JST's activity towards the realization of a dynamic and affluent low carbon society

IEA EGRD workshop

Island energy – status and perspectives

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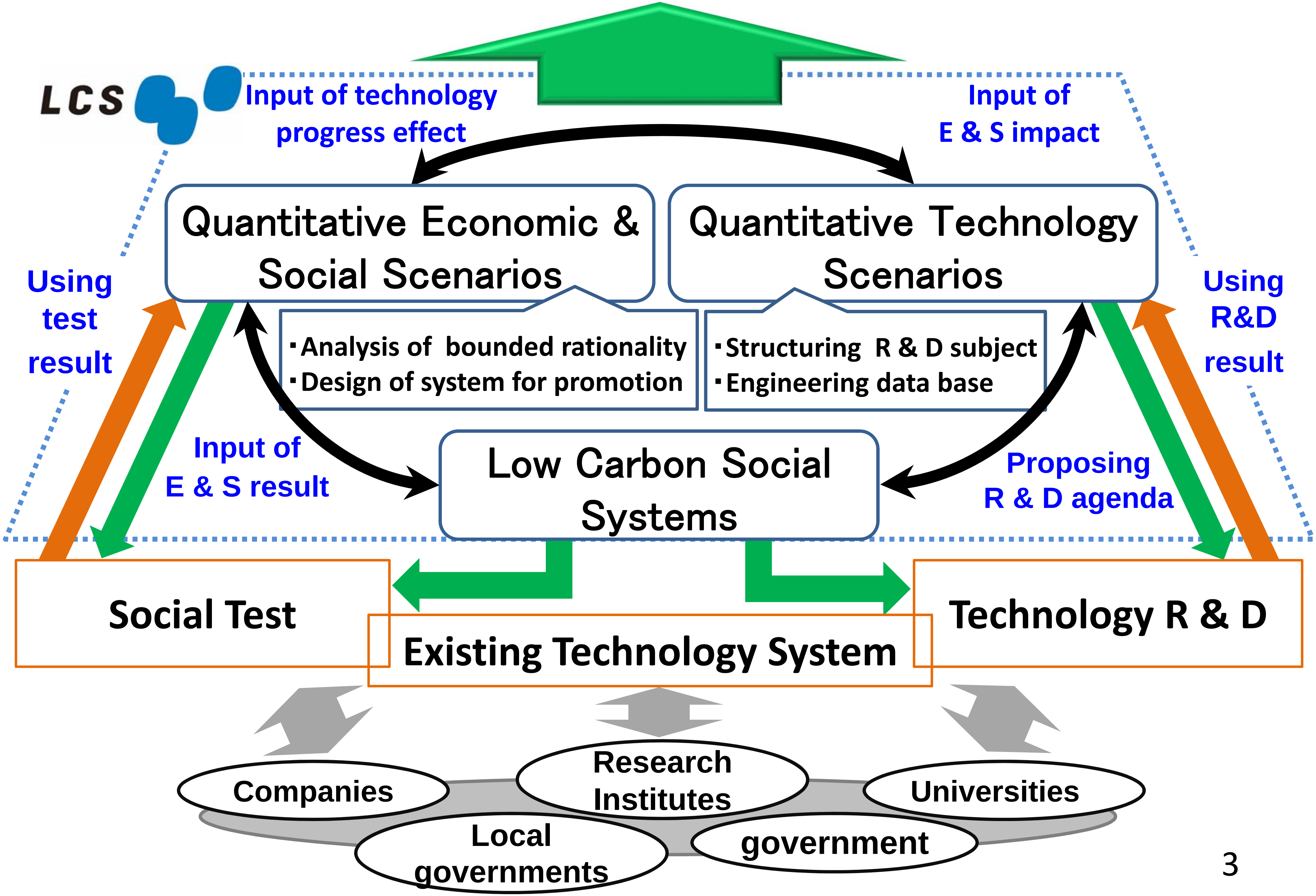
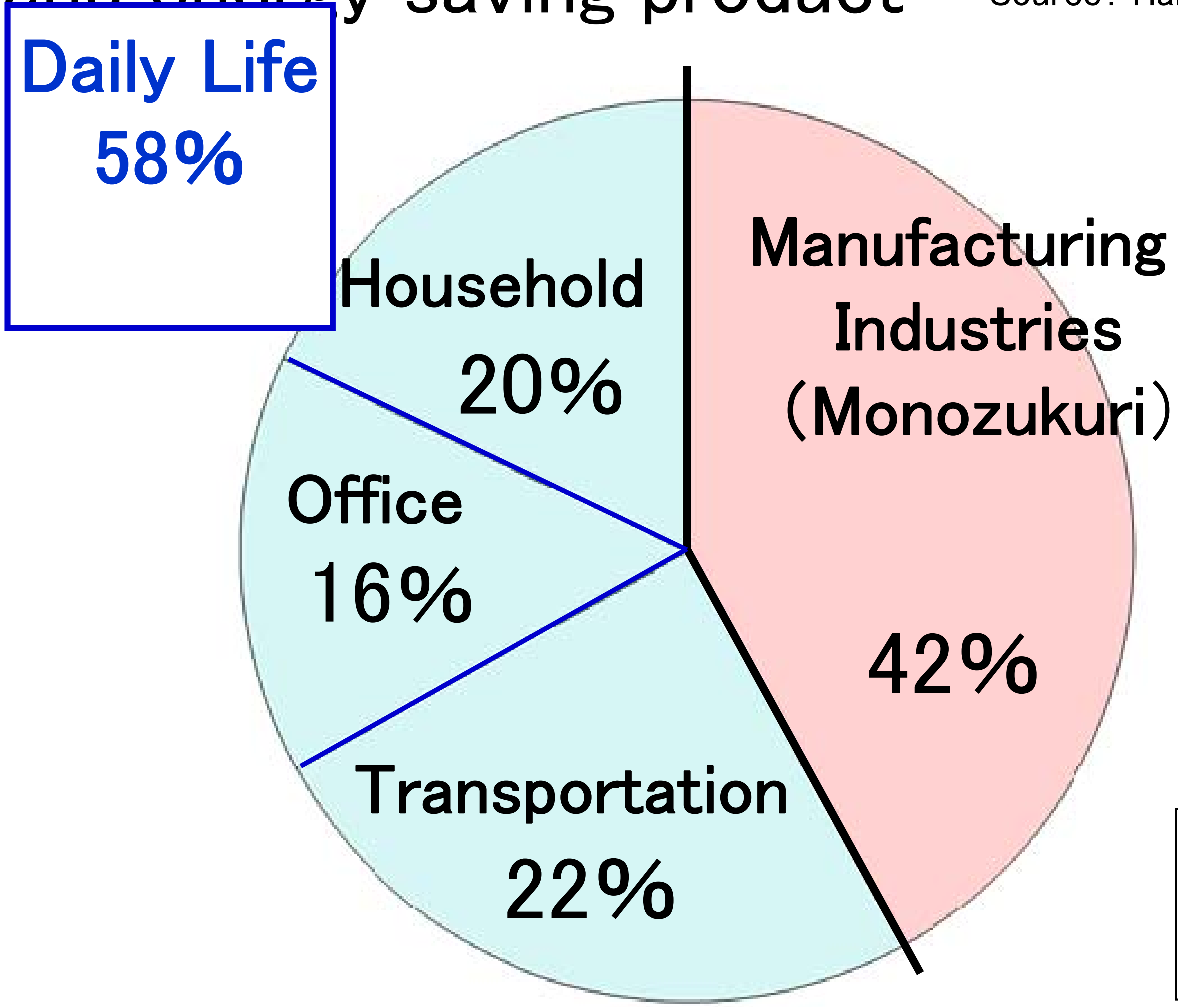
Towards affluent low carbon society



