A Comparative Study of Representative Electric Utility Companies Taking Community-based Strategy in the United Kingdom and the United States

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Electric system reform has been progressing step-by-step in Japan after the Great East Japan Earthquake in 2011. Meanwhile, each electric utility company has not necessarily been aware of how to proceed and what to aim for after the electric system reform. In a sense, it seems to be close to actuality that each electric utility company is preparing to cope with reform without looking ahead.

In this paper, we compare the representative electric utility companies in the UK and the US. They have reached the present stage through efforts towards various reforms as a result of the advancement of the electric system reform in advance of Japan.

First, we will present an overview of the status of Japanese electric system reform and the liberalization situation, and the status of the UK and US electricity system reform and liberalization situation, in order. Then, we will compare the business activities and management situations of the two utilities in the UK and the US, based on the differences in status of the electricity system reform and liberalization in each country. The two companies are SSE plc [Scottish & Southern Energy: UK] and AEP [American Electric Power: US]. In recent years, these two companies have focused on a strategy that should be called a community-based type that maintains a certain level of market share in the domestic and local areas, rather than expanding the scale to overseas business areas. In addition, we analyze and consider case examples of strategy with emphasis on the relationship between their communities, focusing on the change in the concept of the area for each value chain that occurred along with the electric system reform.

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1. Status of electric system reform and liberalization of entry into the electric market in each country

1-1 Status of Japan's electric system reform and liberalization of entry into the electric market

The purposes of the electric system reform in Japan are the following three items: "To ensure stable supply of electricity," "To minimize electricity charges," and "To expand options for customers and business opportunities for business operators." In order to achieve these objectives, in April 2015, "the Organization for Cross-regional Coordination of Transmission Operators" was established to expand the operation of the wide-area grid system. Subsequently, in April 2016, the full liberalization of entry into the electricity retail business was introduced.





(Source) Ministry of Economy, Trade and Industry in Japan: HP

 $\mathbf{2}$

Separation of transmission and distribution companies from generation and retail companies is a major point of the electric system reform that is as important as the full liberalization of entry into the electricity retail business. For stable power supply, discussions are underway carefully by the government.

In order to deliver electricity stably, a transmission and distribution network is indispensable. In a business type that provides services while utilizing core networks such as gas, communication, and transport as well as electricity, the transmission and distribution network part is not suitable for competition, so it is separated and shared as a common part. In competitive parts, market mechanisms are introduced as policies. In order to maintain a fair competition environment in the electric utility business, it is necessary to open the transmission and distribution network part as a neutral common infrastructure. To this end, it is important to ensure the neutrality of the transmission and distribution part.

In Japan, as a method to ensure neutrality, preparations for legal separation of transmission and distribution companies from generation and retail companies are underway. This is a method where the capital relationship between them is accepted if the independence can be secured by strict information blocking between them.

Figure 1-2 Legal separation method under examination in Japan for separation of transmission and distribution companies from generation and retail companies



(Source) Created by author based on Ministry of Economy, Trade and Industry in Japan: HP

As shown in Figure 1-2, the Japanese government is currently under consideration as a method for separation of the transmission and distribution network part based on (1) a holding company system, or (2) a generation and retail integration system. In the case of (1), it is a method of setting a generation company, a

<Current status>

transmission and distribution company and a retail company under a holding company that is not in the electric utility business. It is also possible for the generation company and the retail company to be the same company. In the case of (2), it is a method of setting a generation company and a retail company as a parent company and setting a transmission and distribution company as a subsidiary under it. It is also possible to set a generation company and a retail company, one as a parent company and the other as a subsidiary.

Transmission and distribution companies will be used for fair use by generation companies and retail companies. Transmission and distribution companies implement construction, maintenance and system operation of transmission and distribution facilities (load-dispatching instruction to each power plant, stable power supply by operation of transmission and distribution facilities). The current situation of electric system reform in Japan ¹ is as described above.

From the next section, while reviewing the past history, we would like to compare the current situation of the UK and US where electric system reform and the liberalization of entry into the electricity business were advanced ahead of Japan.

1-2 Status of UK electric system reform and liberalization of entry into the electric market

In overseas developed countries, first, we would like to confirm the history of the UK, which has been working on the electric system reform ahead of other countries. The UK privatized the state-owned electric utilities in 1990 and has implemented the liberalization of entry into the electricity business.

In 1989, the central electric utility company (CEGB (Central Electricity Generating Board)), which had been state-owned until that time, was divided and privatized, becoming three power generation companies of National Power, Power Gen and Nuclear Electric and 1 transmission company (National Grid). The State-owned 12 Distribution Boards were privatized and replaced by 12 Regional Electricity Companies (RECs). In the power transmission business in the England and Wales region, only NGET, which is a transmission subsidiary of National Grid, acquired a transmission license.

On the other hand, in Scotland, even after privatization, there has been a form of vertically integrated system (Scottish & Southern Energy Power (SSE plc) and Scottish Power (SP)), provided that accounting separation (generation, transmission, distribution and retail) is obliged, and functionally separated as a business division system in terms of operation.

After that, along with the progress of efficiency improvement through liberalization, corporate mergers and acquisitions became active. As a result, the three major electric power companies were acquired by other European energy companies, and the majority of the 12 distribution companies entered these energy companies and, after all, they were consolidated into five major groups. Furthermore, due to the addition of British Gas (now: Centrica), the former state-owned gas company that has increased its share in the electric power business, it was consolidated into six electric power company groups. As a result, it is in a situation called "Big 6."

¹ In this paper, we will not discuss the concrete content of each measure for developing the market environment in the government, but the following discussion is under way now.

 $[\]cdot$ Realization of the early competitive wholes ale electricity market

Promotion of reduction of electricity charges and diversification of services through active competition in the power
generation / retailing field

[•] Measures to solve public interest issues under liberalization (improvement of capacity mechanism, establishment of non-fossil value market, cost sharing burden of maintenance of transmission and distribution network, etc.)



