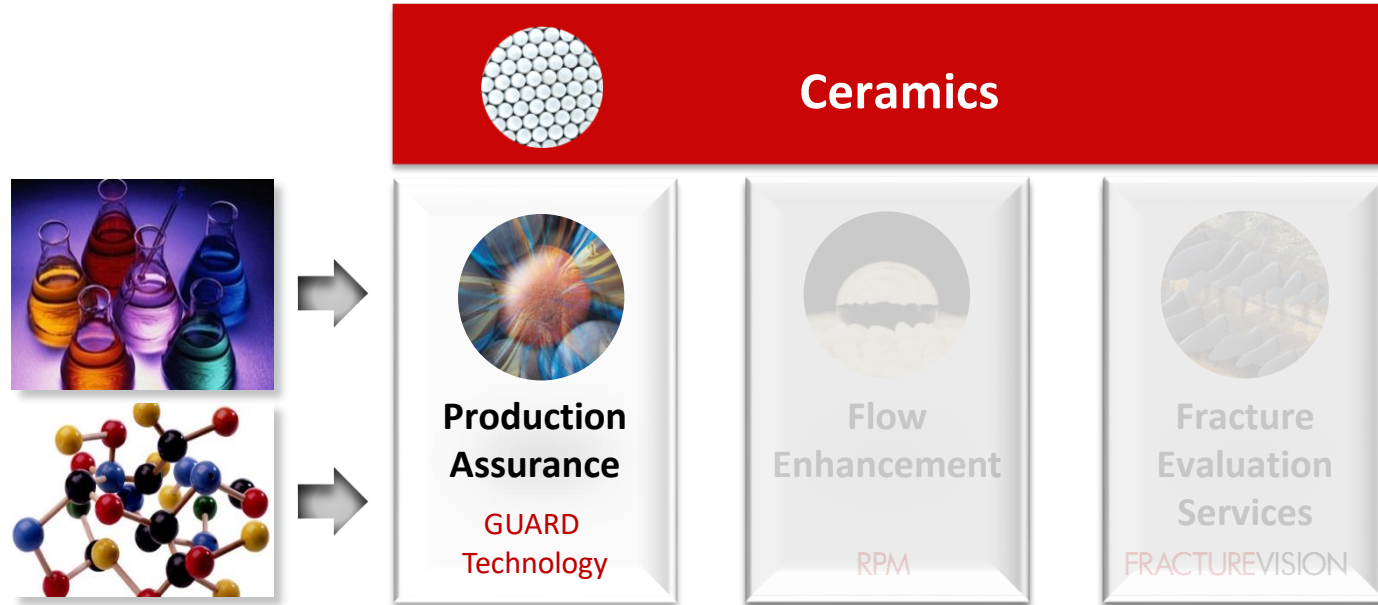


Protecting your Production During Completions: Proppant-delivered Technologies

Jeff Hebert

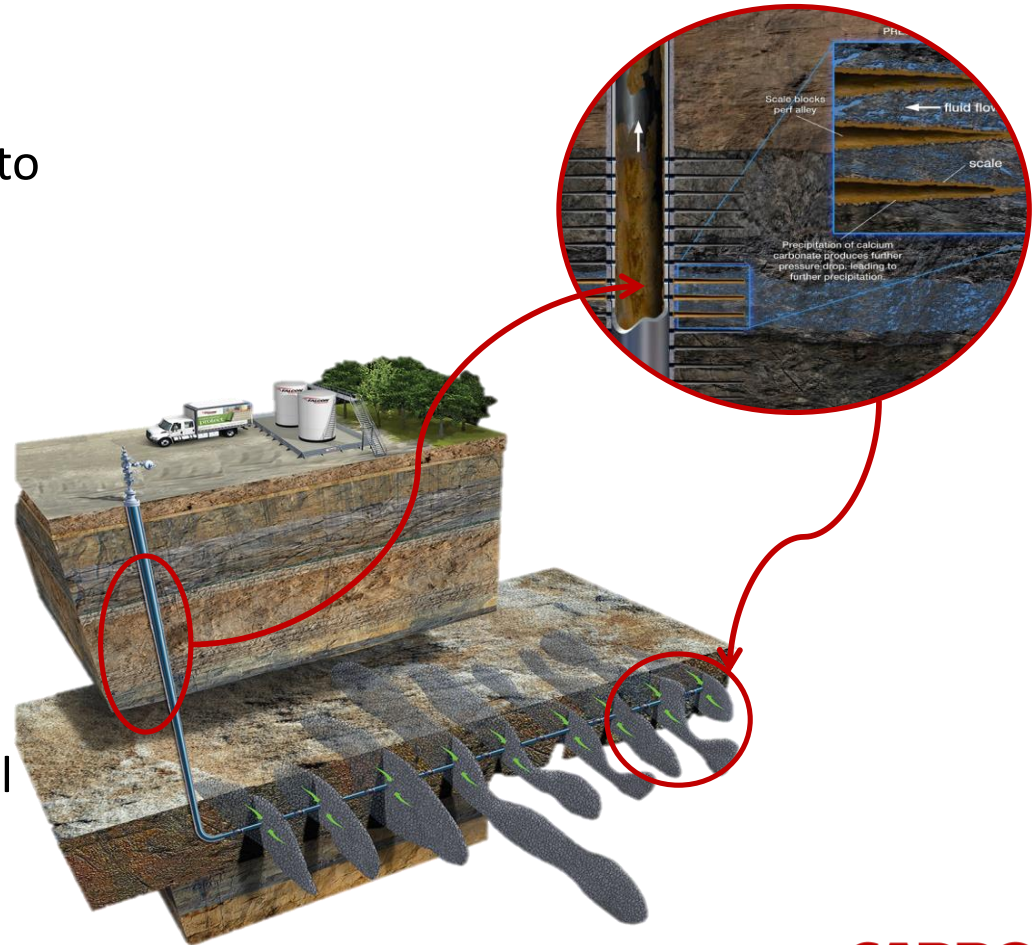
Platform Manager, Production Assurance

Proppant-Delivered Technology Platforms



