

Roadway Safety and Energy Development

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Currently investigating best practices and lessons-learned about how DOTs are managing impacts from oil, gas, and wind developments on roadways in ...

Top eight (8) energy producing states

- Colorado
- Kansas
- North Dakota
- Oklahoma
- Pennsylvania
- Utah
- West Virginia
- Wyoming

Types of impacts analyzed

- Finance
- Maintenance
- Safety
- Environmental

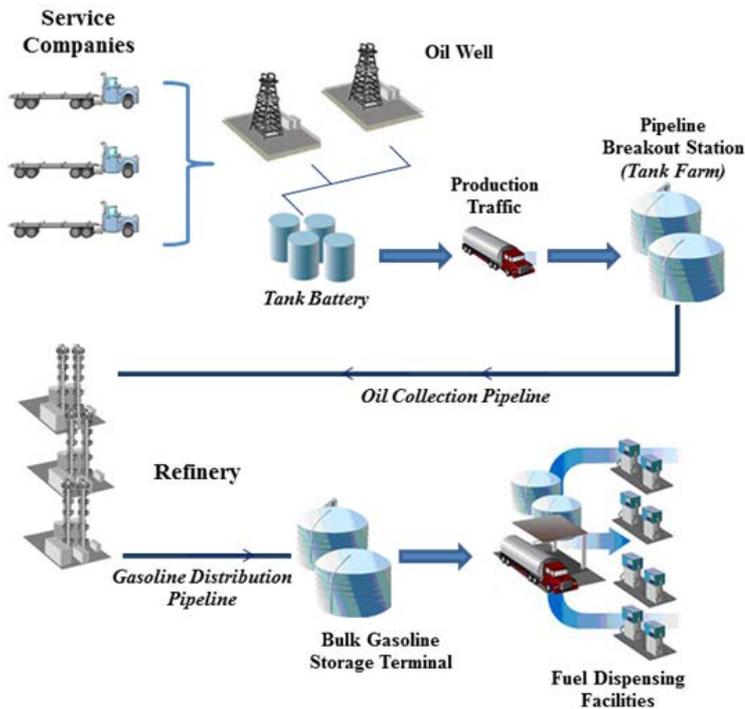
Research is on-going, discussion today is on preliminary results for these states.

Energy Development (EDev) and roadway traffic₁

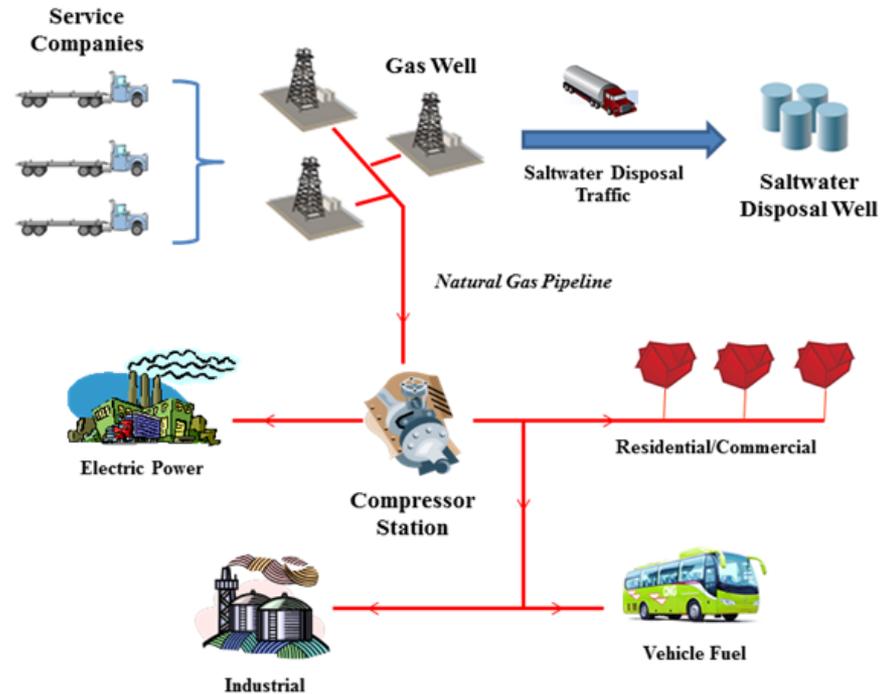
- EDev is often concentrated in **rural/agricultural areas**
 - Local infrastructure & networks designed for low traffic volumes
 - Can also affect urban areas
- EDev is associated with rapid **increases in population**
- EDev affects roadway traffic and driver characteristics:
 - Specific types of vehicles (**heavy trucks**) and drivers (**younger, male**)
- EDev activity is **difficult to predict**

Truck traffic and energy supply chains

Energy Supply Chain for Oil



Natural Gas Energy Supply Chain



Source: Prozzi, Grebenchikov, Banerjee, and Prozzi (2011). *Impacts of Energy Developments on the Texas Transportation System Infrastructure*. Center for Transportation Research, University of Texas.