CO_2 Low Carbon Society led by CO_2 reduction in daily life and energy saving product

Source: Handbook of Energy & Economic Statics in Japan (2015)



Total CO_2 emissions 1.2Gton(2013FY, Japan)

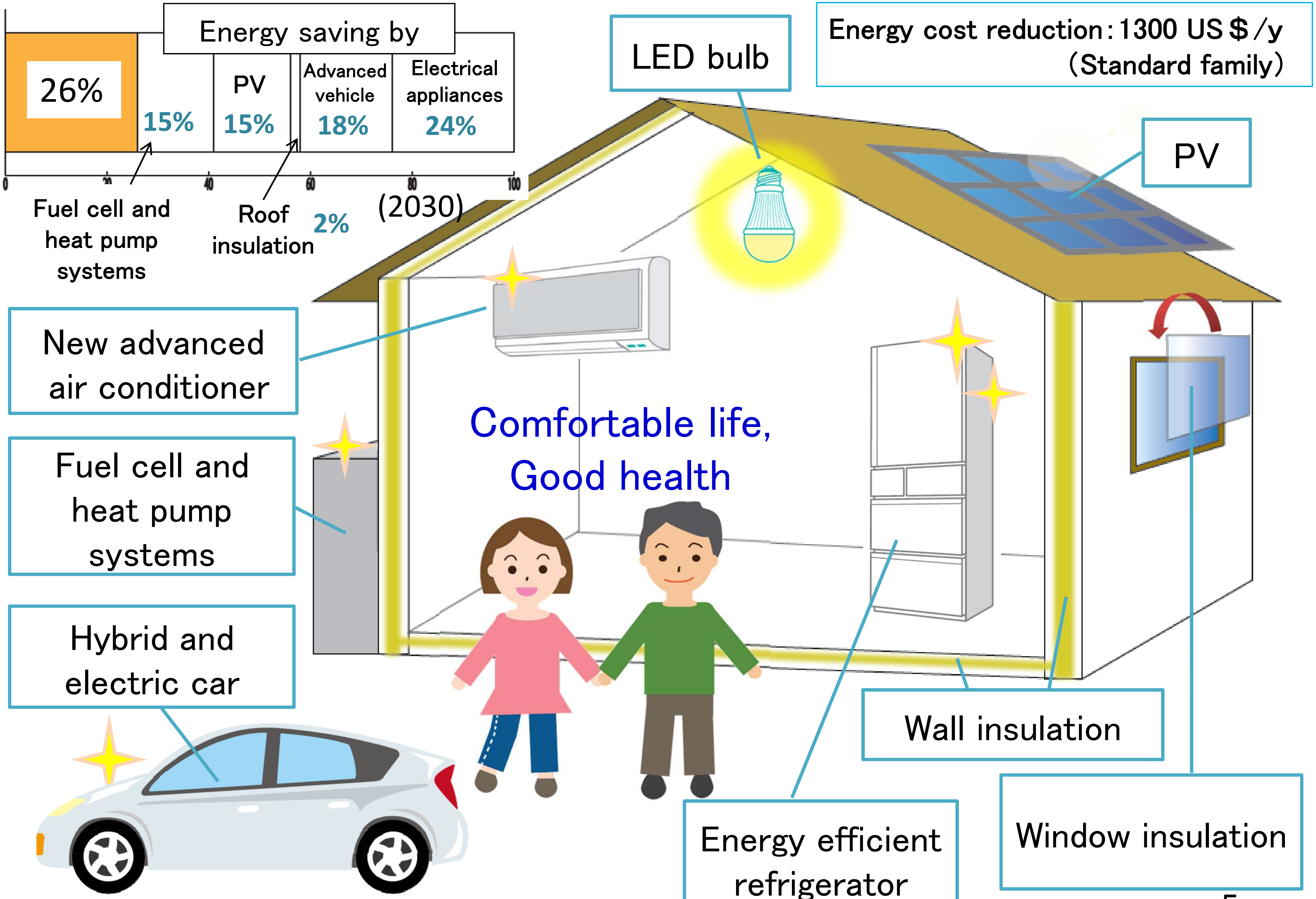
Producing energy has approached a theoretical value.

