global cemfuels
CONFERENCE & EXHIBITION

PRAGUE – February 22-23, 2016

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The first US MBT plant to supply high quality SRF to the cement industry

A CASE STUDY OF CLOSE COOPERATION BETWEEN CEMENT PRODUCER AND TECHNOLOGY PROVIDER

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You are cordially invited to the

GROUNDBREAKING OF

ENTSORGA
West Virginia

The first Mechanical Biological Treatment (Waste-to-Solid Fuel) Plant to be built in the United States

Join us for the groundbreaking of a State-of-the-art waste-to-solid fuel plant that will divert municipal solid waste form landfills. 80% of the waste that is received by the plant will be used to produce a high quality alternative fuel for us in combination with fossil fuels. This new process will minimize landfill dependency, increase recycling rates, and create a cleaner environment.

The introduction of this "clean" technology will change the future of waste disposal in West Virginia and beyond.

Please join us as we start this journey

Date: Wednesday, January 6, 2016
Time: 1:00pm to 3:00pm
Where: 870 Grapevine, Road, Martinsburg, WV 25405

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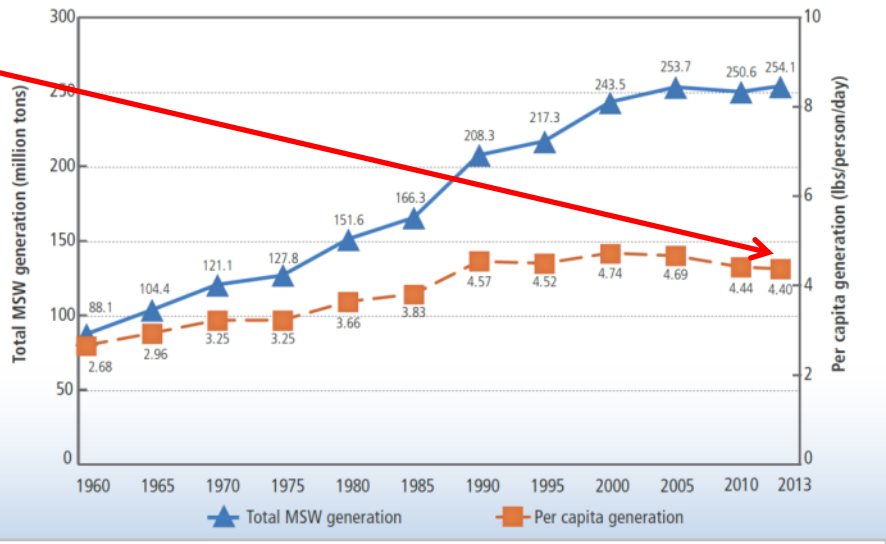
THE U.S. WASTE MANAGEMENT SITUATION

In the U.S. waste production per capita is nearly twice than Europe

Most of the MSW (52.8% 167 million tons) is discarded and 137 million tons is landfilled

The MSW landfilled has a high calorific value due to high content of plastic (higher than Europe)

Figure 1. MSW Generation Rates, 1960 to 2013



Source EPA - Advancing Sustainable Materials Management: 2013 Fact Sheet

Figure 4. Management of MSW in the United States, 2013

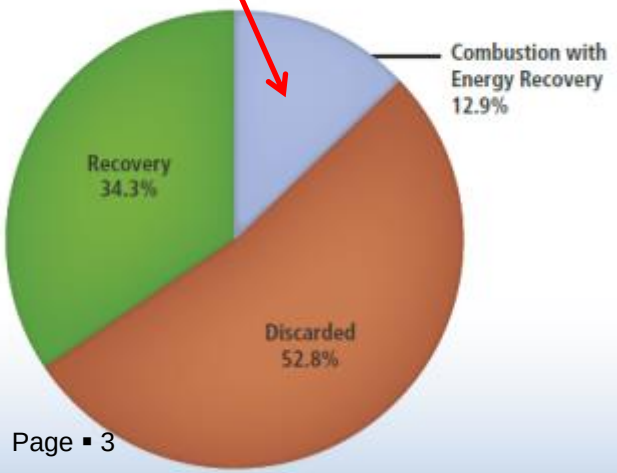
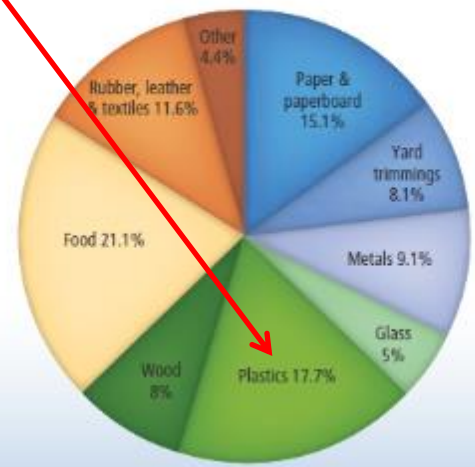