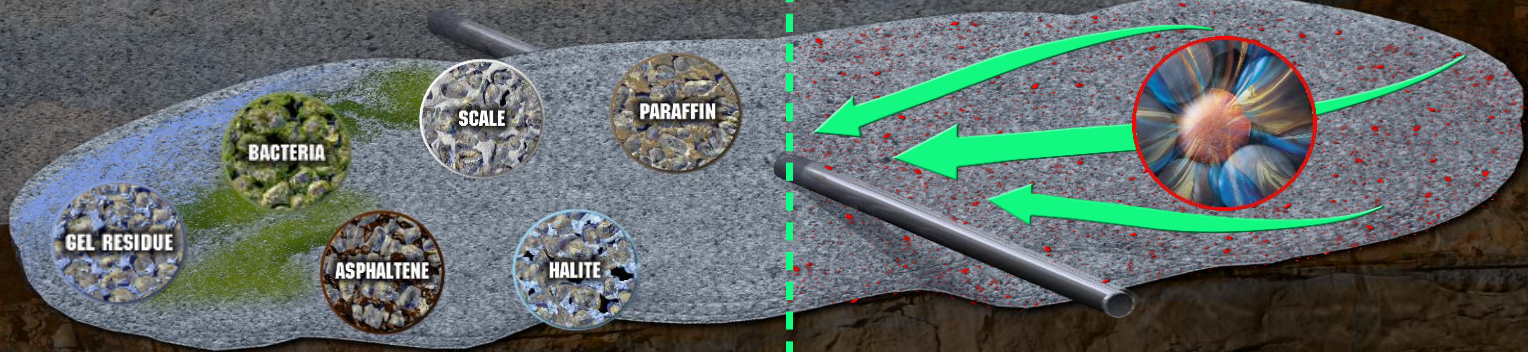
Post-completion Issues

- Economical flow of hydrocarbons to point of sale
 - Paraffin/Scale/Bio damage
- Involves effectively preventing / handling solid deposits
 - May cause catastrophic blockage
- Financial loss may be astronomical



