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Lessons from the Development of the US Natural Gas Industry

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Beginnings

Synthetic Gas

- 1820s Manufacturing – Plants in Cities
- Distribution – LDCs
- Local Regulation – franchises
- Lighting

Oil Drilling Development

- First Oil Well Titusville, PA 1859
- Associated Natural Gas

Natural Gas Transportation

- 1872 Titusville, PA – 5 mile 2-inch line
- Technology limits pipelines to short distances



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Beginnings (cont.)

Gas Heating Replaced Gas Lighting by 1900

NG Pipelines less than 200 miles by the 1920's

1900s/20s State Regulation NG Distribution

1920s-30 Longer Systems

- Northern Natural -- 1100 miles (1930)

Interstate Pipelines

- Merchants, unregulated



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Early Federal Regulation

Federal Law for Interstate Pipelines—

- Natural Gas Act of 1938
 - regulated prices of sales for resale to LDCs
 - approved pipelines
 - encouraged long term contracts
- Wellhead Price Regulation for Interstate Pipes
 - 1940s for affiliated producers
 - 1954 for all producer sales for resale
(Phillips Supreme Court Decision)



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Early Federal Regulation (cont.)

Regulating Wellhead Prices a Disaster

- Regulation of Interstate not Intrastate Sales
 - Cost of service for producers unworkable
 - 1960s
 - Area rates
 - Five Zones
 - effectively froze prices at 1959 levels
- 1970's –National Ceiling Price
 - other factors added to cost of service



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Transitions

Rising Oil Prices Raise Demand for Natural Gas

- Interstate shortages in 1970s
- High Priced Supply Fixes
 - Great Plains Coal Gasification Plant 1982
 - Alaskan Natural Gas Transportation System
 - LNG plants

Emergency Natural Gas Act of 1978

- Crisis – Lack of gas caused
 - 400 Manufacturing Plants closed
 - 1,000,000 workers laid off
 - hundreds of schools closed
- Presidential emergency powers reallocate gas.

