

Major variables affecting decision points along the natural gas value chain

Marcellus/Utica focus



Natural Gas Utilization Workshop Overcoming Hurdles of Technology Implementation

November 1-3, 2016

Waterfront Place Hotel, Morgantown, WV

Solutions for Today | Options for Tomorrow

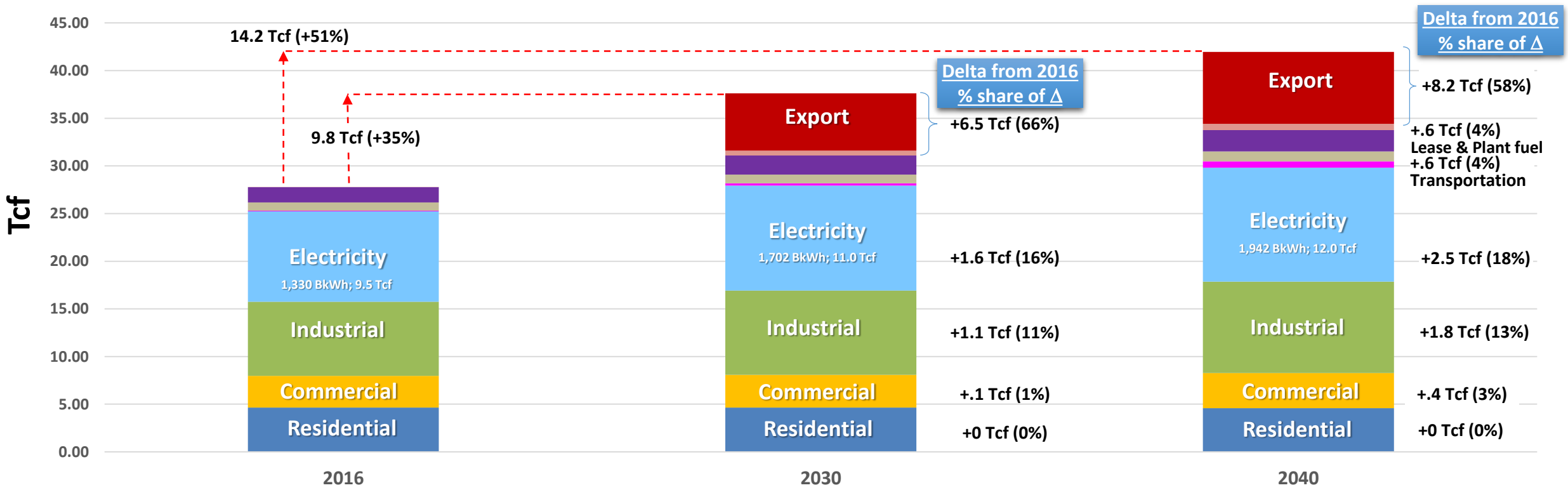


Incremental NG Consumption by Sectors

EIA's Annual Energy Outlook 2016 Reference Case



- Residential
- Commercial
- Industrial
- Electric Power
- Transportation
- Pipeline Fuel
- Lease and Plant Fuel
- Liquefaction for Export
- Net Positive NG exports (pipe+LNG)



