Resource Recovery from Wastewater in Japan

Japan Sewage Works Association
Director Hiroyuki Uchida

Overview of Wastewater Service, 2015

Accessibility:77.8%
Served pop. : 99,260,000
Treated WW : 154.6m3/year
Generated sludge: 2,409,091t-DS

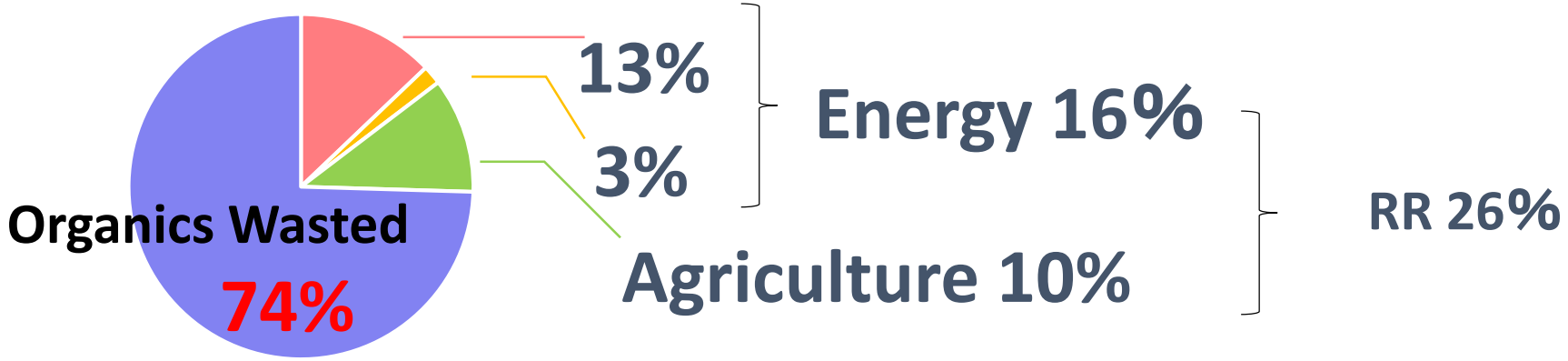
Sewer network : 468,537km
WWTPs : 2,134
Sludge Treatment Facility (STF): 1,966
Lift station: 3,677
Manhole pump: 48,717
Water reuse facility: 345

National Policy
Sewage Sludge(SS): Locally Available Resource

- PAST: Landfill, Ocean Disposal
- NOW: Recycle in Construction Industry
- FUTURE: Fuel and Fertilizer
- WWTPs: Production Center of Energy & Fertilizer.

