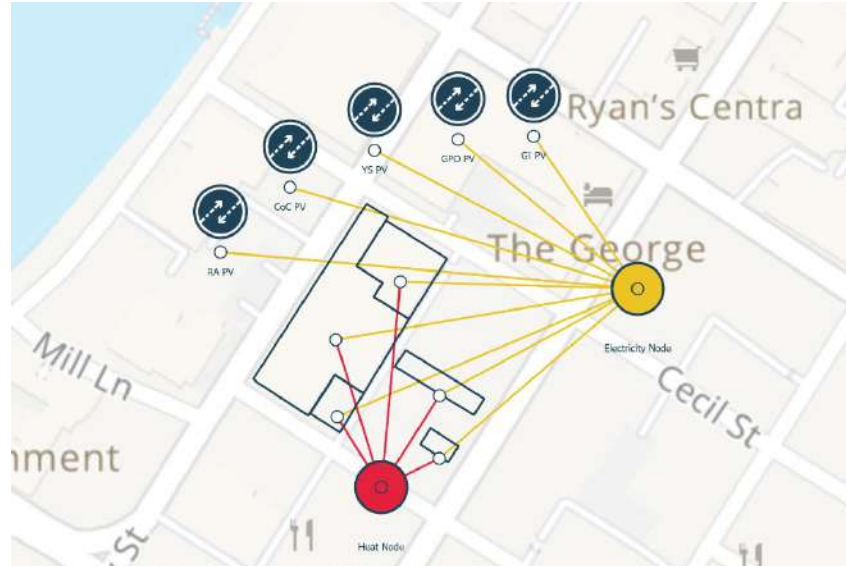
Limerick Simulations to Achieve PEB : Realistic retrofit buildings – improvement of energy use from baseline:



Example 1 building:

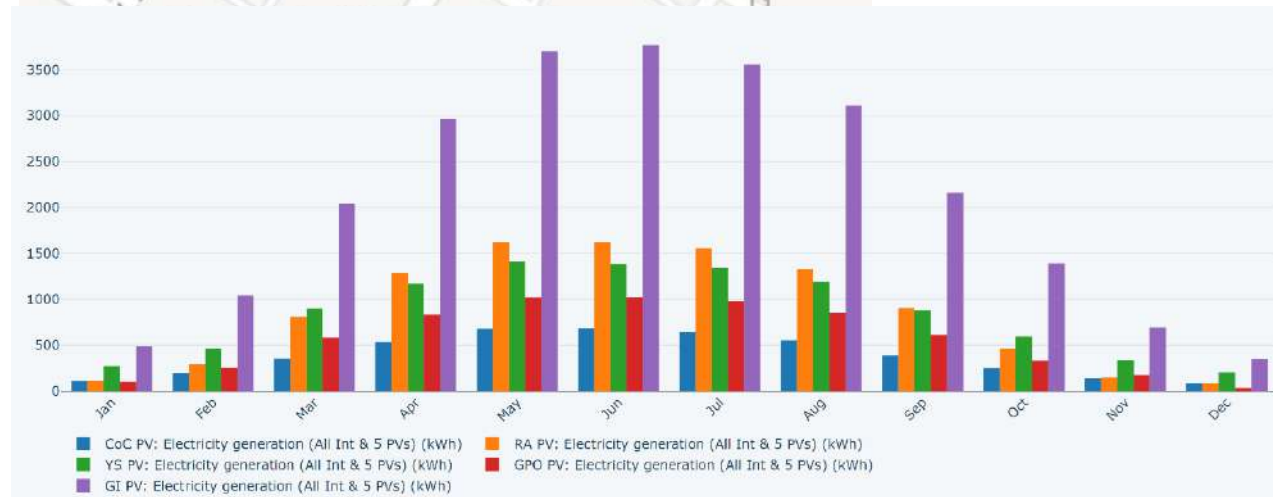


Example all PEB buidlings Solar PV integrated for energy sharing:

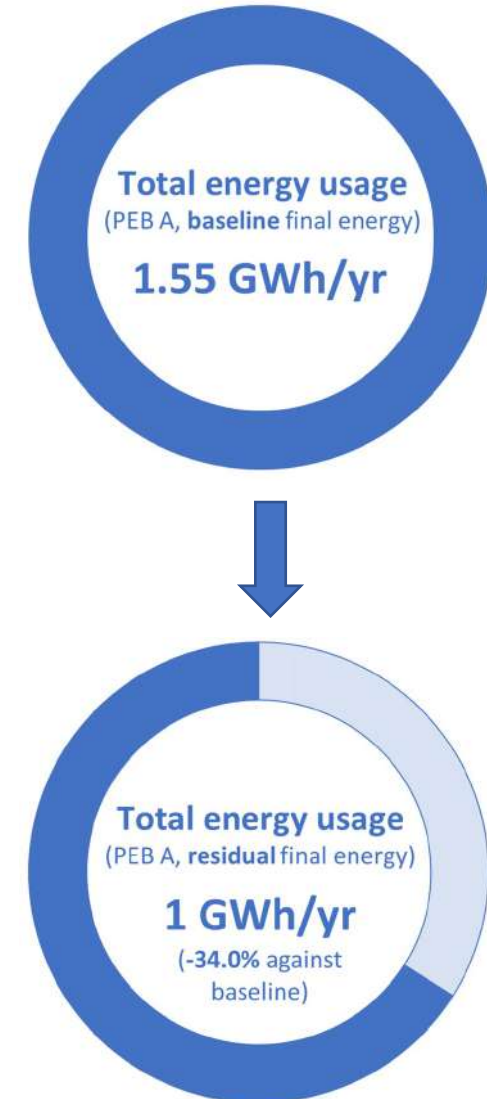
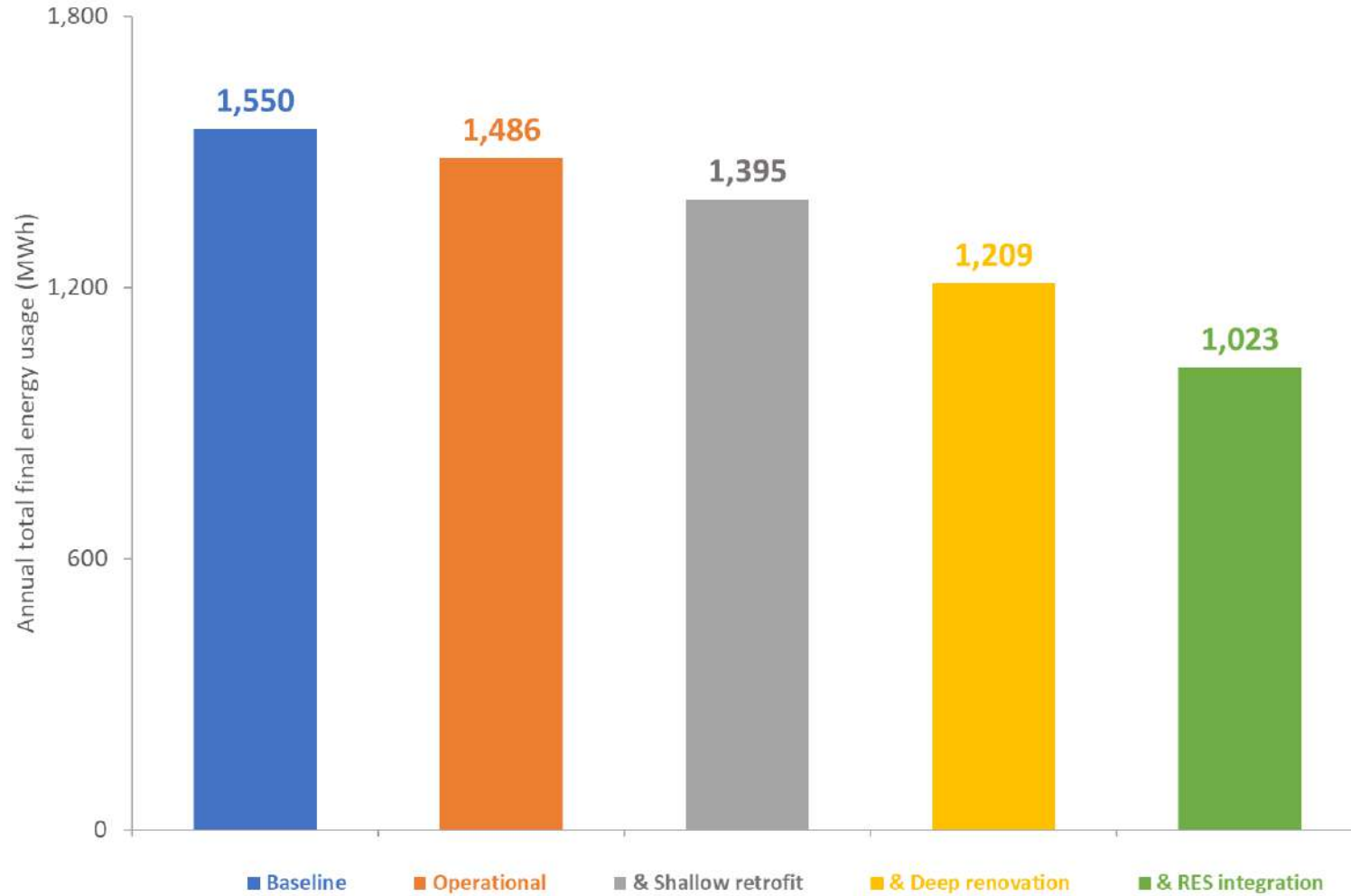


Included analysis on:

- Energy saving
- Energy sharing
- Cost and payback



Limerick: Overall PEB Results



Limerick 2050 Roadmap to Decarbonisation

Considered Historic City Centre already Baseline and applied:

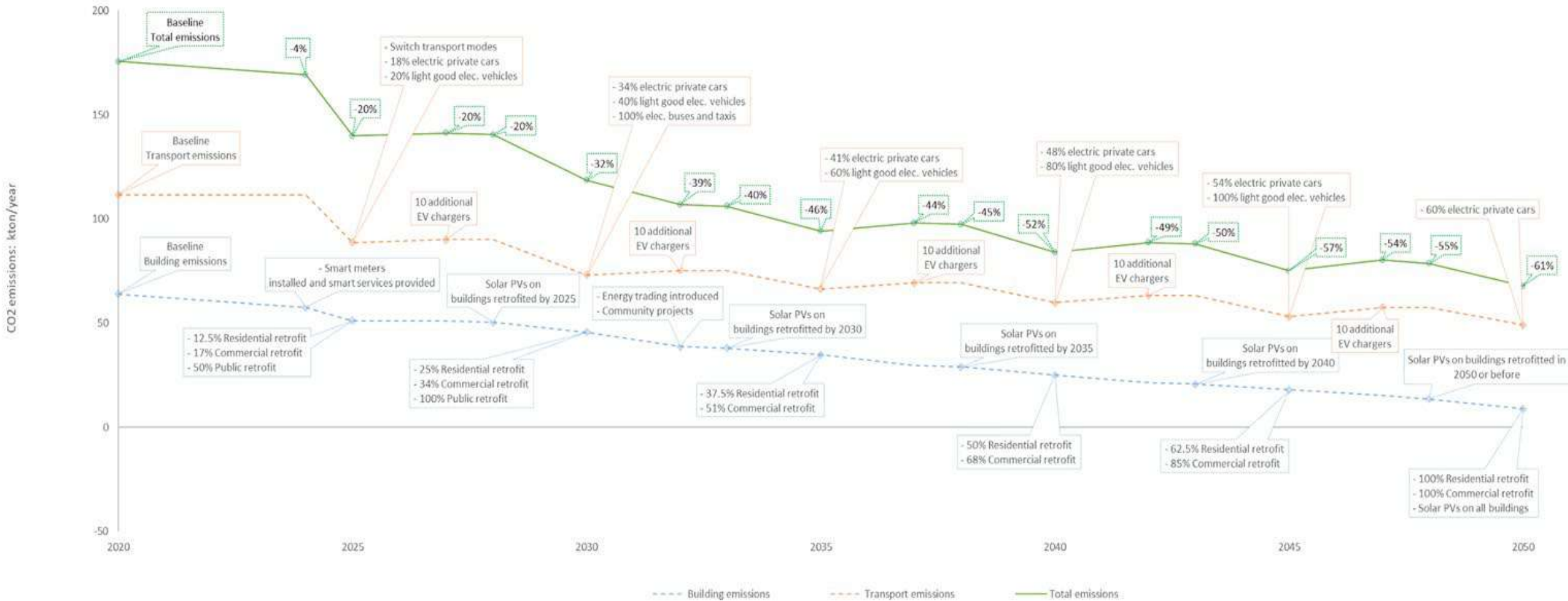
- Recommended retrofit measures across the area in 5 year intervals (see below from DST)
- Solar PV where possible in time intervals
- Transition to EVs in time intervals
- Smart of metering energy reduction
- Energy sharing incentives
- Behavioral energy reduction campaigns

