Flaring Issues, Solutions, and Technologies (FIST)

Interstate Oil and Gas Compact Commission
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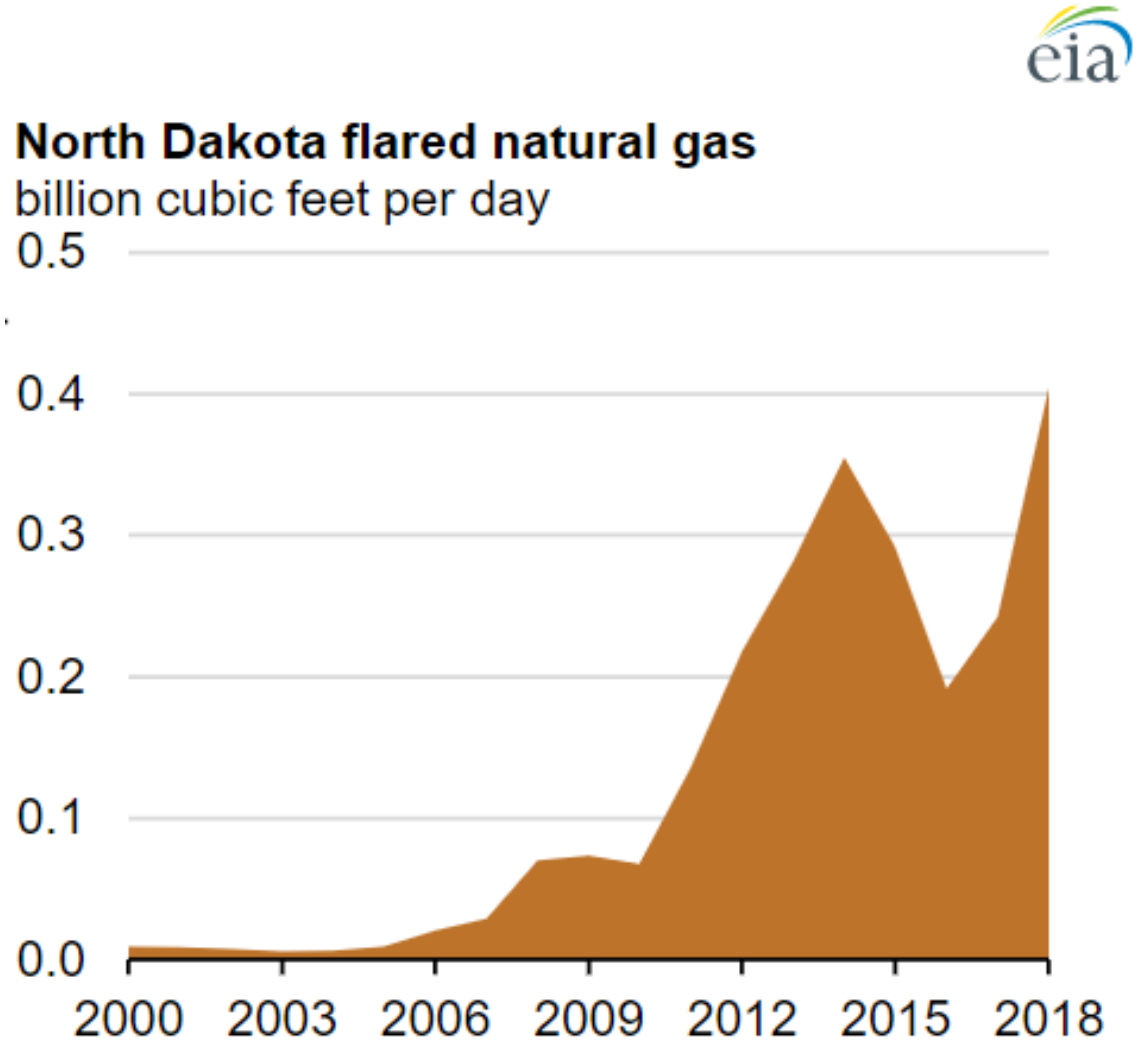
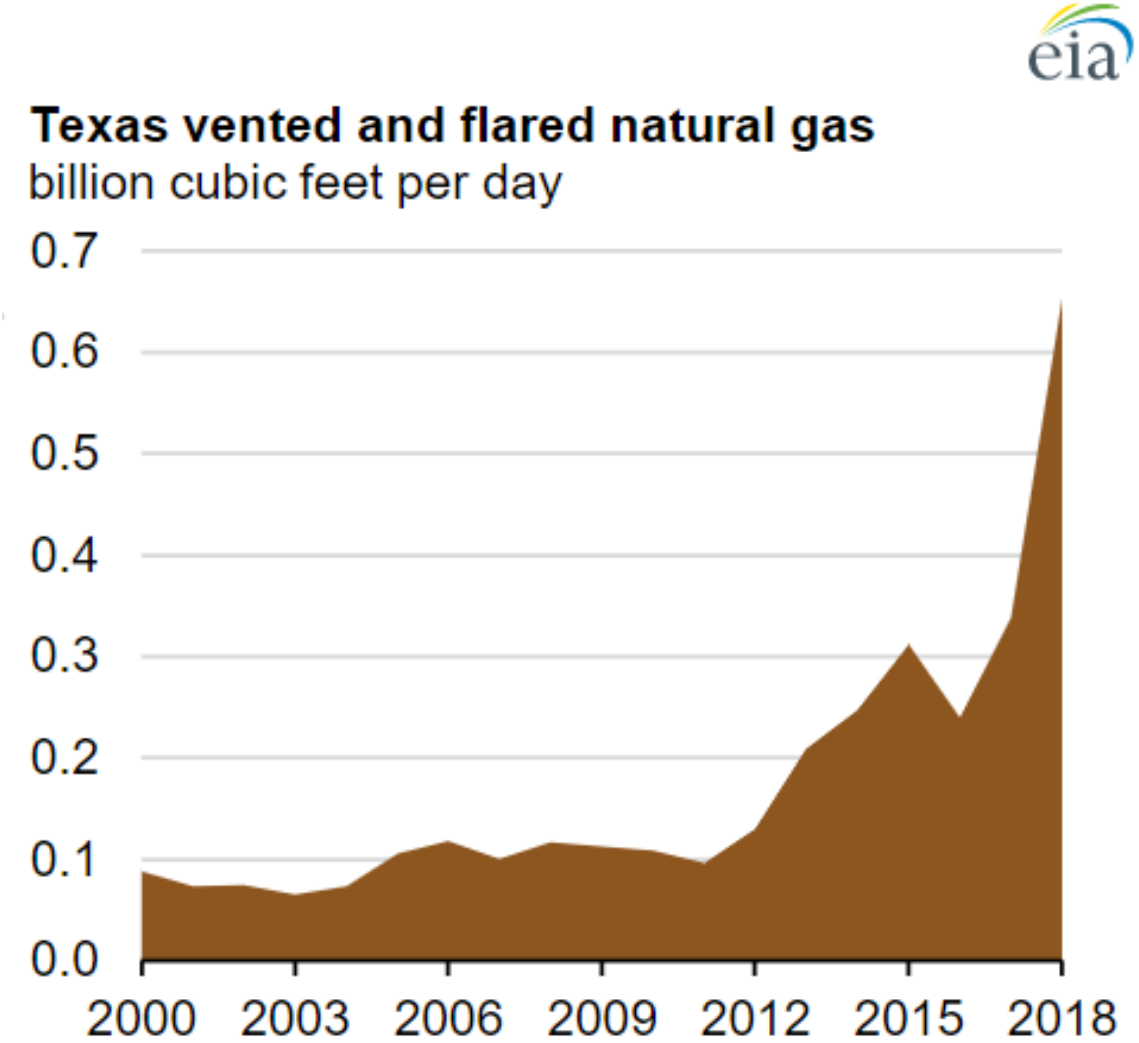
Rich Haut
Haut@HESTLLC.com
281-787-8768

