

OPTIMISED ENERGY EFFICIENT DESIGN PLATFORM FOR REFURBISHMENT AT DISTRICT LEVEL

Optimised Energy Efficient Design Platform for Refurbishment at District Level H2020-WORK PROGRAMME 2014-2015 – 5. Leadership in enabling and industrial technologies H2020-EeB-05-2015: Innovative design tools for refurbishment at building and district level

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OPTIMISED ENERGY EFFICIENT DESIGN

PLATFORM FOR REFURBIS

AT DISTRICT LEVEL

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OptEEmAL

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Abbreviations and Acronyms

Acronym	Description
OptEEmAL	Optimised Energy Efficient Design Platform for Refurbishment at District Level.
D	Deliverable
Μ	Month
ACC	ACCIONA Infraestructuras
ARG	ARGEDOR Information Technologies Ltd.
CAR	Fundación CARTIF
DTTN	Distretto Tecnologico Trentino SCARL
ES	Expert System S.p.A.
FSS	Fomento de San Sebastián
FUNITEC	Fundació Privada Universitat i Tecnologia
LUND	Lunds Kommun
NBK	Nobatek/Inef4
SEZ	Steinbeis-Europa-Zentrum
TEC	Fundación TECNALIA
TUC	Research Committee of the Technical University of Crete
UTRC-I	United Technologies Research Centre Ireland, Ltd.
WP	Work package





Executive Summary

<u>"The OptEEmAL Solution for Energy Efficient District Retrofitting" - OptEEmAL Project Final</u> <u>Conference in Valladolid</u>

The Horizon 2020 funded project celebrated its Final Conference in Valladolid, Spain on 20th February 2019. Project partners presented the achievements of the project and the solution for the energy efficient retrofitting design at district level.

After three years and a half of work, the OptEEmAL consortium was proud to present an Optimised Energy Efficient Design Platform for refurbishment at district level, able to design energy efficient retrofitting projects that are based on different energy conservation measures to improve the performance of a district.

The participants discovered the multiple benefits the OptEEmAL Platform can bring to the design of retrofitting measures at the project's final conference. The OptEEmAL project partners presented the great technological achievements of the project, the challenges they overcame and an outlook of what can further be done to revolutionise the energy retrofitting sector. During the conference, the OptEEmAL Platform was presented and the audience was guided through the different steps of the platform. The conference was concluded with a site visit to the Cuatro de Marzo district in Valladolid where retrofitting actions have led to a reduction in energy consumption of over 50%.

In the following, the different steps and measures that led to a successful final conference will be explained in more detail.



1 Conference

1.1 Concept

With the OptEEmAL project coming to an end the concept of conference was designed to present the project findings, the technological challenges the consortium overcame and the great technological achievements the project has made possible. All partners involved in the project were included in the conference programme.

1.2 Agenda

The agenda was presented as follows:



Figure 1: Agenda of the OptEEmAL Final Conference







The OptEEmAL project partners presented the great technological achievements of the project, the challenges they overcame and an outlook of what can further be done to revolutionise the energy retrofitting sector. During the conference, the OptEEmAL Platform was presented and the audience was guided through the different steps of the platform.

Besides the presentation of the partners' achievements in this project and the relevance of the OptEEmAL Platform for the design of retrofitting actions, exciting keynote speeches rounded off the event: about the next steps towards decarbonising the building stock by a representative of the Green Building Council and an approach to nearly zero energy retrofitted buildings presented by Energiesprong UK.

The event offered a great opportunity for city representatives and public authorities, urban planners, architects and experts from the energy and construction sectors to exchange on energy efficient retrofitting topics.

Also, the project's final booklet was handed over to the participants, offering an excellent overview about project objectives and the different modules of the OptEEmAL Platform.

For a detailed insight into the content of the sessions, the presentations of the speakers are attached in the appendix.

1.3 Participants

The participants discovered the multiple benefits the OptEEmAL Platform can bring to the design of retrofitting measures at the project's final conference.

37 international participants attended the event. Most of the participants were Spanish, but there were also representatives from England, Italy, Germany, Sweden, France, Ireland, Turkey and Greece.

Company/Organisation	City	Country
CARTIF	Valladolid	Spain
Energiesprong UK	Nottingham	UK
Expert System	Rovereto	Italia
OFundació Privada Universitat i Tecnologia	Barcelona	Spain
Steinbeis-Europa-Zentrum	Stuttgart	Germany
Lund Municipality	Lund	Sweden
AEICE	Valladolid	Spain
Lund Municipality	Lund	Sweden
Veolia Servicios LECAM S.A.U.	Valladolid	Spain
VEOLIA	Valladolid	Spain
Consultor Urbanismo, Arquitectura y Desarrollo Local	Freiburg	Germany
CARTIF	Valladolid	Spain
CARTIF	Valladolid	Spain

The following table shows the different participants by organisation, city and country:





Acciona	Sevilla	Spain
НОВО	Valladolid	Spain
Valladolid City Council	Valladolid	Spain
CARTIF	Valladolid	Spain
Steinbeis-Europa-Zentrum	Stuttgart	Germany
Freelancer	Crete	Greece
Technical University of Crete	Crete	Greece
Fundación TECNALIA	Pais vasco	Spain
VEOLIA	Valladolid	Spain
CARTIF	Valladolid	Spain
Fomento San Sebastián	San Sebastian	Spain
GBCe	Valladolid	Spain
Fundación TECNALIA	Pais Vasco	Spain
NOBATEK	Anglet	France
ana prada diseño de interiores	Valladolid	Spain
United Technologies Research Centre Ireland	Cork	Ireland
Ayuntamiento de Palencia	Palencia	Spain
CARTIF	Valladolid	Spain
Expert System	Rovereto	Italia
CARTIF	Valladolid	Spain
ARGEDOR Bilişim Teknolojileri	Ankara	Turkey
Universidad de Valladolid	Valladolid	Spain
Promantio	Valladolid	Spain
CARTIF	Valladolid	Spain

Table 1: Overview of OptEEmAL's Final Conference participants





2 Marketing

In the following paragraph, the marketing measures before and during the conference will be discussed in more detail.

2.1 The Conference webpage

The event was set up on various websites in order to achieve the widest possible reach. First, the event was placed on the project's own website. The registration tool Eventbrite was used to offer the registration for the event in English and Spanish.

In addition, the project partners promoted the event via their own websites.



