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Collaborate… Learn… Optimize… Sustain

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Unconventional Resource Development in Latin America
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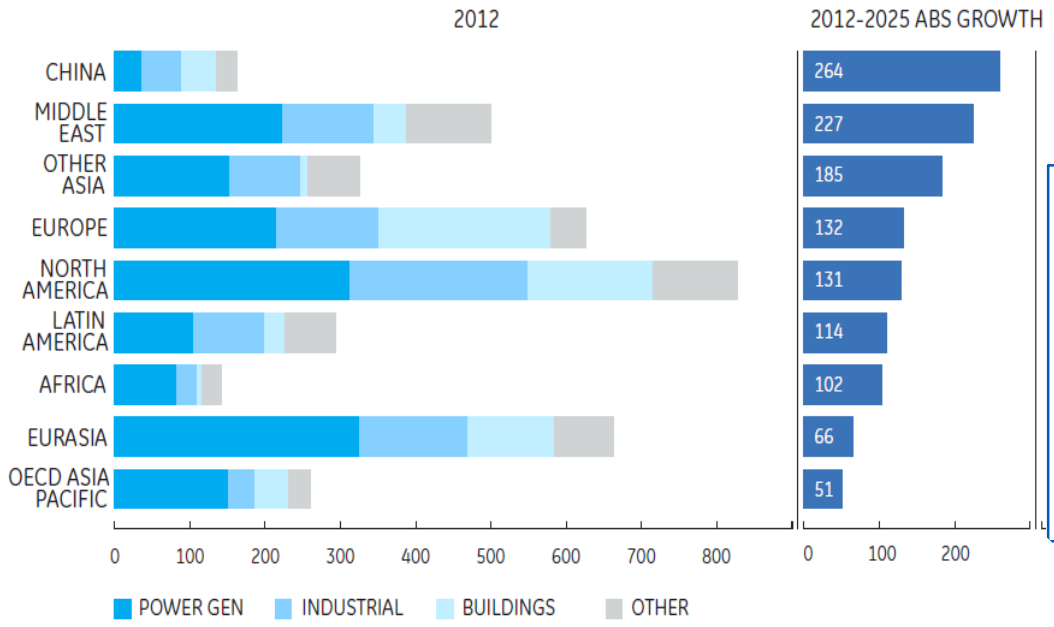
The Age of Gas

Natural gas is taking a larger role in global energy mix

Percent of Primary Global Energy Production

1990	2012	2025
20%	23%	26%

"Age of Gas" Outlook '12 –'25 (Bcm per year)



Global growth 36% '12 to '25
~3,500 Bcm → ~4,700 Bcm

Key drivers

- Unlocking new gas supply sources
- Need for environmental mitigation
- Price competitiveness … Asia & EU
- **Gas network growth**

