Green Energy & Energy Storage Development and Policies in Taiwan

Taiwan Electrical and Electronic Manufacturers’ Association

Dec 05 2019 Joseph Cheng
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Part ONE

Brief Introduction of TEEMA
**Brief Introduction of TEEMA**

**About TEEMA**
- TEEMA stands for Taiwan Electrical and Electronics Manufacturers’ Association
- Founded in 1948
- About 3,006 members with a total of about 783,430 employees

**Our member**

With more than 3,000 members, categorizing by products into 16 categories including communications, semiconductors, optoelectronics, consumer electronics, electrical devices and apparatus, and etc.

- 2,169 SME (Capital below US$2.54Million)
- 844 Large Enterprises (Capital above US$2.54Million)
With more than 3,000 members, categorizing by products into 16 categories including communications, semiconductors, optoelectronics, consumer electronics, electrical devices and apparatus, etc.

### Industrial Performance

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Production Value</th>
<th>Export Value</th>
<th>Import Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taiwan</td>
<td>US$490,412.89</td>
<td>US$336,050.27</td>
<td>US$286,655.43</td>
</tr>
</tbody>
</table>
Part TWO

Forward-looking Infrastructure Development Program: Green Energy
Energy Transformation Strategies, Goals, and Methods

- **Nuclear Energy Elimination** → **Increase Renewable Energy rate** → **Renewable energy output smoothing**
- **Demand Management, Reduce consumption** → **Reduce 5% of the peak load** → **Peak load shifting demand response**
- **Stable power supply** → **Increase 5% of the Operating Reserve Rate** → **Storage to Replace Operating Reserve**
4 Major Spindles of Green Energy Construction

Photovoltaics (PV)
The “Two-year Solar PV Promotion Plan” has been helping the industry in development of high efficiency, low-cost component technology.

Wind Power
Establish underwater foundations and heavy wharf for wind power development, such as the Kaohsiung Marine Technology Industry Innovation Zone and the Taichung Port Offshore Wind Power Industry Zone.

Shalun Smart Green Energy Science City
With the goal of constructing an innovative green energy industry ecosystem, building a green energy technology industry platform and related plans to drive the development of Taiwan's green energy industry.

Smart Innovative Energy Saving
Promote the construction of low voltage smart meters: Implement the proper electricity pricing plan, save energy and reduce the peak load, expand the performance of the smart meters.
Expectations of Green Energy Construction

**Transformation:**
Strengthen energy security, with the goal of 20% renewable energy ratio, innovate green economy, and promote environmental sustainability and social equity.

**Industry:**
To make Taiwan an important base for the development of green energy industry in Asia, and act as an essential role in global green energy industry within 5 to 10 years.

In response to the advent of the green economy era, Taiwanese government is promoting the green energy construction, with the goal of nuclear energy elimination and industrial innovation, while attracting top international manufacturers to invest in Taiwan, and combining local potential manufacturers to enhance the future competitiveness of Taiwan's industry.
Energy Issues and Development Program

Part THREE
Transformation Issues

- Increase the proportion of renewable energy supply, reduce or stop nuclear power generation.
- Using gas instead of coal for thermal energy generation, reducing carbon emission and air pollution.
- Power grid intellectualizing and decentralizing, reducing the risk of large-scale power outages.
- Combining supply and demand management to improve use efficiency.
- Open up the power trading market and create an innovative business model.
Development Program

Development Goals:
Balanced development of green economy, environmental sustainability and social equity, achieve the goal of nuclear energy elimination in 2025 to sustain energy development.

Energy Safety:
Effectively apply various energy according to their advantages, in order to build a stable, affordable and low-risk energy supply and demand system.

Green Economy:
Strengthen the all-directional development of energy conservation, energy creation, energy storage and intelligent system integration. Combine the advantages of regional resources and talent, motivate the green economy.

Sustainability:
Improve the air quality, deploy energy facilities, complete the back-end disposal of nuclear power generation and build a clean energy system.
Key Policy Actions

Part FOUR
The 4 Major Spindles of Green Energy Construction

1. Energy Creation
   Energy creation refers to the use of renewable energy such as solar energy, wind energy, biomass energy and geothermal energy for power generation. Upgrading the development of energy creation technology-related industries by developing new energy technologies.