Figure 1-3 UK's major electric utility "Big 6"

(Source) 2016 IEEJ "Electricity liberalization" Trends in the Japanese energy market

"Big 6" includes not only energy companies in the UK but also those in continental Europe. Specifically, as shown in Figure 1-3, there are 6 groups. They are RWE and E.ON in Germany, EDF in France, Scottish Power of the Iberdrola group in Spain, and SSE plc and Centrica of British Gas group in the UK. As of 2016, these "Big 6" account for about 90% of the retail market and about 70% of the power generation market.

Figure 1-4 UK electricity transmission operators/distribution operators and business areas of SSE plc



(Source) National Grid [Transmission, Distribution] : HP

At present, only the power transmission subsidiary of National Grid (NGET), which conducts electricity transmission business and gas conduit business, is responsible for the power transmission facilities in the England and Wales region after separation of ownership by division and privatization. On the other hand, in the Scottish region, the power transmission facilities are owned by two companies, SSE plc's transmission subsidiary (SHET) and Scottish Power (SP) transmission subsidiary (SPT). [Note: Operation of the transmission system owned by these three companies is implemented by NGET's system operation department, which is a "single system operator" (SO)]. Meanwhile, the distribution department has 12 companies (DNO) for each region, and owns and operates distribution facilities in the areas under their jurisdictions.

In Scotland, electric companies can operate the electric power businesses in a vertical integration form, provided that it is necessary to restrict the business activity by recognizing the power transmission business as a separate entity. As for the central and southern part of England, SSE plc carries out power generation, distribution, and retail businesses other than power transmission business, because the power transmission operator is NGET. In Scotland, only SSE plc and SP acquired all licenses for power generation, transmission and retail businesses.

1-3 Status of US electric system reform and liberalization of entry into the electric market

In the US, the establishment of the Energy Policy Law in 1992 substantially liberalized the electric wholesale market. Furthermore, in 1996, the Federal Energy Regulatory Commission (FERC) orders 888 and 889 obliged the opening of third-party access to transmission facilities of each electric utility company for the purpose of promoting competition in the electric wholesale market. Also, functional separation between the transmission department and the power generation department (establishment of ISO²) was recommended.

On the other hand, liberalization of the electricity retail market was implemented based on the judgment of each state. First, in 1997, partial liberalization began in the state of Rhode Island, followed by liberalization in 24 out of 50 states in the US and Washington, DC, one after another. However, after that, the electricity crisis occurred in California State in 2000, and it led to the discontinuation of liberalization. This triggered the discontinuation of liberalization in other states as well.

Like this, although there were various twists and turns until now, at present, 15 states and Washington, DC are implementing full liberalization. 3

² ISO is called "independent system operator" and it is adopted in parts of the United States and Europe. Specifically, while the ownership of the electricity grid remains in the electric power company, the operation and management of the electricity grid is carried out by an organization independent from the electric power company (a non-profit company not belonging to any electric company), and this independent organization is ISO. In the United States, the establishment of ISO is encouraged by Federal Energy Regulatory Commission (FERC) Order 888 prescribed in 1996. ISO has the obligation to aggregate power supply plans of power generation companies in the area under jurisdiction in advance and maintain the balance of power supply and electricity demand, and has the responsibility to maintain the frequency in real time.

³ There are six states that are implementing partial liberalization (limited to large customers), which are Oregon, Nevada, Montana, Virginia, Michigan and California. Of these states, California resumed liberalization of the electricity retail market for general household customers in 2010, but the upper limit of liberalization has been set to the level before the discontinuation of liberalization. In addition, Michigan has revised the Liberalization Act in 2008 and has been implementing irregular liberalization that limits the scope of liberalization to 10% of the electricity sold by electric utilities in the previous year. There are five states that abandoned liberalization or that started but abolished it, which are Arizona, New Mexico, Oklahoma, Arkansas and West Virginia.



Figure 1-5 Status of implementation of retail liberalization in the US

(Source) EIA Independent Statistics & Analysis

In the states that decided to implement retail liberalization, it was considered effective to separate the power generation assets from the existing electric utility companies with power transmission assets to promote competition. However, if the state governments forces private electric utility companies to sell their own power generation assets (ownership separation), it will conflict with the issue of property rights. For that reason, many states have established requirements for ownership separation so that regulators and private electric utility companies can negotiate with each other to reach a contract.

Many states urged electric utility companies to separate legally, to promote the establishment of power generation companies under the holding company and to transfer the power generation assets to the company. In some cases, electric utility companies voluntarily proposed to sell power generation assets to other companies and put them into practice.



Figure 1-6 Categorization of electricity separation in the US

(Source) Created by author based on AEP Group HP

In the US's electric grid, the electric grid is largely divided into three 4 and Interconnection lines between these electric grids are limited, and each line is operated almost independently. In the area where ISO / RTO 5 are established, transmission operational functions are separated. Furthermore, as a result of separation of the power generation assets in the states where retail liberalization was implemented, the business structure is categorized into four patterns <1> to <4> as shown in Figure 1-6. In the northwest region and the southeastern region, there are still electric utility companies that maintain almost vertical integration.

On the other hand, in the northeastern region including the state of New York, many electric utility companies have implemented legal separation and ownership separation in addition to functional separation. Details will be described later in 3-1-2 (2), but the AEP group consists of vertically integrated companies, power transmission companies including transmission construction JV and retail companies which is a non-regulated business. In the classification of separation type, the vertical integration company and the power transmission company correspond to the type indicated by <3> in Figure 1-6.

It is a type of legal separation in which the holding company AEP, Inc. is the parent company and each operating company becomes its subsidiary.

