

THE FRACKING DEBATE

THE RISKS, BENEFITS,
AND UNCERTAINTIES
OF THE SHALE REVOLUTION

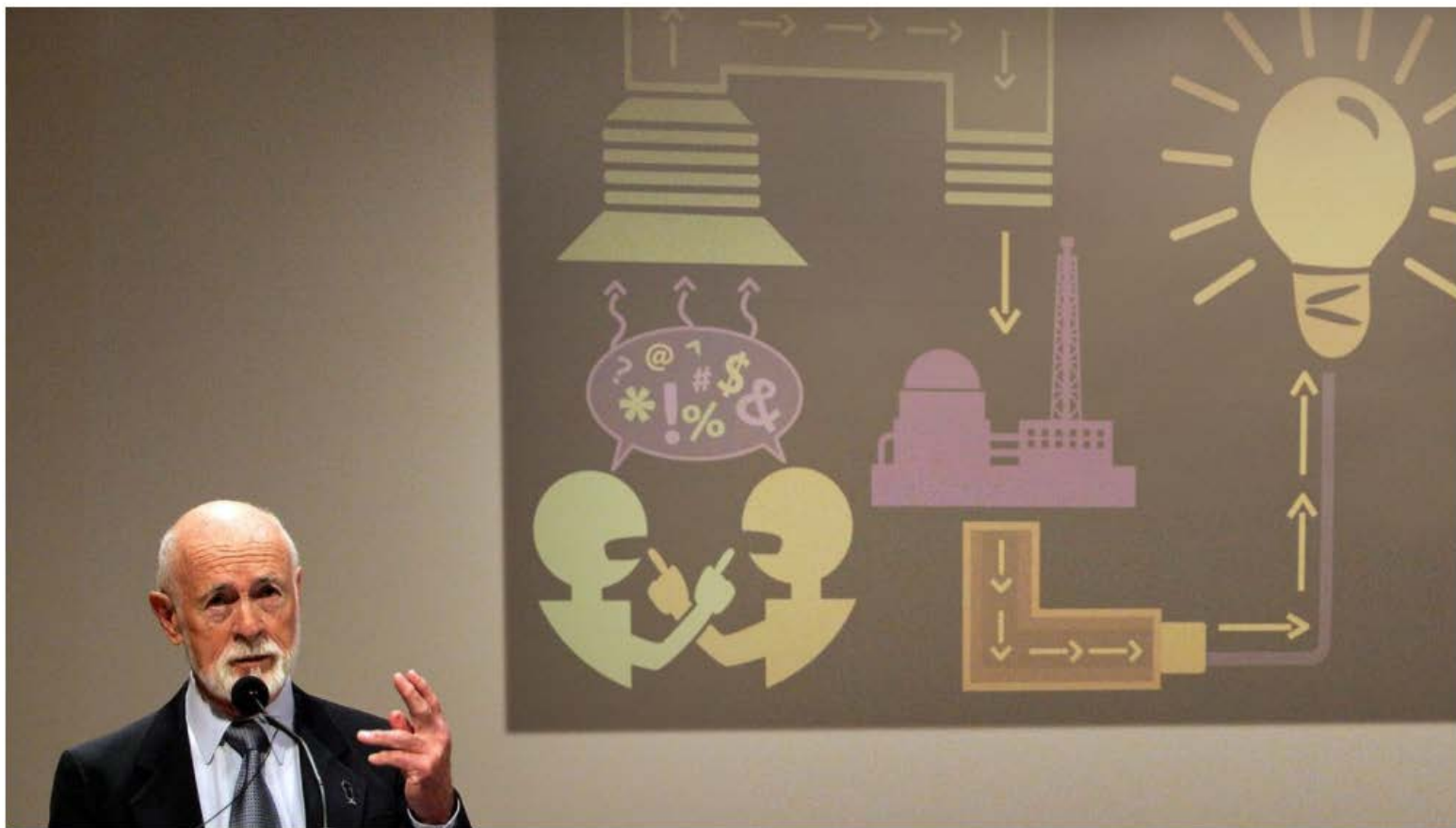
