Introduction of Micro-gen in Japan

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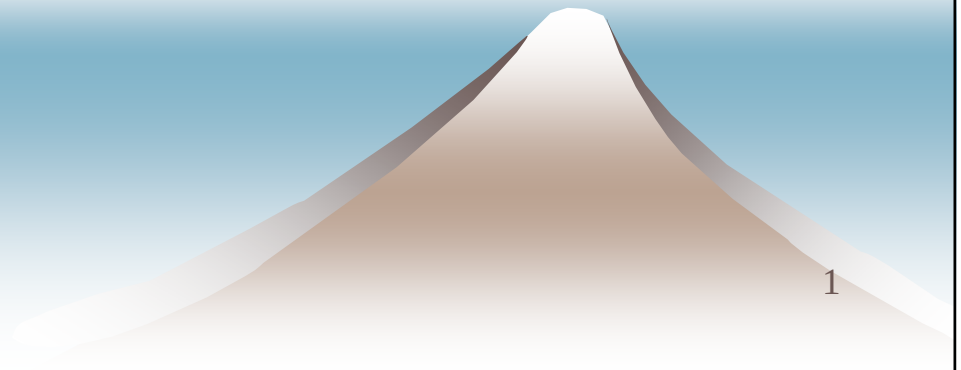
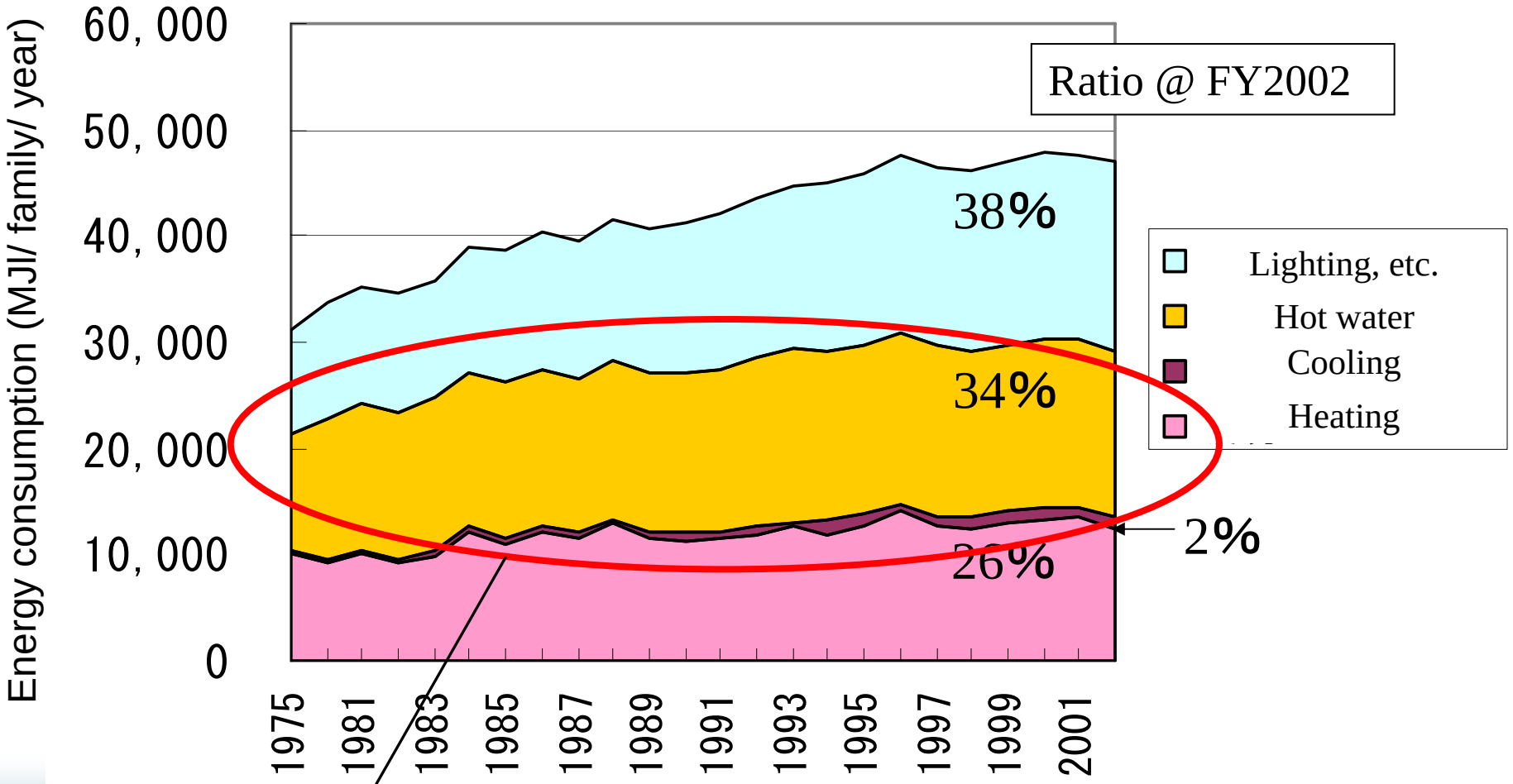