	Number of companies	(Composition ratio)	Number of customers (Composition ratio)	Generated electricity amount (Composition ratio)	Sales electricity amount (Composition ratio)	Sales revenue (Composition ratio)	Generation capacity (Composition ratio)
Investor-Owned Utility (IOU)	189	5.7%	68.4%	38.7%	52.3%	59.0%	36.3%
Local public electricity utilities	2,013	60.9%	14.5%	9.9%	15.4%	14.8%	10.6%
Federal electricity utilities	9	0.3%	0.0%	6.4%	1.0%	0.4%	6.5%
The cooperative association electricity utilities	877	26.5%	12.8%	5.1%	11.1%	11.2%	5.3%
Independent Power Producer (IPP)							41.3%
Power Marketer (Power trading company)	218	6.6%	4.3%	39.9%	20.2%	14.6%	
total amount	3,306	100%	100% [147.85 million]	100% [4,134TWh]	100% [3,735TWh]	100% [\$ 377.5 billion]	100% [1,164TW]

Figure 1-7 The composition of US electricity utilities by ownership type (2013)

(Source) The American Public Power Association : 2015-16 Annual Directory & Statistical Report

Figure 1-7 shows the composition of US electricity utilities by ownership type as of 2013. There are 3,306 electricity utilities in the U.S., which is overwhelmingly larger than the total of 320 electricity utilities in the UK. (All in the UK are private electricity utilities. The number of customers is 28 million.)

In terms of ownership type, there are an overwhelming 2,013 local public electricity utilities ⁶. There are only 189 investor-owned utilities (private electricity utilities), but the capacity of power generation assets accounts for about 36% of the total.

⁶ Local public electricity utilities are owned by state or local governments. They are mainly engaged in power distribution business and the majority of them are small-scale electricity utilities. However, there are also large-scale vertically integrated utilities, such as the Sacramento Electricity Authority (SMUD) and the Los Angeles Water and Electricity Authority (LADWP). In addition, the cooperative association electricity utilities are established as members of residents in rural areas with low demand density. They are primarily supplying electricity to their members, most of which are specializing in electricity distribution. On the other hand, Federal electricity utilities are mainly engaged in hydroelectric power development and wholesale sales of generated power, and the Tennessee Valley Development Corporation (TVA) and Bonneville Power Bureau (BPA) are known.

⁴ "Eastern Interconnection" on the east side of the Rocky Mountains excluding Texas, "Western Interconnection" on the west side of the Rocky Mountains, and "ERCOT Interconnection" covering most of the Texas area.

⁵ In the US, institutions that have broadened the ISO are called RTO (Regional Transmission Organization), and in addition to the functions of ISO, RTO have independence from market participants and the responsibility for developing the network extension plan.

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2. Representative electric utilities in the UK and the US

In terms of business activities, in general, European electric utilities aim for international expansion with the aim of active scale expansion. On the other hand, most US electric utilities are negative and tend to withdraw after international expansion. In Europe, in terms of organizational structure, electric utilities are separated vertically with respect to the value chain of power generation, transmission, distribution, and retail by regulation. On the other hand, in the US, there are differences in the presence or absence and degree of liberalization of the electricity market. Also, there are differences in the legal or social background for each state or region. For that reason, the organizational structure of each electric utility is various such as businesses vertically separated along the value chain and businesses vertically integrated by region. There are also intermediate forms of them.

Against this backdrop, this time, we would like to pick up the following two companies (AEP and SSE plc) and scrutinize them as representative electric utilities in the UK and the US.

2-1 UK's electric utility SSE plc

SSE plc is a holding company that operates electricity and gas business in the UK and Ireland, based in Perth, Scotland. Among the "Big 6," the only British capital companies are SSE plc and Centrica. SSE plc is one of them. Of the two public organizations that are the roots of SSE, one is the North of Scotland Hydro-Electric Board, founded in 1943, and the other is the South England Power Distribution Company (Southern Electricity Board). After privatization in 1989 and management integration in 1998, the present SSE plc was born.

In 2000, SSE plc acquired Swalec plc (South Wales Electricity), which operated distribution and gas supply business in southern Wales. Subsequently, in 2004, SSE plc acquired Atlantic Electric & Gas Limited, an independent electricity and gas utility of US capital. Moreover, SSE plc acquired Airtricity Ltd, a wind power generation business in Ireland in 2008, and expanded the range of energy business.

SSE plc is the largest renewable energy company in the UK, operating hydro power in Scotland and wind power in Ireland and Scotland. In addition, SSE plc also operates a natural gas storage business.



Figure 2-1 SSE plc value chain (electricity / gas)

(Source) SSE plc Annual Report 2016

Figure 2-1 shows SSE plc's gas and electricity value chain from upstream to downstream projects. As mentioned above, in Scotland, SSE plc acquires power generation, power transmission and general supply license and operates the business in a vertically integrated system. In the northern part of Scotland, SSE plc operates in a vertically integrated system from production in gas fields to storage, transportation, transmission, electricity and gas retailing on the coast of the North Sea.

Among the UK's "Big 6," SSE plc is the only utility with domestic capital holding traditional supply areas. By the way, Centrica plc was originally British Gas, which was a monopoly gas utility in the UK. Since its establishment in 1997, Centrica plc has expanded its business by entering the domestic electricity business. In addition, Centrica plc acquired Direct Energy, a power utility company in the United States, in 2000, and has entered the North American electricity market.

Regarding the other four companies, they are electric utilities of foreign-owned companies (Germany, Spain, France), and the parent company actively promotes international development.

SSE plc, on the other hand, has not developed internationally since the start of power liberalization within the UK in 1990. SSE plc has adopted a community-based strategy that focuses closely on domestic business areas and focuses on communication with local communities. Thus, SSE plc contrasts to and is distinctive from the other five companies of the "Big 6."