DANIEL RAIMI



COLUMBIA
UNIVERSITY
PRESS

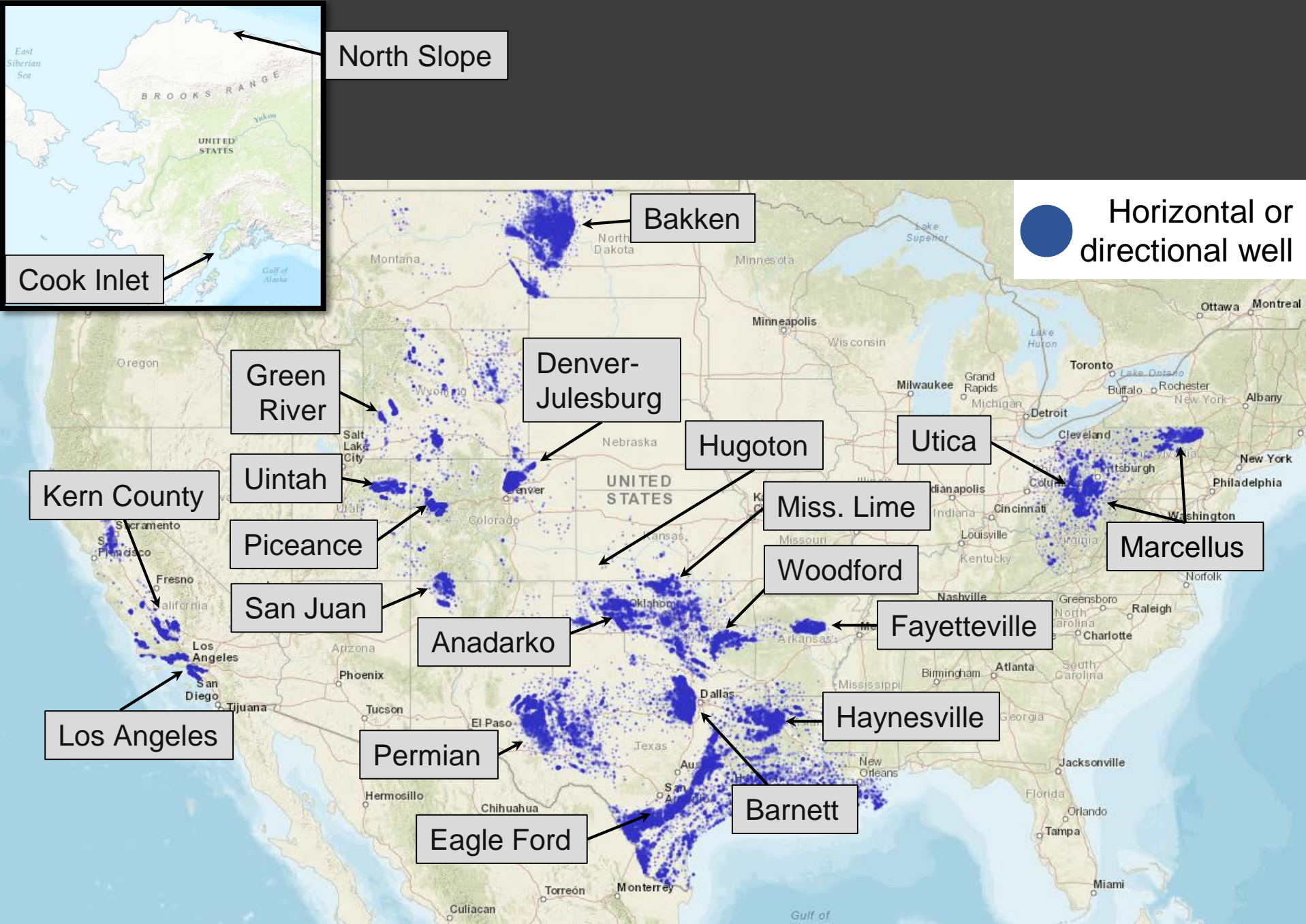


