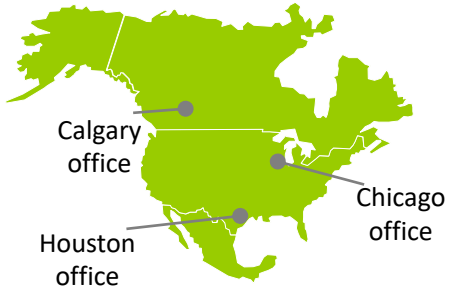
Country showcase for Gas in Transport - North America

Emanuel Grassal, Congreso Gasnam 2019

BP is one of the largest suppliers of renewable natural gas (RNG) to the U.S. transportation sector

- Biogas is a competitive, renewable alternative to conventional fuels. As a vehicle fuel it provides an opportunity to generate RINS under the EPA RFS program and LCFS credits under CARB's LCFS program.
- **We are active in most voluntary and regulatory carbon and renewable fuels markets** including EPA RFS, California LCFS and Cap and Trade.
  - Renewable Identification Numbers (RINs)
  - Low Carbon Fuel Standard (LCFS)
  - California Carbon Offsets (CCOs)
  - Western Climate Initiative (WCI)
  - Regional Greenhouse Gas Initiative (RGGI)



- In 2017, BP acquired the upstream portion of Clean Energy's Renewable Natural Gas business, reflecting our low carbon commitment and **building a platform for long term presence in the rapidly growing renewable natural gas market**.

Potential for renewable natural gas production is significant

Nationwide there are over 2,400 Municipal Solid Waste (MSW) landfills; 632 currently have operational Landfill Gas (LFG) projects

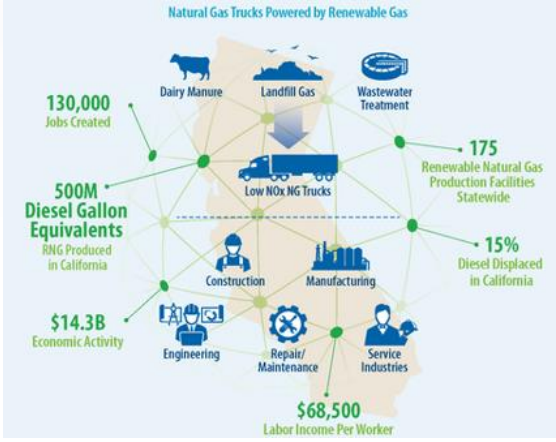
- The EPA states there is an additional 470 sites that are good candidates for LFG projects. Of those operational, only 40 landfills have high-Btu RNG facilities to pipeline (EPA, Landfill Methane Outreach program)

There are over 17,000 wastewater treatment facilities.

- Only 1,200 of these have anaerobic digesters onsite or send their waste to a site (Water Environment Federation, Biogas data)

Biogas recovery systems are technically feasible at over 8,000 large dairy and hog operations in the US

- Currently only 260 agricultural facilities have operational anaerobic digesters (EPA AgStar)



2030 Potential - Infographic from "Economic Impacts of Deploying Low NOx Trucks fueled by Renewable Natural Gas" - ICF, 2017

A renewable fuel pathway has three components – feedstock, production process, and fuel type

1. **Biogas Production Facility must complete an Engineering Review** by an approved provider once the facility is "mechanically complete" and producing Biogas.
2. **Biogas must enter a "common carrier system"** to be eligible to generate RINs under the RFS.
   - The definition of "common carrier" by the EPA includes Interstate and Intrastate Pipelines, and Local Distribution Systems.
   - Biogas must meet pipeline quality specifications
3. **Two Pathways must be satisfied to receive EPA Pathway Approval.**
   - Physical Pathway – Party(s) must demonstrate a theoretical physical pathway that links the Biogas Production Facility with the Vehicle Fuel Producer - EPA allows for displacement of molecules – no auditable trail required.
   - Contractual Pathway – Party(s) must prove via affidavit the link between the Biogas Production Facility and Vehicle Fuel Producer and each party that held title in between.

Fuel Type	Feedstock	Production Process	D Code
Renewable CNG/LNG	Biogas from landfill	Any	D3

Headwinds for Natural Gas in Transport

Cost of RNG Production is higher than long-term Natural Gas Prices
Economically sustainable production depends on long term monetization of environmental attributes to close cost gap or breakthrough in production

Demand side - We need more RNG trucks on the road
"With Friends Like These….." Opposition from the environmental community against programs that involve internal combustion engine which will hamper efforts to build RNG vehicle fuel demand

Infrastructure build - Connecting the biomass feedstocks for RNG to existing distribution systems is expensive and unclear who will provide the capital to do so in a cost effective way

Regulatory Uncertainty – Regulatory programs (LCFS, RFS, RPS programs) drive market and are inherently uncertain.