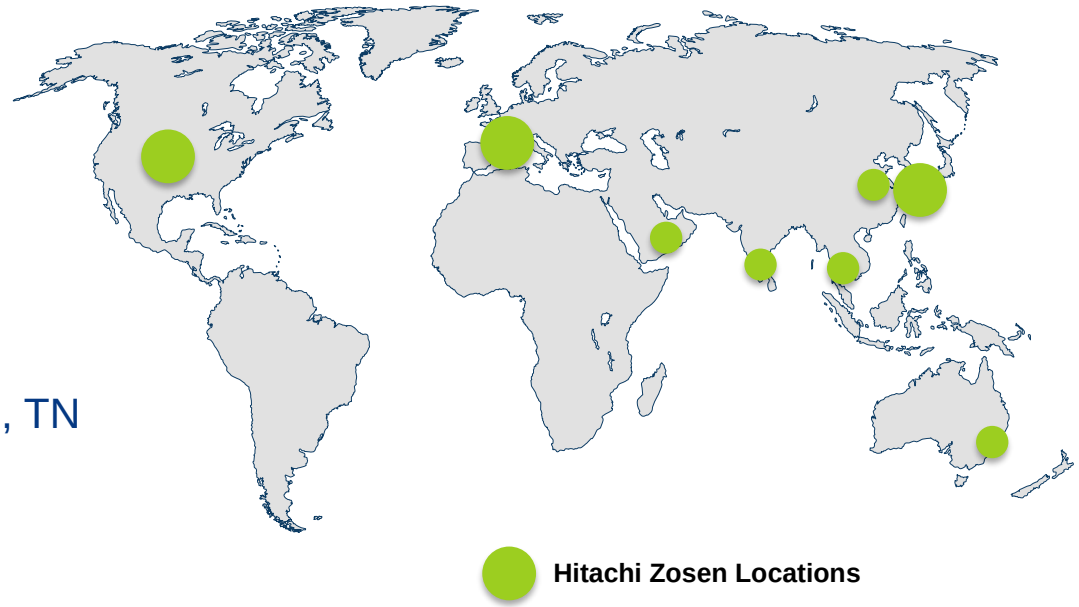
Hitachi Zosen
INOVA

Pacific Islands Climate Collaborative Forum
Pacific International Center for High Technology Research (PICHTR)
Session 3 - Climate Solutions EXPO

March 23, 2022

Introduction to Hitachi Zosen Inova (“HZI”)

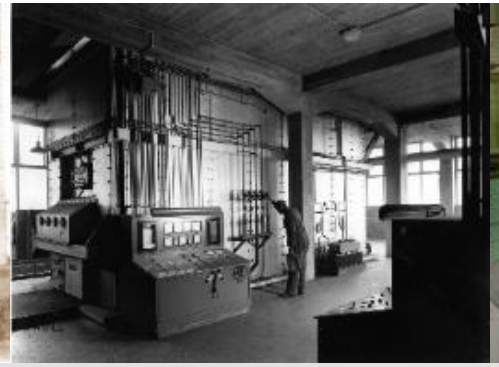
- **Largest combined Energy-from-Waste* (“EfW”) and Anaerobic Digestion (“AD”) company in the world**
- Over 10,000 full-time employees in Japan, and 1,000+ in Zurich and overseas
- 140 years of continuous operations
- Over 600 EfW & AD reference plants in 15+ countries
- Two operational AD plants in the US
  - 12 in development in California, and 6 in development in Northeast, US & Canada
- Parent commitment to North America includes HQ in Knoxville, TN



* also known as Waste-to-Energy, WtE, in the U.S.

HZI's Strength from Experience

- Within 140 years experience – 90 years of success in solid waste handling and environmental engineering
- Publicly traded parent company with mature shareholding structure, management, and governance
- Deep bench of internal engineering and operational experts
- Profitable operations with $3.7B revenue
- Strong balance sheet with $3.7B in assets
- Investment grate rating: BBB+


HZI's Global Businesses

Hitachi Zosen INOVA

Environmental Systems

Industrial Plants

Machinery & Process Equipment

Infrastructure

Precision Machinery

- Facilities
  - Anaerobic Digestion plants
  - Energy-from-Waste plants
  - Power-to-Gas plants
- Systems
  - Material recycling systems
  - Methane fermentation systems
  - Eco-agriculture systems
  - Water treatment systems
  - System of producing fuel from sewage sludge
- Services
  - Long-term operations and management services
  - AOM business (after-sales service, operation control, and chemical supply)

Environmental Challenges

Hitachi Zosen INOVA

Challenges

Waste

- Depleting landfill capacity
  Close to cities
- Contamination from waste
- Pest, Urban hygiene

Resources

- Demand for energy
- High dependence on fertile soil
- Seek reliable on demand or base load resources

Legacy

- Global Warming
  Methane from landfill is a potent GHG
- Long term waste management issues
  Nuisance to nearby inhabitants and communities.
  Costly maintenance and rehabilitation