Figure 7. Total MSW Discards (by material), 2013
167 Million Tons (after recycling and composting)



- In the last 20 years Mass Burning but also Waste to Energy plant have become economically unfeasible for the increasing cost of cleaning requirements coming from new regulation (CISWI rules 2014, Clean Air Act etc.).
- As a consequence burners are decommissioned and not rebuilt.

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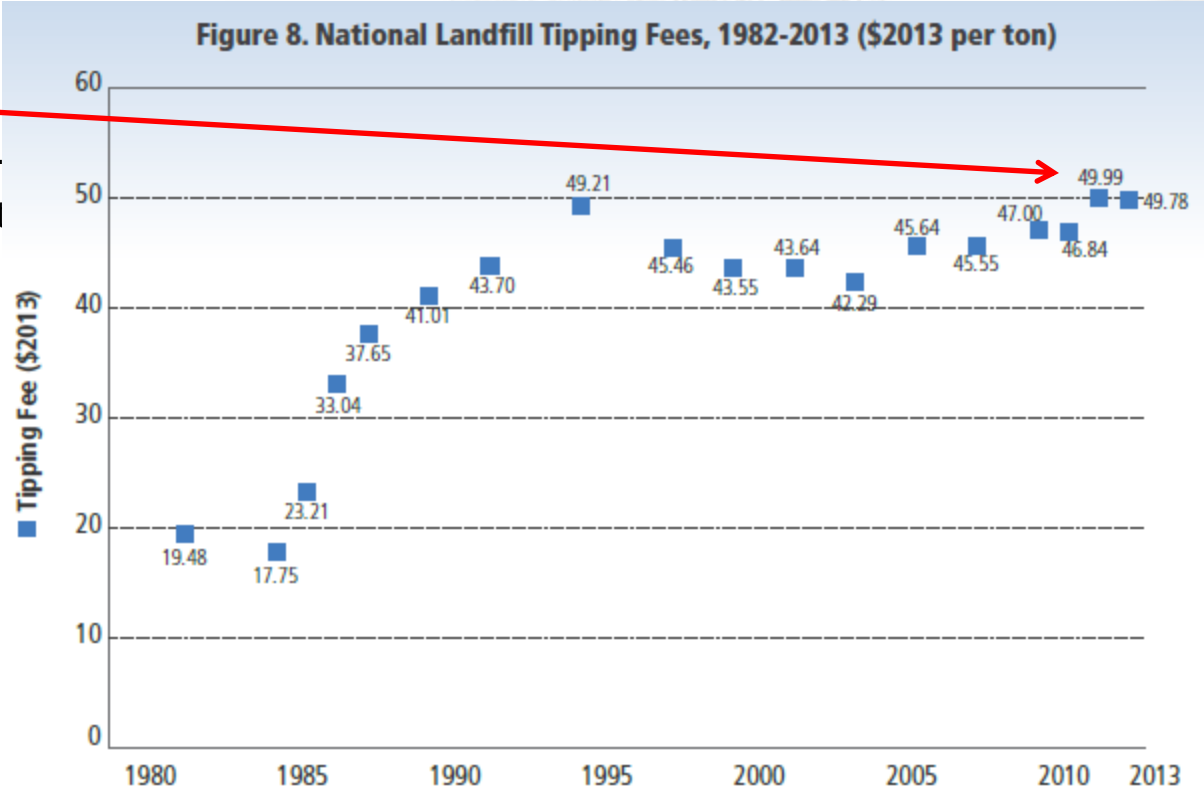
THE U.S. WASTE MANAGEMENT SITUATION

Mean tipping fee is still low but increasing and some specific areas have higher tipping fees (East Coast) .