CO_2 emissions from electric power ; 53%

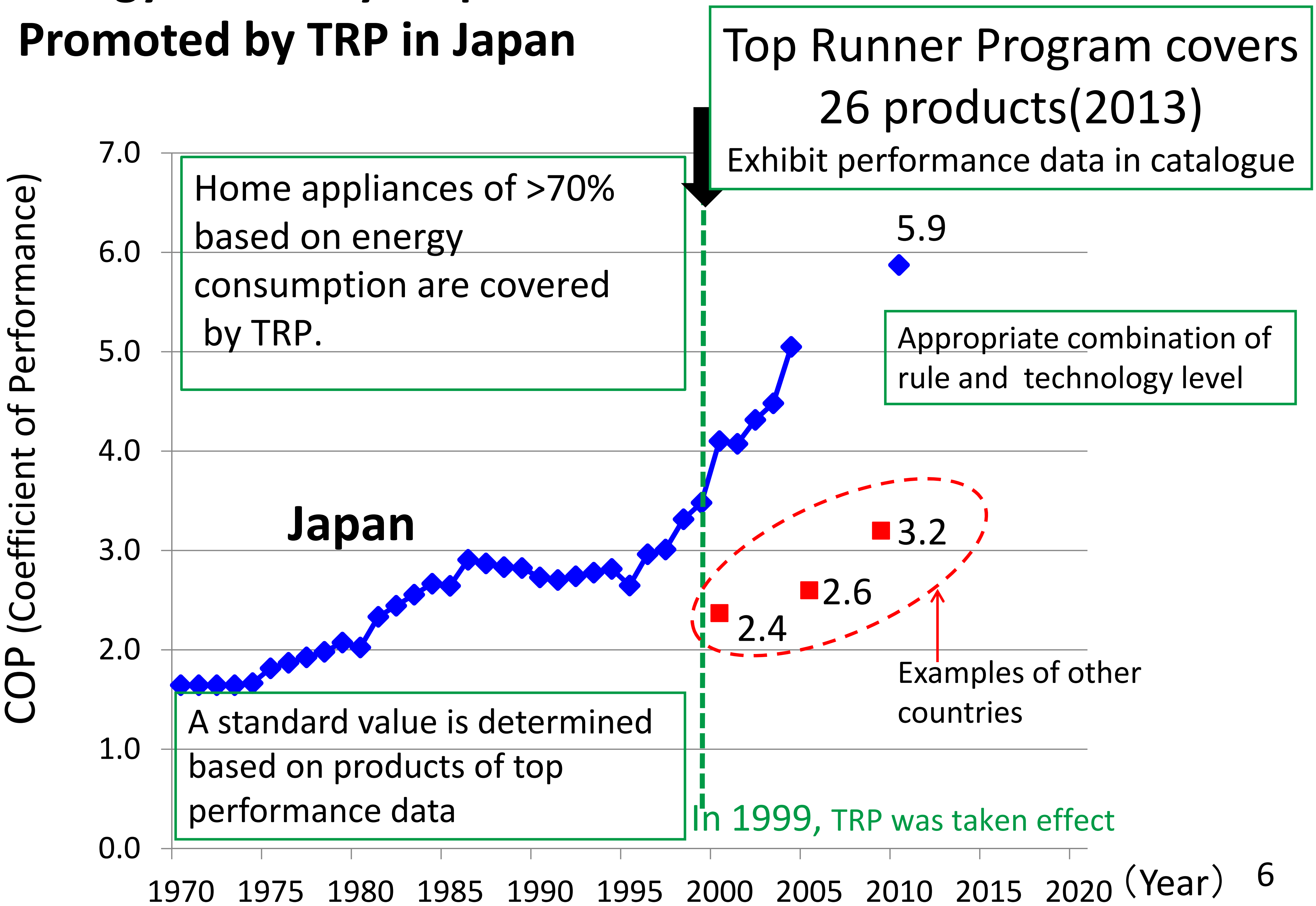
Affluent low carbon society towards 2050

