

Assessment of Natural Gas Loss from the Well-to-Tank Value Chain of Natural Gas Based Transportation Fuels: CNG and Methanol

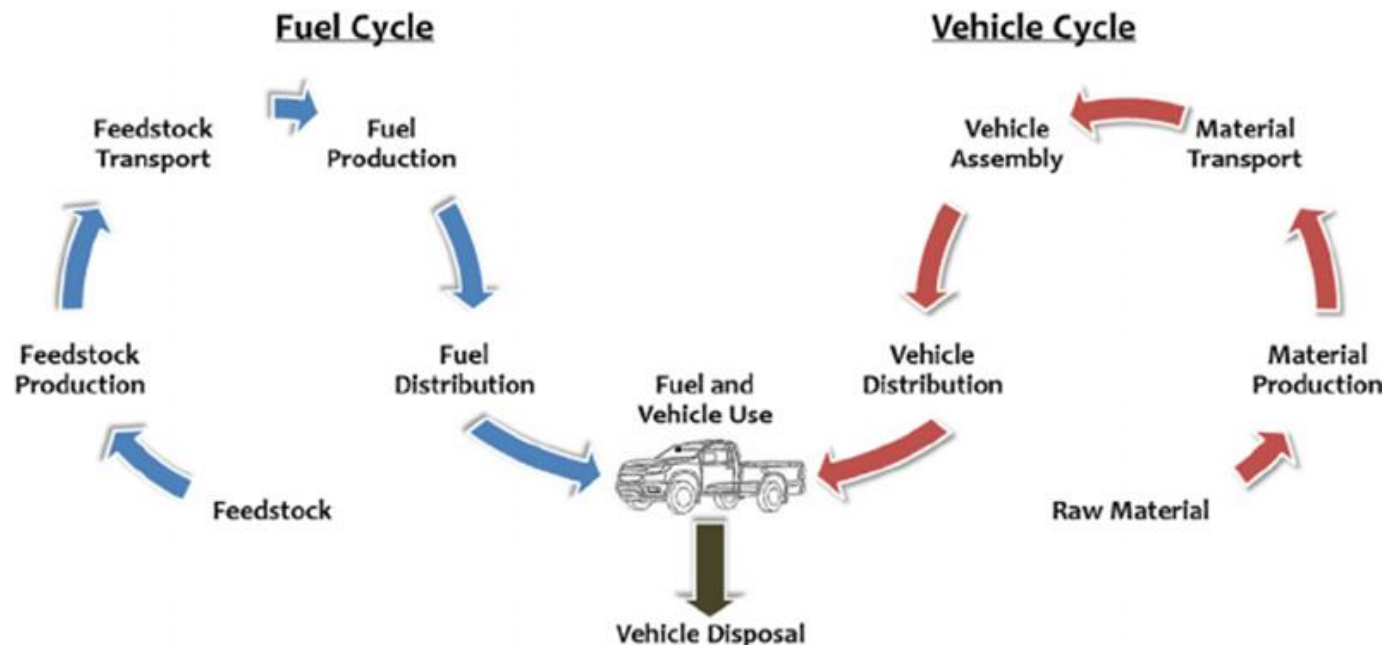
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Background

- ‏ A new study was initiated in March 2017 to assess natural gas loss from the fuel cycle of natural gas based transportation fuel
- ‏ The study is funded by the Ministry of Environmental Protection and the Fuel Choices Initiative
- ‏ The presentation will describe the rationale and goals for the study
- ‏ Final results will be available in about 2-years