Damage Mechanism

GUARD
Production Assurance
Technologies



GEL RESIDUE

BACTERIA

SCALE

PARAFFIN

ASPHALTENE

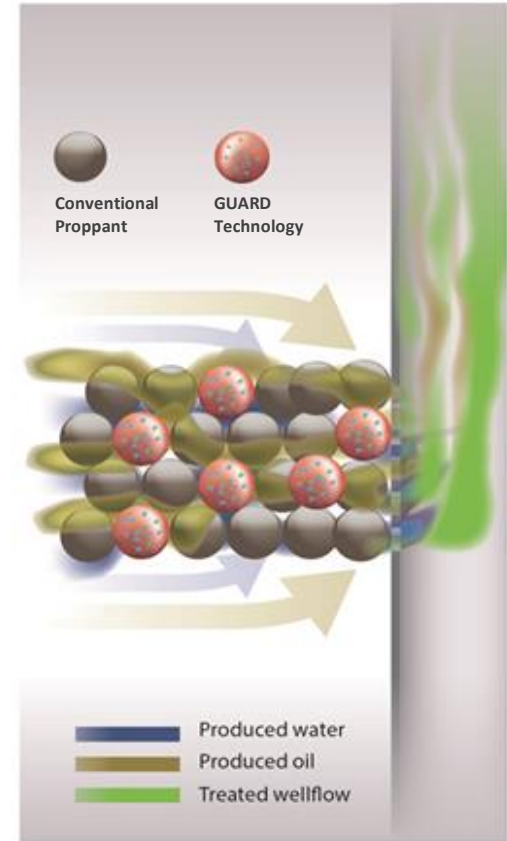
HALITE



Once damage occurs it can never be fully remediated!

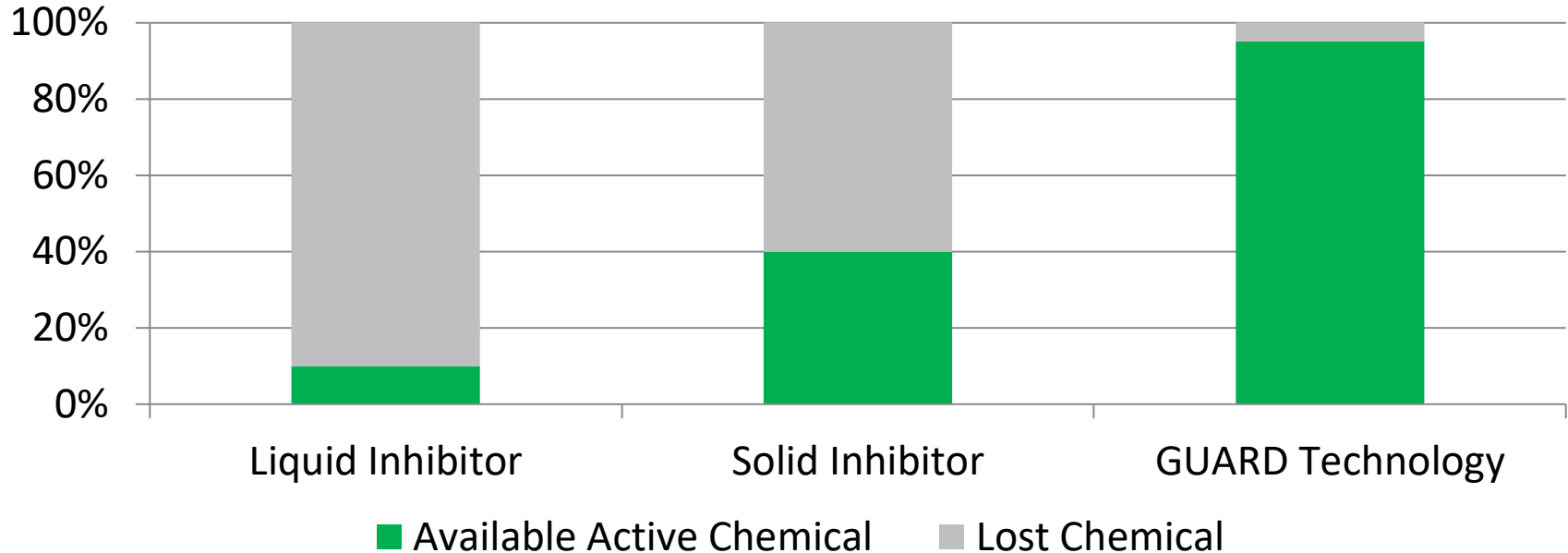
GUARD Technologies

- Prevents damage to reservoir leading to increased EUR
- Controlled release technology – only releases when in contact with production fluids
- Treats multiple years without additional cost to AFE
- Technology pays for itself almost immediately
- Replaces < 5% of proppant volume