1. High energy efficiency
2. Renewable energy increase
3. Resource recycling system

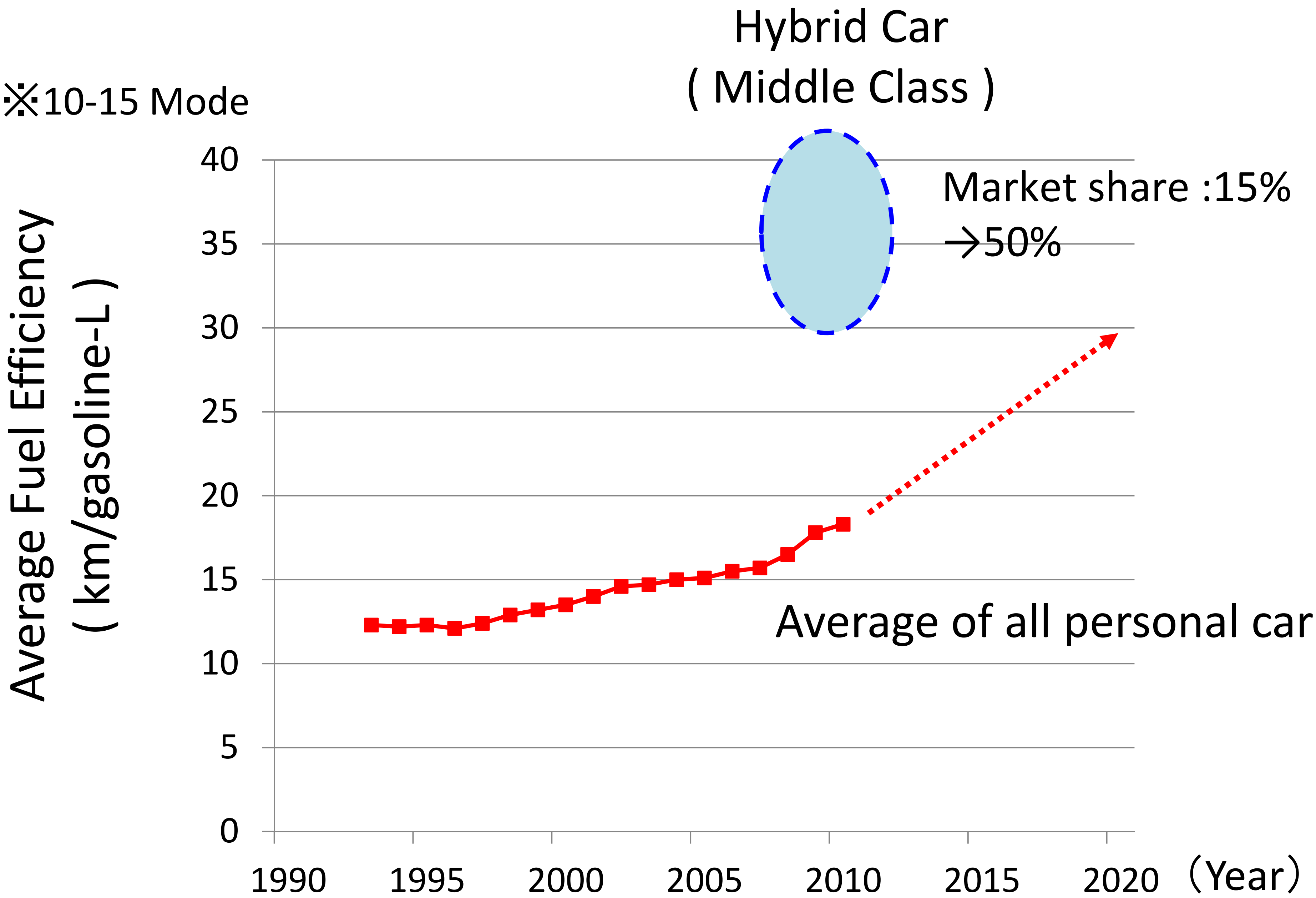
Energy consumption in daily life can be reduced by 75%

