

Guide to the Innovative ICT Fund Projects for Beyond 5G/6G



A Hopeful Future Achieved Through Beyond 5G: Looking Toward Society 5.0





Beyond 5G/6G

The Cyber Physical System (CPS) of the Beyond 5G Era

In the Beyond 5G era, the advanced control of time and space will lead to the integration of both physical and cyber spaces, enabling the realization of futures that were not achievable with physical space alone. It will become possible to provide novel services by combining enablers (platform services and basic functions) generated by crossing the integrated physical space and cyberspace. These services are expected to help solve various social issues including those related to life, industries, disaster prevention, education, and medical services.



Vision for Society in the 2030s after the Realization of Beyond 5G/6G

In light of national strategies and social scenarios that the entire government is addressing based on the three social scenarios proposed in the "Beyond 5G Promotion Strategy" (June 2020, MIC), the social scenarios to be realized by Beyond 5G has been organized and concretized as follows.

Specifically, "A society in which everyone can play an active role (Inclusive)" mentions contributing to the "Digital Garden City Nation Concept," health care, the extension of social life expectancy, and reform of work styles; "A society that can grow sustainably (Sustainable)" mentions addressing green/environmental energy issues, strengthening international competitiveness, and promoting economic growth; while economic security, response to the COVID/Post-COVID society, disaster prevention and mitigation, and national resilience are mentioned under "A human-centered society in which safety and security are ensured (Dependable)."

Responding to these social scenarios with Beyond 5G will lead to the realization of Society 5.0.



Innovative ICT Fund Projects for Beyond 5G/6G

Purpose and Background

Beyond 5G/6G is expected to become the next generation's core information and communications infrastructure, serving as the foundation for all industrial and social activities and utilized across national borders.

To promote research and development of innovative information and communication technologies, including Beyond 5G, the ICT Research and Development Fund has been established by the National Institute of Information and Communications Technology (NICT), enabling flexible research and development over multiple years.

The Innovative ICT Fund Projects for Beyond 5G/6G, which will be newly implemented by the same fund, is primarily intended to strengthen support for research and development and international standardization aimed at social implementation and overseas expansion, focusing on technical fields where Japan has strengths. For this reason, this fund project supports the following initiatives.

- Initiatives featuring both strategy and determination for social implementation and overseas expansion, including investments by those implementing research and development projects themselves
- Research and development of technologies that should be led by the government and addressed across industries (hereinafter referred to as "common basic technologies") to achieve early social implementation and overseas expansion
- Research and development for establishing elemental technologies and creating technological seeds from a medium-to long-term perspective
- Research and development of technologies that contribute to the effective use of radio waves

For Beyond 5G, the next-generation information and communications infrastructure, we aim to change the paradigm of the global communications infrastructure market and secure about 30% of the international market share. We will do this through robust promotion of research and development to achieve a next-generation network that enables revolutionary high speed, high capacity, low latency, low power consumption, high reliability, and coverage expansion, as well as promotion of the social implementation and overseas expansion of the results of this R&D. This will not be an extension of conventional mobile communications (wireless), but rather an integrated network that encompasses wired and wireless communications, land, sea, air, and space.

Project Details

The fund project primarily targets research and development of technologies that contribute to achieving the next-generation information and communications infrastructure Beyond 5G, as well as strengthening Japan's international competitiveness and ensuring economic security through social implementation and overseas expansion. Specifically, support will be provided through **the programs outlined on the next page.**

Strategic Program for Social Implementation and Global Deployment

This program focuses on technology domains where Japan has strengths and implements research and development projects to achieve social implementation and overseas expansion. As a general rule, this program targets R&D that aims to achieve a certain level of Technology Readiness Level (TRL) within a certain period of time. Its implementation is split into the following two categories.

Business Strategy Support Type

1 Research and Development Subject

We prioritize support for research and development projects with strategies and commitments for social implementation and overseas expansion, with a focus on technologies in the competitive domains of individual companies.

2 Grant or Commissioned Project

In principle, this is implemented as a grant project.

③ Grant Rate Concept

Up to 1/2 of the total project costs for the entire implementation period is granted.

④ Support Scale per Project (Government Funds) Several billion yen per year (estimated)

(5) Other

Additional support for costs related to international standardization activities will be provided as follows.

Subject for International Standardization Activity Support ("Supporting International Standardization Activities")

Those implementing projects selected in the Business Strategy Support Type

- Grant or Commissioned Project :
- Implemented as a grant project
- \cdot Eligible Expenses : Travel expenses for international
- standardization activities, personnel costs for specialists, etc. • Grant Rate Concept : 1/2 of the eligible expenses for international standardization activities
- Maximum Grant Amount per Project (Government Funds) : Up to about 100 million yen per 2 years (estimated)
- Grant Period : Up to about 2 years

Program for Elemental Technologies and Seeds Creation

1 Research and Development Subject

This program mainly targets research and development (including international joint research) for establishing elemental technologies and creating technological seeds from a medium- to long-term perspective, with technologies corresponding to TRL 1-3 at project launch and requiring a certain period until social implementation.