Retrofit year

- 2025
- 2030
- 2035
- 2040
- 2045
- 2050



Limerick 2050 Roadmap to Decarbonisation



Il caso di ESA ESRIN

|

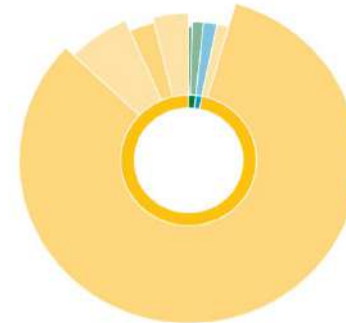
Cosa stiamo facendo qui



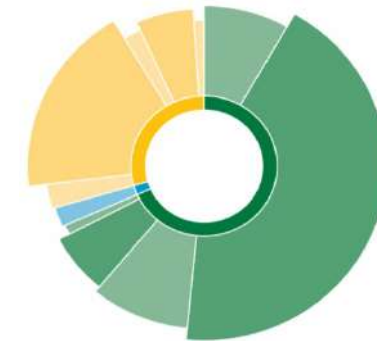
Il caso di ESA ESRIN

Sostenibilità e Digitalizzazione a ESA - ESRIN

Sostenibilità con protocolli energetici ambientali



WELL
Social 97%
Environmental 2%
Economic 1%



LEED
Environment al 68%
Social 30%
Economic 2%

Digitalizzazione con gemello digitale in supporto alla progettazione, al cantiere e alla gestione



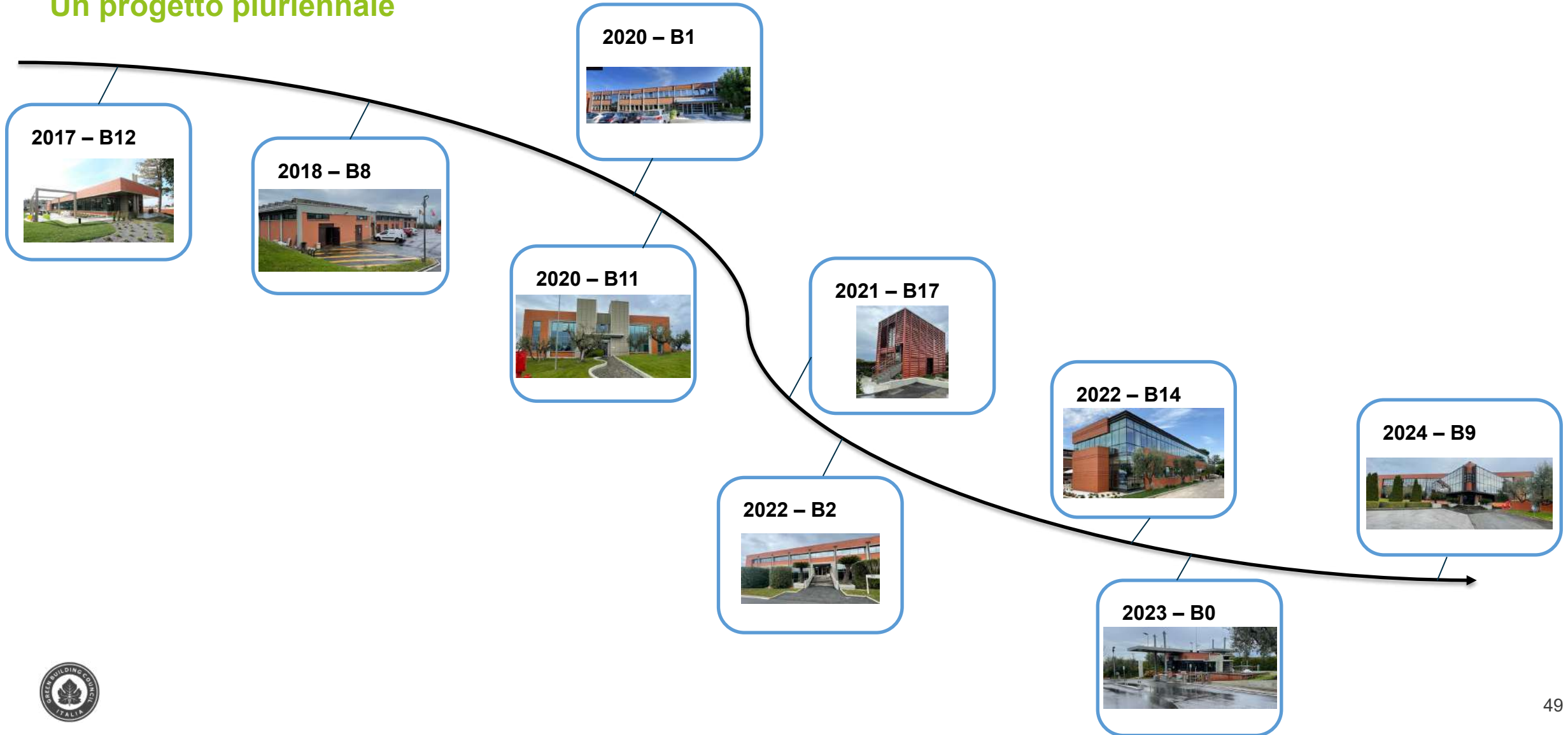
Smart Readiness Indicator (SRI)

DBL
DIGITAL BUILDING LOGBOOK



Il caso di ESA ESRIN

Un progetto pluriennale



Il caso di ESA ESRIN

Le certificaioni energetico ambientali



ESA B12 450 m2
• LEED Gold nel 2019



test qualità:
aria
acqua
comfort
termico

ESA B14 1350 m2
• LEED Platinum nel 2023
• WELL Platinum nel 2023



ESA B9 5000 m2
• LEED Platinum in corso
• WELL Platinum in corso





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Italia

18 luglio 2023

La decarbonizzazione dell'ambiente costruito: strumenti e buone pratiche

Alessandro Piccinini

**Modellazione energetica dinamica
LIVE DEMO**

www.gbcitalia.org

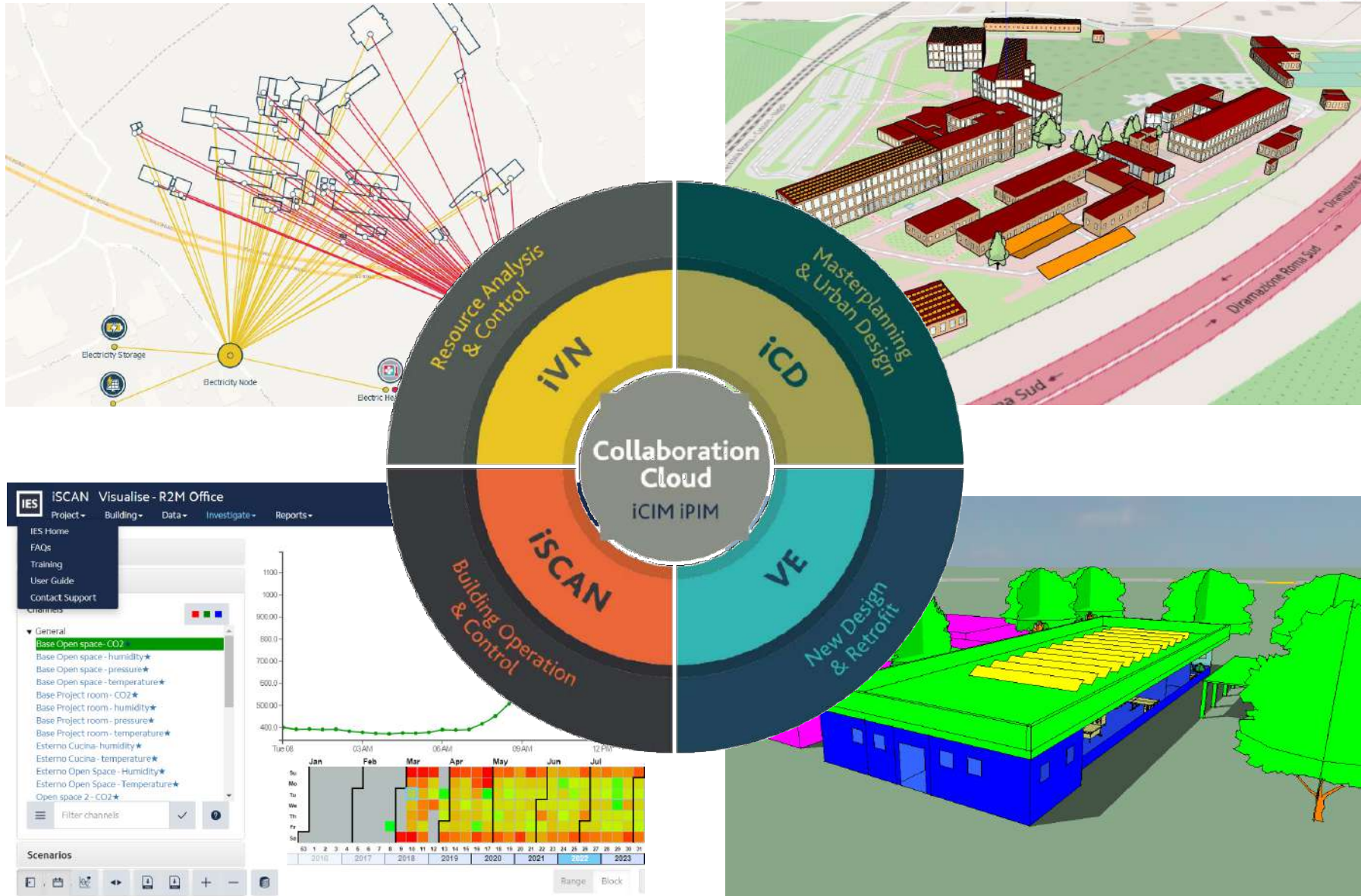
IN COLLABORAZIONE CON

R2M
RESEARCH TO MARKET
SOLUTION

IN COLLABORATION WITH

esa

LIVE DEMO



Collaboration Cloud
iCIM iPIM

Resource Analysis & Control (iVN)
Masterplanning & Urban Design (iCD)
Building Operation & Control (iSCAN)
New Design & Retrofit (VE)

IES Visualise - R2M Office
Project - Building - Data - Investigate - Reports -
IES Home
FAQs
Training
User Guide
Contact Support

General
Base Open space - CO2
Base Open space - humidity
Base Open space - pressure
Base Open space - temperature
Base Project room - CO2
Base Project room - humidity
Base Project room - pressure
Base Project room - temperature
Esterno Cucina - humidity
Esterno Cucina - temperature
Esterno Open Space - Humidity
Esterno Open Space - Temperature
Open space 2 - CO2

