

# **The Japanese Solar PV Industry - Challenges & Opportunities -**

**13th December 2023**

**Japan Photovoltaic Energy Association (JPEA)**

**Takeaki Masukawa (Secretary General)**

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## ■ Foundation

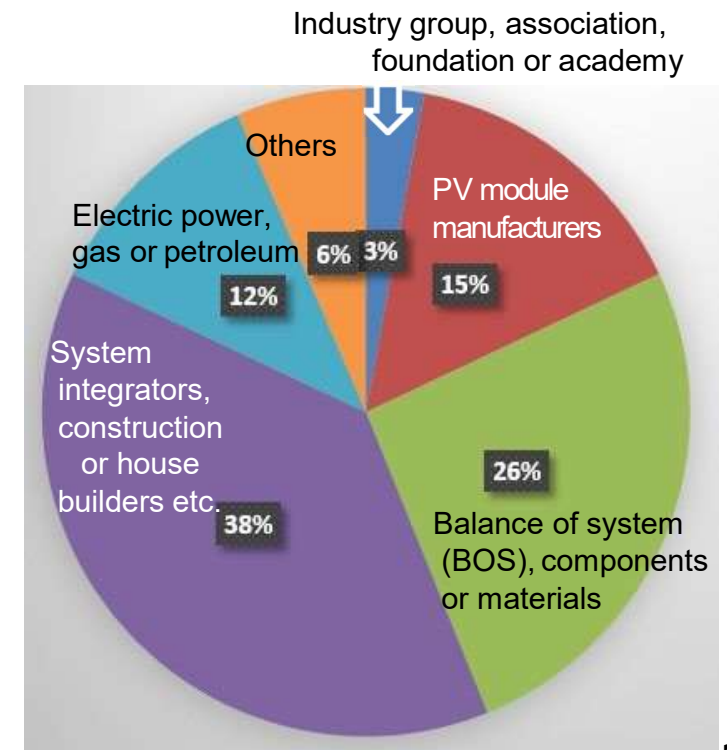
April 23, 1987 (Founder: Dr. INAMORI, Kyocera Corporation)

## ■ Objective

The association aims to contribute to the prosperity of Japanese economy and the improvement of the national life depending on the establishment and the deployment promotion regarding utilization of the technology of photovoltaic solar power generation system. Moreover, in order to achieve this objective, the business is achieved in compliance with the applicable laws and regulations via:

1. Investigation, research and obtaining statistics about production, distribution, use, and trade on photovoltaic systems
2. Offering proposals and opinions to the related organizations, and others. concerning promotion of photovoltaic systems
3. Research in standardization concerning photovoltaic systems
4. Promotion of mutual interchange among members, collaboration with related domestic agencies and international, and promotion of international cooperation concerning photovoltaic systems
5. Holding symposiums and seminars about photovoltaic system's market trend, technological development, and use, etc.
6. Publicity and enlightenment concerning photovoltaic system

## ■ 128 Members (Private companies/Groups)

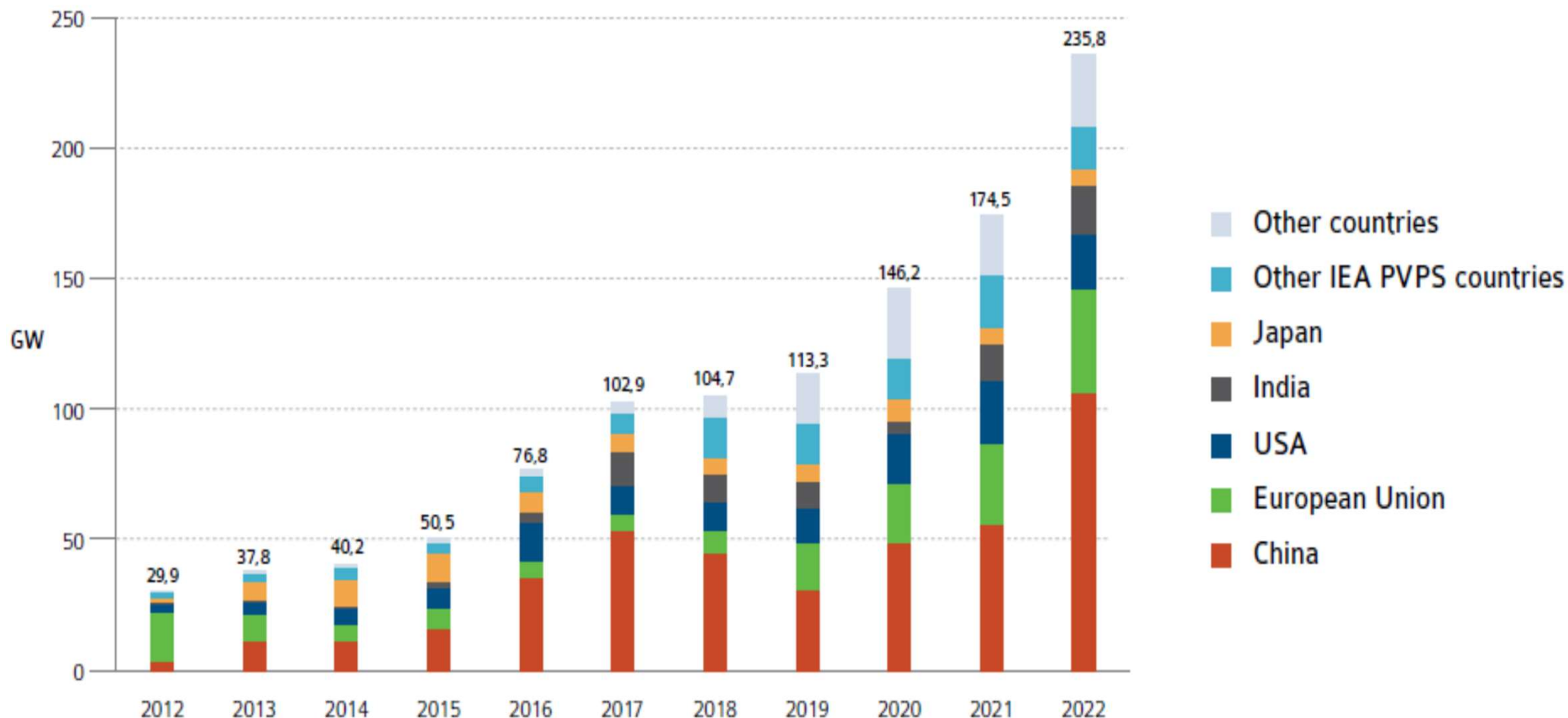


# Spectacular growth of Global Solar PV Market

■ New capacity addition in 2022 was 236GW<sup>※</sup><sub>DC</sub> (日本の最大電力需要の1.5倍程度)