2. Energy Conservation
   Energy-saving technology research and development planning, create energy-saving, sustainable industries according to the construction of smart cities and policies.

3. Energy Storage
   In response to the government’s policy and the demand of the development of green energy industry, using the battery technology research and development platform to improve the battery industry technology, establish energy storage system verification and audit regulations.

4. Smart System Integration
   Integrate power management of smart homes, commercial buildings, factories, etc. to provide demand response and achieve the goals of energy-saving.
# Energy Transformation Plan

## Renewable Energy Installed Capacity

<table>
<thead>
<tr>
<th>Energy</th>
<th>2016</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Photovoltaics</td>
<td>1,342</td>
<td>8,776</td>
<td>20,000</td>
</tr>
<tr>
<td>Onshore Wind Power</td>
<td>747</td>
<td>1,200</td>
<td>1,200</td>
</tr>
<tr>
<td>Offshore Wind Power</td>
<td>8</td>
<td>520</td>
<td>3,000(5,500)</td>
</tr>
<tr>
<td>Geothermal Energy</td>
<td>1</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>Biomass Energy</td>
<td>742</td>
<td>768</td>
<td>813</td>
</tr>
<tr>
<td>Hydropower</td>
<td>2,089</td>
<td>2,100</td>
<td>2,150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,929</td>
<td>13,514</td>
<td>27,363(29,923)</td>
</tr>
</tbody>
</table>
Part FIVE
Green Energy Technology Industry Innovation Promotion Program
Solar Photovoltaics:
A. Duration and objectives:
Photovoltaics cumulative capacity to reach 20 GW in 2025, with an expected annual power generation of 25 billion kWh.
B. Background:
To achieve the goal of nuclear elimination in 2025, using photovoltaics according to the renewable energy application of our industry foundation, increase the green energy efficiency.
C. Programs:
1. Two-year Solar PV Promotion Plan
2. Green Energy Roofs project
3. Expand the checking of idled lands
Promotion Program

Wind Power:

A. Duration and objectives:
The cumulative capacity to reach 1.2 GW for onshore wind power and 5.5 GW for offshore wind power in 2025, total 6.7 GW.

B. Background:
We have excellent wind power resources in the western coast of Taiwan and the Taiwan Strait. Wind power is one of the most economically viable renewable energy.

C. Programs:
1. Four-Year Plan of Promotion for Wind Power
2. Regulatory Coherence
3. Infrastructure construction
4. Environment and ecosystem protection
Promotion Program

Smart Power Grid

A. Duration and objectives:
Complete 24,000 (about 86%) power grid distribution in 2020, automation switch device upgrading, and complete 303 (about 50%) substation intelligentization.

B. Background:
In line with the energy transformation policy, promote key projects including transmission and distribution automation, smart meter system infrastructure, and micro-grid technology development to achieve long-term renewable energy development goals.

C. Programs:
1. Promote automation of power transmission and distribution: distribution automation, and substation intellectualization.
2. Building smart meter system infrastructure.
Promotion Program

Shalun Smart Green Energy Science City

A. Duration and objectives:
With the four major spindles which are energy conservation, energy storage, energy creation and smart energy-saving, to promote the research and development of advanced energy technology research and its application, focusing on the front-end green process equipment and the innovative application of the back end.

B. Background:
Based on the integration of energy creation, energy conservation, energy storage and smart systems, strengthen the features of industrial research village with the Joint Research Center for Green Energy Technologies. Combining Green Energy Technology Demonstration Site and universities, research institutes, exhibitions and commercial areas, to establish the green energy industry network and the estuary.