Addressing Flaring – Today

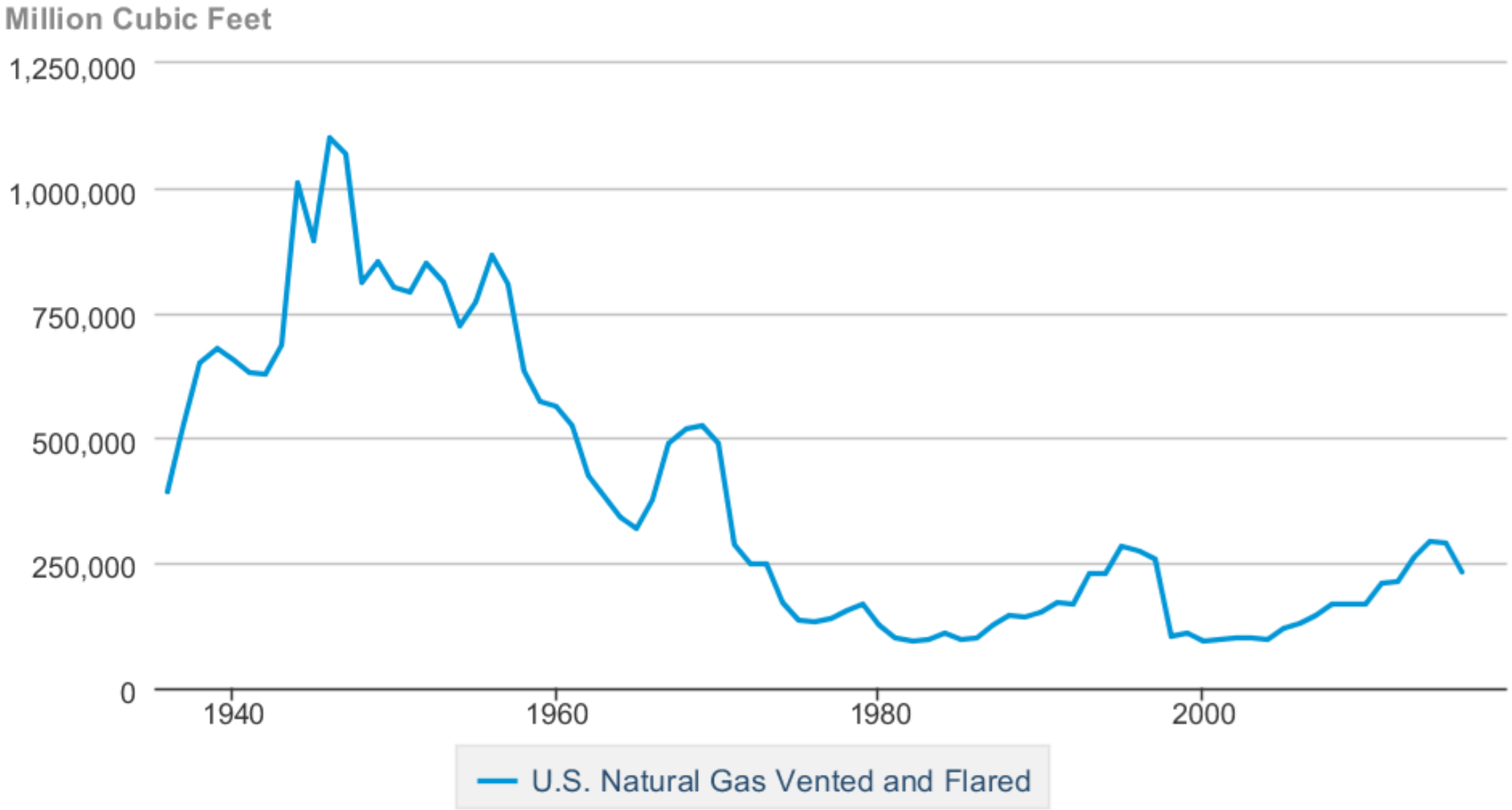
- Latest Flaring Data
  - United States and Global
- What is Working
- What is Important
- What Can Happen