Considering hauling cost disposal cost can go up to 130-140 $/ton (short)

The top 3 U.S. waste management companies control about 80% of the landfills



- Increasing demand for BETTER ENVIRONMENTAL PRACTICES by the public and government
- Reducing dependency from landfills
- Availability of positive statutory framework
- Support by government, authorities and public

- Haulers eager to improve their standing and get rid from dependency form landfill
- Equity capital available

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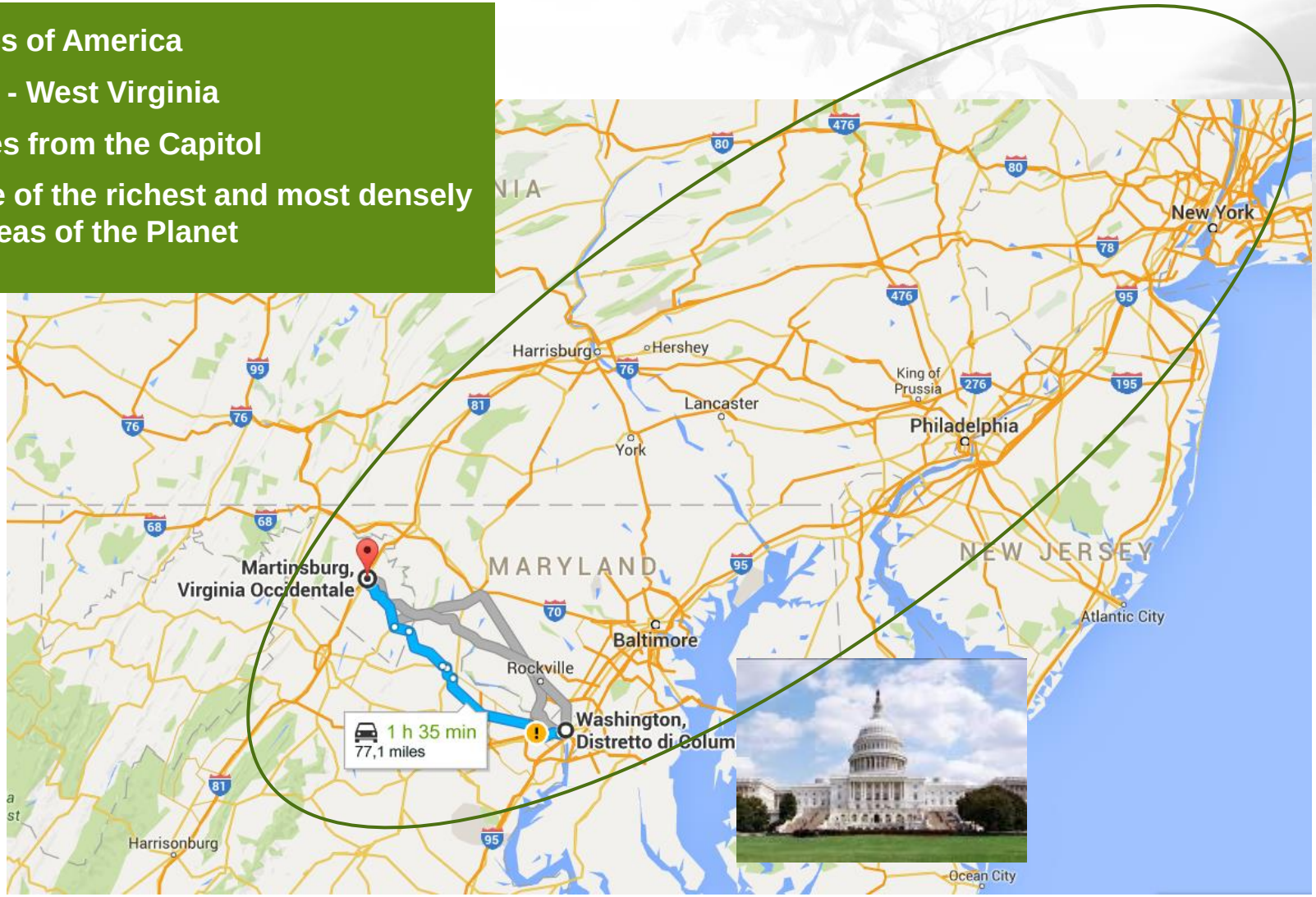
WHERE WE ARE ?

United States of America

Martinsburg - West Virginia

Only 77 miles from the Capitol

Close to one of the richest and most densely inhabited areas of the Planet



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WHAT WE ARE GOING TO BUILD THERE ?

MBT PLANT will receive about 110.000 tpy of residential MSW and C&I waste that will be converted to PROMETHEUS clean burning alternative fuel (Solid Recovered Fuel or SRF), which will be used as an alternative or supplement to fossil fuels. It is ideal for co-processing plants such as cement kilns and steel mills as a source for the production of renewable energy.

At capacity, the plant will be capable of producing approximately 50,000 tons of solid recovered fuel annually. That represents approximately 40% of the incoming waste.
The fuel will be delivered to the Essroc Cement Plant and used in conjunction with coal in the production of Portland cement.

