

Ahorro de energía para su familia (Casos de Japón)

Voluntario de JICA

Hiroshi FUKAYAMA

Name : Hiroshi FUKAYAMA
JICA Volunteer : Renewable and Energy Saving
for 2 years at INTI
(2017 Oct.~ 2019 Sep.)

[Activity in INTI]

- (1) Support and Advice for Energy Saving Activity by INTI
- (2) Strengthen the function of Energy Audit
- (3) Public Relation and Training Activity for Energy Saving Promotion



INTI Energia

**JICA : Japan International
Co-operation Agency**

Contents

**I . Energy Basics and
Energy Situation in JAPAN**

II . Energy Saving in Home

III. Smart Drive / Eco House

- **What is `Energy` ? :**

Ability of an object to do work

- **The Origin of the word is Greek :**

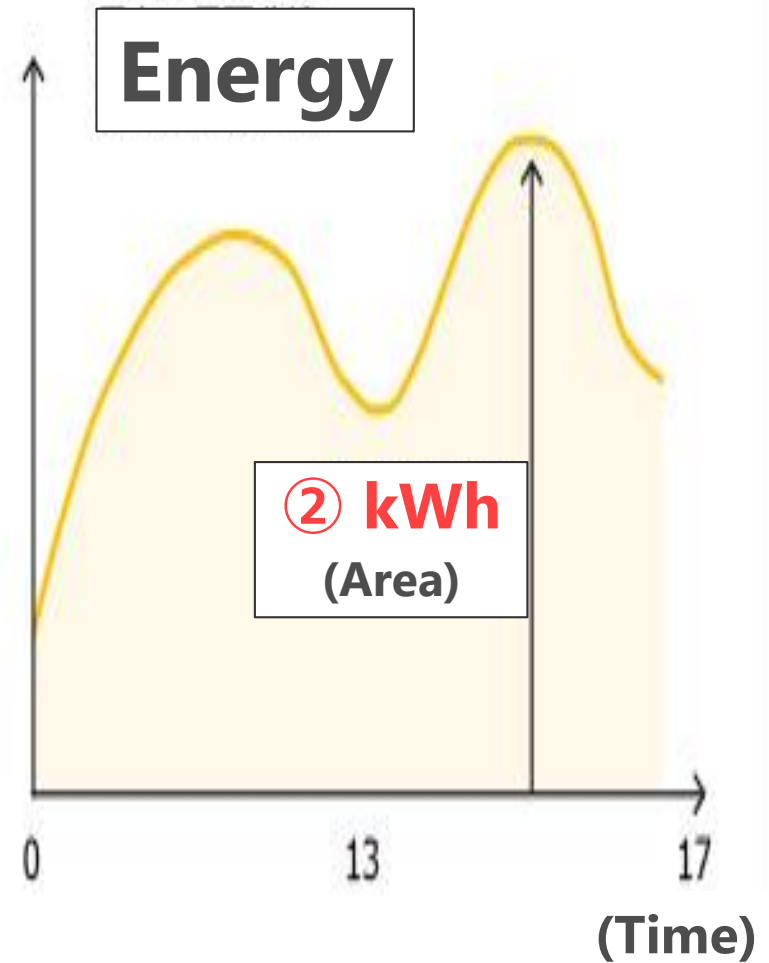
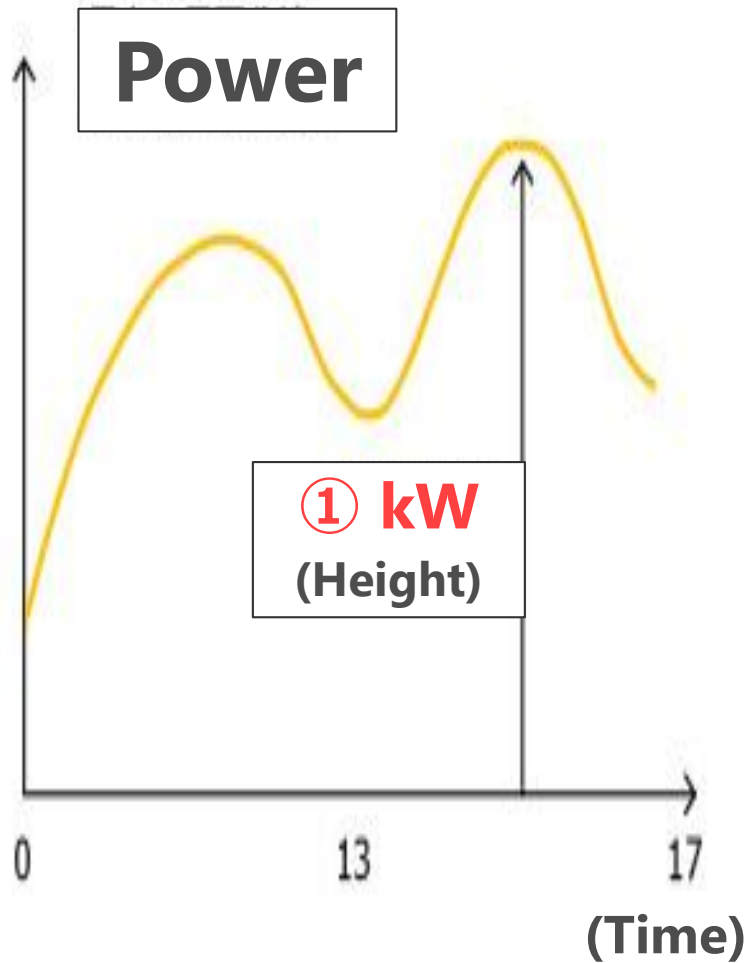
En + Ergon ➡ Energeia

(In) (Work) (Capacity to Work)



Energy
1 jule – 1 N x 1 m

kW vs kWh (J)



③ **Joule** = 1 W x 1 sec

Primary Energy

Secondary Energy

Energy Usage



Oil/Natural Gas



Coal



Solar/Wind/Hydro



Gas Plant



Oil Refinery



Thermal Power St.



Solar/Hydro/Wind
Power St.

City Gas/LP Gas



Bath



Kitchen



Stove

Gasoline/Kerosene



Car



Stove

Electricity



Lighting

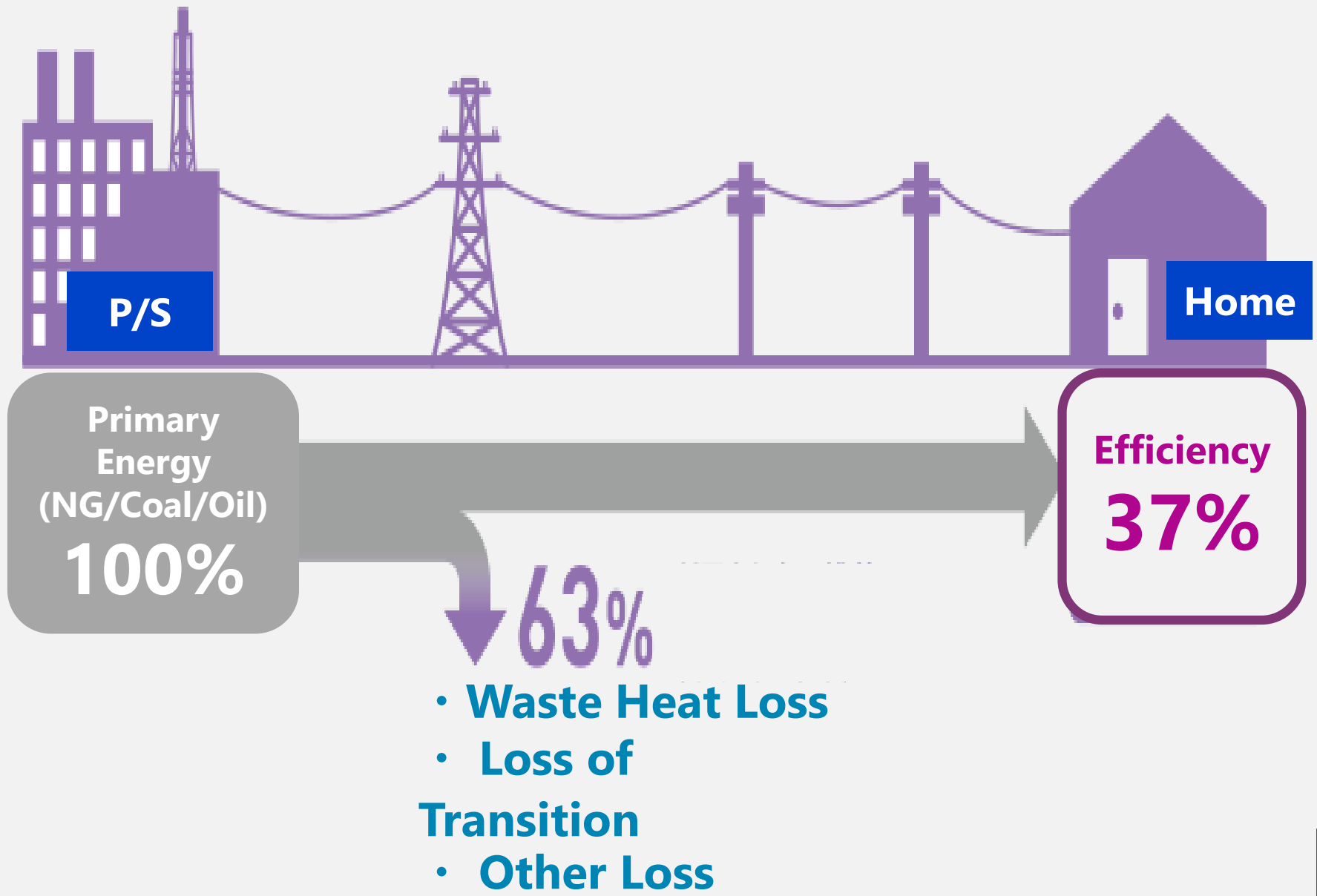


Home appliance



Electric Car

Energy Efficiency of Thermal Power Station



GDP 1973-2015 2.6 times

Final Ene Cons. 1973-2015

Transportation 1.7

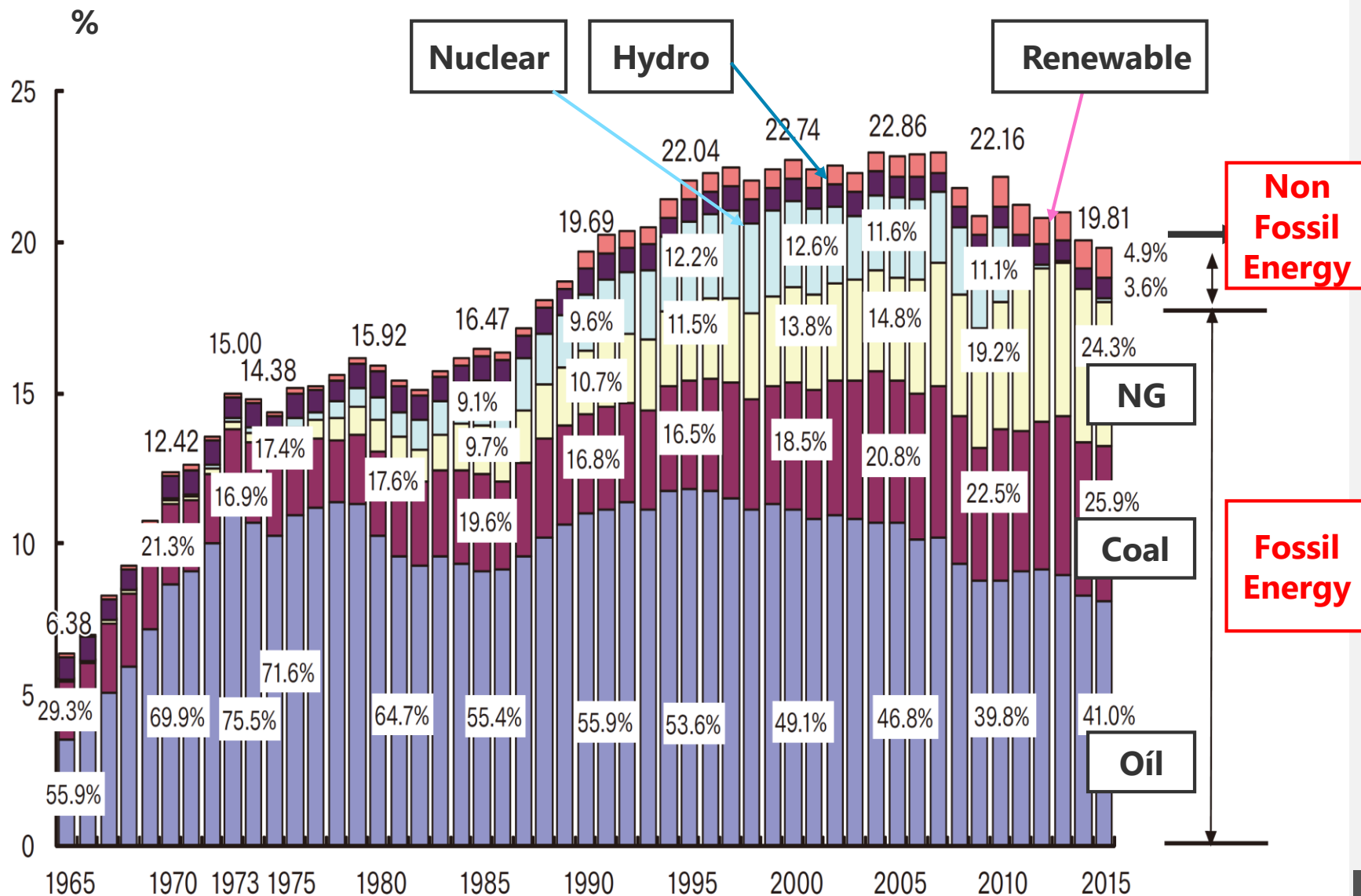
Household 1.9

Business 2.4

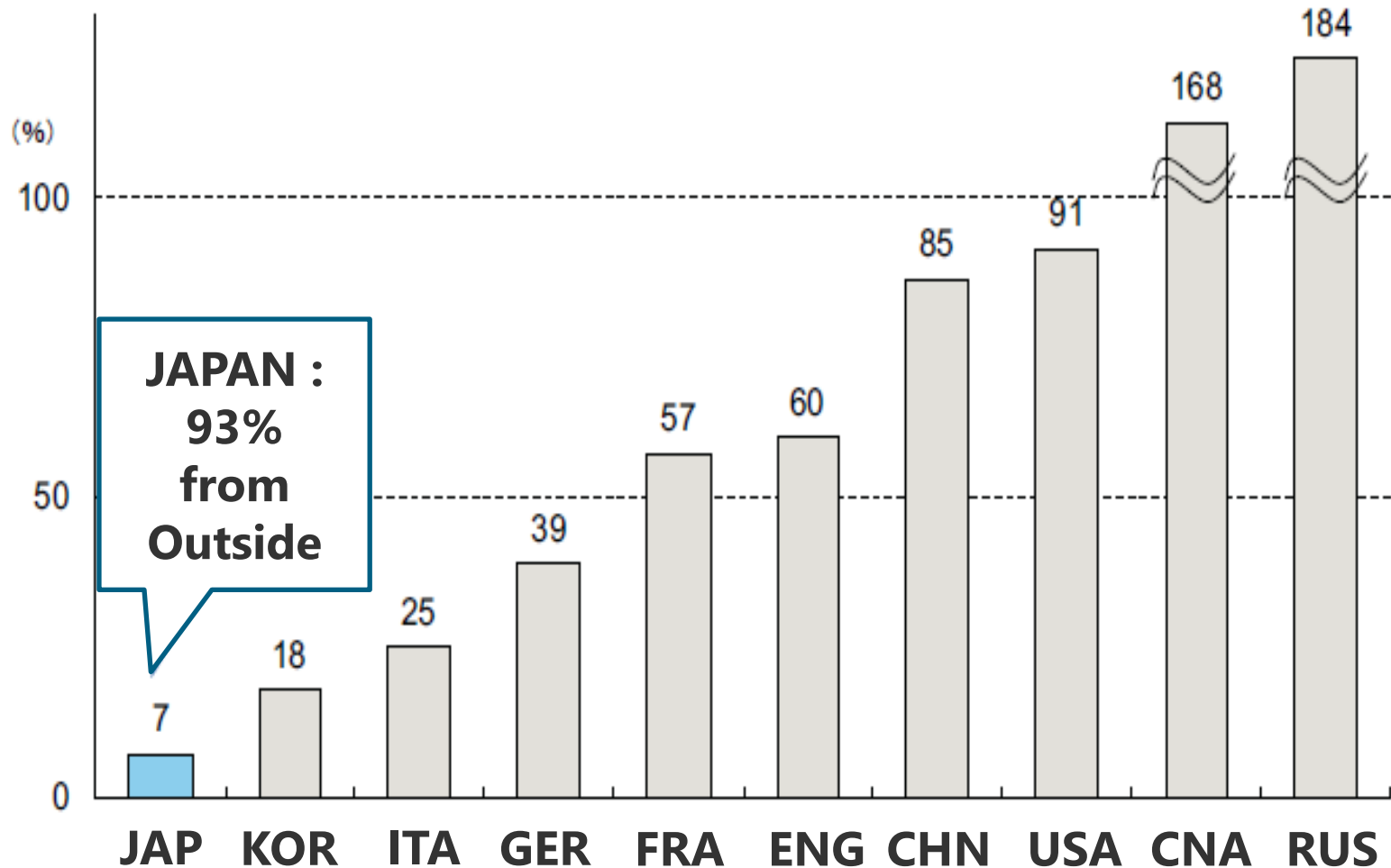
Industry 0.8

TOTAL: 1.2

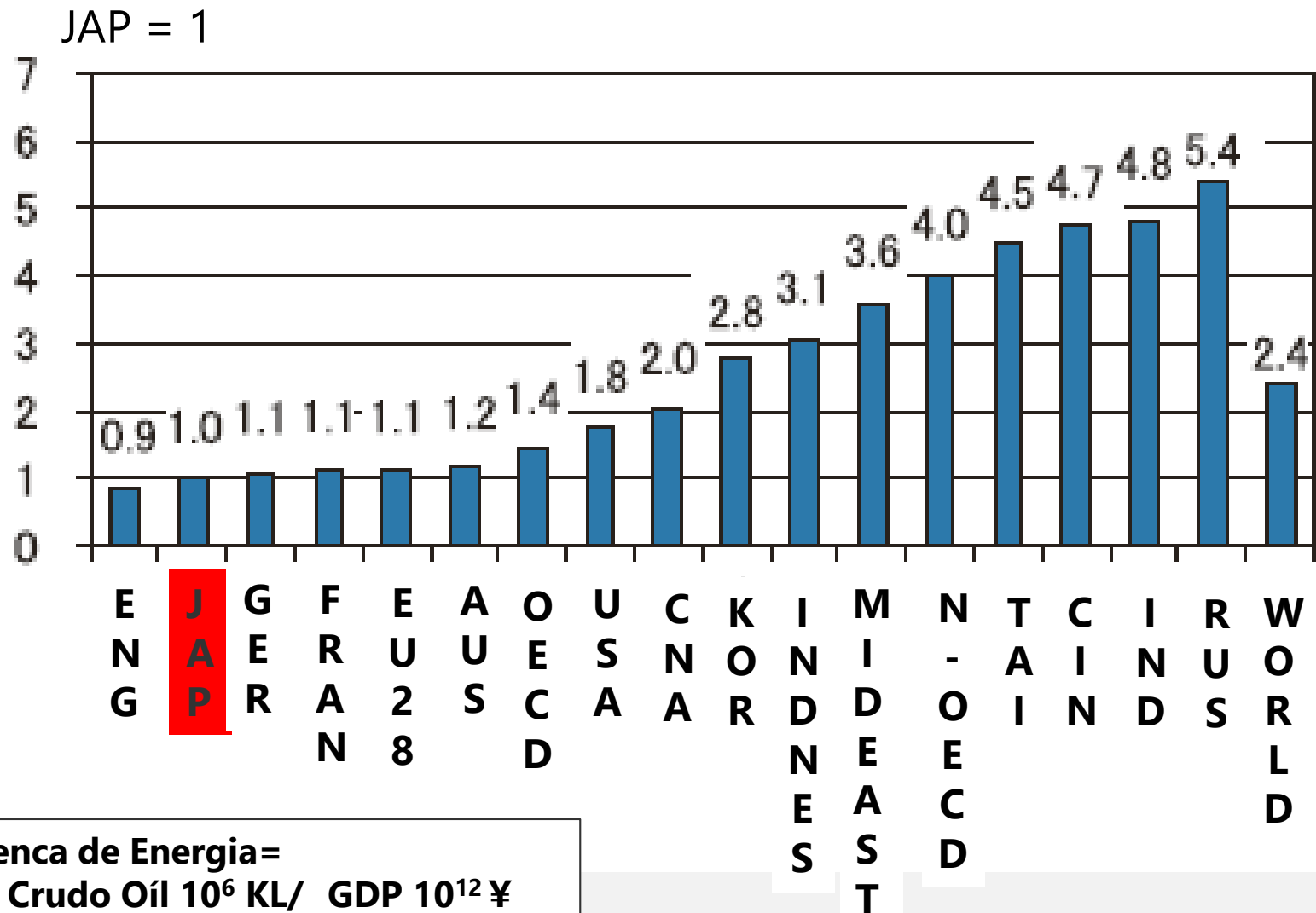
Change of Primary Energy Supply (JAPAN 1965-2015)



