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OIL AND NATURAL GAS IN COLORADO

Erik Anglund, Rockies Water Manager

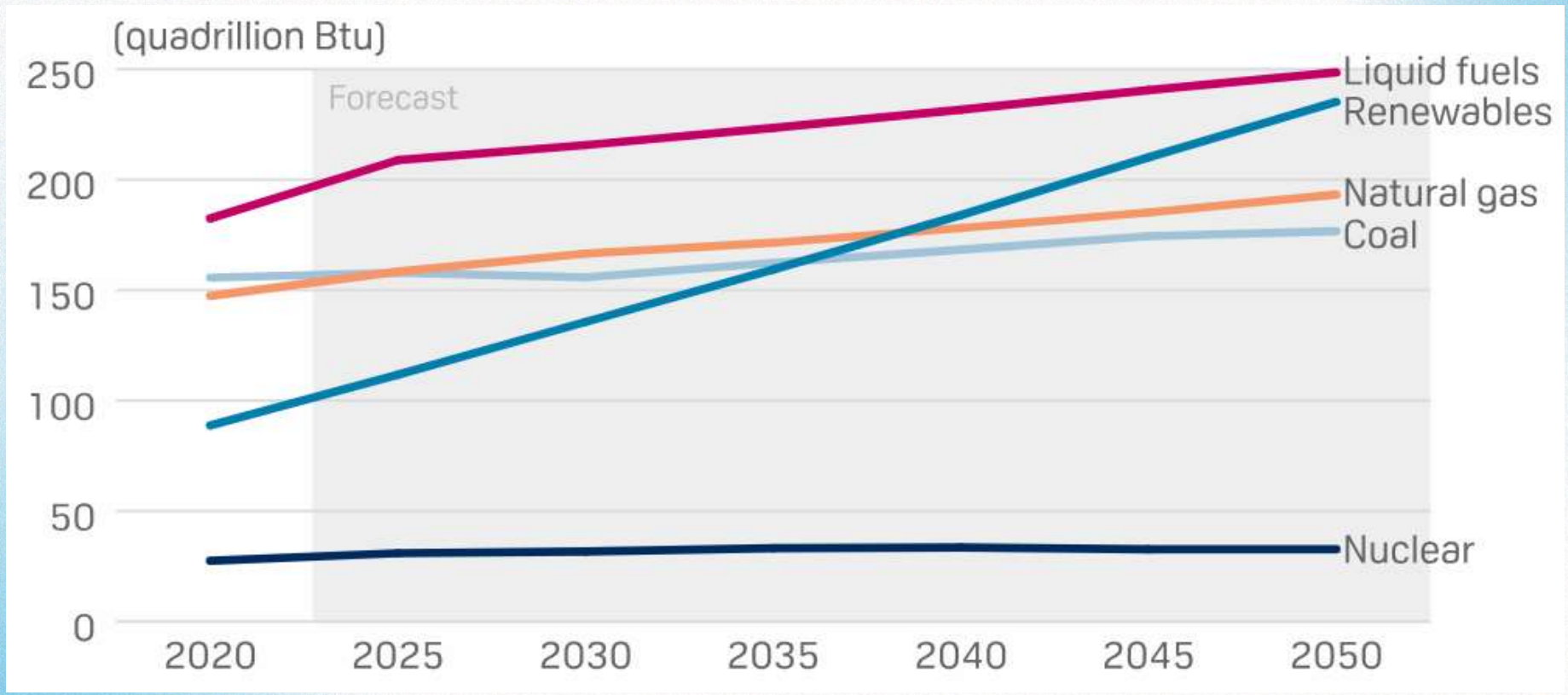
ERIK ANGLUND – ROCKIES WATER TEAM MANAGER

- **FARMER** – Lifelong Longmont area family operations
- **STUDENT** – Mechanical, agricultural, civil & petroleum engineering
- **ENGINEER** – Water supply, quality, conservation, recycling, regulations
- **FATHER** – Family, school, sports, 4H
- **EXPLORER** – Rockies region camping, hunting, hiking, skiing, climbing

OIL & NATURAL GAS ARE FUNDAMENTAL FOR MODERN LIFE

GLOBAL PRIMARY ENERGY CONSUMPTION SOURCES (2020-2050)