North Dakota / Texas EIA data



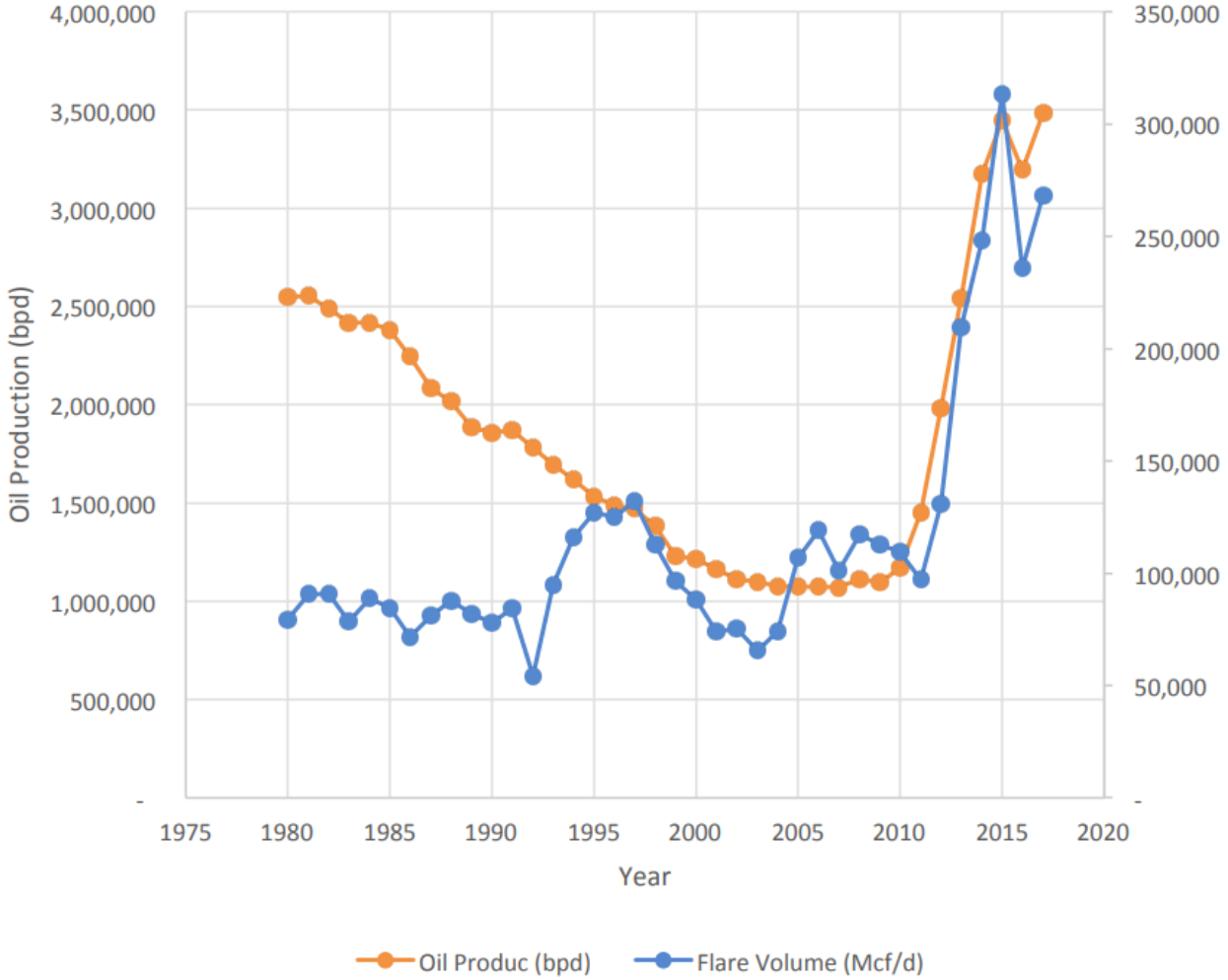


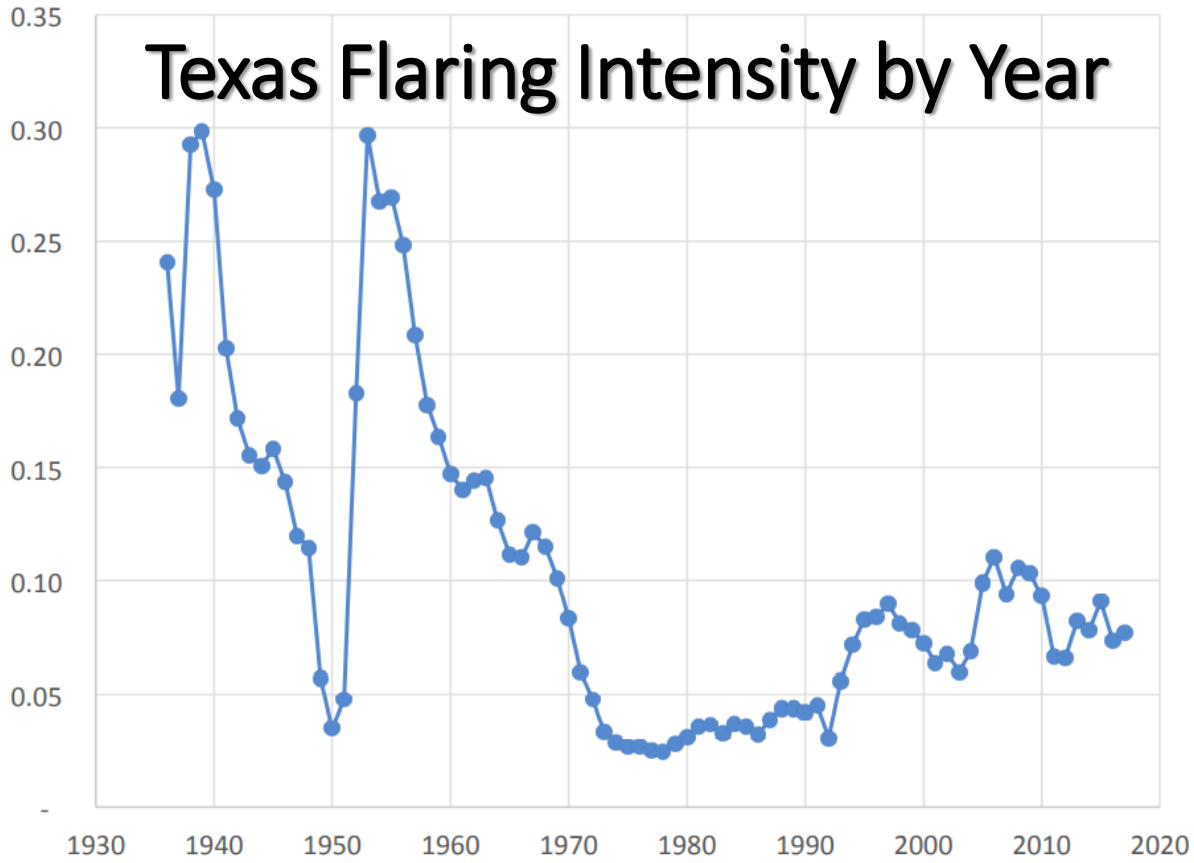
