

Contribution of Cogeneration Systems to Sustainable Development Goals

What are SDGs?

1. Background

The issues currently facing the world — such as poverty, inequality and climate change — are global in scope and intimately connected with one another in terms of their **economic, social and environmental** aspects. Resolving these issues will require efforts and cooperation that go beyond national boundaries, involving nations, municipalities, companies and civil society.

2. Objectives

The Sustainable Development Goals (SDGs) are common objectives of the international community, agreed upon in 2015 by a unanimous vote of U. N. member countries. The SDGs portray an ideal world and identify the global-scale issues that should be prioritized and solved to ensure sustainable development by 2030. Their aim is to bring about efforts on a global scale based on a series of common objectives and targets.

3. Description

The SDGs comprise **17 goals** and **169 specific targets**. They cover a wide range of issues relating to sustainable development and other matters that require action and should be dealt with on a global scale by entities that include governments, companies and voluntary organizations.

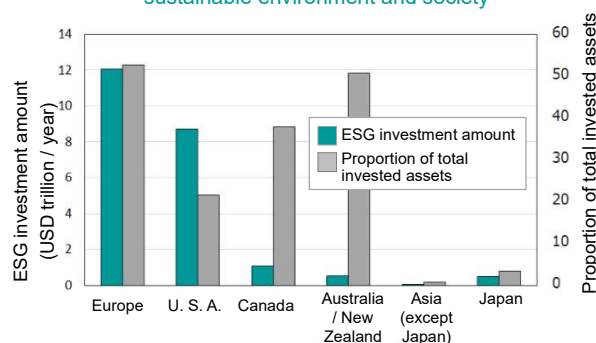
The 17 goals

Global common blueprint agreed upon by the United Nations to achieve a better and more sustainable future, solving various issues regarding economy, society and the environment

1 NO POVERTY	No Poverty	10 REDUCED INEQUALITIES	Reduced Inequalities
2 ZERO HUNGER	Zero Hunger	11 SUSTAINABLE CITIES AND COMMUNITIES	Sustainable Cities and Communities
3 GOOD HEALTH AND WELL-BEING	Good Health and Well-Being	12 RESPONSIBLE CONSUMPTION AND PRODUCTION	Responsible Consumption and Production
4 QUALITY EDUCATION	Quality Education	13 CLIMATE ACTION	Climate Action
5 GENDER EQUALITY	Gender Equality	14 LIFE BELOW WATER	Life Below Water
6 CLEAN WATER AND SANITATION	Clean Water and Sanitation	15 LIFE ON LAND	Life on Land
7 AFFORDABLE AND CLEAN ENERGY	Affordable and Clean Energy	16 PEACE, JUSTICE AND STRONG INSTITUTIONS	Peace, Justice and Strong Institutions
8 DECENT WORK AND ECONOMIC GROWTH	Decent Work and Economic Growth	17 PARTNERSHIPS FOR THE GOALS	Partnerships for the Goals
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	Industry, Innovation and Infrastructure		

ESG investment in each part of the world and proportion of total invested assets

Investments in Europe and the United States and other parts of the world take into account the formation of a sustainable environment and society



Source: Prepared based on GSIA, Global Sustainable Investment Review 2016

The Circumstances Surrounding SDGs

1. Government activities (in Japan)

The Japanese government is taking the lead in efforts to achieve SDGs. The government has established “SDGs Promotion Headquarters” chaired by the Prime Minister, and is formulating “SDGs Implementation Guiding Principles” and an “Expanded SDGs Action Plan”. The government also encourages local governments to introduce SDGs, selecting “**SDGs Future Cities / SDG Model Projects**” and providing financial assistance to local governments that propose outstanding activities to achieve SDGs.

2. Economic activities

Companies that incorporate the Environmental, Social and Governance (ESG) Criteria into their activities can look forward to sustainable growth, and as a result increasingly such companies are likely to be investment targets. **ESG investment** has become a new trend throughout the world, accounting for 26% of total investment worldwide and more than 50% of that in Europe.

