



Advances in the Inashco metals recovery process

WTERT, Columbia University, October 6, 2016

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- 
- **Inashco company profile**
 - **The process & the products**
 - **Metals**
 - **Minerals**
 - **Ash recycling in the Netherlands**
 - **Inashco projects**

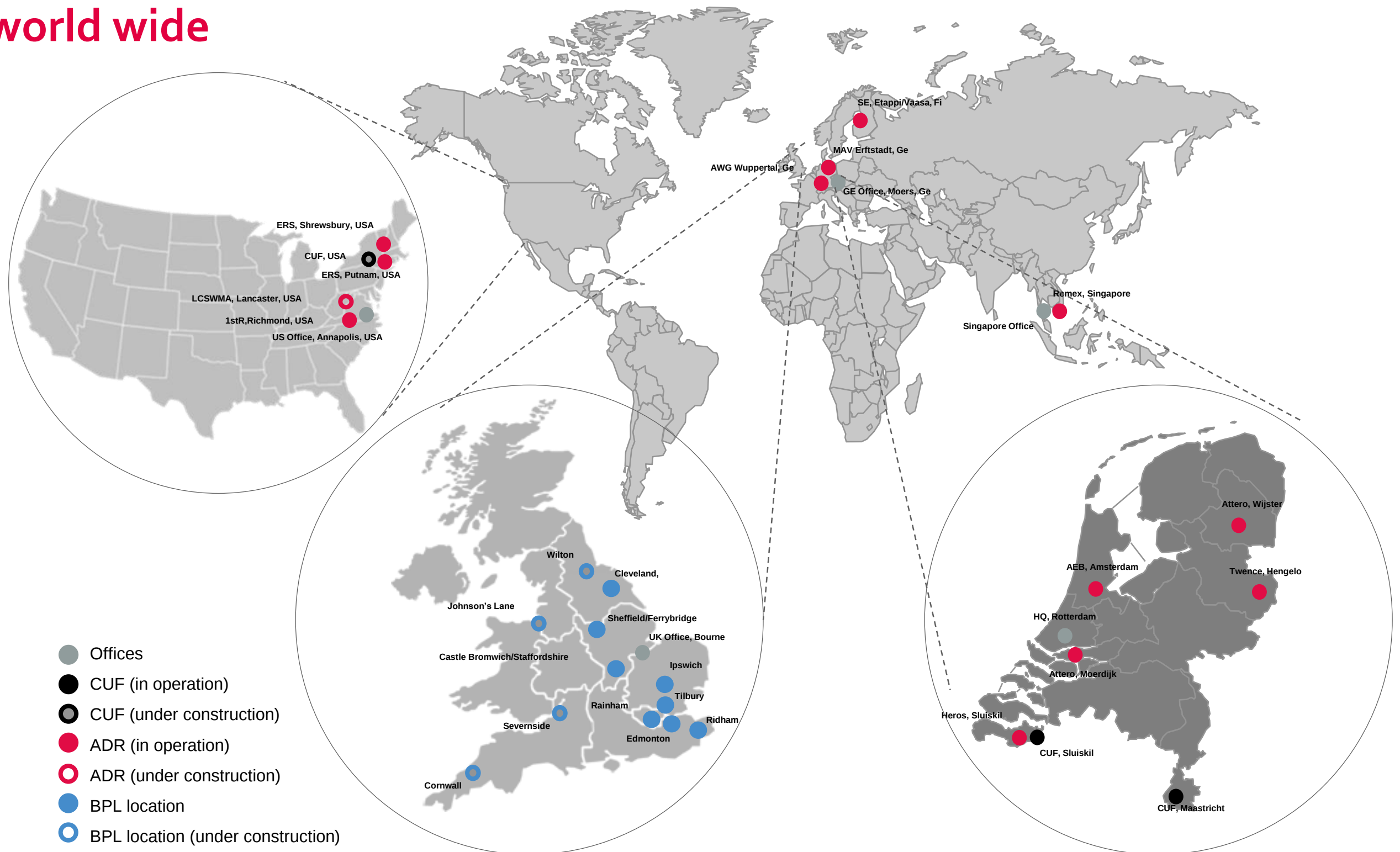
In the US with a Strong Foundation



- Waterland: Private **equity**, \$4 billion AUM
- Fondel: **trading** company, approx. \$1.5 billion
- Delft University of Technology, **IP** provider