Sources: History -BP Stat report, EIA, IEA.
Outlook- GE Fuel COE Jul '13

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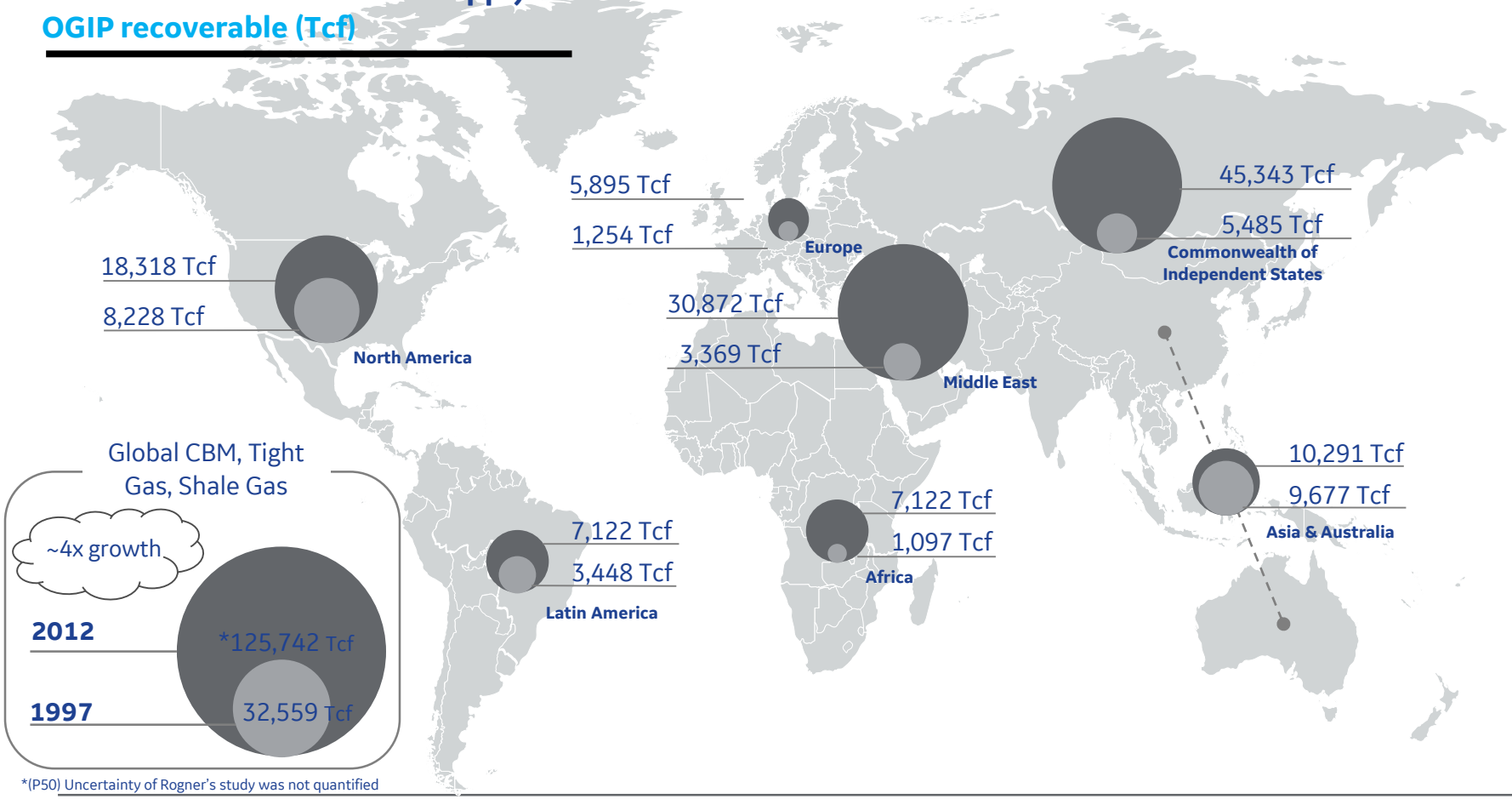
Available for download at:
http://www.ge.com/sites/default/files/GE_Age_of_Gas_Whitepaper_20131014v2.pdf

Global Unconventional Gas Supply
1997 - 2012

Global Unconventional Gas Supply Resource Estimates
OGIP recoverable (Tcf)



*(P50) Uncertainty of Rogner's study was not quantified

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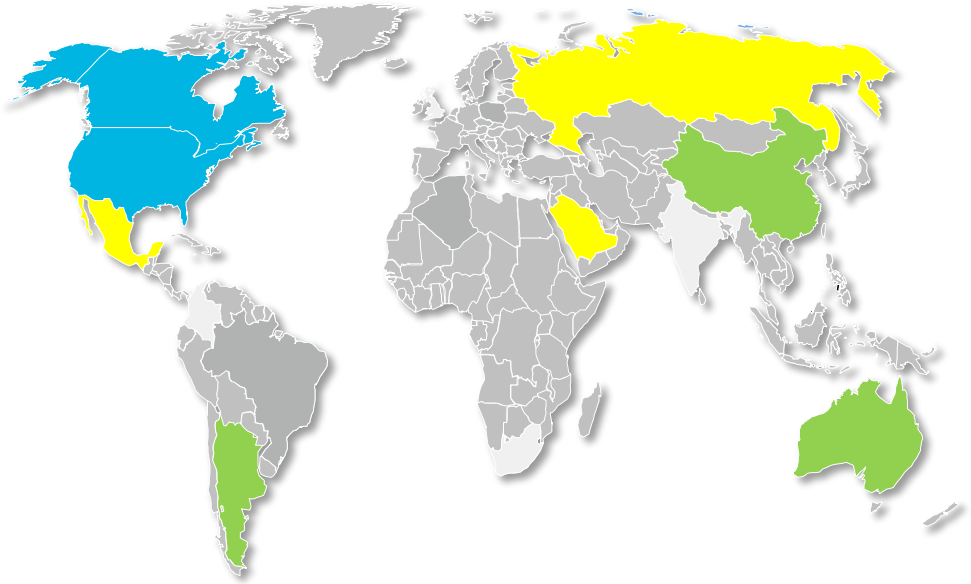
Sources: Rogner, An Assessment of World Hydrocarbon Resources (1997); Zhenzhen Dong, A New Global Unconventional Natural Gas Resource Estimate (August 2012)