Study Goals

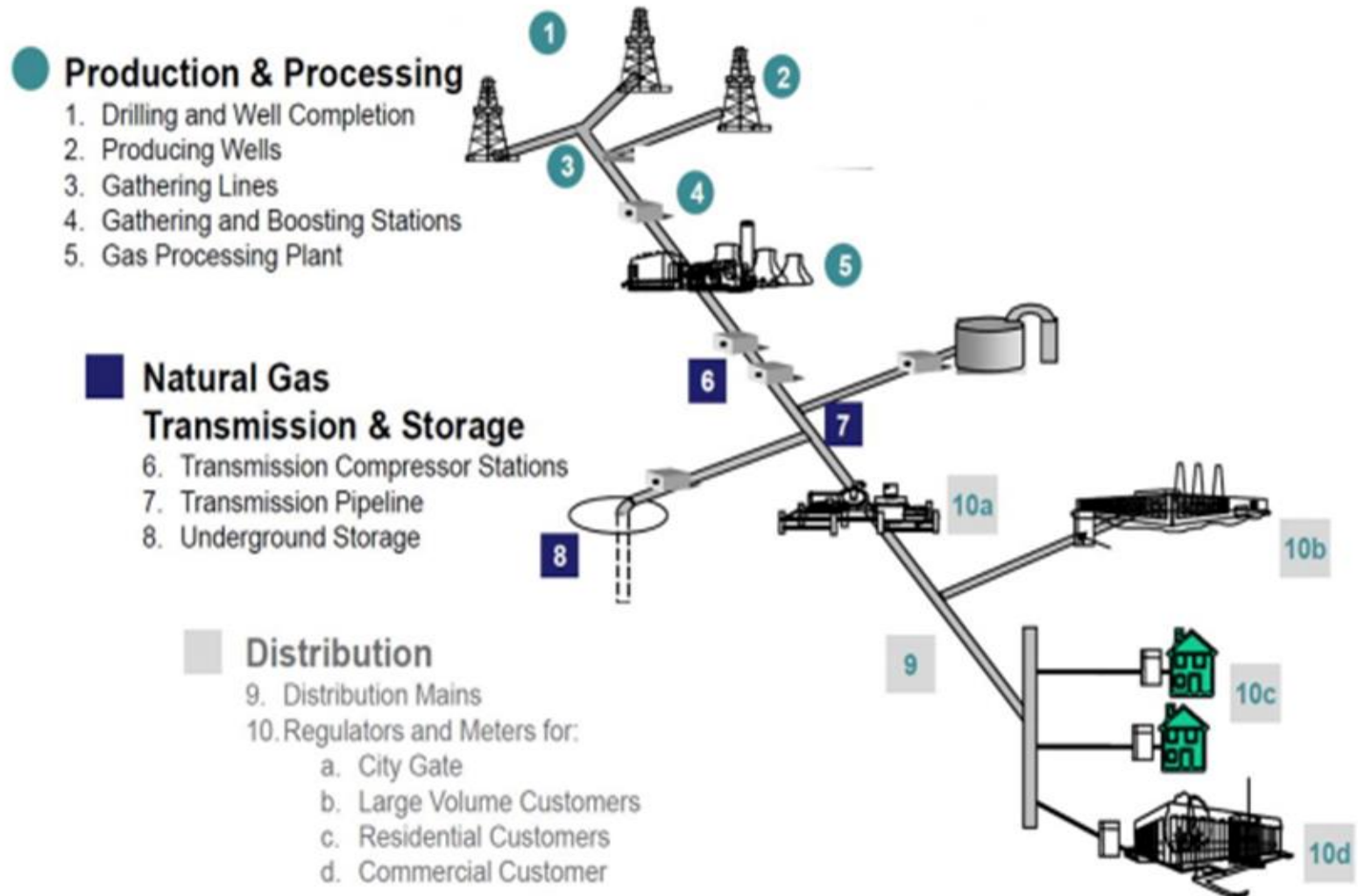
- Assemble a data base containing the most recent literature and data on NG loss rates from various segments of the NG based fuels value chain;
- Evaluate the potential impacts of a set of NG based transportation fuels in terms of NG loss, venting, flaring and leakage and their associated GHG emission rates;
- Develop NG loss and energy balance scenarios to understand the contribution of the upstream value chain and the fuel pathways considered;
- Describe optional policy considerations for minimizing NG loss and GHG emissions.



