



ECONOMIC & COMMUNITY IMPACTS OF MARCELLUS SHALE: PENNSYLVANIA'S EXPERIENCE

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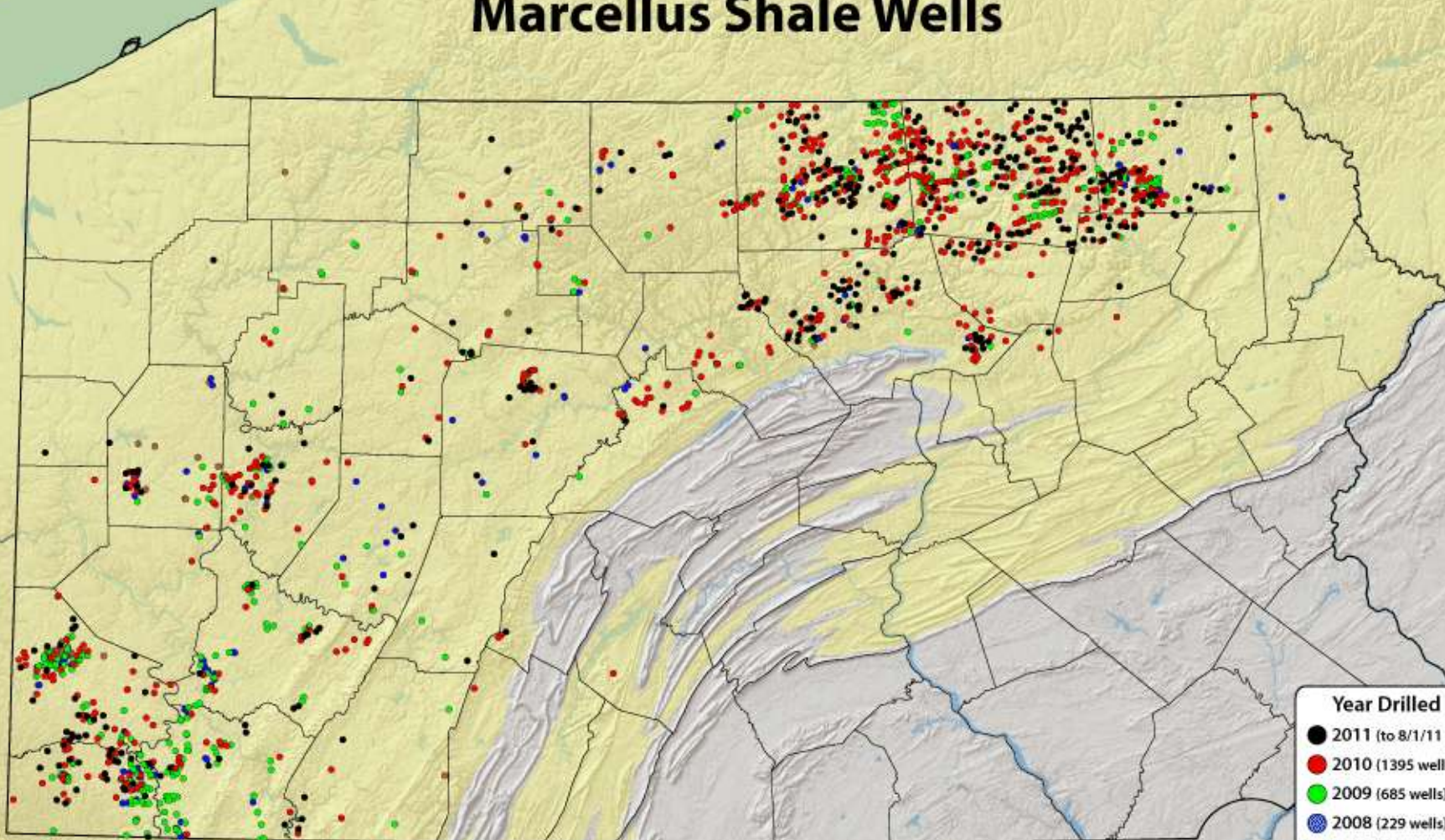
A Few Background Concepts

- Scale of this is **BIG**
 - Second largest natural gas field in the world (USGS)
 - Hundreds of thousands of acres
 - \$1.46 trillion recoverable gas in PA
 - (PA economy is \$355 billion as measured by earnings)
 - ~\$2 million ‘landowner’ share per well
 - (80 acre spacing)
- Resource-based economic development; when it’s gone, it’s gone
- Local impact- multiplier effects if keep dollars local

A Few Background Concepts

- New 'haves' and 'have nots'.
- Lots of uncertainty (costs; risks; long run implications)
- Public discussion increasingly divided and antagonistic