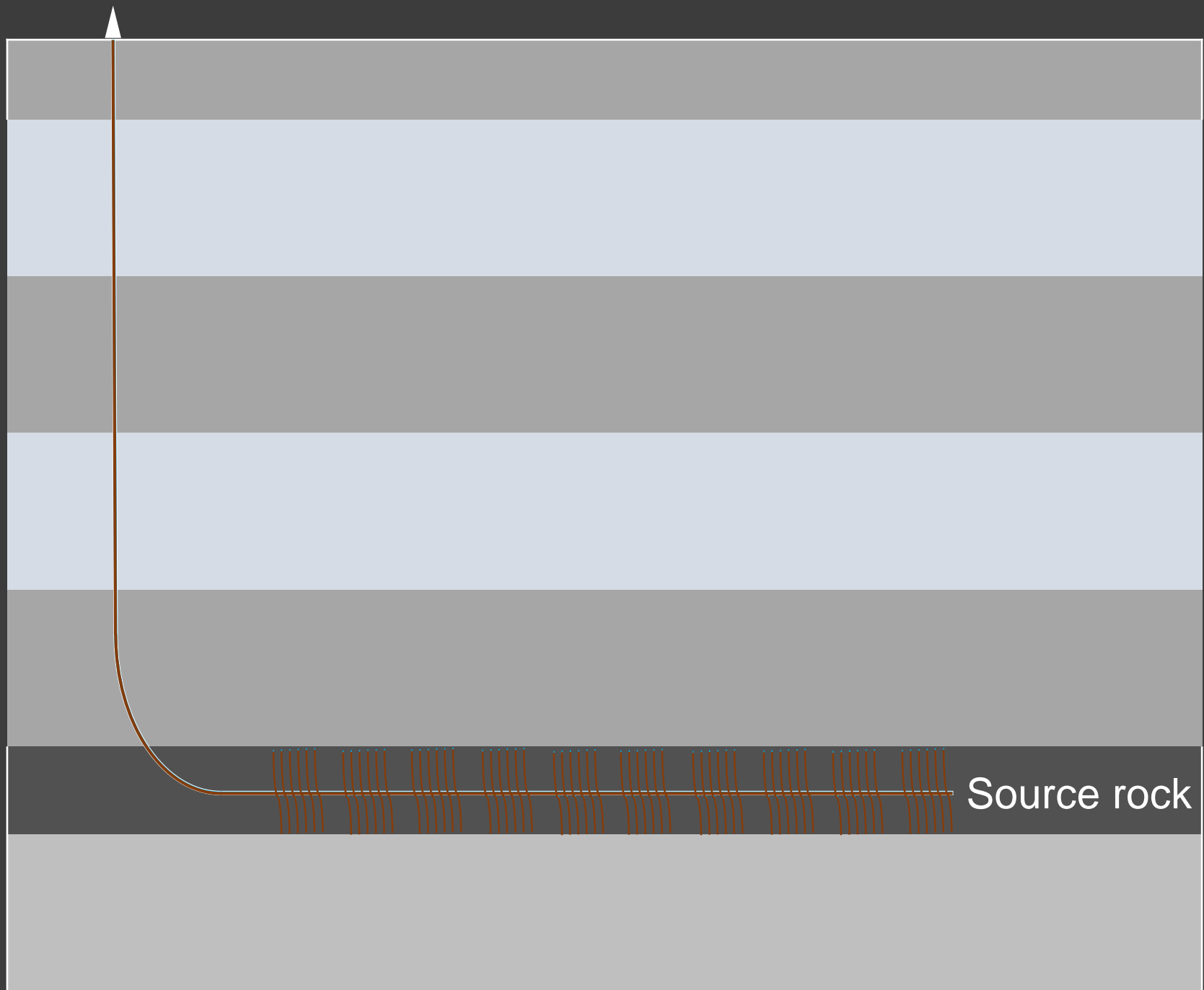
Scientists Working To Harness Energy Produced By Intense Fracking Debates



