INTERNATIONAL LUNAR RESEARCH STATION (ILRS)

2023-05

Deep Space Exploration Laboratory of CNSA

CONTENT

1. China Lunar Exploration

1. The importance of Lunar Exploration

- **Moon is the closest celestial object to the Earth, mankind has explored more than 120 times.**
- **Moon is the transit station towards farther deep space, is an important way to study the "three origins" of life, solar system and the universe.**
- **Moon is the hot spot of international space science research, the development and utilization of lunar resources is of great significance to the sustainable development of mankind.**

1. China Lunar Exploration

■ 2. Three Steps of China Lunar Exploration

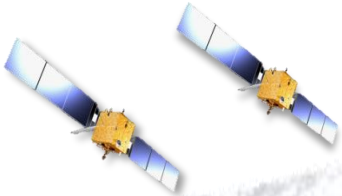
Chang'E-1 2007.10

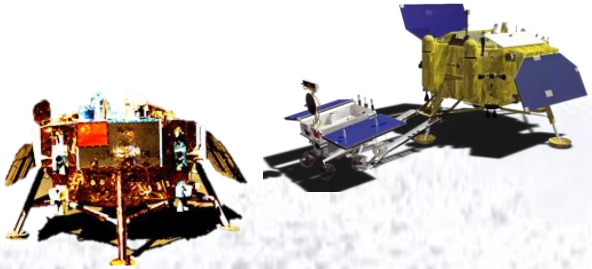
Chang'E-2 2010.10

Chang'E-3 2013.12

Chang'E-4 2018.12

Chang'E-5 2020





Orbiting

Landing

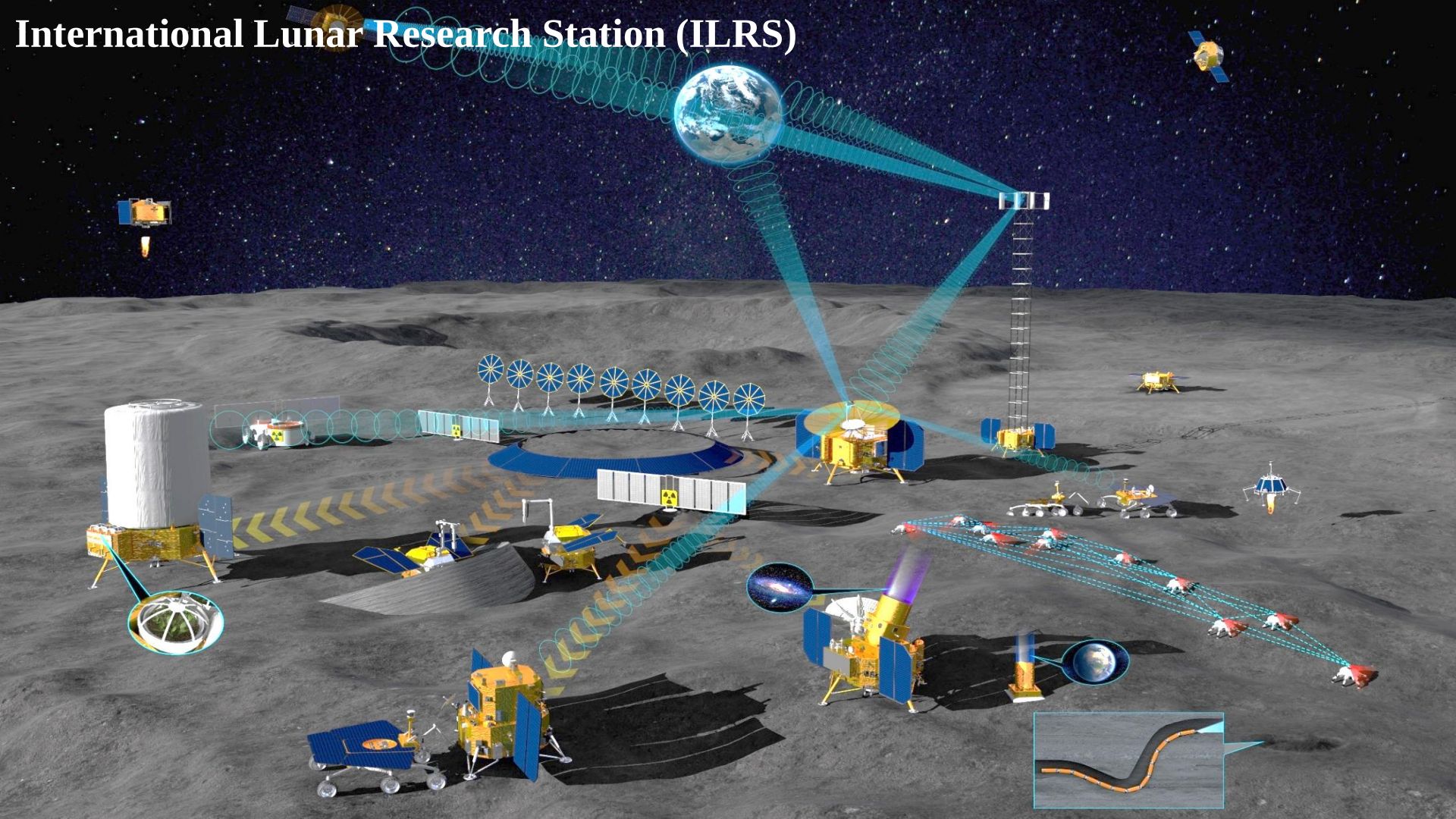
Sample Return

1. China Lunar Exploration

■ 3. Serve for Human Civilization

CONTENT

International Lunar Research Station (ILRS)

