

MIRAI★

ENGINEERING

— A GRAND OPPORTUNITY FOR THE FUTURE —

## COMPANY OUTLINE

## CONTENTS

■ OUR MISSION	02
■ AT A GLANCE	03
■ MIRAI ENGINEERING	05
■ ENERGY VALUE CHAIN	07
■ GLOBAL ENVIRONMENTAL ENGINEERING	11
■ CHIYODA AI SOLUTION	15
■ SERVICE	17
■ CSR VALUE AND THE VALUE CREATION STORY	19
■ GLOBAL NETWORK	21



Laffan Refinery (Qatar)

photo Laffan Refinery Company Limited 2

## Energy and Environment in Harmony

Chiyoda Corporation is a world-leading, fully integrated international engineering company and EPC contractor.

We apply our technological expertise and extensive project execution experience by providing planning, engineering, procurement, construction, operation and maintenance services in a wide range of business fields including oil & gas, chemicals and petrochemicals, pharmaceuticals, environmental technology, renewable energy, social infrastructure and industrial facilities. Since its founding in 1948, Chiyoda has provided Project Lifecycle Services in the successful completion of numerous projects in over 60 countries around the world.

While global energy demand from growing economies steadily increases and the shale gas revolution affects the energy demand and supply balance, society is simultaneously undergoing a transition towards low-carbon emissions.

As a leader in energy-related technology, we use engineering to conquer business challenges with the aim of achieving a balance between energy consumption and preserving the environment.

Chiyoda continues to develop these strengths in the pursuit of a sustainable future for society based on our corporate philosophy of 'Energy and Environment in Harmony'.

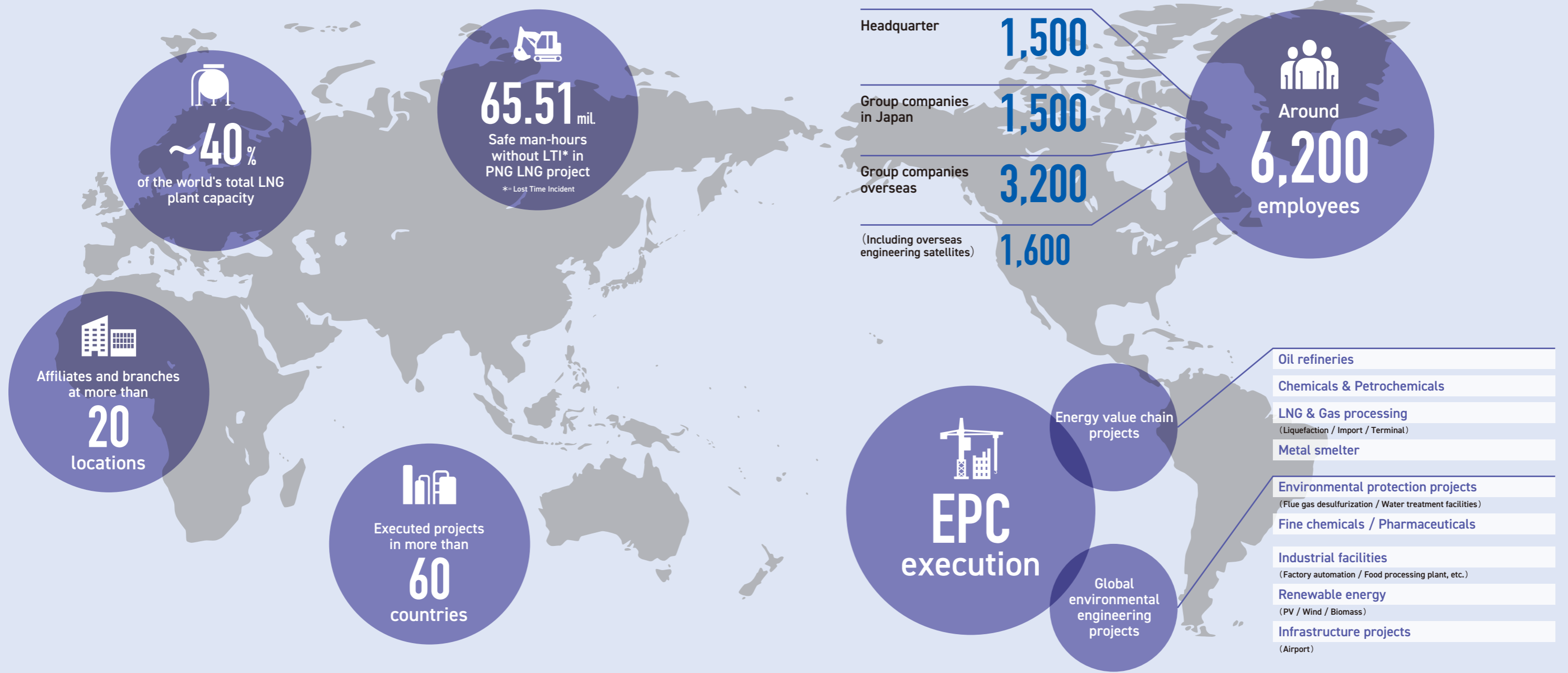
# OUR MISSION

# AT A GLANCE

Chiyoda Corporation is a world-leading, integrated engineering and construction company.

The Chiyoda Group has developed its cutting-edge technology in this highly challenging industry and a wealth of experience throughout the last seven decades.

The Chiyoda Group provides excellent services backed by ample experience and technical knowledge, while striving for vital business with 'Energy and Environment in Harmony.'



# MIRAI ENGINEERING

-A GRAND OPPORTUNITY FOR THE FUTURE-  
KEY MANAGEMENT ISSUES OVER THE MEDIUM TERM

Chiyoda Group has released a medium-term management plan, 'Mirai Engineering -A Grand Opportunity for the Future' for the period starting from fiscal year 2017 to 2020 (the MTMP). The aim of the MTMP is for Chiyoda Group to be a global top-tier 'Integrated Engineering and Service Provider' in the fields of energy and environment.

Given macro trends such as changes in the supply and demand structure for energy, heightened awareness of the global environment and digital innovation driving changes in industrial structure, Chiyoda Group will

1) provide technological strength and project execution capabilities, as the core value, that achieve harmony

between energy and the environment;

2) contribute to the development of a sustainable society;

3) and create a corporate management structure that resonates with all stakeholders and earns their recognition and trust.

In the MTMP, we will seek to simultaneously pursue (i) creating a solid management base for future growth (Structural Reform) and (ii) expanding business fields and transforming the business model looking ahead 10 years (Growth Strategy).