Quadrillion British thermal units



SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION

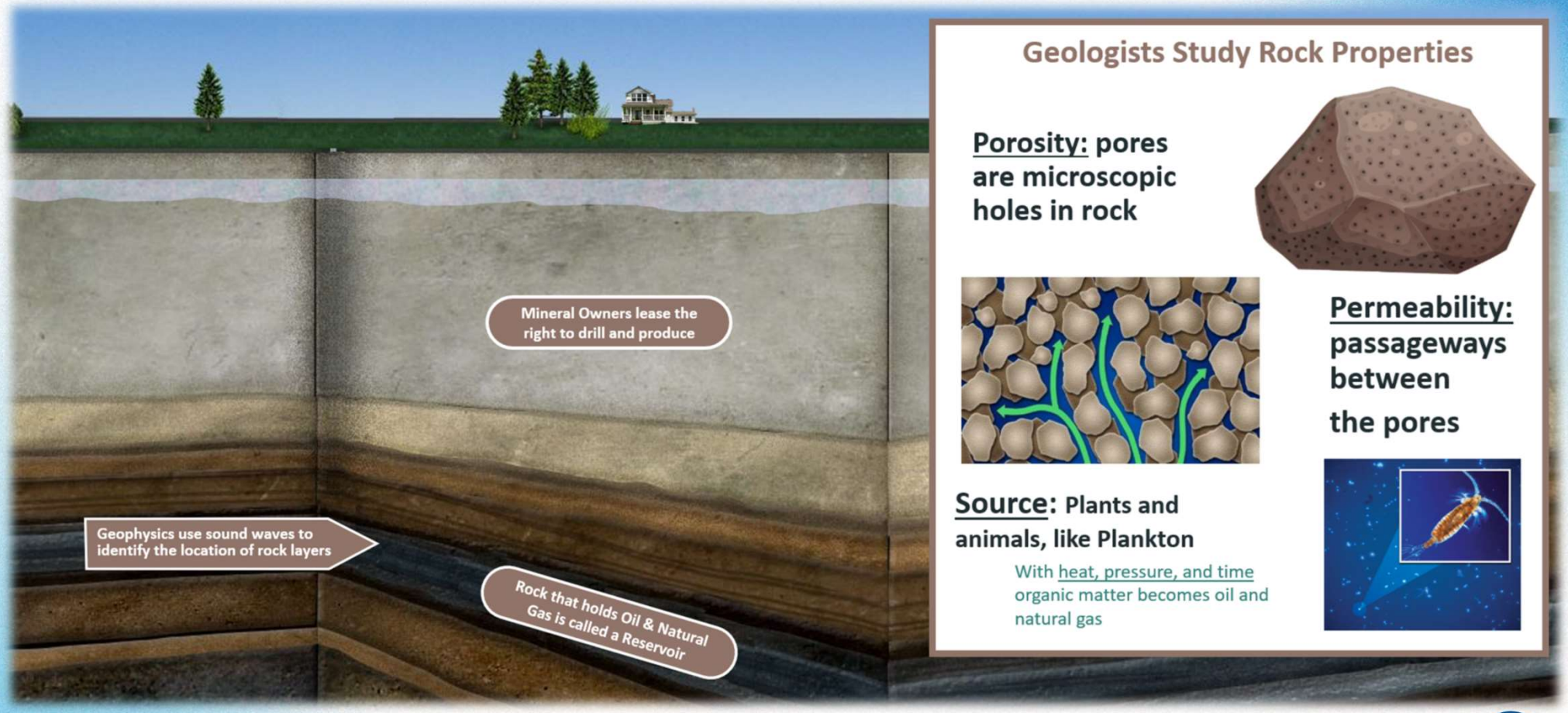
HOW DO WE PRODUCE OIL & NATURAL GAS?

