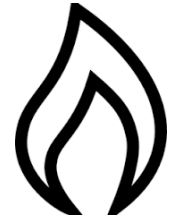


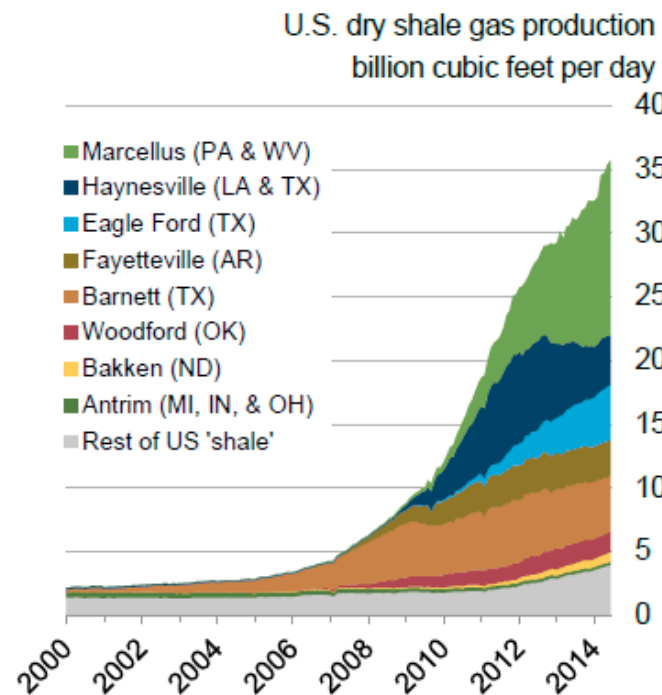
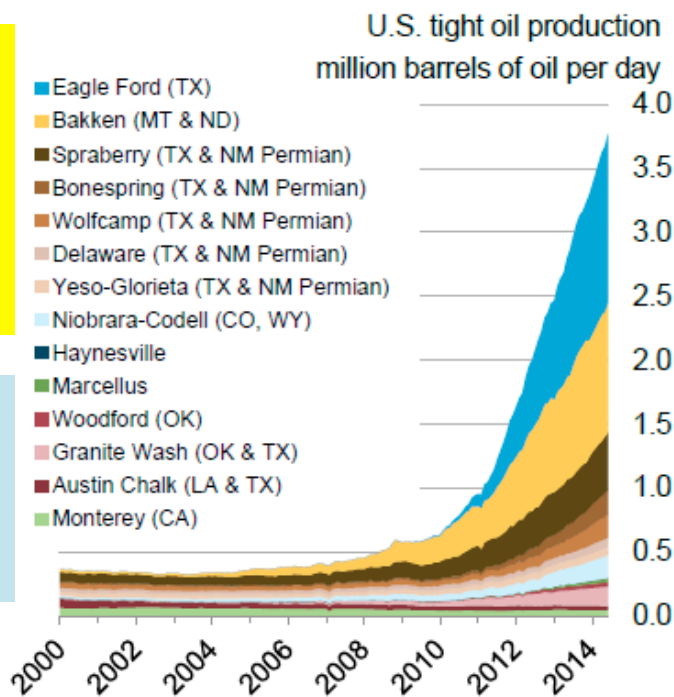
Air Impacts of Oil and Natural Gas Production



The surge in tight oil and shale gas exploration and production operations in the US has raised concerns about their immediate local air quality impacts and also longer term climate impacts of fossil fuel production and use.

US tight oil production
4 million
bb/day in
2014

US daily oil
consumption
19 million
bbl



US shale gas
production
35 Bcf/day
in 2014

US daily gas
consumption
60-100 Bcf

Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through June 2014 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

**Local / Global
Forces**

Energy
Markets

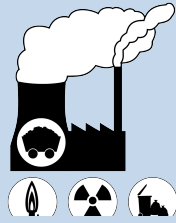
Energy
Systems
Infrastructure
(incl. access)

*Policies/
Regulations*

Costs

*Technology
Readiness*

Energy Demand



**Local / Global
Impacts**

Environmental

People and
animal welfare

Climate

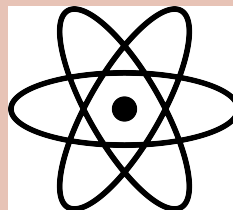
Air Quality

Water

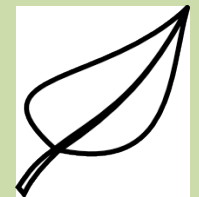
Land use, soils

**Societal,
Political...**

Finite Energy Sources



Renewable Energy Sources



Local / Global Forces

Energy Markets

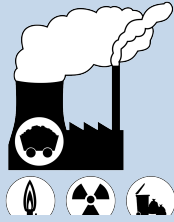
Energy Systems
Infrastructure
(incl. access)

*Policies/
Regulations*

Costs

*Technology
Readiness*

Energy Demand



Local / Global Impacts

Environmental

People and animal welfare

Climate

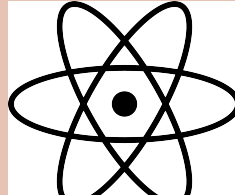
Air Quality

Water

Land use, soils

**Societal,
Political...**

Finite Energy Sources



Renewable Energy Sources





Research Questions



- Emissions of air pollutants at facility level and regional scale
 - Greenhouse gases
 - Ozone precursors
 - Air toxics
- Contributions to local air quality standards violation
 - Winter or summer surface ozone pollution

Research Tools

- Observations of air composition and meteorology
 - Mobile: instrumented vehicles, aircrafts, balloons, satellites
 - Fixed: surface stations or towers
- Empirical and Engineering Models
 - Emission inventories
- Numerical Models
 - Air quality modeling (local, regional, global)