- Inashco BV in the Netherlands, 2008, **parent**, \$130 million turnover, ~250 FTE
- Ballast Phoenix , Ash Recycling, 80% **UK**, 20 yrs, 10 sites, \$ 26 turnover, ~82 FTE
- Boskalis, 1910, \$3.5B, ~14,000 FTE, Cooperation Agreement, **Minerals** expertise
- Inashco North America, 4 yrs, **subsidiary** company, ~20 FTE
- ERS **JV**, 2+ yr, 20 FTE, 2 ADR-projects, 1 Central Upgrading Facility under design

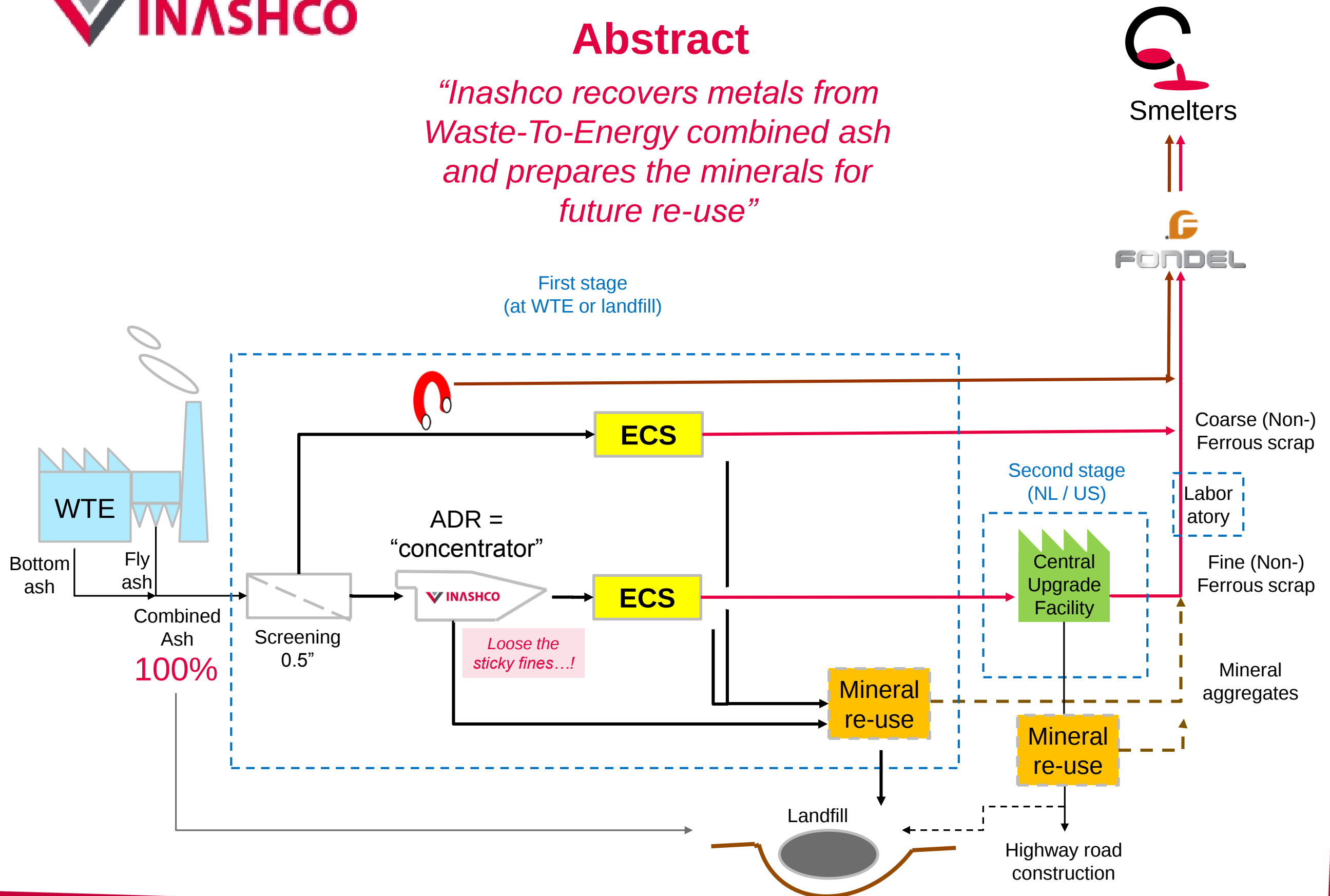
2015: >5 million tons ash
processed by Inashco
world wide