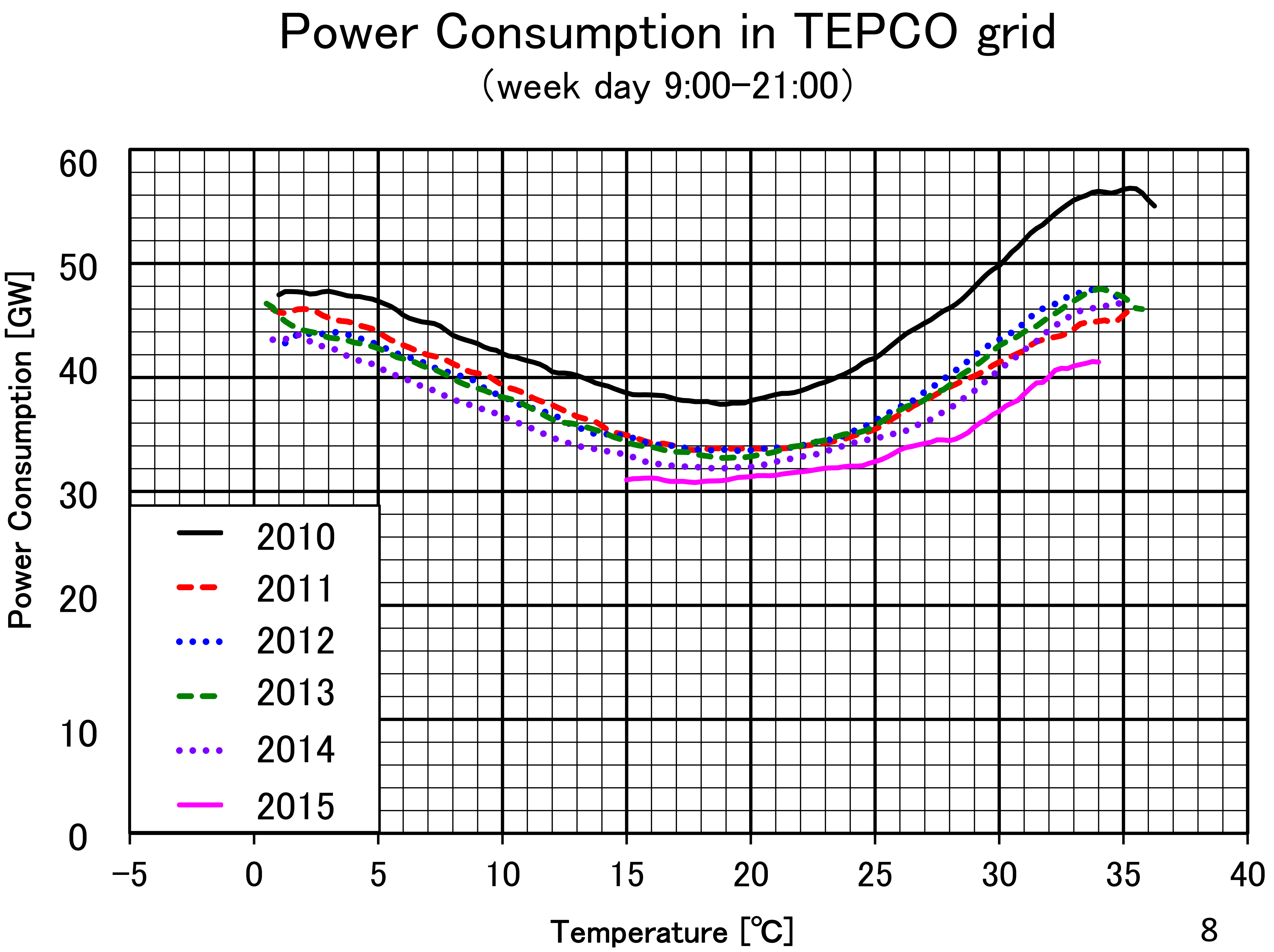


Energy efficiency Improvement of Home Air Conditioners Promoted by TRP in Japan



Energy Improvement of Vehicles (JAPAN)



