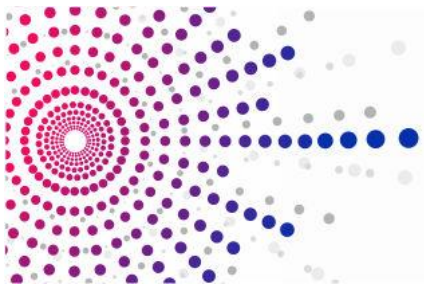


BD4ENEF

**Large Scale Pilots: De-Risking Investments
in Energy Efficiency and Increasing the
Efficiency and Comfort of Buildings**

Víctor Serna - CARTIF



CARTIF – Who we are?



RESEARCH CENTRE - technical knowledge
FOUNDATION - private non-profit

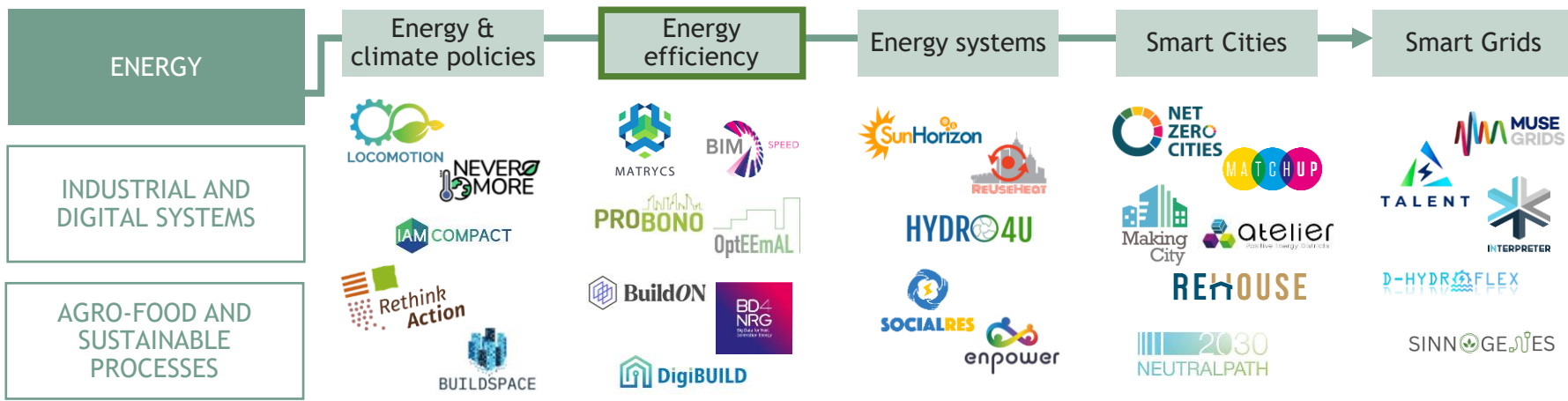
“Our mission is generating technological knowledge and innovative solutions to companies to improve their competitiveness.”

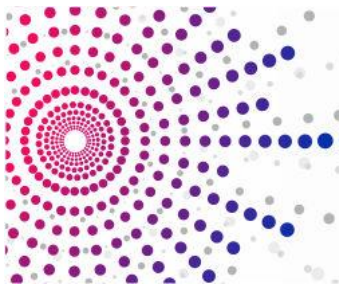
CARTIF Technology Centre
Boecillo Technology Park, 205
47151 Boecillo, Valladolid
SPAIN
<http://www.cartif.com>



VÍCTOR IVÁN SERNA GONZÁLEZ
IT Engineer, Researcher
vicser@cartif.es

Our experience in European projects





“BD-4-ENEF” Large Scale Pilots: De-Risking Investments in Energy Efficiency and Increasing the Efficiency and Comfort of Buildings

More than a third of the total final energy consumed in the European Union is consumed in buildings in the residential and tertiary sector!