Global presence



Abstract

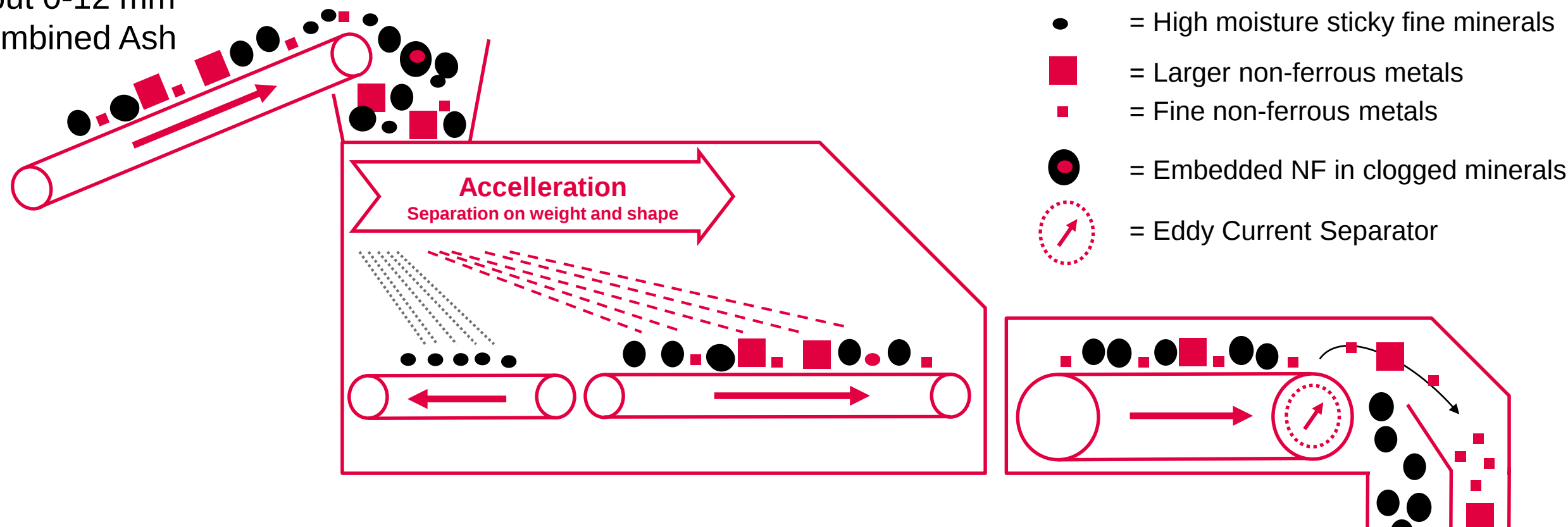
"Inashco recovers metals from Waste-To-Energy combined ash and prepares the minerals for future re-use"



Ballistic concentration explained (ADR)