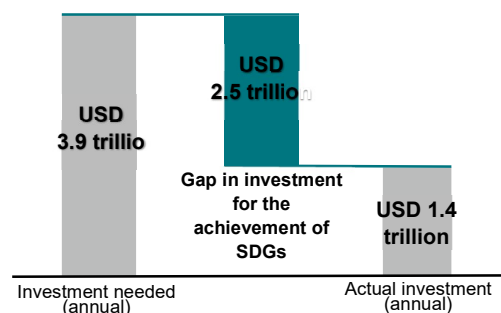
Enormous investment will be needed to achieve SDGs. As SDGs are closely related to the ESG Criteria and have become standardized worldwide, **corporate investors are trying to include corporate activities for attaining SDGs in their investment guidelines. As a result, a major market for SDGs is in the process of being formed.**

3. Consumer activities

There is now a strong view on the part of consumers that companies should contribute to resolving social issues. It goes without saying that actions rooted in social responsibility **will be a requirement for a company to be chosen by consumers.**

Estimated annual investment in 2015 - 2030 toward achievement of SDGs

Enormous investment will be needed to achieve SDGs =>

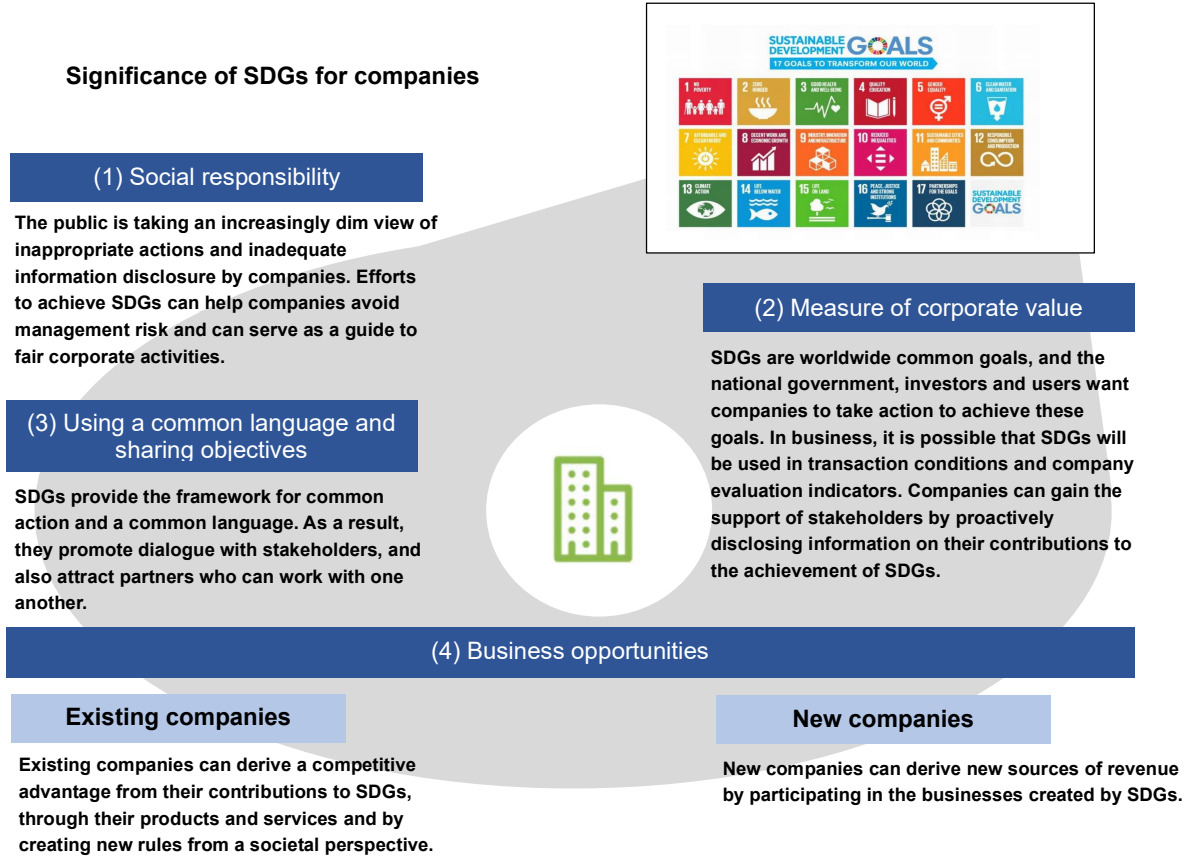


Source: Prepared based on UNCTAD, World Investment Report 2014

Significance of Introducing SDGs

1. Significance for companies

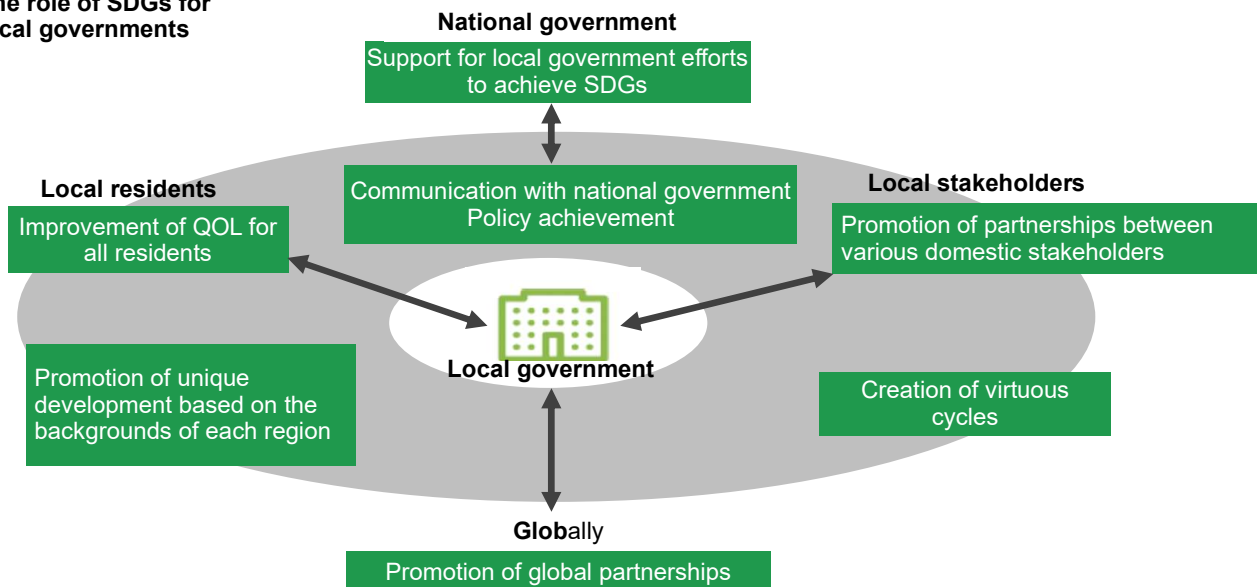