U.S. Natural Gas Vented and Flared



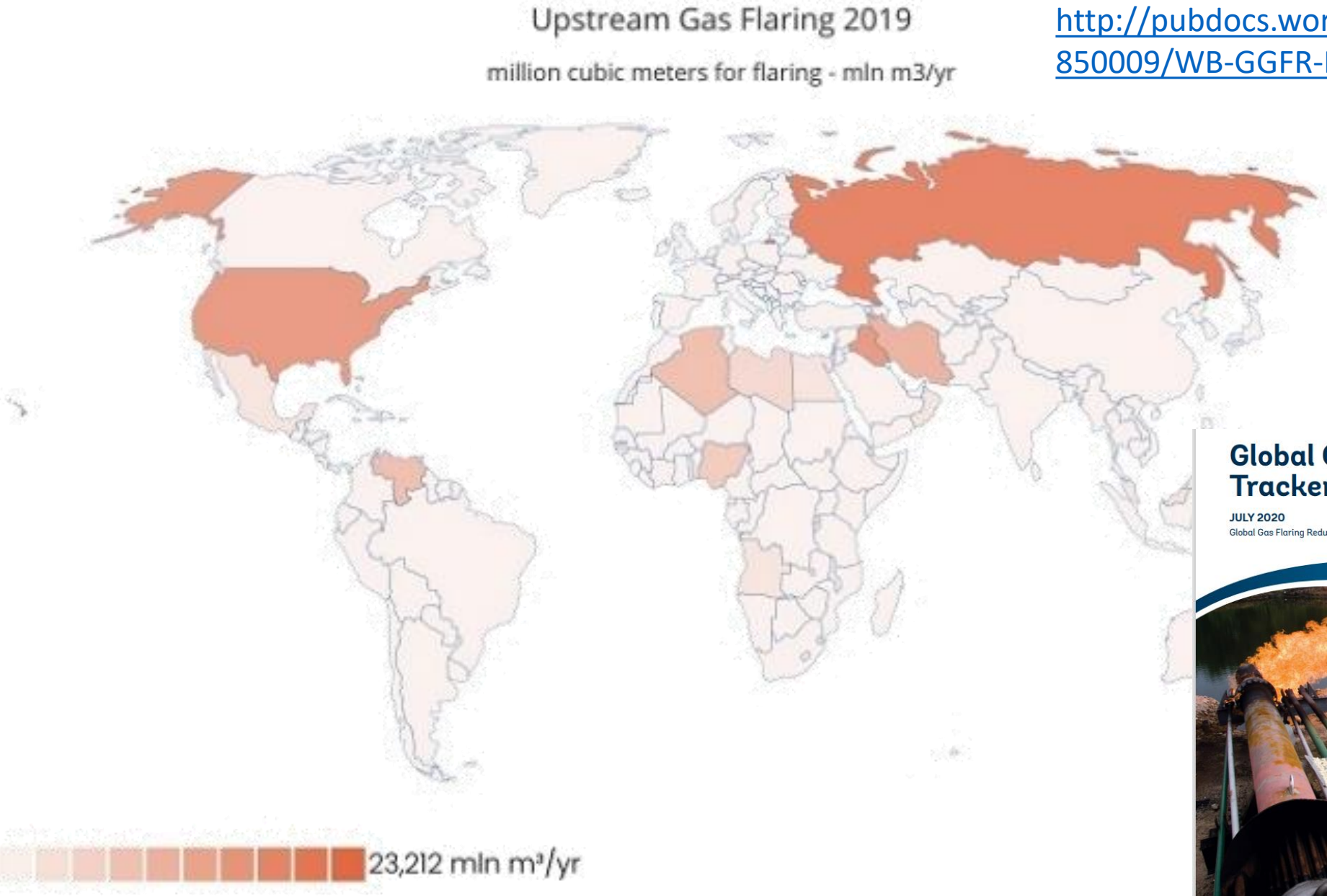
Source: U.S. Energy Information Administration

