

Policy Directions for Activating Energy Prosumer

5th NEAESF

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Outline

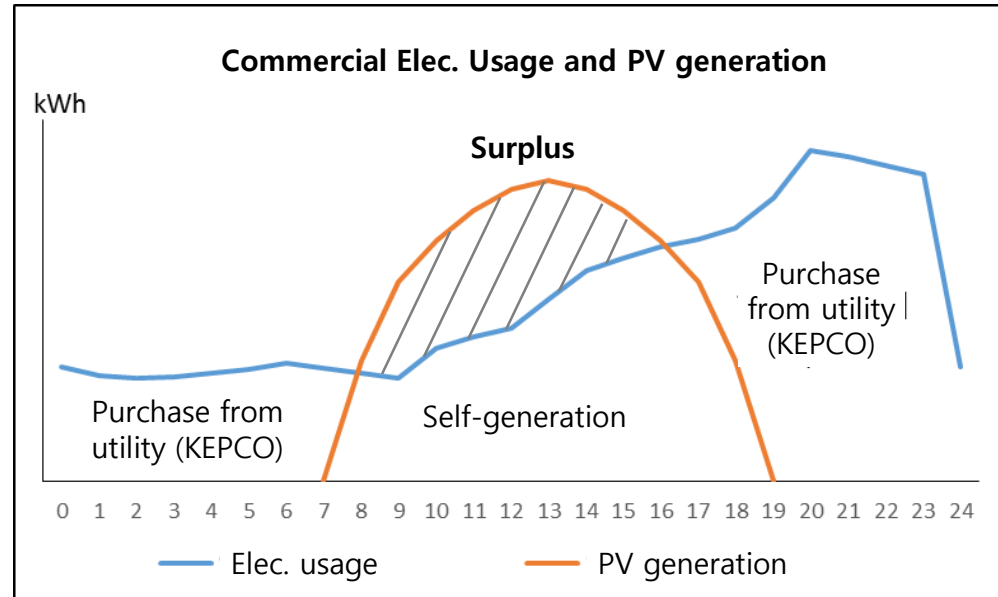
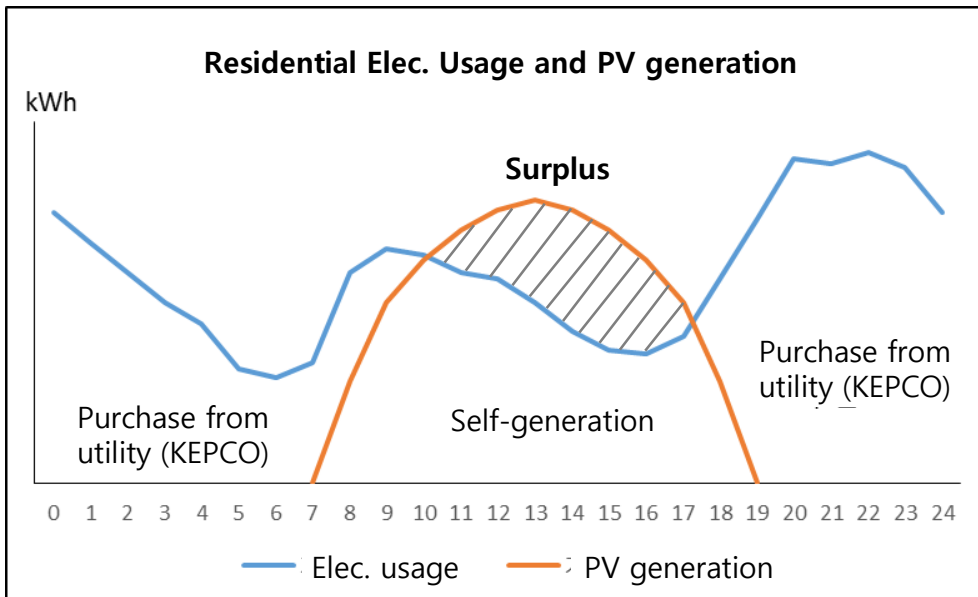
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1. Energy Prosumer

