

RENESCIENCE IBCM 2016



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New Bio Solutions, Bioenergy & Thermal Power*





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DONG
energy

DONG Energy is one of the leading energy companies in Northwestern Europe

Four business units

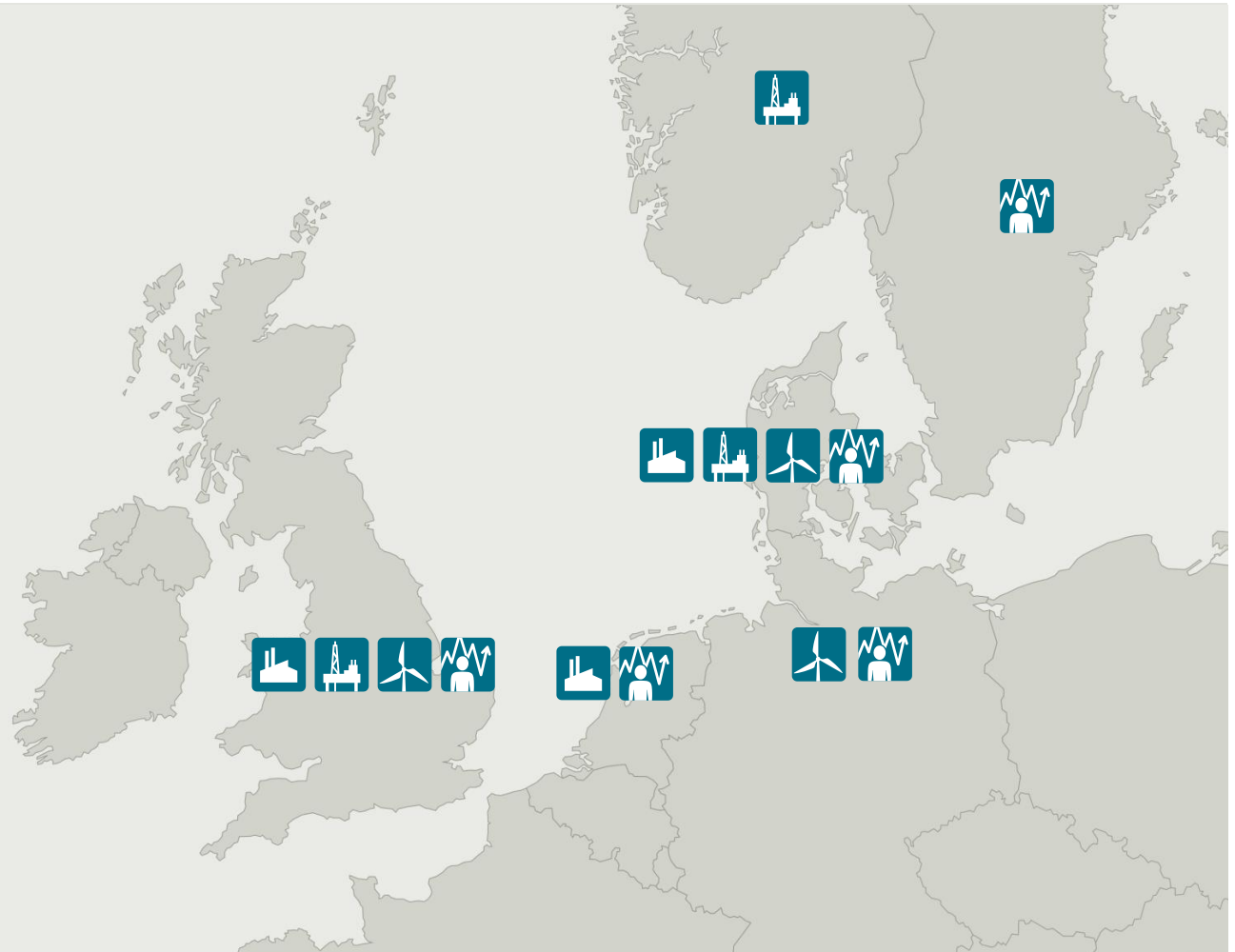
-  Oil & Gas
-  Wind Power
-  Bioenergy & Thermal Power
-  Distribution and Customer Solutions