Figure 2: Conference webpage on OptEEmAL website



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AT DISTRICT LEVEL

OptEEn





Figure 3: Registration via Eventbrite

2.2 **Promotion materials**

2.2.1 OptEEmAL Final Conference Flyer

A conference flyer with the agenda was produced to use for promotional purposes. It was distributed via the project's website, the websites of the project partners and via Social Media. To exclude language barriers, the flyer was produced in English as well as in Spanish.

The flyer has taken up the existing Cl of the project to ensure consistency. In addition to the agenda, a text on the conference itself and some background information on the demo site visit were included. On the back of the flyer the different possibilities to get in contact with the OptEEmAL team were pointed out. In addition, more information about the registration as well as the registration deadline and the address of the venue were shown.

In the following the two flyer versions are displayed.





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AT DISTRICT LEVEL

OptEEmAL

OptEEmAL	OptEEmAL
Get in touch with us www.ww.optermal_Eli OptEEmAL project.eu Piezeregistration This conference is free of charge. Piezeregistrumtil 14 ^e Potrary 2019 under the following link: https://tinyut.com/optermal	OPTEEMAL PROJECT Final conference
Venue Museo de la Ciencia de Valladolid Av. de Salamanca, 59, 47014 Valladolid, Spain Collaborators	OPTIMISED ENERGY EFFICIENT DESIGN PLATFORM FOR REFURBISHMENT AT DISTRICT LEVEL The Solution for Designing
Partners Par	your Energy Efficient District retrofitting Project
Image: Strength of the strengt of the strength of the strength of the strength of the strength	the second second
	This project has received funding from the European Union's Hortzon 2020 research and Innovation programme under grant agreement No 600376.
AutEmAL Find Amfennes	



Figure 4: English version of the conference flyer



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AT DISTRICT LEVEL

OptEEmAL

OptEEmAL	OptEEmAL
Www.opteemal-project.eu	
OpteEmAL project	
Registro La asistencia a la conferencia es gratuita. Se contará con traducción simultanea	DEL PROYECTO OPTEEMAL
El registro es obligatorio. Puede hacerlo hasta el 17 de febrero de 2019 a través del siguiente enlace: https://timeur.com/onteemal	
Lugar de celebración Museo de la ciencia de Valladolid	OPTIMISED ENERGY EFFICIENT DESIGN
Av. Salamanca, 59, 47014, Valladolid Colaboradores	PLATFORM FOR REFURBISHMENT
	AI DISTRICT LEVEL
	;La solución para diseñar tu provecto
Partners	de rehabilitación energética de distrito!
[NONSER] CARTIF ARGEDOR donotiasustapena tomotoarectable	
STEINBEIS-	
United Technologies to United Technologies	
LUND	
	Este proyecto ha recibido fondos del programa Horizonte 2020 de Investigación e Innovación de la Unión Europea antida el acuanto de automoción No 60/07/2
OptEEmAL Conferencia Final	
Lugar: Museo de la Ciencia (Valladolid)	
Fecha: 20 de febrero de 2019	
ACENDA	FORMA PARTE DE LA CONFERENCIA FINAL DEL PROYECTO OPTEEMAL!
8:00 Registro y café de bienvenida 8:30 Bienvenida e introducción	El proyecto OptEEmAL, financiado por la Comisión Europea bajo el para- guas de la iniciativa de Edificios Energéticamente Eficientes (EeB) está
Nathalie da Silva Steinbeis-Europa-Zentrum	legando a su fin y los socios han organizado una Conferencia Einal donde
8:40 Apertura de la conferencia	poder compartir los desarrollos y avances realizados durante sus algo más
840 Apertura de la conferencia Manuel Garvel, A Juvatanieto de Valadold José R. Parena (L'entro Reconsidges CARTIF 900 D proyecto DUETINL: una plateforma spra diseñar proyectos de rehabilitación	poder compartir los desarrollos y avances realizados durante sus algo más de tres años de duración. El proyecto ha servido para desarrollar una herramienta software de soporte al diseño de proyectos de rehabilitación energética de edificiós a escala de distrito basados en el análisis v
840 Apertur de la conferencia Marsus Garvie, l'opertaniento de Valladolid José R. Peran I Centro Tecnológico CARTE 900 El proyecto 0ptErn.NL: una plataforma para dischar proyectos de rehabilitación energética para edificios y distrois Miguel A. García-Fuentes I Centro Tecnológico CARTIF 900	negarioro de sufficiente desarrollos y avances realizados durateritar i nel donce poder compartir los desarrollos y avances realizados duraterites sus algo más de tres años de duración. El proyecto ha servido para desarrollar una herramienta software de soporte al diseño de proyectos de rehabilitación energética de edificios a escala de distrito basados en el análisis y optimización de escenarica que contempulan la combinación de diferentes Medidas de Conservación de la Energía.
8.40 Apertura de la conferencia Marca Si avvis, il purcanaires de Valladold José R. Pariani, Centro Encológico CARTIF 9.00 El propeto DEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEE	neganizo de compatir los desarrollos y avances realizados durantes una latoritad poder compatir los desarrollos y avances realizados durantes una algo más de tres años de duración. El proyecto ha servido para desarrollar una herramienta software de soporte al diseño de proyectos de rehabilitación energética de edificios a escala de distrito basados en el análisis y optimización de escenarios que contempina la combinación de diferentes Medidas de Conservación de la Energía. Aprovecho esta oportunidad para poder conocer de primera mano el proyecto y los benefícios que la herramienta OptEEnAL ofrece a los
840 Apertura de la conferencia Maruel Sarvel, a juvataniento de Valladold José R. Paran J. Centro Renológios CARTIF 9:00 Brayosto OpticTinul: una platforma para diseñar propertos de rehabilitación emergéncia para edificios y distritos Miguel A Carrier Jonnes To Tecnológios CARTIF 9:30 Práctica de conde España Emilio M. Mitre I Genes Biológios Cancia España (BORO) 10:00 Rehabilitación conde España Carren Budling megifica hasia additios de consuma caí não el modelo de Energiesprong Araux Andrese I Ayustaniento de NotingTian y Energiesprong U 10:00 Carlé	poder compartir los desarrollos y avances realizados durante sus algo más de tres años de duración: El proyecto ha senvicio para desarrollar una herramienta software de soporte al diseño de proyectos de rehabilitación energética de edificios a escala de distrito basados en el análisis y optimización de escientraliza que contemplana la combinación de diferentes Medidas de Conservación de la Energía. Aproveche esta aportunidad para poder conocer de primera mano el proyecto y los beneficios que la herramienta OptEEmAL offece a los agentes involucrados en el proceso de rehabilitación en efficians. La Conferencia tendrá lugar el próximo 20 de febrero de 2019 con una agenda diseñada para poder prostima los lotros cenciópicos del
840 Apertura de la conferencia Marrait Survei, I Ayustaniento de Valiadold José F. Peren I. Centro Finonógico CARTIF 9000 El proyecto OLEGETAL: una plastorma para diseñar proyectos de rehabilitación reregidas para edificios y distritos Magen A. Carreira - Annes I. Centro Finonógico CARTIF 930 Précisiona passa hacia fa desarabritación de parque residencial perspectiva desde el Green Buding Concell España Ennils M. Milte I. Orene Buding Council España (SIDRe) 1000 Rehabilitación constructura está noca el modelo de l'andrégorang Arnaut Andrexe I. Ayuttaniento de hotting hara presenta proyectos de rehabilitación energifica a novel de distrito.	poder compartir los desarrollos y avances realizados durante sus algo más de tres años de duración. El proyecio ha servició para desarrollar una terramienta software de soporte al diseño de proyectos de velhabilización energificia de edificios a esocial de distrito basados en el análisis y optimización de escenarios que contemplan la combinación de diferentes Medidas de Conservación de la Energía. Aproveche esta oportunidad para poder concoer de primera mano el proyecto y los beneficios que la herramienta foptEEmAL offece a los agentes involucrados en el proceso de rehabilización energífica de edificios. La Conferencia tendrá lugar el próximo 20 de febrero de 2019 con una agenda diseñada para poder presentar los logros tenológicos del proyecto, los desaños superados y las perspectivas de futuro de la rehabil- ticación energífica. Y, yor supuesto, tamibin habrá tiemo para debatir