DRILLING *5-8 days*

HYDRAULIC FRACTURING *5-8 days*

PRODUCING WELL *20+ years*

PLANNING HORIZONTAL WELLS



Geologists Study Rock Properties

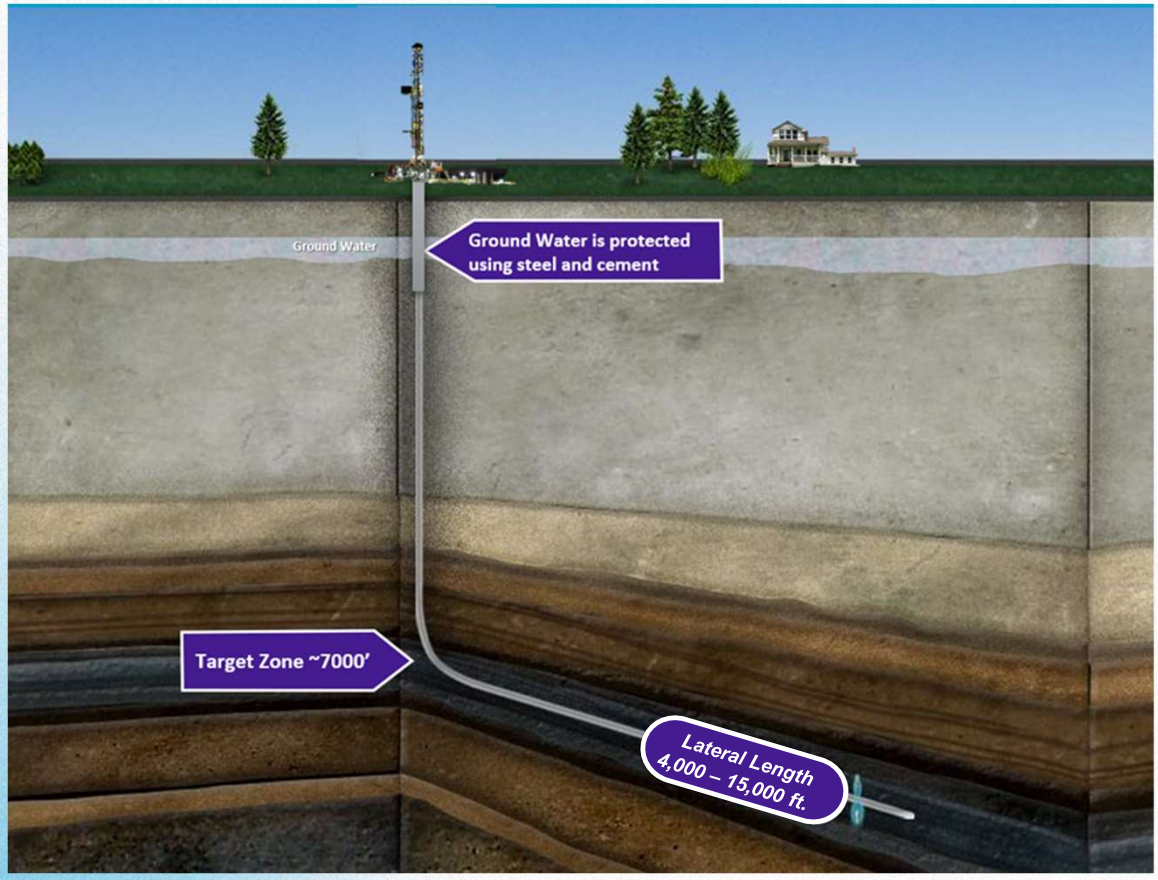
Porosity: pores are microscopic holes in rock

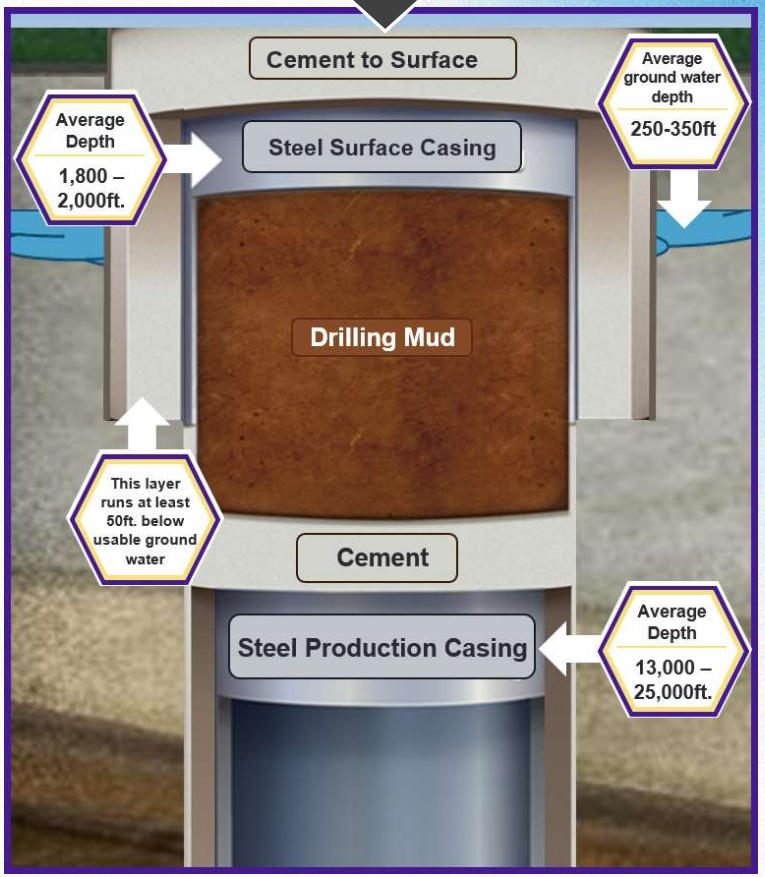
Permeability: passageways between the pores

