



**Chongqing University of Posts
and Telecommunications**



**National Academy of Sciences of
Tajikistan**

Collaborative Research Agreement

on Chinese-Tajikistan joint research within the proposed project under the Support of the Key Programmes of “Intergovernmental International Scientific and Technologic Innovation Cooperation” in National Key R&D Plan of China

1. Collaborative Research Title

Health management and optimization control of small and medium-sized photovoltaic energy storage systems in high-altitude and all-weather conditions.

2. Principal Investigators and Main Participants

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Chongqing University of Posts and Telecommunications

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Sheng Xiang (Lecturer dr., Chongqing University of Posts and Telecommunications)

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Jiwei Wang (Associate Prof dr., Xinjiang University)

Party B:

National Academy of Sciences of Tajikistan

Principal Investigator:



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and Telecommunications**



**National Academy of Sciences of
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Main Participants (Participating Institutions):

Jamshed Rahmatov (Center of Innovative Development of Science and New Technologies of
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Umarchon Madvaliev (Prof, Dr., JSC “Systemautomatika”)

Sakina Karimova (Center of Innovative Development of Science and New Technologies of
NAST)

Sabur Rasulov (Dr., Center of Innovative Development of Science and New Technologies of
NAST)

3. Research Plan, Division of Labor and Timetable

The project seeks to deepen collaborative relationships between China and Central Asia in photovoltaic energy storage technology. It focuses on integrating advanced photovoltaic and storage systems into microgrids, promoting safe and efficient renewable energy operations. As a strategic development initiative, this project facilitates the alignment of energy policies between China and Central Asian nations, particularly through practical collaborations. The research is both pioneering and interdisciplinary, holding particular relevance for Central Asian countries like Tajikistan, where photovoltaic technology is crucial for achieving energy independence and enhancing power system stability. The research encompasses several key areas: (1) developing photovoltaic power prediction models using multi-source spatio-temporal data fusion. (2) Health monitoring and fault diagnosis for energy storage batteries. (3) Collaborative optimization of photovoltaic storage systems for maximum power point tracking. (4) Verification and demonstration of small to medium-sized photovoltaic power stations in high-altitude, all-climate conditions. These initiatives are designed to bolster technical capabilities for energy transition and sustainable development in China and Central Asia.

The project will be completed through cooperation between Part A and Part B. The Part A is mainly responsible for research on photovoltaic power prediction, energy storage battery



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health monitoring technology, and verification and demonstration applications of small and medium-sized photovoltaic power stations. The Part B is mainly responsible for the research on maximum power point tracking control of photovoltaic storage systems and optimal control of energy storage battery distribution. Taking into account the long-term, efficient and fruitful cooperation between Part A and Part B in the energy field, such a division of tasks will provide appropriate synergy for the planned research.

The project is structured over a two-year period, with sequential annual milestones: In 2025, (1) developing a photovoltaic power prediction model under all-climate conditions in high mountains, and (2) developing a health state prediction method for energy storage batteries. In 2026, (3) efforts will shift to optimizing control and configuration strategies for photovoltaic and storage systems, and (4) verification and demonstration of small and medium-sized photovoltaic power plants under all-climate conditions in high mountains. The project also includes biannual exchanges between the Part A and Part B, facilitating technical support, academic discussions, and annual summaries of the work completed. This interaction is essential for the success and mutual benefit of both parties in the energy sector.

4. Ownership, Use and Transfer of the Intellectual Property

Intellectual property rights (IPRs) of the project cover all results obtained within the project. The IPR of common results will be shared by both of two parties concerned. The IPR of results obtained independently by one party without any assistance from the other party or obtained before or after the collaboration will belong to the respective party.

Authorship and acknowledgement in papers should be based on contribution to the project and decided in discussions involving all parties concerned.

Before submitting any application for related IPRs, one party should first consult with the other party and may proceed only after the other party has agreed without objection on the ownership of the IPR.

Without the written consent of both parties, none of the project's common IPR may be transferred to any third-party.

5. Duration, Amendment and Withdrawal

The project will terminate upon completion of all research activities, which is agreed



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on May 5, 2026, A research partner who decides to withdraw from the project before the above-mentioned date should notice other members of the collaborative research at least three months before the change happens. Any amendment to this agreement should be agreed by both parties.

6. Legal Validity

The present agreement comes into effect on May 5, 2024 and terminates on May 5, 2026. Both of two parties could extend the Agreement at their own discretion. It is made in two counterpart originals and two counterpart copies, with one of the originals to be retained by each of the two parties and one of the copies to be retained by the Ministry of Science and Technology of the People's Republic of China and the National Academy of Sciences of Tajikistan, respectively.

7. Signature by Principal Investigators of Both Parties, Date and Place

Party A: Chongqing University of Posts
and Telecommunications



Party B: National Academy of Sciences
of Tajikistan

**Center of Innovative Development of
Science and New Technologies**

Legal representative:



Legal representative:

**Deputy Director for Science and
Jamshed Rahmato**



Signature of Project PI:

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Date: May 5, 2024

Place: Chongqing, PR. China

Signature of Project PI:

Jamshed Rahmato

Date: May 5, 2024

Place: Dushanbe, Tajikistan