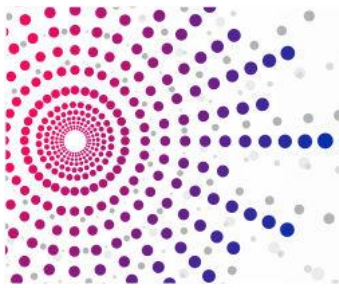
Energy Efficiency measures for:

- reduce energy consumption and greenhouse gas emissions
- reduce import bills
- achieve a sustainable energy supply
- improve security of supply
- competitiveness of the EU



BD-4-ENEF Large Scale Pilots (LSP) focus:

- increase the application of energy efficiency actions in buildings, but always taking into account the **comfort** of the users
- increase investments in energy efficiency measures, which can be achieved by **decreasing the risk** of investments



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**BD4
NRG**
Big Data for Next
Generation Energy

-**Predict energy performance** by dynamically confronting EPCs and real energy consumption information to provide actionable information

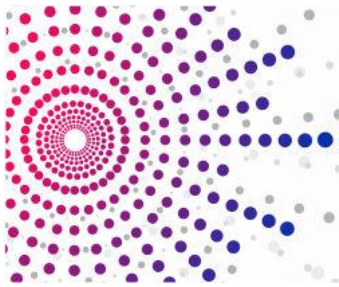
-**Encourage business models** that facilitate **energy retrofitting actions** with a focus on improving thermal comfort

-**Reduce uncertainty** associated with **energy efficiency investments** exploring past and future information

Manly adapted to:

- ESCOs and
- financing institutions





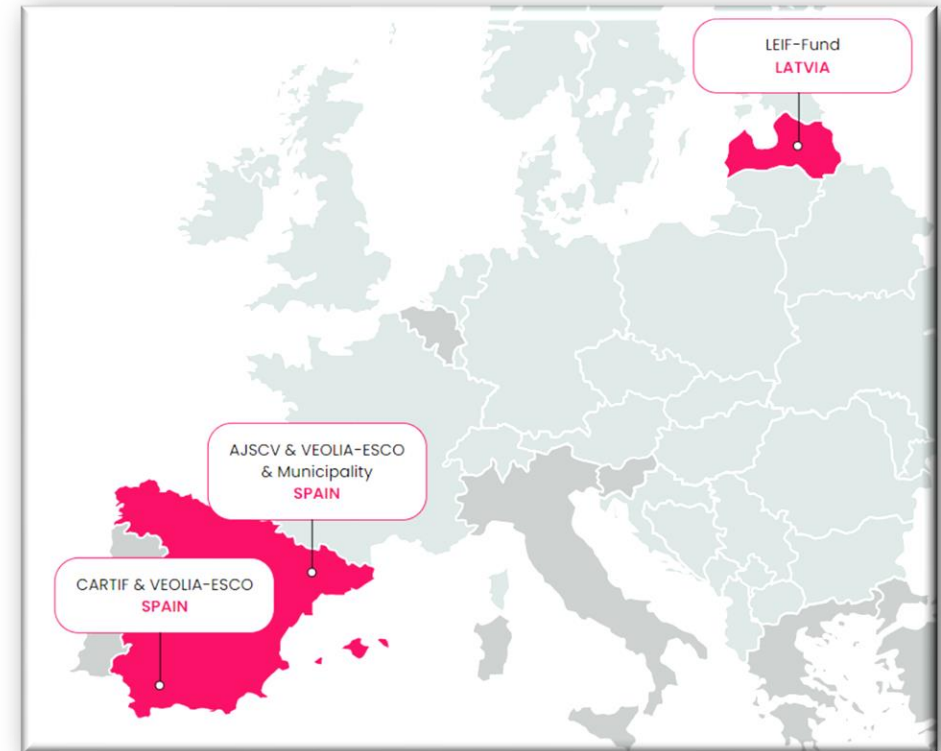
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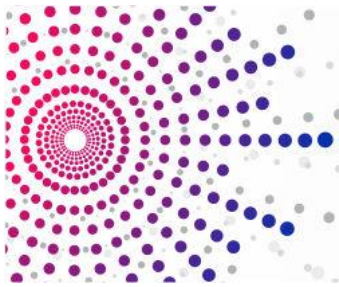
BD-4-ENEF Pilots:

LSP10: Predictive and Prescriptive Analytics for improved Energy Performance Certificates [CARTIF]

LSP11: Weather-enhanced Building Thermal Comfort Prediction to Enable Energy Efficiency Reliable Forecasting [AJSCV]

LSP12: Predictive Analytics for Energy Efficiency Investments De-risking [LEIF]