ADR & ECS are complementary technologies

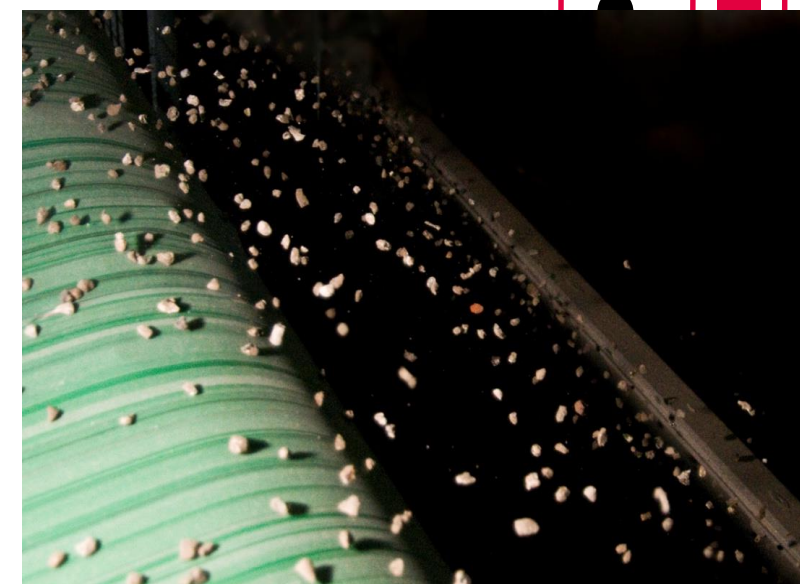
Input 0-12 mm
Combined Ash



Mineral fine/moist 0-2 mm



ADR Concentrate to ECS



Minerals

NF



Fine minerals
(0 – 2 mm)



Mineral aggregates
(2 - 50 mm)



Non-ferrous concentrate
(1 - 12 mm and 12 - 50 mm)



Ferrous concentrate
(12 – 50 mm and above)