1. Energy Prosumer

Energy Prosumer : Concept

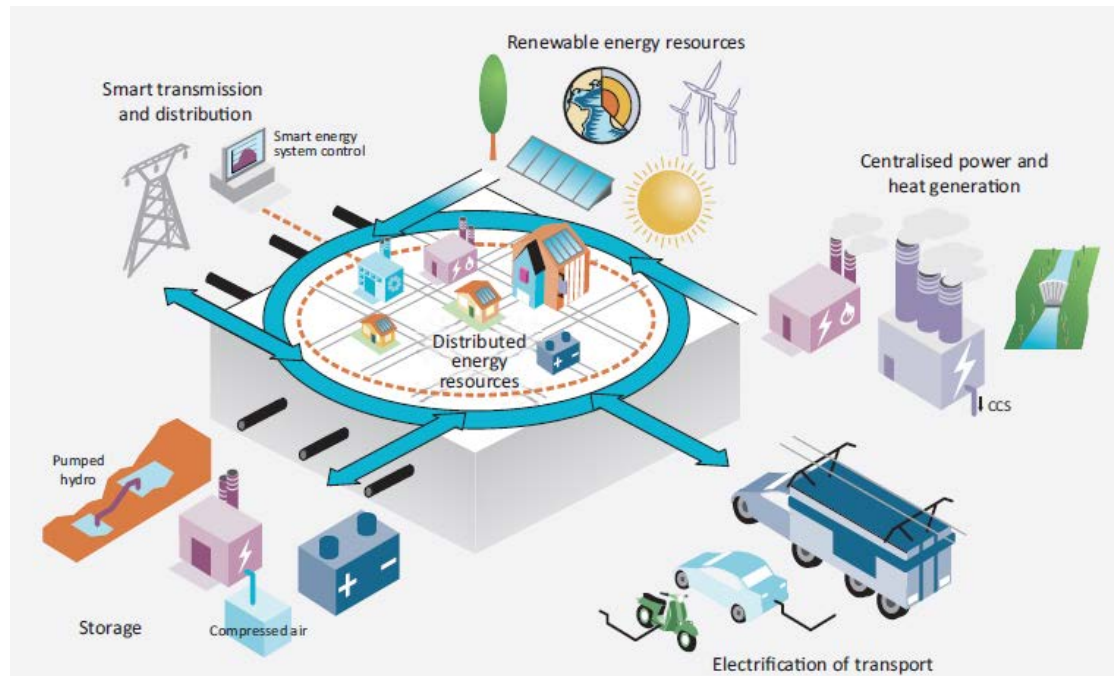
- An electricity consumer who also produces it and can sell it back to the grid
- Sell self-generated electricity through net-metering, P2P transaction, etc.
- Various types: ① residential prosumers; ② citizen-led energy cooperatives or housing associations; ③ commercial prosumers; and ④ public institutes



1. Energy Prosumer

Energy Prosumer : Role

- Promote distributed resources, such as small- and mid-scale renewables
- Transform the energy system from a central-oriented toward a distributed one
- Reinforce consumer influence, and thus, create new energy services
- Worsen utility profits and thus, contribute to innovating their services