Marcellus Shale Wells

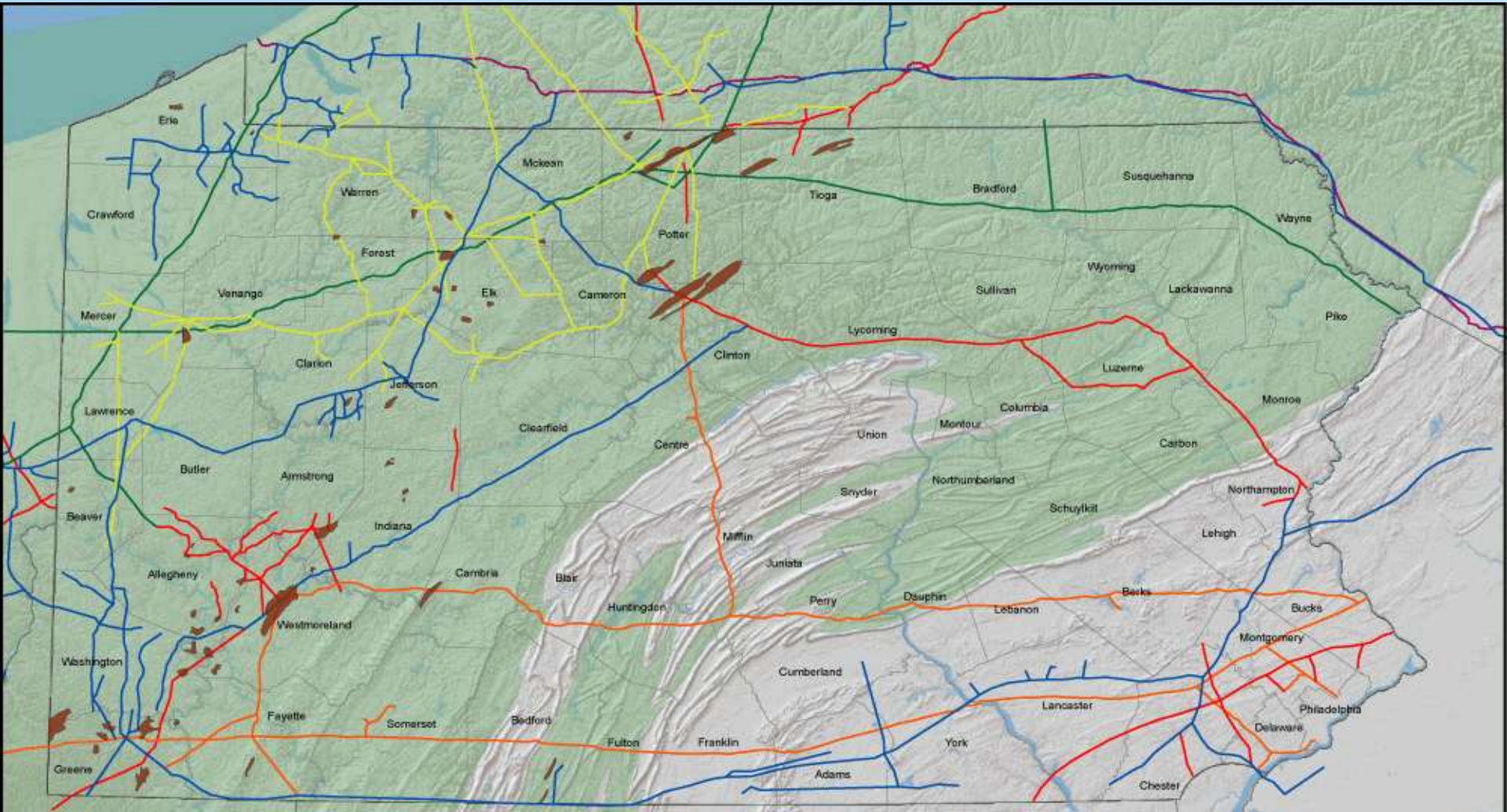


Year Drilled

- 2011 (to 8/1/11 1045)
- 2010 (1395 wells)
- 2009 (685 wells)
- 2008 (229 wells)
- 2007 (60 wells)

Based on Pennsylvania Department of Environmental Protection Rig and Permit Activity reports
www.dep.state.pa.us/dep/deputata/mirves/oilgas/RIG10.htm

Major Gas Pipelines



Major Gas Pipelines and Gas Storage Areas in Pennsylvania

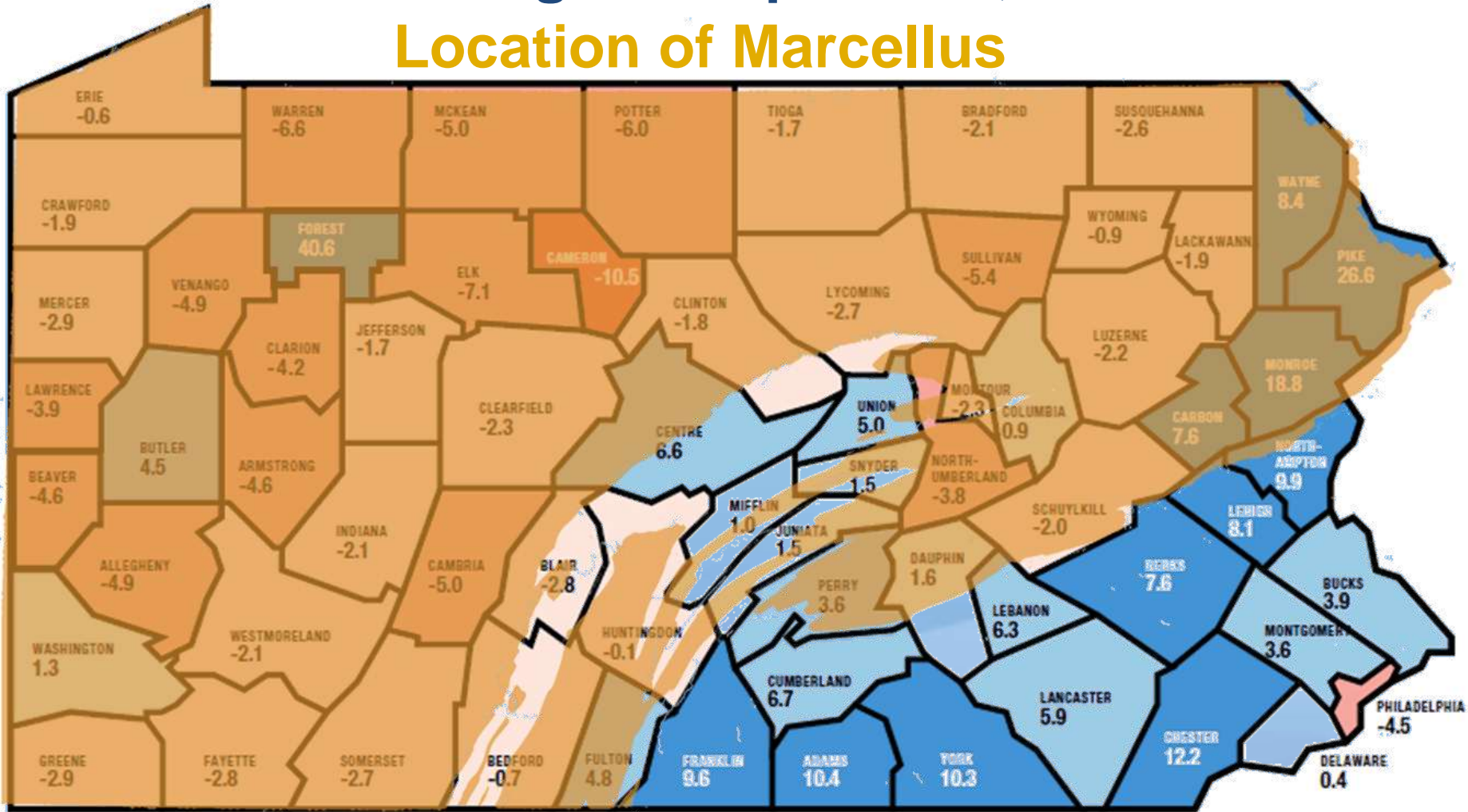
Columbia	Tennessee	Extent of Marcellus Shale
Dominion	Texas Eastern	Gas Storage Area
Millennium	Transco	
National Fuel		

Gas storage area locations from: "Oil and Gas Fields of Pennsylvania", Map 11, Pennsylvania Geologic Survey, compiled by S.L. McCoy and Zachary Schmitt, 4th edition 2007.