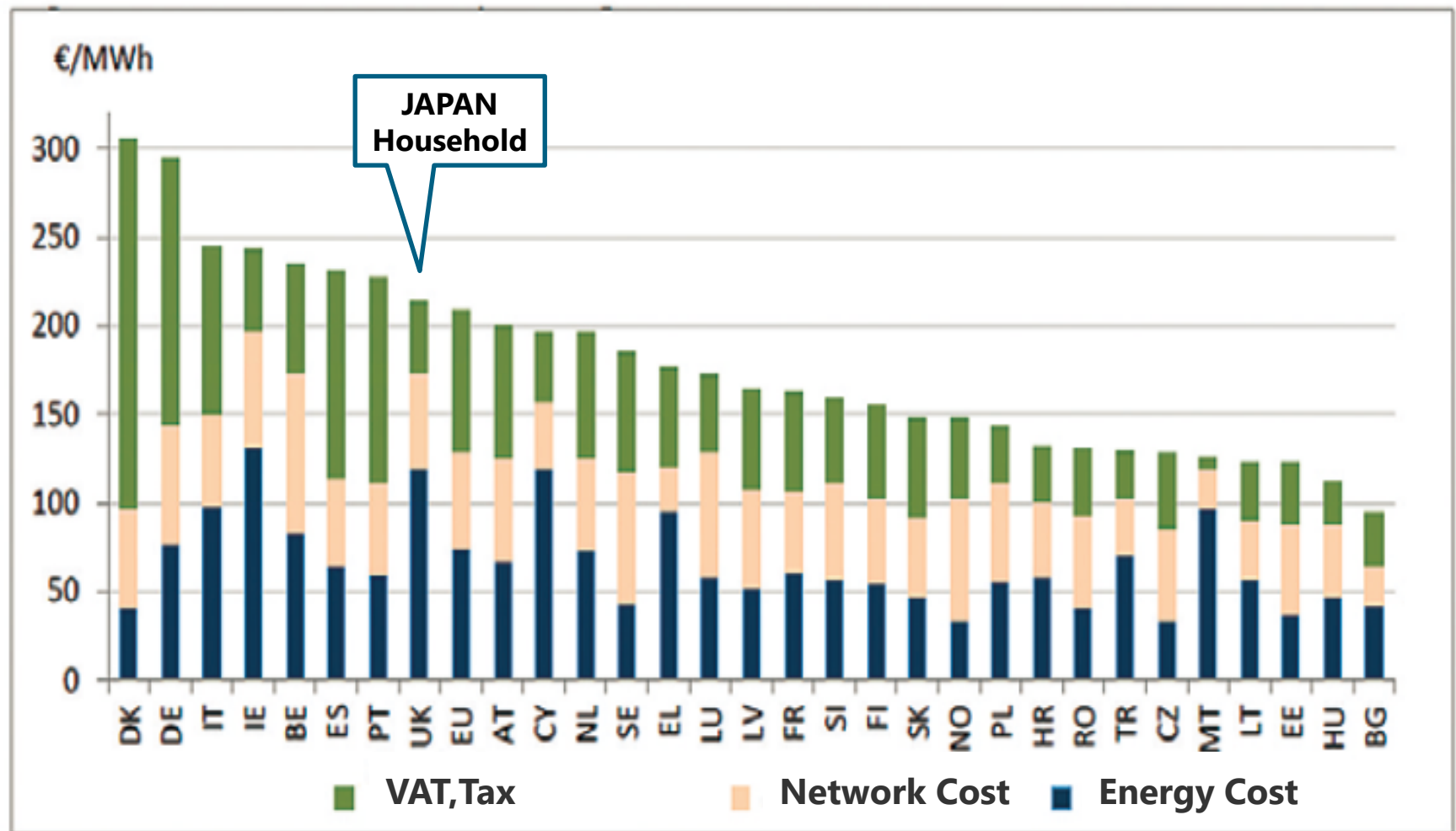
Self-sufficient Ratio of Primary Energy (at 2016)



Comparison of energy efficiency with another country



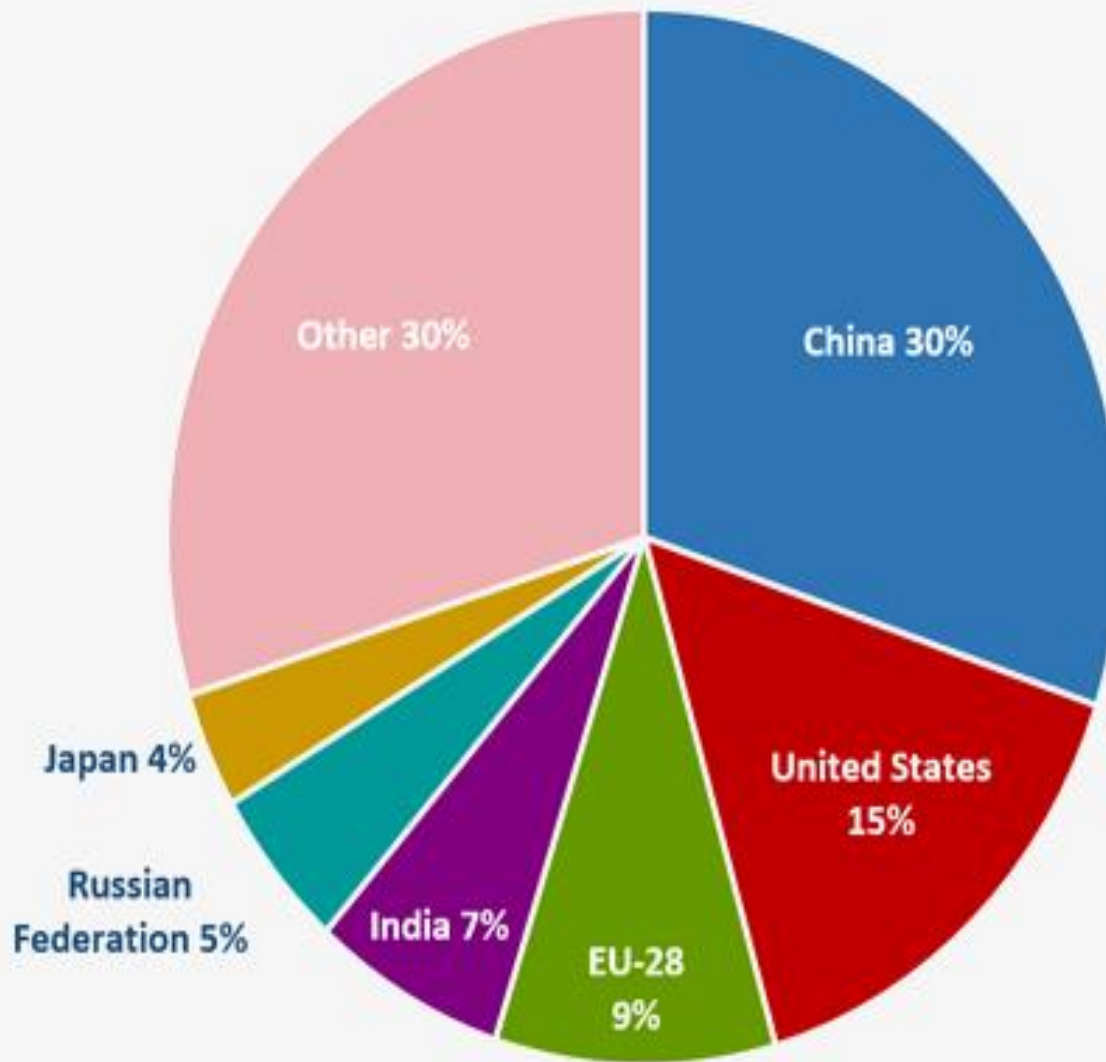
Comparison of Electric Price



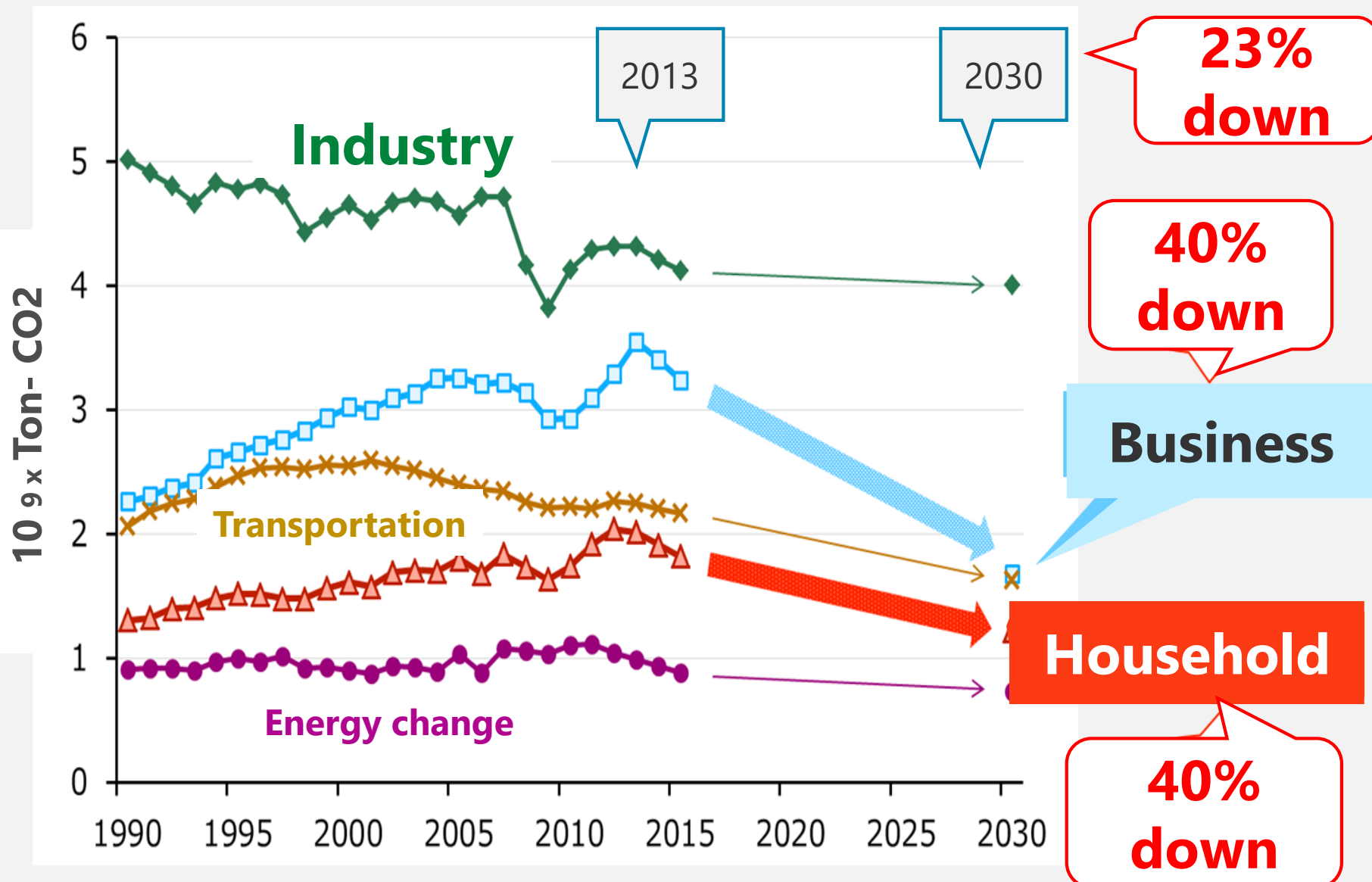
※DK:デンマーク、DE:ドイツ、IT:イタリア、IE:アイルランド、BE:ベルギー、ES:スペイン、PT:ポルトガル、UK:イギリス、EU:EU28か国平均、AT:オーストリア、CY:キプロス、NL:オランダ、SE:スウェーデン、EL:ギリシャ、LU:ルクセンブルク、LV:ラトビア、FR:フランス、SI:スロベニア、FI:フィンランド、SK:スロバキア、NO:ノルウェー、PL:ポーランド、HR:クロアチア、RO:ルーマニア、TR:トルコ、CZ:チェコ、MT:マルタ、LT:リトアニア、EE:エストニア、HU:ハンガリー、BG:ブルガリア

出典：European Commission

2014 Global CO₂ Emissions from Fossil Fuel Combustion and Some Industrial Processes



GHG Reduction Target of JAPAN at 2030



II . Energy Saving in Home

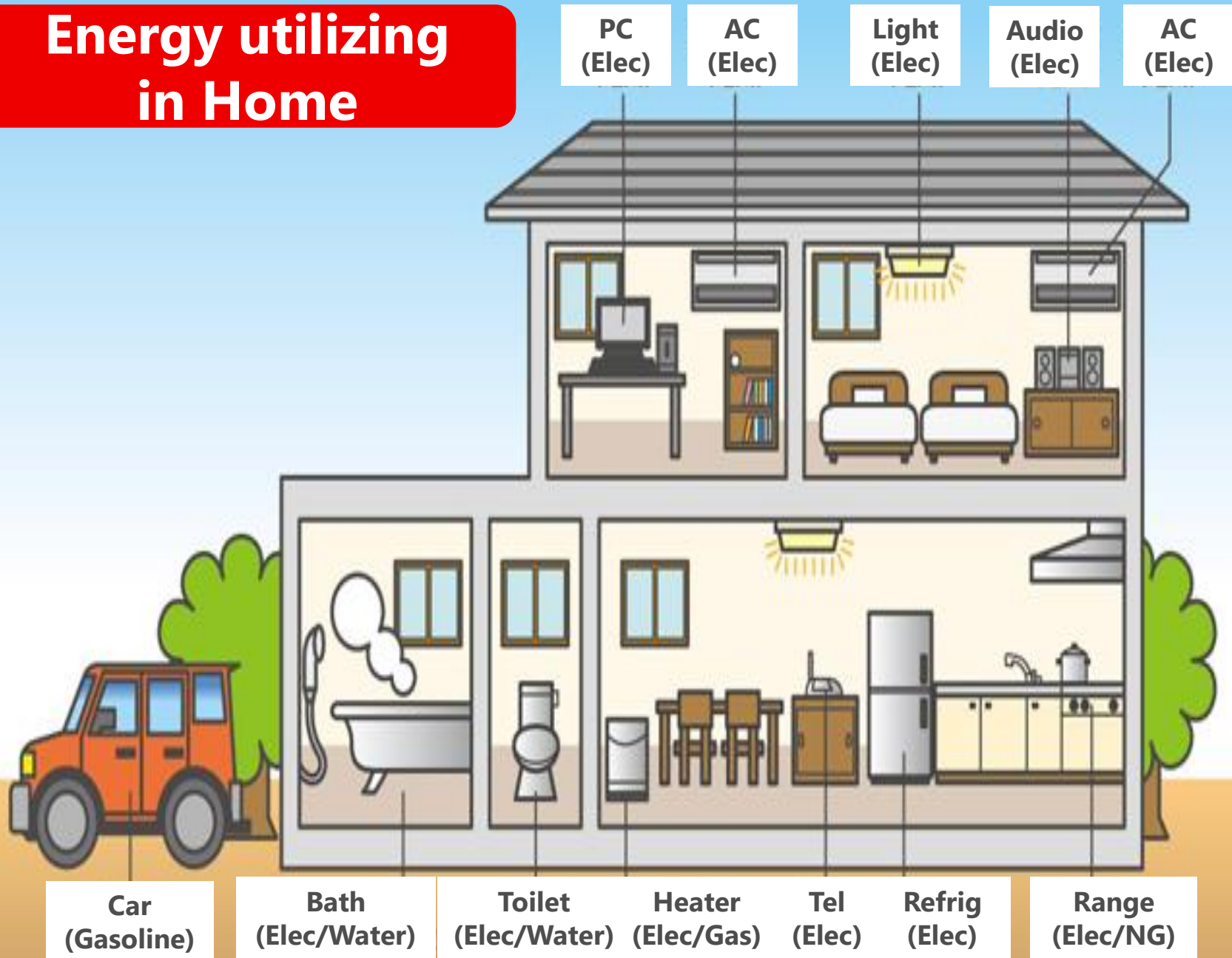
1. Energy Consumption Condition

2. Lighting/Refrigerator/AC

/TV/Standby Power

3. Information of Energy Saving

Energy utilizing in Home

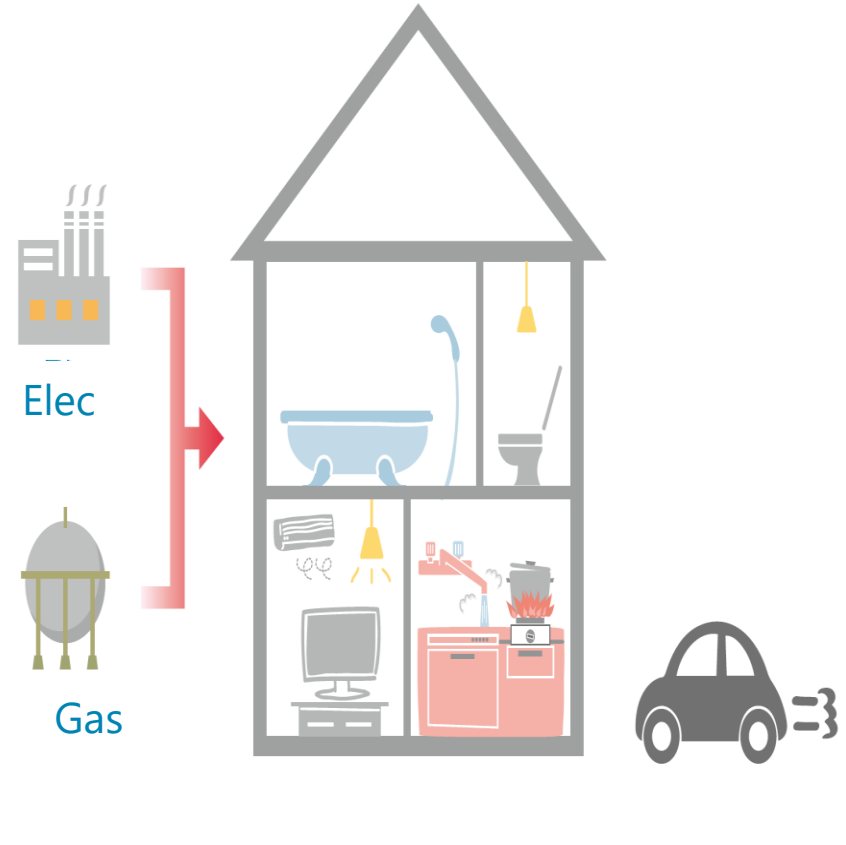


Climate Change and Our Life

Electric, gas, gasoline that we use make CO2 exhaust.

