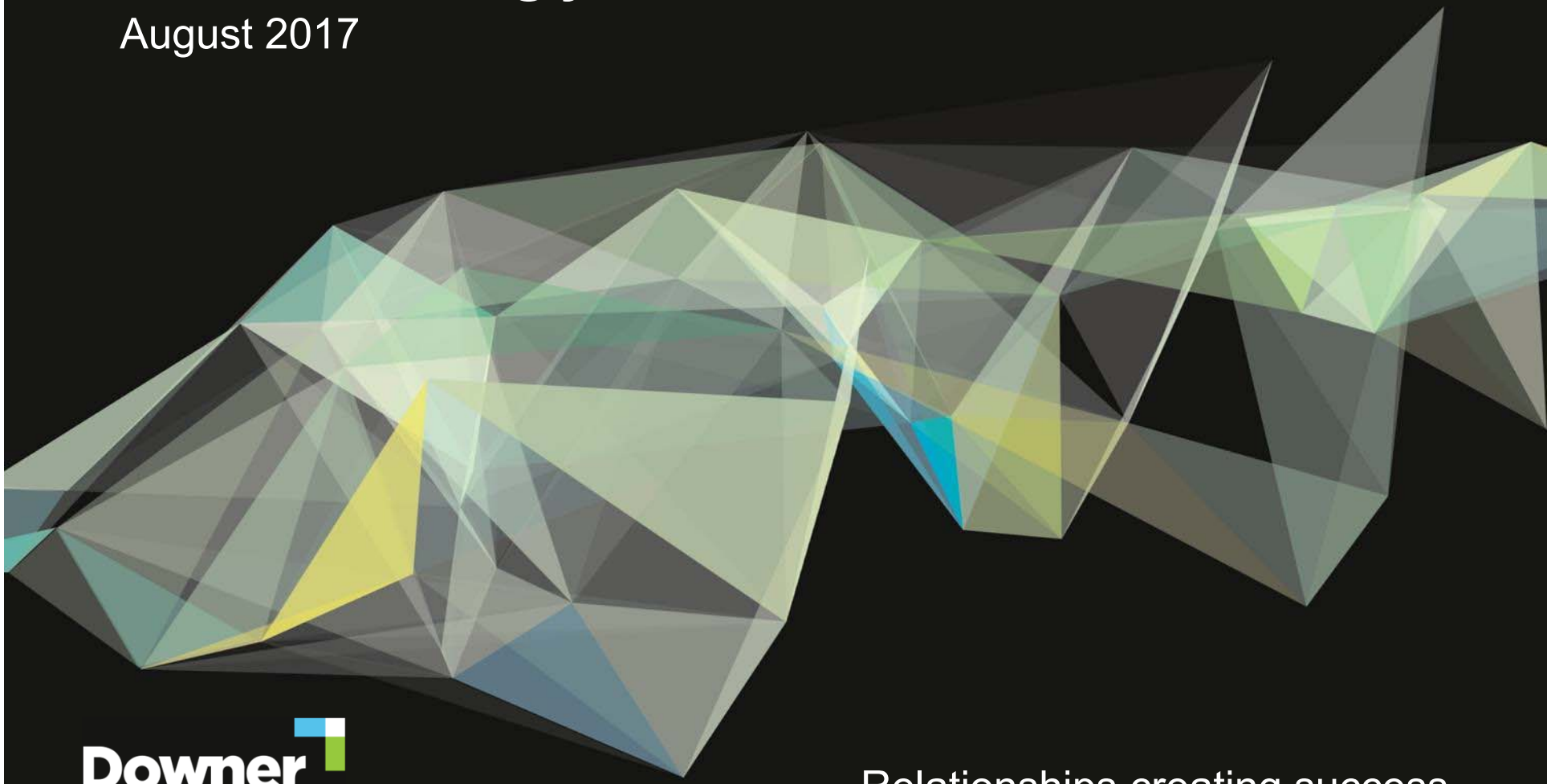
Choosing A Waste to Energy Technology

August 2017



Downer
Relationships creating success

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Additional notes from the days events