Current Recycle, FY2015

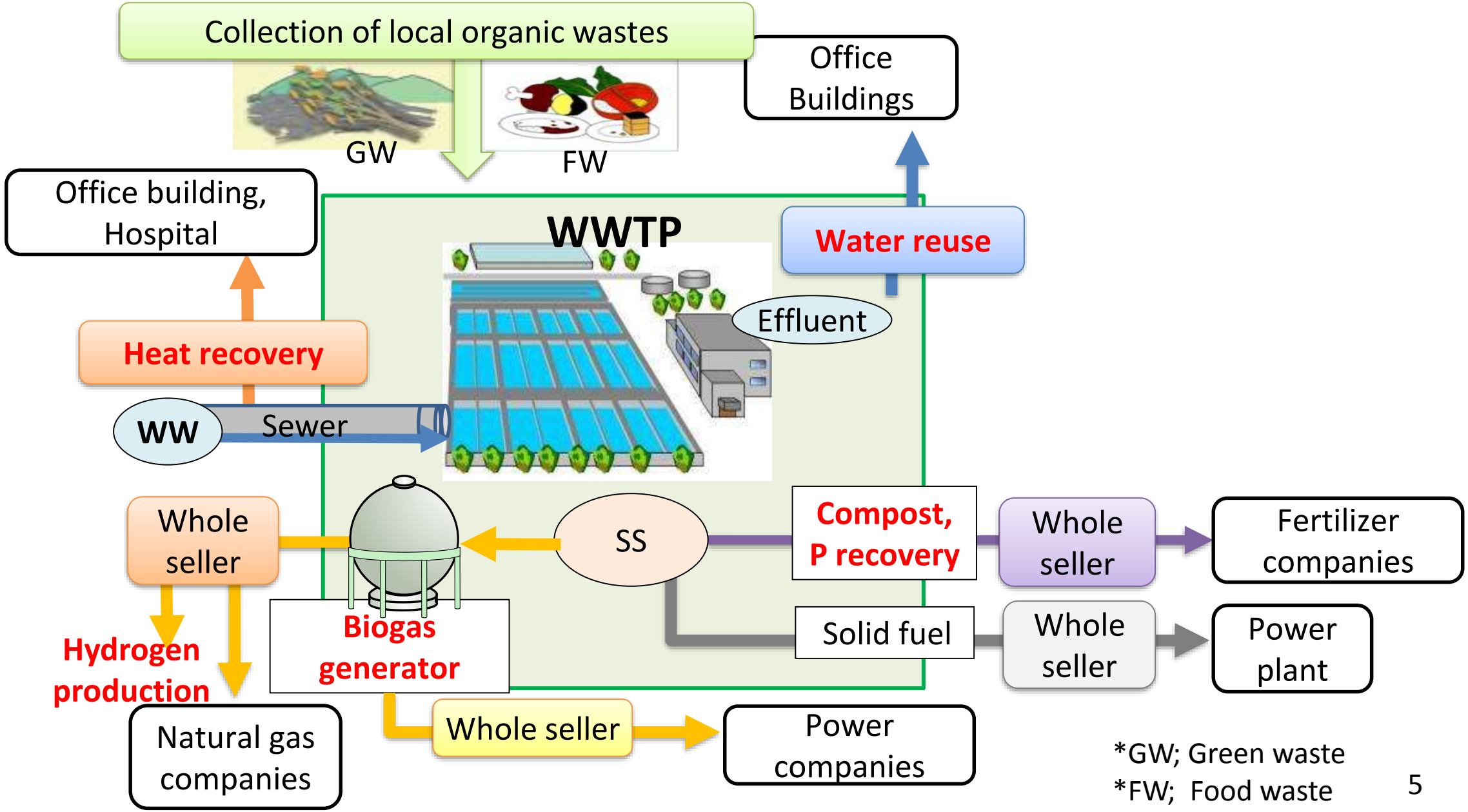
2.4 Mt/y SS contains 1.9 Mt/y organics,
which could generate power for 1.1M households



Note) 68% Recycled if construction use included.

National Target;
Recycle rate from 26% now up to 40% by 2020 for energy and agricultural