EDev and roadway traffic

- EDev can require **over 1,000 truck trips** to develop and fracture a single well:
 - Site and well installations
 - Large/heavy construction and rig equipment
 - Access roads
 - Well operations - millions of gallons of water/chemical/sand mixture per well
 - Freshwater input
 - Saltwater output
 - Resource extraction – crude oil trucks
 - Additional truck trips for refracturing the well
 - Timing??
 - Equivalent to millions of passenger cars

Roadway safety issues

- Roadway condition
- Roadway design
- Congestion
- Commercial vehicle operations
- Driver behavior

Roadway conditions

- Surface condition (e.g., rutting, spalling, cracking)
- Structural integrity
 - Road base
 - Bridges
- Contamination
 - Mud
 - HazMat/
chemicals
- Signage

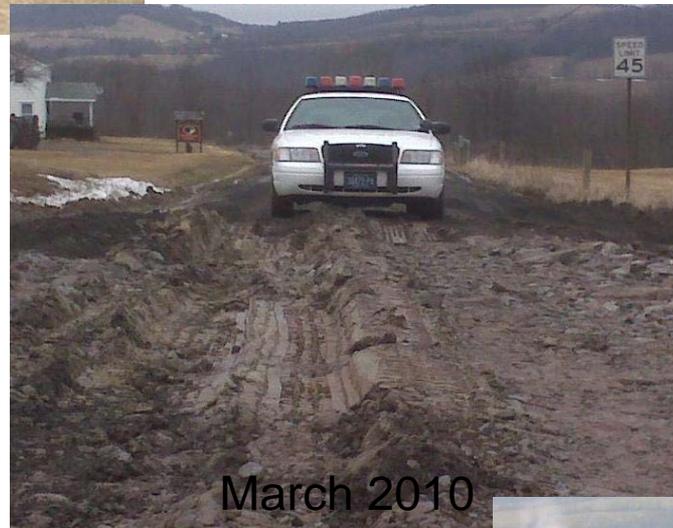


Photo by D. Bierling, Texas A&M Transportation Institute.

Roadway conditions



August 2009



March 2010

Roadway conditions before, during, and after intensive energy development activity in Bradford County, Pennsylvania (Christie, 2012)



November 2010

Roadway design

- Lane width & shoulder width
- Number of lanes
- Access road/driveway entrances
- Structure (pavement/base thickness)
- Signalization



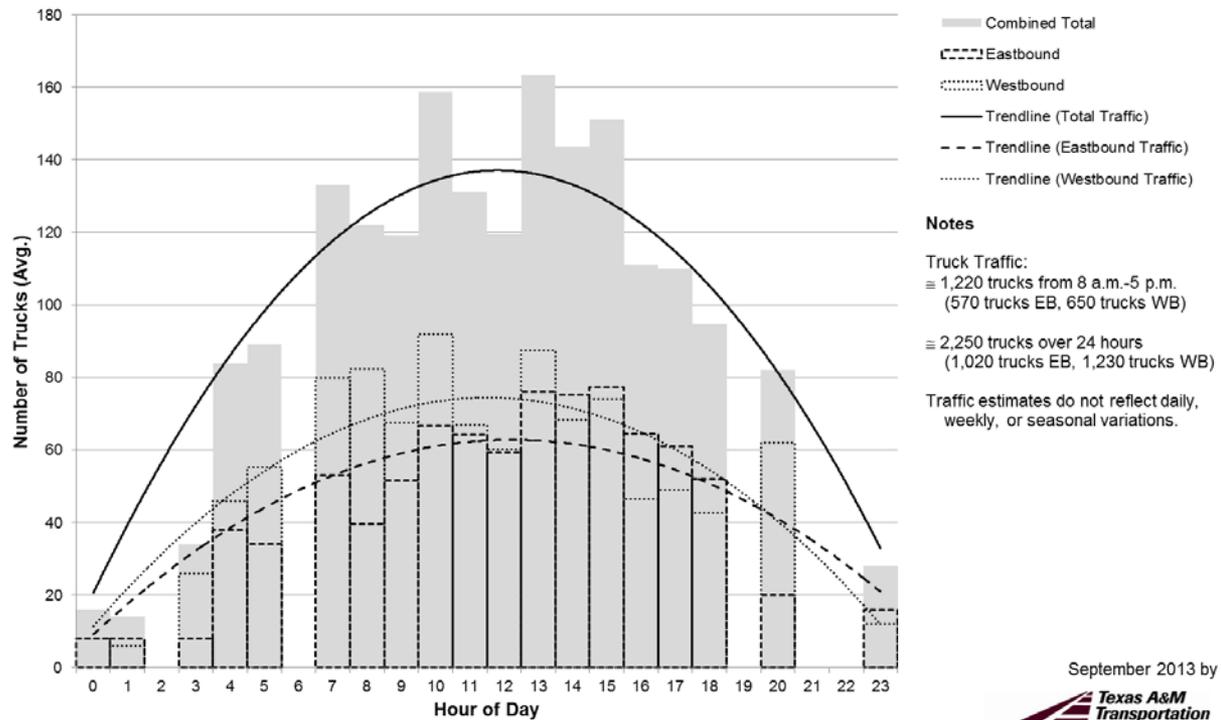
Photo by D. Bierling, Texas A&M Transportation Institute.