- **Why do all Waste to Energy companies focus on MSW?**
  - **The Councils control the contracts and can enter into a waste agreement for the 15 years required to finance a project.**
- **Waste to Energy projects only tackle post recycled waste.**
  - **On top of that Waste to Energy facilities should have a MRF front end to further eliminate recyclable from the feedstock.**
- **Danger to the environment?**
  - **Facilities will be required to adhere to the EPA guidelines in the areas that they are built.**
- **It was said that in some European Cities there is a concern that recycling is only at 10% and that increasing recycling could starve the waste to energy facilities.**
  - **We are being told that recycling in Australia already exceeds 70%. Waste to Energy facilities already understand the post recycled waste availability in Australia therefore the facilities should be able to maintain their feedstock, not to mention the MRF front ends which will increase the recycling.**
- **A tonne of waste going into a plasma gasifier produces about 1 Mwatt of net energy, 300-350 litres of potable water, 150 Kg of an inert aggregate, 15-25 Kgs of Metal and about 8kg of elemental sulpher.**
  - **Should this not be considered as further recycling? Also consider that the 1 tonne of waste is post recycled waste.**

Some Terms

- **Renewable**
  - **The Organic Portion of the Fuel/Feedstock**
- **Sustainable**
  - **Residual Waste; Diversion from Landfill**

Your Waste? Desired Offtake?

What Waste are you trying to treat?

- How much waste can you commit?
- What is the makeup of the waste?
- Moisture content of the waste?

What is your desired offtake?

- Power
- Transport Fuels

Diversion from Landfill?

