

小規模分散型バイオマス熱電利用の可能性

Possibility of small-scale distributed biomass heat and power utilization

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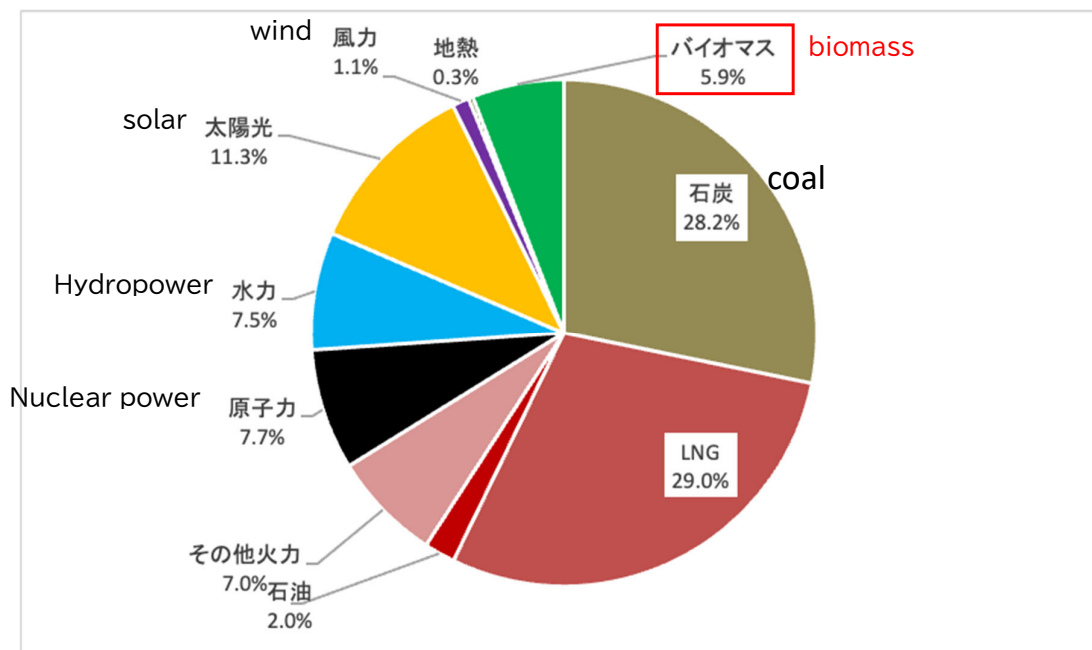
Table of contents

1. Current status and challenges of biomass power generation in Japan
2. Small and medium-sized biomass power generation facilities
3. Possibility of small-scale distributed biomass heat and power utilization
4. Conclusion



