



EXPANSION  
ENERGY

# “VX™ Cycle”

Ultra-Small-Scale and Mid-Scale  
LNG Production Technology

## Overview of Expansion Energy LLC

- Created & patented the “VX™ Cycle” technology
- Energy technology development firm
- Core technological expertise:
  - Cryogenics
  - Processing of gases
- Business model: Technology licensing; strategic alliances
- Headquarters: Metro New York City, USA
- Technology portfolio (partial)
  - Liquefied natural gas (LNG) production
  - Waterless fracturing & EOR technology (avoids use of water & chemicals)
  - Utility-scale & commercial-scale power storage
  - Carbon capture & sequestration
  - Coal ash (CCR) processing / clean-up

**[www.expansion-energy.com](http://www.expansion-energy.com)**

## Patented “VX™ Cycle” LNG Technology Overview

- **Mobile** LNG production plants
  - Trailer-mounted or skid-mounted
  - Factory-built / turnkey
  - Fully functional within days/weeks of arrival at deployment site
- Ultra-small-scale LNG production
  - As low as 1,500 gallons/day (GPD)
  - Far smaller than competing technologies
- A methane expansion cycle – methane is both the product and the refrigerant
- Gas-to-LNG conversion efficiency of 70-75% for < 10,000 GPD plants
  - Efficiency is higher (> 80%) at larger scales or with higher-pressure feed gas
- Produces its own power ➡ No connection to the electrical grid is required
- Can be fully automated ➡ No continuous labor required
- Ambient temperature rating: -40° F to 110° F
- Additional option: Separation of NGLs (propane, butane, etc.) from the feed gas

# “VX™ Cycle” Applications

## Upstream

- Monetize associated gas at oil wells
  - Eliminate gas flaring
- Separate NGLs from feed gas (optional feature)
- Stranded gas fields w/o pipelines
- LNG fuel to replace diesel for:
  - Drilling rigs
  - Hydraulic fracturing pumps
  - Field trucks
  - Construction equipment
  - Distribution to nearby retail LNG fueling stations
- Offshore oil & gas platforms

## Midstream

- LNG for shipping to remote communities & gas “microgrids”
- LNG for shipping to remote industrial & mining/quarry sites
- Peak-shaving gas storage facilities

## Downstream

- “Distributed” production of vehicle-grade LNG at fueling stations (replaces diesel fuel)
- Eliminates the need to truck LNG from large, centralized plants to distant fueling depots
- Upgrade existing CNG stations
- Clean, inexpensive LNG fuel for:
  - Long-haul/heavy-duty trucks
  - Delivery fleets
  - Railroad locomotives
  - Marine (ships/barges/ferries)
  - Construction & mining equipment

## “VX™ Cycle” Advantages

- Mobility – trailer-mounted or skid-mounted plants
- VX methane expansion cycle provides:
  - High efficiency – uses an optimal balance of refrigeration & compression + uses waste heat/cold
  - Low capital cost
  - Low operating costs
- Simplifies LNG production vs. other LNG technologies such as: Mixed Refrigerant Cycles / Nitrogen Cycles / Cascade Cycles
  - Less complex equipment
  - Fewer process inputs (e.g., no separate refrigerants to ship in; no “make-up” refrigerants)
  - Less sensitive to ambient temperatures
- Can utilize virtually any high- or low-pressure feed gas
  - Pipeline gas from local gas distribution systems or interstate pipelines
  - Well gas
- Small, modular VX plants allow for incremental expansion with low capital risk
  - Use of multiple modules ensures a higher % of uptime



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# Contact Information

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