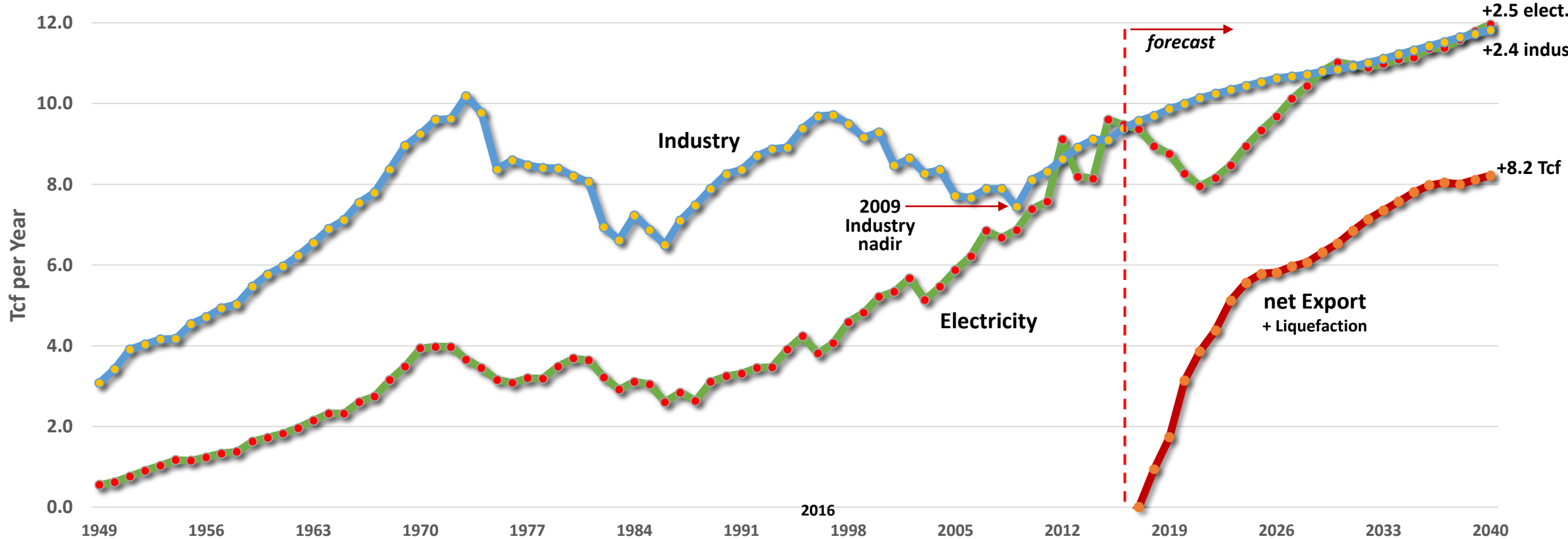
Incremental natural gas for export by 2040 equals ~2X incremental domestic electricity and industrial use

Past and Forecast of Key Natural Gas Sector Consumption

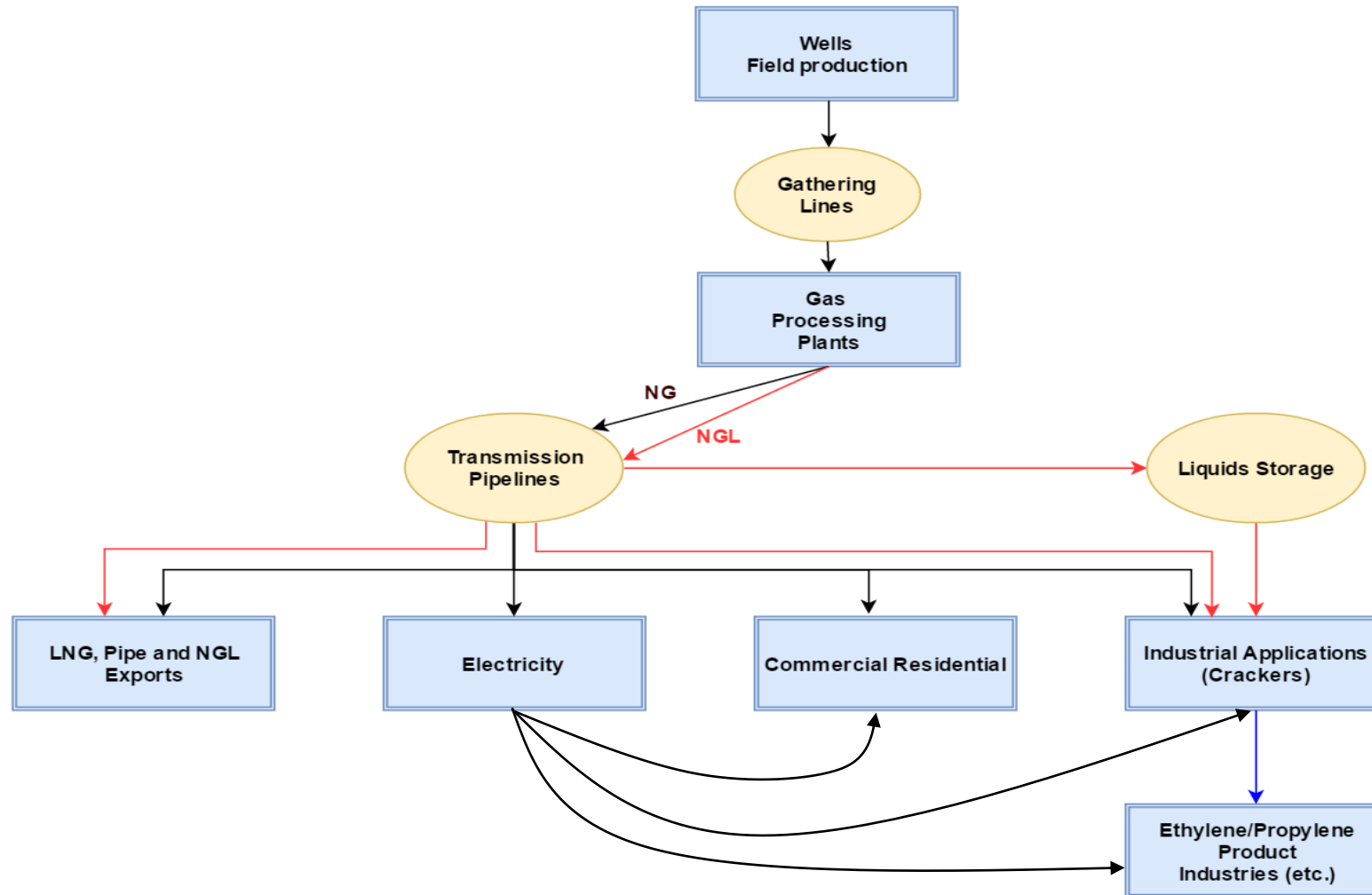
EIA's Annual Energy Outlook 2016 Reference Case