1. Current status and challenges of biomass power generation in Japan

Japan's domestic power source mix

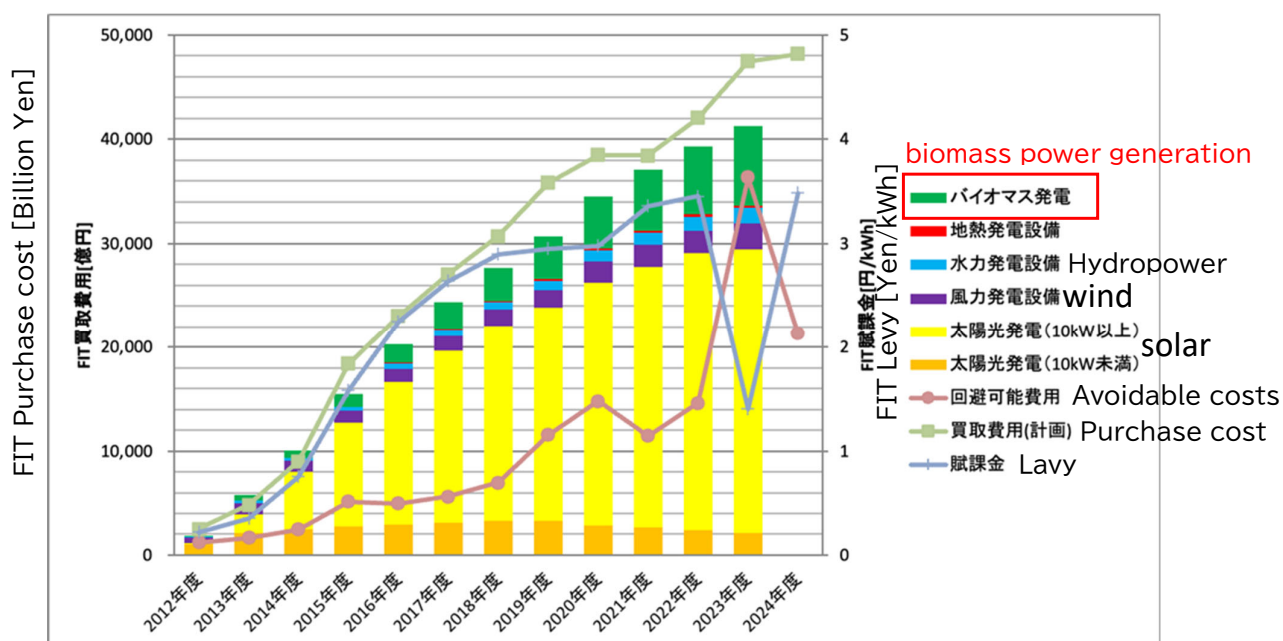


Japan's domestic power source mix (annual power generation in FY2023)
Source: Agency for Natural Resources and Energy, "Electricity Survey Statistics," etc.



1. Current status and challenges of biomass power generation in Japan

Japan's domestic power source trends of renewable energy power generation facilities



Trends in the annual amount of renewable energy power generation facilities installed under the FIT system

Source: Agency for Natural Resources and Energy, "Electricity Survey Statistics," etc.

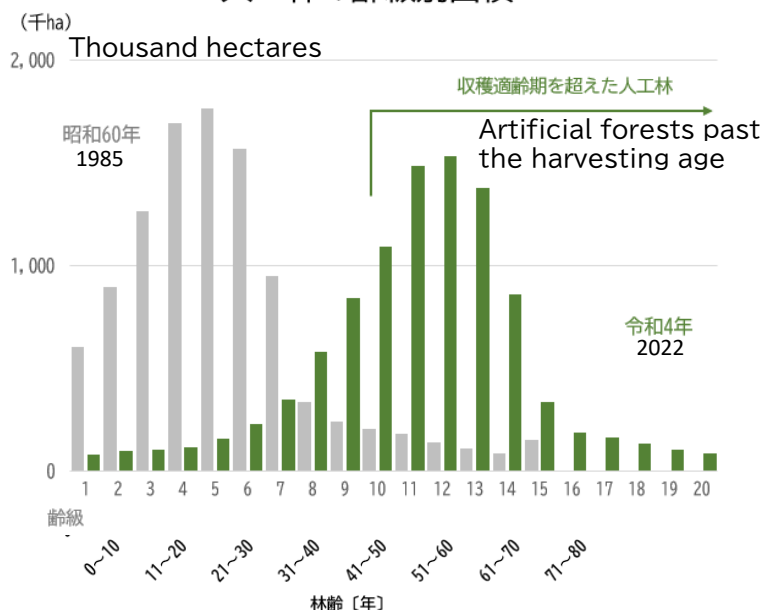


1. Current status and challenges of biomass power generation in Japan

Japan's domestic power source trends of renewable energy power generation facilities

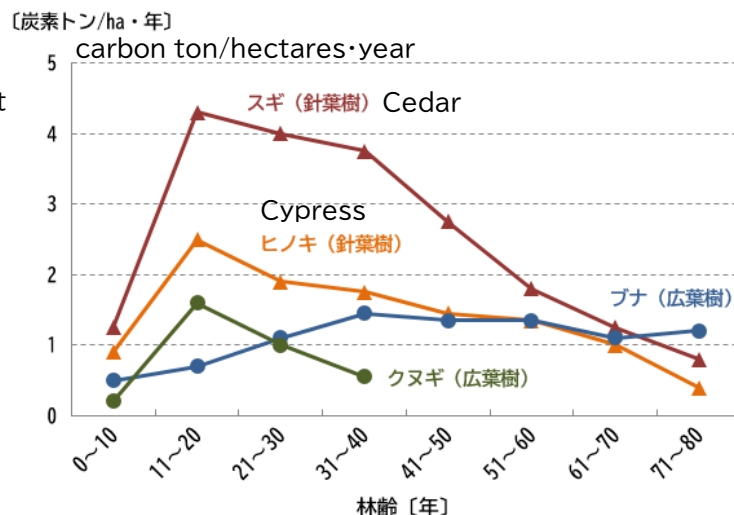
Area of artificial forest by forest age

人工林の齢級別面積



Carbon absorption by tree species and tree age

樹種別・林齢別炭素吸収量



Source: Forestry Agency "Forest Resource Status Survey"