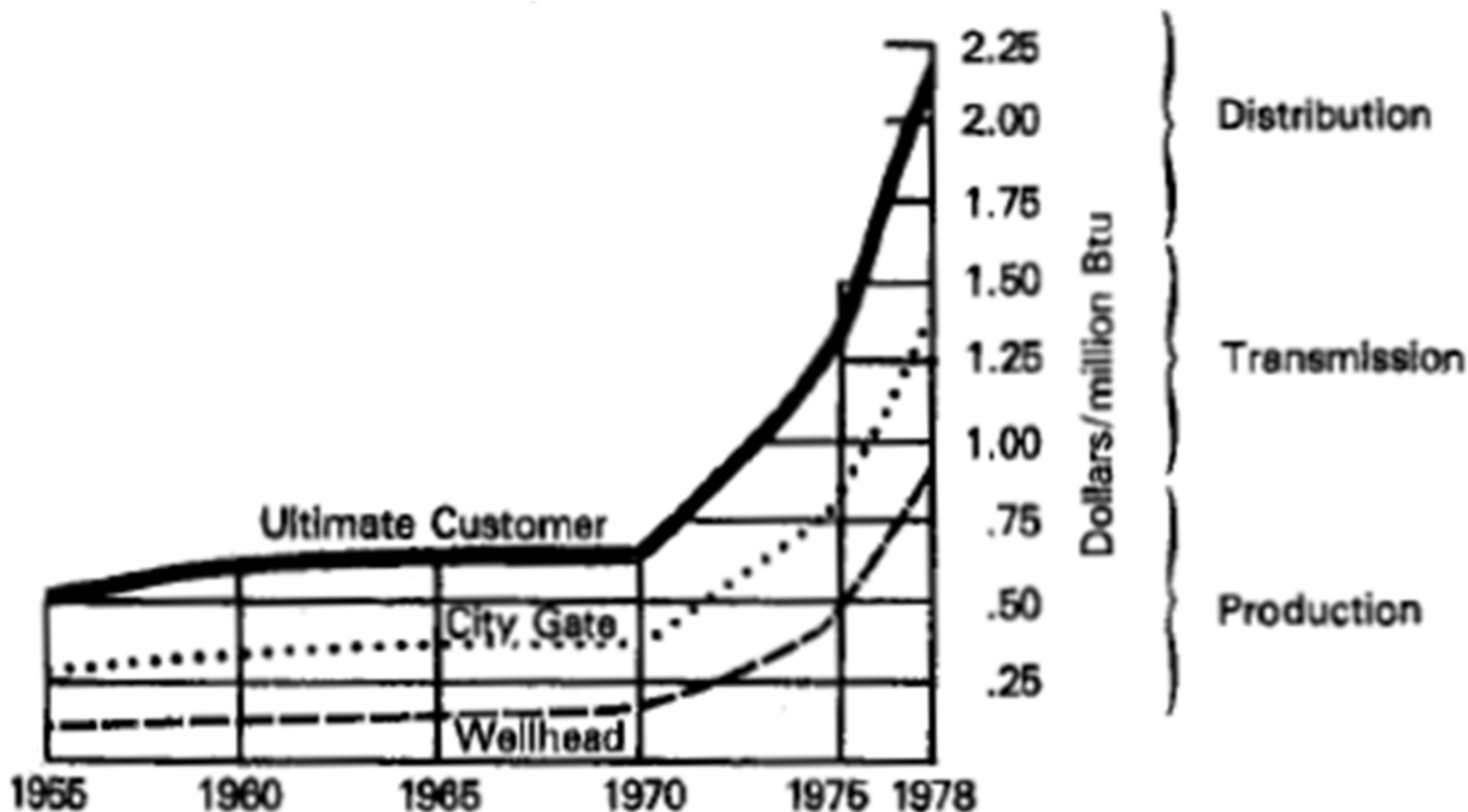


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Component Costs of End-Use Natural Gas Prices



