Korean solar PV promotion policy and its impact on the domestic market

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4th Basic Plan Targets of Renewable Energy Deployment

Primary Energy

Target rate: **11.0%** (2035)

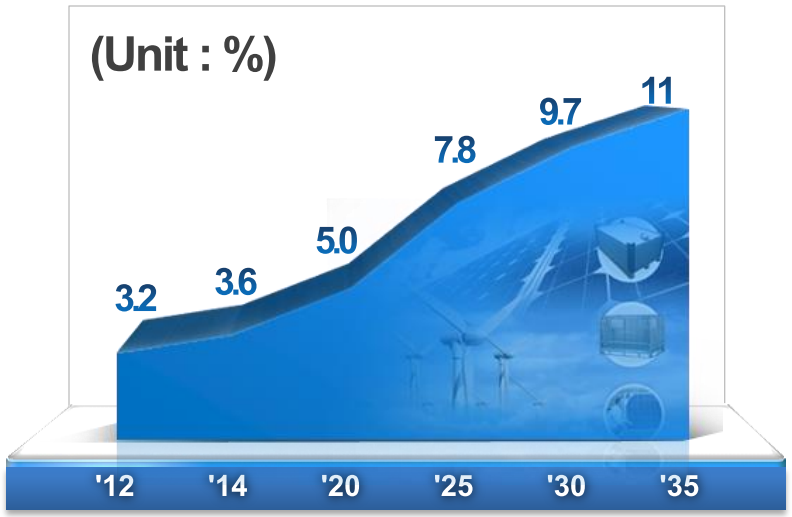
Annual NRE growth rate between 2014 and 2035: 6.3% > Annual demand growth rate of primary energy: 0.7%

Electricity

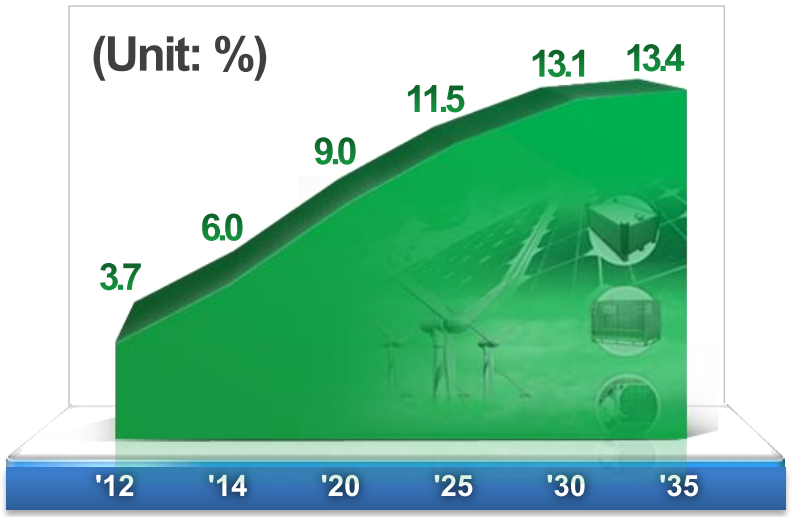
Target Rate: **13.4%** (2035)

Annual NRE growth rate between 2014 and 2035: 5.8% > Annual demand growth rate of electricity: 1.8%

NRE share targets based on primary energy



NRE share targets based on Electricity



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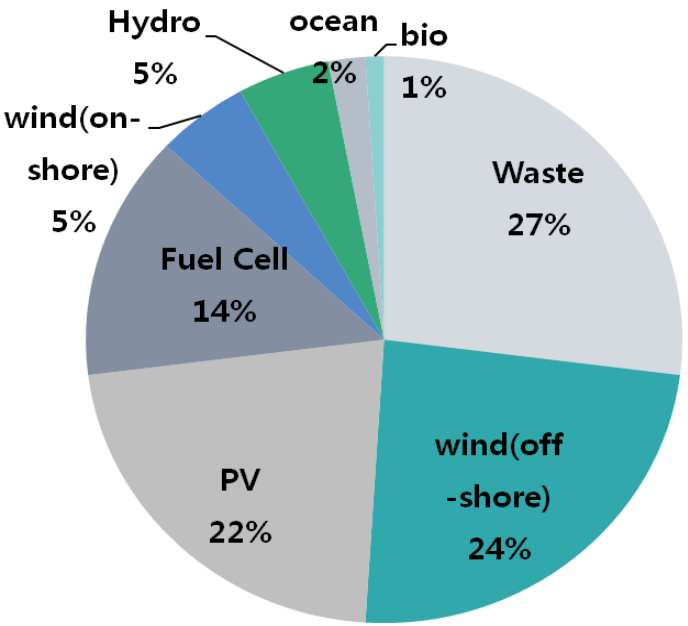
Changes in 2035 RE Share Target

