Residential Sector

AIM Training Workshop

Tokyo, Japan Oct 22-26, 2007

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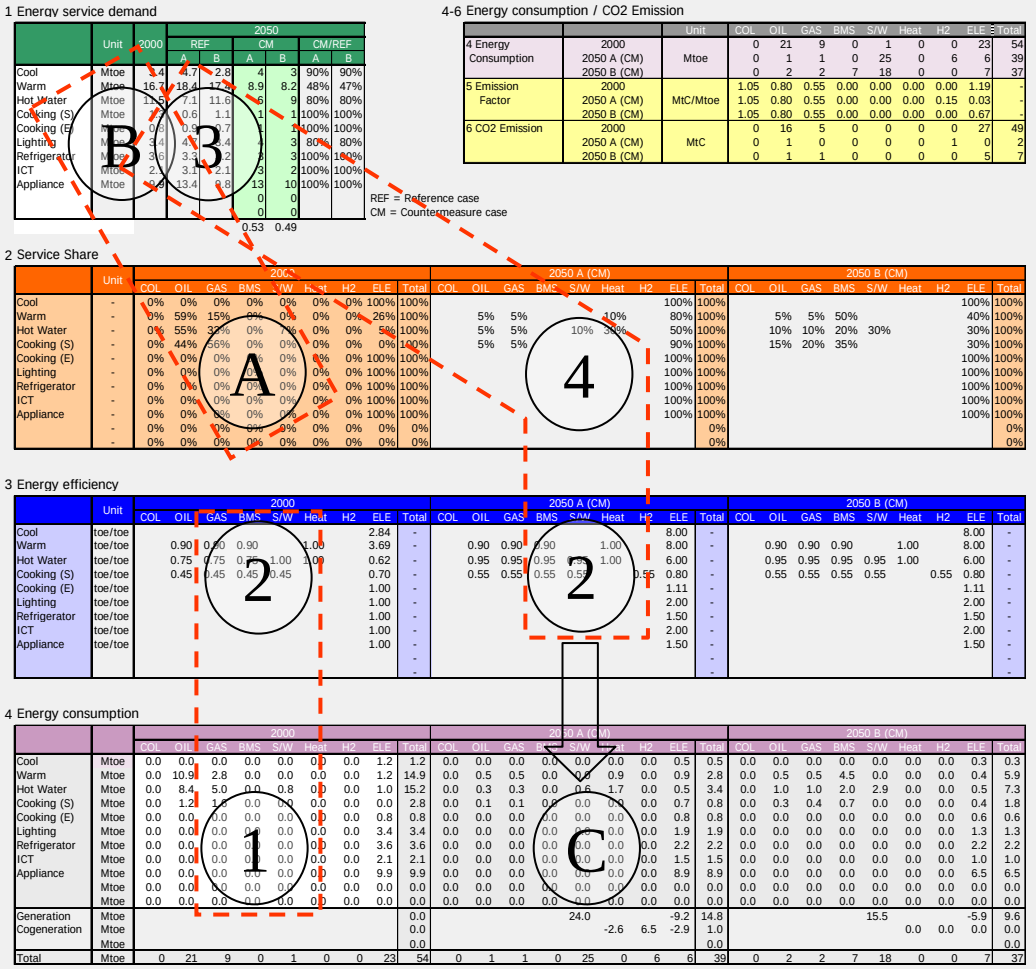
- Energy Efficiency
- Energy-wise Service Share
- Energy Service Demand in Future

Structure of Energy Consumption



1. Energy consumption in base year
2. Energy efficiency in base year and future
3. Energy service demand in future
4. Energy-wise service share in future

A. Energy-wise service share in base year

B. Energy service demand in base year

C. Energy consumption in future

Residential Sector

1 Energy service demand

	Unit	2000	2050 REF A	2050 REF B	2050 CM A	2050 CM B	CM/REF A	CM/REF B
Cool	Mtoe	3.4	4.7	2.8	4	3	90%	90%
Warm	Mtoe	16.7	18.4	17.4	8.9	8.2	48%	47%
Hot Water	Mtoe	11.5	7.1	11.6	6	9	80%	80%
Cooking (S)	Mtoe	1.3	0.6	1.1	1	1	100%	100%
Cooking (E)	Mtoe	0.8	0.9	0.7	1	1	100%	100%
Lighting	Mtoe	3.4	4.7	3.4	4	3	80%	80%
Refrigerator	Mtoe	3.6	3.3	3.2	3	3	100%	100%
TV	Mtoe	2.1	3.1	2.1	3	2	100%	100%
Appliance	Mtoe	9.9	13.5	9.8	14	10	100%	100%
					0	0		
					0	0		
					0.53	0.49		

REF = Reference case
CM = Countermeasure case

4-6 Energy consumption / CO2 Emission

		Unit	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
4 Energy Consumption	2000	Mtoe	0	21	9	0	1	0	0	23	54
	2050 A (CM)		0	1	1	0	8	0	4	14	27
	2050 B (CM)		0	2	2	7	18	0	0	7	37
5 Emission Factor	2000	MtC/Mtoe	1.05	0.80	0.55	0.00	0.00	0.00	0.00	1.19	-
	2050 A (CM)		1.05	0.80	0.55	0.00	0.00	0.00	0.47	0.00	-
	2050 B (CM)		1.05	0.80	0.55	0.00	0.00	0.00	0.00	0.41	-
6 CO2 Emission	2000	MtC	0	16	5	0	0	0	0	27	49
	2050 A (CM)		0	1	0	0	0	0	2	0	3
	2050 B (CM)		0	1	1	0	0	0	0	3	5

2 Service Share

	Unit	2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Warm	-	0%	59%	15%	0%	0%	0%	0%	26%	100%		5%	5%			10%		80%	100%		5%	5%	50%				40%	100%
Hot Water	-	0%	55%	33%	0%	7%	0%	0%	5%	100%		5%	5%		10%	10%		70%	100%		10%	10%	20%	30%			30%	100%
Cooking (S)	-	0%	44%	56%	0%	0%	0%	0%	0%	100%		5%	5%					90%	100%		15%	20%	35%				30%	100%
Cooking (E)	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Lighting	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Refrigerator	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
TV	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Appliance	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
	-	0%	0%	0%	0%	0%	0%	0%	0%	0%								0%	0%									0%
	-	0%	0%	0%	0%	0%	0%	0%	0%	0%								0%	0%									0%

3 Energy efficiency

	Unit	2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	toe/toe								2.84	-								8.00	-								8.00	-
Warm	toe/toe		0.90	0.90	0.90		1.00		3.69	-		0.90	0.90	0.90		1.00		8.00	-		0.90	0.90	0.90		1.00		8.00	-
Hot Water	toe/toe		0.75	0.75	0.75	1.00	1.00		0.62	-		0.95	0.95	0.95	0.95	1.00		6.00	-		0.95	0.95	0.95	0.95	1.00		6.00	-
Cooking (S)	toe/toe		0.45	0.45	0.45	0.45			0.70	-		0.55	0.55	0.55	0.55		0.55	0.80	-		0.55	0.55	0.55	0.55		0.55	0.80	-
Cooking (E)	toe/toe								1.00	-								1.11	-								1.11	-
Lighting	toe/toe								1.00	-								2.00	-								2.00	-
Refrigerator	toe/toe								1.00	-								1.50	-								1.50	-
TV	toe/toe								1.00	-								2.00	-								2.00	-
Appliance	toe/toe								1.00	-								1.50	-								1.50	-
										-									-									-
										-									-									-

