Conversion of waste from gasification facilities, refineries, and steelmaking plants to H_2 and/or CO

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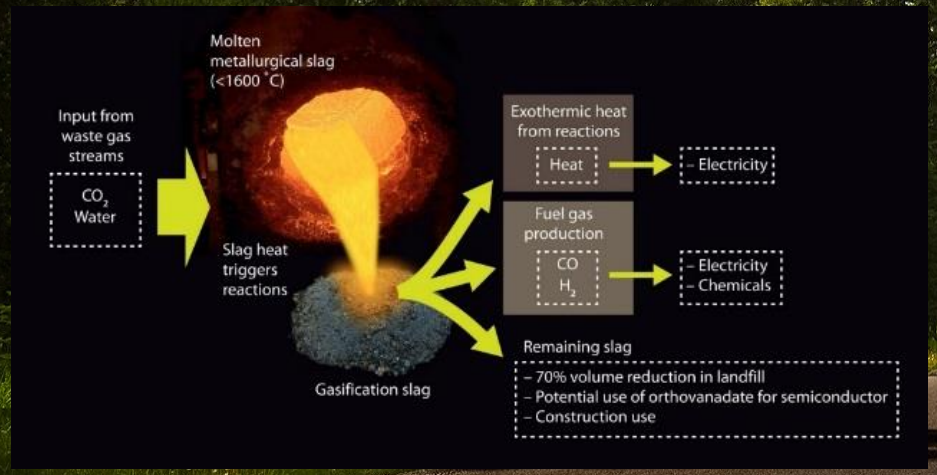
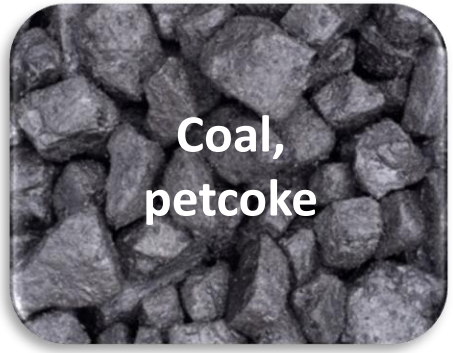


Solutions for Today | Options for Tomorrow

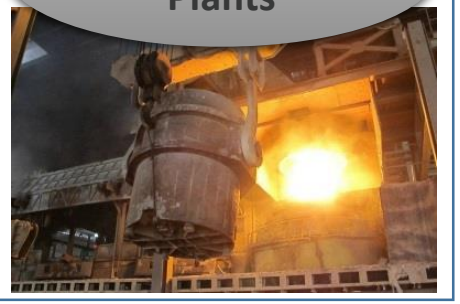
Problems

Carbon feedstock

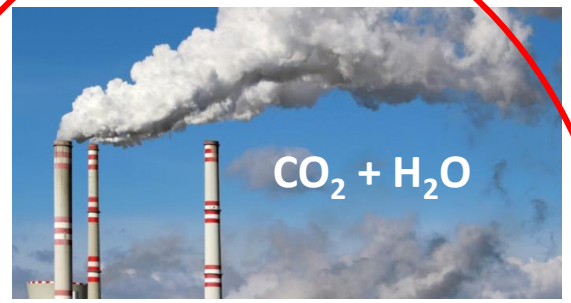


Power/
Gasification
Plants

Steelmaking
Plants



Waste Byproduct



Environmental

Landfill

Ideal resolution

Waste Byproduct

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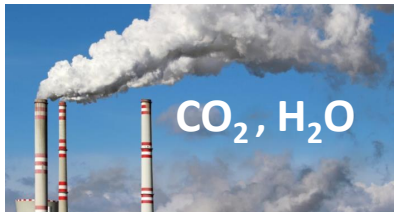
Valuable products?

FUELS!