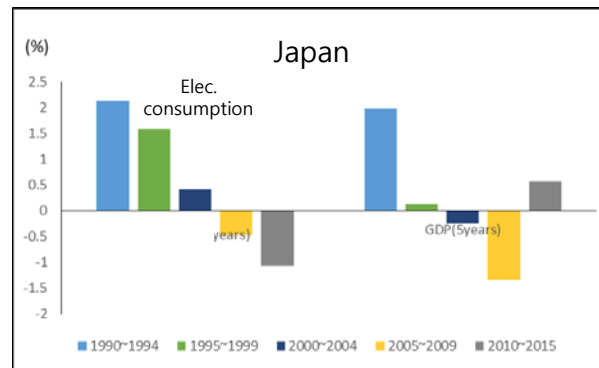
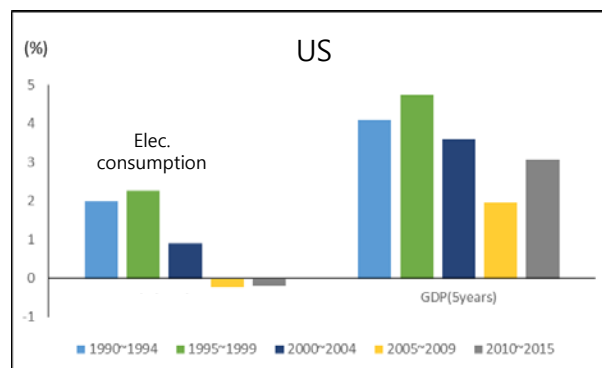
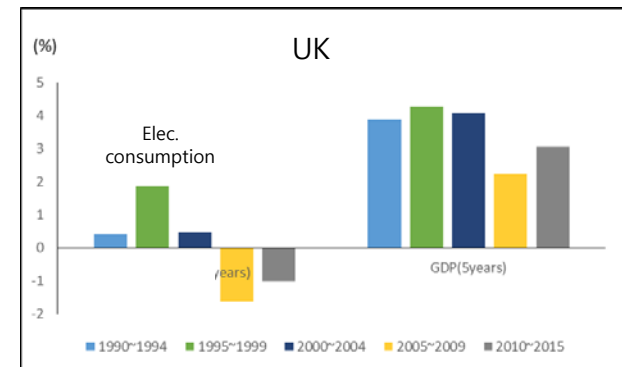
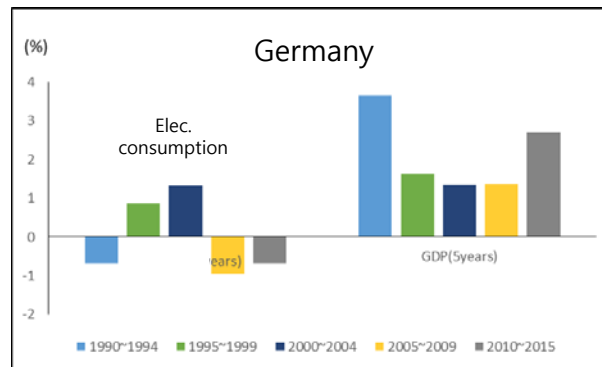
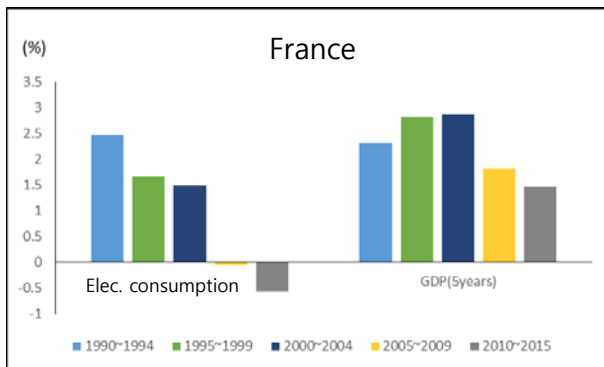


2. Foreign Cases

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GDP growth & Electricity consumption growth of 5 countries

- Decreasing GDP growth rates & Decreasing electricity consumption growth rates
- Electricity consumption growth rates decrease faster than GDP growth rates because of energy efficiency improvement and demand-side management.