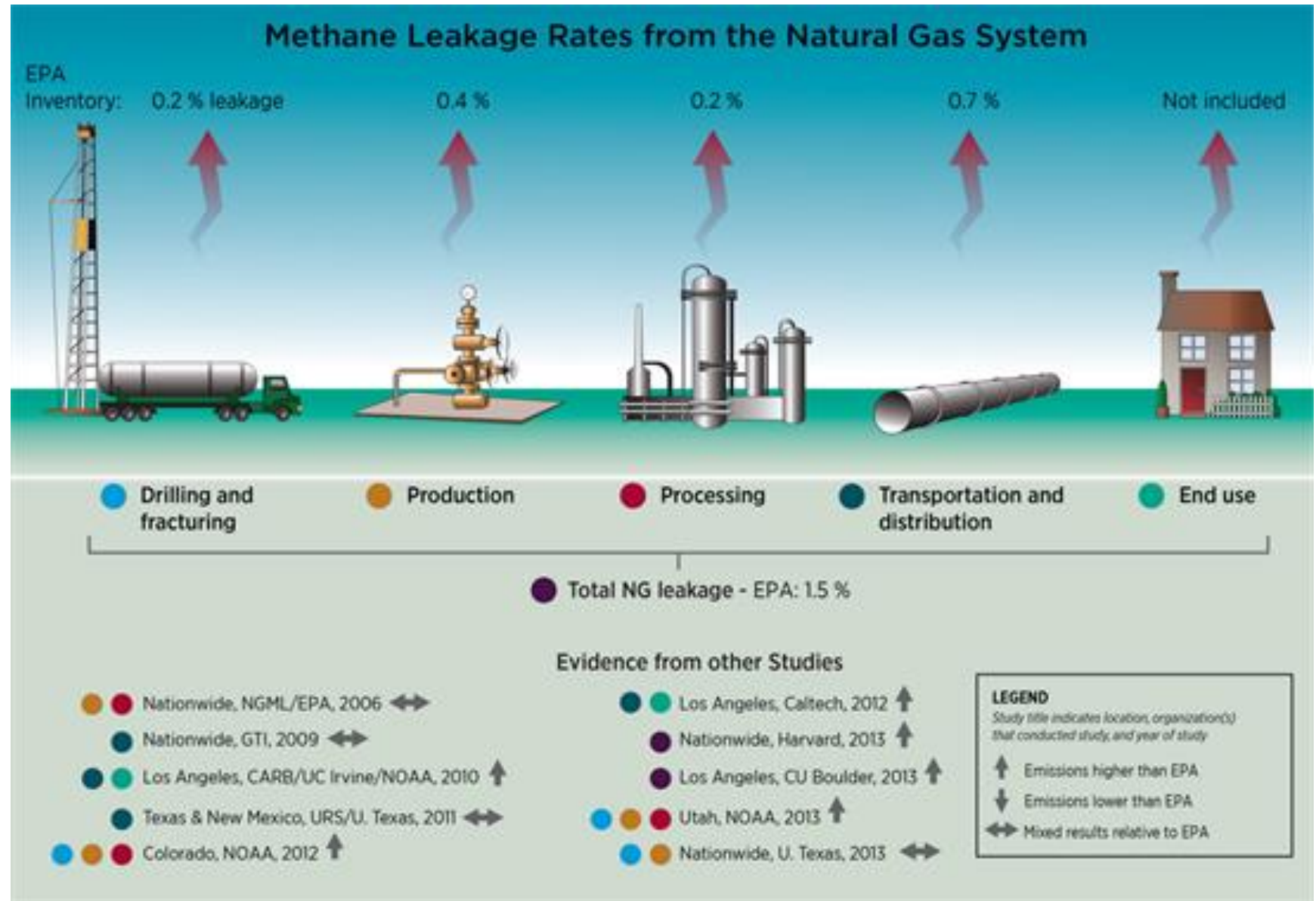
Study Tasks

1. Collection and summary of recent scientific information on typical loss rates and GHG emissions from the Upstream NG value chain:
2. Assessment of comparative data for each of the segments of the Upstream NG value chain obtained in Task 1 including
3. Collection and summary of recent scientific information on NG loss and GHG emissions associated with the use of NG for manufacturing alternative transportation fuels including:
4. Integration of all the data collected and analyzed in Tasks 1-3 and the development of a summary report that will be comprised of:
5. Assessment of all the integrated results obtained in Task 4 to enable the comparison of the different fuel pathways

