REGISTRATION FORM FOR CZECH SCIENTIFIC INSTITUTION

1. Research institution data (name and address):

University Centre for Energy Efficient Building
Czech Technical University in Prague
Trinecka 1024
273 43 Bustehrad, Czech Republic

2. Type of research institution: Public university (veřejná vysoká škola)

3. Head of the institution: Ing. Robert Jára, Ph.D.

4. Contact information of designated person(s) for applicants:

Kristina Reist – Research projects coordinator
e: kristina.reist@cvut.cz, +420 773 744 228

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5. Research discipline in which the strong international position of the institution ensures establishing a Dioscuri Centre:

Natural Sciences and Technology: *Production and processes engineering* - modelling, product design, process design and control, construction methods and engineering, power units and systems

6. Description of important research achievements from the selected discipline from the last 5 years including a list of the most important publications, patents, or other results:

CTU UCEEB systematically supports application projects with output to practice and contractual projects with the application sphere. UCEEB ČVUT is implementing about 111 applied research projects, funded by both Czech and European grant providers.

Since 2016, over 497 contracts for contract applied research and a number of innovation vouchers have been concluded. UCEEB has sold 14 utility model licenses, filed 15 patents and 57 utility models. In addition, it has a number of applied results extending functional samples and prototypes, among which successful technology transfers include the S.A.W.E.R. project presented at the EXPO 2021 World Exhibition in Dubai and the so-called "solar bench" presented at EXPO 2015 in Milan, a wireless technology enabling remote radio reading of water meters.

Related to the chosen topic, we can list following results and publications.

Patents

Heat Exchanger Control and Diagnostic Apparatus (European Patent Office. Patent EP3308081. 2020-03-18.); author: Dostál, J.

Utility model

A Device for Heat Exchanger Control in a Single-Pipe Heating Network (Czechia. Utility Model CZ 31889. 2018-07-02.); authors: Bäumelt, T.; Dostál, J.; Hauser, J.; Kubeš, J.; Valtr, J.; Zlevor, O.

Publications:

An optimization approach to photovoltaic building integration towards low energy buildings in different climate zones, DOI: https://doi.org/10.1016/j.apenergy.2021.117017

Mixed Mesh Finite Volume Method for 1D Hyperbolic Systems with Application to Plug-Flow Heat Exchangers, DOI: https://doi.org/10.3390/math9202609

7. List of no more than 3 important research projects in the selected discipline awarded in national and international calls to the institution in the last 5 years:

Title: **Hydronics 4.0**

Name of P: Ing. Jiří Dostál

Source of funding: Technology Agency of the Czech Republic

Amount of funding: 44 086 735 CZK (app.1 764 000 EUR)

Title: **Centre for Advanced Materials and Efficient Buildings**

Name of P: Ing. Robert Jára, Ph.D.

Source of funding: Technology Agency of the Czech Republic

Amount of funding: 100 000 000 CZK (app. 4 000 000 Eur)

Title: **Centre of Advanced Photovoltaics**

Name of P: Ing. Ladislava Černá, Ph.D.

Source of funding: Operational Programme Research, Development and Education

Amount of funding: 172 574 735 Czk (app. 6 903 000 Eur)

8. Description of the available laboratory and office space for a Dioscuri Centre:

Laboratory of Control systems and optimization

The laboratory deals with a design, development and testing of innovative (hydronic) heating systems. At present, our research is focused on development of a distributed pump system, which is based on a so-called one-pipe topology.

A vision of our team is a heating system, which minimizes both installation costs thanks to simpler topology and operational costs by using modern predictive algorithms for heating in buildings.Main laboratory activities include the development of innovative heating systems which take advantage of advanced control algorithms, estimation, etc.

The laboratory focuses on distributed pump systems which are based on the onepipe topology. Emphasis is placed on minimizing both operating and installation costs. The lab is equipped with a testing heating circuit and all necessary equipment for measurement and control. There is also a fast prototyping platform which is based on interconnection of a PLC Unipi and the Matlab Simulink program, with which it is possible to quickly prepare and perform experiments.

Laboratory of Photovoltaic Systems and Energetics

Main activities: Analyzing the behavior, collecting data and prediction of yield of PV systems; Analyzing and monitoring the behavior; of hybrid PV systems; Design of PV systems for mobile applications; Testing the PV inverters

CTU UCEEB provides equipped offices for its research and administrative staff. As part of the basic equipment, each employee has his/her own workstation, personal computer/laptop with internet connection and free access to the shared equipment such as printers, scanners, copiers, projectors, audiovisual equipment, etc., according to the needs of the activities performed.

9. List of the available research equipment for a Dioscuri Centre:

Laboratory of Control systems and optimization

The lab has a testing device with a heating circuit with all the necessary sensory equipment and a wide range of control options for actuators. All the data is continuously recorded; in addition, the experiment can be controlled via completely remote access.

For this purpose, the team created a platform which is specifically focused on rapid prototyping and commissioning of various experimental sets.

Laboratory of Photovoltaic Systems and Energetics

Simulator of PV field with maximum output of 20 kW (1000 V / 20 A) capable of static as well as dynamic simulation of the electric output of PV modules according to set operational conditions (intensity of radiation, temperature, shielding)

Exact analyzer of output ZIMMER LMG 670 for measuring and recording of electrical quantities

Assembly of three programmable loads ZSAC for AC as well as DC load with the output up to 5,2 kW

Experimental PV field with the output of 2,5 kWp and an assembly for the verification of behavior of hybrid systems in real conditions

10. List of the additional benefits (other than listed in the conditions for hosting a DC, see invitation) that the Institution declares to provide for a Dioscuri Centre (i.e.: additional funds, personal benefits, dual career options, relocation support or other):

- 30 days holiday
- Meal allowance
- Language courses and further training
- Flexible working hours
- Opportunity to travel abroad and attend Czech and international conferences as part of projects
- Kids and dogs friendly office
- Friendly team and free coffee (and bubbly water)
- Work in a modern building in a quiet environment near Prague (possibility of using shared transport)
- Interesting and innovative environment on the border between academy and corporate environment
- Opportunity to implement own ideas and personal development

11. Other information about the internationalization of the research institution, international researchers employed at the institution, the availability of English language seminars etc.:

CTU UCEEB cooperates with a number of foreign research institutions. We are promoting international mobility of our staff as well as hosting of international colleagues/students. In these cases, English language is our means of communication. Internal communication (group staff emails, newsletters etc.) is conducted in English. The language of our seminars is always adapted to the composition of the participants. If attended by a foreign participant, the event is conducted in English.

At this moment, we have 13 colleagues in our team and one student fellow from abroad.