**Well Stimulation Technology**

Well stimulation technology (WST) broadly describes techniques that inject fluids, and/or chemicals into wells to harvest oil and natural gas from underground rock formations. **Hydraulic fracturing or “fracking”**, **matrix acidization and acid fracturing** are WST techniques used in California.

**Hydraulic fracturing (HF)**, the most common WST used in California, injects high-pressure fluids (usually water with chemicals) and sand into drilled underground wells. The high-pressure fluids create “fractures” in the rock formation. Sand keeps these fractures open and allows oil and natural gas to reach the well. **Acid fracturing (AF)** also creates hydraulic fractures like HF but uses acid instead of sand to retain fracture openings. **Matrix acidization (MA)** injects acid and other chemicals below fracture pressure that dissolve minerals, opening flow pathways to release oil and gas.

**Potential Impacts Evaluated**

- Ecology, Wildlife
- Human Health
- Air Emissions
- Water Quality/Use
- Geology, Earthquakes
- Technology

**WST Locations in California**

Fractured wells in California produce 20% of its oil and 25% of its natural gas.

- **Northern CA** produces mostly natural gas with less than 5% from fractured wells.
- **Central and Southern CA** produce both oil and natural gas.
- **Most California fracturing is in Kern County**

**WST Methods in California**

- **Typical CA**
  - Lesser volume of water (140,000 gallons)
  - Gel based additive (guar gum)
  - Simpler fractures
  - Vertical fracturing

- **Other US Regions**
  - Larger volume of water (1,000,000+ gallons)
  - Slick-water additives (detergents)
  - Complex fractures
  - Horizontal fracturing

**California WST Facts**

- **Regulation and Policy**
  - Senate Bill 4 (SB4): Requires mandatory reporting of all well stimulation activities since January 1, 2014
  - Well stimulation requires a permit through California Division of Oil and Geothermal Resources (DOGGR)
  - SB4 stipulates that the study focus on WST methods including acid fracturing, hydraulic fracturing, and matrix acidization. Other techniques such as steam injection, water flooding and wastewater disposal practices are beyond the scope of the study

- **Production and Hazards Concern**
  - 96% of California fracturing activities occur in the southwestern San Joaquin Basin (mostly in Kern County)
  - About 75% of fracturing occurs at <600m (2000ft), closer to groundwater sources than most fracturing activities outside of California

**Emerging Questions with WST**

WST activities present a variety of concerns for both the producers of California’s natural gas and oil and those who live in communities with WST activities.

- What are the issues with transporting WST equipment?
- What are the limitations of current technology?
- Does WST activity cause earthquakes?
- What WST methods are currently used?
- How is WST different in California?
- How does WST impact communities?
- Are there health or occupational concerns?
- Will traffic, light, and noise increase?
- Does WST contaminate air, water or soil?
- Will demands on natural resources increase?

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