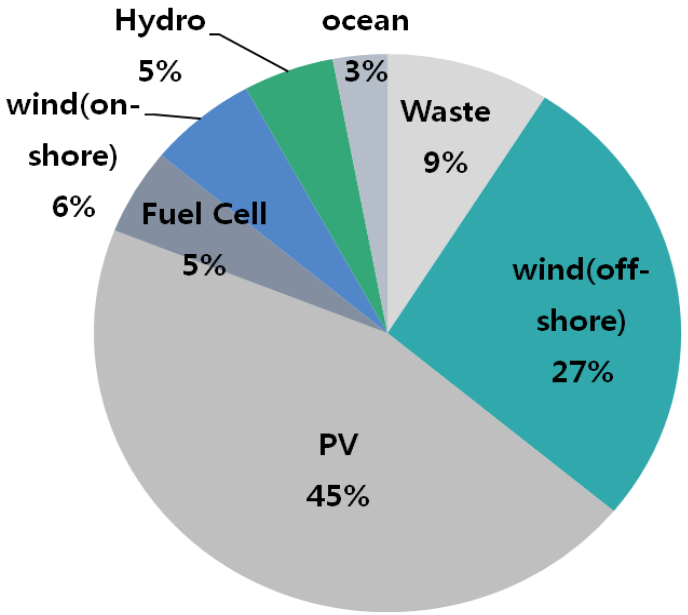
- While **ratio of waste has decreased largely**, the amount of shortfalls are expected to be replaced with Solar PV and Wind

  * Ratio to TPES (%, '12→'35) : Waste(68.4→29.2), Wind(2.2→18.2), Solar PV(2.7→14.1)