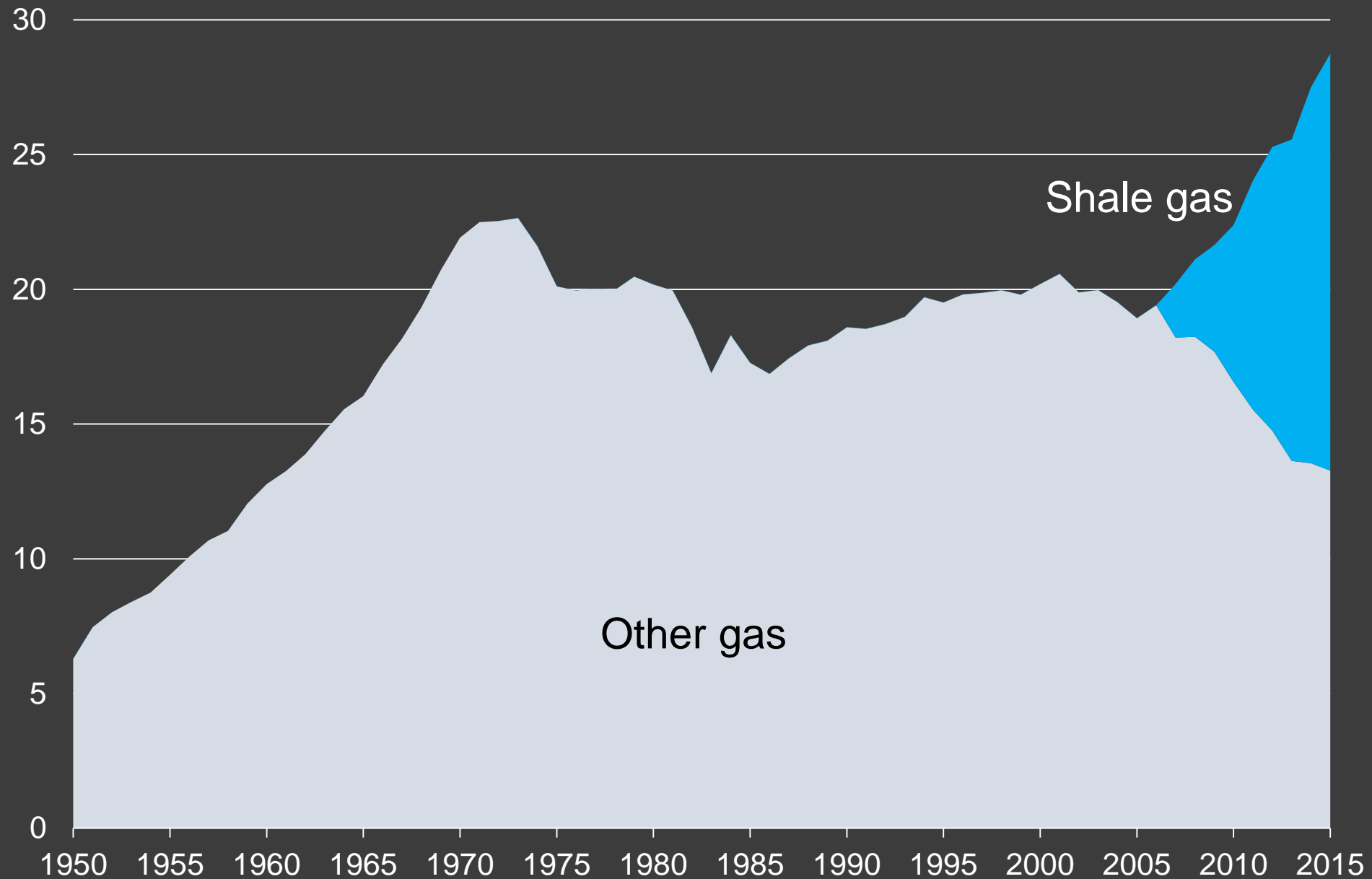
The Fracking Debate

1. Introduction
2. What is Fracking?
3. Does Fracking Contaminate Water?
4. Will Fracking Make Me Sick?
5. Does Fracking Cause Earthquakes?
6. Is There Any Regulation on Fracking?
7. Is Fracking Good or Bad for Climate Change?
8. Will Fracking Make the US Energy Independent?
9. Is Fracking Good for the Economy?
10. Will Fracking Spread Around the World?
11. Do People Living Near Fracking Love it Or Hate it?
12. What's Next?