2015 key numbers

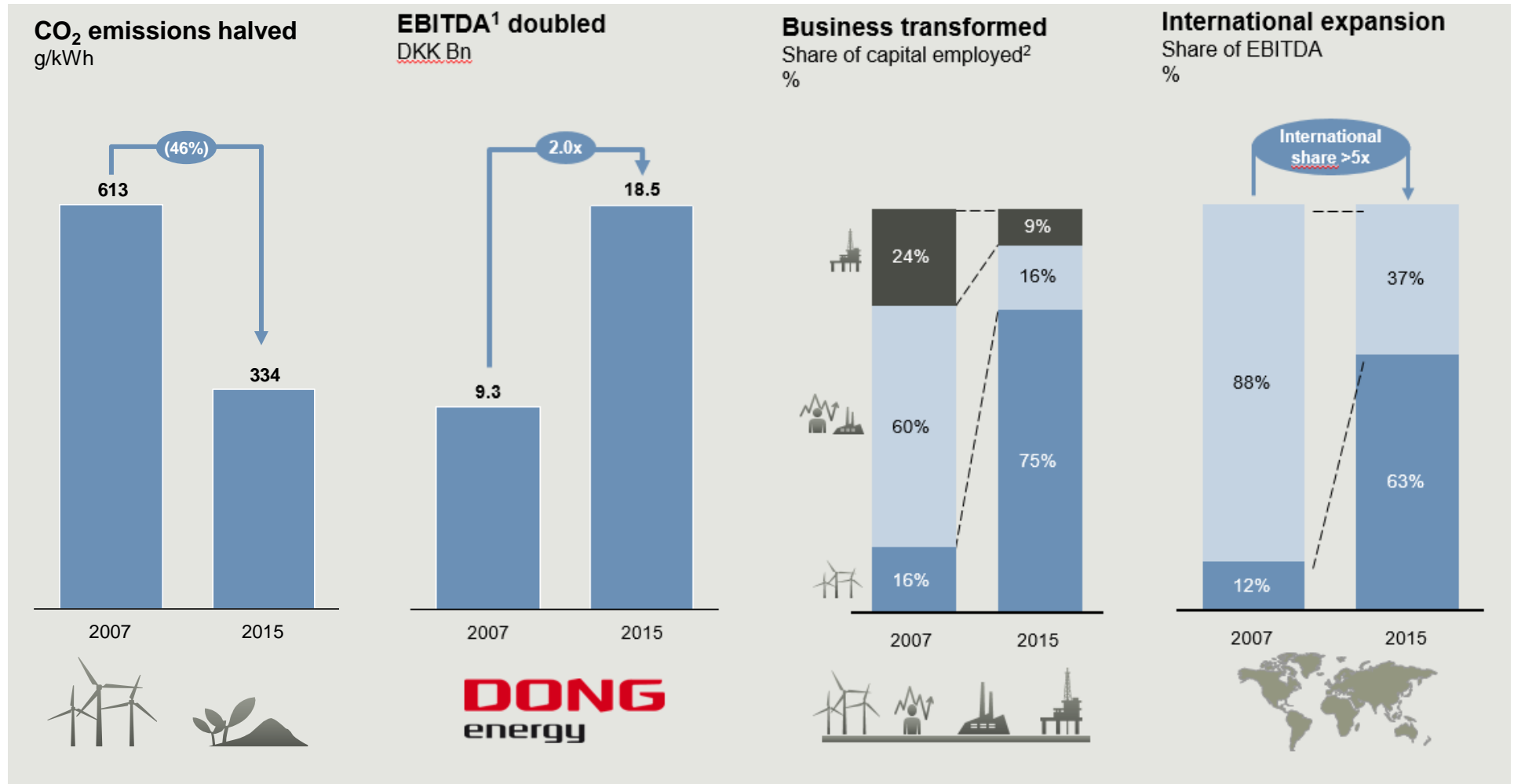
- Revenue: EURO 9.5bn
- EBITDA: EURO 2.5bn
- 6,700 employees