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Percent Change in Population, 2000-2007

Location of Marcellus



FAST GROWTH
7.2% and over

VERY SLOW DECLINE
-0.1 to -3.5%

SLOW GROWTH
3.6 to 7.1%

SLOW DECLINE
-3.6 to -7.1%

VERY SLOW GROWTH
0.0 to 3.5%

FAST DECLINE
-7.2% and over

PA: 1.2 %
U.S.: 7.2%

Source: Alter et al., "Pennsylvania Road to Growth," Penn State 2009

WHAT AFFECTS ECONOMIC IMPACTS?



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1. Timing, Scale & Pace Drive Impacts

Three Phases of Natural Gas Development

Development Phase (Short Lived/Labor Intensive)

- Well-pad and Access Road Construction
- Local collection pipeline Construction
- Drilling of the Well
- Fracturing of the Well
- Reclaiming some Disturbance

Production Phase (Long lived/Small & Steady Labor Force)

- Trucking Water and condensate from Well Site
- Monitoring Production
- Occasional Well Work-Overs (partially re-drill/re-frac)

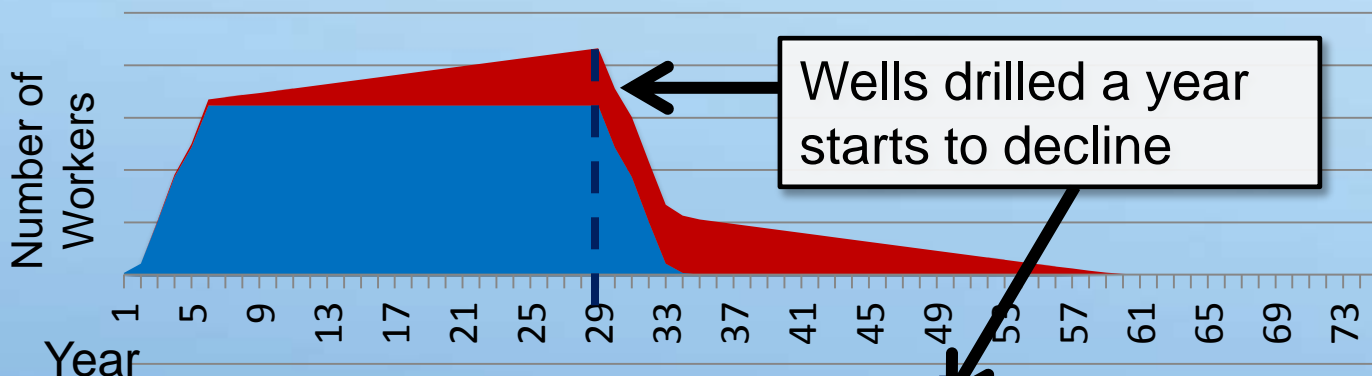
Reclamation Phase

- Dismantle and Reclaim well-sites

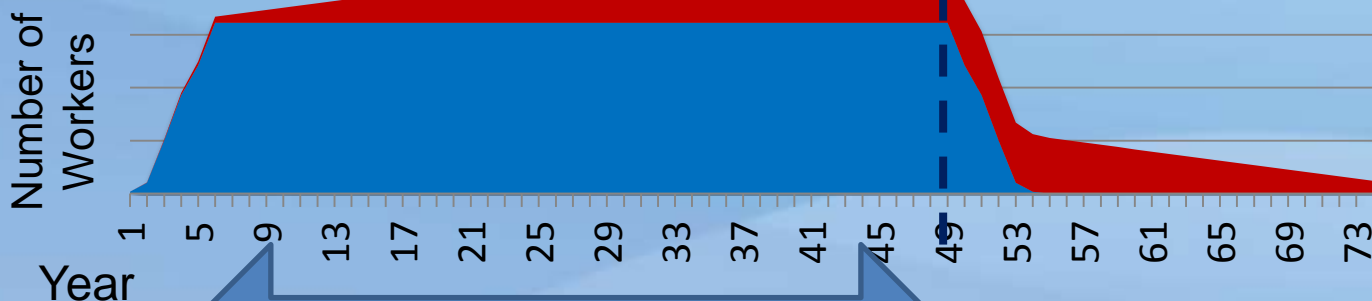
PA Statewide Possible Direct Workforce, by Phase

■ = Development phase jobs ■ = Production phase jobs

If 30 years
of active
drilling



If 50 years
of active
drilling

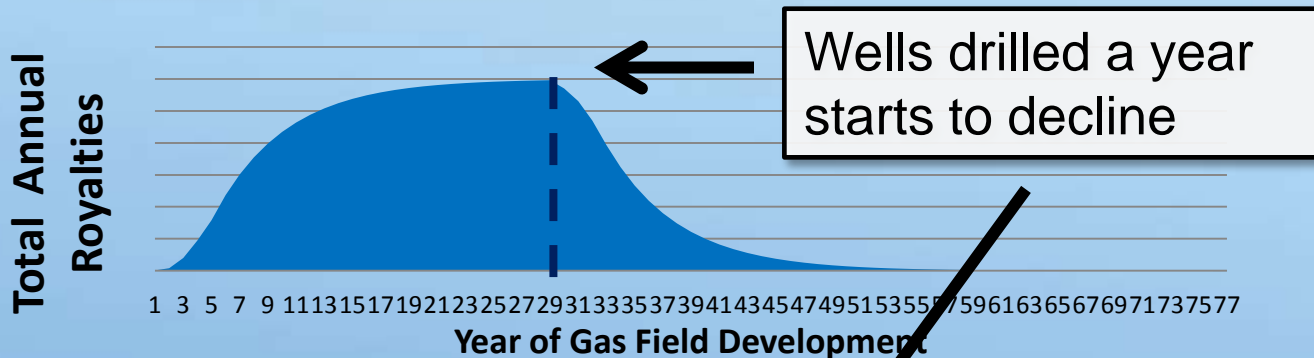


Duration?

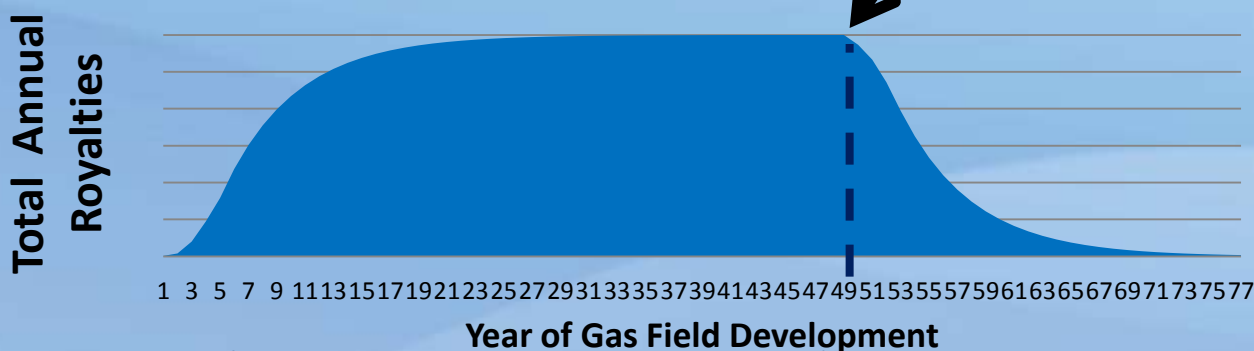
Likely shorter in individual communities