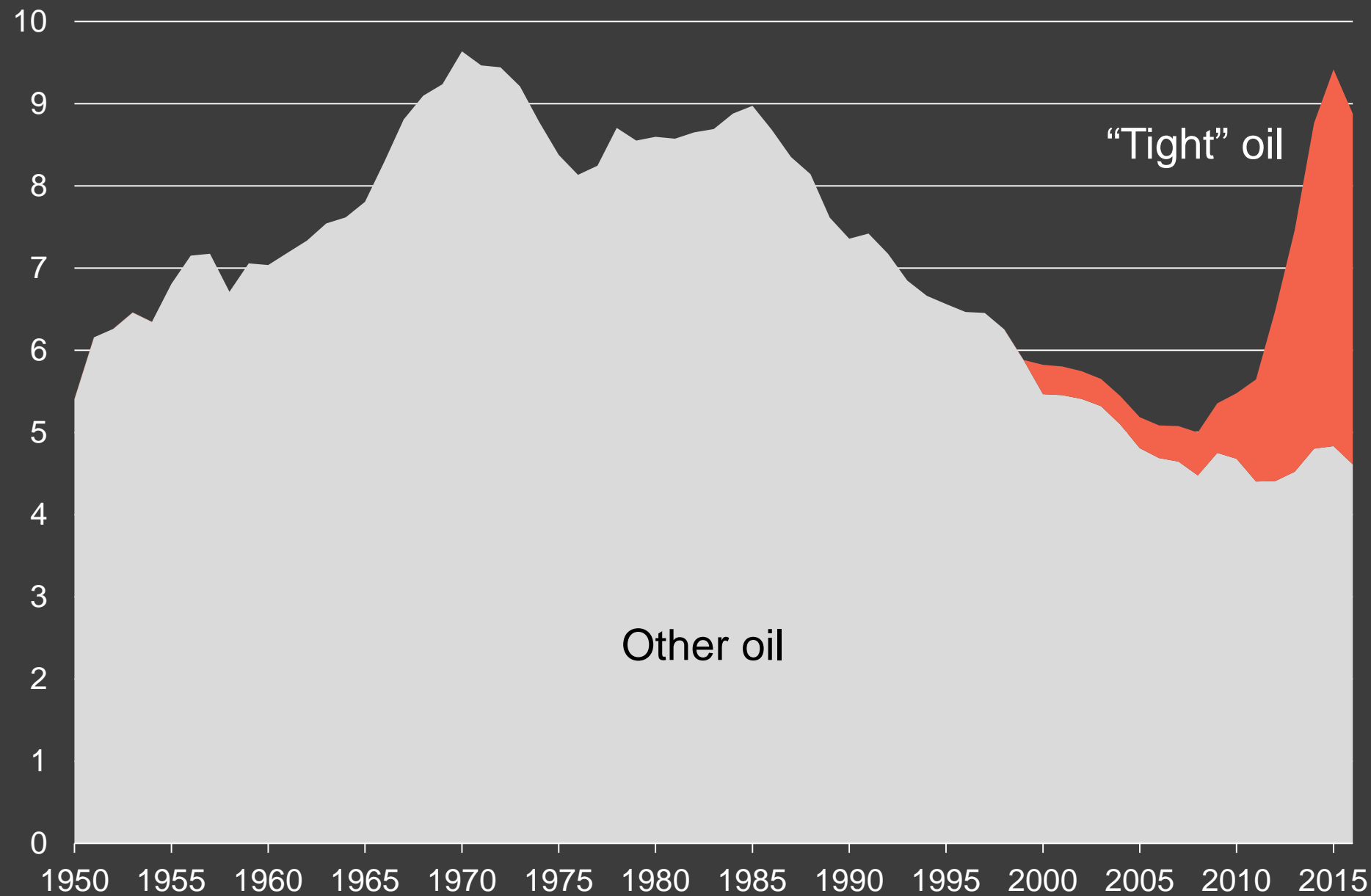


U.S. Natural Gas Production (trillion cubic feet per year)



Data source: U.S. EIA. Note: Shale production available only from 1/2007.

U.S. Crude Oil Production (million barrels per day)



Data source: U.S. EIA. Note: Tight oil production only available from 1/2000.