Sustainability

Solutions

Habitat

- Protects human habitat
- Improves soil quality
- Protects humans from disease

Recycling

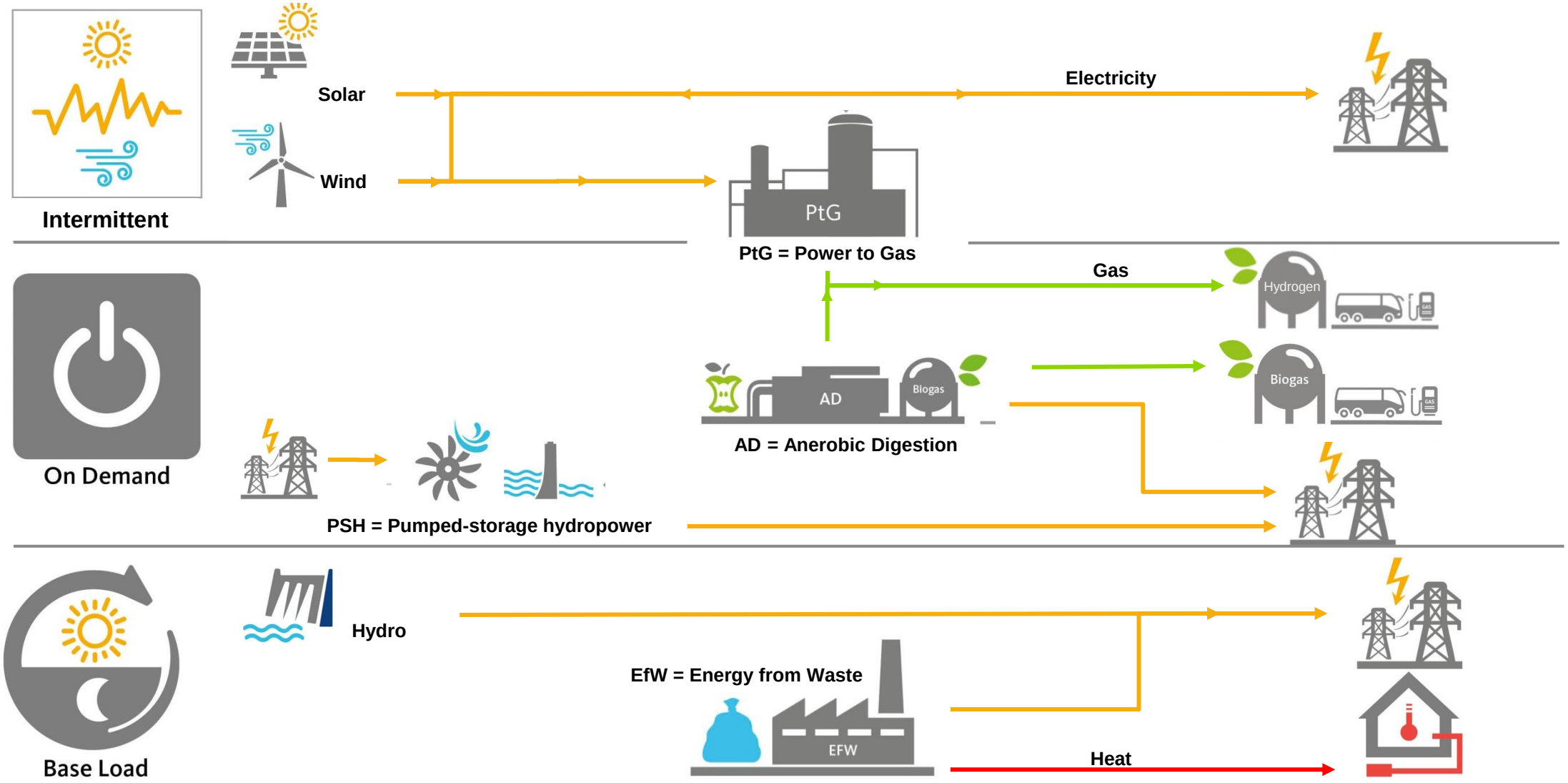
- Generation of renewable natural gas, RNG, or Electricity
- Carbon efficient
- Compost production

