Jeju Symposium for Promoting Renewable Energy in Japan and Korea

The Role of Central and Local Governments, Related Companies and Citizens

| Dates August 23-25, 2016

| Venue The Suites Hotel Jeju, Suites Forum(B1)

| Hosted by Kyoto University, Korea University, Meijo University

| Sponsored by Toyota Foundation, Jeju Peace Institute,
Japan Society for the Promotion of Science, REEPS

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한일 재생가능에너지 전문가 제주심포지엄 개최에 즈음하여

작년 12월 프랑스 파리에서 열린 제21차 기후변화협약당사국총회(COP21)에서 전 세계가 기후변화의 심각성을 공감하고 금세기 중 지구 기온을 산업혁명 이전 온도 대비 최소한 2도 이내로 억제하기 위해 파리협정을 체결하였습니다. 아울러 세계 각국은 온실가스를 감축하기 위한 자발적인 감축목표(INDC)를 발표하였는데, 한국은 2030년까지 BAU기준으로 37% 감축(2010년 배출량 대비 21% 감축)을, 일본은 2030년까지 2013년 배출량 대비 26% 삭감을 목표로 정하였습니다. 또한, 한일 양국은 파리협정의 INDC목표달성의 전제조건으로서 2030년까지의 전원구성계획도 발표하였습니다. 일본의 전원구성은 원전 20~22%, 화석에너지 약 56%인 반면 재생가능에너지는 22~24%에 그치고 있어 결국 80% 가까이가 지구환경에 부정적인 전원으로 구성되어 있습니다. 한국 역시 원전 29%, 화석에너지60%, 그리고 신재생에너지는 단지 11%에 그치고 있어 인류의 생명과 안전 그리고 생태계의 지속가능한 공존이 어려운 전원 구성으로 되어있습니다.

한일 양국 모두 2030년의 전원구성에서 여전히 원전과 화석에너지가 중심이 되고 있는 것은 어찌 보면 신재생에너지의 확대는 전력비용을 상승시키고 경제에 부정적인 영향을 미칠 것이라는 인식이 자리 잡고 있기 때문일 것입니다. 하지만 한일 양국 모두 신재생에너지의 확대가 어느 정도 경제에 부정적인 영향을 미칠지에 대해서는 명확히 밝히지 않고 있습니다. 또한, 신재생에너지의 빠른 기술진보에 따른 가격 경쟁력, 그리고 신재생에너지 공급을 통한 지역의 에너지 자립과 고용 및 경제 활성화, 그리고 화석에너지로부터의 탈피를 통한 에너지 안보 등 신재생에너지가 갖고 있는 장점들이 단지 단기적인 비용 측면만의 평가로 간과되고 있는 것은 아닌지 하는 우려가 생깁니다.

현재 EU에서는 2030년에 전력의 45%를 신재생에너지로 공급하는 것을 목표로 하고 있고, 미국 캘리포니아주에서는 2030년까지 신재생에너지 공급비중을 50%로 설정하고 있습니다. 다시 말해, 「2030년에 전력의 40%이상을 신재생에너지로 공급」 하는 것이 선진국들의 목표라는 것을 알 수 있습니다. 한일 양국 모두 선진국 대열에 진입해 있는 만큼 국제사회가 기대하고 있는 선진국의 역할을 외면하기는 어려운 상황입니다. 따라서 지속가능한 저탄소 사회를 구축하기 위해 필요한 신재생에너지 공급 목표는 어느 정도인지 그리고 그 목표를 달성하는 데 필요한 에너지 정책은 무엇인지 지혜를 모으는 것이 필요한 때입니다. 그런 차원에서 2030년까지 탄소제로섬을 천명하고 신재생에너지 보급을 적극적으로 전개하고 있는 제주도에서 한국과 일본의 우수한 전문가들이 모여서 심도 있는 토론을 벌이는 것은 매우 의미 있는 일이라 할 수 있습니다.

근래 한일 양국이 신재생에너지 정책에 있어 새로운 제도 전환을 통해 신재생에너지의 보급이 늘어나는 등 괄목할 만한 성과들이 나타나고 있습니다. 하지만 양국 모두 대규모 태양광발전 중심으로 이뤄지고 있고, 소규모 지역밀착형 신재생에너지는 여전히 보급이 미미한 수준입니다. 이번 심포지엄에서는 신재생에너지의 환경가치 외에도 지역 가치를 조명하고, 소규모 신재생에너지가 비즈니스 모델로서 성공적으로 정착할 수 있는 대안을 모색하고자 합니다. 이번 한일 심포지엄의 특징은 중앙정부, 지방정부의 정책 연구자 그리고 시민과 기업 측면에서의 왕성한 활동을 하고 있는 한일 전문가들이 한자리에 모여 그동안의 각각의 제도전환의 성과와 과제를 비교 분석하고 앞으로 지역형 신재생에너지의 보급 활성화 방안을 찾아보는 데 있습니다.

마지막으로 본 심포지엄에 많은 지원을 해주신 제주평화연구원, 토요타 재단, 그리고 일본 문부성의 학술진흥재단에 감사드립니다.

2016년 8월 23일

메이죠대학교 교수 이수철, 교토대학교 특임교수 나까야마타꾸오, 고려대학교 교수 조용성

韓日再生可能エネルギー専門家済州シンポジウム開催に際して

昨年12月フランス、パリで開かれた国連気候変動枠組条約第21回締約国会議 (COP21)では、全世界が気候変動の深刻性に共感し、今世紀中地球気温を産業革命以前の気温に比べて2度℃以内で抑制するためのパリ協定が締結されました。世界各国は温室ガスを削減するための約束草案(INDC)を公表したが、日本は2030年まで2013年排出量対比26%削減、韓国は2030年までBAU基準として37%削減(2010年排出量対比21%削減)削減を定めました。

また、日韓両国はパリ協定のINDC目標達成の前提条件として2030年までの電源ミックス計画も発表しました。日本の電源構成は原子力発電が20～22%、化石エネルギーが約56%である一方で再生可能エネルギーは22～24%に留まり、結局80%近くが生命と地球環境に不安な電源構成となっています。韓国も原子力発電が29%、化石エネルギーが約60%、そして再生可能エネルギーが11%に過ぎず、日本よりさらに人類の生命と地球生態系を脅かす電源構成となっていました。

日韓両国が2030年の電源構成において依然として原子力発電と化石エネルギーが中心となっているのは、再生可能エネルギーの拡大は電力費用を上昇させ、経済に否定的な影響を及ぼすという認識があったためでしょう。しかしながら、韓日両国ともに再生可能エネルギーの拡大がどれほど経済に否定的な影響を及ぼすかについては明らかになっていません。また、再生可能エネルギーの急速な技術進歩にともなう価格競争力向上、そして再生可能エネルギー普及による地域のエネルギー自治と雇用および経済活性化、そしてエネルギー安全保障など再生可能エネルギーが有する長所が、見過ごされているのではと考えられます。

現在EUでは2030年に電力の45%を再生可能エネルギーでまかなう目標を立てており、米国のカリフォルニア州では2030年まで再生可能エネルギー供給目標を50%までに設定しています。言い換えれば、「2030年に電力の40%以上を再生可能エネルギーで供給」ということが先進国のスタンダードと言って良いでしょう。韓日両国ともにOECD先進国として地球温暖化問題においても国際社会に貢献する義務があります。

今まさに、持続可能な低炭素社会を構築するために必要な再生可能エネルギー供給目標はどの程度なのか、そしてその目標を達成するために必要なエネルギー政策は如何なるものであるべきか知恵を絞ることが必要な時期となっています。このような状況でいち早く2030年まで炭素ゼロアイランドを打ち出し、再生可能エネルギー普及を積極的に展開している済州道で韓国と日本の優れた専門家たちが集まって議論を深めることは非常に意義高いといえます。

近年、韓日両国は、再生可能エネルギー政策転換を図り、再生可能エネルギーの普及が従来より進むなど一定の成果が現れています。ただし、両国ともに大規模太陽光発電が中心となっており、小規模地域密着型再生可能エネルギーは依然としてその普及が芳しくない状況にあります。

今回のシンポジウムでは、再生可能エネルギーの環境価値のほかに、地域価値にも注目を当てて、小規模再生可能エネルギーがビジネスモデルとして定着できる方策を模索することを目的としています。

今回のシンポジウムの特色は、中央政府、地方政府の再生可能エネルギー政策に詳しい研究者そして市民運動家と企業で活動をしている日韓の専門家が一同に集まり、その間のそれぞれの政策転換の成果と課題を比較考察し、今後地域型再生可能エネルギーの普及活性化方策を探ることであります。

最後にシンポジウムの開催に支援を惜しまなかったトヨタ財団、済州平和研究所、そして日本文部科学省の日本学術振興会の関係者の方々に深く感謝申し上げます。

2016年8月23日

名城大学教授　李秀澈・京都大学特定助教　中山琢夫・高麗大学教授　趙容成

Jeju Symposium for Promoting Renewable Energy in Japan and Korea

The Role of Central and Local Governments, Related Companies and Citizens

Dates: August 23~25, 2016
Venue: The Suites Hotel Jeju

[Day 1] August 23(Tue.)	**9:00-9:30 Registration** **9:30-9:50 Greetings** President Tae-young MOON (Jeju Peace Institute) Professor Soocheol LEE (Meijo University) Assistant professor Takuo NAKAYAMA (Kyoto University) *Moderator: Professor Yongsung CHO (Korea University) **10:00-11:00 Session Ⅰ** Session topic: Climate Change Policy and Energy Outlook after Paris Agreement Presentation 1: Professor Soocheol LEE (Meijo University) Presentation 2: Professor Yongsung CHO (Korea University) **11:00-12:00 Session Ⅱ** Session topic: Role of Central Government to Promote Renewable Energy Presentation 1: Assistant professor Takuo NAKAYAMA (Kyoto University) Presentation 2: Dr. Changhoon LEE (Korea Environment Institute) **12:00-12:40 Discussion on session Ⅰ and Ⅱ** Chair: Dr. Hyuncheol KIM (Jeju Development Institute) Discussant: Dr. Intaek HAN (Jeju Peace Institute) Journalist Ho-chun KIM (Yonhap News Agency) **12:40-14:00 Luncheon** **14:00-15:00 Session Ⅲ** Session topic: Role of Local Government and Company to Promote Renewable Energy Presentation 1: Director Heejung CHUNG (Seoul Metropolitan Government) Presentation 2: CEO Yoshihito IWAMA (Shinmutsu-ogawara) **15:10-16:10 Session Ⅳ** Session topic: Role of Citizens to Promote Renewable Energy Presentation 1: President Jiwon HA (EcoMom Korea) Presentation 2: Specialist Yosuke TOYOTA (Kiko Network) **16:10-16:30 Coffee Break** **16:30-17:30 Discussion on Session Ⅲ and Ⅳ** Chair: Professor Kyung-nam KIM (Korea University) Discussant: Professor Dongsoon LIM (Dong-eui University) Director Youngung LEE (Korean Federation for Environmental Movements of Jeju) **18:00 -20:30 Dinner at Lotzu**
[Day 2] August 24(Wed.)	**10:00-11:30 Visit Jeju Prefecture** **11:30-13:30 Luncheon** **13:30-17:30 Visit renewable energy facility** **18:30-20:30 Dinner by Jeju Peace Institute**
[Day 3] August 25(Thur.)	**10:00-12:00 Round table meeting** Topic: Renewable Energy Cooperation Between Japan and Korea Chair: Professor Soocheol LEE (Meijo University) Keynote address: Professor Nobuo SHIRAI (Hosei University) "Renewable Energy and Regeneration of Regional Communities : Comparison of Citizens' Consciousness in Japan and Korea" **12:00-13:30 Luncheon** **13:30 Closing Remark**

Proceedings

Session I - 1	**Japan` Energy Outlook in 2030 and Climate Change Policy to Meet INDC of Paris Agreement** - Professor Soocheol LEE (Meijo University)
Session I - 2	**Climate Change, Paris Agreement, and Korea** - Professor Yongsung CHO (Korea University)
Session II - 1	**Current Status and Issue of Japanese RE Policy at Central Government Level** - Assistant professor Takuo NAKAYAMA (Kyoto University)
Session II - 2	**Recent Developments of Korea's Renewable Energy Policy** - Dr. Changhoon LEE (Korea Environment Institute)
Session III - 1	**One Less Nuclear Power Plant** **Seoul Sustainable Energy Action Plan** - Director Heejung CHUNG (Seoul Metropolitan Government)
Session III - 2	**Renewable Energies in Rokkasho** - CEO Yoshihito IWAMA (Shinmutsu-ogawara)
Session IV - 1	**The Role of Citizens in the Generalized Use of Renewable Energy** - President Jiwon HA (EcoMom Korea)
Session IV - 2	**Citizens' and Regional Initiatives towards 100% Renewable Energy in Japan** - Specialist Yosuke TOYOTA (Kiko Network)
Keynote address	**Renewable Energy and Regeneration of Regional Communities Comparison of Citizens' Consciousness in Japan and Korea** - Professor Nobuo SHIRAI (Hosei University)

SESSION Ⅰ - 1

Japan` Energy Outlook in 2030 and Climate Change Policy to Meet INDC of Paris Agreement

Professor Soocheol LEE (Meijo University)

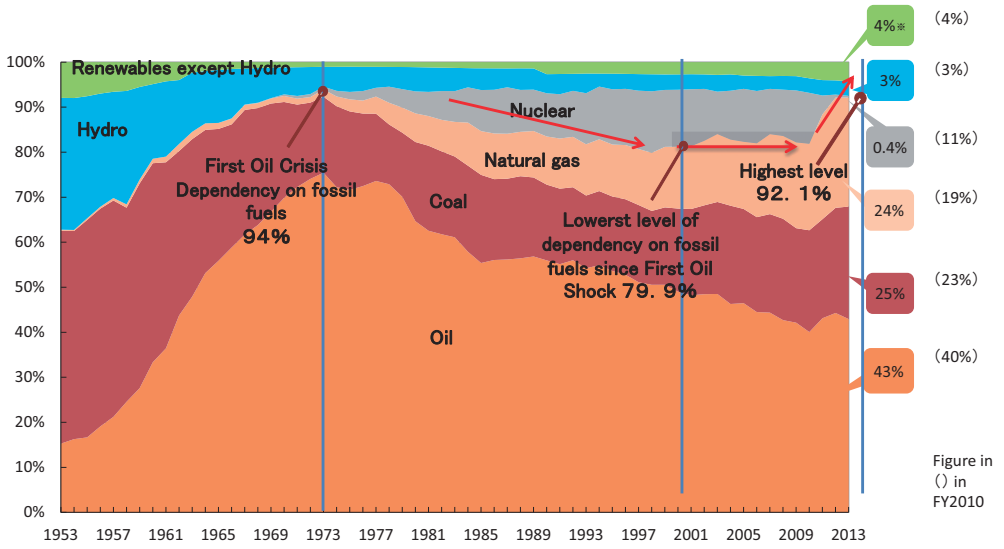
Japan-Korea Jeju renewable energy promotion symposium
August 23-25, 2016

Japan` Energy Outlook in 2030 and Climate Change Policy to Meet INDC of Paris Agreement

Soocheol Lee
(Meijo University)
slee@meijo-u.ac.jp

Current Energy Situation and Outlook of Energy Plan in Japan

Figure 1 Historical change in primary energy mix of Japan



Source: MET, Comprehensive Energy Statistics

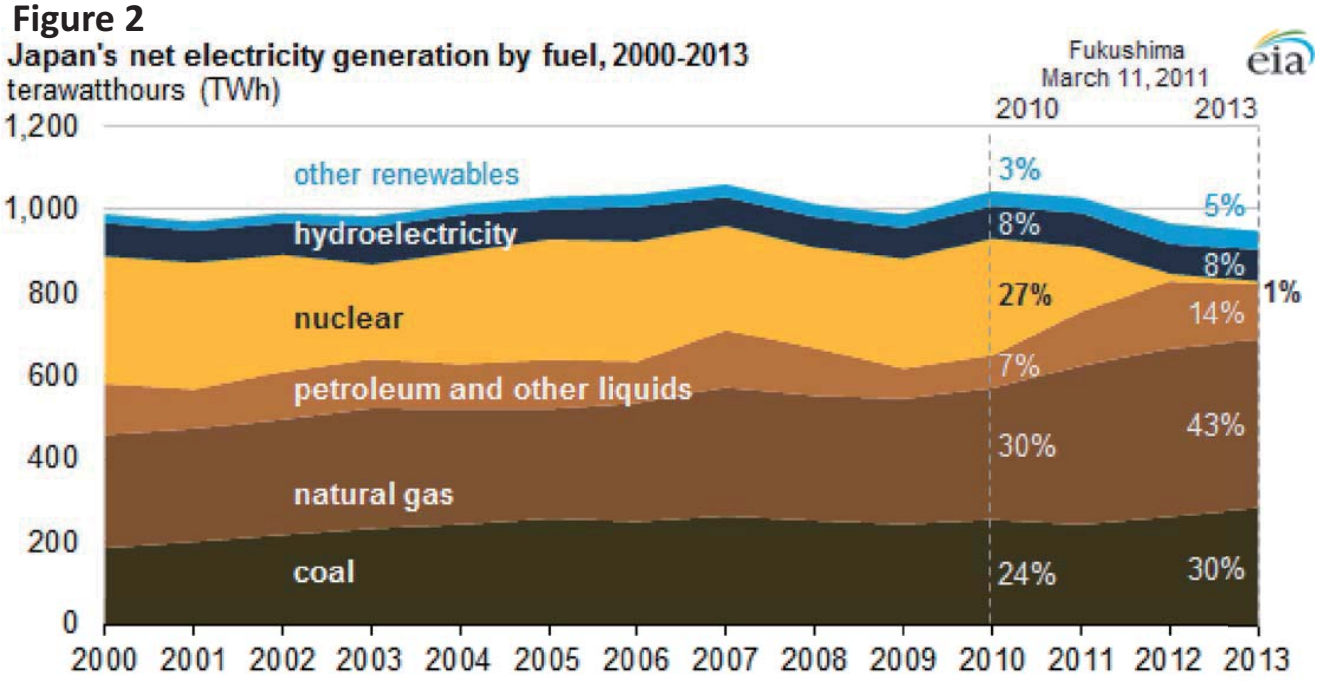
※ Solar (0.1%)、Wind (0.2%)、Geothermal (0.1%)、Biomass (3.6%)

3

Figure 2

Japan's net electricity generation by fuel, 2000-2013

terawatthours (TWh)

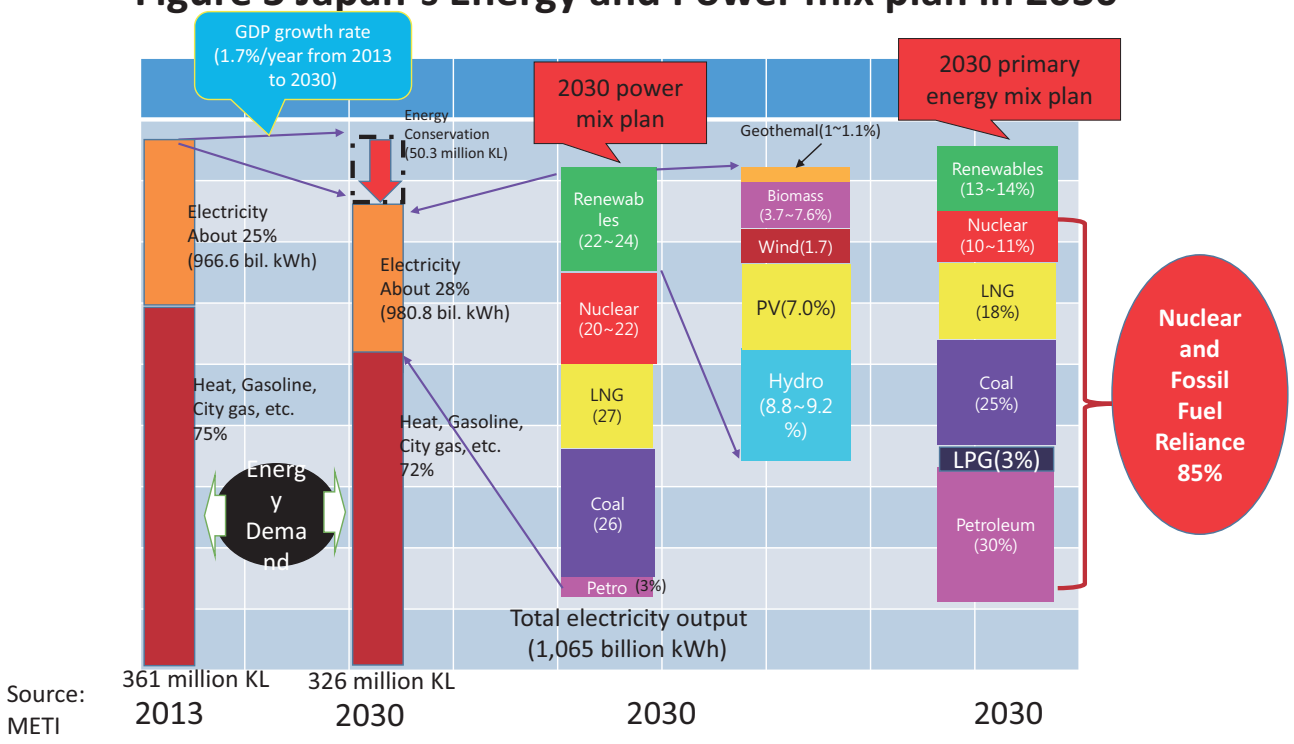


Source: The Federation of Electric Power Companies in Japan

Table 1 Changes of Energy Basic Plan and energy policies in Japan

	Energy Basic Plan	Outline
2003	Energy Basic Plan	Formulate a basic plan on energy supply and demand
2007	1st revision of Energy Basic Plan	Measurement to get the Kyoto Protocol target of Japan
2010	2nd revision of Energy Basic Plan	Share of Zero emission electricity (nuclear and renewables) target 50% in 2020and 70%(nuclear 50% and renewables 20% approximately) in 2030
2012	Innovative Energy and Environment Policy	Share of electricity mix as nuclear 0%, renewables 35%, and fossil fuels 65%
2013	New Energy Basic Plan	Regard nuclear as important base load electricity. Enlarge renewables
2015	National Long-term Energy Demand-Supply Outlook	Ratio of nuclear 20 ~ 22% in 2030, renewables 22 ~ 24% and fossil fuels 60% in total electricity.

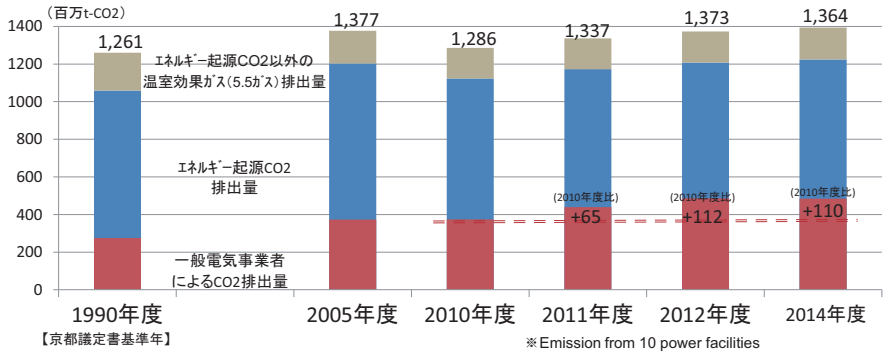
Figure 3 Japan`s Energy and Power mix plan in 2030



Source: METI

Table 2　Trend in GHG emissions of Japan

	FY1990	FY2005	FY2010	FY2011		FY2012		FY2014	
GHG emissions （Mt-CO2）	1，261	1，377	1，286	1，337		1，373		1，364	
CO2 emissions from energy sources （Mt-CO2）	1，059	1，203	1，123	1，173		1，208		1，265	
Fom power generation※ （Mt-CO2）	275	373	374	439	(10年比)▲65	486	(10年比)▲112	495	(10年比)▲110
From other sources （Mt-CO2）	784	830	749	734	▲15	722	▲28	770	▲9



※Emission from 10 power facilities

【出典】総合エネルギー統計、環境行動計画（電気事業連合会）、日本の温室効果ガス排出量の算定結果（環境省）をもとに作成。

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Figure 4 CO2 Emission Trend of Japan, Korea and Germany

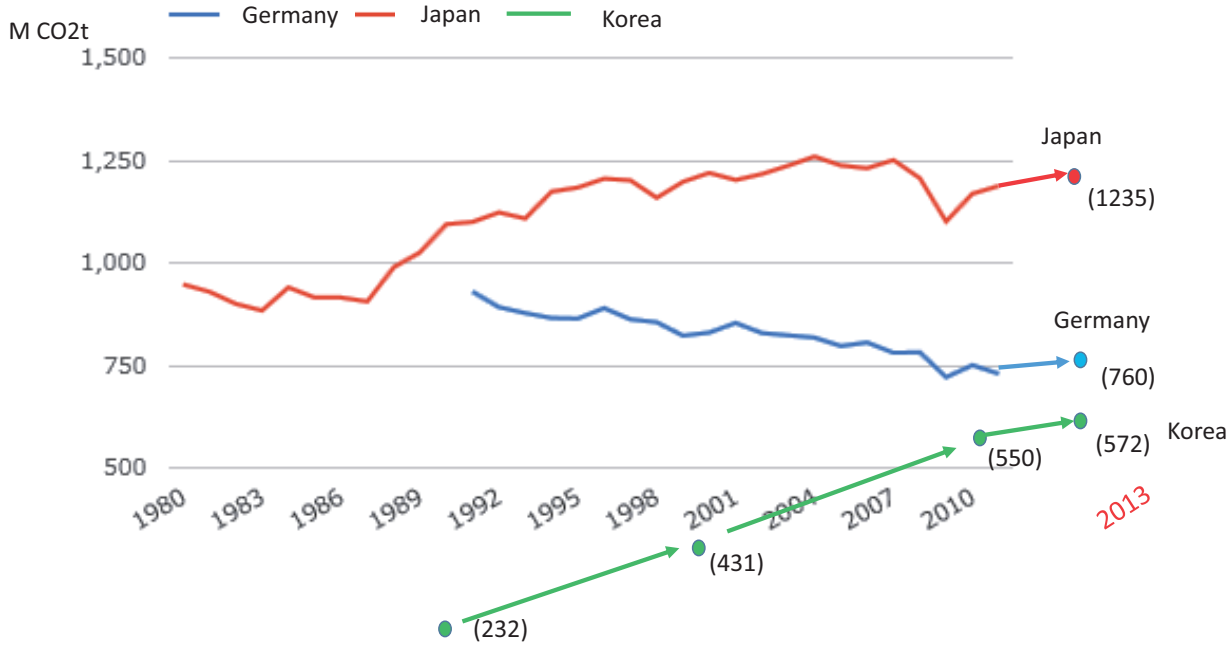


Figure 5 Japanese GHG targets in 2030 and 2050

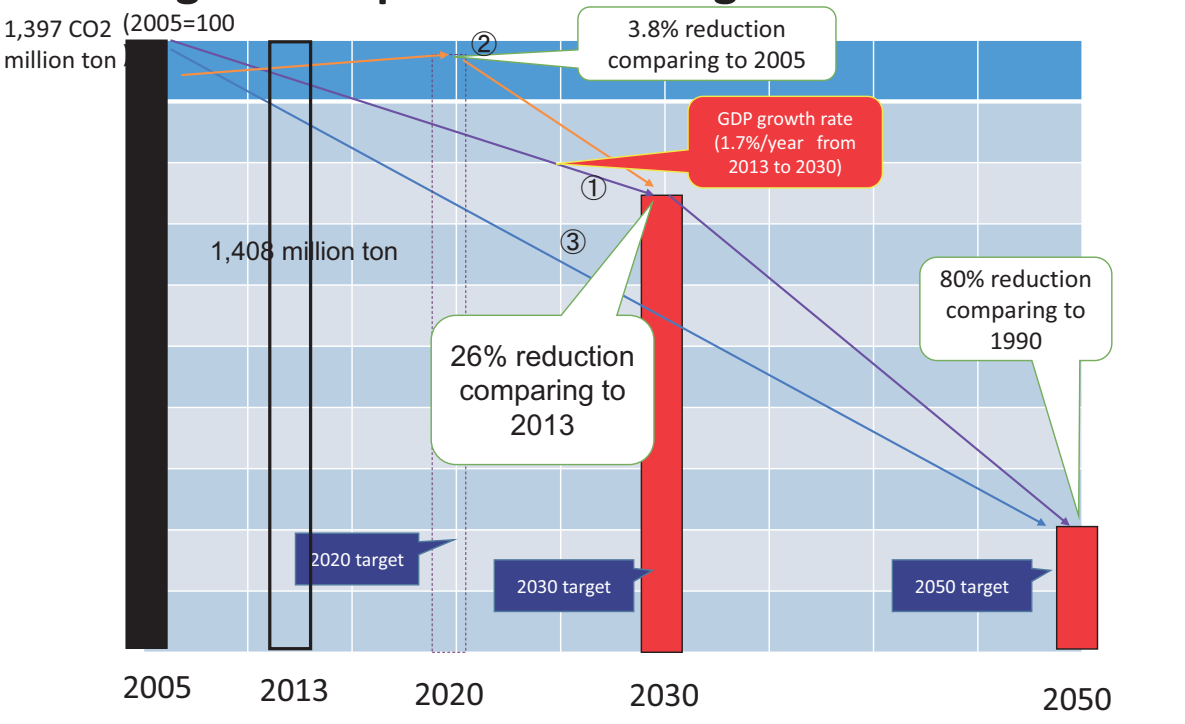
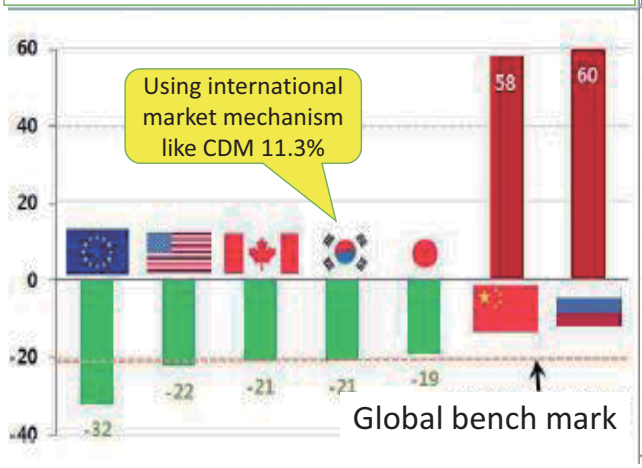


Table 3 GHG target of selected countries to meet INDC

	Base year	Target year	Reduction rate	Etc.
EU	1990 (2005)	2030	▲40% (▲35%)	No contribution from international credits.
US	2005 (1990)	2025	▲26～28% (▲14～16%)	
China	2005	2030	(CO2/GDP) From base year of INDCs▲60～65%	Making CO2 emission peak around 2030(as soon as possible)
Korea	BAU	2030	▲37%	utilize international market Mechanisms 11.3% (-8.1% comparing to 2012)
Japan	2013 (1990) (2005)	2030	▲26% (▲18%) (▲25.4%)	

Figure 6 GHG Target of Selected Countries

GHG2030 Target Comparing to 2010

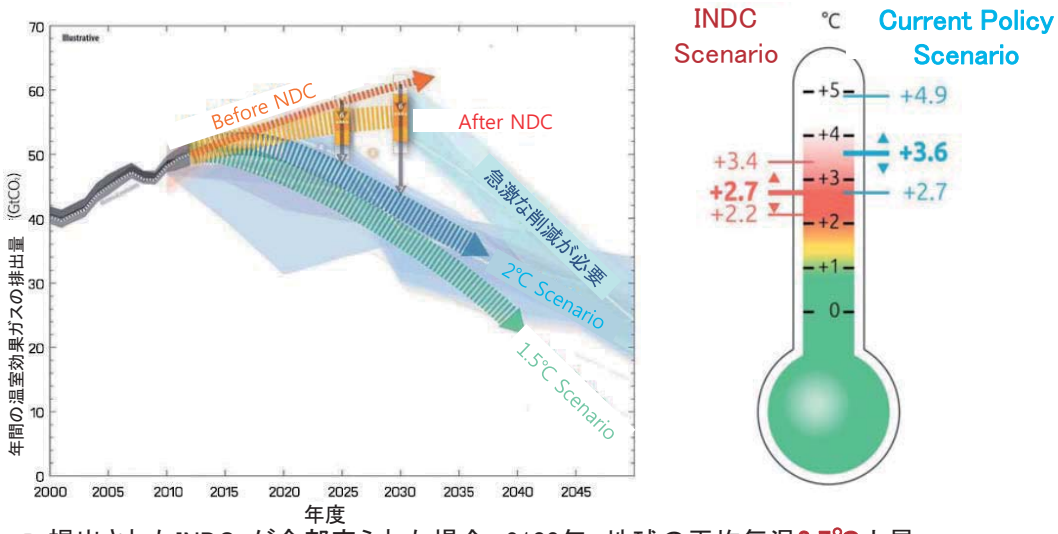


2050GHG Target

Countries	Basic year	Target
U.S.A	2005年	-83%
EU	1990年	-80~95%
Japan	2005年	-80%
Russia	1990年	-50%
Canada	2006年	-60~70%
Korea	-	-

Source : How Ambitious Are the Post-2020 Targets?(Bloomberg New Energy Finance(BNEF), '15.7)

Figure 7 Global Temperature before and after INDCs

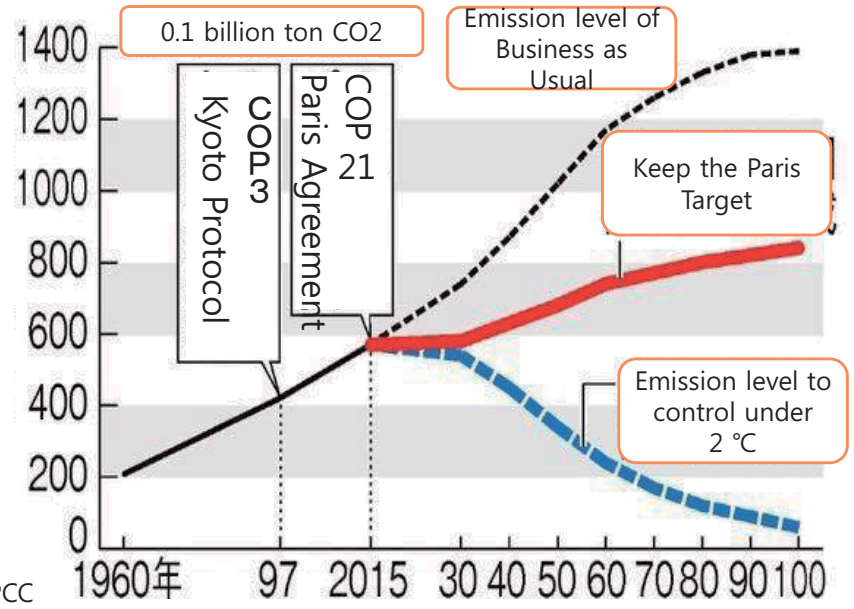


- 提出されたINDCsが全部守られた場合、2100年、地球の平均気温2.7℃上昇
- 現在、INDCsでは2030年までのCO_2の累積排出量は748.2Gtに達し、炭素予算1兆トンの75%消尽予想