PA Statewide Estimated Annual Total Royalties

If 30 years of active drilling



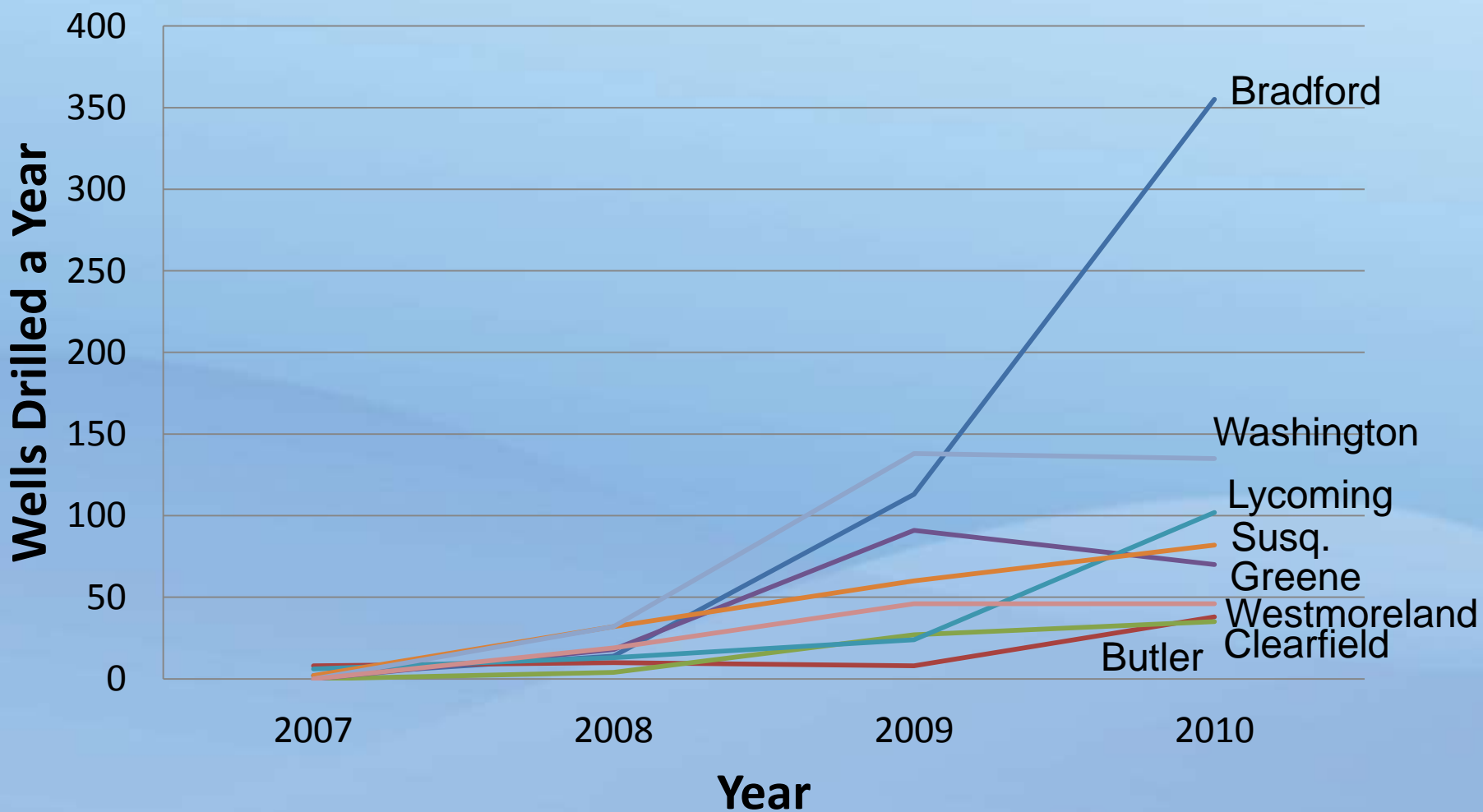
If 50 years of active drilling



Duration?

Likely shorter in individual communities

Marcellus Wells Drilled Annually, by County



2. Spatial Nature of Development

Gas development is more than just wells

- Multiple well pads – *intense activity, but short run until well is drilled*
- Multiple supporting locations – *intense activity, lasts until all wells in area are completed*
- Multiple specialized companies & workers.
Massive coordination task.
- Changing transportation patterns
- Communication