VISITA A UNO DE LOS CASOS DE ESTUDIO: CUATRO DE MARZO

VISITA A UNO DE LOS CASOS DE ESTUDIO: CUATRO DE MARZO El distito residencial Datro de Marzo ge la sometido resientemente a un proceso integrado de inskabilitación que ha levado a una redución del 54% en el consumo de anergía integrando metidas pasivas, soluciones activas, fuentes de energía renovables y estrategias de control, es un ejempio pertecto del 110 de proyetos de rehabilitación a los que optEEmAL pretende dar soporte. Está fuel anaxin por la que los socios del proyecto selecionariones ete aceas oromo uno de los caso de estudios para diseñar e implementar la herramienta optEEmAL. Los asistentes tendrán la posibilidad de concoer de primera mano las asociones implementadas dentro de este distrito y sus consiguientes beneficios.

LAS PONENCIAS SERÁN EN ESPAÑOL E INGLÉS, PERO CONTAREMOS CON TRADUCCIÓN Simultánea a disposición de los asistentes.

¡Forma parte de la conferencia final de OptEEmAL! Para más información y acceder al registro, por favor visite nuestra página web

Figure 5: Spanish version of the conference flyer



tación de eso de Com

na plataforma inte ión energética efic ini | Expert Syste a | Expert S 1 A

clusiones y presentación de buenas práct ana Martín | Centro Tecnológico CARTIF halie da Silva | Steinbeis-Europa-Zentrum

Visita a uno de los casos de estudio: Cuatro de Marzo Cecilia Sanz | Centro Tecnológico CARTIF

Experiencia de usuario y demonstración de uso de la plataforma OptEEmAL Maxime Pousse | NOBATEK/INEF4 nds: ¿Cómo contribuye OptEEmAL a apo nergética? a Carmen Devesa | AEICE: Clútster Hábit liker Martínez | Fomento de San Sebas Elin Dalaryd | Lunds Komenun Maxime Pousse | NDBATEK / INEF4

12:00

12:30

17:30

CONFERENCIA FINAL DEL PROYECTO OPTEEMAL



OptEEm/	AL Conferencia Final	OPTIMISED ENERGY EFFICIENT DESIGN
Lugar: M	useo de la Ciencia (Valladolid)	PLATFORM FOR REFURBISHMENT
Fecha: 20	0 de febrero de 2019	AT DISTRICT LEVEL
Fecha: 24 600 600 600 600 600 600 600 60	O de febbrero de 2019 Representation de la constantia de la const	<section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header><text><text></text></text></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header>
1630 1330 LAS POHI Con TRAE	Buere wards (cardo Renordego over15 Notarie do Buer Serie e estado Cuardo 24 Mano Cencia Serie (Cardo Renordego over16 Reno Leo Conferencia Enclas Serán en español e inglês, pero contaremos Ducción simultánea a disposición de los asistentes.	i Forma parte de la conferencia final de OptEEmAL! ra más información y acceder al registro, por favor visite nuestra página web
		www.opteemal-project.eu
	Contacte con nosotros www.opteemal-project.eu @ opteemal_EU OptEEmAL project	
Esta de h de s	e proyecto he recibito fondos del programe Horizonte 2020 mestigación e innovación de la Unión Europea según el acuardo usbrención No 620676	Colaboradores Partners Colaboradores Partners Partners Colaboradores Partners Colaboradores Partners Partners Par

Figure 6: OptEEmAL Final Conference Poster

Based on the Spanish version of the Conference flyer a poster was designed. The poster was printed and distributed at local universities and faculties in Valladolid.





2.3 Social media

2.3.1 Twitter

There was a lot of tweeting about the project's own twitter channel and the channels of the partners before and during the conference. Below are a few examples are listed:



♀ 1↓ 11 ♡ 12 ☑

Figure 7: Tweet Site Visit

1 opteemal_EU hat retweetet



Gonçal Costa @GonsCosta · 20. Feb.

Round table: how does OptEEmAL support strategies for energy efficiency retrofitting? #BIM #OptEEmAL @opteemal_EU



Figure 8: Tweet Round Table







opteemal_EU @opteemal_EU · 20. Feb.