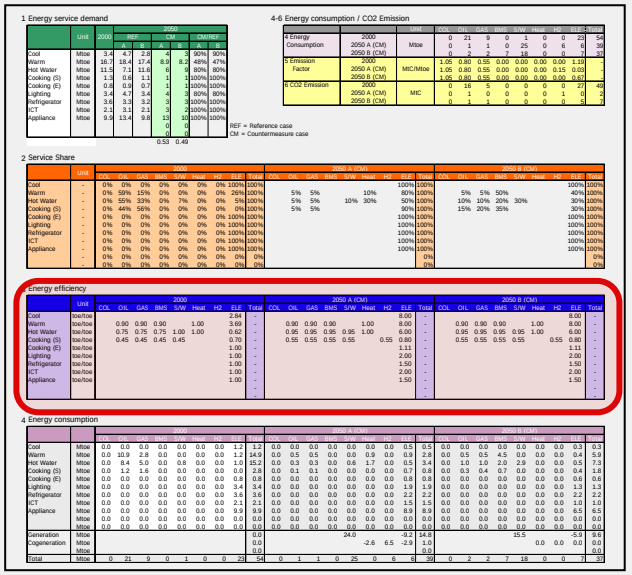
4 Energy consumption

		2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Warm	Mtoe	0.0	10.9	2.8	0.0	0.0	0.0	0.0	1.2	14.9	0.0	0.5	0.5	0.0	0.0	0.9	0.0	0.9	2.8	0.0	0.5	0.5	4.5	0.0	0.0	0.0	0.4	5.9
Hot Water	Mtoe	0.0	8.4	5.0	0.0	0.8	0.0	0.0	1.0	15.2	0.0	0.3	0.3	0.0	0.6	0.6	0.0	0.7	2.4	0.0	1.0	1.0	2.0	2.9	0.0	0.0	0.5	7.3
Cooking (S)	Mtoe	0.0	1.2	1.6	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.7	0.8	0.0	0.3	0.4	0.7	0.0	0.0	0.0	0.4	1.8
Cooking (E)	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
Lighting	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
Refrigerator	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2
TV	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Appliance	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	6.5
	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation	Mtoe									0.0						7.6		-2.9	4.7								-5.9	9.6
Cogeneration	Mtoe									0.0							-1.5	3.6 -1.6	0.5						0.0	0.0	0.0	0.0
	Mtoe									0.0									0.0									0.0
Total	Mtoe	0	21	9	0	1	0	0	23	54	0	1	1	0	8	0	4	14	27	0	2	2	7	18	0	0	7	37

Energy Efficiency

Structure of ESS
Energy Efficiency
Energy-wise Service Share
Energy Service Demand

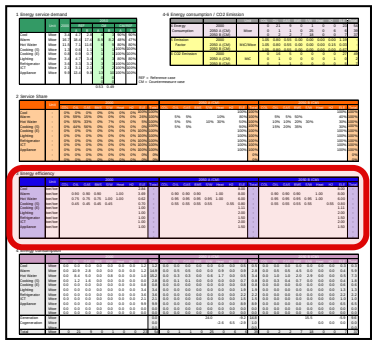
Worksheet for Energy Efficiency



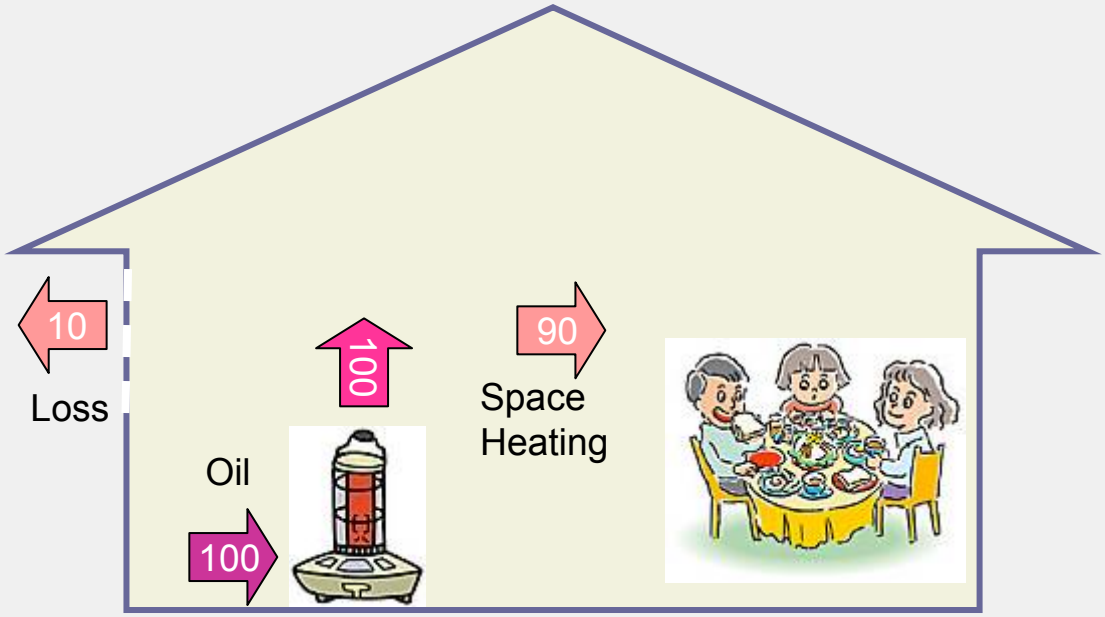
Enter values of energy efficiency in base year and future in Energy Snapshot.

Enter grounds of parameter in the worksheet “Efficiency”.

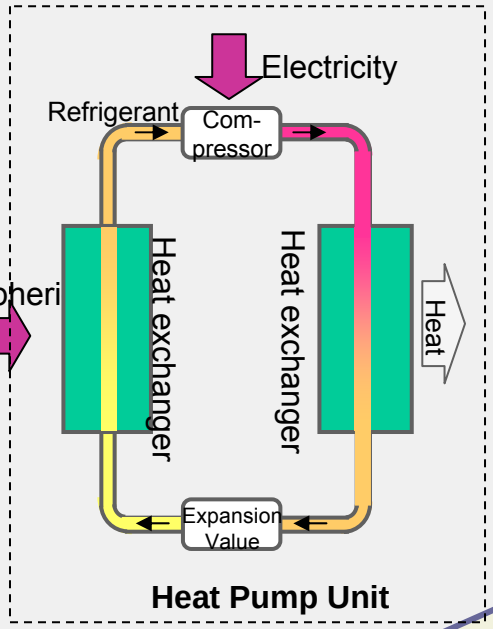
	Grounds of Parameter
Space heating	
Space cooling	
Hot water heating	
Refrigerators and freezers	
Cloth dryer	• Data Source, assumption etc
Cooking	
Cloth washers	
Dish washers	
Other energy uses	
Miscellaneous electric energy	
Lighting	

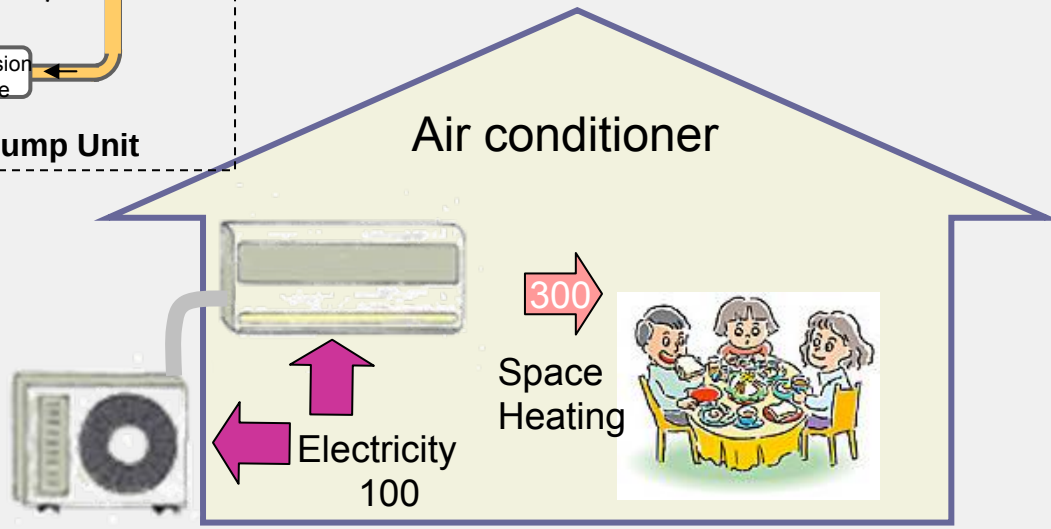


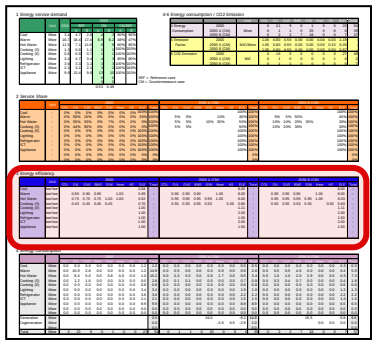
Space Heating (Stove)



