



THE UNIVERSITY
of EDINBURGH

Frontiers Champions Programme

**KNOWLEDGE EXCHANGE TOWARDS
SUSTAINABLE SMART CITIES:
ENERGY EFFICIENCY AND AIR QUALITY OF NUR-SULTAN CITY**

Astana IT University, Kazakhstan

Project Resume



About Frontiers Champions Programme:

- supported by the Royal Academy of Engineering, UK
- a grant for £10,000 over one year that aims to convene a network of peers, from both the Frontiers network and a wider pool of researchers, innovators and practitioners, through regional or thematic events
- aims to promote collaboration and interdisciplinarity to address shared global challenges
- sharing insight and exchanging best practices

Project Resume



Knowledge exchange towards Sustainable Smart Cities: Energy efficiency and air quality of Nur-Sultan city

Project aim:

Developing expertise in improving the existing inefficient energy system and air quality in cities like Nur-Sultan that are highly reliant on coal and capacity building for the development of sustainable smart cities

Objective I	Objective II	Objective III
Identification of technological solutions for the problem with IT specialists/researchers and Energy modelers	Building a regional and cross-border network for sustainability and impact	Forming a collaboration roadmap between the University of Edinburgh and Astana IT University

Events and activities



Project Initiation Workshop

- The Energy sector of Astana
- Research projects on Smart Energy systems on Cooling and Heating at the University of Edinburgh
- The concept of Biofilters
- Online

March 2022

A guest lecture with Dr Thomas Morstyn (UoE)

- Multiscale Design for System-Wide Peer-to-Peer Energy Trading
- Sharing expertise in the sustainable energy transition toward net-zero greenhouse gas emissions and introduction of a new approach of distributed energy resources (DERs).
- Online

June 2022

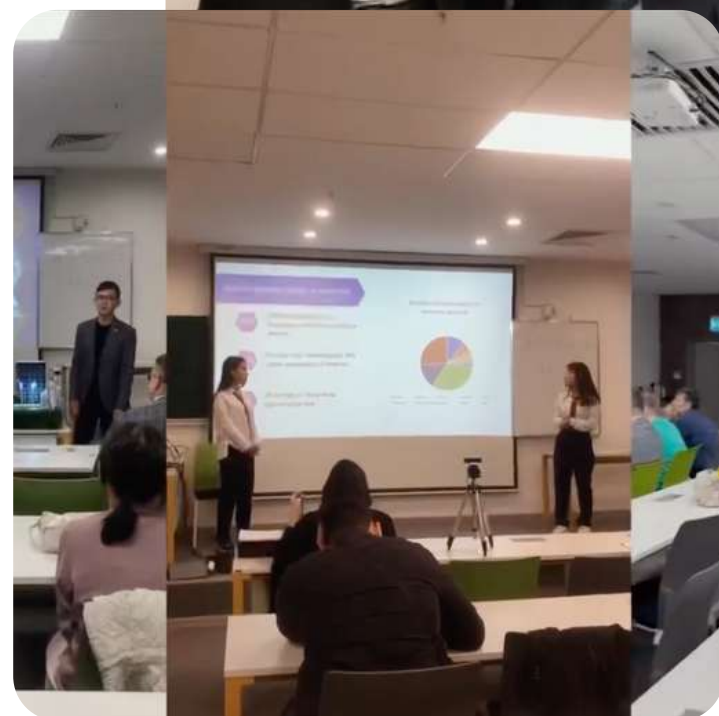
The Science Day at Astana IT University

- Exhibition of AITU projects
- Best paper award of AITU scholars
- Series of seminars on scientific collaboration and networking



April 2022

Events and activities



Capacity Building on Sustainable Smart Cities

- Republican competition of scientific IT projects on “Sustainable Smart city technologies” among school and university students of Kazakhstan
- 104 applications, 8 winners
- The goal was to build a diverse global and regional community of next-generation scientific leaders

January-May 2022

Events and activities



Workshop with Visiting Professors

- Speaker: Prof. Octavian Postolache, Instituto Universitário de Lisboa, IEEE IMS Portugal
- Smart Information Technologies - Tech. for everyday life

- Speaker: Dr Khaled Rabie, University of Manchester, UK
- The role of Connectivity in Shaping future Societies