2 Grant or Commissioned Project

Implemented as a commissioned project

③ Project Scale per Case

Up to 100 million yen per year (up to several hundred million yen) (estimated)



Common Network Infrastructure Technology Establishment Type

1 Research and Development Subject

Technologies in cross-industry common basic domains or cooperative domains necessary for rapid social implementation and overseas expansion, which are, in principle, clearly stated in government documents as to be implemented by the government.

② Grant or Commissioned Project Implemented as a commissioned project

③ Project Scale per Case Up to several billion yen per year (estimated)



Program for Research and Development of Effective Utilization of Radio Spectrum

① Research and Development Subject

This program targets research and development of technologies specified in Article 103-2, Paragraph 4, Item 3 of the Radio Act.

② Grant or Commissioned Project Implemented as a commissioned project

3 Project Scale per Case

Depending on the development scale, similar to other research and development programs (estimated)



Research and Development Issues to Be Addressed to Make "Beyond 5G" a Reality

As an overall picture of the Beyond 5G network, a study of the direction of the network architecture, which is composed of "services," "network platforms," "network infrastructure," and "devices/ equipment/terminals," and Japan's strengths towards Beyond 5G was conducted, following which, the R&D issues that the entire industry, academia, and government should work on towards Beyond 5G have been organized into the following 10 issues. Note that issues 1 to 10 are interrelated.



Using Shared Research and Development Testbeds

The National Institute of Information and Communications Technology (NICT) has prepared the following scheme for those involved in this fund project to use the Beyond 5G shared research facilities and equipment (shared research and development testbeds) provided by NICT.

- To conduct the Beyond 5G commissioned research, the researchers or developers can use the R&D Testbeds maintained by NICT free of charge in accordance with the Terms and Conditions of the Contract for Commissioned Research.
- To carry out the subsidy qualified projects, the researchers or developers can use the R&D Testbeds maintained by NICT free of charge in accordance with the Guidelines for Issuance of the Subsidy established by NICT.

Available Facilities and Equipment

	Beyond 5G/loT Testbed with High-reliability and High-elasticity	Beyond 5G Reliable Virtualization Infrastructure
		Beyond 5G Mobile Environment
		CyReal Demonstration Environment
		DCCS (Data Centric Cloud Service)
		High Speed R&D Network Testbed "JGN"
		Large-scale Computer Environment "StarBED"
		P4 Experiment Environment
	Advanced ICT Device Lab Facilities	
	Kashima 35cm Telescope for Satellite Observation	
	Ultra-high speed Optical Transmission Experiment Facility	
	Anechoic Chamber for Microwave Band - RF Measurement Environment -	
	Anechoic Chamber for Terahertz Band - Beyond 5G Testing Environment -	

Shared Research and Development Testbeds



Anechoic Chamber for Microwave Band

An anechoic chamber for measuring and evaluating antenna characteristics, transceiver transmission characteristics, etc. Equipped with manipulators and other relevant apparatus, this anechoic chamber is suitable for microwave bands.

Advanced ICT Device Lab: Cleanroom

Cleanrooms (processing rooms) maintained in very low dust-free conditions. The lab is intended to research and develop various innovative device technologies. It provides an all-in-one research environment that enables integrated research from fabrication to evaluation of devices.



This chamber is used to measure and evaluate antenna characteristics, transceiver transmission characteristics, etc. The anechoic chamber is equipped with an antenna positioner for the ultra-high frequency band, including the terahertz band expected to be used in Beyond 5G systems.



Kashima 35cm Telescope for Satellite Observation

This telescope has been installed primarily for precise orbit determination of geostationary satellites by conducting optical observations of the satellite. From 2012 onwards, modifications have been made to the frame of the telescope to enable observation of low-earth orbit optical communication satellites.

Optical Transmission Technology Development Environment

- Ultra-low loss, low nonlinear 10,000km straight-line transmission line connecting 100 optical amplification repeaters
- Flexible grid optical node, 3,000km transmission line with 3 types of fiber configuration
- Optical transceiver characteristic evaluation system compatible with super-channels of 400 Gbps class or higher



StarBED

A large-scale experimental emulation platform consisting of a group of PC servers. By providing a large-scale verification environment consisting of general-purpose PC servers and switches, verification can be performed using the actual hardware and software implementations.

*To use the facilities, you need to submit a Facility Use Plan and coordinate usage schedules. For the procedure, refer to the URL on the right. *We may decline usage requests for safety reasons or to ensure proper use of equipment. *We may also decline usage requests made on short notice or long-term exclusive use to avoid conflicts with other users. Consult with the point of contact at least 45 days prior to the desired date of use.

Information and Inquiries about the Shared Research and Development Testbeds

URL: https://www.nict.go.jp/collaboration/utilization/B5G/ E-mail: NICT_shared_facilities@ml.nict.go.jp

National Institute of Information and Communications Technology General Produce Office, Open Innovation Promotion Headquarters https://www.nict.go.jp/



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