The Hydrocarbon Age?

Here?

Here?
Can We Eliminate Hydrocarbons?

Hydrocarbon Use on Earth
- Energy
- Plastics & Polymers
- Petrochemicals
How much energy does it take (on average) to produce 1 kilogram of the following materials?

- **Iron** (from iron ore): 20-25 MJ (5,550 to 6,950 watt-hours)
- **Glass** (from sand, etcetera): 18-35 MJ (5,000 to 9,700 watt-hours)
- **Steel** (from iron): 20-50 MJ (5,550 to 13,900 watt-hours)
- **Plastics** (from crude oil): 62-108 MJ (17,200 to 31,950 watt-hours)
- **Aluminum** (from a typical mix of 80% virgin and 20% recycled aluminum): 219 MJ (60,800 watt-hours)
- **Silicon** (from silica): 230-235 MJ (63,900 to 65,300 watt-hours)
- **Aluminum** (from bauxite): 227-342 MJ (63,000 to 95,000 watt-hours)
- **Titanium** (from ore concentrate): 900-940 MJ (250,000 to 261,000 watt-hours)

Source: [http://web.mit.edu/ebm/www/publications.htm](http://web/mit.edu/ebm/www/publications.htm)
Global Energy Consumption Is Going to Increase – (Why?)
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Population Statistics
China: 1.3 Billion (19.4%)
India: 1.2 Billion (17.5%)
USA: 317 Million (4.5%)
Where do we get energy?

Aug 2016
Shale gas production has declined 2.4 Bcf/d since February 2016

All shale gas plays have declined

EIA World energy consumption by fuel type

Source: EIA Natural Gas Weekly Update & Labyrinth Consulting Services, Inc.
Plastics & Polymers
Petrochemicals Predominate
Can We Eliminate Hydrocarbons?  (Probably Not)

Hydrocarbon Use on Earth
- Energy
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- Petrochemicals
Regional Gas Demand

- 3 BCF/Day to Canada
- Shell Cracker
- PTT Cracker?
- Dominion Cove Point LNG Export
Crude Oil vs Natural Gas Prices

• Will they decouple further?
• Will a separate ‘gas’ market develop?
  • Petroleum Feedstocks from gas are cleaner, cheaper
• Regional Market?
  • Ethane Crackers in PA, OH, WV
Where are the Jobs? **Everywhere!**

Electromechanical, automation, process controls and measurement are key components of all of these industries.
Petroleum Degrees at Stark State College are designed to have broadly applicable skill crossover to support the resurgence of the Appalachian Basin Economy.