Focus areas

- Offshore wind
- Bioenergy



Significant transformation of DONG Energy over the past decade

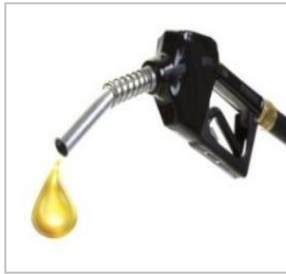


1. Operating profit (EBIT) before depreciation, amortisation and impairment losses

2. Excluding unallocated capital employed on DONG Energy group level

Smart waste : Global megatrends require new solutions to waste management

Global megatrends



Resource scarcity

- Optimise resource utilisation
- Reduce dependency on imported energy



Urbanisation

- Waste challenge for cities
- Increasing energy consumption per capita



Climate change

- Regional and national CO₂ reduction targets
- Government and private demand for green technologies

REnescience green credentials



Household waste is transformed into:

2/3 climate friendly recyclables and energy production:



Recyclables



Green gas



Climate friendly power

1/3 environmentally friendly disposal/recycled of residue containing



Digestate

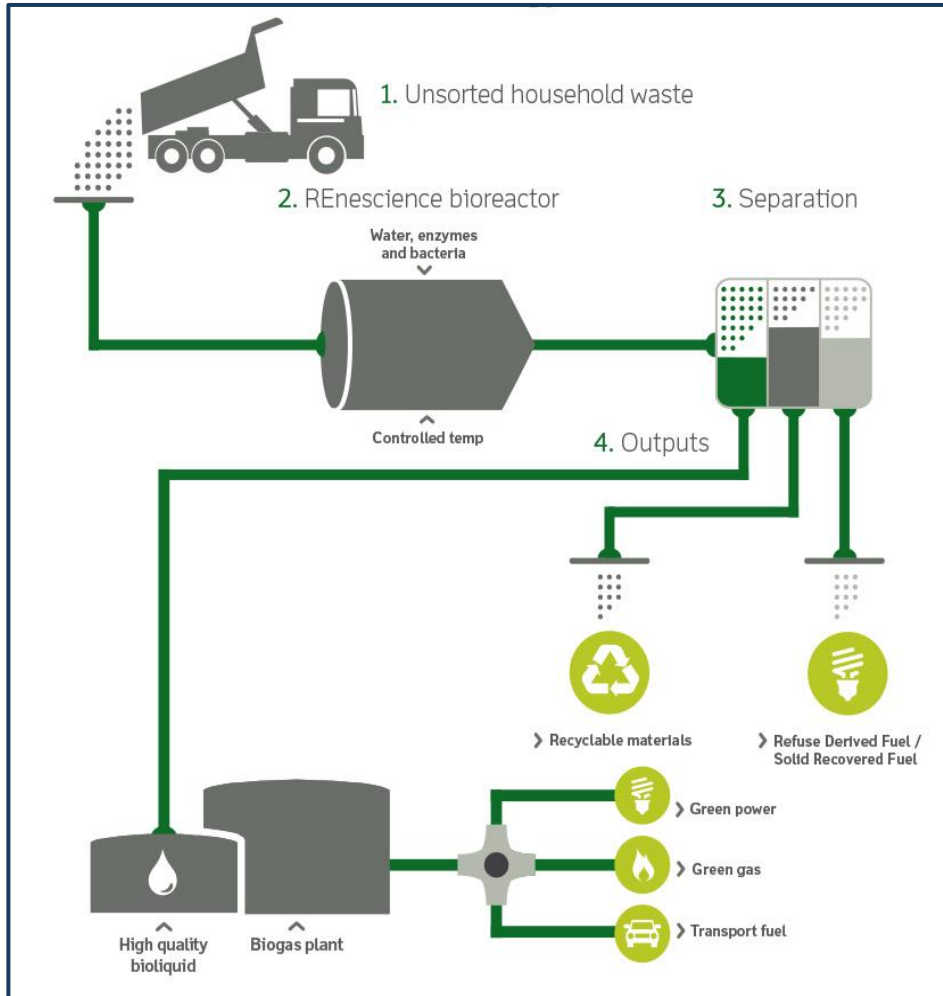
* Pesticides, medicine, nicotine, bisphenol A, phthalates, halogenated compounds, mercury etc.