For private companies, introducing SDGs enables the company to (1) fulfill social responsibility and avoid risks (2) respond to a new indicator to measure corporate value and disclose information (3) communicate with stakeholders using a common language and share objectives (4) create opportunities for new business. These efforts can enable companies to achieve sustainable development.



2. Significance for local governments

Incorporating SDGs enables local governments to deal with a variety of issues that are important to them: people's health, education, living environment and employment, as well as urban development and vitalization of local communities. For issues such as these, SDGs serve as a common language for promoting partnerships with the national government, local communities, companies and local organizations.

The role of SDGs for local governments



To Introduce SDGs

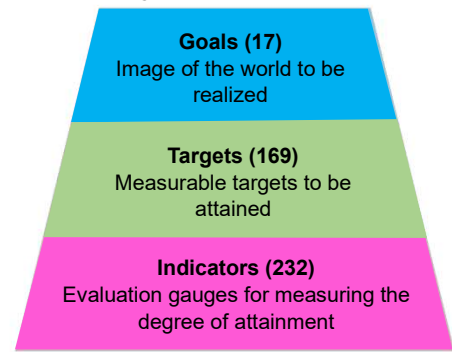
1. Understanding the SDGs

The SDGs comprise **17 goals** and **169 specific targets** for the purpose of achieving these goals. **232 indicators have been proposed for quantitative and qualitative measurement of the progress in achieving SDGs.** This creates a three-level configuration for the SDGs, made up of goals, targets and indicators.