Arnout Andrews from @EnergiesprongUK is presenting their approach to nearly zero #energy #retrofited #buildings at the @opteemal_EU Final Conference in @AyuntamientoVLL today! Join us and find out more about the project bit.ly /2Fmu1rS





Du, Energiesprong EU, CARTIF und 7 weitere

Q t] 3 ♡7 🗹

Figure 9: Keynote Arnout Andrews



opteemal_EU @opteemal_EU + 20. Feb. Emilio M. Mitre from @GBCEs is speaking about the next steps towords #decarbonisation of the #building stock at our @opteemal_EU final conference in @AyuntamientoVLL #energyefficiency #H2020Energy more information tinyurl.com/opteemal



Figure 10: Keynote Emilio M. Mitre

2.3.2 LinkedIn

In addition to the activities via Twitter, the LinkedIn group of the project also referred the potential participants to the conference. Below are a few examples are listed:







Kathrin Eckerlin • 1st Project Consultant at Steinbeis-Europa-Zentrum (SEZ)

Be part of the OptEEmAL Final Conference in Valladolid, Spain on 20th February 2019! Register now under: https://bit.ly/2MVMBXV More information on the event are available here: https://bit.ly/2Dqd4bU



OPTEEMAL PROJECT FINAL CONFERENCE

Figure 11: Promotion via LinkedIn group



Nathalie da Silva • 1st Innovation management & Technology Transfer, Innovation in SMEs & Corporate 1mo • Edited

Dear OptEEmAL members,

The OptEEmAL project is coming to an end and we are proud to present the progress and achievements the OptEEmAL partners have

Find more information on our first OptEEmAL Training in Lund under https://lnkd.in /dw5tFTu!

You can find more information on the other trainings taking place in San Sebastian and Trento in February here: https://lnkd.in/dqeYqax!

And don't miss our FINAL CONFERENCE on February, 20th 2019 in Valladolid in Spain. You can learn about newest trends in the retrofitting sector from experts like Arnaut Andrews (Energiesprong UK) and see which breakthroughs the OptEEmAL Platform and project have achieved. You can register now under: https://lnkd.in /dmgjRXZ!

Please share this information with interested city and municipal representatives, enrgy consultants, architects and construction and retrofitting experts!

Let's revolutionise the design of retrofitting projects! **#energyefficiency #retrofitting #constructionjobs #smartcities**

Sincerely, Your OptEEmAL Team

Figure 12: Promotion via LinkedIn group





2.4 Promotion via partner's various media channels

To ensure a proper dissemination and communication of the event, the conference information and flyer were distributed via mailings to Smart City projects by SEZ and CAR and "personal"/targeted emails to potentially interested authorities and companies (city representatives, public authorities, city planner and interested experts from the energy, architecture or construction sector). The LinkedIn and Twitter accounts of the project partners' organisations and/or personal accounts were used for awareness raising as well.

2.5 **Promotion via other channels**

In order to promote the conference as widely as possible, various channels were used and multipliers asked for support.

2.5.1 BUILD UP

The conference was published on the BUILD UP web portal, The European Portal For Energy Efficiency In Buldings. The BUILD UP web portal is intended to reap the benefits of Europe's collective intelligence on energy reduction in buildings for all relevant brings audiences. lt together new practitioners and professional associations while motivating them to exchange best working practices and knowledge and to transfer tools and resources. The BUILD UP web portal targets professionals working in the building sector (public or private) with an interest on the latest developments at technical or practice level, policy legislation, financial issues, etc related to energy efficiency.



Figure 14: Screenshot of OptEEmAL article on BUILD UP



OptEEmAL Final Conference

The OptEEmAL project is coming to an end. Within OptEEmAL, an Optimised Energy Efficient Design Platform for refurbishment at district level was developed, able to design energy-efficient retrofitting projects that are based on different energy conservation measures to improve the behaviour of a district. Learn more about the benefits that the OptEEmAL Platform can bring to the design of retrofitting projects at district level at the project's final conference in Valladolid, Spain!

On 20 February 2019, OptEEmAL will present the great technological achievements of the project, the challenges they overcame and the outlook of what can further be done to revolutionise the energy retrofitting sector. Moreover, there will be two Keynote speaker on the following topics:

 The next steps towards decarbonising the building stock: a view by the Green Building Council

 An approach to nearly zero energy retrofitted buildings: the Energiesprong model More information on the agenda will be available soon on the <u>website</u>. Registration is open until Thursday, 14 February 2019 please register <u>here</u>.

Figure 13: OptEEmAL article in SCIS newsletter





The article about the OptEEmAL conference can be found under this permanent link: http://www.buildup.eu/en/node/57061

2.5.2 SCIS newsletter and SCIS website

The Smart Cities Information System (SCIS) is a knowledge platform to exchange data, experience and know-how and to collaborate on the creation of smart cities, providing a high quality of life for its citizens in a clean, energy efficient and climate friendly urban environment. The SCIS monthly newsletter reaches a large number of project developers, cities, research institutions, industry, experts and citizens from across Europe. In the January edition the OptEEmAL Final Conference was featured. Please find the newsletter via the following link:

https://smartcities-infosystem.eu/newsroom/newsletter

In addition, the OptEEmAL Final Conference was also listed in the event calender on the SCIS website:

https://smartcities-infosystem.eu/newsroom/events/opteemal-project-final-conference

2.5.3 Women4Energy Network

The OptEEmAL Project Final Conference was also promoted via the European Network of Women for Innovative Energy Solutions, which connects women from all backgrounds and working cultures in the energy related sectors. The network shared the invitation via its Twitter channel @Women4Energy.



Figure 15: Women4Energy Tweet about OptEEmAL Final Conference

2.6 OptEEmAL branded chocolate

To have a fun way to promote the OptEEmAL project and the project's Final Conference small chocolates with OptEEmAL branding were produced. They were handed out to the participants during the Final conference. The participants loved the chocolates and they were very well received.



Figure 16: OptEEmAL branded chocolate





3 Feedback

During the OptEEmAL Project Final Conference a feedback form was handed out to the participants. In the following paragraph the feedback given by 19 participants will be evaluated.