2-2 US's electric utility AEP

The American Electric Power Company (AEP) is a private electric utility company with the largest transmission system in the nation. Since its founding in 1906, AEP has provided comprehensive power service including power generation, transmission and distribution, to local customers. AEP's headquarters is in Columbus, Ohio, which takes the form of a holding company that directly or indirectly owns common stock of utility subsidiaries and other affiliated companies. AEP also provides power generation, power transmission and distribution services in 11 states in the east to south of the United States (Arkansas, Indiana, Kentucky, Louisiana, Michigan, Ohio, Oklahoma, Tennessee, Texas, Virginia, West Virginia). Transmission facilities of utilities subsidiaries are interconnected and operation adjustments are being made.



Figure 2-2 Business area of AEP

(Source) AEP Economic & Business Development Overview (AEDA.SM)

AEP started aiming at diversification by M&A from 1980, acquired Columbus and Southern Ohio Electric Company in 1980 and merged with Central and South West Corp. in 2000 based in Dallas and Texas. As a result, AEP became one of the largest electricity utilities in the US. At that time, power utilities who felt a sense of crisis in liberalization in the US pursued the merit of scale and activated M&A to acquire a competitive advantage to survive in competition. AEP also expanded its business to overseas electricity markets such as the UK's power generation market, although it did not become a huge multinational company by extreme integration like European utility companies.

However, the California power crisis in the US broke the momentum of liberalization, and that is why the number of M&As also declined rapidly with peaks in 2000. AEP recognized the management risk associated with M&A and the risk of liberalization itself, so it shifted again to a policy of concentrating on the electric business in the US, as the core business. In order to strengthen the community-based electric power business, AEP reorganized the distribution business to a decentralized type so that decision making could be made in the vicinity of customers in the area. Electricity utility companies in each region that became the AEP group made it possible to continue business with the existing company name (Indiana Michigan Power, Kentucky Power, Appalachian Power, etc.).

In this way, AEP also has features that make full use of the strengths of community-based organization that can gain trust from local communities. Meanwhile, AEP shrank overseas operations, including selling coal-fired power plants owned in the UK to SSE plc in 2004.

2–3 Analysis and comparison of representative electricity utilities in the UK and the US

As mentioned above, there are differences in the status of electricity business system reform and liberalization in each country of the UK and the US, but there are some similarities between their two companies SSE plc and AEP. Their similarities are that both companies are electricity utility companies with a long history in the country, and they are continuing a vertical integration form even after the electricity business system reform and liberalization. And, in recent years, both companies are focusing on community-based strategies to maintain a certain level of domestic market share rather than expanding the scale to overseas business areas.

We cannot uniformly say that these electricity utility companies are the ideal form of Japanese electric utilities after electricity business system reform. However, with reference to the cases of the preceding countries, it is beneficial for us to learn about the concrete measures for the arrangement of the market environment and the promotion of competition, and to learn about the influence on the Japanese electricity utilities in the near future. Therefore, it is significant to consider this through analysis and comparison of two electricity utility companies in the UK and the US.

2-3-1 Comparison of basic information

Table 2-1 Comparison of basic information on SSE plc/AEP 7

	SSE plc (Scottish and Southern Energy plc)	AEP (American Electric Power)
Head office location	Perth (UK [Scotland]: Perth)	Columbus (United States: Columbus, Ohio)
Major business area (<u>Underlined</u> regions and states are liberalized)	<u>UK Scotland Northern region</u> <u>UK England Central / South regions</u>	Eastern states and Southern states of the US (Indiana, Kentucky, Louisiana, Michigan, <u>Ohio</u> , Oklahoma, Tennessee, <u>Texas</u> , Virginia, West Virginia)
Establishment	$1943 \ ({\rm predecessor} \ {\rm organization}: {\rm North \ of \ Scotland} \ {\rm Hydro-Electric \ Board})$	1906
Total assets	£ 23.3 billion	\$ 59.6 billion
Revenue	£ 28.8 billion	\$ 17 billion
Net income	£ 1.2 billion	\$ 1.6 billion
Number of customers	Number of power transmission customers : 3.7 million Number of electricity and gas retail customers : 8.08 million	5.3 million
Shareholder composition	The Capital Group Companies, Inc 15.0%、BlackRock, Inc 6.1%、UBS Investment Bank 5.2%、Invesco Limited 4.7%, etc.	Vanguard Group Inc 6.4%、State Street Corp 5.1%、BlackRock Fund Advisors 3.1%、Vanguard Total Stock Mkt Idx 2.0%, etc.

(Source) Created by author based on SSE plc/AEP Annual Report

Table 2-1 compares the basic information and financial information of the two companies as of 2015. SSE plc is a comprehensive utility company that not only generates, transmits, distributes and retails electric power, but also stores, transports, and retails natural gas. SSE plc provides broadband and capacity

⁷ (Reference) $\pounds 1 = US \$ 1.26$ [Exchange Rate, February 2017]

to public sectors, private companies and internet service providers by utilizing communications network services. SSE plc has over 10 million customer accounts in the UK and supplies natural gas and electricity to more than 3.5 million homes and businesses. SSE plc is characterized by both electricity and gas making profit without great bias, and is focusing on renewable energy power generation business, mainly wind power generation. Besides that, SSE plc has about 60 branches of electrical construction contracting business in the UK as one of the UK's energy-related services. SSE plc is also the largest street lighting contractors in the UK and manages more than 1 million light sources and so on.

On the other hand, AEP provides comprehensive electricity service including power generation, transmission and distribution, to local customers, and takes the form of a holding company that directly or indirectly owns common stock of utility subsidiaries and other subsidiaries. In recent years, AEP is focusing on developing renewable energy businesses, and is also expanding into demand response and smart grid-related businesses. AEP is specialized in the electricity business and has not advanced into gas related business.

(1) Basic information on SSE plc





(Source) Created by author based on SSE plc Annual Report

Figure 2-3 shows the SSE plc's capacity of the power generation facility for each power supply.