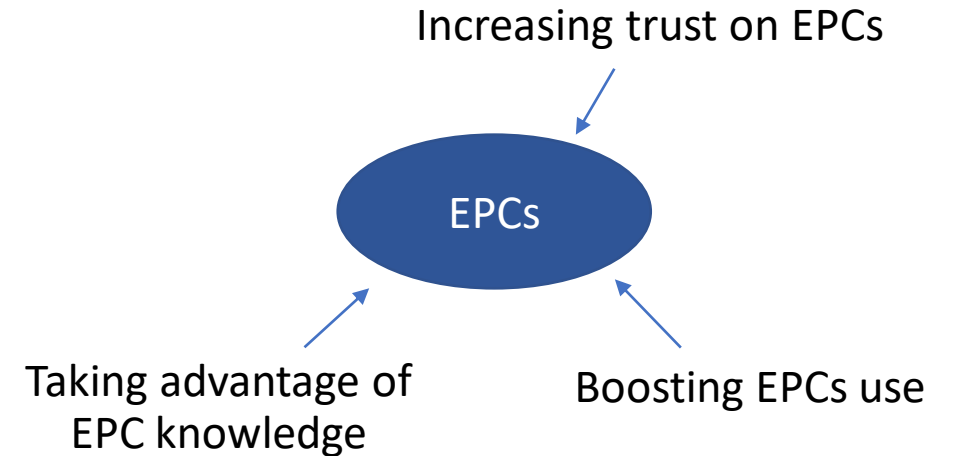
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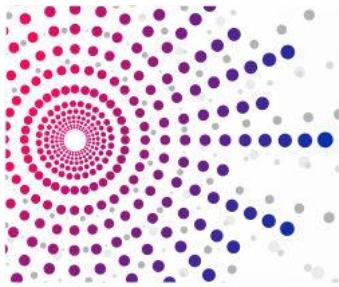
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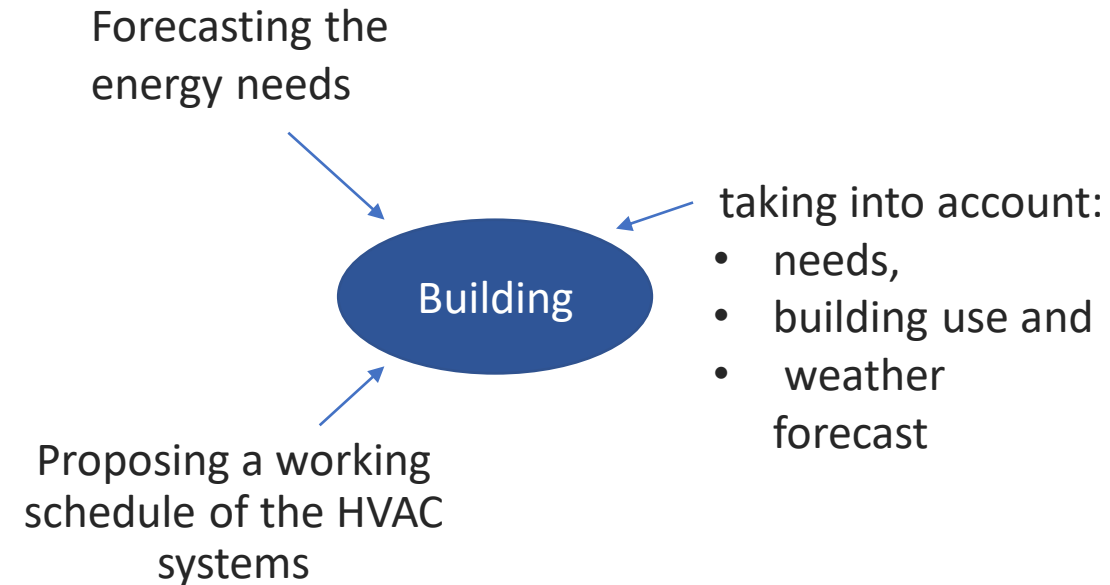
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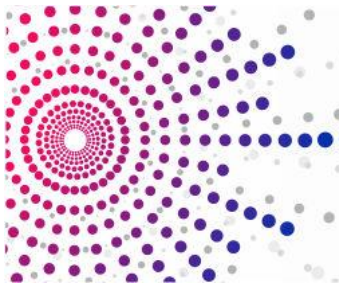
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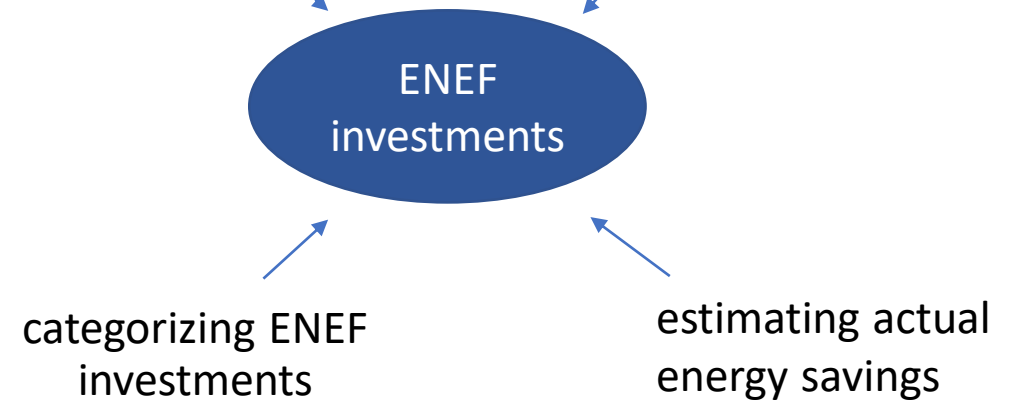
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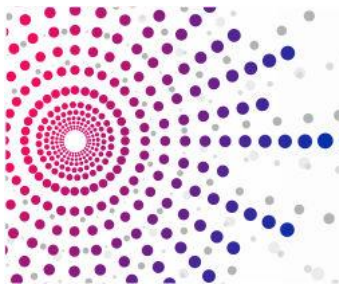
LSP11: Weather-enhanced Building Thermal Comfort Prediction to Enable Energy Efficiency Reliable Forecasting [AJSCV]