Source: IPCC

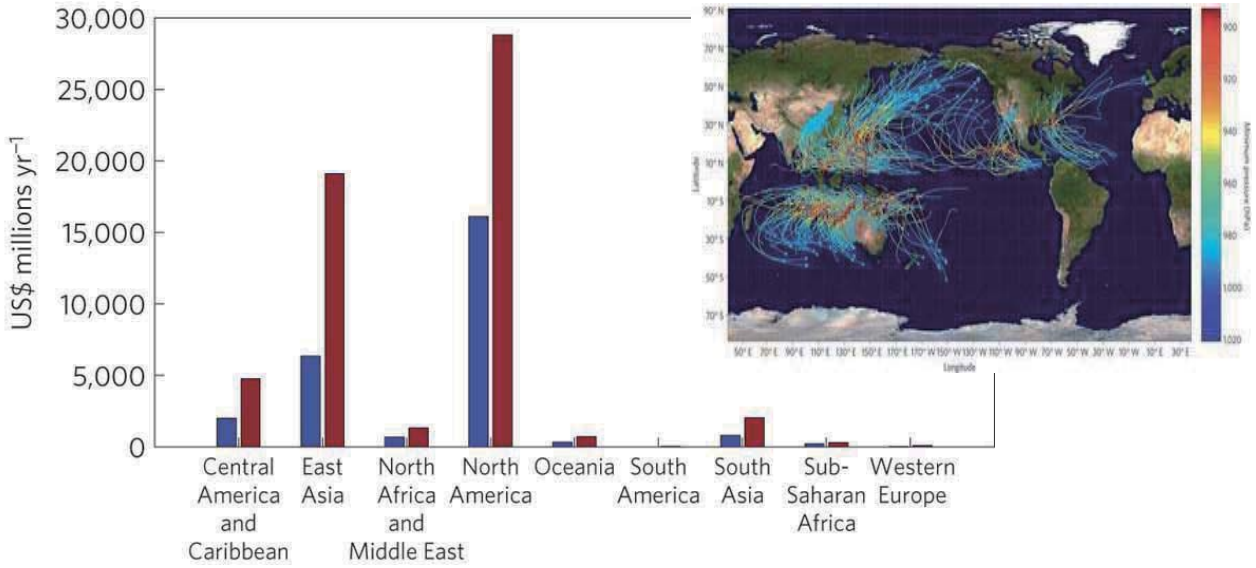
13

Figure 8 GHG emission level to control global temperature under 2 ℃



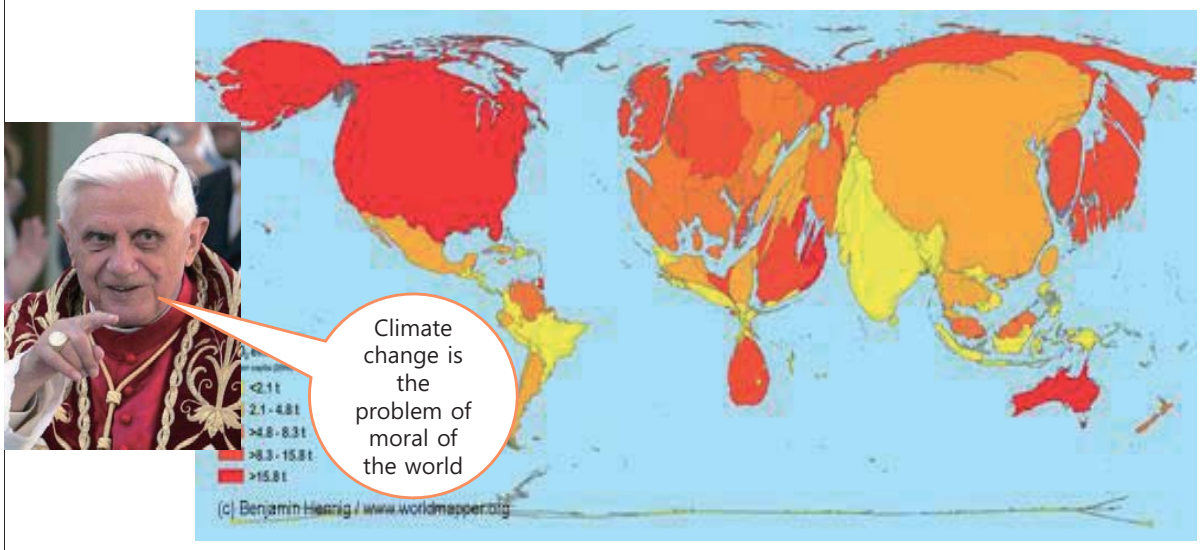
Source: IPCC

Figure 9 The impact of climate change on global tropical cyclone damage



Source: Nature Climate Change

Figure 10 Mapping GHG emissions of the world




SAVE
NEW COAL
THE GREENS
NO NEW COAL
CREATE JOBS
CLIMATE CAN'T WAIT
Chicago Tribune


Energy and
Climate Change
Policy in Japan

Figure 11 Raito of renewables in total electricity supply

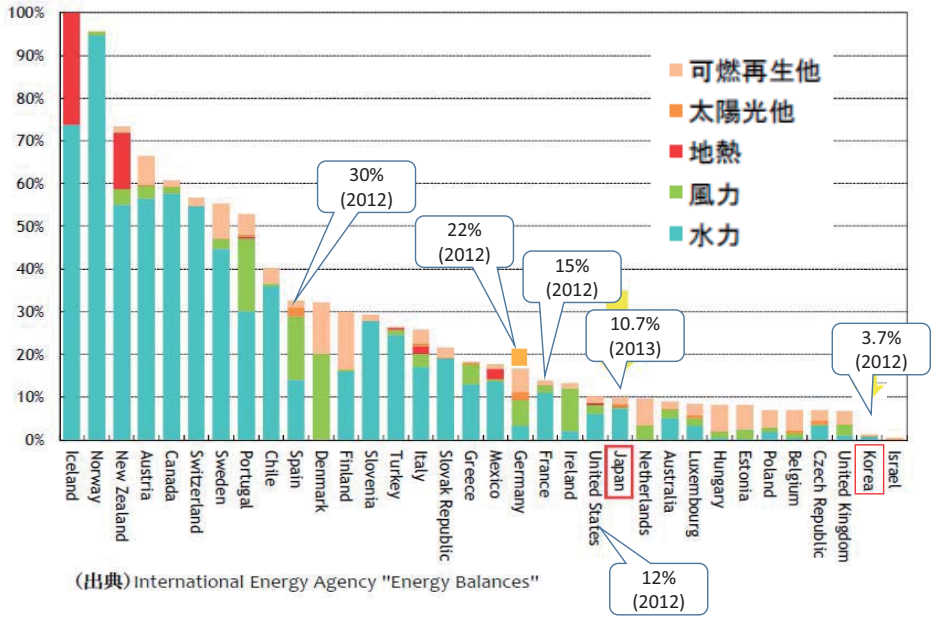
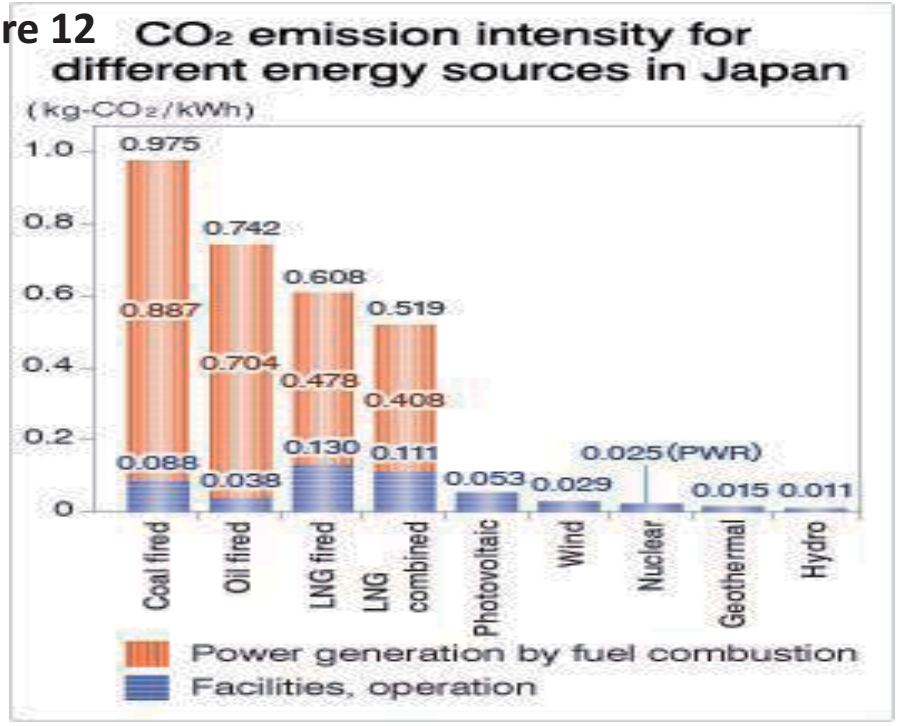


Figure 12 CO_2 emission intensity for different energy sources in Japan



Source: The Federation of Electric Power Companies in Japan

Figure 13 Levelized Cost of Electricity in € per kWh

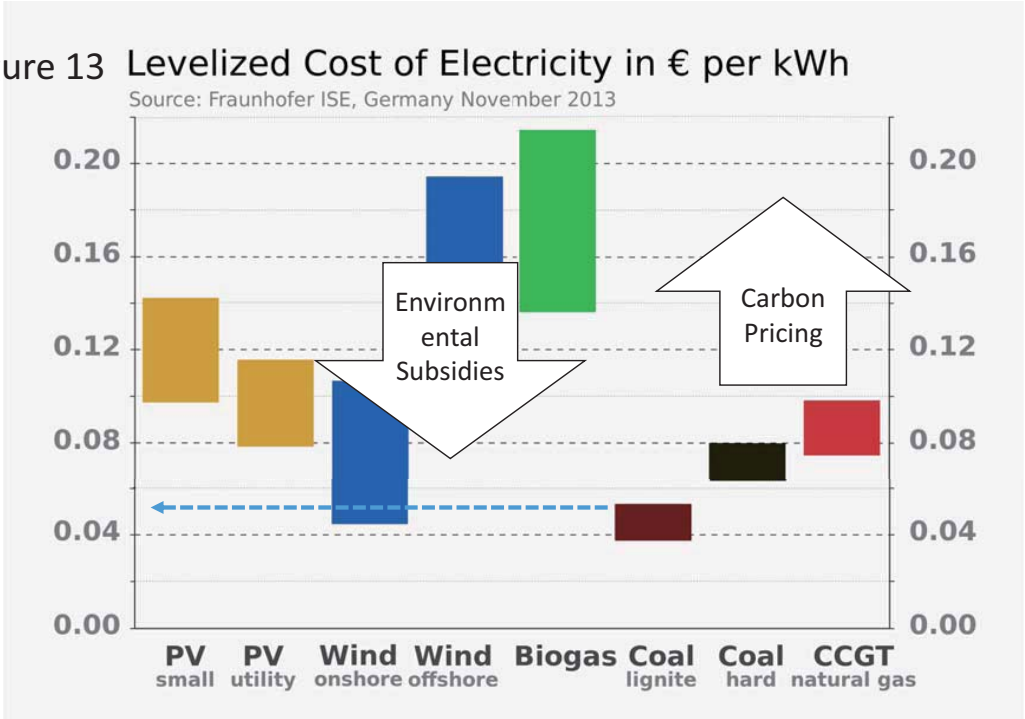


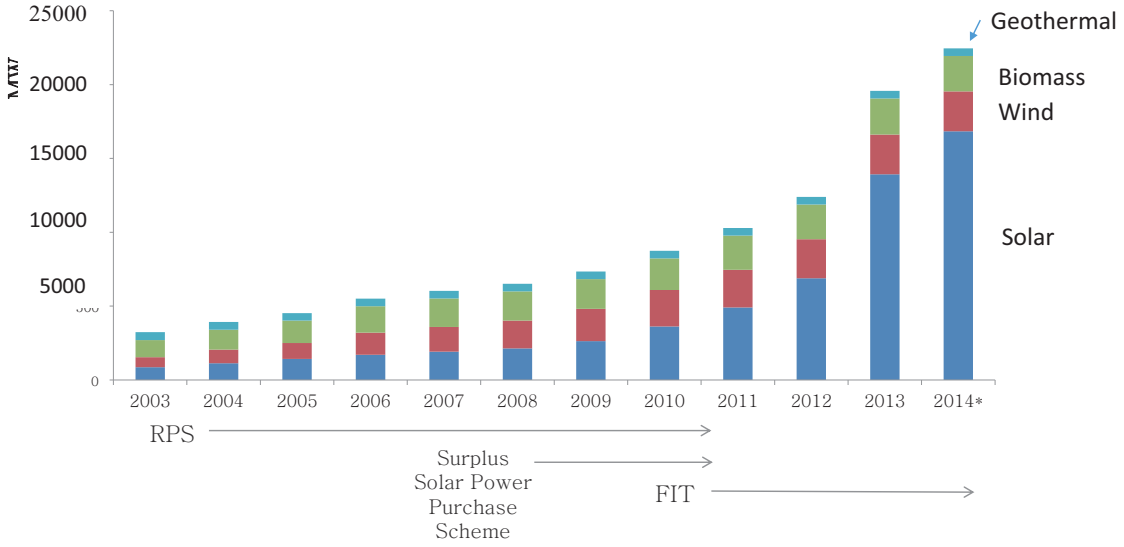
Table 4 FIT tariff and installed capacity of renewable energy in Japan

Technology	Tariff(JPY/kWh)						Installed capacity (July2012~April2016) (MW)
	Tariff years	2012	2013	2014	2015	2016	
PV (smaller than 10kW)	10	42	38	37	33~35	31~33	4,030(4,690)
PV (larger than 10kW)	20	40	36	32	29	24	24,280(74,760)
Wind (smaller than 20kW)	20	55	55	55	55	55	500(2,840)
Wind (larger than 20kW)	20	22	22	22	22	22	
Wind(off shore)	20	-	-	36	36	36	
Small hydro (smaller than 200kW)	20	34	34	34	34	34	170(780)
Small hydro (200-1000kW)	20	29	29	29	29	29	
Geothermal (smaller than15000kW)	15	40	40	40	40	40	10(80)
Biogas	20	39	39	39	39	39	530(3,710)
Solid biomass (unutilized wood)	20	32	32	32	32	32	
Solid biomass (wood and processed residue from agriculture)	20	24	24	24	24	24	
Waste	20	17	17	17	17	17	Total:29,520(86,860)

Note: ( ) of installed capacity is amount approved.

Source: Agency for Natural Resources and Energy, Japan, Website June 2016 access

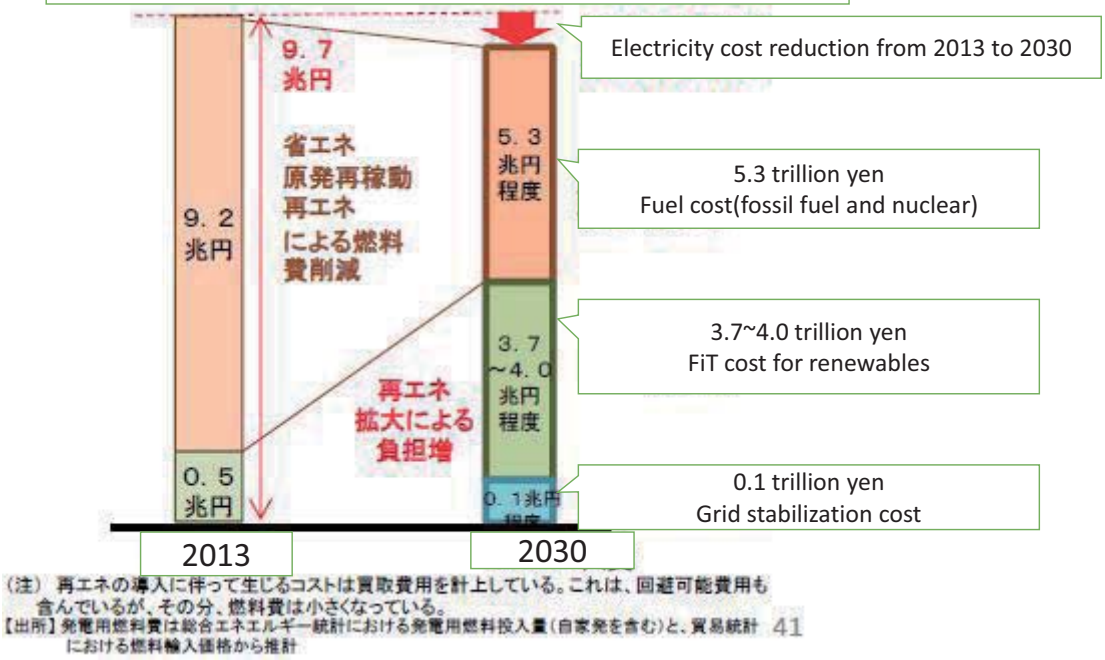
Figure 15　Expanding Generation Capacity of Renewable



Source Produced based on Materials of METI。FY2014 cover only capacity introduced from April to July.

23

Figure 16　Image of electricity generation cost in 2030



（注）再エネの導入に伴って生じるコストは買取費用を計上している。これは、回避可能費用も含んでいるが、その分、燃料費は小さくなっている。
【出所】発電用燃料費は総合エネルギー統計における発電用燃料投入量（自家発を含む）と、貿易統計における燃料輸入価格から推計

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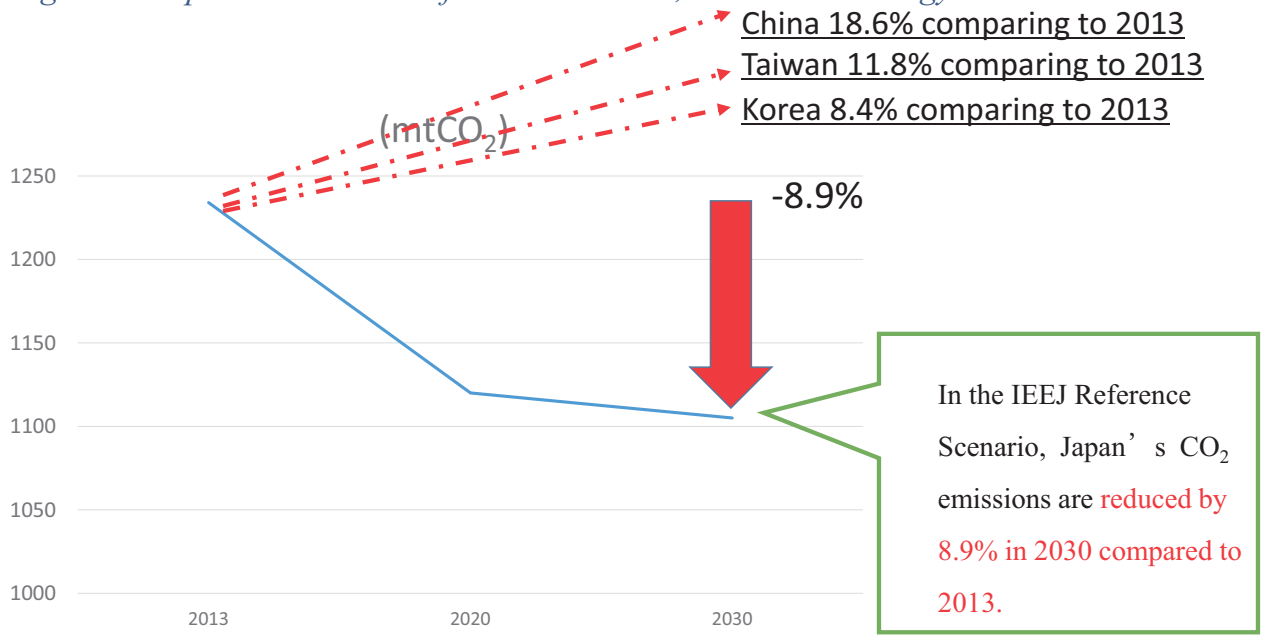
Source: METI

Figure 17 Countries which already introduced carbon tax

COUNTRY	INTRODUCED	APPROXIMATE LEVELS (USD / ton)
Finland	1990	27 $
Netherlands	1990	19 $
Norway	1991	15 $ to 60 $
Sweden	1991	30 $ (Industry rate)
Denmark	1992	16 $
Switzerland	2007	32 $
Ireland	2010	20 $
UK	2011	25 $ in 2013 (increase to around 47 $ in 2020)
Japan	2012	2.5 $

Figure 18 Japan CO2 in the Reference Scenario, Asia/World Energy Outlook 2015



Source: Asia/World Energy Outlook 2015 (IEEJ 2016).

Revise National Energy Plan

- Reduce shares of Nuclear and fossil fuel energy
- Increase renewable energy share at least 30% by 2030

Revise current renewable energy policy more friendly to small size and localized generation

- Hybrid renewable policy(e.g. RPS(Mega Sola etc.)+FIT(small size and localized generation))

Introduce carbon pricing positively

- Carbon pricing is now widely implemented or scheduled for implementation
- Carbon pricing stimulate low carbon investment and renewable energies

- "40 years life span in principle" under the legislation would probably bring share of nuclear to less than 15%; and to zero around 2050.

-Need to prepare additional measures for the situation in which nuclear power plants could not operate as assumed

- Concern about numerous plans to newly construct coal fired plants

-Need some regulation to set level playing field.

Figure 21　Trend of generation capacity of nuclear power in case finish generation in 40 and 60 years

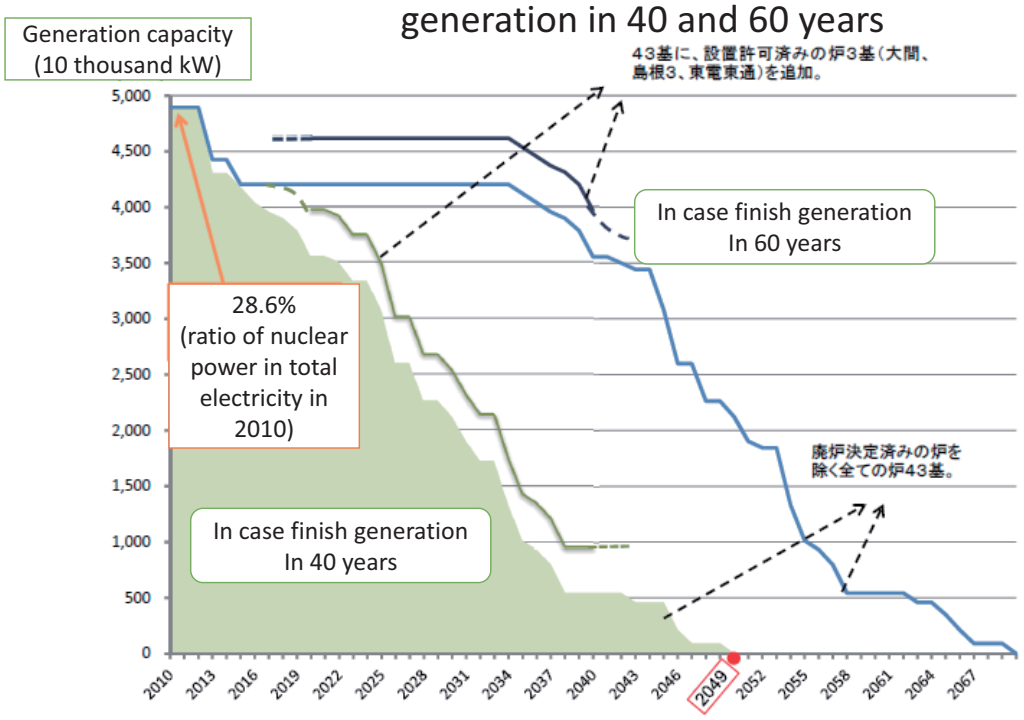


Figure 22　East Asia super grid vision

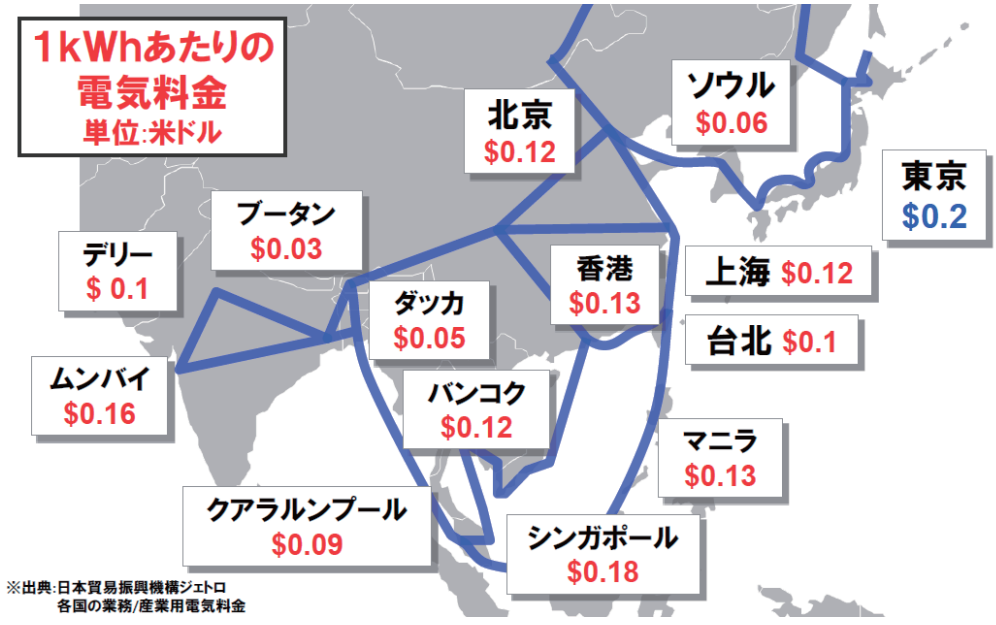
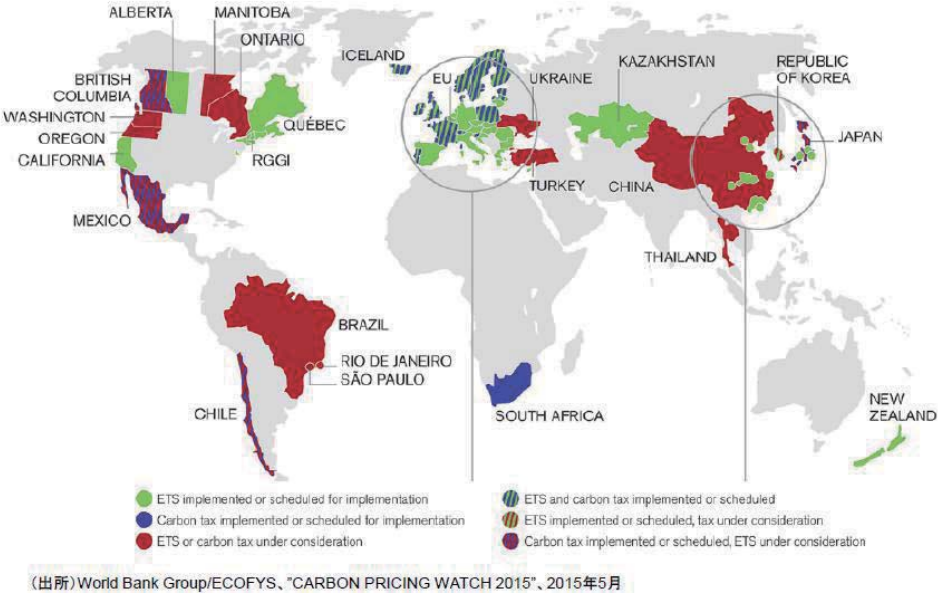


Figure 23 Countries implemented or scheduled carbon pricing for implementation



（出所）World Bank Group/ECOFYS、"CARBON PRICING WATCH 2015"、2015年5月

Figure 24 : GDP, CO_2 emissions, GHG targets, energy systems and low-carbon policies of Japan and Korea

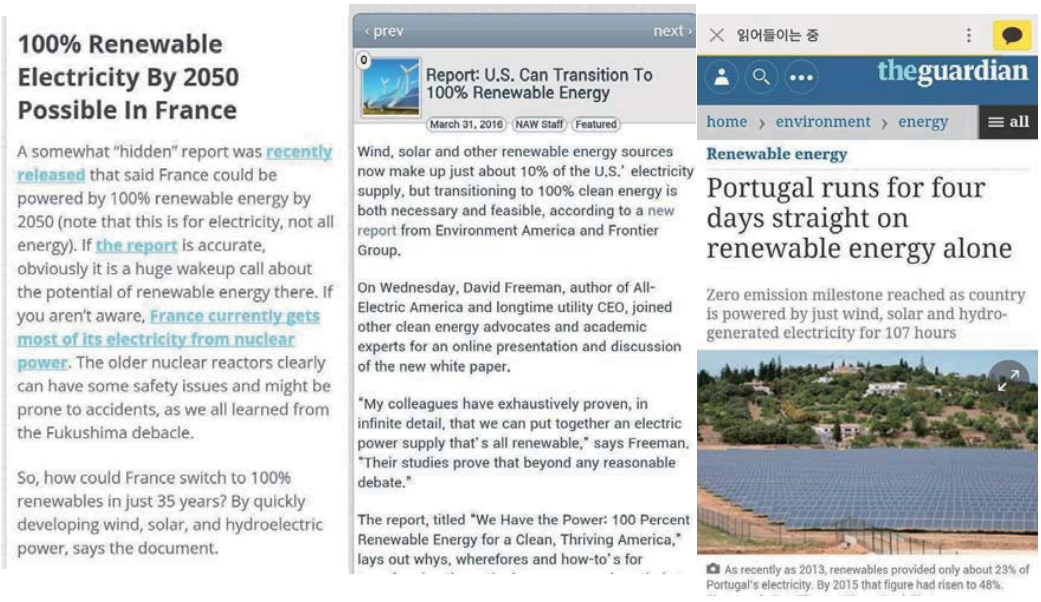
		Japan (year)	Korea (year)
GDP	GDP (bn US$)	3,104 (1990), 4,902 (2013)	270 (1990), 1,222 (2013)
	GDP (per capita US$)	25,140 (1990), 38,491 (2013)	6,308 (1990), 24,329 (2013)
CO_2 emission and GHG targets	Energy related CO_2 emission (M CO_2ton)	1,095 (1990), 1,235 (2013)	247 (1990), 601(2013)
	INDC 2030 GHG target(%)	-18.0(comparing to 1990) -25.4(comparing to 2005) -26.0(comparing to 2013)	-37.0%(BAU) -21%(comparing to 2010) *including oversea`s credit
Renewable energy and nuclear power target	Renewable (% of total electricity)	10.7% (2013), 13.5% (2020), 22~24.0% (2030)	3.7% (2012), 10% (2022), 15% (2035) 11% of primary energy (2035)
	Nuclear (% of total electricity)	29.2% (2010), 1.7% (2013), 20~22%(2030)	32.2% (2010), 27.6% (2013), 27.8% (2024), 29% (2035)
Low-carbon policy	Carbon tax	289 yen/tCO_2 from 2012	Not yet; under discussion
	ETS	Not yet nationally but municipally from 2010 (Tokyo City), 2011 (Saitama Prefecture)	Nationally from 2015
	Renewable energy policy	FIT	RPS(Renewable Portfolio Standard)

Sources: Websites of World Bank, IEA, IAEA,World Nuclear Association and Lee et al.,2015.

Reference Figures

Figures from PPT of Prof. Sun-Jin Yun of Seoul National University presented at Meijo University on August 1st, 2016

100%再生可能エネルギー社会の可能性:国家



100% Renewable Electricity By 2050 Possible In France

A somewhat "hidden" report was recently released that said France could be powered by 100% renewable energy by 2050 (note that this is for electricity, not all energy). If the report is accurate, obviously it is a huge wakeup call about the potential of renewable energy there. If you aren't aware, France currently gets most of its electricity from nuclear power. The older nuclear reactors clearly can have some safety issues and might be prone to accidents, as we all learned from the Fukushima debacle.

So, how could France switch to 100% renewables in just 35 years? By quickly developing wind, solar, and hydroelectric power, says the document.

‹ prev next ›

Report: U.S. Can Transition To 100% Renewable Energy

March 31, 2016 NAW Staff Featured

Wind, solar and other renewable energy sources now make up just about 10% of the U.S.' electricity supply, but transitioning to 100% clean energy is both necessary and feasible, according to a new report from Environment America and Frontier Group.

On Wednesday, David Freeman, author of All-Electric America and longtime utility CEO, joined other clean energy advocates and academic experts for an online presentation and discussion of the new white paper.

"My colleagues have exhaustively proven, in infinite detail, that we can put together an electric power supply that's all renewable," says Freeman. "Their studies prove that beyond any reasonable debate."

The report, titled "We Have the Power: 100 Percent Renewable Energy for a Clean, Thriving America," lays out whys, wherefores and how-to's for

읽어들이는 중

theguardian

home › environment › energy all

Renewable energy

Portugal runs for four days straight on renewable energy alone

Zero emission milestone reached as country is powered by just wind, solar and hydro-generated electricity for 107 hours

As recently as 2013, renewables provided only about 23% of Portugal's electricity. By 2015 that figure had risen to 48%.

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100%再生可能E社会の可能性：地方政府/都市

DIALOGUE REPORT:

100% RENEWABLE ENERGY IN CITIES

7 December 2015 | Cities and Regions Pavilion – TAP 2015 | COP21, Le Bourget, Paris

- Aspen, United States of America
- Byron Shire, Australia
- Curitiba, Brazil
- Kaohsiung, Chinese Taipei
- Medellín, Colombia
- Tshwane, South Africa
- Australian Capital Territory, Australia
- Cape Town, South Africa
- Jeju Province, Korea
- Malmö, Sweden
- Paris, France
- Vancouver, Canada

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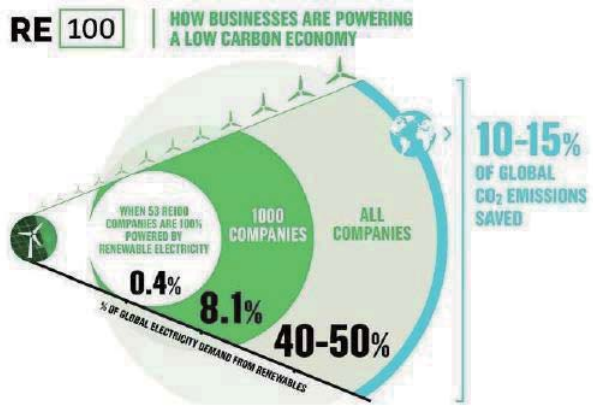
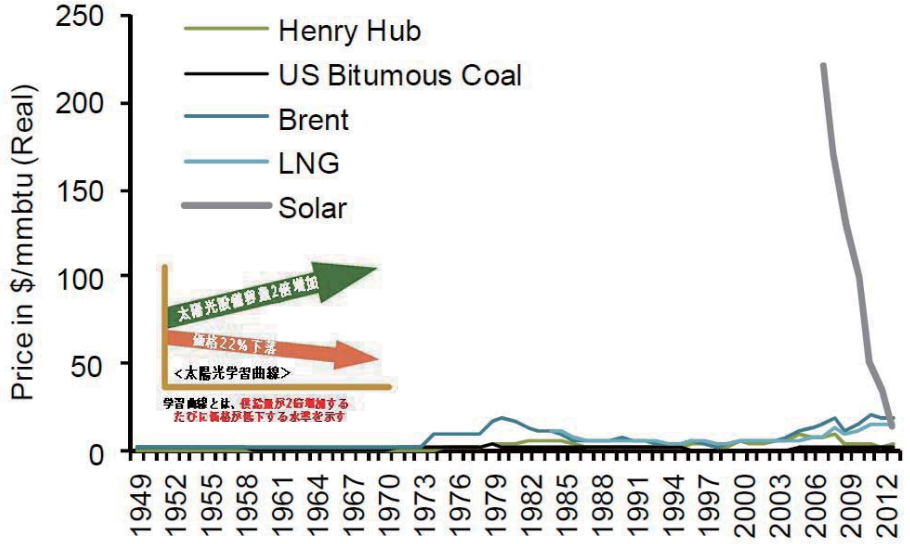
100%再生可能E社会の可能性： 企業



- 現在100%再生エネルギー宣言グローバル企業数は58社
- 全ての企業が100%再生エネルギーを利用する場合、世界消費電力の40～50%節約、世界CO_2排出量の10～15%低減

Adobe, Alstria, Autodesk, Aviva, Biogen, Bloomberg L.P., BMW Group, BROAD Group, BT Group, Coca-Cola Enterprises, Commerzbank, Crédit Agricole Group, DSM, Elion Resources Group, Elopak, Formula E, Givaudan, Goldman Sachs, Google, H&M, HP inc., IKEA Group, Infosys, ING, International Flavors & Fragrances Inc.(IFF), J. Safra Sarasin, Johnson & Johnson, Kingspan, KPN, La Poste, Land Securities, Marks & Spencer, Mars Incorporated, Microsoft, Nestlé, Nike, Inc., Nordea Bank AB, Novo Nordisk, Pearson PLC, Philips, Procter & Gamble, Proximus, RELX Group, Salesforce, SAP, SGS, Sky pcl, Starbucks, Steelcase, Swiss Post, Swiss Re, Tata Motors, UBS, Unilever, Vaisala, Voya Financial, Walmart and YOOX Group.

