

TOSHIBA
Leading Innovation >>>

**Development and Commercialization
of Toshiba ENE-FARM***

* ENE-FARM is the standard name of 1kW class residential fuel cell in Japan



November 15, 2011
Toshiba Fuel Cell Power Systems Corporation

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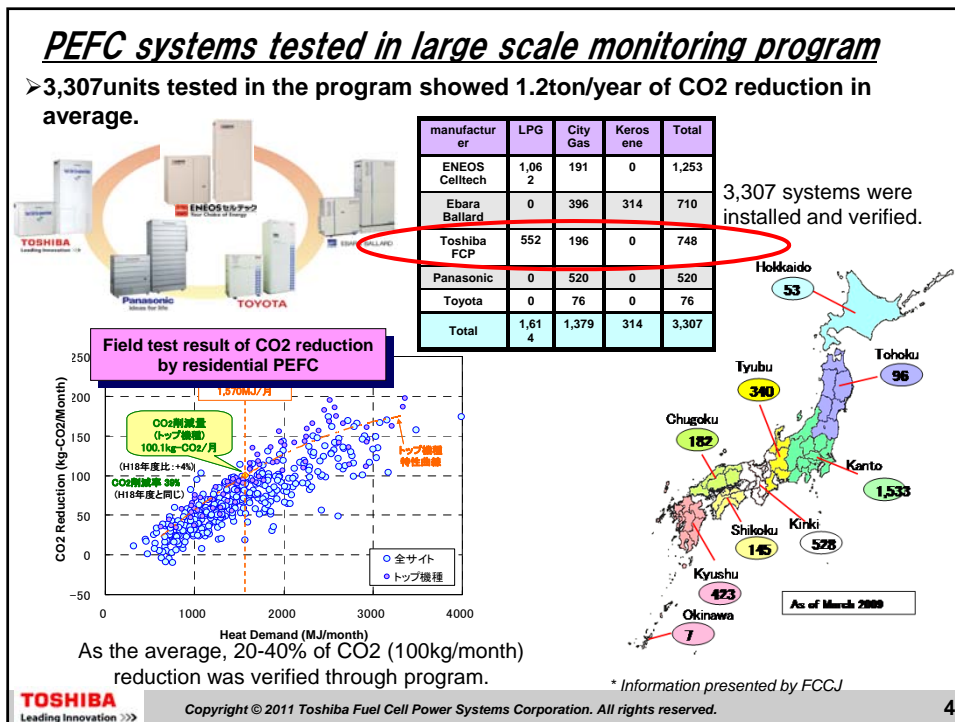
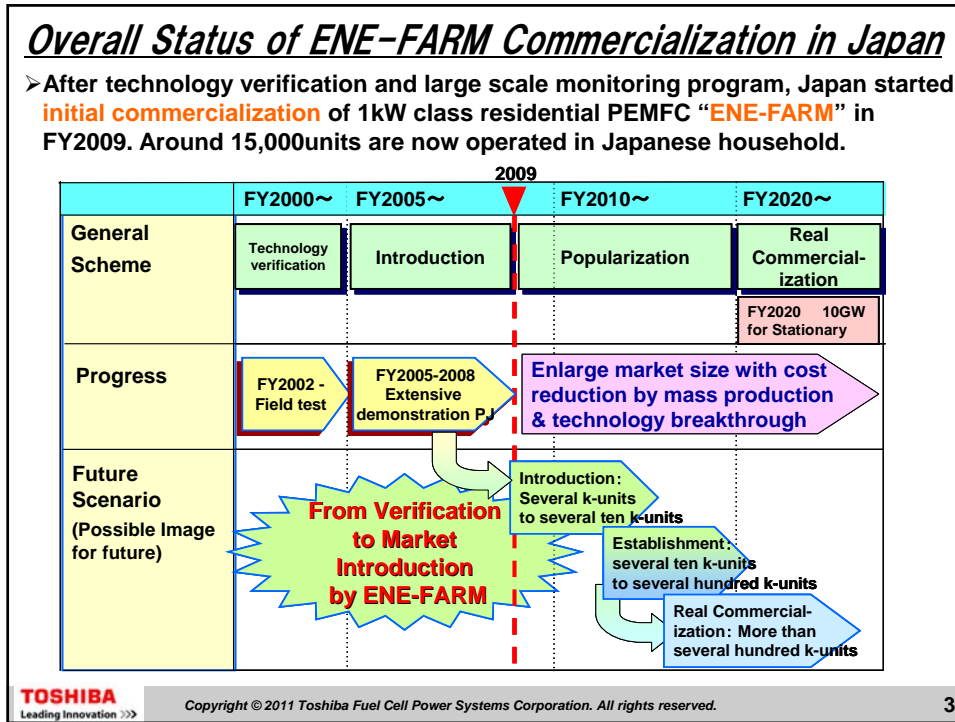
Contents

- 1. General status of residential FC dissemination in Japan**
- 2. Development and commercialization activities in Toshiba**
- 3. Future Scope**

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2



“ENE FARM” Commercialization started

- Commercialization for domestic market started in FY 2009.
- Residential fuel cell CHP system is named “ENE FARM”
(Unified product name of Japanese companies.)
- Governmental subsidy to end-users for “ENE FARM” Promotion.