3.1 Organisation and Benefit

			Feedback form																			
1.	ORGANISATION		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Sum
		very much	x	x	x		x	x	x	x	х	x	x	х	x		x	х		х	х	16
Were	e you satisfied with	it was satisfying				х										x			х			3
conference?		not that much, there is space for improvement																				0
How	was the	very good	x	х	х		x	x	x	x	х	х	х	х	х	x	х	х	х	х	х	18
(info	rmation before the	good				х																1
cont frien	erence, dliness)	not that good																				0
2.	YOUR BENEFIT																					
		yes, fully	x	х			x	x	x			x			x			х			х	9
Did 1	the event meet	mostly			х	х				x	х		х	х		х	х		х	х		10
your	expectations?	not that much																				0
		not at all																				
		yes, much	x			х		x			х						х	х		х		7
Did y	ou get new	yes, some		х	х		x		x	х		х		х	х	x			х		х	11
infor	mation?	not much											х									1
		not any																				0
		very useful					х		х		х							х		х		5
Was for y	the event useful our future	useful	х	х	х	х		х		х		х	х	х	х	х	х		х		х	14
activ	vities and	not that useful																				0
000	cooperation?	not useful at all																				0

Table 2: Feedback of participants

From nineteen participants sixteen were very much satisfied with the structure of the conference and all were satisfied. The organisation was for the most part (18 votes) very good, only one person found it good. The expectations were fully or mostly met and the participants received a lot of information (7 people) or some information (11 people). Only one person did not receive so much information. The question "Was the event useful for your future activities and cooperation?" answered five participants with *very useful* and fourteen participants with *useful*. Overall, the consortium received very positive feedback from the participants.

3.2 Open questions

Besides the multiple choice questions the participants also were given the opportunity to speak their mind in answering three open questions. Please find the questions and the received answers below.

Your thoughts of today's event (networking opportunities, speakers):

- Good to have more companies, municipalities, etc. attending the conference
- Got some new ideas to apply in my city





- involve more stakeholders
- very good for networking and to understand how the platform works
- More info about the IPD approach
- Length of presentations appropriate (more than 30 minutes makes it difficult to maintain attention of attendees)
- Speakers were on point, good subjects
- Interesting to hear about the Energiesprung, subjects a little too technical sometimes; nice lunch and nice venue
- Event was well organized, bringing together stakeholders in the field of building refurbishment for energy efficiency. Keynote speakers were knowledgeable and shared their insights. Nice to hear positive perspectives about OptEEmAL from the invited attendees.

Your thoughts and ideas on which topics you would like to see in the programme and requirements you have in that field:

- Future work and validation results
- Another 3D Modelling different than BIM
- Similar projects/ links to other projects
- nothing to add
- Interesting to include in the programme the following topics: (1) the fact that the support of big institutions and huge organizations are imperative to finance projects, (2) Getting the financial support depends on the economical impact of the project and how the market works.
- For the limited time allocated to the event, the event was good.
- Wish to see more technical work done in the project. OptEEmAL has done a lot and showed very little

Your thoughts and ideas on how we can improve on today

- Improve attendance for future events
- Limit the free access of technicians to the platform
- Bring more guests to see their thoughts on the platform
- More details about structure of the platform and IPD approach, Wi-Fi connection was missing
- Event could have used a little more publicity outside the consortium, as it is a very interesting project everything perfect
- Invite more people who don't work in the project in order to raise the awareness of the citizens about such an important topic like energy efficiency in buildings and the social, technological and economical impact.
- Advertise widely and in advance to have larger audience. Showcase the innovation developed by allocating more time to technical sessions.





4 Conclusions

This deliverable has been completed in M42 as part of subtask 7.3.4 Fairs and conferences to give an overview on the organisation, contents and procedures of the OptEEmAL project's final conference and related activities carried out by the project partners. It is public and will be available on the OptEEmAL project website, along with the video and audio recordings.

The event was reported in D7.4 Report on press releases, blogs, short articles, newsletter and scientific publications.

The participants represented a healthy mix of representatives from municipalities, public authorities, city planner and interested experts from the energy, architecture or construction sector. A high number of promotional materials has been produced over the course of the project, i.e. 2 project flyers, 2 videos, conference proceedings and information materials. This material can be used by the project partners for further communication and dissemination activities in the near future upon further development of the OptEEmAL Platform and tools.





5 Annexes

The presentations given by the speakers are provided in the following pages.










































































11































































 OptEEmAL	Building data ex	ktrac	tion: Mate	erial data		
		Family:	System Family: Basic Wall 🔗		Liped.	
		Tune:	ane: AM External Induited from		Dunkate	
WALL			in crushing and and		Dogacotern	
Opaque					Rename	
material		Type Parameters				
material			Parameter	Value	= ^	
		Analytic	d Properties		8	
		Heat Ira	nster Coefficient (U) Resistance (R)	1.6863 (m ² -K)/W		
		Thermal	mass	(44.55 kJ/K		
		Absorpta	nce	0.100000		
		Roughne	55	1		
•••••						
		Impe:	44_1400x2110mm_metal 3 ×		Qupicate	
WINDOW					Rename	
Glazing		T			Development	
material		Type Fala	Darameter	Value		
		Amphatics	- aronneter	Value		
		Visual Lic	ht Transmittance	0.900000	Î	
		Solar He	st Gain Coefficient	0.780000		
		Heat Tra	nsfer Coefficient (U)	3.6885 W/(m ⁺ K)		
		Tharmal	Construction Resistance (R)	ang		
		11101110			uumun analad (
OptEEmAL GA r OPTEEMAL PRO	no. 680676 District data model Gonçal DJECT FINAL CONFERENCE 2019 Multi scale	Costa e integratio	n for district simulation	s		

ptEEmAL	S uata ext		cital ua	ta
onfiguration of the va faterial Browser - Brick, Cammon	alues of so	me paramet	ers:	1
q	Identity Graphics Appear	rance Physical Thermal		
Project Materials: All 🔹	Enck - Mediumweight		86 C5 X	-
Name	▶ Information			
Analysical Slab Surface Analysical Slab Surface Analysical Walt Surface Asphalt:Shingle Brick; Common Brick; Solider:Course Carpet (1)	Properties Schwor Thermal Conductivity Specific Heat Density Emissivity Pornoalbilly Romodalling Reflectivity Electrical Residuvity	Teanumis Light Instrumis Light Instrumis S400 W/(m+K) S400 W/(m+K)	 → → → → → → → → 	
Cheny Concrete Mesonry Units Concrete, Cast- in-Place gray				



Opteemal Opteemal The second structure of the second s

OptEEmAL final Conference

Integration of simulation models to evaluate the performance of candidate retrofitting scenarios

Dr. El Hassan Ridouane - United Technologies Research Centre Ireland Ltd

Dr. Georgios N. Lilis - Technical University of Crete



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 680676







- Retrofit scenario assessment in OptEEmAL
- Developed tools
 - Data checking
 - Semantic enrichment
- Conclusions





Retrofit scenario assessment in OptEEmAL

Objectives:

- Assess retrofit scenarios using **District Performance Indicators** (DPIs)
 - Generate multiple simulation model input files (scenario / building)
 - Invoke external tools to perform the computation (EnergyPlus, NEST, ...)
 - Post-process results to compute DPIs
 - Communicate back the DPIs

1. Data preparation

- Building data are prepared following specific design guidelines
- Building data are exported using a modified IFC exporter

2. Data checking

- All required building data should be complete (no missing information).
- Input data should be correct (error free).