REnescience
value from waste

DONG
energy

REnescience – high value products



Description and status

Key competitive advantage

- No source separation required
- High recycling potential
- High green gas yield

Technology description

- Unsorted municipal waste mixed in bioreactor with warm water and enzymes extracting most of the biodegradable content
- Subsequently, a separation process yields three fractions :

1. Recyclables (metals, plastics),

2. Residues – ie Refuse Derived Fuel (foils, clothes) and inerts (glass, sand, gravel),

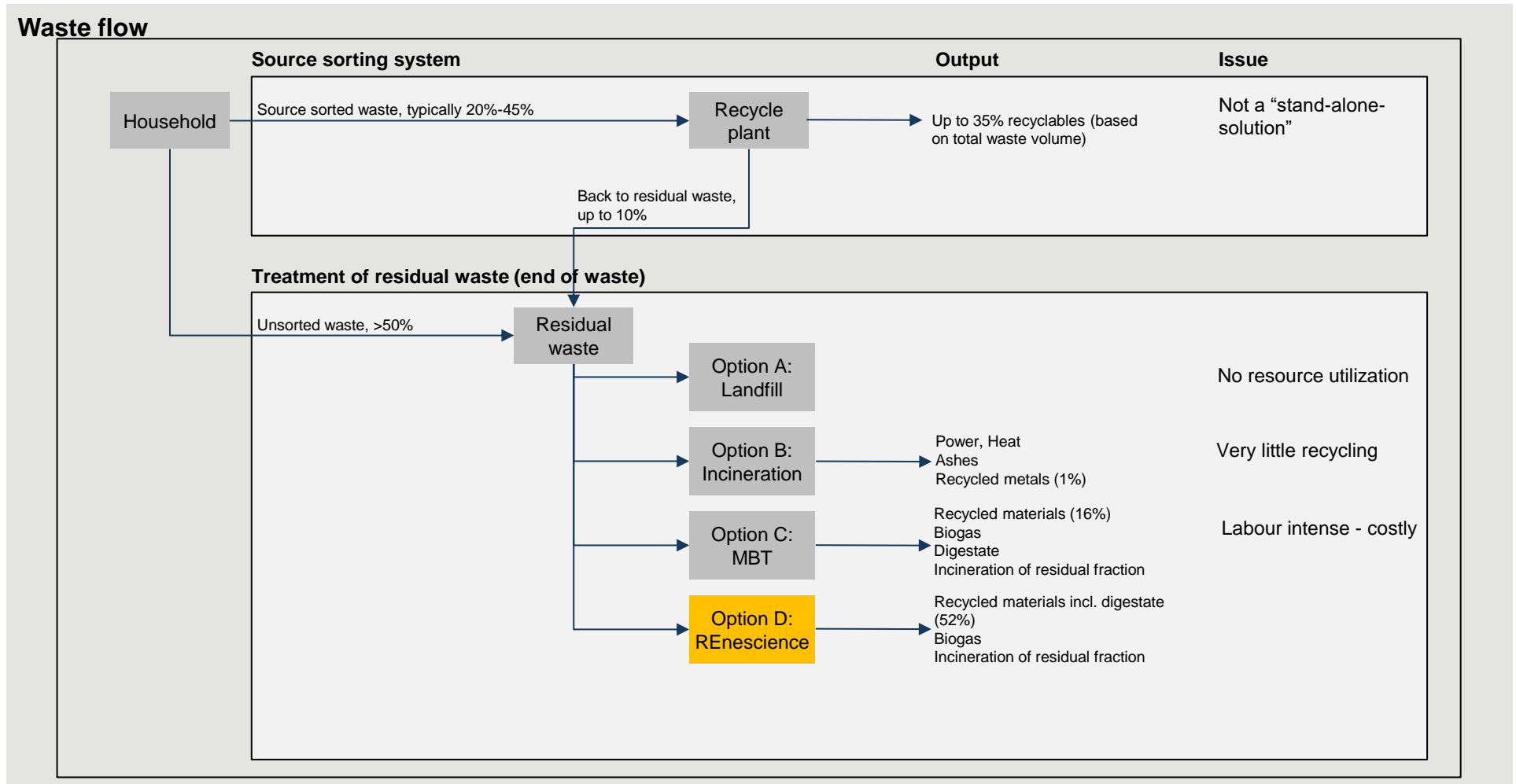
3a. Bio-liquid which through a biogas plant is converted into biogas and with the help of gas engines generate electricity,