Energy saving activity reduce the CO2 exhaust.

Energy is using in water purification plant and sewage treatment, reduction water connect CO2 exhaust reduction.



$$\text{Fuel Consumption} \times \text{CO2 Exhaust Ratio} = \text{CO2 Exhaust Volume}$$

$$\text{Fuel Consumption} \times \text{CO}_2 \text{ Exhaust Ratio} = \text{CO}_2 \text{ Exhaust Volume}$$

Fuel	CO2 Ex. Ratio*	Unit
Electricity	0.531	Kg/kWh
Natural Gas	2.23	Kg/m3
Gasoline	2.32	Kg/L
Water and Sewage	0.65	Kg/m3

Example of Tokyo, JAPAN

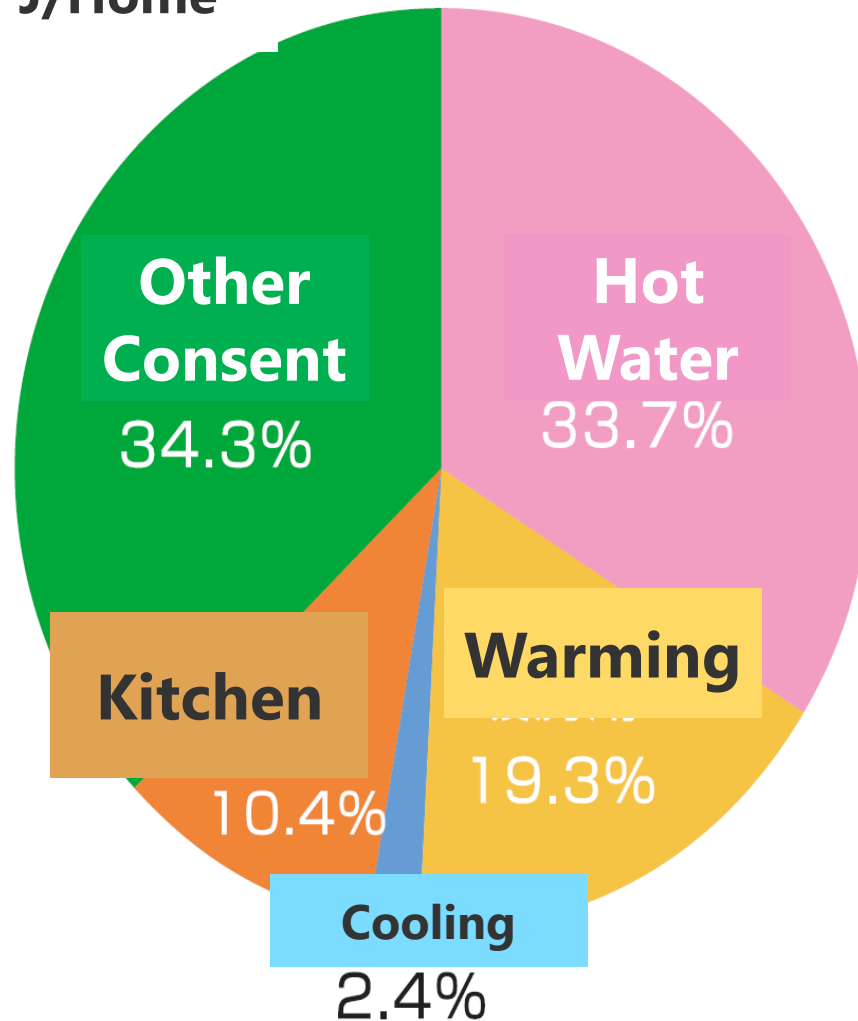
Sample of CO2 Exhaust Volume (per Month)

Fuel	Fuel Consumption x CO2 Exhaust Ratio = CO2 Exhaust Volume
Electricity	300 kWh x 0.531 kg/kWh = 159.3 kg
Natural Gas	30 m ³ x 2.23 kg/m ³ = 66.9 kg
Gasoline	50 L x 2.32 kg/L = 116.0 kg
Water and Seawater	20 m ³ x 0.65 kg/m ³ = 13.0 kg
	TOTAL 355.2 kg

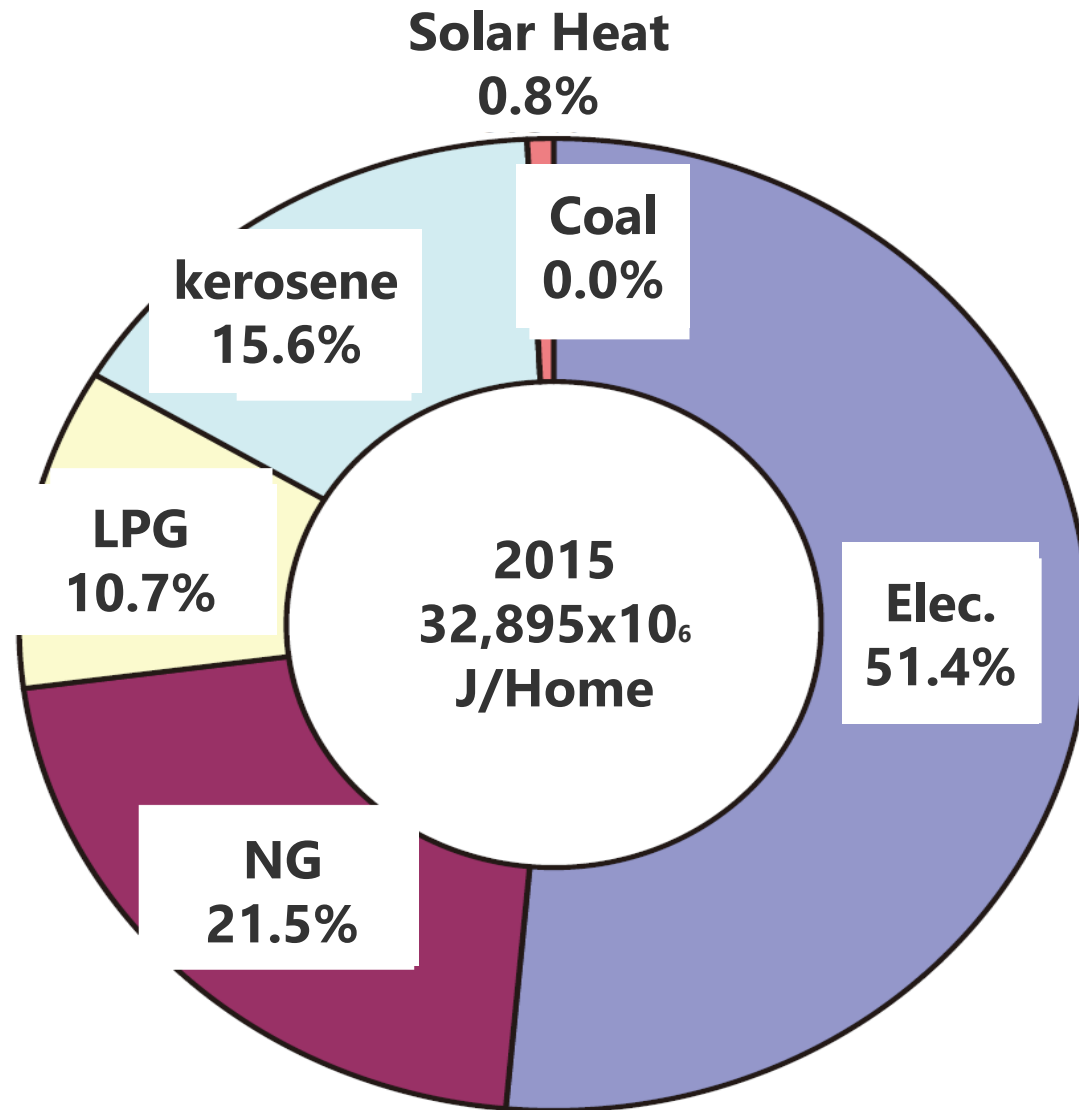
Example of Tokyo, JAPAN

Energy Usage in our Home (Year)

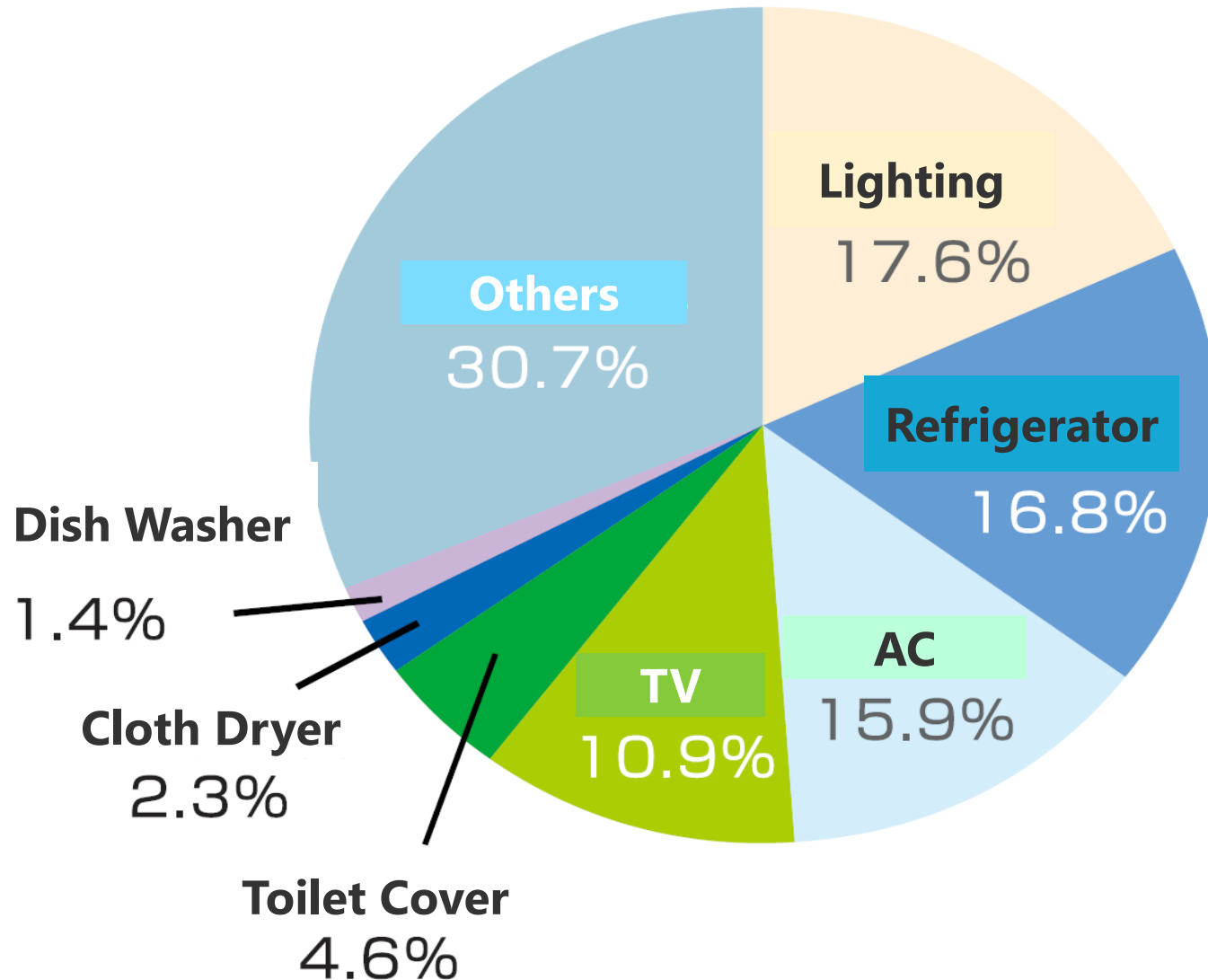
Tokyo, 2015 –
32,895 x 10⁶ J/Home



Consumption of Energy Type in our Home (Year)



Consumption of Electric Home Appliance (Tokyo, 2015)



Ⅱ . Energy Saving in Home

1. Energy Consumption Condition

2. Lighting/Refrigerator/AC

/TV/Standby Power

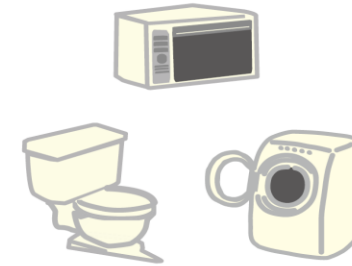
3. Information of Energy Saving

MAX

**Power
consumption**

MIN

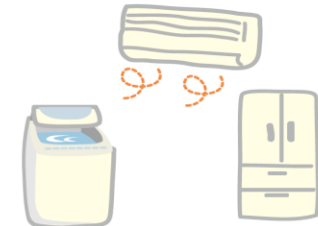
IH cooking Heater	(3000 W)
Microwave	(1400 W)
Iron	(1400 W)
Electric cooker	(1300 W)
Bathroom dryer	(1290 W)



Oil Heater	(1000 W)
Open toaster	(1000 W)
Vacuum cleaner	(1000 W)
Electric heater	(1000 W)
AC (Big)	(750~1000W)
Electric pot	(800 W)



AC (small)	(450 W)
Washing machine	(400 W)
Refrigerator	(200~300W)



LC TV	(50 W)
PC	(45 W)
Wind Fan	(34 W)
LED lighting	(8 W)

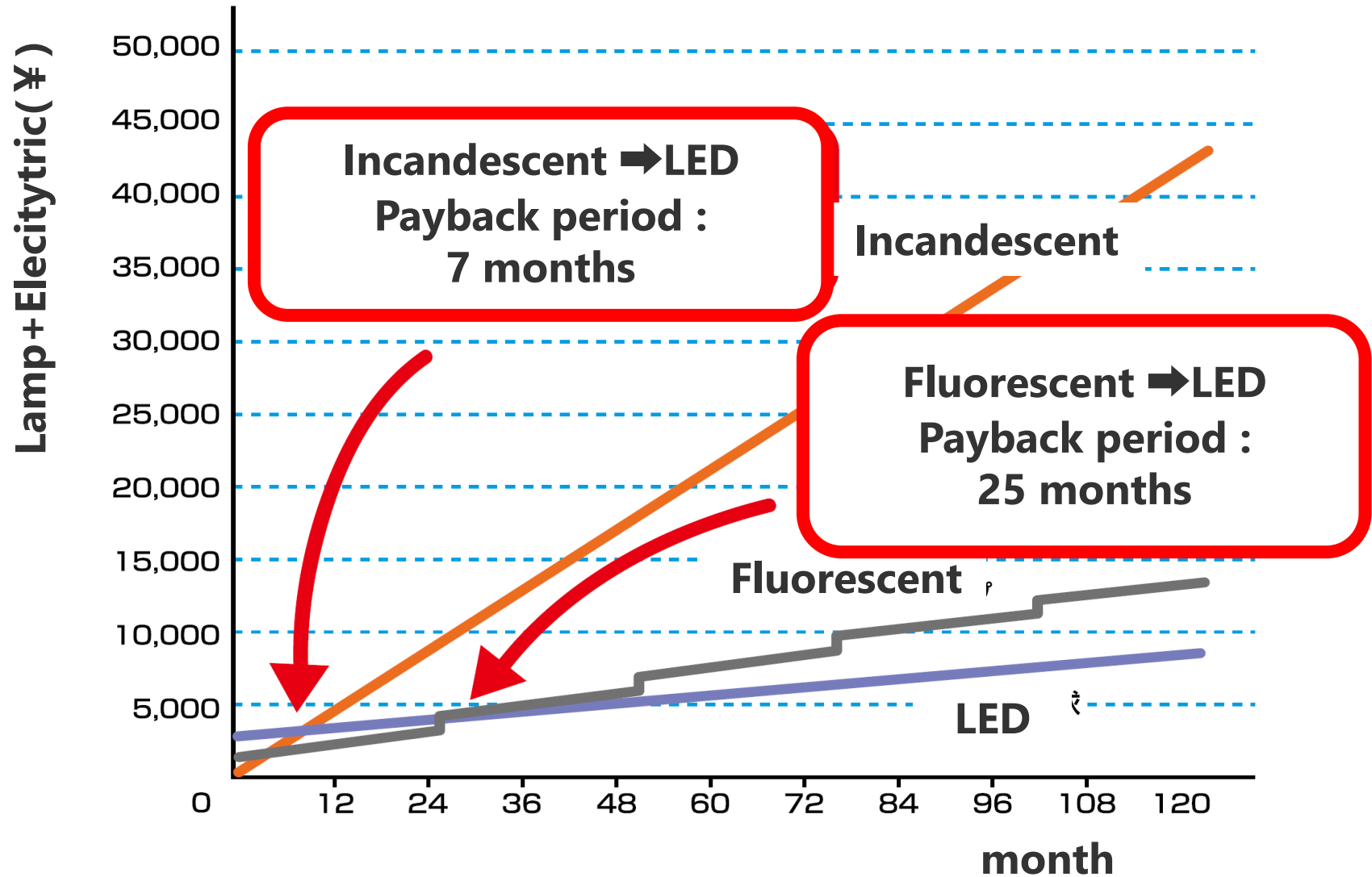


Lighting Type in our Home



Light Type	Electric Consumption	Life Time	Price
① Incandescent Light	54 W	1,000 hrs	\$25
② Bulb Type Fluorescent Light	12 W	6,000 hrs	\$200
③ LED Bulb Light	8 W	40,000 hrs	\$500

Cost Comparison (Lamp + Electricity)