3. Building data semantic enrichment

- Inclusion of thermal energy flow surfaces
- Inclusion of shading surfaces from neighbor buildings
- Active systems and controls inclusion
- SimModel file generation and enrichment





Overview





OptEEmAL GA no. 680676 | Integration of simulation models to evaluate the performance of candidate retrofitting scenarios OptEEmAL final conference | Valladolid, 20 February 2019



Overview





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Developed tools towards the objectives







Data Preparation: Design Guidelines

- Place spaces in all areas of the building;
- Check if each space is bounded properly;
- Set material thermal properties for opaque building elements;
- Set thermal properties for doors, windows and panels;
- Define building type and infiltration class;
- Define parameters and schedules for each space;
- Configure properly the modified IFC Exporter.







Data Preparation: IFC Exporter Issues





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The BIM Checking tool applies a set of static rules and methods to check the data availability in the IFC4 file, requested from a Building Energy Performance Simulation (BEPS) perspective.

The tool reports the results in text format :

```
Checking report for the model:
    DEM04
The rule "space boundries, parent space boundaries, corresponding space boundaries" has passed.
The rule "spaces, loads, parameters, schedules" has passed.
The rule "doors, thermal parameters" has the following problems:
    issue related to M_Door-Curtain-Wall-Single-Glass:M_Door-Curtain-Wall-Single-Glass:218240 (3RvIiUq4X8GweJx_3dFm2s) "frame material" parameter is missing
The rule "windows, thermal parameters" has passed.
The rule "windows, thermal parameters" has passed.
The rule "plates, thermal parameters" has passed.
The rule "plates, thermal parameters" has passed.
The rule "materials, thermal parameters" has passed.
The rule "materials, thermal parameters" has the following problems:
    issue related to Door - Panel "specific heat capacity" is missing
    issue related to Door - Panel "thermal conductivity" is missing
    issue related to Door - Panel "thermal conductivity" is missing
    issue related to Door - Panel "mass density" is missing
```





Geometry Error Detection tool¹ helps the modeler on providing an error-free IFC file in terms of geometry by reporting certain error types in XML and OBJ (visually readable)

- Space Definitions Errors
- Clash Errors
- Surface Errors

</boundaryRepresentation>





1. G. N. Lilis, G. Giannakis and D. Rovas. (2015). Detection and semi-automatic correction of geometric inaccuracies in IFC files. *IBPSA Building simulation conference*. Hyderabad, India.



</spaceError>



Developed semantic enrichment tools







Semantic Enrichment: CBIP tool

The CBIP tool² enriches the IFC file with geometry information that is required for BEPS (namely, generates the 2nd-level space boundary information)



2. G. N. Lilis, G. Giannakis and D. Rovas. (2017). Automatic generation of second-level space boundary topology from IFC geometry inputs. Automation in Construction, 76, 108-124.



The DNS tool⁴ retrieves information from the context and city repositories and generates a set of surfaces that have shading effect to the buildings under investigation (these buildings define the district).



4. G. N. Lilis, G. Giannakis and D. Rovas. (2017). Inter-building shading calculations based on CityGML geometry data. IBPSA Building Simulation Conference. San Fransisco, CA, USA.





Semantic Enrichment: SimModel Enrichment

The SimModel Enrichment tool retrieves the SimModel XML file genarated by invoking the SimModel RDF to XML tool and enriches the energy data models with additional information required for energy simulations.









DPIs Calculation: HVAC tool

HVAC tool 5

- Responsible for simulation of HVAC, controls and renewables at building and district level;
- Data models and EnergyPlus outputs' data retrieve to calculate Energy and Comfort DPIs;
- Flexible to model district supply only, building supply only or a mixture of the two using nonlinear efficiencies;



5. L. De Tommasi , E.H. Ridouane, G. Giannakis, K. Katsigarakis, G. N. Lilis, D. Rovas: Model-Based Comparative Evaluation of Building and District Control-Oriented Energy Retrofit Scenarios, Buildings, 8, 9, 2018





HVAC, Controls and Renewables Performance Evaluation

HVAC tool - Architecture



- Data exchange to the platform using xml-model and EnergyPlus .eso-files
- Generation of configuration files with inputs for building HVAC and control models
- Simulation of HVAC/controls and calculation of Baseline/Scenario DPIs.





HVAC, Controls and Renewables Performance Evaluation

HVAC tool - Functionalities



- Solves the sizing problem based on the peak load
- Determines applicable HVAC configurations to meet the district load
- Filters the configurations based on the oversize and number of equipment
- Simulates selected configurations along with their controls and calculates DPIs





HVAC, Controls and Renewables Performance **Evaluation**

HVAC tool - Equipment Models

•





- Boilers are modeled as non-linear efficiency
- Model is rescaled based on nominal efficiency from technical data sheets

$$P_{bo,i}(t) = \eta_{bo,i}(PLR)P_{bo,i,in}(t) \qquad \sum_{i=1}^{N} P_{bo,i}(t)$$





- Heat-pumps and chillers are modeled as quadratic functions of PLR and linear functions of outdoor temp.
- Model is rescaled based on the nominal COP from the technical data sheets

$$COP(t) = (\alpha + \beta T_{out}(t))(a_1 + a_2 PLR(t) + a_3 PLR^2(t))$$
$$P_{hp,el}(t) = \frac{P_{hp,th}(t)}{COP}$$



Hot water loop

- Hot-water loop model includes water temperature and circulation pump control.
- Water flow temperature is varies following a linear law

$$T_f = T_{f,min} + \left(T_{f,max} - T_{f,min}\right) \frac{T_{out} - T_{out,max}}{T_{out,max} - T_{out}}$$



 $) = L_{th}(t)$







HVAC, Controls and Renewables Performance Evaluation

HVAC tool - Equipment Models



Established models in the technical literature were implemented

$$P_{PV} = G \cdot A \cdot \eta_{PV} \cdot (1 - F_L)$$

$$P_{TC} = G \cdot A \cdot \eta_s \cdot \eta_c$$

$$\eta_c = \eta_{c0} - \frac{K_1(T_m - T_{out})}{G} - \frac{K_2(T_m - T_{out})^2}{G}$$