エネルギー源別価格変化：太陽光価格急落



- ヘンリーハブ：北米地域の代表的な天然ガス価格指標

<出所: Bernstein Research, 2014>

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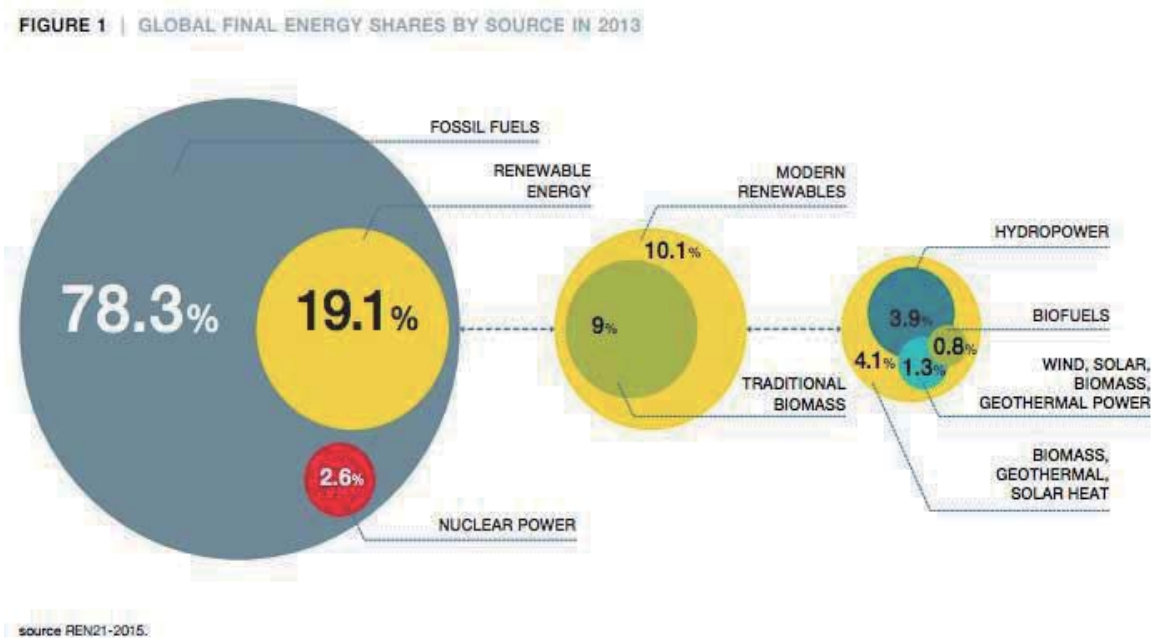
SESSION Ⅰ - 2

Climate Change, Paris Agreement, and Korea

Professor Yongsung CHO (Korea University)

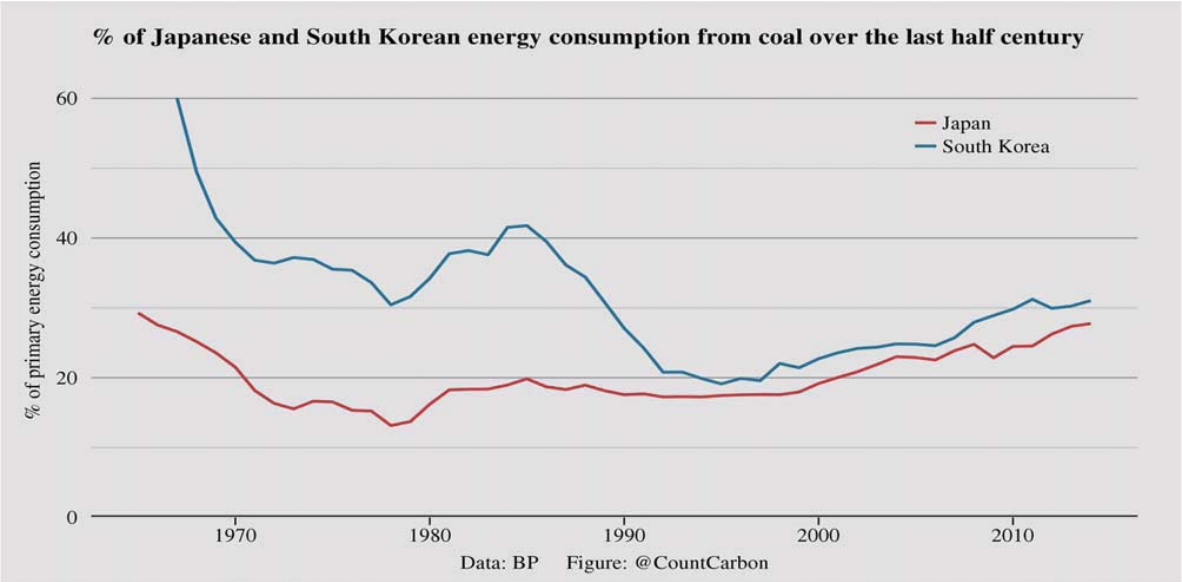
Climate Change, Paris Agreement, and Korea

Yongsung CHO
KOREA University



http://www.pulseheadlines.com/greenpeacess-energy-revolution-proposals-2015/6356/

Source: https://twitter.com/pro_arithmetic/status/759815157010751488 (2016.09.19)

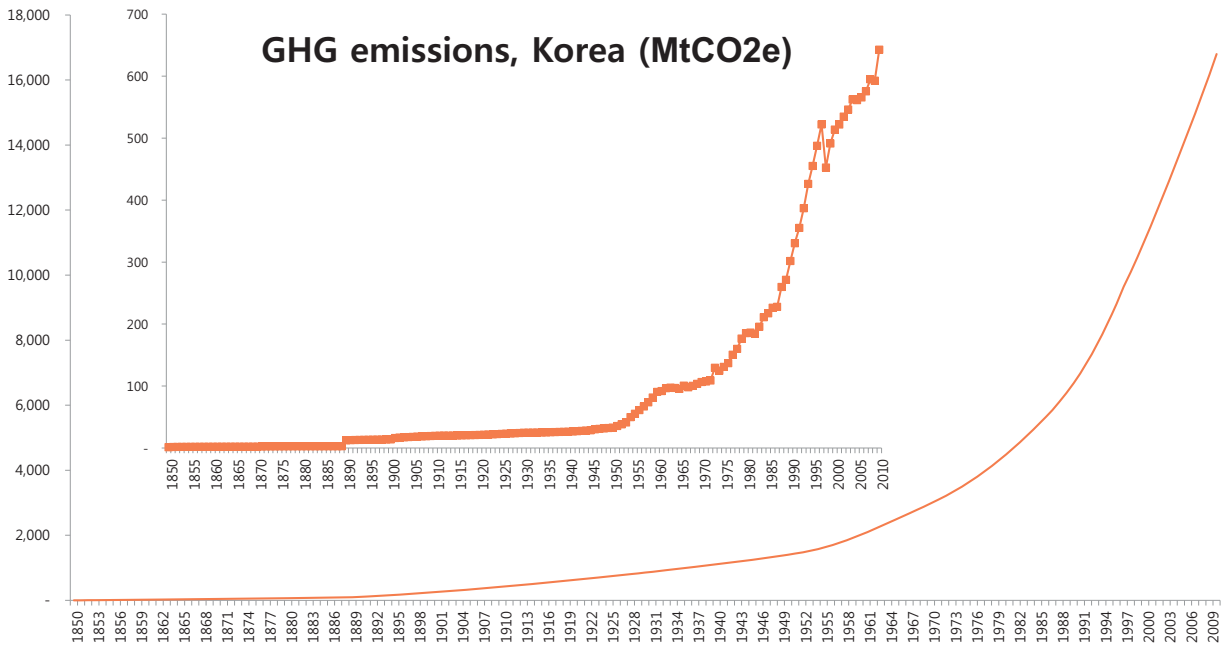


South Korea's power demand increased by 162% over the period 1990–2013 and is dominated by coal-fired (45% in 2013) and nuclear generation (26% in 2013) (IEA, 2014).

Current status of Korea

- **Fossil fuels** accounted for about **66% of energy supply** in 2014.
- Nuclear energy with 15%, but **renewable energy only 1.1%**
- Of **renewable energy**, bio fuels and waste energy accounted for about 73%, followed by hydro energy at 12% and solar power with 7.4%

- **Question: Why Korea has such a low renewable energy share?**



National Targets

- BY 2020: 30% below BAU
- By 2030: 37% below BAU (536 MtCO2e)
  - 22% reduction below 2012 GHG levels.
  - actual mitigations of 25.7% + purchase of global carbon credits (11.3%), leading to a restriction of emissions to 536 MtCO2e.

Yearly Target Emissions based on Roadmap 2020 & INDC

	National Greenhouse Gas Emissions Reduction Roadmap 2020 (2014.1)							INDC (2015.6)		
	'14	'15	'16	'17	'18	'19	'20	2020	2025	2030
BAU	694.5	709.0	720.8	733.4	747.1	761.4	776.1	782.5	809.7	850.6
Target Emission	659.1	637.8	621.2	614.3	604.4	585.4	543.0	-	-	535.9 (632.0)
Reduction rate	5.1%	10%	13.8%	16.2%	19.1%	23.1%	30%	-	-	37% (25.7%)

Source: National Greenhouse Gas Emissions Reduction Roadmap 2020 (2014.1) and the 2030 South Korea to GHG Mitigation Goal to 37% from BAU (2015.6)

Difficulties : K-ETS

- K-ETS launched in 2015 to provide 525 local companies with opportunities to reduce carbon emissions through selling leftover or buying shortages of emissions rights.
- However, companies are reluctant to sell their leftover emissions rights, which can be rolled over to the next year.
- **Why? Solutions?**

Government actions

- The Cabinet on Feb. 2016 approved plans to hand over responsibility for the nation's emissions trading scheme to the Office for Government Policy Coordination, and changed an ETS rule to make it easier for emitters to meet their targets.
  - But, the market was oversupplied in the first year (2015).

- Change of roll : MoE ➔ Ministry of Strategy and Finance
  - Tasks: setting up & coordinating plans on emissions quotas, as well as controlling the emissions rights market.

Change : New Energy Industry Promotion Plan

- Ministry of Trade, Industry and Energy (MOTIE) unveiled a detailed investment plan on July 5, 2016 to promote the "**new energy industry**" as Korea's next growth driver.
- The gist of the investment plan is that
  - invest a combined 42 trillion won ($36.6 billion) into new energy businesses by 2020
  - including renewable energy, electric vehicles (EVs), energy storage systems (ESS) and smart grids
  - aims not only to fight climate change but also to nurture a new export industry

- To develop and promote new energy industry, 30 trillion won (71%) is slated to be spent on the **construction of renewable energy power plants** with a combined power generation capacity of 13 million kilowatts, equivalent to that of 26 coal plants.

- To speed up renewable power plant construction, MOTIE will raise the "renewable portfolio standard (RPS)" to 5% from an earlier target of 4.5% in 2018, and from 6% to 7% in 2020.

- Incentives will be offered to solar power producers utilizing ESS, which will double the ESS market to 600 billion won by 2020.

- Deregulation measures
  - to allow solar power generators to sell electricity to individual and corporate customers via the Korea Power Exchange.
  - the opening of the power generation & supply market ➔ draw more private companies into the new energy market~

- The long-term investment goal is to develop these new energy companies into exporters.
  - Pairings will be sought with Korean financial institutions and public energy giants (i.e., Korea Electric Power Corp.) to help new Korean energy ventures tap into overseas markets.

Key issue

- **Can we sustain the economic development without further construction of nuclear or coal power plants?**

- **Energy conversion**
  - **Sustainable energy – renewables**
- **Decentralized technologies**
- **Material recycling & reuse**
- **Ecologically based land use planning**
- **Forest conservation**
- **Sustainable agriculture**
- **Redirection of economic development toward an environment-friendly industrial base**

SESSION Ⅱ - 1

Current Status and Issue of Japanese RE Policy at Central Government Level

Assistant professor Takuo NAKAYAMA (Kyoto University)

京都大学 KYOTO UNIVERSITY

Current Status and Issue of Japanese RE Policy at Central Government Level

Japan-Korea Renewable Energy Symposium

Tuesday, August 23 2016

Jeju Peace Institute

Takuo Nakayama, Ph.D.
Assistant Professor, Graduate School of Economics,
KYOTO UNIVERSITY

0

Position of Renewable Energy in Japan

- FUKUSHIMA ACCIDENT (3.11, 2011)
  - Serious damage
- Cabinet decision of “Strategic Energy Plan”(April 11 2014)
  - Japan will review from scratch the energy strategy
    - It mapped out before the Great East Japan Earthquake
  - Japan will minimize its dependency on nuclear power
  - Needless to say, that is the starting point for rebuilding Japan’s energy policy

1

FUKUSHIMA ACCIDENT also revealed

- Frailty of power supply system
- Issue of wide area grid operation
- Effectiveness of regional decentralized energy system

2

After stopping Nuclear Power Plants in japan,

- Dependence on fossil fuels has increased more
- 90% of power supply are depending fossil fuels imported from foreign countries (primary energy base)
- This situation is not sustainable
  1. Energy Security
  2. Global Warming countermeasure
  3. Fuel costs burden

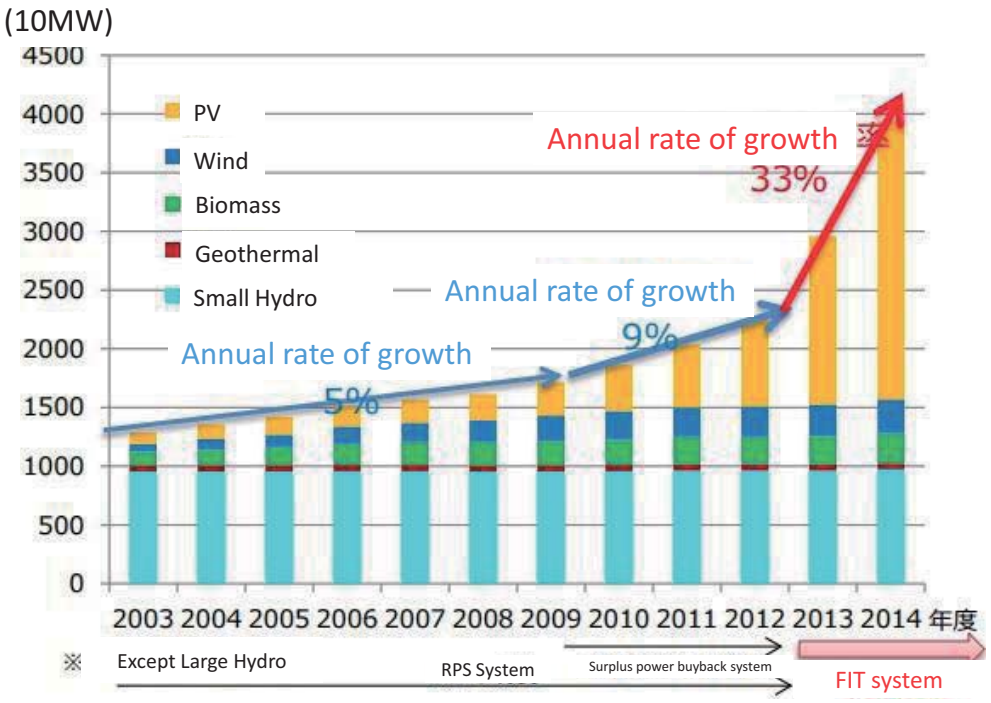
3

Introduce of Feed-in Tariff: FIT for renewables

- Started in July 2012
- RE generations (including conventional hydro) exceeded petroleum-fired power generation in 2014
  - 12.2% of total generation
    - Conventional Hydro: 9%, Other RE: 3.2%
- GOJ (Government Of Japan) has accelerated the introduction of renewable energy as far as possible three years since 2013 followed by continuous active promotion (”Strategic Energy Plan”, p.21).

4

Increasing Renewable Energy Capacity in Japan



Source: METI

5

Long-term Energy Supply and Demand Outlook

- Issued by METI (Ministry of Economy, Trade and Industry) in July 2015
- 2030 Energy Mix Perspective
  - RE: 22-24% of 2030 total power generation
    - 13-14% of primary energy supply
- Japan proposed 2030 global warming target
- FIT law revised under 2030 Energy Mix
  - Submitted to the Diet on May 25, 2016

6

Points of Revised FIT Law (2016)

1. Revise the authorization system
2. Change the FIT price setting method
3. Change the FIT electricity buyer to grid operator
4. Revise exemption of tariff system for heavy power consuming industries

7

1.Revise the authorization system

FIT authorization system up to now

- RE generation operator can get FIT authorization before grid interconnection request or consultation
- By get FIT authorization in initial phase, operator are more susceptible to loan
- Problem of the FIT authorized project that are not start operation
  - Business PV projects (560,000)
  - Over 310,000 projects are not start operation (as of Jan.2016)
  - Risk of increasing the tariff burden for final consumers

Authorization System Under the Revised FIT Law

- Grid interconnection contract is a condition for FIT authorization
- FIT Authorizations for projects that have not started generation will expire in principle

$\Rightarrow$

- It will be easy make RE introduction forecast, then it will be easy to make policy decision for example FIT price.
- Effective grid utilization will be available for prospective commercialization projects

10

Importance of Grid Interconnection Contracts

- Delay of grid interconnection contract bring delay of FIT authorization
  - Grid interconnection contract is condition for FIT authorization
  - Usually, grid interconnection contract take with in 9 months
- More than ever, it is important to
  1. Grid interconnection contracts are performed without delay
  2. It is guaranteed to connect to the grid by the grid operators

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Adding New Standards

- With this FIT law revision, new standards are added

1. Appropriate operation and management, disposal
2. Compliance with the relevant laws
   - e.g. River Act or Forest Act
   - FIT authorization of inappropriate project can be expired
3. Start generation within the appropriate period of time
   - FIT authorization of inappropriate project can be expired

12

Measures for not running projects

- Business PV projects that do not start operation for 3 years after FIT authorization
  1. Reduce FIT price
  2. Reduce FIT period
  - The Procurement Price Calculation Committee examine the decision
- Housing PV projects that do not start generation for 1 year after FIT authorization
  - FIT authorization expire

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Subject of Authorization System Change

- Not only PV but also all RE sources
- It is necessary to focus on the effect of the FIT system operation
  - Offence for funding by FIT authorization become behind
  - Adverse effect for RE sources except for PV that have long lead time

⇒In response to these issue, FIT authorization application is available before grid interconnection contract to shorten the time

- It is important to create fine-grained transitional measures not to suffer undue disadvantage for RE operator

14

2. Change the FIT Price Setting Method

15

Long Term Vision and Enhance Investment to RE Sources

- Set the “Target Price” to promote effective introduce of RE
  - One of the consideration to set FIT price
  - Aim to promote related businesses’ efforts to reduce costs
  - Enhance the perspective to reveal long-term direction for cost reduction
- Setting FIT authorization project for a few years away
  - For RE power sources that are long lead time

  (Wind, Small Hydro or Geothermal)
  - Promoting investment to these power sources

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Auction System as a method of determination of FIT price

- Certain generation facility’s authorization will be attached by auction
- All RE power sources will be the target in this revised FIT law
- In the discussion at committees or parliament, It is assumed comparatively large scale PV facilities in the mean time
- That is because Japanese high PV system and installation cost

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Toward Cost Effective PV Introduction

- Global PV generation cost has halved for 5 years (from 2010 to 2014)
- Japanese PV generation cost is still high
- Committee set 4 options for cost effective PV introduction
  - A) Strict use of the current pricing method (Top Runners Approach)
  - B) Decide a price reduction rate beforehand, then reduce the cost
  - C) Furthermore, it is fluctuated at a price reduction rate according to quantity of introduction
  - D) Auction

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Optional Choice (Report of the Committee)

- For Housing PV and Wind
  - Option B) is appropriate
- For Business PV
  - Should take advantage of the A) and D)
  - When we use option D) Auction
    - It is important to consider the introduction of small scale generation that are core of community based generation business, self consumption integrated generation of building or factory
    - Aiming for the bid from relatively large scale generation facilities

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Auction for Small Scale Operator

- Same Pricing over 10kW PV (Business PV generation) as of now
- Larger scale facilities, cheaper generation cost
- Relatively small capital operator, for example community based generation operator cannot make a bid
  - Risk that cannot acquire FIT authorization
- German trial auction system for large scale PV in 2015
  - Go ahead while confirming whether there is not the entry wall of community or private operator

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3. Change the FIT Electricity Buyer to Grid Operator

21

Flow of FIT Electricity

- Based on proceeding electricity system reform
- FIT electricity buyer is changed from retailer to grid operator (after the enforcement of the revised FIT law, in April 2017)
  - FIT electricity that grid operator buy will be sent it to wholesale market
  - Under full liberalization of electricity retail business
    - There is a risk that FIT electricity purchase application concentrated in the specific retail company
- Power producer and supplier have merits
  - They can raise electricity from the market

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Role of Grid Operator and Electric Retailer

- On the midway of Electricity system reform
  - Generation and transmission have not unbundled in Japan yet
- It is inevitable to secure the neutrality of grid operator to ensure the reliability of FIT system
  - Guarantee purchase FIT electricity
  - Grid interconnection contract
- Electricity Retailers are required to change their over 44% retail electricity for non-fossil
  - Demand of FIT electric procurement becomes higher

23

4. Revise Exemption of Tariff System for Heavy Power Consuming Industries

24

Clarification of Target Exemption Company

- Nowadays, heavy power consuming industries are exempt to pay tariff
  - Depending on application
  - Up to 80%
- Half of this exempt tariff are levied from consumer and small and medium-sized enterprises
- The reason was to “reinforce of the international competitiveness”
  - at the time of FIT law establishment
- Example of exemption company
  - which does not match the reason
  - which does not meet an energy saving standards

25

Conclusion

26

Evaluation of FIT System Reform

- Japanese Energy-Mix Plan in 2030
  - RE: 22-24% of total power generation
  - To be one of the basic power supply
  - It is necessary to install capacity for
    - PV: more than twice
    - Wind, Geothermal, Biomasses: about three times
- This system change is to cope with the problems that are revealed FIT operation from July 2012
  - Inevitable for sustainable introduction of RE under FIT system2727
- FIT: Raise the foreknowledge of the investment collection by buying electricity with fixed prices
  - Promote the investment, promote introduction of RE
- Too frequent system reform has minus effect for investment for RE
  - In terms of stability of the system or predictability

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SESSION II - 2

Recent Developments of Korea's Renewable Energy Policy

Dr. Changhoon LEE (Korea Environment Institute)

Recent Developments of Korea's Renewable Energy Policy

Dr. Chang Hoon Lee

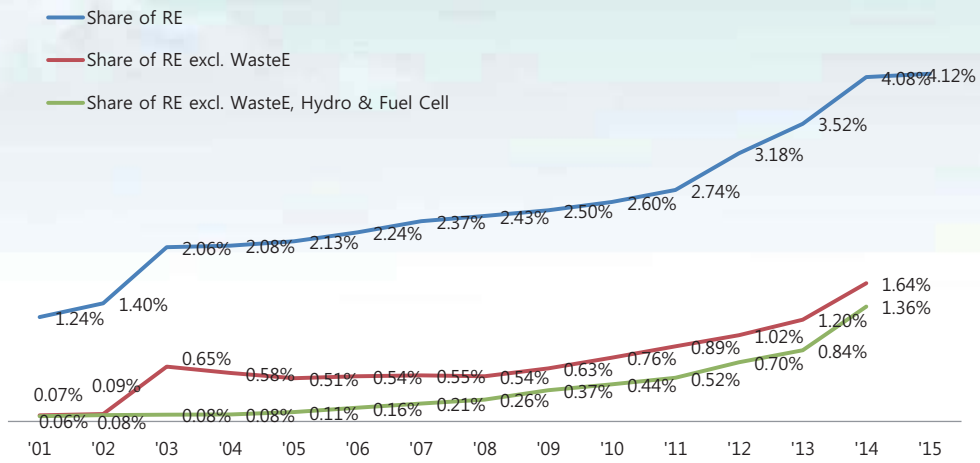
2016. 8. 23.

Korea Environment Institute

Contents

Renewable Energy Use

Renewable Energy Supply (share in TPES)

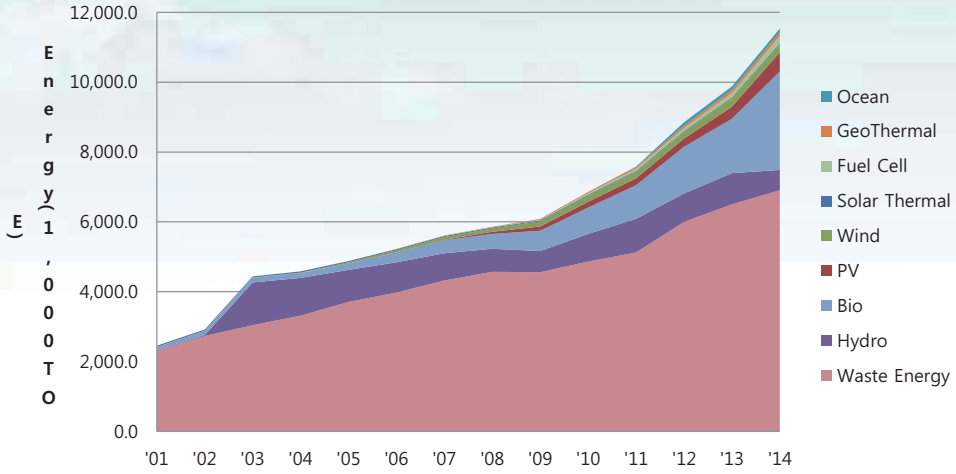


Source: MOTIE(2015), Statistics of New and Renewable Energy.

- Definition of Korea's 'New & Renewable Energy' :
  RE(IEA) + Waste Energy (mostly industrial waste gas) + Large Hydro + Fuel Cell

Renewable Energy Use

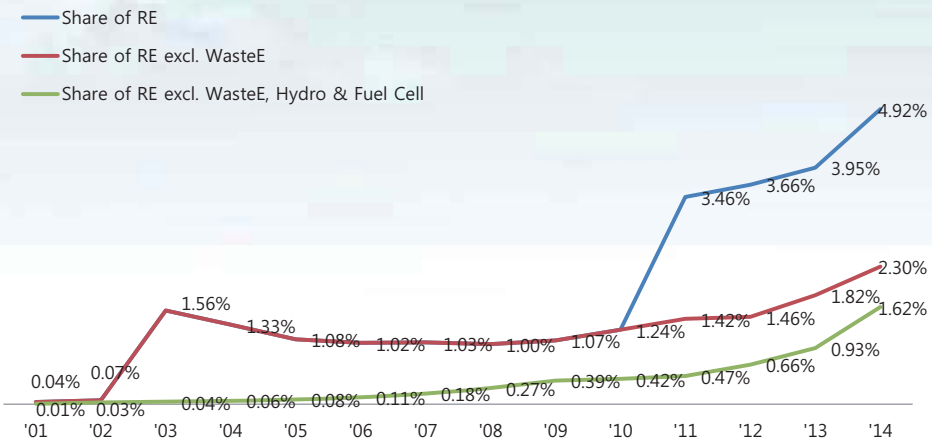
Renewable Energy Supply



Source: MOTIE(2015), Statistics of New and Renewable Energy.

Renewable Energy Use

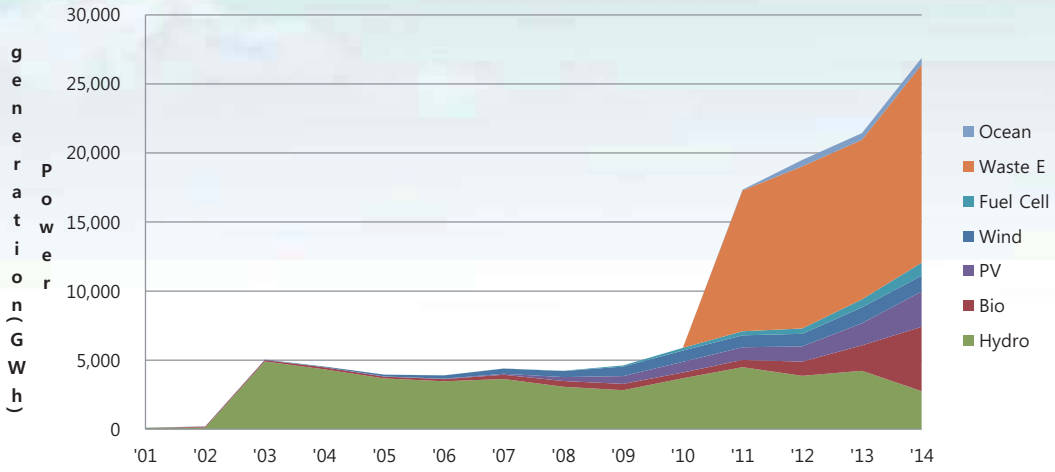
Renewable Electricity



Source: MOTIE(2015), Statistics of New and Renewable Energy.
* No data available for electricity generation from waste energy before 2011

Renewable Energy Use

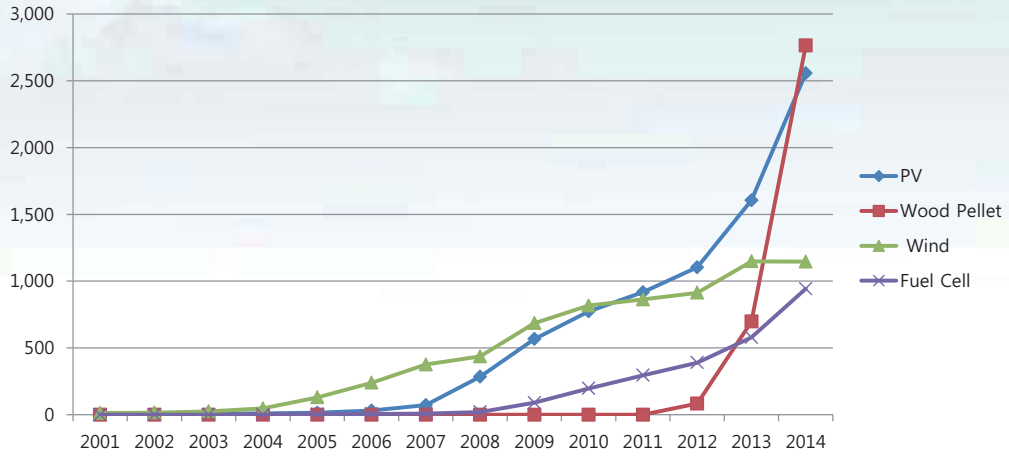
Renewable Electricity



Source: MOTIE(2015), Statistics of New and Renewable Energy.

Renewable Energy Use

Main Drivers of Recent Development



- PV : new addition of capacity of 1 GW per year in 2014-2016
- Wood Pellet (imported) : co-combustion in coal-fired plants

Renewable Energy Use

Capacity target of renewable electricity

Category	2015		2020		2025		2035		Annual increase
	Installed Capacity	Share(%)	Installed Capacity	Share(%)	Installed Capacity	Share(%)	Installed Capacity	Share(%)	
PV	2,221	24.6	6,184	34.6	11,010	43.4	17,504	44.6	10.9
Wind	732	8.1	3,588	20.1	5,884	23.2	12,785	32.6	15.4
Bio	173	1.9	193	1.1	193	0.8	193	0.5	0.5
Hydro	1,759	19.5	1,779	10.0	1,804	7.1	1,854	4.7	0.3
Ocean	260	2.9	835	4.7	835	3.3	1,025	2.6	7.1
Waste	2,788	30.9	2,938	16.4	2,968	11.7	2,968	7.6	0.3
Fuel cell	781	8.7	1,450	8.1	1,788	7.0	2,034	5.2	4.9
Coal IGCC	300	3.3	900	5.0	900	3.5	900	2.3	5.6
Total	9,013		17,867		25,381		39,261		

Source: MOTIE(2014), The 4th New and Renewable Energy Plan

Policy Framework – RPS

RPS Target

- Mandatory for power producers with installed capacity over 500MW (18 firms in 2016)

RPS Target (%)

year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
target, 2012	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0		
target, 2015	2.0	2.5	3.0	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0

PV Target

(No extra PV target from 2016)

		2012	2013	2014	2015	2016
Target (GWh)	2012	276	591	907	1,235	1,577
	2013	276	723	1,156	1,577	1,577
	2014	276	723	1,353	1,971	
Corresponding New capacity (MW)	2012	220	230	240	250	260
	2013	220	330	330	320	
	2014	220	330	450	450	

Policy Framework – RPS

REC Weight

	REC Weight	Energy sources & Types	
PV	1.2	On general land	~100kW
	1.0		100kW~3,000kW
	0.7		3,000kW~
	1.5	On existing buildings	~3,000kW
	1.0		3,000kW~
	1.5	Floating facilities on the water	
	1.0	Plants for own use	
Non PV	0.25	IGCC, Waste Gas	
	0.5	Waste, LFG	
	1.0	Hydro, onshore wind, bio-energy, RDF, Waste gasification, tidal (with existing embankment)	
	1.5	Wood biomass, offshore wind (grid connection less than 5 km), water heat	
	2.0	Fuel cell, Current	
	2.0	offshore wind (grid connection longer than 5 km), geothermal, tidal (with existing embankment)	Fixed weight
	1.0~2.5		Variable weight
	5.5	ESS (connected to wind power)	2015
	5.0		2016
	4.5		2017

Policy Framework – RPS

RPS Implementation

		2012	2013	2014
Target(REC) (A)	PV	276,000	734,820	1,390,359
	Non-PV	6,144,279	10,161,737	11,515,072
	Total	6,420,279	10,896,557	12,905,431
Performed(REC) (B)	PV	264,180	697,461	1,332,922
	Non-PV	3,890,047	6,627,400	8,745,429
	Total	4,154,227	7,324,861	10,078,351
B/A	PV	95.72%	94.90%	95.90%
	Non-PV	63.31%	65.20%	75.90%
	Total	64.70%	67.20%	78.10%

- Penalty for Non-fulfillment : less than150% of the market price, considering the reasons etc.

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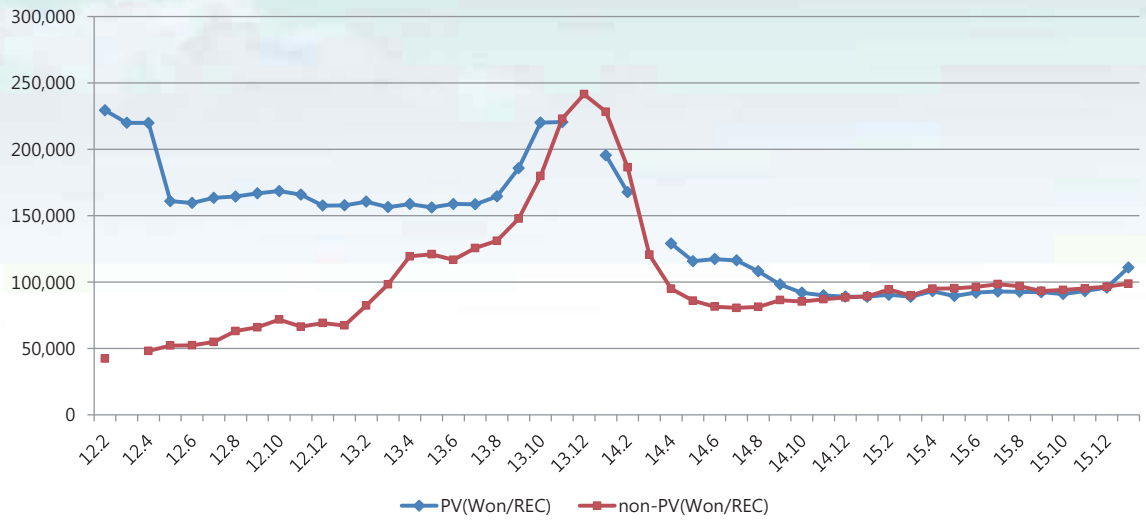
Policy Framework – RPS

REC Price – Spot market



- REC market is unified since Jan.2016.