Case: 60W, 8 hours/day, ¥28/kWh

Merits of LED Lighting



Significant
reduction of
power
consumption



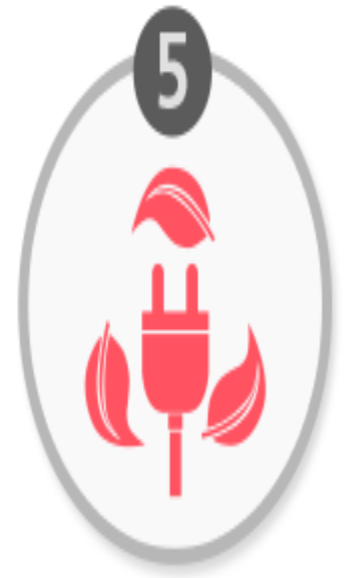
Reduction of
replacement
cost by long
life time



Reduction of
power
consumption
by instant
lighting

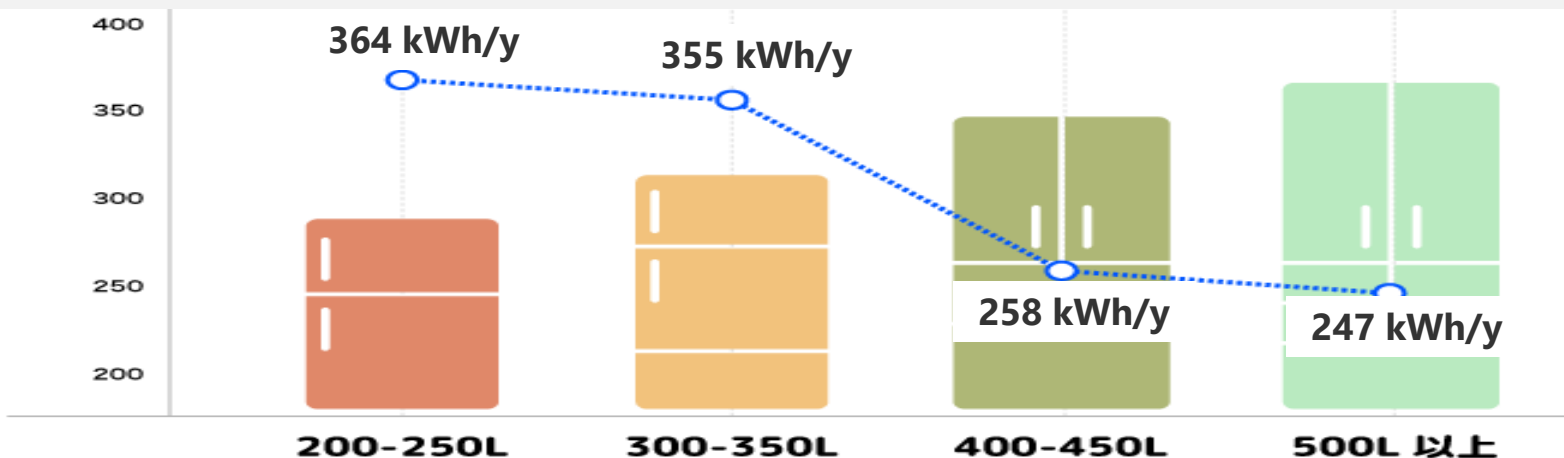


Low invite
insect effect
by light
emitting zone
which insect
avoid

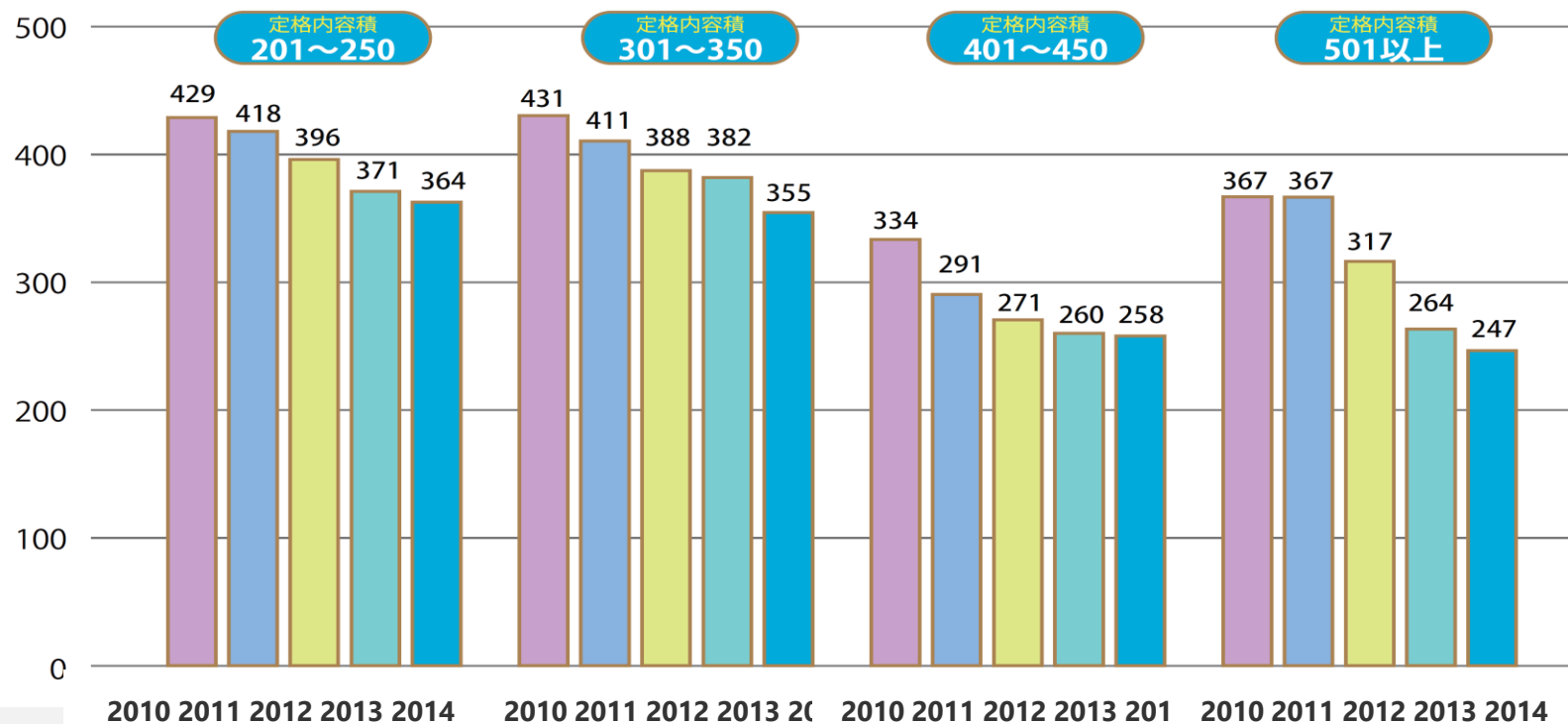


Mercury free
good for
environment
and human

Annual power consumption by Refrigerator size



※資源エネルギー庁 省エネ性能カタログ 2015 夏版より作成



Correct Usage of Refrigerator



Appropriate Space
Side and Upper part



Avoid direct sunlight
and nearby gas stove



Stuffing too much
is prohibited



Be careful for
door packing



Opening and
close door be
short and quick



Cleaning and organizing
inside once a month



Put the hot things
after it cool down

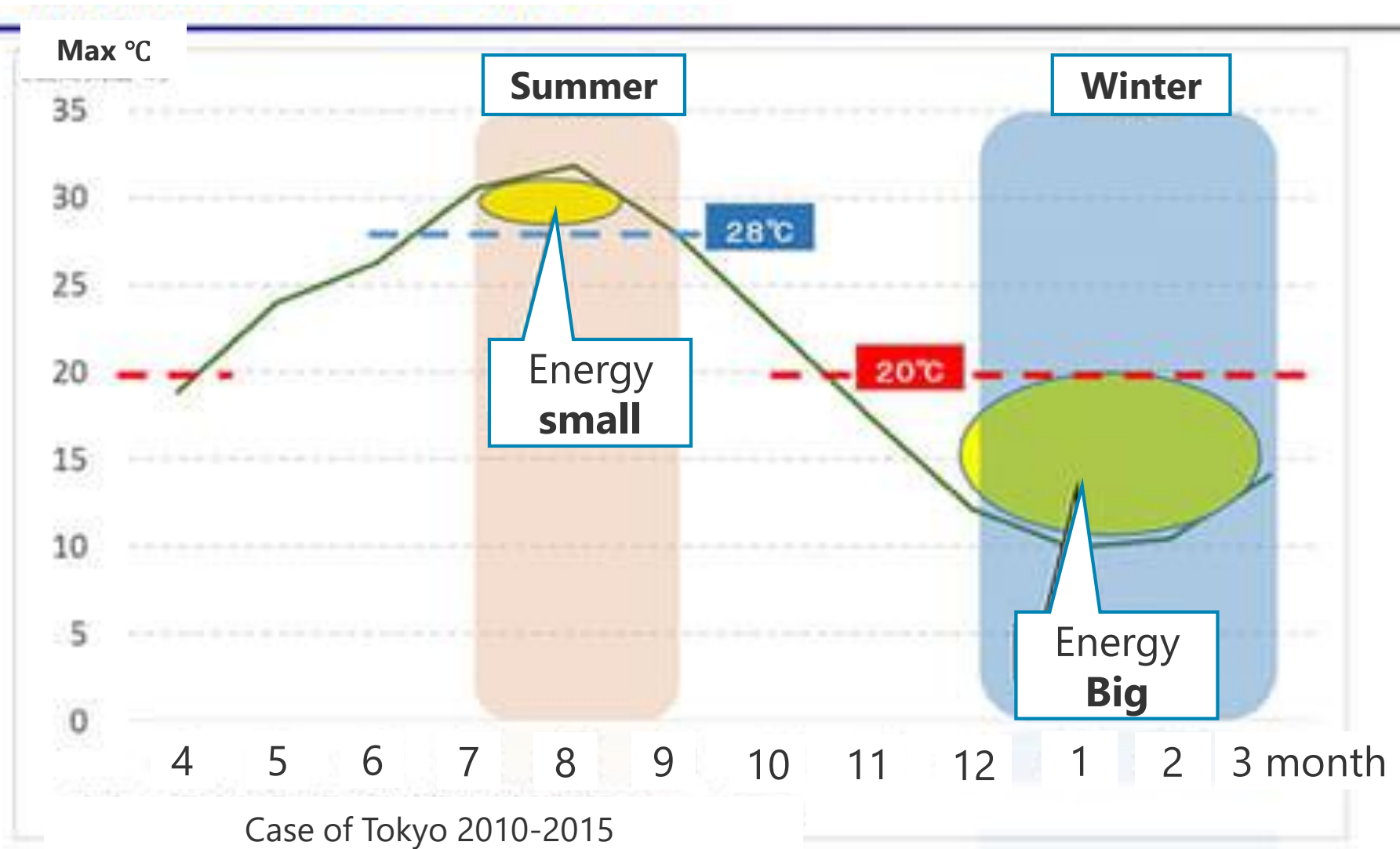


Let adjust the
set temperature

Energy Saving Items for Refrigerator

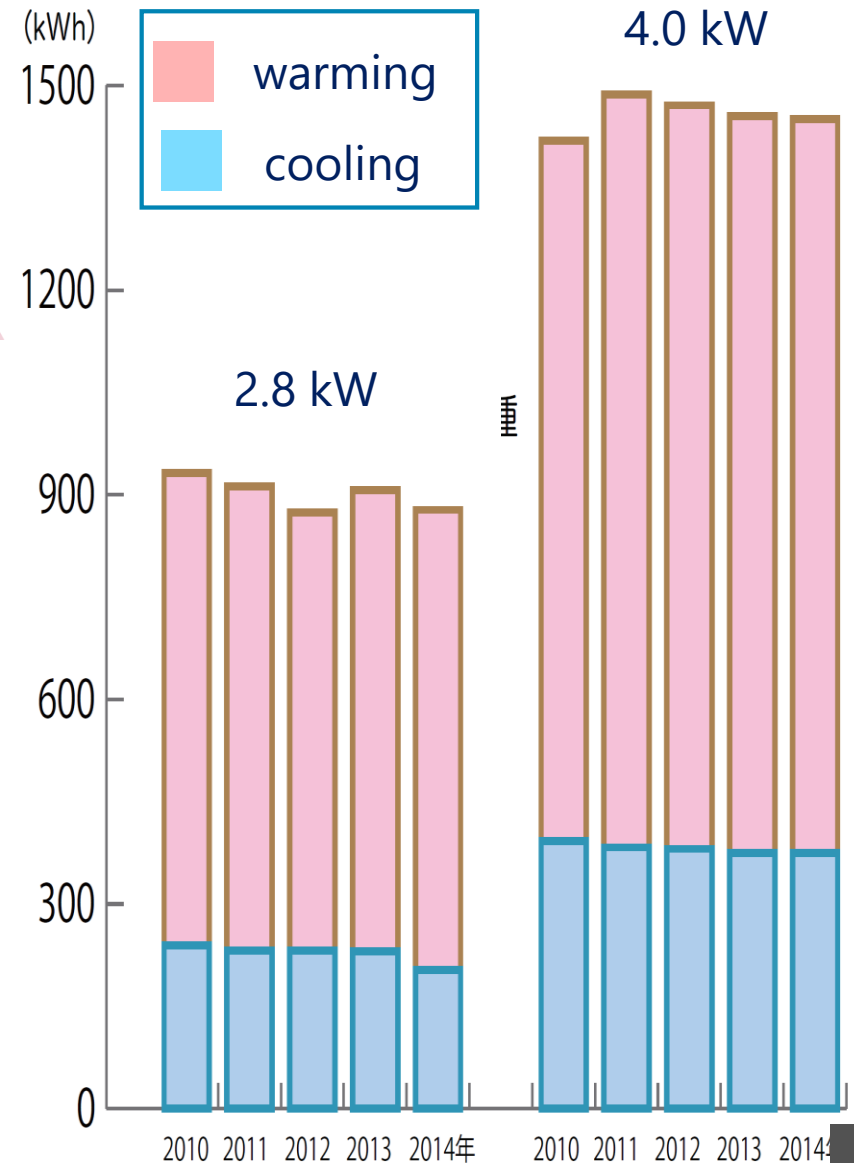
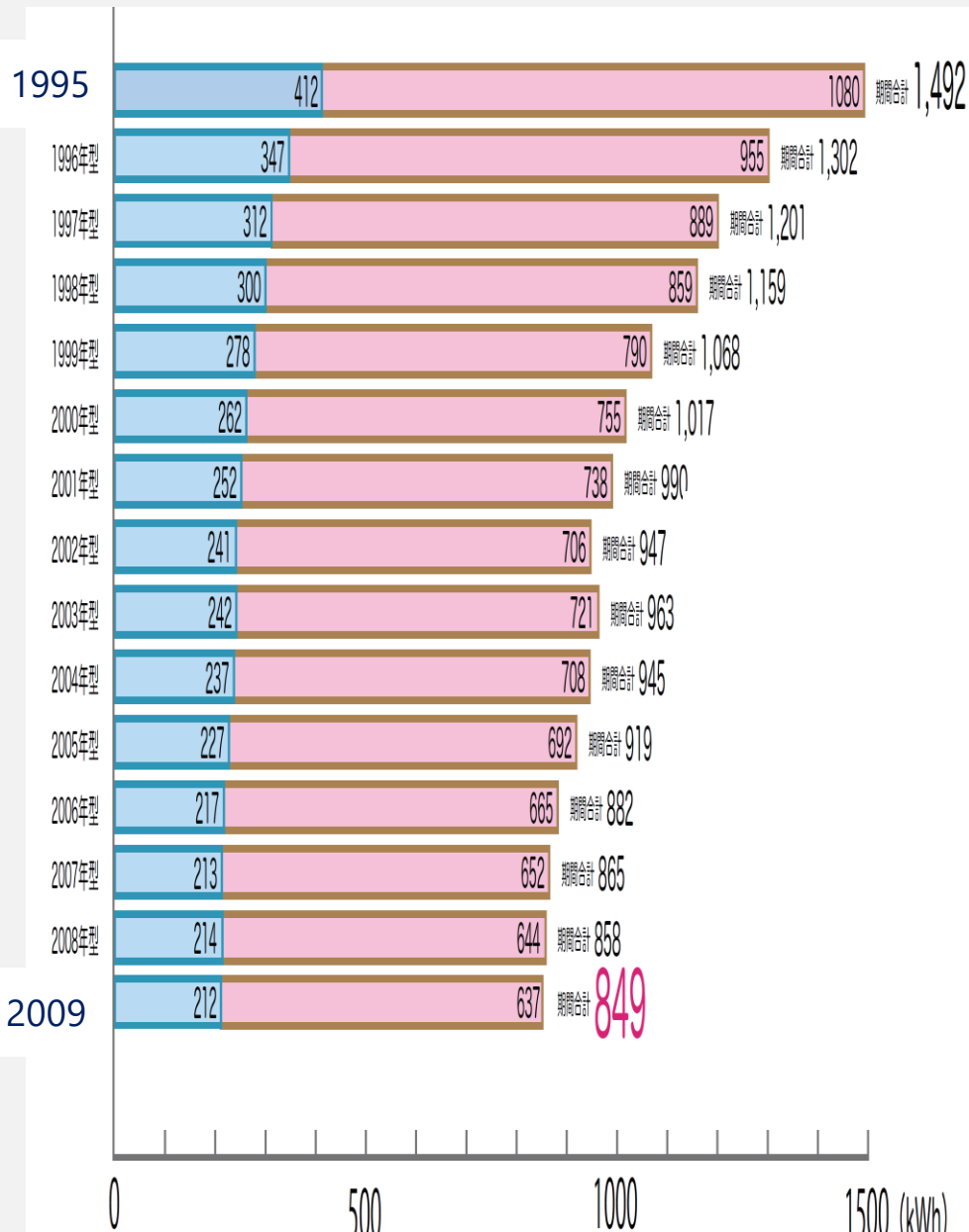
Action/Effect (Year)	Elec.	Cost	CO2
① Adjust setting temperature according to season (Max→Mid)	61.7 kWh	\$450	34.2 kg
② Set appropriate space and improve ventilation	45.1 kWh	\$300	25.7 kg
③ Eliminate over filling (Full → Half)	43.8 kWh	\$280	24.3 kg
④ Do not wastefully open and close (50 times →25 times)	10.4 kWh	\$70	5.8 kg

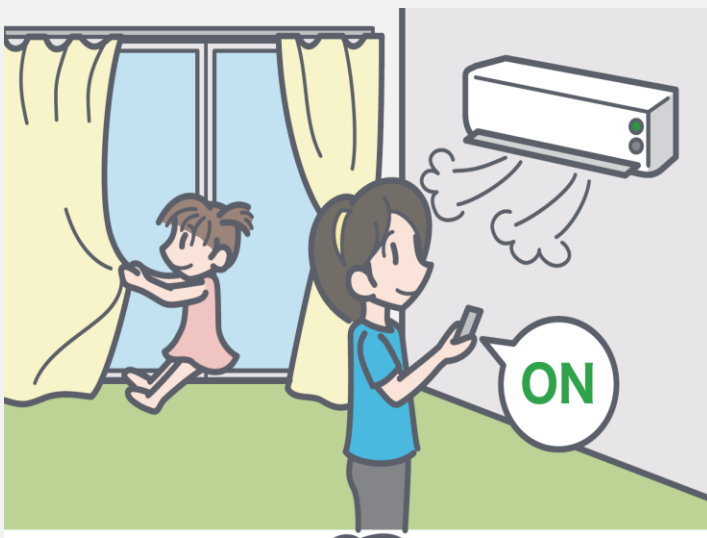
AC power consumption of winter and summer



Heating in Winter will overwhelming use more energy compared to cooling in summer.