Resource recovery for energy and fertilizer



*GW; Green waste
*FW; Food waste

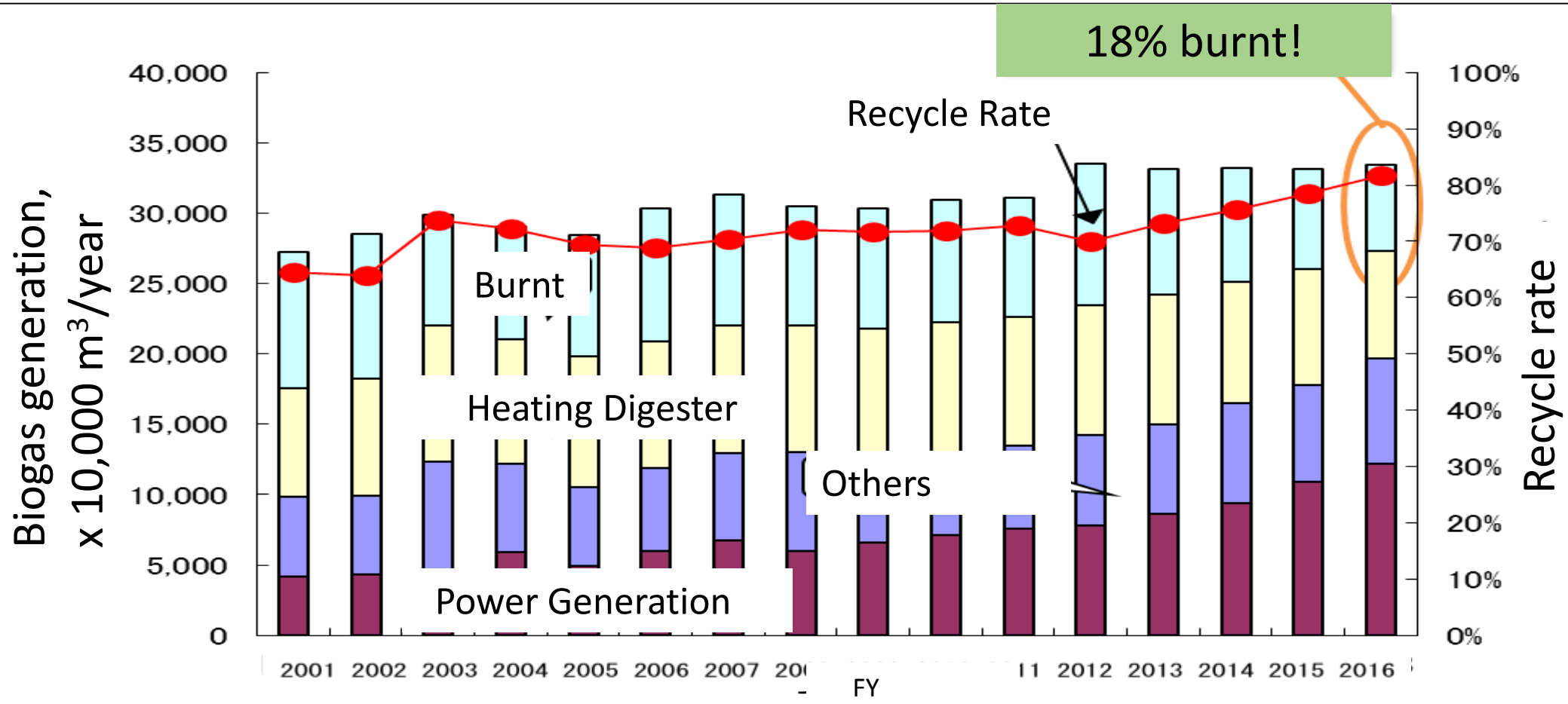
Recent Legislation and Government Policy

- ✓2014: 4th National Energy Plan included WW resource as renewable.
- ✓2015: Local governments shall recycle sewage sludge as fuel and/or fertilizer, Sewerage Act revised.
- ✓2017: PPP/PFI encouraged for RR with subsidy.

Energy Recovery
from Sewage Sludge (SS)