- **PV Generation Capacity Target : 17.5GW by 2035**



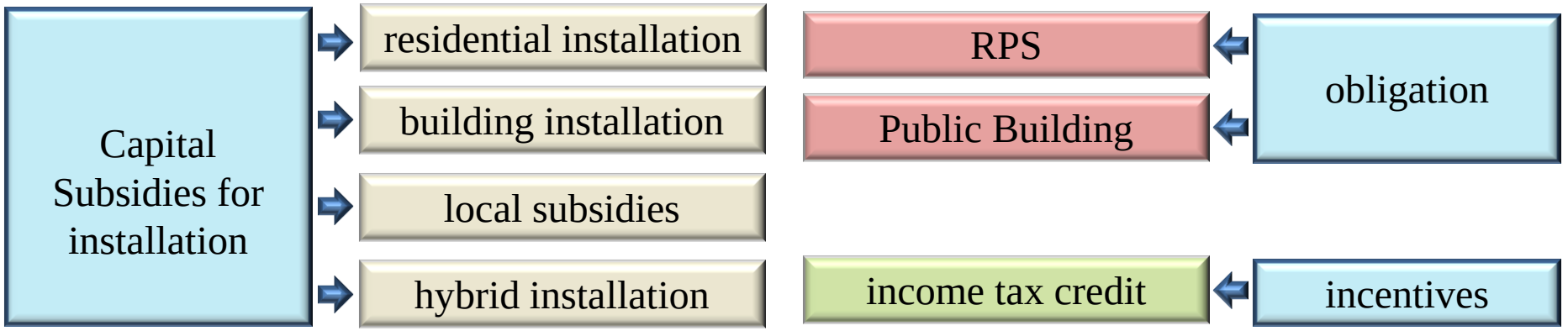
Expected Share of RE generation



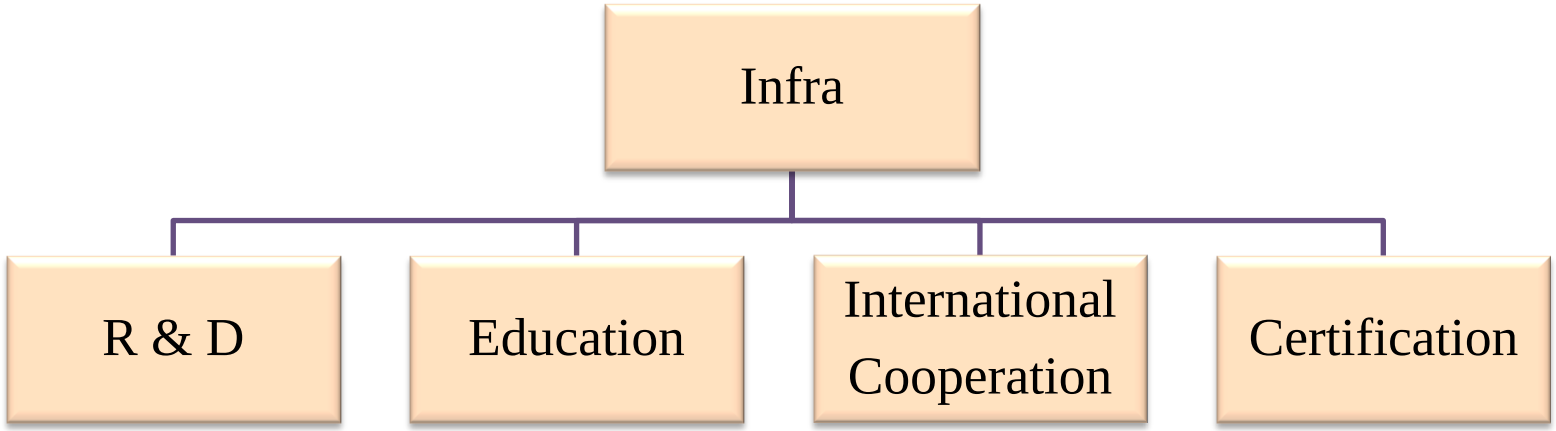
Expected Share of RE capacity

Policy structure to promote PV industry

- **Market / Demand Creation Policy**



- **Infrastructure Development Policy**



Renewable Portfolio Standard

- **RPS (Renewable Portfolio Standard)**

  Annual generation amount of RE = Total Generation x Mandatory Ratio (%)

- **RPS compliances**

Year	`15	`16	`17	`18	`19	`20	`21	`22	`23	`24
3rd Plan (%)	3.5	4.0	5.0	6.0	7.0	8.0	9.0	10.0		
4th Plan (%)	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**6.0**	**7.0**	**8.0**	**9.0**	**10.0**

- **PV shows almost 100% of fulfillment ratio in RPS. On the contrary, other REs have been recording low levels because of approval, technology, price, sourcing etc.**

	2012		2013	Remark
	Fulfillment ratio	Actual ratio	Fulfillment ratio	
PV	95.7%	93.7%	94.9%	Actual ratio is the figure without the government REC
Other REs	63.3%	32.5%	65.2%	
Total	64.7%		67.2%	

PV in Korean RPS

- **PV set-aside quota**

Year	2012	2013	2014	2015	Remarks
Annual quota (MW)	220	330	330	320	Tuned in 2012
Annual quota (MW)	**220**	**330**	**480**	**470**	Increased in 2013

Term	Features	Operation	Remarks
Y2012~ Y2015	Two tracks • PV quota • Other renewables	**RPS / Two tracks** PV Market / Other renewables like wind, fuel cell, biomass, waste etc.	• PV quota to protect & promote PV market
From Y2016	• To be united so that all the RE sources incl PV competes in REC bidding	**RPS / One track** Other renewables like wind, fuel cell, biomass, waste etc.	• PV shows higher implementation ratio in RPS than any other REs. Accordingly, the government may not have to operate two-track scheme.