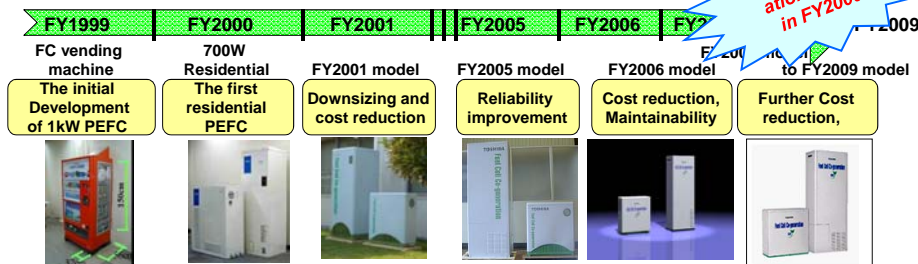
Joint declaration of commercialization of “ENE FARM” (Jan. 2009)



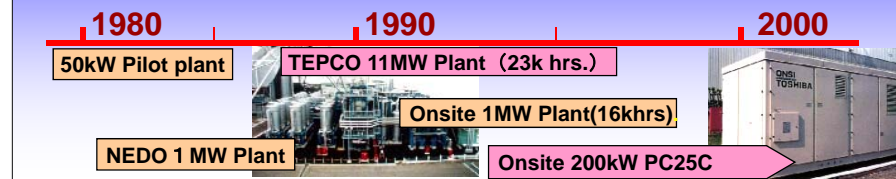
Toshiba’s “ENE FARM”

History of stationary fuel cell in Toshiba

Commercialization started in FY2009!



30 years experiments of FC development in Toshiba



Key factors in technology development for commercial PEFC

Performance:
Power efficiency is around 36% at rated power. Total efficiency is higher than 80%.

E-efficiency characteristics

Durability:

Cell Voltage Trend in Field Testing

The recent CSA shows better durability longer than 40khrs

CSA summary by accelerating testing

Reliability:
Through continuous QC activities, present annual failure rate of TSB ENEFARM to be less than 5%. Further improvement is expected by recent retrofit.

Recent failure rate 5 - 10%
Target < 3%

Cost:
Down to 1/8 cost from the level in FY2004 by trimming system, cell number reduction and so on.