Development

- Curbs emissions of GHG

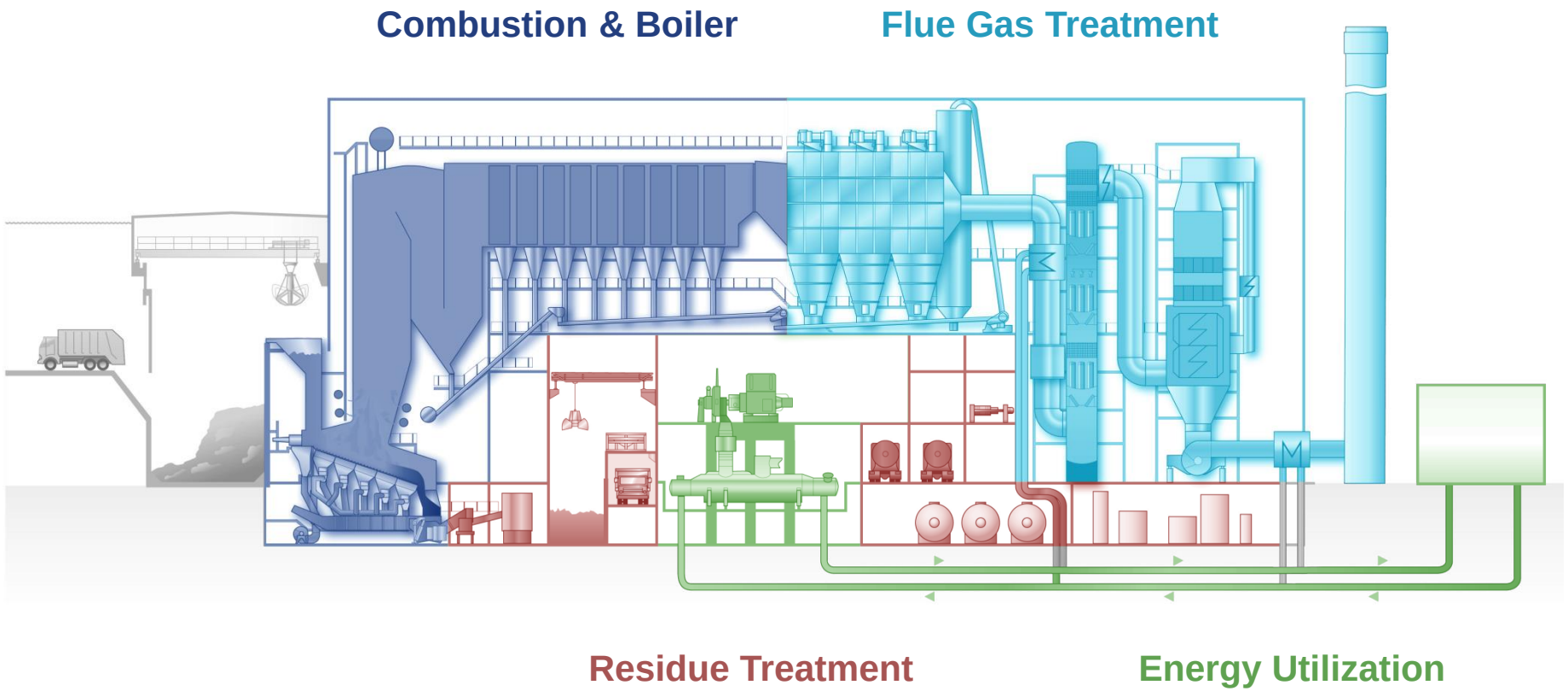
- Smaller footprint and self-contained operations
  No emissions, no smell

HZI Technologies in the Context of Renewable Energy



Energy from Waste (EfW) – Established Experience

Hitachi Zosen INOVA



Power-to-Gas (“PtG”) – New Frontier

Hitachi Zosen INOVA

- **Longer-term Operational Enhancement – Renewable Hydrogen Production:**
  - First industrial size (6MW) Power-to-Gas facility in Europe (Werlte, Germany) for Audi GmBH. Uses HZI ETOGAS® technology
  - Two electricity-to-hydrogen projects under construction with Swiss government

Power-to-Gas plant for Audi beside AD plant

One of three 2MW electrolyzers

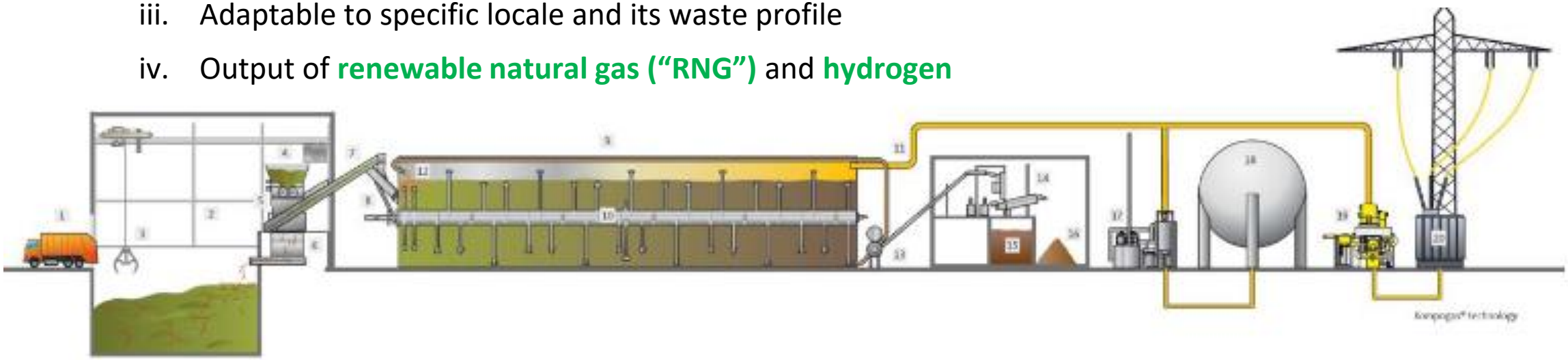
Gas plant

Curtailed power received from local wind farm

Anaerobic Digestion ("AD") – Patented Technology

Hitachi Zosen INOVA

- **HZI Kompogas® Technology**
  - Dry continuous plug-flow system that has:
    i. Extraordinary capacity to accept high cellulosic organic waste (SB1383 compliant)
    ii. Fully enclosed with state-of-the-art odor and emission controls
    iii. Adaptable to specific locale and its waste profile
    iv. Output of **renewable natural gas ("RNG")** and **hydrogen**