The use of SRF from the Entsorga process has been proven to generate emissions comparable to or less than those found in traditional US fuels (e.g., coal or pet coke). Facilities that have used SRF as an alternate fuel have reduced their Greenhouse Gas emissions and their overall carbon footprint. **As a result of less MSW being disposed of in landfills a substantial GHG emissions reduction of 24,800 tons per year of carbon dioxide (or carbon dioxide equivalent) will be achieved.**

The vertical integration of the model that will be deployed in Berkeley County further adds to the plant's innovativeness and functionality. Residential waste collected by Apple Valley Waste will be transported locally to a facility owned partially by the hauler and converted and used within the county as an alternative, renewable fuel.

This plant will not only have a significant impact on reducing the amount of waste disposed of in landfills, but it will have a meaningful impact on fossil fuel dependency. It is a "sneak peek" at the next generation of waste collection and disposal in the U.S.

The project involves a long-term financing of $25 million provided by the Authority Infrastructural Development of West Virginia after the placement of government bonds for the same amount and duration and by subscription of local institutional investors.

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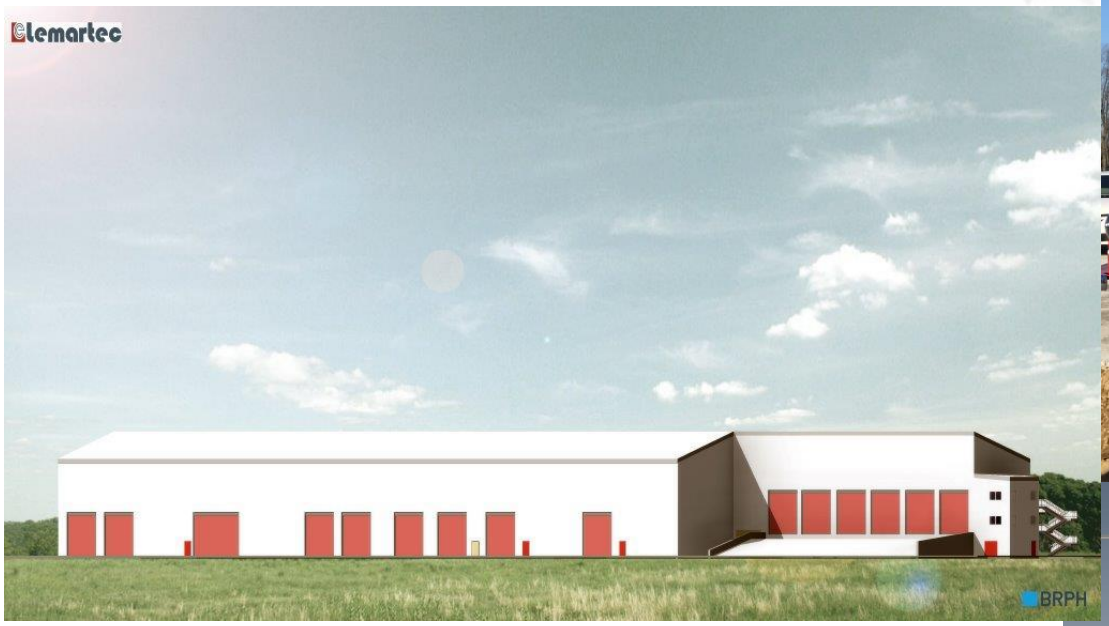
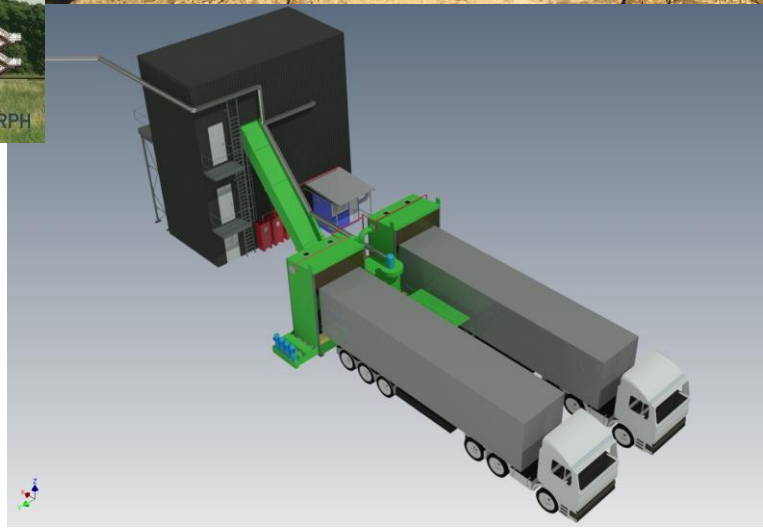
A 110.000 tpy MSW and C&I waste plant for producing up to 50.000 tpa of HQ SRF
The plant will enter into operation at the end of 2017
Investments $25 million





Entsorga docking station and pneumatic feeding station at cement plant provided to Essroc Cement.