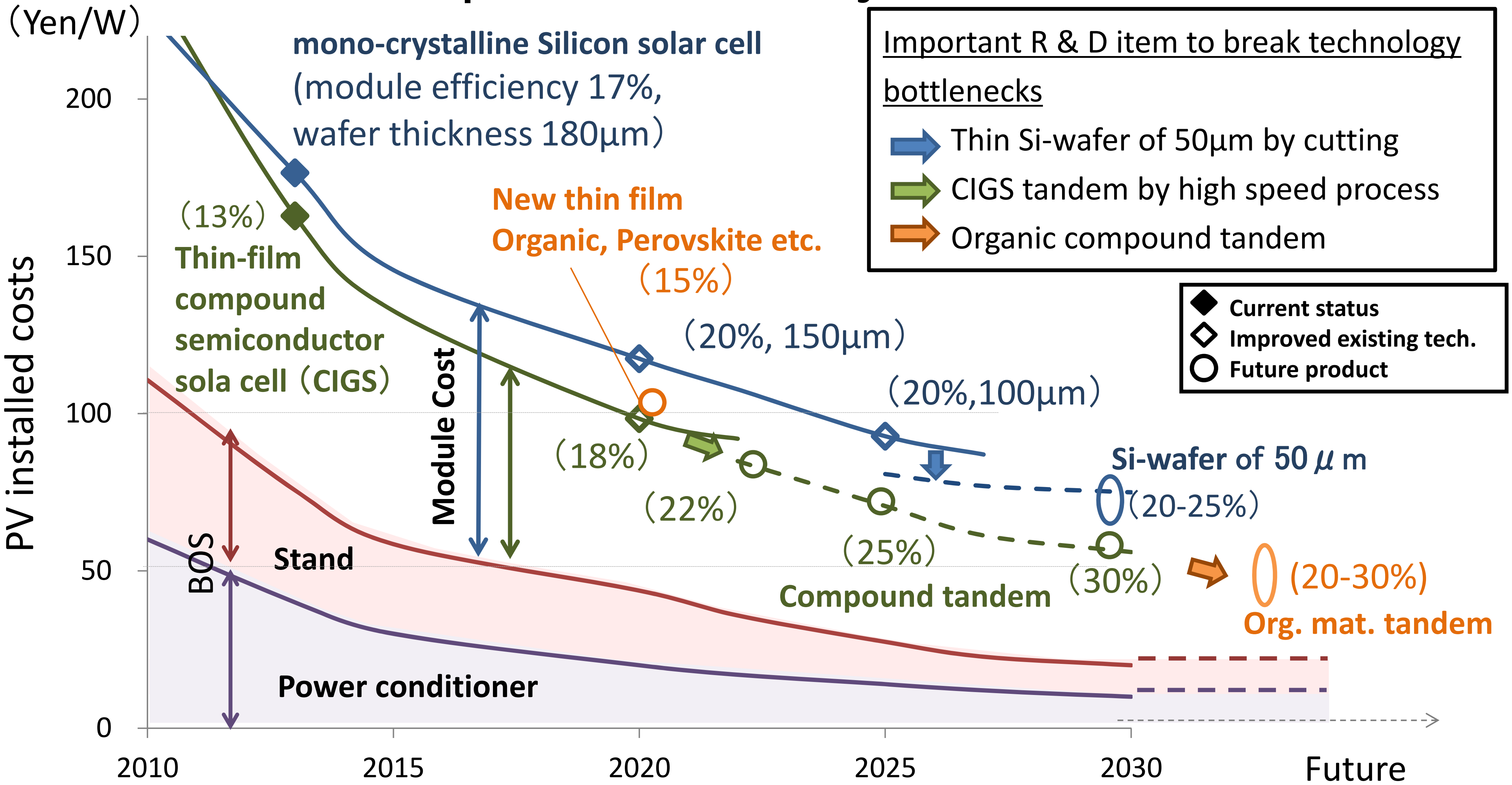

Power Consumption in TEPCO grid
(week day 9:00−21:00)
Power Consumption [GW]
60
50
40
30
20
10
0
−5
0
5
10
15
20
25
30
35
40
Temperature [℃]
2010
2011
2012
2013
2014
2015

Potential of Renewable Energy (Japan)

	Power generation potential (TWh/y)	
Photo voltaic	>400	variable RE
WP (onshore)	>500	variable RE
Geothermal	>500	stable RE
Hydro (small/medium)	70	stable RE
Biogas	20 ※	stable RE
Biomass	40	stable RE

Biogas※: 20% of Fermentation potential ($5 \times 10^9 m^3$/y)

Prospect of PV System Cost



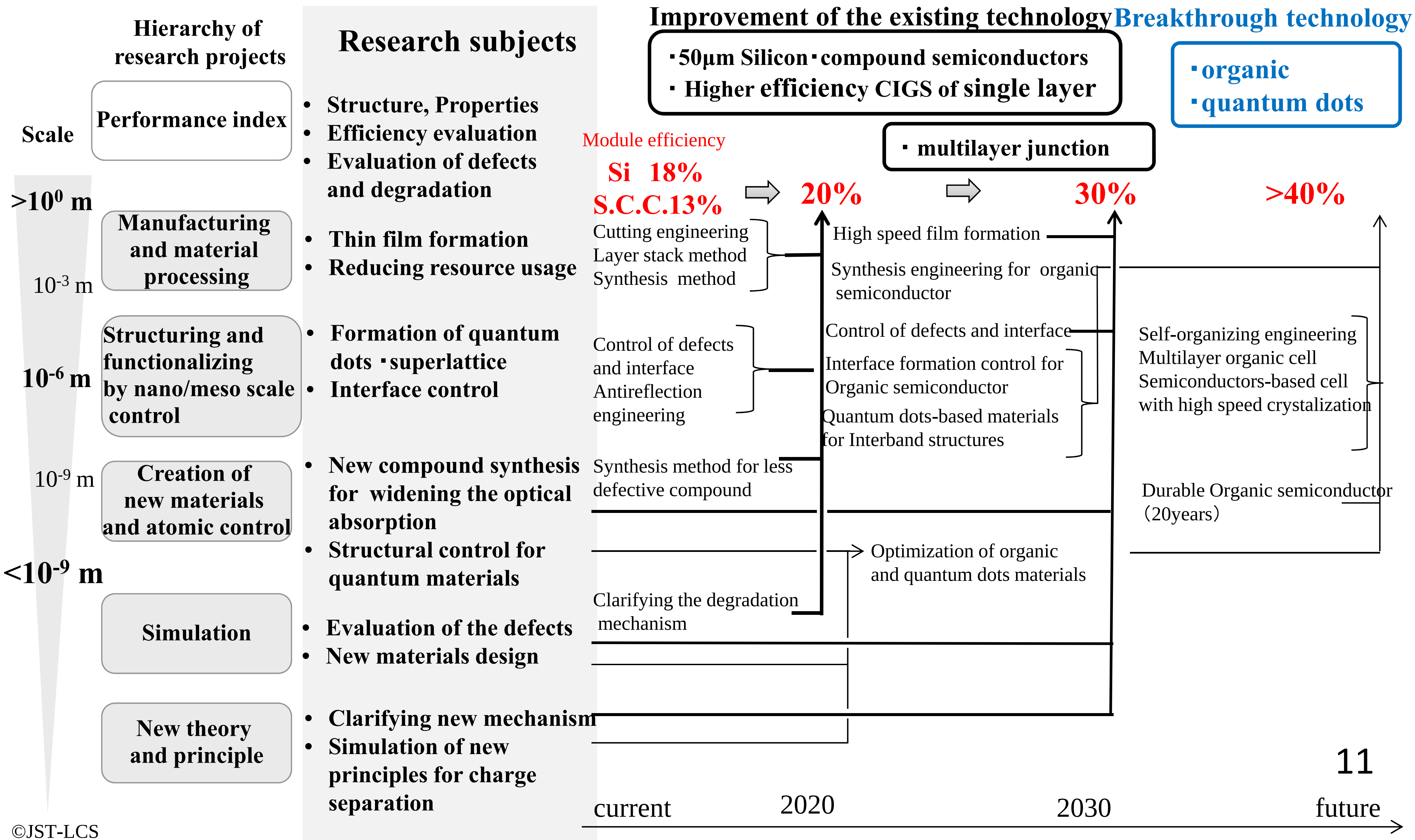
		2013	2020	2030	Future PV
Annual product		1 GW/y	5 GW/y	5 GW/y	1 GW/y or larger
lifetime (years)		20	20	30	20 or longer
Installed sys. cost	Module cost	79 Yen/W	50 Yen/W	37 Yen/W	24 Yen/W
	BOS cost	84 Yen/W	47 Yen/W	20 Yen/W	20 Yen/W
	Total PV system cost	163 Yen/W	97 Yen/W	57 Yen/W	44 Yen/W
Cost of electricity		18 Yen/kWh	11 Yen/kWh	5 Yen/kWh	4 Yen/kWh