Annual power consumption of Air Conditioner





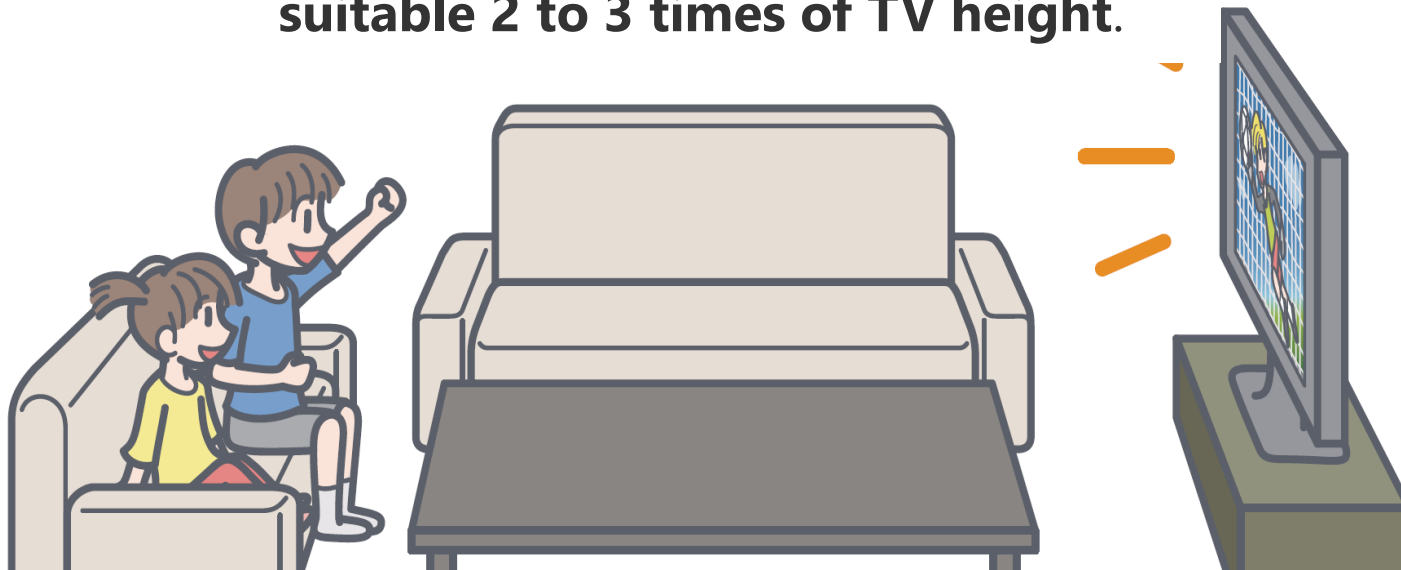
Action/Effect (Year)	-Elec.	-Cost	-CO2
① Adjust at 20 °C during heating in winter (6 °C→21 °C to 6 °C→20 °C at 2.2 kW)	53.1 kWh	\$350	31.2 kg
② Adjust at 28 °C during cooling in summer (31 °C→27 °C to 31 °C→28 °C at 2.2 kW)	30.2 kWh	\$200	17.8 kg
③ Heating/Cooling only start when it is necessary (stop 1 hour/heating)	40.7 kWh	\$250	23.9 kg
④ Clean up filter of AC once a month	31.2 kWh	\$210	18.8 kg



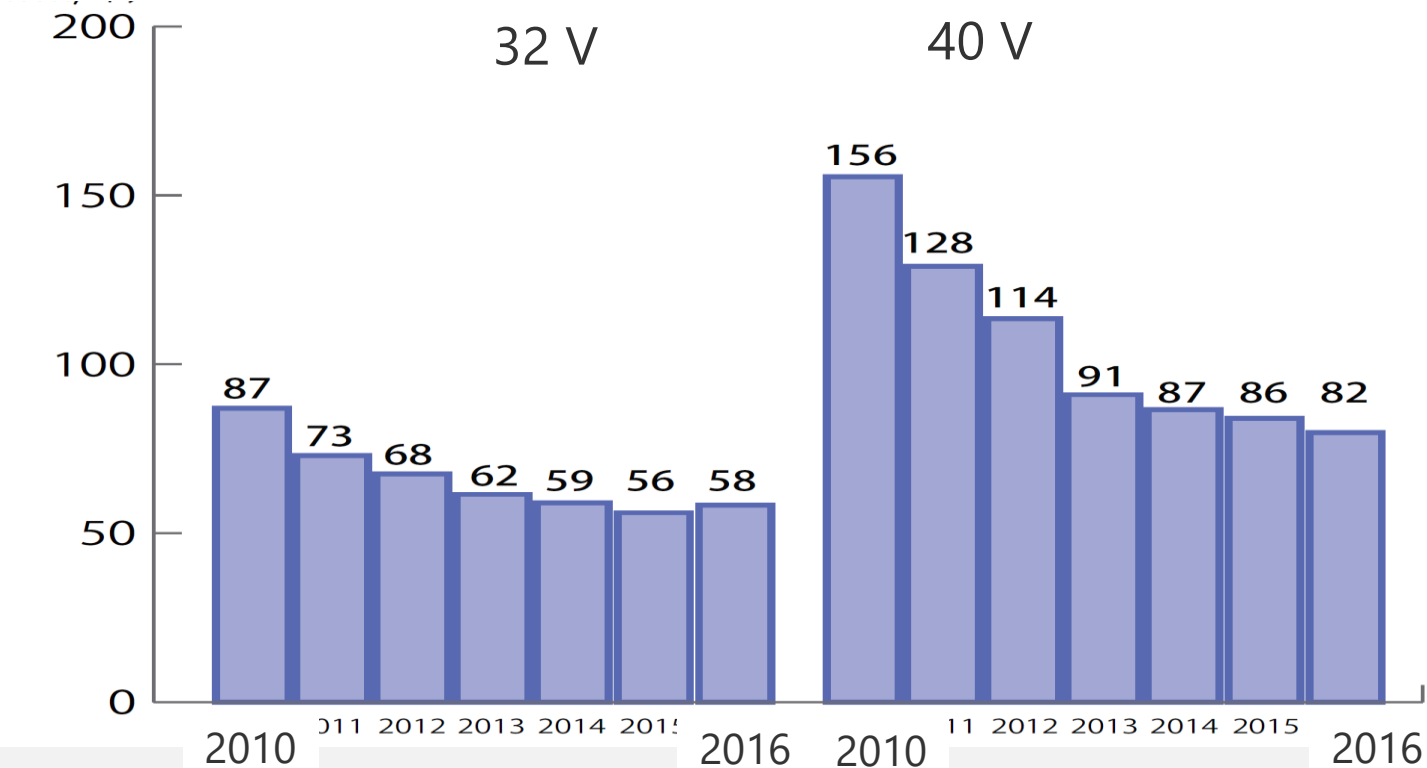
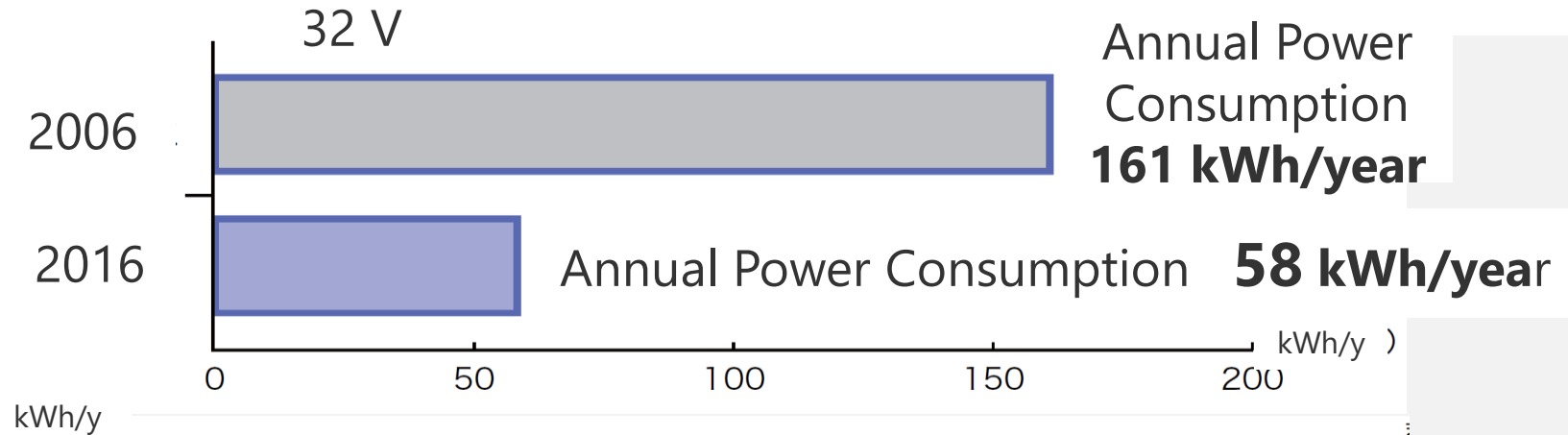
TYPE : 2 K < 4 K < Organic EL

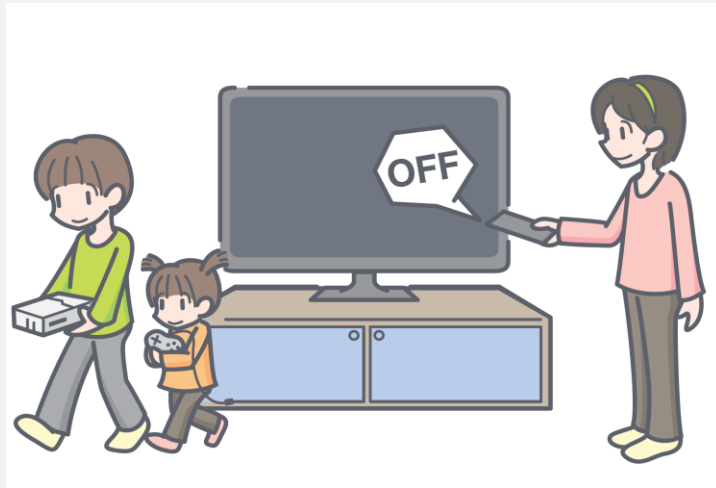
SIZE : 22 inch < 32 < 44 < 65

**The viewing distance of hi-vision TV is
suitable 2 to 3 times of TV height.**



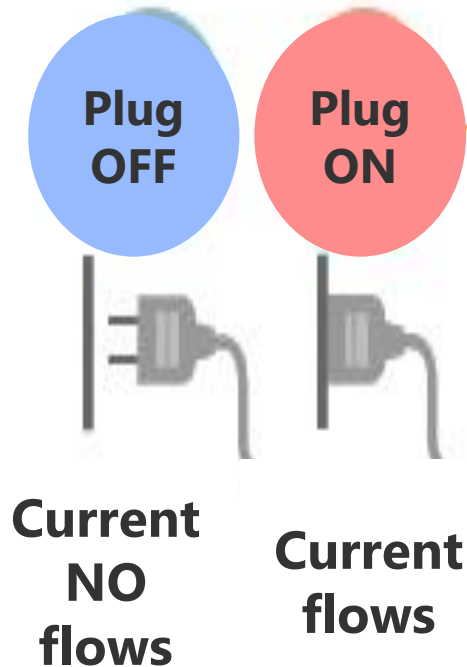
Annual power consumption of TV





Action/Effect (Year)	-Elec.	-Cost	-CO2
① Switch off TV when you do not watch (32 V :1 hour /day)	16.8 kWh	\$ 110	9.9 kg
② Make sure the screen is not too bright (32V: Max to Middle)	27.1 kWh	\$180	15.9 kg

Standby Power Consumption



1. Power consumption for Keep function

Memory internal clock
Monitor Display

2. Power consumption for instruction wait state

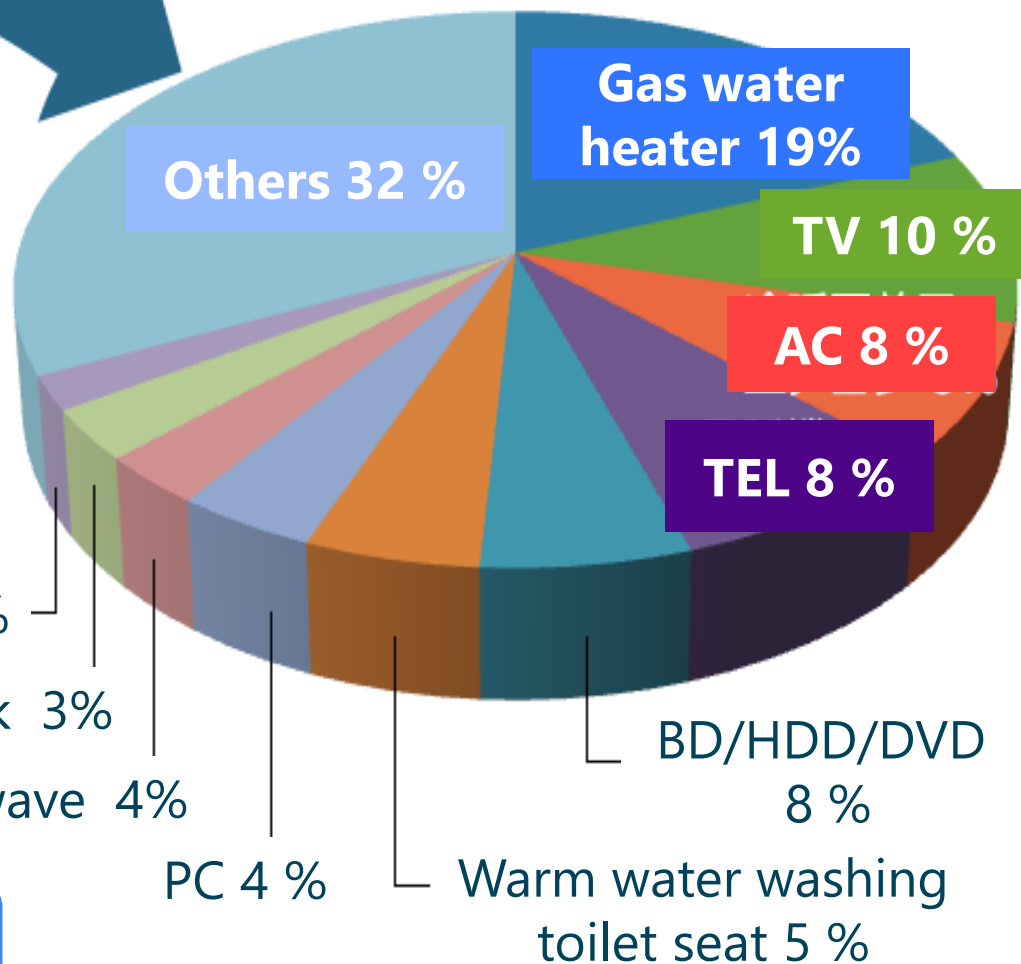
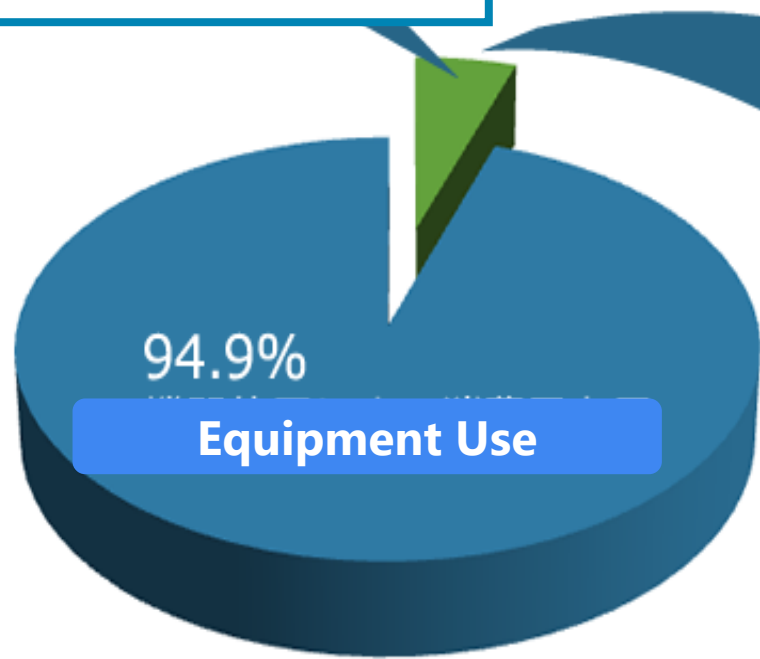
Wait state for remote control
Wait state for start function

3. Power consumption for just connection

only connecting to consent

Portion of Standby Power Consumption

Standby Power
5.1 %
228 kWh/y · home



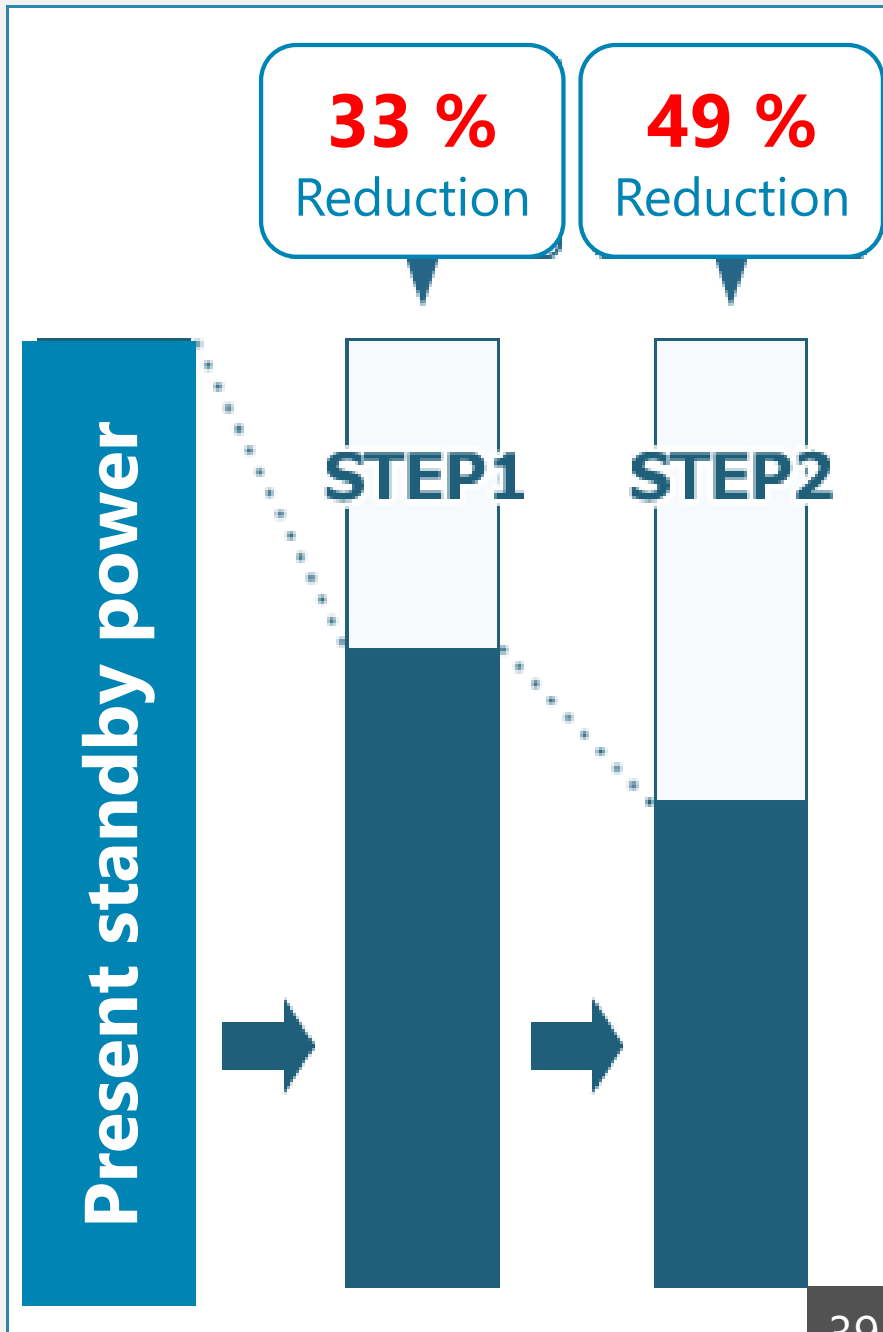
Total Power Consumption:
4,432 kWh/y · home

STEP 1

Main switch on when only using, main switch off when no using

STEP 2

Unplug it when not in use, for example washing machine, AC, PC etc.