Filter channels

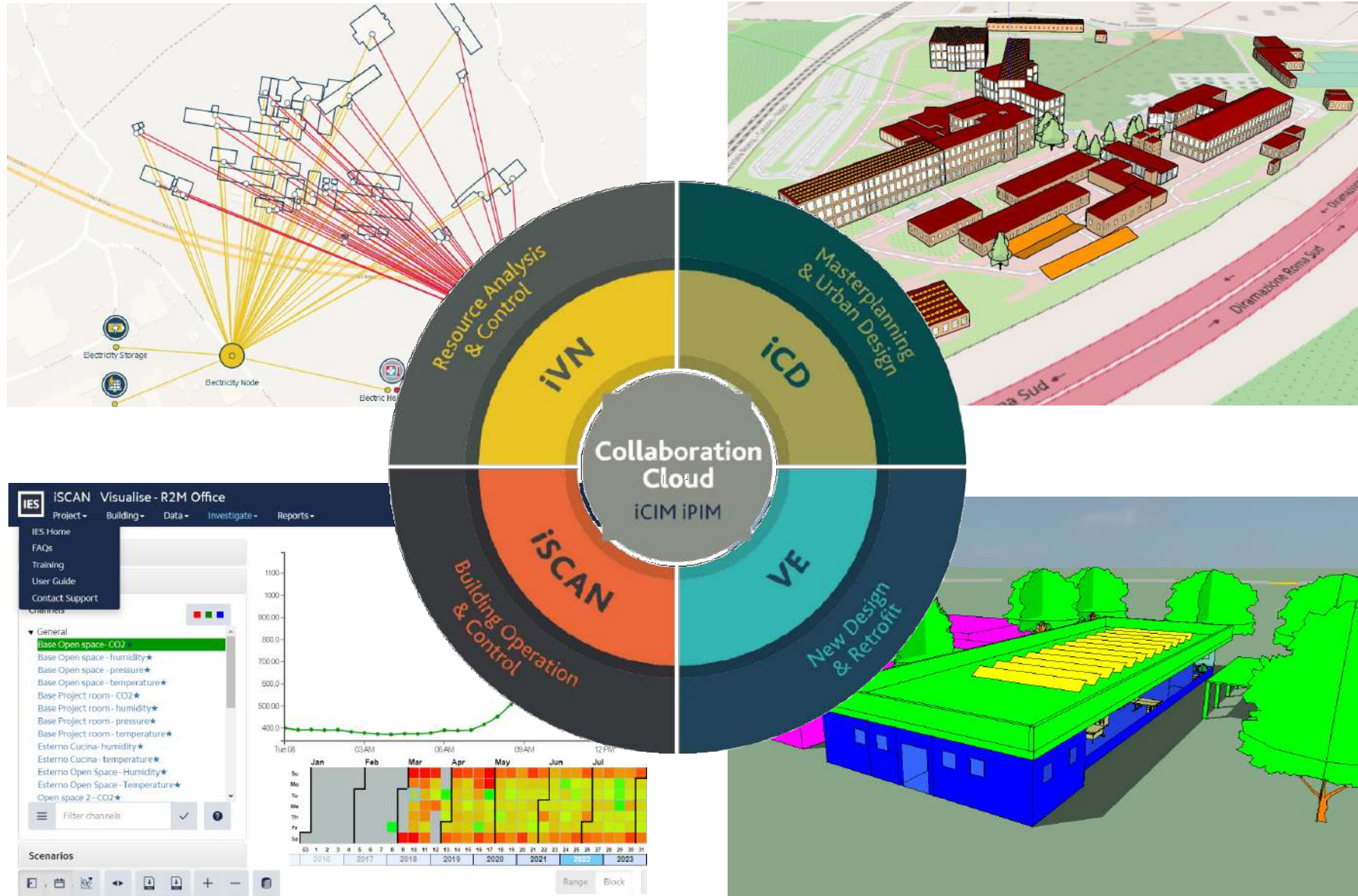
Scenarios

Year	Jan	Feb	Mar	Apr	May	Jun	Jul
2016	Low	Low	Low	Low	Low	Low	Low
2017	Low	Low	Low	Low	Low	Low	Low
2018	Low	Low	Low	Low	Low	Low	Low
2019	Low	Low	Low	Low	Low	Low	Low
2020	Low	Low	Low	Low	Low	Low	Low
2021	Low	Low	Low	Low	Low	Low	Low
2022	Low	Low	Low	Low	Low	Low	Low
2023	Low	Low	Low	Low	Low	Low	Low

5
2



LIVE DEMO



The central diagram is a circular hub with four quadrants, each representing a different phase of the building lifecycle:

- iVN (Resource Analysis & Control):** Represented by a network map showing connections between buildings and infrastructure like electricity nodes and storage.
- iCD (Masterplanning & Urban Design):** Represented by an aerial site plan showing building footprints, roads, and green spaces.
- iSCAN (Building Operation & Control):** Represented by a software interface showing a list of sensor channels (e.g., CO2, humidity, temperature) and a data visualization chart.
- VE (New Design & Retrofit):** Represented by a 3D architectural rendering of a building with a solar panel array on the roof.

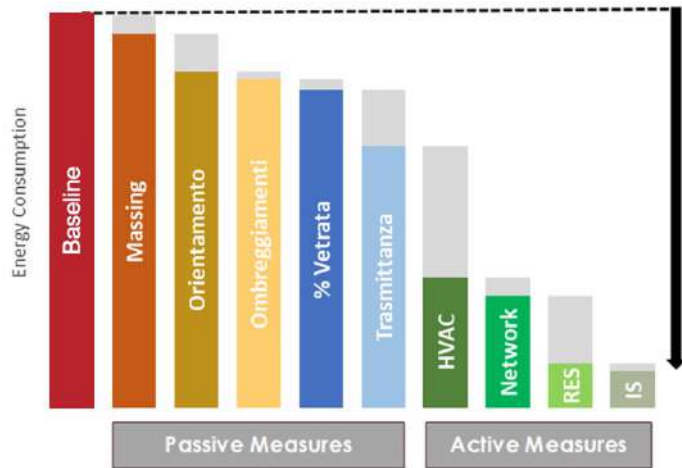
The center of the circle is labeled "Collaboration Cloud" and "iCIM iPIM".

5
3



1- ICD e ICIM - supporto di scenari di decarbonizzazione su scala urbana

Supportare la progettazione di edifici o distretti attraverso la metodologia PED



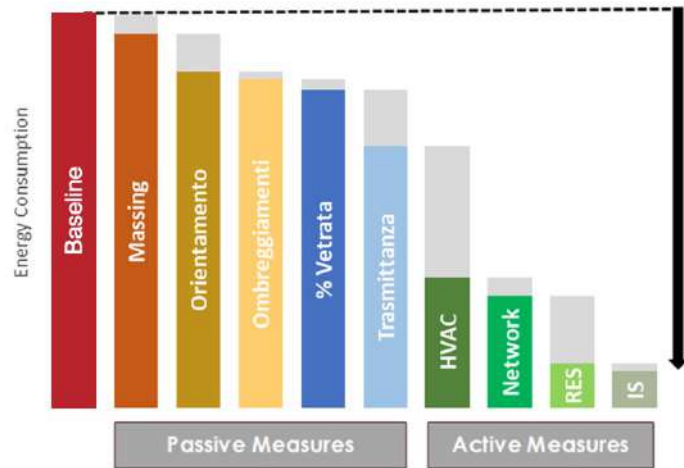
- Analisi del modello di **baseline**
- Analisi scenari comparativi
- Individuazione **migliori scenari**
- **Analisi incrementale**

The screenshot displays the IES software interface with a 3D model of a building complex. A circular diagram titled 'Collaboration Cloud ICIM IPIM' is overlaid on the right, divided into four quadrants: 'Resource Analysis & Control' (IVN), 'Masterplanning & Urban Design' (iCD), 'Building Operation & Control' (iSCAN), and 'New Design & Retrofit' (VE). The interface also shows a 'SCENES' panel with energy metrics and an 'ATTRIBUTES' panel with a bar chart for 'Sim cooling energy' and a 'METRICS LEGEND' for 'Sim total energy'.

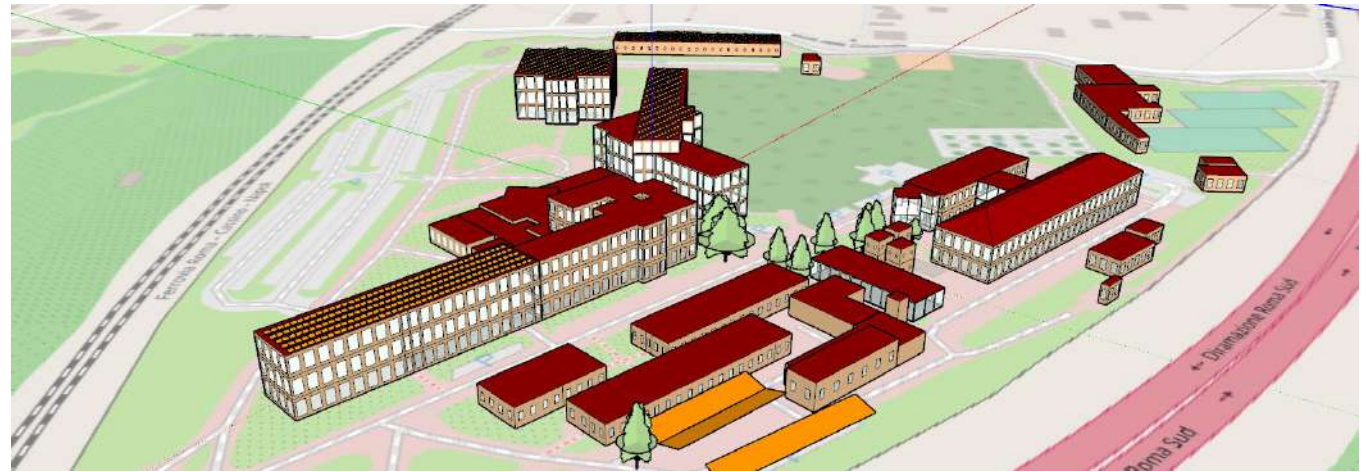


1- ICD e ICIM - supporto di scenari di decarbonizzazione su scala urbana

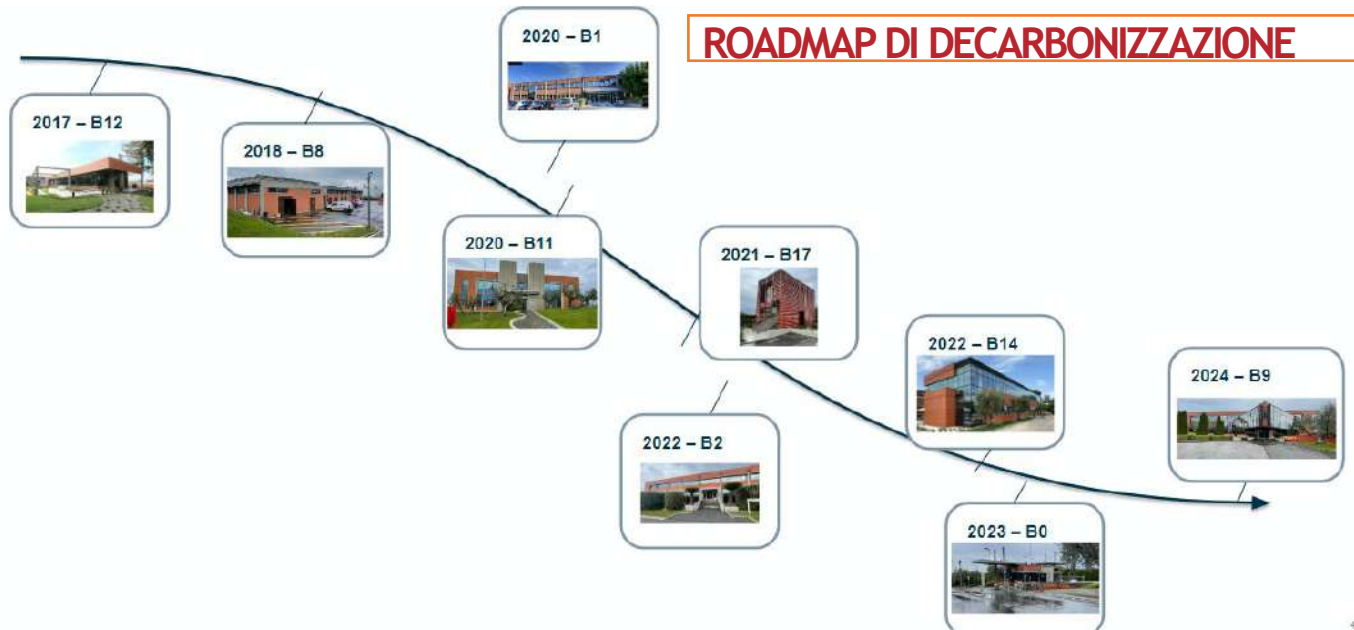
Supportare la progettazione di edifici o distretti attraverso la metodologia PED



- Analisi del modello di **baseline**
- Analisi scenari comparativi
- Individuazione **migliori scenari**
- **Analisi incrementale**



ROADMAP DI DECARBONIZZAZIONE



LIVE DEMO

2a - ICD e VE - Modellazione Dinamica semplificata - Integrative Process LEED

REQUIREMENTS

Beginning in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems. Use the analyses described below to inform the owner's project requirements (OPR), basis of design (BOD), design documents, and construction documents.