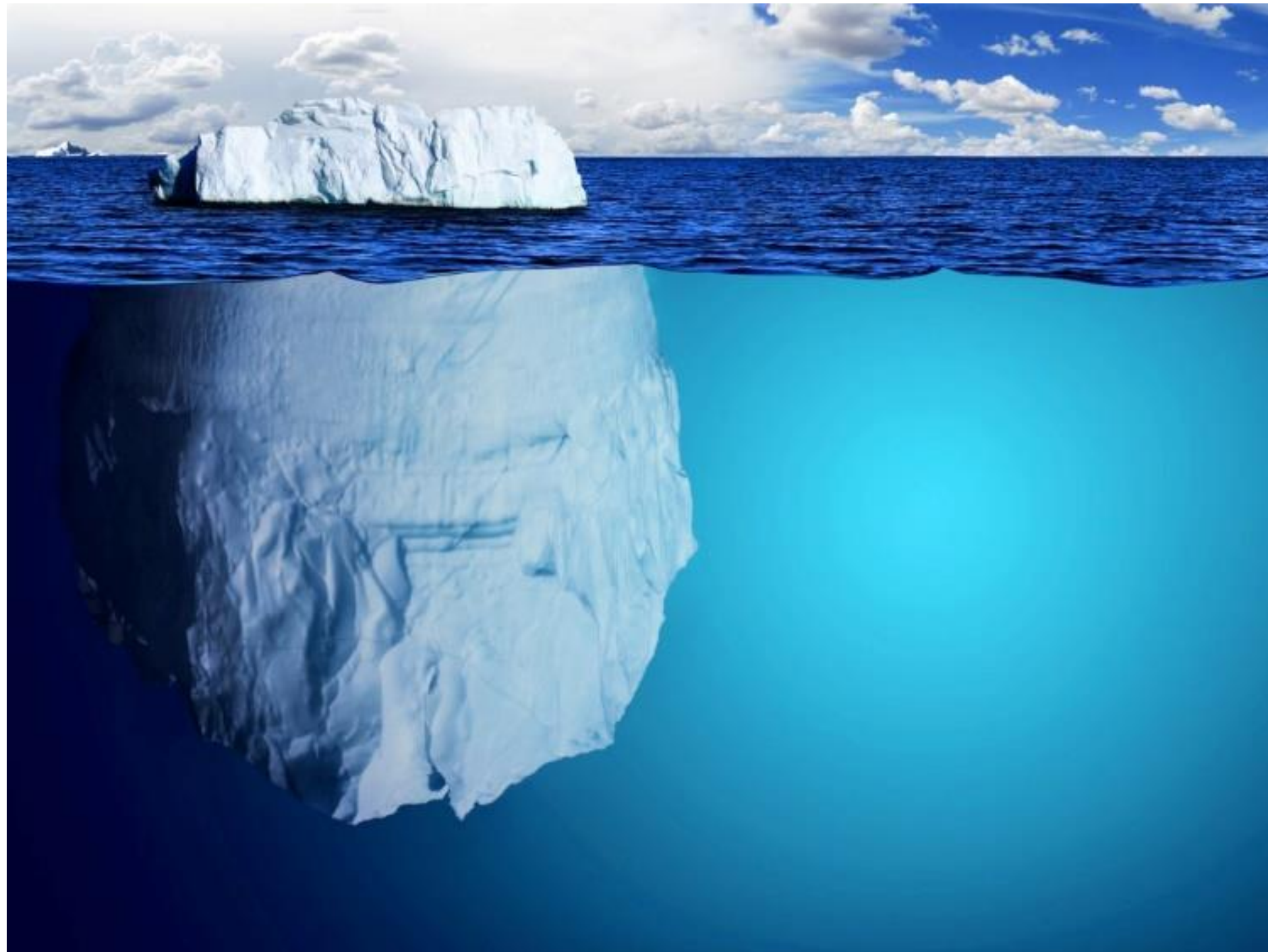
Aluminum scrap product

- 1 – 12 mm
- 75 - 80 % pure metal scrap



Heavy non-ferrous scrap

- 1 – 12 mm
- 95-99 % pure metal scrap

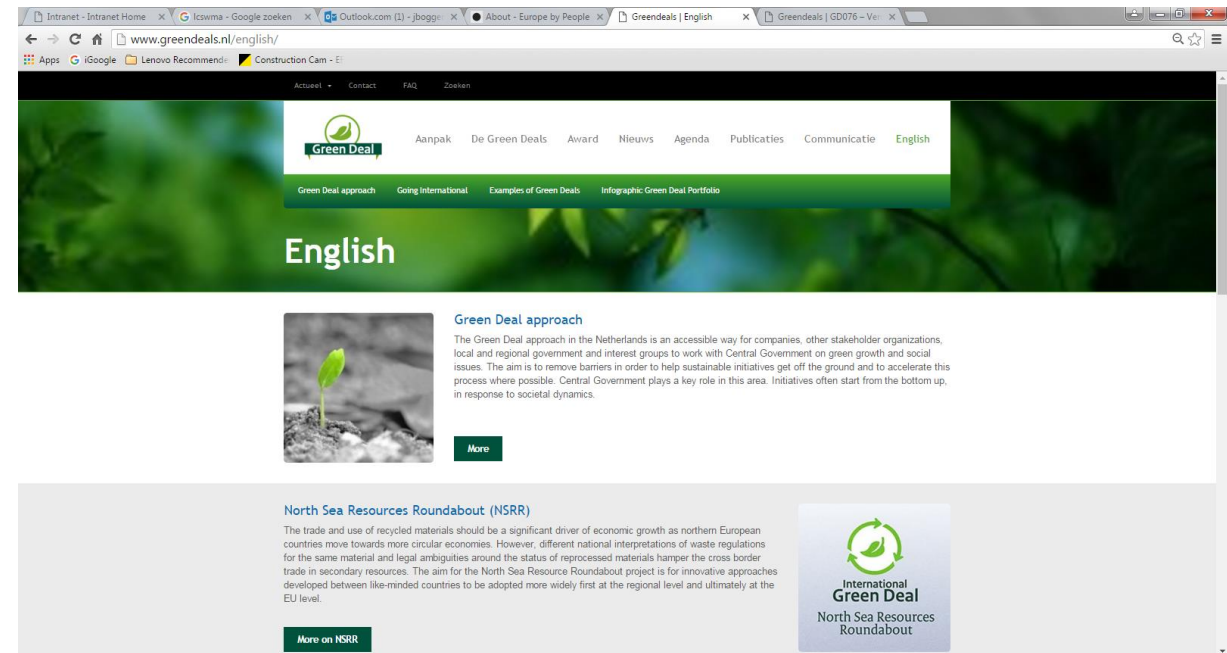


METALS

MINERALS



- The Netherlands (Holland)
- 17 million people
- 16,000 sq miles (1/3 NY)
- 40% ↓ sea level