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Using ENEF projects real data

Predicting the value of ENEF investments





“BD-4-ENEF” Large Scale Pilots: De-Risking Investments in Energy Efficiency and Increasing the Efficiency and Comfort of Buildings

BD4
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Big Data for Next
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LSP12: Predictive Analytics for Energy Efficiency Investments De-risking

LEIF: pilot leader



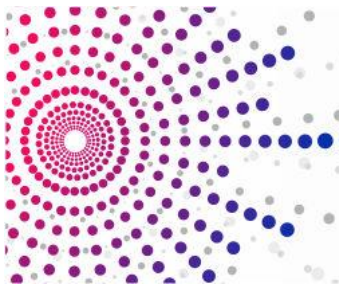
NTUA: Technical supporter



The services developed allow:

- Quickly and easily, **assess key project performance indicators** – KPIs (analysis and evaluation methodologies for projects and companies, comparison tools, financial indicators for investors...).
- **Explore past and future projects** (project history, brief descriptions, projects and companies more attractive to investors).
- **Conduct a comprehensive risk assessment** (incorporating key indicators such as the debt service coverage ratio, compliance with legal requirements of environmental legislation and regulations).





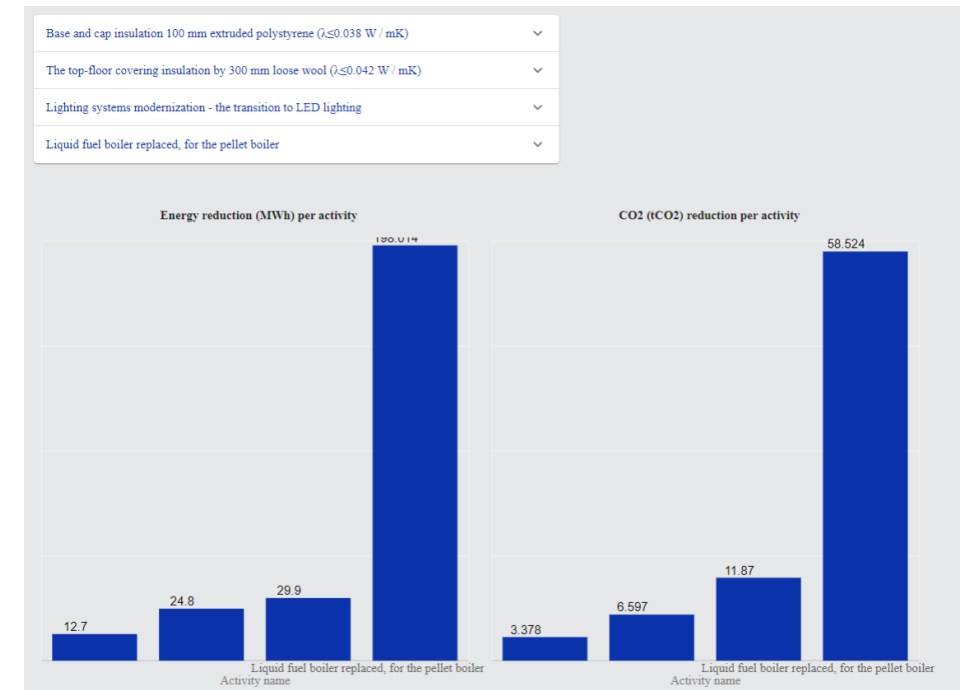
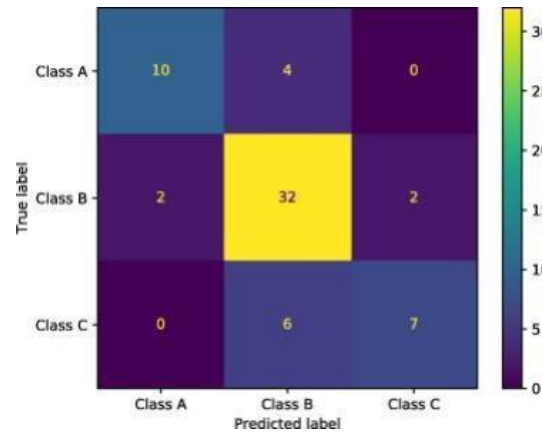
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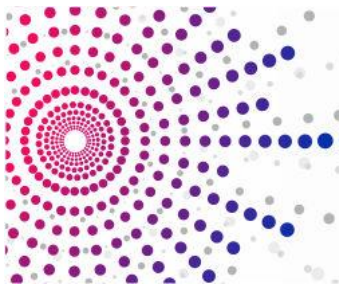
LSP12: Predictive Analytics for Energy Efficiency Investments De-risking

1st Service: Energy Efficiency Investments

Objective:

Provide information about implemented projects in Latvia.





“BD-4-ENEF” Large Scale Pilots: De-Risking Investments in Energy Efficiency and Increasing the Efficiency and Comfort of Buildings