Source: Plants and animals, like Plankton

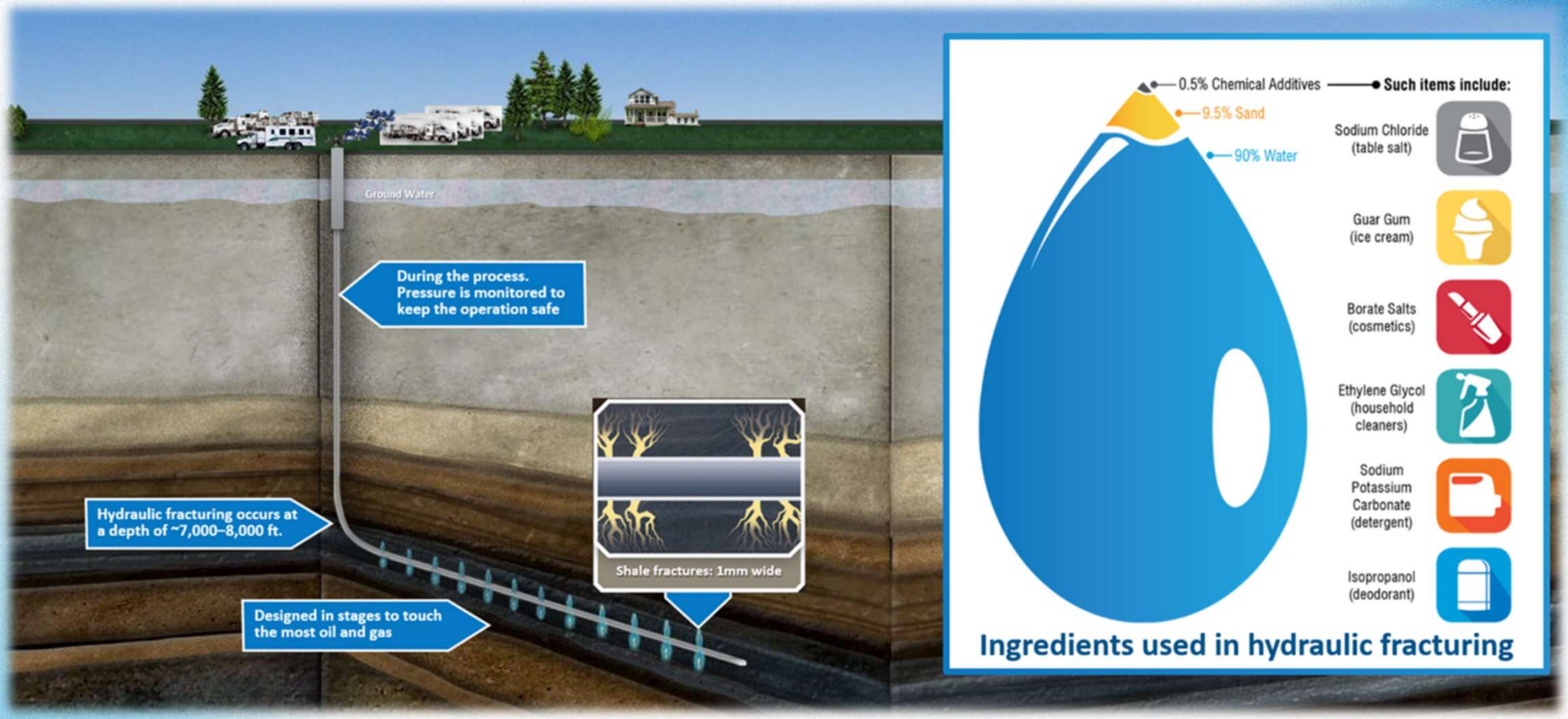
With heat, pressure, and time organic matter becomes oil and natural gas