Waste Receiving & Pre-Treatment | Anaerobic Digestion | Extraction & Post-Processing | Energy Utilization

Process Details

Waste Receiving & Pre-Treatment

1. Receiving Lobby
2. Bunker
3. Crane
4. Shredder
5. Sieve
6. Sieve rejects

Anaerobic Digestion

7. Conveyor
8. Feeding System
9. Digester
10. Agitator
11. Biogas pipe
12. Inoculation pipe

Extraction & Post-Processing

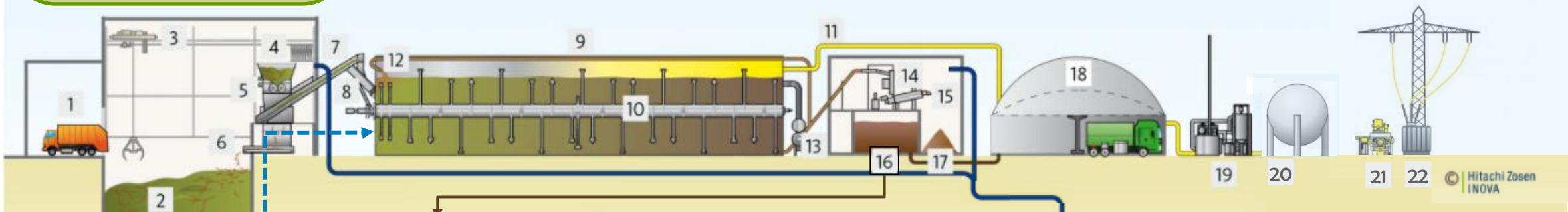
13. Discharge System
14. Kom + Press
15. HZI Speed Screen
16. Liquid Digestate
17. Solid Digestate

Energy Utilization

18. Outbound Compost Storage
19. Biogas Upgrading
20. RNG Storage / Interconnection

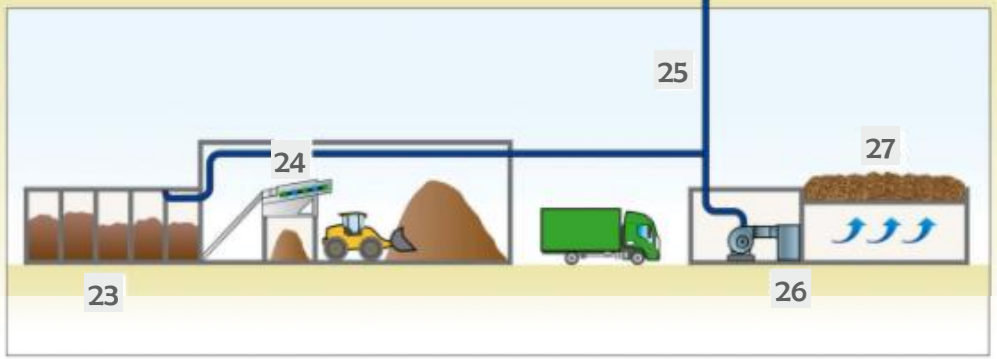
Alternative:

21. CHP Plant
22. Electricity Interconnection



16. Liquid Digestate:

Liquid Fertilizer
or
Wastewater Treatment
for Water Reuse

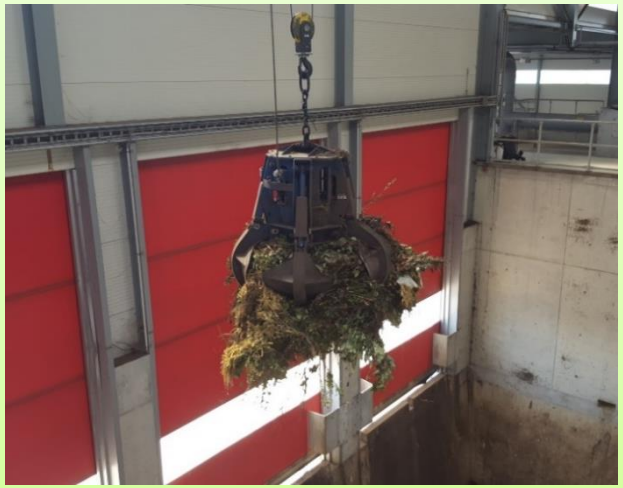


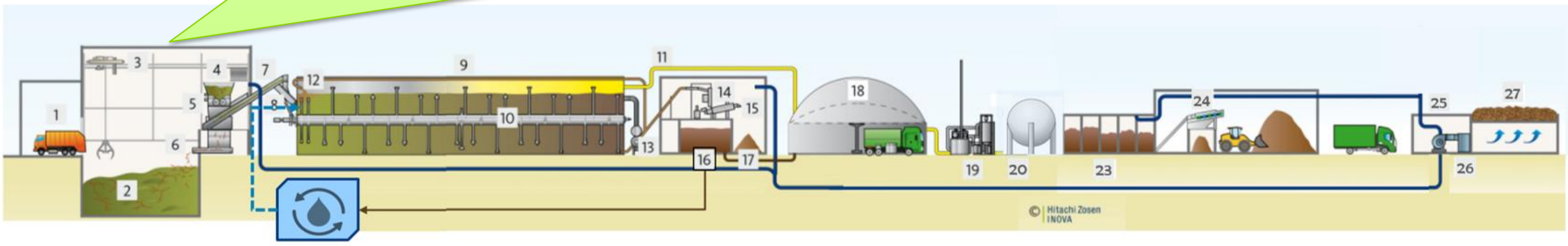
Compost

23. Aerated Tunnels
24. Compost Screening
25. Air Ventilation System
26. Exhaust Air Scrubber
27. Biofilter

Virtual Walkthrough – How it works

Receiving Hall

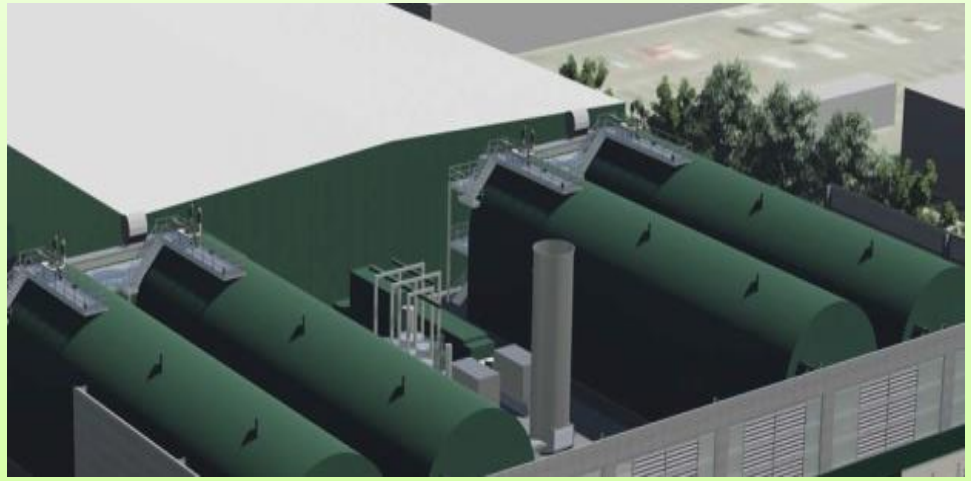


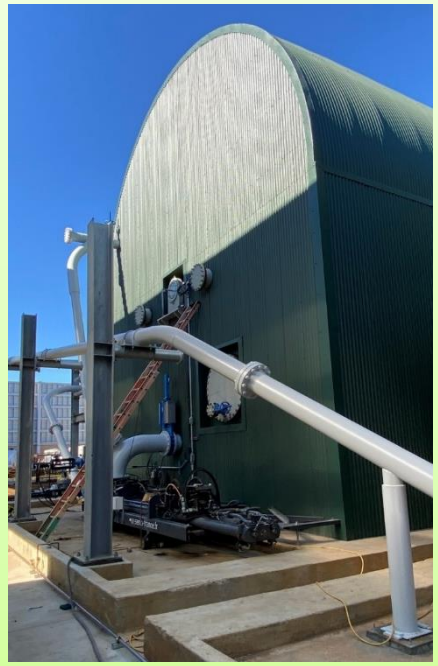


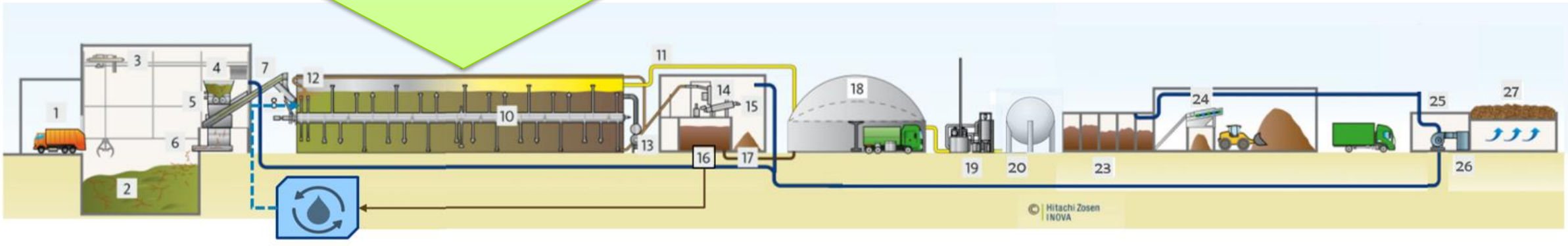