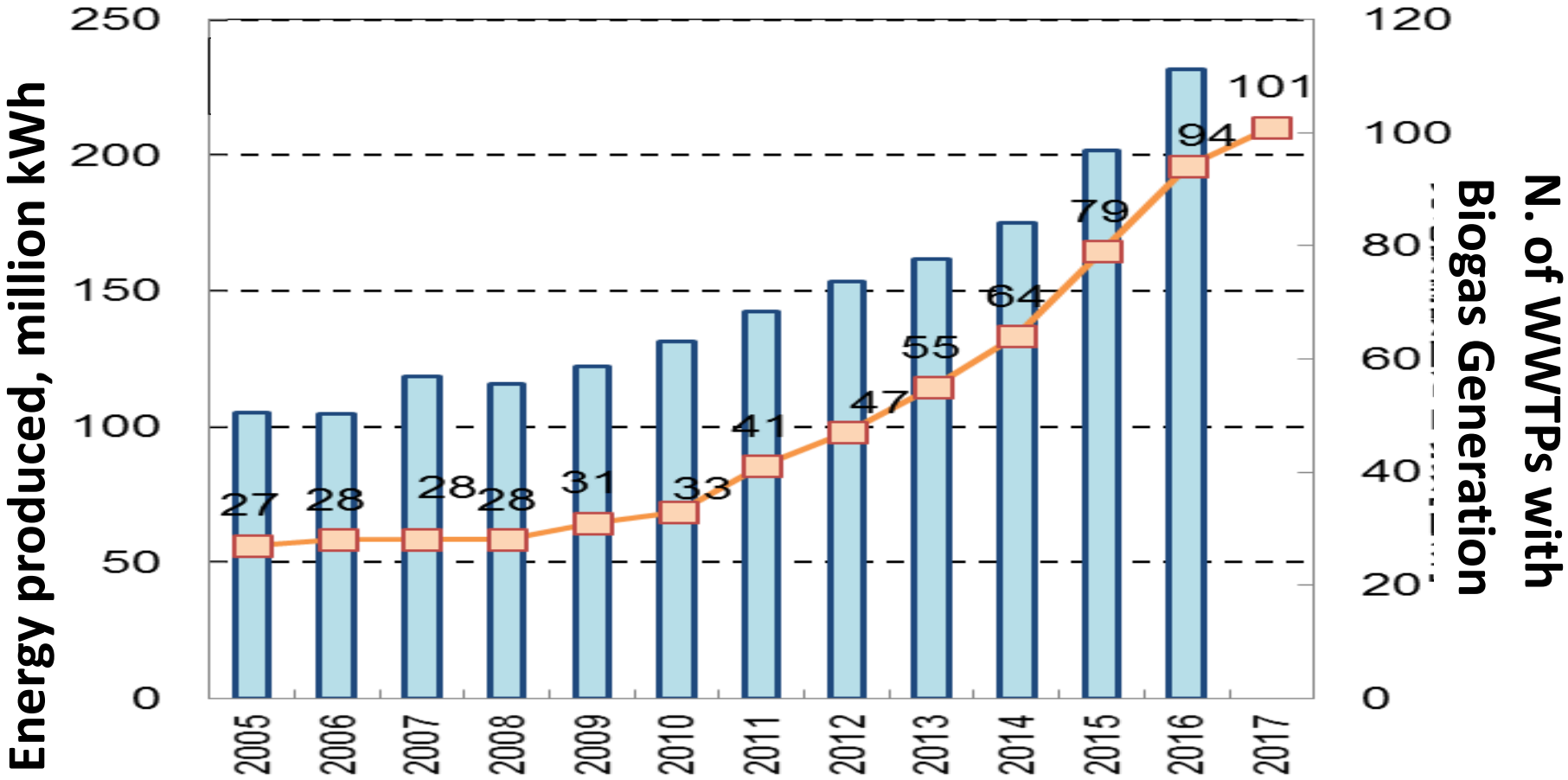
Biogas use, 2016

- Heating digestion tanks. Excess gas, burnt and wasted
- 82% recycled with 37% power generation and 23% heating digester.
- But 18% burnt!