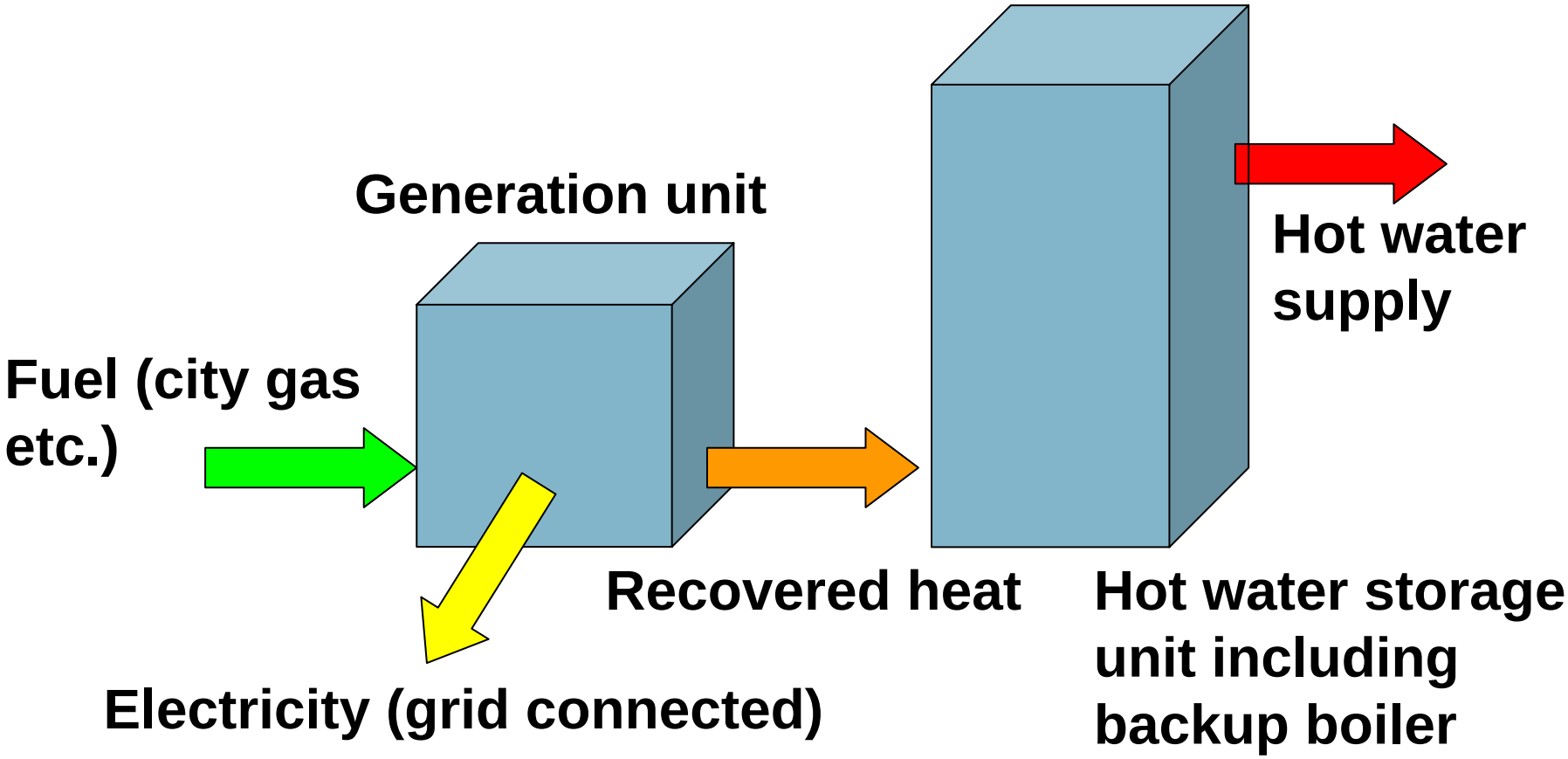
Transition of energy consumption rate in Japanese residential sector



Jukankyo Research Institute Inc.