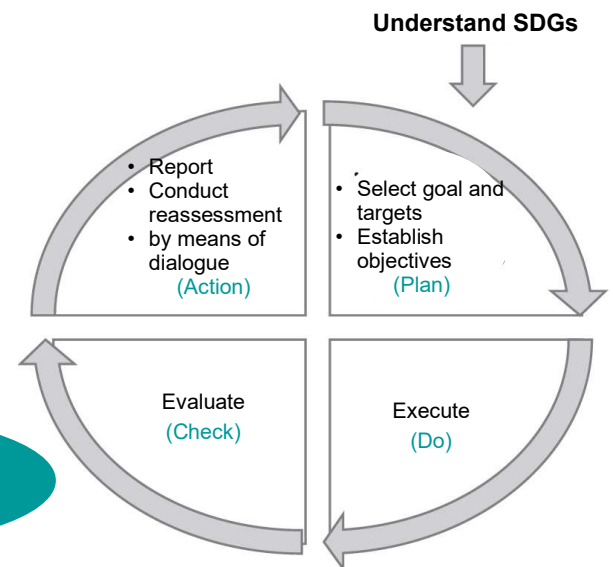
2. Understanding the procedure for activities

Activities to achieve SDGs should use the PDCA cycle (Plan, Do, Check, Action). The process begins with an understanding of the SDGs. Next, goals and targets are selected and objectives are set with respect to the targets (Plan). Then the activities are executed (Do) and evaluated (Check). Finally, reporting (on progress, issues to be resolved etc.) is conducted for the purpose of dialogue with stakeholders, and improvements are implemented based on the above activities (Action). These steps should be integrated with the PDCA cycle for improving business activities.

Three-layered structure in SDGs

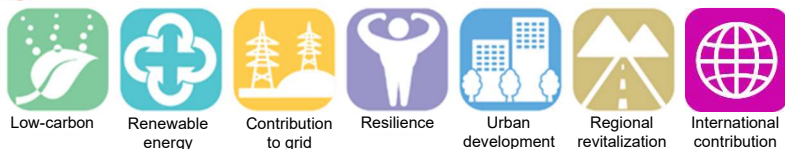


Procedures for action on SDGs



Step	Content executed
Select goals and targets	Review one's company and its value chain, and then select goals and targets, with the priority that the company can achieve the greatest impact.
Establish objectives	Establish objectives for each goal and target, considering the type of company that is desired and the contributions that it can make to society through its achievements. The objectives should be both ambitious and measurable.
Execute	Incorporate the SDG objectives into the company's management objectives, various local government plans, and the objectives of individual departments, and execute.
Evaluate	Confirm the results of execution and evaluate the degree to which objectives have been achieved. Reassess plans, etc. as needed.
Report Reassess by means of dialogue	Compile the results and disclose them publicly. SDGs can serve as a common language for dialogue with stakeholders. Through dialogue with users, investors, business partners, local residents and other stakeholders, the results can be used to set future objectives and improve business operations.

The Value Provided by Cogeneration



Cogeneration systems provide various types of value such as economics, environment, disaster prevention, urban development, regional revitalization and so on. Cogeneration systems help to promote the SDGs of companies and local governments.

(1) Shift to low-carbon energy utilization



1. Effective utilization of heat

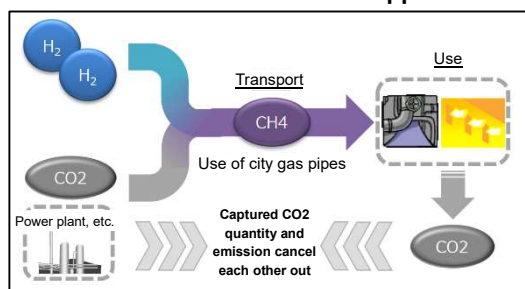
Heat use accounts for 70% of final energy consumption in Japan, and shifting to low-carbon heat sources is an important issue. In a cogeneration system, the heat produced by power generation is also assigned to various uses in a cascading manner in accordance with the temperature level. This results in a major contribution to the shift to low-carbon energy sources.

2. Contribution to the realization of a hydrogen-based society

Hydrogen is being proposed as a next-generation energy source. Fuel cells are one of the crucial technologies for hydrogen use, enabling the use of hydrogen in place of power and heat. Popularizing the use of fuel cells and reducing their cost will lead to the realization of a hydrogen-based society.

In the future, manufacturing methane from the CO₂ discharged from factories and other sources to react with hydrogen will create carbon-neutral methane whose recovered quantity will be equal to the quantity of the emission. This will result in no increase in CO₂ emission, enabling decarbonization of the existing city gas (methane) infrastructure.