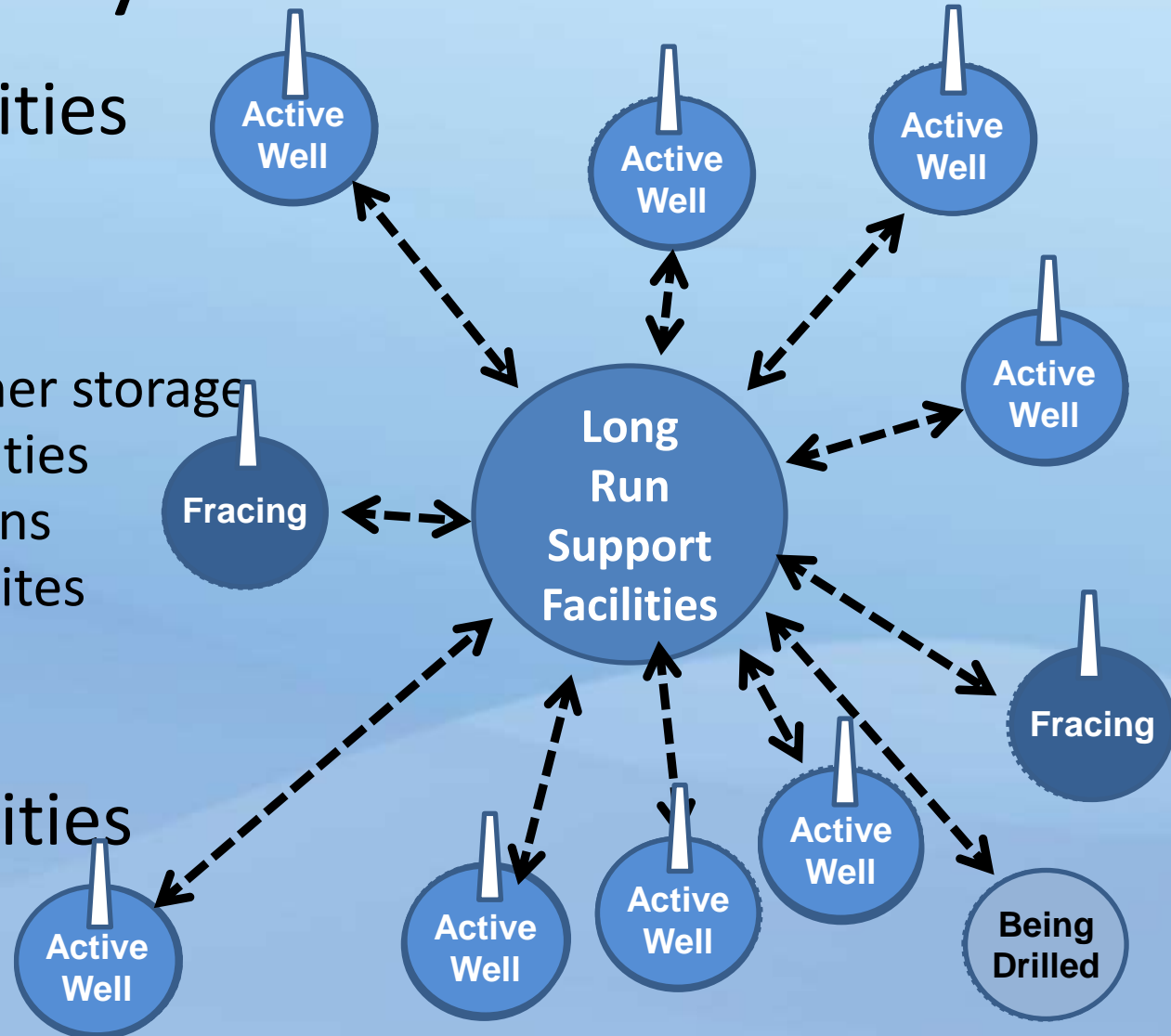
Spatial activity

- “Long Run” facilities

- Staging areas
- Worker housing
- Office areas
- Pipe, sand and other storage
- Maintenance facilities
- Compressor stations
- Water withdrawal sites
- Water treatment
- Etc.

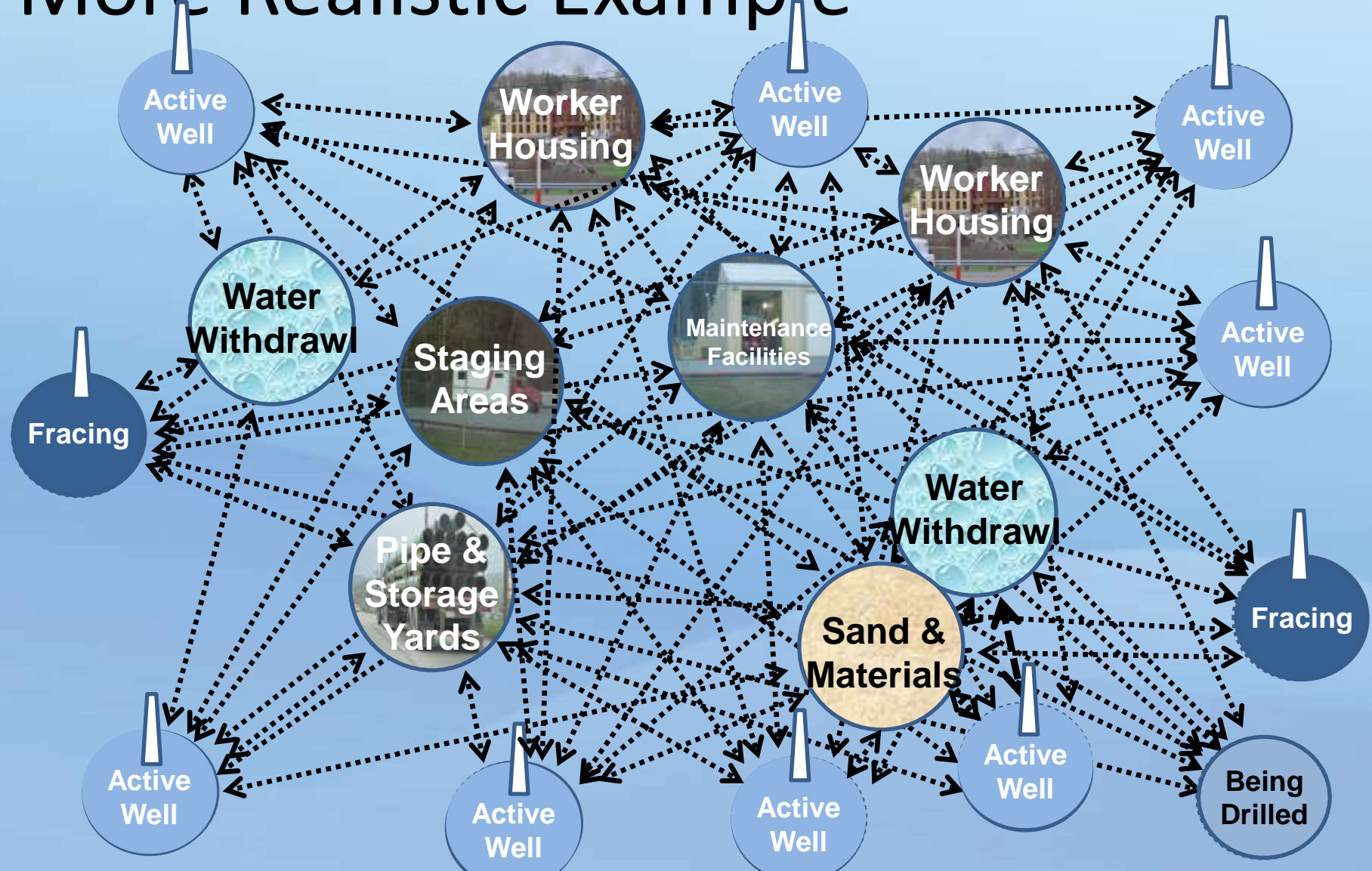
- “Short run” facilities

- Well pads



Simple Example

More Realistic Example



Though still much simplified

3. Where the Dollars Go

Business spending & workforce

- Share of workforce - around 70% are Pennsylvania
 - Proportion is increasing as workforce is trained
- Share of Pennsylvania-based businesses?

Where Leasing & Royalty Dollars Go

Marcellus Land Ownership in Pennsylvania

Owner	Proportion of Marcellus Land
County residents	50.6%
Residents elsewhere in PA	24.7%
Commonwealth/other public	17%
Non-Pennsylvanians	7.7%

How the dollars are used by residents

- 55% of leasing dollars are saved
- 66% of royalty dollars are saved

Where and when will those saved dollars be spent?