3b. Residues from the biogas production called digestate (wood fibre, granulated inerts)



Source sorting typically covers 20-45% of waste produced – more than 50% needs other treatment

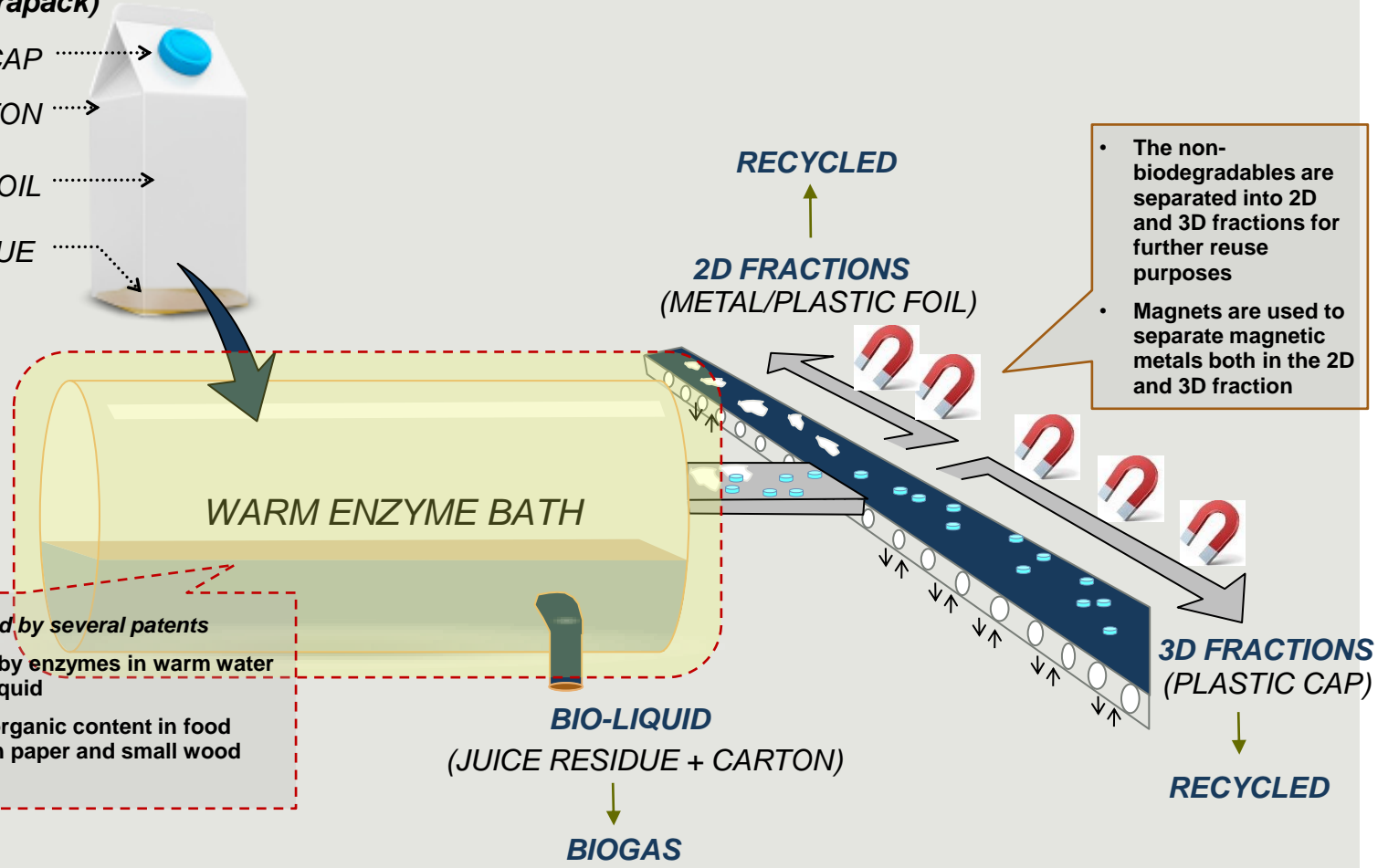
ILLUSTRATIVE



REnescience is a DONG Energy developed and patented technology that separates MSW into organic, recyclable and reusable fractions

Example: Juice carton (tetrapack)

PLASTIC CAP
CARTON
METAL/PLASTIC FOIL
JUICE RESIDUE



- The non-biodegradables are separated into 2D and 3D fractions for further reuse purposes
- Magnets are used to separate magnetic metals both in the 2D and 3D fraction

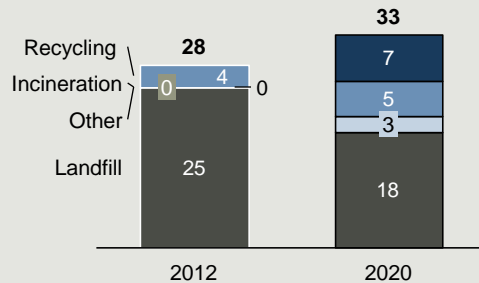
- RSC core-technology protected by several patents
- Organic content decomposed by enzymes in warm water bath at 50°C and forms a bio-liquid
- Enzymes able to break down organic content in food waste and cellulosic content in paper and small wood fractions