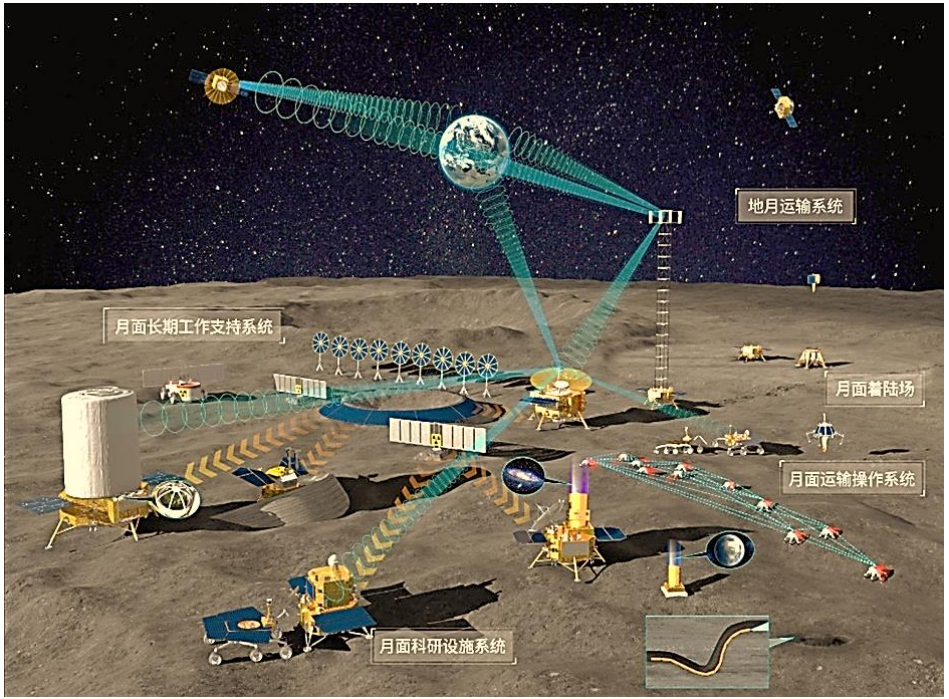


2. ILRS Concept

2.1 Definition of ILRS

- Proposed by China and jointly built by many countries,
- a scalable and maintainable comprehensive scientific experiment facility.
- operates autonomously on the lunar surface and lunar orbit for a long time, with short-term manned participation.
- Has ability to support **energy supply, central control, communication& navigation, space-earth round trip, lunar scientific research and ground support,**
- continues to carry out multidisciplinary, multi-target, large-scale scientific and technological activities such as scientific exploration and research, resource development and utilization, and cutting-edge technology verification.

ILRS Concept



2.2 Vision and Mission

Vision:

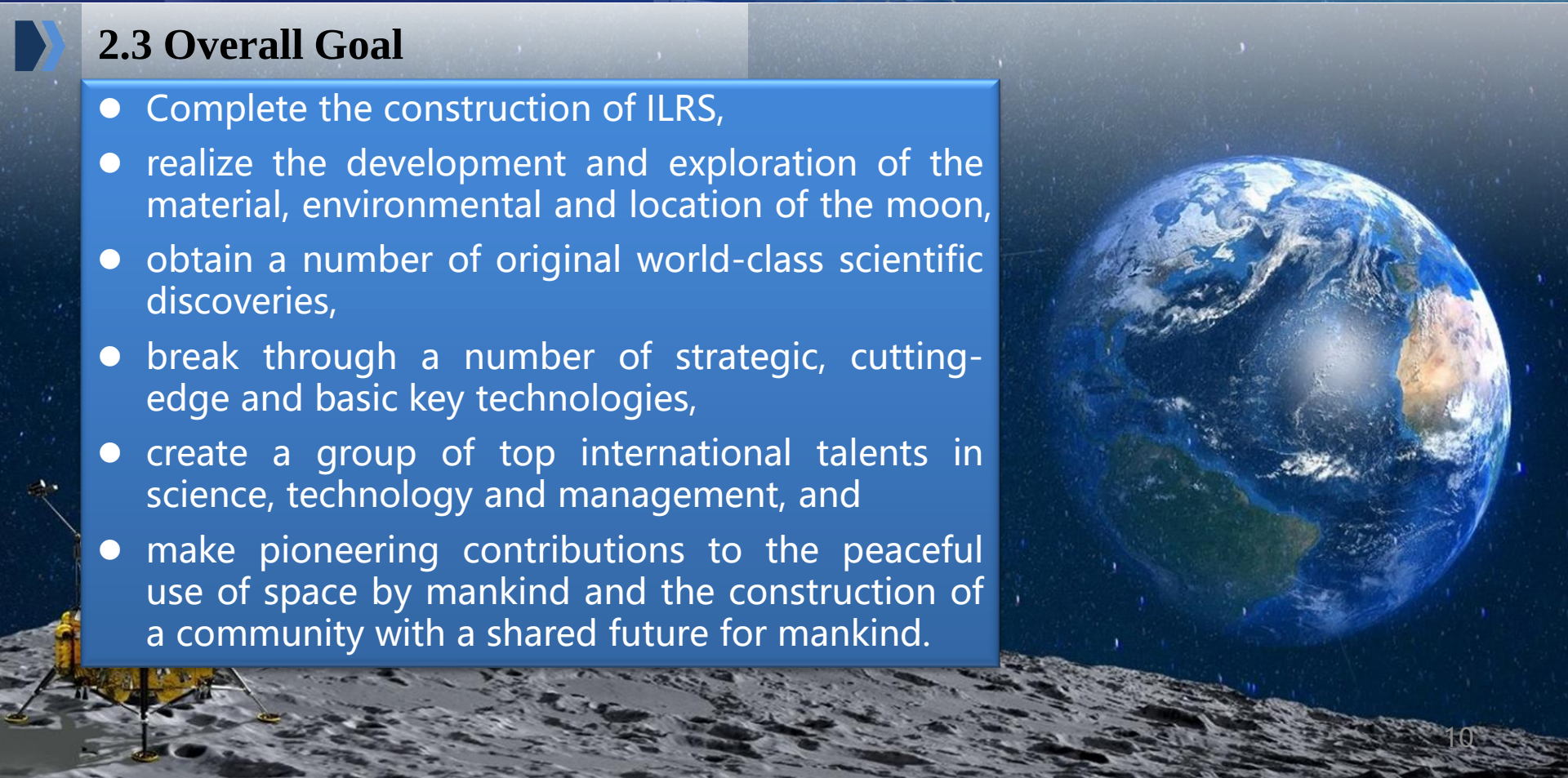
- Within 10-15 years, gather all human resources of different countries, races and civilizations, walk out of the cradle of the earth,
- jointly build and share and operate the first extraterrestrial home in the solar system, serves the community of human destiny on the surface of the moon, used for long-term exploration and development of the universe, and contributes Chinese wisdom and strength.
- In the future, human beings will set off from the moon again, rush to a wider universe, land on Mars and more distant planets, and further explore the mysteries of the solar system.