Spending by the Commonwealth

How should the Commonwealth use the leasing & royalty dollars it receives?

1. Spend it in the year those dollars are received?
 - General Fund?
 - Agency-specific spending (e.g. Fish & Boat; Game Commission?)
 - Targeted expenditures (e.g. environmental programs, aid to local governments, infrastructure investment, etc)
2. Investing it for future needs?
 - DCNR Oil & Gas Fund?
 - Legacy Fund?
 - Environmental Reclamation Fund?
 - Or...?

LESSONS FROM OTHER STATES



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Past Experience during Energy Booms

- An extensive research literature on energy boomtowns exists
- Direct & significant influence on population, affecting nearly all sectors of the community – Housing, Culture, Public Services
- Local governments are often unprepared by waves of growth
- Increases in social problems such as crime, mental health problems, community dissatisfaction, conflict

Experience *After* Energy Booms

- Many post-energy boom communities are no better off as a result of the experience
 - Poorer economic and social well-being (poverty, unemployment, etc.) than other communities
 - Lack of trust, leadership and human capital to find a way out
- Those which are better off after a boom tend to:
 - Have strong local leadership & community involvement
 - Entrepreneurial support systems to allow adaptation
 - Actively monitor and respond to issues

West Virginia Experience with Energy Booms

- Mining dependent counties had economic surge in 1970's, but were hard hit during bust of 1980's
 - Lack economic diversity
 - Lower education levels
 - High income inequality
- Relying upon energy boom is not a definite solution for long-term growth and prosperity

What we're seeing in Pennsylvania

PENNSYLVANIA'S ECONOMIC EXPERIENCE



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Pennsylvania's Economic Experience through 7/2011

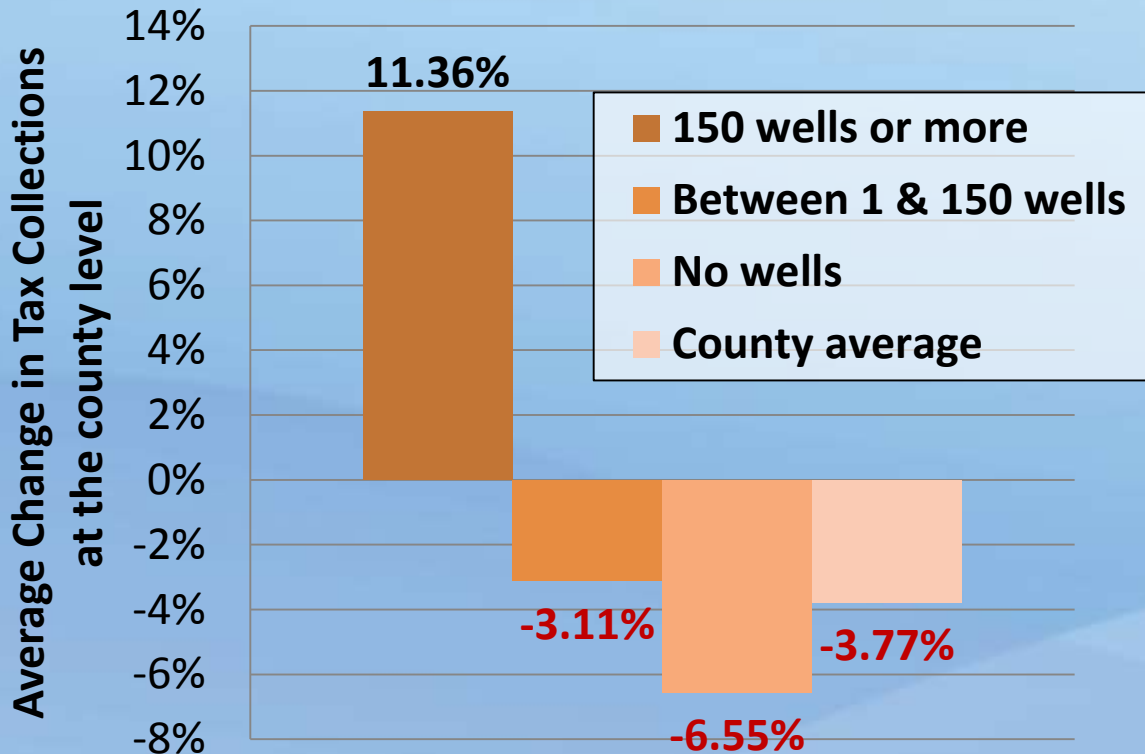
- More hiring, lower unemployment, higher average wages in Marcellus counties
- Impacts are economy wide
- Tourist destination businesses report either no change, or increase in business activity
- Majority of people leasing did so without talking with an attorney, reviewing educational materials, or talking with more than one company

Pennsylvania's Economic Experience through 7/2011

- Higher state tax collections (sales tax, income tax)
- Higher state gov't costs (though no estimate)
- More local gov'ts report higher costs than new revenues
- Major change in communities
 - Traffic & road impacts
 - Rents tripling in some counties
 - More social conflict
 - Lots of uncertainty

Change in State Sales Tax Collections, by County Level Marcellus Drilling Activity

July, 2007- June, 2010



Sales tax dollars go to the state - none remains at the local level (except in a few urban counties)

Counties with more than 150 wells since 2007 include:

- Bradford (482 wells)
- Tioga (387 wells)
- Washington (305 wells)
- Greene (179 wells)
- Susquehanna (174 wells)

Counties by Number of Marcellus Wells Between 2007 and December, 2010

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Change in Total Compensation, by County Level Marcellus Drilling Activity, 2007-09

Sector of the Economy	90 Wells or More	1-89 Wells	No Wells	State Average
Mining	8%	7%	-3%	1%
Construction	10%	-1%	-10%	-6%
Wholesale trade	11%	-4%	-5%	-3%
Retail trade	5%	2%	-1%	0%
Transportation and warehousing	17%	-3%	0%	0%
Finance and insurance	10%	6%	2%	4%
Real estate & rental & leasing	0%	1%	-8%	-4%
Professional, scientific, & technical	7%	6%	2%	4%
Arts, entertainment, & recreation	17%	-4%	2%	1%
Accommodation & food services	2%	-3%	-3%	-3%

Source: Thompson and Kelsey, 2011, using US BEA data

Impacts on Businesses, 2010

Bradford & Washington Counties

	Percent responding 'Yes'		
	All Responses	Bradford County	Washington County
Because of natural gas drilling...			
Have your business activities changed?	17%	22%	9%
Have your annual sales <u>increased</u> ?	28%	32%	23%
Have your annual sales <u>decreased</u> ?	3%	3%	2%
Has the number of regular non-gas customers <u>increased</u> ?	7%	10%	3%
Has the number of regular non-gas customers <u>decreased</u> ?	3%	3%	2%