Malaysia is a growth market for waste treatment and supports biogas, but willingness to pay likely to be an issue



MSW treatment and forecast growth '000 t/day

Very attractive

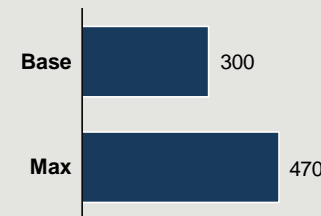


- Waste generation still growing quickly
- Current focus on upgrading landfill to reduce environmental impacts
- Incineration set to grow as space for new landfill limited
- Recycling target for 2020 is set at 22%

Green energy / recycling support

Attractive

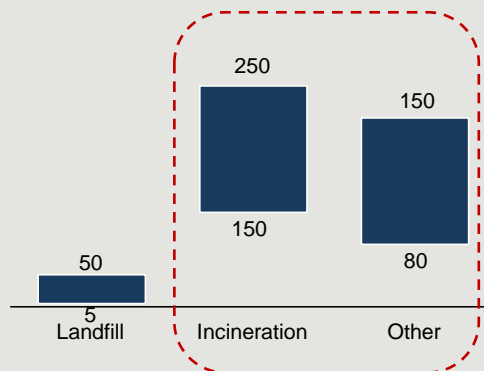
Feed-in tariff revenues - biogas projects MYR/MWh (2016)



- Targeting 250MW of grid-connected biogas projects by 2020 from just 12MW in 2014
- Feed-in tariff scheme for biogas, with bonuses for efficiency, local sourcing and use of certain feedstocks

Current gate fees / treatment costs MYR/t (2016)