REC (Renewable Energy Certificate)

- REC stands for "Renewable Energy Certificate"
- It is the tool to make transaction of RE electricity
- Issued unit of REC is MWh
- If the generating companies taking part in RPS did not obtain obligatory RECs at each year, executory REC should be paid by 150% of average REC price (Penalties)

  -20% of the obligatory RECs could be carried over by next 3 years

Revenues of RE developers or installers in RPS

= [REC Price X multiplier] + SMP

Changes in REC multipliers

on LAND type

multipliers	type	land classification	standard capacities
0.7	not using building facility	farmland, orchard, mountain, ranch, forest	
1.0		other type	〉100kW
1.2			≤100kW
1.5	On building & water		

on CAPACITY size

type	small 〈100kW	Medium 100kW~ 3MW	large-scale 〉3MW
land	1.2	1.2+1.0	1.2+1.0+0.7
Building	1.5		1.5+1.0
On Water	1.5		

guidelines

- changes from managing land classification to promoting small-scaled PV
- compound calculation in multiplication

(e.g) 500kW : [(100kW X 1.2)+(400kW X 1.0)]=520kW

5,000kW : [(100kW X 1.2)+(2900kW X 1.0)+(2000kW X 0.7)]=4420kW

Public Building Obligation

Public Building Use

- The public building of which floor area is more than 1,000m ² should generate the electricity through renewable energy according to obligatory standard (%).
  - More than 10% of energy consumption should be provided by renewable energy
  - The required amount is supposed to be gradually increased to 30% by 2020.
    *The standards got higher than previous ones by becoming 30% from 20% by 2020
  - Applied to new building or retrofitted one

- The target to generate renewable energy in public building

Year	2011~2012	2013	2014	2015	2016	2017	2018	2019	2020
Standard	10%	11%	12%	13%	14%	15%	16%	18%	20%
New Standard	10%	11%	12%	15%	18%	21%	24%	27%	30%