DRILLING HORIZONTAL WELLS



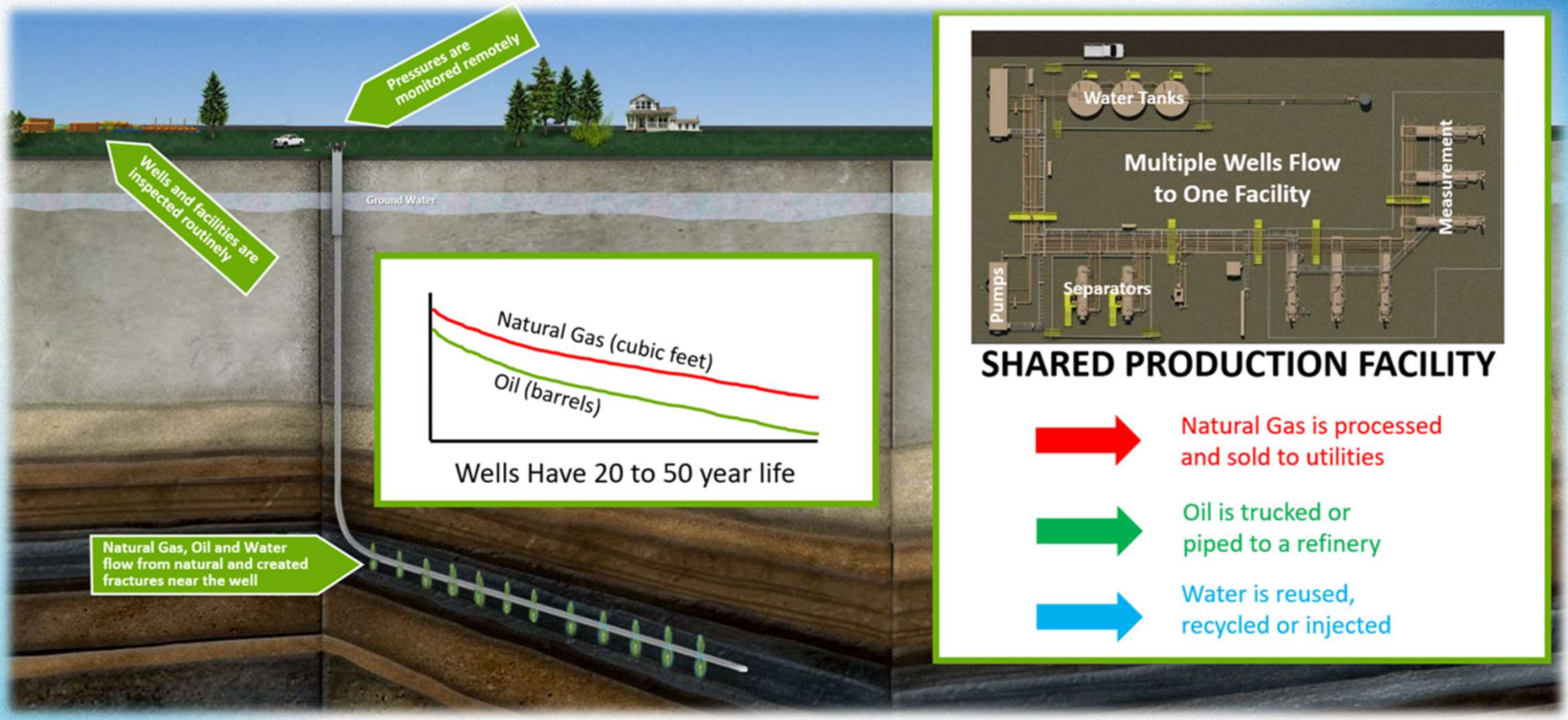


HYDRAULIC FRACTURING WELLS

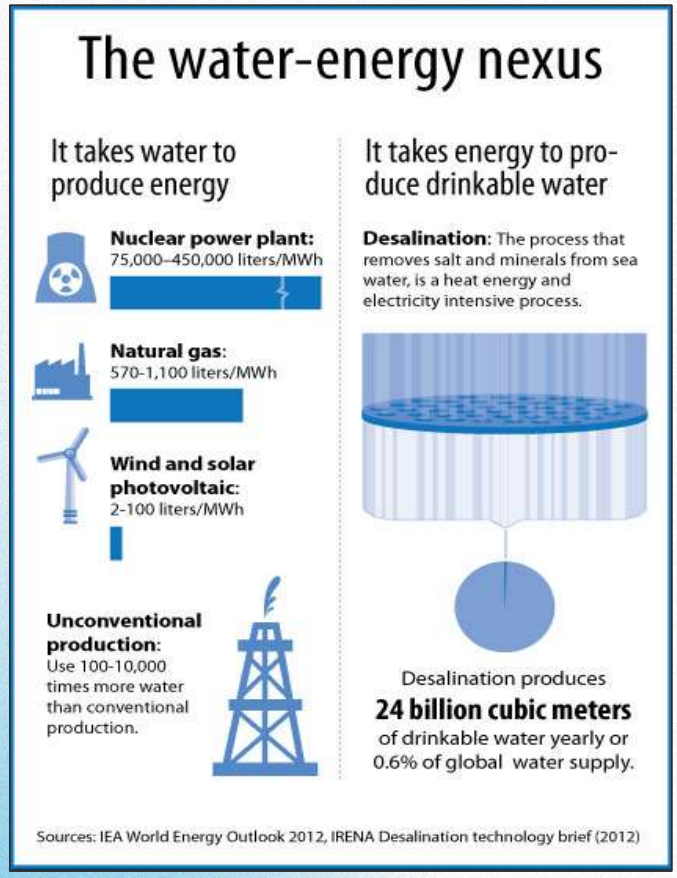


SOURCE: FRACFOCUS, *WHAT IS FRACTURING FLUID MADE OF?*

PRODUCING WELLS

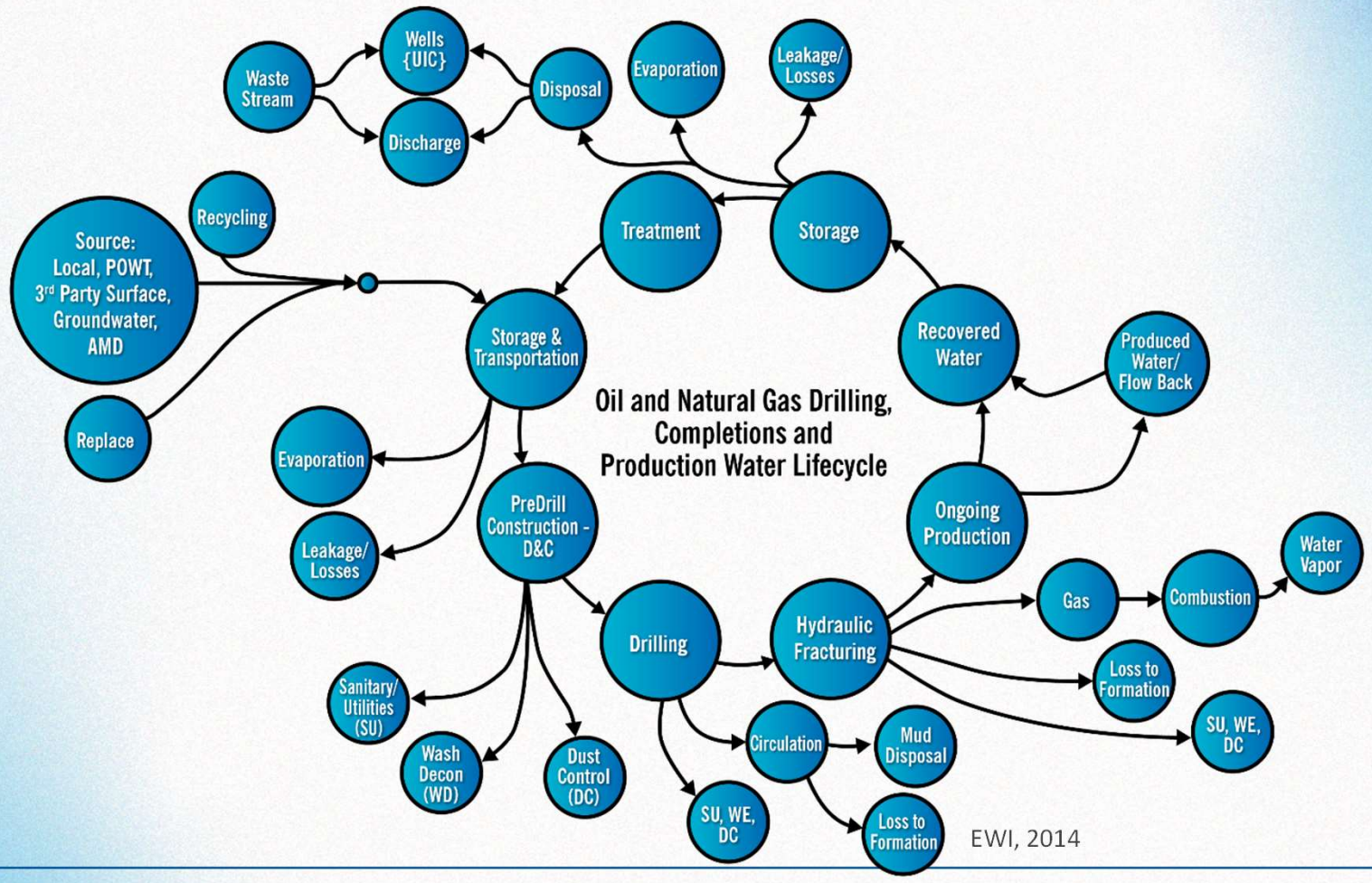


WATER-ENERGY NEXUS



- Energy and water considerations
- State priority
  - Groundwater Protection Council (GWPC)
  - Intestate Oil and Gas Council (IOGCC)
  - Texas, Colorado, Utah, Wyoming
- Federal priority
  - Funding
  - Regulations that impede the use of water
- Industry priority
  - Energy Water Initiative (22 companies)
  - Water treatment technologies
  - Water infrastructure