C. Programs:
Joint Research Center for Green Energy Technologies （Ministry of Science and Technology）
Green Energy Technology Demonstration Site （Ministry of Economic Affairs）
Energy Storage System Application Effect

- Energy Market Arbitrage
- Provide Assisting Service
- Reduce the Assisting Demand
- Reduce the Cost of Electricity Production
- Reduce Power Generation Investment
- Delay Transmission and Distribution System Investment
- Increase User Reliability
- Improve Electricity Quality
- Integrate Intermittent Renewable Energy
- Reduce the Usage of Traditional Power Generation Equipment
- Increase User Reliability
- Improve Electricity Quality
Part SIX

The Trend of Household Energy Storage Industry
The Trend of Household Energy Storage Industry

- The market demand for global energy storage batteries is about 6GWf per year.
- Household energy storage is starting to grow, relying on the national policy subsidies.
- Japan continues to provide subsidies to stimulate general household energy storage.
- Germany has a subsidy policy to improve the efficiency of renewable energy use.
- As an emerging, Taiwan may consider combining local enterprises to seize the business opportunities.
Part SEVEN

Introduction of Successful Case Studies
Case Study—Tatung Co., Ltd.

1949-2000
Power Equipment Provider

1949
Industrial Motor

1955
Mechanical Meter

1967
Switch Gear

1974
Amorphous Transformer

2000
Smart Meter

2004

2018

2000-2019
Smart Energy Solution Provider

- Smart Metering
- Building/Campus EMS
- Substation Turnkey Solution
- Power Plant Turnkey Solution

At Present

1950
Power Transformer

1966
Power Cable

1974
Generator

2000
Substation Turnkey System

2018
MW Scale Energy Storage System

- Solar System
- Micro Grid System
- Big Data and AI Application
- MW Scale Energy Storage
Products & Solutions – Smart Energy Company

- Electronics and Appliances
- Motor and Diesel Generator Set
- Industrial Appliance
- Wire & Cable

Smart Energy

Solution

System

Service

Sustainability

Smart Grid

Electro-Mechanical Systems

Smart Solutions

Information System
Micro Grid System in Tatung

**Part 7**

### Household
Tai-Tung Mountain, Taiwan

- **2.5kW PV**
- **1.5kW Wind**
- **15kWh ESS**
- **Support Lighting and Comm. Electricity**

**Facture:**
- 獨立型風光互補
  Integration of PV and wind energy without utility’s grid

### Disaster Prevention
Wulai District, Taiwan

- **18kW PV**
- **60kWh ESS**
- **Support Emergency and Living Electricity**

**Facture:**
- 防災型不斷電系統
  Uninterruptible Power System for Disaster Prevention

### Village
Guan-Tai Wetland, Taiwan

- **78kW PV**
- **10kW Wind**
- **159kWh ESS**
- **Load Shedding**
- **Forecasting**
- **Islanding Operation**

**Facture:**
- 村莊級離島運轉
  Village-based Islanding Operation
- 2015 APEC銀質獎
  2015 APEC ESCI Silver Medal

### Island
Chi-mei Island, Taiwan

- **355kW PV**
- **Smart PV Inverter**
- **Autonomous Control**

**Facture:**
- 2018 智慧城市展創 新應用獎
  2018 Innovation Award
- 智慧型變流器導入
  Smart PV Inverter

### Island
Itu Aba Island (Taiping Island)

- **160kW PV**
- **612kWh ESS**

**Facture:**
- 節省柴燃油資成本
  Reduce Fossil Fuel

### Water and Electricity
Dubai

- **20kW PV**
- **84kWh ESS**
- **200L Water Generator**

**Facture:**
- 獨立型水電結合
  Integration of Water and Electricity Resource
- 2016系統整合獎
  2016 System Integration Award

### MW Scale
Kaohsiung, Taiwan

- **1.2 MWh ESS**
- **Smoothing**
- **Stable Output**
- **Voltage Regulation**
- **Frequency Regulation**
- **Reducing Reverse Power**
- **Scheduling**

**Facture:**
- 台灣第一座MW等級儲能系統
  First MW Scale Energy Storage in Taiwan
TECO Systems and Services

Intelligence Appliances with I-cloud

Features:
✓ Remote control management through phones and tablets
✓ Energy conservation visualization

Smart Building Energy Management (EMS System)

Features:
✓ Building up energy expense devices by utilizing distributed control and central management

AC Integration Service

Features:
✓ In line with the energy-expense-centered idea to set up services and offer overall solution programs
✓ Offer product diagnostic analysis and remote maintenance and monitoring system (RMMS)
THANKS
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