June, September 2022



Events and activities



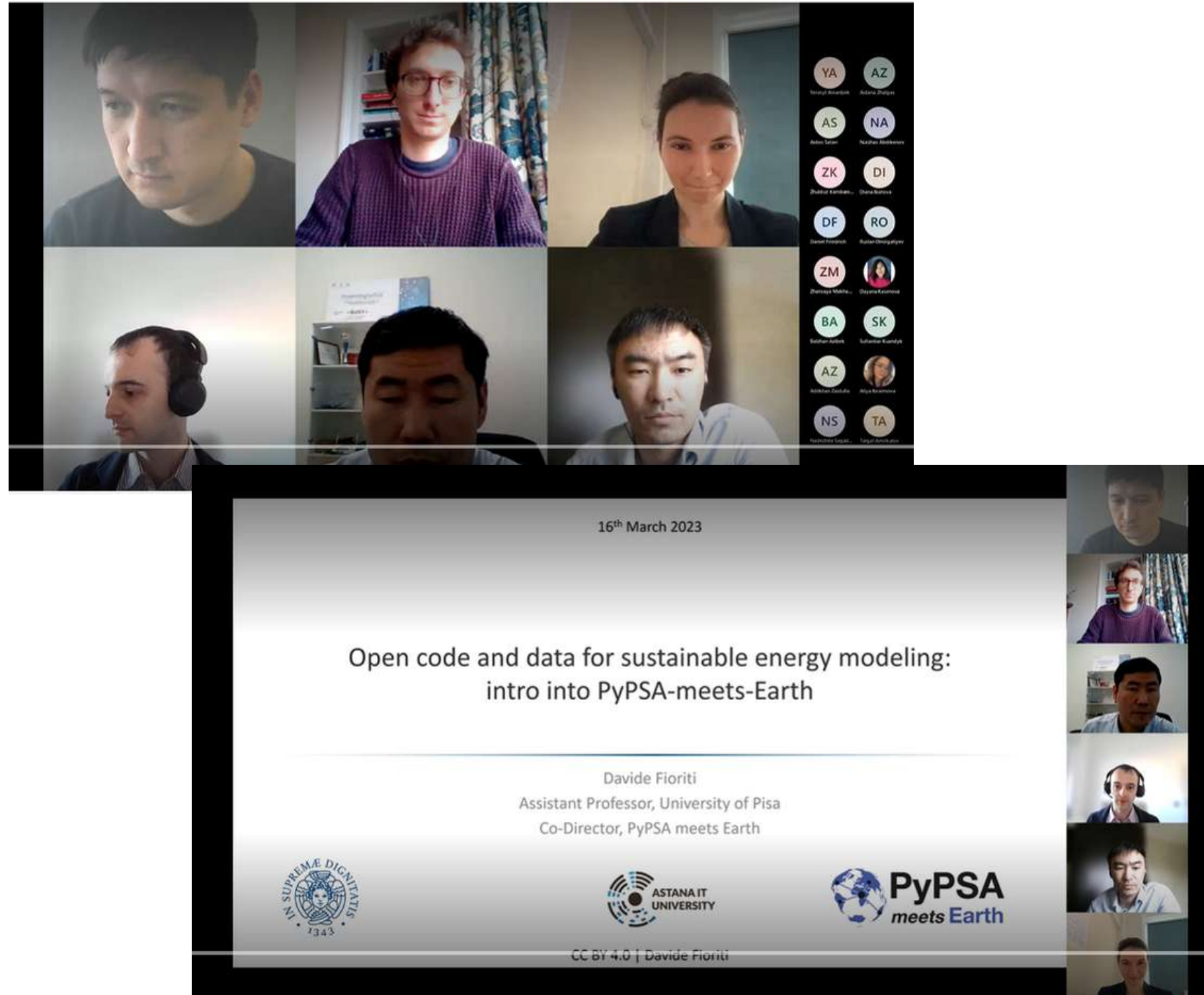
Workshop and Guest Lecture

- Guest Lecture Integrating thermal energy with the wider energy system
- Speakers: Prof Daniel Friedrich and Dr Andrew Lyden

- Workshop "Air Quality: current situation in Astana and prospects for development"

February 2023

Events and activities



Online workshop

“Open code and data for sustainable energy modeling: intro into PyPSA-meets-Earth”

Speakers:

1. Davide Fioriti- Assistant Professor, the University of Pisa, Italy
2. Ekaterina Fedotova, Senior Researcher, Moscow Power Engineering Institute, Russia
3. Albert Solà Vilalta, the University of Edinburgh, UK

March 2023

Joint paper publication



As a result of joint research and collaboration the following papers were published, in which RAENG and the Frontiers Champions Programme were acknowledged:

1. Amanbek Y, Kalakova A, Zhakiyeva S, Kayisli Korhan, Zhakiyev N, Friedrich D. Distribution Locational Marginal Price Based Transactive Energy Management in Distribution Systems with Smart Prosumers—A Multi-Agent Approach. *Energies*. 2022; 15(7):2404.
<https://doi.org/10.3390/en15072404> . Impact factor -3.0, Scopus percentile ~80.
<https://astanait.edu.kz/en/2022/06/09/hybrid-simulation-of-a-smart-grid/>
2. A. Zhanbolatov, S. Zhakiyeva, N. Zhakiyev, K. Kayisli (2022) "Blockchain-Based Decentralized Peer-to-Peer Negawatt Trading in Demand-Side Flexibility Driven Transactive Energy System" *International Journal of Renewable Energy Research (IJRER)*, 12(3), 1475-1483.
doi:10.20508/ijrer.v12i3.13195.g8530 (Cite score-3.7, Scopus)
3. Zhakiyev, N., Sotsial, Z., Salkenov, A., & Omirgaliyev, R. (2022). Set of the data for modeling large-scale coal-fired combined heat and power plant in Kazakhstan. *Data in Brief*, 44, 108547.

Project Team



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**THANK
YOU**