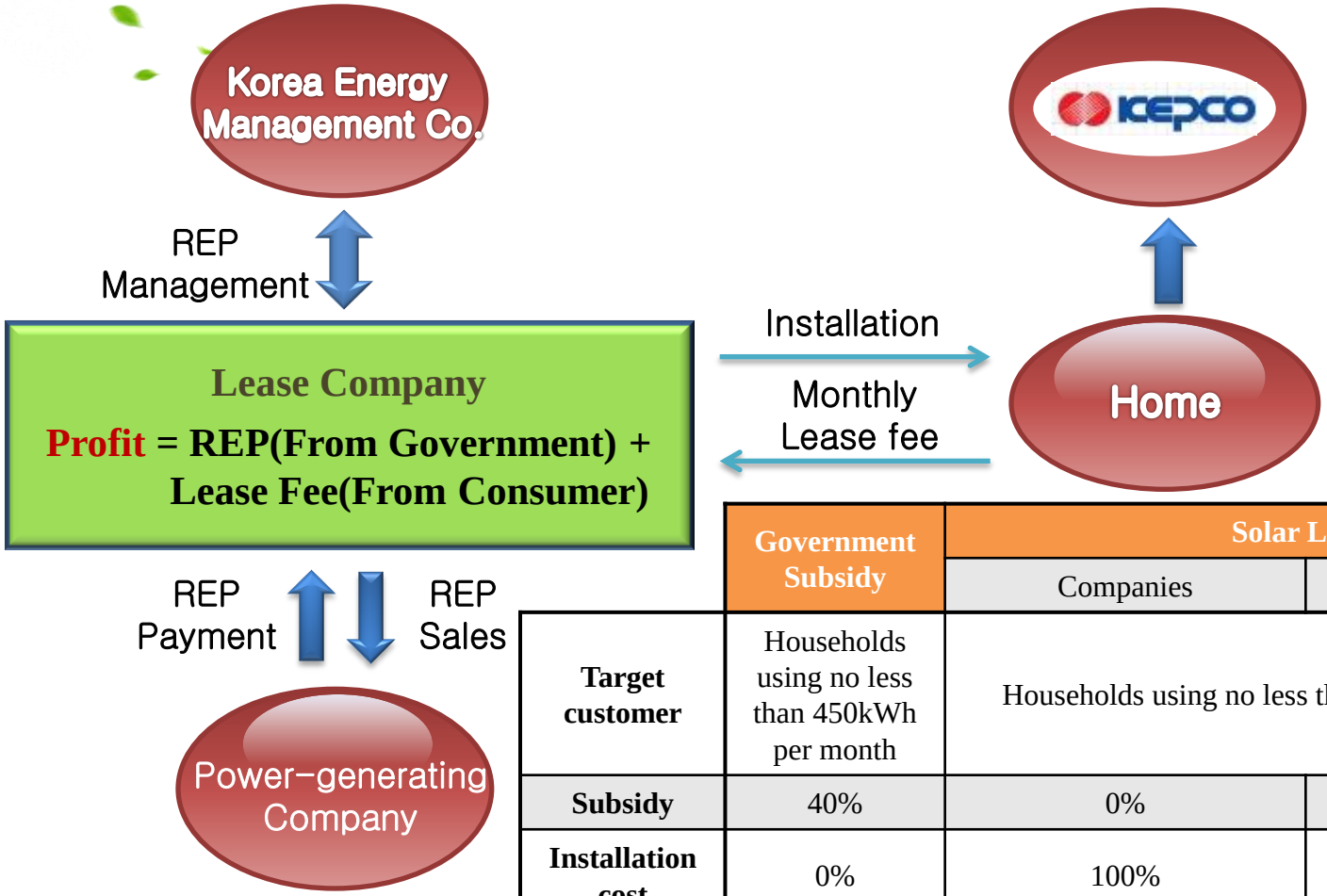
PV Subsidy-based Programs

Subsidy Programs	Home (Green Home 1mil.)	Building	Local
Features.	• For 3kW of the households • Started in 2004 • Subsidy in 2013 : USD 3,400/for 3kW	• For the private buildings to supply their own electricity through PV • For the buildings combining PV & other Res	• Provided by local government • Different according to local government
Cumulative Capacities until 2013	141MW	22MW	71MW

Solar Lease in Korea

	2013	2014	2015
goal	2,000 households	2,000 households	5,000 households
Results	60 homes (180kW)	2006 homes(6MW)	
business term	3 months (Sep. ~ Dec.)	6 months (Jun. ~ Dec.)	6 months (May~October)
REP price	12.8 cents/kWh for 12 years	21.6 cents/kWh for 7 years	21.3 cents/kWh For 7 years
contract extension	none	possible to extend contract for additional 8 years. However, there isn't REP in extended period	
upper limit in lease fee	USD 100/month	USD 70/month	
consumers	Households consuming more than 550kWh/M	households consuming more than 350kWh/M	Households using more than 350kWh from 3~10kW, apartment housing
developers	SEIB, Jeonnam City Gas, Hanwha	SEIB, LG Electronics, Solar ENS, Hanwha Q-cells, Hanvit EDS	S-Power, Solar ENS, Haezoom(LG), Hanbit EDS, Hanwha Q-cells, HY GAS

Solar Lease (Rental)



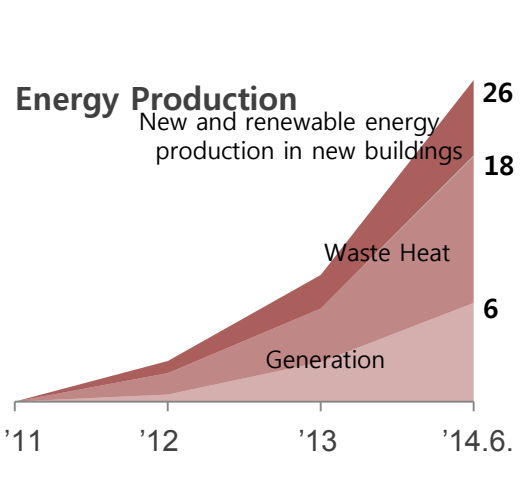
	Government Subsidy	Solar Lease	
		Companies	Consumer
Target customer	Households using no less than 450kWh per month	Households using no less than 350kWh per month	
Subsidy	40%	0%	0%
Installation cost	0%	100%	0%
Ownership	Households	Belonging to lease company	None
Profit Scheme	Saving electricity Price	REP + Lease fee	Saving electricity price
O & M	3~5 years	O&M for contracted term (7+8 years)	Managed by PV lease company