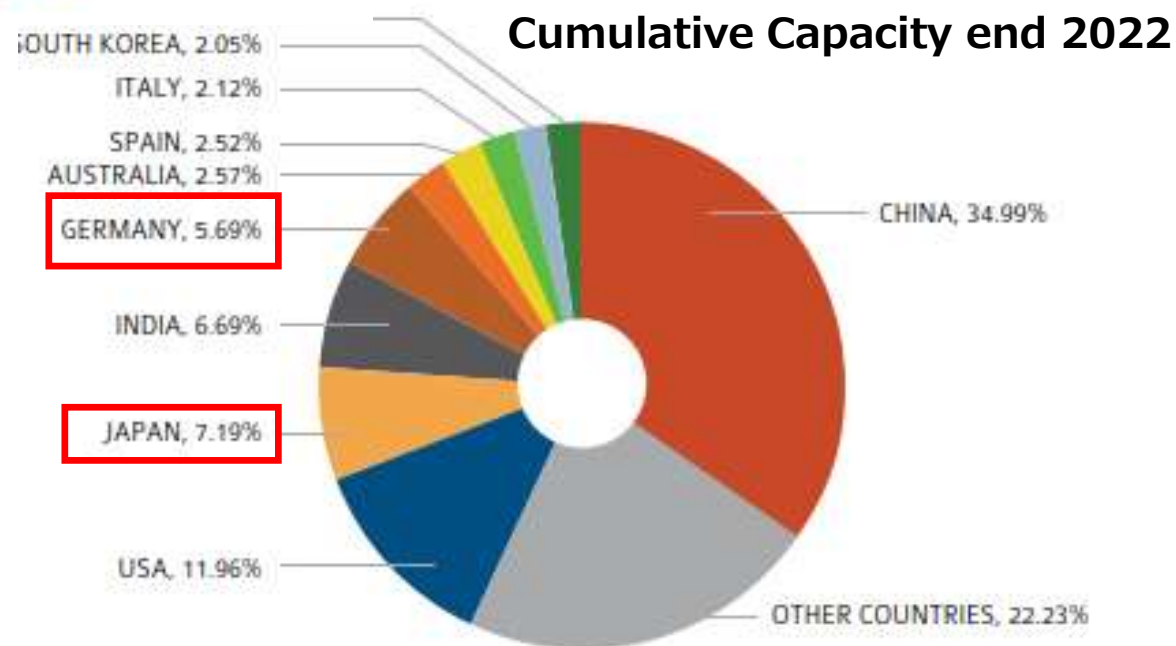
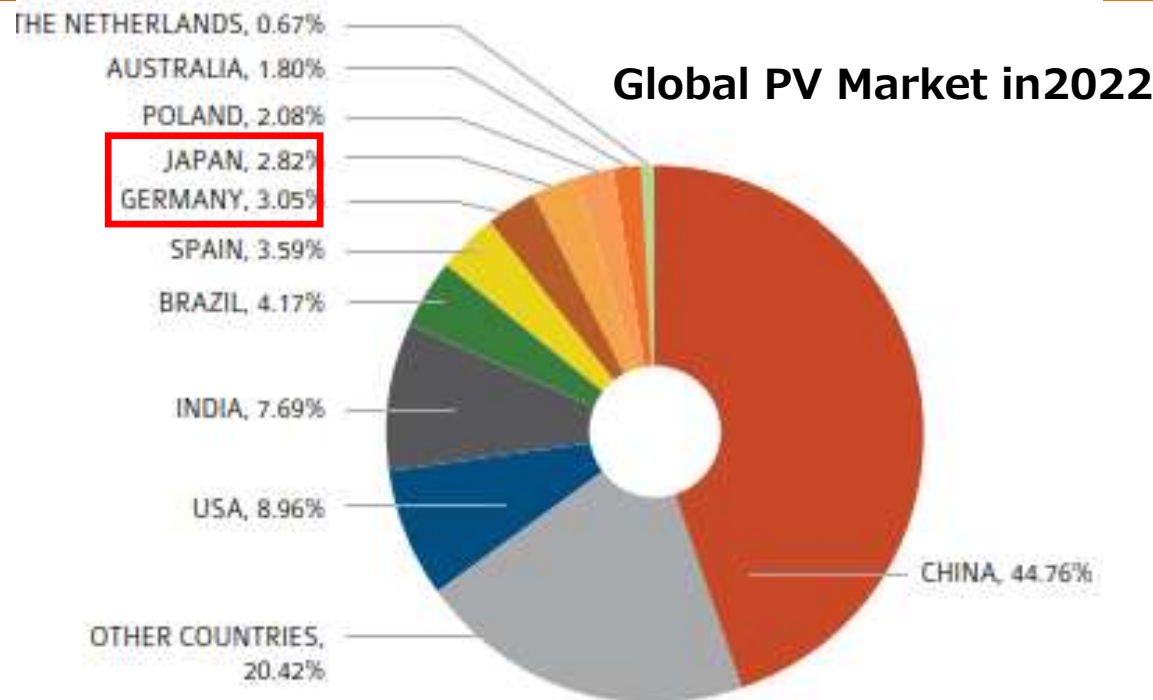
※：容量の単位：GW（ギガワット=100万kW）、GW<sub>DC</sub>は直流出力（太陽電池モジュールの合計出力）  
出所は国際エネルギー機関（IEA PVPS）

