

Residential Sector



AIM Training Workshop
Tokyo, Japan Oct 22-26, 2007



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Structure of ESS

Energy Efficiency

Energy-wise
Service Share

Energy Service
Demand in Future

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- Structure of ESS
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Worksheet for Energy Efficiency

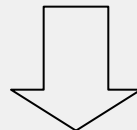
1 Energy service demand											4-4 Energy consumption / CO2 Emission										
Unit	2000	REF	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	
Coal	Mtboe	3.17	2.23	1.1	1	34%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Warm	Mtboe	16.7	18.4	17.4	8.3	48%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Hot Water	Mtboe	11.3	11.1	11.4	4	9	80%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Cooking (S)	Mtboe	1.3	0.6	1.1	1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Cooking (I)	Mtboe	2.8	0.9	0.7	1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Lighting	Mtboe	3.4	4.7	3.4	4	3	80%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Refrigerator	Mtboe	2.8	1.2	1.2	1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
ICT	Mtboe	2.1	1.1	2.1	1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Appliance	Mtboe	9.8	13.4	9.8	11	10	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
							0	0	0	0	0	0	0	0	0	0	0	0	0	0	
							0.53	0.49													

2 Service Share										
Unit	2000	REF	2050	2050	2050	2050	2050	2050	2050	2050
Coal		0%	0%	0%	0%	0%	0%	100%	100%	100%
Warm		0%	50%	10%	0%	0%	0%	5%	5%	10%
Hot Water		0%	50%	20%	0%	7%	0%	0%	0%	0%
Cooking (S)		0%	45%	56%	0%	0%	0%	0%	0%	0%
Cooking (I)		0%	0%	0%	0%	0%	0%	100%	100%	100%
Lighting		0%	0%	0%	0%	0%	0%	100%	100%	100%
Refrigerator		0%	0%	0%	0%	0%	0%	100%	100%	100%
ICT		0%	0%	0%	0%	0%	0%	100%	100%	100%
Appliance		0%	0%	0%	0%	0%	0%	100%	100%	100%
		0%	0%	0%	0%	0%	0%	0%	0%	0%

3 Energy efficiency										
Unit	2000	REF	2050	2050	2050	2050	2050	2050	2050	2050
Coal	tsu/boe	0.90	0.90	0.90	1.00	2.84		0.90	0.90	0.90
Warm	tsu/boe	0.75	0.75	1.00	1.00	0.82		0.95	0.95	0.95
Hot Water	tsu/boe	0.45	0.45	0.45	0.45	0.30		0.55	0.55	0.55
Cooking (S)	tsu/boe	1.00				1.11		1.11		
Cooking (I)	tsu/boe	1.00				1.00		1.00		
Lighting	tsu/boe	1.00				1.50		1.50		
Refrigerator	tsu/boe	1.00				2.00		2.00		
ICT	tsu/boe	1.00				1.50		1.50		
Appliance	tsu/boe	1.00				1.50		1.50		

4 Energy consumption										
Unit	2000	REF	2050	2050	2050	2050	2050	2050	2050	2050
Coal	Mtboe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warm	Mtboe	0.0	10.9	2.8	0.0	0.0	0.0	1.2	1.2	0.0
Hot Water	Mtboe	0.0	8.4	0.0	0.0	0.0	0.0	1.9	1.9	0.0
Cooking (S)	Mtboe	0.0	1.2	1.6	0.0	0.0	0.0	0.0	0.0	0.0
Cooking (I)	Mtboe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lighting	Mtboe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Refrigerator	Mtboe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ICT	Mtboe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Appliance	Mtboe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Generation	Mtboe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Consumption	Mtboe	0.0	21.0	6.5	2.1	14.8		15.5		0.0
Total	Mtboe	0.0	21.0	6.5	2.1	14.8		15.5		0.0

Enter grounds of parameter in the worksheet "Efficiency".



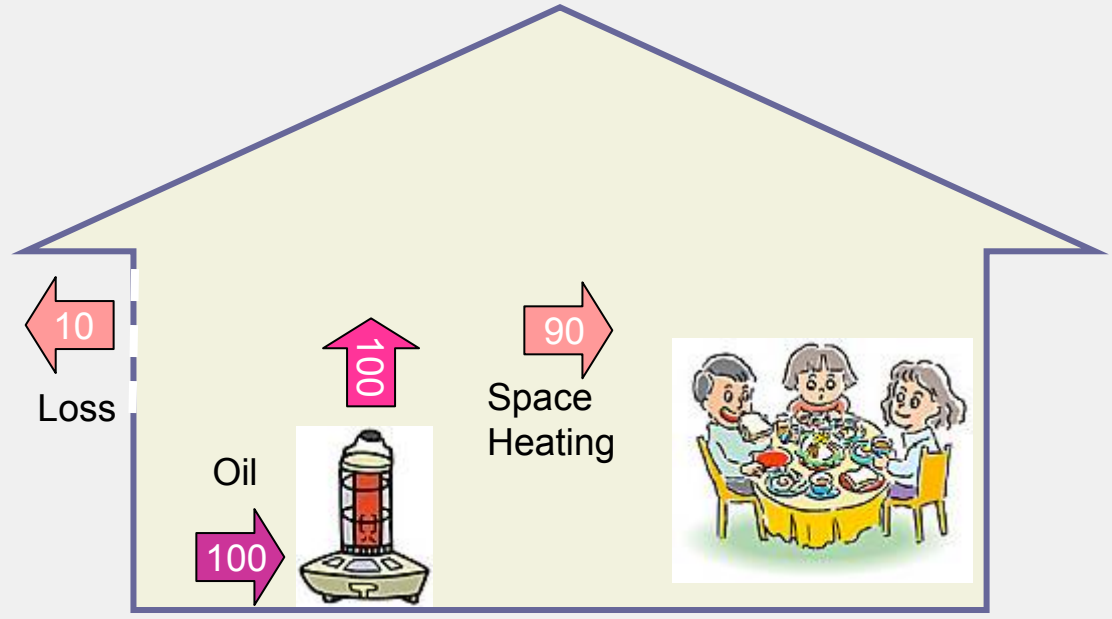
Grounds of Parameter	
Space heating	
Space cooling	
Hot water heating	
Refrigerators and freezers	
Cloth dryer	• Data Source, assumption etc
Cooking	
Cloth washers	
Dish washers	
Other energy uses	
Miscellaneous electric energy	
Lighting	



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

Space Heating (Stove)