Natural Gas Consumed by the Industrial*, Power and Export Sectors, Total (Tcf)
 (* - including Lease and Plant Fuel)



Variables Affecting Decisions in Natural Gas Value Chain



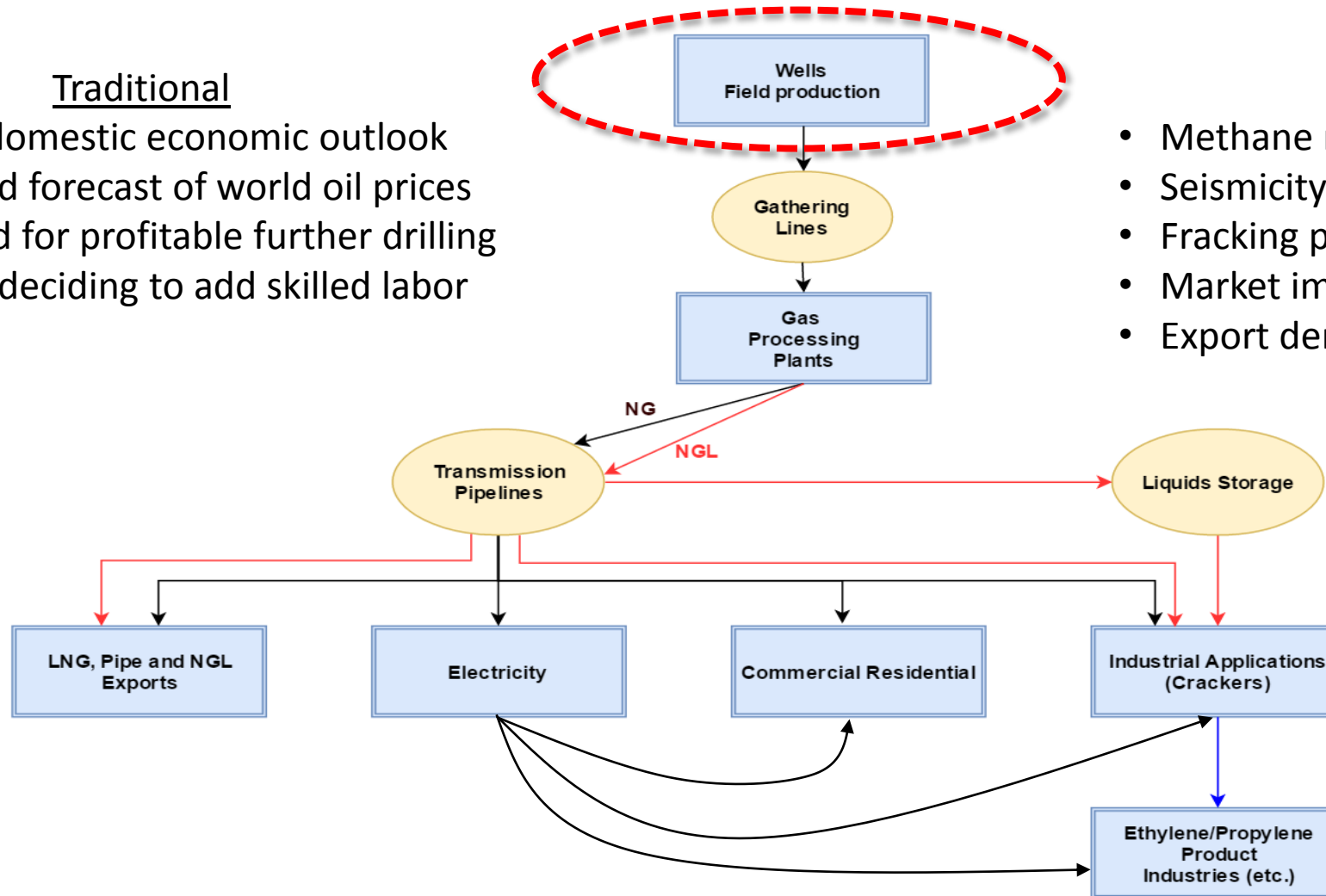
Variables Affecting Decisions in Natural Gas Value Chain