Scheduling Controls

Thermostatic



٠

Modifies the baseline energy profiles to account for different schedules Based on reduced order models that are calibrated using EnergyPlus simulation output

$$C\frac{dT_{b,RC}}{dt} + \frac{T_{b,RC} - T_{out}}{R} = P_{th} \quad P_{th}(t) = 0 \quad t_{stop,ecm} < t < t_{start,ecm}$$
$$[R, C] = \arg \min_{R, C, P_{th}(t)} |T_{b,E+}(t) - T_{b,RC}(t)|^2$$



- Controls hot water temperature to meet zone air set-point
 - Zone temperature set-points are set at the thermostat
- Calibration of the models is performed using Energy Plus simulations

 $T_{b,bas} \le T_{b,valve,sp} \Rightarrow T_{b,ecm} \cong T_{b,bas}$

$$T_{b,bas} > T_{b,valve,sp} \Rightarrow T_{b,ecm} = T_{b,valve,sp}$$





valve

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HVAC Tool: Cuatro de Marzo District

Baseline system:

- District of five buildings
- individual boilers supplying baseboard systems

Retrofit Scenario 7: HVAC tool

recommendations





Scenario 7 ECMs: Active and renewables

 Building 4284:
 RE.RO.SC.PV.03.30, RE.RO.SC.TC.01.50, AC.DE.BO.CG.03

 Building 4286:
 RE.RO.SC.PV.03.5, RE.RO.SC.TC.01.70, AC.DE.BO.NG.02

 Building 4288:
 RE.RO.SC.PV.01.95, RE.RO.SC.TC.01.5, AC.DE.BO.NG.02

 Building 4288:
 RE.RO.SC.PV.03.90, RE.RO.SC.TC.01.10, AC.DE.BO.NG.02

 Building 4290:
 RE.RO.SC.PV.03.90, RE.RO.SC.TC.01.10, AC.DE.BO.CG.03

 Building 4292:
 RE.RO.SC.PV.02.20, RE.RO.SC.TC.02.35, AC.DE.BO.BM.03

Energy DPIs (kWh/m2.yr)	Baseline	Scenario 7
Total energy consumption	199.72	176.82
Thermal energy consumption	91.08	73.83
Thermal gas energy	91.08	47.72
Thermal biomass energy	0	26.11
Electric energy consumption	108.64	102.99
Solar thermal production	0	51.06





EnergyPlus IDF generation tool

The IDF Generation tool receives from the SimModel RDF to XML process an input message, which contains the Energy Data Model (SimModel) in XML. Then the IDF Generation tool executes the mapping process, serializes the IDF data into a string and sends an output message to the cluster to perform the simulation.







EnergyPlus IDF generation tool

EnergyPlus IDF Generation tool





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DPI Calculation: Process Diagrams







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Conclusions

Conclusions

- A series of tools to support the automatic simulation model generation for assessing the retrofitting scenarios has been developed.
- The tools can be classified in to three categories:
 - Data preparation tools and guidelines (BIM guidelines, Dedicated IFC exporter)
 - Data checking tools (BIM checking tool, Geometric Error Detection tool)
 - Semantic enrichment tools (CBIP tool, DNS tool, SimModel enrichment tool)

- The enriched SimModels per building and scenario are transformed to EnergyPlus input data files for simulation execution and DPI calculation.
- HVAC, controls and renewables are simulated using a dedicated tool that performs equipment sizing, selection and DPI calculation.





Thank you for your attention!

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 680676







FNFRGY **OptEEmA** TFORM FOR REFURBISHMENT AT DISTRICT LEVEL

Energy Conservation Measures Catalogue & Optimisation process

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 680676







OptEEmAL Agenda

HORIZON 2020-WORK PROGRAMME 2014-2015

5. Leadership in enabling and industrial technologies

H2020-EeB-05-2015

Innovative design tools for refurbishment at building and district level

GA no. 680676

Contact contact@opteemal.eu

- **OptEEmal concept**
- Energy conservation measures
 - Passive ECMs

•

- Control ECMs
- Active ECMs
- Renewable ECMs
- Selection of the ECMs
- ECM Simulation procedure
- Dynamic catalogue
- Optimization process
 - Optimisation Algorithm
 - Problem definition
 - Scenarios generator
 - Cost & Benefit functions
 - Iterative process
 - Pareto Front

















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OptEEmAL

Energy conservation measures

- 136 solutions to improve the • building's energy performance:
 - <u>39 Active interventions</u>
 - <u>11 Renewable</u> interventions
 - 65 Passive interventions
 - 21 Control interventions

 A^+

Α

B













• Reduce energy demand







• Most efficient and cleanest use of traditional energy sources







Optimum use of the resources



Sensor Data (Temperature/Humidity)



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• Generation of **clean** and **sustainable** energy







Selection of the ECMs – Questionnaire

Automatic suggestion of measures

District Level Questions	Building Level Questions
	Answer this questions for each building, you may select multiple buildings.
Answer these questions regarding the whole district.	Q.1Can you modify building façades?
0.1 Will you connect buildings to a District Heating & Cooling system?	Yes O No
	Q.1.1Can they be refurbished externally?
(i) Yes (i) No	Yes No
0	Q.1.2Can they be refurbished internally?
0.0.1Do you have useful land surface to implement renewables?	🚫 Yes 💿 No
Q.o. Too you have useruh and surface to implement renewables:	Q.1.3Do you know the thickness of the air chamber of your façades?
Yes No	🔿 Yes 💿 No
0.0.1.1Can you use land surface for thermal production?	Q.2Can you you modify building windows?
g.o roun you use rand surface for thermal production.	Yes No
🔿 Yes 💿 No	Q.3Can you modify building roofs?
0.0.1.2Can you use land surface for electricity production?	Yes No
	Q.3.1Can you apply external roof insulation?
🔿 Yes 💿 No	🔿 Yes 💿 No
	Q.3.2Can they be internally refurbished?
	🖲 Yes 🔘 No
	-
	★
Configuration of the Applic	able Matrix per EACH building
Configuration of the Applic	able Matrix per EACH building





Selection of ECMs – Check Strategies

- **Select** the most convenient intervention
 - Display and edit economic information







- Add new Energy Conservation Measures
 - Create & edit your own ECM to implement in your project
 - Manufacturers will be able to add their own ECMs
 - Maintenance of the catalogue





Optimisation process





OptEEmAL

Optimisation Algorithm



Multi-objective algorithm based on the **MOHS** (Multi-Objective Harmony Search) that **simultaneously optimizes cost and benefit fitness functions** at district level.