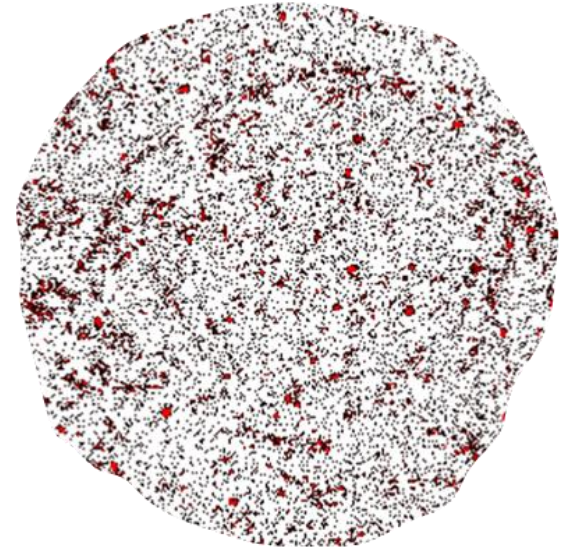
Highly Efficient Proppant Delivery System

Percent of Effective Chemical Available after Placement



Engineered Porosity / Infusion

- Maximize strength
- Advanced chemical delivery
 - Uniform and interconnected
 - Chemical infusion throughout the pellet
- Allows placement of larger volume of chemical than surface adhesion



Controlled Release Technology

- Engineered membranes
 - Controlled release
 - Significant reduction in initial washout
 - Improved frac fluid compatibility



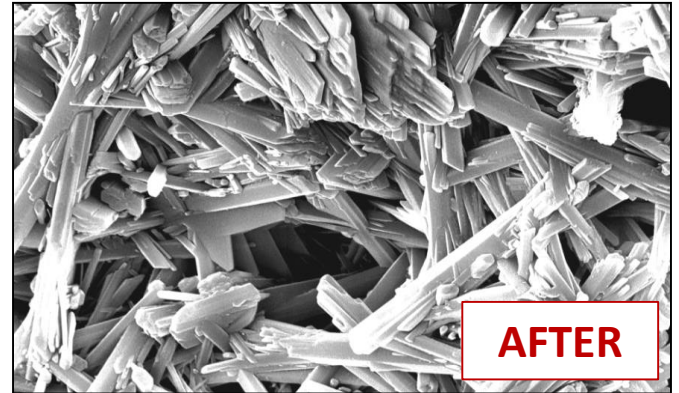
Proppant Technology - SCALEGUARD

- Chemically infused porous proppant:
 - Phosphonate – highly effective calcite, barite inhibitor
 - Polymer – high temperature, iron resistant calcite, barite inhibitor
- Each job engineered to reservoir conditions
- Proppant is blended into base proppant
 - Replaces small portion of total proppant
 - No conductivity impact



Proppant Technology – SALTGUARD (in field trial)

- Chemically infused porous proppant:
 - Polymeric / pseudo polymer blend
- Low minimum dosage required compared to other inhibitors
- Crystal modifier inhibitor



Proppant Technology – H2SGUARD (in development)

- Proppant-delivered H₂S scavenger increases efficiency of inhibitor
 - Scavengers become more efficient as exposure time is increased
 - Typical Triazine scavengers 30% efficiency, H₂SGUARD 90%
- High pH of other scavengers increase scaling
- Blended into base proppant