SSE plc is engaged in production, storage and transportation in gas fields possessing interests in the North Sea including North of Scotland, so the ratio of gas-fired power generation is high. Also, in recent years, SSE plc has greatly advanced the development of renewable energy generation, especially for wind power generation, proactively developing not only land-type but also offshore-type generation. However, since SSE plc has a high percentage of transmission line equipment among the electricity business and a high percentage of gas business, the capacity of power generation equipment is small compared to AEP described below.

SSE plc's coal-fired power generation ratio decreased significantly in 2015 compared to 2009. This is based on the flow of development support of low carbon power supply (renewable energy, nuclear power, thermal power with CCS) in "Electricity Market Reform" (EMR: Electricity Market Reform) passed by the bill in 2013.

(2) Basic information on AEP



Figure 2-4 Percentage of profit by segment / business of AEP (2015)

(Source) AEP 2015 Annual Report





(Source) AEP 2015 Annual Report

Figure 2-4 shows the profit ratios of AEP by segment and business, and the profit of the network department accounts for 47% of the total. In addition to renewable energy business that has actively been invested in, it accounts for 65% of the total in recent years. The proportion of wholesale (power generation) also accounts for about 30% of the total, and the capacity of power generation facilities is about 42 GW. From now on, AEP plans to focus on investment in network business and renewable energy business rather than thermal power generation business for which wholesale price declined and profitability became lower.

Figure 2-5 shows the trend of the ratio of power generation capacity by power source. Although the ratio of coal-fired power plants has declined compared to 66% at the time of 2009, it still accounts for a high percentage of 60% even in 2015.

2-3-2 Comparison of financial situation



Figure 2-6 Financial status ⁸ and rating transition of SSE plc / AEP

(Source) Created by author based on SSE plc/AEP annual report [* Rating: Moody's Credit]

Figure 2-6 shows the changes in sales and net income for the past 10 years for the two companies SSE plc and AEP.

As for SSE plc, since the gas business and the gas fired thermal power generation ratio are high, in 2009, it was greatly affected by market fluctuations in the gas trading market. As the wholesale electricity price soared, SSE plc suffered losses with customers contracted at a fixed price and profits drastically declined in 2009. Although profit improved once, SSE plc has been affected by gas price hikes again from 2012. Due to the economic downturn, demand is also sluggish, so the profit of SSE plc is continuing its downward trend.

On the other hand, with respect to AEP, both sales and net income are steadily increasing, and the profit margin in 2015 is high at around 12%.

Regarding the ratings of both companies, SSE plc has obtained a high evaluation of A3 stably and AEP has also risen from Baa 2 to Baa 1 in recent years.

⁸ (Reference) $\pounds 1 = US \$ 1.26$ [Exchange Rate, February 2017]

(1) Relative comparison between SSE plc and 3 other UK utilities



Figure 2-7 Comparison of rating transition between SSE plc and 3 other UK utilities (E.ON / Iberdrola / RWE)



Figure 2-7 shows a comparison of recent trends in ratings between SSE plc and the other three companies out of the UK "Big 6." While SSE plc maintains the level of A3, the other three companies that have aggressively expanded international business have recently declined to Baa 1. In particular, E.ON and RWE fell into deficit in 2015. This is because the profitability of coal and gas fired power has deteriorated significantly due to the sharp fall in the electricity price in the domestic wholesale market.

(2) Relative comparison between AEP and 2 other US utilities

Figure 2-8 Comparison of transition of revenue and net profit and profit rate between AEP and 2 other US utilities (AEP / Exelon / Con Edison Inc)



(Source) Created by author based on 3 utilities (AEP / Exelon / Con Edison Inc) Annual Report

Figure 2-8 shows a comparison of recent trends in net sales, net income and profit margin between AEP and the other two major electric utilities in the United States. The profit margin of AEP is 12.5%, which is high compared to other electric utilities.

Both electric utilities have shifted their focus areas to regulated businesses and retail businesses in recent years because profits in power generation business are on a downward trend.

2-3-3 Comparison of management policy / investment plan

(1) Management policy / investment plan of SSE plc

SSE plc has a management policy with the following three pillars and plans to focus on their investments in the future: (a) Further promotion of renewable energy development, (b) Continuation of investment to increase gas production capacity, and (c) Continuation of investment for extension of transmission lines.

Figure 2-9 Achievement / plan of SSE plc renewable energy development Renewable generation Renewable generation project development TWh 15 4 GW Slieve Divena 2 **19MW** 10 94MW Dunmaglass 2 8.5 5 1 Bhlaraidh 108MW 0 C FY11 FY16 **FY14 FY15** 172*MW **FY12 FY13** Clyde ext. Output Capacity Tievenameenta 35MW 120MW* Galway Beatrice** 235MW* 2014 2015 2016 2017 2018 2019

(a) Further promotion of renewable energy development

(Source) SSE plc Annual Report

Figure 2-9 shows the trends in the capacity and power generation of renewable energy generation from 2011 to 2016, and the development plan for renewable energy generation until 2019.

SSE plc is aggressively expanding the introduction of renewable energy generation mainly based on the development plan of wind power generation capacity of 783 MW.

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(b) Continuation of investment to increase gas production capacity



Figure 2-10 SSE plc's achievement / plan of gas development and production

Figure 2-10 shows the trends in results and plans of the development and production for gas fields from 2012 to 2028. In July 2015, SSE plc actively made large-scale investments such as acquiring 20% of the interests for construction of new production facilities in the Laggan-Tormore gas field at £565 million. SSE plc plans to further invest about 350 million pounds by 2018 to expand gas productivity.

(c) Continuation of investment for extension of transmission lines



Figure 2-11 Overview of transmission projects of SSE plc

(Source) SSE plc Annual Report

Figure 2-11 shows the trend in investment results for transmission line expansion, which is the regulated asset, and the trend in the investment plan. In 2013, SSE plc invested 1.1 billion pounds in its largest submarine transmission line construction project (HVDC) and began construction.