Driver for Biogas Recycle, Feed in Tariff system

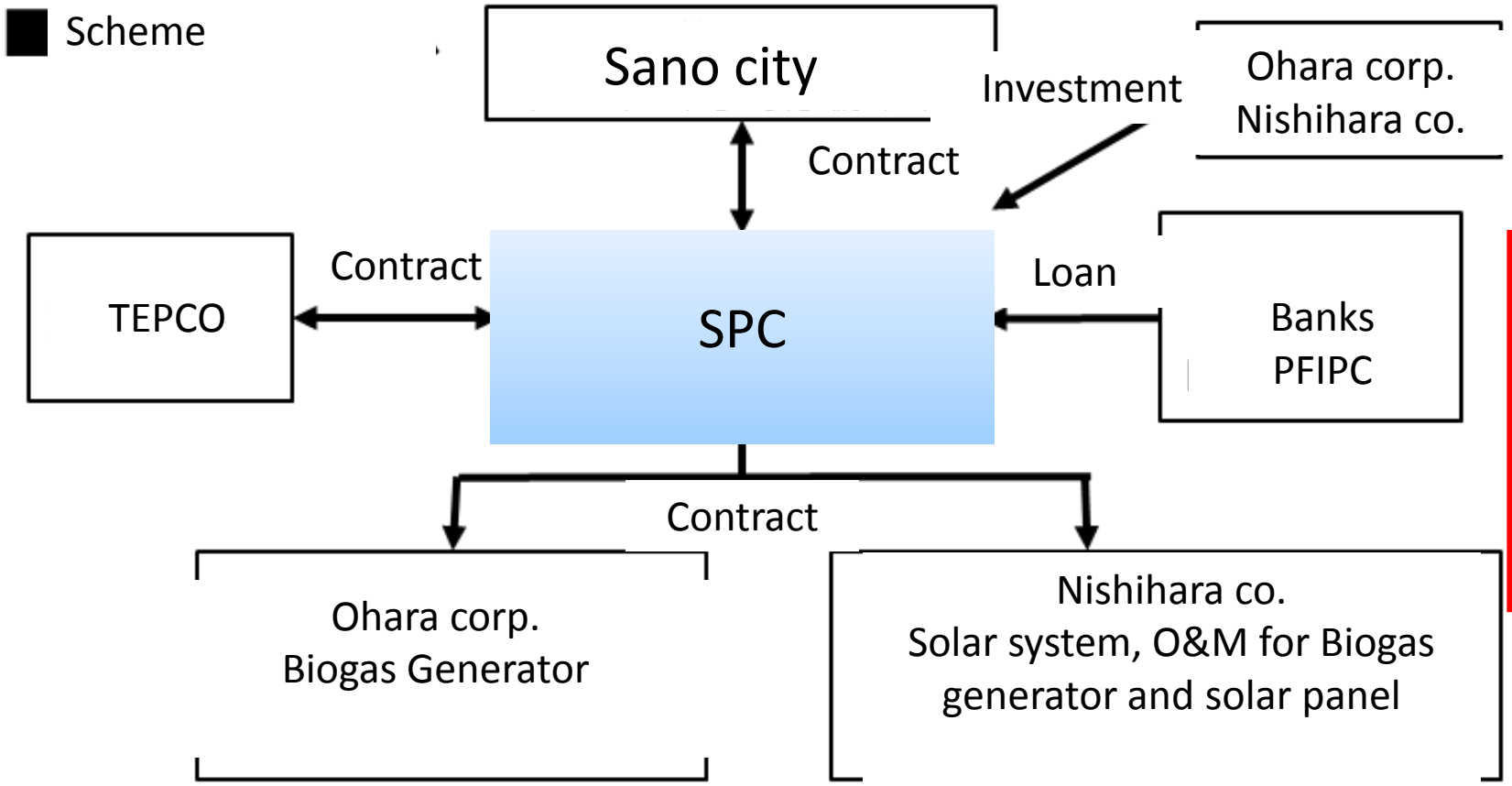
- ✓ Legislation that requires power companies buy renewable energy
- ✓ Number of biogas power projects increasing



Sano city

- ✓Biogas Generation with PFI
- ✓Support by Private Finance Initiative Promotion Corporation of Japan (PFIPC)

■ Scheme



Sano city

Delivery	BOT
Period	2015.3～2036.3
Commencement	2016.4
Location	Sano WWTP
Outline	✓ Power plant built in WWTP with PFI ✓ 2.6Mkw/y from biogas and solar system, sold to TEPCO. ✓ Sano city gets $2,100/y from SPC
Facility	✓ Biogas generator 250kW ✓ -Micro gas engine 50kW, 5units ✓ Solar system 940kW ✓ -Solar panel 0.26kW, 3,616units