Source: American Gas Association

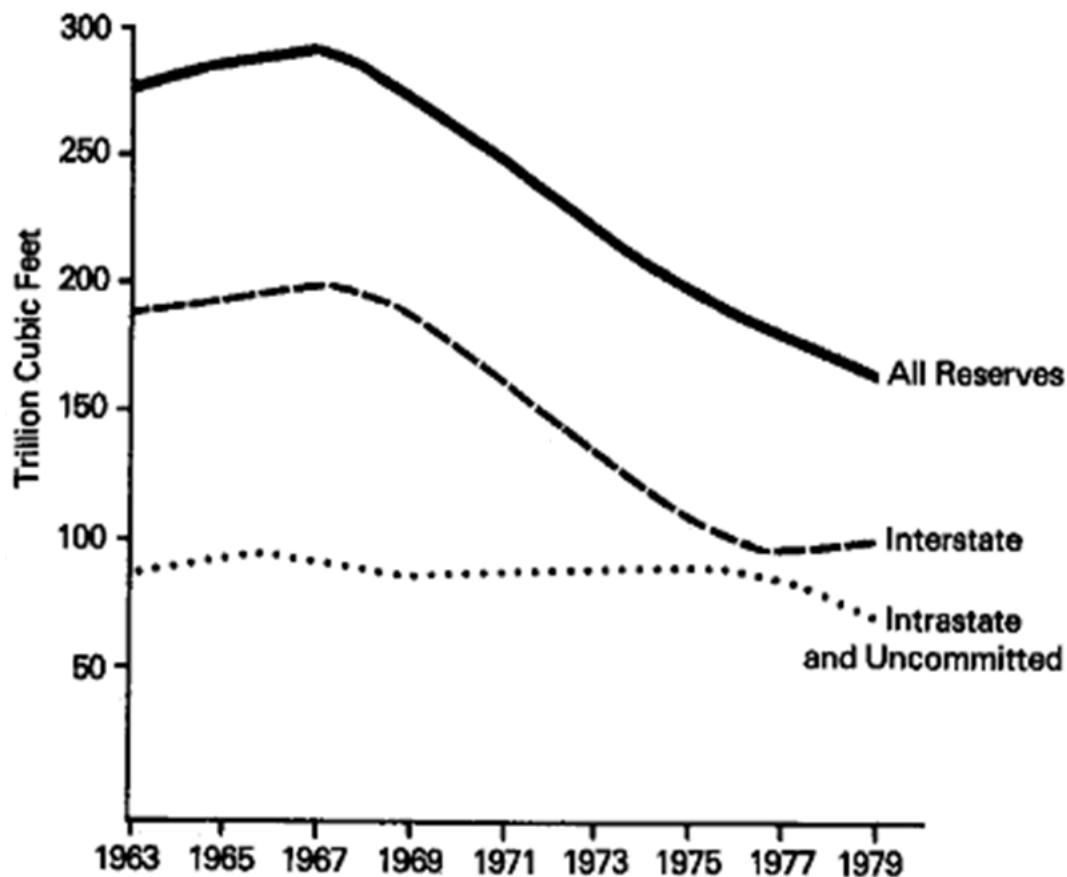


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Inter and Intrastate Natural Gas Reserves



Source: (Adapted from) Energy Information Administration, U.S. Department of Energy, *Intrastate and Interstate Supply Markets under the Natural Gas Policy Act* (Washington, D.C.: U.S. Government Printing Office, October 1981).



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Natural Gas Policy Act of 1978

- Objectives
 - Create single national natural gas market
 - Equalize supply and demand
 - Use market forces to set wellhead prices
- Defined categories of natural gas based on
 - Vintage
 - Production characteristics
- Prices/escalation rates set for each category
- Post-NGPA vintage gas to be deregulated by 1/1/85



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Response to NGPA (1980-1985)

- Pipelines use to shortages sign long term supply contract with take-or-pay clauses.
- Producers expand production and exploration
- But differing price caps cause incentives to produce higher cost gas
- Average wellhead price rise dramatically
- Users partially shielded by blending of old and new contract prices
- Price increases led to decreased demand
- Pipelines have more gas than they can sell, prices drop.



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Beginning of the End of Pipeline Merchant Function

- Special Marketing Programs (1983)
 - customers with alternatives (dual fuel) buy gas at wellhead with pipeline transporting
 - Federal Court finds discriminatory
- FERC Order 436
 - allows pipelines to unbundle transportation on a non-discriminatory basis
 - transportation open generally



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Post Order 436

- FERC 500 (1987)
 - Allows buyout of take or pay contracts transporting pipelines
- Natural Gas Wellhead Decontrol Act (1989)
 - Extends decontrol old gas
- FERC Order 636 (1992)
 - requires transportation / ends pipeline sales
 - separates affiliated marketers
 - sets up capacity brokering (release/resale)
- FERC Order 637 (2000)
 - eased restraints on release and resale
 - ends price caps on short term (< 1 year) capacity release

for



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Summary of Development of Gas Industry

- Fifty years to...
 - undo impacts of wellhead price controls
 - provide flexibility to adjust to change
- None too soon as shale gas creates new challenges