The carbon-neutral methane approach

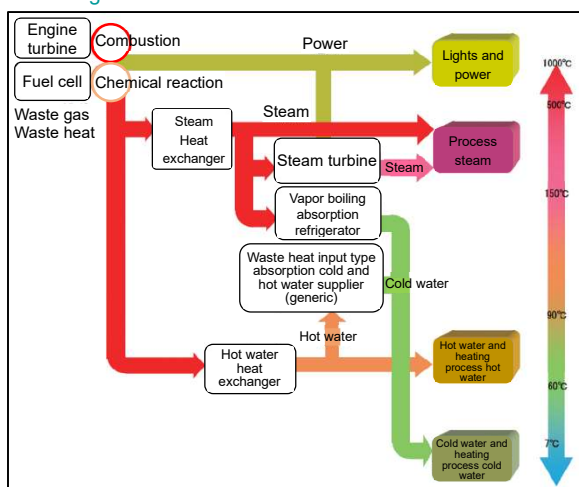


Source: Ministry of Economy, Trade and Industry
Hydrogen and Fuel Cell Strategy Council reference

If CO₂ is captured and made to react with hydrogen so that the CO₂ emission and the captured quantity cancel each other out, decarbonization of the existing city gas infrastructure will be possible with no increase in CO₂ emissions.

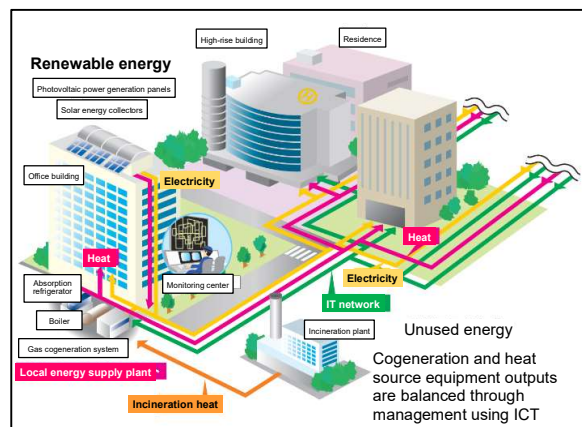
Cascading use of heat from cogeneration

Power generation at the customer's site and effective use of waste heat in accordance with the temperature level are helpful in shifting to low-carbon energy sources including heat use.



The "smart energy network" concept

The construction of a smart energy network with a cogeneration system at its core, comprising an area-wide network of the heat and electricity produced locally will optimize energy use (including renewable energy) throughout the entire region.



(2) Introduction of renewable energy



1. Use of biomass and waste fuel

Cogeneration systems can use woody biomass, wastes, the digestive gases that are produced by sewage processing and so on as fuel. This will promote the use of renewable energy.

2. Construction of a smart energy network

Construction of smart energy network will optimize energy use throughout entire regions. It will consist of a cogeneration system at its core and an area-wide network of heat and electricity produced locally. It will enable local production and consumption of renewable and unused sources of energy, through optimal energy management.



Contribution to grid

(3) Contribution to electrical power grid

1. Coordination with naturally fluctuating power sources

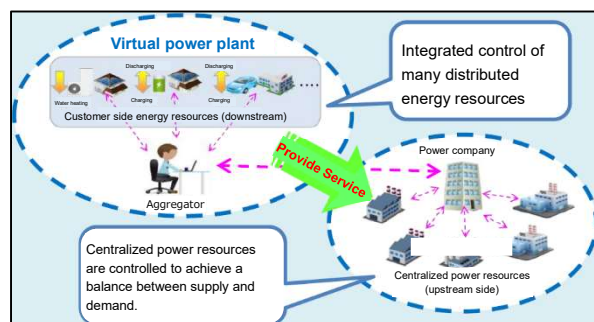
Power demand and power supply must always be in balance. However, as renewable energies such as wind power and photovoltaic power have constantly fluctuating output, a source of power to make up for the fluctuations is needed. Integrated control of distributed power sources (including cogeneration systems) and load adjustment (demand response) on the customer side can function as a single virtual power plant (VPP). This will help to balance supply and demand and promote the introduction of renewable sources of energy.