Purpose: equality and mutual benefit, peaceful use, inclusive development

2. ILRS Concept

2.3 Overall Goal

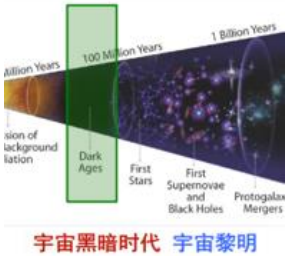
- Complete the construction of ILRS,
- realize the development and exploration of the material, environmental and location of the moon,
- obtain a number of original world-class scientific discoveries,
- break through a number of strategic, cutting-edge and basic key technologies,
- create a group of top international talents in science, technology and management, and
- make pioneering contributions to the peaceful use of space by mankind and the construction of a community with a shared future for mankind.

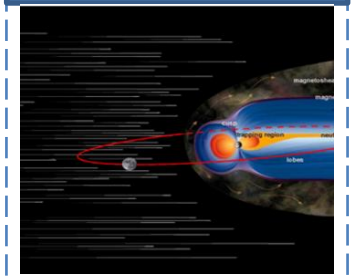


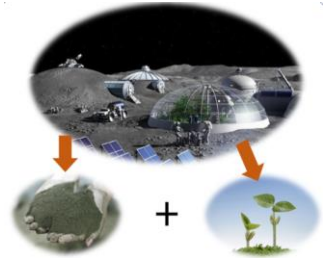
2.4 Scientific Goals

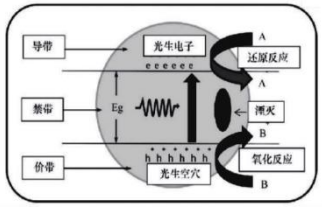
Scientific Goal

Lunar archaeology	Universe survey	Sun-Earth relation	Scientific experiments	Resource utilization
Solve the problem of the origin and evolution of the moon	How the Dark Ages and Dawn Ages of the universe evolved	Explore the nature of Earth-like living environments	Lunar ecological and basic scientific experiments	Resource development and utilization: energy, materials, construction









2.5 Engineering Goals

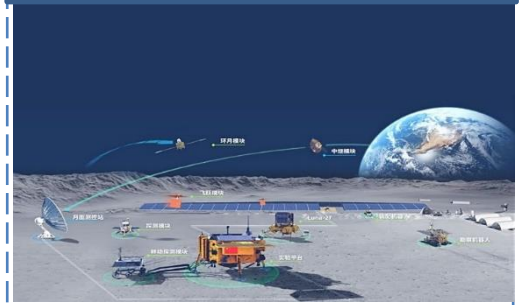
Engineering Goals

platform for scientific experiments

Build an international scientific research public platform for moon-based scientific experiments, development and utilization of lunar resources, etc

Drive technology leaps across generations

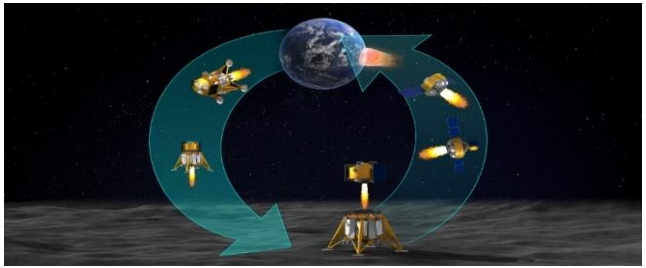
Realize the cross-generation leap of key technologies such as flight control, energy security, communication and navigation, and operation of extraterrestrial object detection



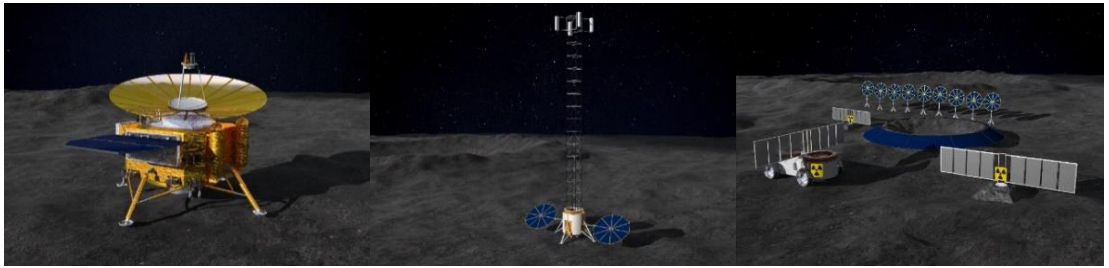
Build an engineering facility system

For larger scale, more ways, Laying the foundation for further space lunar exploration, development and utilization, and human activity facilities