Traditional

- Global and domestic economic outlook
- Direction and forecast of world oil prices
- Price needed for profitable further drilling
- Finding and deciding to add skilled labor

Novel

- Methane regulation cost impacts
- Seismicity impacts on water disposal practice
- Fracking proposals of next administration
- Market impact of Clean Power Plan decision
- Export demand determinants (LNG permits)



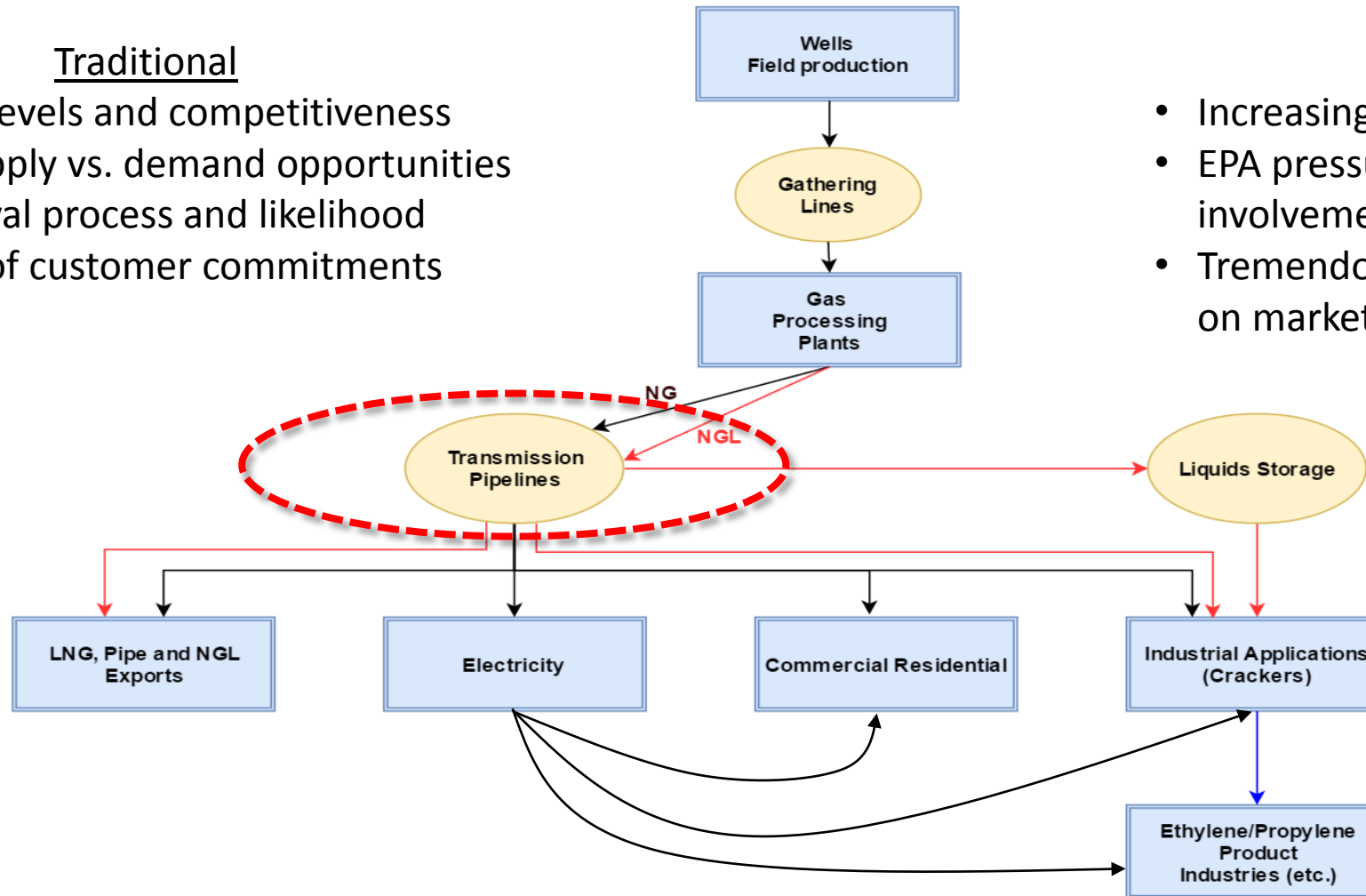
Variables Affecting Decisions in Natural Gas Value Chain