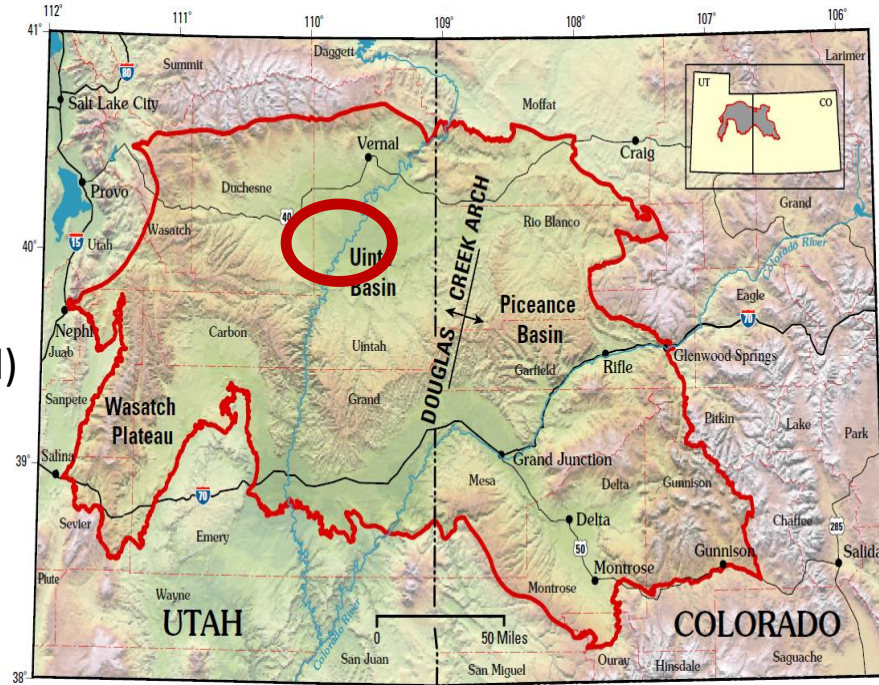
Proppant Technology – PARAGUARD (in development)

- Long-term proppant-delivered paraffin inhibitor and dispersant
 - Three classes of inhibitors covering wide range of waxes found in N. American production
 - Highly efficient prevention of damage in the reservoir
- Blended into base proppant



Field Results, Area 1

- 5% addition of GUARD technology
- 24 total wells analyzed
 - Vertical wells, 3–5 stage (500,000 lbs per well)
 - 12 SCALEGUARD wells
 - 12 particulate-based inhibitor wells