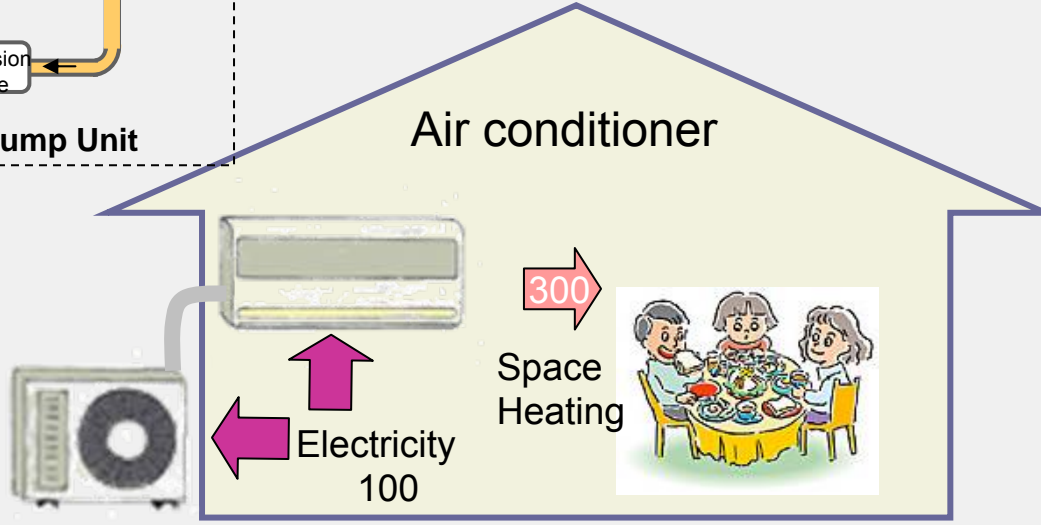
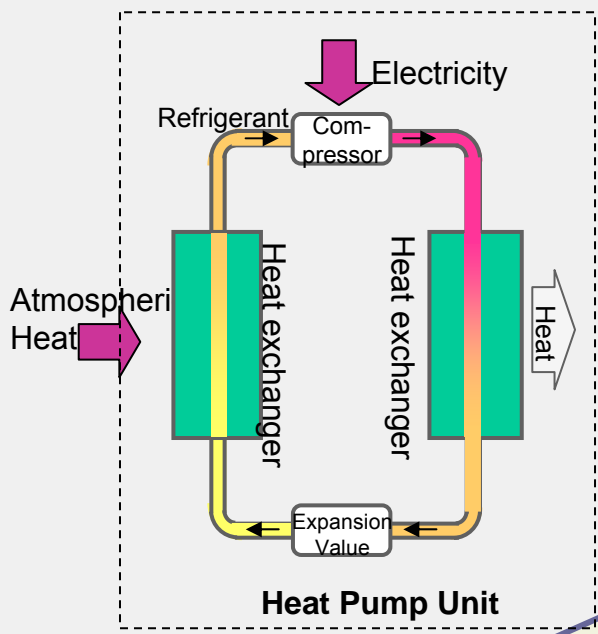
Structure of ESS
Energy Efficiency
Energy-wise Service Share
Energy Service Demand



Category	Value	Unit
Oil	100	kg
Loss	10	kg
Space Heating	90	kg

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

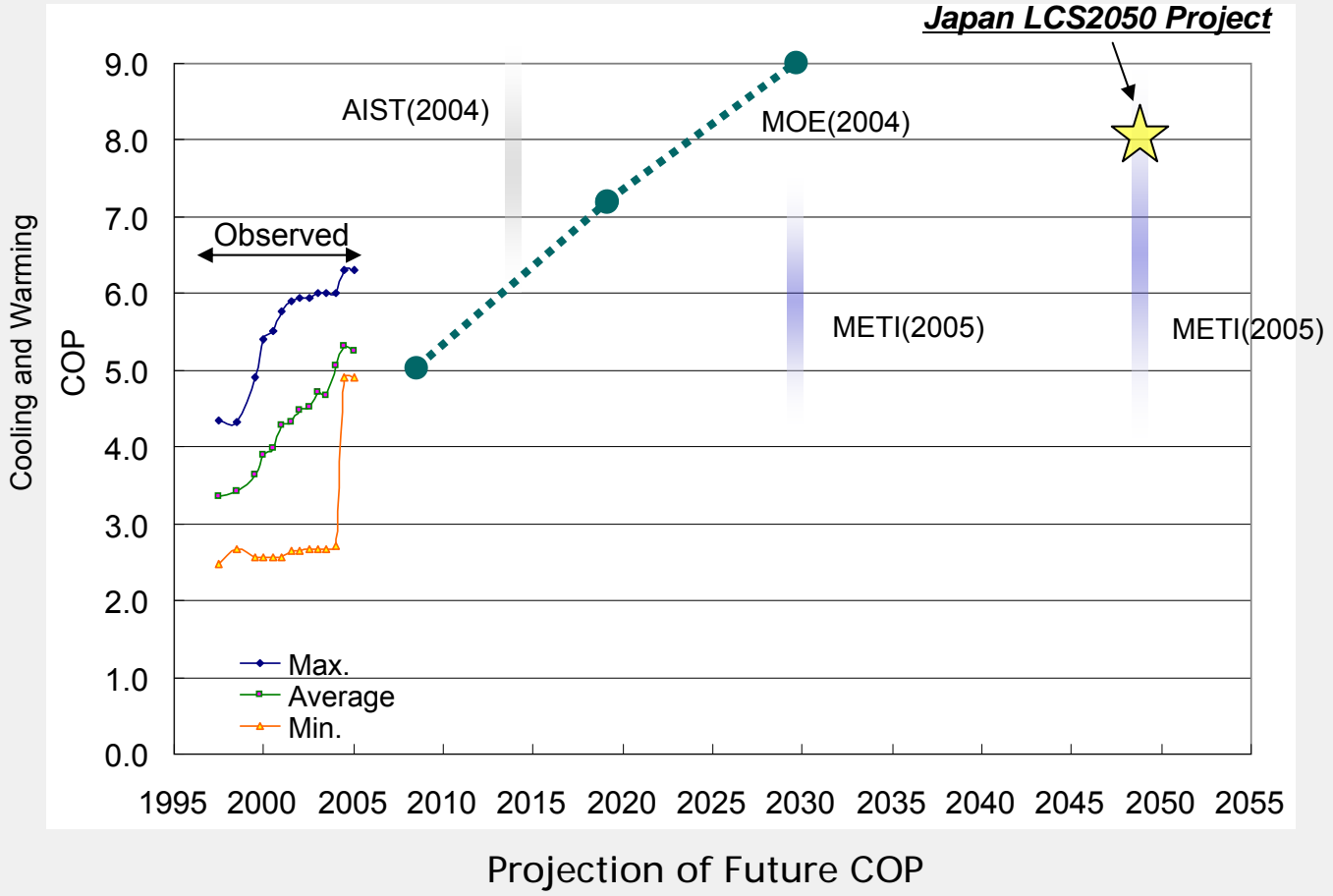
Space Heating (Heat Pump)