## STRUCTURAL REFORM

### (1) Further strengthen risk management capabilities

We will strengthen the structure for execution and profitability management of EPC projects on a consolidated basis. We will also establish a structure for expansion of business fields and the transformation of the business model.

### (2) Increase basic earnings strength and enhance resilience to downturns

We will seek to expand basic earnings by reinforcing technological strength and project execution capabilities and cost competitiveness, reduce consolidated

fixed costs with the aim of balancing basic earnings and costs, and redefine the domestic and global operational structure.

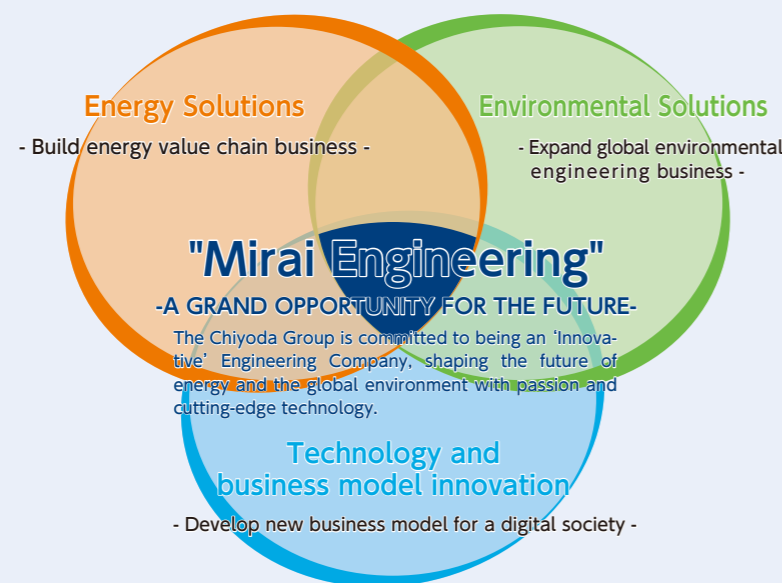
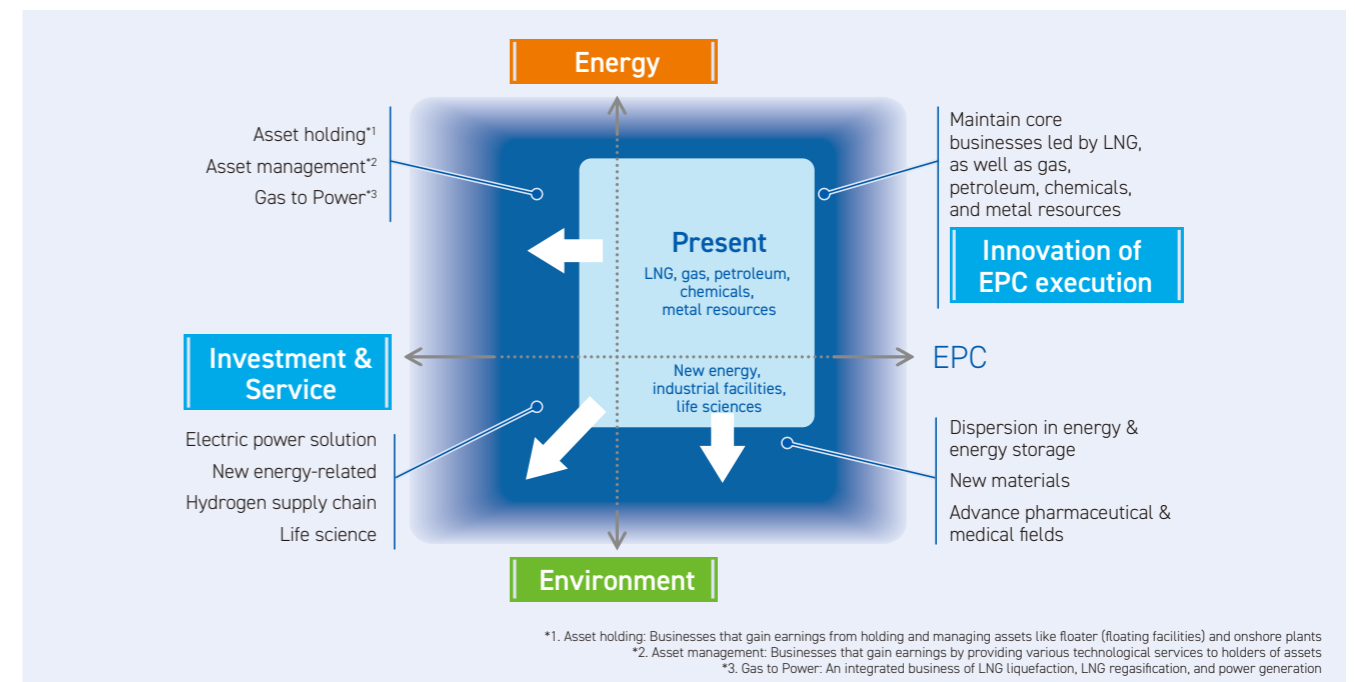
### (3) Further expand human resource base

To reinforce our technical strength and project execution capabilities, we will realign the human resource development system with a medium- to long-term outlook and implement optimal assignment of human resources for continuous earnings growth. Through these efforts, we will foster a stronger corporate culture and foundation with high loyalty and a willingness to pursue new challenges.

## GROWTH STRATEGY

### (1) Expansion of business fields and transformation of the business model

The fields of EPC, LNG, gas, petroleum, chemicals and metal resources will remain the Chiyoda Group's core businesses. In addition, we plan to expand the two key business fields of energy and the environment. And we aim to innovate EPC execution and diversify our business into investment and service areas by utilizing innovative digital technologies.



### (2) Build energy value chain business

We plan to enhance the three segments; upstream (enter and strengthen floater business), midstream (comprehensively strengthen and expand LNG lineup) and downstream (build up orders in petroleum, chemicals and metal resources responding to shale and increasing demand from newly developing countries. Also, enter the Gas to Power business). In addition, we aim to move into the asset holding business and asset management business.

### (3) Expand global environmental engineering business

We will increase the contribution to profit with new energy (integration of renewable energy with energy storage, electricity storage as well as dispersion energy), the environment, energy conservation and industrial facilities (technologies that reduce environmental impact and conserve energy for industrial facilities and metal resources fields) and life science (pursue business opportunities and models in cellular, tissue and gene therapies).