Energy-Related Systems

DISCOVERY

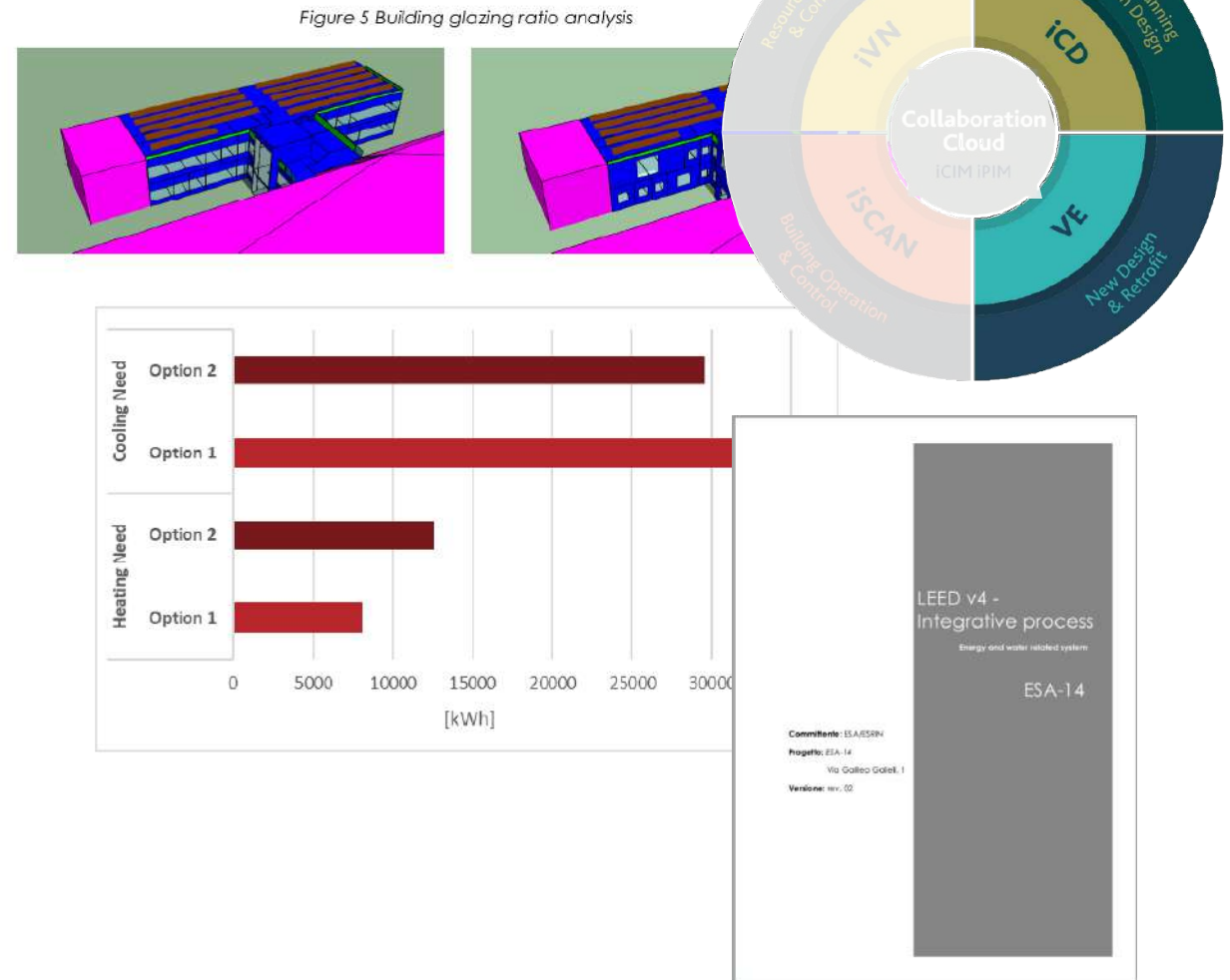
Perform a preliminary "simple box" energy modeling analysis before the completion of schematic design that explores how to reduce energy loads in the building and accomplish related sustainability goals by questioning default assumptions. Assess at least two potential strategies associated with the following:

- **Site conditions.** Assess shading, exterior lighting, hardscape, landscaping, and adjacent site conditions.
- **Massing and orientation.** Assess how massing and orientation affect HVAC sizing, energy consumption, lighting, and renewable energy opportunities.
- **Basic envelope attributes.** Assess insulation values, window-to-wall ratios, glazing characteristics, shading, and window operability.
- **Lighting levels.** Assess interior surface reflectance values and lighting levels in occupied spaces.
- **Thermal comfort ranges.** Assess thermal comfort range options.
- **Plug and process load needs.** Assess reducing plug and process loads through programmatic solutions (e.g., equipment and purchasing policies, layout options).
- **Programmatic and operational parameters.** Assess multifunctioning spaces, operating schedules, space allotment per person, teleworking, reduction of building area, and anticipated operations and maintenance.

AND

Water-Related Systems

DISCOVERY



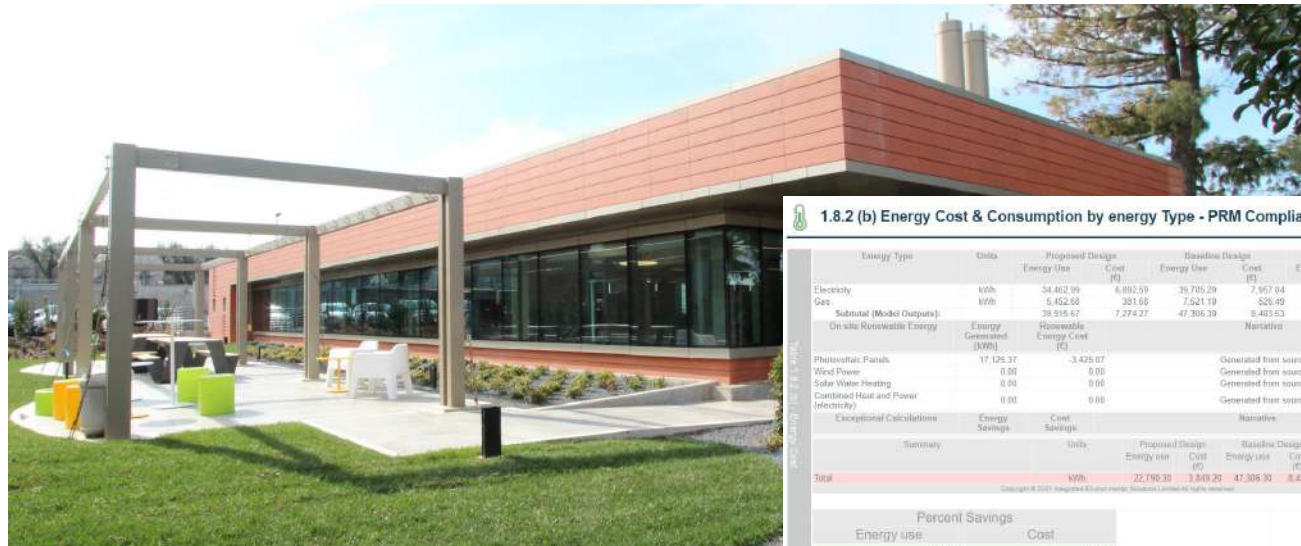
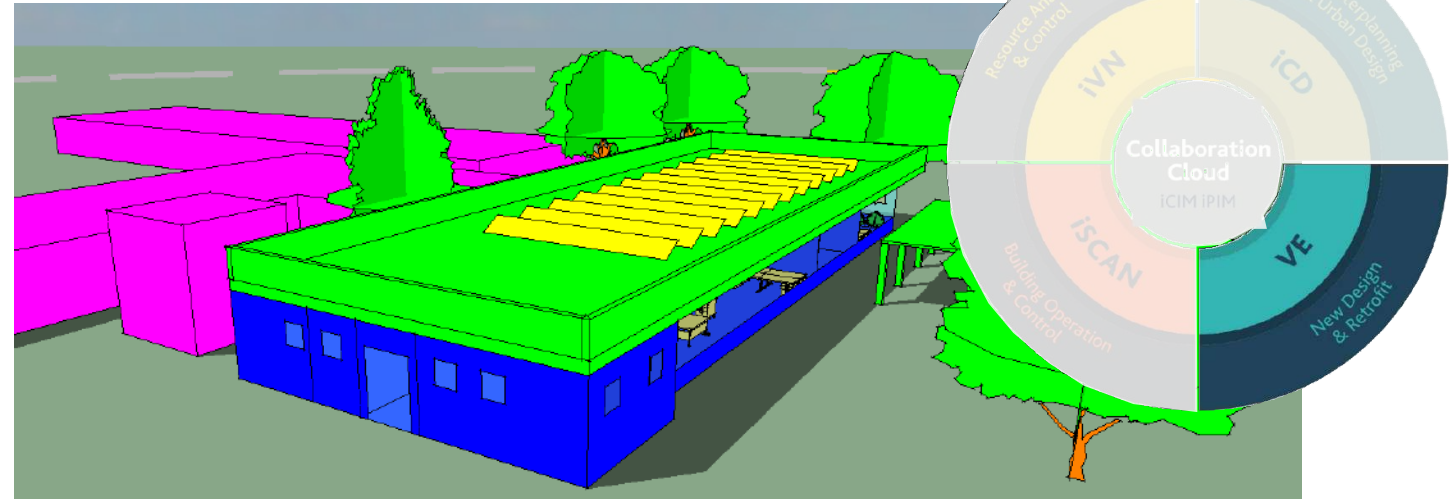
LIVE DEMO



2b - VE - Modellazione Dinamica Dettagliata – Optimize Energy Performance LEED

Nel LEED si confronta il modello BASELINE (ASHRAE 90.1) con il modello Proposed (Progetto Esecutivo). In base ai «cost savings» raggiunti si attribuisce un punteggio :