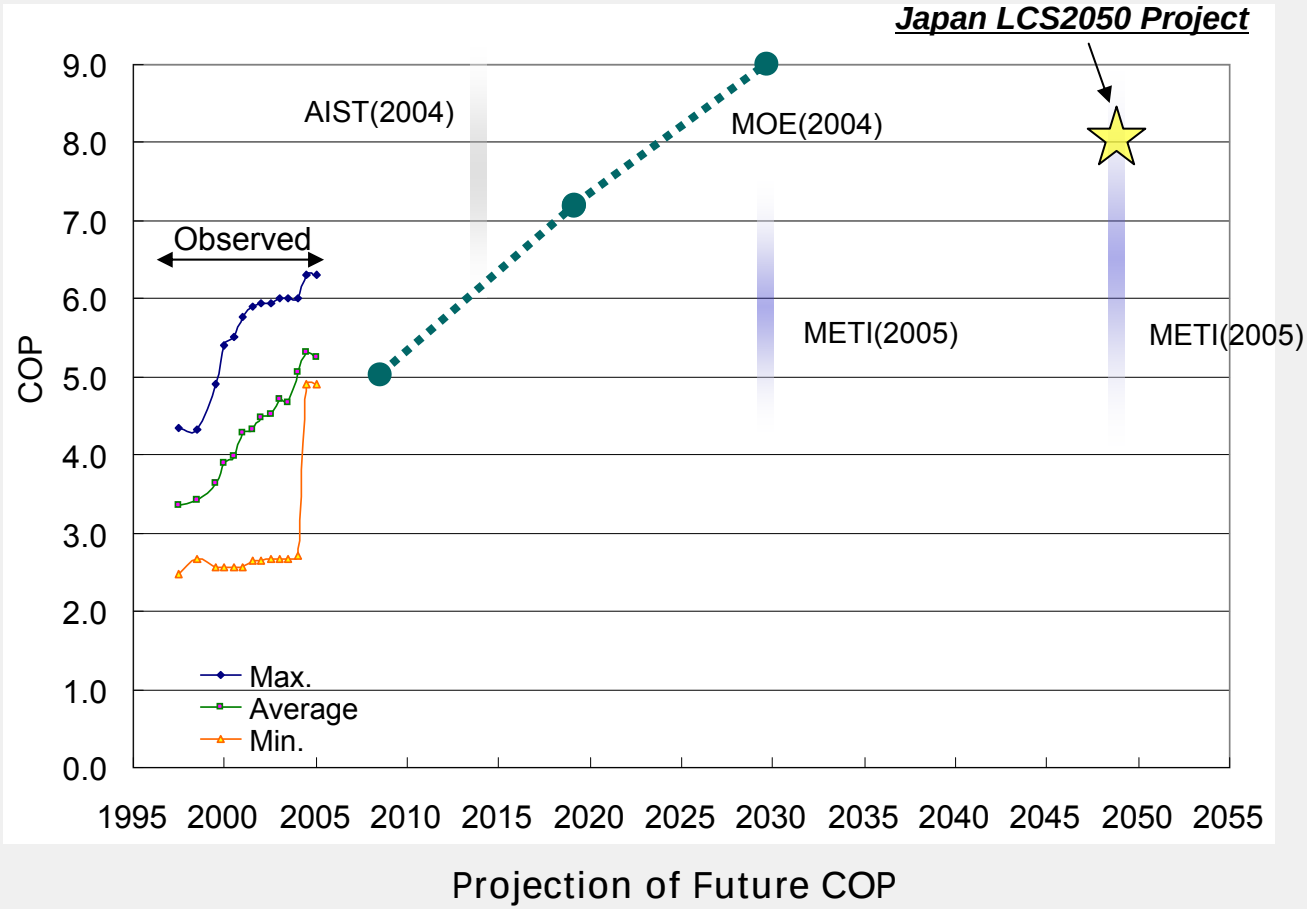
Space Heating (Heat Pump)

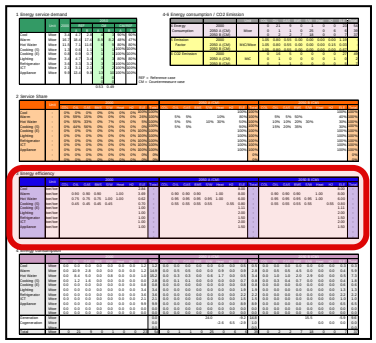


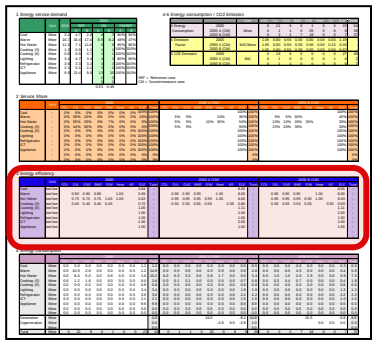




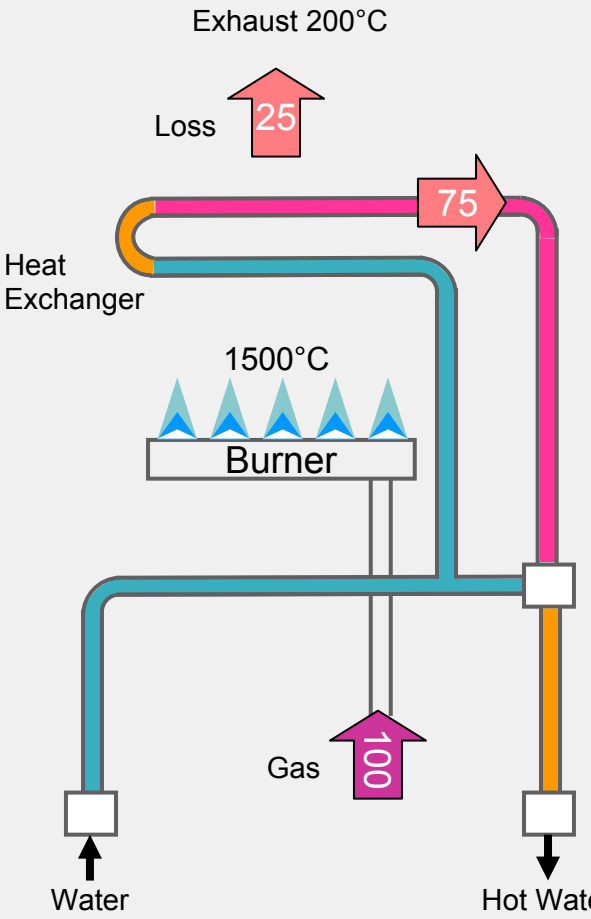
Space Heating (Heat Pump)



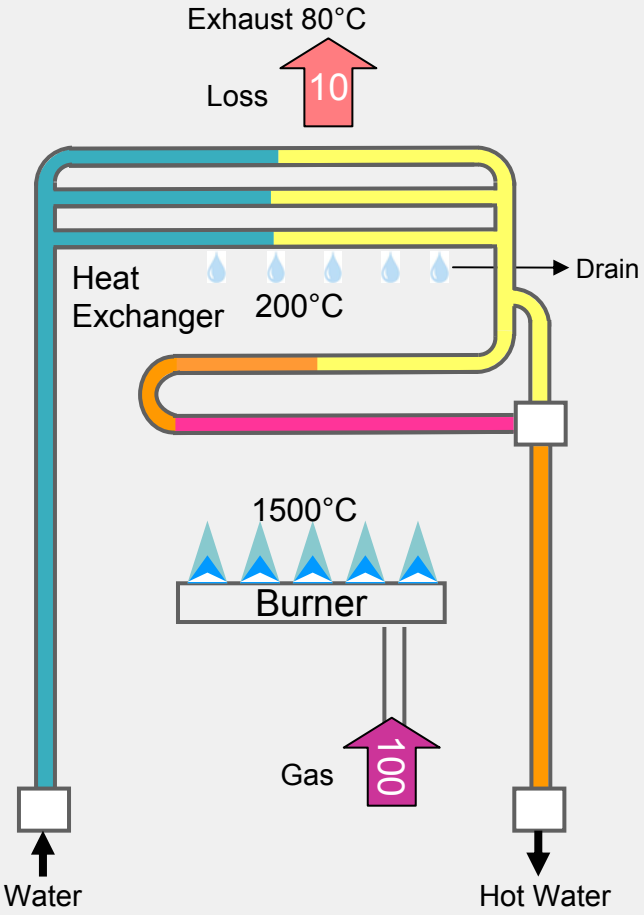




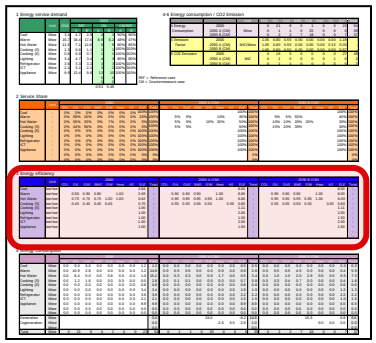
Water Heating (Gas Heater)