### (4) Develop new business model for a digital society

For promotion of the use of digital technologies, companywide, innovative EPC execution and encouraging its application in the asset management business, we will work on cultivating capable human resources, partnering with cutting-edge digital technology companies and innovating project IT with artificial intelligence (AI) and others.

# ENERGY VALUE CHAIN

Chiyoda contributes to the sustainable development of society by engineering and constructing upstream to downstream energy projects that satisfy customer requirements by efficiently utilizing fossil fuels and mineral resources.

Floating LNG Plant



PNG LNG Project (Papua New Guinea)



photo Courtesy of ExxonMobil Development Company  
Courtesy of ExxonMobil PNG Limited

## Offshore & Upstream ~Contributing to natural resource exploration~

Chiyoda collaborates in the initial stages of natural resource exploration projects with Xodus Group (Hoidings) Ltd., a British company with extensive oil and gas exploration experience, and improves midstream, downstream and plant profitability by implementing total project plans to optimize operations.

Chiyoda completed a Floating Gas Processing Plant off the coast of Indonesia in 2017 and plans to continue participating in the Floating Unit business field by engineering and constructing Floating LNG Plants (FLNG), Floating Production, Storage and Offloading Facilities (FPSO) and Floating LNG Power Vessels (FLPV).

Sabetta-Firstcargo2017



photo Courtesy of JSC Yamal LNG

# ENERGY VALUE CHAIN

## Midstream ~Developing into the world's No.1 LNG Contractor~

As the world's No. 1 LNG Contractor, Chiyoda has participated in 40% of global LNG production capacity and successfully completed LNG projects in seventeen countries, while Chiyoda has participated in approximately 50% of the LNG receiving terminal projects in Japan, the world's largest LNG importer.

Chiyoda will continue to be a guardian for the global environment by securing future projects in LNG, an environmentally friendly source of energy.

## Downstream ~Pursuit of fossil fuels and mineral resources~

Since its foundation in 1948, Chiyoda has engaged in more than eight hundred petroleum refinery projects, more than six hundred petrochemical and chemical projects and has recently completed nonferrous metal projects in Southeast Asia and the Middle East.

LNG Plant (Qatar)



Titanium Sponge Plant (Saudi Arabia)



photo Courtesy of Qatargas Operating Company Limited  
Courtesy of Advanced Metal Industries Cluster and Toho Titanium Metal Company Limited (ATTM)

Condensate Refinery



photo Courtesy of Qatargas Operating Company Limited

# GLOBAL ENVIRONMENTAL ENGINEERING

In the quest for sustainable global development, Chiyoda combines energy source engineering with the development of environmental and life science technology into a new business segment, Global Environment Engineering.

CIS Solar Cell Plant and Mega Solar (Japan)



Pilot Plant for Production of Renewable Jet and Diesel Fuels (Japan)



photo Courtesy of Solar Frontier K.K.  
Courtesy of euglena Co., Ltd.

## Renewable Energy/Green Energy ~Pursuing an ideal supply of energy~

Chiyoda contributes to reducing the world's carbon footprint and protecting the environment from global warming by exploring renewable energy/green energy, including photovoltaic solar power and biomass energy which utilize natural and bio power discharge.

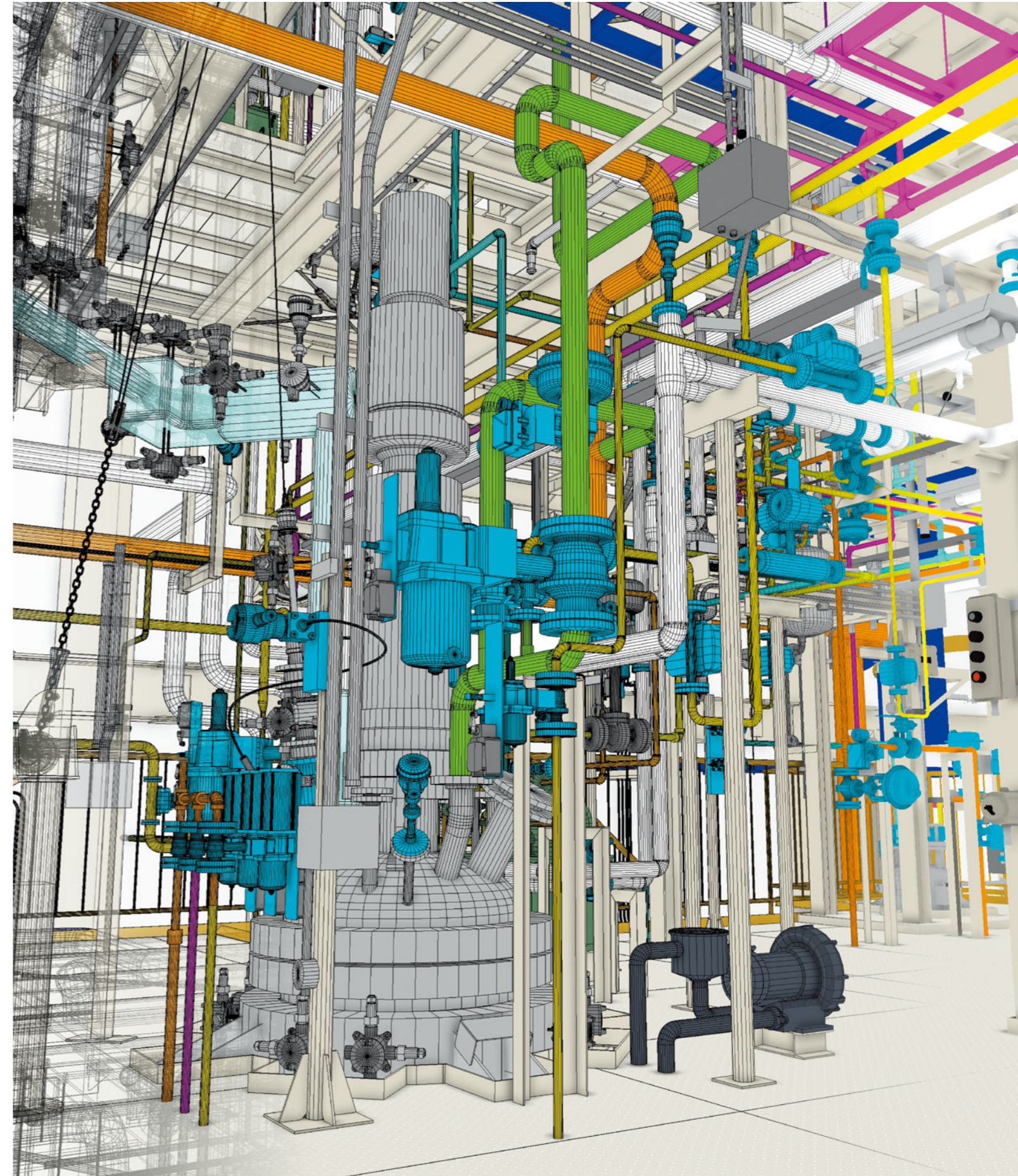
By blending fossil fuels and new technology for renewable/green energy from battery sources, Chiyoda is pursuing the most ideal combination for the supply of energy.