Category	Value	Unit
Electricity	100	kWh
Space Heating	300	kWh

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

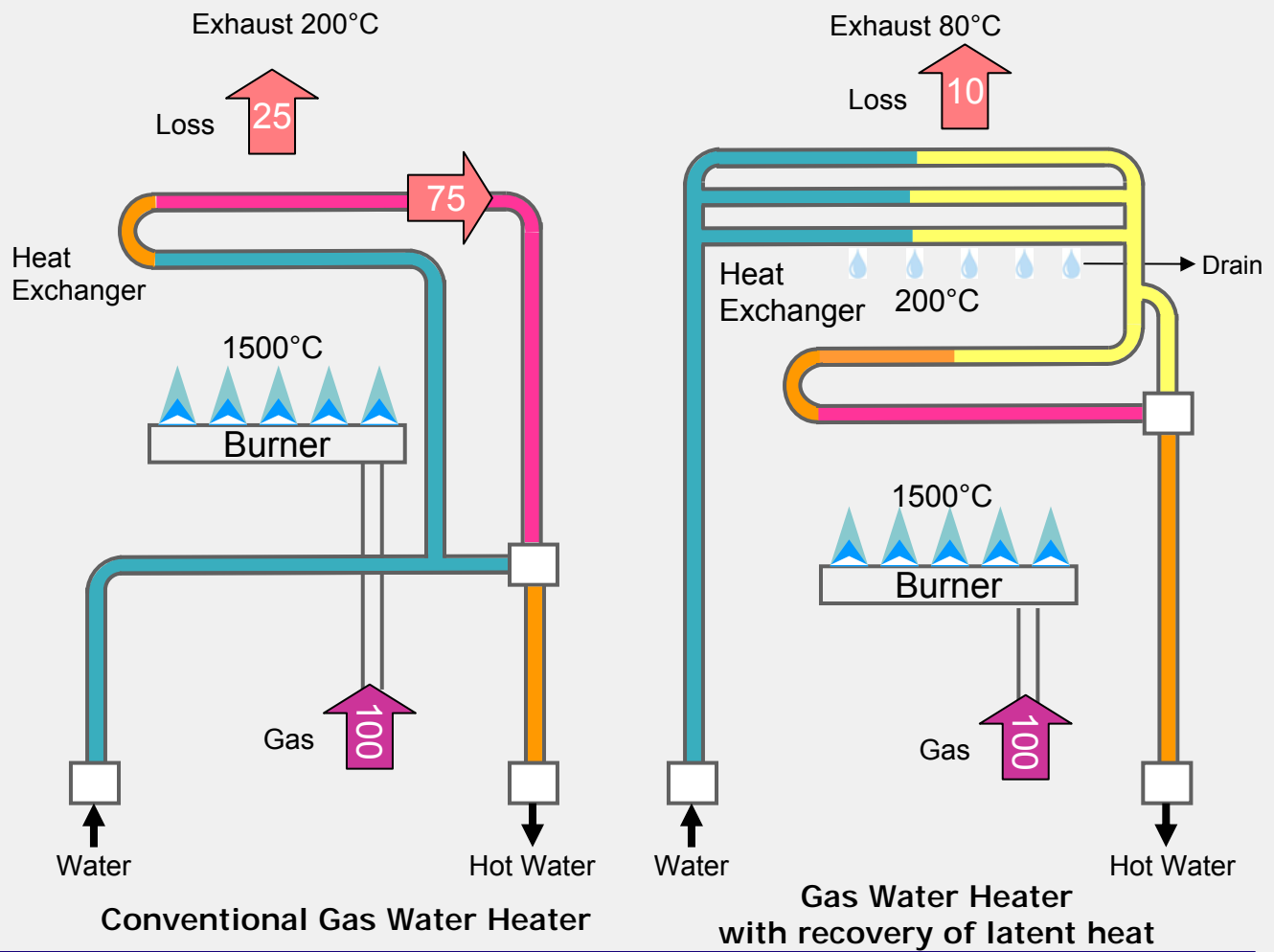
Space Heating (Heat Pump)



Category	Item	Value	Unit
Energy Service Demand	Space Heating	1.2	1000 kWh/yr
	Water Heating	0.8	1000 kWh/yr
	Air Conditioning	0.5	1000 kWh/yr
	Lighting	0.2	1000 kWh/yr
Energy-wise Service Share	Space Heating	40%	%
	Water Heating	25%	%
	Air Conditioning	15%	%
	Lighting	20%	%

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

Water Heating (Gas Heater)

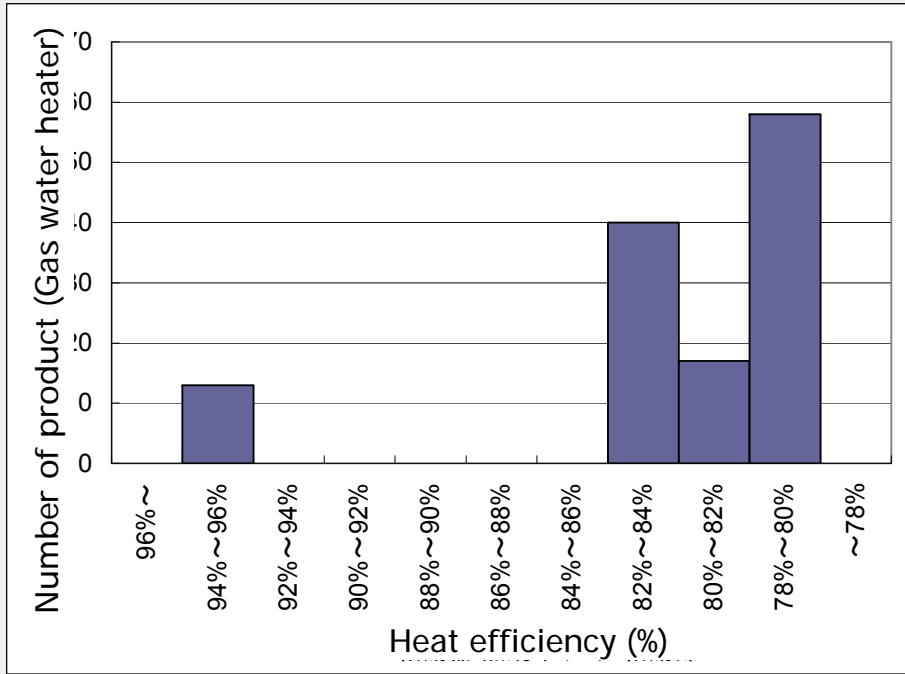


Energy Service	Energy Service Demand	Energy Service Share	Energy Efficiency
Water Heating	100	75	75%
Space Heating	100	75	75%
Water Heating	100	75	75%
Space Heating	100	75	75%

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

Water Heating (Gas Heater)

Gas Water Heater with recovery of latent heat Conventional Gas Water Heater

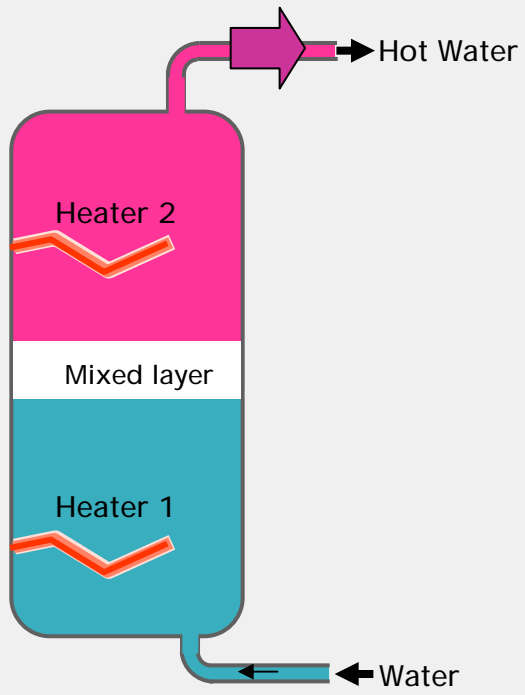


Number of product in 2004, Japan (24 size classification)