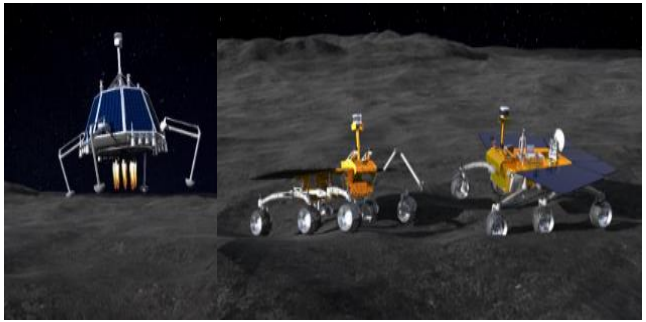
2.6 Five Facilities



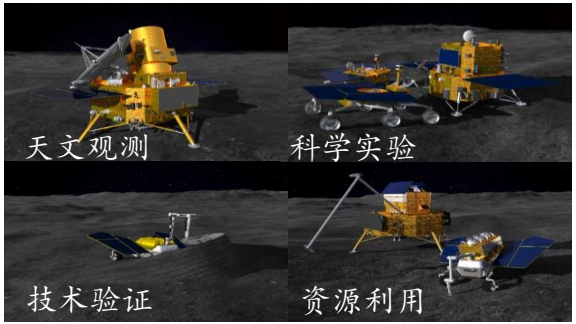
Lunar-Earth Transportation Facility



Long-term support facility on lunar surface



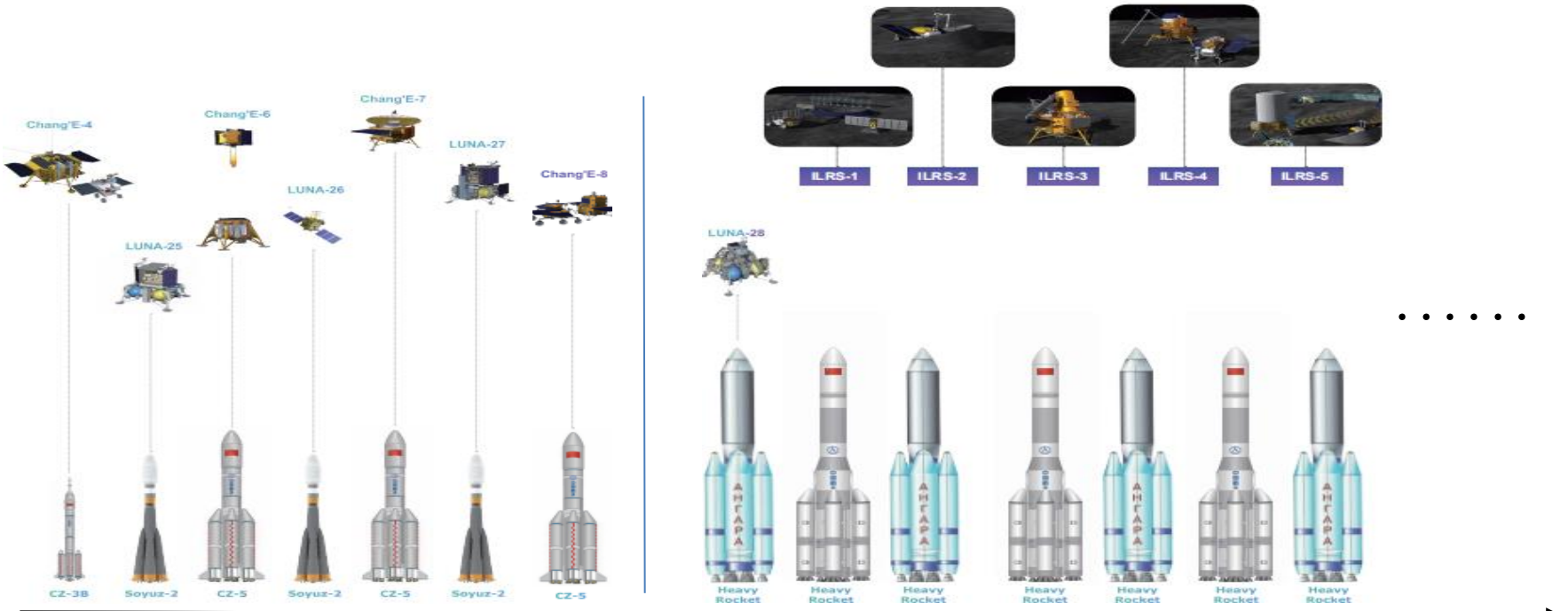
Transportation and Operation Facility



Lunar Scientific Facility

Ground Support and Application Facilities

2.7 Development Phases

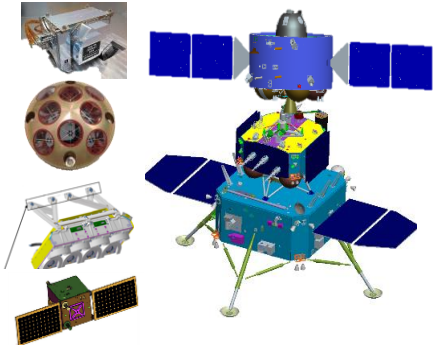


2. ILRS Concept

2.5.1 Phases I--------Basic Model：CE-6/7/8

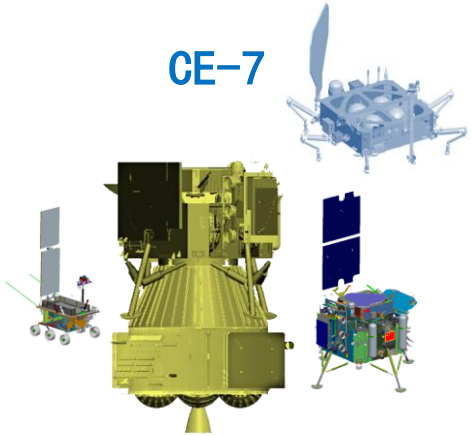
ILRS (basic Model)

CE-6



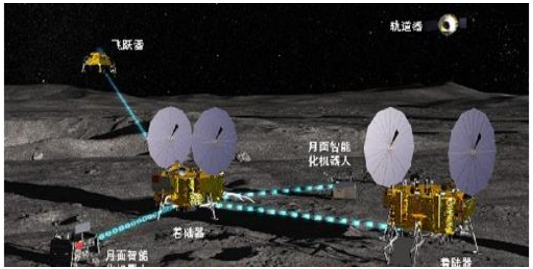
- Plan to launch on May 2024
- Achieve the first human sample return on the far side of the moon.