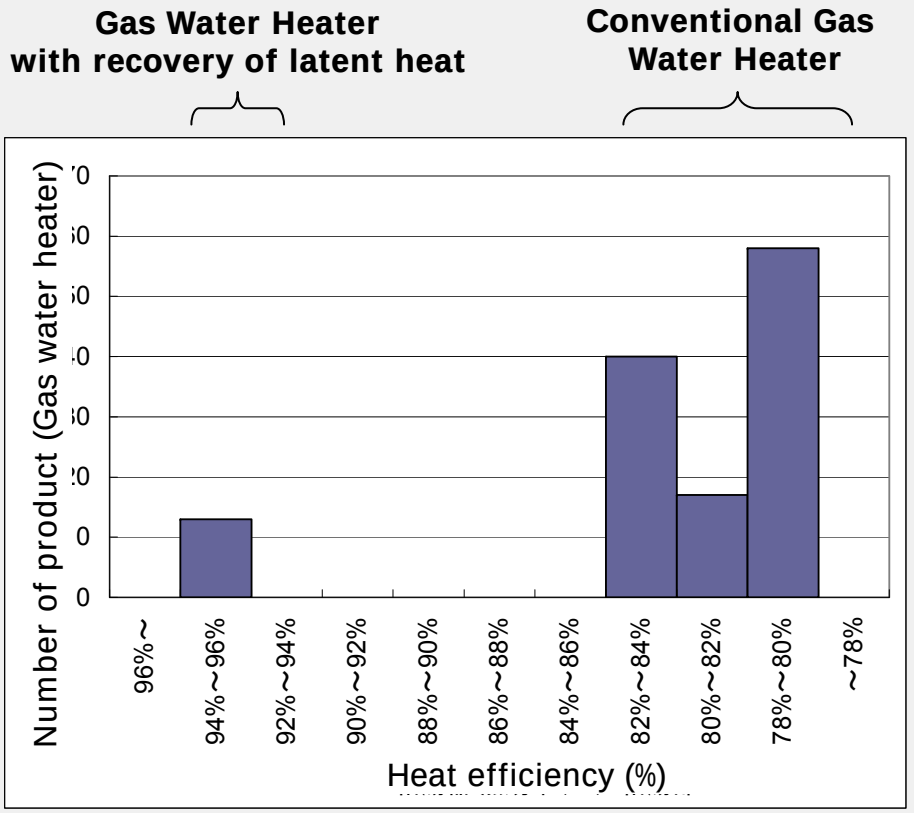
Conventional Gas Water Heater



Gas Water Heater with recovery of latent heat

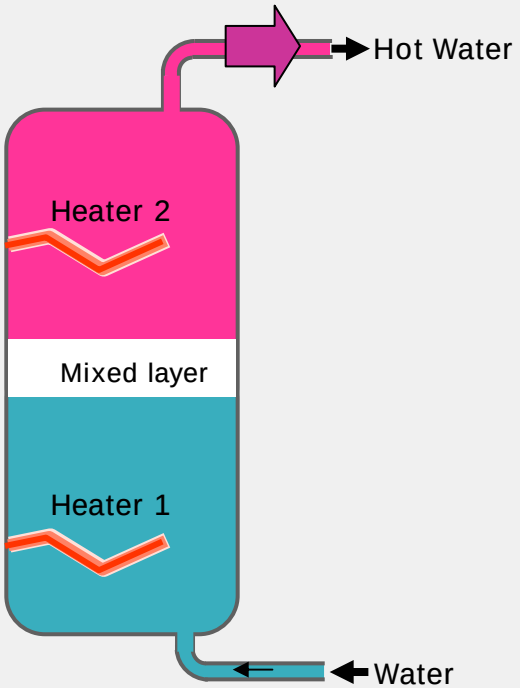


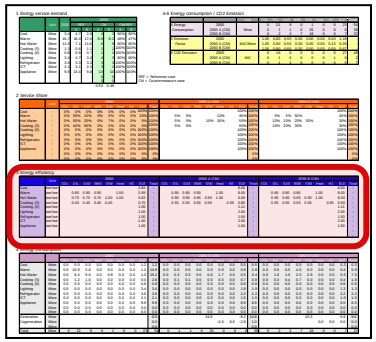
Water Heating (Gas Heater)



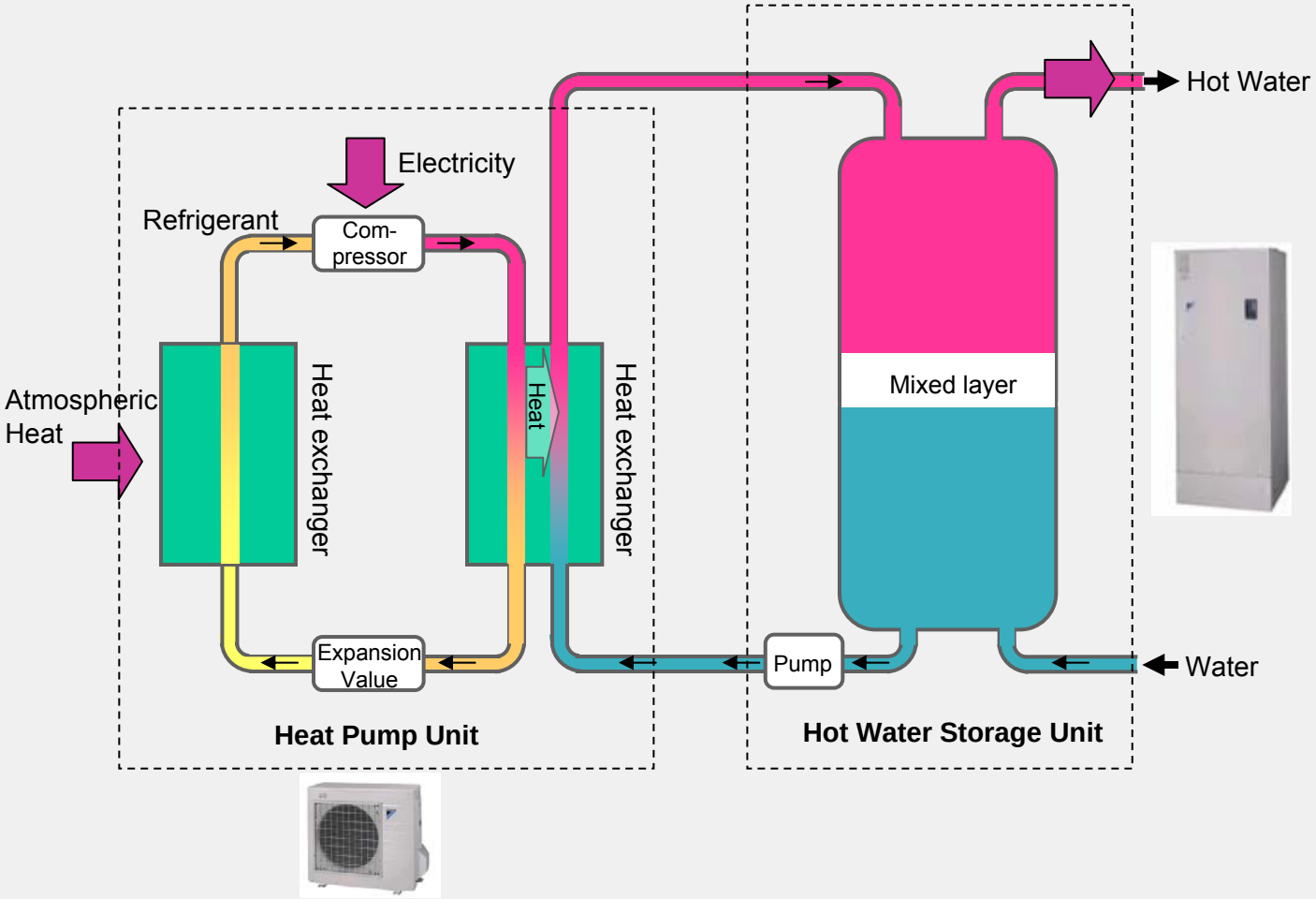
Number of product in 2004, Japan (24 size classification)

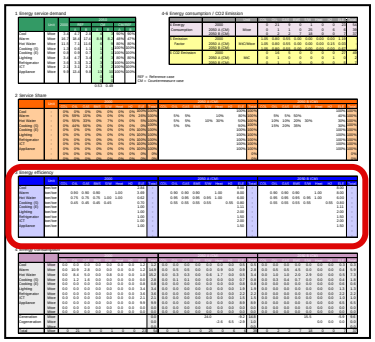
Water Heating (Electric Heater)