Delivery of energy service to the kiln

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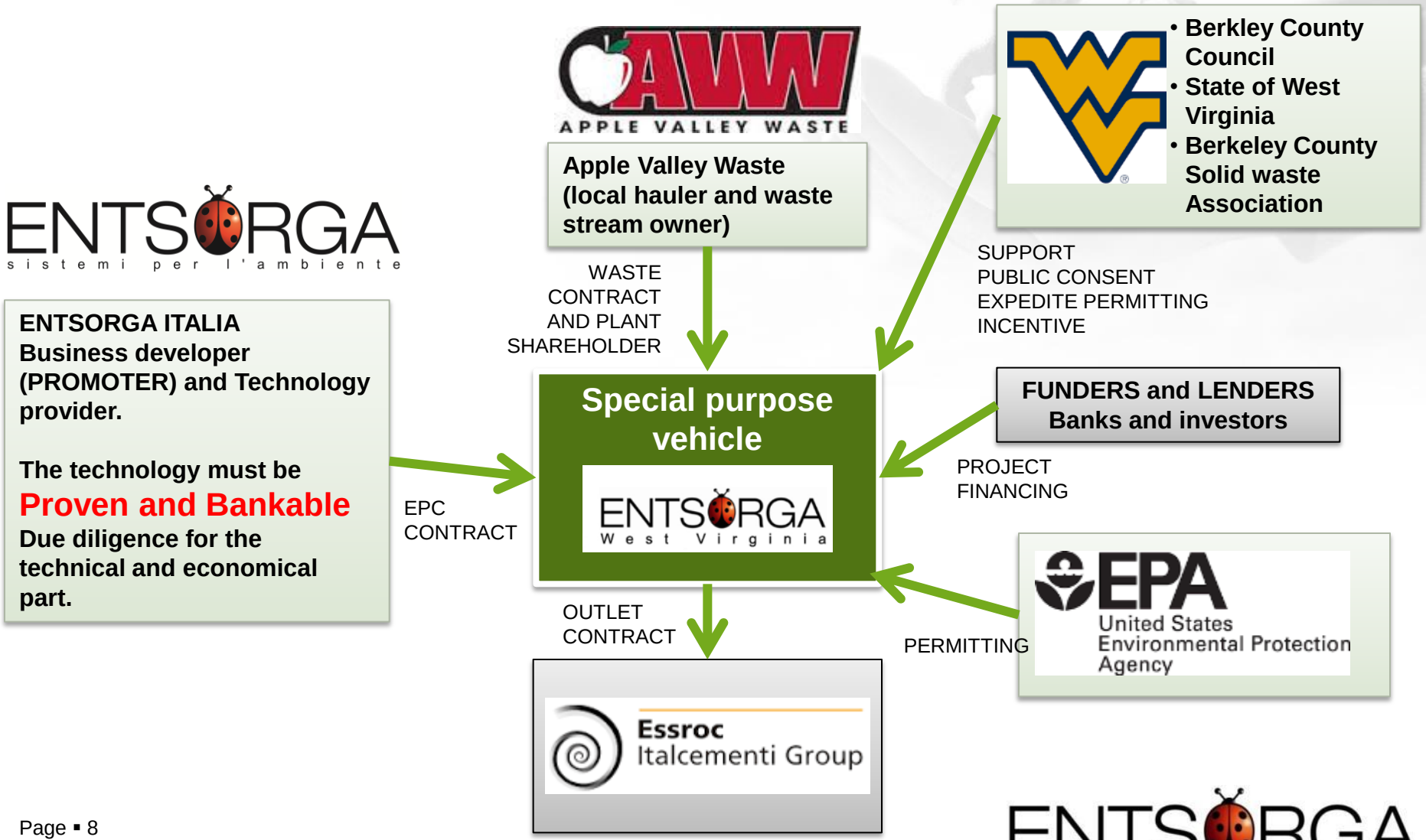
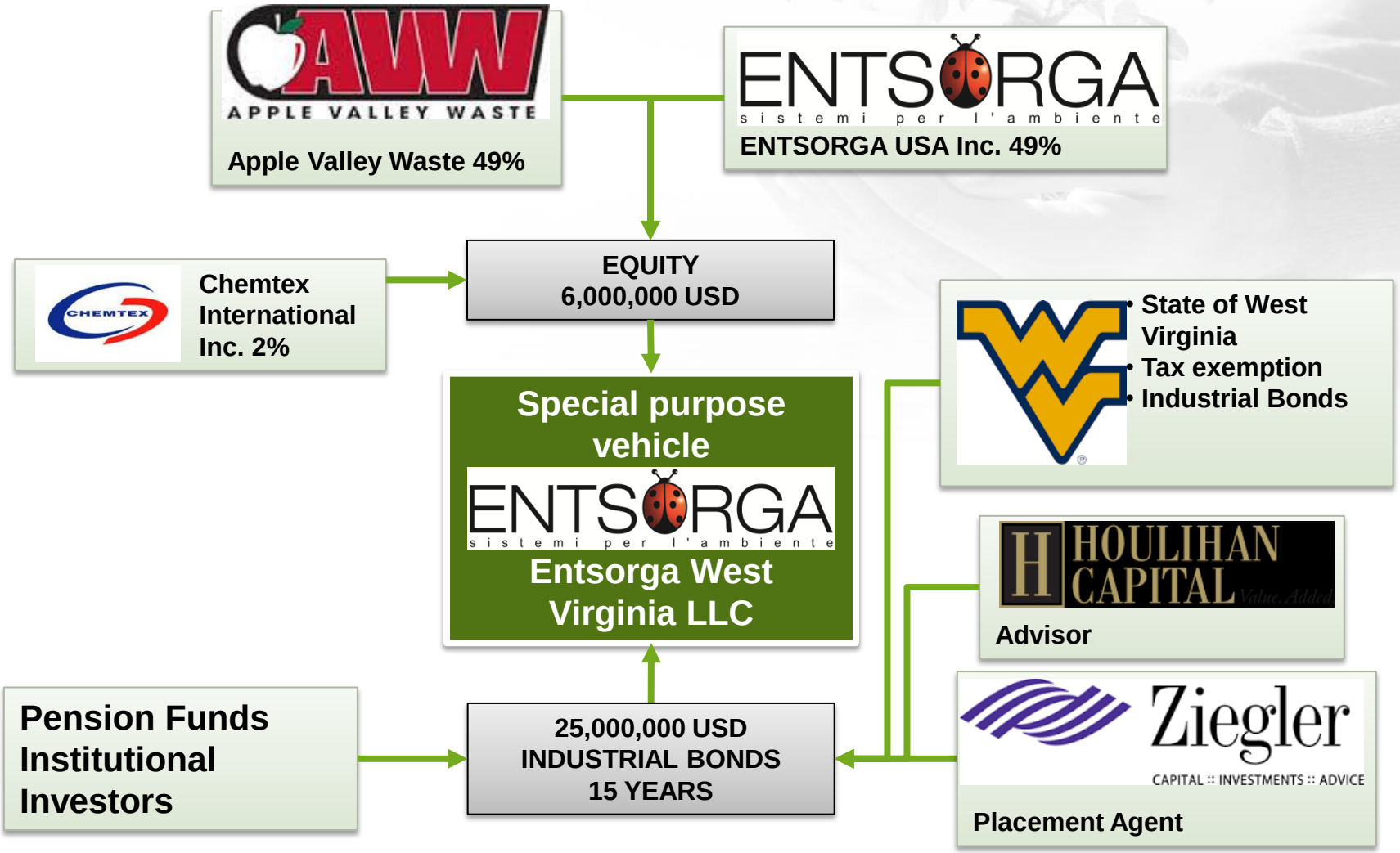
THE «BIG GAME»