2. Improved power flow through installation of equipment near customer locations

Introduction of large scaled solar and wind power generation and other renewable energy sources in locations far from customer areas has resulted in increased investment for power transmission networks and reduced rates of utilization. Cogeneration systems are installed in regions where there is a great demand for electrical power and where power will flow in from the grid, and therefore they are expected to help reduce power transmission quantities and improve the electrical grid power flow.

VPP concept

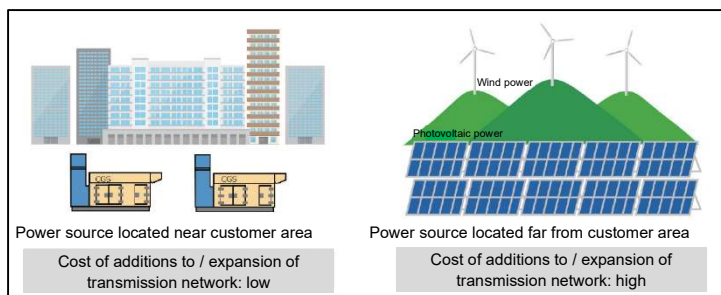
Integrated control of cogeneration systems, other distributed power sources and load adjustment (demand response) on the customer side makes them function as a virtual power plant (VPP). This helps to balance output fluctuations in the naturally fluctuating power sources.



Source: Ministry of Economy, Trade and Industry

Distance between customer areas and power plants / cost of constructing transmission networks

Cogeneration systems installed in customer areas can reduce the cost of constructing transmission networks and improve the electrical grid power flow.



Resilience

(4) Increased resilience

Introduction of cogeneration systems helps to increase the resilience of the energy supply to cope with power outages and earthquakes or other disasters.

Gas pipelines that carry city gas at medium or high pressure are designed to be earthquake-resistant. Moreover, the use of power-outage-ready equipment makes it possible to ensure long-term supply of heat and power for essential services even in the event of a power outage.



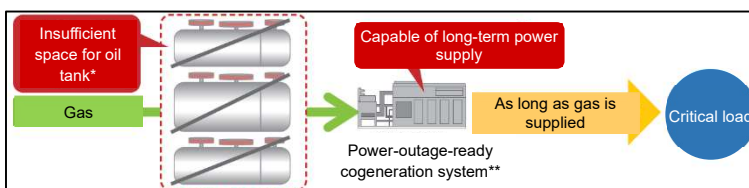
Urban development

(5) Contribution to urban development

In metropolitan cities, there is an increased need for office buildings to maintain functions in the event of a disaster, particularly for buildings in which global companies, engaged in business throughout the world, have their offices. In areas where business operations need to be maintained even in the wake of a disaster, installing earthquake-resistant gas pipelines and power-outage-ready cogeneration systems will make it possible to supply heat and power, not only to the site where the facilities are installed, but also to neighboring areas via independent transmission lines and heat conduits. This will improve the resilience of the region as a whole and help to shift to low-carbon energy society in urban areas, which will help to increase property values as well.

Role of cogeneration in BCP

Introducing cogeneration systems, which are earthquake-resistant and power-outage-ready, ensures the supply of heat and power in the event of a disaster. This improves the resilience of the region and also helps to increase property values.



Source: Prepared based on information on Tokyo Gas Co., Ltd. website

(6) Contribution to regional revitalization



Local energy businesses that use distributed energy infrastructure are expected to vitalize local economy. The use of local resources, which are produced and consumed within the region, will create sustainable virtuous economic cycles, enabling efficient energy use and ensuring energy security and creating both industries and jobs.

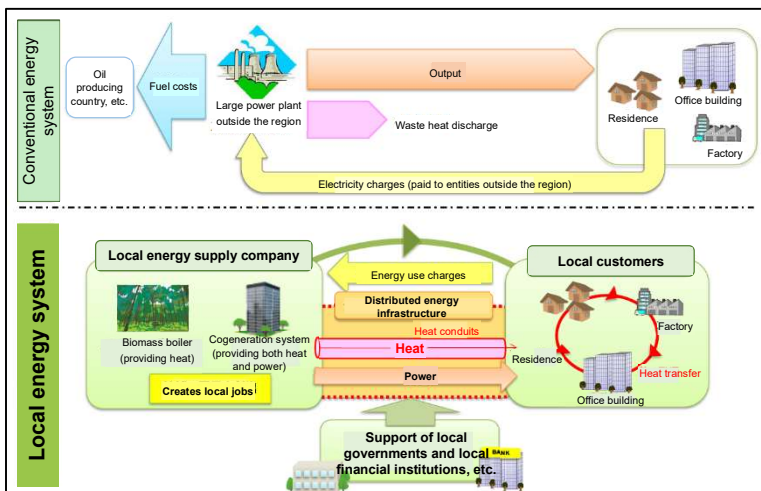
(7) International cooperation and partnerships



