

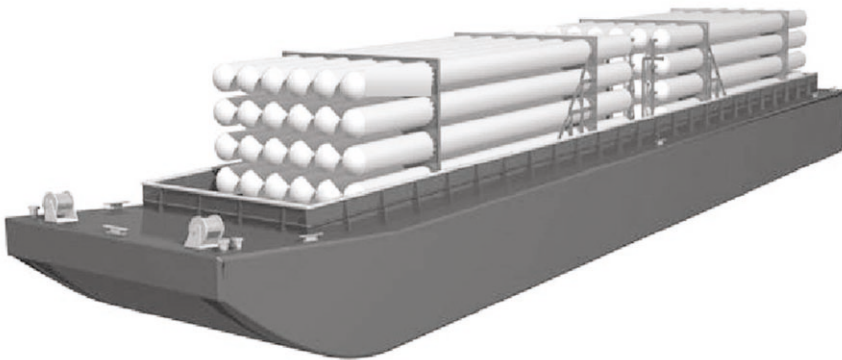
# Fuel Transport Modules



## New Lightweight Natural Gas Modules Allow for More Efficient Alternative Fuel Vehicles

One of the prerequisites for a natural gas vehicle is that the weight of the fuel tanks not be too great. Norman Fawley, NCF Industries, with the aid of a grant from the Inventions & Innovation Program, designed, built, and tested a lightweight compressed natural gas (CNG) transport module. The module consists of an Al tube on the inside and glass filament reinforced with resin on the outside. The tubes were pressure and fire tested and are rated up to 3000 psi. Natural Gas Vehicle Systems used these 13-inch diameter tubes to convert vehicles to use natural gas from 1989 to 1999. The container modules and licensing are available from NCF industries.

The license was sold in 1999 to TransCanada Pipelines who are producing tubes with a 42 inch diameter that will be used to transport CNG. The Gas Transport Modules (GTMs) consist of a low-alloy, high strength steel pipe that has high strength fiberglass films impregnated with resin wrapped around the pipe. This increases the strength of the vessel while the weight is only 60% of an equivalent steel vessel. The GTMs are up to 80 feet long and 42 to 60 inches in diameter. The GTMs are undergoing the technical and certification processes necessary before putting them to work in transporting and storing natural gas. They are being designed for ship, barge, truck, or rail transportation modes. GTMs will be used in places where a pipeline is not economically justified either due to distance or to the amount of gas needed. They provide market flexibility while avoiding the environmental issues associated with pipelines.



*Gas Transport Modules being Shipped by Barge*

## Overview

- ◆ Designed and tested by Norman Fawley of NCF Industries
- ◆ NGV Systems used the modules until they were sold in 1999
- ◆ Licensed to TransCanada PipeLines, Ltd. in 1999

## Applications

- ◆ Modules are used on natural gas vehicles for fuel storage and for hydrogen transportation
- ◆ Larger modules (up to 60 inch diameter tubes) are being developed to transport natural gas

## Capabilities

- ◆ Lightweight aluminum transport tubes allow natural gas to be used as fuel on alternative gas vehicles.
- ◆ Larger modules make transportation of gas to remote regions cheaper.

## Benefits

- ◆ Has superior fracture and tear control compared to all steel vessels.
- ◆ Resists corrosion compared to traditional steel pipes and vessels.
- ◆ Has 40% less weight per volume transported than all-steel CNG transport alternatives.