## Environmental Preservation and Industrial Facilities ~Preserving the global environment for the next generation~

To fulfill our 'Energy and Environment in Harmony' corporate philosophy, Chiyoda contributes to protecting the environment by utilizing our technologies for water purification and preventing air pollution.

Chiyoda also serves clients by engineering and constructing industrial facilities such as food factories and automobile assembly plants.

Advanced Material Plant ("Chiyoda Visual Management" rendering)



# GLOBAL ENVIRONMENTAL ENGINEERING

Advanced Pharmaceutical Plant to Manufacture Injection (Japan)



Flue Gas Desulphurization Plant (CT-121) (USA)



GMP Vector Manufacturing Plant for Tissue Engineering (Japan)



photo Courtesy of CMIC CMO Co., Ltd.  
 Courtesy of Georgia Power Co.  
 Courtesy of I'ROM Group Co., Ltd. / ID Pharma Co., Ltd.

## Life Sciences

~Engineering the preservation of our health and well-being.~

Careful management and high levels of engineering skill are required to satisfy stringent international standards and protect our health and well-being in the manufacture of pharmaceutical products.

Chiyoda provides total engineering services, perfected from the successful completion of more than 500 pharmaceutical related projects over 40 years, to meet customer globalization, diversification and manufacturing efficiency requirements.

Recently, Chiyoda has also engaged in regenerative medicine processes.

## SPERA Hydrogen®

~Establishing a hydrogen supply chain~

The use of hydrogen as a viable source of energy has long been considered a distant dream due to seemingly insurmountable hurdles to its safe and economical storage and transportation. Chiyoda's proprietary technology, SPERA Hydrogen®, transforms this dream into reality by reliably storing and transporting hydrogen in stable liquid form at ambient room temperature and pressure.

As a further step towards a zero emission society, Chiyoda will implement its SPERA Hydrogen® technology by establishing an international hydrogen supply chain, consisting of a hydrogenation plant in Negara Brunei Darussalam and a dehydrogenation plant in Kawasaki's coastal region of Japan, in 2020.

The Dehydrogenation Plant in TOA OIL's Keihin Refinery, Kawasaki's Rinkai Industrial Area and Port (Japan)



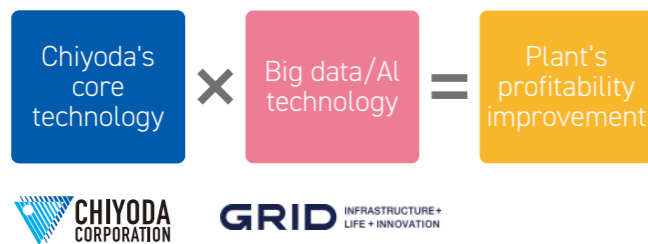
Facilities for Solid Preparation (Japan)

photo Chiyoda Corporation  
 Courtesy of Nichi-Iko Pharmaceutical Co., Ltd.



# CHIYODA AI SOLUTION

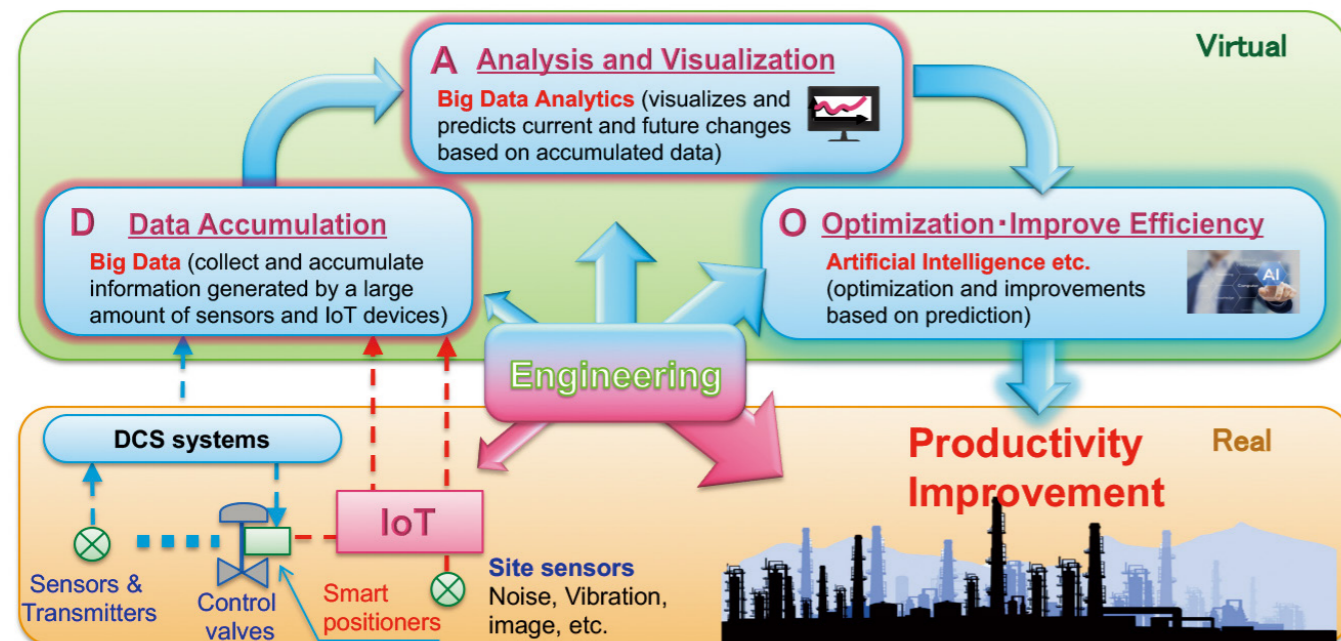
Chiyoda's advanced services based on combination of Chiyoda's core and Big Data/Artificial Intelligence (AI) technology can improve a plants' profitability by enhancing its reliability, which is backed up state-of-the-art AI technologies provided by GRID.