## New Capacity Additions (GW<sub>DC</sub>)



Source IEA PVPS & Others

# Japan's' share in the Global PV Installed Capacity

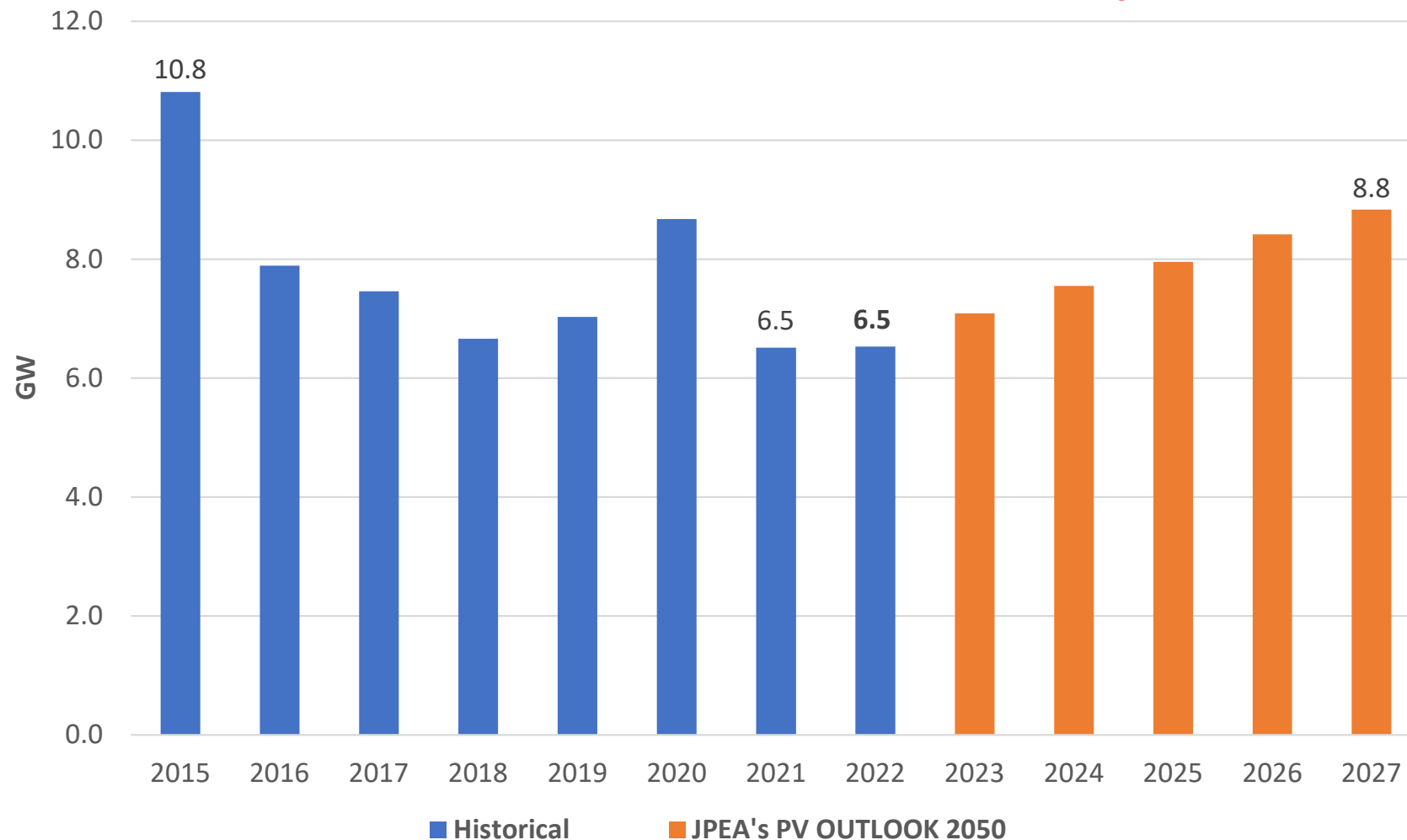


Source IEA PVPS & Others

# Overview of PV developments in Japan

- Japanese PV market has been on a downtrend following the reduced FIT support
- The cumulative installed capacity at the end of 2022 reached some **85 GW<sub>DC</sub> (69GW<sub>AC</sub>)**
- Even with the reduced FIT support, Japan's PV market is expected to start trending upward again from 2023, due to the growth in residential and industrial rooftop markets, and new corporate renewable Power Purchasing Agreement (PPA) models.

