

Commercialization Progress and Future Vision of Residential Fuel Cell "ENE-FARM" in Toshiba

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Under a remarkable governmental program, Large Scale Monitoring Program by METI in FY2005 through FY2008, Japanese industrial parties jointly installed more than 3,300 systems in usual Japanese houses, verified its effectiveness as eco-friendly products and ensure enough reliability for future commercial product. The parties also prepared manufacturing readiness, and also established sales and maintenance capability, especially by energy companies and systems manufacturers during the program. Many components manufacturers also showed their contributions in providing their products with higher reliability and attractive price.

After the program, Japan started the commercialization of residential fuel cell in FY2009 with its standard name, "ENE-FARM". Since then, 40,000 units were already installed and being operated in Japan as of the end of FY2012 as shown in Fig. 1.

In this trend, Toshiba Fuel Cell Systems Corporation (TFCP), as one of ENE-FARM system manufacturers, has been successfully promoting and expanding its business. The first generation unit, TM1-Z, were delivered in FY2009 and reached its accumulated volume to be around 8,000 through FY2011.

Succeeding to it, the second generation unit was delivered in FY2012 with the name of TM1-AD (Fig.2). The further product improvements were achieved in TM1-AD development mainly related to the following factors. They offer more attractive ENE-FARM with expecting larger market.

- Lower cost: As the most important factor for TM1-AD, every effort was devoted in the development with the concept of "REDUCE"
- Higher performance: While reducing the cost, total efficiency of the system, which was 85% by TM1-D, was enhanced to 94% with 38.5% of electrical efficiency.
- Longer Durability: Integrating of material improvement and component modification, 80,000hrs of cell stack life was estimated in real field condition.

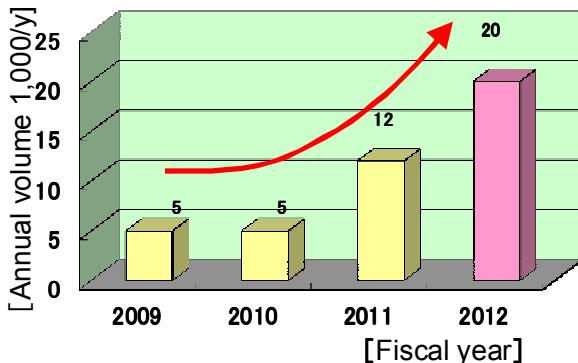


Fig. 1 Annual Trend of ENE-FARM Dissemination
*Installation basis estimated by TFCP



Fig.2 Outlook of Toshiba ENE-FARM "TM1-AD"

The wider variety in the application or option is also the key to lead ENF-FARM to be a more attractive and flexible product for end customers. Grid independent capability, an option newly added into TM1-AD, is expected to enhance the energy security for individual houses. Fig.3 explains the outline of this option. It is also suggested that the tolerance to various fuel properties, flexibility for both outdoor and indoor installation, and capability for cold area are important factors for such the variety. In addition, system integration of ENE-FARM into HEMS (Home Energy Management System) will be also one possibility and attractiveness for future smart houses. With the newly developed ENE-FARM, TM1-AD, TFCP delivered higher than 10,000 units as the business results in FY2012.

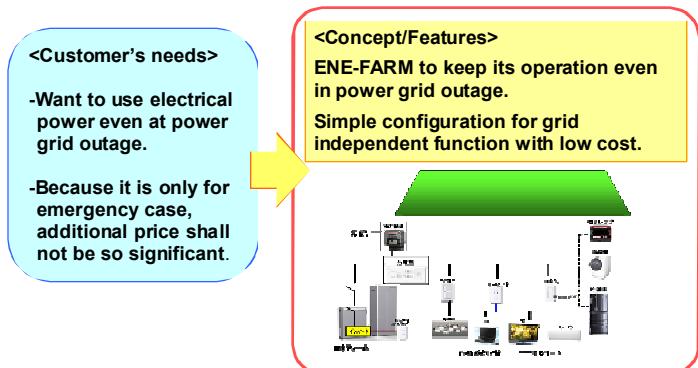


Fig.3 Outline of Grid Independent (GI) Option

It is noted that the successful result of today's Japanese commercialization on residential fuel cell has been based on strong leadership and support by Japanese government, especially METI, and also aggressive collaboration within fuel cell industries. TFCP will promote the business activities on ENE-FARM toward the next stage, which will be real commercialization phase, with further technology innovation/ improvement for ENE-FARM itself, preparation of wider application, and also foreign business challenge.