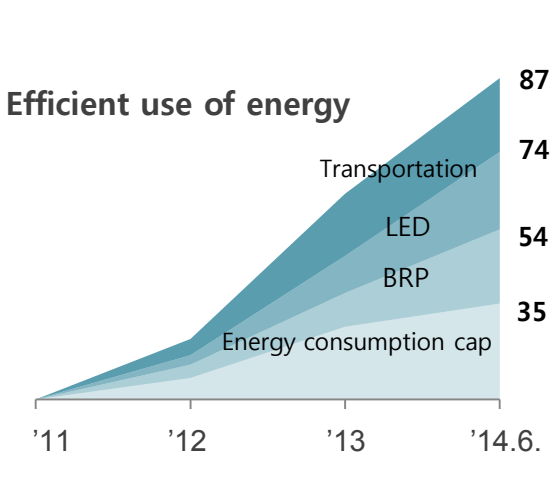
One Less Nuclear Power Plant

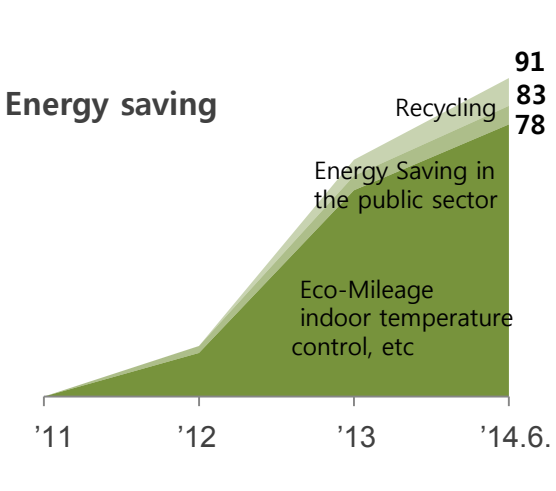
Phase 1:

Achievement of 2 Million TOE Goal

- **Set the goal (2 million TOE) from 2012 to 2014, preemptive response to the energy crisis and climatic changes**
- **The goal is achieved six months ahead of schedule** by means of energy production, efficient use and energy saving with the citizens







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The solar city, SEOUL

Goal to achieve:

Construct 200MW, 50% of the potential amount of Seoul by 2020

Production of “Healthy and Clean Electricity” through Citizens’ Solar Power Generation

Abolish unnecessary regulations

- Allow installation in city parks
- Allow small-sized Generating facilities to sell electricity

Various support systems

- Seoul’s own FIT
- Loan support with low interest
- Provide solar map
- Provide subsidy on PV installation

Close cooperation with the private sector

- Provide public land
- Reduce rent for city land, etc.
- Education office

Expand citizen participation

- Arrange "Solar Power Generation Citizens' Fund"
- Develop and supply mini solar energy generator, etc.
- Support the cooperative