Energy demand in Southeast Asia is expected to grow rapidly, which will make the countries there major energy importers in the future. Participation in energy downstream sectors that include introducing cogeneration systems, which are environmentally friendly and economically viable, means creation of new business opportunities and help to provide environmental measures in other Asian countries, as well as forging friendly relations between nations.

Regional energy system and flow of funds within the region









Use of distributed energy infrastructure that makes use of regional financial resources helps to create virtual economic cycles, create industries and bring about regional revitalization.























Source: Ministry of Internal Affairs and Communications

SDGs that Cogeneration Systems can Help to Achieve

Cogeneration systems can help to achieve SDGs through the aforementioned value. The following examples show the main goals and targets that cogeneration systems can help to achieve. (Note that these are general examples only; goals and targets must be selected based on the individual cases.)

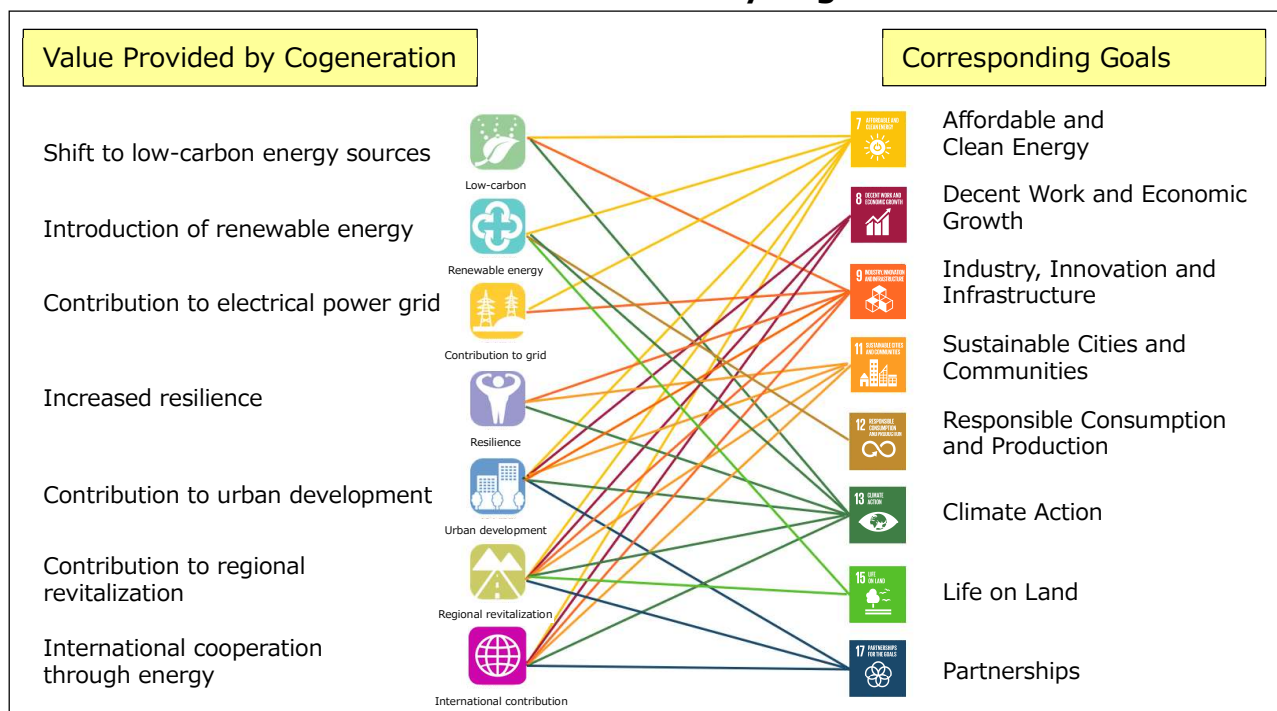
SDG		Value contributed by cogeneration system value
Goal	Target	
 Affordable and Clean Energy	7.1 By 2030, ensure universal access to affordable, reliable and modern energy services.	 Contribution to grid Urban development Regional revitalization International contribution <p>Construction of energy supply systems that (1) help to stabilize the power grid and (2) are earthquake-resistant and power-outage-ready</p>
	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix.	 Renewable energy <p>Use of cogeneration systems '(1) that are fueled by renewable energy sources, or (2) to control fluctuation of variable renewable energy sources</p>
	7.3 By 2030, double the global rate of improvement in energy efficiency	 Low-carbon Renewable energy <p>Reduced energy consumption through cogeneration systems (1) operated with high efficiency and/ or (2) fueled by renewable energy</p>
	7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing states and landlocked developing countries, in accordance with their respective programs of support.	 International contribution <p>Creation of International relationships through overseas energy infrastructure</p>
 Decent Work and Economic Growth	8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labor-intensive sectors.	 Urban development International contribution <p>Increased property values through construction of environmentally conscious and disaster resilient buildings, which also c attract high-value added industries</p>
	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.	 Urban development Regional revitalization <p>Vitalization of local economies through creation of local energy industries</p>