Product	Model	Capacity (L)	Heat Efficiency (%)	Number of Products
Gas Water Heater with recovery of latent heat	Model 1	15	96% ~ 94%	15
	Model 2	18	96% ~ 94%	15
	Model 3	21	96% ~ 94%	15
	Model 4	24	96% ~ 94%	15
	Model 5	27	96% ~ 94%	15
	Model 6	30	96% ~ 94%	15
	Model 7	33	96% ~ 94%	15
	Model 8	36	96% ~ 94%	15
	Model 9	39	96% ~ 94%	15
	Model 10	42	96% ~ 94%	15
Conventional Gas Water Heater	Model 11	15	82% ~ 84%	100
	Model 12	18	82% ~ 84%	100
	Model 13	21	82% ~ 84%	100
	Model 14	24	82% ~ 84%	100
	Model 15	27	82% ~ 84%	100
	Model 16	30	82% ~ 84%	100
	Model 17	33	82% ~ 84%	100
	Model 18	36	82% ~ 84%	100
	Model 19	39	82% ~ 84%	100
	Model 20	42	82% ~ 84%	100

Water Heating (Electric Heater)

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



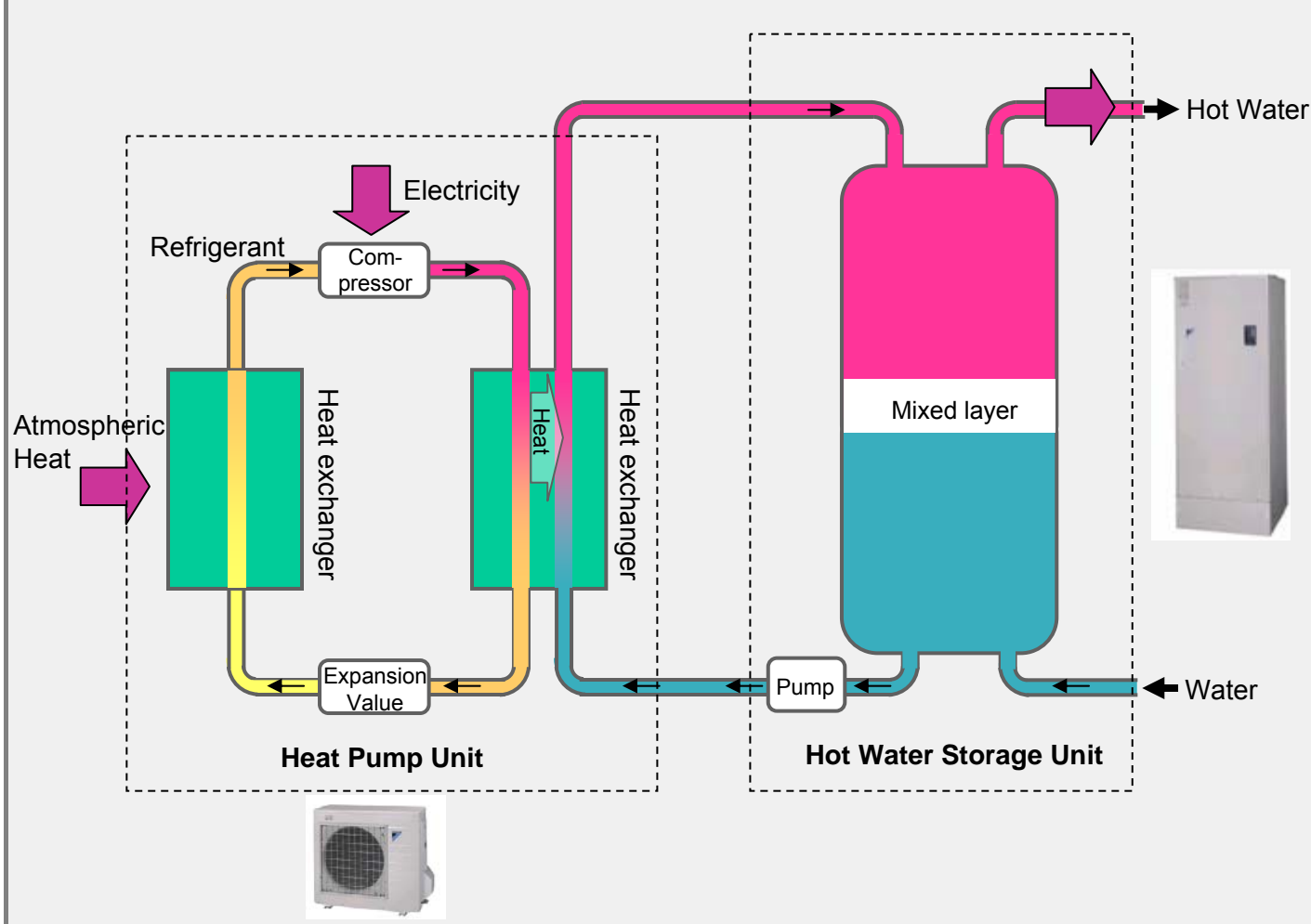
Category	Value	Unit
Electricity	1.2	kWh
Gas	0.5	kWh
Water	0.1	kWh
Other	0.0	kWh
Total	1.8	kWh

Category	Value	Unit
Electricity	1.2	kWh
Gas	0.5	kWh
Water	0.1	kWh
Other	0.0	kWh
Total	1.8	kWh

Category	Value	Unit
Electricity	1.2	kWh
Gas	0.5	kWh
Water	0.1	kWh
Other	0.0	kWh
Total	1.8	kWh

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

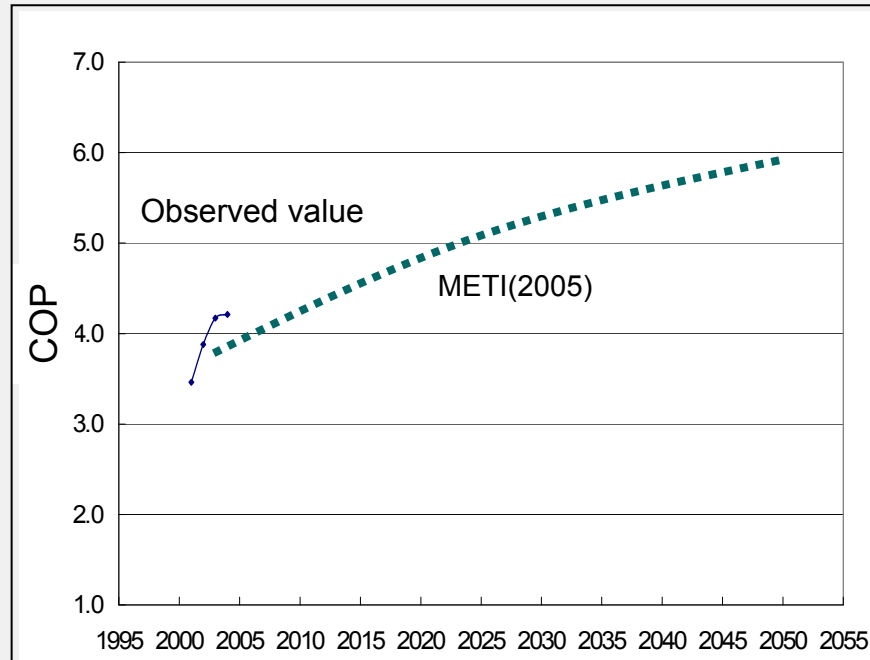
Water Heating (Heat Pump)