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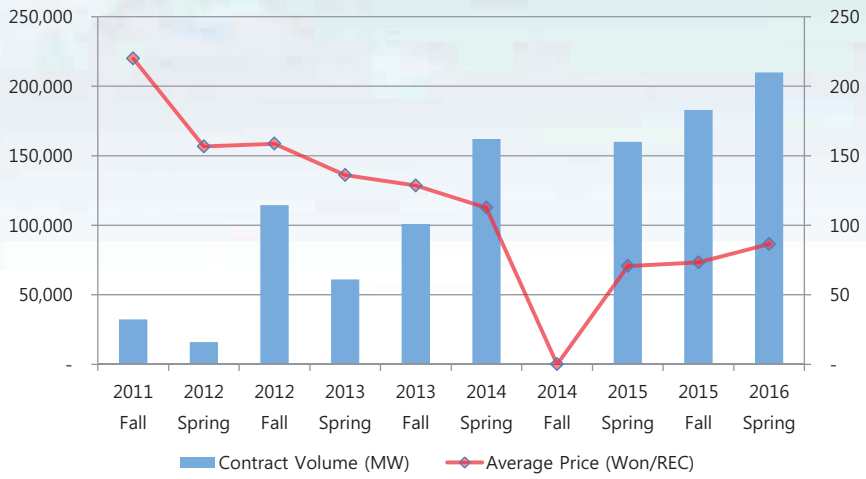
Policy Framework – RPS

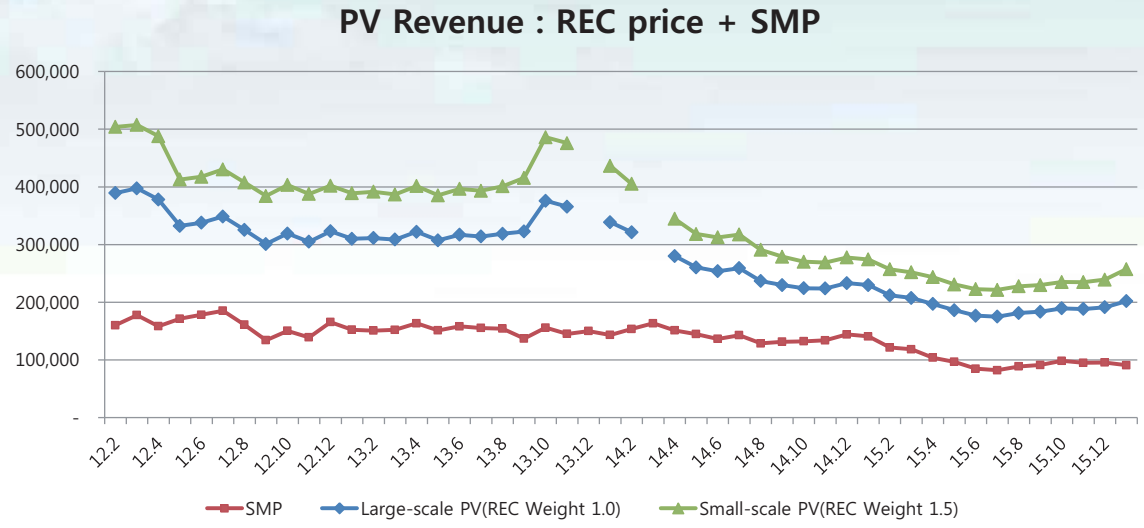
REC Contract Market for PV : Price and Volume



- Mandatory for 6 big power producers (with capacity over 5GW) to buy RECs in a bidding system in a 12-year constant price contract : 300MW per year
- Prefer the small scale PVs : at least 150MW for the capacity less than 100kW

Policy Framework – RPS

PV Revenue (REC price + SMP)



- SMP(System marginal price) : wholesale electricity price

Policy Framework – RPS

LCOE of PV

<Table> LCOE of Small scale PV

Category	Unit	2013	2015	2020	2025	2030	2035
Investment Costs	1,000KRW/kW	2,500	2,365	2,060	1,794	1,562	1,360
Technical lifetime	Years	20	20	25	25	25	25
Fixed O&M	1,000KRW/kW	49	46	39	32	24	18
Load Factor	%	15.5	15.5	15.5	15.5	15.5	15.5
LCOE	KRW/kWh	197	186	148	127	108	91

<Table> LCOE of Large Scale PV

Category	Unit	2013	2015	2020	2025	2030	2035
Investment Costs	1,000KRW/kW	2,100	1,981	1,713	1,481	1,280	1,107
Technical lifetime	Years	20	20	25	25	25	25
Fixed O&M	1,000KRW/kW	49	46	39	32	24	18
Load Factor	%	15.5	15.5	15.5	15.5	15.5	15.5
LCOE	KRW/kWh	171	161	128	109	91	77

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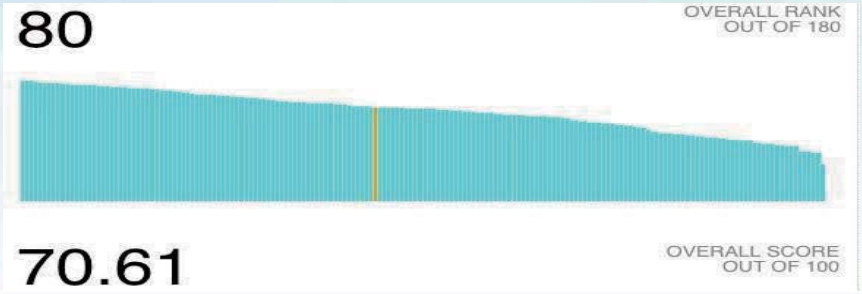
Challenges

Air Pollution : Environmental Performance Index 2016



NAME OF INDICATOR	SCORE	RANK	10 YEAR CHANGE
Health Impacts	65.93	103	-1.2%
Air Quality	45.51	173	77.15%
Water and Sanitation	95.11	35	-2.1%
Water Resources	93.15	19	8.87%
Agriculture	57.8	133	8.89%
Forests	74.42	32	0.11%
Fisheries	58.47	33	2.01%
Biodiversity and Habitat	69.34	126	-0.53%
Climate and Energy	62.39	83	0%

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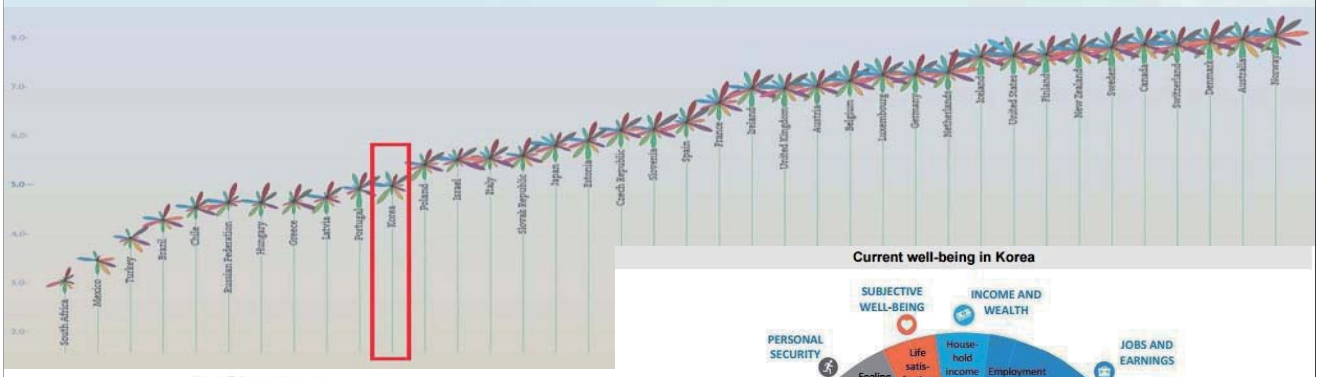
Challenges

Air Pollution : OECD Better Life Index 2016



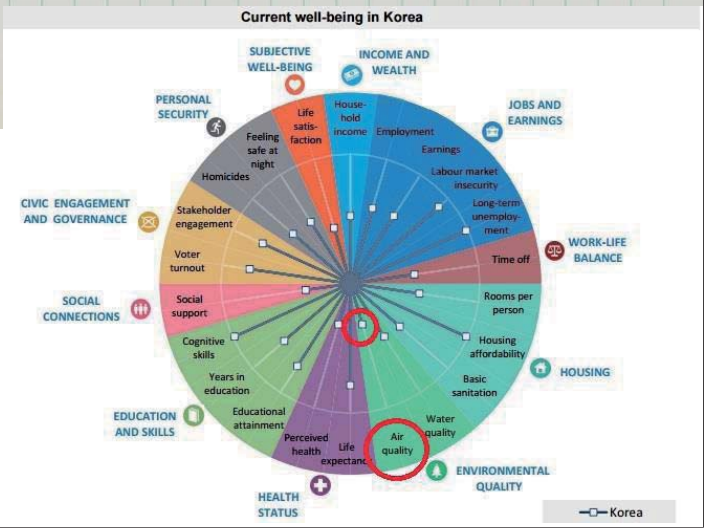
Indicators

Air pollution
29.1 micrograms

Rank:
38 / 38

Water quality
77.6%

Rank:
26 / 38

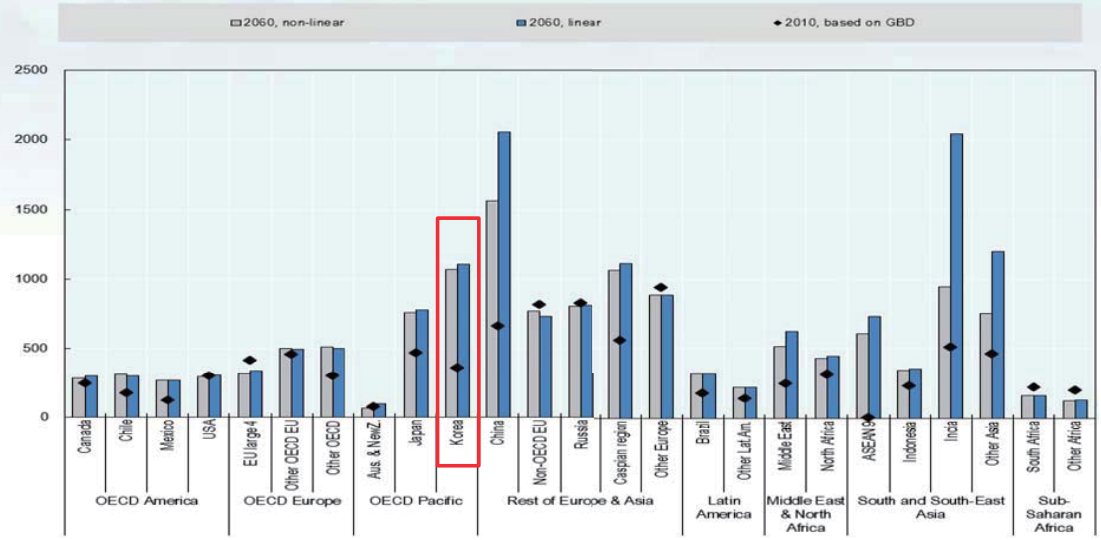


Challenges

Air Pollution : Health Risk

Premature deaths from exposure to particulate matter and ozone

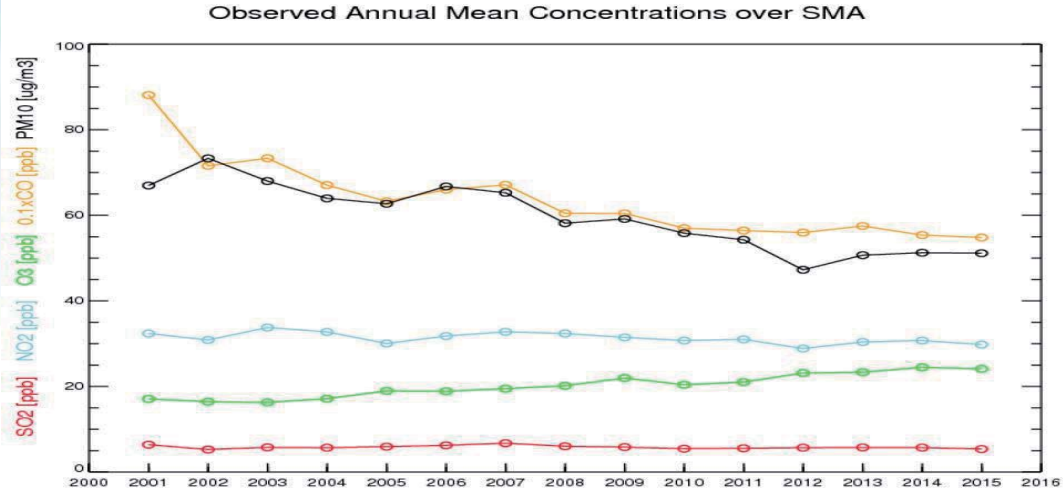
(Number of deaths caused by outdoor air pollution per year per million people)



Source: OECD(2016), The Economic Consequences of Outdoor Air Pollution

Challenges

Air Pollution : Trend reversed



Source: S.Kim et. al. (2016)

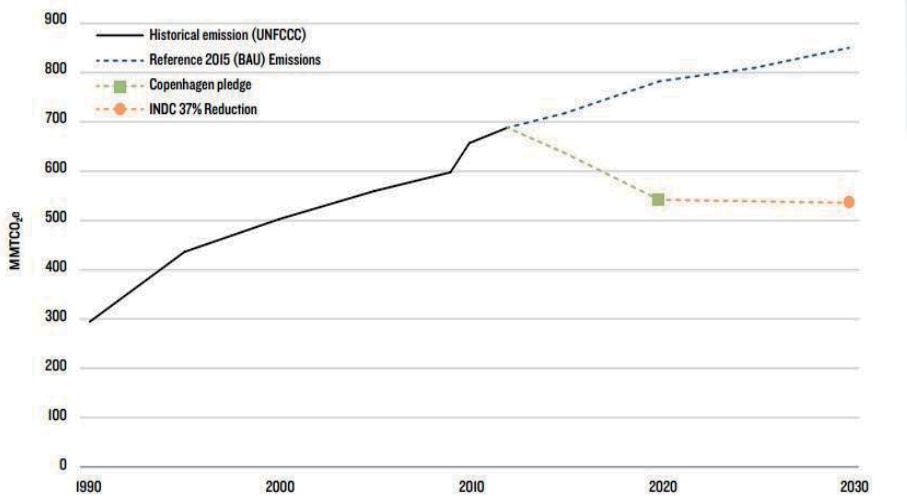
- New Measures (2016.6)
  → From diesel to electric or hybrid cars
  → Shut down of old coal-fired power plants

Challenges

Climate Change : INDC

Korea's INDC

- 37% Reduction from the BAU level : 850.6 → 535.9 (MtCO2eq)
- 11.7% of 37% by using international market mechanism



Source: NRDC(2015), Paris Climate Conference South Korea

Challenges

Climate Change : INDC

Greenhouse Gas Emissions in BAU (MtCO2eq)

	2013	2030
Energy total	606.2	738.9
Energy Industries	274.7	333.1
Manufacturing & Construction	182.1	239.1
Transport	88.3	104.1
Other Sectors	56.6	54.1
Fugitive emissions	4.6	8.4
Industrial Process	52.6	75.6
Agriculture	20.7	15.5
Waste	15.0	20.7
Total CO2 Equivalent Emissions	694.5	850.6

Source: 2013 data from National Greenhouse Gas Inventory Report of Korea 2015,
2030 data (estimated) from Y. Cho(2016)

- Limited reduction target for industry: 12 % reduction from the BAU level
  → More pressure for the energy sector
  → From Coal to Nuke, LNG, Renewable Energy?

Perspectives

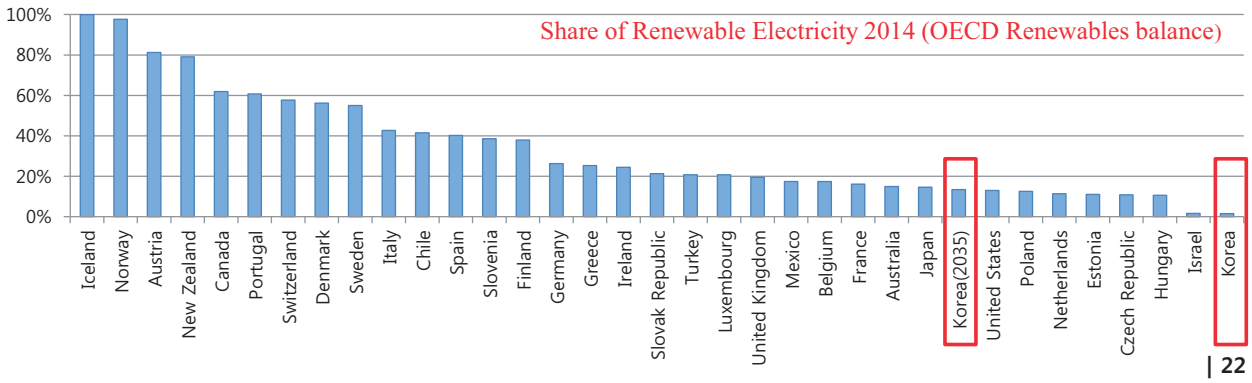
How much of Renewable Energy?

- Higher RPS target for 2018~2020 as a response to PM issues
  mainly to compensate for earlier shut-down of 10 old coal-fired plants (3GW)

year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
target, 2012	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0		
target, 2015	2.0	2.5	3.0	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
target, 2016							**5.0**	**6.0**	**7.0**				

* 2016 target from : MOTIE(2016.7), Measures for New Energy Industry and Improved Regulation.

- Is it not too low to set 2035 RE target as much as 11% (13.4% of electricity supply)?

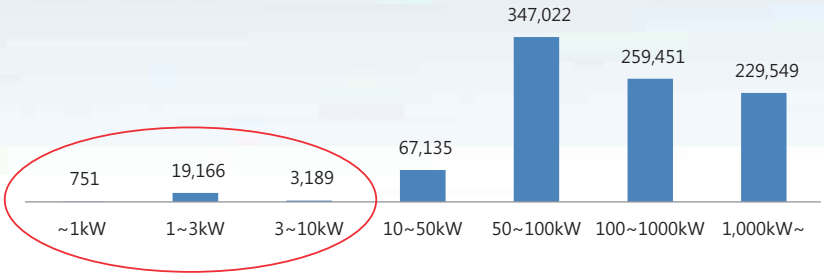


Perspectives

How : Is the RPS enough?

- A very weak diffusion of the small-scale facilities
  - The market mechanism of RPS is too complicated to a private household

Installed Capacity of PV in 2014 (kW)



- A Re-Introduction of FIT for small scale facilities is in discussion.
- But in avoiding windfall profit caused by an artificial tariff setting in traditional FIT
  - Setting the tariff similar to market price of REC & SMP of the last year or the last quarters
  - Volume-dependent tariff setting analog to German FIT(2014)

Perspectives

Who pays for more Costs of RE ?

- A main reason of switch of FIT to RPS in 2012 : an unclear financing mechanism
  → no automatic transfer mechanism of more production costs of renewable energy to consumer price of electricity (contrary to German and Japanese cases)
  → More costs of RE was paid by the 'Electricity Industry Fund' which is financed and limited by a surcharge(3.7%) of electricity tariff
  → A big concern of the government about the case in that the subsidy for RE is not fully covered by the fund

- Electricity consumer price is a regulated price in Korea
  → RPS implementation costs of electricity producers are paid by KEPCO, the sole electricity retailer, but the consumer price is not automatically adapted so much, but regulated by Ministry of Strategy & Finance
  → Electricity price stability is a very high priority of the government, not only for private consumers, but also to back up the competitiveness of Korean manufacturing industries

- Regardless of RPS or FIT, an automatic pricing and transfer mechanism of more costs of renewable energy is indispensable
  → to ensure a more expansion of renewable energy financially
  → to have a demand management effect additionally

Thank you

chlee84@kei.re.kr

SESSION III - 1

One Less Nuclear Power Plant
Seoul Sustainable Energy Action Plan

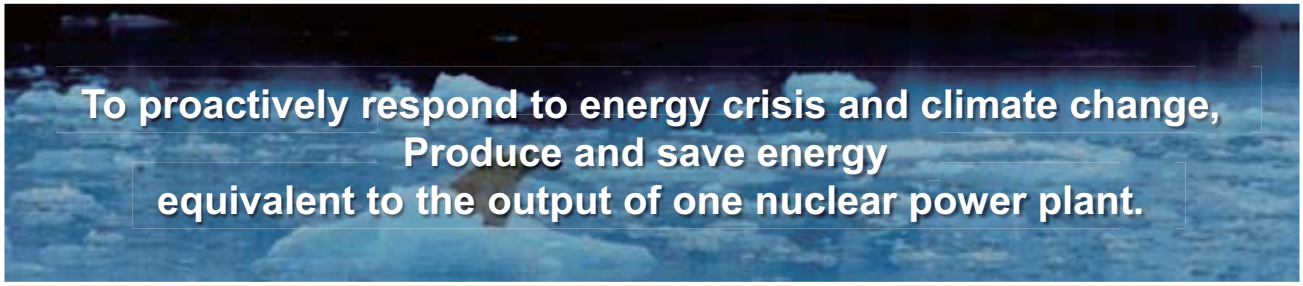
Director Heejung CHUNG (Seoul Metropolitan Government)

SEOUL

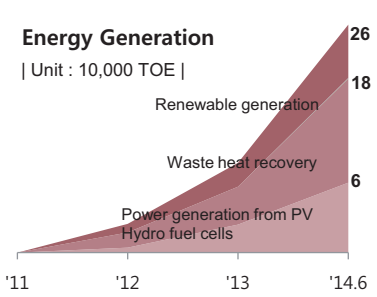
ONE LESS NUCLEAR POWER PLANT
SEOUL SUSTAINABLE ENERGY ACTION PLAN

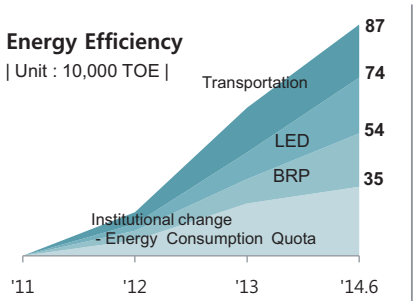
SEOUL METROPOLITAN GOVERNMENT

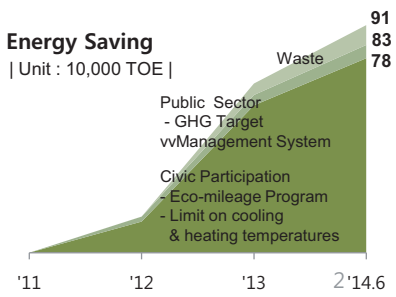
1

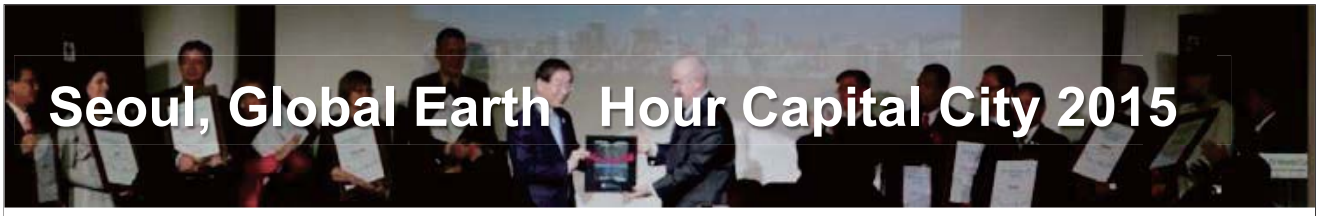


In the first half of 2014, 2 million TOE of energy was saved!









Seoul, Global Earth Hour Capital City 2015

Seoul earned a reputation as a global green city and global recognition

<One Less Nuclear Power Plant>
WWF
National Earth Hour Capital

<One Less Nuclear Power Plant>
WGBC
Climate Action Leadership Award

< Eco-mileage Program >
UN
Winner of 'Fostering participation In public policy' Category

< PV policies>
C40-SIEMENS
Winner of 'Green energy' Category

"Energy-saving rooted in daily lives"

< Covered by a Taiwanese media >
(January 21 2015)

Benchmarked by provincial governments, as a local energy policy model

< Gyeonggi Province Energy Vision 2030 >
(June 25 2015)

Global cooperation for climate action

< 2015 ICLEI World Congress>
(April 11 2015)

ONE LESS NUCLEAR POWER PLANT

SEOUL SUSTAINABLE ENERGY ACTION PLAN

Generation · Efficiency · Saving
4m-TOE cut

Electricity Self-reliance Rate 20%

GHG Emissions
10m-ton cut

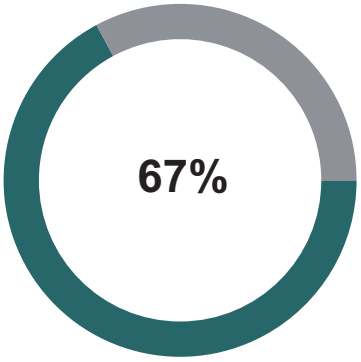
By 2020

Transition to 'Energy Independent City'

- Promote energy-independence, sharing and participation -
- Purse High energy-efficient Society -

Power Self-reliance Rate

4.7%



Progress (As of late 2014)

4.7%

7.0%

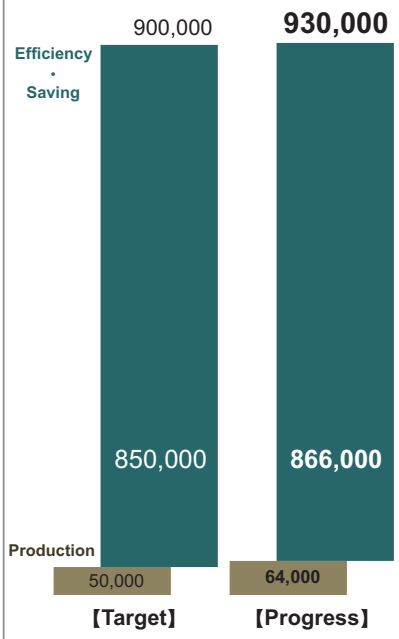
Target

- Power generation : 852GWh
- Energy demand cut : 1,866GWh

Production • Efficiency • Saving

103%

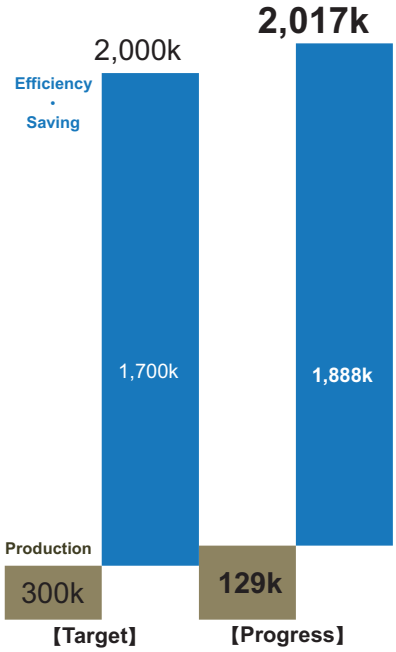
| Unit : TOE |



GHG emissions cut

101%

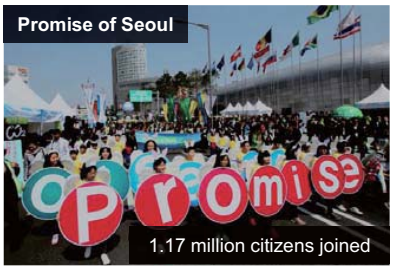
| Unit : 1,000 ton CO_2 /eq |



5

ICLEI World Congress 2015

SUSTAINABLE SOLUTIONS FOR AN URBAN FUTURE



A total of 3,049 delegation members from 316 cities in 91 countries participated

A bridge toward a new climate regime(POST-2020)

Built momentum toward the UNFCCC Climate Conference (COP21)

6

SEOUL

ONE LESS NUCLEAR POWER PLANT
SEOUL SUSTAINABLE ENERGY ACTION PLAN

에너지 살림도시, 서울 원전 하나 줄이기 2

Key Progresses

SEOUL METROPOLITAN GOVERNMENT

7

8

Solar City, Seoul Project

Solar Power Capacity of 101.2MW ('03.1 ~ '15.9)

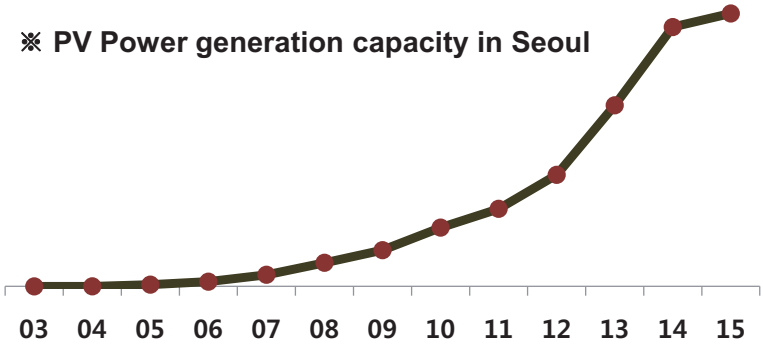
Public Buildings **41.4**

Schools **12.1**

Private Buildings **32.1**

Micro PV **15.6**

※ PV Power generation capacity in Seoul



101.2MW

Enough to power 34,000 households

- Power generated for 3.5 hours per day
- Households with a monthly average power consumption of 312kWh

9

Expansion of PV installations

1,325 places / 1,007kW ('15.1 ~9)

Expand PV installation subsidies
(households → all buildings including public buildings)

Build PV landmarks to raise public awareness

<PV on bus stations>

< PV on soundproof walls >

<Hybrid Security Lights>

PR : PV panels on display, pilot PV installation etc.

< Official Solar Map Website >

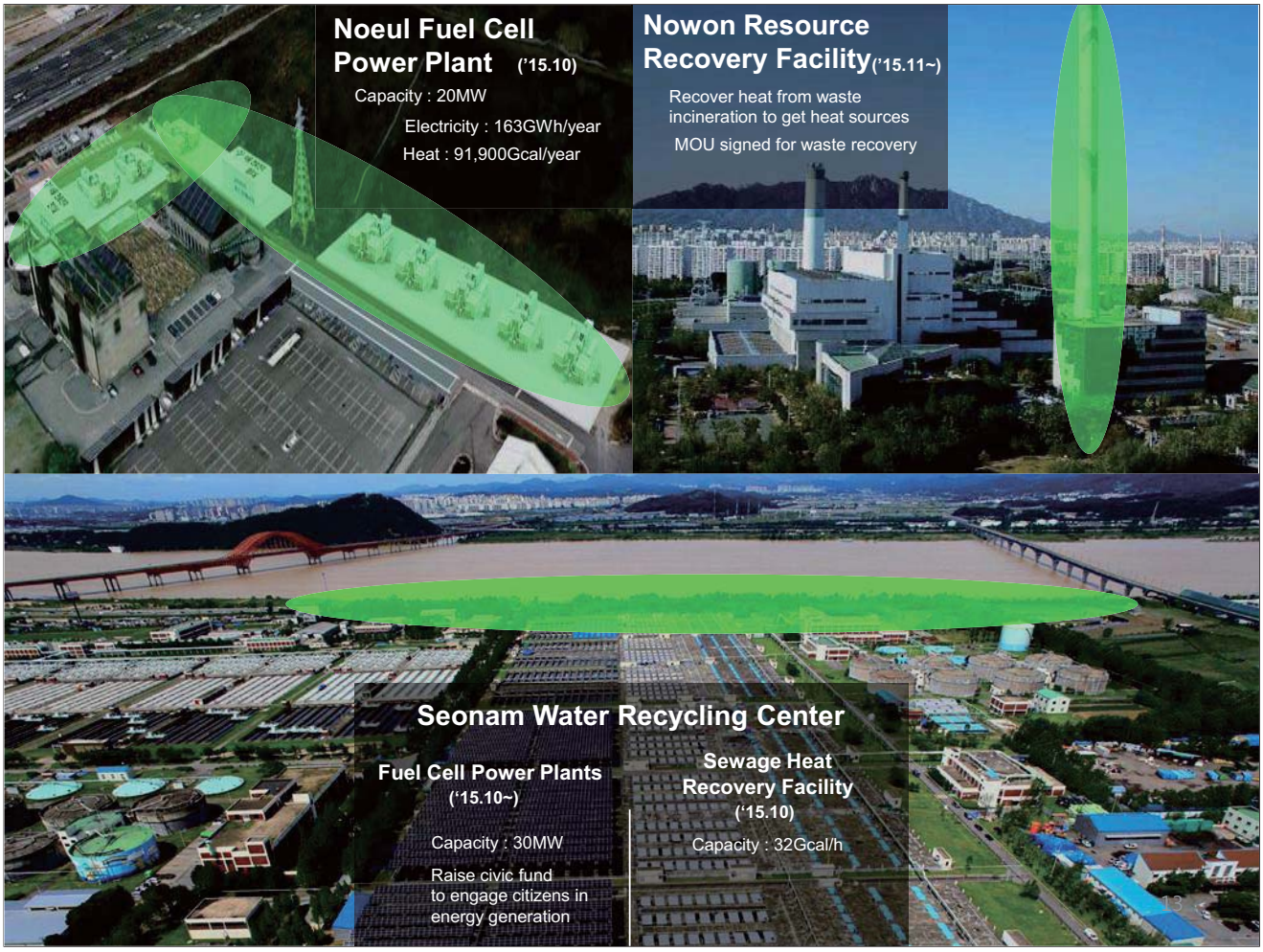
< Lotte Hi-mart Outlet >

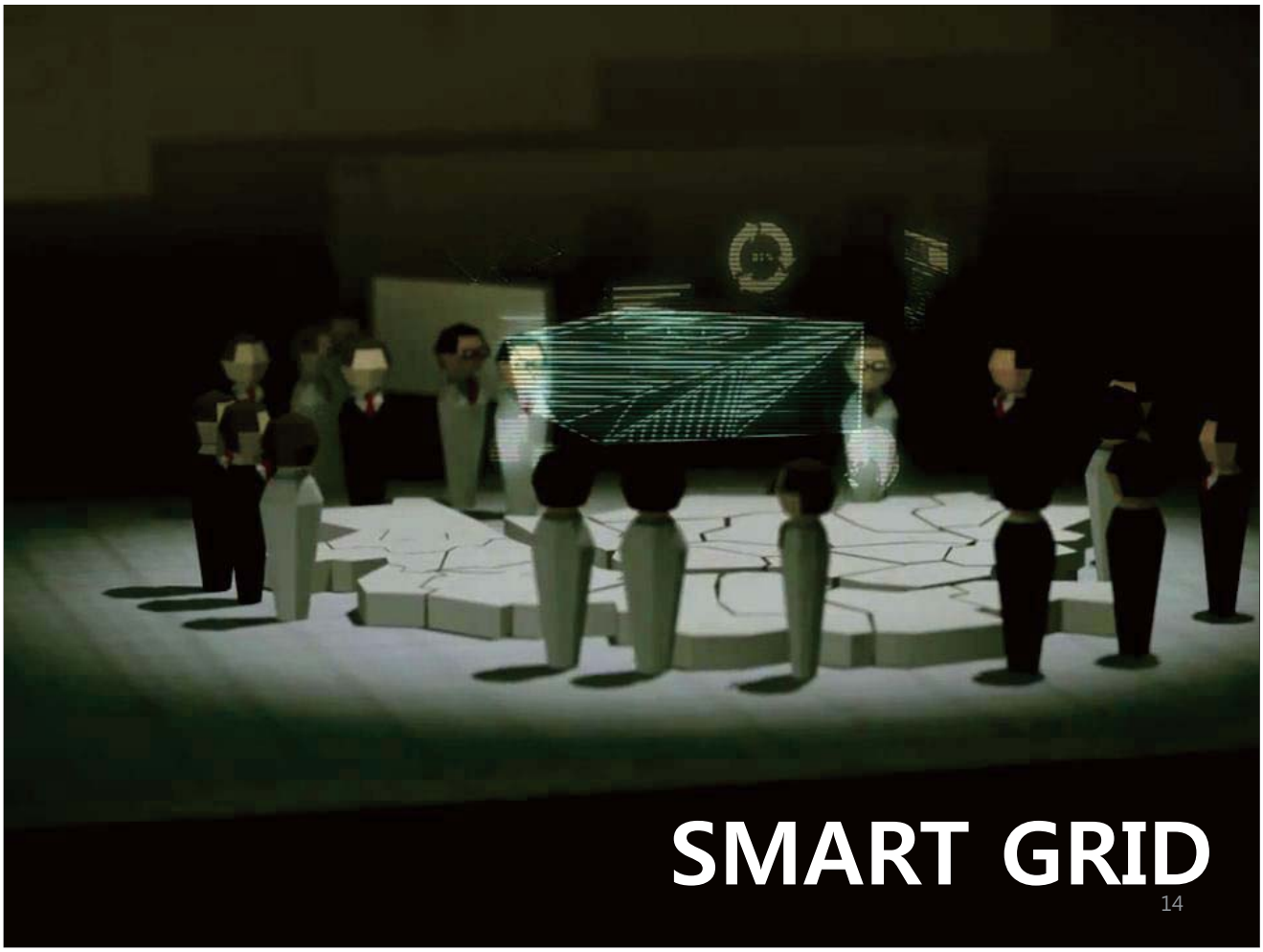
< Street Vendors >

10


Civic Fund (August 2015)
KB Seoul Solar Power Plant Investment Trust
- Maturity : 3 years
(Minimum USD 879, Maximum USD 8,791)
- Total : USD 7.25 million
- Holders : 1,044 persons
※ Average investment per person : USD 6,938
- Invest in installation of 4.24 MW PV power plants, and the profits will be shared by the holders
11


Fuel Cell Power Plants
Identify unused energy sources
12


Noeul Fuel Cell Power Plant ('15.10)
Capacity : 20MW
Electricity : 163GWh/year
Heat : 91,900Gcal/year
Nowon Resource Recovery Facility('15.11~)
Recover heat from waste incineration to get heat sources
MOU signed for waste recovery
Seonam Water Recycling Center
Fuel Cell Power Plants ('15.10~)
Capacity : 30MW
Raise civic fund to engage citizens in energy generation
Sewage Heat Recovery Facility ('15.10)
Capacity : 32Gcal/h
13


SMART GRID
14

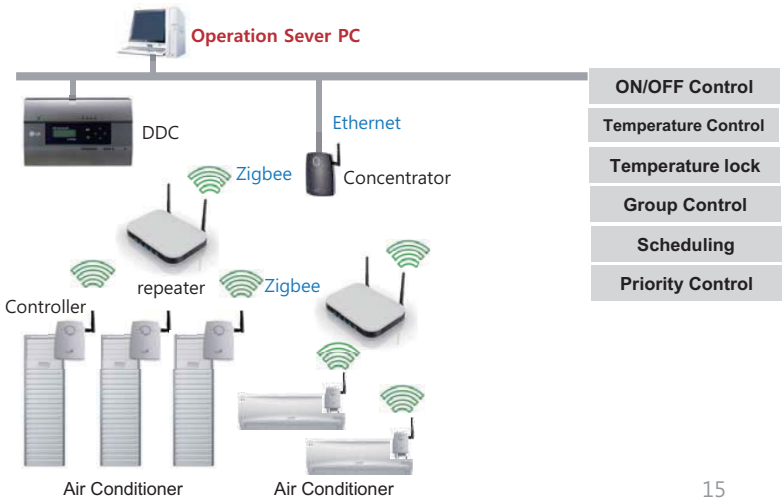
Urban Smart Grid Project

Introduced at two energy independent villages (Sept. 2015)