Large amount of energy for hot water

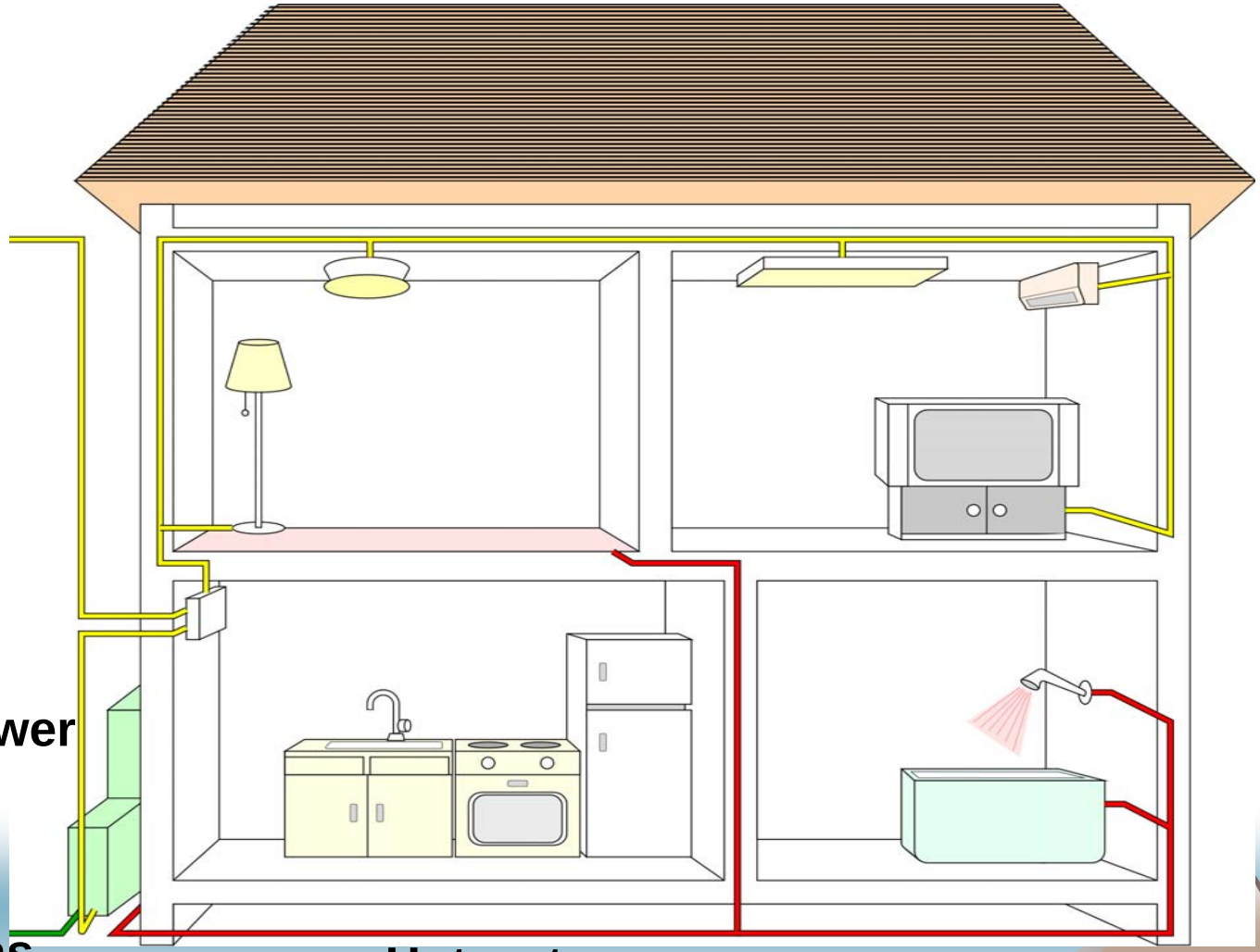
What's residential CHP in Japan?