Traditional

- Production levels and competitiveness
- Regional supply vs. demand opportunities
- FERC approval process and likelihood
- Availability of customer commitments

Novel

- Increasing social resistance to siting
- EPA pressure on FERC for permitting involvement
- Tremendous influence of global LNG market on market supply and flows



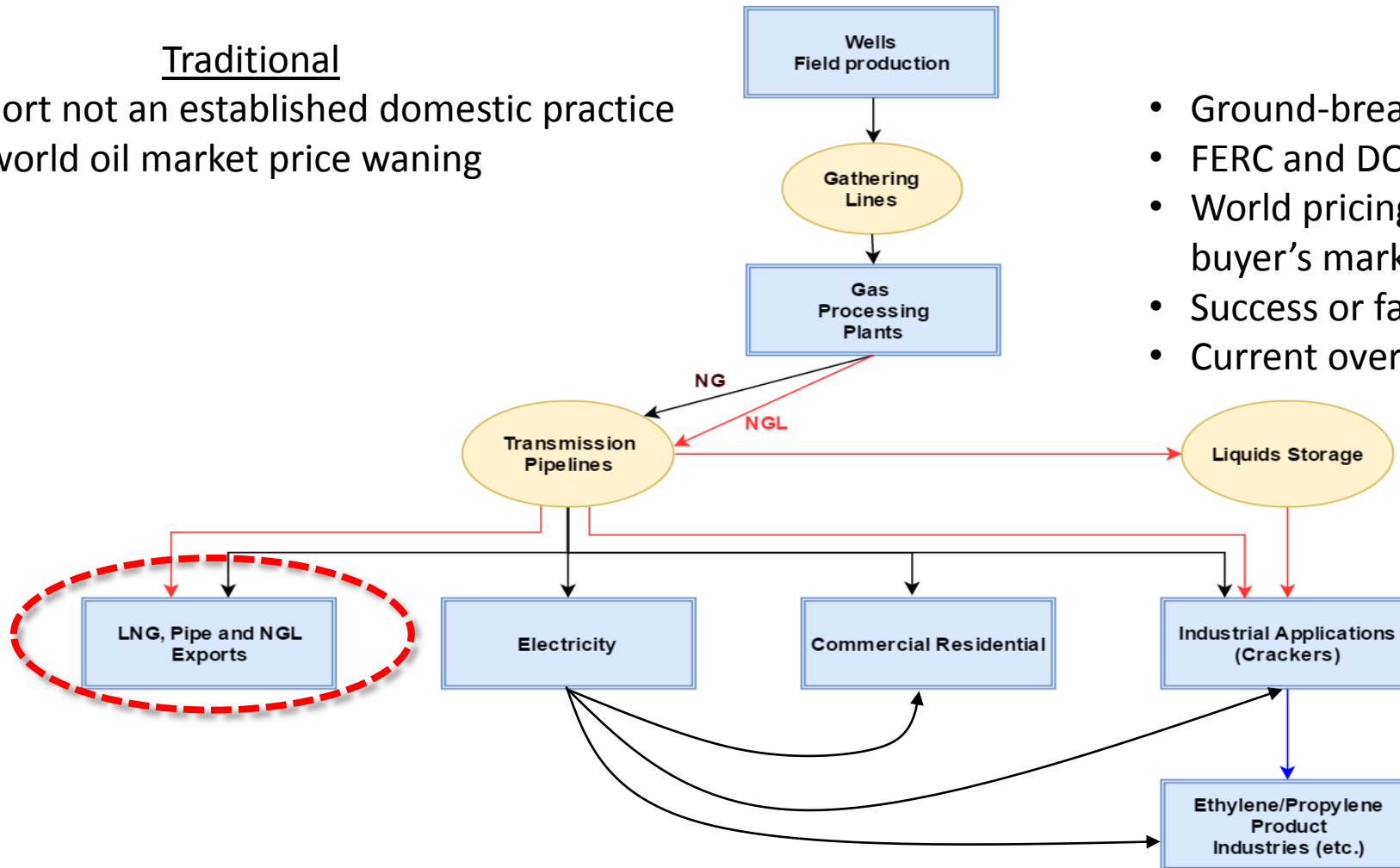
Variables Affecting Decisions in Natural Gas Value Chain

Traditional

- LNG export not an established domestic practice
- Link to world oil market price waning