- Government support
- Sustainable economic growth
- Stakeholders
- Resolution of Regulatory hurdles
- Legislation, market, incentives, R&D
- GD 076
 - > 2017 : 50% un-contained minerals
 - > 2020 : 100%



The value chain goal



Waste-to-Energy



Fe and NF Metals



Ash Upgrading



Road Construction



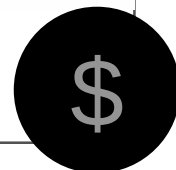
Landfill



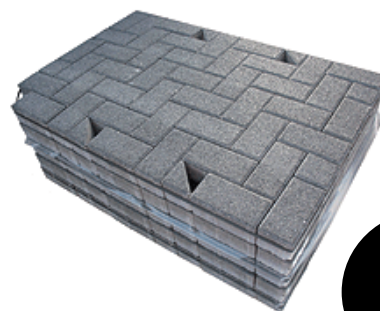
Continuous Technology Development

Cu/Zn Scrap

Al Scrap



Concrete Products



Cement





Courtesy of Wheelabrator Technologies

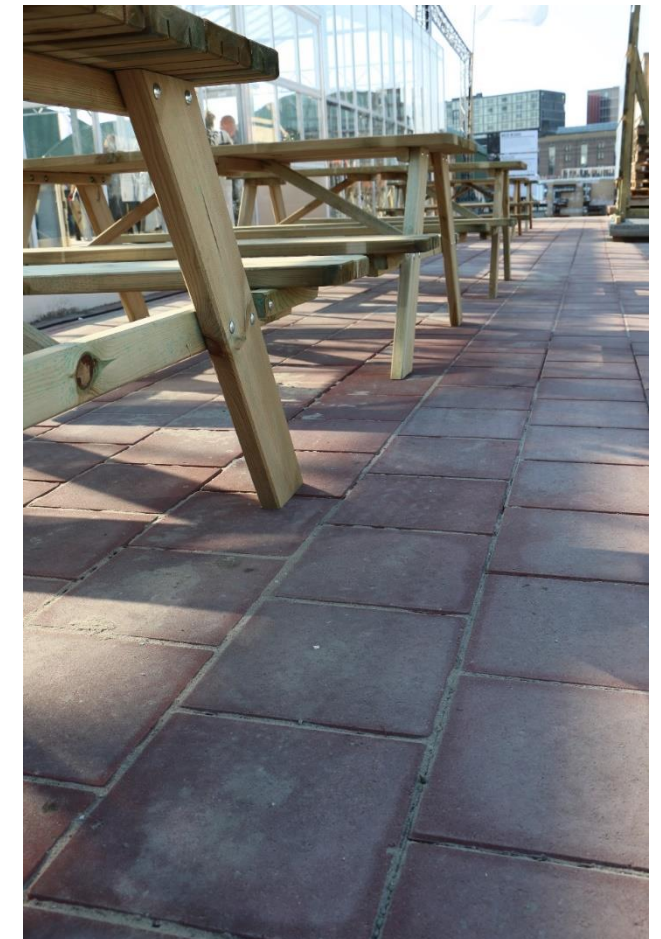


- The advantages
 - Porosity:
 - Not for compressive strength (e.g. constructive)
 - Beneficial for low water-cement ratio applications (internal curing)
 - Low density: large volumes per load
 - Pavers with 20%-50% minerals:
 - Higher thaw-frost cycle resistance
 - Higher tensile strength
 - Higher abrasiveness resistance
 - Particle Size Distribution
 - Marketing the sustainable character
 - Cost vs primary aggregates
 - >> Expectations 2018: 80/90% mix of IBA-minerals and crushed concrete



- The Inashco test projects with partners:
 - 110 ST batch pilot
 - 165 ST batch pilot
 - 1650 ST test