- To make such a project to fly it is required the contribution of all players.



FUNDING STRUCTURE

- To make such a project to fly it is required the contribution of all players.



KEY ELEMENTS

WASTE

- Waste is the “prime material”, in every area there are strong operators and usually this is the issue that is more difficult to get.
- Landfill owner will always adverse this king of projects as they jeopardize part of their profit.
- Haulers sometimes don’t catch the opportunity and go defensive in the attempt to protect their position

PUBLIC SUPPORT

Public support by government authorities and public is essential.

There is no way to do anything without such support. A small group fighting the project may significantly delay or abort the project.

FUNDING

Given the key elements above are verified it is possible to fund the project budget assuming to have a 20-25% of equity and the remaining amount trough lenders.

The market has appetite for subscribing bonds issued to finance such kind of projects.

CEMENT KILN

It is essential to close the waste cycle

It is essential to have a take or pay contract in order to make the project bankable.

In reality Entsorga only pursue project where such assumption is verified from the early beginning.

TECHNOLOGY

It has to be “proven and bankable” thus meaning to have a conspicuous track record of plant in operation and lot of data coming from such plants such as performances, environment impact, economics etc.

Due diligence may be required in order to prove the plant works.

Such requirement is absolutely mandatory for both permitting and funding.

Entsorga put lot of effort in having a PROVEN and BANKABLE proprietary technology

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THE MARTINSBURG PLANT

- Building materials have been produced on the site of the current Essroc Cement plant in Martinsburg, West Virginia, USA since the late 1800s. Today the site is owned by Essroc's parent company Italcementi Group. In 2015 Italcementi has been taken over by Heidelberg Cement
- In **2010**, the plant underwent a massive overhaul under Essroc, when it was switched from three wet-process kilns to a single FLSmidth dry-process line.
- The upgrade increased the plant's clinker production capacity from around 0.6Mt/yr to **1.6Mt/yr**.
- The utilisation of high quality alternative fuel SRF, is compatible with the general principles and with existing US national policies on energy efficiency, climate change and waste management.
- *Cement manufacturing process*: the use of alternative fuels and raw materials has the potential to reduce GHG emissions commensurate with the reduced use of conventional fossil fuels, and conserves non-renewable resources.

At full capacity the plant demand is for 4160 GJ/y of which up to 30% is planned to come from alternative fuels

The plant is the major employers in the area and after being revamped has archived an impressive environmental standard.

At present the mean substitution ratio of fossil fuel in the US with AF is below 3% of which nearly 100% are tires and liquids.

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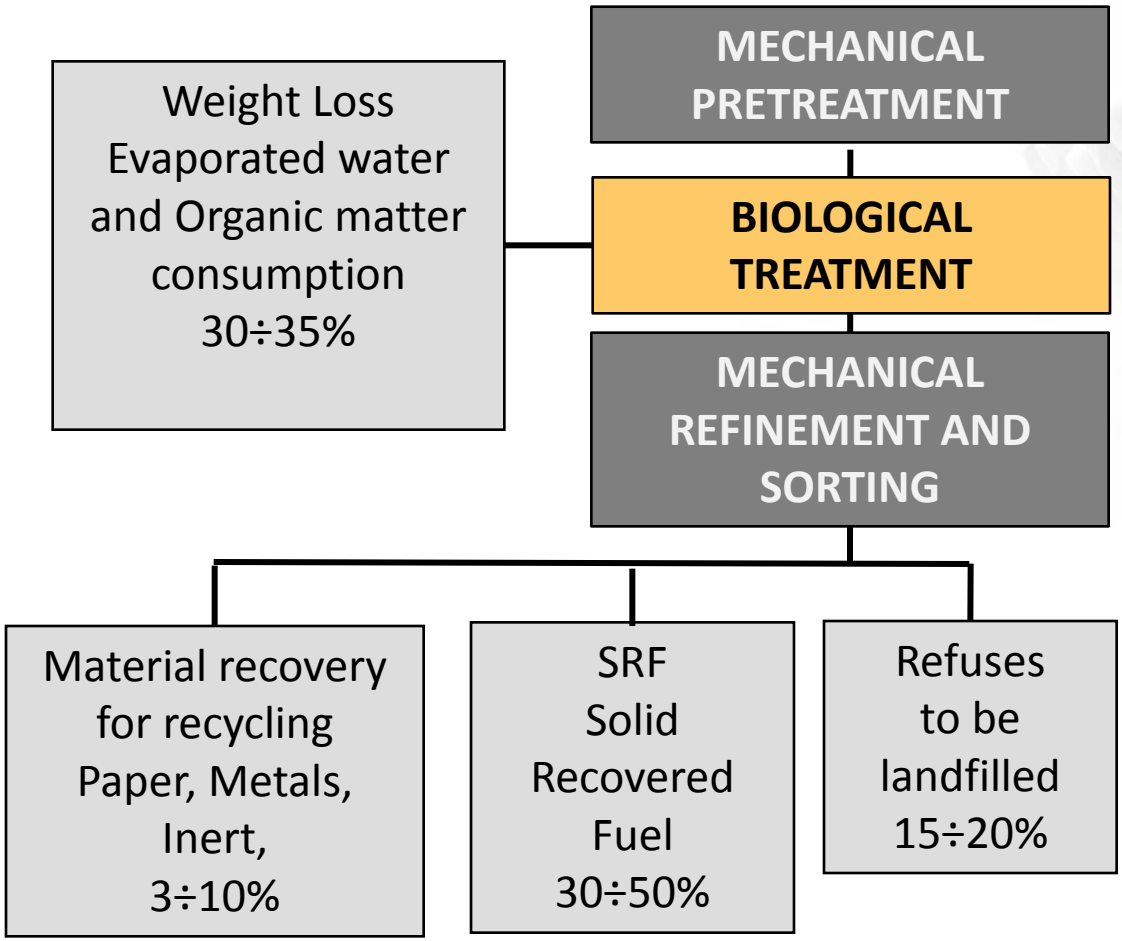
THE MECHANICAL BIOLOGICAL TREATMENT OF MSW