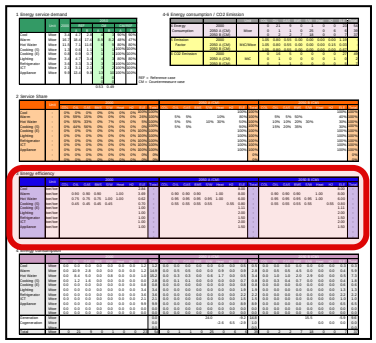




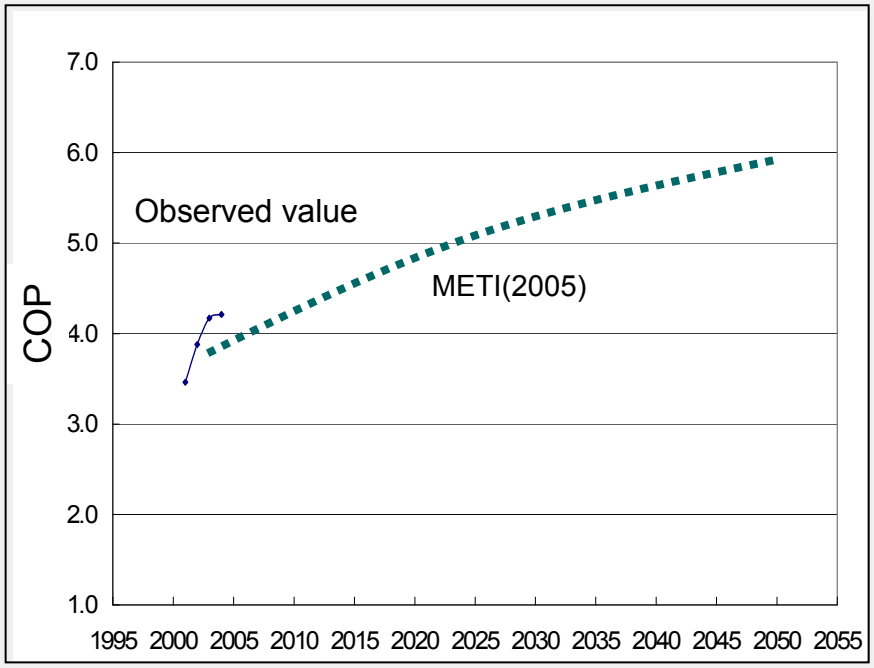
Water Heating (Heat Pump)



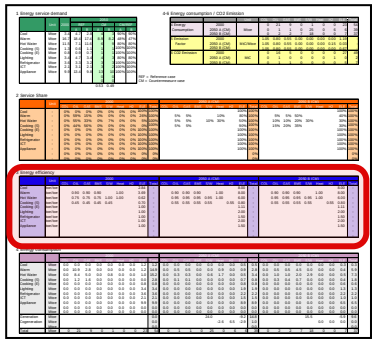




Water Heating (Heat Pump)

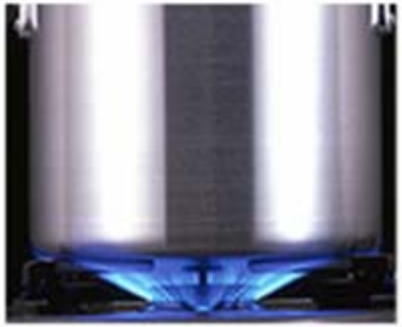


COP of heat pump water heater



Cooking (Stove Burner)

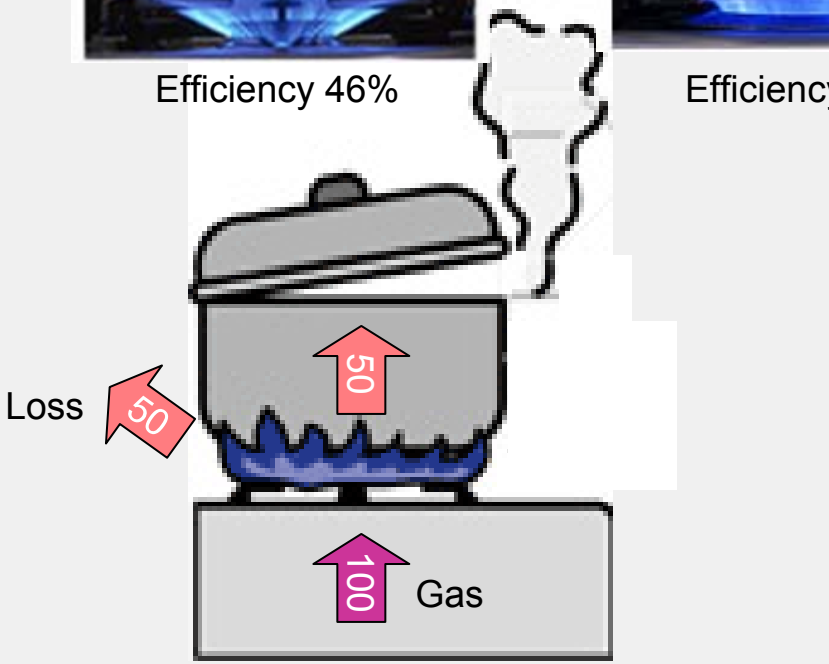
Conventional Burner



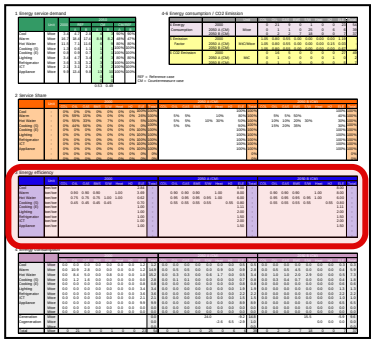
Efficiency 46%

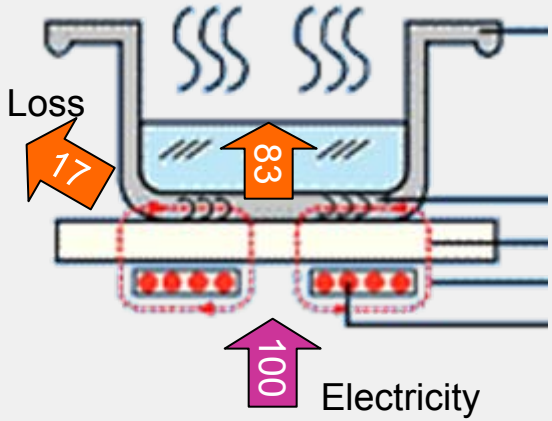
Inner-flame Burner

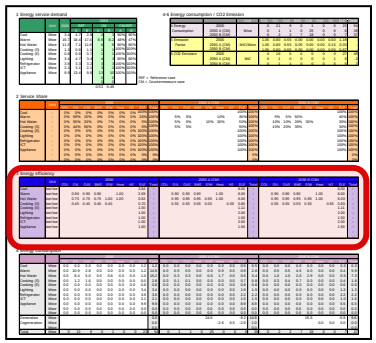
Efficiency 56%



Cooking (Electric)