Oil Production and Flaring Volumes in Texas 1980-2017

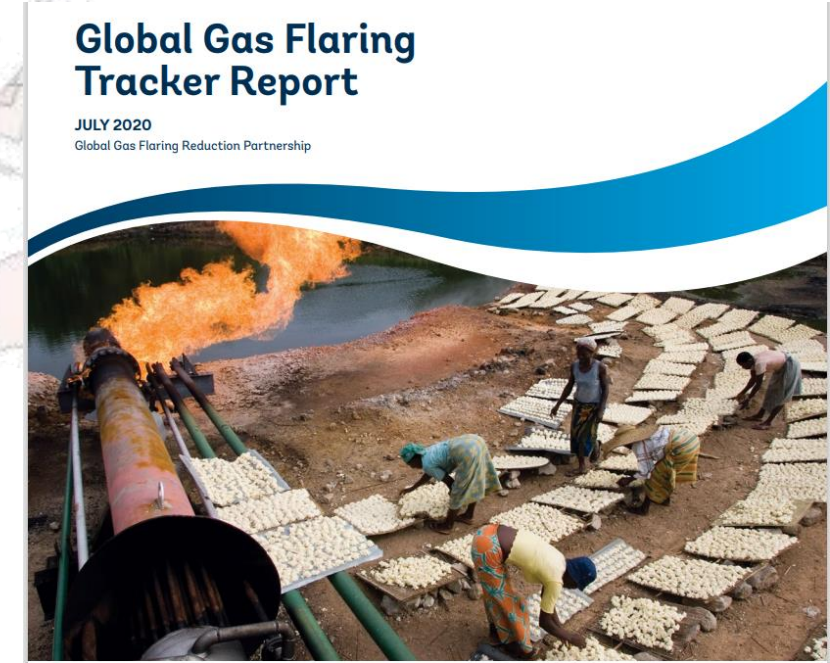




World Bank Data

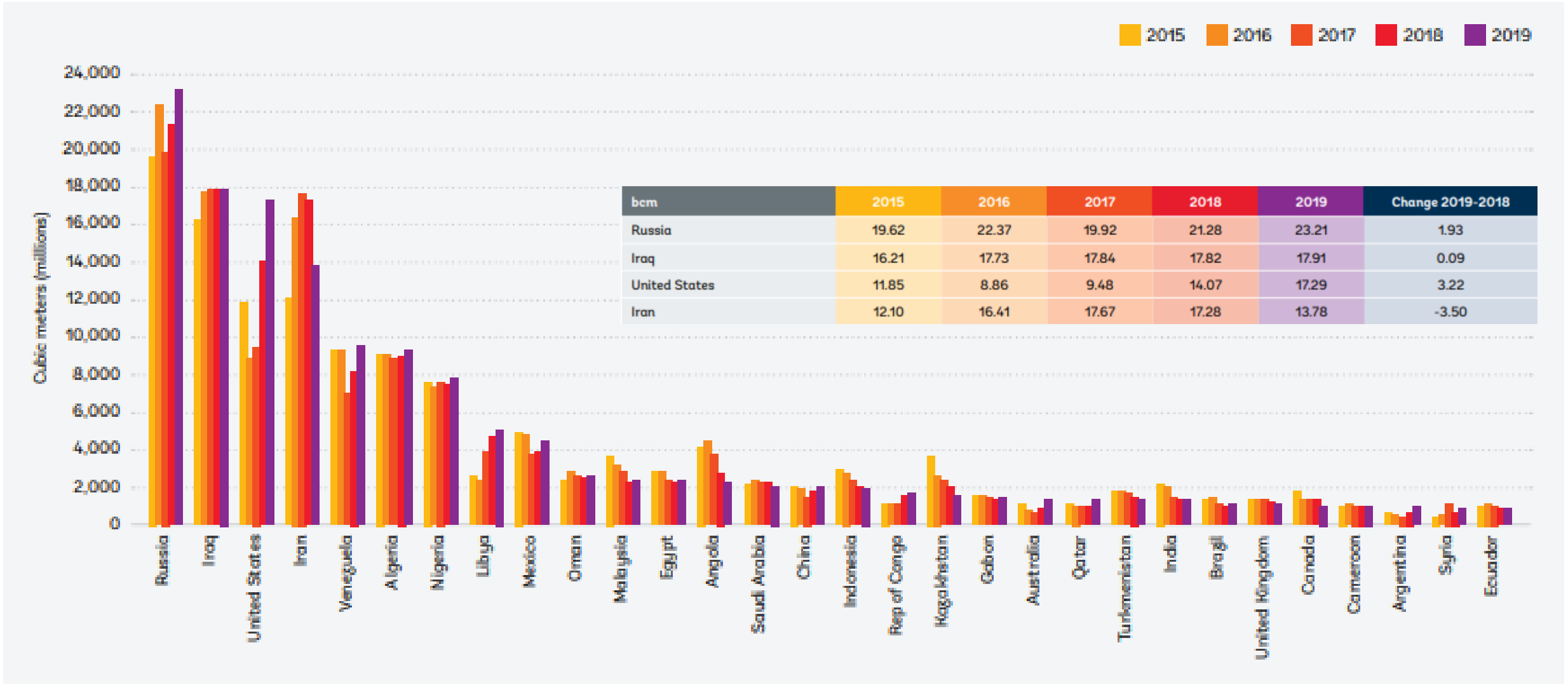


http://pubdocs.worldbank.org/en/503141595343850009/WB-GGFR-Report-July2020.pdf



Flaring Volumes (World Bank Data)

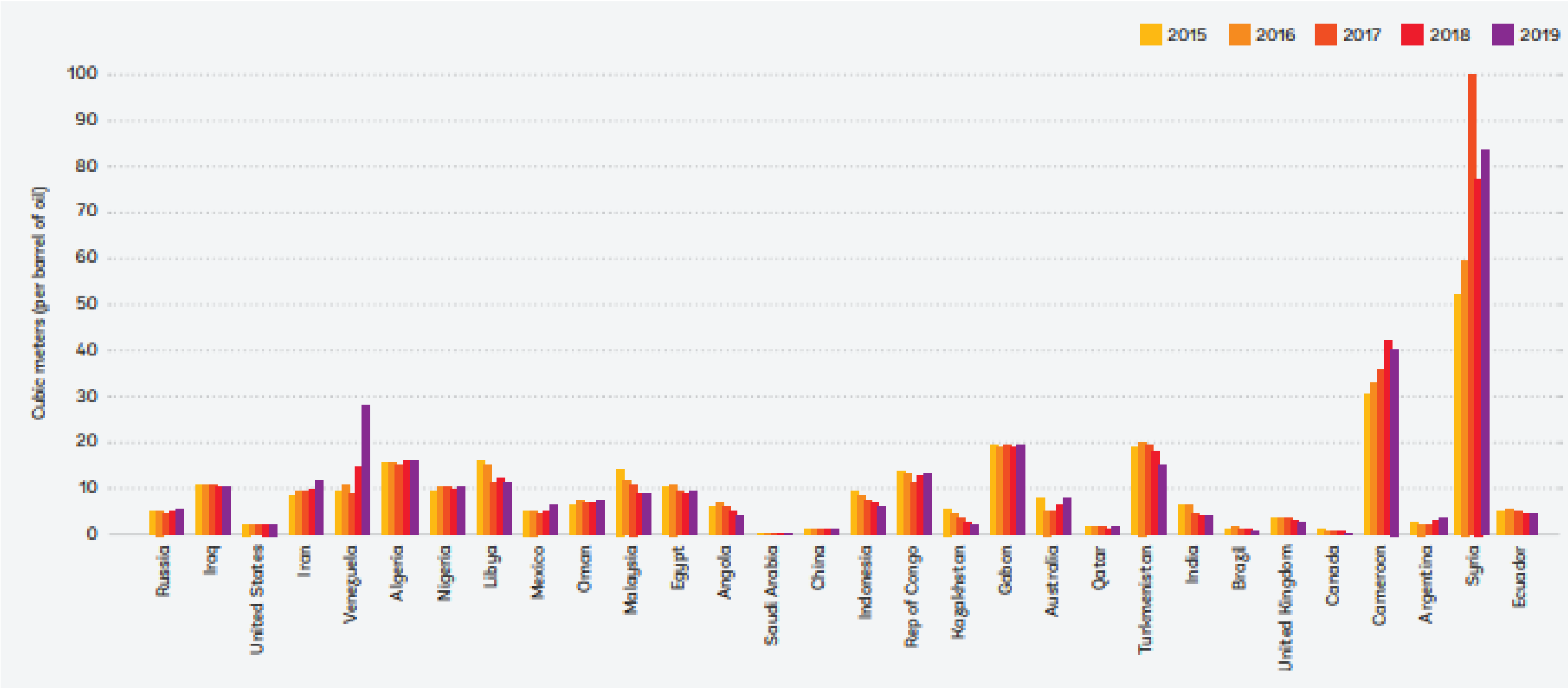
Flare volumes for the top 30 flaring countries from 2015 to 2019 (Sorted by 2019 flare volume)



bcm	2015	2016	2017	2018	2019	Change 2019-2018
Russia	19.62	22.37	19.92	21.28	23.21	1.93
Iraq	16.21	17.73	17.84	17.82	17.91	0.09
United States	11.85	8.86	9.48	14.07	17.29	3.22
Iran	12.10	16.41	17.67	17.28	13.78	-3.50

Flaring Intensity (World Bank Data)

Flaring intensity for the top 30 flaring countries from 2015 to 2019 (Ranked in order of the top 30 flaring countries)



World Bank Report – Key Findings

- **Global flaring in 2019 reached 2009 levels, 3% greater than 2018.**
  - United States up 23%, where oil production increased by 20%
  - Venezuela up 16% where oil production decreased by 40%
  - Russia up 9%, where oil production remained flat.

- **Top four gas flaring countries (Russia, Iraq, United States, Iran) account for 45% of global flaring.**

- **Excluding top four, global flaring declined by 10% from 2012 to 2019.**

- **Governments/companies in the GGFR Partnership reduced flaring by 5% from 2012 to 2019.**

- **Global flaring in 1Q2020 fell by 10% with declines across most top 30 countries.**

- **United States flaring reduced significantly during 1Q2020, while oil production increased.**

FIST Program

1. Identify most applicable practices.
2. Identify technologies.
3. Identify research, development and demonstration needed.
4. Identify research recommendations.
5. Identify policy barriers.