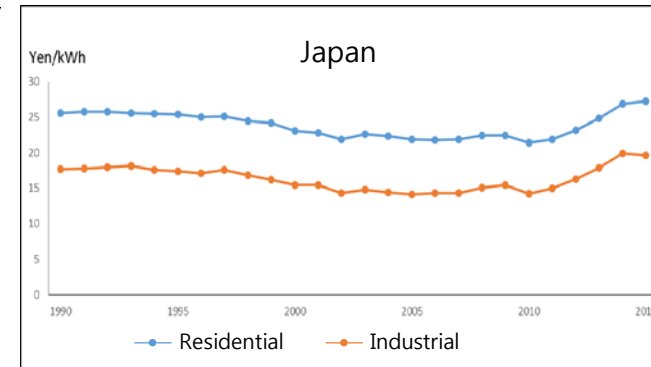
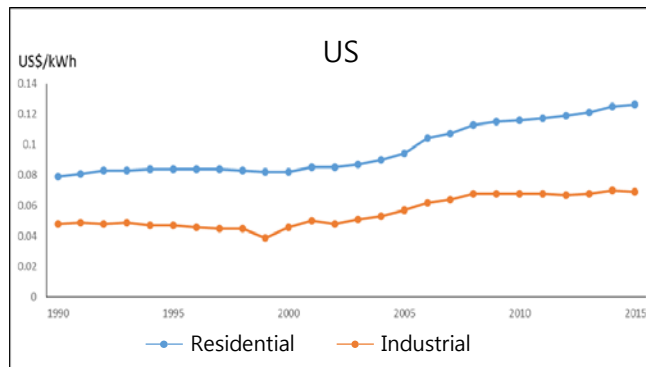
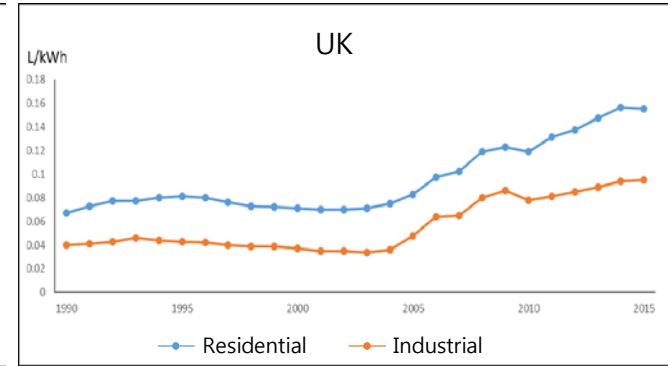
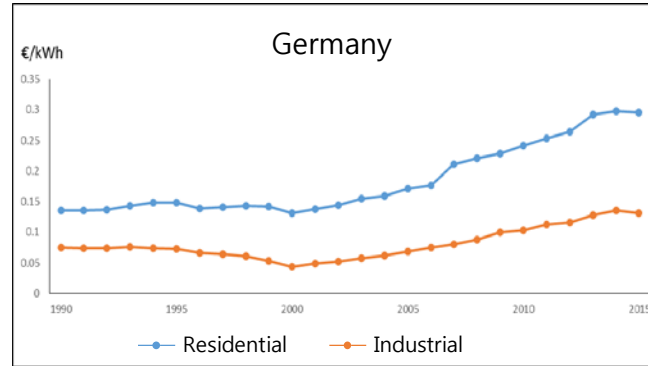
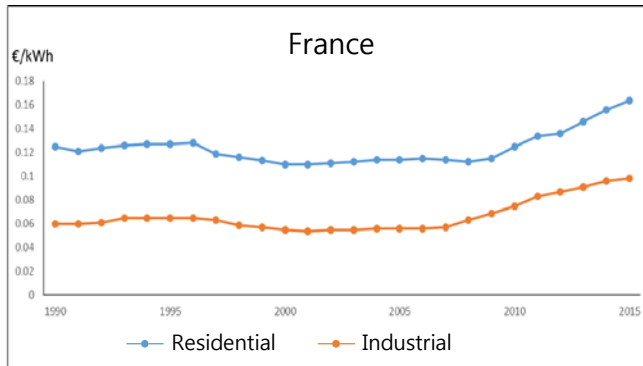


Source : Enerdata

2. Foreign Cases

Electricity rate structures of 5 countries

- Retail electricity price : SMP + T&D costs + sales costs & margin
- Utilities bear the costs of supporting renewables, regulatory costs, etc.
- These costs are transferred elec. rates, and the gap b/w SMP and retail price increases.