Novel

- Ground-breaking developer decision making
- FERC and DOE decision making trends
- World pricing mechanisms changing in a buyer's market
- Success or failure impacts domestic supply
- Current oversupply; global economy concerns



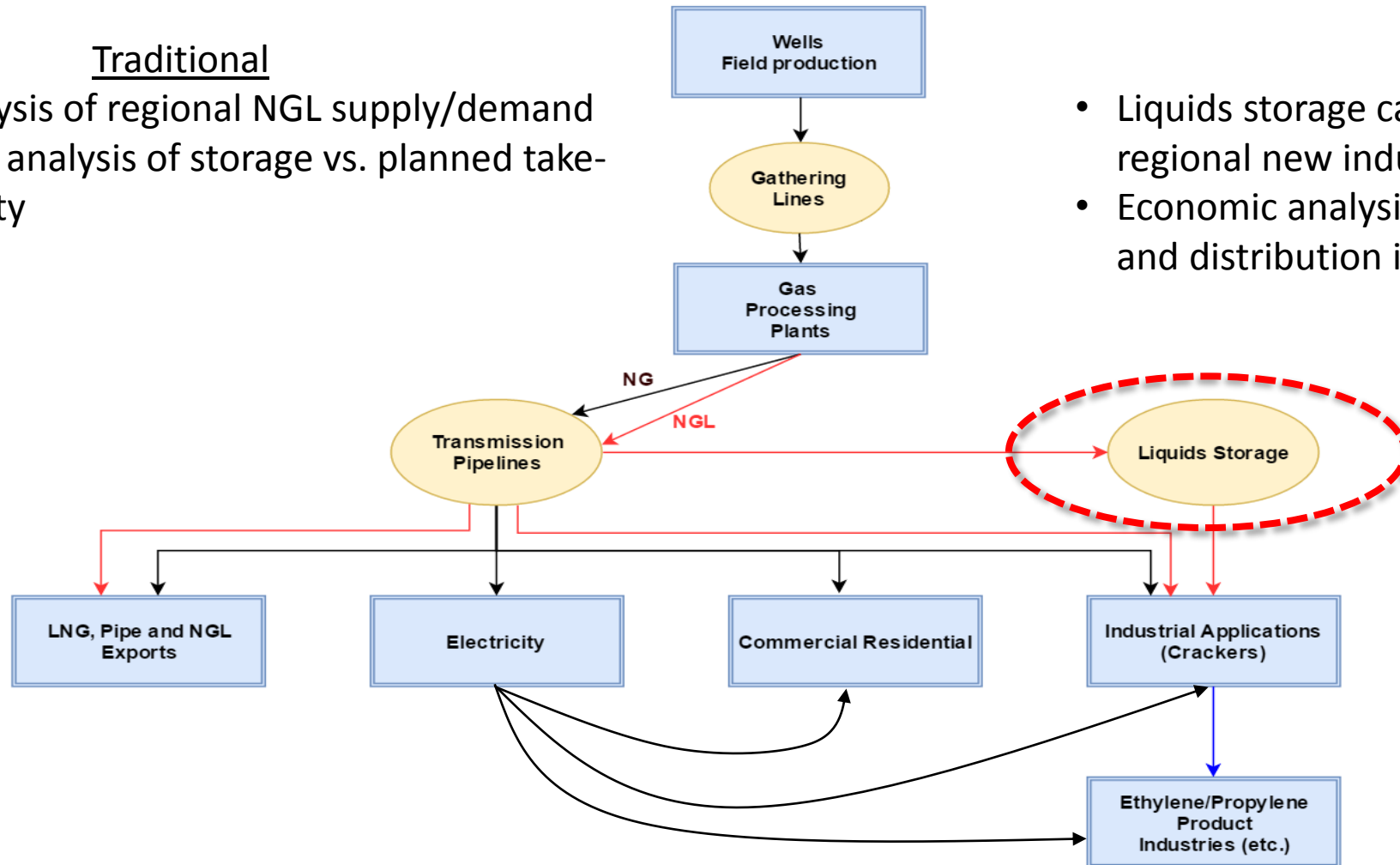
Variables Affecting Decisions in Natural Gas Value Chain

Traditional

- Market analysis of regional NGL supply/demand
- Competitive analysis of storage vs. planned take-away capacity

Novel

- Liquids storage capacity needed to support regional new industrial applications
- Economic analysis of costs for new storage and distribution infrastructure