FIST Project Findings

- Infrastructure
  - Infrastructure is a bottleneck
  - Working relationships with 3rd party partners
- Alternatives to Flaring
  - Reservoir Storage
  - Repressuring
  - Use of Field Gas
    (Powered by Natural Gas)

- Technology
  - Operability
  - Reliability
- Culture
  - Internal communications throughout organization
    - **Charts/Metering to track daily flaring volumes**
    - **Everyday discussions / meetings – daily flaring volumes**
    - **Everyone has ownership**
    - **Strong relationships with midstream**

Proven gas turbine power generation using Bakken flare gases, Y-grade and other NGLs.

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Wellsite power systems available for sale or lease in mobile units from 65 kW to 30 MW.

Turning your flares into **clean** power

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STATUS QUO vs. IDEAL SITE

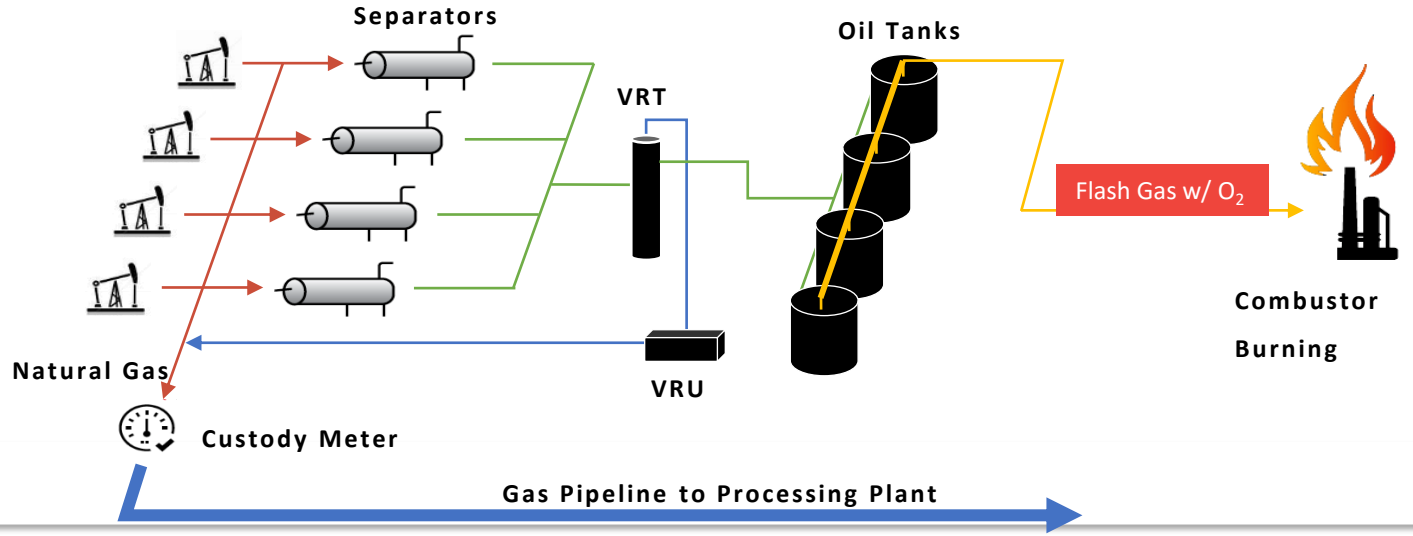
Zero Pad Emissions with Higher Production & Cash Flow

West Texas Installation
Recovering 2 MMCFD of Tank Flash Gas

- **Gross Monthly Revenue ~ $330,000**
- **VOC reductions ~ 670 TPY**
- **NOx reductions ~ 65 TPY**

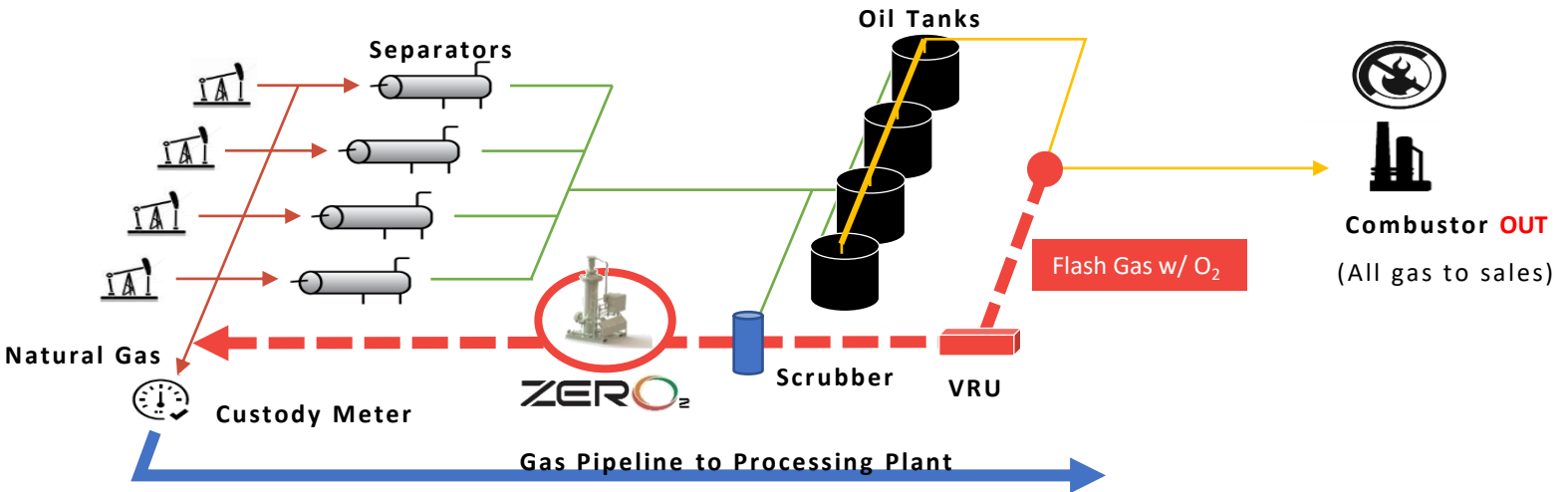
STATUS QUO – WITH VRU/VRT

Higher Risk, Higher Cost



IDEAL SITE – SITE VRU / $ZERO_2$

Zero Pad Emissions with Higher Cash Flow



Green Completions – All Vapors Tied In

- High capacity–5MMscfd methane eq. per unit
- 99.99% combustion efficiency
- Typical gas sources tied into a “ “ ECD:
  - Wellbore gases from HP and LP separation
  - Liquid storage tank vapors
  - Truck-out vapors
  - Single unit handles multiple streams with varying pressures and flowrates
- Sturdy portable design–Hydraulic trailer