Japanese Solar PV Market Scenario 2023 - 2027 (**GW<sub>DC</sub>**) by JPEA

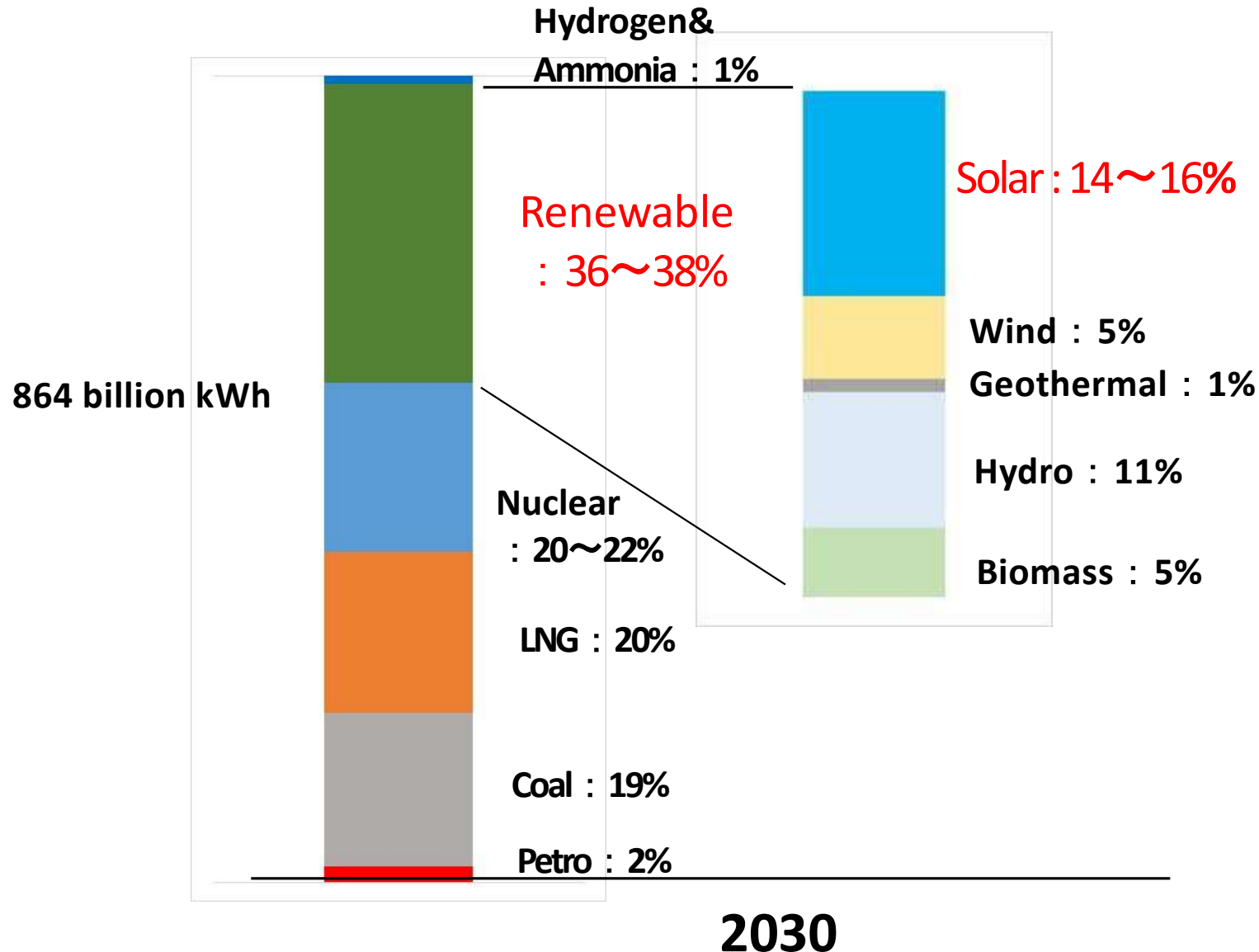


# Renewable Energy Target by the government (METI) towards 2030



- Increase the renewable energy part of the electricity generation mix to **36-38%** by 2030 to meet the carbon reduction target of **46%** by 2030.

## Power generation mix in 2030

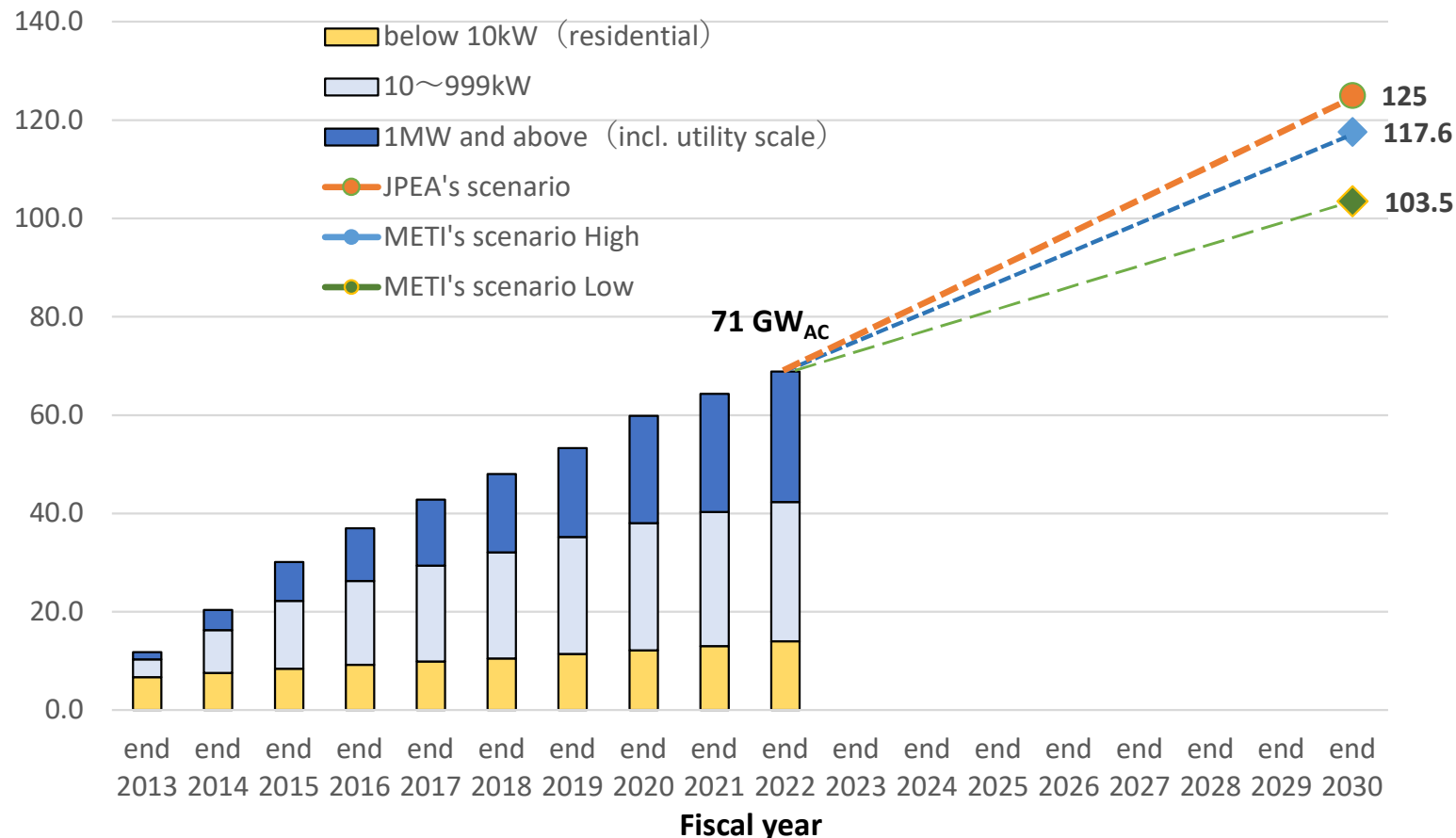


# Japanese Solar PV targets towards 2030



- Cumulative installed capacity at end fiscal year 2022 : 71GW<sub>AC</sub> (87GW<sub>DC</sub>)
- The government's Solar PV target: 103.5GW<sub>AC</sub> to 117.6GW<sub>AC</sub> (129GW<sub>DC</sub> to 147 GW<sub>DC</sub>) by 2030 in METI's ambitious scenario.
- Japan Photovoltaic Energy Association's (JPEA's) scenario (PV OUTLOOK 2050): 125GW<sub>AC</sub> ( 154 GW<sub>DC</sub>) by 2030. This ambitious target means around 7GW<sub>AC</sub> (8.6GW<sub>DC</sub>) solar PV will have to be installed every year until 2030.