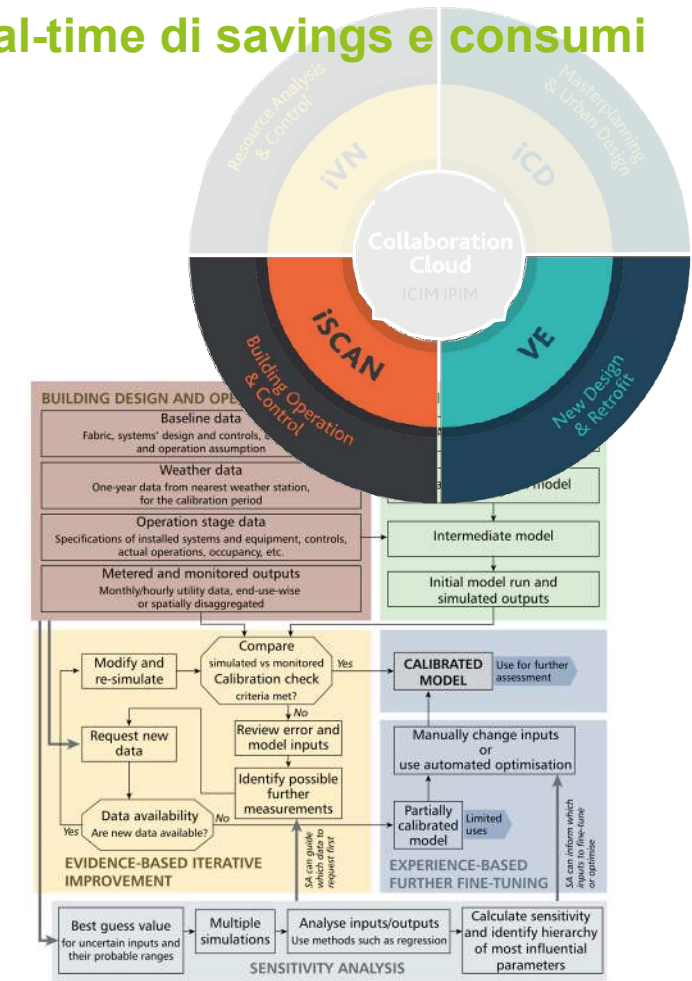
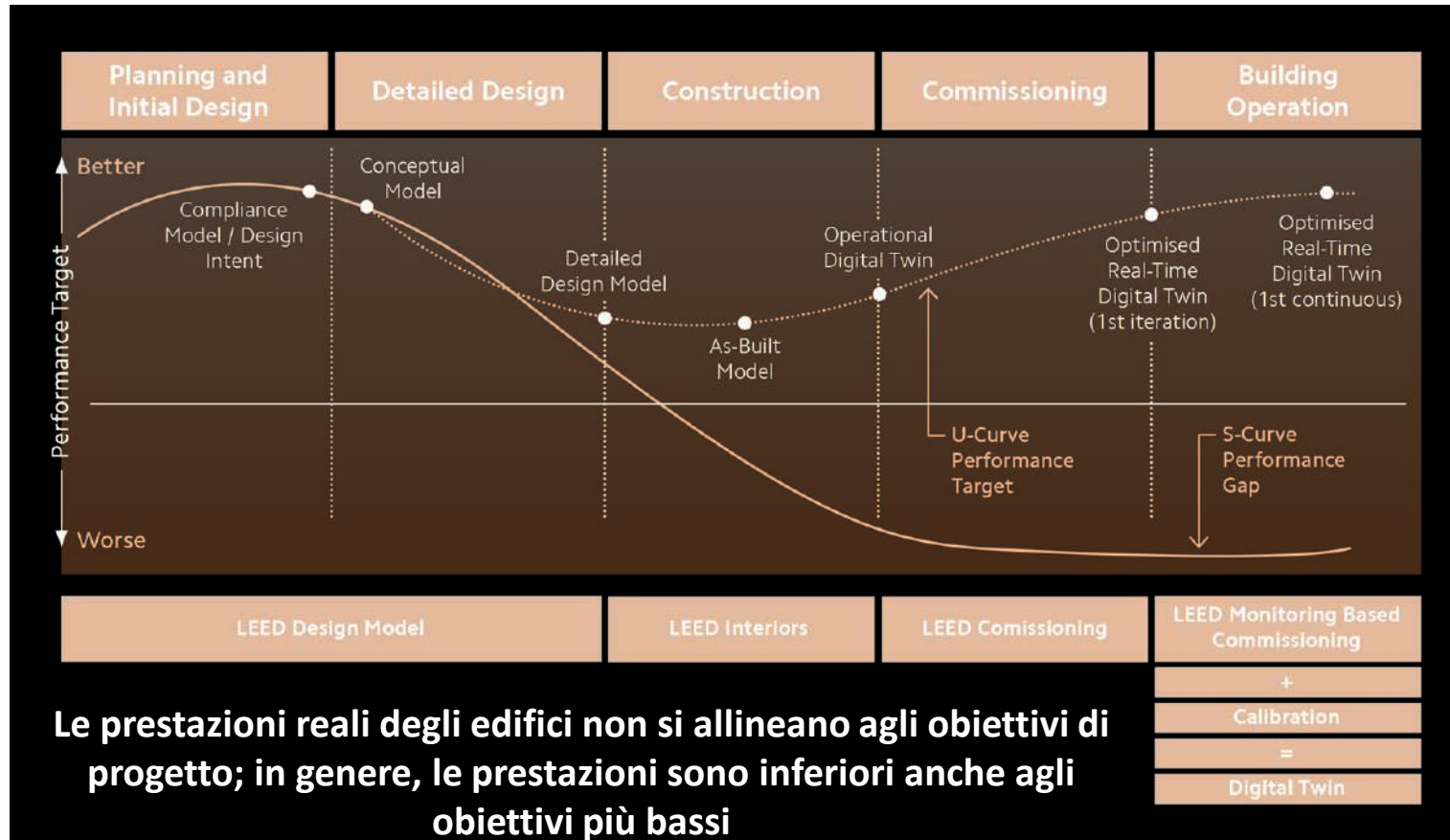
% improvement in energy performance (for new construction)	Points
6	1
8	2
10	3
12	4
14	5
16	6
18	7
20	8
22	9
24	10
26	11
29	12
32	13
35	14
38	15
42	16
46	17
50	18



Energy Type	Units	Proposed Design		Baseline Design		Percent Savings	
		Energy Use	Cost (€)	Energy Use	Cost (€)	Energy Use	Cost
Electricity	kWh	34,462.99	8,492.99	39,705.29	7,957.04	13.58	13.39
Gas	kWh	5,452.68	391.68	7,521.19	526.49	27.56	27.50
Subtotal (Model Outputs)		39,915.67	7,274.27	47,306.39	8,483.53	16.62	14.25
On site Renewable Energy	Energy Generated (kWh)						
Photovoltaic Panels		17,126.37	-3,425.07				Generated from source
Wind Power		0.00	0.00				Generated from source
Solar Water Heating		0.00	0.00				Generated from source
Combined Heat and Power (electricity)		0.00	0.00				Generated from source
Exceptional Calculations	Energy Savings		Cost Savings				Narrative
Summary	Units	Proposed Design Energy use	Cost (€)	Baseline Design Energy use	Cost (€)	Percent Savings Energy use	Cost
Total	kWh	22,790.39	-3,849.29	47,306.39	8,483.53	51.82	54.63
Percent Savings							
Energy use		51.82		Cost		54.63	

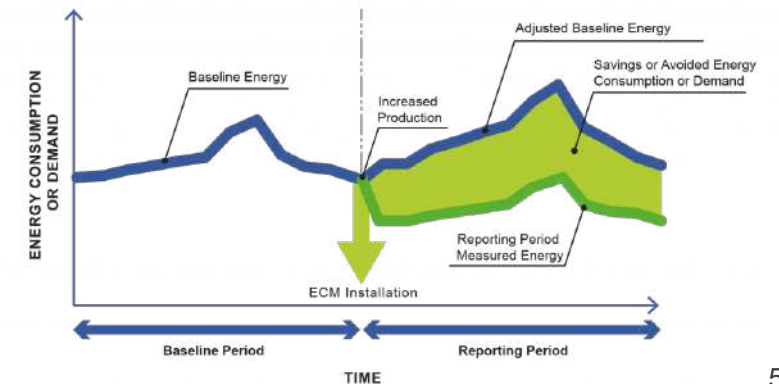
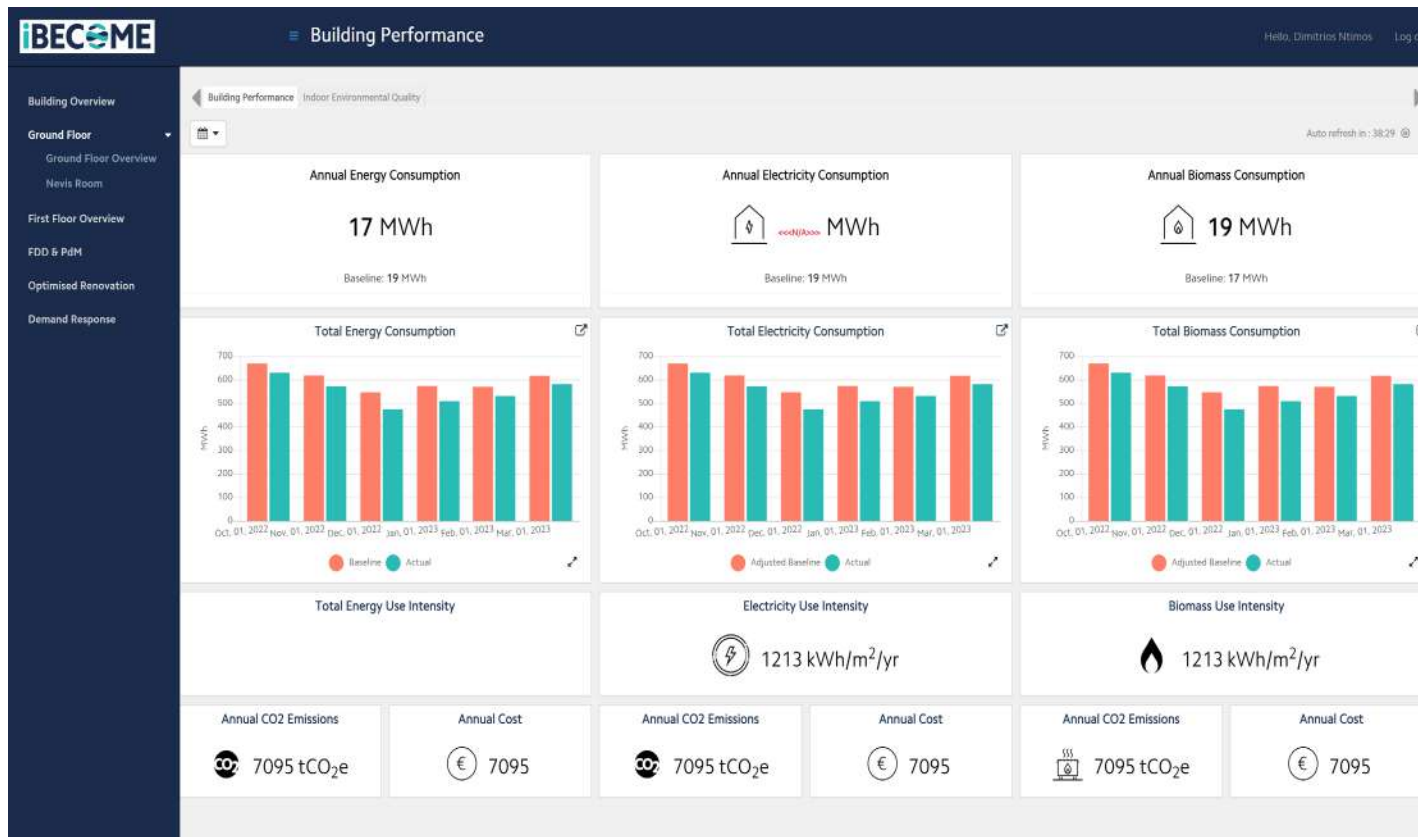


3a – iSCAN e VE - la calibrazione del modello energetico e valutazione real-time di savings e consumi



3a – iSCAN e VE- la calibrazione del modello energetico e valutazione real-time di savings e consumi

Attraverso iDashboard e la raccolta dati fatta con iSCAN è possibile visualizzare in tempo reale i savings dell'edificio confrontando il «modello baseline aggiustato» realizzato ad esempio con IES-VE con i consumi reali ricevuti dal sistema BMS in ottica IPMVP.