Marcellus Shale, Pennsylvania



Greene County, PA



Washington County, PA



Susquehanna County, PA

610

**Cabot Oil & Gas
GESFORD, K. PAD 2**

**610 CARTER ROAD
DIMOCK TOWNSHIP
SUSQUEHANNA COUNTY**

ACCESS ROAD ENTRANCE: 41.738786, -75.880516

IN CASE OF EMERGENCY CALL 9-1-1
24 HOUR COMPANY CONTACT NUMBER: (800) 642-0300

Shale wells drilled and “stray gas” cases in Pennsylvania

Year	New shale wells	New stray gas cases from shale wells	New stray gas cases per shale well
2010	1,600	12	0.75%
2011	1,957	9	0.46%
2012	1,352	7	0.52%
2013	1,215	5	0.41%
2014	1,372	5	0.36%
2015	785	0	0.00%

Data source: Pennsylvania Dept. of Environmental Protection. 2016 Oil and Gas Annual Report. Data not available for 2016.

Economic impacts of shale gas development in Pennsylvania

Change from 2007 - 2010	No Marcellus wells	Most Marcellus wells
Rents, royalties, copyrights	+15%	+461%
Business net profits	-5%	+14%
Total taxable income	-8%	+6%
Wages & salaries	-3%	+2%
Total employment	-3%	+1%

Permian Basin, Texas



Andrews County, TX



Midland County, TX



Seminole, TX



Public perception in a Colorado context

The Front Range ain't West Texas

West Texas



Front Range



Source: High Country News

Public perception: The Colorado context

- Colorado is perhaps the state with the most contentious debate over “fracking”
 - Dense population in close proximity to production
- There have been several focusing events
 - Local bans, Firestone, and others
- Many residents come for the natural amenities
 - Living near production may be unexpected
- The economy is healthy and diverse, especially along the Front Range
 - Residents may ask: do we “need” oil and gas production to support the economy?

Key concerns

- Quality of life impacts
 - Noise, light, traffic
- Environmental impacts
 - Climate change is at the forefront
- Local health impacts
 - Research in this area continues to develop
 - Regardless, local concerns are likely to persist

What next?

- Colorado is already a leader on stakeholder engagement
- But disputes over development are not going to go away, especially along the Front Range
- There are two models that operators and regulators could follow:

The “head down” model

- This model has been the default approach for many in industry and policymaking
- But this approach does not engage the full range of stakeholders