II . Energy Saving in Home

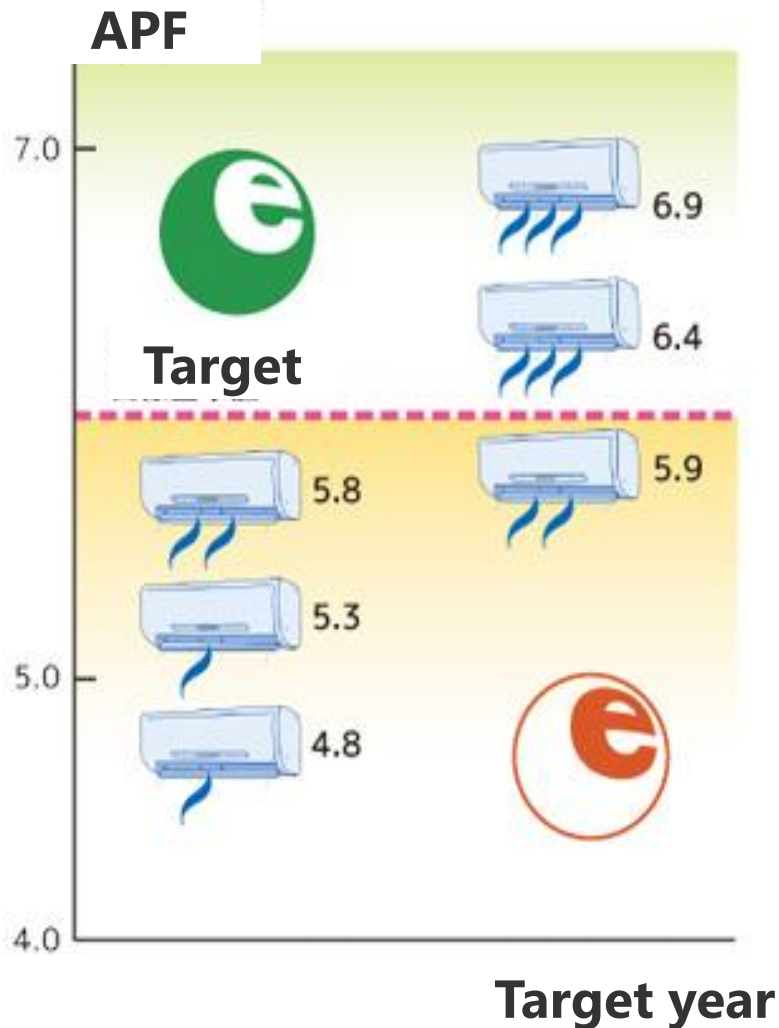
1. Energy Consumption Condition

2. Lighting/Refrigerator/AC/TV/Standby

3. Information of Energy Saving

Top Runner Standard

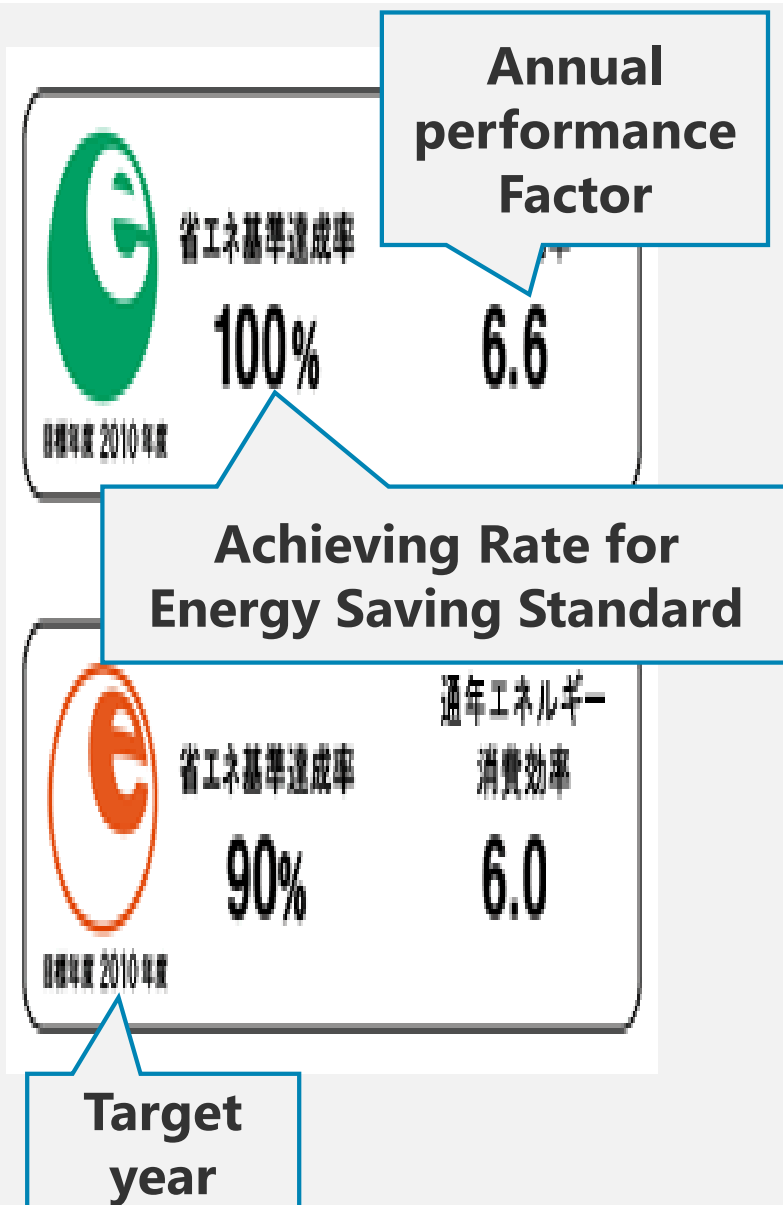
Target Value (in case of AC)



Target Equipment

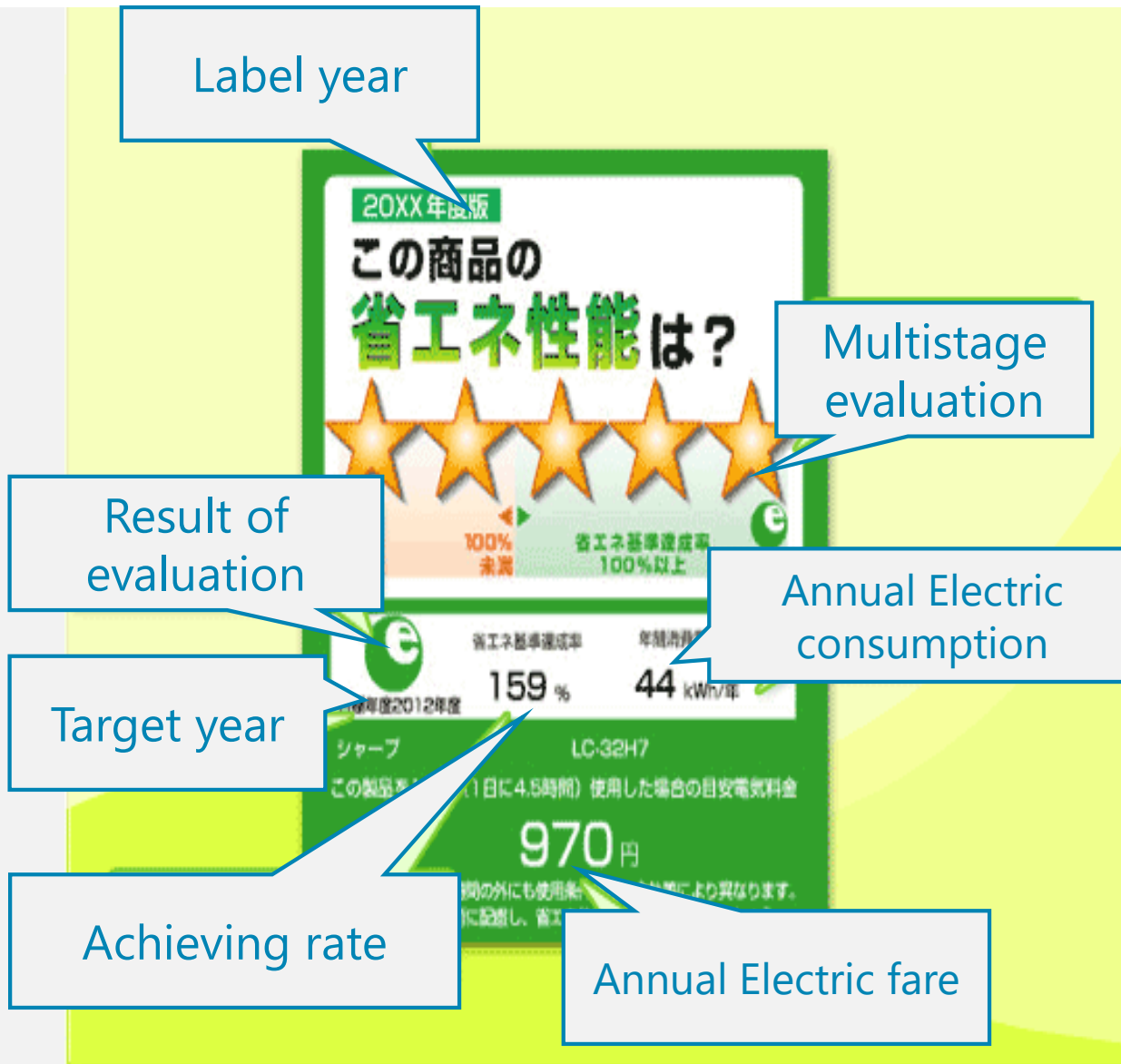
1. Passenger Automobile
2015 - 17.9 km/L
2020 - 21.8 km/L
2. AC
2010 - APF 5.8
2015 - APF 6.6
3. Lighting
4. TV
5. Copy machine
6. Computer
7. Magnetic disk
8. Freight car
9. Video recorder
10. Refrigerator
- .
- .
- 32 Items

Labeling System (by Manufacture)



AC	TV	Refrige rator	Freezer
Cooking Oven	Micro wave	Lighting	Toilet seat
DVD	Stove	Gas cooking	Gas water heater
Oil water heater	HP water heater	Comput er	Magnet Disk
Transform er	Motor	Rutting	Swathing

Labeling System (by Retailer)



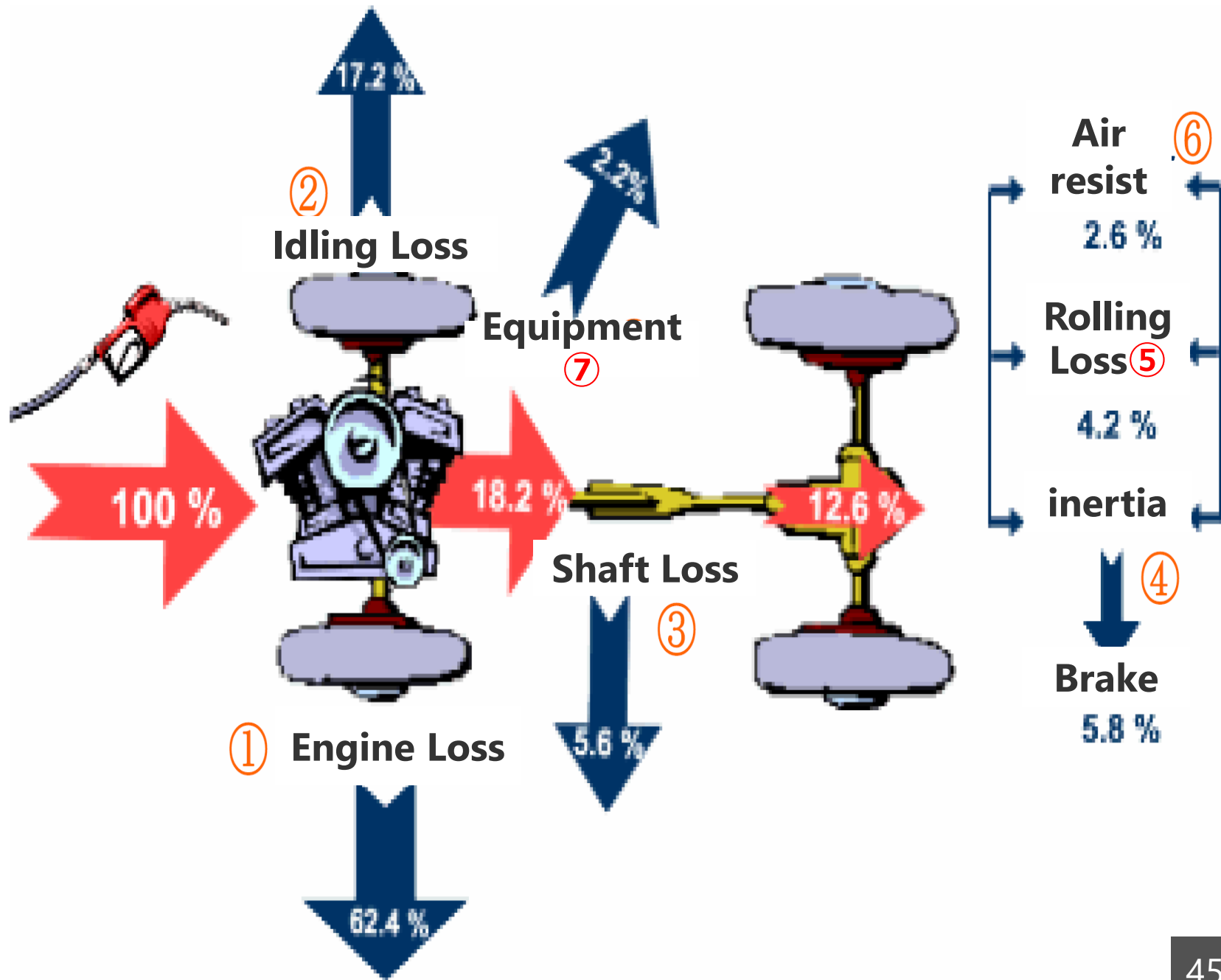
AC	TV
Cooking Oven	Micro wave
Refrige rator	Freezer
Lighting	Toilet seat