3b – iSCAN e VE - la calibrazione del modello energetico e valutazione real-time di savings e consumi



4 – iVN – Studio fattibilità tele-riscaldamento e tele-raffrescamento



R1
Residential 40.492,5 mq SLP (+8.100 mq SLP ed. Convezionata CCL)
Maximum height of 9 storeys

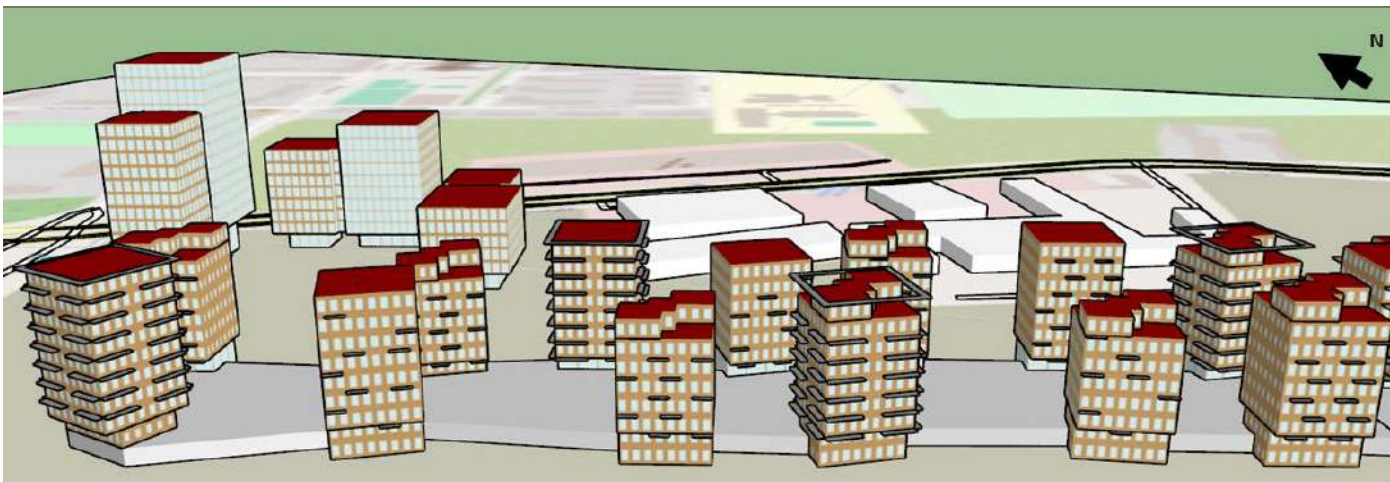
C
Comercial 8000 mq SLP
+ CAM + CSRA

R2
Residential 40.492,5 mq SLP
Maximum height of 19 storeys

T
Tertiary 265000 mq SLP

SCOPO: Dare visibilità al fornitore di energia della potenza di allaccio e delle curve di domanda termica per per la rete di tele-riscaldamento e tele-raffrescamento

4 – iVN – Studio fattibilità tele-riscaldamento e tele-raffrescamento

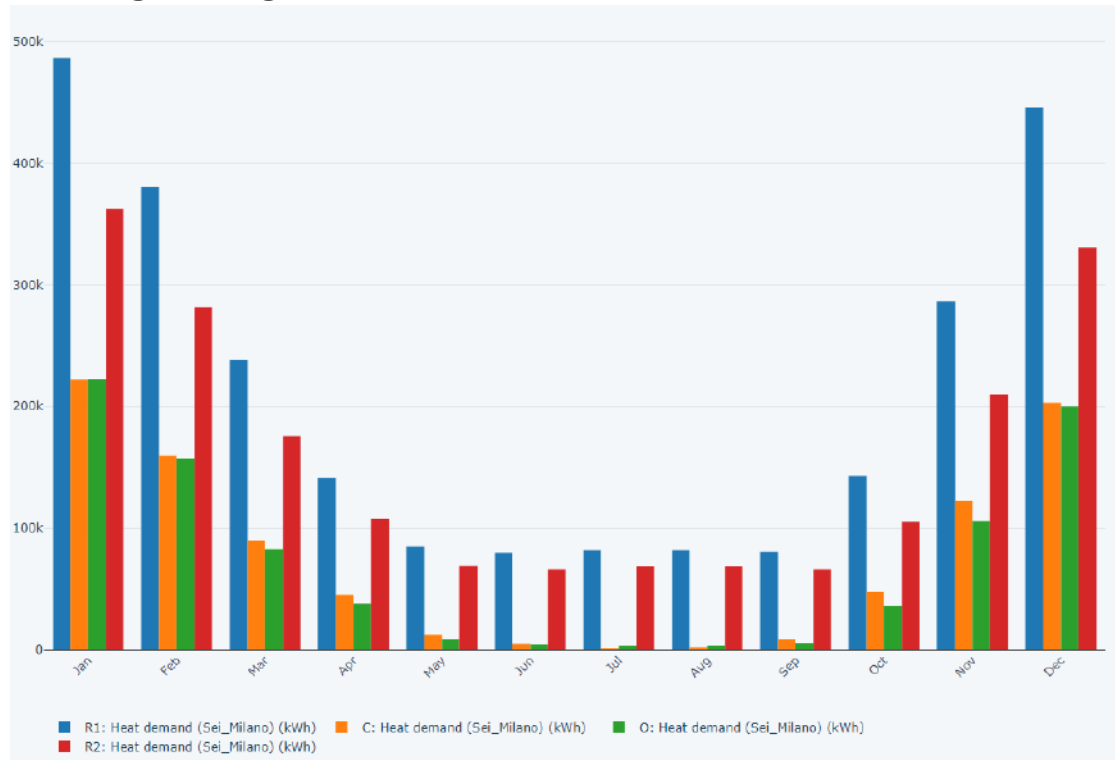


Domanda di energia termica

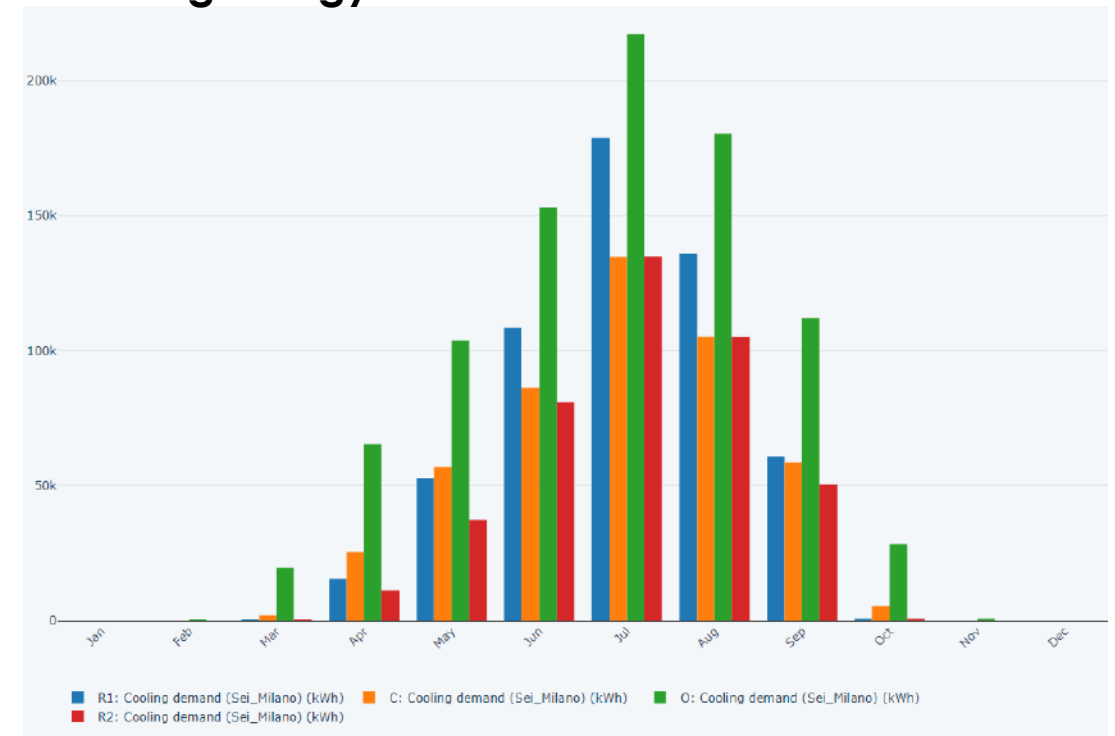
- Identify total and group of buildings' energy demand.

	R1 Residential	R2 Residential	O Office	C Commercial	TOTAL
Heating energy demand [GWh/y]	2.53	1.91	0.87	0.92	6.23
Cooling energy demand [GWh/y]	0.55	0.42	0.88	0.47	2.33

Heating Energy Demand



Cooling Energy Demand



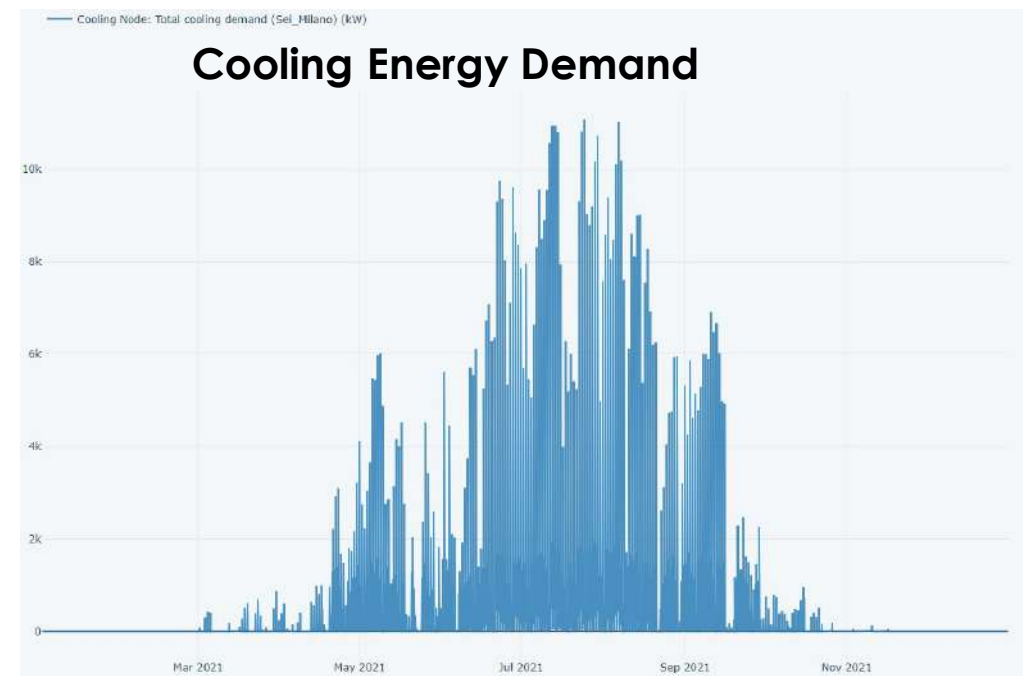
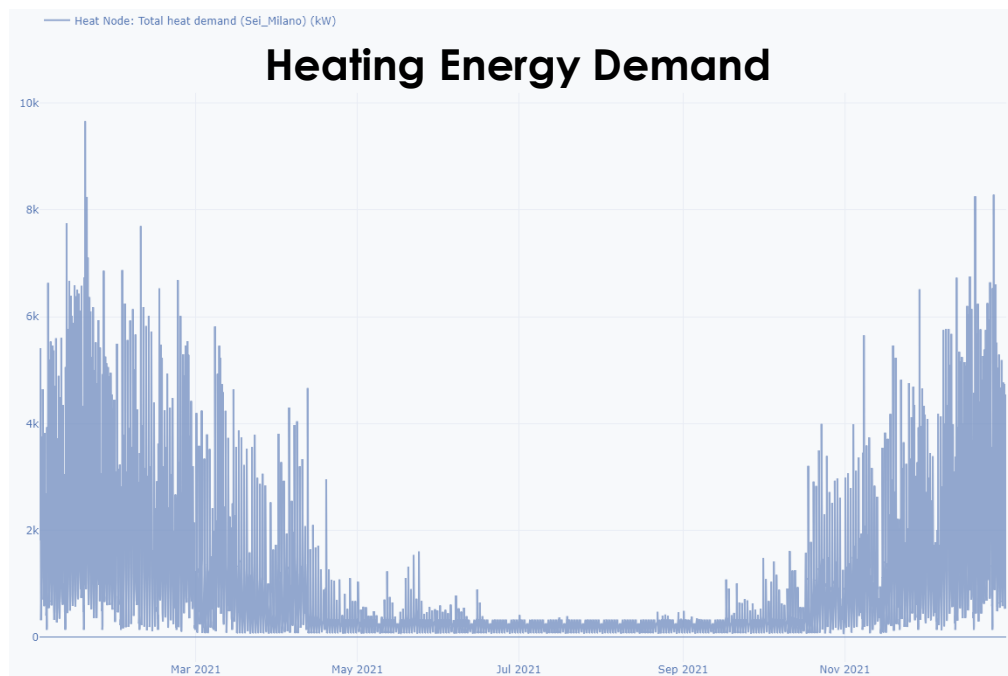
Picco di domanda di energia termica

- Identify total and group of buildings' peak energy demand.