Category	Item	Value	Unit
Energy Efficiency	Energy Efficiency Ratio (EER)	2.5	-
	Seasonal Energy Efficiency Ratio (SEER)	12	-
	Coefficient of Performance (COP)	3.5	-
	Energy Efficiency Index (EEI)	0.3	-
Energy-wise Service Share	Energy Service Demand (ESD)	100	kWh/year
	Energy Service Demand (ESD)	100	kWh/year
	Energy Service Demand (ESD)	100	kWh/year
	Energy Service Demand (ESD)	100	kWh/year
Energy Service Demand	Energy Service Demand (ESD)	100	kWh/year
	Energy Service Demand (ESD)	100	kWh/year
	Energy Service Demand (ESD)	100	kWh/year
	Energy Service Demand (ESD)	100	kWh/year

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

Water Heating (Heat Pump)



COP of heat pump water heater

Category	Item	Value	Unit
Energy Service Demand	Space Heating	10.0	kWh/m²/yr
	Water Heating	15.0	kWh/m²/yr
	Cooling	5.0	kWh/m²/yr
	Lighting	2.0	kWh/m²/yr
Energy Efficiency	Space Heating	0.8	kWh/m²/yr
	Water Heating	1.2	kWh/m²/yr
	Cooling	0.4	kWh/m²/yr
	Lighting	0.16	kWh/m²/yr

Structure of ESS

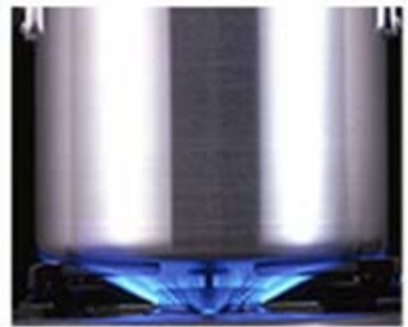
Energy Efficiency

Energy-wise Service Share

Energy Service Demand

Cooking (Stove Burner)

Conventional Burner

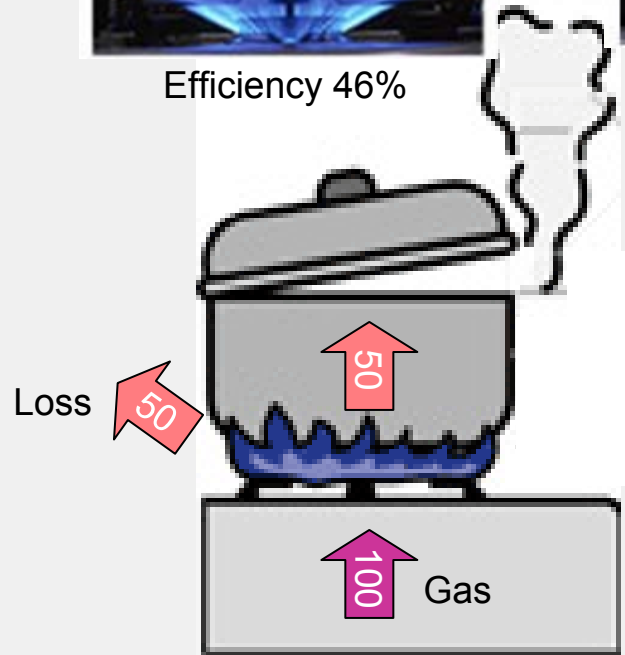


Efficiency 46%

Inner-flame Burner



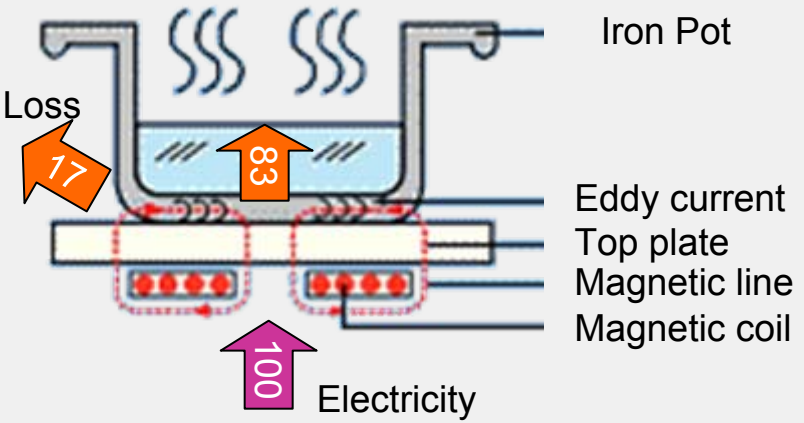
Efficiency 56%



Category	Sub-category	Value	Unit
Energy Efficiency	Energy Efficiency	0.46	%
	Energy Efficiency	0.56	%
	Energy Efficiency	0.56	%
	Energy Efficiency	0.56	%
Energy-wise Service Share	Energy-wise Service Share	0.46	%
	Energy-wise Service Share	0.56	%
	Energy-wise Service Share	0.56	%
	Energy-wise Service Share	0.56	%
Energy Service Demand	Energy Service Demand	0.46	%
	Energy Service Demand	0.56	%
	Energy Service Demand	0.56	%
	Energy Service Demand	0.56	%

Cooking (Electric)

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



Category	Item	Value	Unit
Energy Efficiency	Energy Efficiency Ratio	0.83	-
	Energy Efficiency Index	1.00	-
	Energy Efficiency Class	A	-
	Energy Efficiency Label	Energy Efficient	-
Energy-wise Service Share	Energy Service Demand	1.00	-
	Energy Service Index	1.00	-
	Energy Service Class	A	-
	Energy Service Label	Energy Efficient	-