Virtual Walkthrough – How it works

Hitachi Zosen INOVA

Anaerobic Digesters



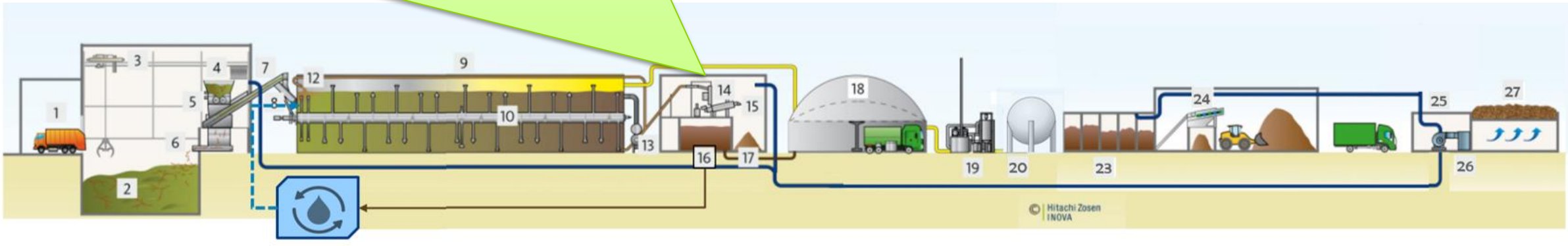




Virtual Walkthrough – How it works

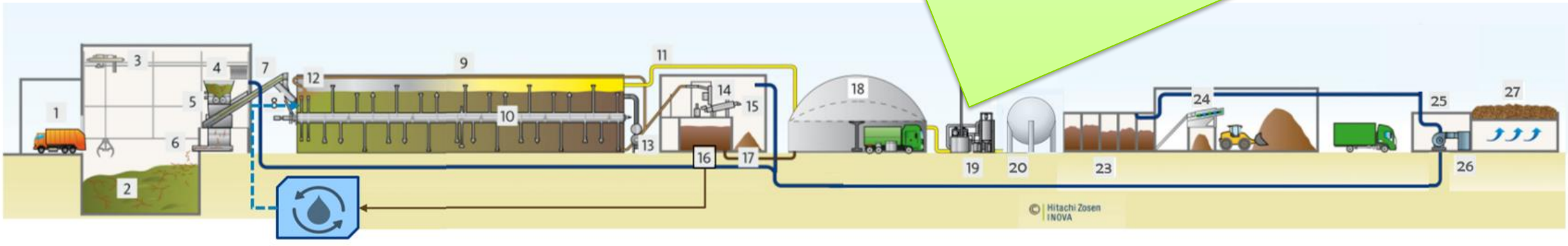
Hitachi Zosen INOVA

Discharge Area



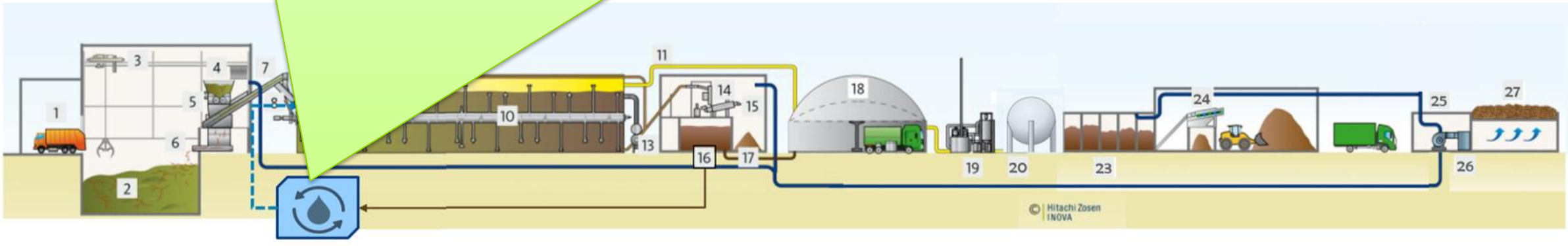
Virtual Walkthrough – How it works

Biogas Upgrade



Virtual Walkthrough – How it works

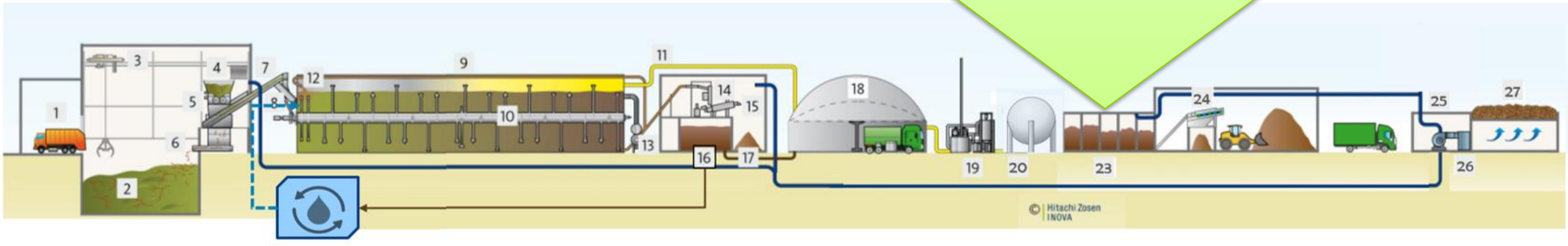
- **Wastewater Treatment** – for projects where water is a scarce resource