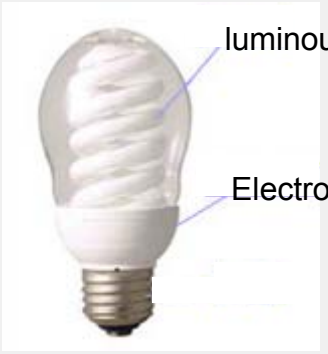






Lighting

Incandescent Lamp

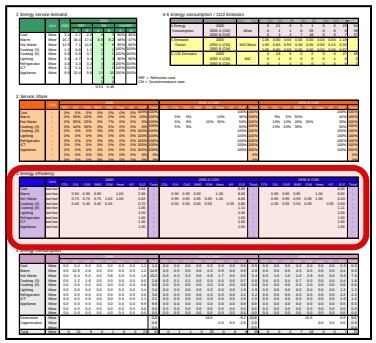


Compact Fluorescent Lamp

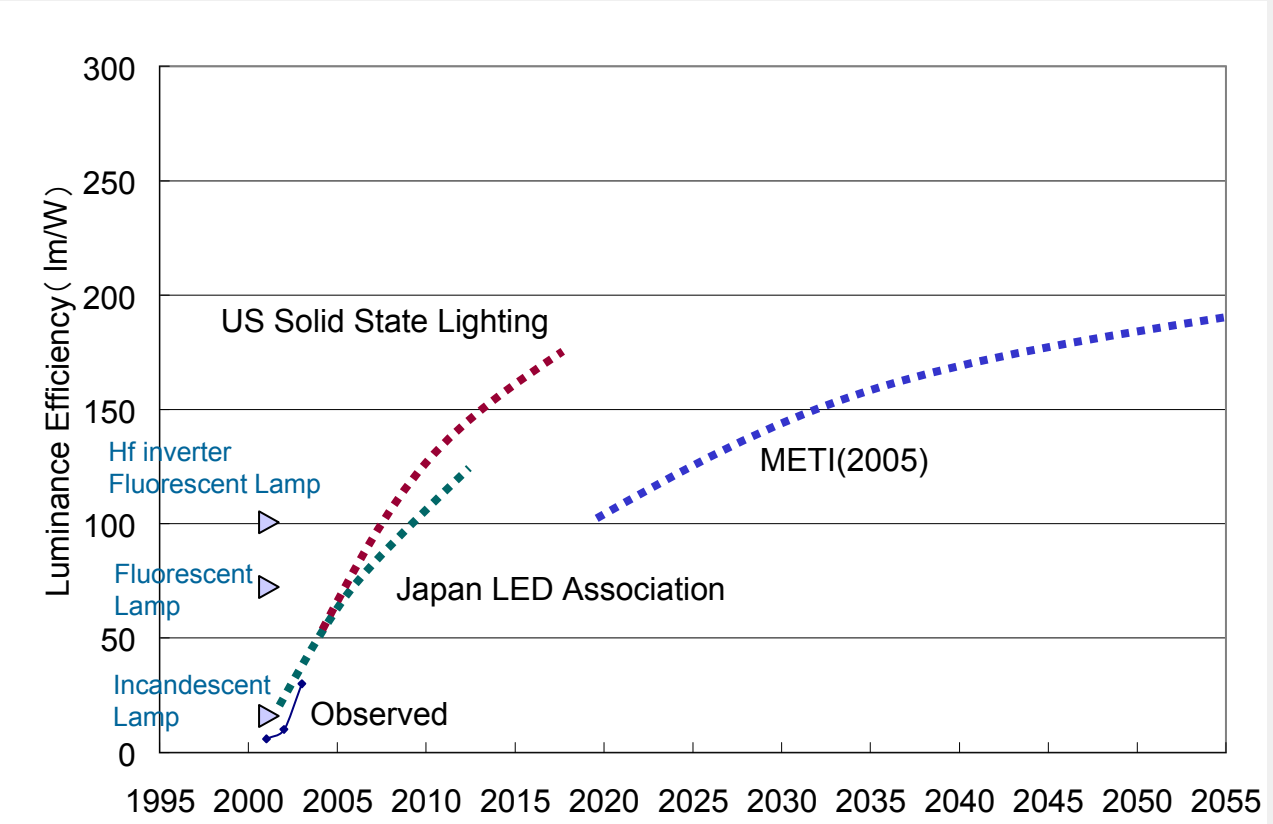
Fluorescent Lamp

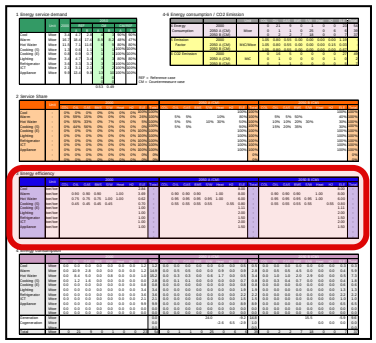
LED Lamp
(Light Emitting Diode)

Organic Electro-Luminescence



Lighting





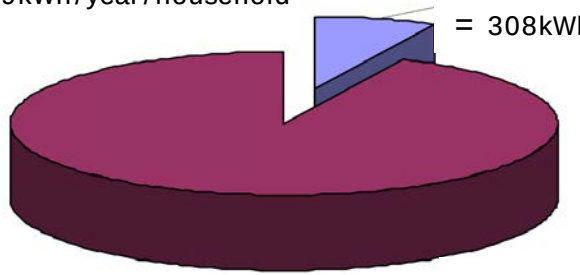
Standby Electricity

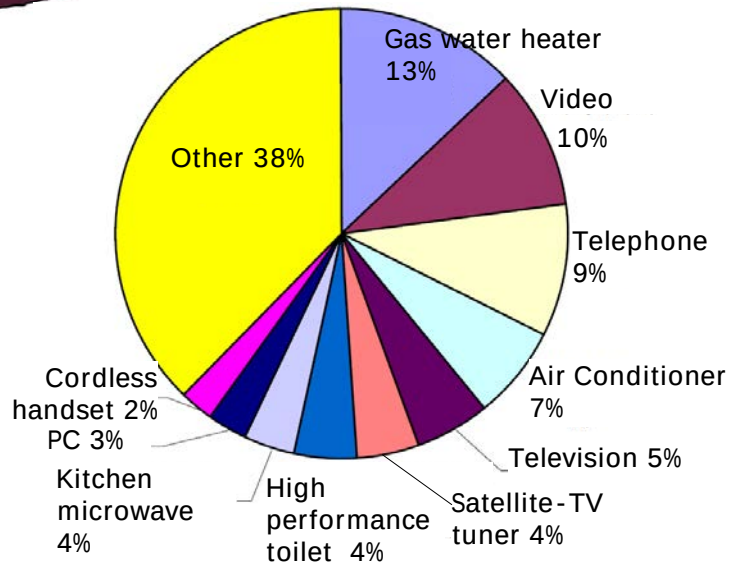
Electricity consumption in residential sector

= 4,209kWh/year/household

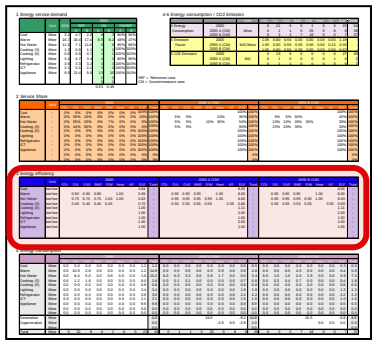
Standby electricity consumption

= 308kWh/year/household (7.3%)

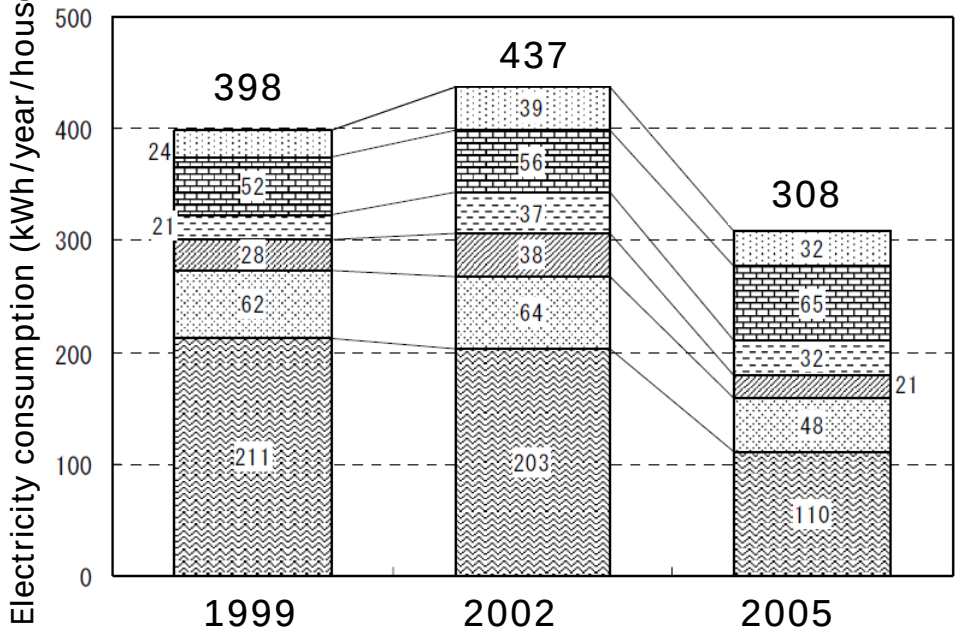




Source: Energy Conservation Center, Japan



Standby Electricity



Source: Energy Conservation Center, Japan

Residential Sector

1 Energy service demand

	Unit	2000	2050 REF A	2050 REF B	2050 CM A	2050 CM B	2050 CM/REF A	2050 CM/REF B
Cool	Mtoe	3.4	4.7	2.8	4	3	90%	90%
Warm	Mtoe	16.7	18.4	17.4	8.9	8.2	48%	47%
Hot Water	Mtoe	11.5	7.1	11.6	6	9	80%	80%
Cooking (S)	Mtoe	1.3	0.6	1.1	1	1	100%	100%
Cooking (E)	Mtoe	0.8	0.9	0.7	1	1	100%	100%
Lighting	Mtoe	3.4	4.7	3.4	4	3	80%	80%
Refrigerator	Mtoe	3.6	3.3	3.2	3	3	100%	100%
TV	Mtoe	2.1	3.1	2.1	3	2	100%	100%
Appliance	Mtoe	9.9	13.5	9.8	14	10	100%	100%
					0	0		
					0	0		
					0.53	0.49		