Global Reality of Unconventionals…

Unconventional resources are everywhere… not everyone will be able to develop them

What we see today…*



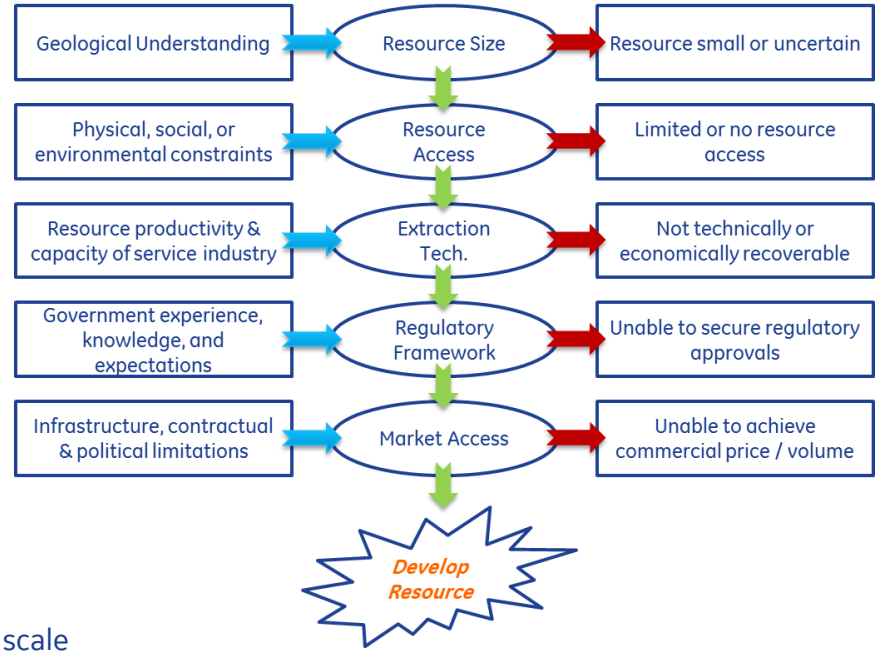
Happening at scale today…

Likely to scale within 5 years…

Potential to scale in the future…

*completely subjective and likely to change as more is understood…

What needs to be considered…



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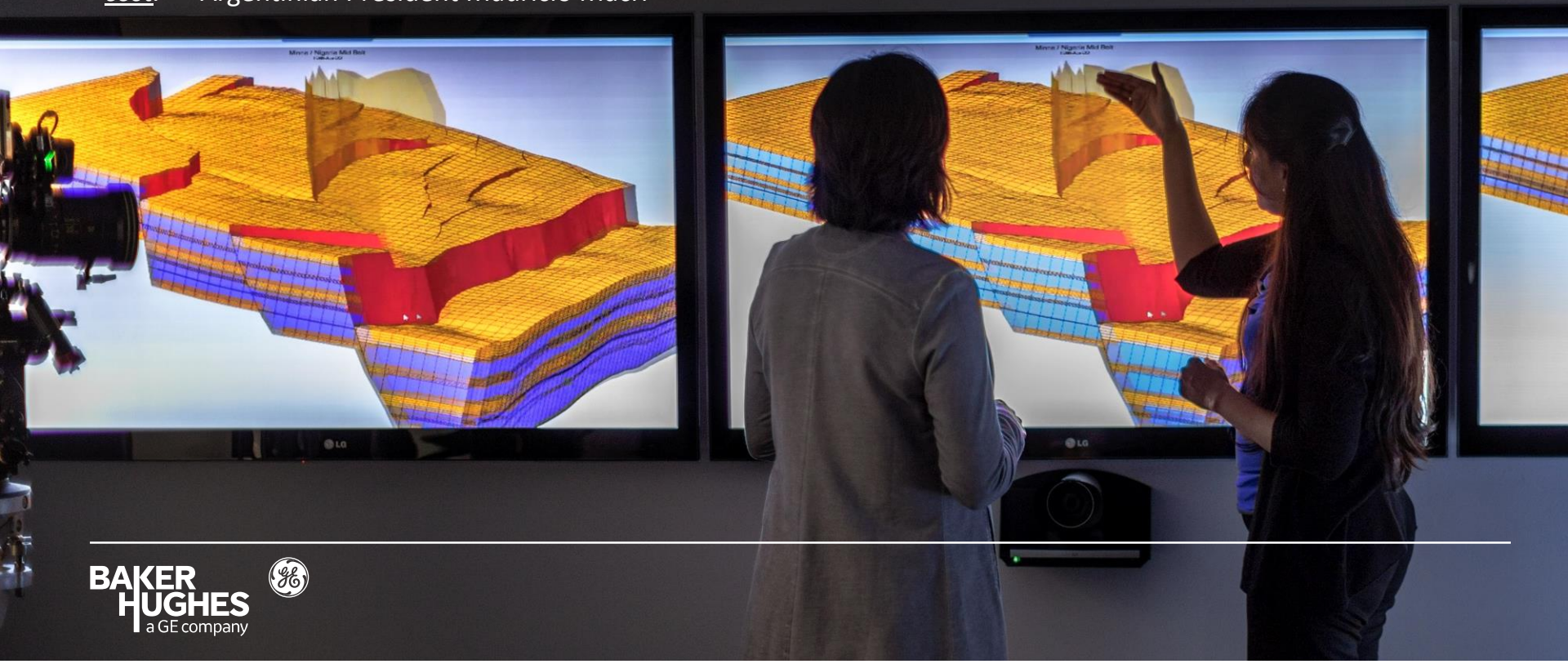
"Foreign and Argentinian companies will be able to work side by side with the same goal: to produce energy sustainably, in a safe way, and at the lowest possible cost." – Argentinian President Mauricio Macri