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

Lighting



Incandescent Lamp



Compact Fluorescent Lamp



Fluorescent Lamp



**LED Lamp
(Light Emitting Diode)**



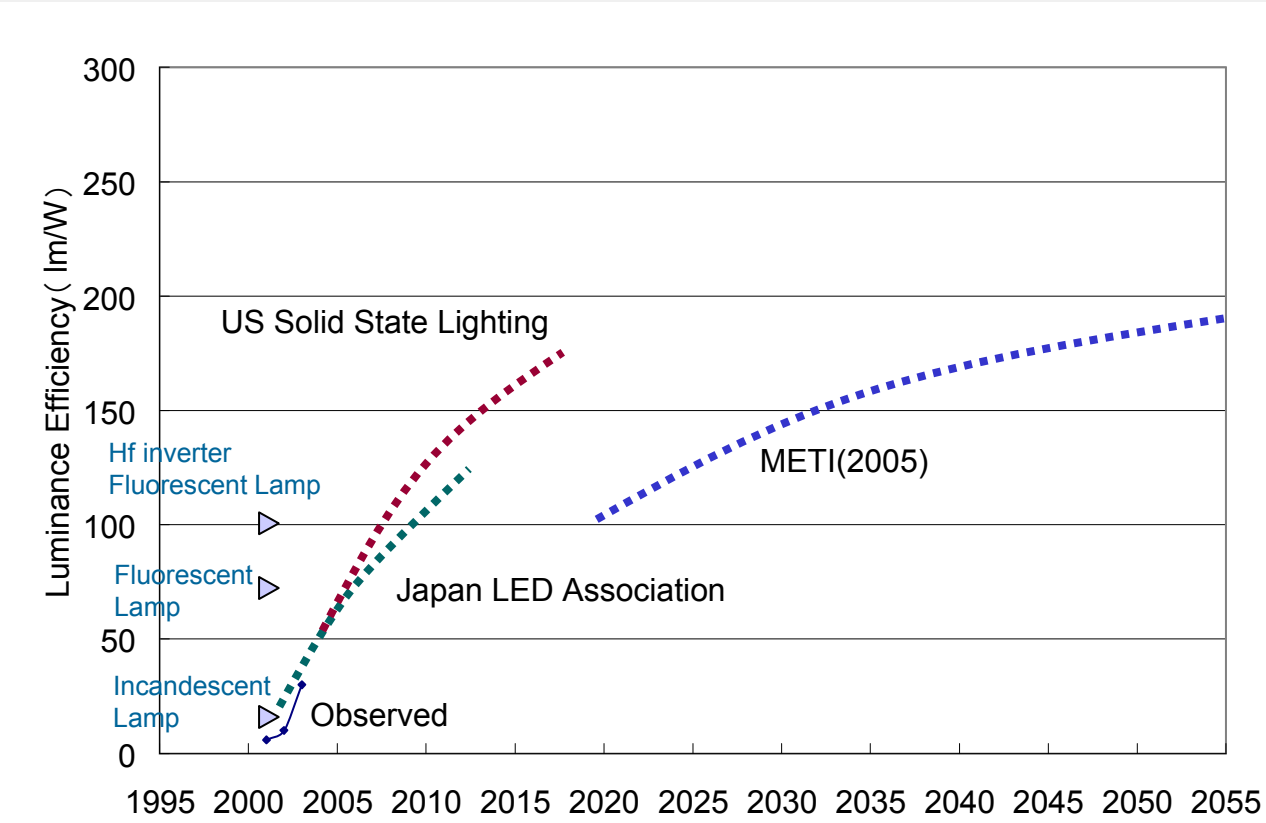
Organic Electro-Luminescence

Lighting	Incandescent Lamp	Compact Fluorescent Lamp	Fluorescent Lamp	LED Lamp	Organic Electro-Luminescence
Energy Service Demand	100	100	100	100	100
Energy Efficiency	100	100	100	100	100
Energy-wise Service Share	100	100	100	100	100

Lighting

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

Category	Item	Value	Unit
Energy Efficiency	Energy Efficiency	0.85	
	Energy Efficiency	0.85	
	Energy Efficiency	0.85	
	Energy Efficiency	0.85	
Energy-wise Service Share	Energy-wise Service Share	0.15	
	Energy-wise Service Share	0.15	
	Energy-wise Service Share	0.15	
	Energy-wise Service Share	0.15	
Energy Service Demand	Energy Service Demand	100	kWh
	Energy Service Demand	100	kWh
	Energy Service Demand	100	kWh
	Energy Service Demand	100	kWh

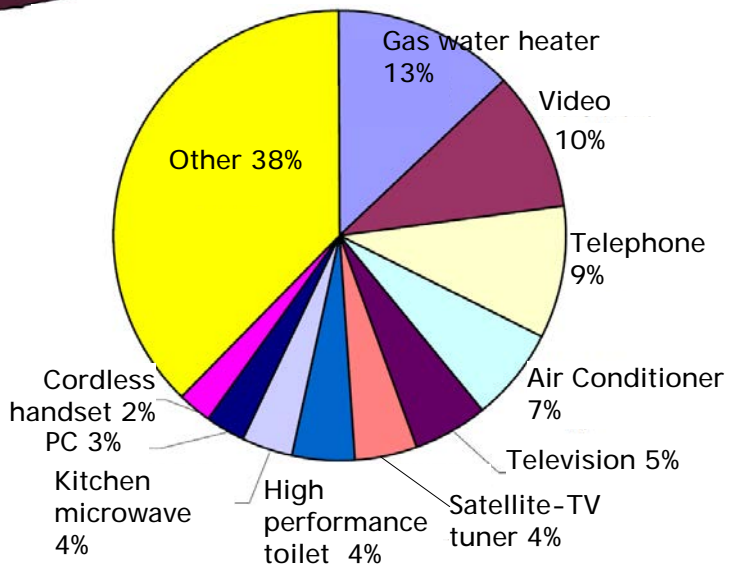
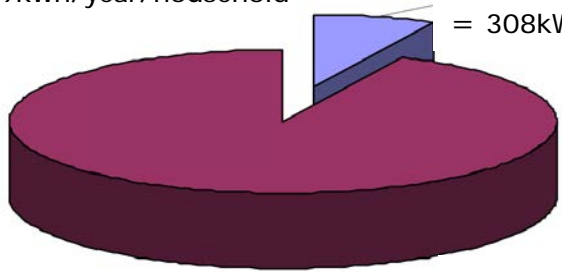


- Structure of ESS
- Energy Efficiency**
- Energy-wise Service Share
- Energy Service Demand

Standby Electricity

Electricity consumption in residential sector
 = 4,209kWh/year/household

Standby electricity consumption
 = 308kWh/year/household (7.3%)