The investment amount of SSE plc is expected to reach 3 billion pounds in 2018, which is scheduled to begin operation. With the expansion of investment in renewable energy related fields such as wind power, SSE plc is trying to expand investment in the construction of power lines.

(2) Management policy and investment plan of AEP

AEP plans the following three items as a management policy, and plans to intensively invest in the future: (a) Priority investment for regulated services and new construction of transmission lines, (b) Promoting the introduction of smart grid related businesses, (c) Abolition of coal-fired power plants with enhanced federal emission regulation.

(a) Priority investment for regulated services and new construction of transmission lines





(Source) AEP 2015 Annual Report

Figure 2-12 shows the investment plan for AEP from 2016 to 2019 by ratio of regulated sector / non-regulated sector. As mentioned above, 11 provinces from the east to the south of the US are the supply area, of which Liberalization Province has only two states, Texas and Ohio, and the proportion of the non-regulated sector is small. Evaluation after liberalization is not so high in the whole of the US, and there are bad influences such as electricity charges rising ⁹ and power investment is not proceeding depending on the region. Against this backdrop, the Annual Shareholders' Meeting of AEP in 2016 also has a policy of focusing on investment in the regulated sector services, which is the core business.

⁹ According to EIA statistical data in the US, the average retail unit price in 2015 is 10.4 cents / kWh on a nationwide average. The average unit price of the liberalized states is 12.8 cents / kWh and the average unit price of non-liberalized states is 9.4 cents / kWh. Thus, the average unit price of the liberalized states is higher by 3.4 cents / kWh. (Source: Energy Information Administration, Forms EIA-861 and EIA-826. Average Revenue per Kilowatt-hour: Deregulated vs. Regulated States).



Figure 2-13: ROE by business company of AEP regulated operation

(Source) AEP 2016 Fact Book

Figure 2-13 shows the results of the ROE of the regulated sector as a whole in 2016 (10.7%) and the results of each operating company. We can see that profit margins are at a very high level mainly by three vertically integrated subsidiaries (APCo, I & M, OPCo) and AEP TX of the transmission subsidiary.

In 1996, according to Order 888, 889 of the Federal Energy Regulatory Commission of the United States of America (FERC), 10 Independent System Operators (ISO) were established. The system operation of the electricity grid owned by the electric power company was entrusted by ISO and kept the independence of its operation. At present, there are seven ISO, which are CAISO, NYISO, ERCOT, MISO, ISO-NE, AESO, and IESO. However, after the establishment of ISO, in the case of long-distance power transmission, a so-called pancake problem occurred. The wheeling charge was accumulated by passing through multiple transmission systems. Therefore, in order to solve this problem and establish a reasonable wheeling charge, Regional Transmission Organization (RTO) was established in 2000. Now, four organizations which are ISO-NE, MISO (above ISO), PJM, and SPP, are certified as RTO by FERC.



Figure 2-14 7 Independent System Operators (ISO) / 4 Regional Power Transmission Organizations (RTO)

(Source) IRC [ISO/RTO Council] 2015

The business area of AEP is managed by PJM, SPP and MISO. The power transmission facilities are owned by AEP, but the operation is carried out by ISO / RTO in each area.

For example, Ohio is an operational area within PJM, and PJM has jurisdiction over the power systems in 13 US states and the Washington, DC, area. Regarding the investment and development of the transmission system in the operation area, PJM makes a regional transmission expansion plan (RTEP) every year to ensure the reliability of power supply. This is made to show the necessary systematic line repair plan. The business operator has undergone the examination of the state up to 15 years ahead and is obliged to properly operate and maintain the power transmission equipment based on the standards set by PJM.

In December 2012, guidance to further justify the incentives stipulated by Order 679 was announced. By calculating the premium remuneration rate (roughly 1 to 3%) that adds business risk to the electricity business ROE and adding it to the total cost, internal reserves are created for the electricity transmission business, and it leads to long-term incentives for network investment. Besides investing in the existing transmission network, incentives for investing in new transmission lines also increased.

In response to that, AEP announced that it will jointly establish a transmission line investment company that will undertake the construction of a new transmission line with Great Plains Energy (GXP) (the shareholding ratio is 86.5% for AEP and 13.5% for GXP). AEP has established a new joint venture, Transource Energy SM LLC (Transource), in the area managed by PJM, SPP and MISO, and has started its business. AEP, in collaboration with Alta Link LP (a transmission company in Canada), decided to participate in the Fort Mc Murray West power transmission plan (500 kV, 500 km) in Alberta, Canada.

AEP is establishing a joint venture that holds assets at both companies, and is in charge of construction and operation. As you can see from Figure 2-13, the ROE of Transource in 2016 is high at 12.1%.

Rather than in the liberalized power generation and retail division, it shows that investment is focused on the construction of new power transmission facilities in the US and Canada. Together with regulated sector services, which are a core business, we are steadily promoting stabilization of earnings.

(b) Promoting the introduction of smart grid related

Date	Field	Contents
2012.1.5	Enterprise	AEP, based in Chicago, agreed to acquire BlueStar, which carries out energy service business at the Federal University, including power supply and demand response for retail customers to liberalized markets such as Ohio and Illinois. AEP started business as AEP Energy since June 29.
2013.11.11	Enterprise	 PSO, a subsidiary of AEP, began offering advanced meter infrastructure (AMI), a high-function meter, and announced the goal of completing exchange of over 520,000 existing meters with new AMI during 2016. From the detailed information on energy consumption by the new meter, it is expected that evolution of energy management, measures against power outages, and improvement of customer service will be promoted.

Table 2-2 AEP's recent investment performance for smart grid-related businesses

(Source) AEP 2015 Annual Report

AEP put more emphasis on promoting introduction of smart grids and expansion of related services. AEP is planning to advance into energy service business such as electricity supply and demand response to customers in Liberalized States such as Ohio and Illinois. From 2016 to 2019, AEP is planning to invest a further \$5 billion / year.

