Andrey Churkin
Ph.D. student
Skolkovo Institute of Science and Technology (Skoltech)
Center for Energy Science and Technology
Bolshoy Boulevard 30, bld. 1, Moscow, Russia 121205

The University of Manchester
Department of Electrical & Electronic Engineering

Dear Committee Members,

By this letter, I want to express my willingness to join the research group led by Dr. Eduardo Alejandro Martínez Ceseña. I am excited about the recently announced Research Associate position within the project "Advanced tools towards cost-efficient decarbonisation of future reliable energy systems". I feel that it suits my field of expertise and my vision of multidisciplinary research in power systems. Please, find details about my experience in the CV attached to the application. I mention my advisors at Skoltech, prof. Janusz Bialek (J.Bialek@skoltech.ru) and prof. David Pozo (d.pozo@skoltech.ru), and my co-author, prof. Enzo Sauma (esauma@ing.puc.cl) at Pontificia Universidad Católica de Chile, as people who know my research and achievements better than anyone and may be contacted for the recommendation.

I am currently completing the education at Skoltech. My thesis defense is scheduled for September-October 2020. In Bachelor's and Master's theses, I worked on electrical engineering issues of power systems, mainly in operation and control. However, in my Ph.D., I focused on more global issues that arise in international energy cooperation and studied electricity markets, energy economics and policies, mathematical programming, and Game Theory. In 2017, I completed an internship at the United Nations ESCAP Energy Division, Bangkok. During the internship, I saw a strong political interest in international energy cooperation and decided that this topic is worth addressing in my Ph.D. thesis. Eventually, my models of cross-border transmission expansion planning contributed to the Skoltech – MIT Next Generation joint project "Energy Systems Planning for Government Regulations: New Formulations, Models and Algorithms" led by prof. David Pozo and prof. Juan Pablo Vielma.

In my research, I extensively use mathematical programming (LP, QP, MIP models) for finding optimal solutions in cross-border transmission expansion planning problems. I also implement Cooperative Game Theory concepts to solve the subsequent cost allocation issues. During the last three years, I achieved significant progress in Cooperative Game Theory applications in power system research. I examined a real-world case study of energy cooperation in Northeast Asia and obtained several fundamental and practical results that have been presented at multiple conferences and published in the Energy Economics journal. The special emphasis in my work is placed on the stability of cooperation: I search for the allocation solutions which have no participants with incentives of breaking an agreement of regional energy cooperation. To further investigate the stability of cooperation, I performed a manipulability analysis of the allocation rules and developed a novel bilevel approach that incorporates Cooperative Game Theory principles into transmission planning algorithms. This approach enables the identification of suboptimal transmission plans with enhanced stability of cooperation and may be used in numerous applications, even beyond power system research.

The position at The University of Manchester appeals to me due to the following reasons. First, the project focuses on the acute issues of power systems transformation due to renewable generation integration. It considers multi-energy systems and cooperation between distribution and transmission network operators, which is a fascinating multidisciplinary direction. Second, I know that the group has advanced skills in stochastic optimization, power systems operation and control, and applied mathematics. Therefore, I hope to study a lot and grow professionally during the project. As part of the team, I would like to develop models of power systems and electricity markets, for which I have experience of building optimization models in Julia/JuMP, perform economic and game-theoretical analysis. However, I do not limit myself to this area and can reach synergy in other directions. Additionally, I have experience in the advanced literature review (using citation network analysis) and am ready to take the leading role in publishing journal papers.

Sincerely,
Andrey Churkin