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Winning by delivering outcomes

50% reduction
in cost of doing business

50% improvement
in productivity

50% improvement
in industrial yield

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Bringing New Perspective & Focus

OIL AND GAS TECHNOLOGY CENTER STRATEGIC FOCUS

1. Accelerate technology development to solve customer challenges
2. Global Onshore Unconventionals & Conventionals
3. Sustainability & the Social License to Operate
4. Geotechnical Competency & Deep Domain Expertise
5. Offshore/Subsea support

Learning to Optimize Outcomes

Learn…

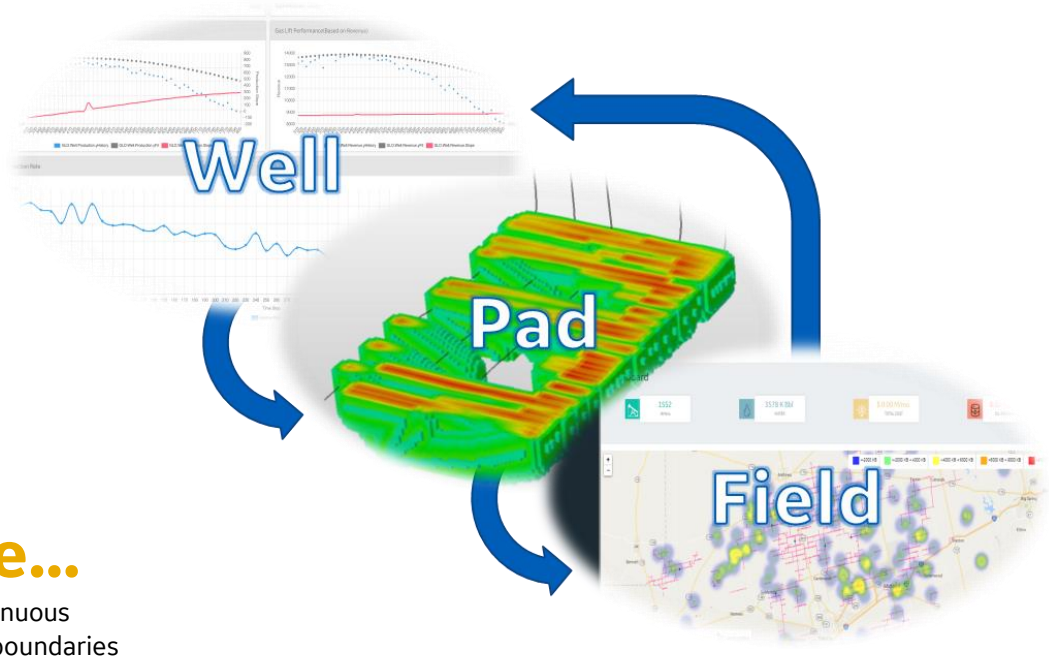
- The NAM “sandbox”
- Each well is a learning opportunity
- The objective, not the afterthought