(c) Abolition of coal-fired power plants to do with enhanced federal emission regulation

INVESTING BILLIONS TO REDUCE EMISSIONS \$ in millions \$102 \$811 \$1,366 \$994 \$887 \$304 \$187 \$241 \$540 \$599 \$353 \$275 \$364 \$217 \$340 \$457 \$424 Total \$8.5 billion 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

Figure 2-15 Trends in investment performance to do with environmental emission regulation

Increasing investment for measures to deal with strengthening environmental emission regulations in the US

 \cdot In 2000-2016, the amount invested in thermal natural gas conversion and renewable energy power generation totaled \$8.5 billion

 \cdot After 2015, we plan to abolish 11 coal-fired power plants and capacity meter 6,500 MW

 \cdot Reduce emissions by 39% compared to 2000



Figure 2-15 shows the trend in the amount of investment that AEP has been implementing for measures to deal with strengthening environmental emission regulations between 2000 and 2016, totaling \$8.5 billion. AEP realized reduction of GHG emissions by about 40% compared to 2000 by new construction investment such as gas thermal power plant and renewable energy power generation. In May 2015, the EPA (Environmental Protection Agency of the United States) issued a Clean Power Plan and strengthened environmental emission regulations such as SO2, NOx, PM, CO2, etc. To deal with this, AEP decided to abolish 9 coal-fired power plants (total installed capacity of 5,535 MW) due to the fact that a large amount of equipment renewal investment is required for continuous operation. In addition, AEP plans to abolish two coal-fired power plants (total 998 MW).

By reviewing these owned power plants, the ratio of coal-fired power plants to the total AEP capacity will be reduced from 60% to 48%. In 2017, under the new Trump government, the environmental policies that have been promoted until now are expected to be greatly reconsidered. However, since domestic gas prices are at a low level, AEP is expected to be unlikely to withdraw the abolition of coal-fired power plants and return to the original plan again.

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3. Relationship between electric utility and local community

3-1 Community-based strategy of electric utilities

From the situation in the UK, we found that SSE plc maintains a relatively high rating, while the management of other major electric utilities is getting worse. We also found that AEP in the United States considered a similar business strategy. While the evaluation of the business strategy that emphasizes business expansion outside the country and outside the region is decreasing, in the investigation report of "The impact of liberalization on community-based strategy of incumbent electric utilities: the case studies of European utilities (Miki Tsutsui ¹⁰ [Central Research Institute of Electric Power Industry], 2015)," the definition and analysis of the term "community-based" was conducted. In recent years, it seems that strategies that emphasize relationships with local communities and regional customers have been reevaluated by taking a "community-based strategy."

According to Mr. Tsutsui's paper, as the reform of the electricity business system such as liberalization progresses, environmental change has occurred in the relationship between electric utilities who have been engaged in long-time business in the existing area and the local community. Regarding such environmental changes, strategies for electric power companies are analyzed by a biaxial structure. They are as follows: ① "Strategies specializing in the local area" to concentrate management resources in the local area even though you can select other areas and expand the scope of activities. ② "Social activities" in which business operators actively strengthen relationships with the community in order to be accepted as a member of the local society. From that point of view, we will review SSE plc's community-based strategy, which is also pointed out in Mr. Tsutsui's paper, and we would like to analyze the AEP's community-based strategy.

3-2 SSE plc's community-based strategy

In addition to the supply responsibility as an energy supply provider, SSE plc sets guidelines on social contribution to promote active participation so that approximately 22,000 employees (as of 2016) have the opportunity to participate in various social activities in the local area. The number of employees engaged in charitable activities and activities that can be helped in schools, hospitals, etc. is increasing every year, and SSE plc is keeping good relations with local communities as a local company.

For example, as shown in the example in Fig. 3-1, SSE plc is making efforts to disclose a guide form for requesting employees for service activities on its homepage and a fill-in form for request.

¹⁰ "The impact of liberalization on community-based strategy of incumbent electric utilities: the case studies of European utilities (Miki Tsutsui [Central Research Institute of Electric Power Industry: Y14008], 2015)"

Figure 3-1 Case study of SSE plc's regional contribution activities



(Source) SSE HP (SSE and the community: Giving a helping hand to our local communities)

Figure 3-2	Trends in the operating profit of the retail sector of SSE plc
	and the number of supply contracts with customers

	14-Mar	15-Mar	16-Mar
Operating Profit * – £m	246.2	368.7	398.9
Electricity customer accounts (GB domestic) - m	4.66	4.37	4.16
Gas customer accounts (GB domestic) – m	3.21	2.96	2.79
Energy customers (GB business sites) – m	0.42	0.45	0.47
All-Island energy market customers (Ire) – m	0.81	0.8	0.79
Total energy customer accounts (GB, Ire) - m	9.10	8.58	8.21

(Source) Created by author based on SSE Preliminary Results (2014 · 2015 · 2016) Retail Key Performance Indicators

As mentioned earlier, we would like to show another important point in addition to establishing a good relationship with the community, such as participating in social contribution activities. As you can see from the actual trends in the past three years in Figure 3-2, while the number of electricity and gas supply contracts has generally declined, the number of contracts for energy-related service supply has increased. It is understood that this contributes to overall operating profit growth in recent years. This is a case where the strategy of expanding services aiming to continue to be selected as a retail customer who is a member of the same community is a successful case.



Figure 3-3 Trends in SSE plc's energy supply and energy related services capex

Figure 3-3 shows the trend of SSE plc's investment in the electricity / gas retail business, showing where it has been putting emphasis in recent years. As electric power demand in the existing area is decreasing overall, SSE plc diversifies its business by providing electrical service contracts, street lighting contractors and broadband communications business, in addition to providing energy-related services. In this way, SSE plc is focusing on providing related services that meet local customer needs.