CE-7



- Plan to launch on 2026
- Consists of a lander, a flyer, and a Queqiao-2 relay satellite.
- Detailed investigation of the environment and resources at the south pole of the moon.

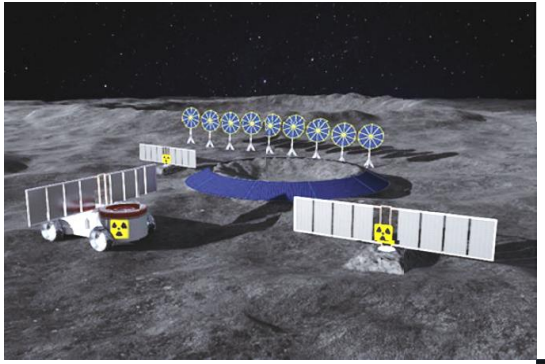
CE-8



- Plan to launch on 2028
- Consists of a lander, a leaper, a lunar rover and a lunar operation robot
- Experimental verification of lunar resource utilization.

2.5.2 Phases II--------Improved Model

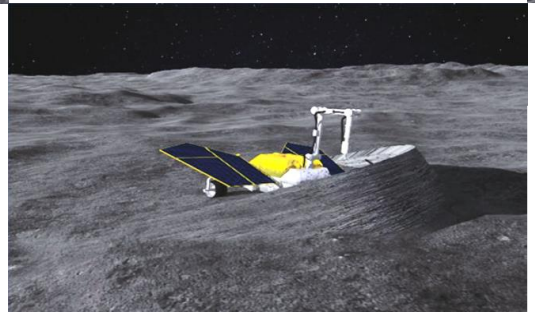
ILRS-1



- Deploy lunar relay satellite, increase long-term energy supply modules on lunar surface
- Geology investigation, multi-source particle detection, in-situ analysis, sample collection

ILRS-2

- Build and expand infrastructure such as communication base stations, conduct multi-probe inter-operation
- VLBI astronomy, In-situ analysis, sample collection



ILRS-3

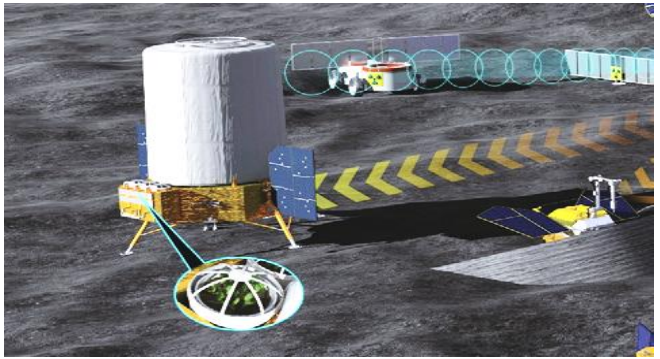
- Gather previously collected lunar samples, and return them to Earth
- Geological investigation by ground-penetration radars

2.5.2 Phases II--------Improved Model

ILRS-4

- Deliver long-term energy support modules
- Sun-Earth-moon space physical observation, Moon-based biological science experiments

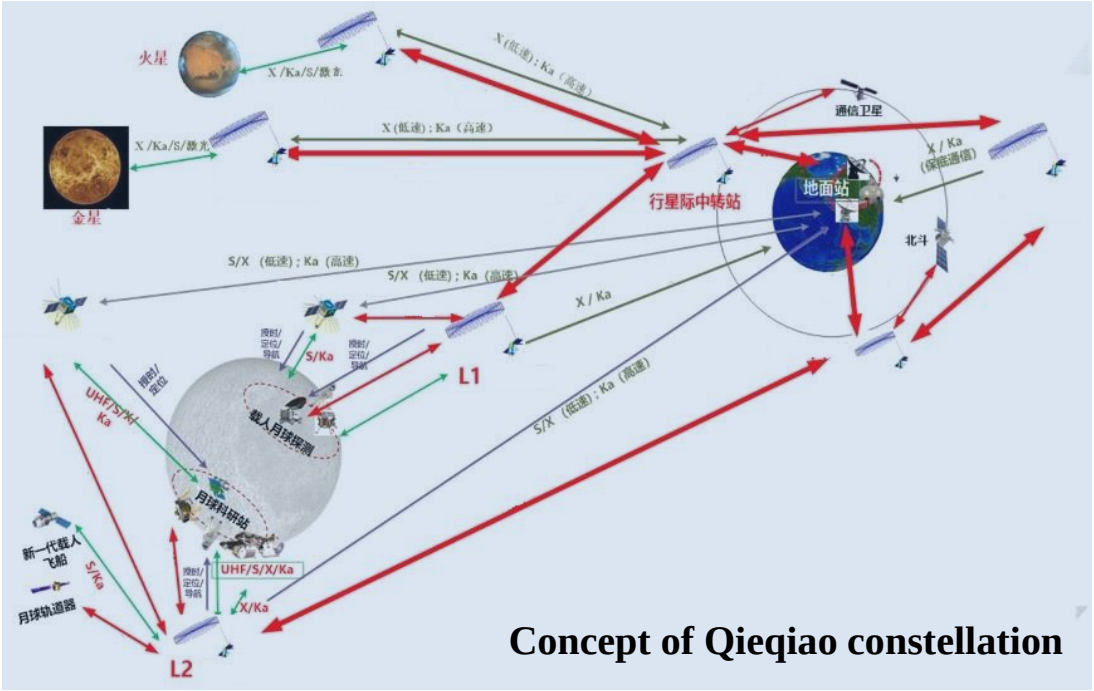
- Establish in-situ observation facilities and support long-term scientific exploration and resource utilization
- Lunar-based astronomical observation, Sun-Earth space environmental investigation, other experiments



