

#### 67th AMEU Convention SUSTAINABLE CUSTOMER CENTRIC ELECTRICITY UTILITIES IN THE 4TH AND 5TH INDUSTRIAL REVOLUTION

#### INVESTIGATIONS INTO HIGH TEMPERATURE COMBUSTION OF MUNICIPAL SOLID WASTE FOR GREEN ELECTRICITY

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# **NEXUS OF WASTE TO ENERGY**

## Waste = MSW

1. High Temperature Incineration (750 -1000°C)

# 2. High Temperature Gasification (4000 °C)





## 1. High temperature INCINERATION

Mature Technology 100's Plants Mostly Developed Economies

Africa = 0

## **Reference ABB**

#### Refurbishment of a 58 year old plant in Switzerland





### **ABB 2012 Fact Sheet**

**Energie Wasser Bern, Switzerland** 

360 000 MWh/aelectricity 132 kV GIS – Grid330 000 MWh/adistrict heating & steam

110 000 t/amunicipal solid waste112 000 t/abiomass (parks & gardens of trees & shrubs)

Cash Flows = payment to deposit MSW + energy sales (electricity + hot water + steam) + sale of recovered metals + sale of slag aggregate as paving bricks for roads = 30 full time jobs.





# 2. High Temperature GASIFICATION

### MUNICIPAL SOLID WASTE TO GAS (HYDROGEN)

Hydrogen Economy (JAPAN)

> Electric Cars (CALIFORNIA)







#### Japan's Vision for a Hydrogen Economy

2015 – 2020 : Strategy Making, Research & Development

2020 – 2030 : Expand Fuel Cell Market + Demo High Efficient Hydrogen Power Generation – small to large scale

2030 + : Introduce H Society in large scale, Commercialize and Market Technologies

#### Deep experience in WTE; emphasis now on H

2018 Data : Greater than 1000 incinerators, 380 WTE Plants 17248 GWh Industrial Waste 1719 GWh MSW





Californian Energy Commission (1975) Clean Energy Economy : Net Zero 2050

> 2008 Hydrogen Economy 38 Hydrogen Refueling Stations 28 Stations Under Construction

Hydrogen : Natural Gas (Grey/Blue) Electrolysis (Green)

Hydrogen from Gasification of Municipal Waste

- Green & 1/3 cheaper than electrolysis
- Acknowledge : SGH2 Project, Lancaster, CA.





### LANCASTER PROJECT – CA USA World's largest green hydrogen plant

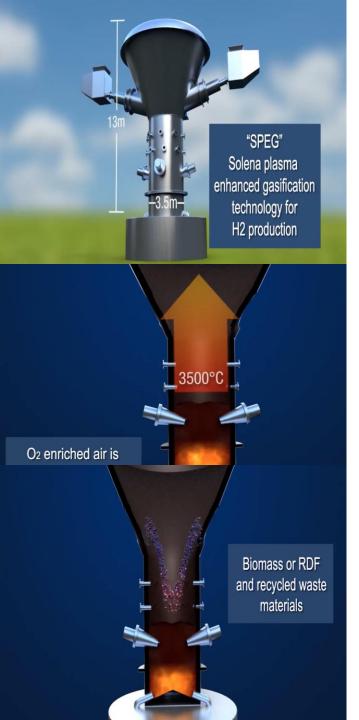
### **Production Plan**

11,000 kilograms of green hydrogen per day, and 3.8 million kg per year – nearly three times more than any other green hydrogen facility – for the next 10 years

Processing 40,000 tons of paper waste annually, saving Lancaster \$50-75 per ton in landfill costs.

Signed 10 year off-take contracts with CEC to supply fuel to 85 of the 120 new hydrogen stations that California is committed to install.

	HYDROGEN TYPES	CARBON INTENSITY	COSTS \$
GREEN HYDROGEN	SGH2 Energy Hydrogen	-188 gCO2eq/MJ	\$2-\$4
	Green Hydrogen (Electrolysis)	0 gCO2eq/MJ	\$10-\$13
HYDROGEN FROM FOSSIL FUELS	Grey Hydrogen (Natural Gas)	+115 gCO2eq/MJ	\$2-\$6 (cost of natural gas)
	Brown Hydrogen (Gasification of Coal)	+20 kg CO2	\$2-\$3
BLUE HYDROGEN WITH CARBON CAPTURE & SEQUESTRATION	Grey Hydrogen	+12 kg CO2	\$6-\$10
	Brown Hydrogen	+20 kgCO2	\$6-\$7



#### Technology utilizes Plasma Torch Heat as additional heating source

Only industrial process to completely extract not only the volatile matter fraction, but also 100% of its fixed carbon fraction into a clean syngas. The carbon conversion into syngas is > 99.99%.

No fly ash, no bottom ash. The only resulting byproduct is a vitrified slag, which is inert and nonleachable, that can be safely used as an aggregate for construction purposes.

### **Recommendation**

## **AMEU for Leadership**

Call for PPP and Investments TALK with the Swiss, Japanese, Americans, ..... Develop the Business Case ... 40 – 50 MW DG Call for Technology Transfer

#### **PEOPLE DEVELOPMENT**

#### AMEU + MUNICIPAL UNDERTAKINGS + ACADEMIA MOA : UJ + AMEU = 100'S PHD'S & MASTER Graduates







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# Thank you



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