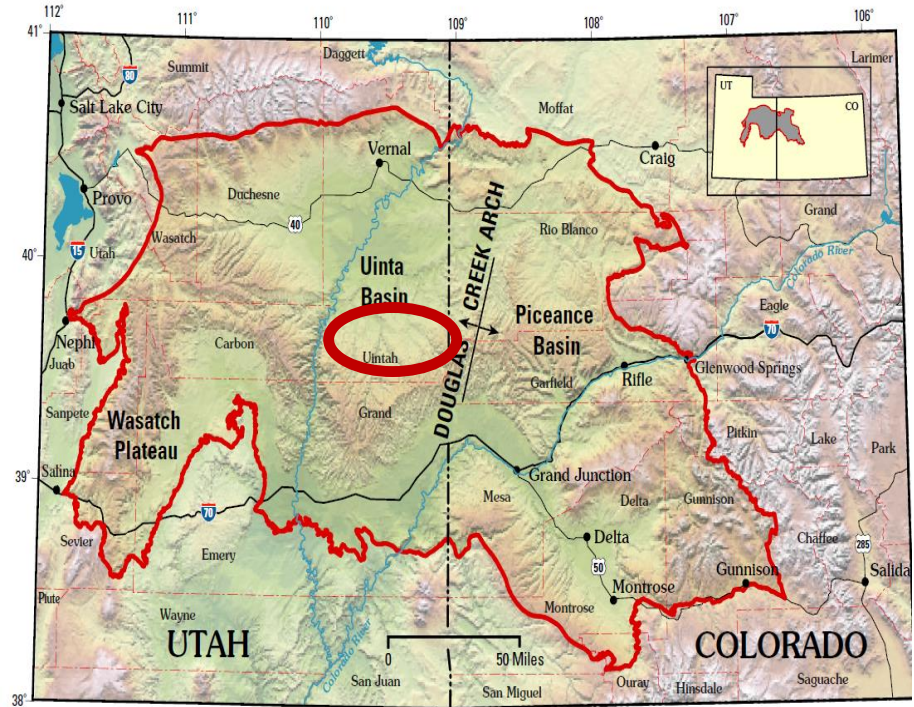


Inhibition Effectiveness, Area 1



Field Results, Area 2

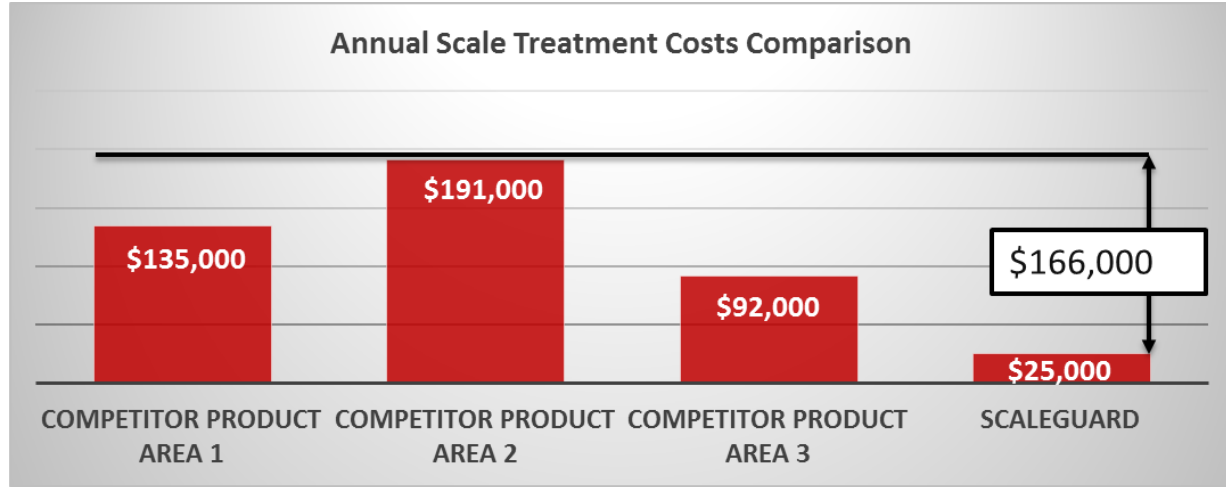
- 20 total wells analyzed
- 0.5% of GUARD technology added
 - Long horizontal, multiple stage jobs (6,000,000 lbs per well)
 - 15 SCALEGUARD wells
 - 5 particulate-based inhibitor wells