Very low

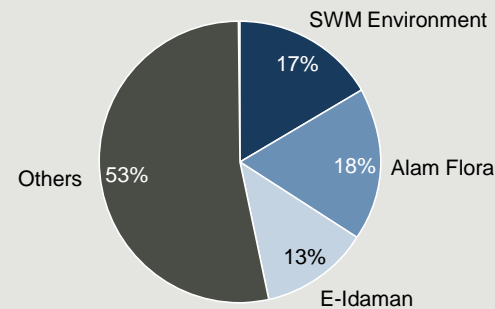


- Significant amounts of waste tipped for no gate fee
- Sanitary landfills currently charging relatively low gate fees
- No real incentives for treatment of waste
- Having to compete against landfilling

Market structure & barriers

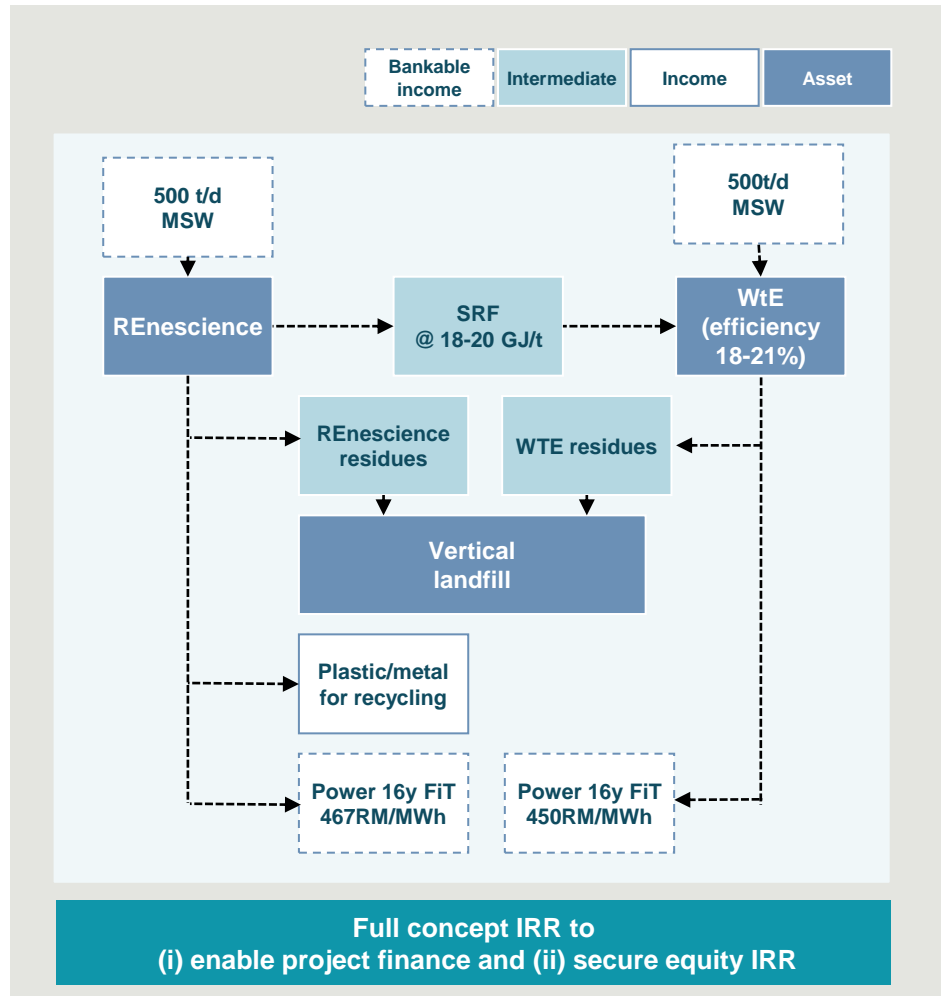
Neutral

Market share (collection only):



- Both public and private waste operators
- Main players are the three government-own concessions along with the main private landfill operators
- Waste processing market still evolving

Integrated Waste Management Centre [Vertical landfill + REnescience + WtE]



Key drivers

- Lifespan of up to 28 years
- Land usage of less than 60 acres
- Production of up to 28MW of green energy
- Higher recycling rate
- Low carbon footprint