ILRS-5

2.5.2 Phases II--------Improved Model:

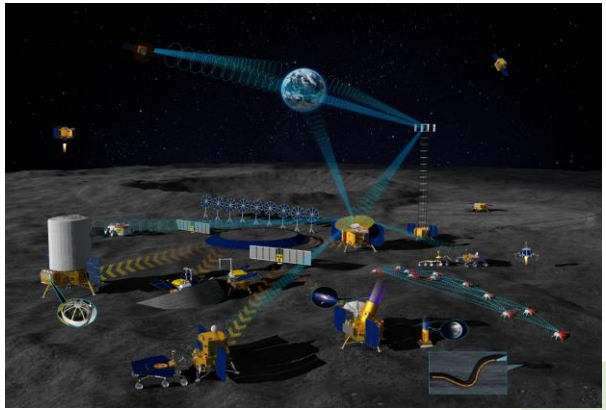
- Build the Queqiao comprehensive constellation with the ability of communication, navigation and remote sensing in the earth-moon space and far-reaching space.
- Serve for manned lunar landing, Mars, Venus and other deep space exploration.



Concept of Qieqiao constellation

2. ILRS Concept

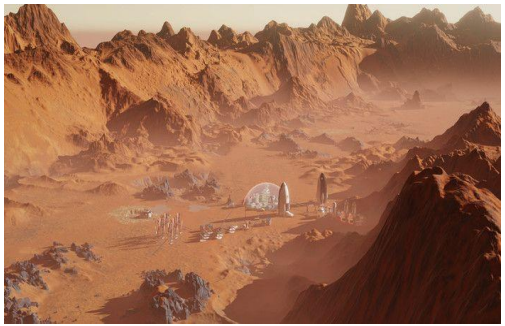
2.5.3 Phases III -------After 2040, from Moon to Mars.



- multi-dimensional and continuous scientific exploration and environmental monitoring of the moon
- technical verification of utilization of lunar resources
- Support follow-up lunar missions

- Add lunar science facilities and related service modules
- From a scientific research experimental station to a practical and multifunctional lunar base

- Experience in the implementation of long-term manned spaceflight activities through orbital/lunar activities
- Validate technology and capabilities for a manned mission to Mars



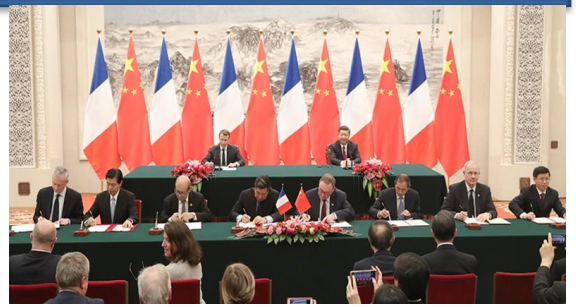
CONTENT

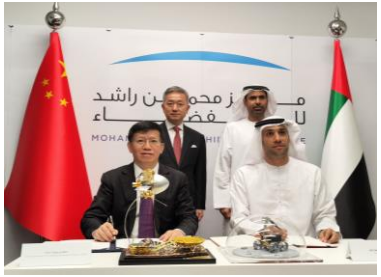
3. International Cooperation

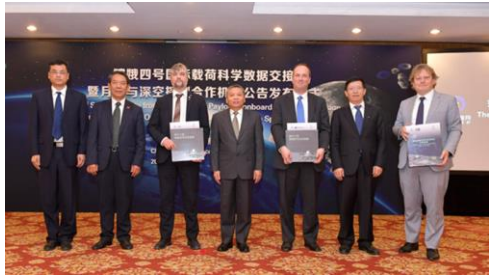
3.1 Welcome all countries to participate

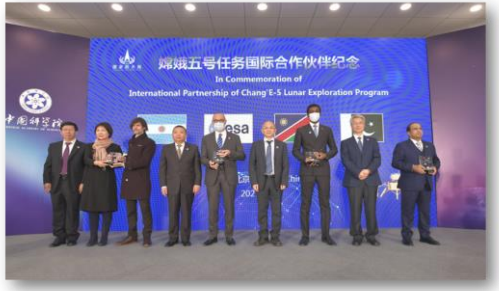
“International partners are welcome to participate in the demonstration and construction of the International Lunar Research Station at all stages of the project and at all levels of the mission.”