Mineral projects



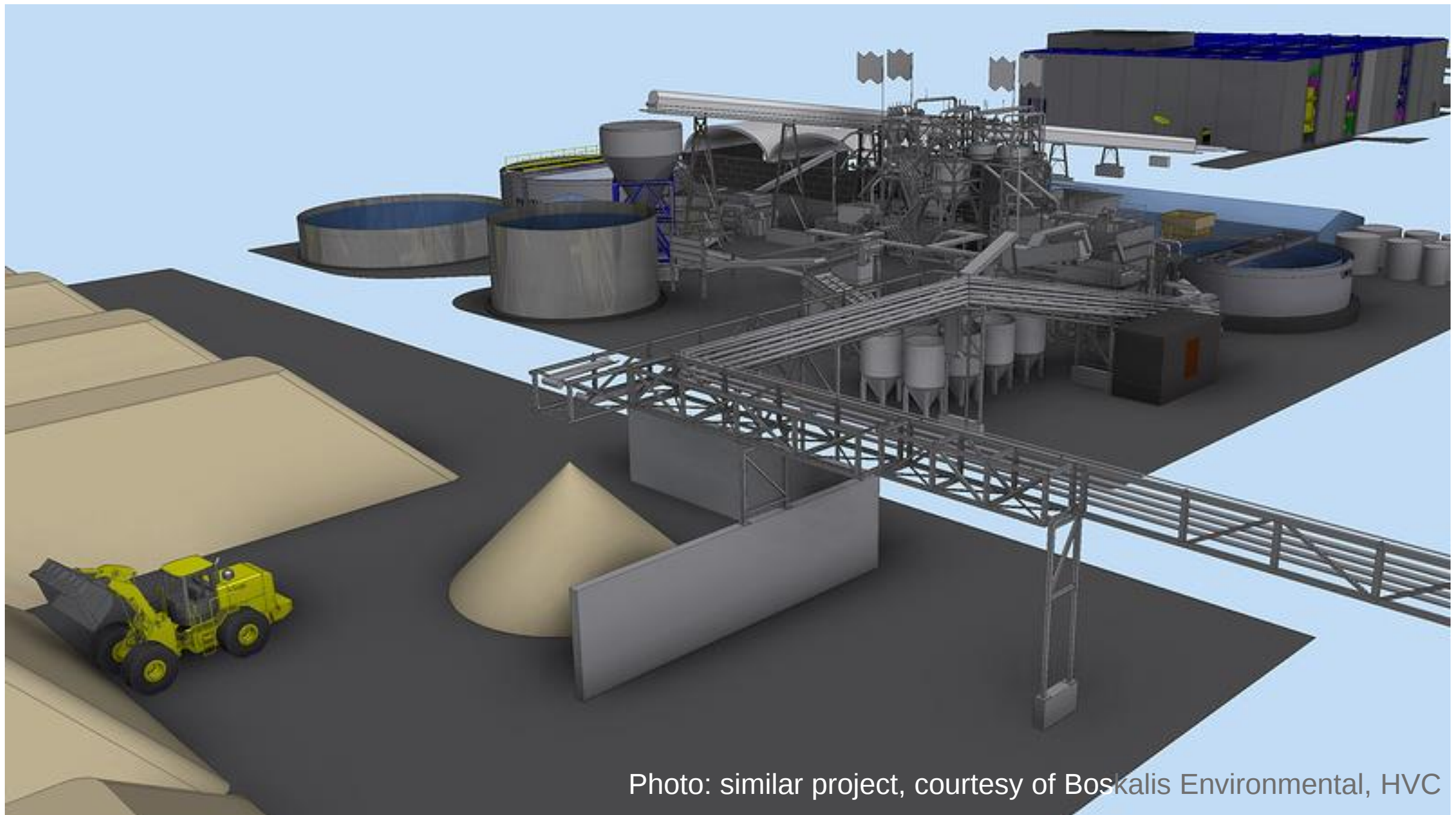
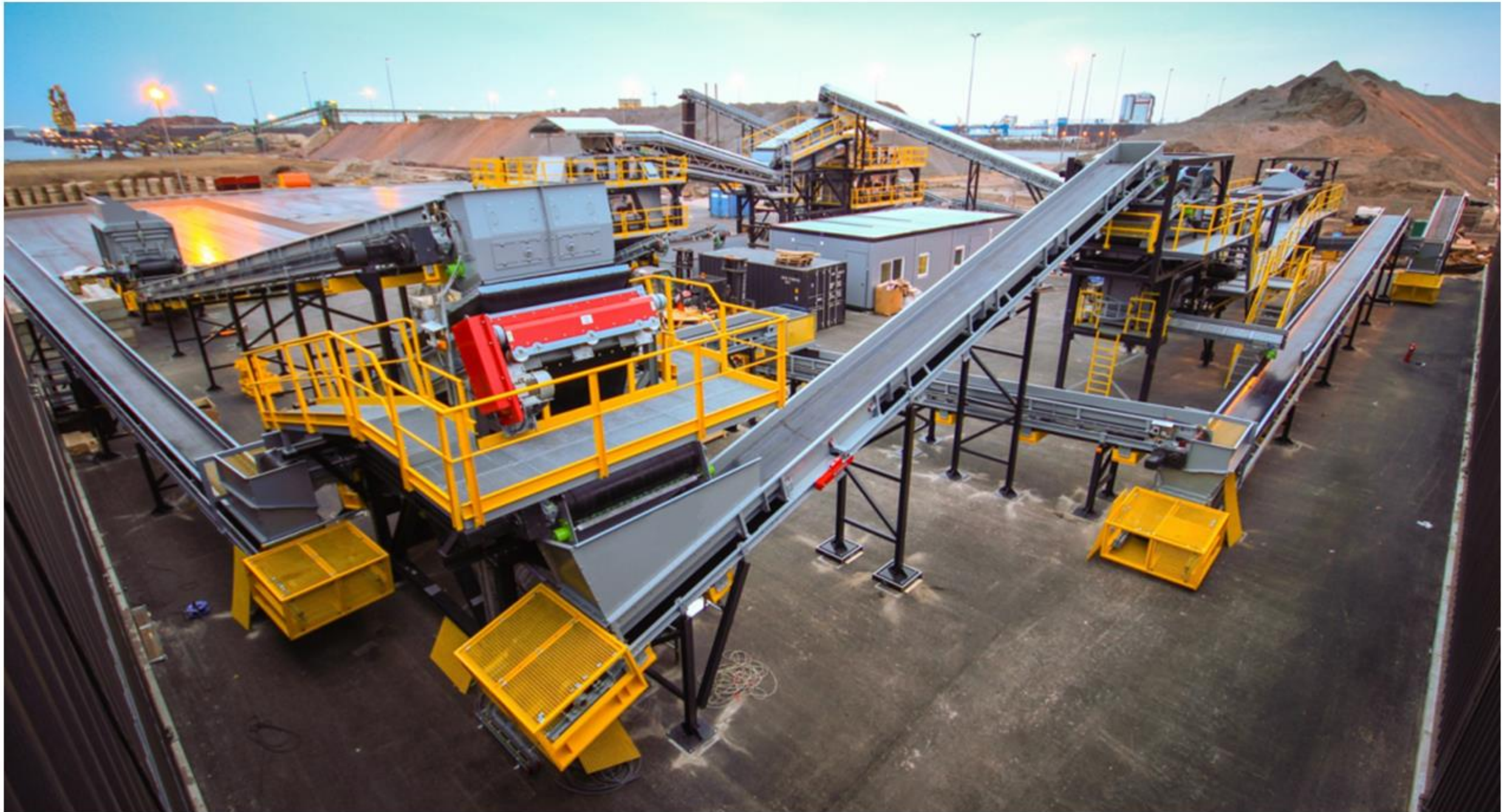


Photo: similar project, courtesy of Boskalis Environmental, HVC

- Nauerna Amsterdam, full scale 660,000 ST, barge-supply of ash, wet process, Green Deal proof, metals and minerals



Central Upgrading Facility #1 Sluiskil, the Netherlands



Central Upgrading Facility #2 Maastricht, the Netherlands





Semi-Mobile ADR Richmond, VA





ADR plant Putnam, Connecticut





ADR plant Shrewsbury, Massachusetts



- Extensive ash **recycling** is happening
- Dense heavily populated areas can practice and benefit from **responsible ash-management**
- WTE should be judged over its entire **value-chain**
- A well-orchestrated **stimulus package** : society education, government facilitation, review of Rules&Regulations, incentives and R&D
- Inashco: the **opportunity** of proven technology, a strong track-record, wide US operational experience and constant R&D

Don't waste your ash!





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