REF = Reference case
CM = Countermeasure case

4-6 Energy consumption / CO2 Emission

		Unit	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
4 Energy Consumption	2000	Mtoe	0	21	9	0	1	0	0	23	54
	2050 A (CM)		0	1	1	0	8	0	4	14	27
	2050 B (CM)		0	2	2	7	18	0	0	7	37
5 Emission Factor	2000	MtC/Mtoe	1.05	0.80	0.55	0.00	0.00	0.00	0.00	1.19	-
	2050 A (CM)		1.05	0.80	0.55	0.00	0.00	0.00	0.47	0.00	-
	2050 B (CM)		1.05	0.80	0.55	0.00	0.00	0.00	0.00	0.41	-
6 CO2 Emission	2000	MtC	0	16	5	0	0	0	0	27	49
	2050 A (CM)		0	1	0	0	0	0	2	0	3
	2050 B (CM)		0	1	1	0	0	0	0	3	5

2 Service Share

	Unit	2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%									100%	100%
Warm	-	0%	59%	15%	0%	0%	0%	0%	26%	100%		5%	5%			10%		80%	100%		5%	5%	50%					40%	100%
Hot Water	-	0%	55%	33%	0%	7%	0%	0%	5%	100%		5%	5%		10%	10%		70%	100%		10%	10%	20%	30%				30%	100%
Cooking (S)	-	0%	44%	56%	0%	0%	0%	0%	0%	100%		5%	5%					90%	100%		15%	20%	35%					30%	100%
Cooking (E)	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%									100%	100%
Lighting	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%									100%	100%
Refrigerator	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%									100%	100%
TV	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%									100%	100%
Appliance	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%									100%	100%
	-	0%	0%	0%	0%	0%	0%	0%	0%	0%									0%										0%
	-	0%	0%	0%	0%	0%	0%	0%	0%	0%									0%										0%

3 Energy efficiency

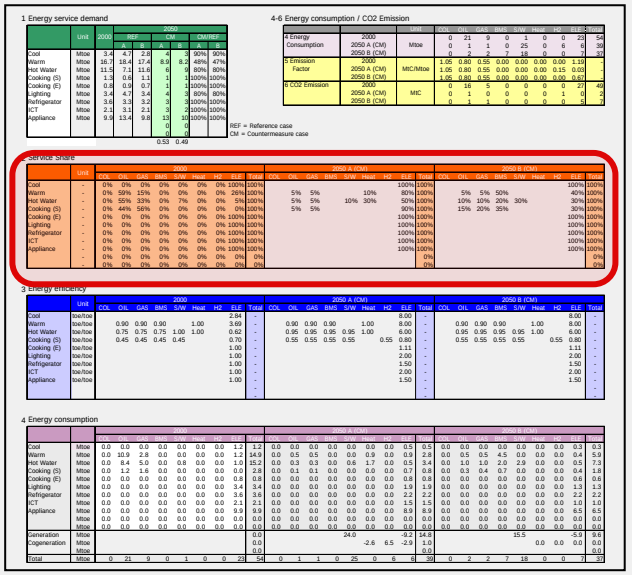
	Unit	2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	toe/toe								2.84	-								8.00	-								8.00	-
Warm	toe/toe		0.90	0.90	0.90		1.00		3.69	-		0.90	0.90	0.90		1.00		8.00	-		0.90	0.90	0.90		1.00		8.00	-
Hot Water	toe/toe		0.75	0.75	0.75	1.00	1.00		0.62	-		0.95	0.95	0.95	0.95	1.00		6.00	-		0.95	0.95	0.95	0.95	1.00		6.00	-
Cooking (S)	toe/toe		0.45	0.45	0.45	0.45			0.70	-		0.55	0.55	0.55	0.55		0.55	0.80	-		0.55	0.55	0.55	0.55		0.55	0.80	-
Cooking (E)	toe/toe								1.00	-								1.11	-								1.11	-
Lighting	toe/toe								1.00	-								2.00	-								2.00	-
Refrigerator	toe/toe								1.00	-								1.50	-								1.50	-
TV	toe/toe								1.00	-								2.00	-								2.00	-
Appliance	toe/toe								1.00	-								1.50	-								1.50	-
										-									-									-
										-									-									-

4 Energy consumption

		2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Warm	Mtoe	0.0	10.9	2.8	0.0	0.0	0.0	0.0	1.2	14.9	0.0	0.5	0.5	0.0	0.0	0.9	0.0	0.9	2.8	0.0	0.5	0.5	4.5	0.0	0.0	0.0	0.4	5.9
Hot Water	Mtoe	0.0	8.4	5.0	0.0	0.8	0.0	0.0	1.0	15.2	0.0	0.3	0.3	0.0	0.6	0.6	0.0	0.7	2.4	0.0	1.0	1.0	2.0	2.9	0.0	0.0	0.5	7.3
Cooking (S)	Mtoe	0.0	1.2	1.6	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.7	0.8	0.0	0.3	0.4	0.7	0.0	0.0	0.0	0.4	1.8
Cooking (E)	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
Lighting	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
Refrigerator	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2
TV	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Appliance	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	6.5
	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation	Mtoe									0.0						7.6		-2.9	4.7					15.5			-5.9	9.6
Cogeneration	Mtoe									0.0						-1.5	3.6	-1.6	0.5						0.0	0.0	0.0	0.0
	Mtoe									0.0									0.0									0.0
Total	Mtoe	0	21	9	0	1	0	0	23	54	0	1	1	0	8	0	4	14	27	0	2	2	7	18	0	0	7	37

Energy-wise Service Share

Worksheet for Service Share

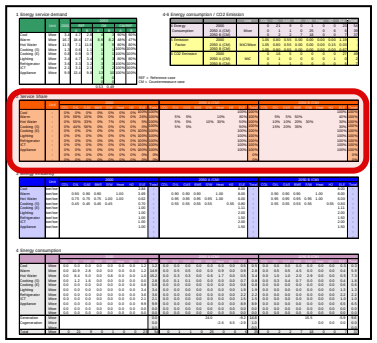


Enter values of energy efficiency in future in Energy Snapshot.

Enter grounds of parameter in the worksheet “Efficiency”.

	Grounds of Parameter
Space heating	
Space cooling	
Hot water heating	
Refrigerators and freezers	
Cloth dryer	
Cooking	
Cloth washers	
Dish washers	
Other energy uses	
Miscellaneous electric energy	
Lighting	

- **Data Source, assumption etc**



Energy-wise Service Share

Cooling — Elect.

Warming — Biomass → Coal → Oil → Gas → Elect.; Renew.

Hot water — Biomass → Coal → Oil → Gas → Elect.; Renew.

Cooking — Biomass → Coal → Oil → Gas → Elect.; Renew.

Lighting — Oil → Elect.

Appliance — Elect.

Residential Sector

1 Energy service demand

	Unit	2000	2050 REF A	2050 REF B	2050 CM A	2050 CM B	CM/REF A	CM/REF B
Cool	Mtoe	3.4	4.7	2.8	4	3	90%	90%
Warm	Mtoe	16.7	18.4	17.4	8.9	8.2	48%	47%
Hot Water	Mtoe	11.5	7.1	11.6	6	9	80%	80%
Cooking (S)	Mtoe	1.3	0.6	1.1	1	1	100%	100%
Cooking (E)	Mtoe	0.8	0.9	0.7	1	1	100%	100%
Lighting	Mtoe	3.4	4.7	3.4	4	3	80%	80%
Refrigerator	Mtoe	3.6	3.3	3.2	3	3	100%	100%
TV	Mtoe	2.1	3.1	2.1	3	2	100%	100%
Appliance	Mtoe	9.9	13.5	9.8	14	10	100%	100%
					0	0		
					0	0		
					0.53	0.49		

REF = Reference case
CM = Countermeasure case

4-6 Energy consumption / CO2 Emission

		Unit	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
4 Energy Consumption	2000	Mtoe	0	21	9	0	1	0	0	23	54
	2050 A (CM)		0	1	1	0	8	0	4	14	27
	2050 B (CM)		0	2	2	7	18	0	0	7	37
5 Emission Factor	2000	MtC/Mtoe	1.05	0.80	0.55	0.00	0.00	0.00	0.00	1.19	-
	2050 A (CM)		1.05	0.80	0.55	0.00	0.00	0.00	0.47	0.00	-
	2050 B (CM)		1.05	0.80	0.55	0.00	0.00	0.00	0.00	0.41	-
6 CO2 Emission	2000	MtC	0	16	5	0	0	0	0	27	49
	2050 A (CM)		0	1	0	0	0	0	2	0	3
	2050 B (CM)		0	1	1	0	0	0	0	3	5