Natural Gas Life Cycle



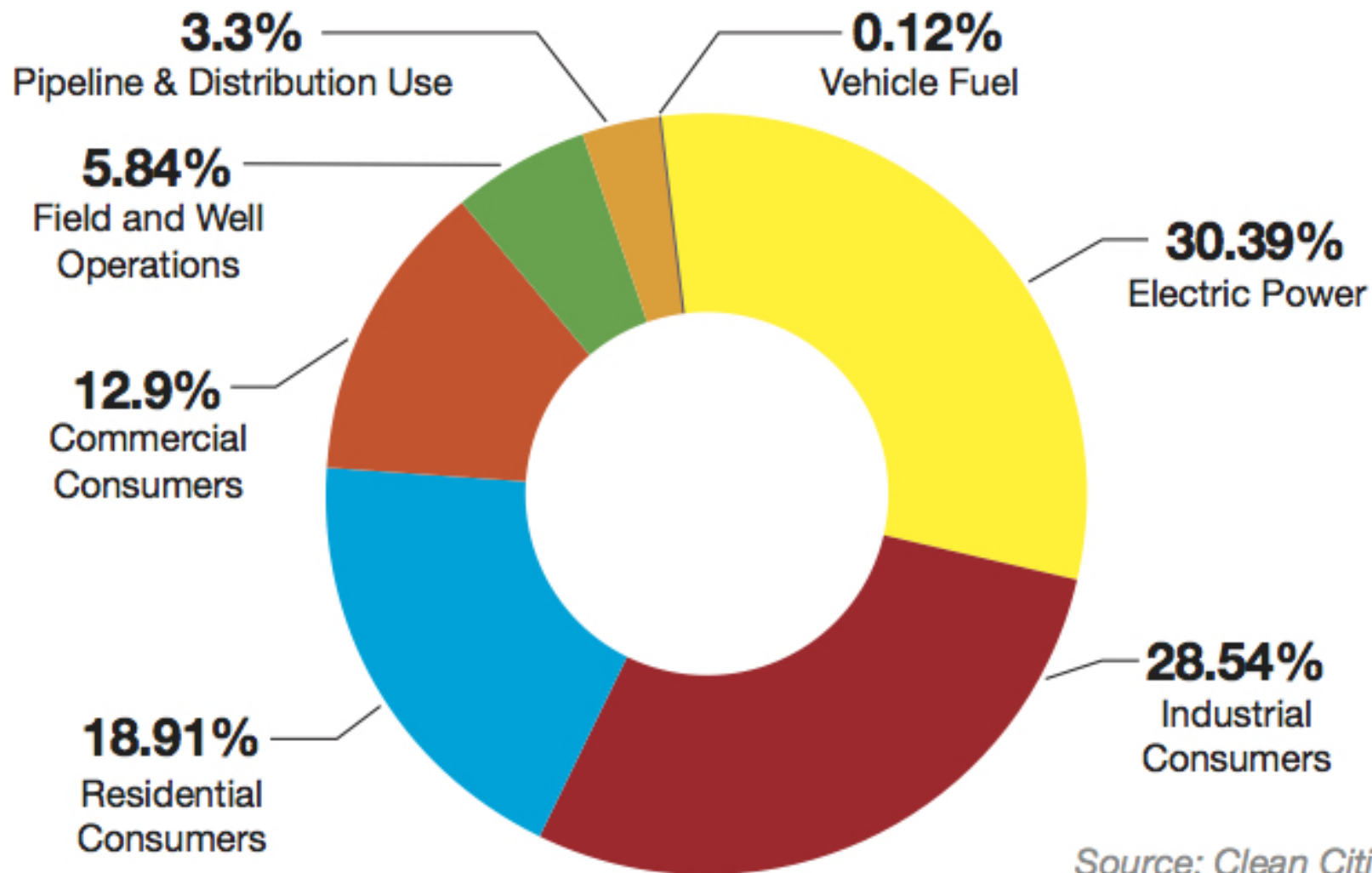
Source:
EPA 2014



Source: Methane leak rates specified in Science paper, "Methane Leaks from North American Natural Gas Systems." - *Stanford University/Science* (2014)

CONSUMPTION OF NATURAL GAS IN THE U.S.