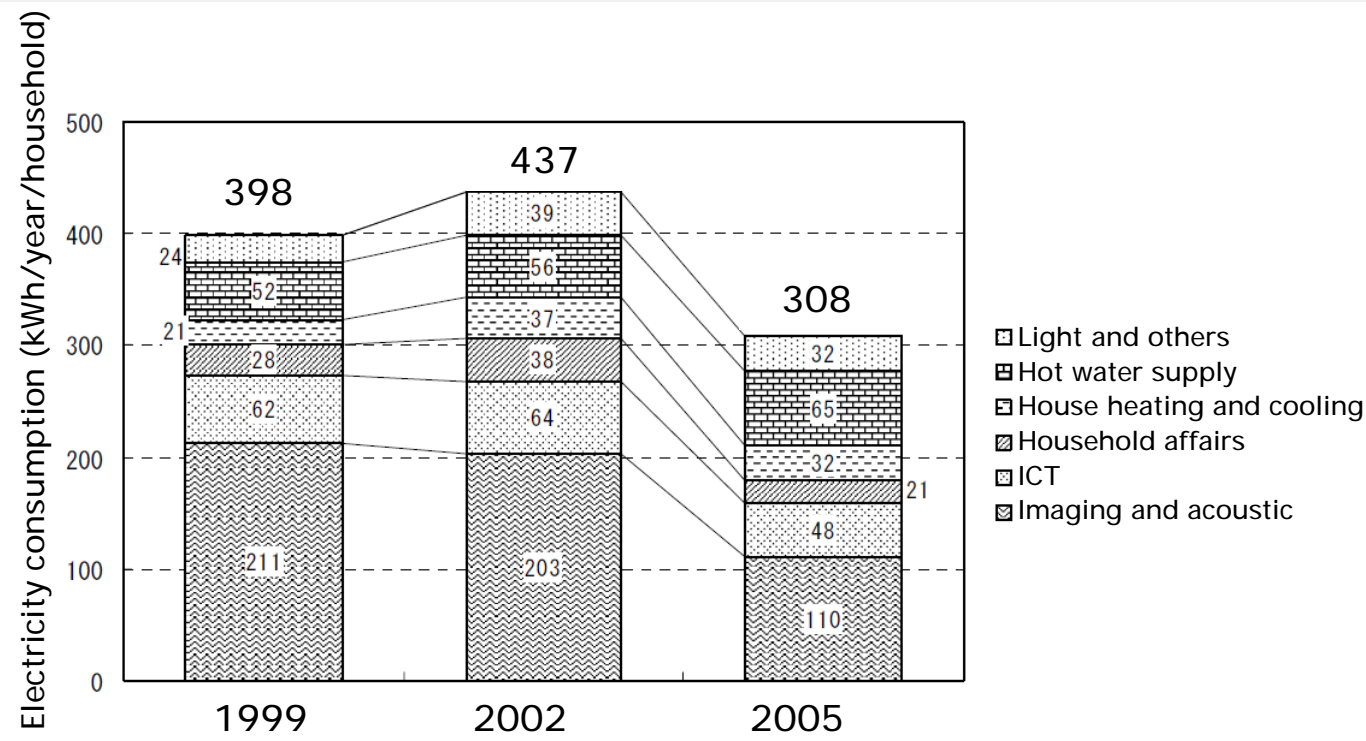


Source: Energy Conservation Center, Japan

Category	Value	Value	Value	Value	Value
...
...
...
...

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

Standby Electricity



Source: Energy Conservation Center, Japan

Category	1999	2002	2005
Imaging and acoustic	211	203	110
ICT	62	64	48
Household affairs	28	38	21
House heating and cooling	21	37	32
Hot water supply	52	56	65
Light and others	24	39	32
Total	398	437	308

1 Energy service demand

Unit	2000	2050								
		REF		CM		CM/REF		A	B	
		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%		
TV	Mtoe	2.1	3.1	2.1	3	2	100%	100%		
Appliance	Mtoe	9.9	13.5	9.8	14	10	100%	100%		
					0.53	0.49				

REF = Reference case
CM = Countermeasure case

4-6 Energy consumption / CO2 Emission

4 Energy Consumption	2000	Unit	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
			0	21	9	0	1	0	0	23	54
			2050 A (CM)	2050 B (CM)							
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	Unit	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total
			0	16	5	0	0	0	0	27	49
			2050 A (CM)	2050 B (CM)							
			0	1	0	0	0	0	2	0	3
			0	1	1	0	0	0	0	3	5

2 Service Share

Unit	2000											2050 A (CM)											2050 B (CM)										
	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	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%	10%	-	80%	100%	5%	5%	5%	-	-	-	-	-	50%	100%			
Hot Water	-	0%	55%	33%	0%	7%	0%	0%	5%	100%	5%	5%	-	-	-	10%	10%	-	70%	100%	10%	10%	20%	-	-	-	-	-	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%	0%	100%	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	100%	100%			
Lighting	-	0%	0%	0%	0%	0%	0%	0%	0%	100%	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	100%	100%			
Refrigerator	-	0%	0%	0%	0%	0%	0%	0%	0%	100%	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	100%	100%			
TV	-	0%	0%	0%	0%	0%	0%	0%	0%	100%	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	100%	100%			
Appliance	-	0%	0%	0%	0%	0%	0%	0%	0%	100%	-	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	100%	100%			
	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	0%	0%			

3 Energy efficiency

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

4 Energy consumption

Unit	2000											2050 A (CM)											2050 B (CM)										
	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total						
Cool	Mtoe	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	0.0	0.3						
Warm	Mtoe	0.0	10.9	2.8	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	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	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	0.8	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	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	3.4	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	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	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						
Generation	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						
Cogeneration	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						
Total	Mtoe	0	21	9	0	1	0	23	54	0	1	1	0	8	0	4	14	27	0	2	2	7	18	0	0	0	7	37					

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

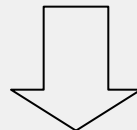
Worksheet for Service Share

1 Energy service demand														4-4 Energy consumption / CO2 Emission													
Unit	2000	REF	2050	2050 A	2050 B	2050 C	2050 D	2050 E	2050 F	2050 G	2050 H	2050 I	2050 J	2050 K	2050 L	2050 M	2050 N	2050 O	2050 P	2050 Q	2050 R	2050 S	2050 T				
Coal	Mtboe	3.11	2.73	2.33	1.91	1.50	1.09	0.68	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Warm Water	Mtboe	16.71	16.4	17.4	17.4	8.7	4.8	4.7%																			
Hot Water	Mtboe	11.52	11.1	11.4	9	80%	80%																				
Cooking (S)	Mtboe	1.1	0.4	1.1	1	100%	100%																				
Cooking (I)	Mtboe	2.8	4.9	0.7	1	100%	100%																				
Lighting	Mtboe	3.4	4.7	3.4	4	80%	80%																				
Refrigerator	Mtboe	2.8	3.2	2	2	100%	100%																				
ICT	Mtboe	2.1	2.1	2.1	2	100%	100%																				
Appliance	Mtboe	9.9	13.4	9.4	11	100%	100%																				

4-4 Energy consumption / CO2 Emission													
Energy Consumption	2050 A (CM)	2050 B (CM)	2050 A (CM)										
Consumption	Mtboe	0	21	0	0	0	0	0	0	0	0	0	0
Emission	2050 A (CM)	2050 B (CM)	2050 A (CM)										
Factor	MAC/Min	MAC/Min	0.05	0.80	0.55	0.00	0.00	0.00	0.00	0.00	0.00	1.19	0.00
Factor	2050 A (CM)	2050 B (CM)	1.05	0.80	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
Factor	2050 A (CM)	2050 B (CM)	1.05	0.80	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00
Factor	2050 A (CM)	2050 B (CM)	0	1	0	0	0	0	0	0	0	1	0
Factor	2050 A (CM)	2050 B (CM)	0	1	1	0	0	0	0	0	0	0	0

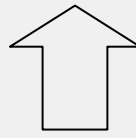
Service Share																								
Unit	2000	REF	2050	2050 A	2050 B	2050 C	2050 D	2050 E	2050 F	2050 G	2050 H	2050 I	2050 J	2050 K	2050 L	2050 M	2050 N	2050 O	2050 P	2050 Q	2050 R	2050 S	2050 T	
Coal		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Warm Water		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Hot Water		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cooking (S)		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Cooking (I)		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lighting		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Refrigerator		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
ICT		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Appliance		0%	50%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Enter grounds of parameter in the worksheet "Efficiency".