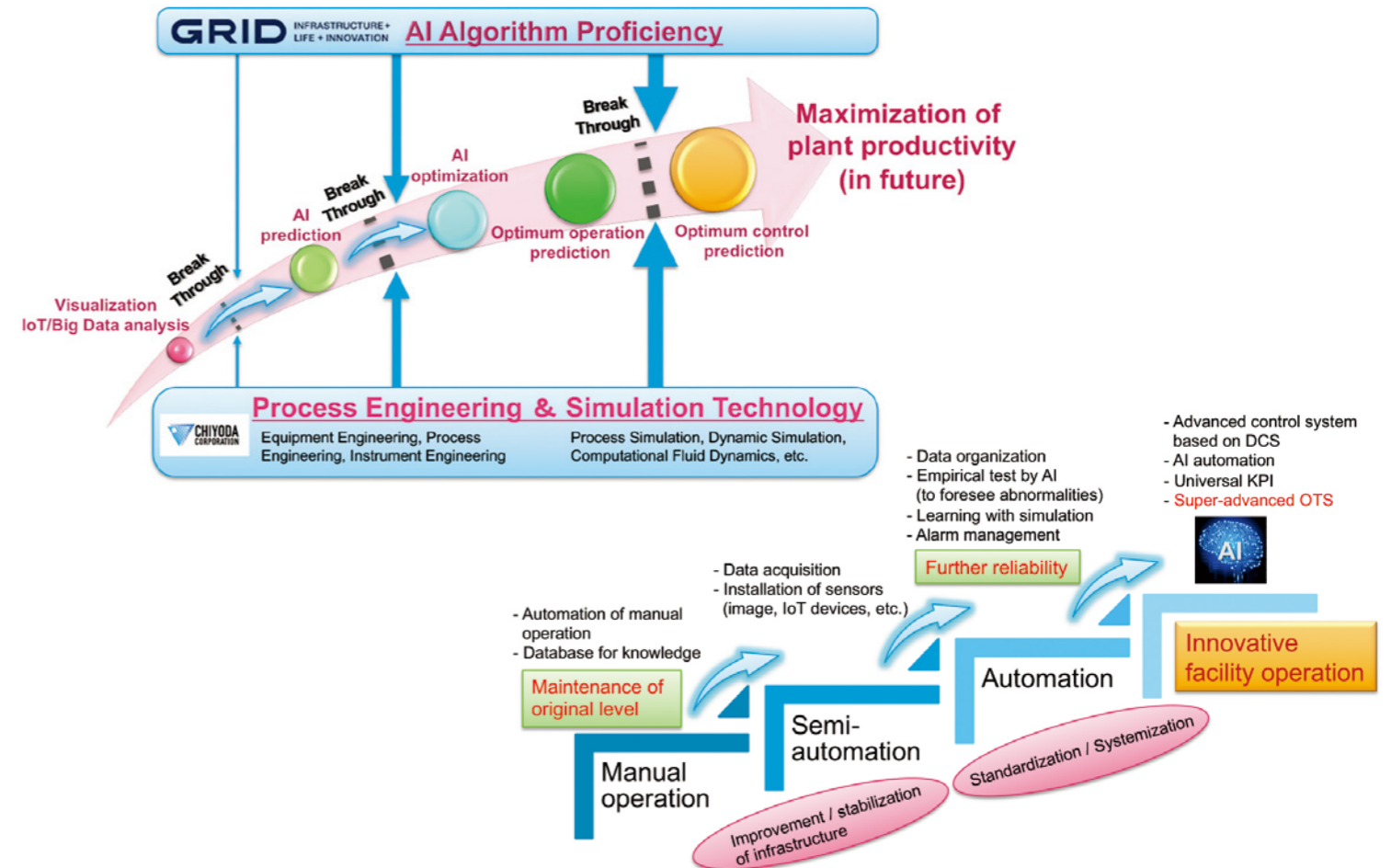
## Chiyoda's IoT / Big Data Analysis / AI Application Concept

Chiyoda uses Big Data Analytics to visualize and predict current and future changes based on Big Data accumulated in energy plants every second from thousands of sensors and Internet of Things (IoT) devices.

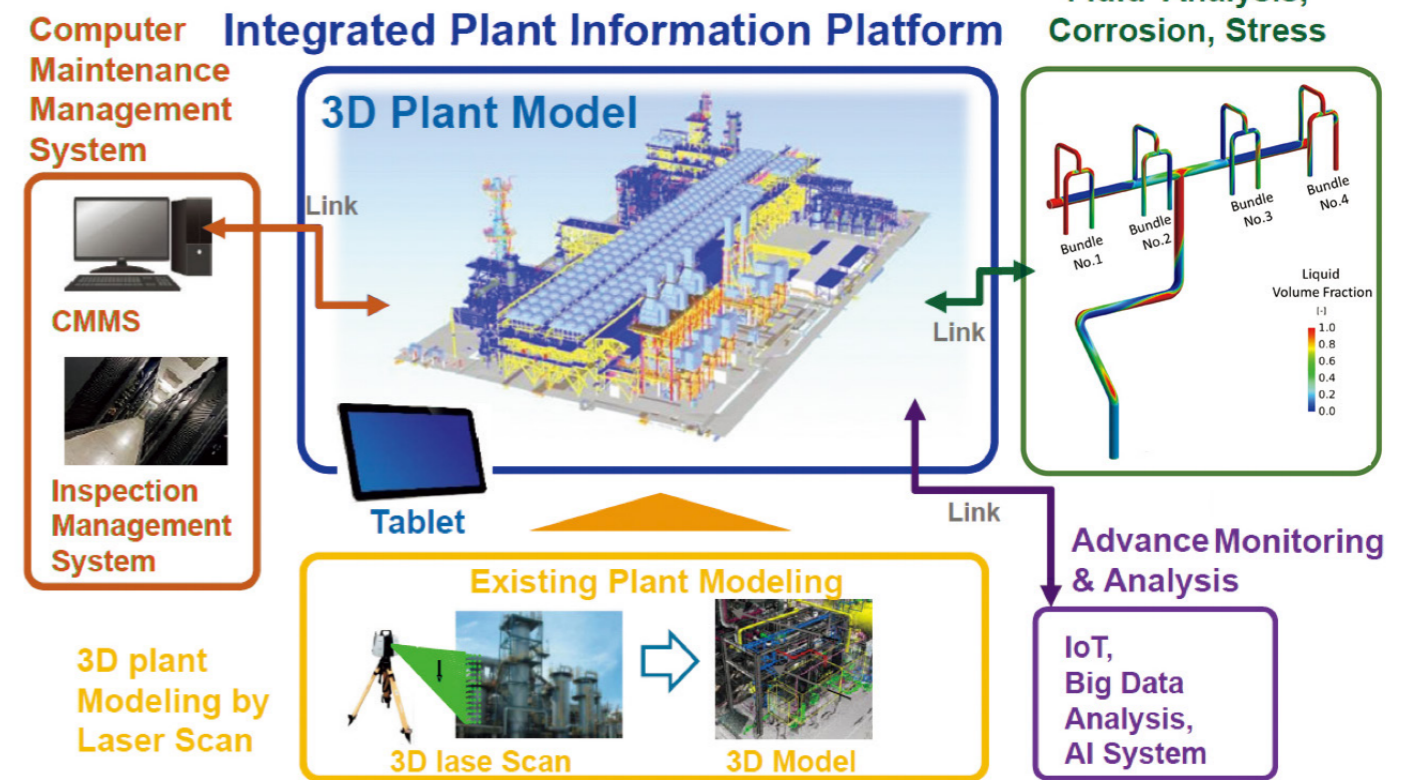
AI is used with advanced engineering technology such as computational fluid dynamics (CFD) for optimization to improve safety, efficiency and productivity.