Resource：Center for Low Carbon Society Strategy (LCS)

Technology Scenario
-Solar cells-

Domestic initial cost for PV installation (Yen/W)

	current status	2020	2030	new PV
module	80	50	40	20
BOS	80	50	20	20
Total	160	100	60	40



Cost of electricity generation system having a high share of RE in 2050 (Different technology scenarios)

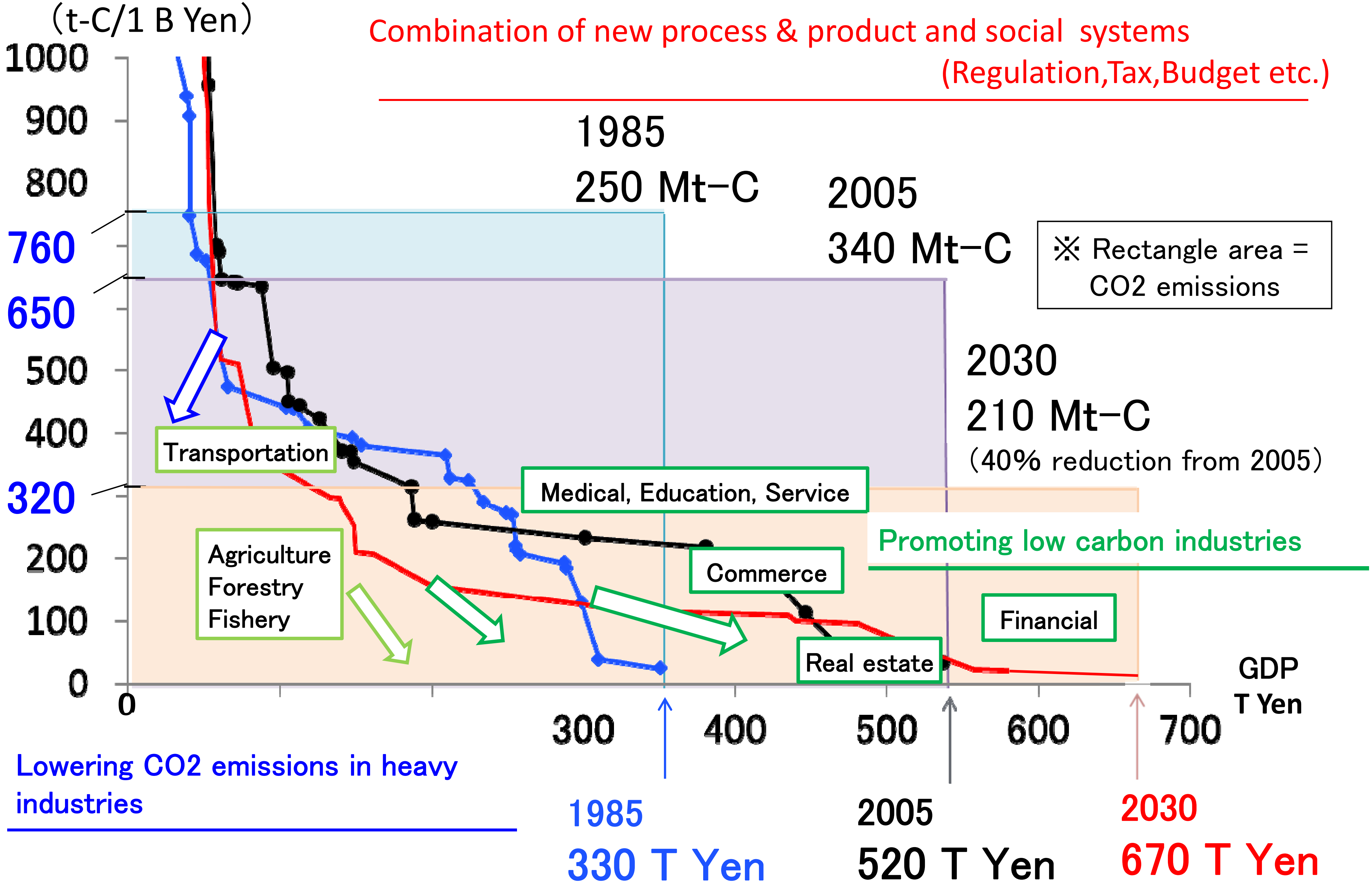
Scenarios		2010 ref.	2012	2030	2050 [2]	
Total (TWh)		1,163	1,093	1,053	1,080	1,102
Supply Elec. Energy (TWh)	PV	2	7	100	429	297
	Wind	4	6	100	15	171
	Hydro	96	84	100	130	130
	Other RE	1	1	30	231	211
	Nuclear	288	16	100	146	146
	Thermal	772	979	623	128	146
	Hydrogen[1]	(0)	(0)	(0)	(2)	(17)
Battery (GWh-ST)		0	0	21	474	151
CO_2 Emission(Mt)		**536Mt**	**716Mt**	**493Mt**	**107Mt**	**86Mt**
Cost (¥/kWh)		**10.9**	**12.7**	**11.0**	**9.7**	**17.5**

CO2 and Cost are estimated by LCS. Technology improvement is included in 2030 and 2050. Cost of Nuclear is 7.5 ¥/kWh in 2012, 14 ¥/kWh in 2030.