——《China’s Space 2021》





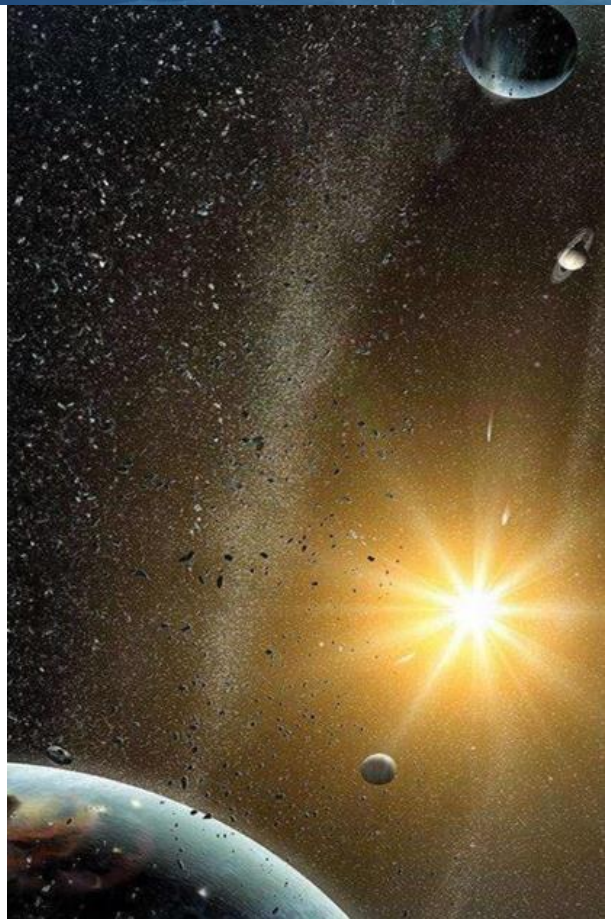




3. International Cooperation

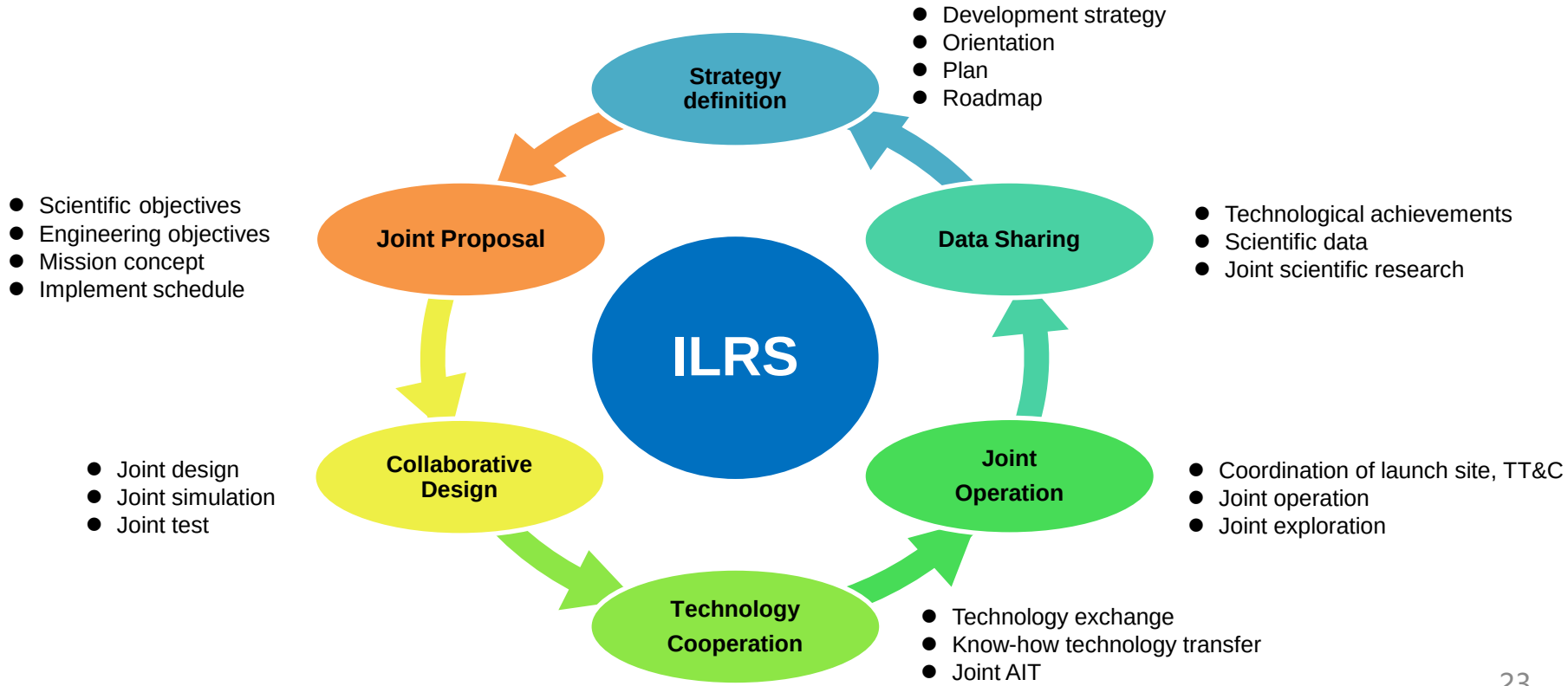
3.2 ILRS Cooperation Initiative

1. **Peaceful exploitation**
2. **Joint discussion, building, sharing**
3. **Various cooperation form**
4. **Sharing scientific outcomes**
5. **Preserving Lunar Resources**
6. **Formation of cooperative organizations**



3. International Cooperation

3.1 ILRS Cooperation domains



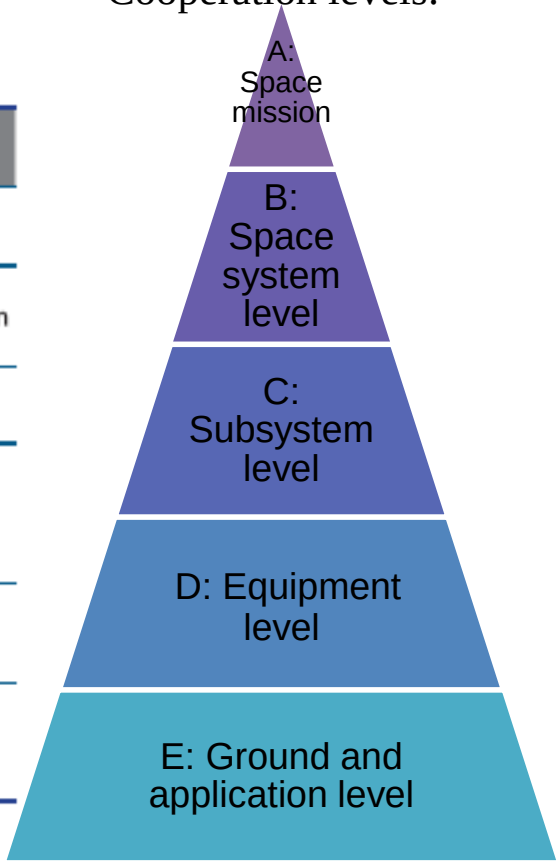
3. International Cooperation

3.2 Opportunities for ILRS missions

Mission	CE-4	CE-6	CE-7	CE-8
Cat. A	Closed	Closed	Mission coordination*	Mission coordination
Cat. B	Closed	Closed	Piggyback of probe system	Piggyback of probe system
Cat. C	Closed	Closed	Joint development	Joint development
Cat. D	Closed	Closed	Piggyback of scientific instrument/ equipment supply	Piggyback of scientific instrument/ equipment supply
Cat. E	Data analysis &sharing	Data analysis &sharing	Data analysis &sharing	Data analysis &sharing

*CE-7and LUNA-26 cooperate on mission level.