	R1 Residential	R2 Residential	O Office	C Commercial
Heating peak energy [kW]	4176.3	3099.9	5008.1	2199.1
Cooling peak energy [kW]	6205.8	4794.0	1420.8	769.9

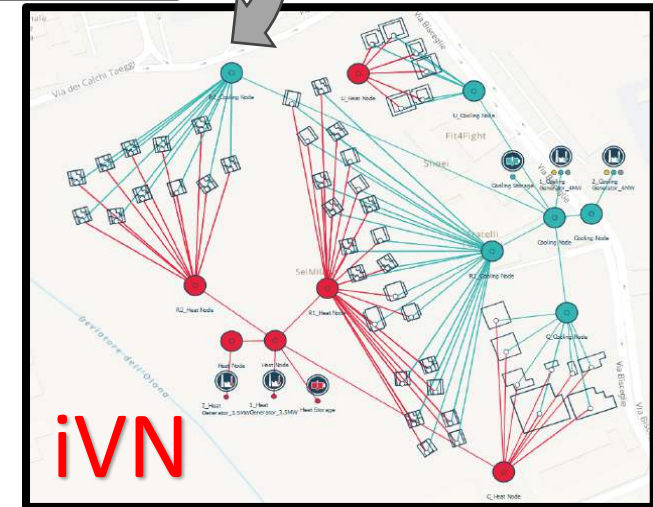
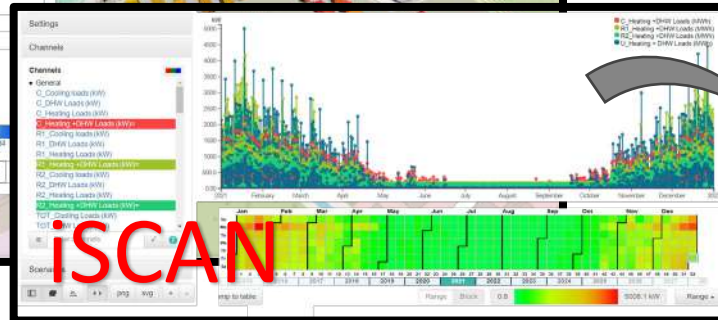
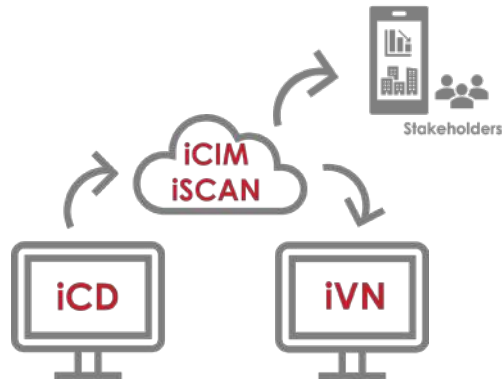
	TOTAL
Heating peak energy [kW]	9656.0
Cooling peak energy [kW]	11071.2

Date:
 18-01-2021 6:00 AM
 24-07-2021 9:30 PM



LIVE DEMO

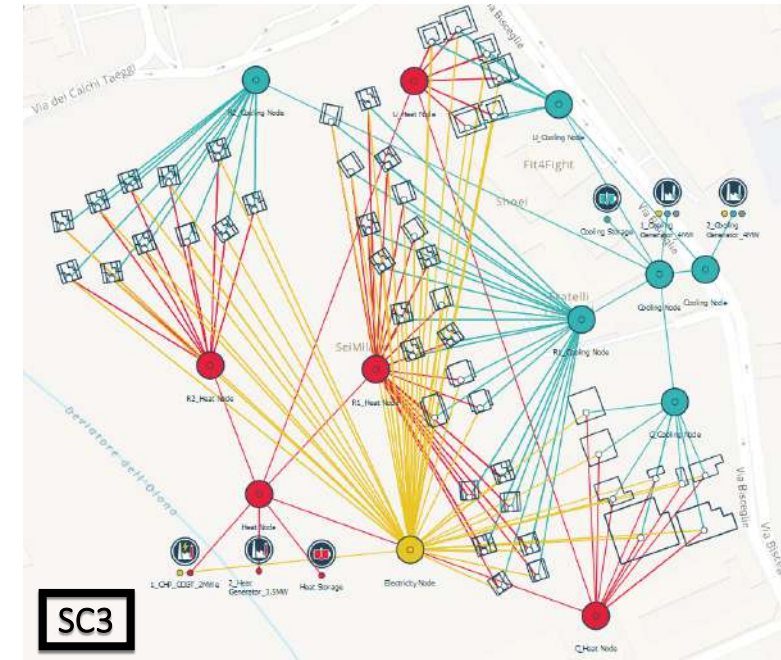
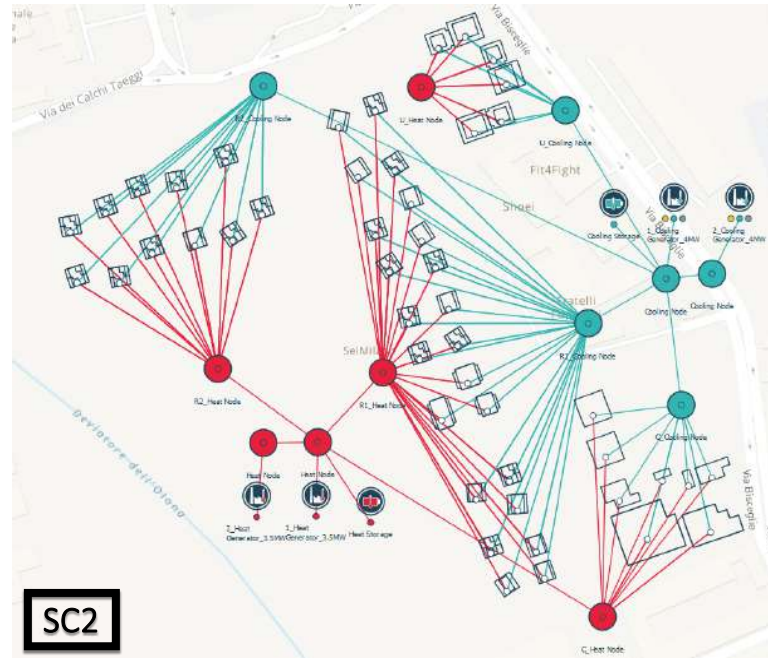
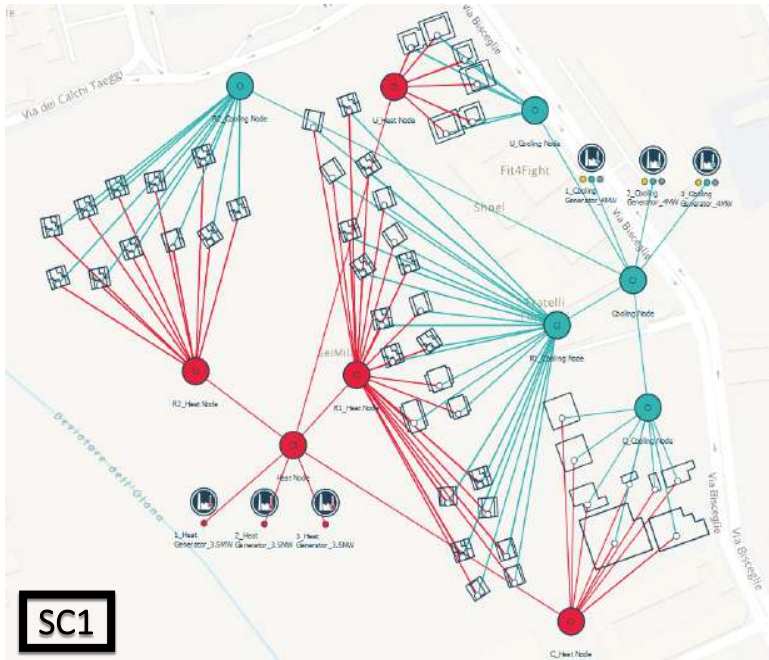
4 – iVN – Ottimizzazione tele-riscaldamento e tele-raffrescamento



Scenari di Tele-riscaldamento

- **SC1:** 3 units of heat generator of 3.5 MW;
- **SC2:** 2 units of heat generator of 3.5 MW and a heat storage;
- **SC3:** 1 CHP 2 MWe (and 3 MWt) combined with 1 unit of heat generator of 3.5 MW and a heat storage.

Heating Peak Energy: 9.66 MW

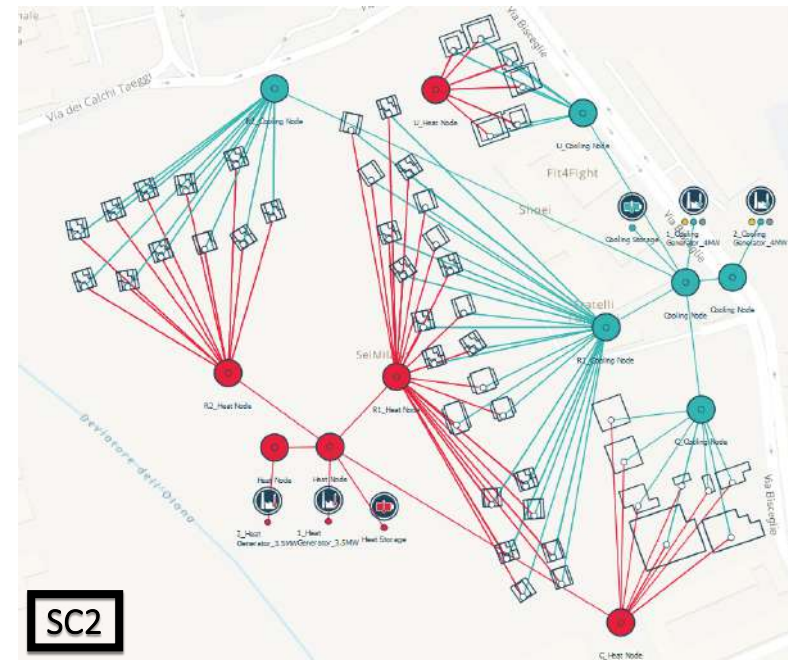
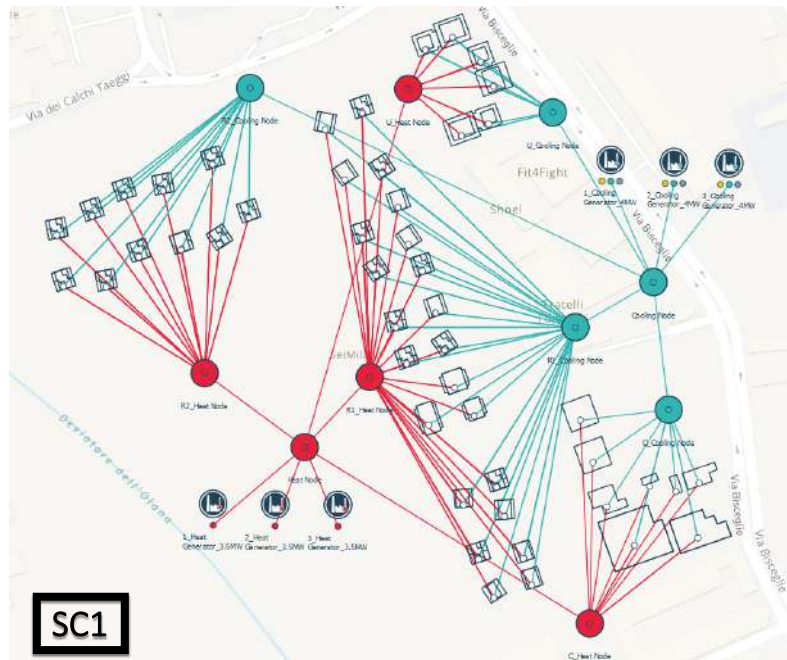