Trend of Cell number

Trend of system cost reduction

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7

Specification of Toshiba ENE-FARM

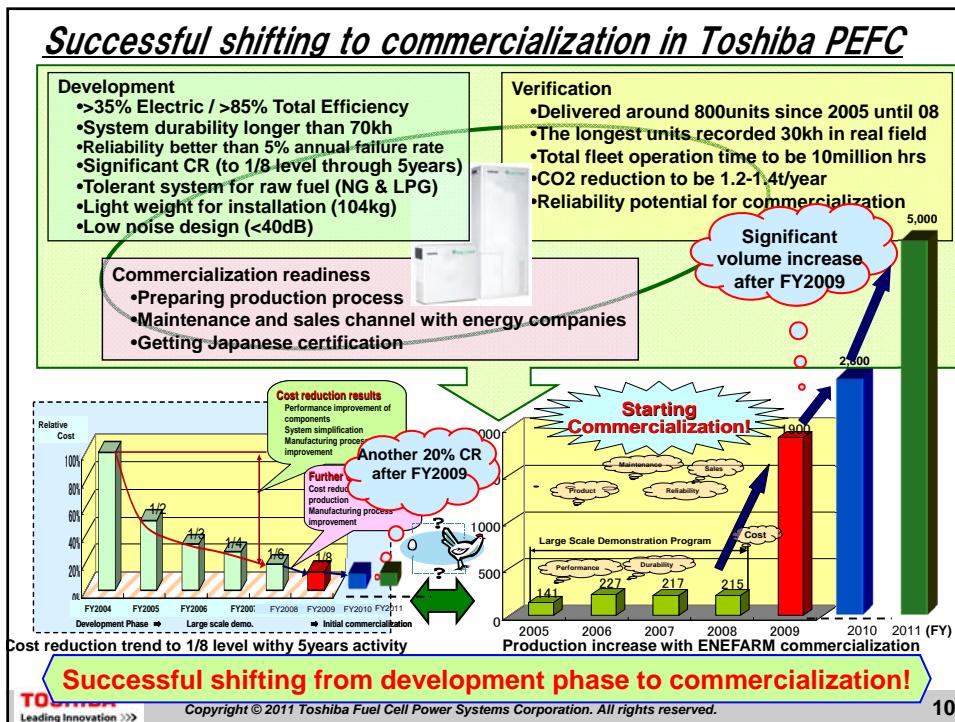
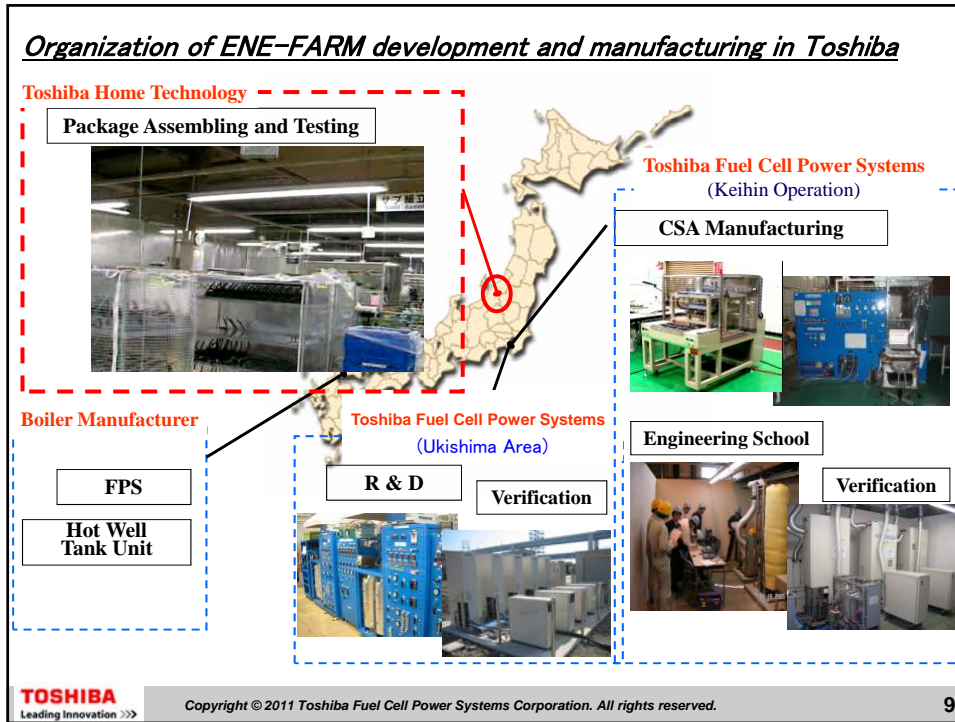
Specification of TSB ENE-FARM

Rated power	W(AC-net)	700
Elec. Eff.	% (LHV)	>36(35)*1
Total Eff.	% (LHV)	>85
Output voltage	V	200
Output water temp.	°C@exit	>60
Fuel		NG/LPG
Operation noise	dB@ 1m	<40
Operation		G.C. w/ Leaning algorithm
Start up time	min	<60
Volume	litter	241
Weight	FC-kg	104
	Tank-kg	105
Certification		JET/JHIA*2

*1 efficiency w/ LPG
*2 Certification organizations
JET; Japan electrical Safety and Environmental Technology Laboratories
JHIA; Japan Heating Appliances Inspection Association

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8



ENE-FARM Market Expansion toward the Future

Develop ENE-FARM as Core Product
Release 2nd Gen system in FY2012!

Performance improvement
Release 2nd Gen system in FY2012!

Various application

Condominium
Compact system

For Cold area
-20deg-C ambient

Hydrogen Society

Fuel Diversification

- LNG, LPG
- Natural gas for overseas

HEMS

HEMS, Smart grid with PV and Battery

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For the future with “Fuel Cells” !

Transportation

乗用車・バス
フォークリフト
列車

病院

マンション

Fuel Cell as a Dream

↓

Fuel Cell as Familiar and Close Product

Others

通信用電源
直流電源応用
バイオガス応用
ライフスポット

Premium application

UPS+FCシステム
GC/GI切替システム
電力貯蔵システム

Co-generation

家庭用
集合住宅
ショッピングセンター
スポーツクラブ
ビジネスホテル

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