Source: Ward, Kelsey, et al. 2011
 Survey of 1,000 businesses in each county; 31% response rate
 Funded by PA Dept of Community & Economic Development

Impacts by Type of Businesses, 2010

Bradford & Washington Counties

	Percent responding 'Yes'			
	Business Activities Changed?		Annual Sales Increased?	
	Bradford	Wash.	Bradford	Wash.
Construction	35%	16%	27%	15%
Wholesale Trade	28%	20%	33%	50%
Retail Trade	25%	8%	44%	28%
Financial, Insurance, Real Estate	28%	10%	50%	40%
Business Services	20%	6%	33%	16%
Eating & Drinking Places	29%	0%	38%	33%
Hotels & Campgrounds	80%	50%	100%	50%

Opportunities and Challenges

ECONOMIC & WORKFORCE ISSUES



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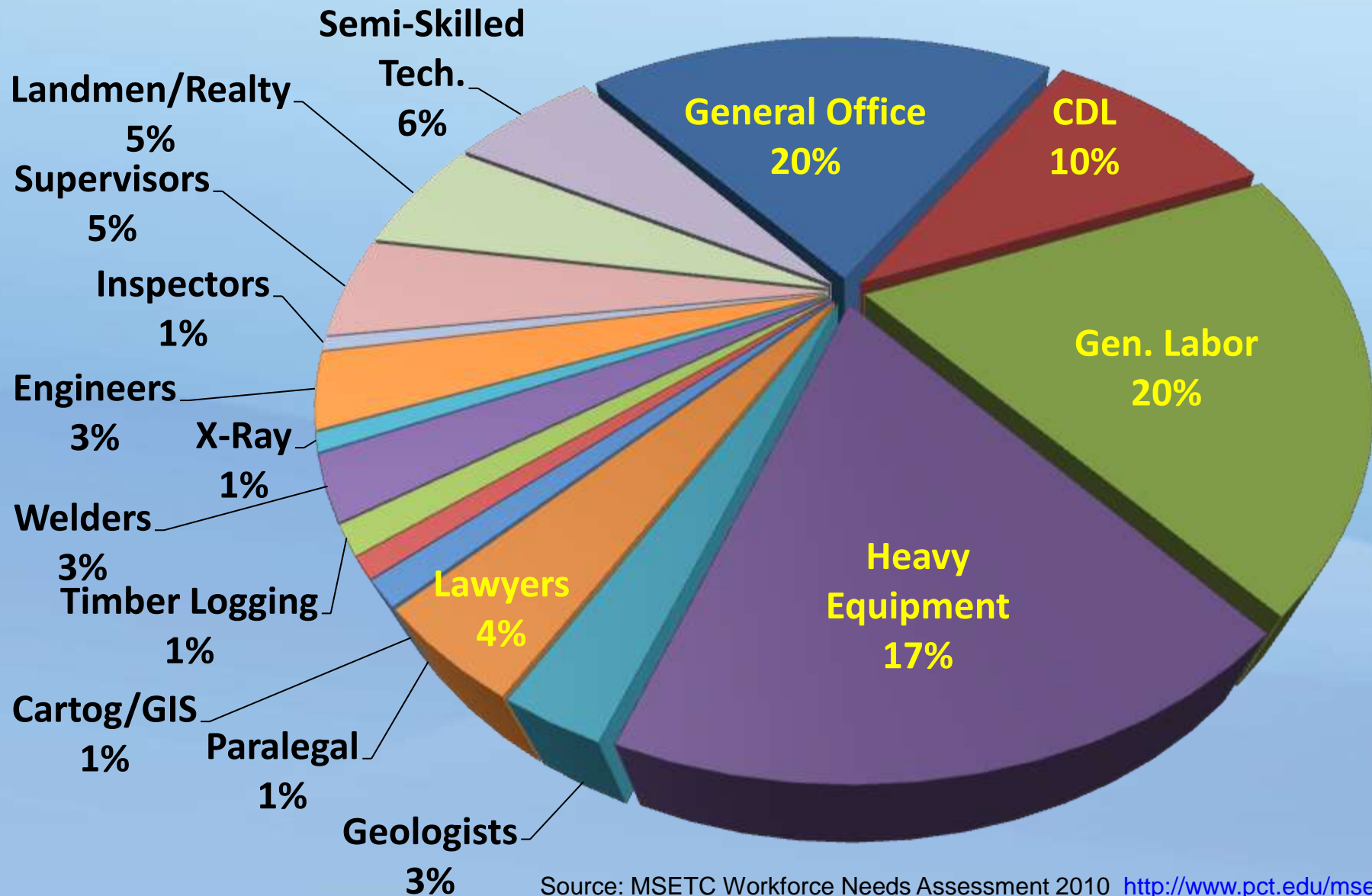
Major Economic Impacts from...

1. Business activity related to Development/Production
 - Gas industry
 - Supporting businesses
 - Other local spending by employees & companies
2. Royalty income to landowners
3. Other industries depending upon natural gas

1. Business Activity Impacts

- Drilling each Marcellus well requires:
 - About 420 individuals
 - Across 150 different occupations
 - 13.1 full time direct jobs for first well on a pad
 - 9.65-9.85 full time direct jobs for each subsequent well on a pad
- Once drilled:
 - Every 100 dry gas wells generate 19 long-term full-time jobs,
 - Every 100 high-BTU gas wells generate 39 long-term full-time jobs

Natural Gas Workforce Requirements By Category



2. Royalty Income Impacts

- Local spending
- Local investment
- Charitable giving
- Opportunities for leaving a Legacy?

Impacts on Lessors Near Active Wells in Tioga and Bradford Counties

What has been the impact of Marcellus Shale gas drilling on you personally?	
Positive impact on them personally	52%
Negative impact on them personally	17%
Both positive and negative impacts on them personally	4%
Not sure whether the impacts are positive or negative	28%

Survey of 1,000 landowners within 1,000 feet of active wells.

51% response rate

Funded by PA Dept of Community & Economic Development

3. Related Economic Development

- Many industries rely upon natural gas as an input
- Starting to see such industries moving to PA



Shell plans cracker plant to process chemicals in Marcellus Shale

Published: Monday, June 06, 2011, 7:41 PM Updated: Monday, June 06, 2011, 9:23 PM

PITTSBURGH — Shell said Monday it plans to build a cracker plant that will process the ethane from Marcellus shale natural gas in the Appalachian region, but it has not decided where to build it. The cracker breaks down large molecules from oil and natural gas into smaller molecules used to manufacture chemicals.



4. Can be a Two-Edged Sword

Can be very high cost of living:

- Inflation rates higher than the national average
- Average rentals increase due to housing demand

Non-Gas field businesses can struggle:

- Lose employees to the gas industry?
- Commercial space can become very expensive

Long run competitiveness?