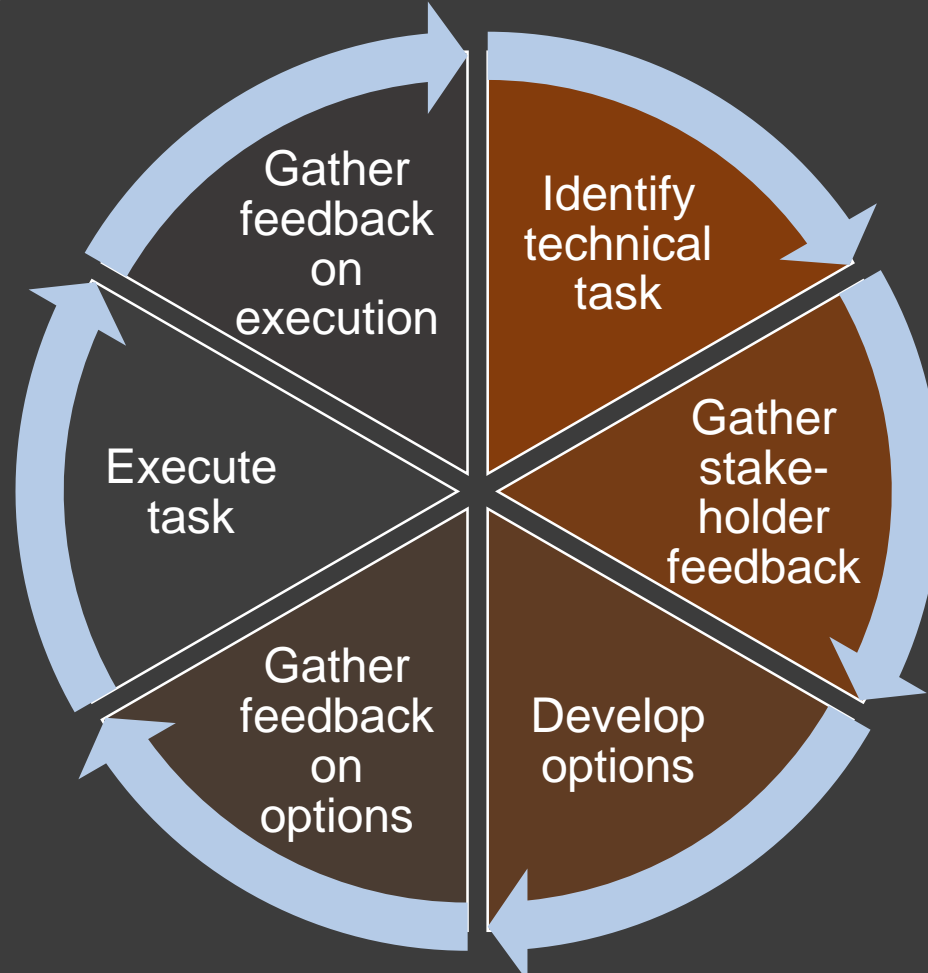
Identify
technical task

Execute
technical task

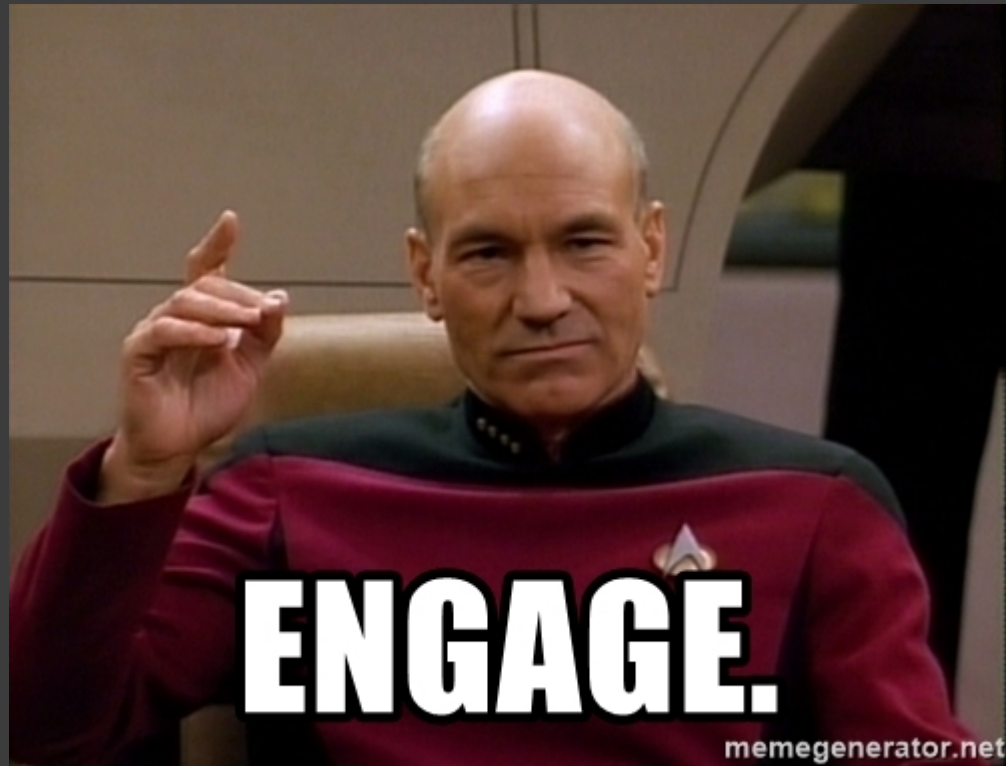
Done!