Cooperation levels:



3.7 ILRSCO

- **Organization**: participating countries establish a International Lunar Research Station Cooperation Organization (ILRSCO). and jointly build ILRS project, jointly manage facilities, and share scientific research results.
- **Founders**: The first signatories will enjoy more favorable terms, more rights and more results as founding members of ILRSCO.
- **HQ**: The HQ of ILRSCO will be located in Hefei Deep Space Science City, China. Five centers will be built, including design simulation, operation control, data process, sample storage and research, and international training centers.

3.8 Timeline

- **ILRS and ILRSCO preparation timeline:**
  - By May, 2023, promote ILRS project, invite national space agencies, organizations to participate;
  - By October 2023, complete the signing of Agreement/MOU with the space agencies or organizations of the first ILRSCO founding countries;
  - Before the end of 2024, define ILRS task shares, sign and approve inter-governmental agreement among founding countries of the ILRSCO.

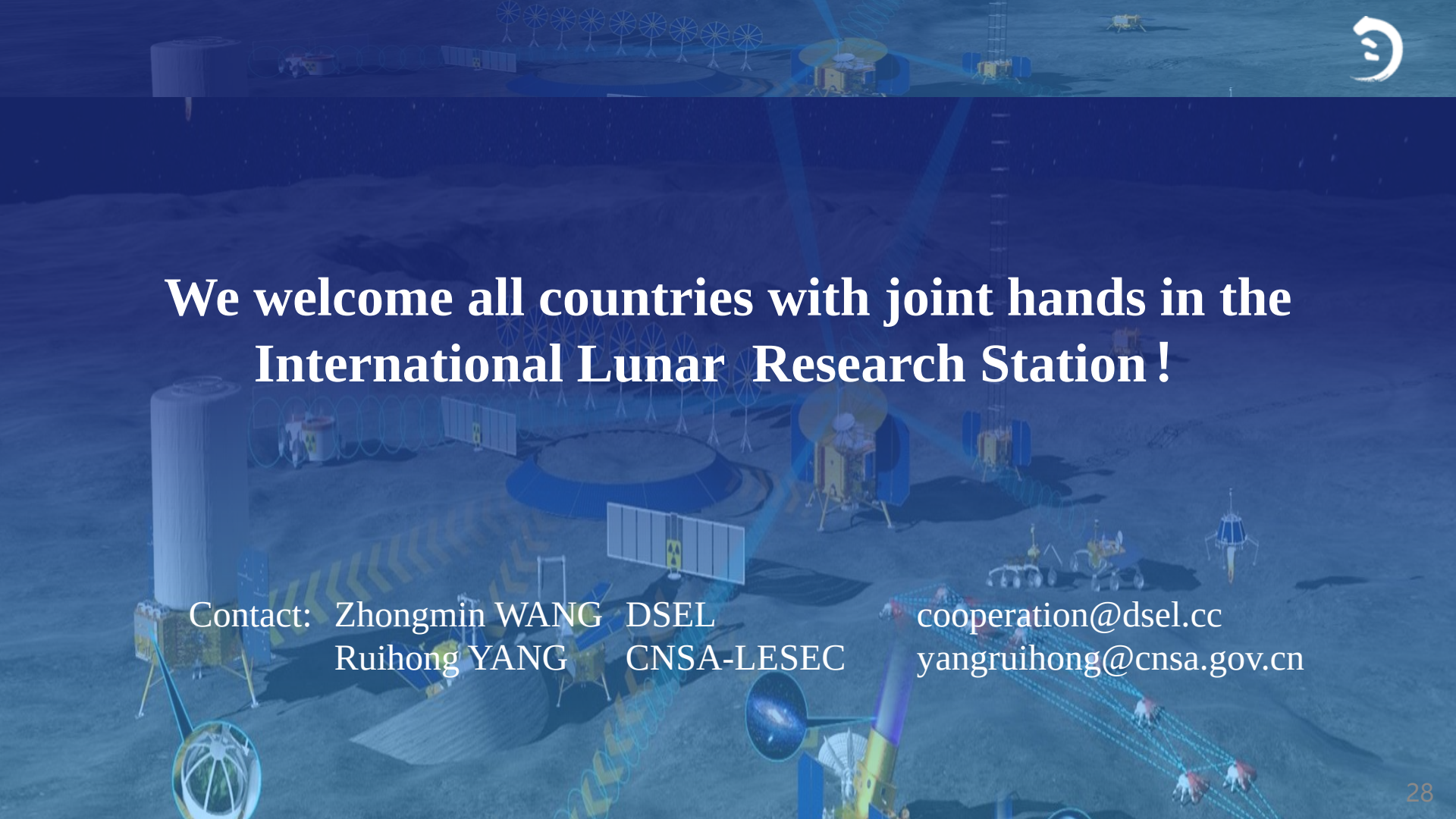
4. About DSEL

DEEP SPACE EXPLORATION LAB
深空探测实验室

Deep Space Exploration Lab (DSEL) are co-founded by CNSA, Anhui government and University of China Science and Technology on 2022.

Currently, DSEL is the major contractor for China Luner Exploration mission and International Lunar Research Station (ILRS) project and cooperation.

Welcome all international partners to participate into this cooperation!



We welcome all countries with joint hands in the International Lunar Research Station !

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