Approach at NETL – The Slag Conversion

Industrial waste stream



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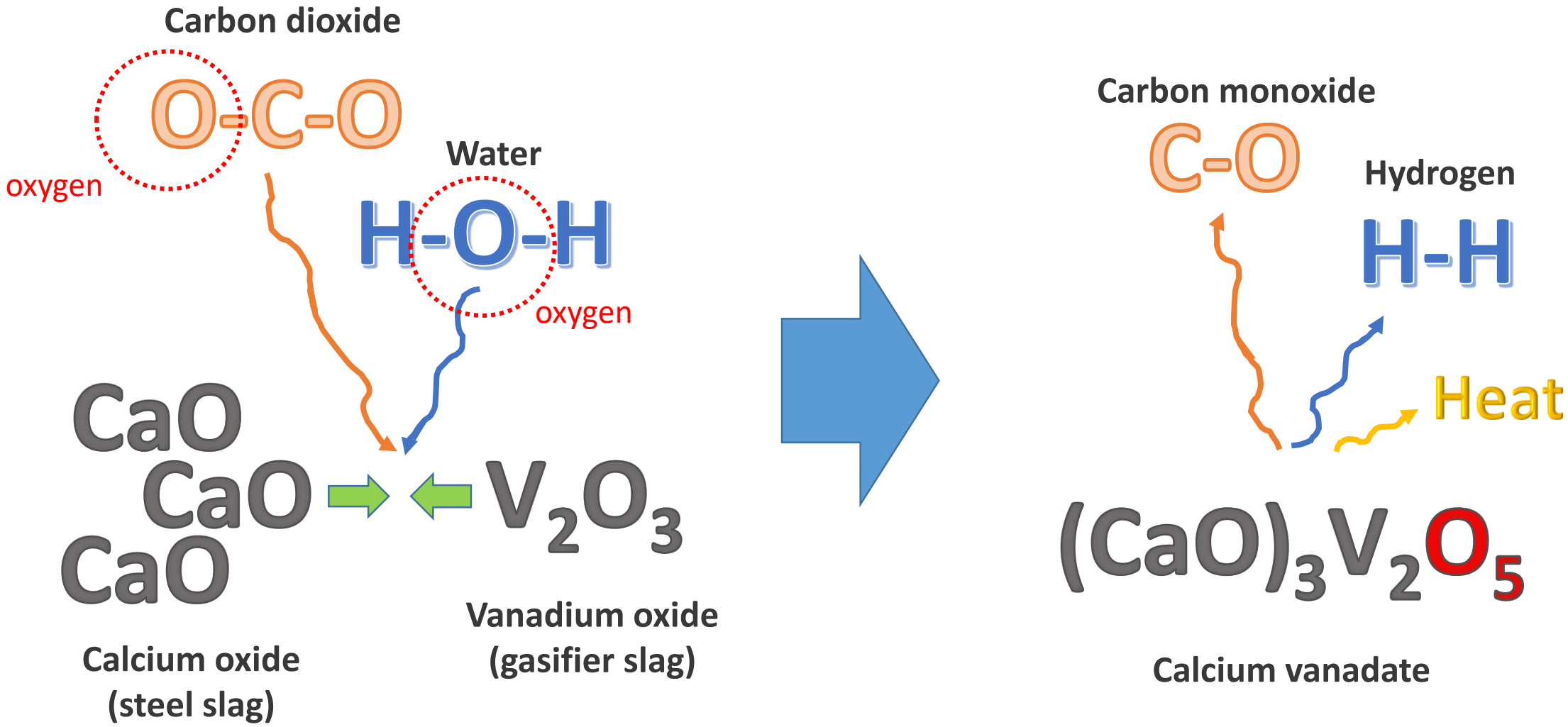
Slag Conversion

Products

Features:

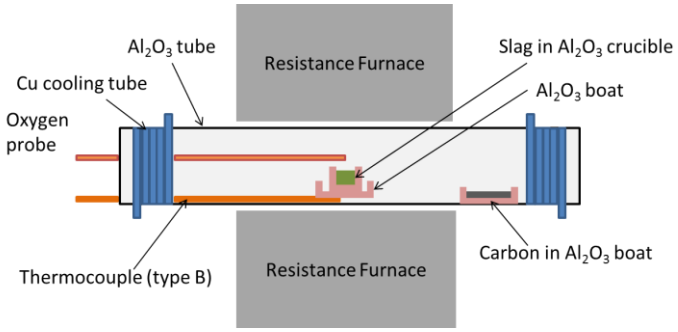
- Only industrial waste
- Simple mixing of slags with CO_2 (and/or H_2O)
- Easy retrofit
- Reduces carbon emission while generating fuels at minimal operation cost
- High conversion rate (99%)