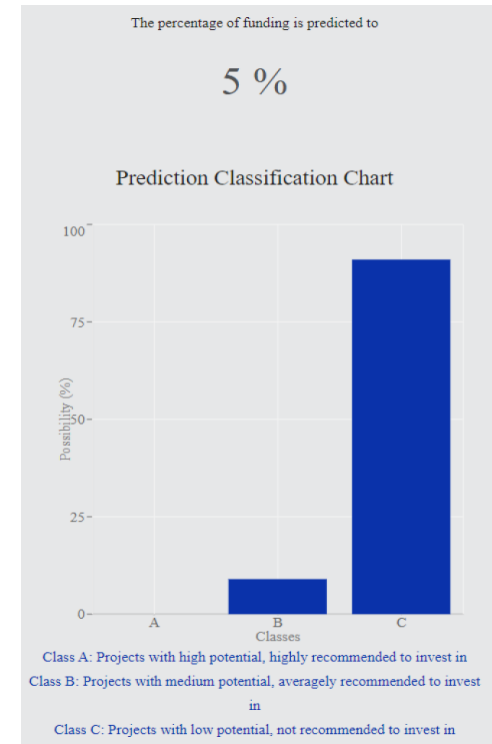
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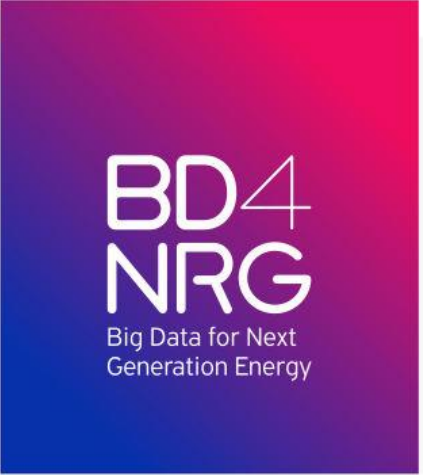
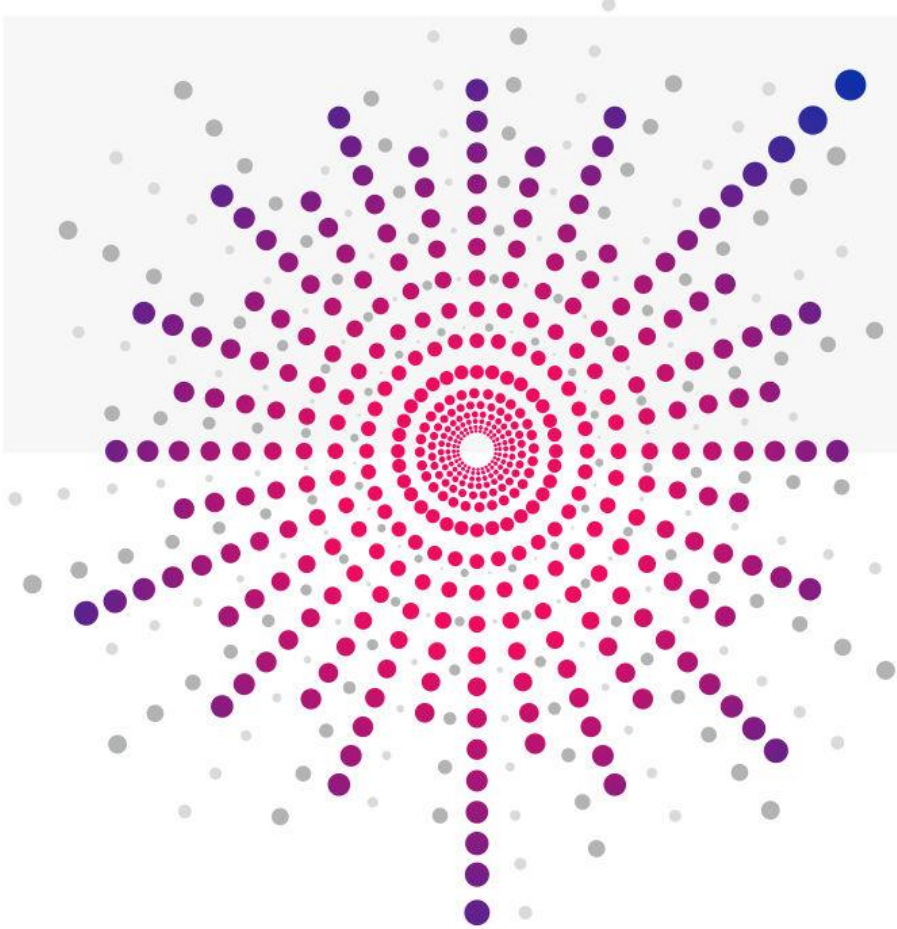
2nd Service: Calculation of Actual Energy Savings

Objective:

Calculate and predict the maximum percentage of funding for user’s project

Building	Error Metric	ML Models				
		ANN	RF	XGBoost	LightGBM	Ensemble
Building 1	CV(RMSE)	0.10	0.12	0.13	0.11	0.10
	NMBE	-0.02	-0.01	-0.03	-0.02	-0.01
	MAE	5.25	5.28	5.23	5.27	5.23
Building 2	CV(RMSE)	0.11	0.12	0.11	0.10	0.10
	NMBE	-0.01	-0.02	-0.01	0.00	0.00
	MAE	4.92	4.95	4.88	4.91	4.91
Building 3	CV(RMSE)	0.09	0.11	0.12	0.10	0.09
	NMBE	-0.01	-0.03	-0.02	-0.01	-0.01
	MAE	6.03	6.08	5.97	6.02	6.02
Building 4	CV(RMSE)	0.14	0.15	0.16	0.14	0.13
	NMBE	0.01	0.02	0.03	0.01	0.00
	MAE	5.70	5.73	5.65	5.69	5.70
Building 5	CV(RMSE)	0.12	0.13	0.14	0.12	0.12
	NMBE	-0.02	-0.01	-0.03	-0.02	-0.02
	MAE	6.18	6.22	6.15	6.19	6.19
Building 6	CV(RMSE)	0.13	0.15	0.15	0.14	0.12
	NMBE	-0.02	-0.01	-0.03	-0.02	-0.01
	MAE	5.42	5.45	5.38	5.41	5.39
Building 7	CV(RMSE)	0.10	0.12	0.11	0.09	0.09
	NMBE	0.00	0.01	-0.01	0.00	0.00
	MAE	4.97	5.00	4.96	4.95	4.95
Building 8	CV(RMSE)	0.08	0.10	0.11	0.09	0.08
	NMBE	-0.01	-0.02	-0.03	-0.02	-0.01
	MAE	5.88	5.92	5.84	5.89	5.85








Thank you!

Victor Serna, CARTIF



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