As of July 2015



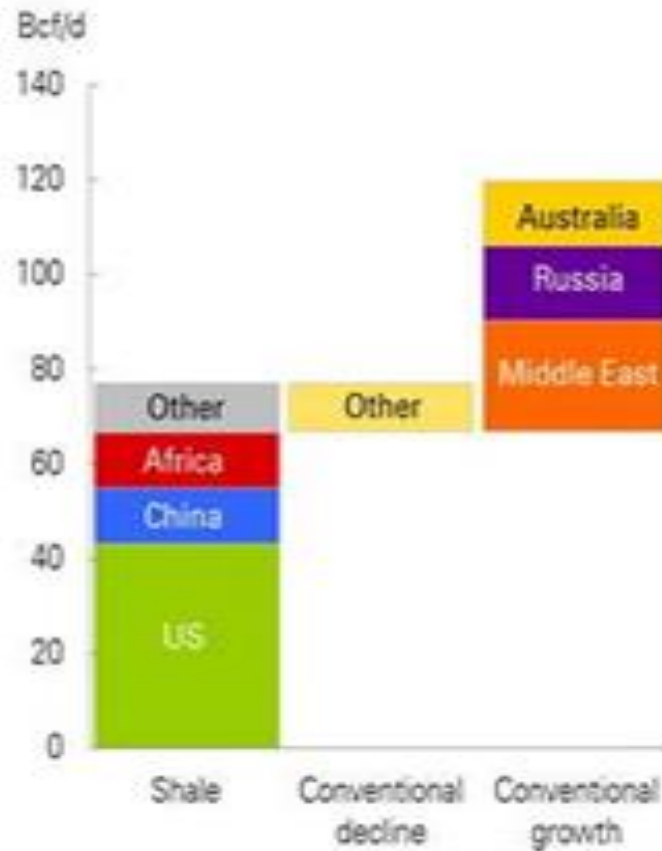
Source: Clean Cities

Base case: Natural gas

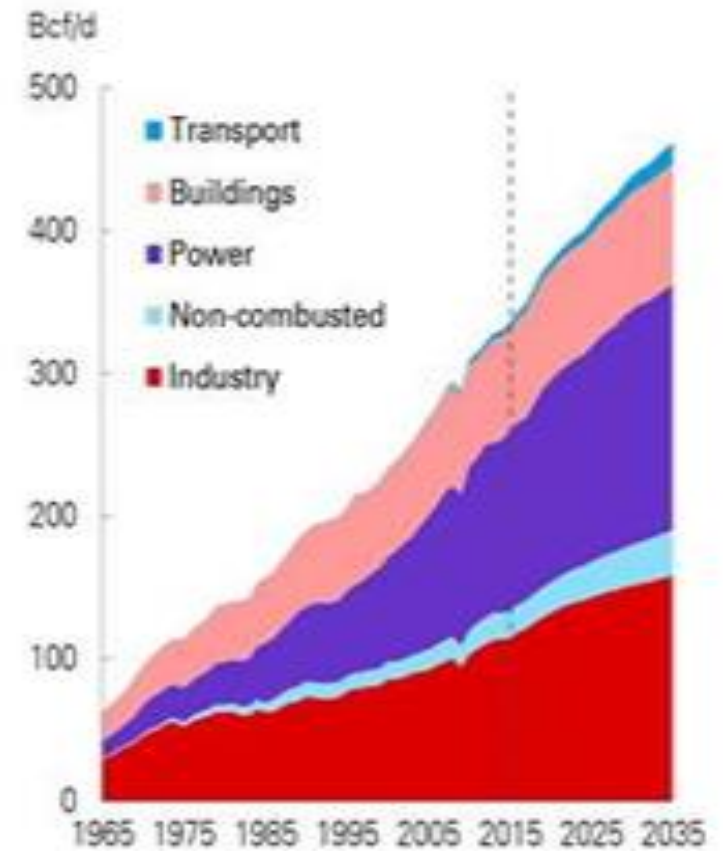


Strong growth in global gas supplies led by US shale...