Inhibition Effectiveness, Area 2



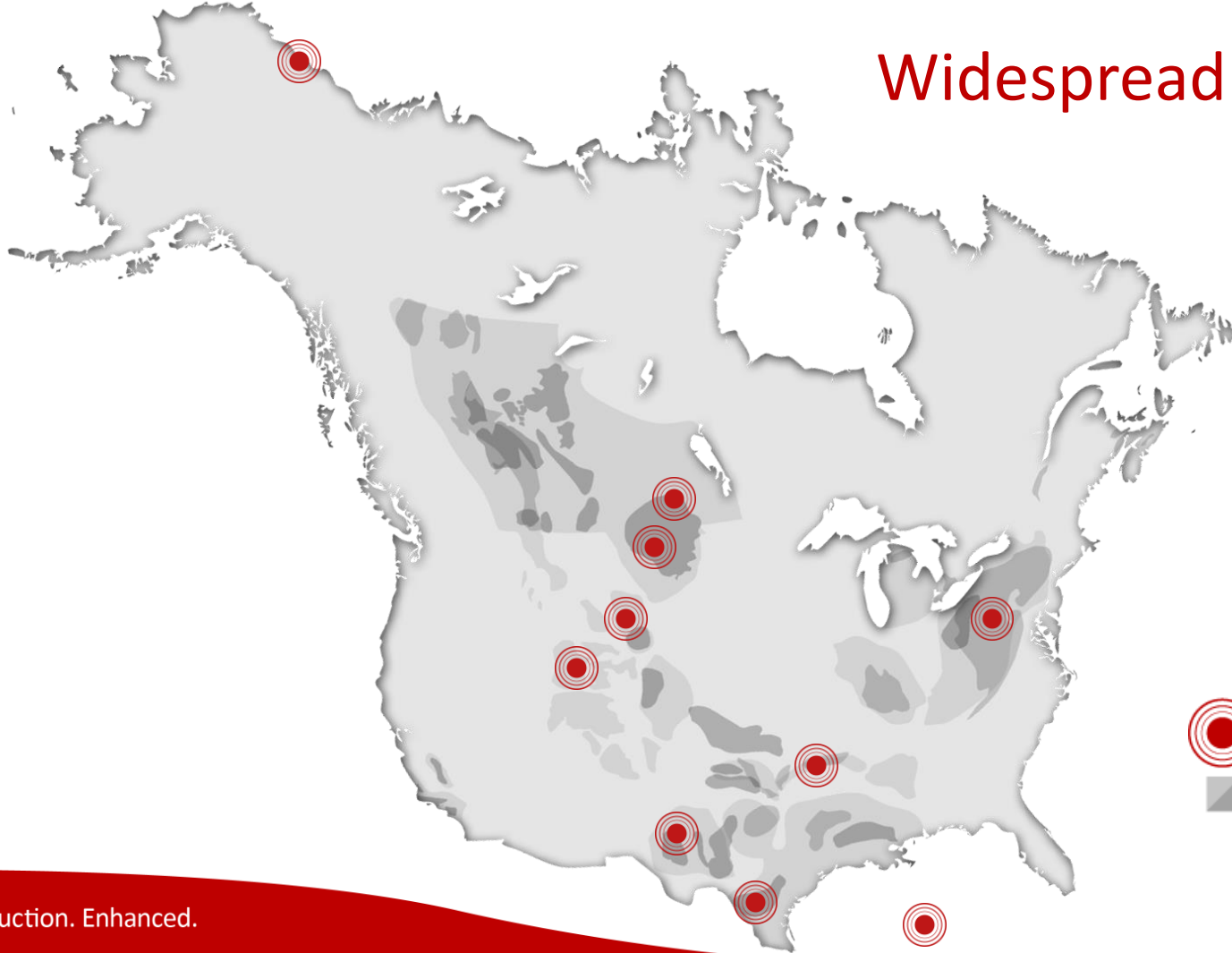
SCALEGUARD vs. Competitor's Products



Chemical costs	\$ 75,000	\$ 125,000	\$ 50,000	\$ 25,000
Top side costs	\$ 2,500 / mo	\$ 2,500 / mo	\$ 2,500 / mo	-
Scale squeeze	2x annually	1 quarterly	annually	-
Deferred production	6 days	9 days	3 days	-

No Workovers

Widespread Growth



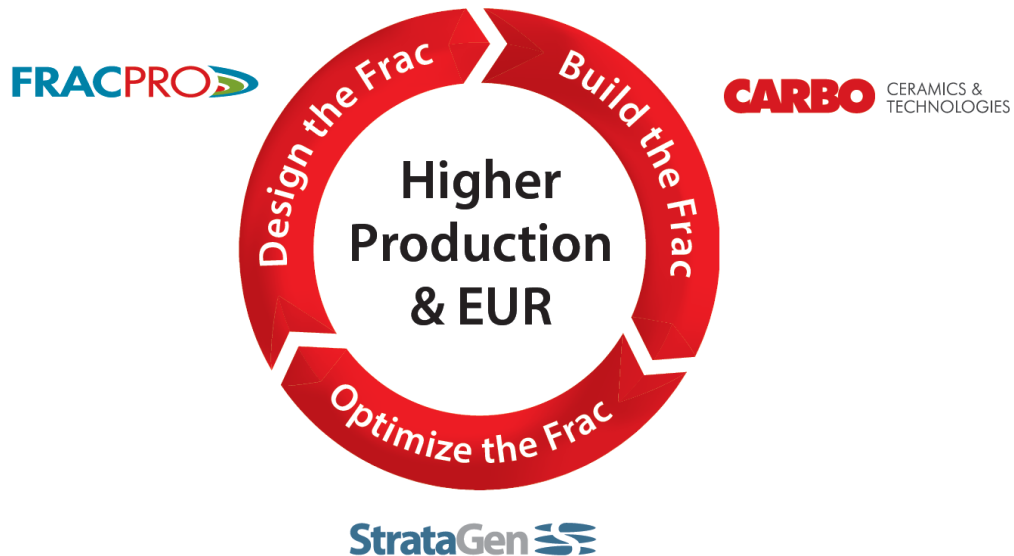
- KEY**
-  GUARD technology in use across region
 -  Gas/liquid plays

GUARD Technology – Maximize your Production

- Highly efficient chemical delivery system
- Increase overall hydrocarbon recovery
- Greatly reduce LOE
- Multiple year treatment without additional cost to AFE



Thank You!



Questions?