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5

2. Small and medium-sized biomass power generation facilities

Selection of power generation method based on output power scale

output power

100kW

500kW

1,000kW

2,000kW



ORC: Organic Rankine Cycle

Heat Properties

Hot water (80°C~90°C)

Low Pressure Steam (120°C~180°C)

Fuel Requirements

Pellets

Higher quality

Tips

Barks

Low-grade chips

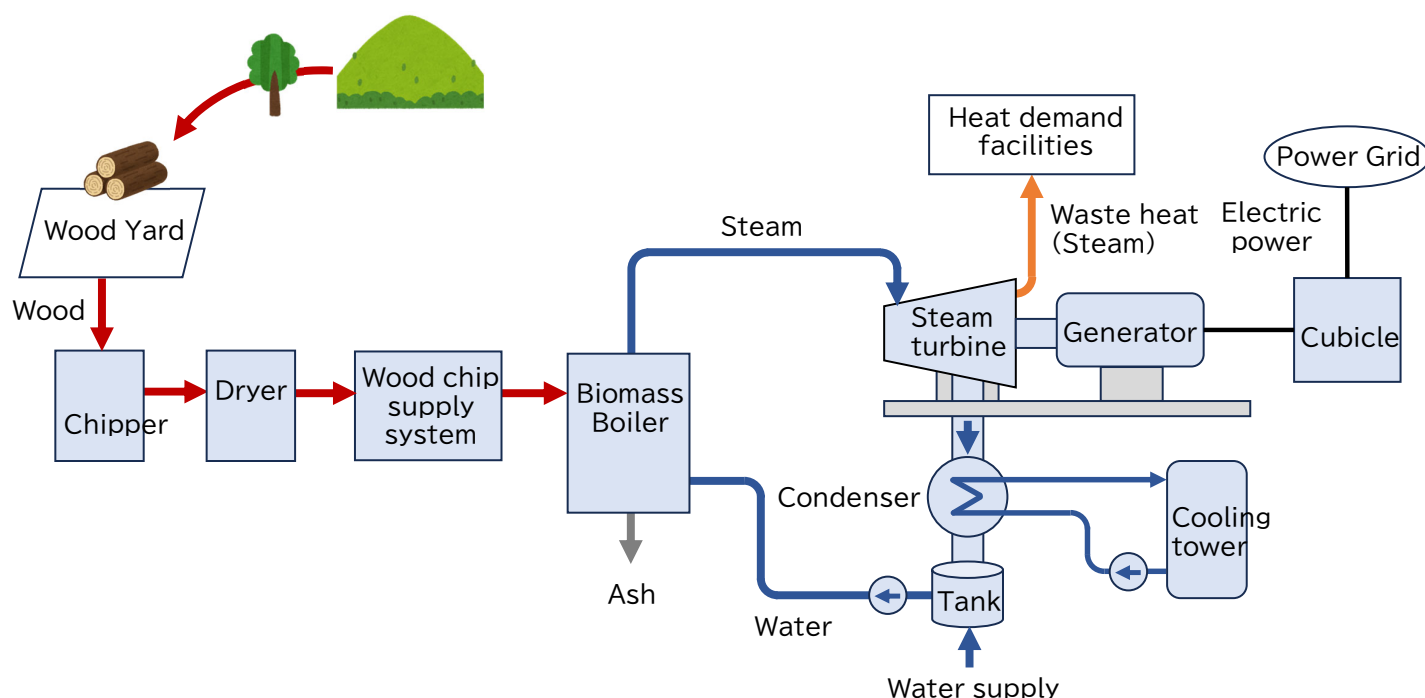


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6

2. Small and medium-sized biomass power generation facilities

Basic configuration of wood biomass power generation (Steam generation)



