Climate change is the world's great challenge, and it is urgent to take measures to reduce greenhouse gas emission from fossil fuel. Specifically, to keep the global mean temperature rise well below 2°C above the preindustrial levels and pursue efforts to limit it to 1.5°C, there needs to be a substantial decline in unabated fossil fuel power in the next decade and complete cessation by around 2050. Especially for developing countries like China relying heavily on coal power, it is necessary to take additional policy measures to restrict coal power expansion and accelerate the phaseout of operating coal power plants.

Our team has worked on a systematic evaluation of the national carbon pricing effect on coal plant operation and phasing out China’s operating coal plants. The research team is highly collaborative and consists of researchers from Institutes of Science and Development of Chinese Academy of Sciences, North China Electric Power University, University of Chinese Academy of Sciences, Tianjin University of Finance and Economics, and Beihang University. This backstory will tell further how our research team came together despite many obstacles and communicated across disciplinary boundaries leading to our publication in a recent issue of the *iScience* (Mo et al., 2021) and continued interdisciplinary collaboration.

**PROXIMITY**

*What was the motivation to launch your interdisciplinary project?*

As the country with the world’s largest greenhouse gas emission and coal power capacity, China has put forward its “carbon peaking” and “carbon neutral” targets. Meanwhile, the much-anticipated national carbon market is on the way and will start with the coal power sector participating within the market in 2021. The implementation of national carbon pricing means that coal plant managers may have to pay for carbon emissions from power generation, leading to higher generation costs, and they may suffer losses in the future and even be forced to decommission coal plants before the normal end of plants’ technical lifetime.

The research team members are discussing their research progress through an online meeting as they were unexpectedly forced to limit face-to-face interactions.
What does the upcoming carbon pricing mean for the coal power plants?

How the carbon pricing may contribute to phasing out China’s coal power is a great concern for the relevant stakeholders and policy makers. Thus, it is necessary to explore how the upcoming national carbon pricing will affect the coal plant operation in the future, which may provide key implications for the coal plant operators, potential investors, financial institutions, and policy makers.

In fact, this motivation is essentially interdisciplinary, as it needs knowledge about energy systems, climate change, the technical and economic aspects of coal power sector, and policy design. With this understanding of the interdisciplinary field in mind, Dr. Jianlei Mo from Institutes of Science and Development of Chinese Academy of Sciences proposed a research framework and organized an interdisciplinary research team to carry out this study.

LANGUAGE

What were the challenges in communication between disciplines and how did you solve them?

As this work is interdisciplinary and our team members have different backgrounds, the first challenge we faced was how to communicate with each other to make each member understand the research motivation. Thus, we have organized several meetings to discuss the research topic and help each member to be clear what they can do to contribute to this research and how they could participate. Specifically, Jianlei Mo, Jiahui Yuan, and Hongbo Duan organized several meetings to discuss and design the research plan; Jianlei Mo also proposed and designed the framework of the model and methods; Weirong Zhang, Jian Zhang, and Zhixu Meng collected the technical and economic data of all the coal plant units; Qiang Tu, Jianlei Mo, and Hongbo Duan collected and calibrated the relevant parameters of the model, e.g. carbon market, electricity market, and coal market parameters. As is clear from this list, each member had a specific role to play in the organization of this work, each tackling an important issue relevant to the overall presentation of the research.

The second challenge is how to assure the research work can be carried out following the research plan, as our members are based in different institutions. Thus, we made the timeline explicit and have discussions on the research progress of each member regularly.

At last, what makes the collaboration more difficult is the outbreak of Corona Virus Disease 2019 (COVID-19). Especially as the situation with COVID-19 was becoming worse, our regular face-to-face meetings were disrupted, which made the communication more difficult as our team felt more connected when we were face to face. Then, we had to continue our research work by online meetings.

LOOKING FORWARD

Do you have any plan to continue the interdisciplinary research in your field?

In fact, in the field of energy-economy-climate systems, almost all the important and challenging issues are essentially interdisciplinary and they cannot be solved well only by one research group. Thus, it is necessary for researchers to collaborate with each other from different areas to do such exciting research. Therefore, I think this is just the beginning of our collaboration and we will continue to do some research work that is interdisciplinary. Specifically, there is still a lot of work to do following the research work we published in the iScience (Mo et al., 2021). For example, the impact of carbon removal technology on the future development of coal power and the energy system evolution can be further explored (Mo et al., 2018). In addition, the interaction effect of the energy and carbon markets on energy system evolution may play an important role in affecting the coal plant operation which should be further explored. Moreover, how the behavior of different players may affect the future prices in the energy and carbon markets is also a critical issue to be explored. At last, if the coal power is gradually phased out, then the renewable energy power would account for a larger portion in power system (Tu et al., 2019, 2020), and how to keep the stability of the power system would be a great challenge which should be further explored.

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When publishing the interdisciplinary paper, how do you decide which community to target? What initiative by publishers would make communicating interdisciplinary research more effective?

When publishing the interdisciplinary paper, besides the scientific contribution for the academic community, what we are concerned about is its impact on the real world. Specifically, we hope the key message in the interdisciplinary paper can reach the relevant stakeholders and policy makers so that our research may help to solve the problems in the real world directly. Thus, the language in the interdisciplinary paper should be straightforward and understood by the majority. Also, we should make the contribution of the paper explicit and transparent, while also choose a journal with broad and high impact.

To make communicating interdisciplinary research more effective, the publisher can make the requirements of the journal more explicit and provide more platforms to introduce the interdisciplinary research work to a wider audience and make it widespread and easily found so that it can also attract more high-quality manuscripts and reach all relevant stakeholders.

FINAL THOUGHTS
What did you learn about interdisciplinary research from the project and what tips would you give to anyone considering undertaking such work?

As what we are familiar with are the energy issues, we can talk about this question by taking the energy field as an example. In the field of energy, a lot of new issues have emerged, as we are facing new opportunities and challenges, e.g. technology innovation, environmental pollution, climate change, energy poverty, energy security, water shortage, economic crisis, etc. If we are ever to promote the energy transition to a more sustainable place, we must face these challenges directly, as well as understand the nexus among these aspects. This will require multidisciplinary knowledge to solve these true scientific questions while also impacting the real world. As the knowledge and the skills mastered by one researcher or group are always limited compared to that which is needed, we should always be ready to cooperate with others to carry out the interdisciplinary research.

Moreover, we may be confronted with some expected and unexpected difficulties while pursuing interdisciplinary research, e.g. the communication issues and the coordination issues among the team members, and the research may be interrupted. In this situation, all the team members should have the common goal and especially the project coordinator should always be prepared to solve the problems in time.

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