- Shipjasung Villiage : 310 smart meters, PV power capacity of 18kW
- Dongjak Hyundai Apartment : 400 smart meters, PV power capacity of 5kW

University of Seoul
created a remote air conditioner control system

[System Diagram]



Seoul Urban Smart Grid Project

Selective installations of systems required for Seoul's pilot urban smart grid project

- TOC (Total Operation Center)
- AMI (Advanced Metering Infrastructure)
- ESS (Energy Storage System)
- EV(Electric vehicle) Charging System
- EMS (Energy Management System)
- PV, Fuel cell and other renewables

15

建物効率化

16

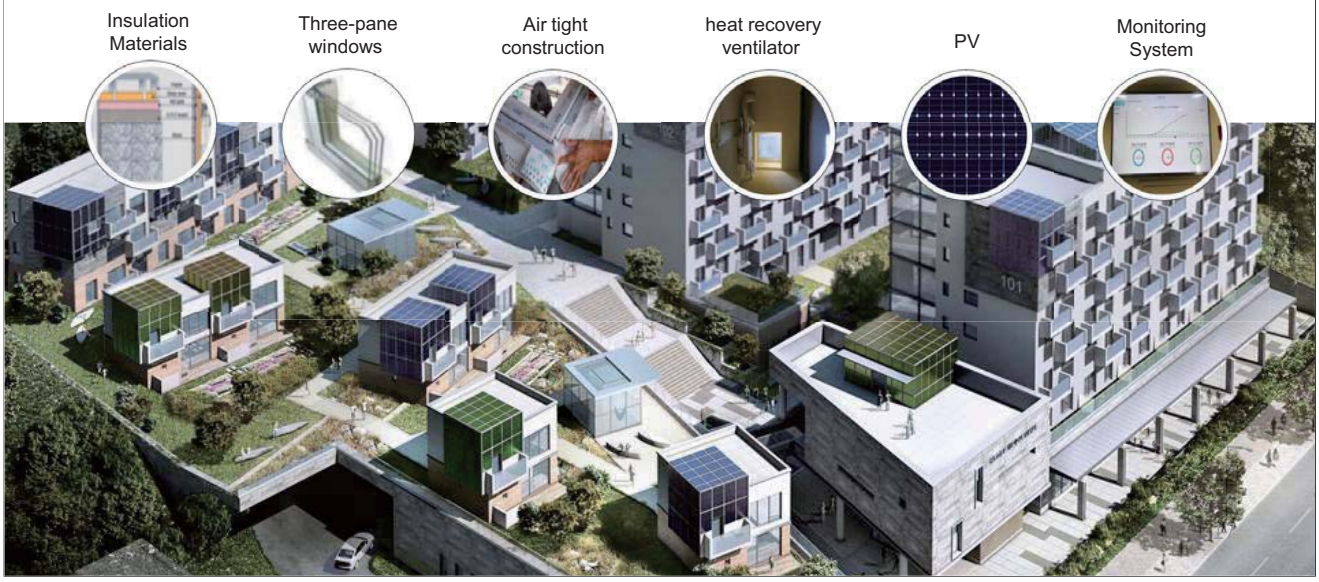
Lighthouse Project

Construction of small · medium energy efficient model houses for PR

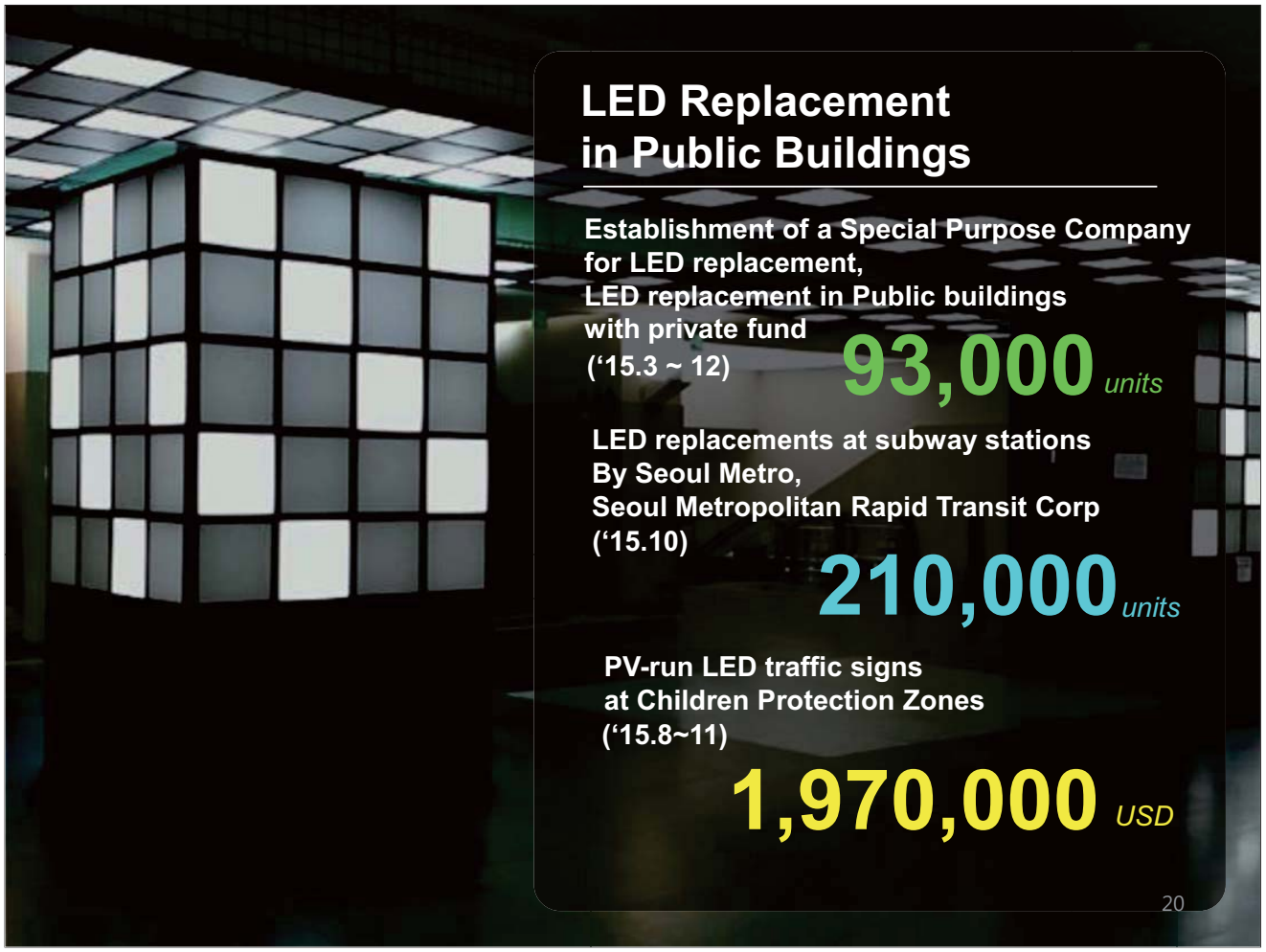
Model houses that include passive elements, energy production and monitoring systems

Four energy efficient model houses to be built including daycare centers and senior citizen community centers

Develop a manual for the model houses, and share and promote the results




LED CITY
SEOUL
19


LED Replacement
in Public Buildings
Establishment of a Special Purpose Company
for LED replacement,
LED replacement in Public buildings
with private fund
('15.3 ~ 12)
93,000 units
LED replacements at subway stations
By Seoul Metro,
Seoul Metropolitan Rapid Transit Corp
('15.10)
210,000 units
PV-run LED traffic signs
at Children Protection Zones
('15.8~11)
1,970,000 USD
20

Improve Eco-mileage Program

1,706,000 members / 339,282 TOE saving ('14.7 ~ '15.9)

Focus resources on actual energy savers

Link GHG reduction and energy welfare improvement

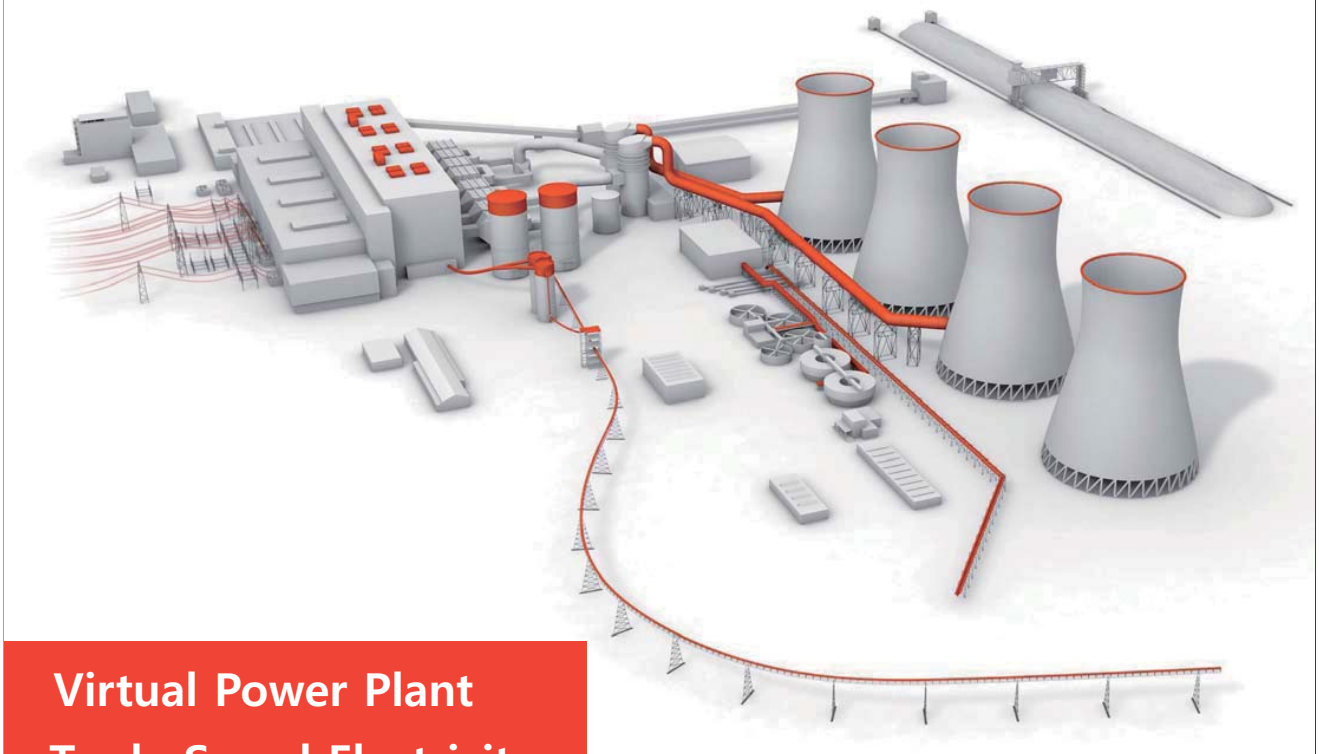
【Expanded standards for provision of incentives】

※ Incentive beneficiaries 70,000 people(Current) → 120,000 people (Expected)

| Changed Standards |

Energy savings	Incentives
Over 5%, less than 10%	10,000 mileages
Over 10%, less than 15%	30,000 mileages
Over 15% (Same as before)	50,000 mileages

22



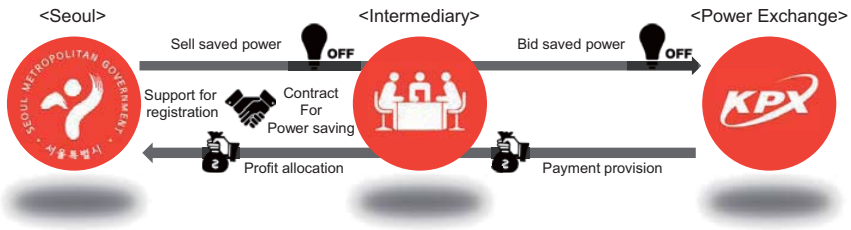
Virtual Power Plant
Trade Saved Electricity

23

Incentivize electricity saving by buildings during electricity peak

Reduced electricity bills and incentives (3~4 times)

Direct benefits : Profit making by selling saved electricity + Indirect benefits : Reduced power costs



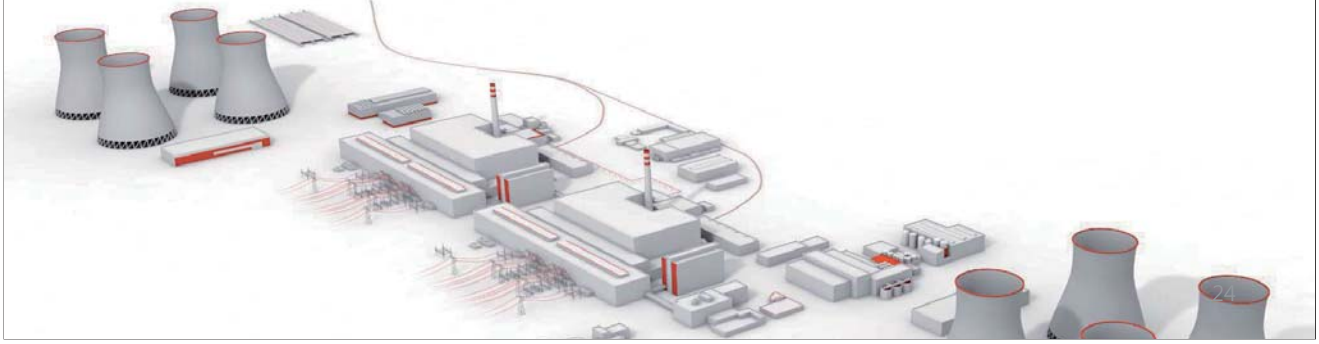
Registration and Operation of First ever local “virtual power plant

17 public buildings, a total 5MW registry → 34,000,000 won in profits(‘15.6 ~9)

Progress made by Public Sector spread toward the Private Sector

Identify new businesses on top of current businesses with a total capacity of 5MW and increase the capacity to 10MW

Turn household buildings like apartments and green campuses into high energy consuming buildings



24

Welfare **I**s **S**haring **E**nergy

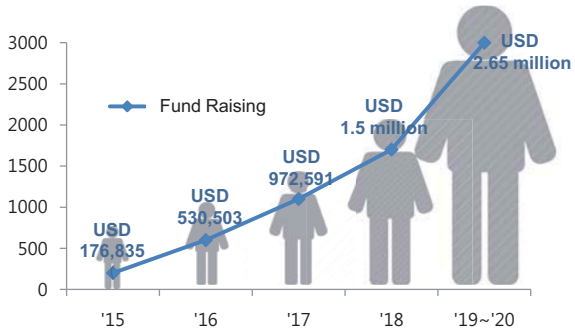
Seoul Energy Welfare Civic Fund

Civic-led Sustainable Fund

Citizens take the rein in mobilization, management and administration of the fund

Civic Participation + Managed by Citizens »» Sustainable Fund

Fund Raising Target by Year



Fund Raising

Raise funds in ways that spend profits from energy generation, efficiency and saving in improving energy welfare for the poor

Fund Management

'Secretariat'
+
'Decision-making Body'
+
'Volunteer Group'

Allocation • Administration

Promote energy saving by the poor by offering micro-PV panels, LED bulbs, and BRP services instead of monetary support

Fund Expansion

Provisions for the energy-poor will be done under the current system, Fund allocation will be expanded to include those who have been neglected under the present system.

26

USD 193,000 / 16,254 persons

Amount of fund raised and number of citizens invest in the fund
(June ~ September 2015)

Launch of 'Citizen Board for Seoul Energy Welfare Civic Fund And Youth Volunteer Group

Management Committee consists of 20 experts in energy welfare, law and accounting

Youth Volunteer Group composed of 45 college students promotes the fund

< Launch of Citizen Board (7.15) >

< Onbichumi Street Campaign (7.18) >

< Fundraising March at Mt. Namsan(9.12) >

Energy Independent Villages, living examples of Seoul's Energy Policies

'Increase the number of Energy Supermarkets' to 13

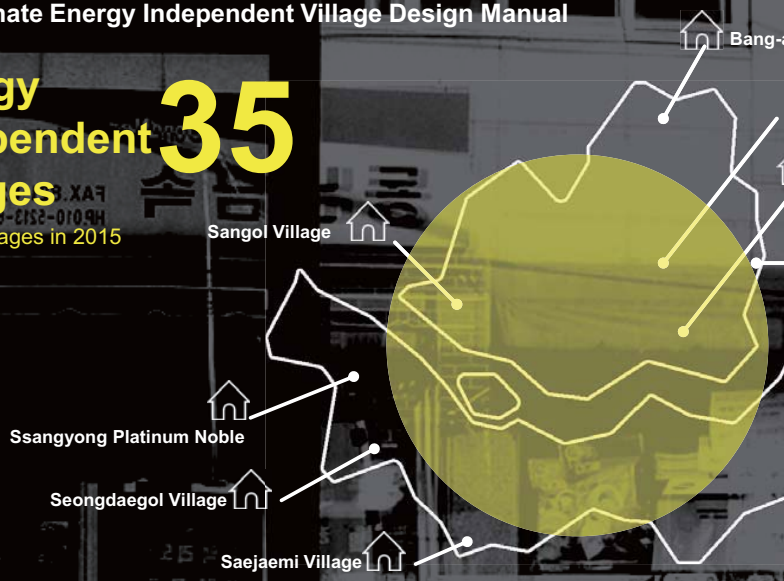
Run 'renewable energy tour programs'

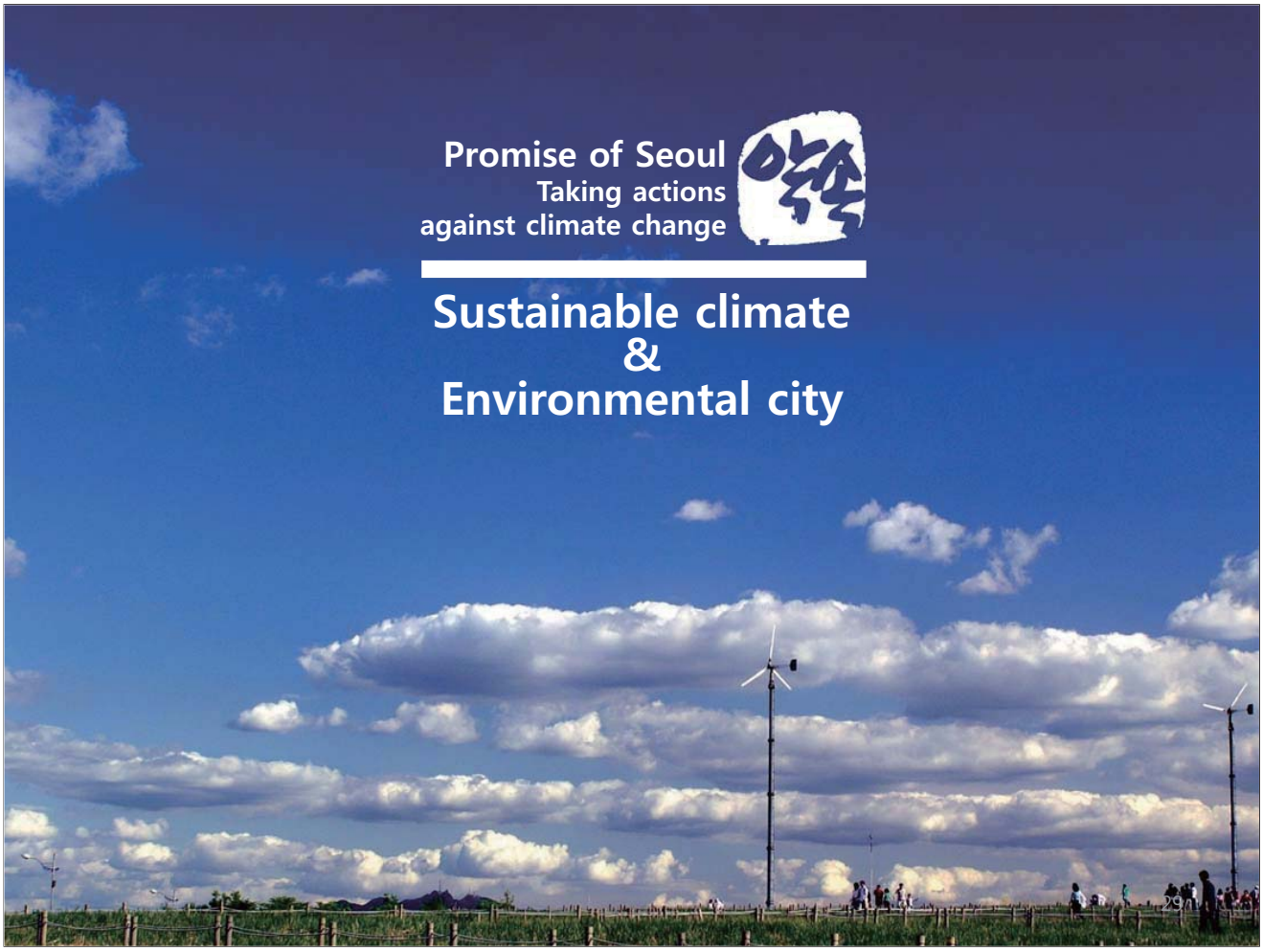
Cut an average energy consumption by the energy independent villages by 8.5%

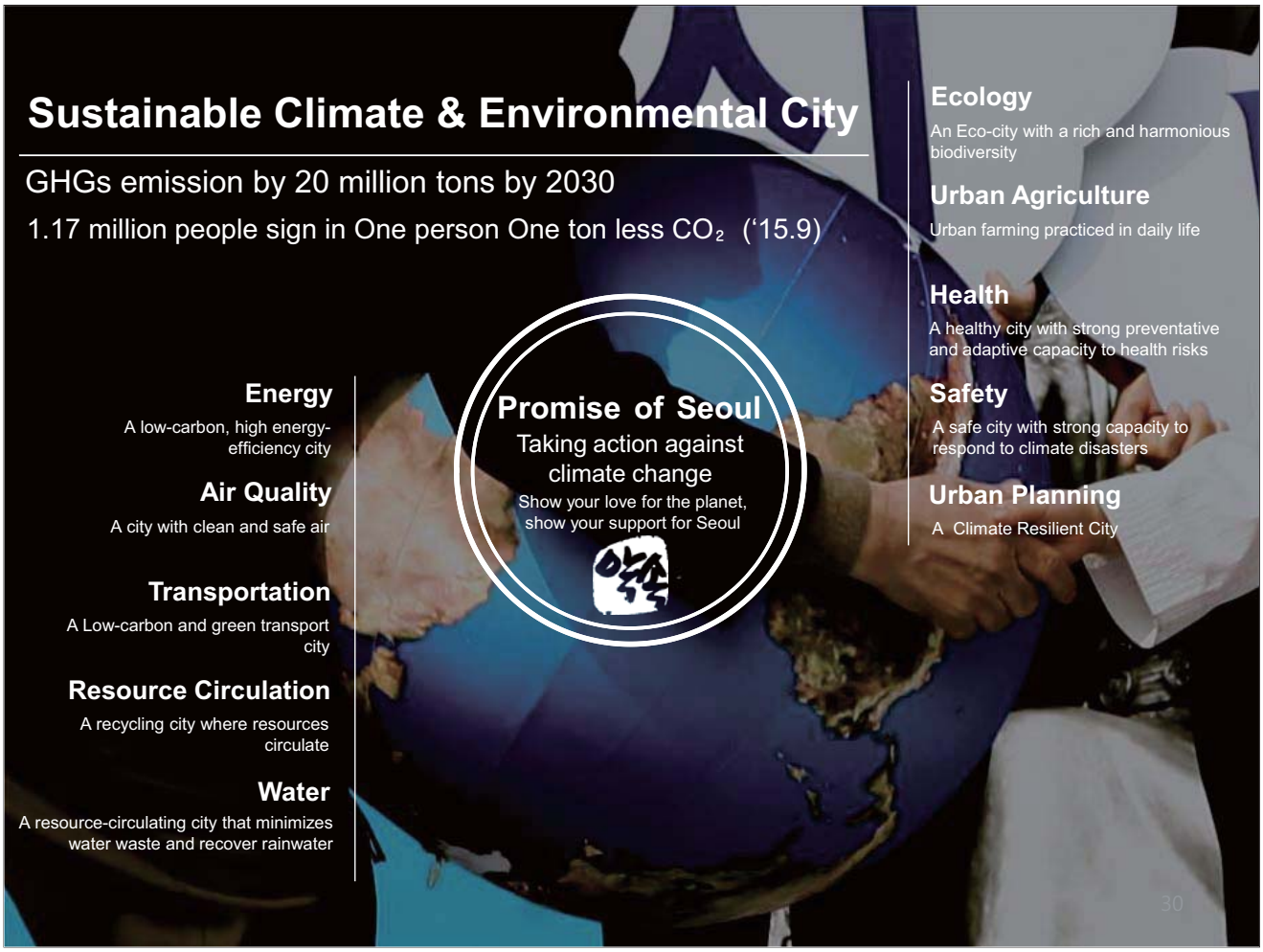
Disseminate Energy Independent Village Design Manual

Energy Independent Villages **35**

21 New villages in 2015




Promise of Seoul
Taking actions
against climate change
Sustainable climate
&
Environmental city


Sustainable Climate & Environmental City
GHGs emission by 20 million tons by 2030
1.17 million people sign in One person One ton less CO_2 ('15.9)
Energy
A low-carbon, high energy-efficiency city
Air Quality
A city with clean and safe air
Transportation
A Low-carbon and green transport city
Resource Circulation
A recycling city where resources circulate
Water
A resource-circulating city that minimizes water waste and recover rainwater
Promise of Seoul
Taking action against climate change
Show your love for the planet, show your support for Seoul
Ecology
An Eco-city with a rich and harmonious biodiversity
Urban Agriculture
Urban farming practiced in daily life
Health
A healthy city with strong preventative and adaptive capacity to health risks
Safety
A safe city with strong capacity to respond to climate disasters
Urban Planning
A Climate Resilient City

SEOUL

ONE LESS NUCLEAR POWER PLANT

SEOUL SUSTAINABLE ENERGY ACTION PLAN

People are our energy

SEOUL METROPOLITAN GOVERNMENT

31

SESSION Ⅲ - 2

Renewable Energies in Rokkasho

CEO Yoshihito IWAMA (Shinmutsu-ogawara)

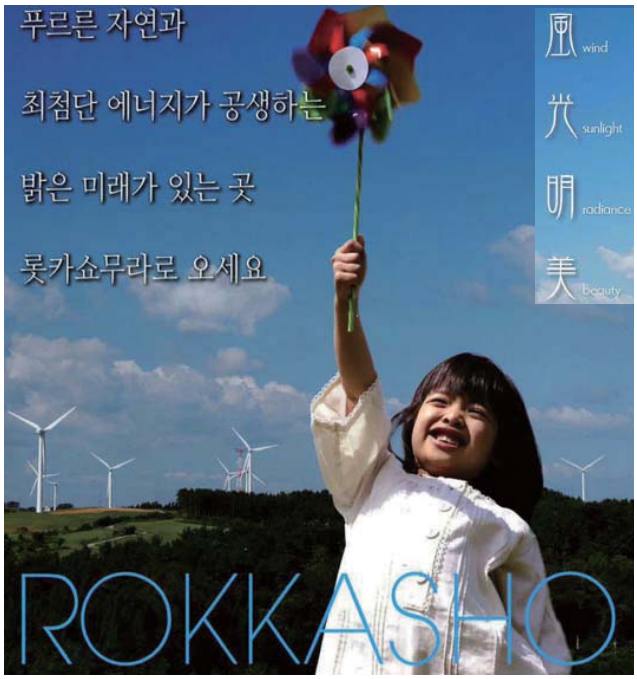
Renewable Energies in Rokkasho

August , 2016

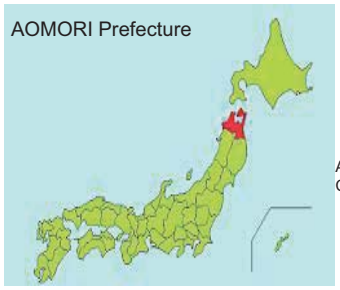
Yoshihito IWAMA
Shinmutsu Ogawara Inc.

1

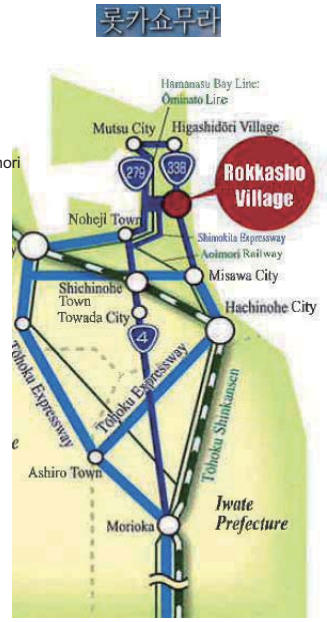
Rokkasho Village in Aomori Prefecture



Population:10,598, Household: 4,702



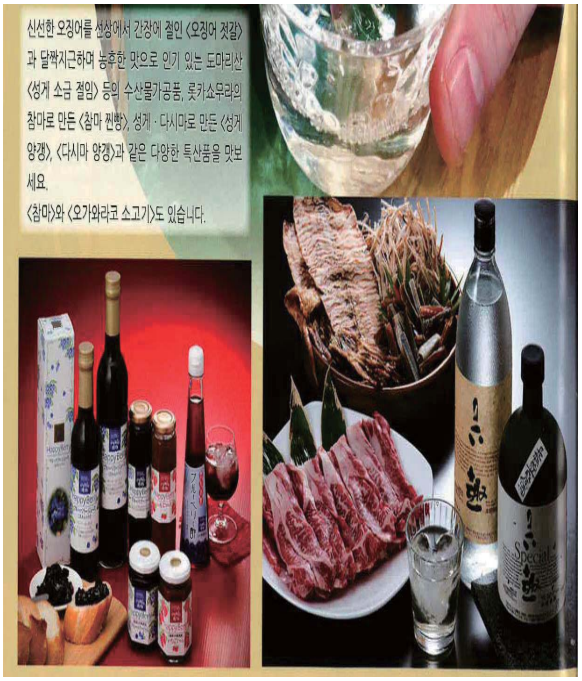
Aomori City



North to South:33km, East to West:14km

2

Local Food in Rokkasho Village



3

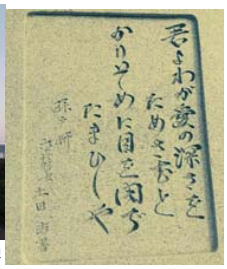




Rokkasho Village fosters continued cultural exchanges, sports exchanges and a homestay program with Yangyang, South Korea.

The Rokkasho International Education and Training Center offers several events and activities, including French, German, Korean and other language classes, and cooking classes.


韓国歌人・孫戸妍氏歌碑





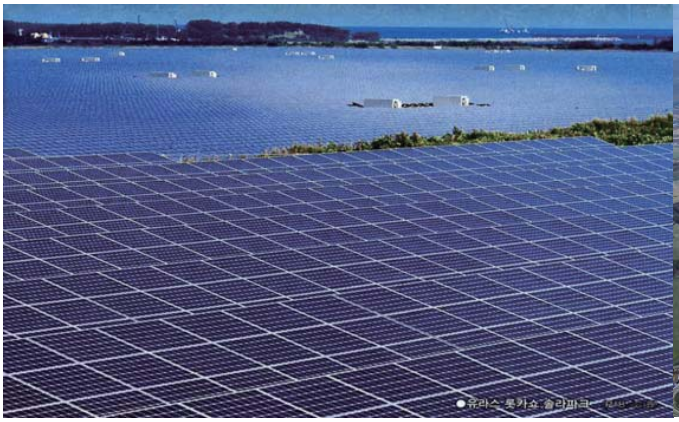
Youth Soccer Exchange Program between Rokkasho Village and Yangyang County, South Korea


Kayoung's Lecture at the high school

Korean New Year Experience with Kayoung !

- What：Let's cook "Tteok" and play Korean games!
- When：January 24th（Sunday）11:00-14:30
- Where：Central Community Center
- Who：Junior high school students (max. 12 participants)
- What to bring：Beverages, Apron
- Fee：Free

4






5

Wind Farms in Rokkasho Village

The Rokkasho Village is windy throughout the year. Harnessing its characteristic, a lot of windmills are introduced(92 windmills, 145,350kW, 23 storage batteries).

Mutsu-Ogawara Wind Farm (2003~): Cosmo Oil etc.
・To operate 21 windmills with total generated electricity of 31,500kW
・Equivalent to the amount of electricity that is consumed by 16,600 Japanese standard households in one year.

Rokkasho-Mura Wind Power (2003~): Japan Wind Development
・To operate 22 windmills with total generated electricity of 32,850kW
・5 large capacity storage batteries (2M NaS (sodium sulfur) batteries) with 12,000kW
・Equivalent to the amount of electricity that is consumed by 17,300 Japanese standard households in one year.

Futamata Wind Development (2009~): Japan Wind Development, Idemitsu Kosan
・To operate 34 large windmills, with total generated electricity of 51,000kW
・17 large capacity storage batteries (2M NaS(sodium sulfur) batteries) with 34,000kW
・To transmit a fixed amount of power, few energy losses and excel in durability

Mutsusakae Wind Farm (2014~): Aomori Wind Development etc.
・To operate 5 large domestically-made turbines with total generated electricity of 10,000kW
・Equivalent to the amount of electricity that is consumed by about 5,000 households, or the total number of houses in Rokkasho Village

Fukkoshi-Daichi Wind Power (2015~): Japan Wind Development, Maeda Corporation
・To operate 10 windmills with total generated electricity of 20,000kW
・6 large capacity storage batteries (2M NaS (sodium sulfur) batteries) with 12,000kW



6

Introduction of Windmills in Japan (as of 2015.3)

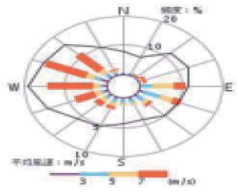
Prefecture	Total wind power output (kW)	The number of windmill
Total (全国)	2, 936, 306	2, 034
1 . Aomori (青森県)	363, 763	229
2 . Hokkaido(北海道)	319, 361	289
3 . Kagoshima(鹿児島県)	255, 415	155
4 . Akita (秋田県)	208, 599	143
5 . Shizuoka(静岡県)	158, 330	92

＊Source: NEDO

Rokkasho Village accounts for approximate 40% of windmills in Aomori prefecture.

- Stabilized wind
- Strong wind
- Wide grassland (pasture)
- Low Natural Disaster Risk (earthquakes, lightening, hurricanes)
- Existence of high-voltage transmission lines of Tohoku Electric Power Company and so on
- Understanding by local resident

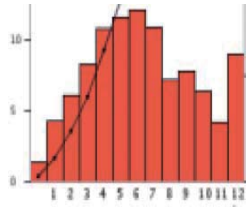
・Wind Rose



Stabilization
- summer: from east
- winter: from west

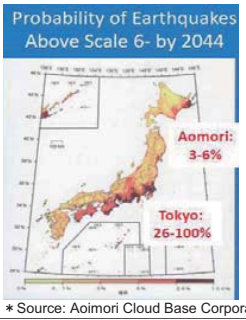
＊Source: Rokkasho Village Office

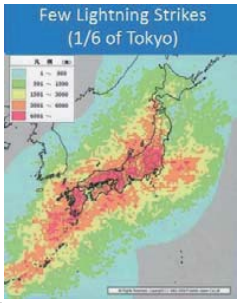
・Wind Condition Curb



Windy
Probability of over 4m/s wind =about 80%

・Low Natural Disaster Risk





＊Source: Aoimori Cloud Base Corporation

7

Planned Wind Farms

Max 500MW of wind farms (far more than 100 new windmills) have been planned/prepared in this area.

(Examples)

Kuroshio Wind Farm: Hitachi Power Solution, Yokohama-Town

・To operate 14 windmills (in ,Yokohama-Town, Noheji-Town) with storage batteries (in Rokkasho Village)
・To generate electricity of 32,200kW
・Equivalent to the amount of electricity consumed by 15,000 Japanese standard households in one year
・The construction started in April of 2016.

Hitachi Zosen Wind Farm

・To operate 18 windmills with storage batteries
・To generate electricity of 61,200kW
・The construction is scheduled to start in 2017Fy.

Rokkasho Offshore Wind Power Generation: NOMCO&CO. , Rokkasho Enginiering etc.

・Planned to operate 32 windmills
・To generate electricity of 80,000kW
・The construction is scheduled to start in 2016Fy.