The proposed multi-objective algorithm does not converge towards a unique solution; **a set of solutions** which represent best trade-offs (related to the bi-objective optimization) that comprise the **Pareto optimal front** is proposed instead.





Prioritisation criteria – Problem definition

Use Manual Prioritisation Criteria Global Warming Potential - GWP (kg Primary energy consumption CO2) 1 2 3 4 5 5 Global Warming Potential - GWP (kg Energy payback time CO2) 18 20 2 3 4 5 6 7 8 9 Global Warming Potential - GWP (kg Investments (in Euro) CO2) 8 7 6 5 4 3 2 2 3 4 5 6 7 Global Warming Potential - GWP (kg Life cycle cost CO2) 2 3 9 8 7 6 5 4 2 4 5 6 7 Global Warming Potential - GWP (kg Payback Period CO2) Energy payback time Primary energy consumption 8 7 6 5 4 3 2 1 2 3 4 5 6 7 Primary energy consumption Investments (in Euro) Life cycle cost Primary energy consumption Primary energy consumption 1. Pairwise DPIs comparison Energy payback time 6 5 4 3 2 2. Predefined weighting Energy payback time schemes 5 4 3 2 Energy payback time 8 7 6 5 4 3 2 1 2 3 4 5 Investments (in Euro) Life cycle cost 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 5

4

Prioritisation criteria – Problem definition

Prioritization Criteria

OptEEmAL

Choose Use Pre-defined Weighting Scheme or Use Manual Prioritisation Criteria ?

•) Use Pre-Defined weighting Scheme	0	Use Pre-Defined	Weighting	Scheme	
-------------------------------------	---	-----------------	-----------	--------	--

Use Manual Prioritisation Criteria

Use Pre-Defined Weighting Scheme

What is your main objective to be achieved within the OptEEmAL platform?

- To achive a nearly Zero Energy District
- To achieve a carbon neutral district
- To promote energy generation through renewable systems
- To promote energy generation through a district heating network
- To prioritise environmental issues.
- To prioritise environmental issues.
- To prioritise the reduction of operational energy costs







- Flexible and functional:
 - Considers the limits and constraints of the project
 - Works towards stakeholders' objectives

1. What are the maximum values you want to con	sider for these topics?	
Investments (in Euro)	150000	€
Payback Period	30	years
Energy payback time	50	years
		SAVE



_____ OptEEmAL

Summary of the Problem – shown to the end user



Applicable ECMs at building & district scale

Prioritization Criteria Results

COSTS		BENEFITS (Level 1)		BENEFITS (Level 2)	
Investments (in Euro)	7.14%	Local thermal comfort	4.55%	Energy use from Biomass	16.67%
Life cycle cost	7.14%	Energy demand	4.55%	Energy use from PV	16.67%
Payback Period	7.14%	Final energy consumption	4.55%	Energy use from Solar	16.67%
Global Warming Potential - GWP (kg CO2)	7.14%	Net fossil energy consumed	40.91%	Thermal Energy use from Hydraulic	16.67%
Primary energy consumption	7.14%	Energy demand covered by renewable sources	40.91%	Energy use from Mini-Eolio	16.67%
Energy payback time	64.29%	Energy use from District Heating	4.55%	Energy use from Geothermal	16.67%

Prioritisation criteria, targets & boundaries



OptEEmAL Scenarios generator



50 scenarios per iteration \rightarrow Improvisation process:

- The Harmony Memory Considering Rate, HMCR → the ECM type (ex. Insulation thickness) or the % of application (for solar panels)
- The Pitch Adjusting Rate, PAR → for passive ECMs a step of 1 (to change the type) is added or substracted, for renewables a step of 5% is added or subtracted with probability 0.5 and for active and control ECMS 1 is set to 0 and vice versa if possible
- The Random Selection Rate, RSR → sets the probability to pick a random value for the new note from their feasible ranges.







YES/NO

YES/NO

YES/NO

YES/NO

YES/NO

YES/NO

YES/NO

YES/NO

(the applicable ECMs to be applied depend on the Active ECMs applied)

Scenarios generator



OptEEmAL Cost & Benefit functions







OptEEmAL simulation module



Performance Indicators at District level (DPIs)

DPIs normalized, weighted & grouped to obtain the cost & benefit functions






Based on the cost and benefit metrics the scenarios are ordered to fill the harmony memory for subsequent iterations.





Pareto Front Generation – Best Scenarios





Best Scenarios and their properties



OptEEmAL GA no. 680676 | PRESENTATION NAME MEETING | PLACE AND DATE



OPTIMISED ENERGY EFFICIENT DESIGN

PLATFORM FOR REFURBISHMENT At district level

THANK YOU FOR YOUR ATTENTION!

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 680676

























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OptEEmAL Project Final Conference Valladolid , 20 February 2019







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	House number	m2	Building year						
	1	4433	1961						
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	3	4058	1914						
	5	3268	1975						
	6	191	1985						
	7	4264	1982						
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R2CITIES: «Renovation of Residential Urban Spaces: towards NZE CITIES»

R2CITIES project: 4 de Marzo demosite

Cecilia SANZ-MONTALVILLO Fundación CARTIF R2CITIES Project Coordinator Valladolid, 20 February 2019



EeB.ENERGY.2012.8.8.3, grant agreement No.314473



CITIES

Key facts



TECNOLOGICO] CARTIF





EeB.ENERGY.2012.8.8.3, grant agreement No.314473



PASSIVE MEASURES: Envelope insulation. Façades, Windows, Roofs

ACTIVE MEASURES: Solar, biomass and geothermal energy. Smart lighting

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Implemented ECMs

R12 CITIES

ENERGY EFFICIENCY



ETICs in façade for thermal insulation



Condensing individual gas boilers with COP>1



Windows substitution or doubling



Roof insulation



LED lighting with presence sensors



VALLADOLID

RENEVABLE ENERGYES



Thermal Solar Collectors for centralized DHW system





PV-Parking Lot for e-vehicle charging





Monitoring schema

VALLADOLID case study











Cecilia SANZ-MONTALVILLO cecsan@cartif.es

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