How to produce a dry engineered alternative fuel from unsorted MSW



WHY SRF FROM MSW ?

- **Biomasses:** the cost is rising because of the expansion of the operations fed by this fuel (power production and cellulosic bioethanol).
- **Hazardous Waste** in the medium term perspective environmental regulation will make the use of this stream more and more difficult.
- **Commercial and Industrial waste**: by implementing recycling programs this stream will be drastically reduced (it has already occurred in many countries).
- **MSW: it is available anywhere, the transport costs are limited, and even with recycling programs in place there will be always be a stream available for SRF.**

In Europe the MBT installed capacity is more than **9,000,000 t** (with 1 additional million t capacity under construction). The highest concentration of MBT plants is in Germany, Italy, Spain and in the UK. Eastern countries such as Poland, Slovenia, Romania, Czech Republic are quickly filling the gap.

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MBT - NORTHACRE RRC – Wiltshire UK

Plant throughput	70,000 tpa of rMSW
Inhabitants served	250,000

The SRF is produced for a number of different users (EfW plants, cement kilns), each one having its own specification.

The flexibility of the plant makes it possible to produce a specific SRF for each user by changing the settings of the refinement equipment.
This plant represents one of the most modern and highly efficient facilities in Europe. It entered into operation in February 2013.

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PROMETHEUS SRF an engineered fuel – NOT AN ORDINARY "RDF"

EPA United States Environmental Protection Agency

The PROMETHEUS ENGINEERED FUEL awarded from EPA the status of NON WASTE thus making it possible to transport and trade as a commodity.
NHSM (Non Hazardous Secondary Material) Rule

The fuel specification will make it possible to maximize substitution rate

- **Moisture ≤ 20% desired ≤ 15%**
- **CV about 16-18 MJ/Kg**
- **Chlorine ≤ 0.7% desired ≤ 0.3%**
- **Dimensions 2D ≤ 30x30 mm**
  3D ≤ 10x10x10 mm

- The PROVEN and BANKABLE technologies we have available already make it possible to meet the required parameters but we need to move forward to meet the desired parameters of **Chlorine≤ 0.3%**

INPUT MSW

Chlorine ≈1.2% w.w.

- **PVC**
- **Salt (NaCl)**
- **Paper**
- **Other plastic**

MBT

SRF
100% Cl ≤ 0.7%
66% Cl ≤ 0.3%

FALCON TECH. High Definition NIR By Entsorga and ONLINE analysis

SRF
100% Cl ≤ 0.3%

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A SUPER WIN-WIN PROJECT

- **Municipality and County WIN** as trough this project the will divert from landfill more than 80% of their waste thus reducing their dependency from landfill and all deriving consequences.
- **State of West Virginia WINS** as they develop another industry on their territory and achieve at same time the target of a more sustainable and modern waste management system
- **Essroc Cement WINS** as they secure a cheap source of fuel over the time and a massive Green House Gases emission reduction.
- **Entsorga WINS** as it will have its flagship and reference plant in the US
- **Apple Valley Waste WINS** as they will get rid of the dependency by landfill and they can increase they standing in the industry from haulers to fuel producers. This will differentiate their service and their offer to the market making it possible for them to get more waste contracts, eventually replicating the same business model.
- Funders **WIN** as the have tax exempted bond granted by West Virginia State

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PROJECT TIMESCALE

- Focusing the project and building the team of promoters (Entsorga, AVW, Essroc) → 2 years
- Preliminary engineering and permitting 18 months
- Awarding the EPA comfort letter for NON WASTE status for the engineered fuel 18 month in partial overlaps with permitting.
- Funding 1 year
- **TOTAL ABOUT 4 YEARS**

- **It has to be taken into account that in this project we have opened a new path for the U.S. and we expect to have future project to be executed in shorter time.**

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All this started in 2009 in an elevator at 9° Cemfuel Conference in Toronto when my collegue Paolo and Gianni (the only italian present) met and started discussing about SRF.

Thank you!

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You are part of our achievement!

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