8

Solar Parks in Rokkasho Village

The Ene One Solar Park (2013 ~) : Saisan, Shinwa Energy

- 14,336 solar panels placed at the site area of 53,353㎡
- Annual energy production is 2,400,000kWh, Eqivalent to the amount of annual power consumption by 650 ordinary homes.
- In wintertime, the height of frame and angle of solar panels are adjusted to fit snowy conditions; 1.2m for minimum ground clearance and 30°angle of solar panels.

In order to generate electricity efficiently by solar power, it is important to have sufficient hours of sunshine during the day as well as not to operate at excessively high temperatures.

⇒Rokkasho Village
- Not long duration of sunshine(1,600h~1,700h/year) :same as that of German cities
- Cool summer .
- One land owner（Shinmutsu Ogawara Inc.)

Eurus Rokkasho Solar Park (2015.10 ~) : Eurus Energy

- Total AC output capacity:115MW
- The amount of the power consumption by about 38,000 general households
- The CO2 reduction ：about 70,000 tons a year
- 513,000panels
- 253ha tract (equivalent to about 50 Tokyo Domes ;the largest domestic solar power plant currently operated in Japan)

9

Rokushu solar energy power generation system （Rokushu Jyouzou Koubou ）

- Aomori Prefecture is the number one producer of Chinese yams(Nagaimo) in Japan. Great effort was put into research on how to produce delicious shochu (Japanese alcoholic beverage) from Rokkasho's Chinese yams.

- Rokushu Jyouzou Koubou manufactures `Rokushu` premium shochu from the Chinese yams that are a specialty of Rokkasho Village. Rokkasho Jyouzo Koubou too has had a solar energy power generation system installed on its premises and commenced operating it in April 2012.

- Each of the two units has a rate capacity of 10 kW, making for a total of 20 kW.

10

Kamikita Rokkasho Solar Electric Power Plant (will be completed in February of 2017) : Sojitz Corporation

- Iyasaka-daira site in Rokkasho Village
- Total AC output capacity:51MW(The total amount of electric power is equal to the amount of the power consumption by about 19,000 general households.)
- Constructed with approximately 270,000 panels made by LS Industrial Systems, Co., Ltd. of Korea
- 143ha tract equivalent to about 29 Tokyo Domes

Solar Power for Resident

Rokkasho Village Office's subsidy (From 2012Fy) : total 31 of houses (174.43kW)
(48，000JY/1kw)

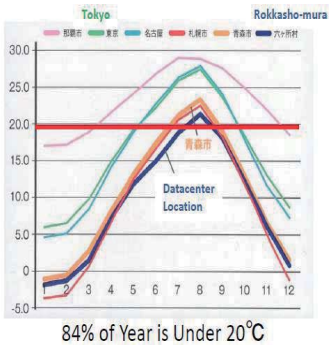
11

Aoimori Cloud Base
（青い森）

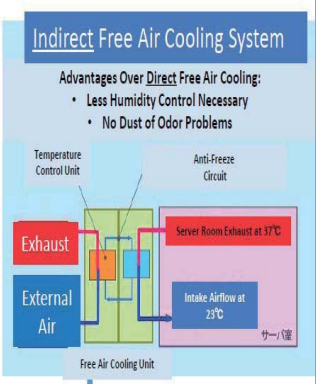
- **Datacenter opened in January of 2016**
- **The largest datacenter in the Tohoku district of Japan**
- **Latest high-performance IT equipment requires higher cooling capability.**

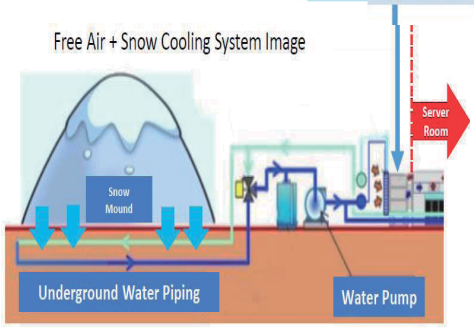
⇒The world's first datacenter that combines free air cooling and snow cooling

- Use no (compressor-based) air conditioning
- Achieve world-class power efficiency



84% of Year is Under 20℃





12

Floritech Japan

Floritech Japan, which is built on Toyota Motor Company owned land, annually produces about 4 million flower pots in the largest flower greenhouse in Asia. It features the 'tri-generation system', which effectively uses CO2 that is ordinary emitted to the atmosphere as well as a cogeneration system from which electricity and heat are produced.

・The generated electricity is used to light the greenhouse.
・The waste heat produced in power generation is used for heating.
・CO2 accelerates photosynthesis in flowers.
・The amount of CO2 discharge is annually reduced by about 900t by introducing natural gas and tri-generation.












13

The training center regarding wind power plants

In order to improve service expertise to handle all types of wind turbines, EOS Engineering & Service Co., Ltd (subsidiary of JWD) established training center and intensively train staffs at the training center.

・ Trained people operate and maintain a lot of wind power facilities all over the nation of several wind power companies.
⇒ Aomori Prefecture Office promoting operation & maintenance business including related human resource development in the area of renewable energy industries and other industries. http://www.21aomori.or.jp/windpower/institution.html







14

Rokkasho Village smart grid demonstration experiment (2010.9～2012.7)

- the efficient use of energy in Rokkasho Village, Aomori according to the electric power situation of the region (power and transmission, demand and supply balance, telecommunications infrastructure, climate etc.)
- Main Participants : JWD, Toyota Motor, Panasonic, Hitachi + residents(6 JWD's employees' houses)

- Wind farm : JWD
- Solar panels (100 kW): Hitachi
- Private line (approximately 8 km, 6.6 kV power cables & optical fiber): JWD
  (independent from the electric power grid)
- Smart meter system: Hitachi
- Storage batteries (NAS batteries 100-kW class): JWD
- Plug-in hybrid vehicle: Toyota
- Charging stand: Toyota
- HEMS: JWD, Toyota and Panasonic.
- Control Center: JWD, Hitachi

A blackout occurred in the Tohoku area including Rokkasho Village after the Great East Japan Earthquake in March, 2011, but the electric power kept being supplied in the JWD's office and the smart grid demonstration houses.

⇓

・supply hot water and so on,
・make many onigiri (rice balls) for village people

⇓

・JWD's employees keep living

15

Eco Education

Obuchi Elementary School / Minami Elementary School

Solar panels on the school building

Small windmills in the play ground

Education by experts

16

Other Energies

・Hydrogen Energy

○Aomori Prefectural Office and Rokkasho Village Office have been considering introducing hydrogen energy system using renewable energy which would supply electricity and heat with the function of storage of electricity including emergency response.

○Main issues to be addressed are cost reduction and increase of efficiency of energy system as well as increase of people's awareness.

・Utilization of geothermal energy

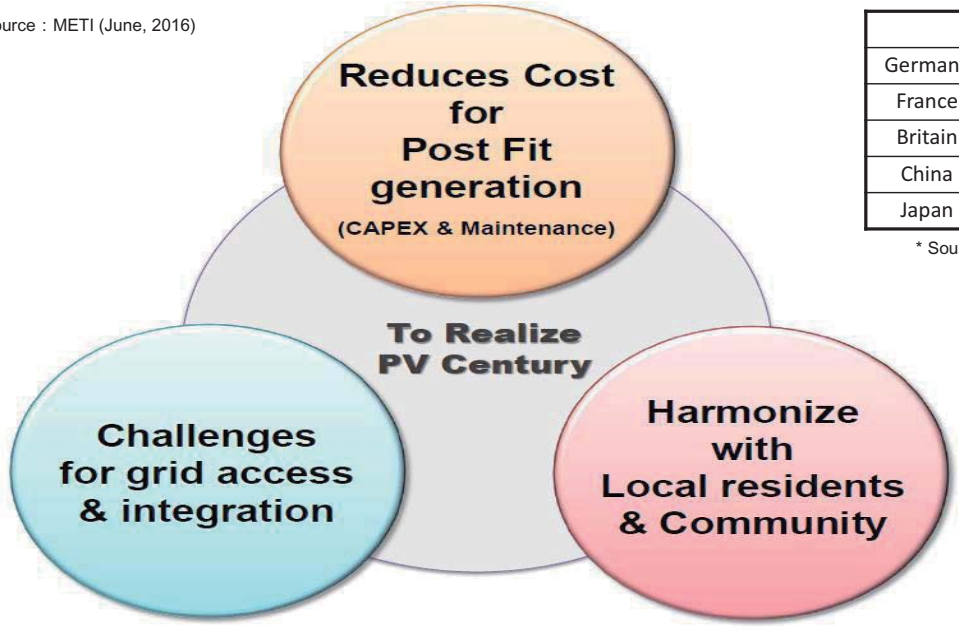
○ Underground heat pipe snow-melting system

○ To melt snow on the pavement in the new town

17

Japanese Government
「Obstacles to be overcome for sustainable development」

* Source：METI (June, 2016)



FIT Price(¢ /kwh)

	Wind	Solar
Germany	9.7	8.9
France	9.2	10.6
Britain	12.2	16.5
China	7.8-9.7	14.3-15.8
Japan	18.3	22.5

* Source：METI (April, 2016)

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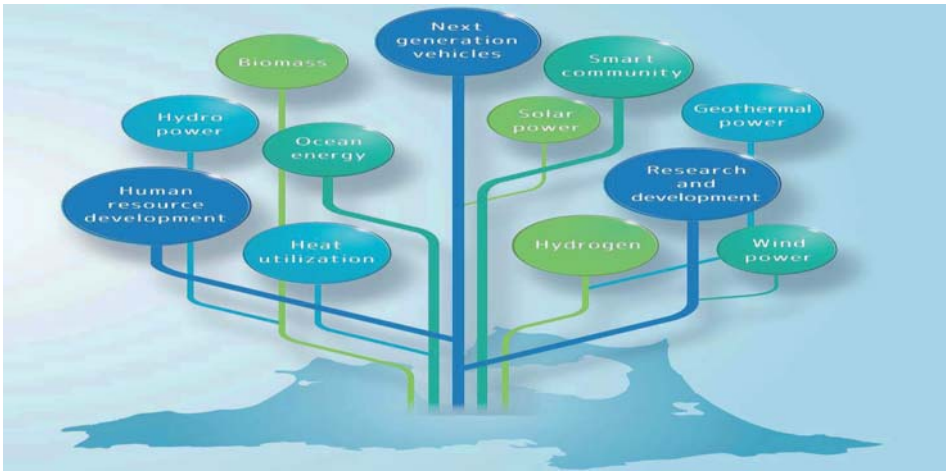
Vision & Smooth Implementation of Regulation by Local Governments

Rokkasho Village: “Village of Energy”

Aomori Prefecture : Strategy on Promotion of Energy Industries（March of 2016）



Local Resources & Profitability (locally produced and consumed)

Attachment by Local People/Government | **Local People/Government as users/showcases**

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21

Many Thanks for your attention!

22

SESSION Ⅳ - 1

The Role of Citizens in the Generalized Use of Renewable Energy

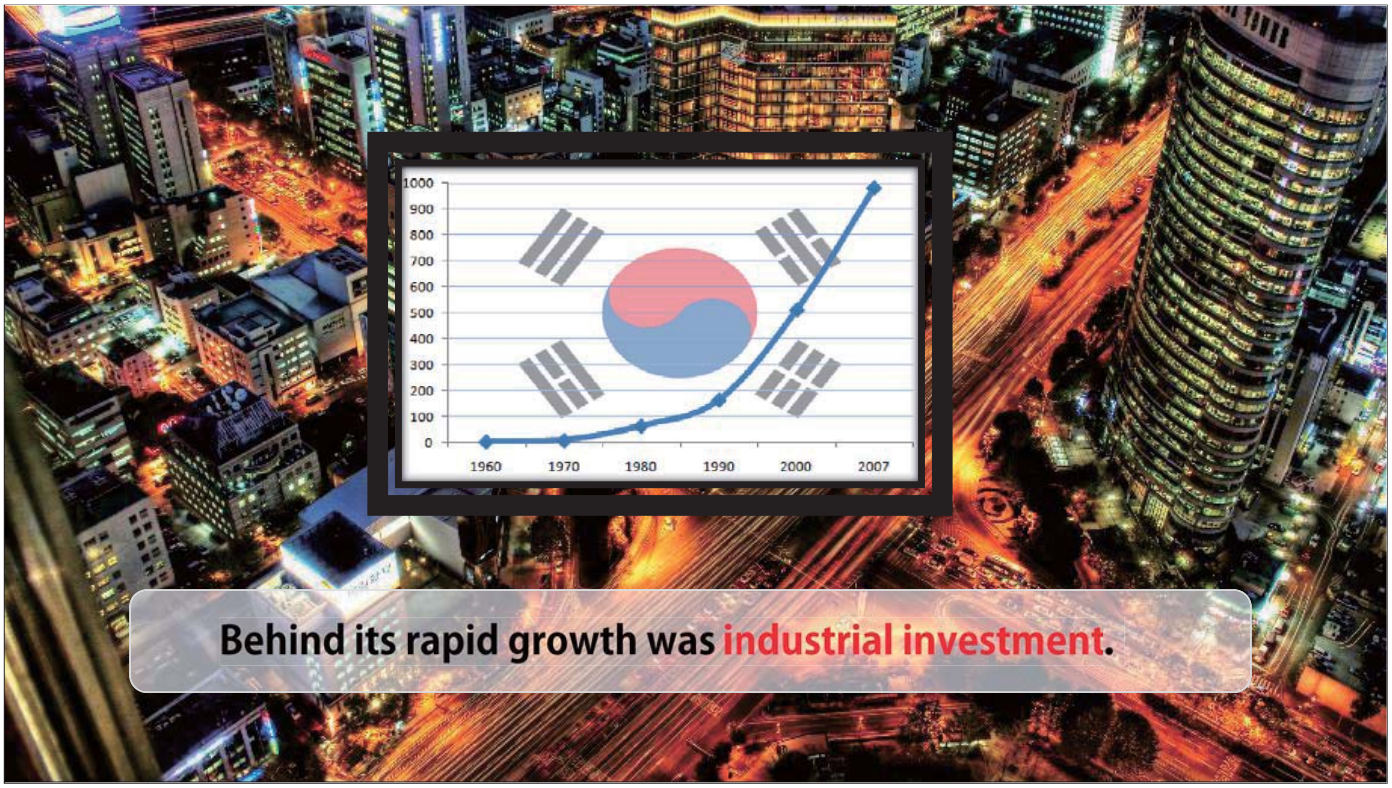
President Jiwon HA (EcoMom Korea)

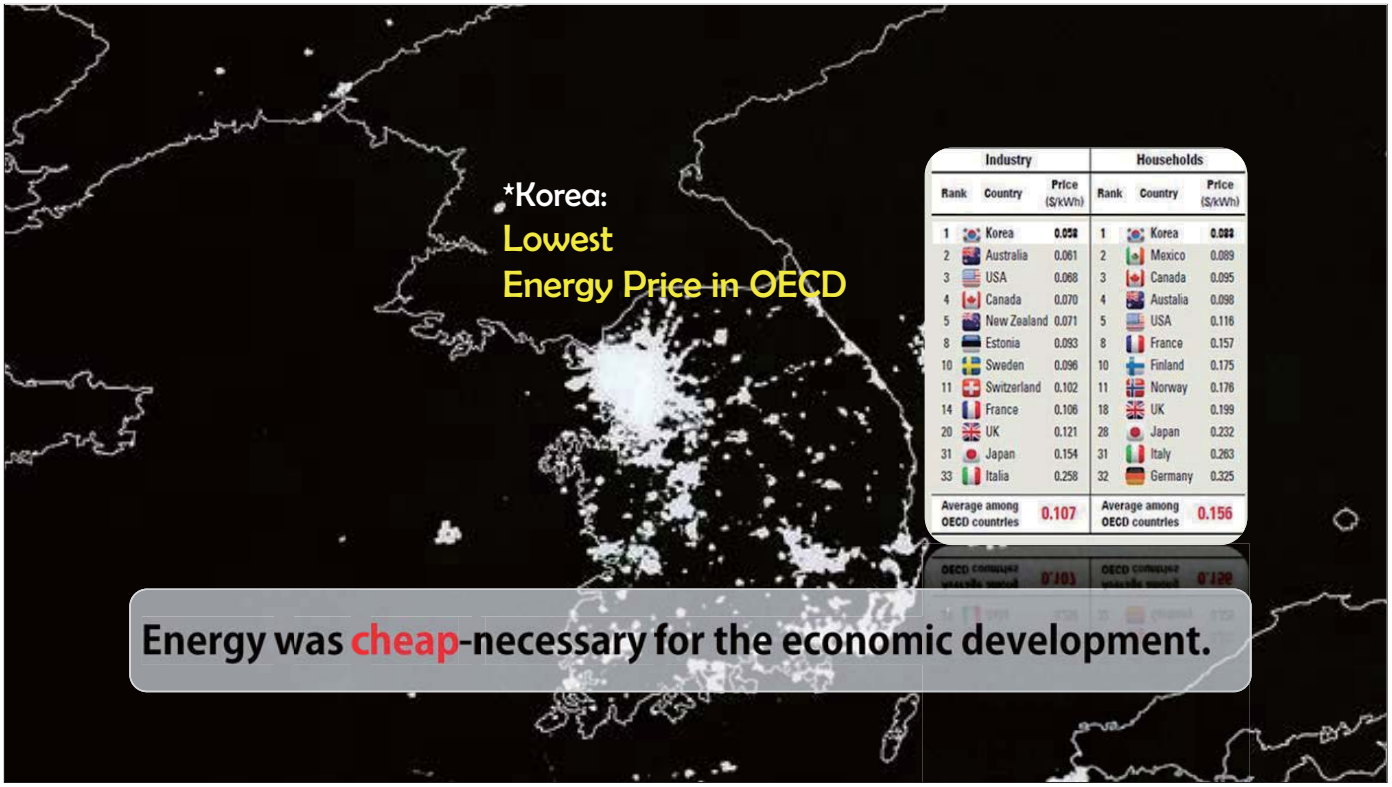
The Role of Citizens in the Generalized Use of Renewable Energy

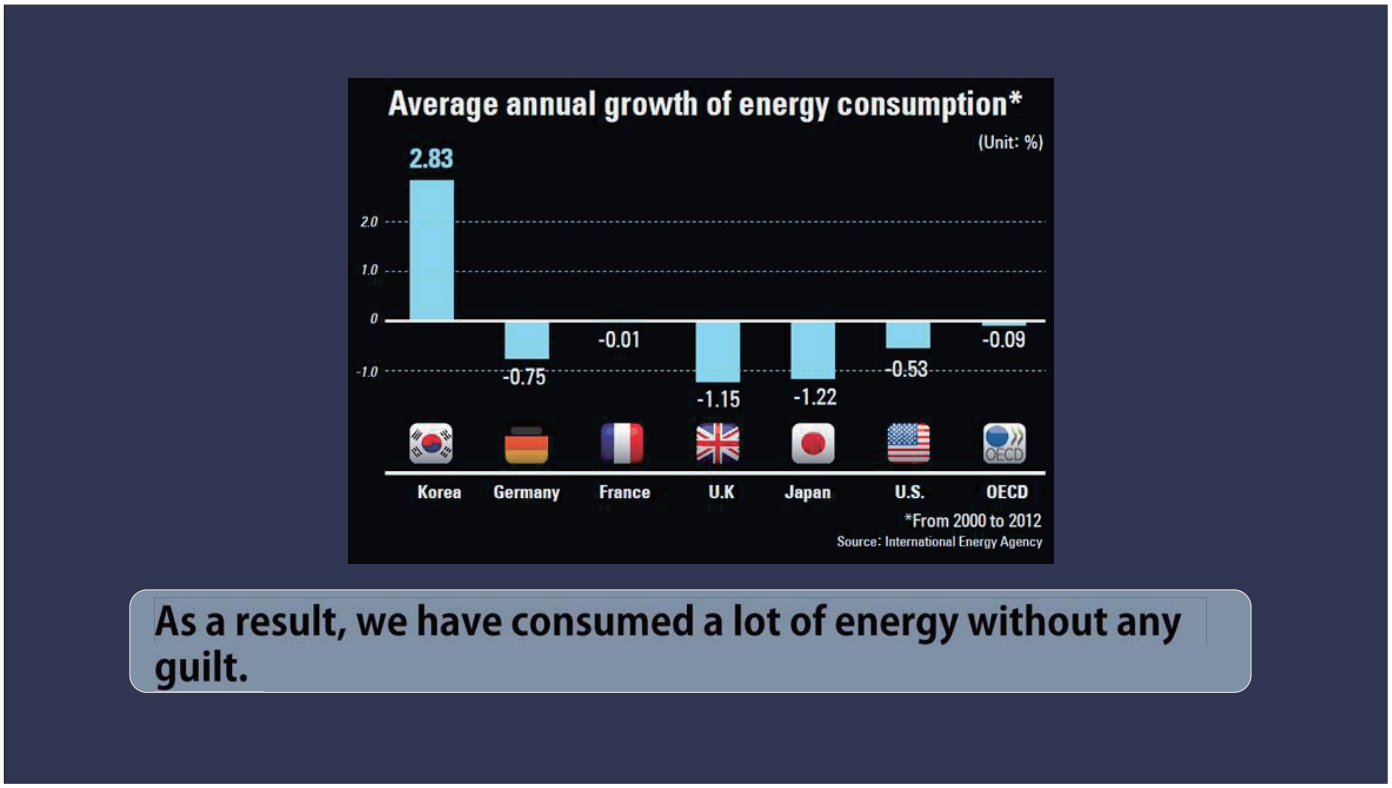
Jiwon Ha, Ph.d
President
Ecomom Korea
greenstarha@naver.com

ecomom
www.ecomomkorea.org


Korea is a country with its unique culture, but no oil or gas.


1000
900
800
700
600
500
400
300
200
100
0
1960
1970
1980
1990
2000
2007
Behind its rapid growth was industrial investment.


*Korea:
Lowest
Energy Price in OECD
Industry
Households
Rank Country Price ($/kWh)
1 Korea 0.058
2 Australia 0.061
3 USA 0.068
4 Canada 0.070
5 New Zealand 0.071
8 Estonia 0.093
10 Sweden 0.096
11 Switzerland 0.102
14 France 0.106
20 UK 0.121
31 Japan 0.154
33 Italia 0.258
Average among OECD countries 0.107
1 Korea 0.088
2 Mexico 0.089
3 Canada 0.095
4 Austalia 0.098
5 USA 0.116
8 France 0.157
10 Finland 0.175
11 Norway 0.176
18 UK 0.199
28 Japan 0.232
31 Italy 0.263
32 Germany 0.325
Average among OECD countries 0.156
Energy was cheap-necessary for the economic development.


Average annual growth of energy consumption*
(Unit: %)
2.83
-0.75
-0.01
-1.15
-1.22
-0.53
-0.09
2.0
1.0
0
-1.0
Korea
Germany
France
U.K
Japan
U.S.
OECD
*From 2000 to 2012
Source: International Energy Agency
As a result, we have consumed a lot of energy without any guilt.

We were laid back as we thought nuclear energy would provide solution to our problems.

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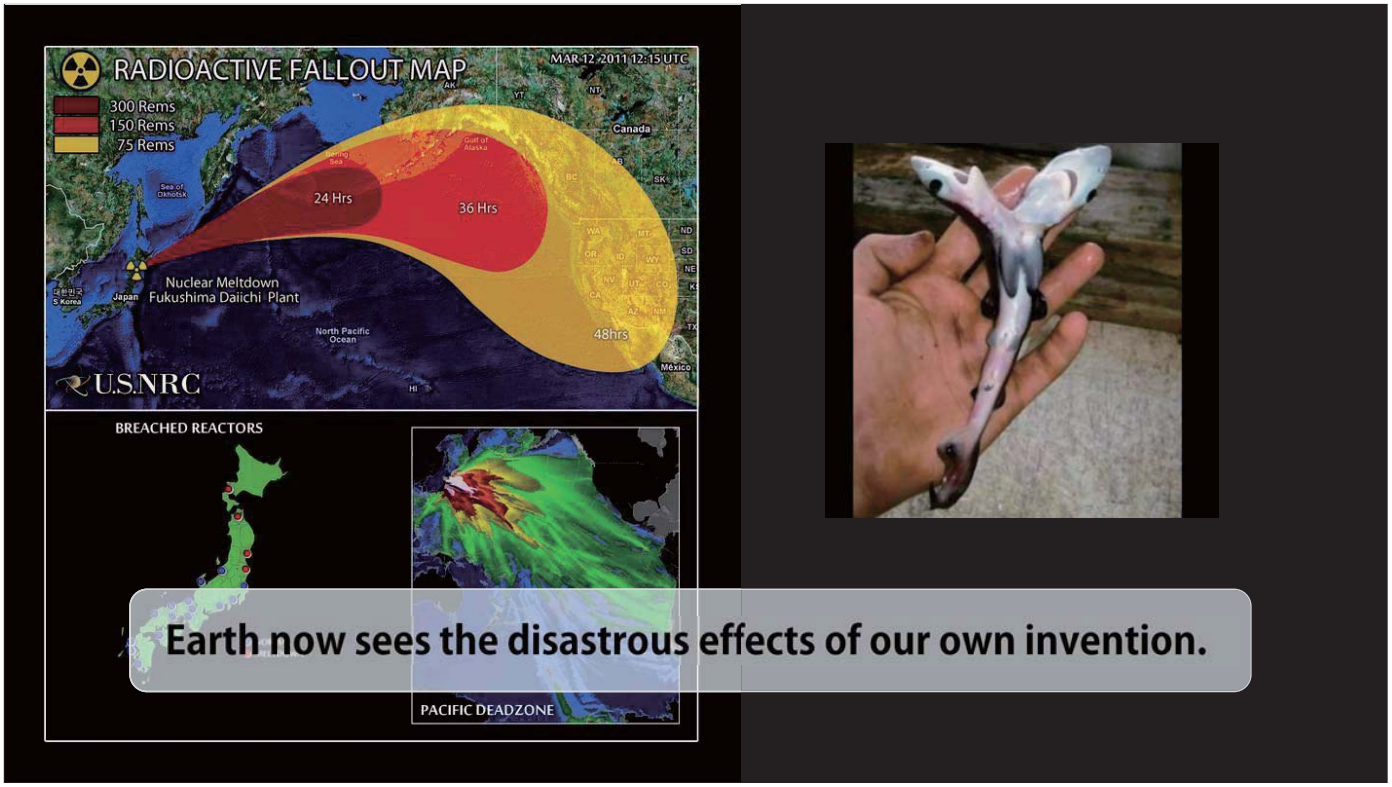
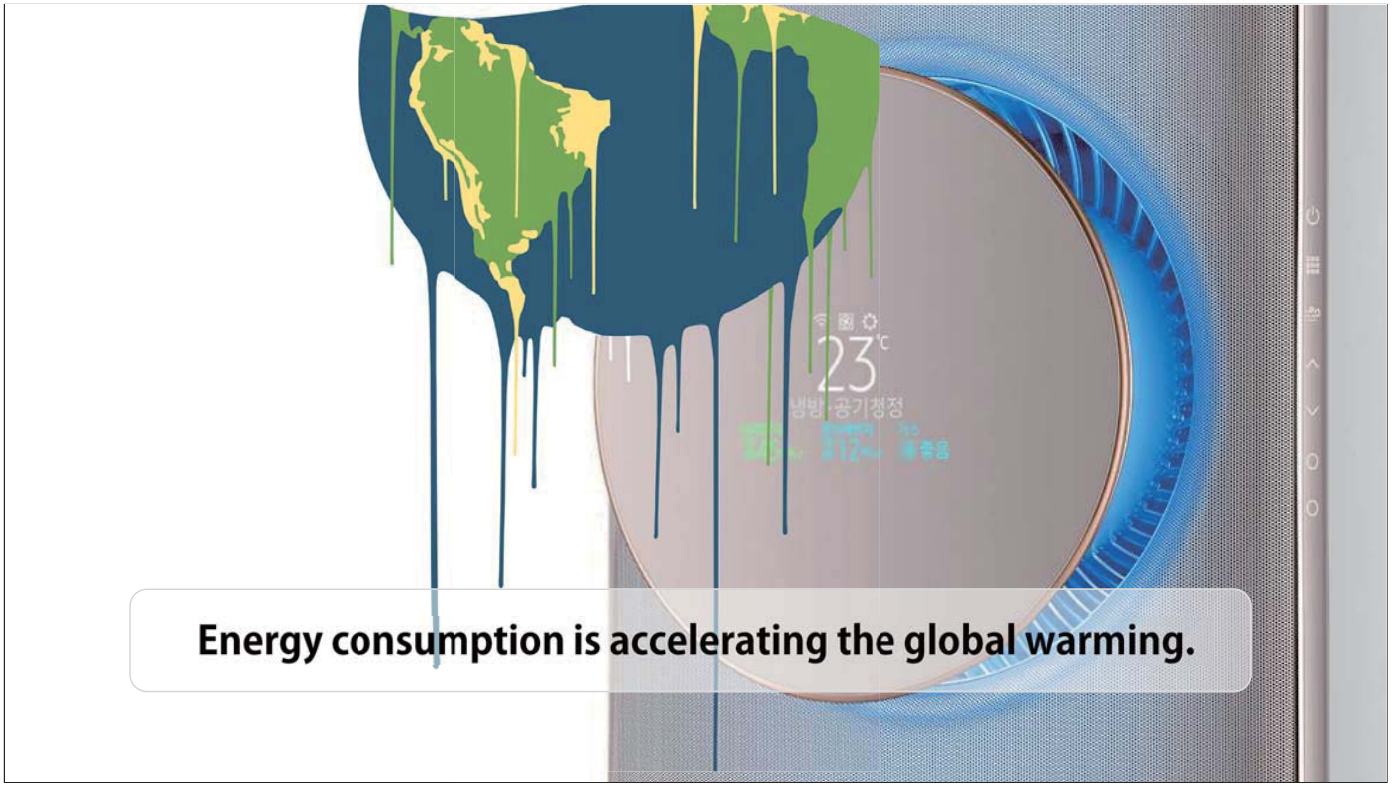
www.ecomomkorea.org

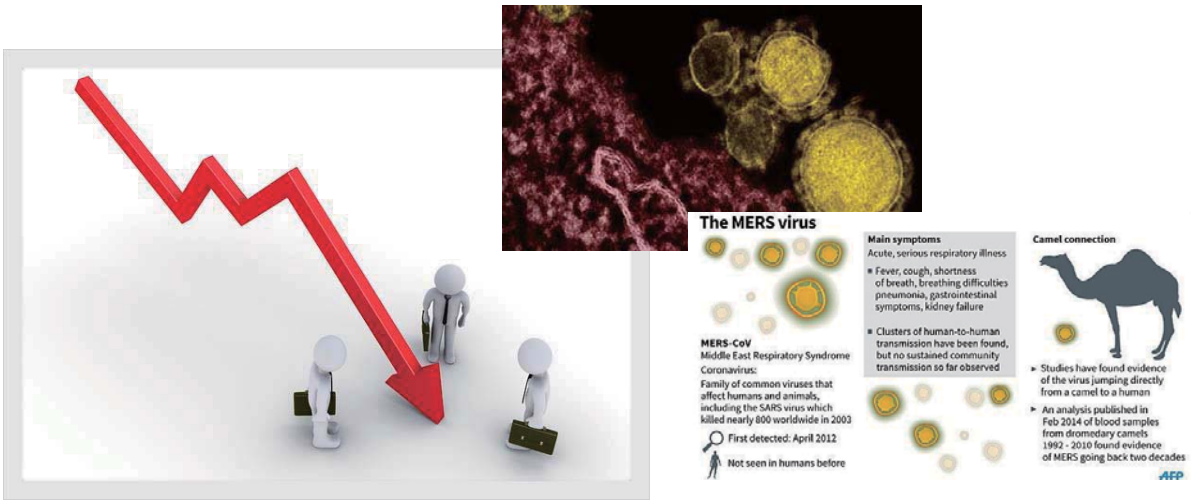
Part 2.
Warning from the EARTH


RADIOACTIVE FALLOUT MAP
MAR 12 2011 12:15 UTC
300 Rems
150 Rems
75 Rems
24 Hrs
36 Hrs
48hrs
Nuclear Meltdown
Fukushima Daiichi Plant
Japan
North Pacific Ocean
Canada
México
U.S.NRC
BREACHED REACTORS
PACIFIC DEADZONE
Earth now sees the disastrous effects of our own invention.


Fine Dust Kills !!!
38.7
31.2
19.1
6.0
5.0
Heavy reliance on coal is making the air life-threatening.


23℃
냉방 공기청정
Energy consumption is accelerating the global warming.


At first,
we targeted short-term profit & cost-effective economy.
ecomom
www.ecomomkorea.org



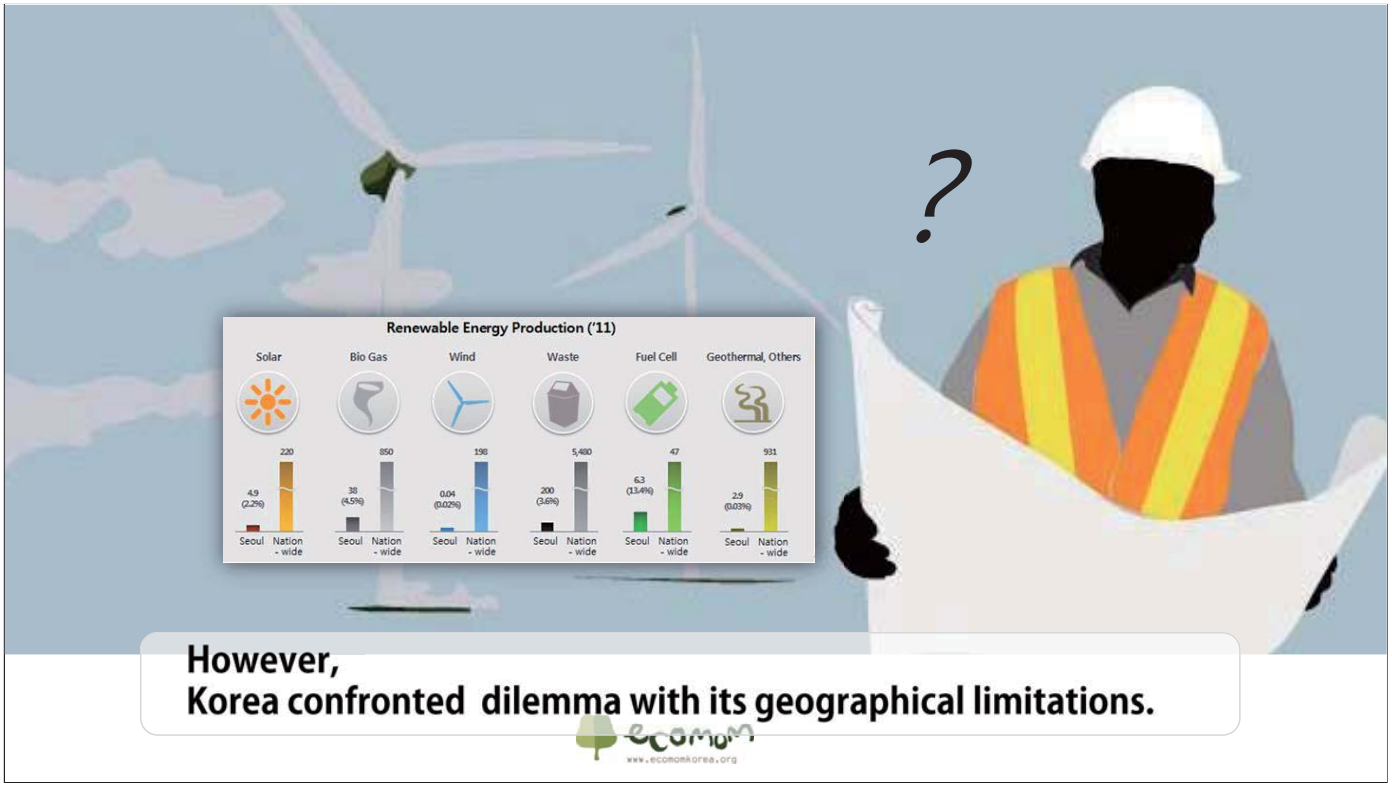
Now,
environmental diseases are making people unhappy.