Economic & Workforce Questions

- **Businesses**

- Existing local businesses benefit
- ‘New’ local businesses?
- Attract outside businesses?



- **Workers & Residents**

- Local residents **HAVE** the skills?
- Locals **LEARN** the skills?
- Youth **LEARN** the skills & stay?
- Newcomers to move into county?

Opportunities and Challenges

COMMUNITY IMPACTS



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Significant Community Issues

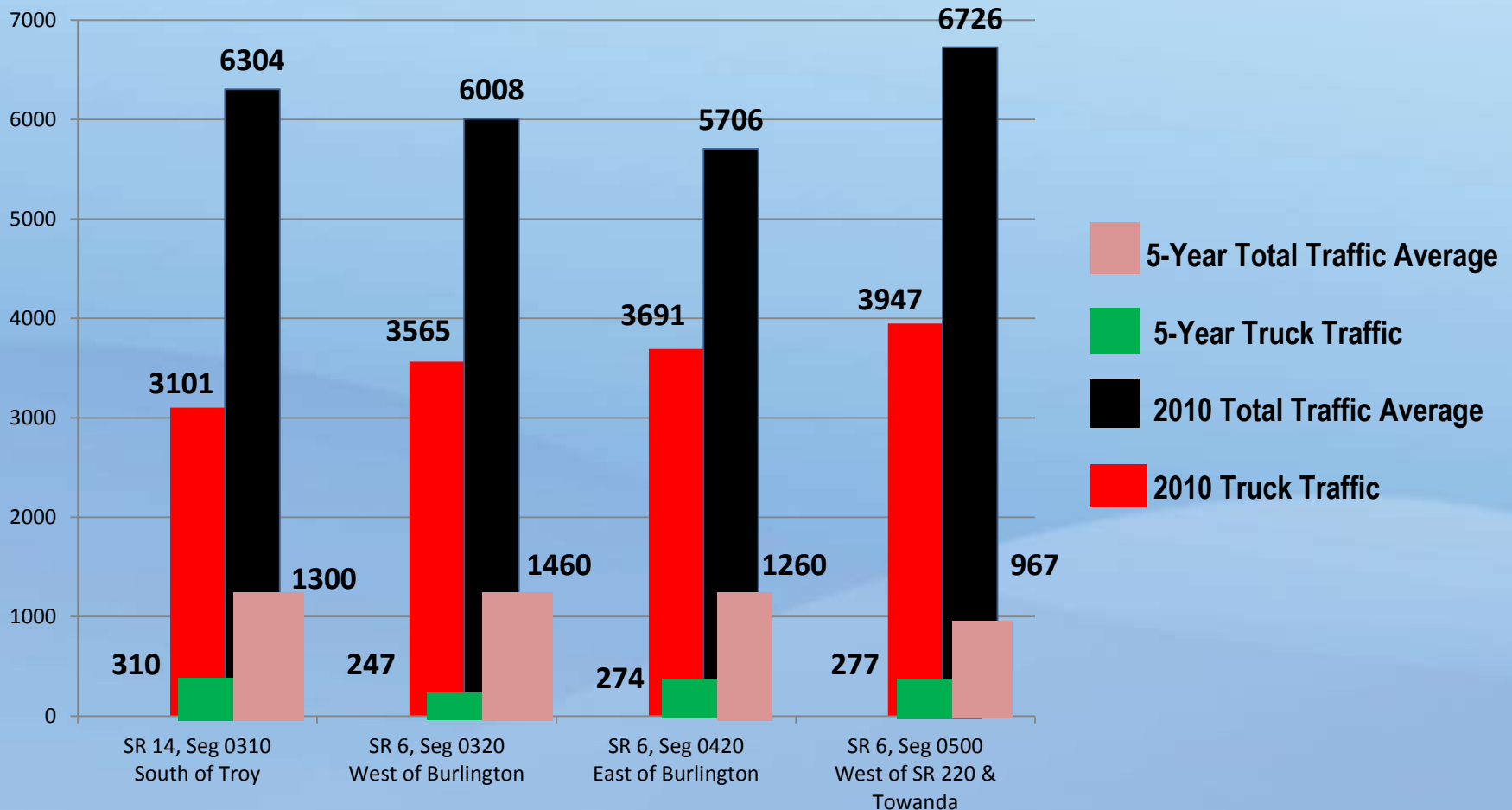
Local infrastructure

- Roads
- Highway safety
- Housing
- Sewerage & water
- Police
- Emergency services
- Schools
- Human services



Traffic Changes – *Bradford County*

5-Year Daily Average vs. 2010 Daily Average



Source: PennDOT Engineering District 3-0

Significant Community Issues

Demographics

- Population change
 - Housing needs
 - Schools
 - Other infrastructure
- Population composition & diversity
- Youth migration?



Family

- Child care implications
- Intergenerational relationships/equity
- Family well-being
- Health, substance abuse, etc

Significant Community Issues

Community & Social

- Social service demands
- Social equity
- Haves & have-nots
- Newcomers & old timers
- Year 'round residents & seasonal residents
- Social cohesion & community identity
- Diversity and potential conflict
- Local power structure
- Social problems

Significant Community Issues

Local Government

- Impact on services & revenues
- Quality of life, environment, community, health & safety
- Local control (tools? Ability to use?)
- Local capacity for being proactive (much less responding)
- Coordination between governments

State & Local Policy

- Local versus state control (versus no control)
- Regulation, incentives, investment, subsidies, taxation
- Monitoring & oversight
- Influence of gas dollars on the political process?

Impacts of Marcellus on Pennsylvania Local Governments

	Change in Services	Change in Costs	Change in Revenues
Increased	28% (35)	26% (33)	18% (24)
Decreased	4% (5)	1% (1)	1% (1)
No Change	67% (84)	70% (89)	75% (97)
Don't Know	2% (2)		6% (8)

Source: Survey of 494 PA municipal governments, fall, 2010
59% response rate (293). 131 reported having Marcellus activity
Kelsey & Ward, 2011.

Opportunities and Challenges

ENVIRONMENTAL IMPACTS



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Water & Natural Resource Issues

- Water use
- Protection of private wells & springs
- Wastewater treatment & disposal
- Habitat fragmentation and disturbance
- Spread of invasive species
- Air quality
- Negative effects on recreation
and aesthetics



Opportunities and Challenges

TAKING ACTION LOCALLY TO SHAPE IMPACTS



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What Does This Potentially Mean?

- Focus needs to be on future **AFTER** the boom, *not just the present*
- Focus needs to be on development in its entirety, not just well sites
- View Marcellus as a potential means to improve economy, social organization, human capital, physical infrastructure – *it is not an end in itself*
- Need public engagement, social networks, collaboration, and communication to address the Long Run, and how Marcellus fits

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