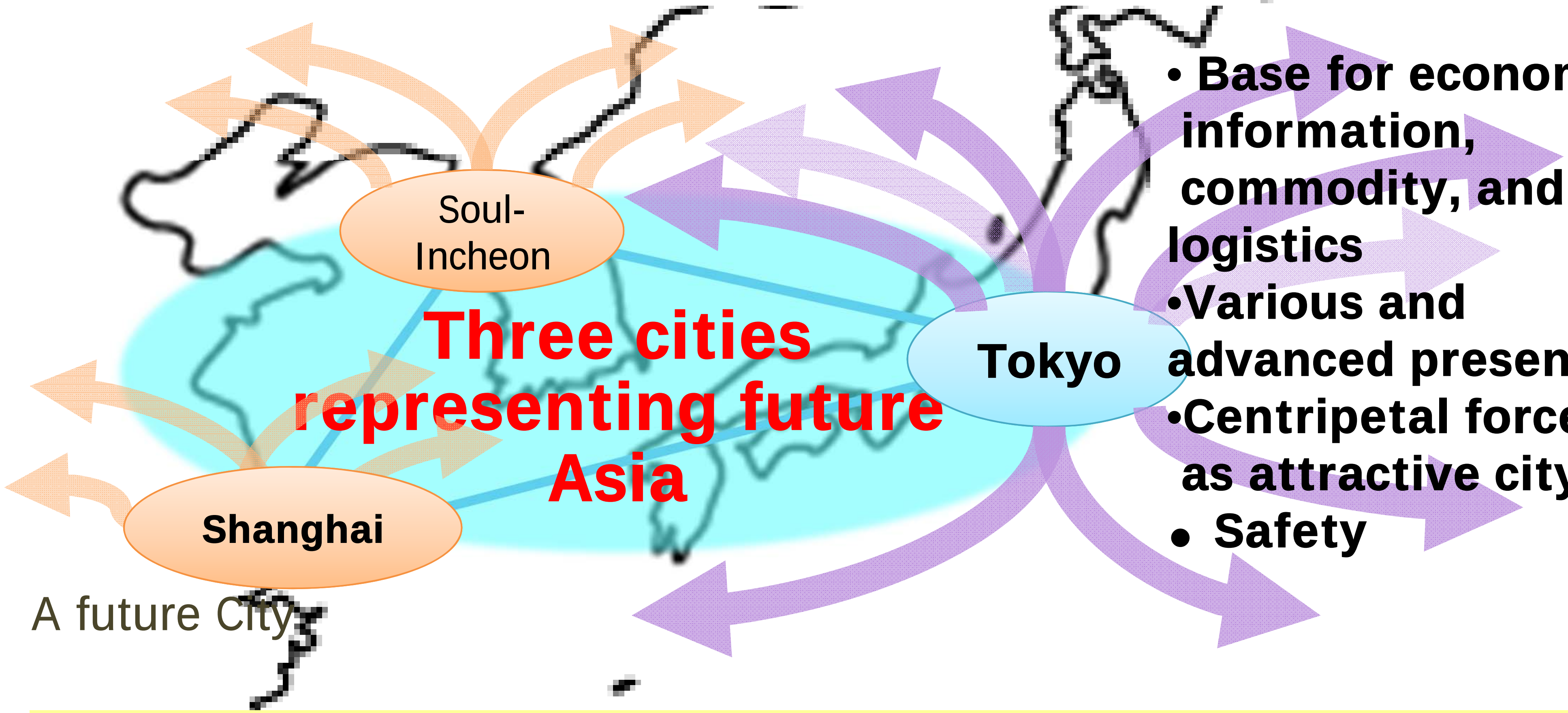
1) Unused electricity without transmission capacity expansion scenarios
2) RE low/high cost scenario in 2050.

Resource：Center for Low Carbon Society Strategy (LCS)

Future industry structure toward affluent low carbon society



A Base in Asia, Tokyo



Top ranking cities※1
London, New York, Paris, Tokyo（the 4th in world）

Specific ranking …
Tokyo is the 1st place in economy and the 2nd place in R&D capabilities.
Tokyo is only the well-balanced city, above 6th places in all fields. ※2

※1 The Mori memorial foundation “Global Power City Index 2014”
※2 Economy, Research & Development, Culture & Exchange, Habitation, Environment, Traffic access

Conclusion

1. Low Carbon Society led by CO_2 reduction in daily life in Japan was explained
2. It is important to quantitatively define the efficiency, economic and environmental sustainability of low carbon technologies, and to understand potential of Renewable Energy.
3. Cost competitiveness of Renewable Energy is growing, so it is possible for us to consider scenarios with electricity generation system having a high share of RE in 2050.