Future of the Energy Industry with Landfills and the Solid Waste Industry

Marc Pauley

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Mr. Fusion fuels the DeLorean converted to CNG to qualify for RINs

EPA RFS program inspired by Spielberg’s Back to the Future
Federal and State Laws form a foundation

- EPA’s Clean Air Act
- PURPA mandates electricity purchases from renewable fuels such as LFG
- Regulatory mandates around LFG such as NSPS, NAAQS & NESHAP
- Landfills comply and more gas collection systems are installed
- Growth into electricity and medium BTU pipeline applications
Landfill gas evolves as a renewable fuel

- Energy project developers seek LFG as a renewable fuel
- States develop renewable portfolio standards
- CARB sets protocols for Landfill GHG credits and trading platforms develop
- Federal Renewable Fuel Standard developed
Renewable energy: transformation

States & Provinces develop Low Carbon Fuel Standards

Renewable Fuel Standard II passes & RINs mature

IOUs form affiliates & policies around RNG purchase (non-RFS)

Advanced technologies form to produce better renewables

Politicians and big oil lobbies wrangle with EPA and RNG becomes strong

Project developers, banks, private equity, venture capitalists make substantial investments

- Membrane
- PSA
- H2S scrubbing
- De-Oxygenation
- Pyrolysis
- Absorption
- Adsorption
- Amine
Renewable & Clean Energy Standards

30 States + DC have a Renewable Portfolio Standard, 5 states have a Clean Energy Standard (8 states have renewable portfolio goals, 5 states have clean energy goals)

- **Renewable Portfolio Standard**
- **Renewable Portfolio Goal**
- **Clean Energy Standard**
- **Clean Energy Goal**
- Extra credit for solar or customer-sited renewables
- Includes non-renewable alternative resources
Source: EPA LMOP, 2022
RNG Facilities
Operational: 249
Under Construction: 105
Planned: 118
Total: 472

Source: RNG Coalition, 2022
Renewable energy: transformation

Environmental impacts

Economic impacts

Political drivers

US states and Canada with/looking at LCFS programs
Source: The Jacobsen, 2020
Renewable identification numbers (RINs)
Low carbon fuel standard (LCFS)
CAR II - Greenhouse Gas Credits
Landfill gas to electricity (RECs)
Where will the energy market be in 5 years?

- **H2 technologies & applications**
- **CO2 developments & markets**
- **LNG international markets: outlets for LFG-related products**
- **eRINs**
  - EPA currently getting input from stakeholders
Capture the benefits

Innovation and development of technologies to optimize the benefits are on the rise

Value propositions are developed and growing

Stay abreast of the value propositions

Participate in development and regulatory constructs to influence positive benefits

Develop plans to capture & optimize the benefits of landfill operations by-products
A leading global producer of sustainable distributed energy

1,156 MWe
97 sites
5 countries

Diversified asset portfolio

- 468 MWe landfill gas
- 323 MW remote energy
- 71 MW renewables
- 294 MW waste coal mine gas
- 13.6 TJ/day gas delivery (LNG/CNG/LFG)

Australia 761 MW

Number of power stations
Operations in North America

NA asset portfolio

- **267MW** total installed generation capacity
- **29** assets
- **3** operating RNG projects
- **2** RNG plants under construction
- **3** early developing RNG projects

Key

- Office
- Landfill gas
- RNG operations
- RNG project – under construction
- RNG project – under development
Thank you

marc.pauley@edlenergy.com

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