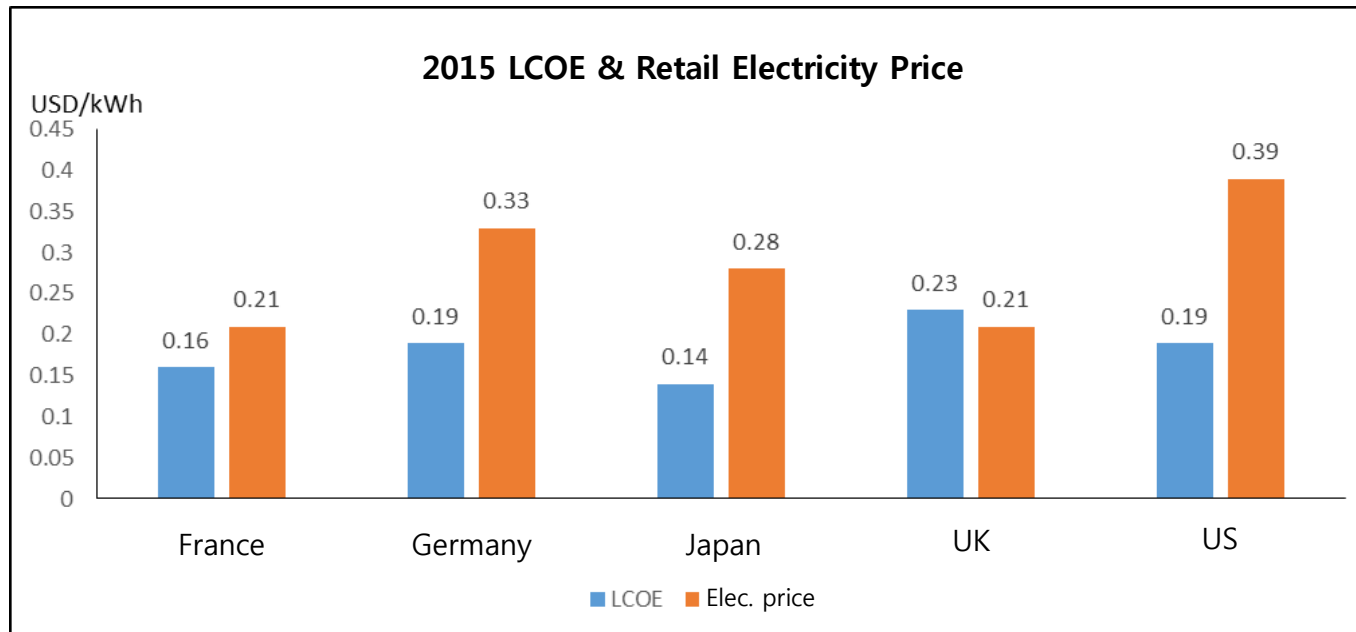


Source : Enerdata

2. Foreign Cases

Incentives to be energy prosumer

- Increasing retail electricity prices but decreasing renewable LCOEs.
- In many cases, PV LCOEs are smaller than retail electricity prices.
- This condition can be an incentive for consumers to be prosumers.
- It also worsens utilities' profits and encourages consumers' strategic behaviors.



Source : Deutsche Bank(2015)



2. Foreign Cases

Net metering

- Allows prosumers to feed electricity they do not use back into the grid.
- A billing mechanism that credit renewable system owners for the electricity added to the grid
- Net metering transactions increase along with decreasing renewables' LCOEs.
- Problem : how to allocate distribution costs b/w consumers and prosumers ;
how to cope with utilities' profit decreases induced by net metering transactions

Self consumption

- Allows prosumers to use their self-generated electricity and for the surplus, to be compensated with some premiums lower than electricity rate
- In Europe, self consumption transactions are more common than net metering.
- The surplus electricity is compensated by price lower than electricity rate.
- Ideally, the best strategy for consumers is to consume 100% of their self-generated electricity if they can utilize storage devices like ESS.



2. Foreign Cases

P2P Transaction via IT platform

- Help prosumers to sell their residual elec. to other consumers without utilities' mediation.
- Utilities or IT companies provide online P2P transaction platforms.
- P2P transaction prices are settled between retail elec. rate and renewable LCOEs.