LIFE CYCLE OF WATER IN UPSTREAM OPERATIONS

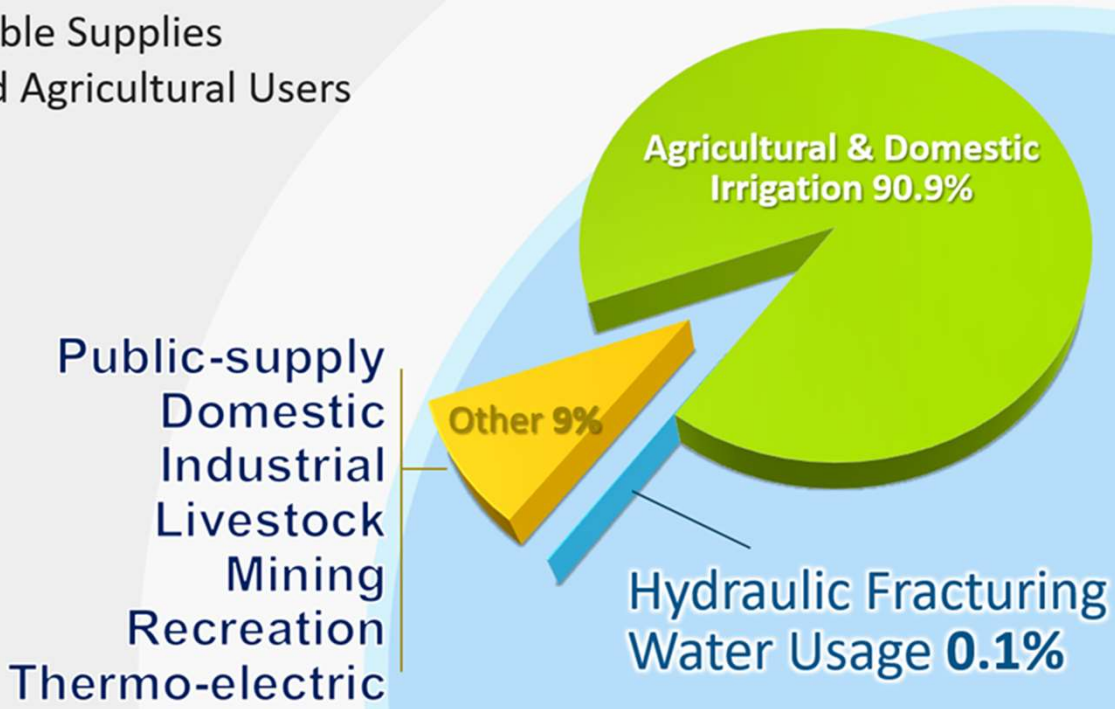


EWI, 2014

RESPONSIBLY MANAGING WATER

Our Approach to Water Sourcing in Colorado

- **Non-Potable** Supplies (Effluent)
- **Commercial and Industrial** Water
- **Recycling and Re-using** Fully Consumable Supplies
- **Avoid Competition** with Municipal and Agricultural Users