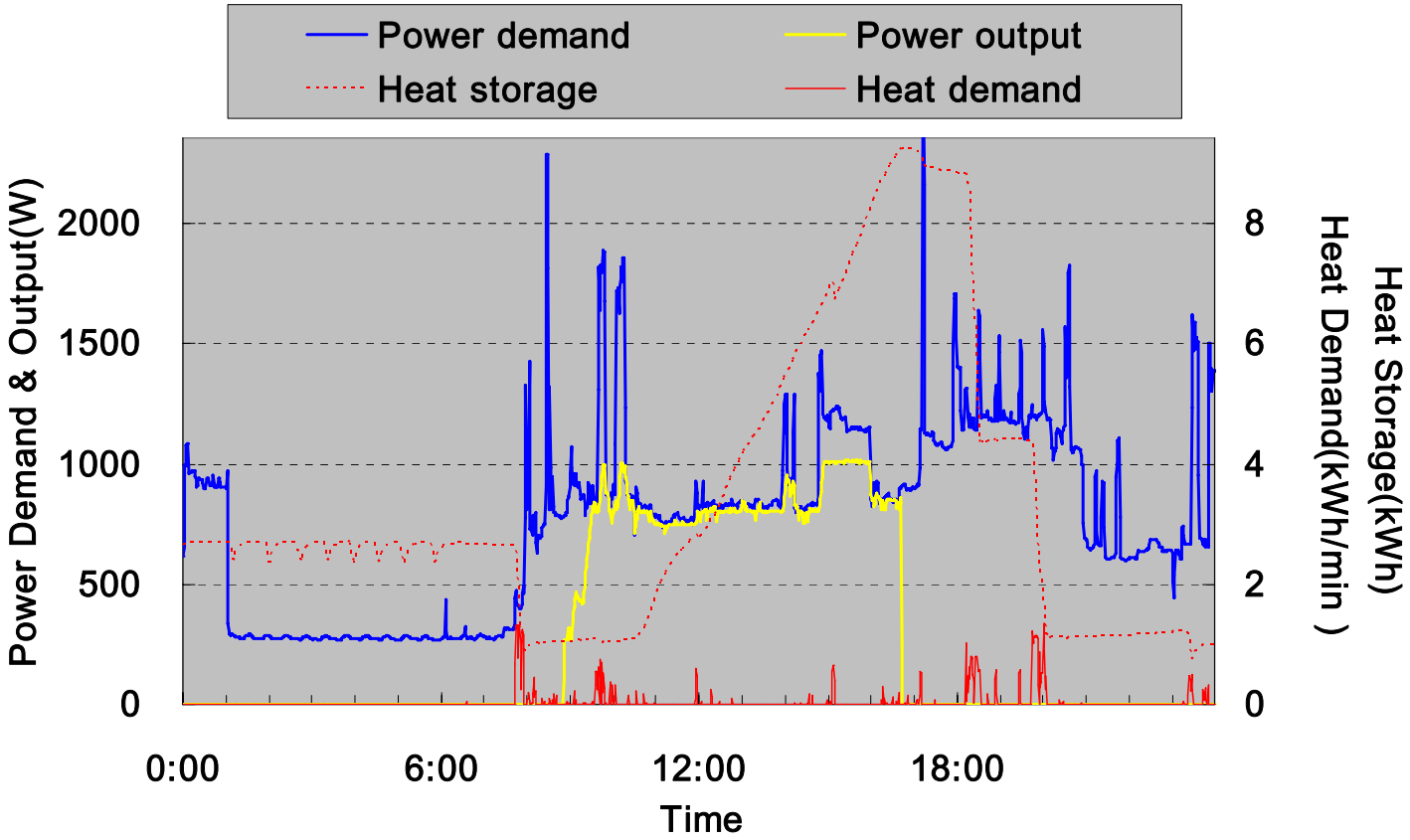
>Rated power: 1kW class

>Recovered heat used as hot water

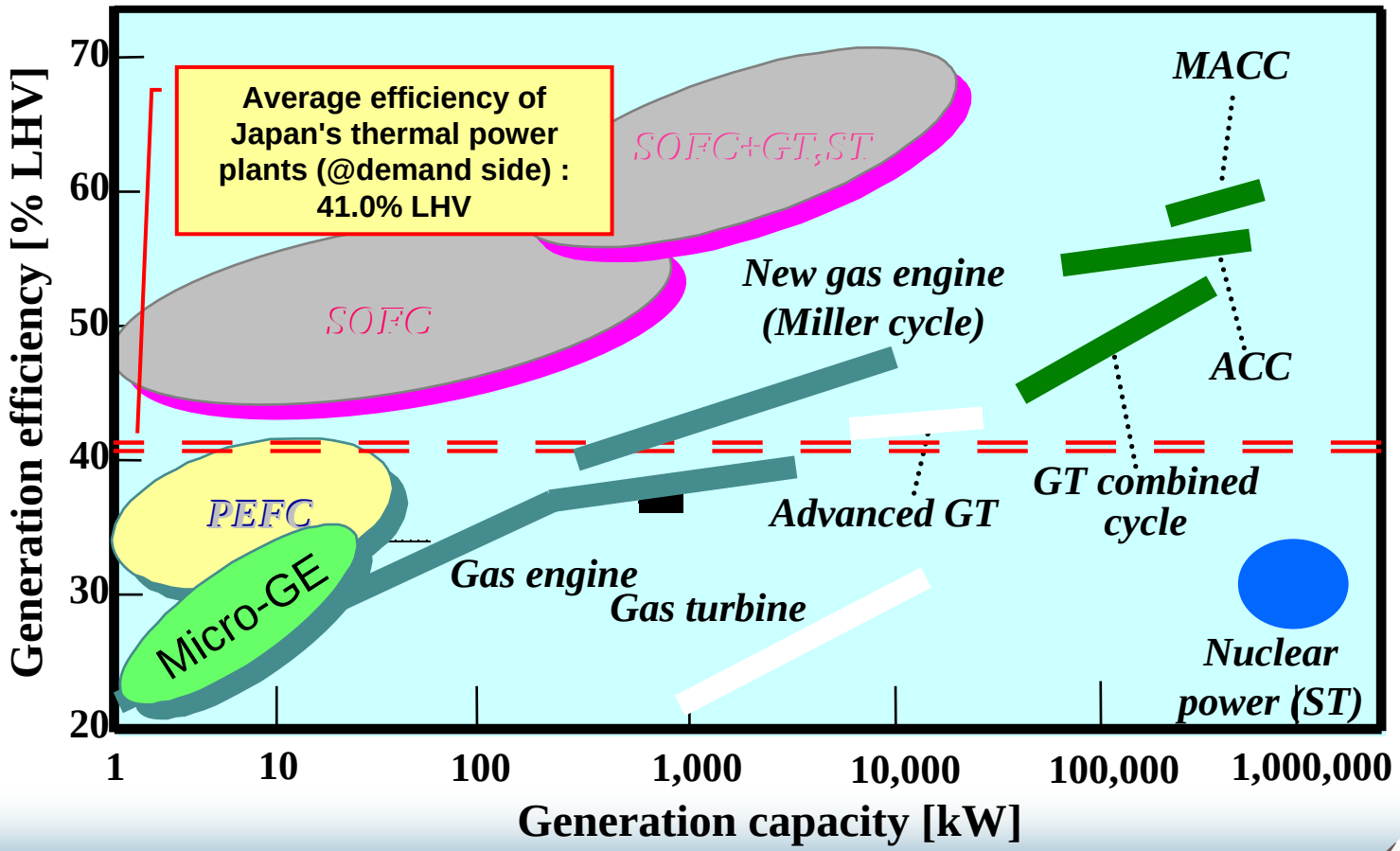
Schematic Image of residential CHP for Connections