Connect…

- Break silos for *fullstream* view
- Value is created in the “gaps”
- Diversity of thought critical

Optimize…

- Not discrete but continuous
- Define the goals and boundaries
- Start small and grow big



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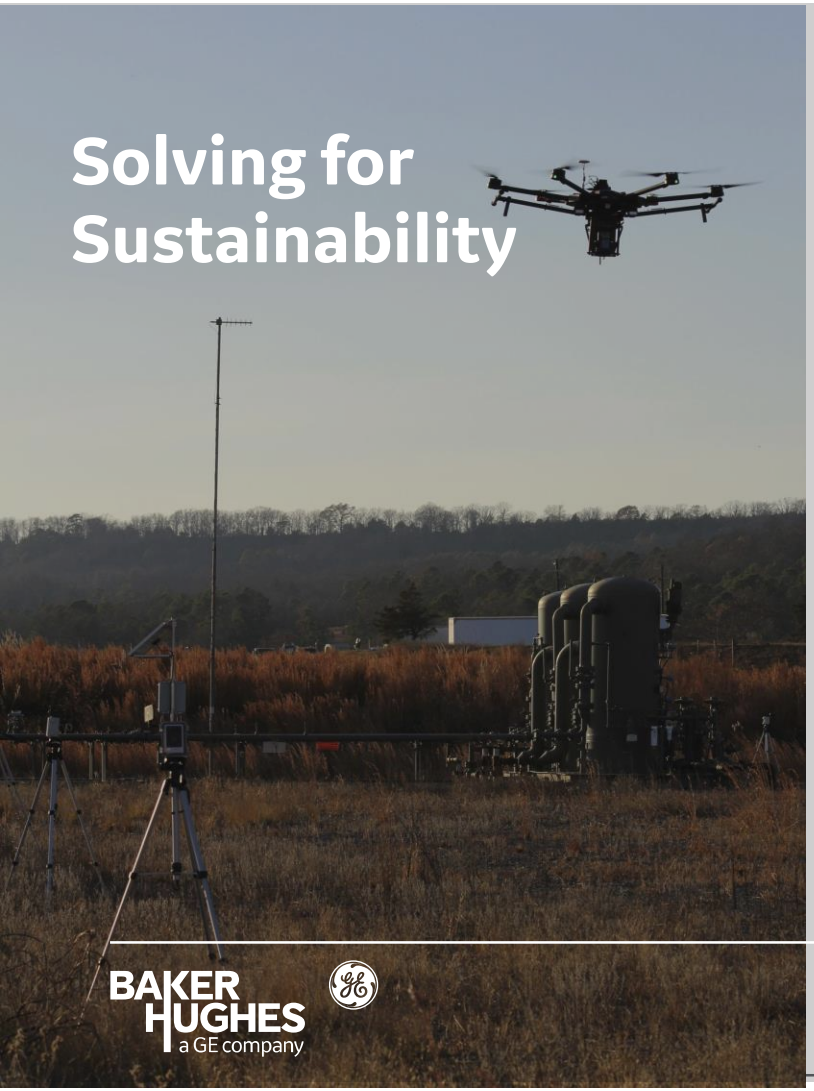
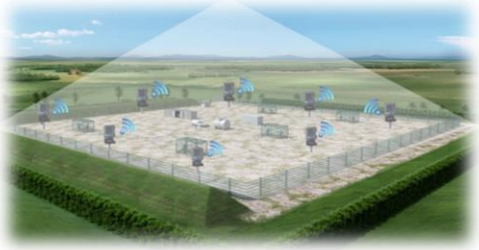