Solar PV Targets towards 2030 (GW<sub>AC</sub>)

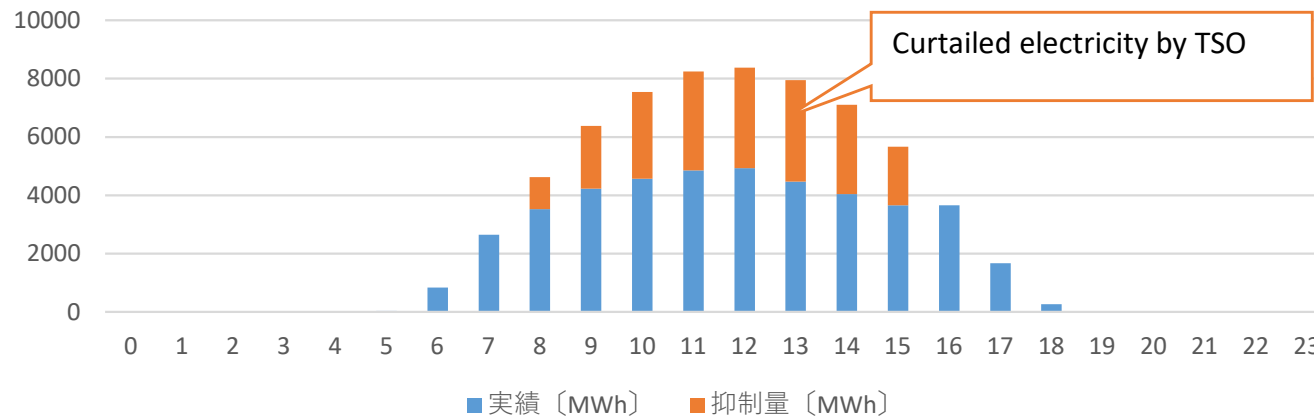


- **The FIT scheme** has been the strongest driver of solar growth in Japan since its introduction in July 2012. However, the relevance of this FIT scheme has decreased, and a more market-oriented **Feed in Premium (FIP)** has been introduced in April 2022.
- The '**self-consumption business model**' for commercial and industrial users is growing rapidly in Japan. On-site, self-consumption PV systems are becoming more attractive to business users, as the LCOE of PV power generation is already competitive with the retail electricity prices of commercial and industrial users.
- An additional driver to solar growth stems from policies setting **PV mandates for new buildings**. The Tokyo Metropolitan Government, and Kawasaki City, will make it mandatory to install PV systems on new buildings, including detached houses, starting in 2025. If similar installation mandates spread to municipalities across the country, the PV market, especially residential rooftop, will expand significantly.
- In addition to the needs of renewable energy users, **the PPA model** is beginning to gain traction in the Japanese PV market, driven by government subsidies and rising electricity prices.

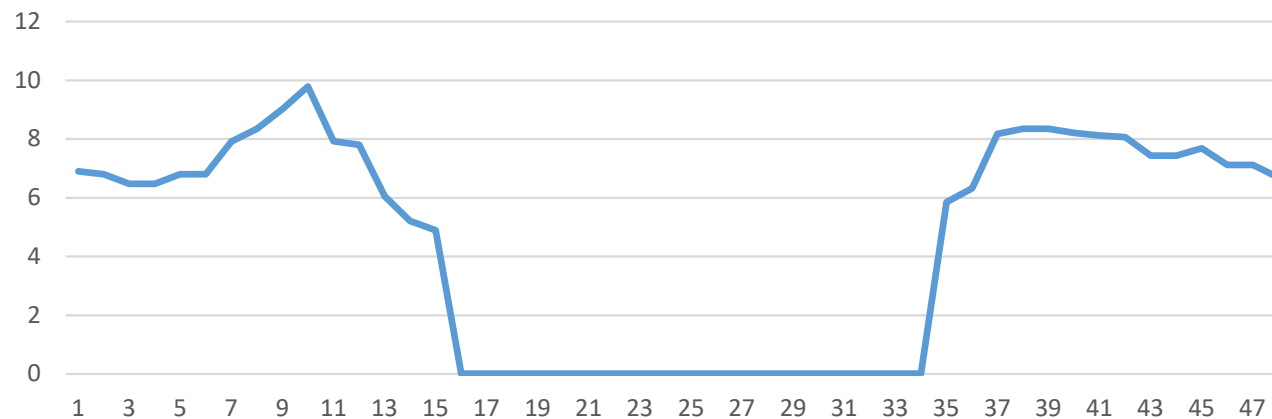


- **Smooth transition from FIT to FIP:** FIPs were introduced in 2022 as a mandatory incentive mechanism for large-scale solar PV (500 kW and above from 2023), and optional for distributed solar PV (50 kW – 500 kW from 2023). One of the biggest challenges for the industry and for policymakers is the smooth transition from FITs to more market-oriented FIPs.
- **Business model transformation:** The role of FIT/FIP will gradually shrink in the coming years. With the emergence of **PPA type business models**, this decade will see the transition towards a market growth with little reliance on the FIT/FIP regime.
- **Grid constraints:** Limited grid capacity and curtailment risks are the primary causes for the downward market trend in Japan. METI has taken several mitigation measures to maximise grid capacity with existing assets, such as the '**Connect and Manage**' programme for transmission and distribution grid levels. Moreover, METI has developed the long-term grid expansion programme to accommodate large amounts of renewable energy.
- **Land availability:** New business models without dedicated land space (e.g., on-site self-consumption models), and **utilisation of unused/abandoned farmland** are a solution to the limited land availability problem. To date, conversion of unused/abandoned farmland to solar farms is very limited as it requires strict legal procedures, and the local authorities' permission. The government is now tackling those constraints by reforming existing laws and regulations.