Technologies for Utilization of Small-Scale Associated Gas

Tech Area	Company	Description	Technology & Operating Conditions	Size Range & Cost	Additional Operational Requirements	O&M
Gas Processing						
1	Aspen Engineering Services: NGL Pro	The 'NGL Pro' process integrates dehydration, compression, cooling and conditioning, eliminating the need for costly glycol and refrigeration systems. Hydrate formation is precluded by a heat integration system. Consequently, no antifreeze additives are required. The 'NGL Pro' process can be coupled with the 'LNG-Pure' system to co-produce LNG and NGL, and thereby eliminate flaring.	**Gas processing and NGL extraction** Please contact company for allowable BTU variability and simulation report H_2S tolerance for the unit is up to 3% Raw gas minimum inlet pressure is 20 - 75 psig Please contact company for components separated and separation efficiency Handles variable flow by stabilizing compression system using recycle stream	Standard unit size is 2.5 MMSCFD. Units can be paralleled for larger capacity Scalable & modular - 2.5 MMSCFD on an 8' x 25' skid. Cost USD650K for 2.5 MMSCFD	Power from grid, on-site micro-grid, or gas-fired generators Independent compressor skid required	Company indicated very low maintenance requirement
2	Aspen Engineering Services: COSR	Revolutionary, cost-effective solution to the EPA's Quad O regulation. The **Crude Oil Stabilization and Recovery (COSR) process captures the value of the natural gasoline from the vent gas and completely eliminates the tank vent.** Concurrently, the volatility of the oil is stabilized for safer storage and shipment. The patent-pending COSR process is a unique solution for the oil and gas industry.	Crude oil is heated to 130° F in the heater treater at 30-50 psig to vaporize and separate volatile organic compounds from hot oil and water. Alternatively, the pressure in the heater treater can be reduced without raising the temperature. The oil from the heater treater is delivered to a Vapor Recovery Tower (VRT) where Volatile Organic Compounds are separated. The oil is cooled in an air cooler, and then flows into the storage tank. The oil does not flash in the storage tank because the Volatile Organic Compounds have been removed and the oil is cooled. The VRT gas flows through a partitioned air cooler to condense water and heavy hydrocarbons. The condensed liquids are separated in a scrubber and pumped to a separator. The scrubber vent is pressurized in a Vapor Recovery Unit (VRU). The pressurized gas from the VRU is condensed in the partitioned air cooler. The condensed liquids from the VRU are separated and stabilized in a separator.	Standard unit size is 2.5 MMSCFD. Units can be paralleled for larger capacity		

Recommendations – States and federal agencies need to provide leadership, partnering with each other

- Share experiences.
- Make it a priority. *The IOGCC is in an excellent position to lead this effort*.
- Workshops and forums should be organized to pull these organizations together.
  - Address barriers to access gathering and power lines. (These could be state or local specific.)
  - Emission/Air Quality Credits.
  - Financial incentives from states to offset their investment in new solutions. (This should be temporary.)

Recommendations – infrastructure

- Infrastructure is a key issue and is a major critical path item.
- Efforts need to be directed to enable early installation (gathering lines, power lines, etc.).
- Infrastructure regulations vary by region. Need for process to exchange ideas and practices.
- Fast-track infrastructure development.

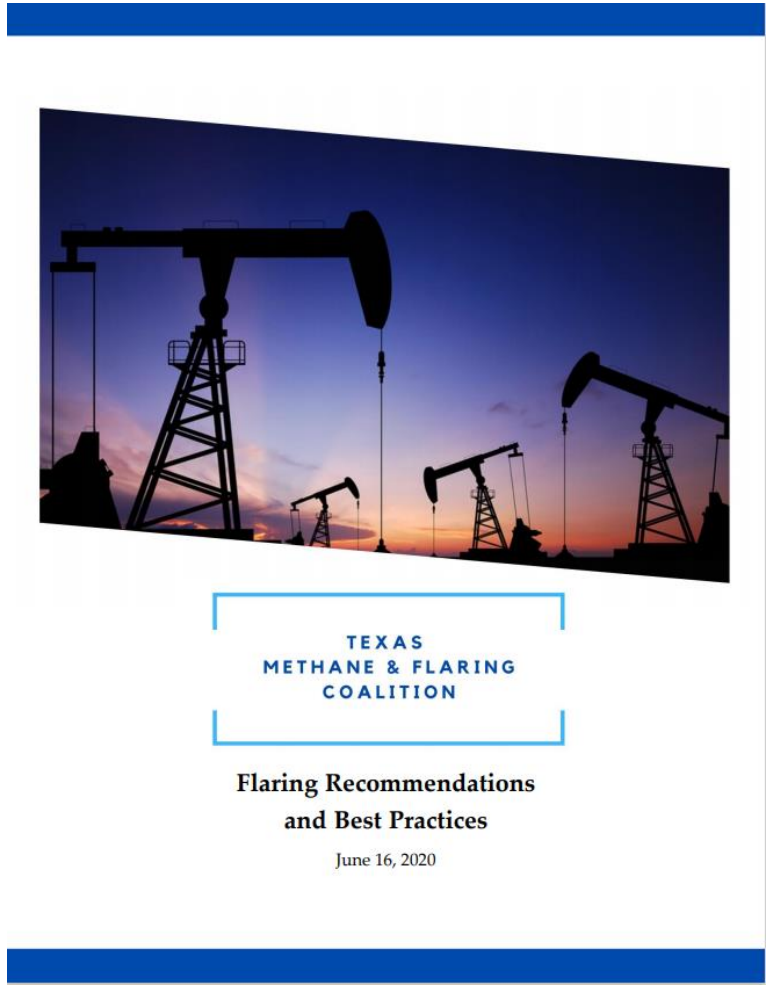
Recommendations (continued)

- Technologies can be synergistic with other efforts. Demonstration of technologies needed.