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Shale Gas Revolution

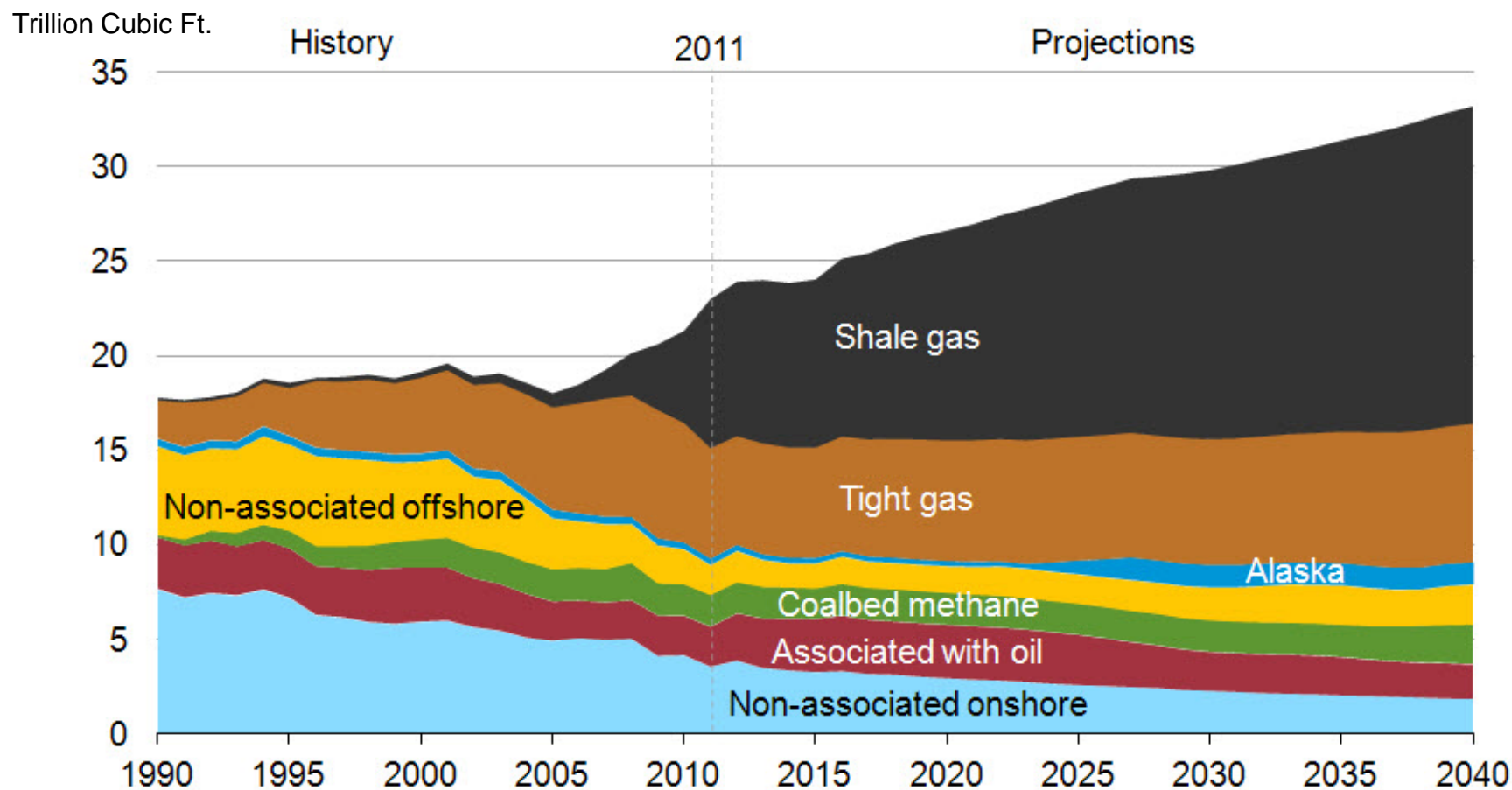


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US Dry Natural Gas Production