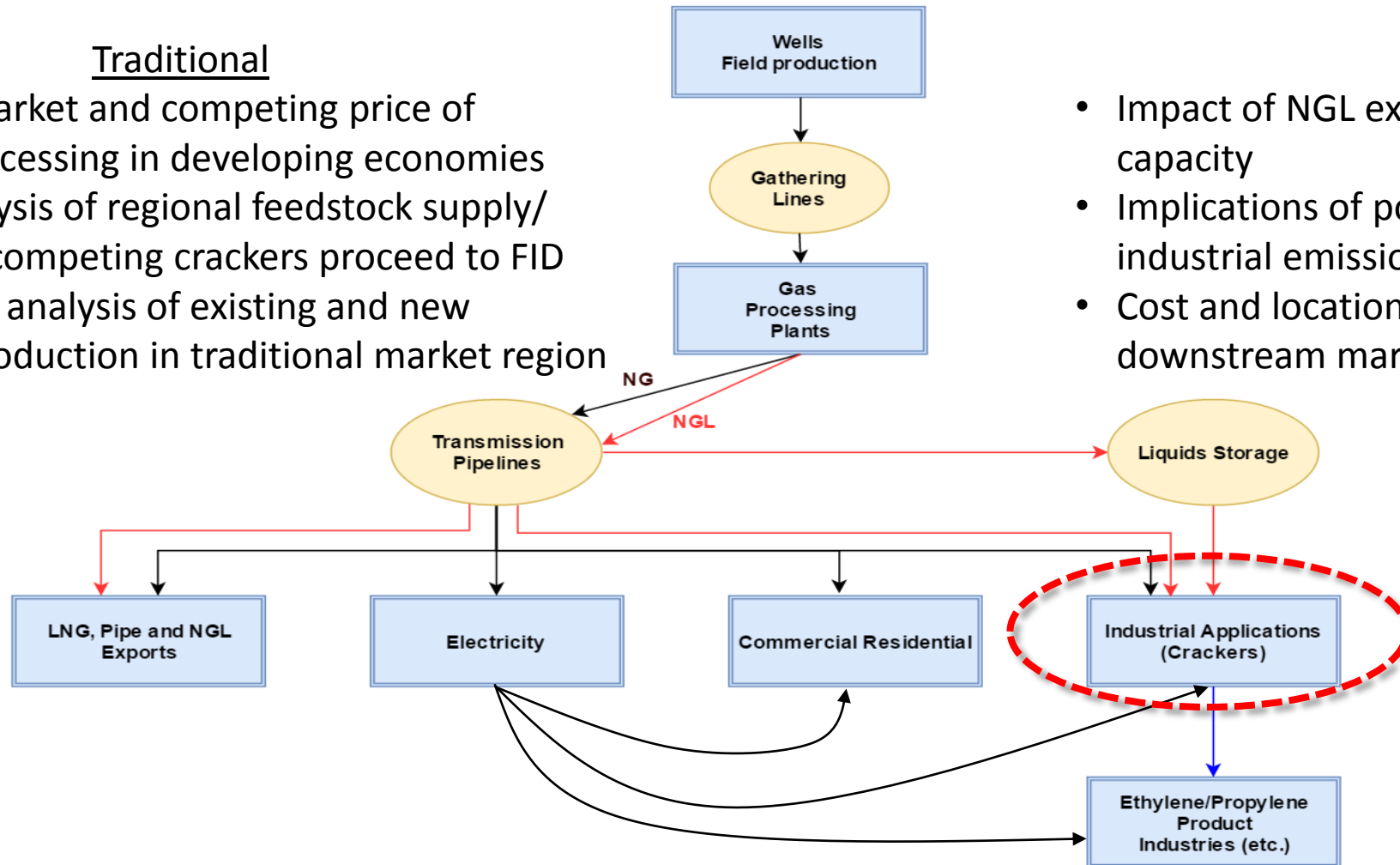
Variables Affecting Decisions in Natural Gas Value Chain

Traditional

- Global oil market and competing price of naphtha processing in developing economies
- Market analysis of regional feedstock supply/demand as competing crackers proceed to FID
- Competitive analysis of existing and new domestic production in traditional market region

Novel

- Impact of NGL export market and take-away capacity
- Implications of potential GHG regulations for industrial emissions
- Cost and location advantage for regional downstream market opportunities