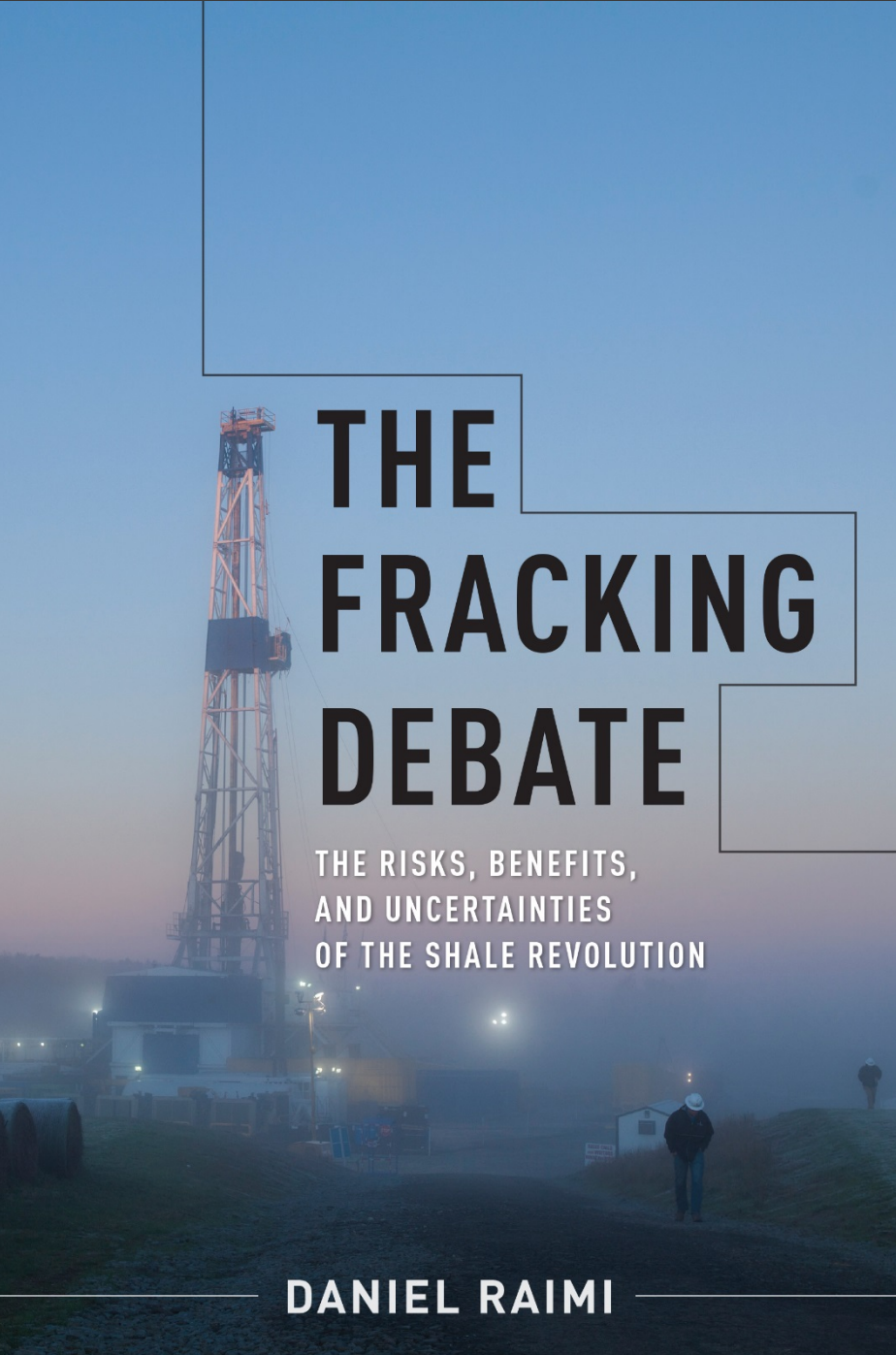
The “heads up” model

- Engaging with a broader range of stakeholders can be frustrating and time-intensive
- Two-way communication is difficult, but essential



The “heads up” model, simplified:





THE FRACKING DEBATE

THE RISKS, BENEFITS,
AND UNCERTAINTIES
OF THE SHALE REVOLUTION

DANIEL RAIMI

Thank You

Daniel Raimi

Senior Research Associate,
Resources for the Future
raimi@rff.org

Lecturer,
Univ. of Michigan Ford School of Public Policy
Faculty Affiliate,
Univ. of Michigan Energy Institute

Learn more

www.thefrackingdebate.com

All photos © Daniel Raimi unless otherwise noted