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2013 Early Release*

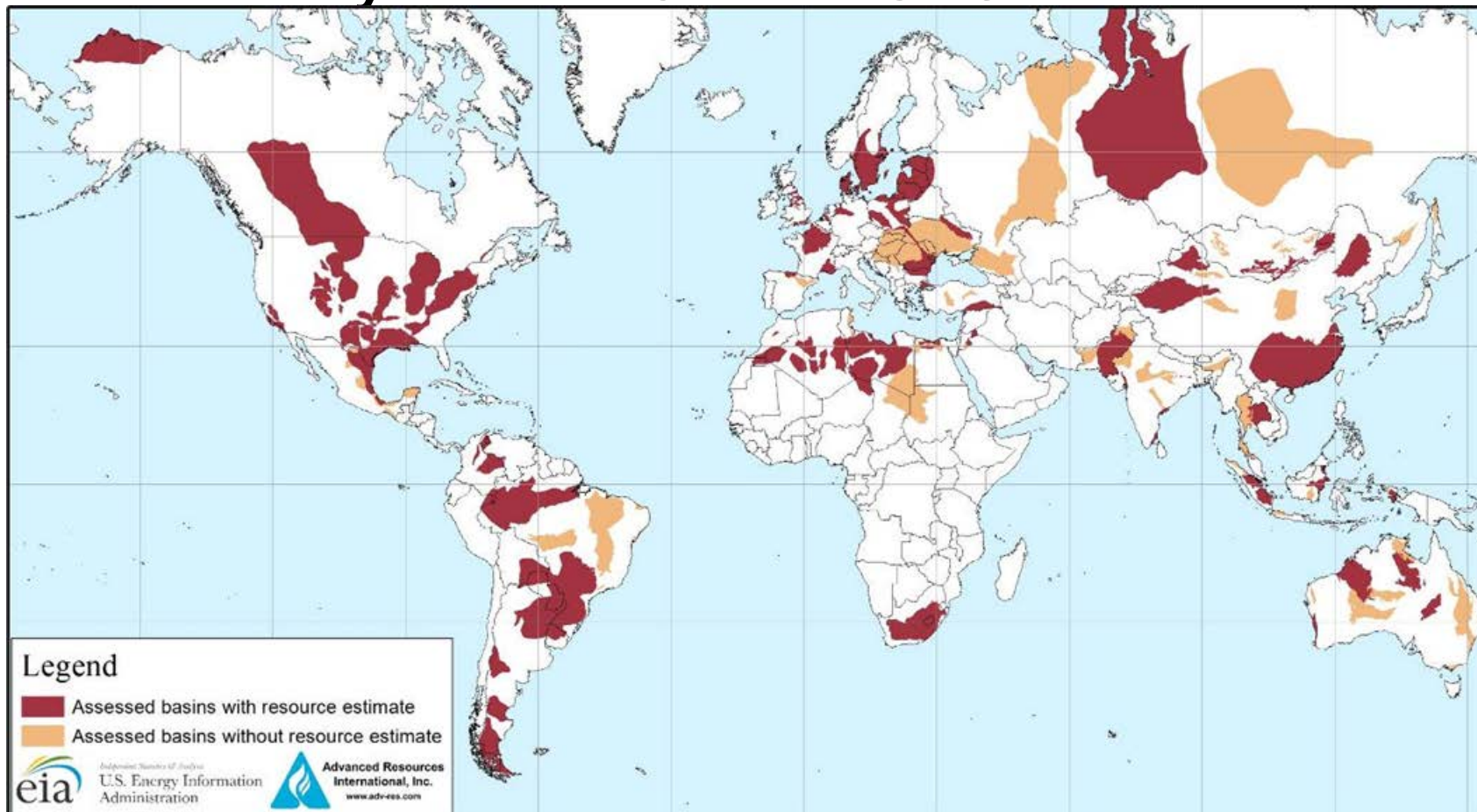


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Technically Feasible Gas and Oil Shale Resources





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Shale Gas Revolution

- US
 - Less than production 1 Tcf in 2005 to 10 tcf in 2012
 - Projections for 2040
 - Production up 4.5 tcf in one year
 - Real Domestic real (2012) price down from \$7.95 to \$7.65
 - exports 5.8 tcf
- Technically Feasible Reserves
 - Gas Shale is 1/3 US reserves 665 tcf
 - Gas Shale is 1/3 world reserves 6634 tcf



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Shale Conclusions

- Situation
 - technology very young
 - many basins in world lacking resource estimates
- Outlook
 - increases in projections for supplies
 - decreases in projection for prices