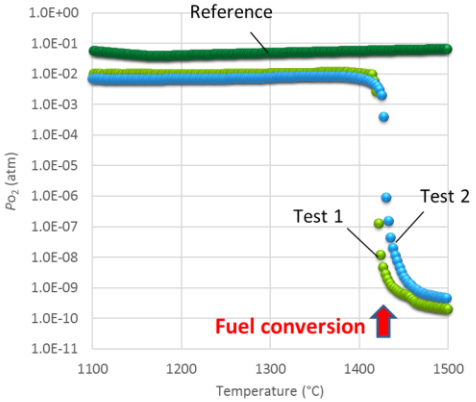
How it Works – The Slag Conversion

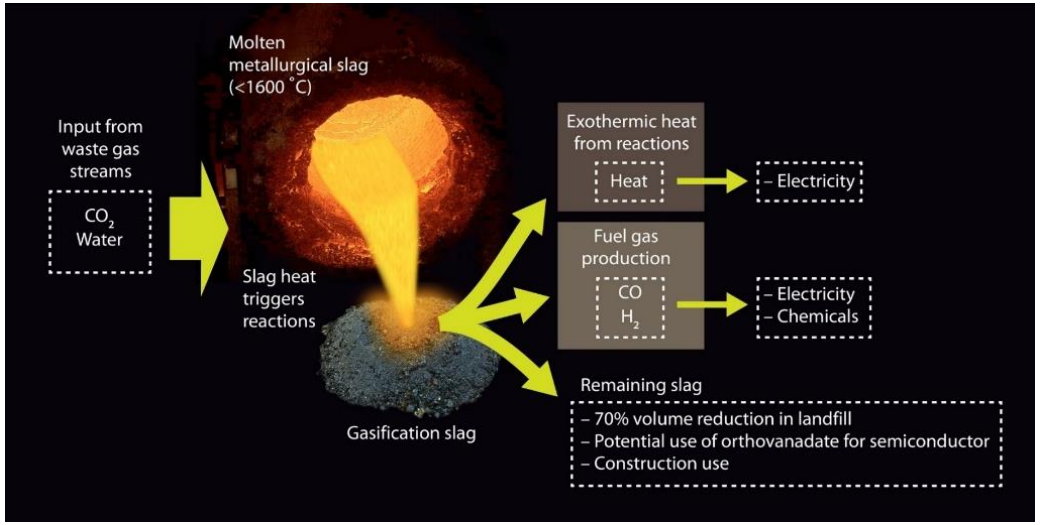


Current Status on Technology

- 2012: Concept proven on lab scale
- 2014: Concept first published in journal (J Int. Hydrogen Eng.)
- 2016 – 2017: Invited conference lectures
- 2017: US patent issued (US9,840,756)
- 2017: TMS Best Professional Energy Paper Award
- 2018: IChemE Global Award for Energy Finalist







Applications

- **Reduction in carbon fuel needs and overall CO_2 emissions at:**
  - Gasification plants, power plants, iron & steelmaking plants, oil refinery facilities, gas producers
- **Chemical and synthetic fuel production using the CO and H_2 generated at:**
  - Chemical companies, gas companies, fuel producers (clean energy vehicles)

EXPECTED if the technology is implemented

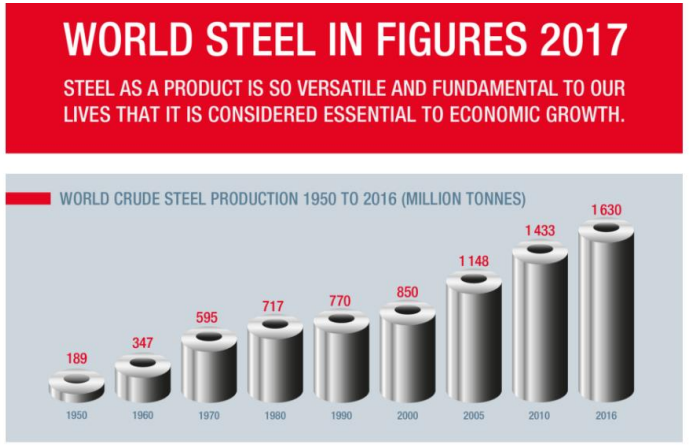
- **Less carbon feedstock required** – reducing operation cost
- **Additional fuel generation** – lowering overall production cost – passed onto the public
- **Additional heat generation (for extra power production)** – extra dollar
- **Reduction in carbon emission**
- **Smaller waste footprint –** less landfill volume

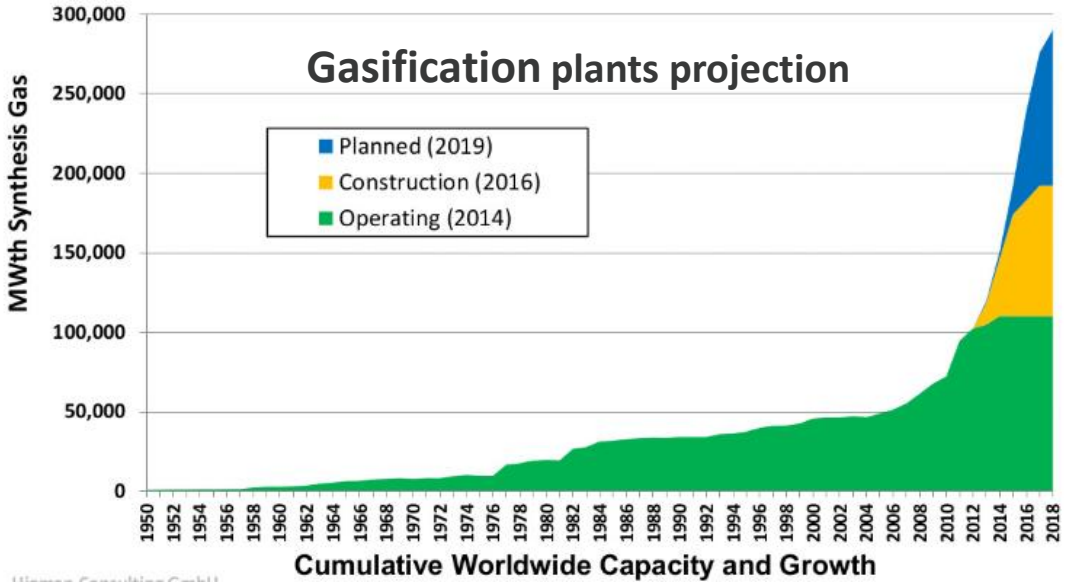
If practiced at	Annual additional power generation	Annual CO_2 mitigation
Steel plant (20 kt steel/day)	195 MW	1 Mt
Perspective profit/savings	$54M – 244M	$50M – $100M