- Buildings' heating and DHW demand connected to a district heating – heating generators;

Scenari di Tele-raffrescamento

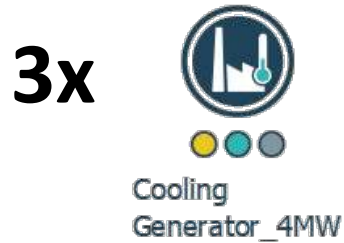
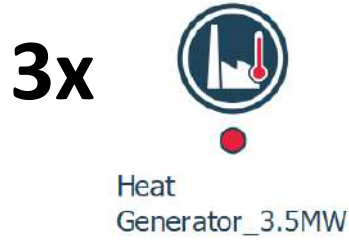
- **SC1:** 3 units of cooling generator of 4 MW **OR** 6 units of cooling generator of 2 MW;
- **SC2:** 2 units of cooling generator of 4 MW and a cooling storage.

Cooling Peak Energy: 11.1 MW

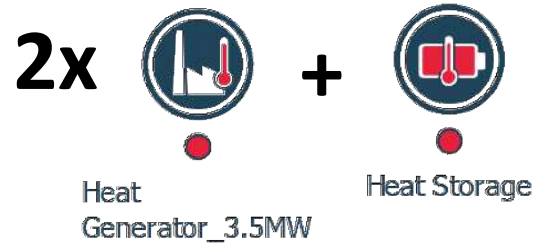


- Buildings' cooling demand connected to a district cooling – cooling generators.

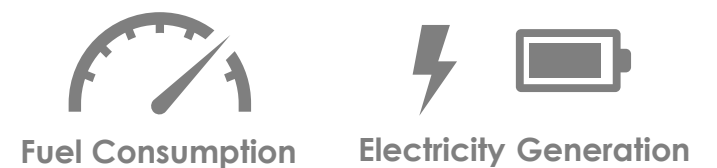
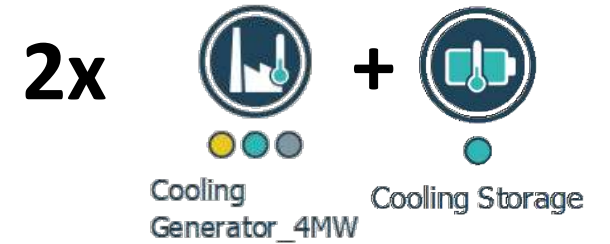
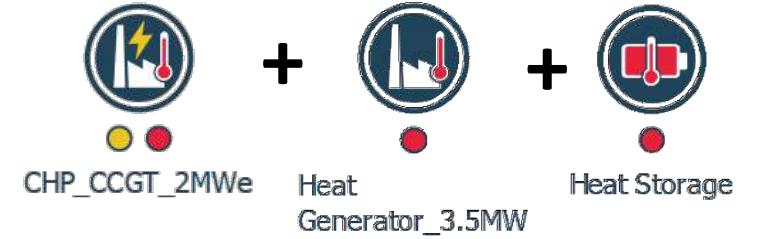
Summary – Energy Network: Operation



Scenario 1



Scenario 2



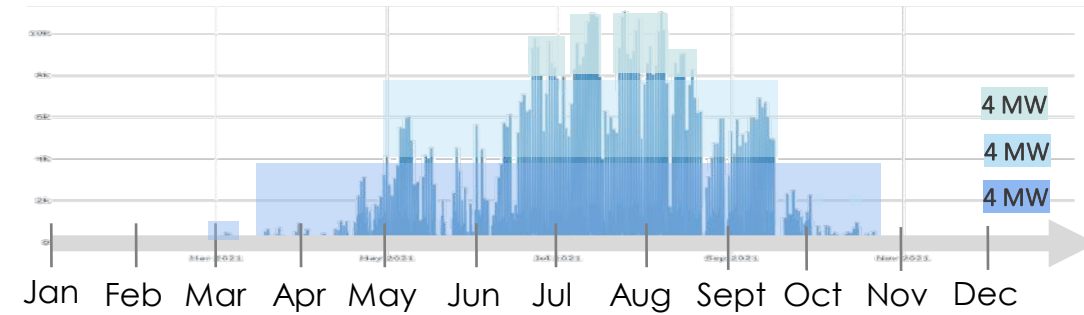
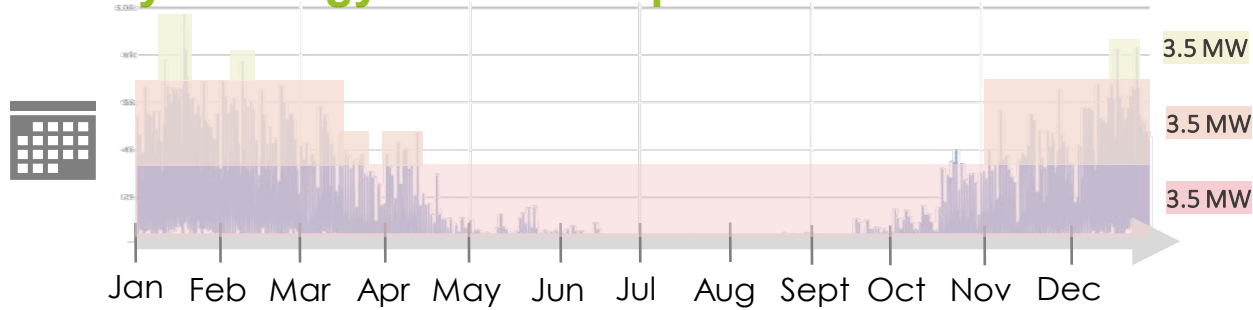
Scenario 3



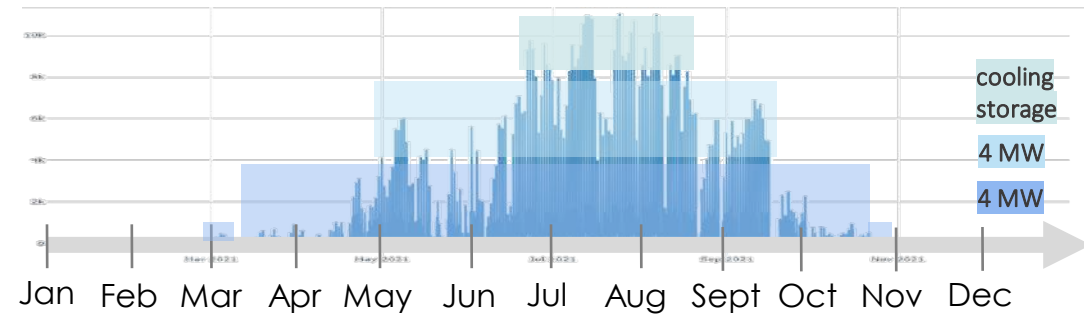
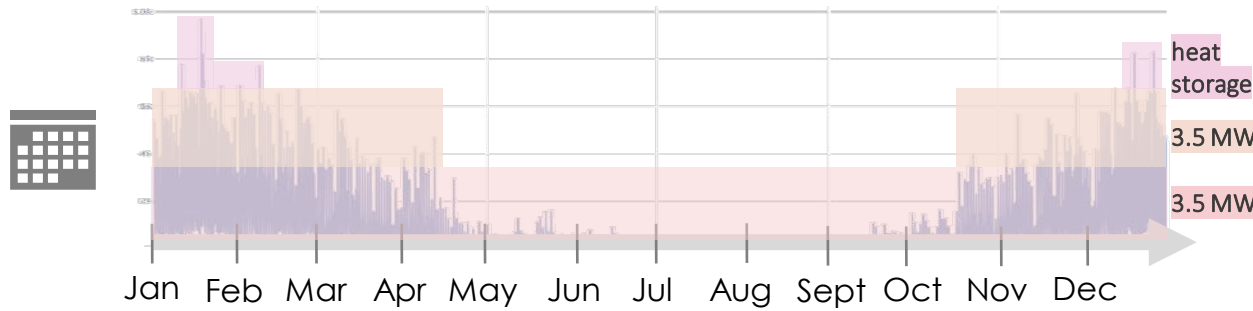
LIVE DEMO



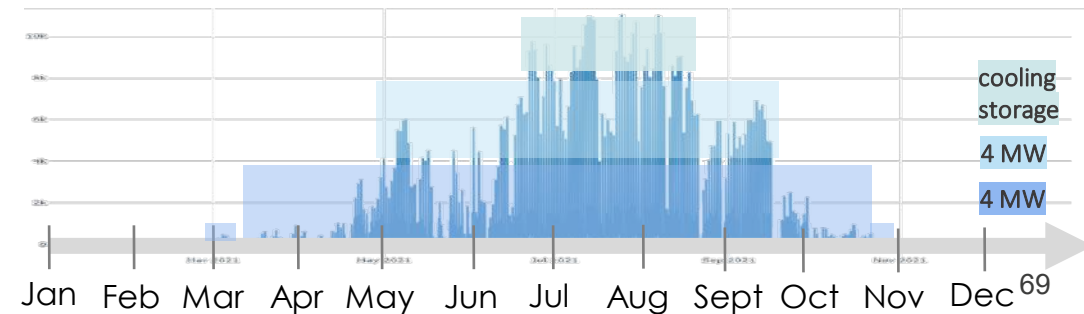
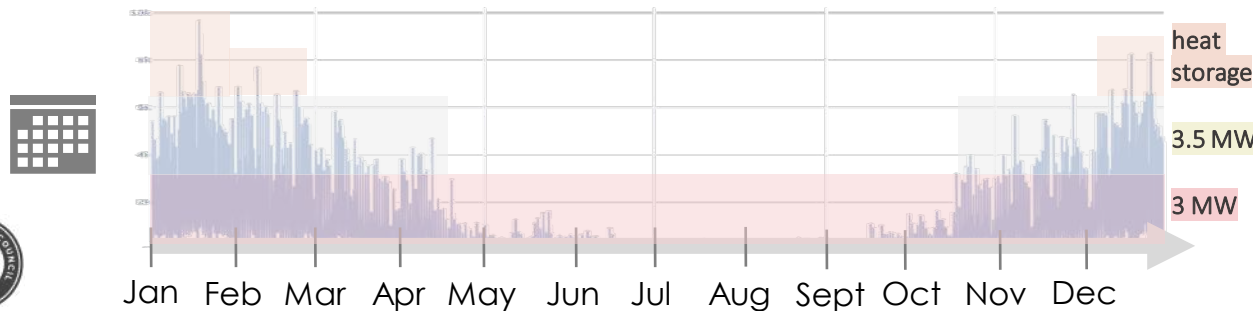
Summary – Energy Network: Operation



Scenario 2



Scenario 3






Green
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Italia


18 luglio 2023

**La decarbonizzazione
dell'ambiente costruito:
strumenti e buone pratiche**

Grazie.

 ies@r2msolution.com

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RESEARCH TO MARKET
SOLUTION

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