## Chiyoda AI mission



## Digital Twin Platform



# SERVICE

Chiyoda is always ready to provide high quality service at any phase of project, anytime and anywhere in the world.

Chiyoda is engaged in numerous projects in countries throughout the world. Our activities, which are focused mainly on plant engineering, procurement and construction (EPC), are wide ranging—from energy to industrial facilities, pharmaceutical products and fine chemicals. Additionally, we are actively developing our own technologies in order to provide further advances in the fields of environmental and chemical engineering.

Using the skills and expertise we have acquired throughout the years in plant construction, we have also developed Project Lifecycle Engineering. This service helps provide support for plants and the social infrastructure throughout their entire life cycles, starting with project planning and consulting, through to engineering, procurement, construction, operation and maintenance.

### FEED<sup>※1</sup> Phase

**FEED Services**

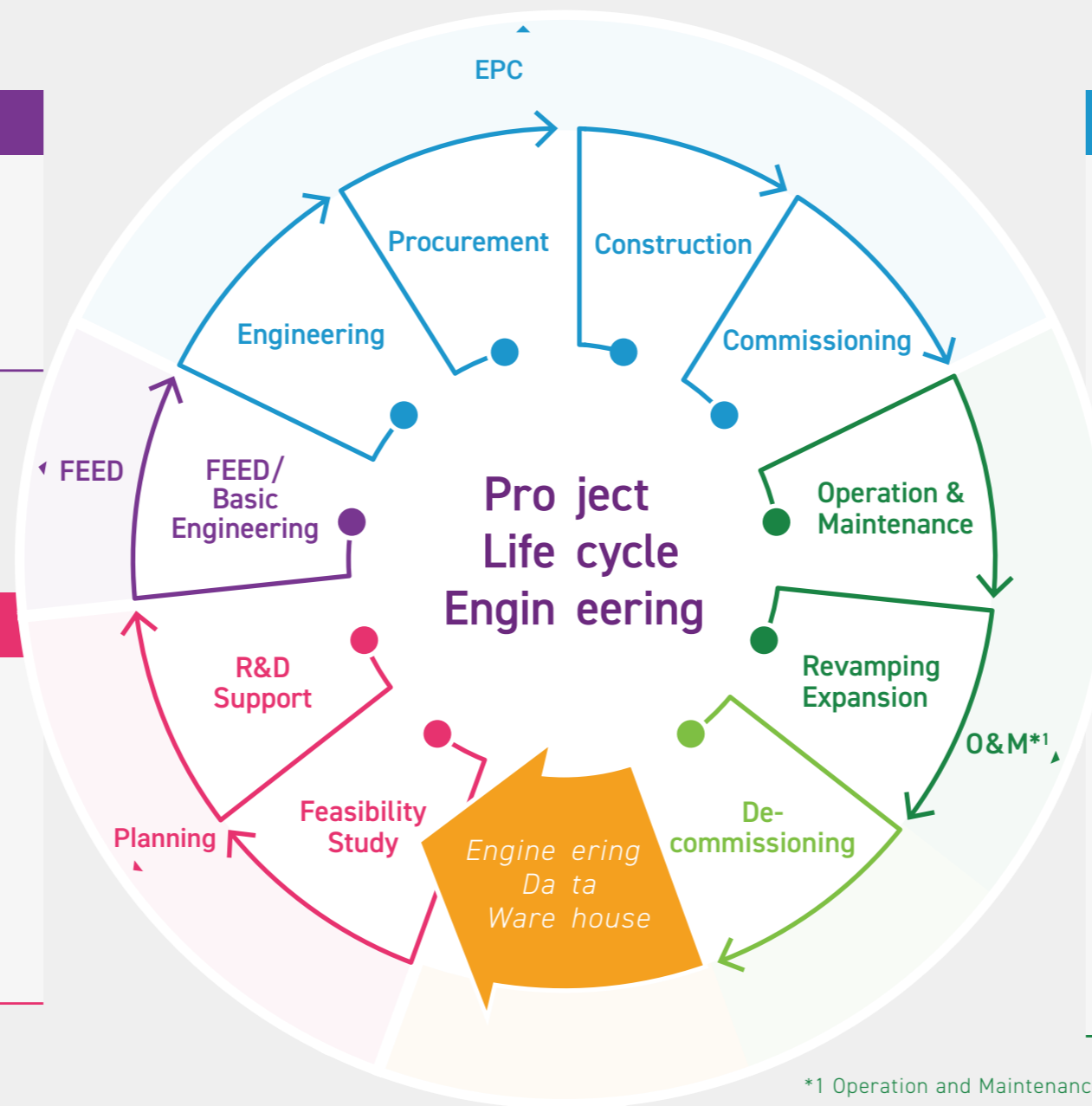
- FEED
- Basic Engineering
- Case Study / Optimization Study

※1 FEED: Front End Engineering Design

### Planning Phase

**Consulting Services**

- Conceptual Design
- Preparation of Pre-FEED
- Feasibility Study
- Process Development Support
- Technology Selection
- Construction Planning
- Existing Plant Re-use Planning



### EPC Phase

EPC Services	EPCm Services
<ul style="list-style-type: none"> <li>• Engineering</li> <li>• Procurement</li> <li>• Construction</li> <li>• Project Management</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering</li> <li>• Procurement Service</li> <li>• Construction Management</li> <li>• Project Management</li> </ul>