From the viewpoint of in which field the operating profit obtained should be reinvested, SSE plc does not invest in businesses in other countries and other regions, but invests in wind power generation projects and power transmission construction projects in existing local areas. Also, SSE plc invests in related projects to enhance customer service offering new value. The shareholders of SSE plc also support the strategy, and as you can see from the transition of the financial information of SSE plc in Figure 2-6, the profit itself is decreasing in recent years, but the rating is still high. This indicates that it has been evaluated from a long-term stable viewpoint. For private electric utility companies, maximizing profits and returning to shareholders is the objective of management. SSE plc can be analyzed as being evaluated from a long-term perspective of business mindset and continuity, such as steady distribution of dividends to shareholders, rather than the pursuit of short-term profits. If the shareholders and other stakeholders support it, the regional close-contact strategy including social contribution leading to the stability and development of the regional economy can be said to be one of the useful business strategy options.

3-3 AEP's Community-based Strategy



Figure 3-4 shows the organizational form of AEP as of 2016, indicating that it distinguishes between regulated and non-regulated businesses by function such as power generation and transmission. Regarding the regulated electricity business, AEP is a regional company organization that deals with community-based business operations. In this way, AEP has many contact points with customers and regulators by making an operating company with regional business companies, so that detailed management and service can be provided.



Figure 3-5	Trends	in AEP	group	s	sales	resul	ts l	by	business
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(Source) Created by author based on AEP Annual Report 2016

Note: The total of individual items and the total sum do not agree with each other because there is a difference in the ownership ratio of consolidated subsidiaries, and there are other non-regulated projects, etc.

Figure 3-5 shows the trend of AEP Group's sales results by business. Of the total sales of the AEP group as a whole in 2016, the total sales (9,092 million dollars) of the vertically integrated electric power company, which is the regulated business, and the total sales of the transmission and distribution company (4,422 million dollars) is about 83%, which means that it accounts for the majority.

Figure 3-6 The regulated business area of AEP [Upper : 7 power companies with vertical integration / Lower : 3 transmission and distribution companies]



(Source) AEP 2016 Fact Book

Figure 3-6 shows the regulated business area of AEP. Seven vertically integrated companies and three transmission and distribution companies have a community-based business structure. Regarding other non-regulated sectors of AEP, we also conduct power generation business, retail business, power transmission business and other fuel river transportation business. However, since AEP is a member of PJM, the power transmission business here means a project for constructing a transmission line by JV. In this way, AEP has its main focus on regulated businesses and continues its business in a stable manner. AEP has continued to pay dividends for more than 100 consecutive years since its establishment in 1906, and shareholders also have a high and stable evaluation over the long term.

4. Conclusion

In this paper, we compared the representative electric utility companies in the UK and the US. They have reached the present stage through efforts towards various reforms as a result of the advancement of the electric system reform in advance of Japan.

Comparing the regional areas of business activities, in general, European electric utility companies tend to expand overseas actively with the aim of expanding their scale, while most electric utility companies in the United States are never active and tend to withdraw even if they expand overseas once. In addition, when comparing from the viewpoint of organizational structure, in the UK and other European countries, electric utility companies are vertically separated with respect to the value chain of power generation, transmission, distribution, and retail by regulation. Meanwhile, in the US, there are differences in each state and region depending on whether or not market liberalization is implemented, differences in legal and social backgrounds, and so the organizational structure of the businesses varies. The organizational structures of the businesses are vertically separated along the value chain, vertically integrated by region, or an intermediate form of them.

Under these circumstances, there are differences in the current situation of electric system reform and liberalization in each country, but two companies which were taken as representative electric utility companies in the UK and the US, SSE plc (Scottish & Southern Energy) and AEP (American Electric Power), have some common points. One point is that both companies are public electric utility companies with long histories in their respective countries and basically have a vertical integration form, and continue their businesses with main focus on regulated business even after the beginning of the electric system reform and liberalization. The other point is that, in recent years, both companies have focused on community-based strategies to maintain a certain level of domestic market share, rather than expanding the scale to overseas business areas.

SSE plc invests in wind power generation projects and power transmission construction projects mainly in the local area. SSE plc also places priority on building a good relationship with its own area and is focusing on providing various related services for the needs of local customers and local areas. They are network business, renewable energy business, communication business, providing energy-related services, electrical construction contracting business and street lighting contracting business, etc. By doing these businesses, SSE plc maintains a high share-holding ratio of electricity supply contracts by improving services and building a good relationship with the local area. Shareholders also support the strategy. Although the profit itself has been decreasing in recent years, we can see that the transition of the rating is still high and SSE plc has been evaluated from a long-term and stable perspective.

While promoting the shrinking of power generation projects such as the large abolition of coal-fired power plants, AEP plans to focus on promoting investment in regulated electricity business, which is a core business with high profitability. Regarding the regulated electricity business (power generation, possession of transmission facilities, distribution, retail supply), AEP is managed in the form of an organizational structure with regional business companies in accordance with community-based business operations.

By increasing the contact with local customers and local regulatory authorities in such an organizational structure, AEP can provide more detailed service and management. While specializing in the electric power business without entering related business such as gas, AEP is conducting a construction project of a new transmission line, promoting the introduction of smart grids and expanding related services. In constructing the new transmission line, AEP is utilizing long-term investment incentives as stipulated in Order 679 of the Federal Energy Regulatory Commission (FERC). In this way, AEP has been steadily continuing its business with its main focus on regulated business. AEP has continued to pay continuous dividends for more than 100

years since its foundation, and has also earned a high and stable evaluation from shareholders over a long period of time.

However, it is necessary for each electric utility in Japan to consider how it will be affected by the government's policy and measures of electric system reform to promote competition. In that case, the example and analysis of the two European and US electric utilities seems to be helpful.

In order for each electric utility to grow and evolve even after the reform, it is necessary to identify the optimum management strategy and the form of an organizational structure for each electric utility and to adapt to mid- to long-term changes in the electric system and competitive market environment. The community-based strategy is considered to be a candidate option.

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