An example of the operation



Micro-gen & CHP in Japan



Residential CHPs in Japan

	Gas Engine	PEFC	SOFC
Efficiency E / H (%LHV)	22.5 / 63	37 / 50	45 / 30
Operation	Start & stop	Start & stop	Continuous
Stage	Commercial	Commercial with subsidy	Field trial
			

PEFC: Polymer Electrolyte Fuel Cell, SOFC: Solid Oxide Fuel Cell

Gas engine based residential CHP

Rated power : 1kW

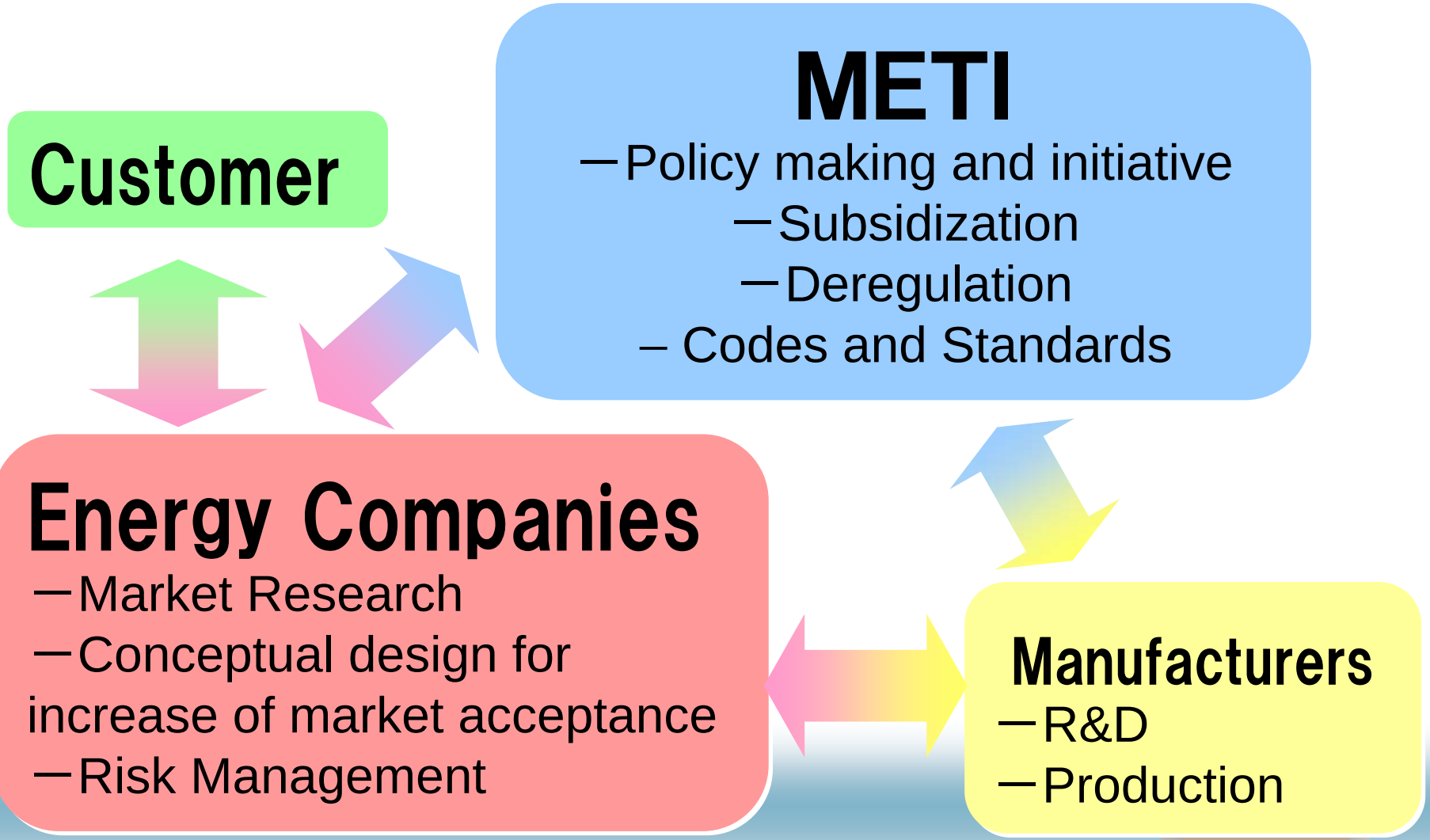
Efficiency (LHV) :