### Operation and Maintenance Phase

Operation & Maintenance	Asset Management Service
<ul style="list-style-type: none"> <li>• Training</li> <li>• Technology Transfer</li> <li>• Shut-down Maintenance</li> <li>• Emergent Maintenance</li> <li>• Maintenance Planning</li> <li>• Spare Parts Management</li> <li>• CMMS<sup>※2</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Risk and Reliability Management</li> <li>• Equipment and Machine Diagnostics</li> <li>• Energy Saving</li> <li>• Advanced Process Control</li> <li>• Advanced CAE<sup>※3</sup> Solutions</li> <li>• Debottlenecking</li> </ul>

※2 CMMS: Computerized Maintenance Management System  
※3 CAE: Computer Aided Engineering

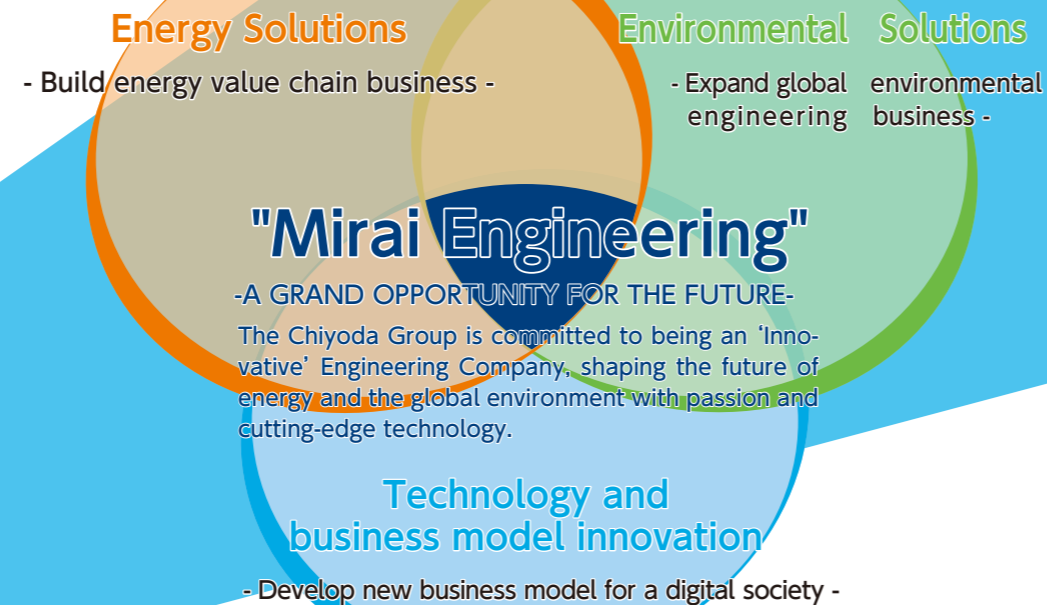
\*1 Operation and Maintenance

# CSR VALUE AND THE VALUE CREATION STORY

The Chiyoda Group pledges to continue as an enterprise that optimizes the use of the cutting-edge technology and human resources to create value for society. We have been pursuing business according to our declared corporate philosophy of 'Energy and Environment in Harmony' and with our CSR visions as our core value. In order to respond to the requirements of global markets and communities, we aim to be a global top-tier provider of comprehensive engineering services in both energy and environmental fields by implementing our medium-term management plan 'Mirai Engineering - A Grand Opportunity for the Future'.

## Medium-term management plan

**"Mirai Engineering"**  
derived from integration of three growth strategies



### Global Standards

- ISO26000
- United Nations Global Compact
- SDGs
- Paris Climate Agreement
- United Nations Convention on Biological Diversity

### Chiyoda Group CSR Value

1. A Reliable Company
2. Environmental Initiatives
3. Social Contributions
4. Respect for Human Rights
5. Commitment to Fairness

### Social Issues

- Human Rights
- Anti-Corruption
- Climate Change
- Global Warming
- Economic Disparity
- Appropriate Employment
- Individual Issues in Local Communities
- Securing Energy Resources

## Realization of the Corporate Philosophy

- The Mission for us to Accomplish -

Enhance our business in aiming for harmony between energy and the environment and contribute to the sustainable development of a society as an integrated engineering company through the use of our collective wisdom and painstakingly developed technology.



- Achievement of SDGs
- Enhancement of Corporate Value

### What are the SDGs (Sustainable Development Goals)?

These are goals that need to be realized by the year 2030 in order to achieve a sustainable development of society. They consist of 17 major goals and 169 targets that were adopted by the United Nations General Assembly in September 2015 to provide a basic framework for action in the international community of both developing and developed countries. As a member of the community, the Chiyoda Group is responding to this movement by engaging in actions intended to contribute to the achievement of the goals.



The Chiyoda Group Supports the SDGs .