2. Small and medium-sized biomass power generation facilities

Example of a steam biomass power plant

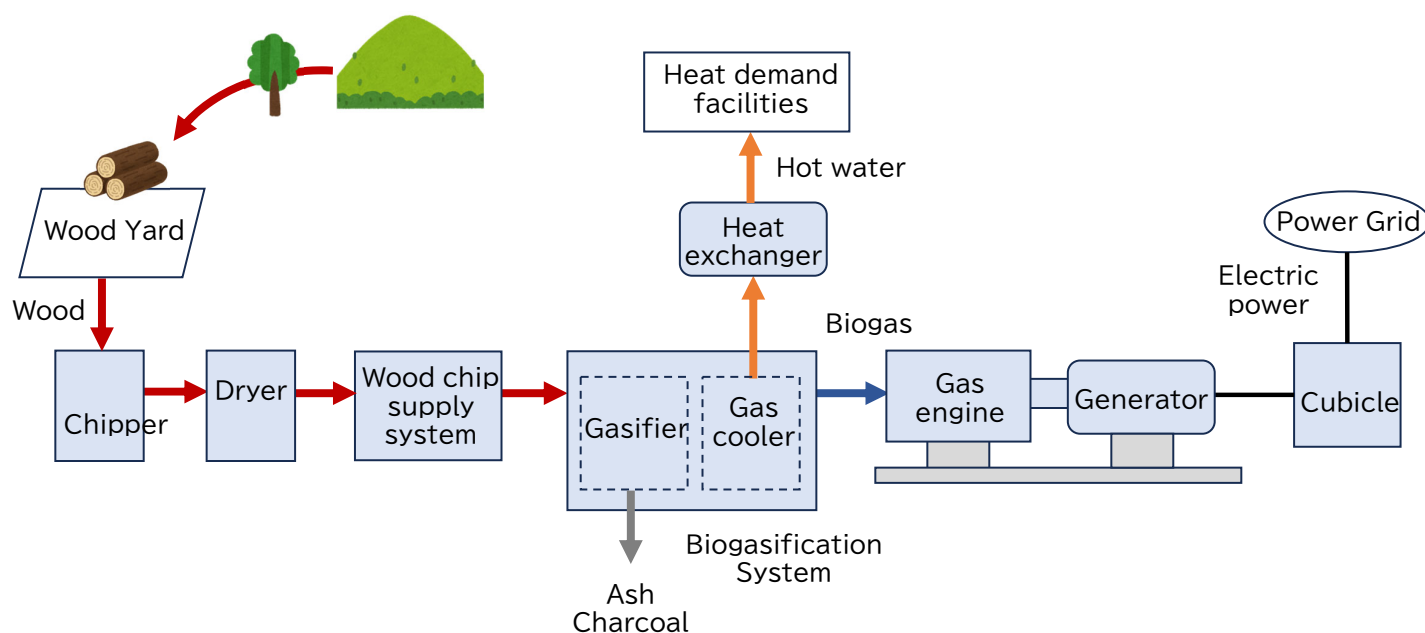
Maniwa Biomass Power Plant

Item	Specification	Remarks
Power generation output capacity	10,000kW	using unused wood, lumber and scrap bark
Fuel used	110,000t/year	planned usage: 148,000t/year
Operation rate	103%	For rated output
Power generation	74,200MWh	
Planned operating days	330 days/year	
Power selling method	FIT	32yen/kWh(Unused wood) 24yen/kWh(general wood)
Sales	2.31 billion yen	
Fuel Purchase	1.42 billion yen	Approximately
CO ₂ reduction	67,000t-CO ₂	54,000t-CO ₂ (Power plants)



2. Small and medium-sized biomass power generation facilities

Basic configuration of wood biomass power generation (Gasification)



2. Small and medium-sized biomass power generation facilities

Example of a Gasification biomass power plant

Tsuwano Biomass Power Plant

Item	Specification	Remarks
Power output capacity	480kW	Heat:1,200kW
Fuel used	6,500t/year	nearby areas
Power generation	3,740MWh	
Facilities	Volter40×12	Chip Dryer:T4 Plus

Azumino Biomass Power Plant

Item	Specification	Remarks
Power output capacity	1,960kW	Heat:3,800kW
Fuel used	25,000t/year	nearby areas
Power generation	15,000MWh	
Power selling method	FIT	40yen/kWh
Facilities	spanner	49kW×40