I . Energy Basics and

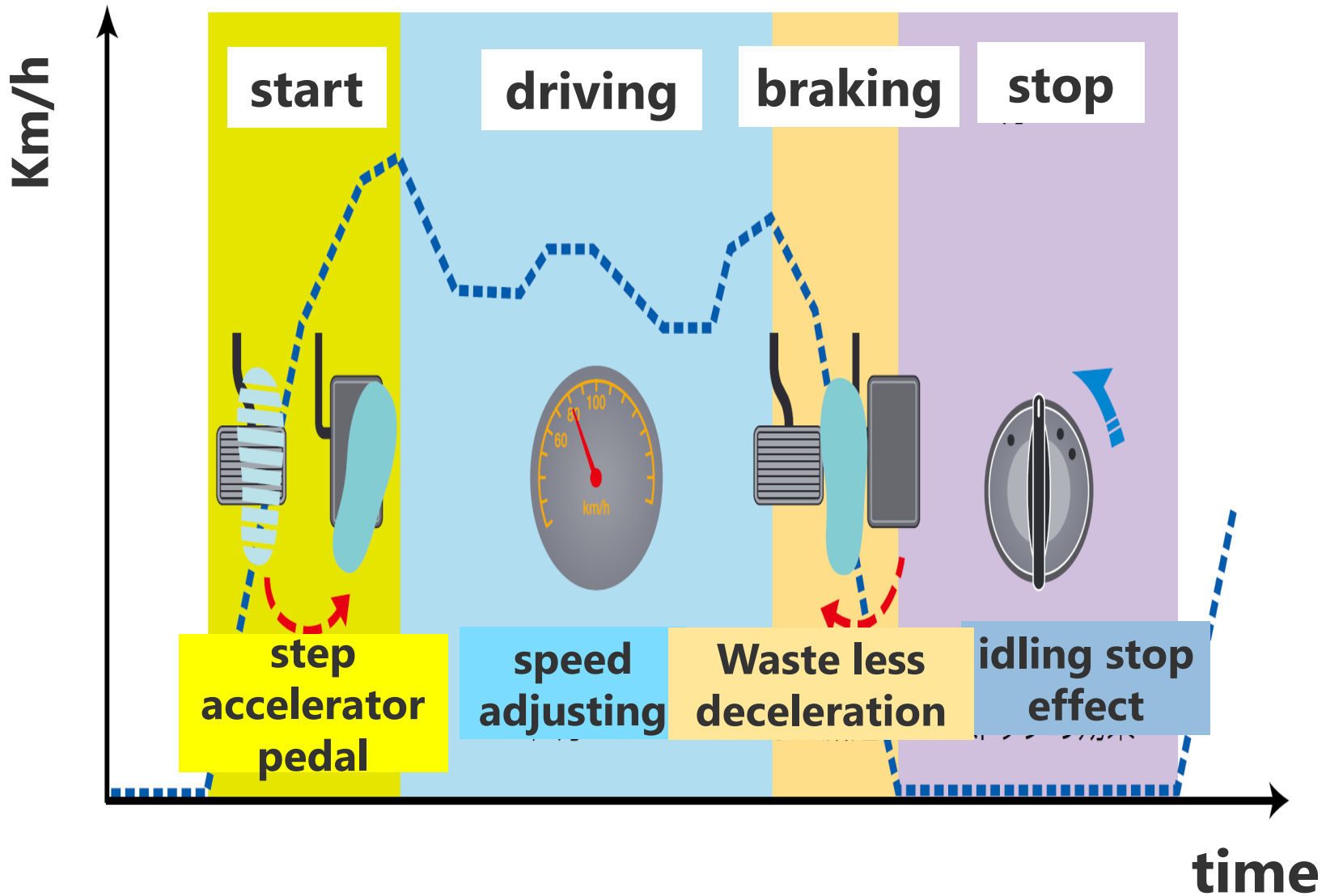
Energy Situation in JAPAN

II . Energy Saving in Home

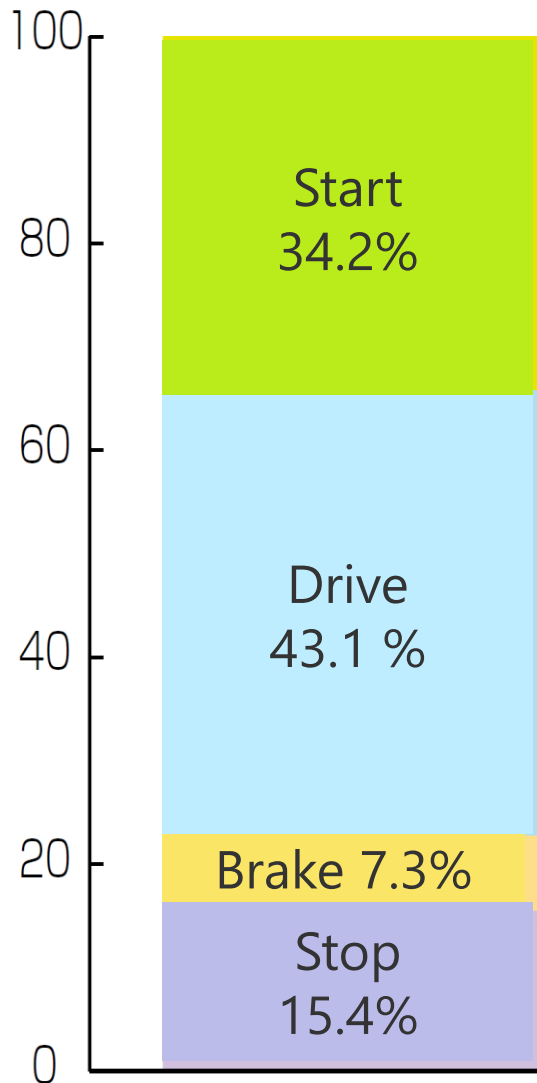
III. Smart Drive / Eco House



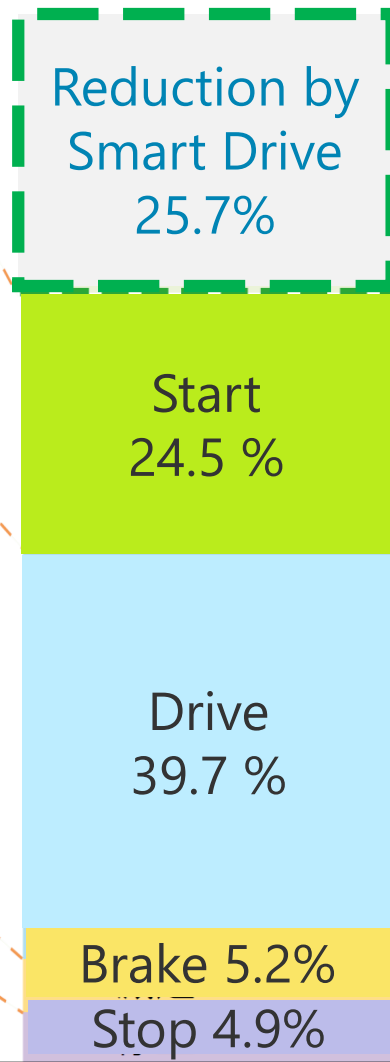
4 Types Driving Mode



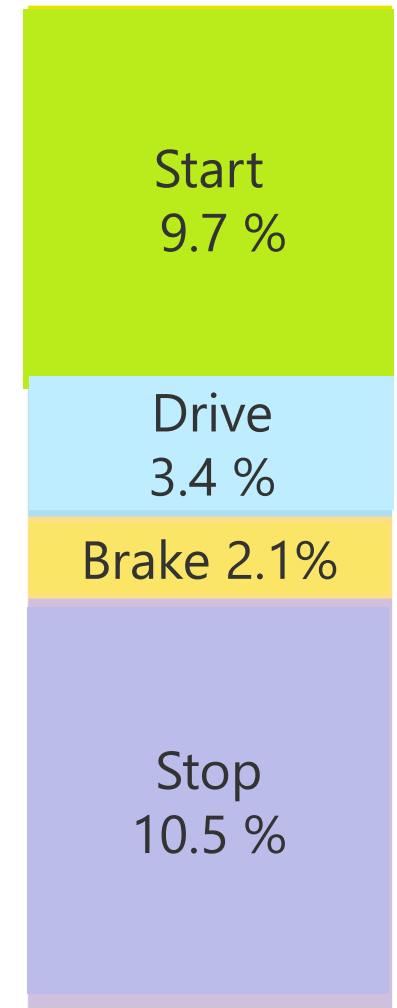
Fuel consumption (Normal Drive)



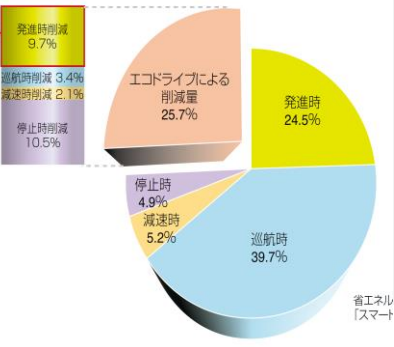
Fuel consumption (Smart Drive)



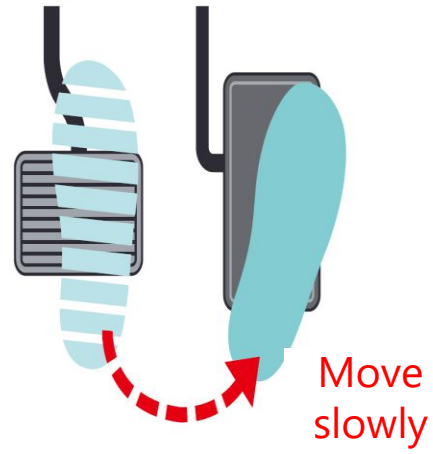
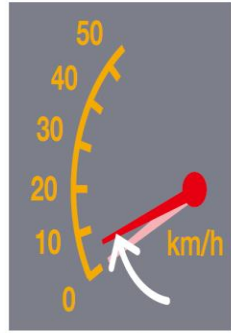
Break down of Fuel Reduction



ふんわり発進
の効果



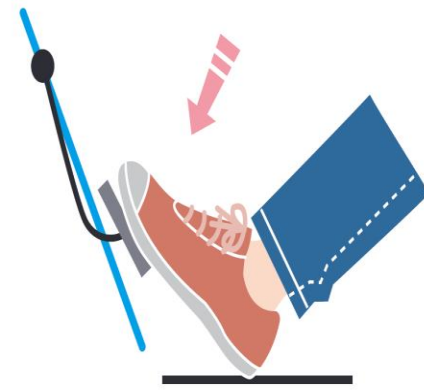
Start
9.7 %



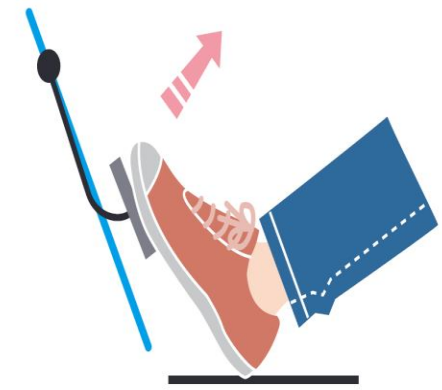
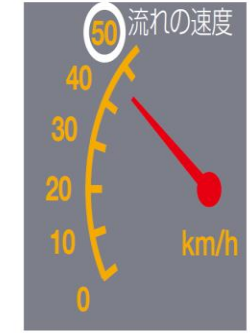
Brake to
accelerator
Feeling a breath
(use creep effect)



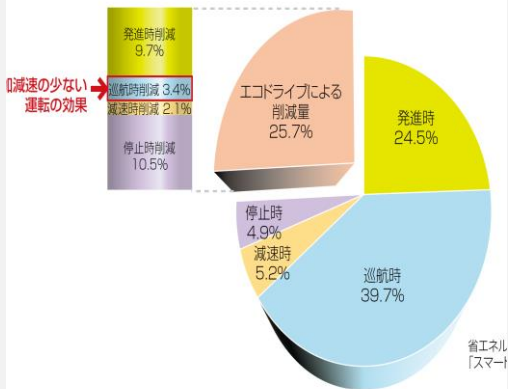
Foot on
accelerator pedal
and slowly
push



Slowly increase
power on pedal
with speed



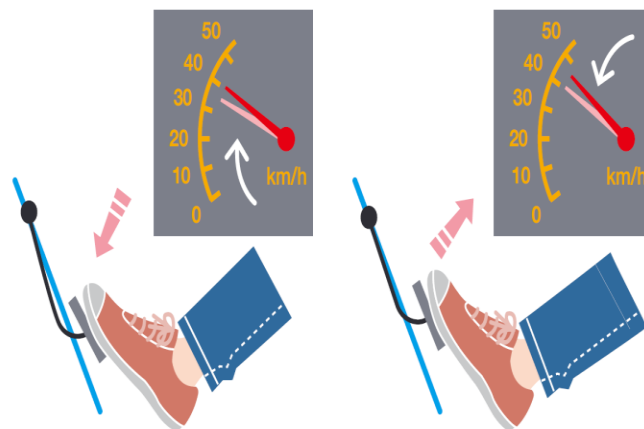
Not to over speed
return pedal
before target
speed



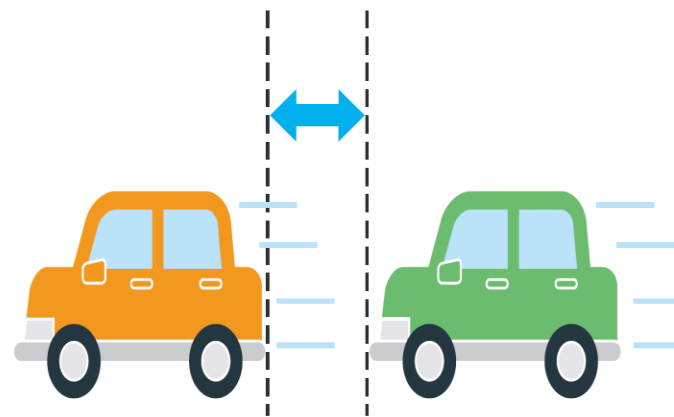
Drive 3.4 %



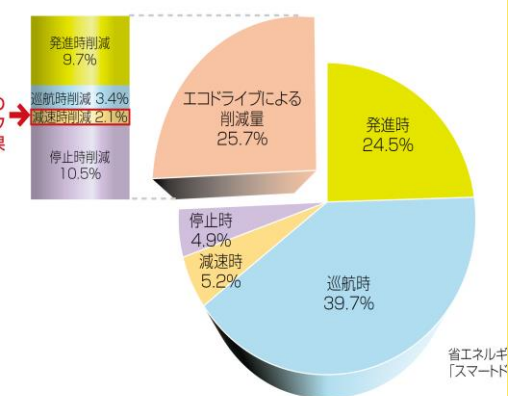
Adjust the speed
with accelerator
not brake



If speed changes, slowly
correct with accelerator

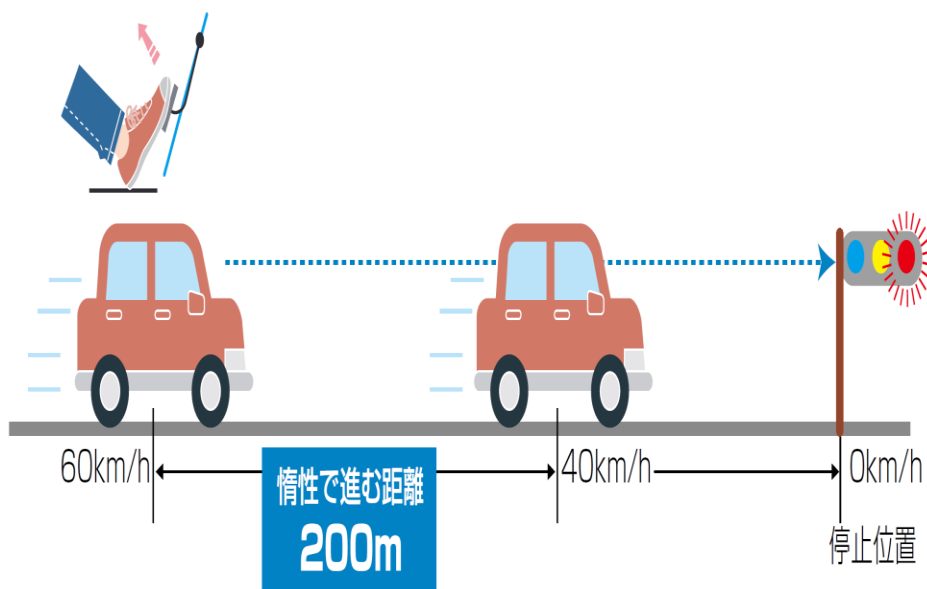


Distance that can be
controlled by fine tuning
of accelerator shall be
selected



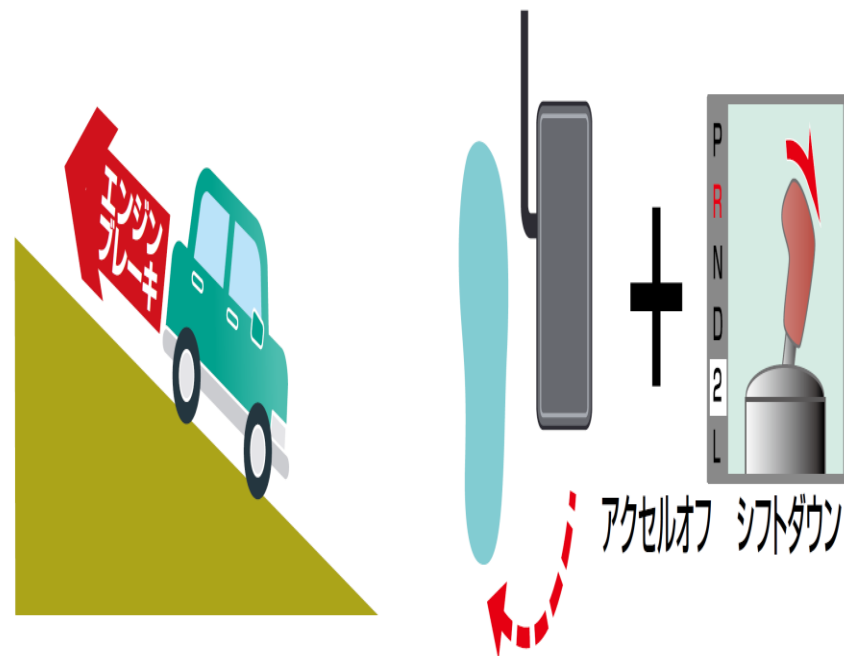
Brake 2.1%

アクセルオフ

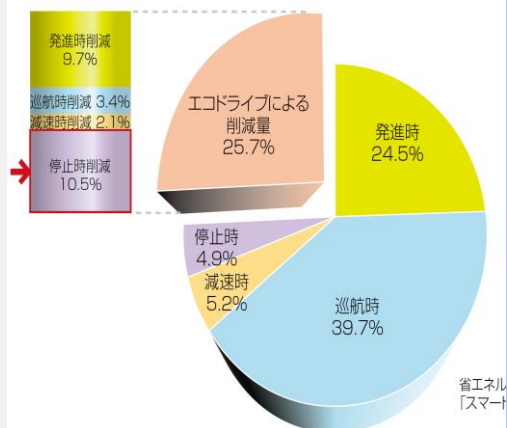


燃料消費量の削減効果=6~10cc

Decelerate with early accelerator off when we know to stop or turn



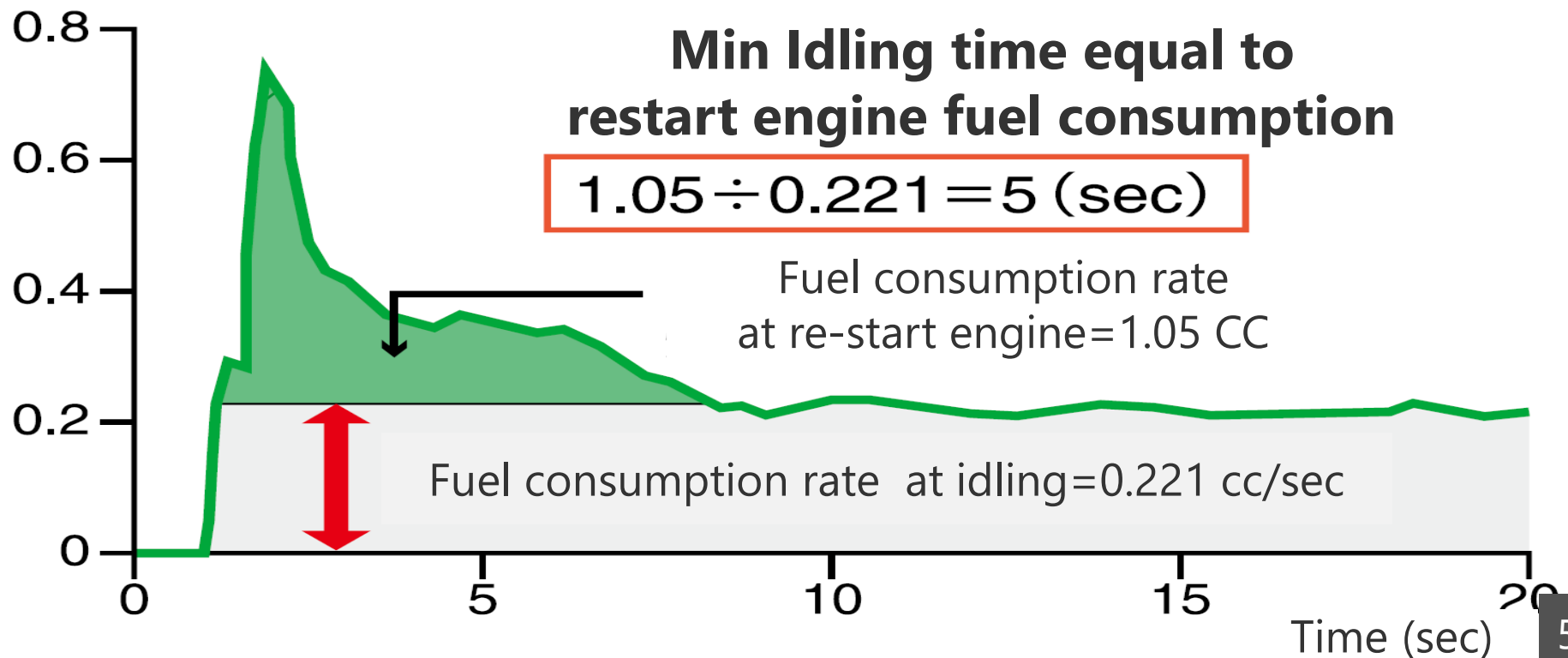
Take advantage of engine brake by shift when going down or deceleration