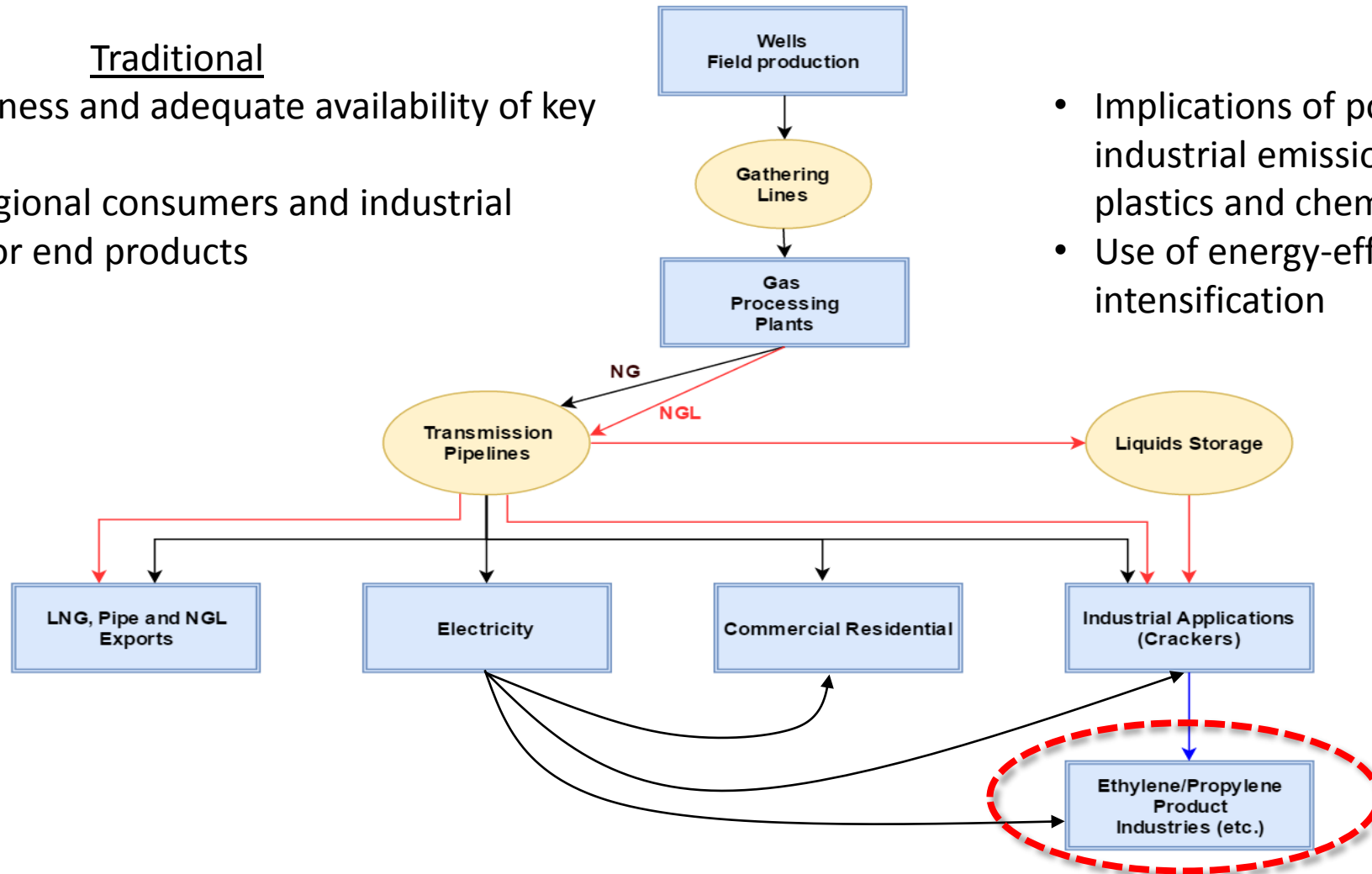
Variables Affecting Decisions in Natural Gas Value Chain

Traditional

- Competitiveness and adequate availability of key feedstocks
- Access to regional consumers and industrial customers for end products

Novel

- Implications of potential GHG regulations for industrial emissions further downstream (e.g. plastics and chemical industries)
- Use of energy-efficient processes and process intensification



- The last six years of Marcellus/Utica energy production growth contributed a significant share of the largest energy production growth period in the nation's history
- Lack of historic precedent for production growth at this scale leads to ambiguous but momentous infrastructure decisions throughout the natural gas value chain
- Opening of global markets to domestic natural gas products (LNG, pipeline and NGLs) introduces unique variables to traditional supply/demand decision making
- Growing environmental focus on production emissions, pipeline and other industry infrastructure permitting can have major impact on costs and regional supply
- Estimates of enormous resource potential, lasting decades at affordable prices, reflect a positive opportunity to optimize the economic benefit of early infrastructure decisions
- Consideration of highest value-added opportunities, within regions with large resource potential, should be performed at the earliest stages of decision making