2. Small and medium-sized biomass power generation facilities

Example of a Gasification biomass power plant

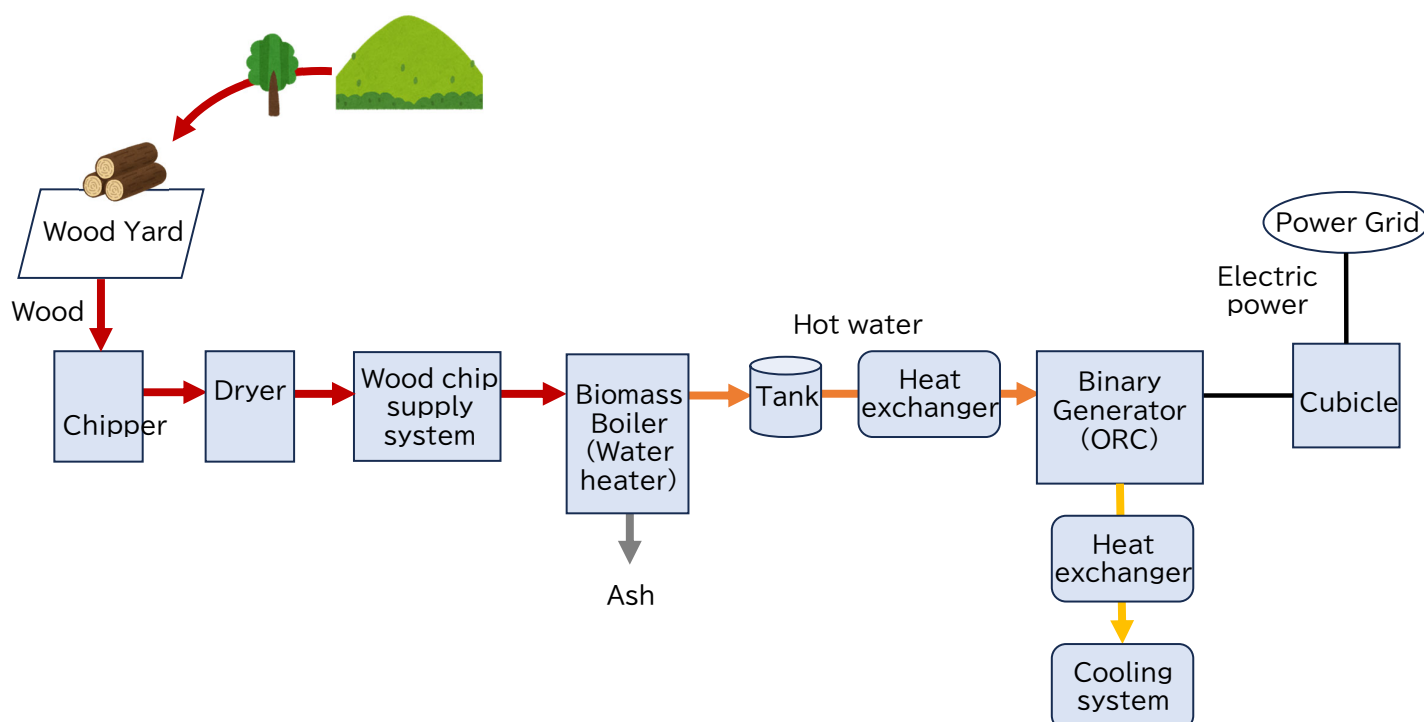
Uchiko Ryuow Biomass Power Plant

Item	Specification	Remarks
Power output capacity	330kW	Heat:520kW
Fuel used	3,600t/year	Wood pellets made from unused wood
Annual operating rate	89%	Approximately
Power generation	2,570MWh	
Power selling method	FIT	40yen/kWh
Heat selling	Hot water supply	Nearby facilities
Facilities	Burkhardt	(V3.9+ECO165HG)×2



2. Small and medium-sized biomass power generation facilities

Basic configuration of wood biomass power generation
(Binary)