2 Service Share

	Unit	2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Warm	-	0%	59%	15%	0%	0%	0%	0%	26%	100%		5%	5%			10%		80%	100%		5%	5%	50%				40%	100%
Hot Water	-	0%	55%	33%	0%	7%	0%	0%	5%	100%		5%	5%		10%	10%		70%	100%		10%	10%	20%	30%			30%	100%
Cooking (S)	-	0%	44%	56%	0%	0%	0%	0%	0%	100%		5%	5%					90%	100%		15%	20%	35%				30%	100%
Cooking (E)	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Lighting	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Refrigerator	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
TV	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
Appliance	-	0%	0%	0%	0%	0%	0%	0%	100%	100%								100%	100%								100%	100%
	-	0%	0%	0%	0%	0%	0%	0%	0%	0%								0%	0%									0%
	-	0%	0%	0%	0%	0%	0%	0%	0%	0%								0%	0%									0%

3 Energy efficiency

	Unit	2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	toe/toe								2.84	-								8.00	-								8.00	-
Warm	toe/toe		0.90	0.90	0.90		1.00		3.69	-		0.90	0.90	0.90		1.00		8.00	-		0.90	0.90	0.90		1.00		8.00	-
Hot Water	toe/toe		0.75	0.75	0.75	1.00	1.00		0.62	-		0.95	0.95	0.95	0.95	1.00		6.00	-		0.95	0.95	0.95	0.95	1.00		6.00	-
Cooking (S)	toe/toe		0.45	0.45	0.45	0.45			0.70	-		0.55	0.55	0.55	0.55		0.55	0.80	-		0.55	0.55	0.55	0.55		0.55	0.80	-
Cooking (E)	toe/toe								1.00	-								1.11	-								1.11	-
Lighting	toe/toe								1.00	-								2.00	-								2.00	-
Refrigerator	toe/toe								1.00	-								1.50	-								1.50	-
TV	toe/toe								1.00	-								2.00	-								2.00	-
Appliance	toe/toe								1.00	-								1.50	-								1.50	-
										-									-									-
										-									-									-

4 Energy consumption

		2000 COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 A (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	2050 B (CM) COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
Cool	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Warm	Mtoe	0.0	10.9	2.8	0.0	0.0	0.0	0.0	1.2	14.9	0.0	0.5	0.5	0.0	0.0	0.9	0.0	0.9	2.8	0.0	0.5	0.5	4.5	0.0	0.0	0.0	0.4	5.9
Hot Water	Mtoe	0.0	8.4	5.0	0.0	0.8	0.0	0.0	1.0	15.2	0.0	0.3	0.3	0.0	0.6	0.6	0.0	0.7	2.4	0.0	1.0	1.0	2.0	2.9	0.0	0.0	0.5	7.3
Cooking (S)	Mtoe	0.0	1.2	1.6	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.7	0.8	0.0	0.3	0.4	0.7	0.0	0.0	0.0	0.4	1.8
Cooking (E)	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
Lighting	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
Refrigerator	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2
TV	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Appliance	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	6.5
	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mtoe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation	Mtoe									0.0					7.6			-2.9	4.7					15.5			-5.9	9.6
Cogeneration	Mtoe									0.0						-1.5	3.6	-1.6	0.5						0.0	0.0	0.0	0.0
	Mtoe									0.0									0.0									0.0
Total	Mtoe	0	21	9	0	1	0	0	23	54	0	1	1	0	8	0	4	14	27	0	2	2	7	18	0	0	7	37

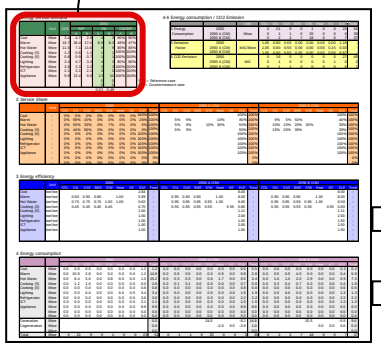
Energy Service Demand

Energy Service Demand in Future

Energy Service Demand in Base Year

$$S(s) = \sum_{e} EC(s,e) * EE(s,e)$$

- *S*: Energy Service Demand
- *EC*: Energy Consumption
- *EE*: Energy Efficiency
- *s*: Service
- *e*: Energy



1 Energy service demand

	Unit	2000	2050					
			REF		CM		CM/REF	
			A	B	A	B	A	B
Cool	Mtoe	3.4	4.7	2.8	4	3	90%	90%
Warm	Mtoe	16.7	18.4	17.4	8.9	8.2	48%	47%
Hot Water	Mtoe	11.5	7.1	11.6	6	9	80%	80%
Cooking (S)	Mtoe	1.3	0.6	1.1	1	1	100%	100%
Cooking (E)	Mtoe	0.8	0.9	0.7	1	1	100%	100%
Lighting	Mtoe	3.4	4.7	3.4	4	3	80%	80%
Refrigerator	Mtoe	3.6	3.3	3.2	3	3	100%	100%
ICT	Mtoe	2.1	3.1	2.1	3	2	100%	100%
Appliance	Mtoe	9.9	13.4	9.8	13	10	100%	100%
					0	0		
					0	0		
					0.53	0.49		

REF =
CM = C

Structure of ESS
Energy Efficiency
Energy-wise Service Share
Energy Service Demand

Energy Service Demand in Future

		Service	Change rate of parameters					Change rate of Service	Service		Grounds of Parameter
		Base Year	Number of Household α1	Holding rate α2	Operating hours α3	Strength α4	Service Loss α5	Σ(1+αi)-1	BaU(U) CM(L)	CM/BaU	
Space heating	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Space cooling	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Hot water heating	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Refrigerators and freezers	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Cloth dryer	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Cooking	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Cloth washers	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Dish washers	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Other energy uses	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Miscellaneous electric energy	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		
Lighting	BaU							0%	0.00	-	
	Countermeasure							0%	0.00		

Enter values based on the method in the previous page.

Enter values based on narrative scenario.

Enter grounds of parameter in the worksheet “Service”.

Energy Service Demand in Future

Change in Energy Service Demand

= Change of Number of Household

** Change of Holding Rate*

** Change of Operation Hours*

** Change of Strength*

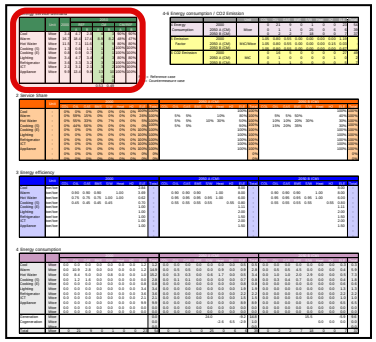
** Change of Service loss rate*

Holding Rate: Stock volume of a device which supplies energy service per household

Operation Hours: Time to supply a service in a year

Strength: Service quantity which a device supplies per hour

Service loss rate: Service loss rate between a donor of service (=device) and a receptor of service (=person) due to lack of insulation etc.



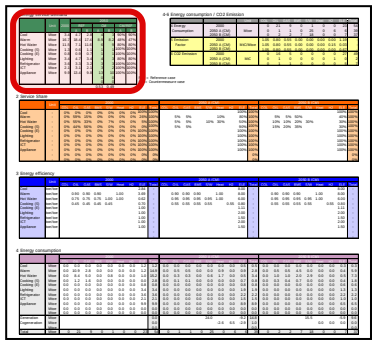
Enter service demand in ESS

Ex. Japan LCS2050 A scenario		Service Base Year	Change rate of parameters: Number of Household α1	Holding rate α2	Operating hours α3	Strength α4	Service Loss α5	Change rate of Service Σ(1+αi)-1	Service BaU(U) / CM(L)	Service CM/BaU
Cool	BaU	3.40	-8%	51%				39%	4.72	0.90
	Countermeasure		-8%	51%	-5%	-5%		25%	4.25	

1 Energy service demand

	Unit	2000	2050 REF A	2050 REF B	2050 CM A	2050 CM B	2050 CM/REF A	2050 CM/REF B
Cool	Mtoe	3.4	4.7	2.8	4	3	90%	90%
Warm	Mtoe	16.7	18.4	17.4	8.9	8.2	48%	47%
Hot Water	Mtoe	11.5	7.1	11.6	6	9	80%	80%
Cooking (S)	Mtoe	1.3	0.6	1.1	1	1	100%	100%
Cooking (E)	Mtoe	0.8	0.9	0.7	1	1	100%	100%
Lighting	Mtoe	3.4	4.7	3.4	4	3	80%	80%
Refrigerator	Mtoe	3.6	3.3	3.2	3	3	100%	100%
ICT	Mtoe	2.1	3.1	2.1	3	2	100%	100%
Appliance	Mtoe	9.9	13.4	9.8	13	10	100%	100%
					0	0		
					0	0		
					0.53	0.49		

REF =
CM = C



Try to make residential LCS in your country.