Generation : 22.5 %
Heat : 63.0 %
Overall : 85.5 %

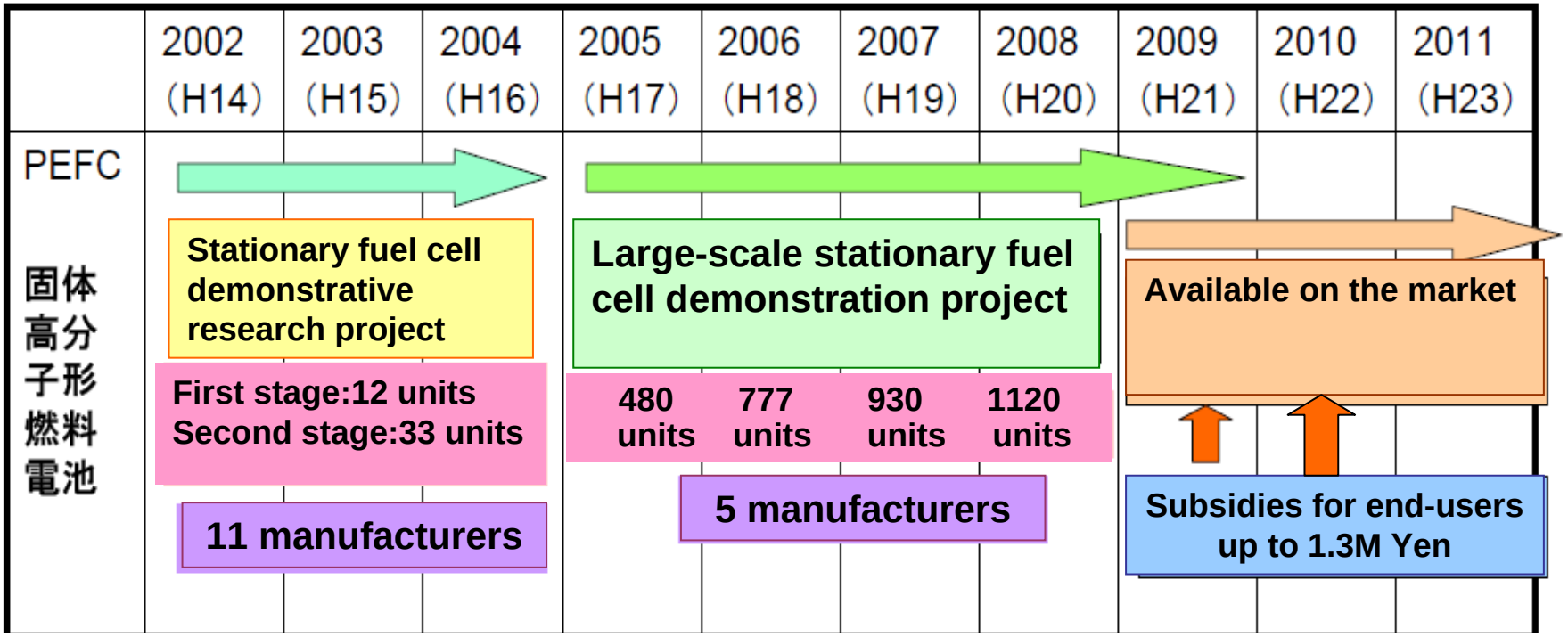
Manufacturer :