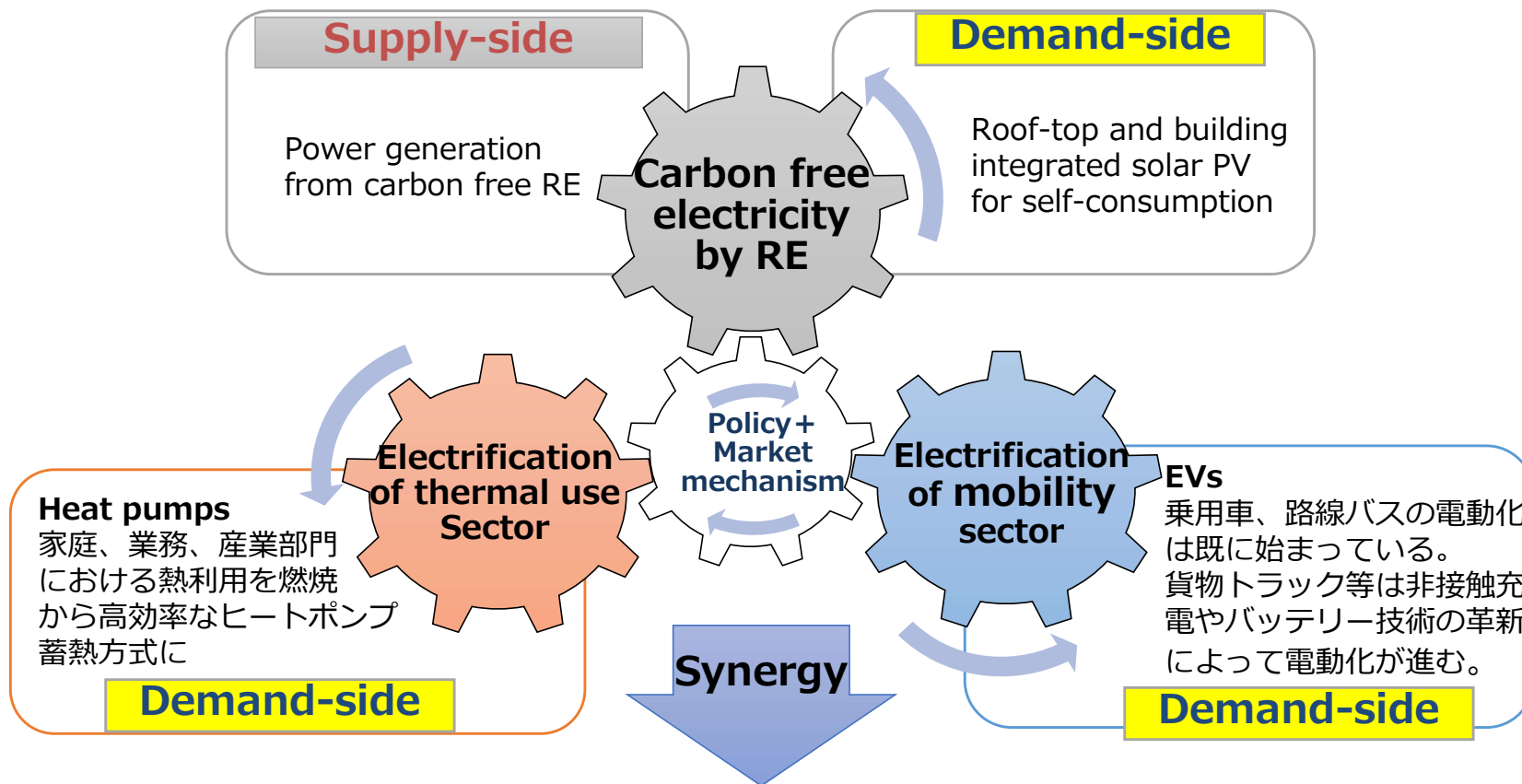
Curtailment of Solar PV in Kyushu Area  
3<sup>rd</sup> May 2021



Spot market prices in Kyushu Area  
3<sup>rd</sup> May 2021



- 電力供給、熱利用、運輸の3つのセクターにおいて高効率化と脱炭素化を一体的に推進。
- 再生エネルギー由来電気の需要が増大し、同時に出力変動を吸収する蓄エネルギー能力が飛躍的に向上。
- 需要側のありとあらゆる場所に設置できる太陽光発電は、「Sector coupling **セクターカップリング**」の推進、そして「Integration of supply-side and demand-side **需給一体型のエネルギーインフラ**」の要となり得る。



**需要側と供給側が一体となって**  
「脱炭素化」 「エネルギー利用効率自給率の大幅な向上」  
を同時達成

## Car parking area of University of Miyazaki





University of Miyazaki  
Faculty of Engineering

## Wall-mounted PV 壁面太陽電池

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Performance evaluation and spectrum-based analysis of a wall-mounted photovoltaic system for zero-energy building



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(a) Wall-mounted Si PV system and (b) 20° tilted Si PV system. Both systems were installed facing south at the University of Miyazaki.

## Wall-mounted PV (University of Miyazaki)

### ZEB 壁面太陽電池



University of Miyazaki

Before 設置前

南面  
South



東面  
East



西面  
West



After 設置後



## Agrisolar with vertically mounted solar PV



Dairy farming in Hokkaido  
(Rakuno Gakuen University)  
By SHIZEN ENERGY Inc.