2. Small and medium-sized biomass power generation facilities

Example of a Binary biomass power plant

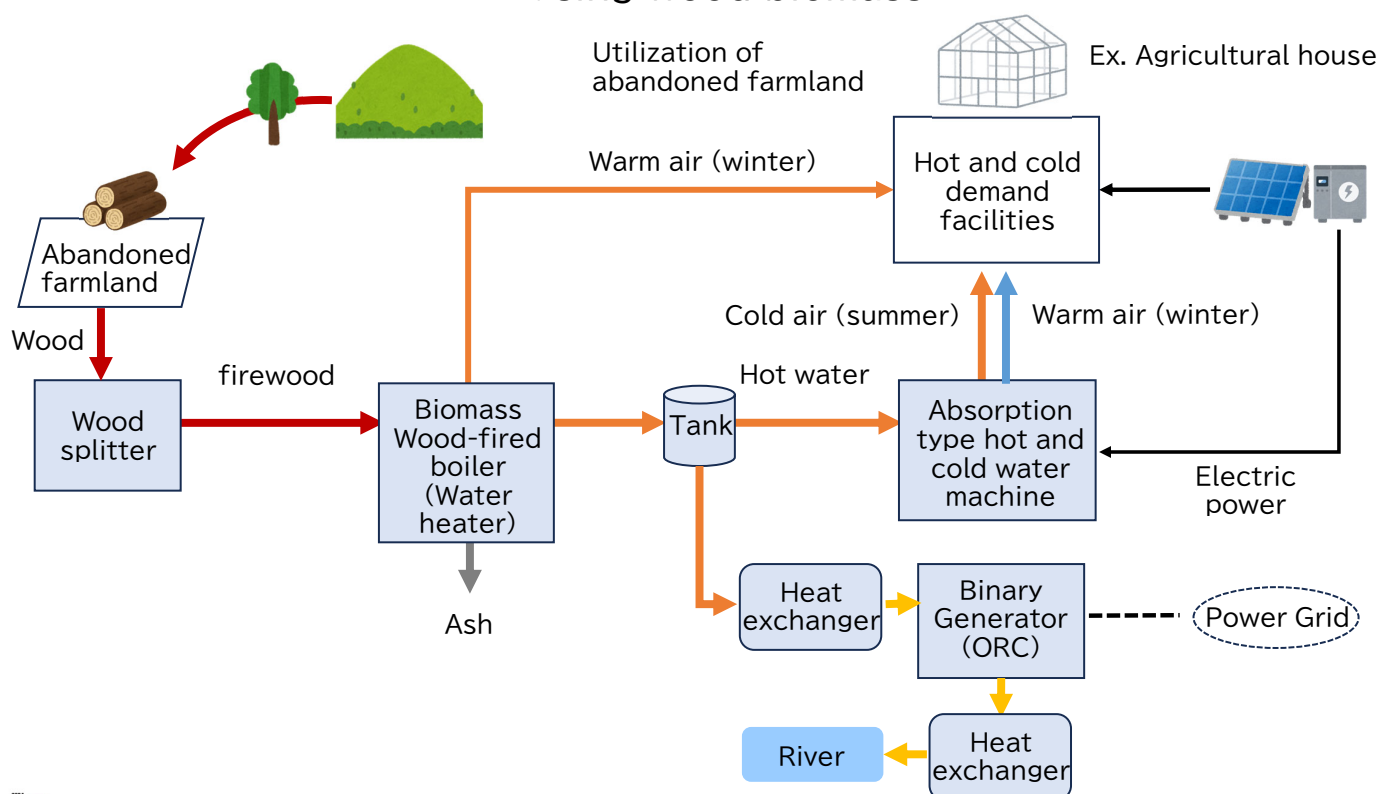
Uchiko Biomass Power Plant

Item	Specification	Remarks
Power output capacity	1,115kW (CHP:990kW +Binay:125kW)	Heat:1,560KW (for Binary) (Gasifier:420kW +CHP:1,140kW)
Fuel used	5,700t/year	Wood pellets
Power generation	8,830MWh	8,110MWh (Sending end)
Annual operating days	330days	
Power selling method	FIT	40yen/kWh
Facilities	Burkhardt	Gasification Unit×6 CHP Unit×6 Binary×1
Binary system	Thermapower™	Thermapower ORC 125XLT