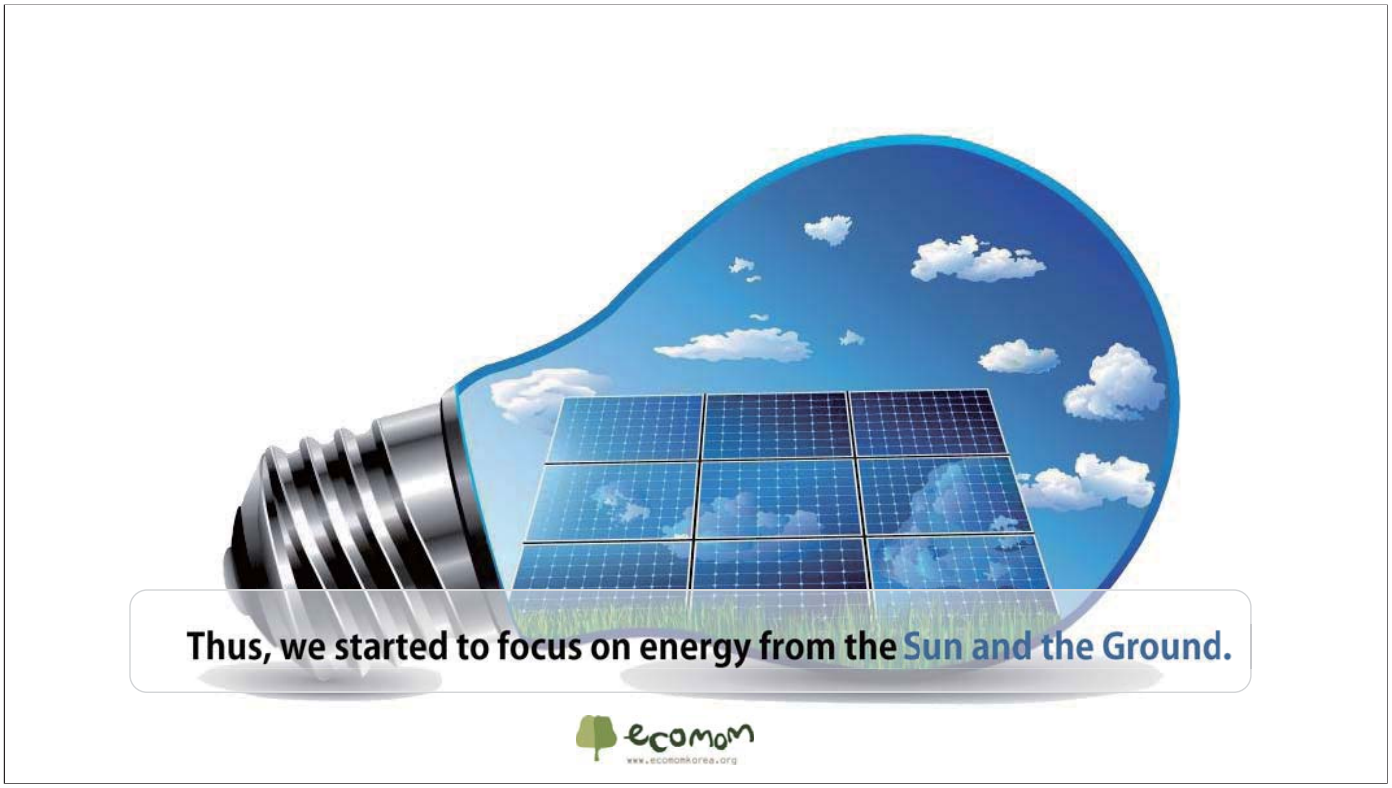
ecomom
www.ecomomkorea.org

Part 3.
Beginning with a Small Change


Economy
Energy
GLOBAL ALLIANCE FOR CLEAN COOKSTOVES
ENERGY STAR
endev
RPS
Renewable Portfolio Standard
United States and Europe have long been interested in renewable energy.


Many energy options are feasible thanks to natural advantages.
PHOTO: KIM STEELE/GETTY IMAGES


?
Renewable Energy Production ('11)
Solar
Bio Gas
Wind
Waste
Fuel Cell
Geothermal, Others
220
850
198
5,480
47
931
4.9 (2.2%)
38 (4.5%)
0.04 (0.02%)
200 (3.6%)
6.3 (13.4%)
2.9 (0.03%)
Seoul
Nation - wide
However,
Korea confronted dilemma with its geographical limitations.
ecomom
www.ecomomkorea.org


Thus, we started to focus on energy from the Sun and the Ground.
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www.ecomomkorea.org

Duckam Village, Junbook city

Every hour, 400kW out of 500kW is produced by solar power, and air-conditioner/heating system is run by thermal energy.

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www.ecomomkorea.org

Sungdaegol Village, Seoul

The village stores and uses solar energy as a source of heating in the winter season.

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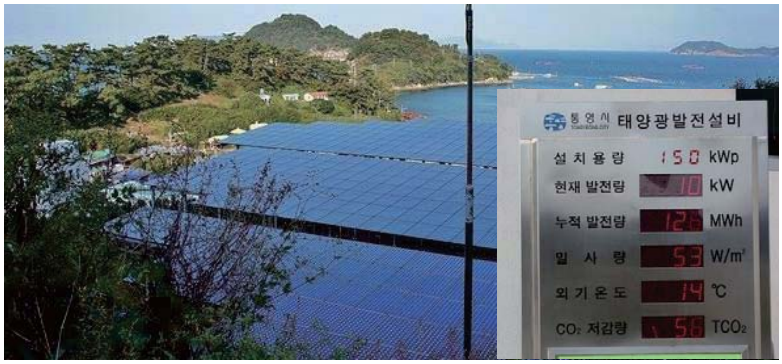
www.ecomomkorea.org

Solar Village, Yondae Island



150kW of Solar energy is delivered to 48 houses, which reduces 56 Ts of CO_2 everyday.

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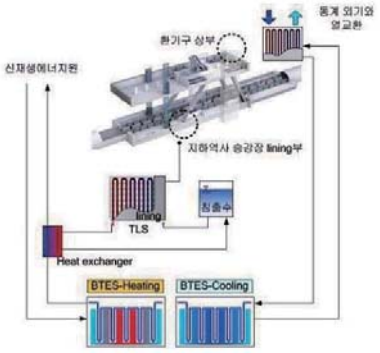
www.ecomomkorea.org

Carbon-Zero Postal Office, Gyung-gi

This energy-zero building achieved 72% decrease in overall energy consumption, and $11,000 profit followed by the CO_2 reduction.

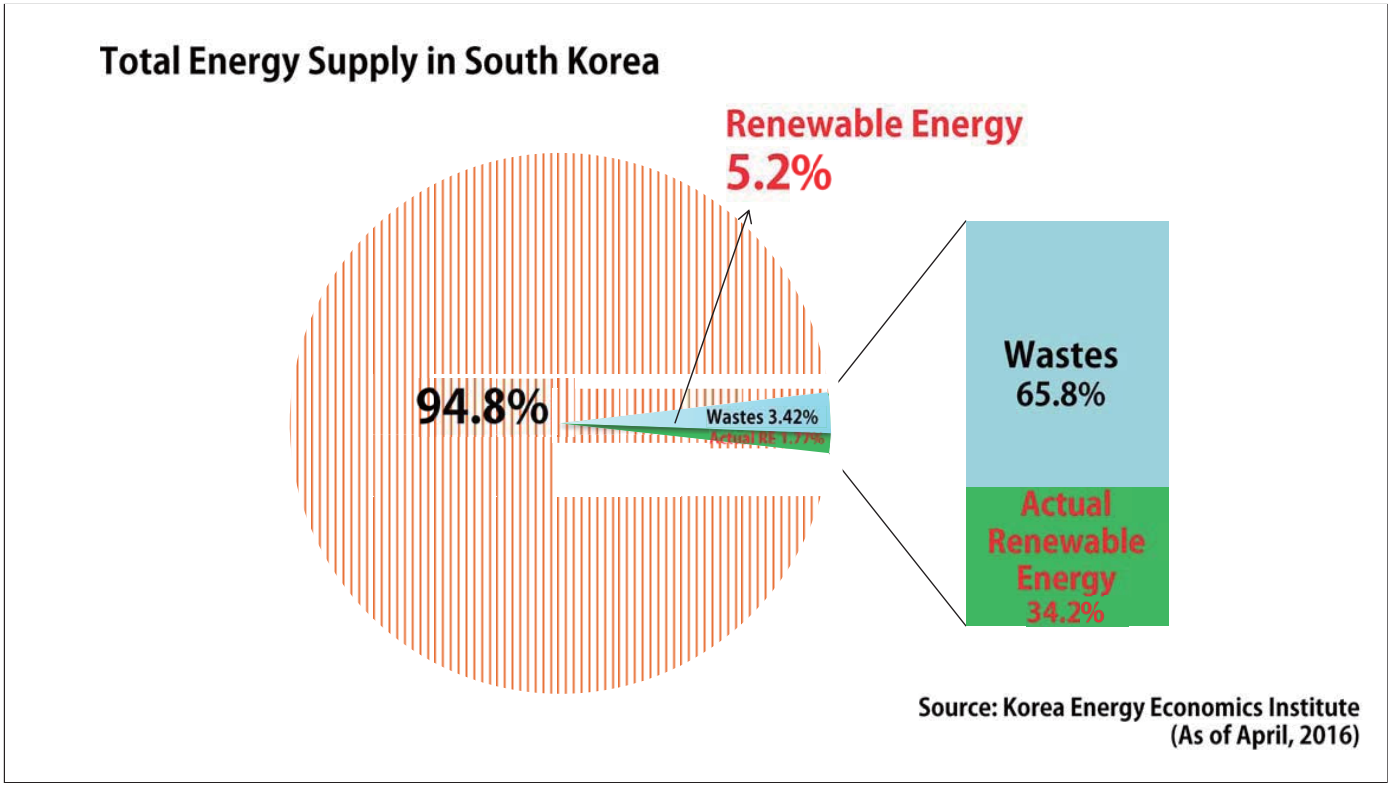
ecomom
www.ecomomkorea.org

Geothermal Subway, Seoul

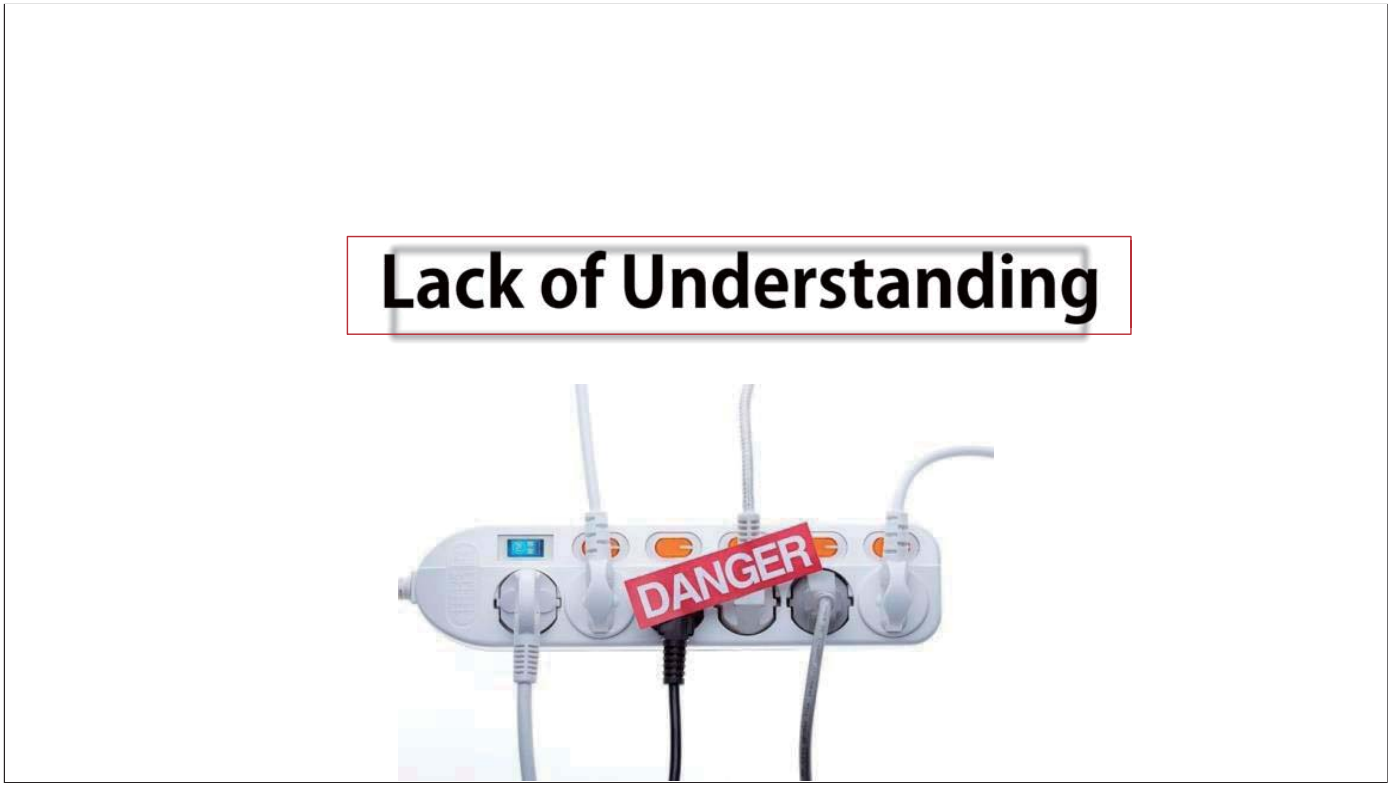


Subways in Seoul are making use of the thermal energy from underground(-180m) to operate air-conditioner and heater.

ecomom
www.ecomomkorea.org


Total Energy Supply in South Korea
Renewable Energy
5.2%
94.8%
Wastes 3.42%
Wastes
65.8%
Actual
Renewable
Energy
34.2%
Source: Korea Energy Economics Institute
(As of April, 2016)

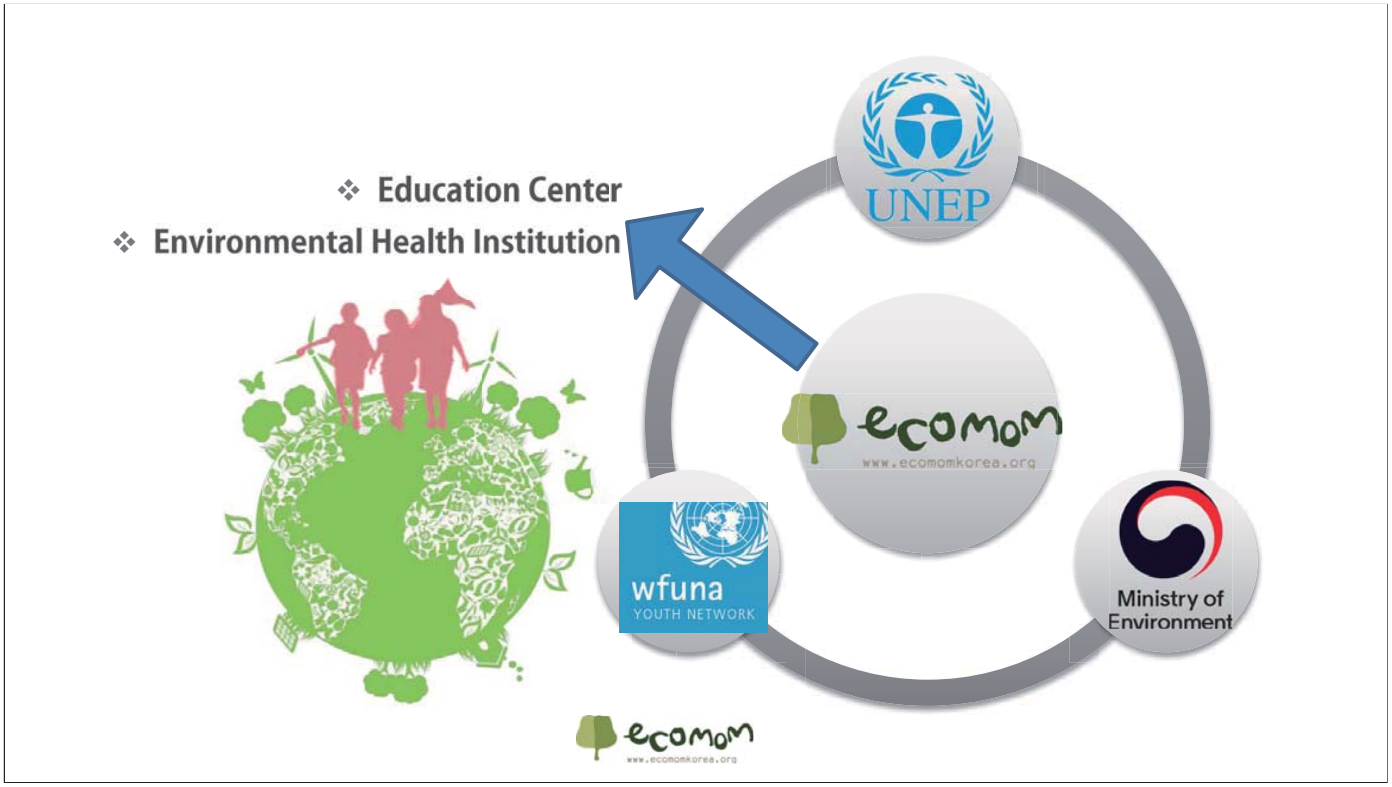

Renewable Energy
Why only 1.17%?


Lack of Understanding
DANGER


Lack of Understanding
Excessive Heating in Winter


Lack of Understanding
ecomom
www.ecomomkorea.org


Education!


❖ Education Center
❖ Environmental Health Institution
UNEP
ecomom
www.ecomomkorea.org
wfuna
YOUTH NETWORK
Ministry of Environment
ecomom
www.ecomomkorea.org


Part 5.
Education for
Our Future
Planting Mangroves,
Philippines, 2016

UN Youth Environmental Conference

UN simulated debate to give globally acknowledged resolutions on today´ s sustainable issue.

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Borrow the Earth Camp

Experiencing serious consequences of pollution and Learning the Eco-Friendly Lifestyle.

ecomom
www.ecomomkorea.org

Eco-Edu Seminar

Understanding *the concept* of sustainable development through a series of meaningful activities and teamwork.

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www.ecomomkorea.org

Overseas Workshop

College Eco-mentors go overseas (i.e. Shanghai, 2016) to build global network and discuss ideas regarding the environmental solutions.

ecomom
www.ecomomkorea.org

Brunch Academy for Parents

Practicing the Resource Upcycling in daily life

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www.ecomomkorea.org

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www.ecomomkorea.org

SESSION Ⅳ - 2

Citizens' and Regional Initiatives towards 100% Renewable Energy in Japan

Specialist Yosuke TOYOTA (Kiko Network)

Citizens' and Regional Initiatives towards 100% renewable energy in Japan

Yosuke Toyota（Kiko Network）
toyota@kikonet.org

Transition of Renewable Energy Polices in Japan

①Subsidies to new energy sources

- "Act on the Promotion of New Energy Usage "in 1997
  - Subsidies for introducing renewable energy.

②Renewable Portfolio Standard(2003~2012)

- "Act on Special Measures Concerning New Energy Use by operators of electric utilities " in 2003
  - Obligation for electric utilities to supply a certain amount of renewable energy electricity

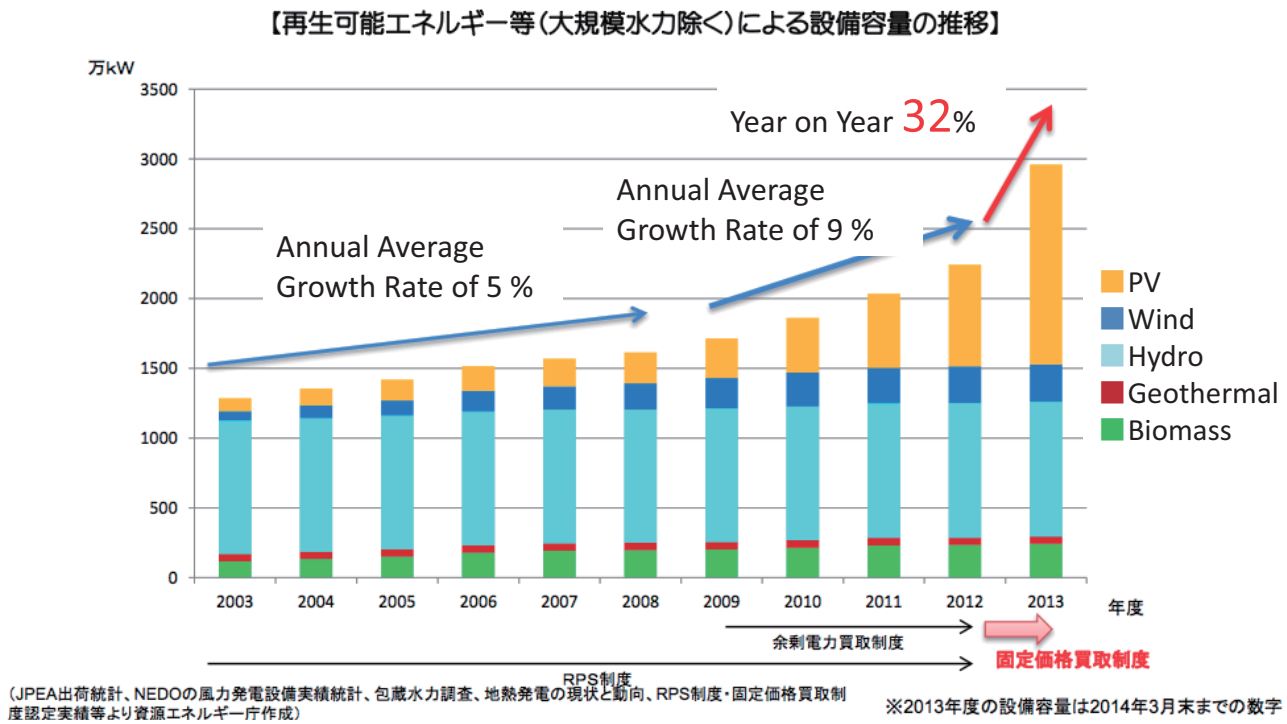
③Feed in Tariff(2009~)

- The Excess Electricity Purchasing Scheme for photovoltaic power started in November 2009 to promote the use of photovoltaic power.
- Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electric Utilities in August 2011.
- For solar, wind, hydro, geothermal, biomass, obligated electric utilities the procurement of renewable energy electricity at the procurement price and period established by the government

Outcome of the feed-in tariff in Japan

- **Rapid introduction of PV since 2012**
  - 2011 power ratio 1.4%, 2014 3.5%, 2015 4%
  - Decline in the price of solar power
  - Grid parity in Japan
- **PV system cut summer peak demand**
  - 5.7% of the 2015 summer peak demand was covered by PV and wind
  - Average of 8.7% in the day of maximum demand in August, in which 25% was supplied by Kyushu Electric Power Co.
- **Reduction of CO_2 and fuel costs from fossil fuel**
  - reduction of 0.20 million CO_2-t and fossil fuel cost 0.5 trillion yen

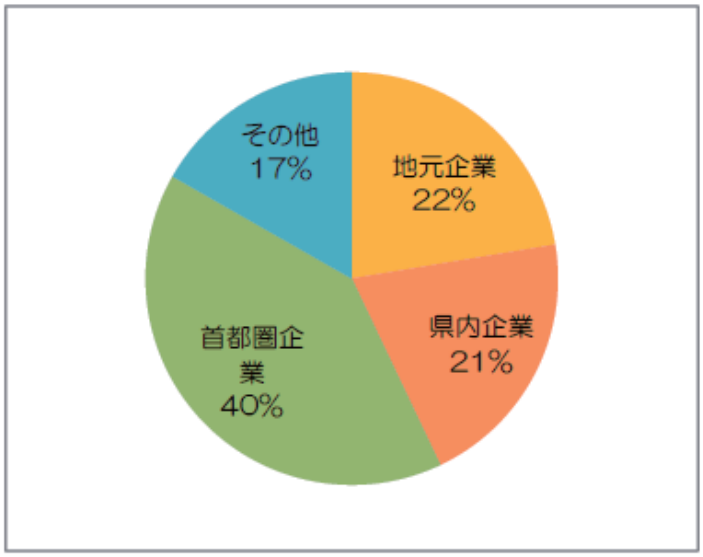
Changes in Renewable Energy Capacity in Japan



出典:総合資源エネルギー調査会 省エネルギー・新エネルギー分科会 新エネルギー小委員会
2014年6月17日　資料より

PV installation rates of core agents

【図３】太陽光発電の設置主体（面積ベース）



Installation by local businesses is **22%**

- Local business
- Prefecture of Companies
- Metropolitan Area of Companies
- Others

出典：農水省「今後の農山漁村における再生可能エネルギー導入のあり方に関する検討会報告書」

How renewable energy should be utilized

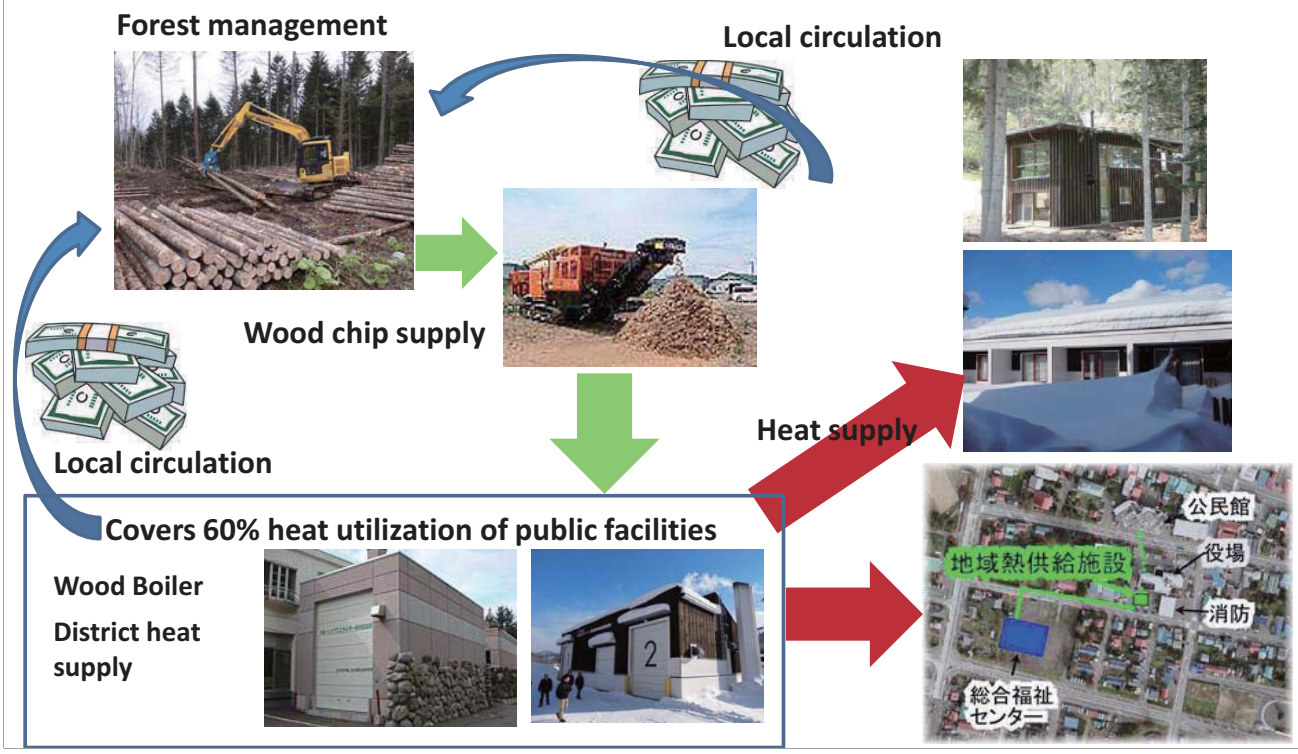
- **Renewable energy is a regional resource**
- **Taking advantage of renewable energy can lead to regional development**
- **Contributing to sustainable development of local communities, such as energy self-sufficiency and activation of regional economy, can be expected**

→Utilization of renewable energy by citizens and local entities will lead to regional development

Case of Shimokawa-cho in Hokkaido

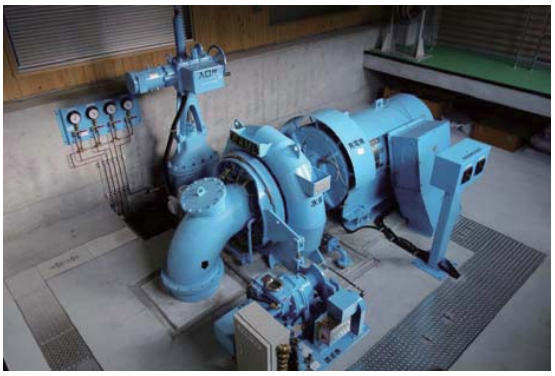
- Current population 3,500. During peak, over 15,500 population.
- Minus 20 degrees in winter
  - 90% of the land is covered in forest.
  - Shimokawa Town is focusing on sustainable forest management (FSC, Woody Biomass utilization).
  - More than 60% of heating in public facilities use wood fuel
  - Fuel equivalent of 16 million yen was used for supporting child care

Employment creation through energy self-sufficiency



Case of Nishiawakura village in Okayama prefecture

- Current population 1500
- 95% of the land is covered in forest.
- In which more than 84% are the artificial forests of cedar and cypress.
- Activities for Energy self-sufficiency
  - Replacing the small hydropower plant(290kW).
  - Heat supply by utilizing wood. Firewood boiler
  - Citizens' Co-owned Renewable Energy Power Plants



290kW Hydropower

Raw material of firewood boiler

Case of Obama Onsen Energy in Nagasaki

- with the 30 hot springs throughout the town producing over 15,000 tons of water per day that can reach temperatures as high as 105℃.
- 100 million tourists visit during peak time but has decreased to 400,000 people.
- Years 2002～2005: as a result of the opposition from members of hot spring district, plans to install hot spring power generation by the town was cancelled
- Discussion among counterparts resumed thanks to the assistance of Nagasaki University
- Launched the Obama Onsen Energy in 2011 by Nagasaki University and members of Obama hot spring districts
- Obama geothermal power plant was completed in 2013.

Benefits of energy independence of the region

Circulation of regional money	• Fuel costs which has been flowing to overseas remain local • Regional money circulates to not only resource suppliers and energy producers but also to maintenance agency and local banks
Job creation	• RE projects and energy efficiency projects produce a variety of jobs in the region. • More than 6.5 million people worldwide was employed to renewable energy-related jobs
Gather people and companies	• Regional image is important for companies. • Working in a good environment relates to motivation • Population has been increasing in Shimokawa Town and Nishiawakura.

Japanese Municipalities are Passing Basic Ordinances to Promote Community-Led Renewable Energy Development

- Since the Great East Japan Earthquake in March 2011, local governments across Japan have been passing basic ordinances related to the promotion of renewable energy.
- The laws mainly cover building awareness on renewable energy and stimulating the growth of private businesses.
- It have been enacted in More than 20 local goverments. Ex) Konan, Shinshiro, Sumoto, Iida, Takarazuka, Odawara, Kyoto-prefecture

Konan's ordinance on the utilization of local renewable energy

- Konan's ordinance on the utilization of local renewable energy went into effect in September 2012. The city views renewable energy as a community-owned resource, and is the first municipality in Japan to adopt the concept of community control in the development of renewable energy resources.
- The concept's aim is to facilitate self-directed efforts in development.
- Since Konan's ordinance was passed, the number of local governments that have established similar ordinances has been increasing.

出典：湖南市ホームページより

Ordinance for renewables-based sustainable development in Iida

- Iida, which passed its own ordinance for renewables-based sustainable development in April 2013, became the first city in Japan to create "community environmental rights".
  - These rights entitle its citizens to preferentially utilize energy generated from renewable sources as a collective property for building the community.
  - The city is creating a mechanism to support such activities as part of a joint initiative between the public and private sectors.
  - Through this mechanism, the city will provide support to various citizen-led entities engaged in developing the community through renewable energy use.

出典：飯田市ホームページより作成

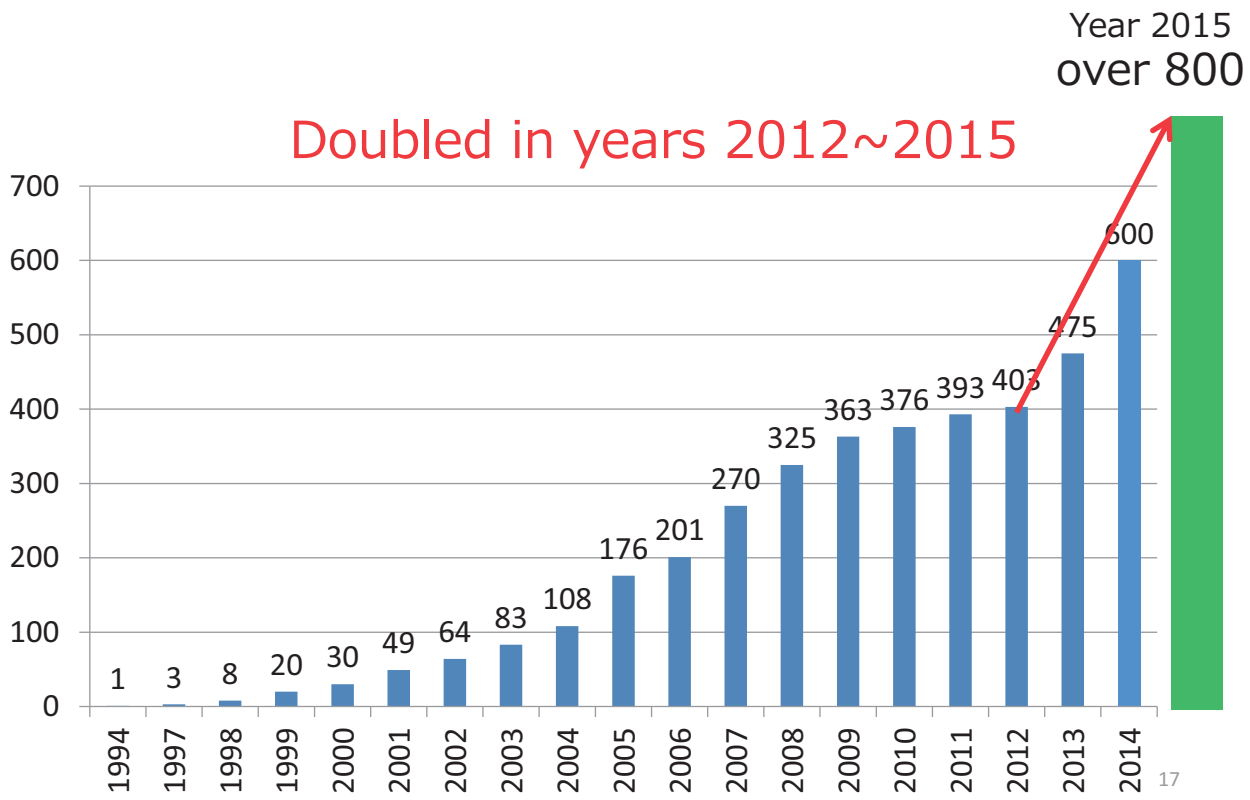
What is Citizens' Co-owned Renewable Energy Power Plants ?

- **Citizens' Co-owned Renewable Energy Power Plants are community-based and installed cooperatively, and a desirable measure to promote renewable energy.**
  - **It occupies a certain percentage of funds from citizens and local.**
  - **Citizens and local people are involved in the decision-making process**
  - **Profit is returned to citizens and community in some way**
  - **Have vision and prospects**

15

Scheme of Co-owned Renewable Energy Power Plants

Trends of Co-owned Renewable Energy Power Plants



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Trends of Co-owned Renewable Energy Power Plants

- **Capacity expansion of PV systems**
  - Increased to over several hundred kW and MW plants.
  - Also greatly reduced kW unit cost by expanding
- **Take advantage of the bank loan**
  - In recent years there has been an increase for companies to get a loan from the bank.
  - Regional banks and credit unions, such as by policy Finance Corporation, ABL (Asset-Based Lending) is expanding.

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Trends of Co-owned Renewable Energy Power Plants

- **Establish partnership with local governments**
  - Japanese Municipalities are Passing Basic Ordinances to Promote Community-Led Renewable Energy Development
  - For example, in Kyoto-city, Izumiotsu and Takarazuka has supported policies of community power projects.
- **Advance coordination with co-op**
  - Renewable energy business by co-op is expanding but there has also been business collaborations between NPO and co-op
  - In the Kansai region, there has been several CREPP established borrowing the roof of co-op
  - In recent years, the energy business of co-op towards the liberalization of the electric power is accelerating.

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Cooperation between Fukushima farmers and NPO Fukushima Ryozen Co-owned Solar Power Plant

- **Farmers suffered a great damage as a result of nuclear power plant accident in Fukushima**
- **Creating a renewable energy power plant to support Fukushima farmers.**
  - 20 million yen was collected from citizens.
  - 2% of revenue devoted to Fukushima reconstruction fund.

Installing a solar power of 50kW in Fukushima in September 2013.

20

Izumiotsu Shiomi Co-owned Solar Power Plant

- Osaka prefecture's first co-owned power plant in collobration with the government.
- rent the land for free from Izumiotsu.
- Recruitment through the TV trust of 19.2 million yen.
- 100,000Yen/Share、Annual interest 1.2%
- Installing a solar power of 50kW in May 2015.