Gas supply growth 2015-2035



Gas consumption by sector



Regional Growth of Natural Gas Vehicles

- ▮ Natural Gas Vehicles are expected to exceed 30 millions by 2024
- ▮ Most of the growth is in the Asia-Pacific region

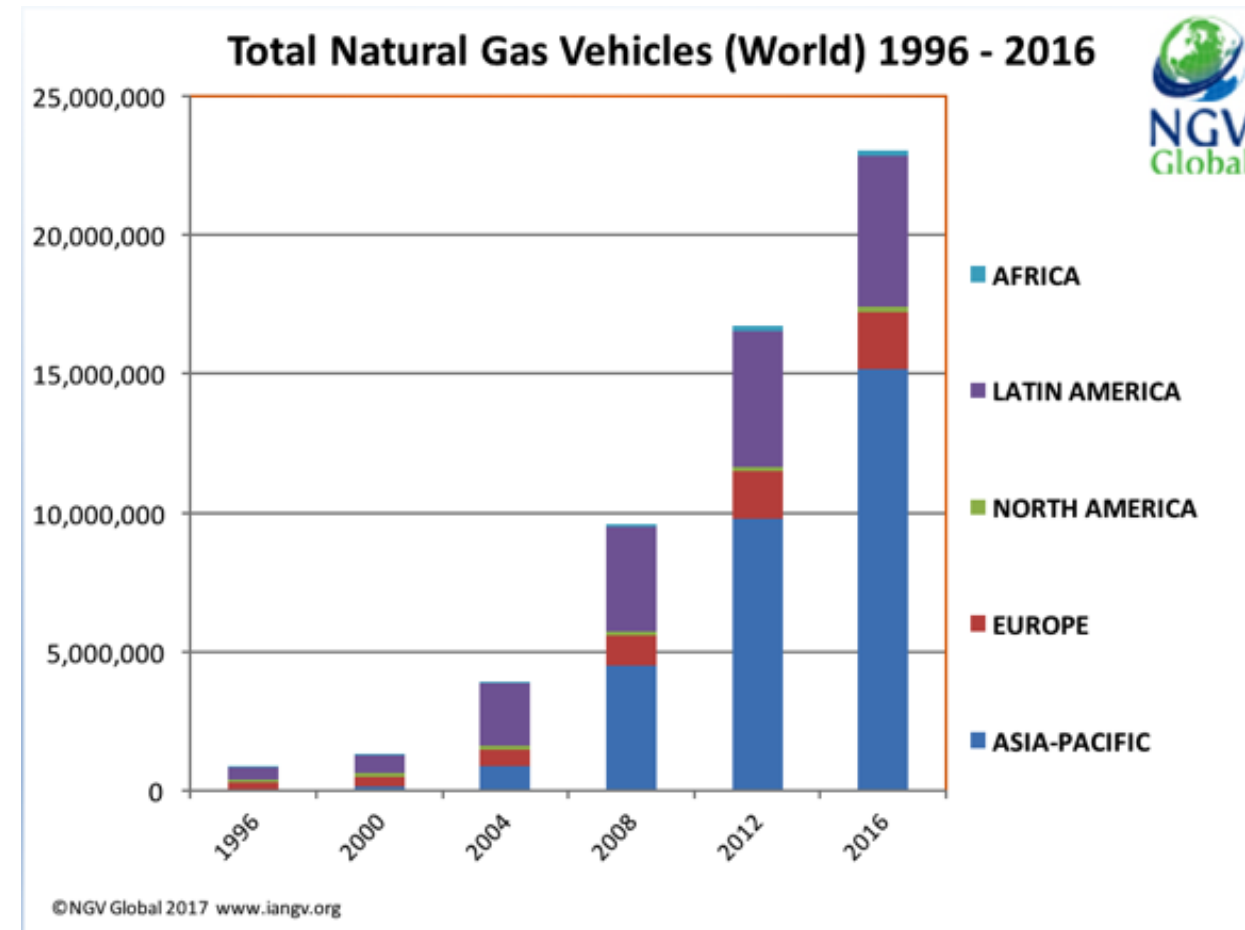
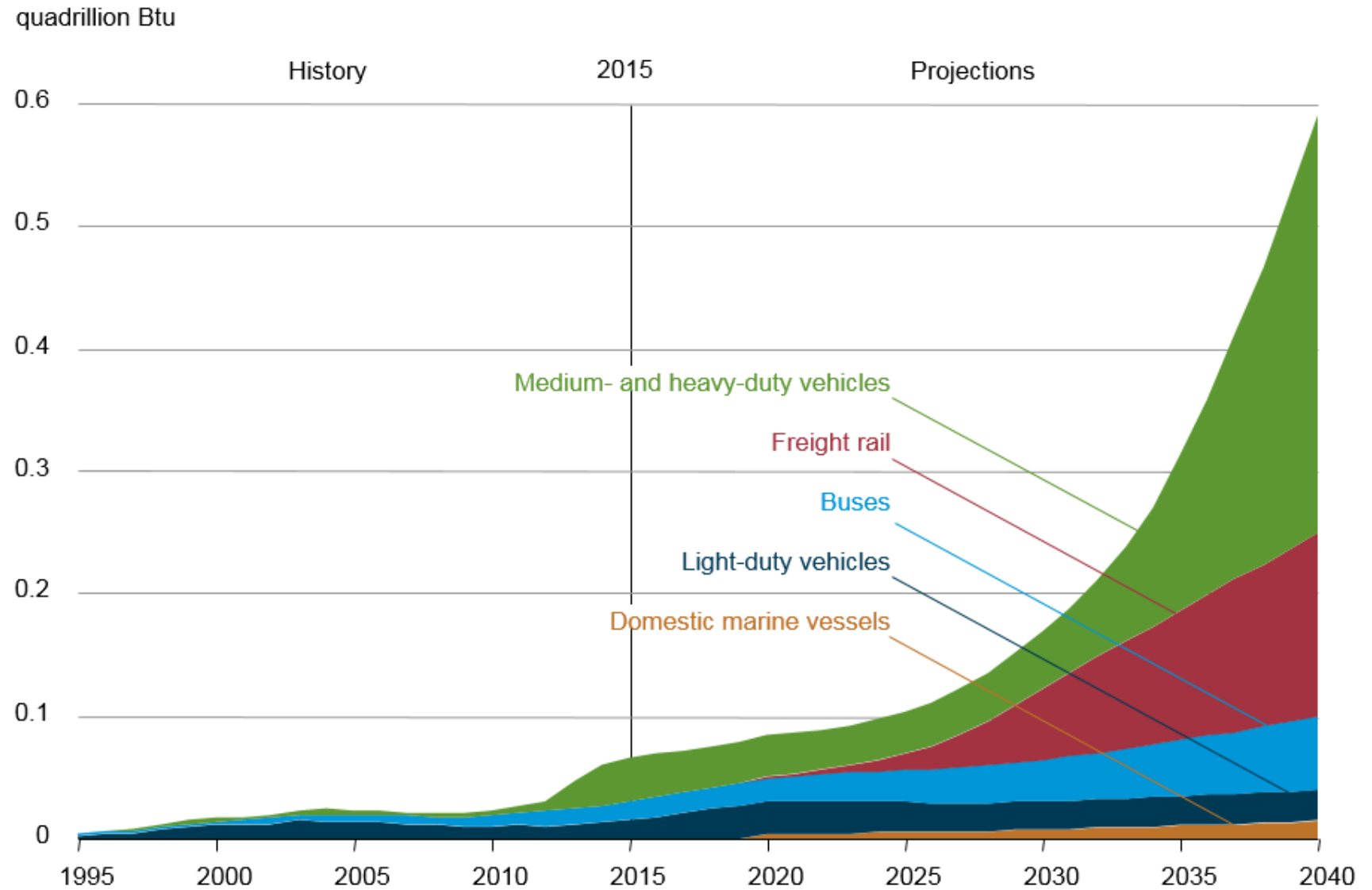
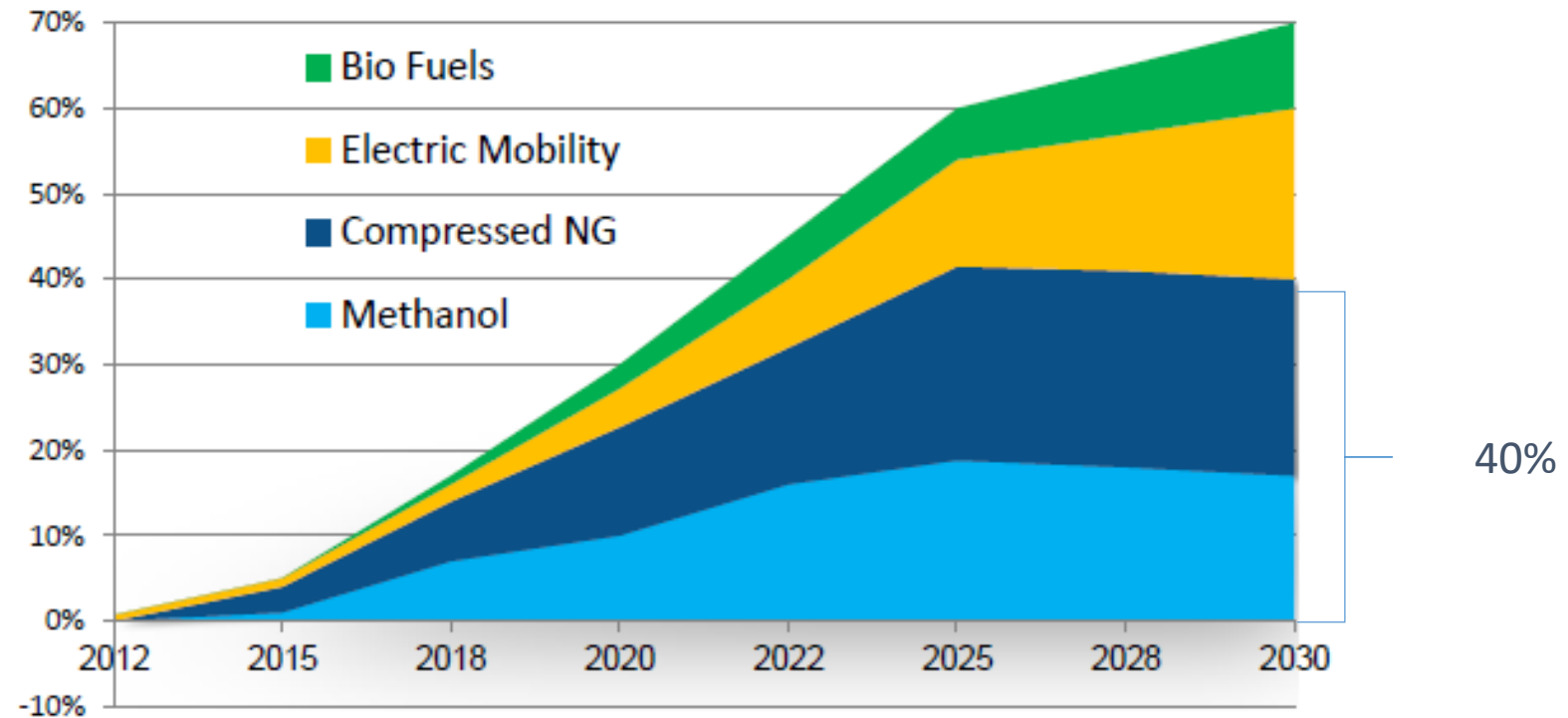


Figure MT-26. Transportation sector natural gas consumption by vehicle type in the Reference case, 1995–2040



Reduce the usage of oil In Israel

Expected Penetration Rate for Alternative Fuels in Israel



Preliminary Information

- ▮ Many fuel pathways specified in GREET (Greenhouse Gas Road Emission Estimation Tool) developed by the Argonne National Laboratory in the US
- ▮ Recent (2015) CNG fuel cycle efficiency as summarized by National Renewable Energy Laboratory (NREL):
 - **92%** - production, processing, transmission (high pressure)
 - **99%** - Natural gas distribution
 - **98%** - Natural gas compression
- ▮ Need to investigate the latest on the efficiency of conversion of methane to methanol for use as an alternative fuel



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Fast-Fill Station