Solid Fuel Project, nationwide, FY2017

	Location	Delivery	Method	Buyer
1	Miyagi, WWTP	DO	Three techs applied 1 Pyrolysis 2 Dry and pelletize 3 Vacuum drying with oil	Three customers 1 Coal fire power plant 2 Manufactures of paper 3 Manufactures of steal
2	Maebashi, WWTP	DO		
3	Saitama pref., WWTP	DBO		
4	Tokyo, STF	DBO		
5	Yokohama, STF	PFI		
6	Niigata Pref., WWTP	DO		
7	Kurobe, WWTP	PFI		
8	Shizuoka city, WWTP	DBO		
9	Aichi, WWTP	DBO		
10	Toyohashi, WWTP	PFI		
11	Shiga, WWTP	DBO		
12	Kyoto, WWTP	DBO		
13	Osaka city, WWTP	PFI		
14	Hiroshima Pref., WWTP	DBO		
15	Hiroshima city, WWTP	DBO		
16	Kitakyushu, WWTP	DBO		
17	Fukuoka Pref., WWTP	DO		
18	Saikai., STF	DBO		
19	Kumamoto city, WWTP	DBO		

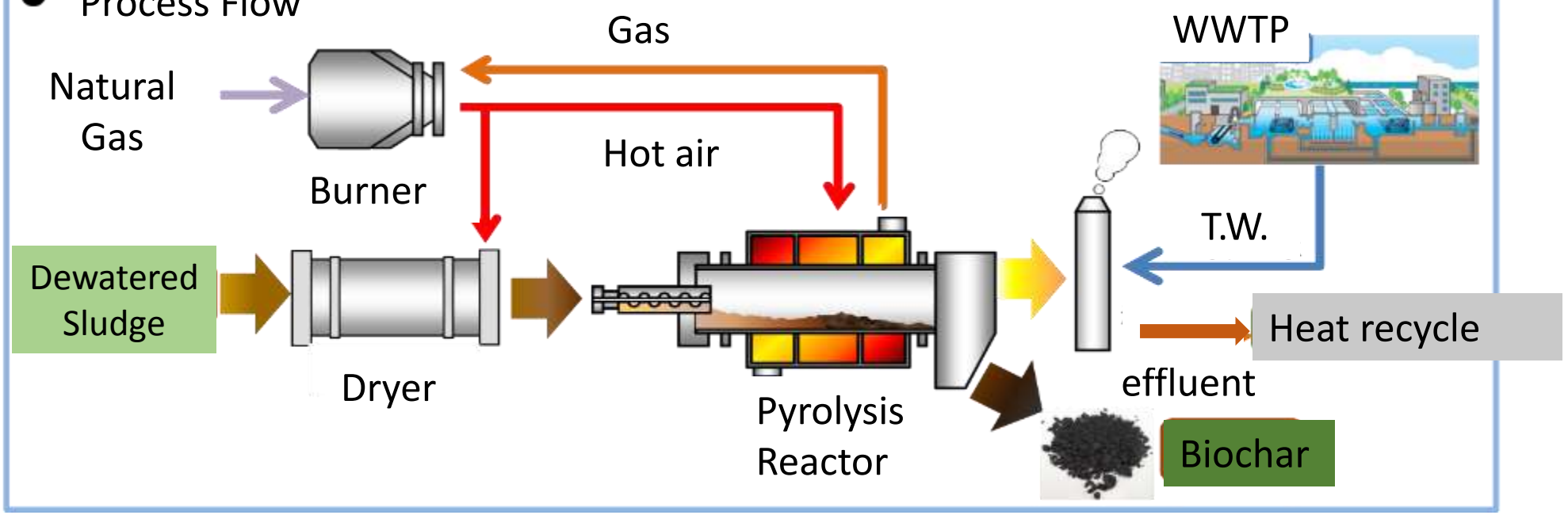
*DP; Direct operation

Pyrolysis project, Tokyo

- 20 year contract with SPC
- Three production line for risk management
- Dryer for stable and efficient operation

Outline	
Start	2007.11
Capacity	100t/ day x 3 lines
Facility	Dryer, Reactor, Burner
Pyrolysis temp	400-500 C.D. 752-932F.D.