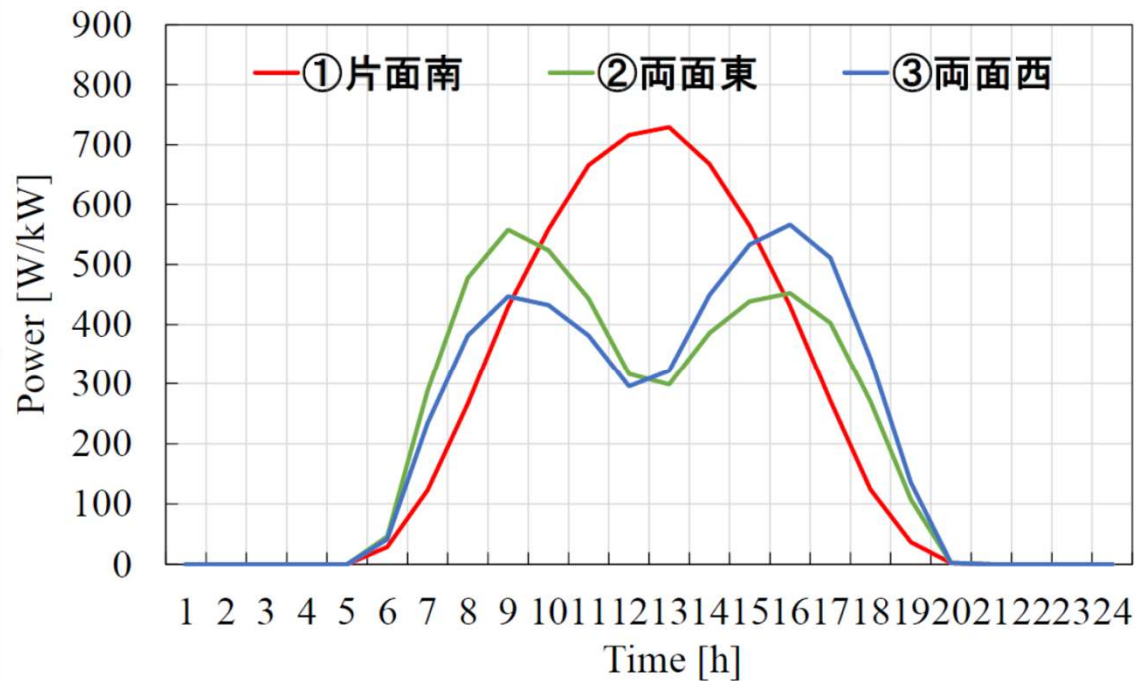
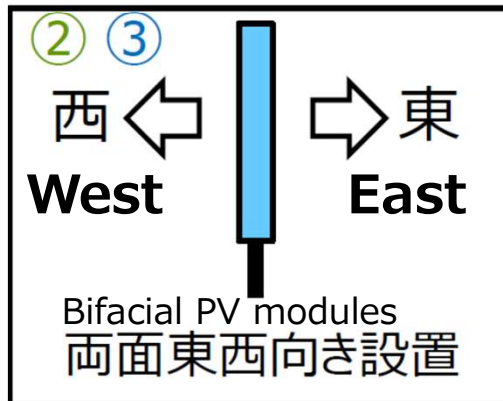
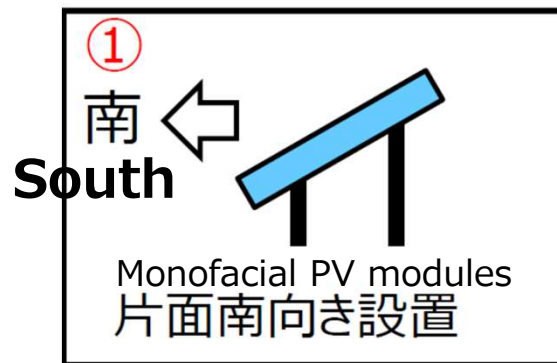


Rice field pilot project in  
Miyagi prefecture  
By SHIZEN ENERGY Inc.

## Application of bifacial PV modules for vertical-mounting

### 対象設置ケース

- ① **片面** PV **南** 向き (一般的な設置方法) (略: **片面南**)
  - ② **両面** PV **東西** (**表面東**) 向き (略: **両面東**)
  - ③ **両面** PV **東西** (**表面西**) 向き (略: **両面西**)
- (両面PV: 裏面の出力は表面の70%)