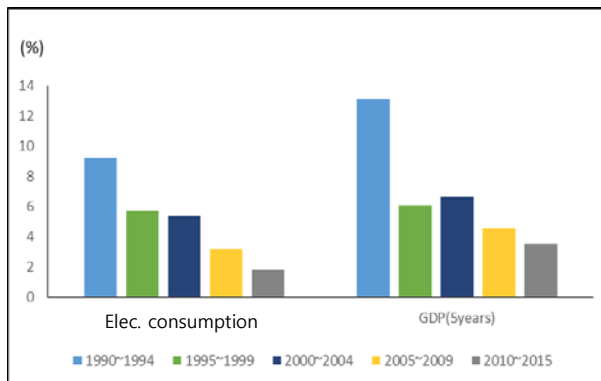
Case	Description
Piclo (UK)	<ul style="list-style-type: none"> • Online platform that performs P2P energy matching • Match customers with renewable generators • Collaboration b/w Open Utility and Good Energy
Vandebrom (Netherlands)	<ul style="list-style-type: none"> • Connect renewable generators with local consumers, bypassing traditional utilities • So far, provide over 80,000 households with access to clean energy.
sonnenCommunity (Germany)	<ul style="list-style-type: none"> • Community of sonnenBatterie owners who are committed to a cleaner and fairer energy future. • Connect batteries and PV system of community members and make them independent on conventional energy providers.

3. In Korea...?

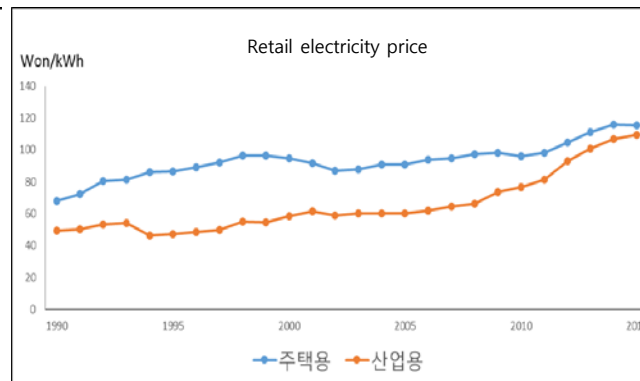
3. In Korea...?

Business conditions of energy prosumer in Korea

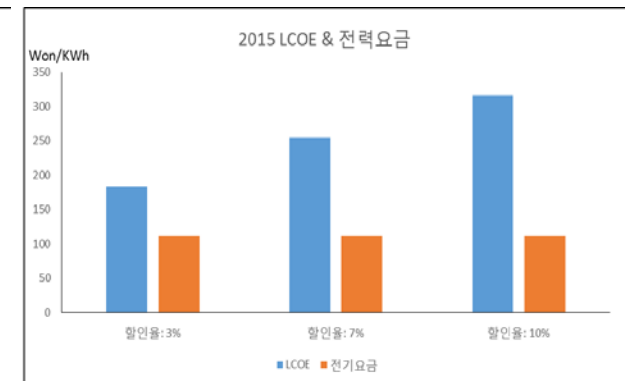
- Retail price of power : wholesale price (\neq SMP) + T&D costs + sales costs & margin
- Wholesale price changes are not directly reflected to retail prices on time.
- Still, power purchased from utility (KEPCO) is cheaper than renewable electricity.
- Incentive for energy prosumers : progressive pricing scheme for residential power consumers
- Consumers who use a lot of power pay expensive prices and thus, are more likely to choose to be energy prosumers.



Source : Enerdata



Source : Enerdata



Source: NEA Projected Costs of Generating Electricity (2015) ; 한국전력통계(2015)

3. In Korea...?

Energy prosumer related businesses

- Net metering for small-scale PV system (~50 kW)
- Small-scale PV system installed from 2000 to Mar. 2016: 102 installations (2,140 kW)
- P2P transactions are allowed since Jul. 2016
- KEPCO plays a role of matching prosumers and consumers in a same distribution network and of balancing their accounts.

프로슈머 전력거래



프로슈머 전력거래란?

태양광 등으로 전기를 자체 생산·소비하는 프로슈머가 남는 전기를 소비자에게 직접 판매할수 있게 하는 제도입니다.