Honda (engine unit)
Noriz or Chofu
(hot water storage unit)

Development Initiative

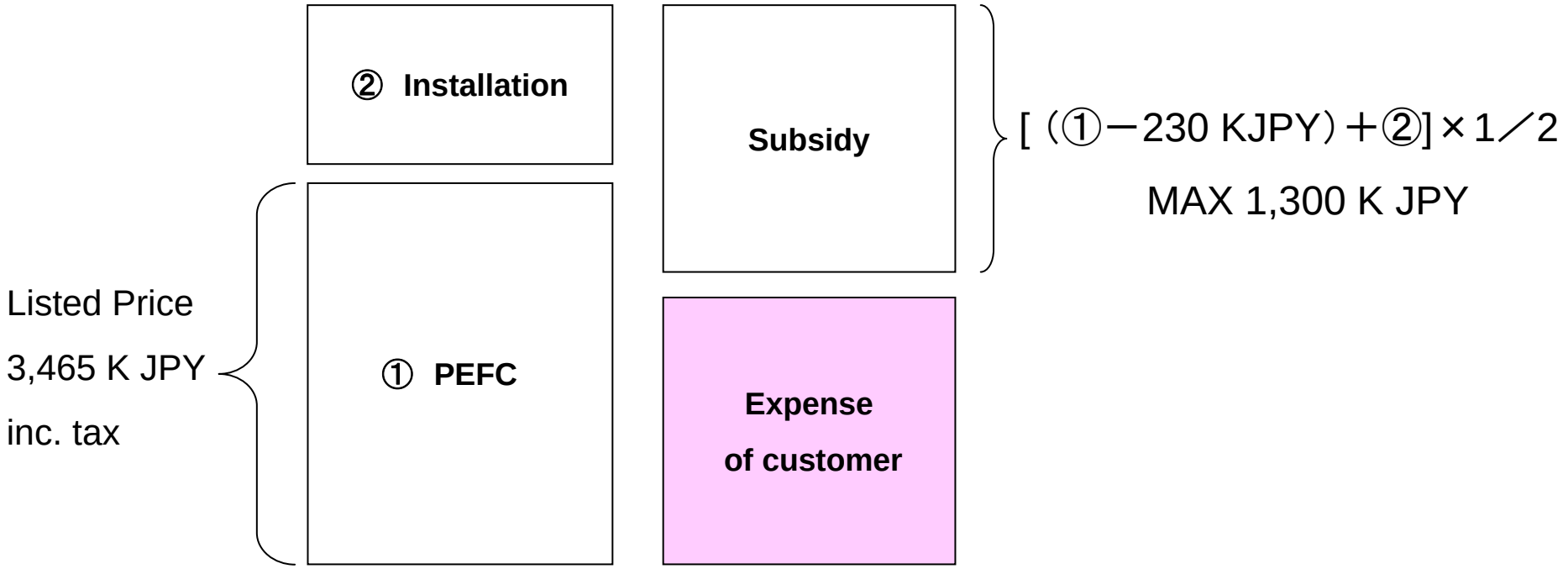


Supportive project by the government for Residential use PEFC



Reference: the New Energy Foundation's Homepage

Government's support to Fuel Cell buyers (end-users) started in 2009, following the demonstration project