# GLOBAL NETWORK

## Optimizing Chiyoda's Strength through Global Operations

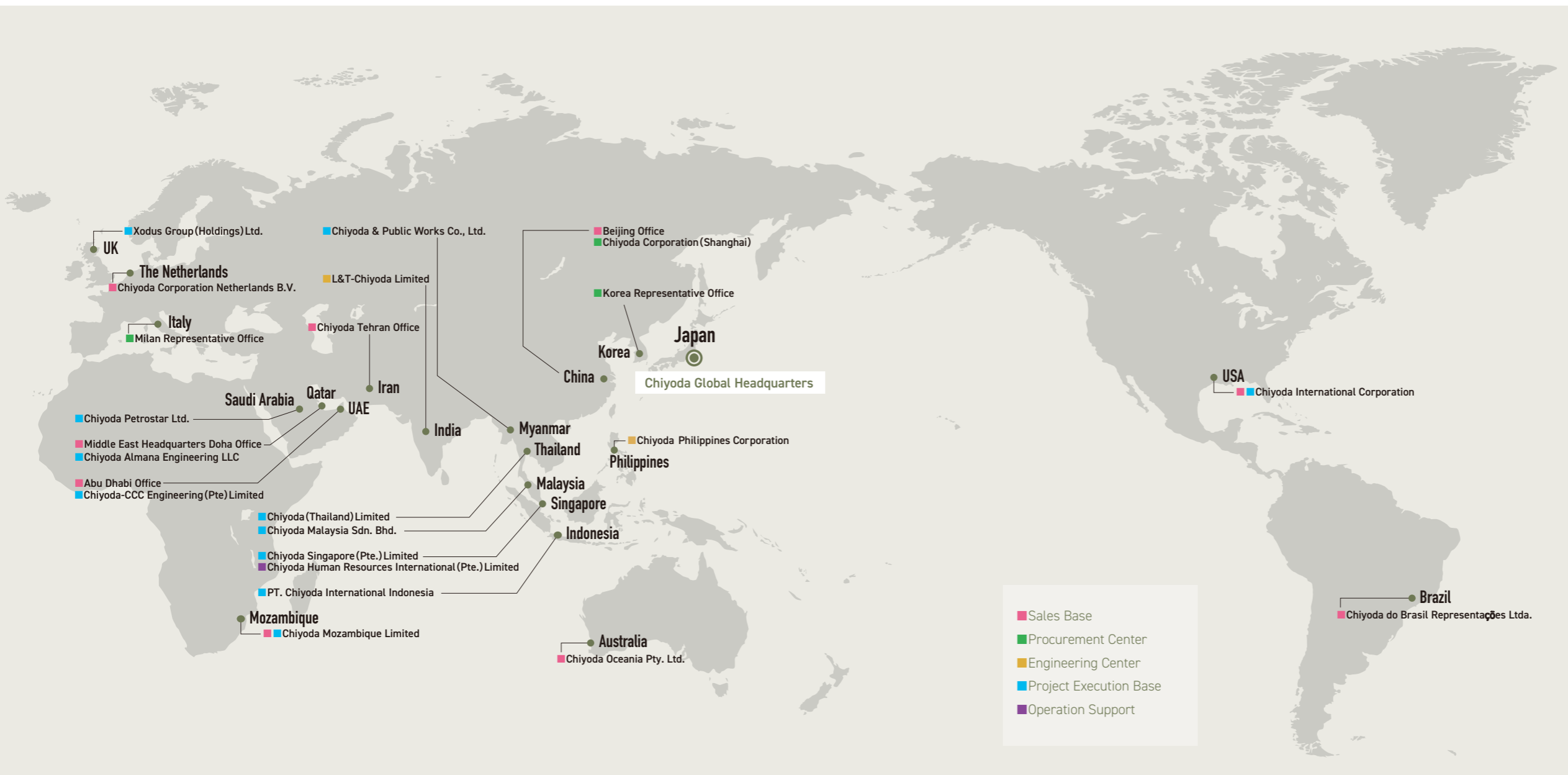
Chiyoda's global network enables Project Lifecycle Engineering to be offered all over the world. Chiyoda has expanded its network in order to provide prompt support for customers' business activities on a global scale. We pursue a group operation style based on region, business fields and function under the core strategy of CGH (Chiyoda Global Headquarters).

Our services cover the entire life cycles of project—from planning, engineering, procurement and construction through operation and maintenance. With a view to meeting the ever-changing needs of our customers, we offer services by utilizing local offices and group companies with a thorough knowledge of the latest local and global circumstances in countries around the world.

※CGH : Chiyoda Global Headquarters

## Corporate History

- 1948 Foundation of the Company.  
Receipt of the first order (Oil extractor).
- 1949 Receipt of the first order for a cracking plant.
- 1960 Receipt of an order of grass-roots refinery in Mizushima.
- 1961 Listed on the first section of Tokyo Stock Exchange.
- 1966 Receipt of the order for Jeddah Refinery in Saudi Arabia.
- 1972 Published a booklet "Legacy for the 21st Century" (Environmental Declaration).
- 1973 First order awarded for LNG plant (UAE).
- 1984 First order awarded for CT-121 Flue Gas Desulfurization plant (USA).
- 1994 Foundation of Engineering Center (India).
- 1995 Foundation of Engineering Center (The Philippines).
- 1999 Commended by the Project Management Institute for Qatargas LNG project as the "International Project of the Year".
- 2000 Received from the Japan Industrial Journal "the Grand Prize for the Global Environment Award".
- 2001 Expansion of natural gas related business.
- 2003 Receipt of the order for Sakhalin II LNG Project. Achieved no LTI throughout the year at domestic projects.
- 2004 Order awarded for 6 trains of the world's largest LNG plants for Qatargas and RasGas from 2004 to 2005.
- 2008 The 60th anniversary of our company's establishment. Capital and Business Alliance with Mitsubishi Corporation.
- 2012 Receipt of the order for Ichthys LNG Project (Australia).
- 2013 Order awarded for refinery and petrochemical complex (Vietnam). Formed a strategic capital alliance with Xodus Group to expand into offshore and upstream business fields. Confirmed proof of concept for SPERA Hydrogen®, a system and technology for massive H2 storage and transportation, through 10,000 hours of operation in its demo plant.
- 2014 Order awarded for Cameron LNG Project (USA). Order awarded for Yamal LNG Project (Russia).
- 2015 Order awarded for Titanium Sponge Plant (Saudi Arabia). Order awarded for Freeport LNG Project Train 3 (USA).
- 2016 Order awarded for Tangguh LNG Project Train 3 (Indonesia). SPERA Hydrogen® received "2016 Nikkei Global Environmental Technology Awards."
- 2017 Announced Medium-Term Management Plan "Mirai Engineering" - A Grand Opportunity for the Future.



## Major Group Companies in Japan



Engineering, construction and maintenance of domestic energy and chemical plants; life and non-life insurance agent



Engineering, procurement, construction and maintenance of electrical and instrumentation, and of social infrastructures. Consulting, development and operation for integrated IT systems



Engineering, construction, supervision, surveying, planning and consulting for research laboratories and fine chemical and hydrocarbon facilities



Feasibility studies and consulting for energy, oil, chemical and environment-related plants and various types of industrial facilities



Business travel and relocation agent; materials export and air cargo agent



## Chiyoda Corporation

Minato Mirai Grand Central Tower  
4-6-2, Minatomirai, Nishi-ku, Yokohama  
220-8765, Japan

[www.chiyodacorp.com](http://www.chiyodacorp.com)

WE SUPPORT



The Chiyoda Corporation is a signatory of the United Nations Global Compact.



FTSE4Good

The Chiyoda Corporation has been included in the FTSE 4 Good Index Series, designed by FTSE Russell (United Kingdom), index of socially responsible investment.



FTSE Blossom Japan

The Chiyoda Corporation has been included as one of the constituent companies in the FTSE Blossom Japan Index designed by FTSE Russell (United Kingdom).



Member of SNAME Sustainability Index 2017

The Chiyoda Corporation is the constituent company of SNAME Sustainability Index.