Virtual Walkthrough – How it works

Hitachi Zosen INOVA

Solid Digestate Aerobization



Virtual Walkthrough – How it works

Hitachi Zosen INOVA

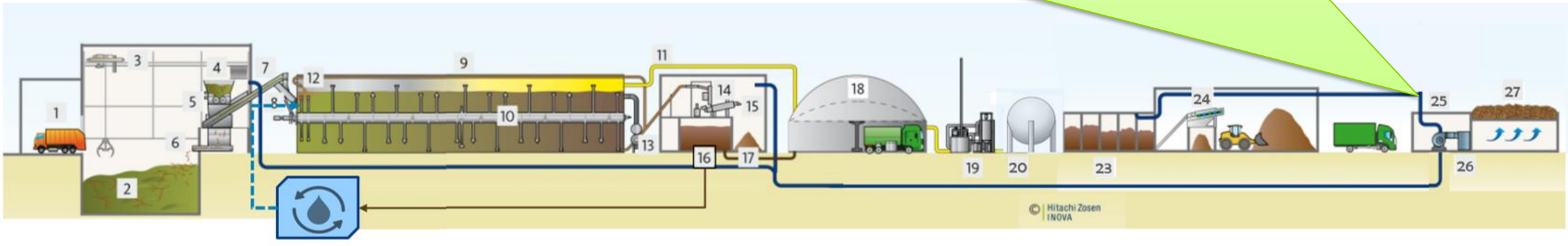
- **Odor Control Systems**: UV & Activated Carbon / Biofilter

UV Reactor

Activated Carbon Filter

Exhaust Air Fan

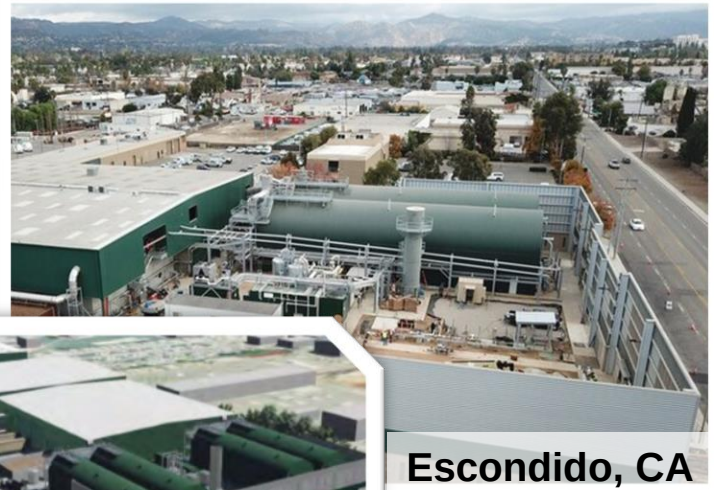
Biofilter



Hitachi Zosen Inova – Projects in California

San Luis Obispo, CA

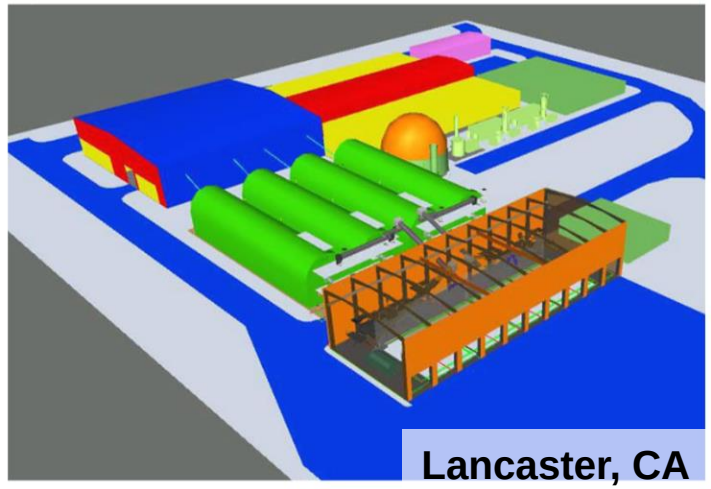
- Completed in 2019
- 30,000 tons of waste per year
- Produces electricity for CA grid