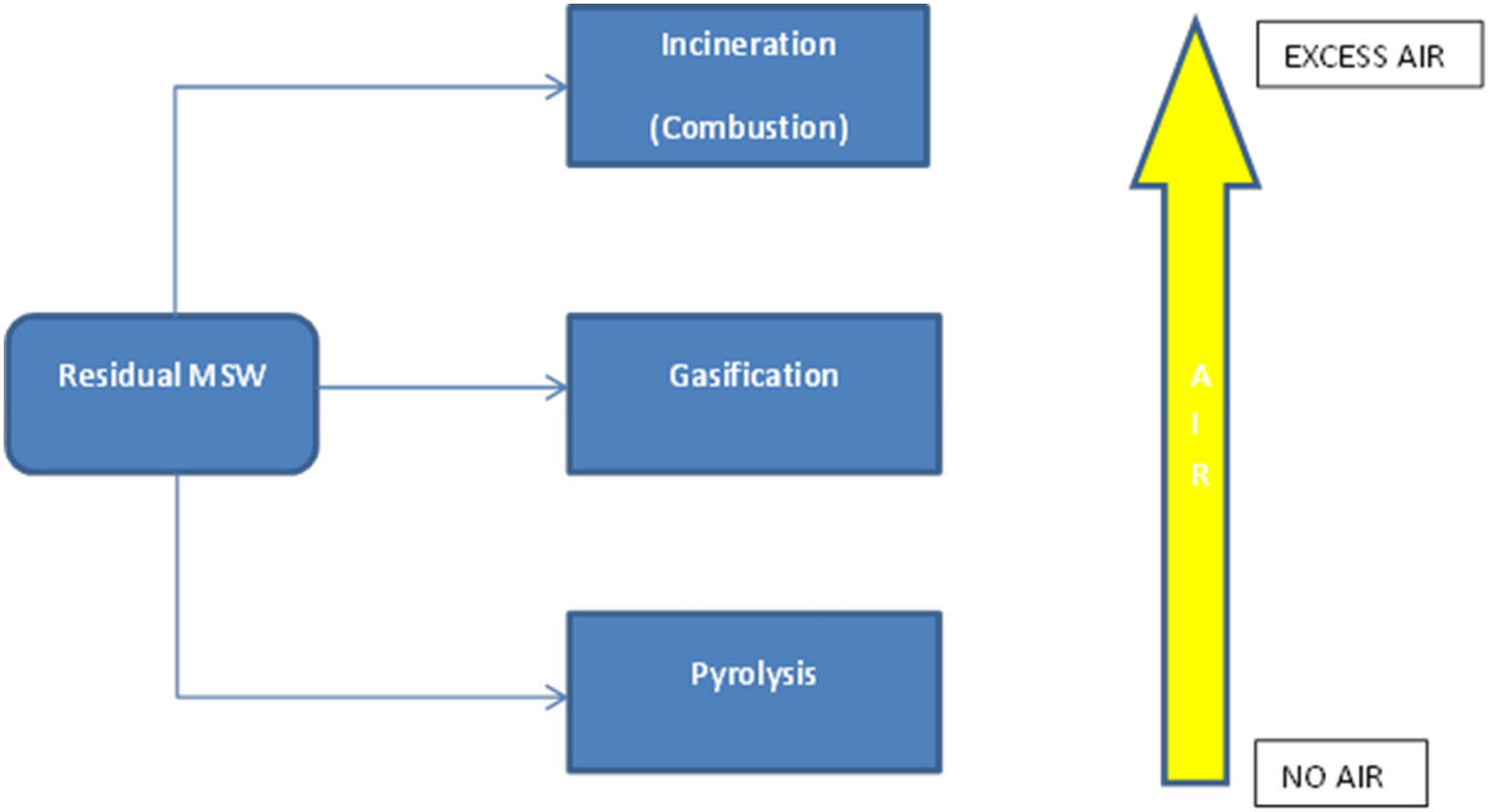
Waste to Energy Technologies

- Non-Thermal
  - Anaerobic Digestion
  - Mechanical Biological Treatment
- Thermal
  - Incineration
  - Pyrolysis
  - Gasification
  - Plasma Gasification

Anaerobic Digestion

- Good for domestic sewage and organic waste treatment, not good for unsorted MSW
- Biological conversion of biodegradable organic materials in the absence of oxygen, 55 to 75C
- Residue is stabilized organic matter that can be used as a soil amendment after proper dewatering
- Used primarily to reduce quantity of sludge for disposal/reuse
- Methane gas generated can be used for energy generation or flared

Thermal
(Advanced Conversion Technologies)



Incineration

- Oxygen required to fully oxidize fuel
  - (Combustion of RAW MSW)
- Process Temperature: 850 – 1200 C

- Waste converted to CO2 and H2O
- Temperature range gives concerns for dioxins, furans
- Non combustibles as bottom ash (30%)
- Fly Ash from APC residue
- Needs high calorific waste to keep combustion process going, otherwise requires high energy for maintaining temperature.

Gasification

- Between pyrolysis and incineration as it involves partial oxidization
- Some heat required to initialize and sustain the process
- Oxygen added in small amounts for oxidization but not full combustion
- Temperatures above 650C
- Produces syngas
- Non-organic materials become bottom ash (30%)

Pyrolysis

- Thermal degradation of organic materials through use of indirect, external source of heat
- Temperatures between 300 – 850C are maintained for several seconds in the absence of oxygen
- Successful with a consistent feedstock
- Typically run in batch operations
- Produces char, oil and syngas

Plasma Gasification

- Use of electricity passed through graphite and carbon electrodes with steam and or oxygen/air injection to produce electrically conducting gas (Plasma)
- Temperatures are above 3000C
- Organic materials converted to syngas
- Inorganic materials converted to an inert vitrified slag
- Can take any feedstock

High Level Scope of a WtE Project

Sources of Revenue

- Tip fees (waste agreement with municipality)
- Electricity (PPA, Power purchase agreement with utility)
- Heat (for district heating or industrial application)
- Environmental Attributes (Financial mechanism used by government to support public policy for renewable energy and/or waste management)
- Aggregate (re-use of slag as aggregate for building materials or as additive to cement)
- Water (recovered water treated to appropriate standard for re-use)
- Metal (ferrous and non-ferrous metals recovered during feed preparation)

Synopsis

Technology	Acceptable Feedstock	Energy Source	Bi-Products	Diversion from landfill MSW Feedstock
Anaerobic Digestion	Domestic Sewage Organic Waste	Methane		50%
Incineration	MSW,ASR, RDF C&I, C&D Medical	Heat -steam cycle power		70%
Gasification	Sorted MSW C&I (RDF)	Syngas Synthetic Fuels Steam cycle, combined cycle power		70%
Pyrolysis	Consistent Feedstock	Combustible tar/bio oil	chars	70%
Plasma Gasification	MSW, ASR, RDF C&I, C&D Medical, Hazardous (Asbestos)	Syngas Synthetic Fuels Steam cycle, recip, combined cycle power	Vitrified silicate Metal ingots Salt, Sulpher, water	98%+

Thank You

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