SDG		Value contributed by cogeneration system value
Goal	Target	
 Industry, Innovation and Infrastructure	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.	     Resilience Contribution to grid Urban development Regional revitalization International contribution Construction of energy supply systems that (1) help to stabilize the power grid and (2) are earthquake-resistant and power-outage-ready
	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.	   Low-carbon Renewable energy Contribution to grid Reduced energy consumption through cogeneration systems (1) operated with high efficiency and/or (2) fueled by renewable energy
	9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing states.	  Resilience International contribution Construction of overseas energy infrastructure
 Sustainable Cities and Communities	11.3 By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries	  Urban development International contribution Development of low-carbon, safe (1) urban cities and (2) compact cities
	11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030*, holistic disaster risk management at all levels.	   Resilience Urban development Regional revitalization Construction of energy supply systems that (1) help to stabilize the power grid and (2) are earthquake-resistant and power-outage-ready
 Responsible Consumption and Production	12.2 By 2030, achieve the sustainable management and efficient use of natural resources.	 Renewable energy Use of cogeneration systems that use renewable energy as fuel
	12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.	 Renewable energy Use of cogeneration systems that use wastes as fuel

SDG		Value contributed by cogeneration system value
Goal	Target	
 Climate Action	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.	  Resilience International contribution Establishment of energy supply systems that are earthquake-resistant and power-outage-ready
	13.2 Integrate climate change measures into national policies, strategies and planning.	     Low-carbon Renewable energy Urban development Regional revitalization International contribution Reduced energy consumption through cogeneration systems (1) operated with high efficiency and installed on-site or (2) fueled by renewable energy
 Life on Land	15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.	  Renewable energy Regional revitalization Use of cogeneration systems that use forestry byproducts as fuel
 Partnerships	17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.	   Urban development Regional revitalization International contribution Contribution to vitalization of local economy and the shift to low-carbon society, which strengthen communication and relationship among various groups, such as local governments, companies, voluntary organizations and citizens

* Activities that should be conducted to prevent disasters, adopted at the UN World Conference on Disaster Reduction (held in Sendai in March 2015). Includes understanding disaster risks, strengthening governance, investment to reduce risks, activities for recovery and reconstruction etc.

Correlation Between Value Provided by Cogeneration and Goals



Contribution of Cogeneration Systems to Sustainable Development Goals Reference Guide

You can download a copy of this Reference Guide at the following URL:

Advanced Cogeneration and Energy Utilization Center Japan (ACEJ) website:

<https://www.ace.or.jp/>



Contents

1. What are SDGs?
2. Significance of Introducing SDGs (for companies)
3. Significance of Introducing SDGs (for local governments)
4. Understanding SDGs
5. Contribution to SDG Achievement through Introduction of Cogeneration Systems
6. SDGs that Cogeneration Systems can Help to Achieve

Currently Japanese version only

コージェネレーションの
SDGs への貢献
参照ガイド



2019年1月31日

コージェネ財団

Icons showing the value provided by cogeneration systems

The following icons symbolizing the value provided by cogeneration systems are available for use. (These icons can also be downloaded at the ACEJ website.)