Escondido, CA

Rendering

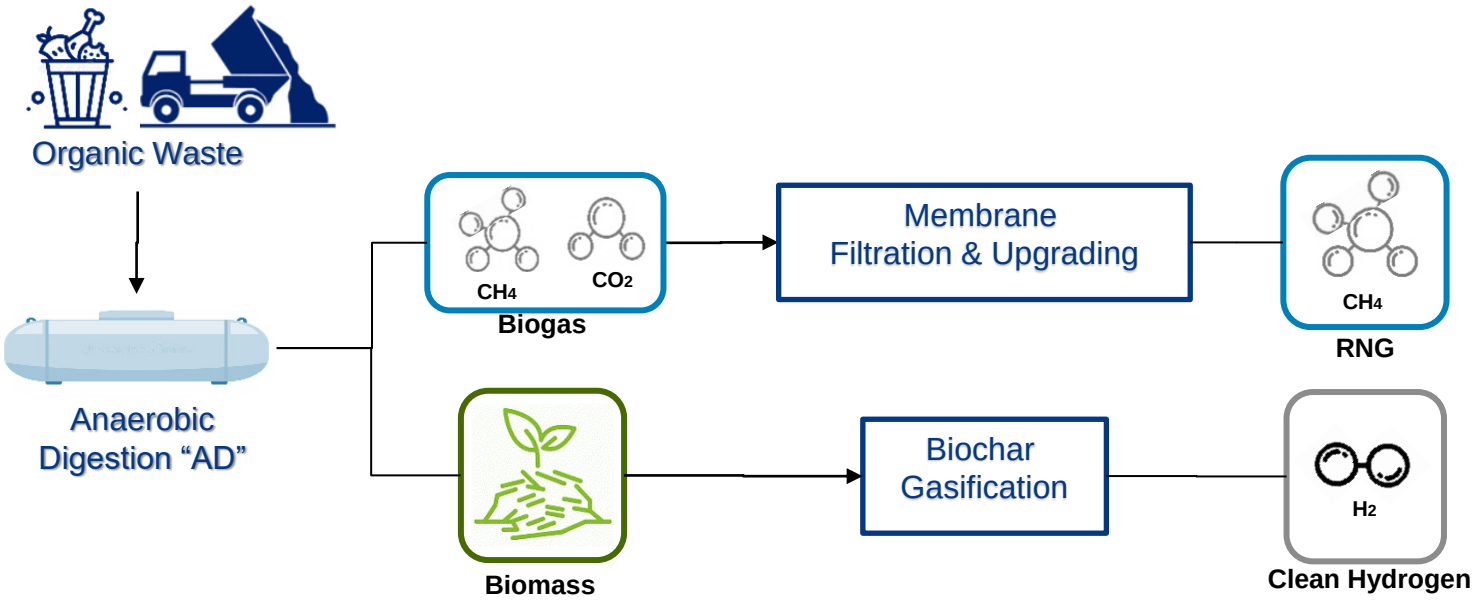
- Phase 1 Completed in 2021
- 88,400 tons of waste per year
- Produces RNG for gas-grid injection

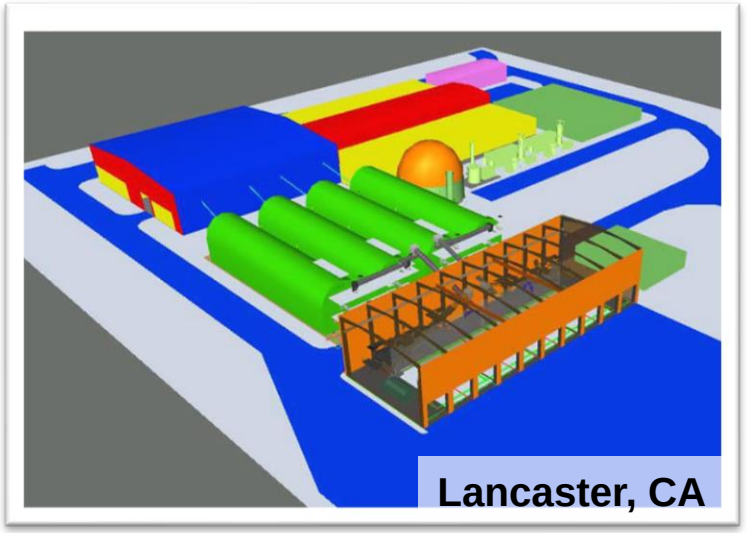


Lancaster, CA

- Start of Construction in 2022
- Large facility at existing Waste Management landfill
- To produce RNG and hydrogen

Hitachi Zosen Inova – Advancing Towards Hydrogen





Benefits of Anaerobic Digestion (AD) for Islands

- Efficient waste management:
  - Diverts organic waste from landfill - where it creates methane (GHG) and nutrient value is lost
  - Kompogas technology processes high cellulosic feedstock (high fiber green waste) and food waste
  - Small plant footprint compared to landfill
  - Closed loop system that recycles water in AD process, conserves fresh water and eliminates emissions and odors
- Clean output:
  - AD process creates locally generated renewable natural gas (RNG) or hydrogen (H2), offsetting fossil fuel imports
  - Process output is rich, natural compost for use as fertilizer and for restoring soil health
  - Can be used to generate renewable electricity
- Ease of execution:
  - Projects are attractive to debt and equity that have increasing appetite for ESG investment
  - Attractive financing available through ECA’s and government subsidies
  - HZI will design, build, own and operate plant over long term for island

Hitachi Zosen Inova – Advisor to City of Lancaster in Hydrogen Transition

Hitachi Zosen INOVA

- Lancaster declared ***First Hydrogen City*** in the United States in August 2021 – Hydrogen Master Plan developed by HZI

- Smart Sister Cities Mission:

  Fostering global relationships to advance hydrogen as the solution to a decarbonized future

- Signed MOU with first city – Namie, Japan – on July 19, 2021

September 30, 2021 – Smart Sister Cities Declaration Signing

October 4, 2021 – Mayor's Address to Japan Hydrogen Ministerial

Hitachi Zosen INOVA

- **English Press Release:**
  https://www.hydrogenfwd.org/mayors-of-lancaster-ca-and-namie-japan-confirm-historic-commitment-at-japans-hydrogen-energy-ministerial/

Thank you!

For further information, please contact:

Lex Heslin, Senior Project Developer, Hitachi Zosen Inova

lex.heslin@hz-inova.com