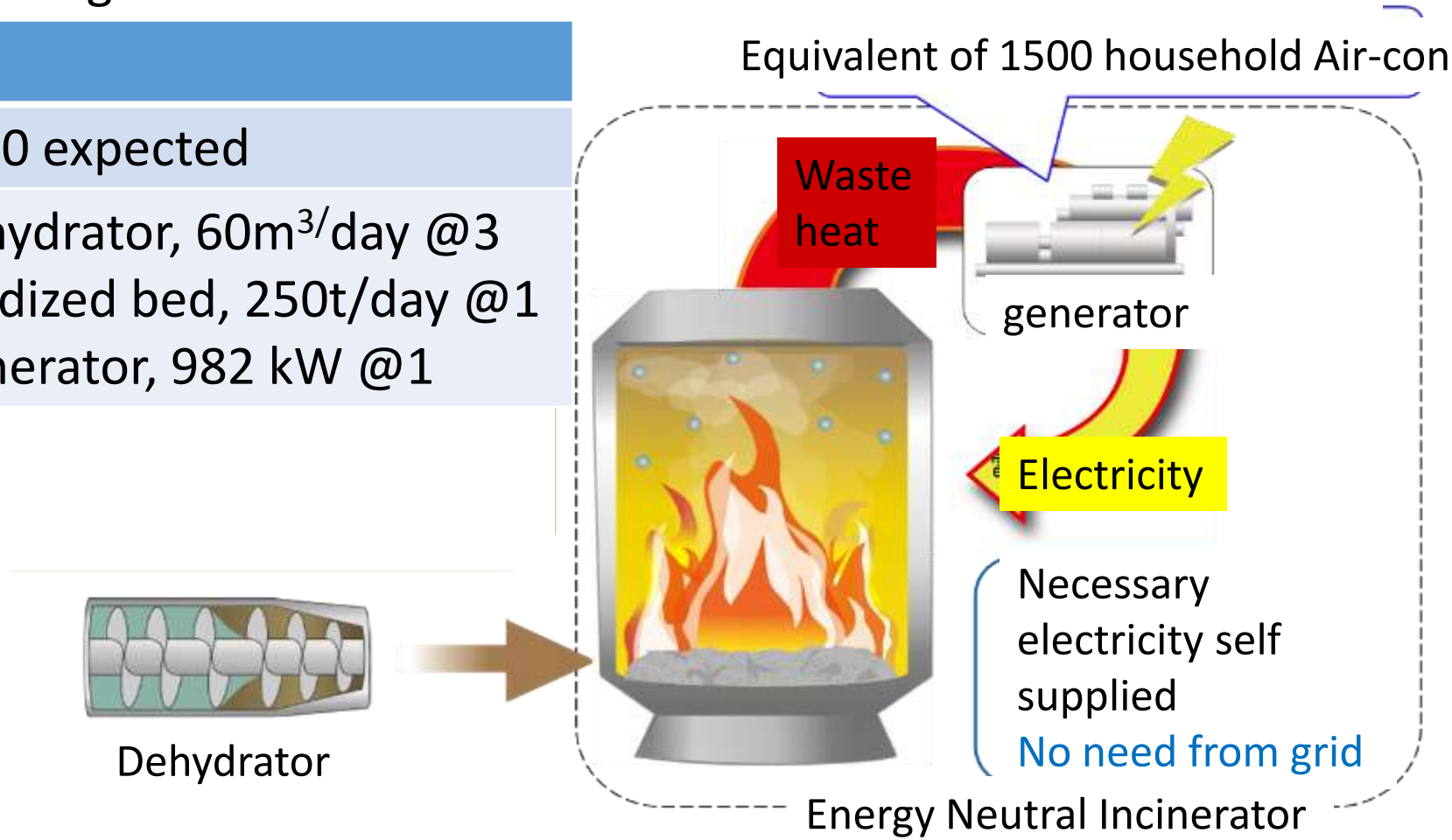
● Process Flow



Energy neutral incineration, Tokyo

- Dehydration up to spontaneous combustion without fuel
- High temp incineration & 50% N_2O reduction
- Power generation from waste heat