Annual PV Installation in Korea

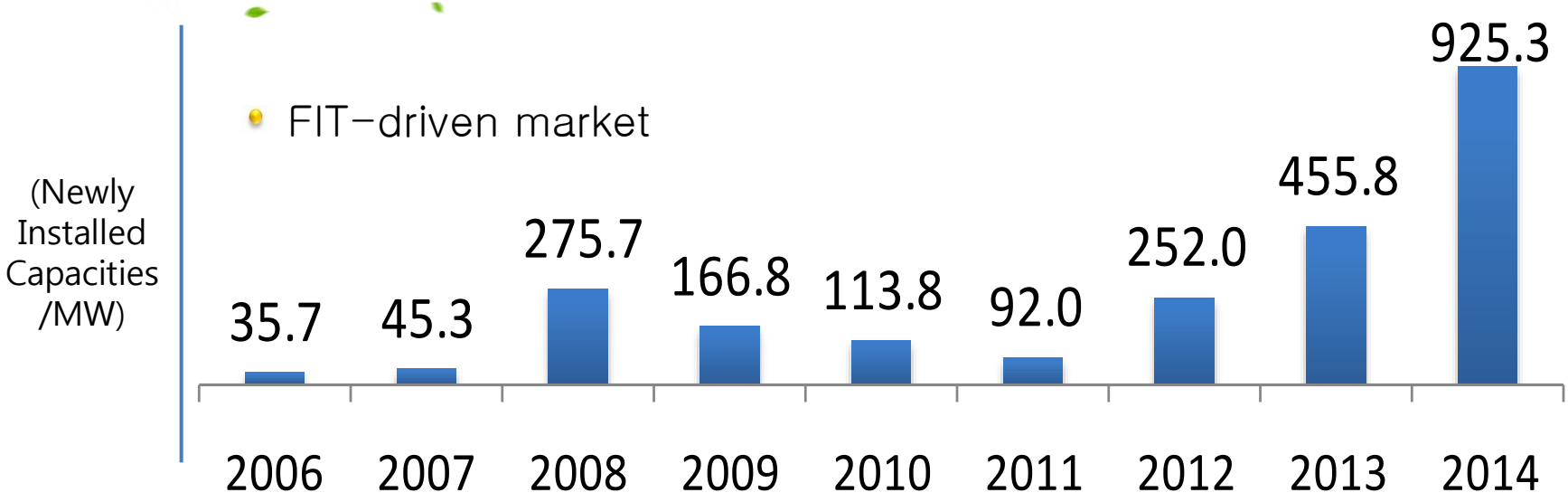


Fig. Annual PV installation in Korea

- Transition from FIT to RPS scheme in 2011
- RPS-driven market from 2012
  - RPS accounts for about 90% of PV installation since 2012
- Owing to RPS, the Korean PV market has been on the track of gradual expansion
- 2,363MW had been installed until 2014 on the basis of accumulation

Korean PV market according to Policy Schemes

Policy Schemes	Installed Capacities (kW)	
	2013	2014
Subsidies for Residential Installation	20,634	22,392
Subsidies for Building Installation	5,589	5,118
Subsidies provided by local government	11,349	10,989
Subsidies for Hybrid Installation		5,632
Public Building Obligation	11,466	15,987
RPS	406,816	865,200
total capacities (kW)	455,854	925,318

PV installation in 2013 and 2014 (KEMCO)

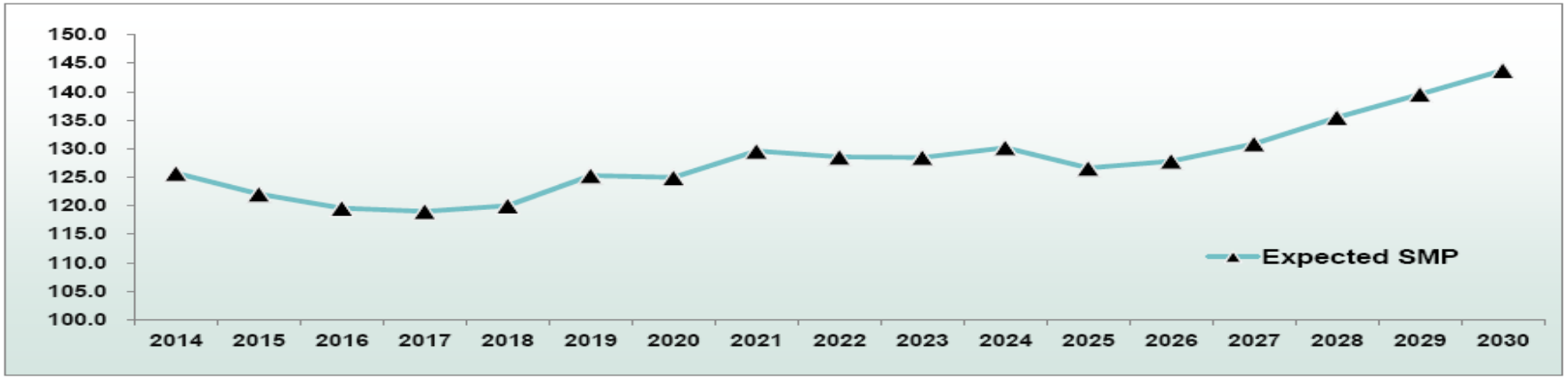
REC Price Trend

declining profitability caused by plummeted REC price

	2011	2012		2013		2014		2015
	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half	
Average REC price per MWh	KRW 219,977	KRW 156,634	KRW 158,660	KRW 136,095	KRW 128,539	KRW 112,591		KRW 70,707
REC price per kWh (UScents)	22	16	16	14	13	11		7

REC of PV spot price was around USD 7cents/kWh in the first half of 2015

SMP also has been showing a sharp decline – USD 14cents/kWh('15.1) → 9cents/kWh('15.6)