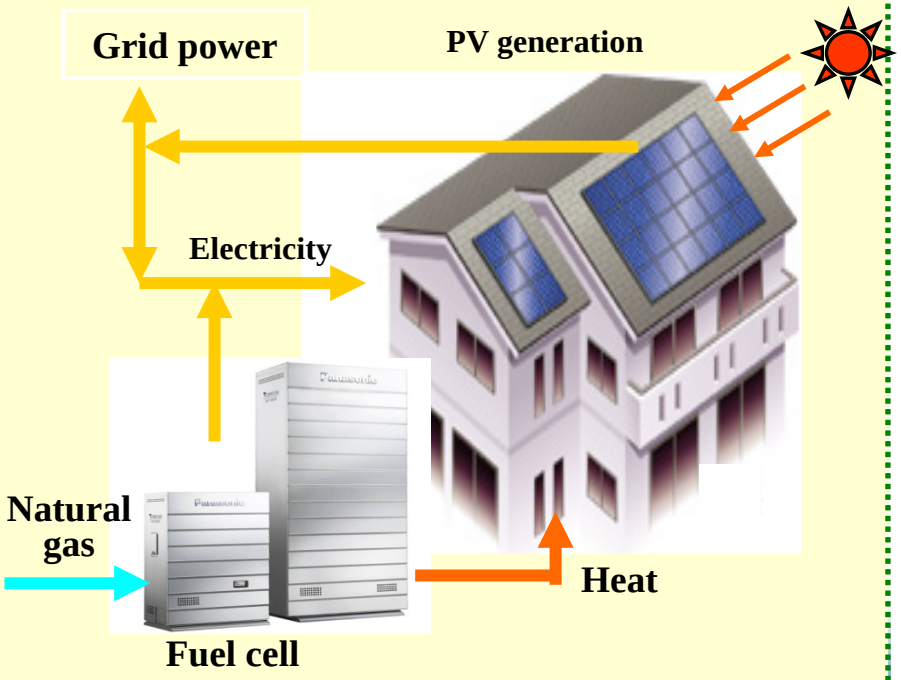


JFY	2009	2010
Total subsidy	¥8.3 billion	¥6.8 billion

Combining renewables with FC

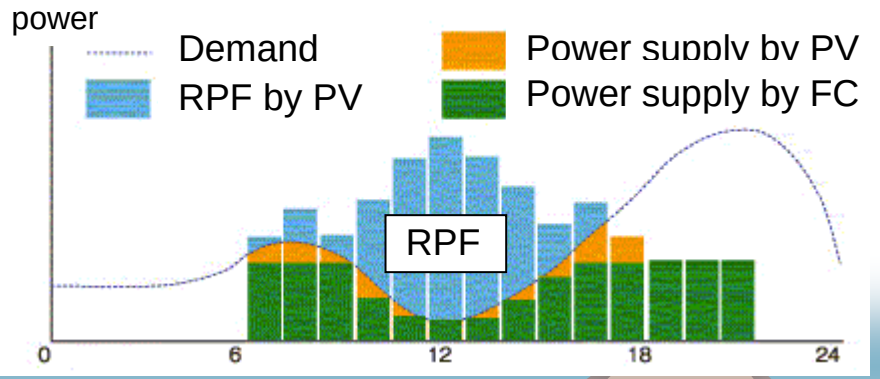
FUEL CELL + PV

The best mixture; Fuel cells compensate the output instability of PV cells.



On 1st November, a new law came into effect, by which the power companies are obliged to buy back the reverse power flow from PV;

- at ¥ 48/kWh if only PV panels are installed
- at ¥ 39/kWh if another generator is installed along with PV



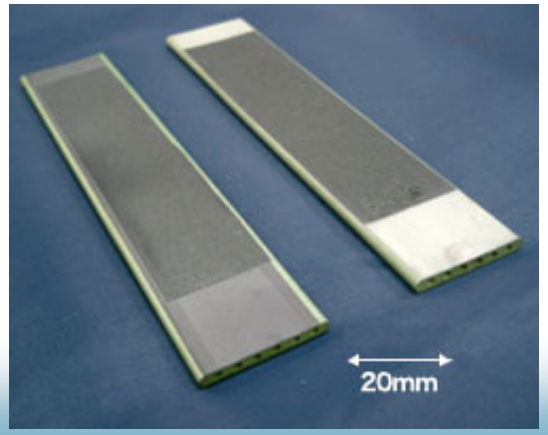
SOFC based residential CHP

- Higher electrical efficiency

Target Electrical Efficiency

:>45%LHV (@ rated power)

Flat tubular Cell



700W(AC) SOFC Unit

by Kyocera

ICE based m-CHP in Japan

Yanmar

				
output	5kW	9.9kW	25kW	35kW
η e	29%	31.5%	33.5%	34%
η total	85%	85%	85%	85%※1 (84%※2)

Aisin

output	6kW
η e	28.8%
η total	85%

Subsidy for m-CHP

Category	Output (kW)		Hot water Storage Capacity (L) (application range: C)	Subsidy amount (¥)
	Heat (application range: A)	Electricity (application range: B)		
1 (residential)	A≦5	B<5	120≦C<500	112,000
2 (commercial)	5<A≦15	5≦B<7	120≦C<500	383,000
3 (commercial)	15<A≦25	7≦B<9	120≦C<500	467,000
4 (commercial)	15<A≦25	9≦B<10	120≦C<500	635,000

Installation of micro-gen in Japan

Natural Gas Fired ICE for Commercial Use

5、6、9.9、25、35kW in Sale（Yanmar, Aisin）

ηe＝28.8～34.0%、ηt＝56.2～51%

Actual implementation：3,902 units 42,324kW（as of April 09）

Natural Gas Fired ICE for Residential Use

1kW in Sale (Honda) ηe＝22.5%、ηt＝63%

Actual implementation：73,344 units 73,350kW（as of April 09）

Polymer Electrolyte Fuel Cell（Natural Gas）

1kW in Sale（Panasonic etc.） ηe＝37%、ηt＝50%

Actual implementation：1,641units 1,470kW（as of April 09）