Outline	
Start	2020 expected
Facility	Dehydrator, 60m^3/day @3 Fluidized bed, 250t/day @1 Generator, 982 kW @1



Resource Recovery for Agriculture

"BISTRO Wastewater" for advance agricultural recycle

■ Change public perception for SS fertilizer

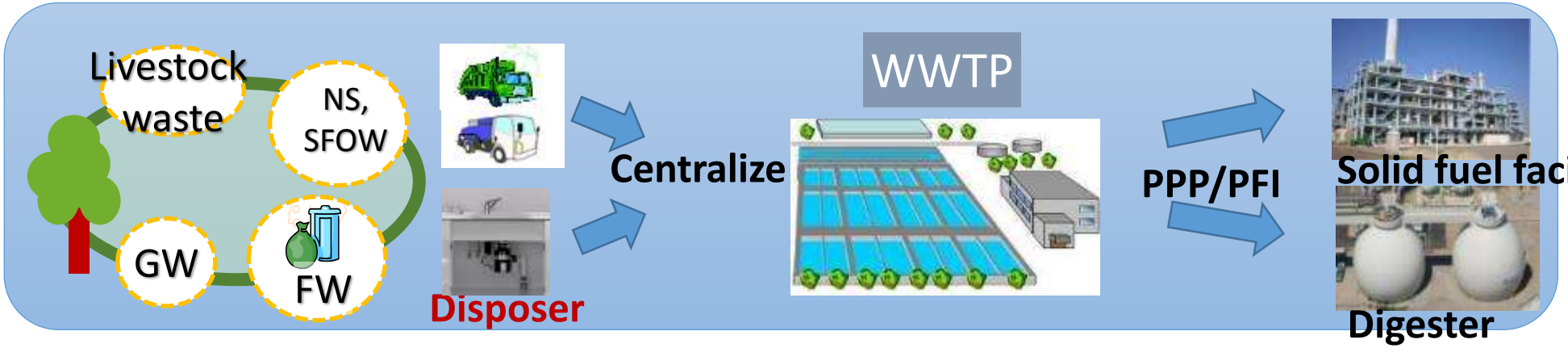
■Raise awareness by campaign "BISTRO Wastewater"

BISTRO Wastewater Poster

Co-digestion projects

Co-digestion Projects

- Co-digestion to enhance economy of scale on organic wastes recycle.
- Cost reduction by decommissioning of aged SFOW treatment facility.



*NS; Night soil
*SFOW; Sludge from onsite WWTP

Codigestion Projects, nationwide

	Commencement	Location	Organic Wastes for Augmentation
1	2017	Toyohashi	SS from other WWTPs*, NS, SFOW, FW
2	2017	Nakanoto	SS*, NS, SFOW,FW, Food factory waste
3	2015	Niigata city	GW
4	2015	Kanuma	NS, SFOW, FW
5	2013	Eniwa	FW of household, NS, SFOW
6	2011	Kurobe	SFOW, Coffee grounds, Disposer waste
7	2011	Kitahiroshima	NS, SFOW, FW of household and commercial
8	2011	Kobe	GW, commercial FW
9	2007	Tamasu	SFOW, NS, commercial FW

Toyohashi

- Energy reuse at WWTP, Biogas and Solid Fuel from SS, NS, FW of household & commercial.
- Biogas generation and biochar production

Previous Recycle

New Approach

Toyohashi

Project delivery	PFI, BTO	
Project cost	$123 M	
Commencement	2017.10	
Processing object	SS,NS, SFOW, household and commercial FW	
Economic effect	Cost reduction by saving rehab cost for SFOW etc. $100M in 20 years.	
GHGs reduction	14,000t/year in CO_2	
Augmentation plan	Wastes	Feed rate
	SS	351m^3/day
	NS, SFOW	121m^3/day
	FW	59t/day

公益社団法人 日本下水道協会

JSWA Japan Sewage Works Association