The prospects of System Marginal Price in Korea (KRW/kWh)

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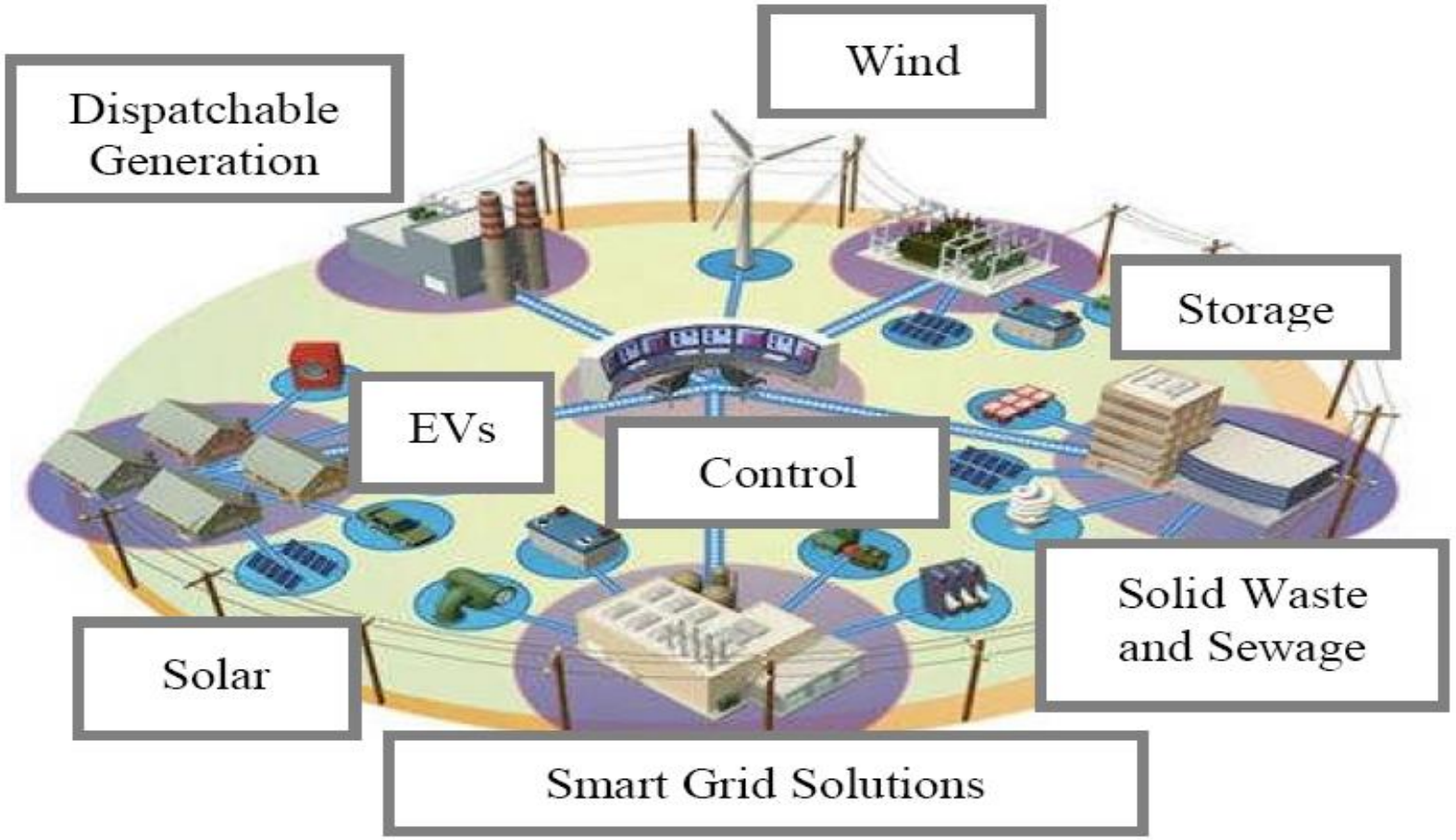
PV for distributed generation

- **Distributed generation based on renewable energy**
- **Storage devices and energy management technology**
- **Smart Grid solution**



Thank you