Market Opportunity (Worldwide)

- **960 million tons slag annually generated at steel plants**
  - **= 61 GW** (from this technology)
  - **= $17 - $76 Billion per year**

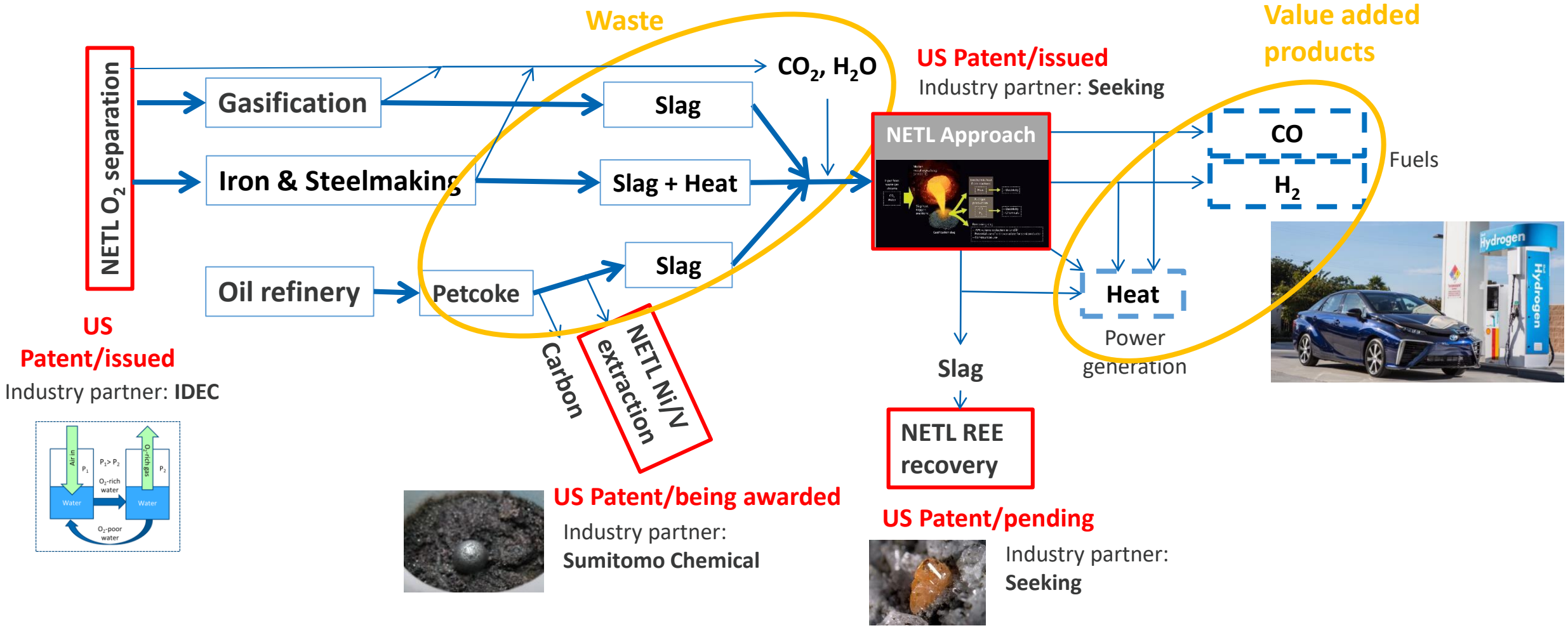
- **14 billion tons CO_2 from power generation per year x Cost of carbon capture and storage ($50-100/t CO_2)**
  - **= $700 Billion - $1.4 Trillion per year**





Future Vision

Combined Efforts → Will Result in Significant Synergy



Thank You

- Contact:

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- NETL Partnership Options
  - Licenses
  - Cooperative Research and Development Agreements
  - Contributed Funds Agreements

- For more Information contact:

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