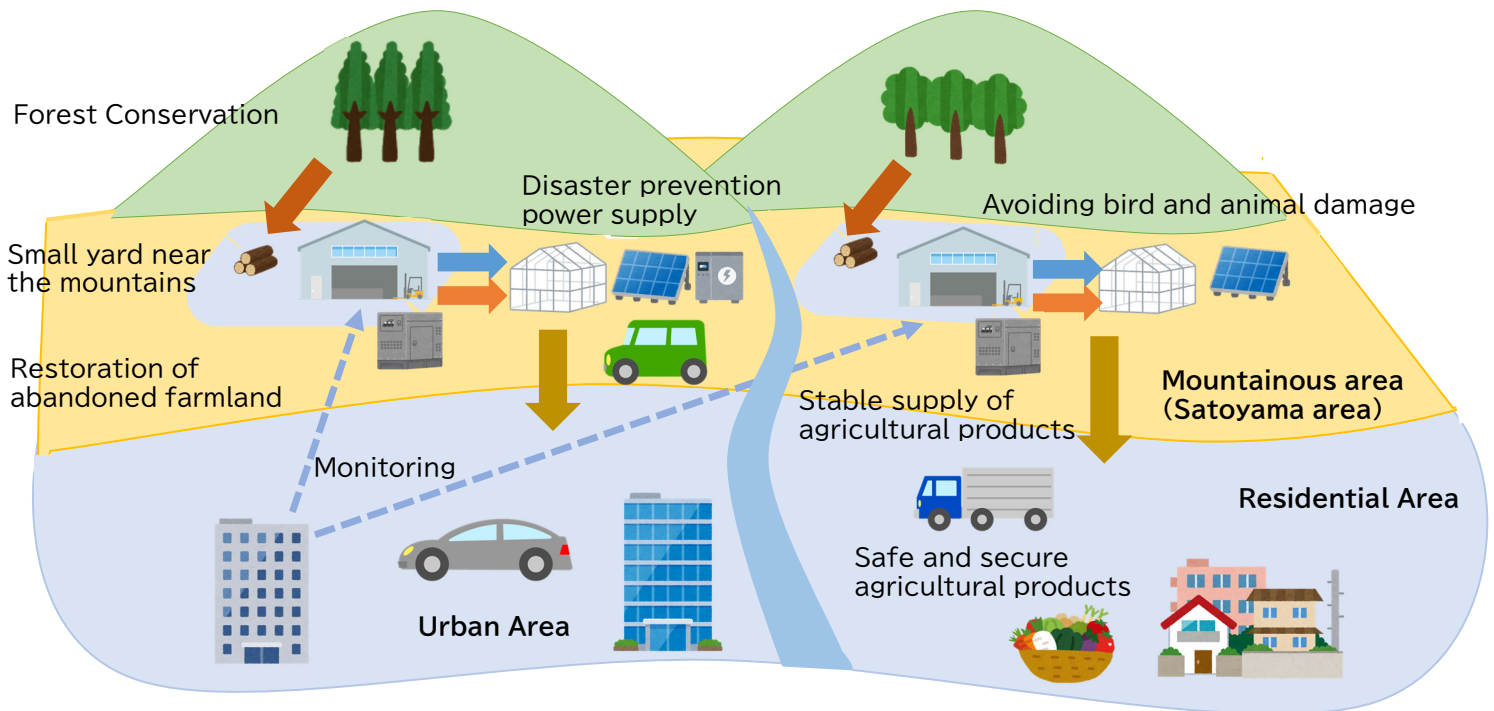
3. Possibility of small-scale distributed biomass heat and power utilization

Small-scale distributed heat and electricity utilization system using wood biomass



3. Possibility of small-scale distributed biomass heat and power utilization

Small-scale heat utilization system grand design of wood biomass use



4. Conclusion

- Wood biomass power generation systems include steam turbines and gasification. Steam turbines are mainstream with over 2000kW, and many plants are used only for power generation, so steam turbines are unsuitable for small to medium-sized scale.
- Gasification is suitable for small to medium-sized scale plants under 2000kW for power generation and heat cogeneration, but requires high quality wood fuel, so is not very suitable for Japan's woodland forests.
- To revitalize Japan's mountainous areas where abandoned farmland is increasing, small-scale distributed biomass thermoelectric use is suitable, using hot water from a simple wood-fired boiler as a heat source.
- As a Satoyama industry that can adapt to climate change, we believe that application of cold and hot heat to greenhouse agriculture is promising.