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

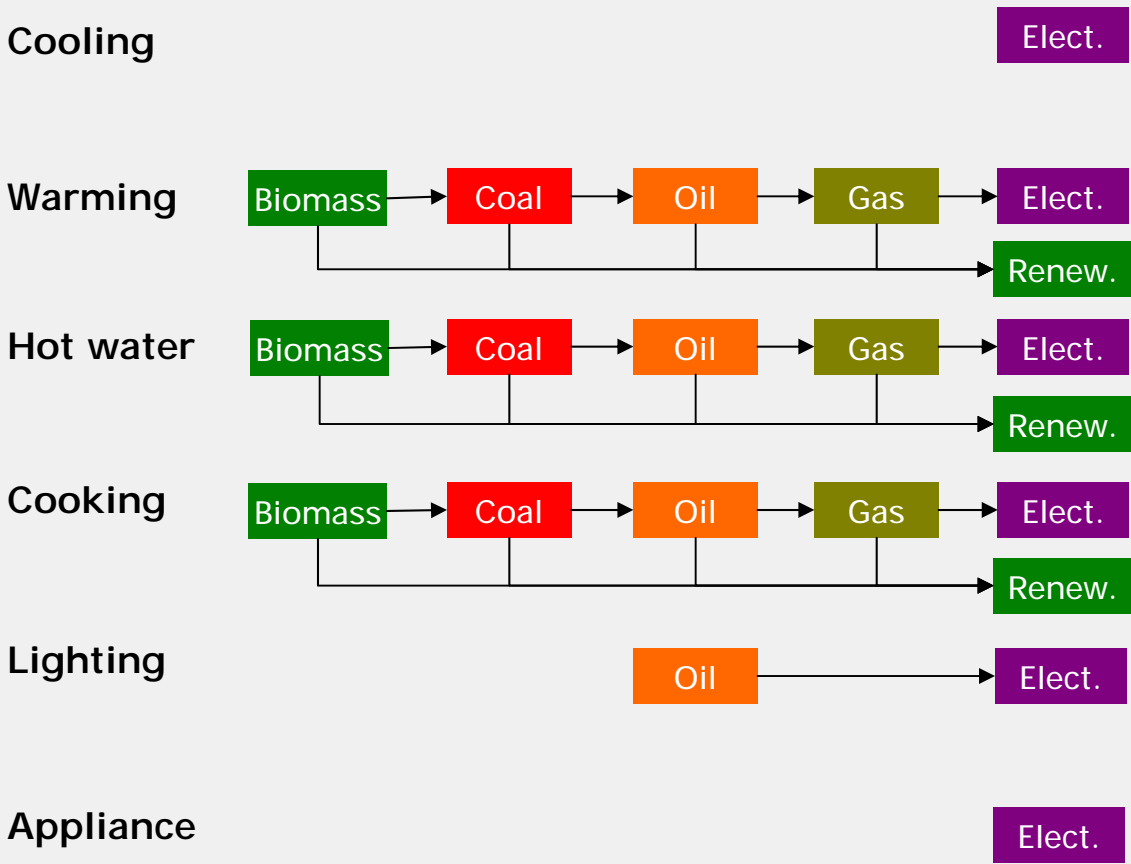
1 Energy service demand														4-4 Energy consumption / CO2 Emission													
Unit	2000	REF	2050	2050 A	2050 B	2050 C	2050 D	2050 E	2050 F	2050 G	2050 H	2050 I	2050 J	2050 K	2050 L	2050 M	2050 N	2050 O	2050 P	2050 Q	2050 R	2050 S	2050 T				
Coal	Mtboe	3.11	2.73	2.33	1.91	1.50	1.09	0.68	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Warm Water	Mtboe	16.71	16.4	17.4	17.4	8.7	4.8	4.7%																			
Hot Water	Mtboe	11.52	11.1	11.4	9	80%	80%																				
Cooking (S)	Mtboe	1.1	0.4	1.1	1	100%	100%																				
Cooking (I)	Mtboe	2.8	4.9	0.7	1	100%	100%																				
Lighting	Mtboe	3.4	4.7	3.4	4	80%	80%																				
Refrigerator	Mtboe	2.8	3.2	2	2	100%	100%																				
ICT	Mtboe	2.1	2.1	2.1	2	100%	100%																				
Appliance	Mtboe	9.9	13.4	9.4	11	100%	100%																				



Enter values of energy efficiency in future in Energy Snapshot.

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

Energy-wise Service Share



Service	Biomass	Coal	Oil	Gas	Elect.	Renew.
Cooling					100%	
Warming	100%					100%
Hot water	100%					100%
Cooking	100%					100%
Lighting			100%			
Appliance					100%	

Residential Sector

1 Energy service demand

	Unit	2050									
		2000		REF		UM		CM/REF		CM/UM	
		COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	Total
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%			

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										2050 A (CM)										2050 B (CM)									
		COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	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%	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%	0%	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%									0%	0%	

3 Energy efficiency

	Unit	2000										2050 A (CM)										2050 B (CM)									
		COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	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	-		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

	Unit	2000										2050 A (CM)										2050 B (CM)									
		COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	COL	OIL	GAS	BMS	S/W	Heat	H2	ELE	Total	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	0.0	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	2.8	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	2.4	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	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	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	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	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	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	0.0		
Generation	Mtoe								0.0	0.0																					
Cogeneration	Mtoe								0.0	0.0																					
	Mtoe								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

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

- 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 $\alpha 1$	Holding rate $\alpha 2$	Operating hours $\alpha 3$	Strength $\alpha 4$	Service Loss $\alpha 5$		$\Sigma(1+\alpha i)-1$	BaU(U)	
								CM(L)			
Space heating	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Space cooling	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Hot water heating	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Refrigerators and freezers	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Cloth dryer	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Cooking	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Cloth washers	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Dish washers	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Other energy uses	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Miscellaneous electric energy	BaU							0%	0.00	-	
	Countermeasures							0%	0.00	-	
Lighting	BaU							0%	0.00	-	
	Countermeasures							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".

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

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.

The image shows several overlapping spreadsheet windows. The top-left window has a red border and contains a table with columns labeled 'Year' and 'Value'. The middle window has an orange border and contains a table with columns labeled 'Device' and 'Value'. The bottom window has a blue border and contains a table with columns labeled 'Device' and 'Value'. The tables contain numerical data, likely representing energy service demand metrics over time or across different device types.

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

Enter service demand in ESS

Ex. Japan LCS2050 A scenario		Service	Change rate of parameters					Change rate of Service $\Sigma(1+\alpha_i)-1$	Service	
		Base Year	Number of Household α_1	Holding rate α_2	Operating hours α_3	Strength α_4	Service Loss α_5		BaU(U)	CM/BaU
			CM(L)							
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		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 =

Try to make residential LCS in your country.