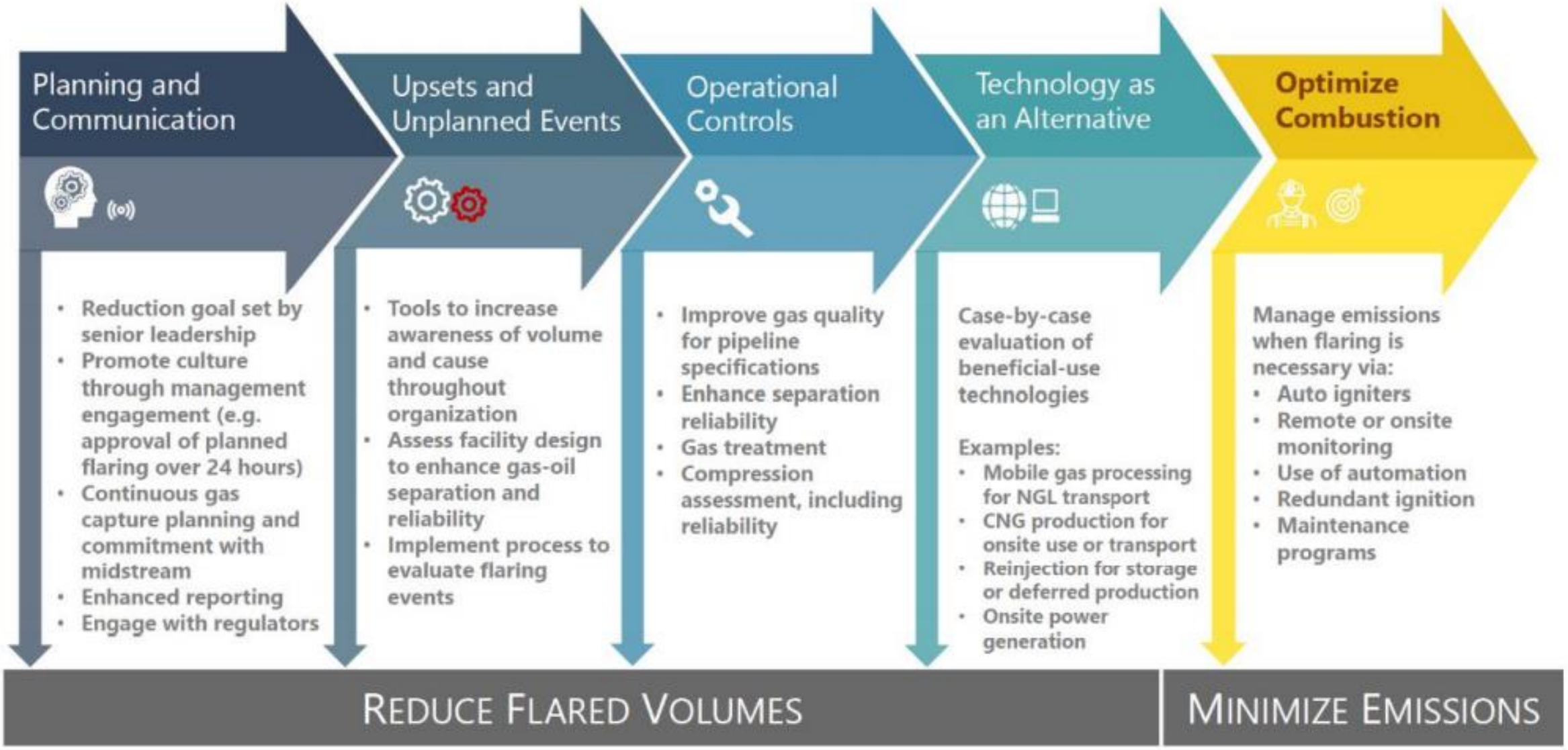
  - Further work should be undertaken to develop a decision management system to screen
  - Evaluation of technologies:
    - Transformation of stranded gases into salable products
    - Reduction of emissions in a cost-effective manner
    - Determination of how technologies and processes could advance exports
  - Analysis of field results.
  - Providing compilation information for operators, regulators and landowners.

Corporate Culture – *Key Industry Initiatives*

- ***The Environmental Partnership***
- ***Our Nation's Energy Future (ONE Future)***
- ***The Texas Methane & Flaring Coalition***



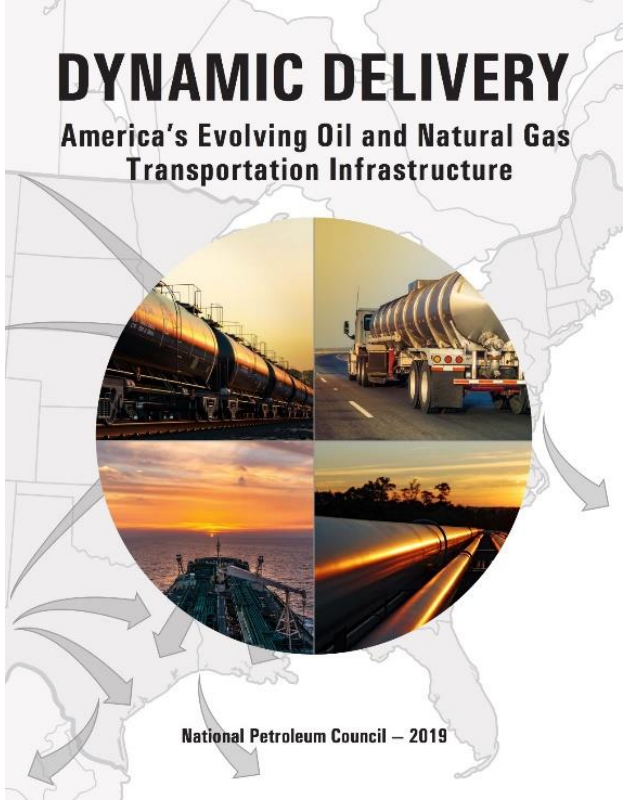
Texas Methane & Flaring Coalition: Flaring Best Practices



https://texasmethaneflaringcoalition.org/wp-content/uploads/2020/06/6-16-20-TMFC-Flaring-Recommendations-Best-Practices-Report.pdf

NEPA Reform

- **Key Finding 13:** The permitting and construction of some energy infrastructure projects has been challenged, delayed, or stopped as a result of litigation by stakeholders concerned about climate change and the associated policy debate.
- **The NPC recommends:** Congress should:
  - **Clarify that greenhouse gas assessments under NEPA, for oil and natural gas infrastructure projects, are confined to emissions that are (1) proximately caused by the federal action (see Dep't. of Transportation v. Public Citizen, 541 U.S. 752 (2004)), and (2) are reasonably foreseeable.**
  - **Enact a comprehensive national policy to reduce greenhouse gas emissions and seek to harmonize federal, state, and sectoral policies to enhance efficiency and effectiveness. Congress should ensure that the enacted national policy is economy wide, applicable to all sources of emissions, market-based, transparent, predictable, technology agnostic, and internationally competitive.**



In Summary

Flaring is being reduced.

Important factors:

- The United States is a leader in flaring reduction actions, policies, and results
- States and federal agencies need to provide leadership, partnering together
- Company Culture
- Use of regional best practices / technologies
- Infrastructure build out is the critical path

All reports and materials referred to in this presentation will be available through the ERRT portal.