**Stop
10.5 %**

fuel consumption at restart engine

fuel consumption cc/sec



Key Word for Smart Drive 5-5-5

at Start 5 seconds

Accurate 20 km/h for 5 seconds

Suppress by 5 km/h

Suppress target speed by 5 km/h

stop over 5 seconds

Idling stop when over 5 seconds stop



**Constru
ction**



Facilities



Insulation of outer skin and blocking sunlight

- Frame insulation
- Window insulation

Methods by Building plan

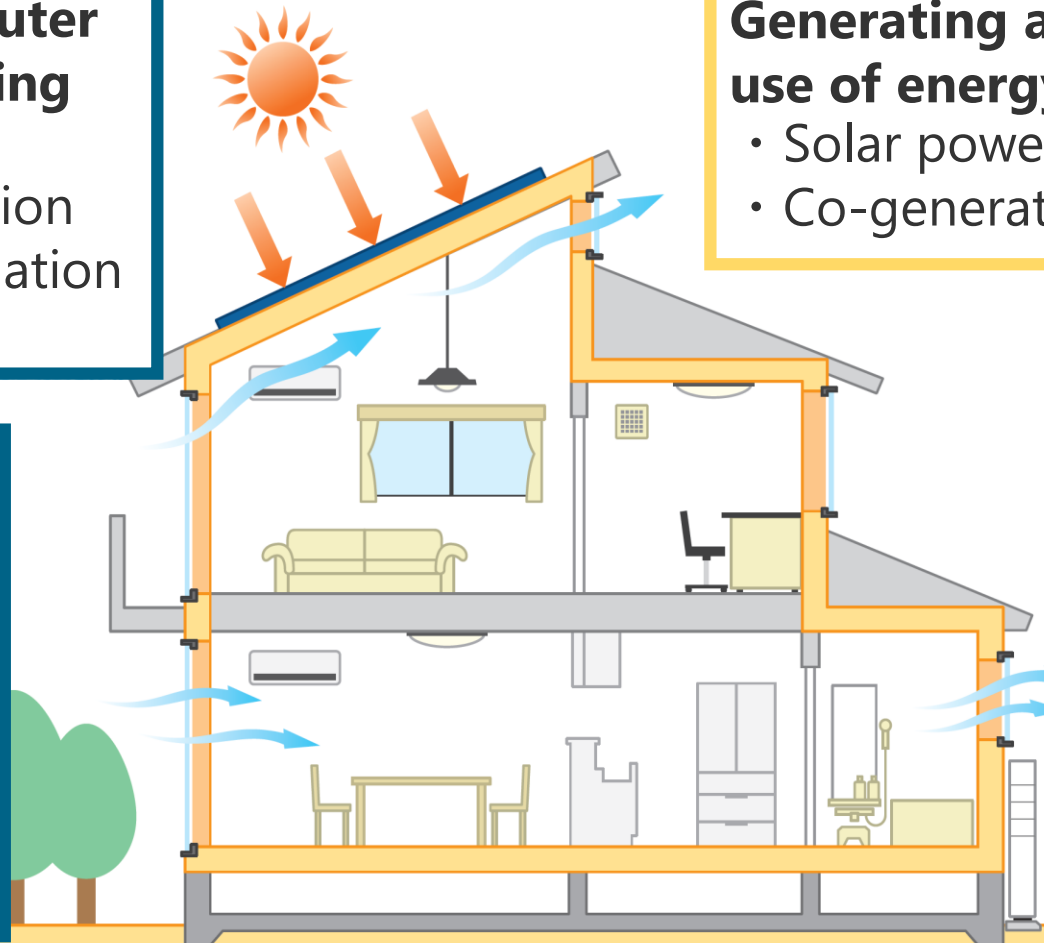
- Regions and premises
- Capture nature

Generating and efficient use of energy

- Solar power generating
- Co-generation equipment

Efficiency improvement of facilities

- Heating and cooling facility
- Lighting
- Hot water supply facility

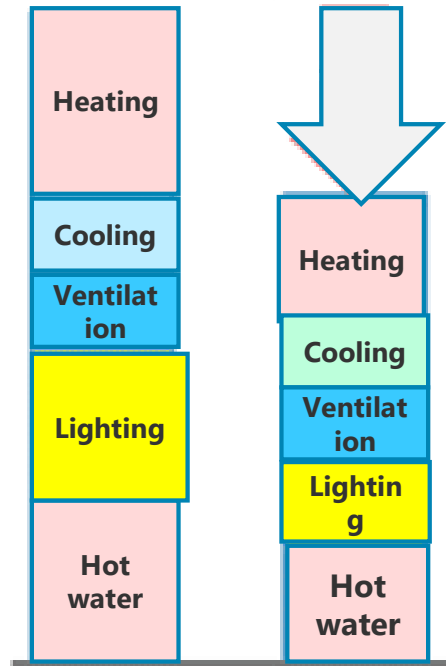


Need small
energy by high
insulation
performance



+

Use energy well by
high efficiency
facility



+

Generating energy



ZEH = Zero Energy House

HEMS=Home Energy Management System

Cell phone

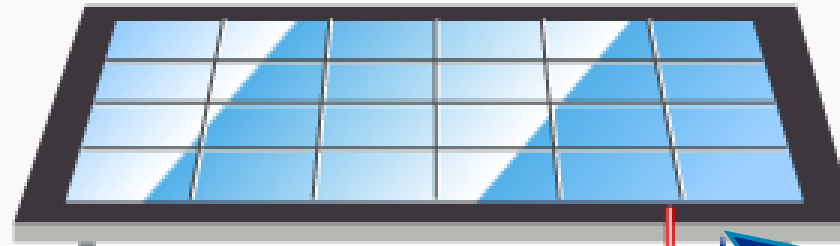


From outside
to control and
operate HEMS

Power charge stand

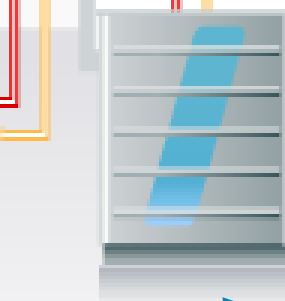
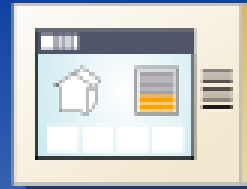


Electric Car

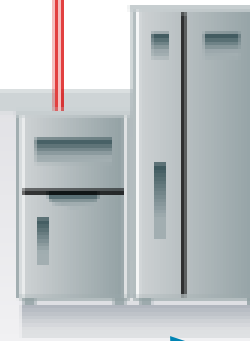


Solar power

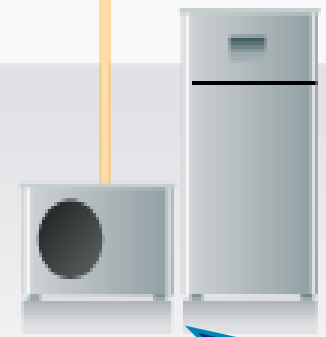
HEMS



Storage battery

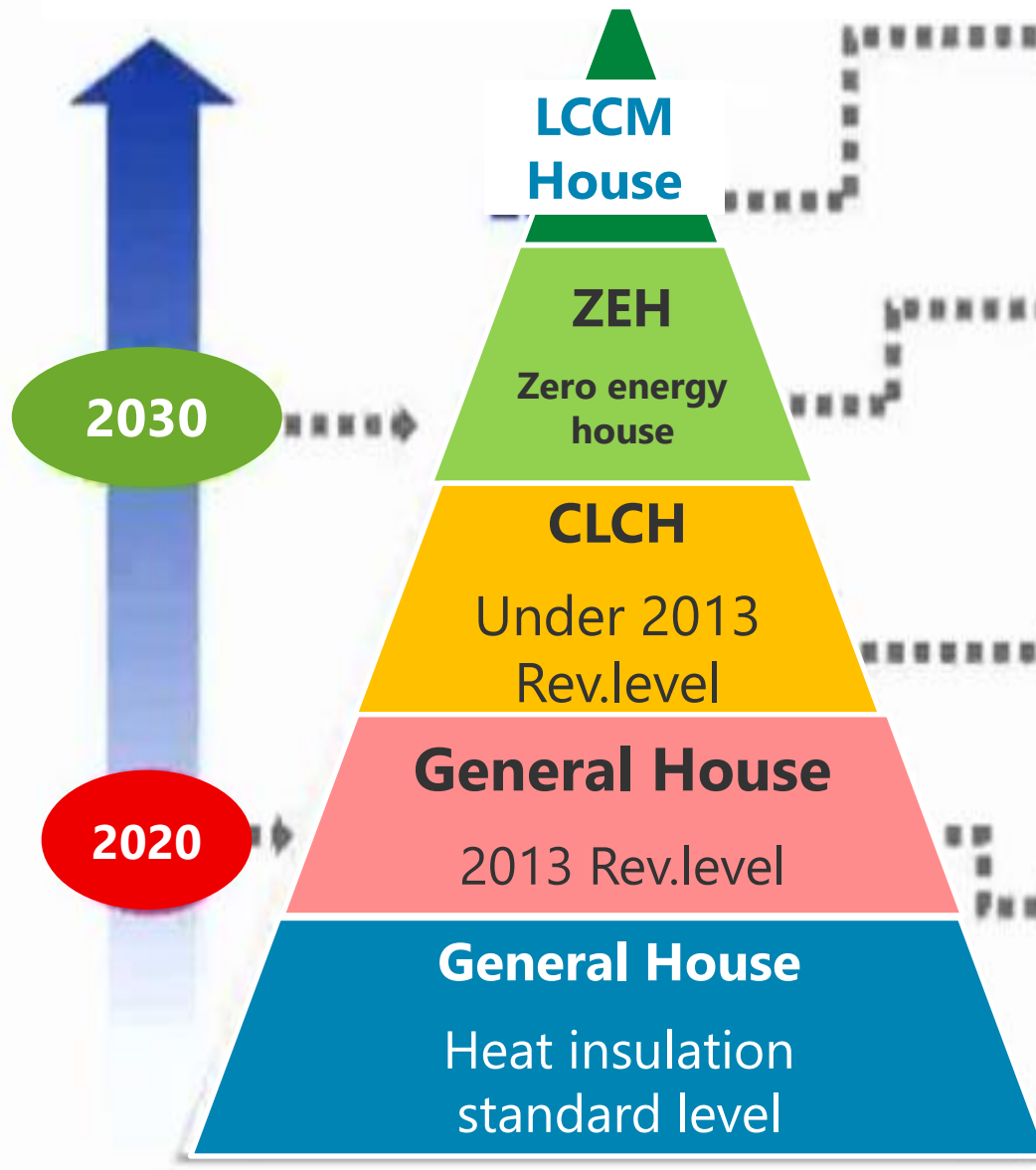


Fuel cell



Water heater

Low Carbon House Target



LCCM House

Total life cycle carbon payment from construction to disposal is minus

Zero Energy House

Energy Consumption is almost equal to Generating

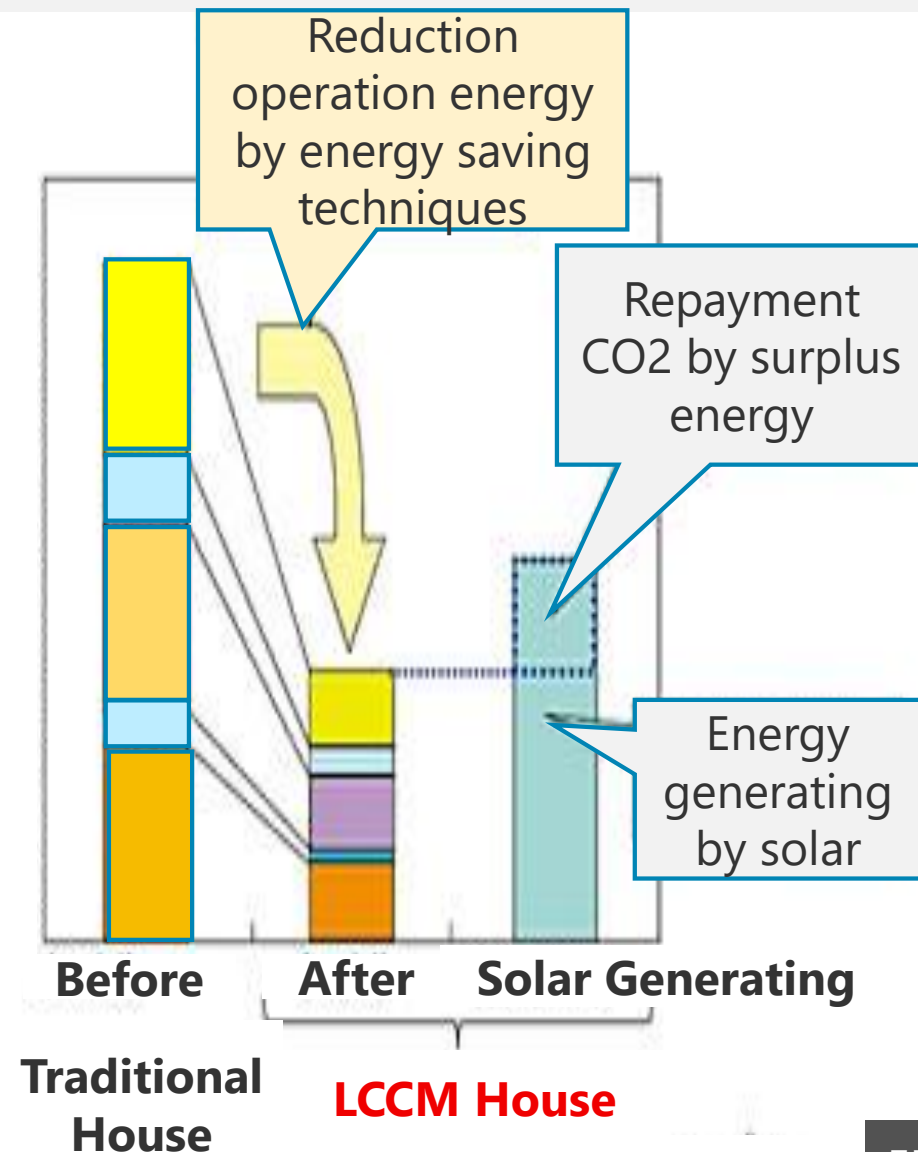
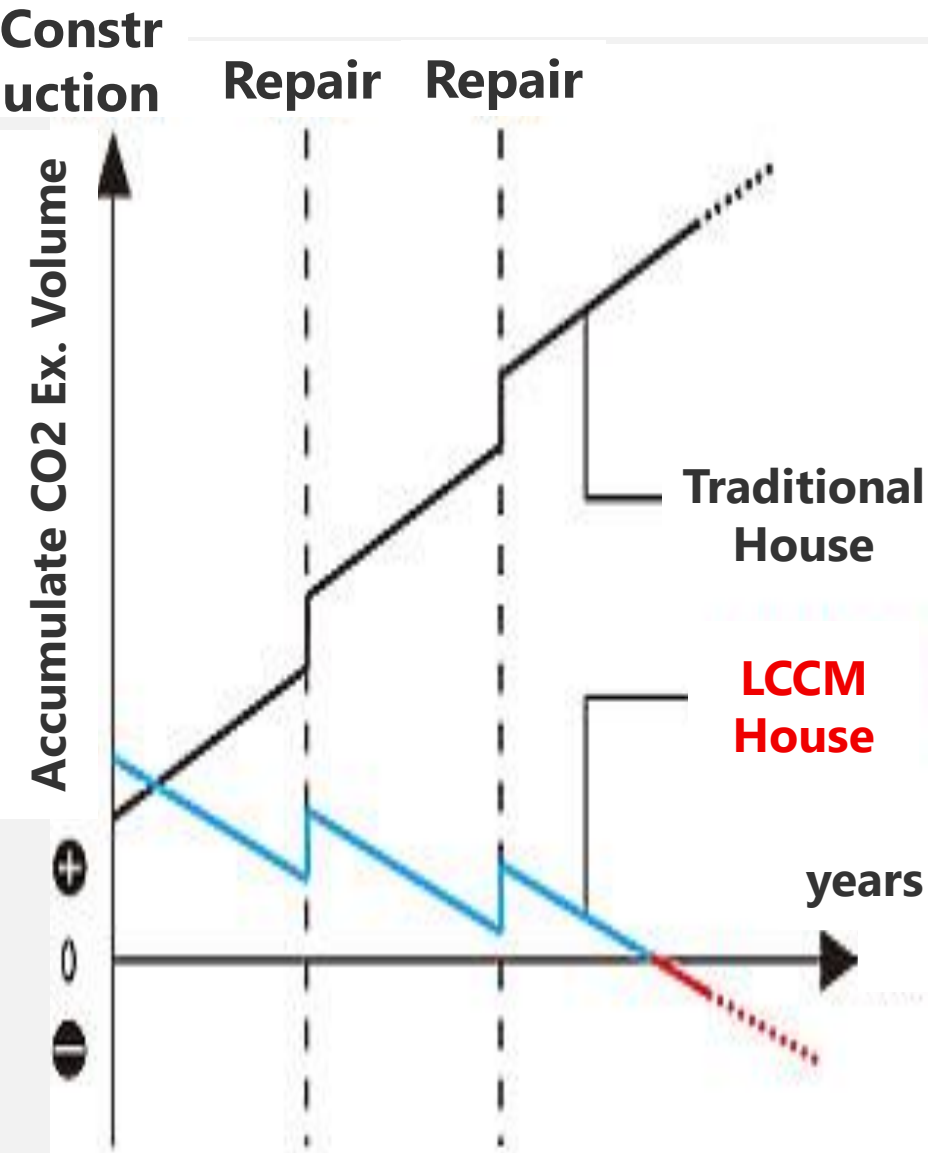
Certified Low Carbon House

Under 10% compare to 2013 standard rev.

General House

Heat insulation of outer skin and energy consumption is under standard level

Life Cycle Carbon Minus House



Life Cycle Carbon Minus House



Ahora, vamos a empezar ahorro de energía en su hogar juntos!



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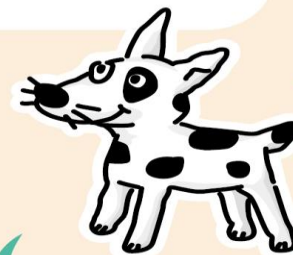
エネミ



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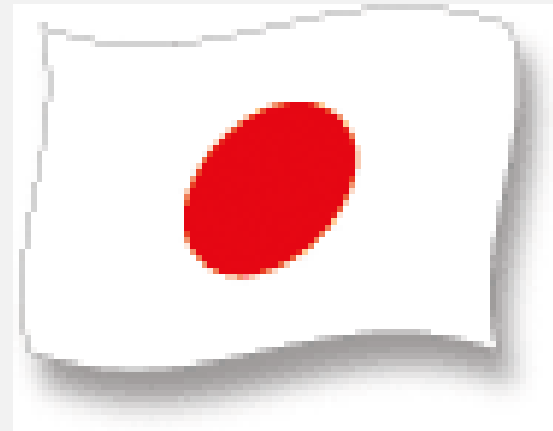
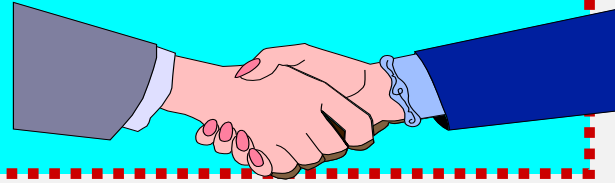


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Muchas gracias !



INTI  **Energía**



Centro de Investigación y Desarrollo
para el Uso Racional de la Energía