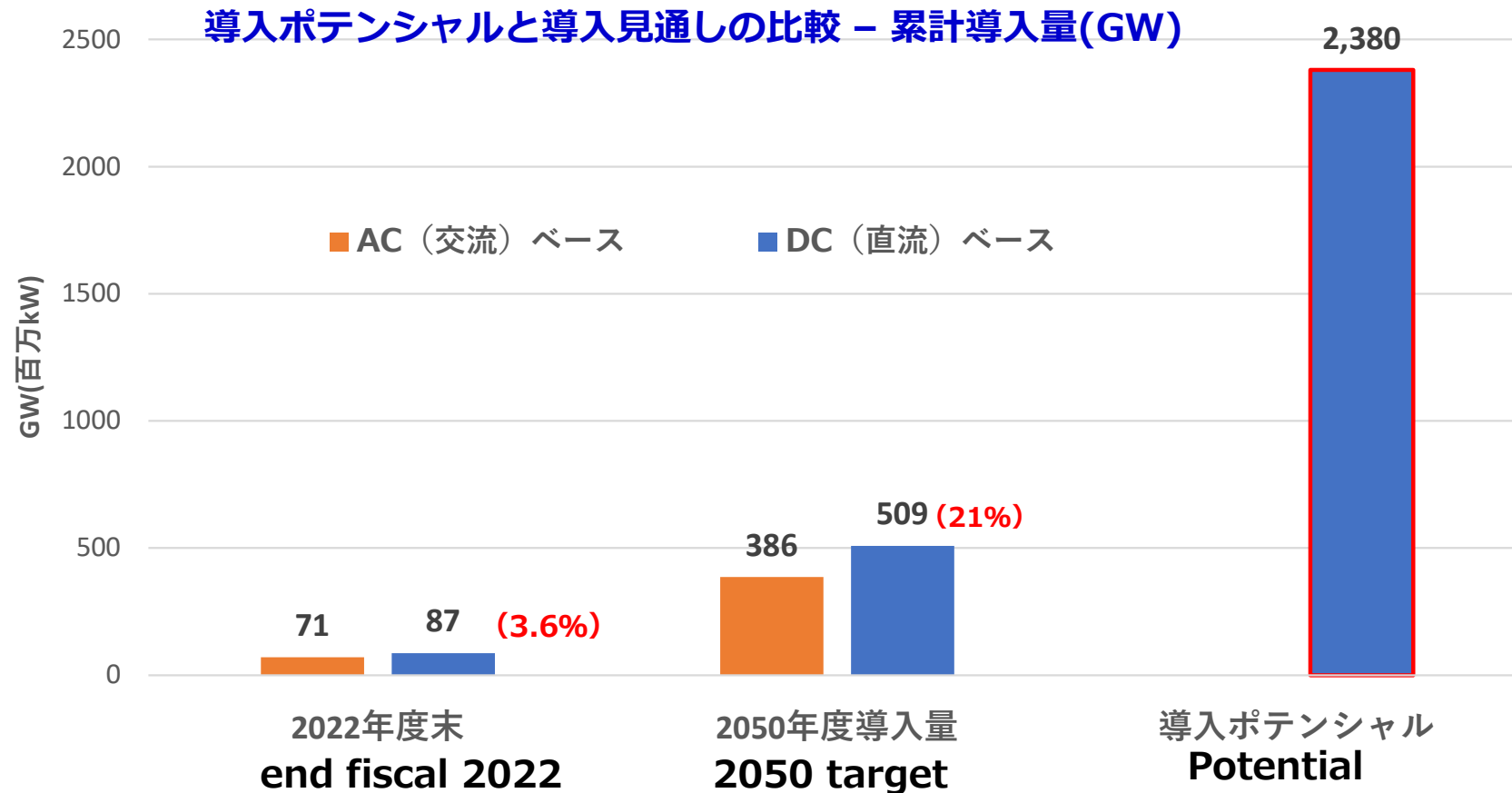


各ケースのPV出力曲線



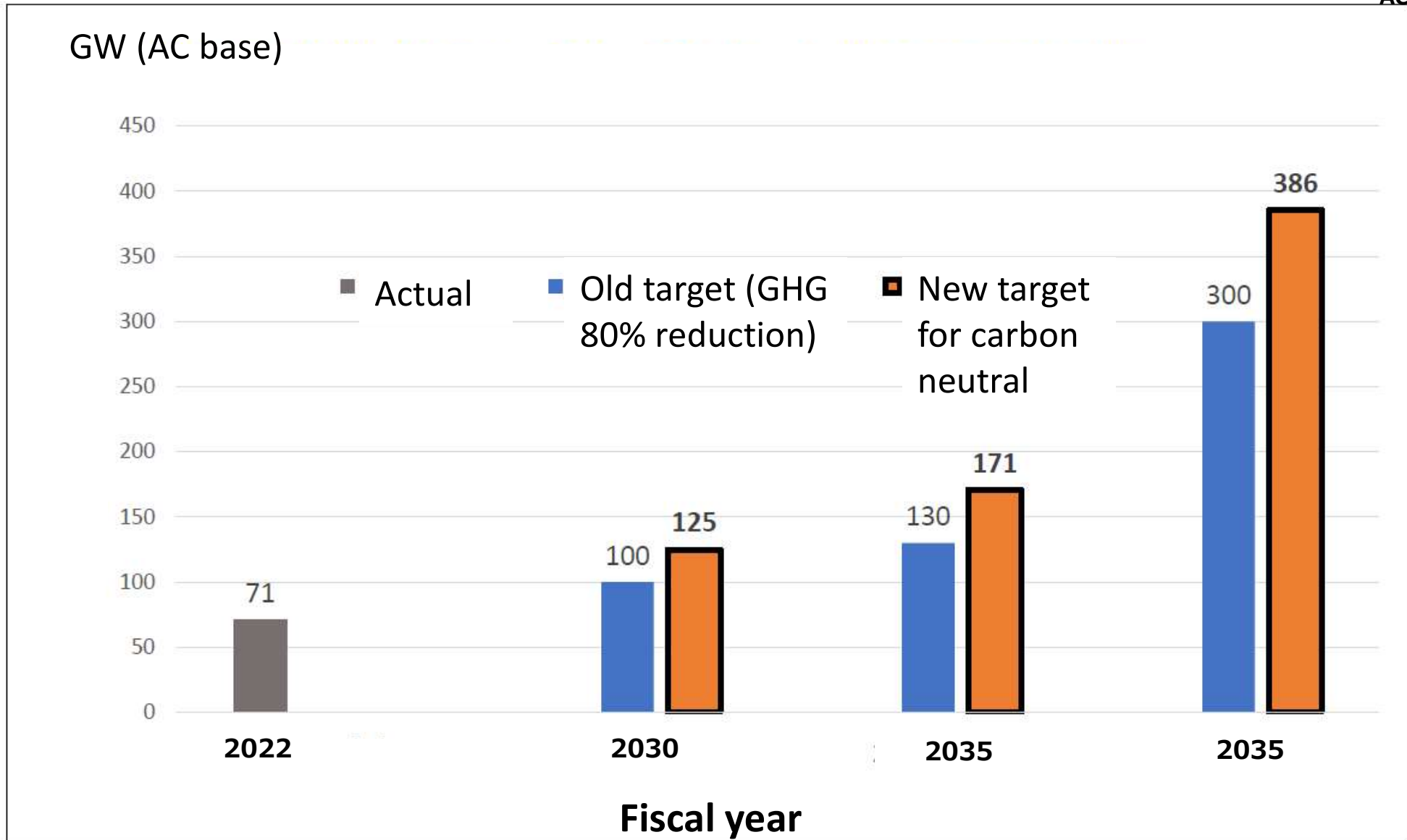
- Solar PV potential in Japan : **2,380GW<sub>DC</sub>** (国内の電力需要の2倍程度か?)
- Installed capacity end fiscal 2022 : **87GW<sub>DC</sub><sup>※1</sup>** is **3.6%** of the potential.
- **2050 target 509GW<sub>DC</sub>** is **21%** of the potential.

## Potential vs. 2050 Target



※ : IEA (国際エネルギー機関) 公表のデータに基づきJPEAが試算。GW (ギガワット=100万kW)、GW<sub>DC</sub>は直流出力 (太陽電池モジュールの合計出力)

Unit : GW<sub>AC</sub>



# PV installation prospects (new targets by JPEA) to achieve carbon neutral by 2050



大分類	中分類	導入場所	2025	2030	2035	2040	2045	2050
建物設置	residential	戸建住宅	18.8	28.8	41.6	57.1	74.4	90.0
		集合住宅	3.6	9.3	13.5	14.8	15.1	15.1
		BIPV (住宅)	0.0	0.1	0.3	1.3	4.1	7.8
	Non residential	商業系建築物	0.4	1.1	1.5	1.7	1.7	1.7
		公共系建築物	2.1	8.1	15.0	17.6	18.1	18.2
		産業系建築物	6.1	15.7	22.7	24.9	25.4	25.5
		その他建物	2.8	4.3	6.4	9.5	14.1	19.7
		BIPV (非住宅)	0.0	0.1	0.6	3.1	13.2	29.4
地上設置	Ground mounted	施設用地	14.2	14.2	14.2	14.2	14.3	14.3
		駐車場	9.6	9.6	9.6	9.6	9.6	9.6
		道路関連施設	3.1	3.1	3.1	3.1	3.1	3.1
		空港関連施設	2.3	2.3	2.3	2.3	2.3	2.3
		鉄道関連施設	1.5	1.5	1.5	1.5	1.5	1.5
		公園・山林等	4.4	4.4	4.4	4.4	4.4	4.4
	Agri solar	耕作地	0.6	1.5	3.6	8.3	18.9	39.7
		荒廃農地	16.0	19.9	24.5	30.1	37.0	44.3
		その他農地	0.0	0.3	3.1	13.8	20.0	20.7
	Floating solar	水上空間等	0.2	0.7	1.9	5.1	12.5	24.0
その他設置形態	その他設置形態	EV車両	0.0	0.1	0.6	2.7	8.9	14.7
合計			85.7	125.0	170.5	225.2	298.7	386.2

Unit : GW<sub>AC</sub>

Thank you !

ありがとうございました