UAV Methane Detection + Mapping

- For interval based LDAR programs
- Increase quantitative understanding in less time
- Value enhanced w/ additional concurrent inspections



Ground Based Sensor Array

- Continuous cost effective monitoring
- Immediate alerts w/ localization + quantification
- Historical performance and trending

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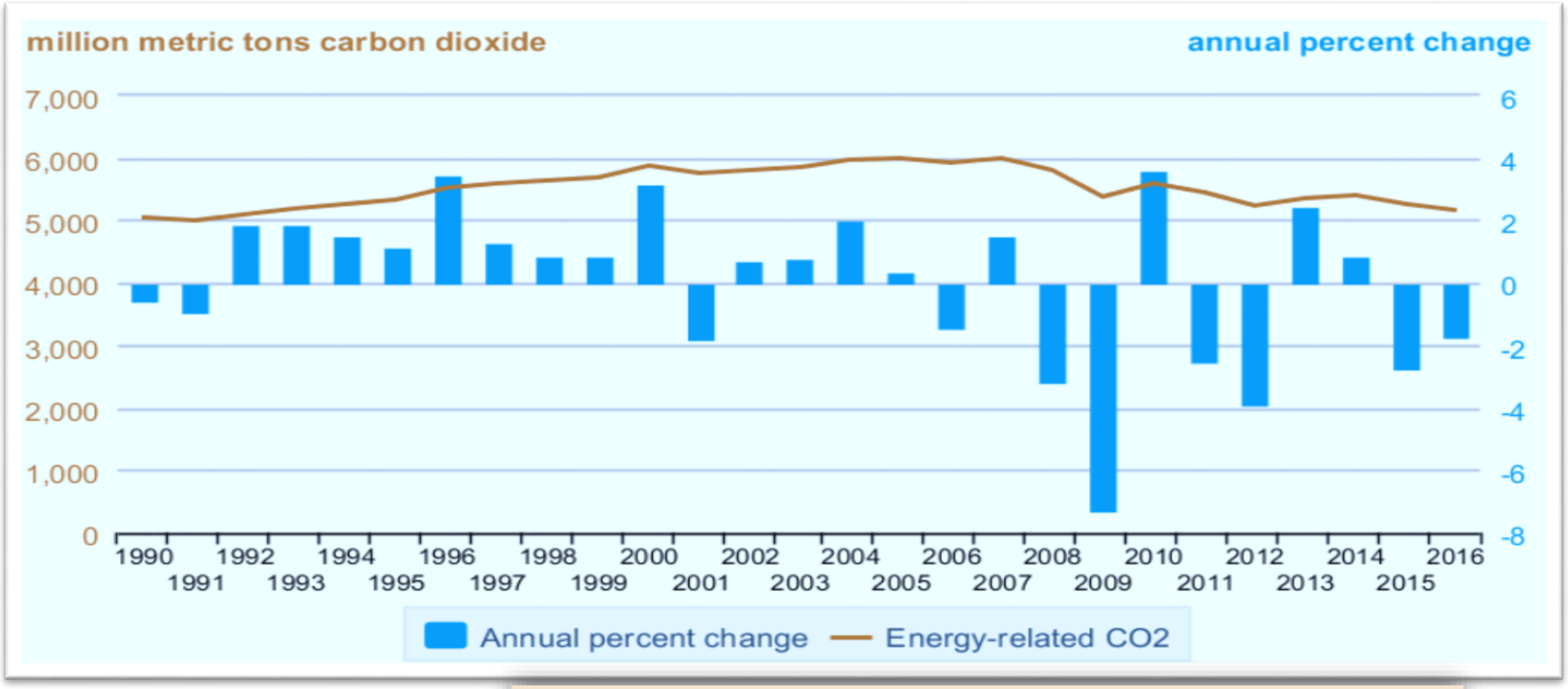
The Environmental Response

Energy-Related C02 Emissions, 1990-2016

- Energy-related carbon dioxide emissions are declining
- Declines in coal-fired electric power generation due to historically low natural gas prices
- Reduced gasoline consumption and improved efficiency



2016 emissions down 14% from 2005 levels

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eia **Source:** U.S. Energy Information Administration, August 2017 *Monthly Energy Review*.

Developing a New Generation of Resources

- Better
- Smarter
- Safer
- Faster
- Cleaner
- More Efficient

Producing these new resources the Right Way

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