프로슈머·소비자 직접신청하기

중개사업자 신청하기

You can apply P2P transaction here on the KEPCO webpage

공지사항

- 프로슈머 이웃간 거래 Q&A
- 프로슈머 전력거래 온라인 신청 개시
- 프로슈머 전력거래 실증사업 착수

더보기 >

2017.07.17

2016.09.19

2016.07.27

에너지 프로슈머란?





3. In Korea...?

Incentives for P2P transaction

- Energy prosumer's options : Net metering vs. P2P transaction
- If P2P transaction offers prosumers greater profits than net metering, prosumers will choose P2P transaction.

Assumptions

- PV system of 3kW → Avg. generation from PV : 300 kWh/month
- That is, surplus can be up to 300 kWh.
- LCOE of PV system : ₩200 per kWh
- Both seller and buyer are residential consumers

Seller(prosumer)'s condition to choose P2P transaction

- P2P transaction price > LCOE of PV system
- (and) Profit from P2P transaction > Profit from net metering

Buyer's condition to choose P2P transaction

- Reducing the burden of progressive pricing scheme
- Payment to prosumer < Payment to utility (KEPCO)



3. In Korea...?

P2P transaction conditions

- Prosumer (seller)'s minimum WTP → Bottom price of P2P transaction
- Consumer (buyer)'s maximum WTP → Top price of P2P transaction
- P2P price range : 200~351.4 ₩/ kWh (with considering PV LCOE)

<Seller's side: Minimum WTA>

Purchase from KEPCO (kWh/month)	Minimum WTA for P2P transaction (₩/kWh)		
	Sell via P2P : 100kWh/month	Sell via P2P : 200kWh/month	Sell via P2P : 300kWh/month
100~300	52.8~148.8 ₩/ kWh	29.8~159.9 ₩/ kWh	19.9~141.9 ₩/ kWh
400~600	148.9~319.0 ₩/ kWh	181.3~319.0 ₩/ kWh	177.8~283.9 ₩/ kWh

<Buyer's side: Maximum WTP>

Electricity Usage (kWh/month)	Maximum WTP for P2P transaction (₩/kWh)		
	Purchase via P2P : 100kWh/month	Purchase via P2P : 200kWh/month	Purchase via P2P : 300kWh/month
100~300	59.6~267.0 ₩/ kWh	29.8~186.5 ₩/ kWh	19.9~144.2 ₩/ kWh
400~600	213.7~319.0 ₩/ kWh	240.4~351.4 ₩/ kWh	195.6~305.5 ₩/ kWh

4. Policy Suggestions



4. Policy Suggestions

Key condition for energy prosumer in Korea

- Retail electricity price > PV LCOE

How to achieve this condition?

- **First, rationalize electricity market and rate structure**
 - ✓ Reflect wholesale price changes to retail price changes, flexibly.
 - ✓ A variety cost of electricity supply and social cost, such as, environmental cost (GHG, fine dust, etc.) should add up to retail prices.
 - ✓ Need to derive social consensus on changes in the electricity pricing scheme.
- **Second, decrease the initial investment cost of PV system**
 - ✓ Government support is required because of lack of incentives for voluntary investment.
 - ✓ Develop a more convenient platform for P2P transaction and revise relevant system.



4. Policy Suggestions

Interconnection of wholesale market and retail market in electricity sector

- Retail electricity price reflects time-varying wholesale price
- Final goal : real-time pricing

Introduction of various time-varying electricity pricing

- Time of use(TOU) pricing for commercial and residential consumer
- For commercial consumer, much higher rate for daytime, discount for nighttime
- For residential consumer, higher rate for daytime, discount for nighttime

Diversifying market participants who sell and purchase the surplus electricity

- Residential and commercial consumer, energy cooperatives, housing association, public institution, etc.
- Possible for commercial consumer to purchase surplus electricity from Solar PV of residential consumer
- If Solar PV + ESS, there could be various marketing strategies.

Thank you.

국가에너지·자원 정책 개발의 요람
Korea Energy Economics Institute