Congestion



Photo by D. Bierling, Texas A&M Transportation Institute.

**Weekday Truck Traffic on TX 97, West of US 281,
Pleasanton, Atascosa County, Texas**



September 2013 by



Roads which previously had less than *tens or hundreds* of trucks per day now have *hundreds or thousands* of trucks per day

Photo by D. Bierling, Texas A&M Transportation Institute. Chart source: Bierling, Jasek, Martin, and Mendez (2013). *Hazardous Materials/Truck Traffic Study: Central Eagle Ford Shale Region, Texas*. Prepared for the Texas Division of Emergency Management and Local Emergency Planning Committees in the Eagle Ford Shale Region.

Commercial vehicle operations

Types of violations include:

- Vehicle **maintenance**
 - Brakes
 - Suspension
 - Tires
 - Frames
- **Hours** of service
- **Oversize/Overweight**
- **Hazardous materials**

Driver behavior

- Accidents
 - Some (but not all) states experiencing increases in heavy truck crashes
- Aggressive driving
- Impaired driving



Photo by D. Bierling, Texas A&M Transportation Institute.

Commercial vehicle violations

Examples from Pennsylvania State Police

- Timeperiod: April 1 to June 7, 2010

Roadside inspections: 400 industry trucks

56% driver or vehicle placed out of service for
serious safety violations (Cook, 2010)

- Timeperiod: January 2010 to June 2011

Roadside inspections: 5,800 industry trucks

13,000 driver and vehicle safety [combined] violations,
including **2,800 serious safety violations** that placed
the driver or truck out of service (Schmitz, 2011)

How are eight other state DOTs addressing safety issues?

- **Prevention**

- Increasing weight/load restrictions for roads and bridges (some states)
- Educating industry and public (some states)

- **Partnering**

- Bonding/road use maintenance agreements (some states)
- Commercial vehicle and traffic enforcement (all states)
- Industry-agency collaborations/coalitions (some states)

- **Maintenance and construction (all states)**

- Resurfacing and rebuilding
- Widening roads and shoulders
- Adding turning lanes

DOT challenges in addressing energy development impacts

- **Informational**
 - Data on traffic, future developments not shared by industry
 - EDev partners may not understand seasonal road impacts
 - Changes in markets, locations difficult to predict
- **Spatial** – scale of impact may be a few counties, or entire state
- **Resources – Financial**
 - Revenue sources
 - Transportation appropriations
- **Resources – Personnel**
 - Labor shortages/ability to pay
- **Organizational**
 - Headquarters/District
 - Proactive/Reactive

Summary

- EDev can have substantial **benefits** for communities, landowners, states, and industry partners
- EDev can also result in transportation system **impacts**, including on traffic safety
- Extremely **complex** relationships between industry, market, regulatory, development, and infrastructure, and demographics
- Other states/DOTs vary in how they are addressing EDev impacts on transportation systems
- **Planning** for growth and associated impacts on local communities and states can be challenging, but is very important

Thank you!

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