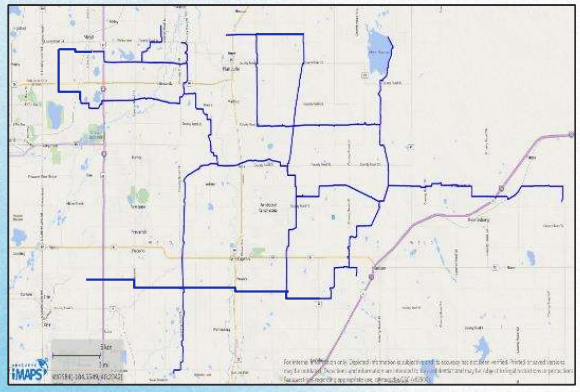


Source: International Gas Union

WATER OPERATIONS

Water Transportation

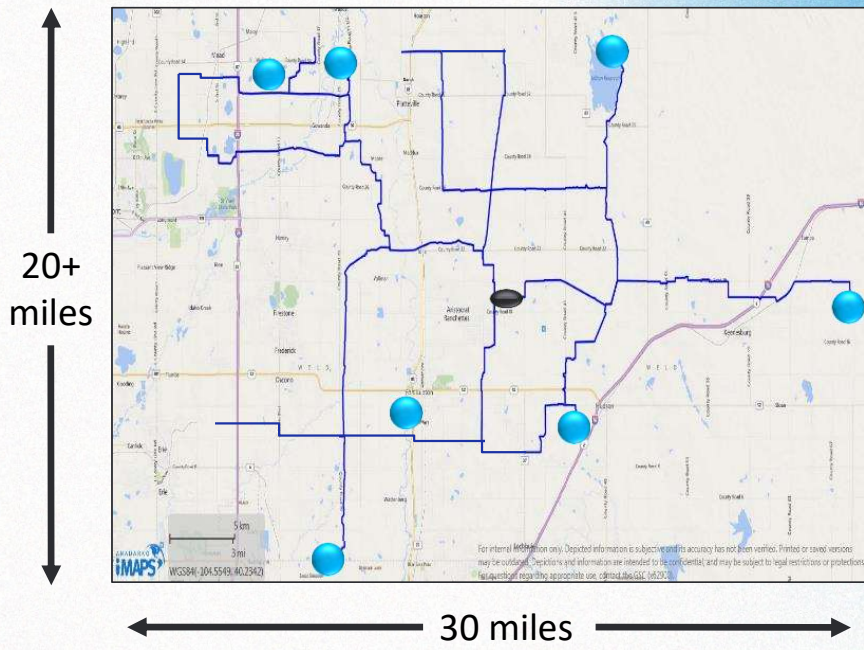
Water Sourcing



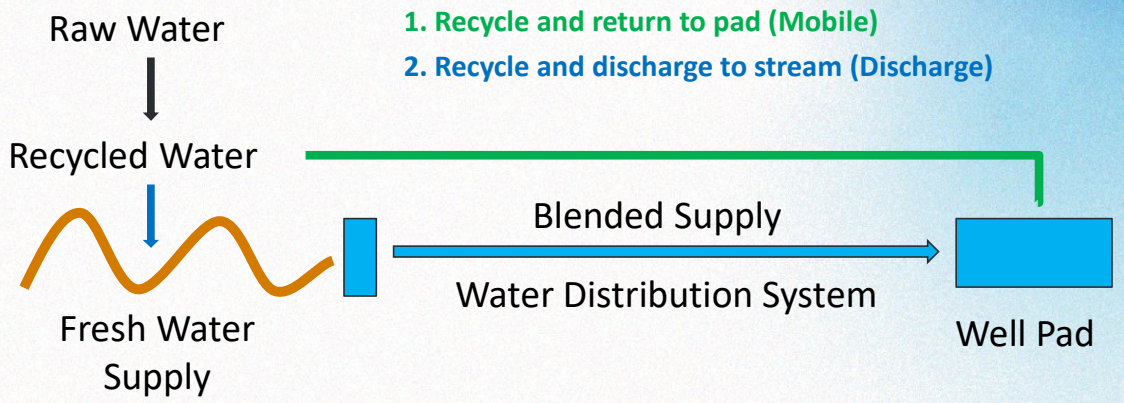
Water Treatment

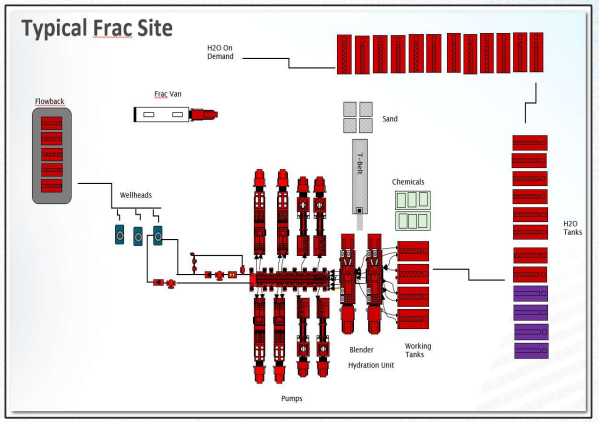
WATER ON DEMAND SYSTEM

- Over 180 miles of permanent pipeline
- Serving 4 frac crews simultaneously
- Up to 10 different water sources
- Eliminating 1,500+ truck trips per day
- Delivered 450,000,000 barrels to-date
- Reduced well pad water storage tanks
  - (from 100+ to ~ 20)



WATER RECYCLING





ADDITIONAL WATER SERVICES

Drilling

Cooling

Fire Suppression

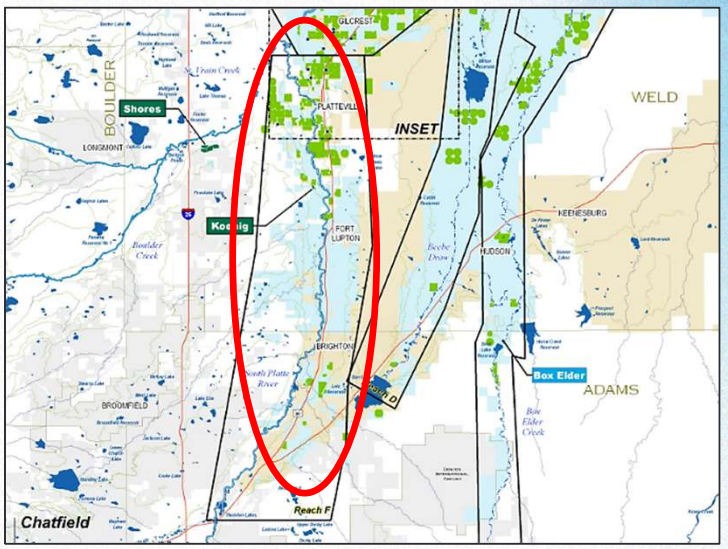
3rd Party Operators

Road/Pad Construction

Additional Regional Needs

REGIONAL BENEFITS THROUGH PARTNERSHIPS

- Short-term Oxy diversion
- Long-term irrigation company diversion
- Designed to irrigation company specifications
- Through Oxy collaboration and funding



- Enhancement of critical river section
- Increase in agricultural irrigator supply
- Beneficial use of commercial water
- Through Oxy collaboration and funding