Community Happy Solar

produced by The Tokushima Regional Energy

- Funding though donations and bank loans.
- Sending crops as appreciation to donors.
- Use of electricity sales revenues is decide in the region.

22

Framework for 100% renewable energy

- **Make concept for regional energy vision**
  - To analyze the current situation, set up the short-and long-term goals, the strategy.
  - Important to involve stakeholders in the region
- **Become renewable energy producers**
  - Local governments and citizens to produce energy.
  - become investors and shareholders, the small investment to fund for renewable energy promotion.
  - We were able to select a power company from April 2016 in Japan.
- **Encourage the environment, society and economy at the same time**
  - Activation of the region is contributing to work on self-reliance

Contact Us

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TEL. +81-75-254-1011

FAX. +81-75-254-1012

E-mail. toyota@kikonet.org

URL. http://www.kikonet.org/

Keynote address

Renewable Energy and Regeneration of Regional Communities Comparison of Citizens' Consciousness in Japan and Korea

Professor Nobuo SHIRAI (Hosei University)

Renewable Energy and Regeneration of Regional Communities : Comparison of Citizens' Consciousness in Japan and Korea

NOBUO Shirai
HOSEI UNIVERSITY
INSTITUTE OF SUSTAINABILTY
PROFESSOR
Ph.D.

TABLE OF CONTENTS

2

1. Background and Purpose of the Research

(1) Situational changes concerning Renewable Energy (RE)

- Large capital make large RE stations in local areas due to FIT
- Conflict and divisions between regional subjects and RE stations
- New possibilities through full liberalization of retail electricity sales

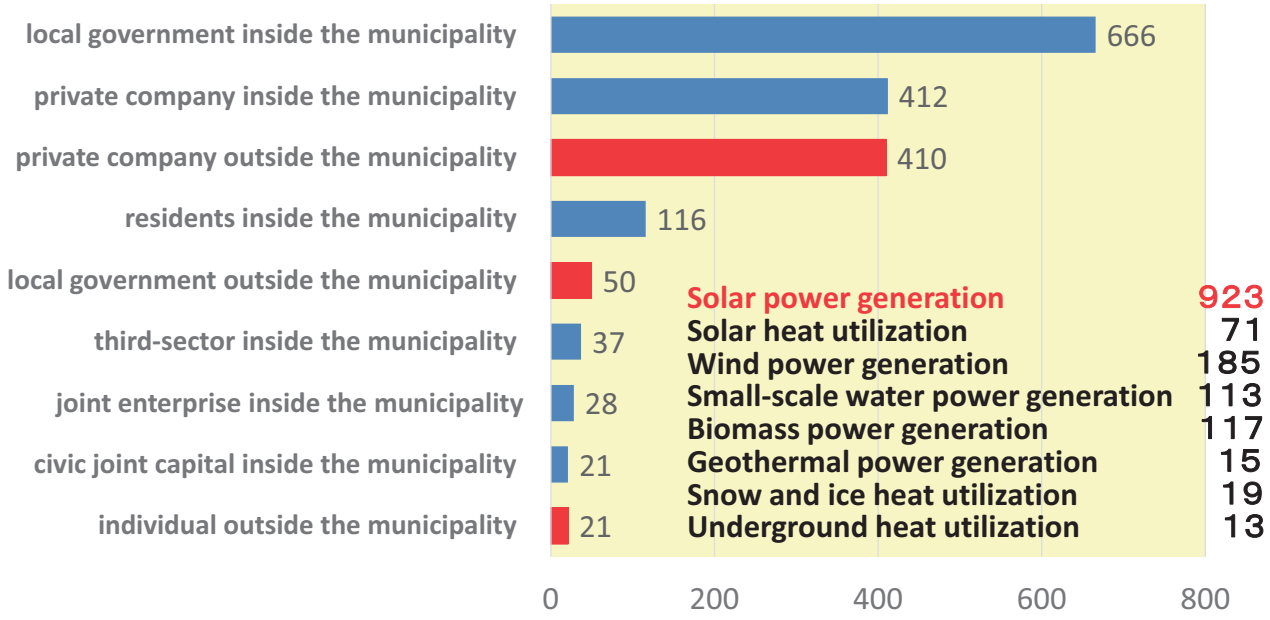
(2) Necessity of goal setting by regional subjects

- What are the goals of making RE stations for regional subjects?
- What measures are necessary to achieve the goals?

(3) Necessity of research that contributes to regional decision-making

- Theoretical framework for structural regeneration of regional communities, and tools to check the status of sought goals with respect to structural regeneration
- Understanding the Citizens' Consciousness and Reflection in the measures

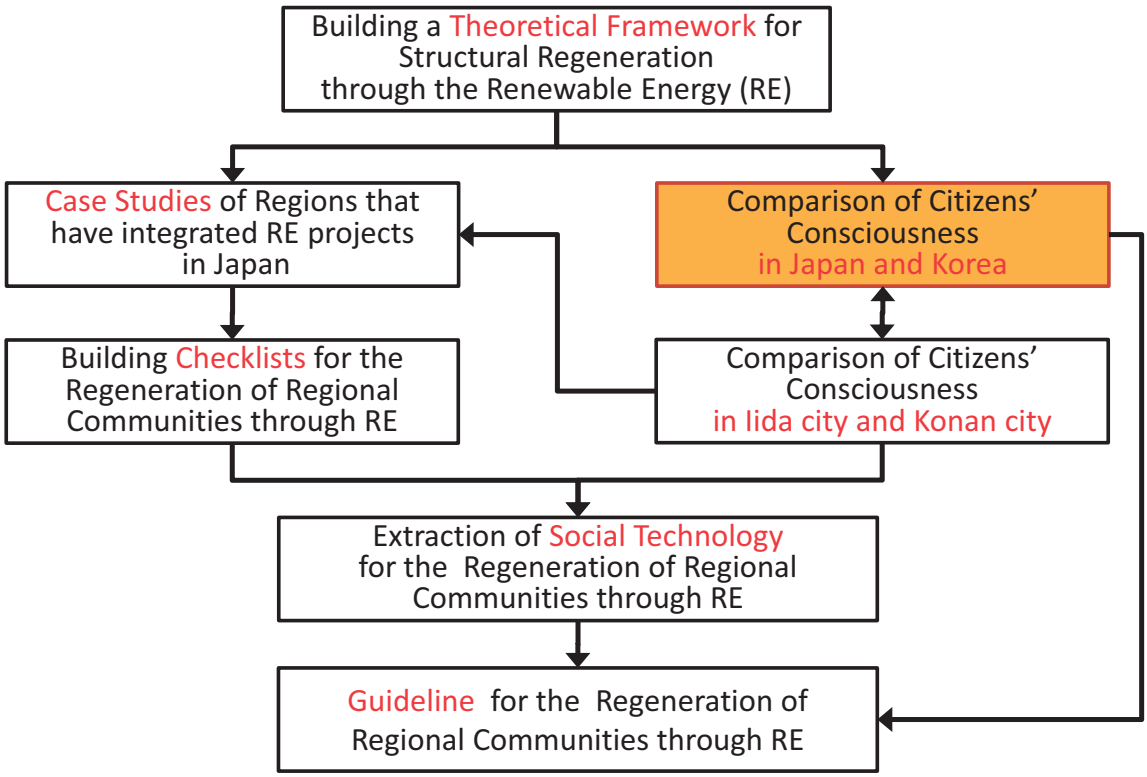
Providers of RE stations in regional areas



Note: The survey was conducted from May through July 2014.
1,371 people responded for a response rate of 78.8%.

Source: K. Fujii and H. Yamashita, A Study on the Actual Conditions of Renewable Energy Use in Japanese Municipalities, Hitotsubashi Economics Vol. 8 No. 1, January 2015

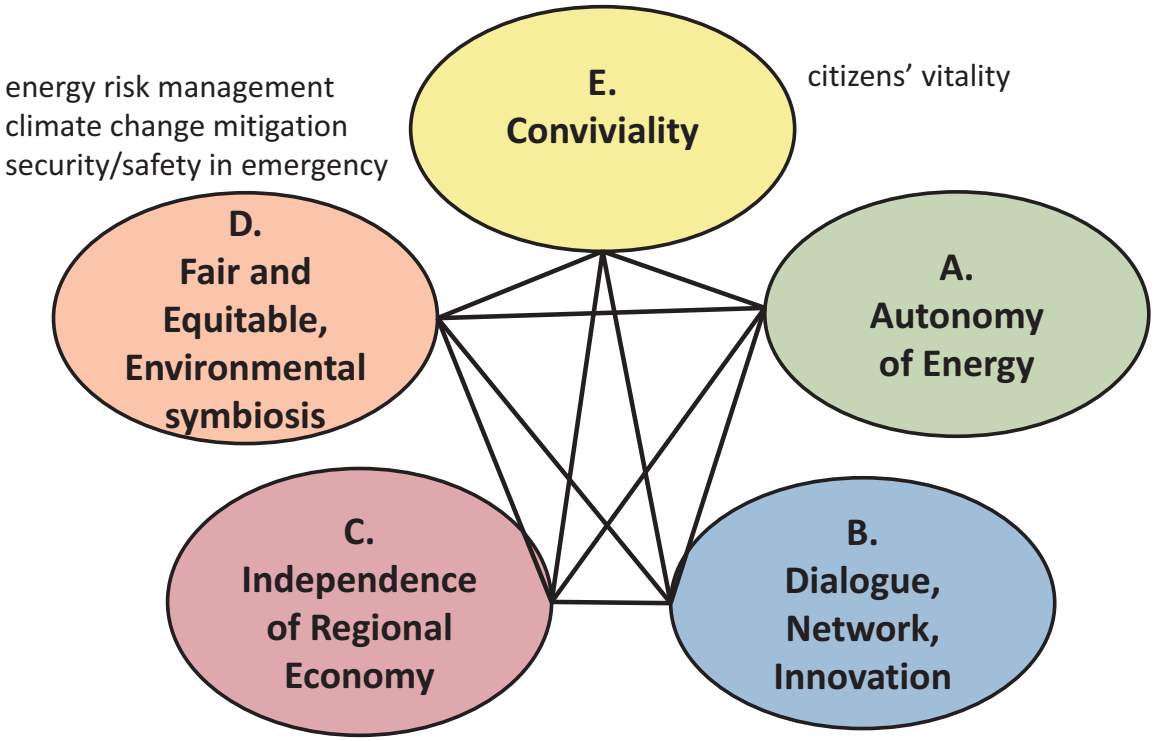
2. Perspective of the Research



5

Building a Theoretical Framework for Structural Regeneration

What are the goals of creating RE stations for regional subjects?



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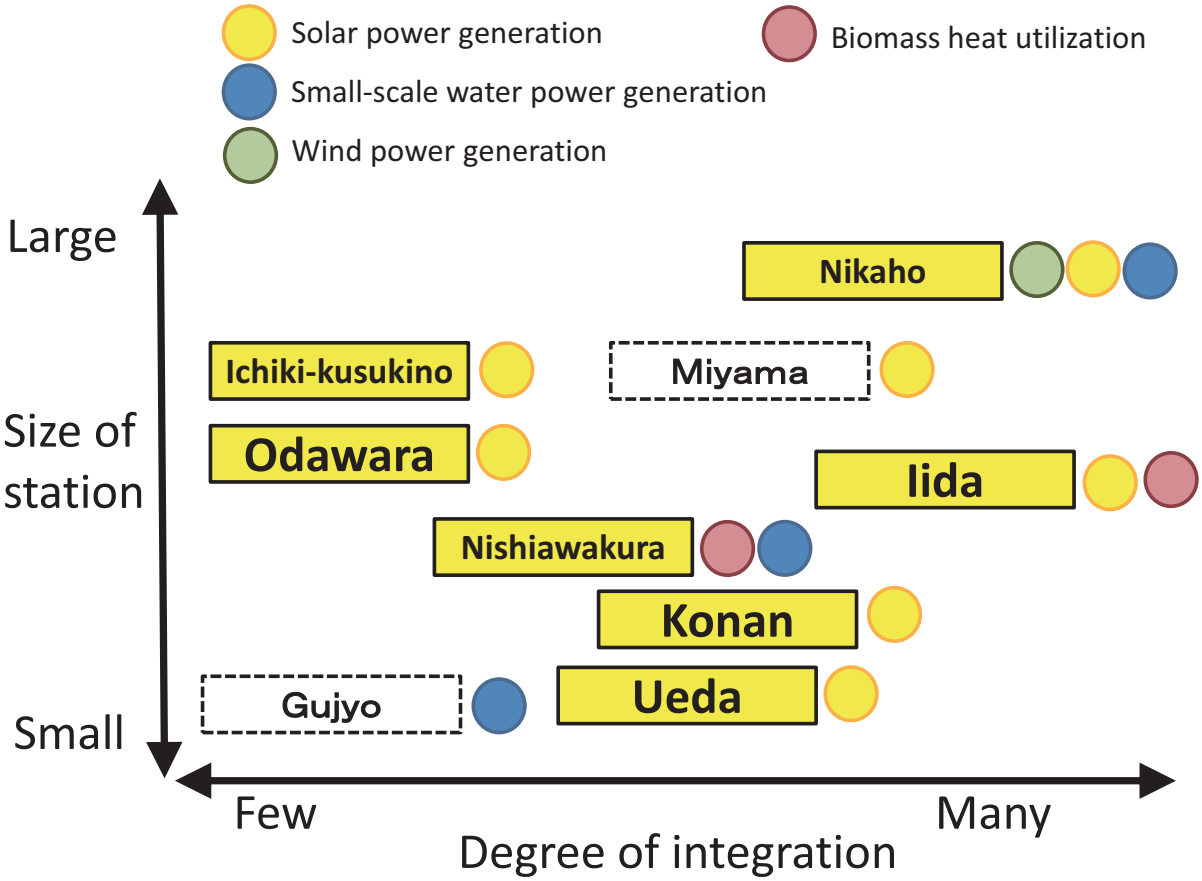
Typification of regions in creating renewable energy stations



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3. Purpose of this presentation

（1） Understanding the citizens' consciousness of the expectation to regeneration of regional communities through renewable energy

- Clarify the features of Japanese and Korean consciousness by the Comparison
- Especially, the comparison of the Answers by gender and age
- Analyze the factors of the expectation to regeneration of regional communities through renewable energy : risk perception for climate change / energy /natural hazard, evaluation of residential area, ideas for environmental problems

（2） Consideration toward regeneration of regional community through renewable energy by Citizens' Consciousness

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4. Methods of the survey on Citizens' Consciousness in Japan and Korea

Questionnaire survey outline (Main survey)

	Japan survey	Korean survey
Samples	Website monitors 3,640 persons Between 20's and 60's Stratified random sampling: 7 areas × 2 gender × 5 age	Web monitors 1,404 persons Between 20's and 60's Stratified random sampling 3 areas × 2 gender × 5 age
Percent of responses	A. Numbers of e-mail sent: 104,655 B. Numbers of responses: 15,921 C. Response rate (B/A) : 15.2%	A. Numbers of e-mail sent: 6,430 B. Numbers of responses: 1,701 C. Response rate (B/A) : 26.5%
Survey period	January, 2016	
Method of survey	Web-based questionnaire survey We used the service of the Japanese research company, which is able to conduct the survey at the same time in Japan and Korea.	

Note: The sample on Korean is not include the residents in rural area.

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But,

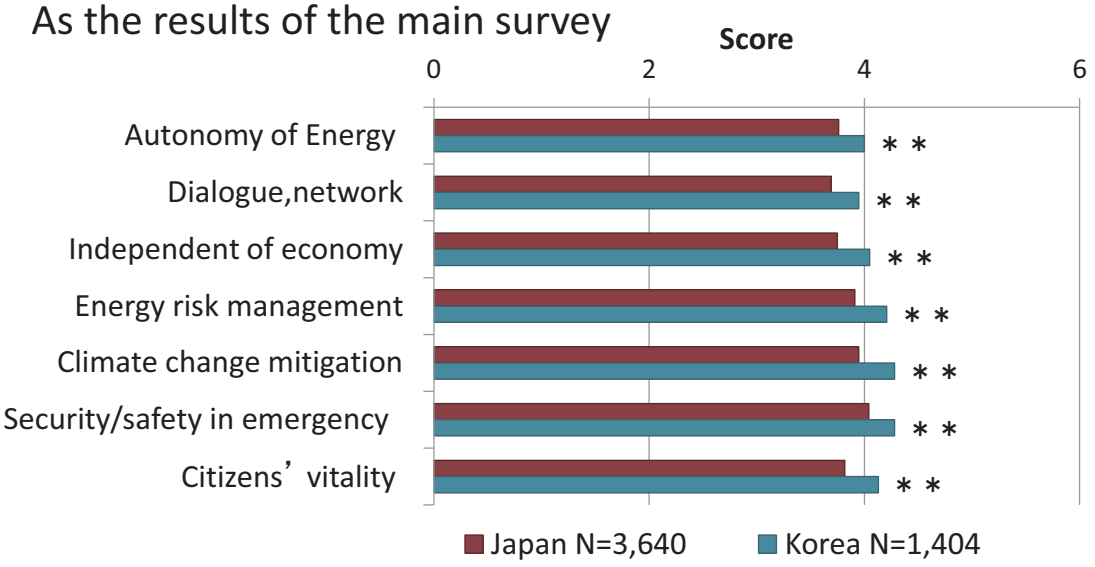
- In the main survey, I used the ordinal scale. As the results, it was clear that Japanese peoples selected the medium choice , and Korean peoples selected the positive choice.
- Because of this, I conducted the additional survey about the part of the question of the main survey, to get the comparable answer.

Questionnaire survey outline (Additional survey)

	Japan survey	Korean survey
Samples	Website monitors 520 persons Between 20's and 60's Stratified random sampling: 2(gender) × 5(age) Only residents in Tokyo's 23 wards	Website monitors 520 persons Between 20's and 60's stratified random sampling 2 (gender) × 5(age) Only residents in Seoul special city
Survey period	April, 2016	

5. The Expectation to Regeneration of Regional Communities through Renewable Energy

As the results of the main survey



Note: The results of t-test, the asterisks *, ** indicate that the coefficients are statistically different from zero at the 5, and 1 percent level, respectively.

Korean peoples selected the positive choice.

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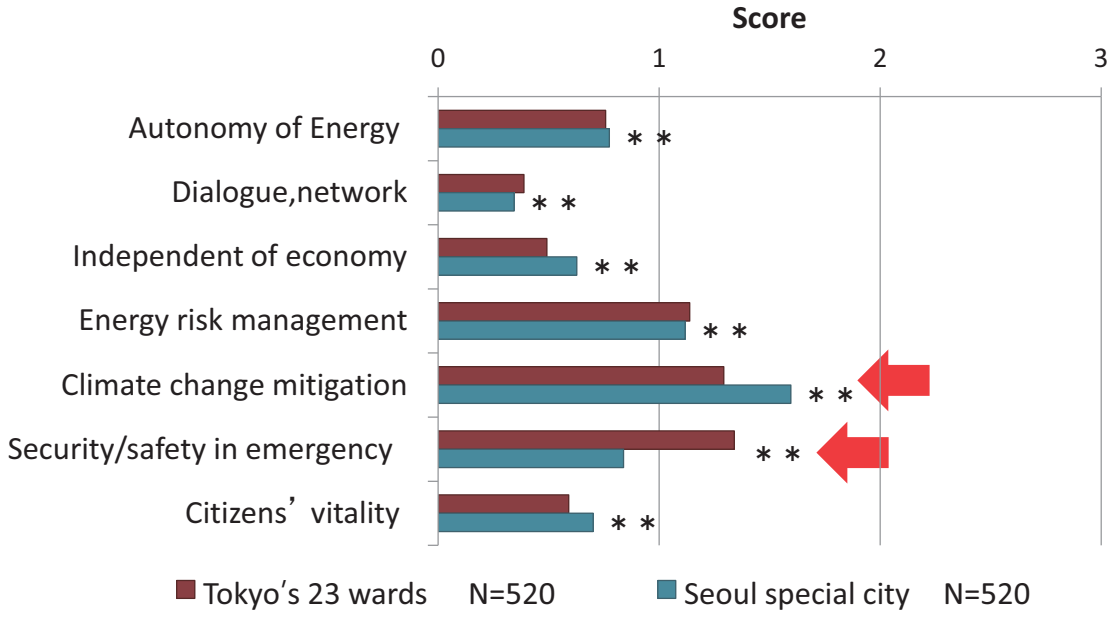
As the results of the additional survey

Select the three high-priority



Note: The results of t-test, the asterisks *, ** indicate that the coefficients are statistically different from zero at the 5, and 1 percent level, respectively.

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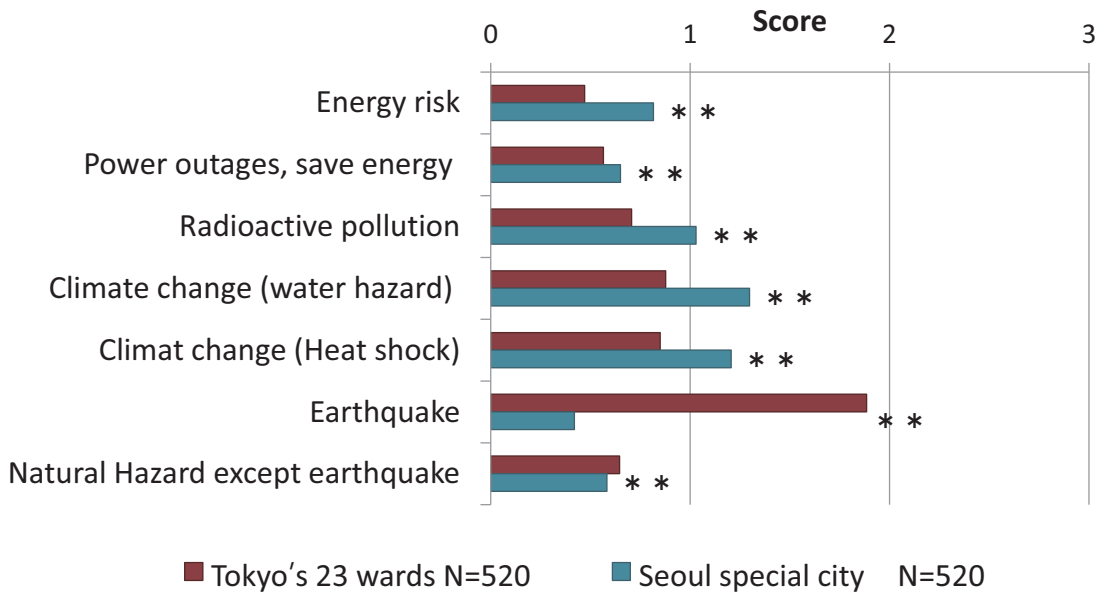
As the results of the additional survey

Risk recognition : Select the three high-priority



Note: The results of t-test, the asterisks *, ** indicate that the coefficients are statistically different from zero at the 5, and 1 percent level, respectively.

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6. The comparison of the Answers by Gender and Age

Japan

		N	Autonomy of energy	Dailog, network	Independent of economy	Energy risk management	Climate change mitigation	Security/ safety in emergency	Citizen's vitality
All		3640	3.76	3.69	3.75	3.91	3.95	4.04	3.82
M	20's	364	3.76	3.70	3.76	3.86	3.84 (*)	3.97	3.67 (**)
	30's	364	3.63 (*)	3.50 (**)	3.56 (**)	3.70 (**)	3.60 (**)	3.76 (**)	3.55 (**)
	40's	364	3.64 (*)	3.55 (**)	3.60 (**)	3.78 (*)	3.78 (**)	3.88 (**)	3.64 (**)
	50's	364	3.74	3.66	3.71	3.85	3.91	3.91 (*)	3.78
	60's	364	3.67	3.66	3.67	3.87	3.97	4.02	3.79
F	20's	364	3.86 *	3.82 *	3.83	4.02 *	4.10 **	4.17 *	3.97 **
	30's	364	3.78	3.72	3.83	3.98	4.02	4.10	3.90
	40's	364	3.79	3.74	3.81	3.96	3.99	4.13	3.89
	50's	364	3.84	3.77	3.82	4.03	4.07 *	4.18 *	3.96 **
	60's	364	3.87 *	3.81 *	3.90 **	4.06 **	4.20 **	4.29 **	4.03 **

Korea

		N	Autonomy of energy	Dailog, network	Independent of economy	Energy risk management	Climate change mitigation	Security/ safety in emergency	Citizen's vitality
All		1404	4.00	3.95	4.05	4.21	4.28	4.28	4.13
M	20's	156	4.06	4.03	4.00	4.17	4.09 (*)	4.15	4.15
	30's	156	4.04	3.96	4.09	4.08	4.10 (*)	4.14	3.90 (**)
	40's	156	3.96	3.81	3.87 (**)	4.06	4.16	4.15	3.96 (**)
	50's	156	4.17 *	4.22 **	4.21 *	4.36	4.48 *	4.43	4.40 **
	60's	93	3.89	3.85	3.99	4.16	4.30	4.28	4.15
F	20's	156	3.85	3.74 (**)	3.97	4.19	4.34	4.29	4.16
	30's	156	3.97	3.96	4.06	4.28	4.35	4.35	4.16
	40's	156	3.96	3.92	4.13	4.31	4.31	4.31	4.18
	50's	156	4.04	4.04	4.12	4.23	4.40	4.40	4.25
	60's	63	3.97	3.86	4.05	4.24	4.30	4.35	4.22

Note: The results of t-test, the asterisks *, ** indicate that the coefficients are statistically different from zero at the 5, and 1 percent level, respectively.

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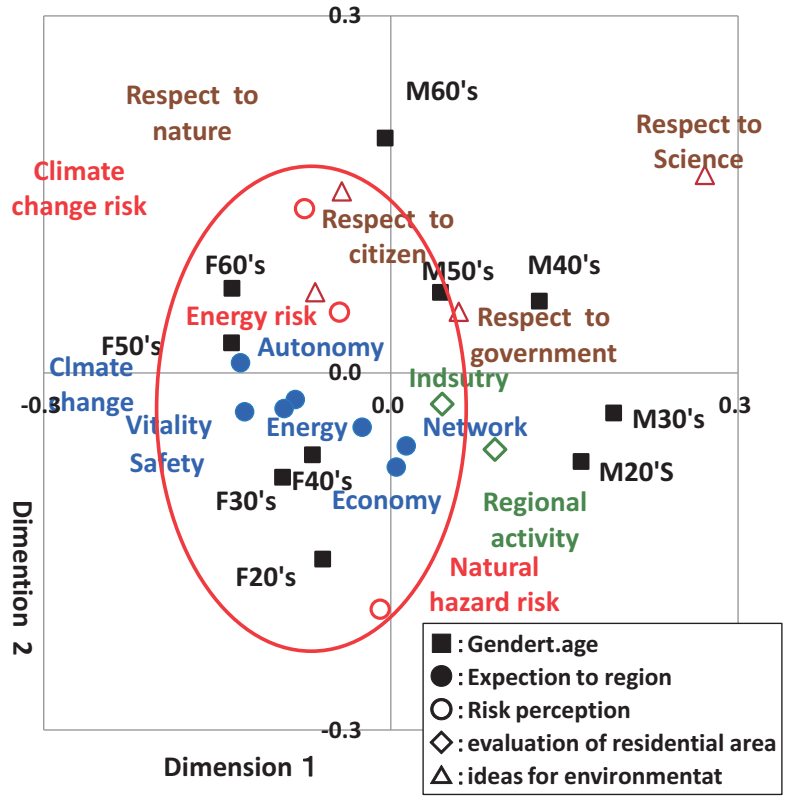
7. The Factors of the Expectation to Regeneration of Regional Communites



Corresponding analysis
Japan
N=3,640

	contribution ratio
Dimension 1	0.452
Dimension 2	0.296

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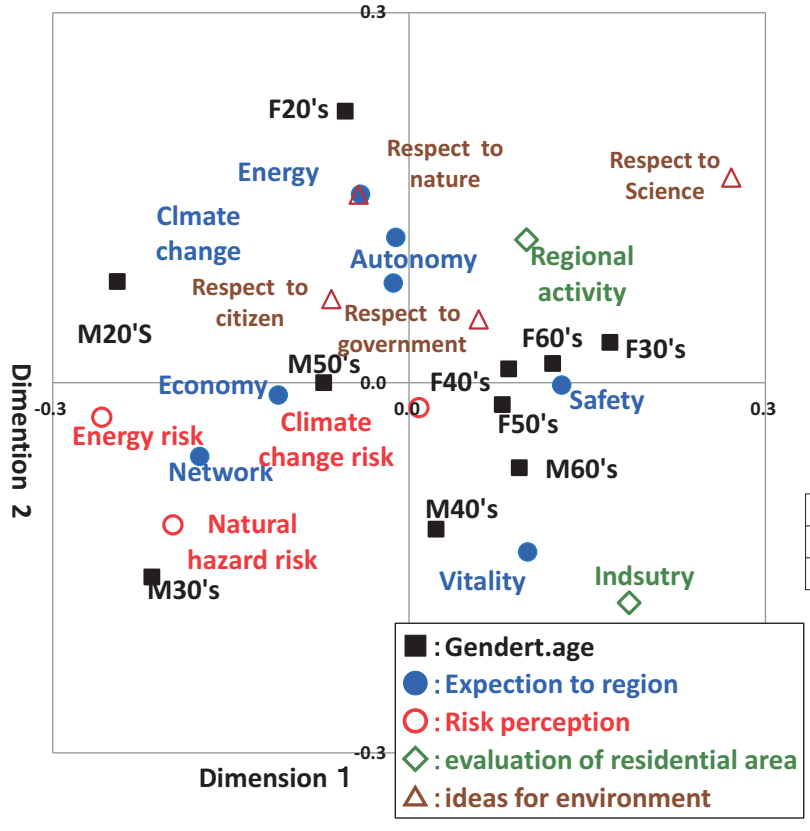

Corresponding analysis
Korea
N= 1,404

	contribution ratio
Dimension 1	0.621
Dimension 2	0.174

Multiple regression analysis
objective variables : The Expectation to Regeneration

Japan N=3640

		Autonomy of energy	Dailog, network	Independent of economy	Energy risk management	Climate change mitigation	Security/ safety in emergency	Citizen's vitality
adjusted R-square		.367	.380	.380	.371	.402	.382	.409
Risk perception	Natural hazard risk	.035 *	.025	.061 **	.078 **	.039	.076 **	.025
	Energy risk	.112 **	.113 **	.083 **	.114 **	.105 **	.115 **	.119 **
	Climate change risk	.126 **	.128 **	.124 **	.083 **	.137 **	.073 **	.107 **
Evaluation of residential area	Regional activity	.160 **	.149 **	.129 **	.102 **	.112 **	.090 **	.142 **
	Agriculture, forestry	.082	.067 **	.052 **	−.022	−.038 (*)	−.053 **	.034
	Industry	.034	.073 **	.081 **	.084 **	.095 **	.096 **	.052 *
Ideas for environmentat	Respect to science	.020	−.027	−.026	.036 *	−.001	.054 **	−.059 (**)
	Respect to nature	.159 **	.157 **	.107 **	.081 **	.108 **	.086 **	.179 **
	Respect to government	.099 **	.127 **	.129 **	.104 **	.104 **	.094 **	.156 **
	Respect to citizen	.083 **	.099 **	.170 **	.210 **	.230 **	.230 **	.158 **

Korea N=1404

		Autonomy of energy	Dailog, network	Independent of economy	Energy risk management	Climate change mitigation	Security/ safety in emergency	Citizen's vitality
adjusted R-square		.212	.213	.214	.204	.238	.213	.193
Risk perception	Natural hazard risk	.048	.055	.085 **	.121 **	.075 *	.099 **	.055
	Energy risk	.110 **	.111 **	.102 **	.115 **	.120 **	.122 **	.124 **
	Climate change risk	.016	.003	.012	.008	.043	−.004	.012
Evaluation of residential area	Regional activity	.083 *	.078 *	.096 **	.036	.065	.087 *	.117 **
	Agriculture, forestry	.123 **	.103 **	.017	−.055	−.073 (*)	−.054	.019
	Industry	.130 **	.145 **	.152 **	.164 **	.140 **	.148 **	.129 **
Ideas for environmentat	Respect to science	.131 **	.103 **	.065 *	.113 **	.121 **	.100 **	.041
	Respect to nature	.025	.056	−.001	.003	.017	.016	.023
	Respect to government	.041	.058	.057 *	−.003	.009	−.043	.055
	Respect to citizen	.062	.056	.155 **	.166 **	.197 **	.202 *	.129 **

8. Consideration toward Regeneration of Regional Communities

① In Japan. risk management is the main expectation of regeneration of regional communities through renewable energy, especially by females.
Japanese peoples, especially females, have high recognition of natural hazard risk (earthquake).
In addition, the high respect to nature effects to the expectation through renewable energy.

② In Korea, females are not strong actor, male 50's have strong expectation to regeneration of regional community through renewable energy.
In addition, Korean peoples expect renewable energy in terms of development of industry and science technology.
It is unique point that the high respect to science effect to the expectation through renewable energy.

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③ In Japan, it is pausing that the big outer company build the mega-solar station in FIT era.
In the post-FIT era, the main issues are changing to regeneration of regional communities through renewable energy.

④ In Japan, as the results of this analysis, the main expectation of residents is risk management, so it is effective to emphasize the risk management by the renewable energy to gain the acceptability of residents.
In addition, woman's participation is necessary to increase the strength of regional activities for regeneration of regional communities.

⑤ On the other hand, energy autonomy and independent of economic are the important theme.
We must promote various public awareness of the purpose of renewable energy in regeneration of regional community.

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9. Summary and Future Issues

① The elements of regional revitalization through renewable energy were set as follows: autonomy of energy, networking, independence of the regional economy, energy risk management, climate change mitigation, citizens' vitality .

② The questionnaire surveys were conducted to compare citizens' consciousness of the expectation to regional revitalization through renewable in Japan and Korea.

③ The results showed that the primary expectation in Japan was energy risk management especially by females, and the respect toward the nature affected the high expectation.

④ The primary expectations in Korea were the development of regional economy and science technology.

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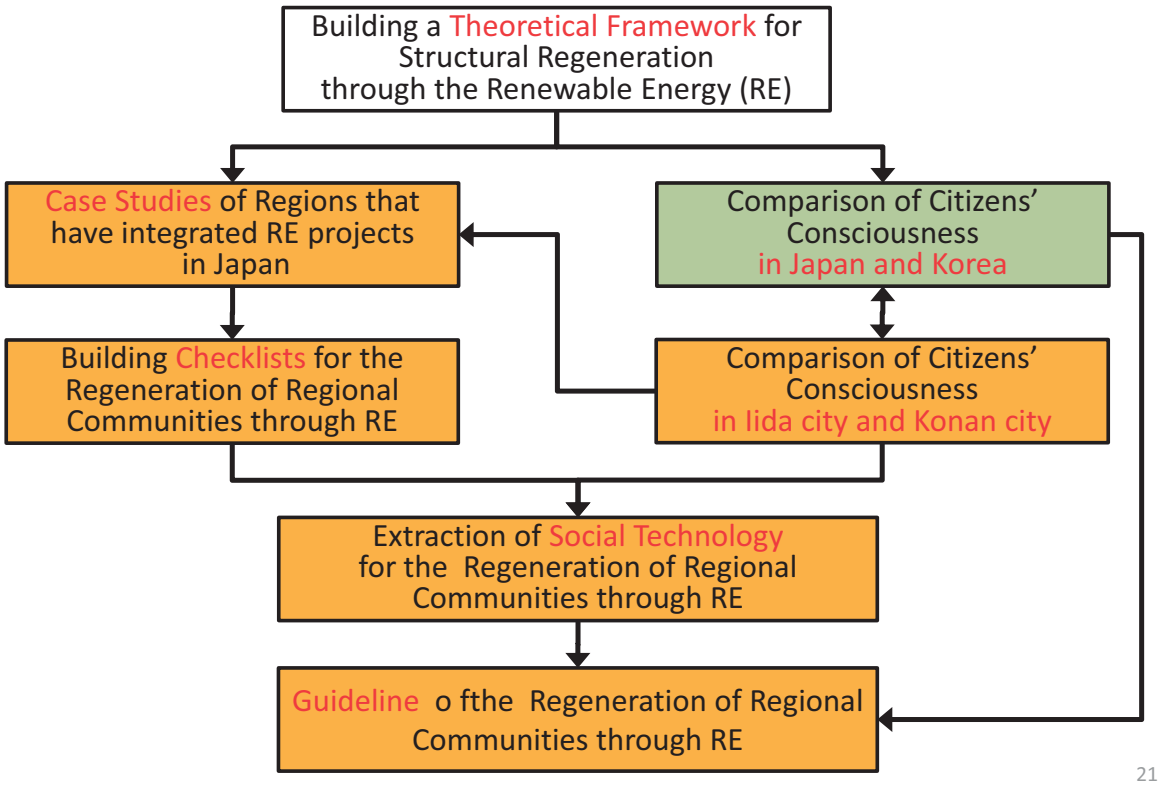
We continue this research plan.



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