BRINGING HEAT TO THE SURFACE: VACUUM INSULATED TUBULARS IN GEOTHERMAL

VALLOUREC NEW ENERGIES

Corey Dufrene

November 19, 2024

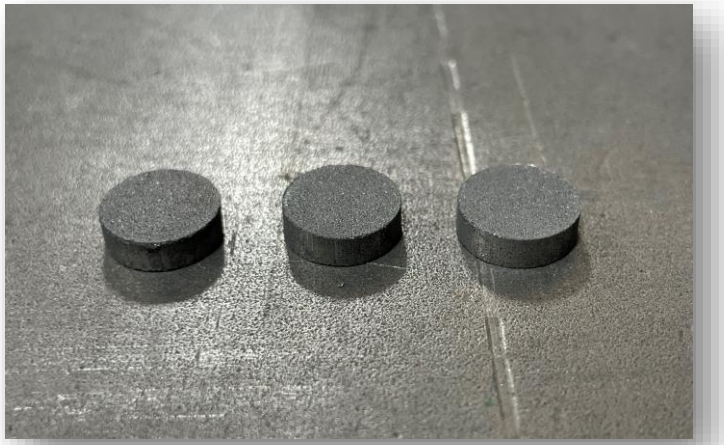
Vallourec® New Energies is Vallourec's commercial offer for the energy transition

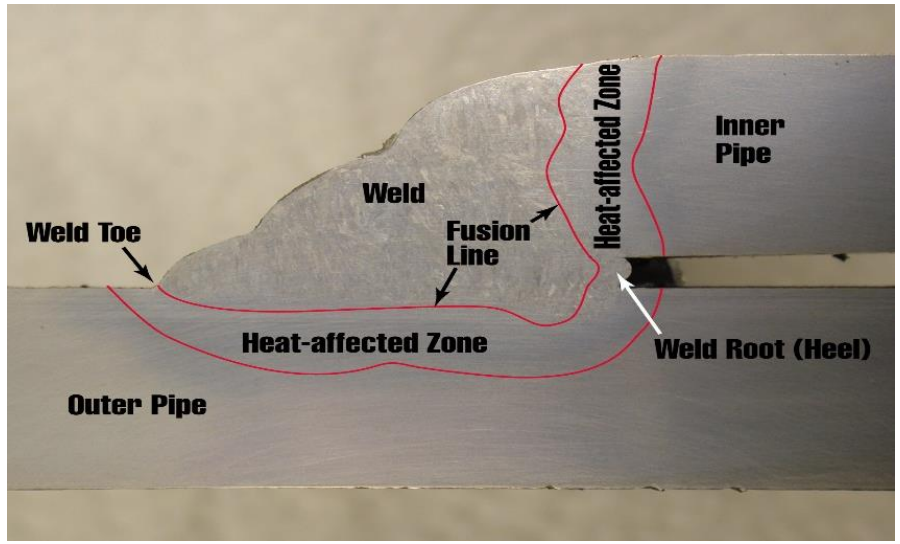
WHAT ARE VITS

- Vacuum Insulated Tubulars (VITs) are double-walled pipe systems with a vacuum annulus to drastically increase thermal insulation between fluid and annulus
- Size ranges from 3.5” x 2-3/8” – 16” x 14”
- Multiple configurations
  - L80/P110/Q125
  - Super 13Cr
  - Outer pipe threaded
  - Inner pipe threaded

vallourec® NewEnergies

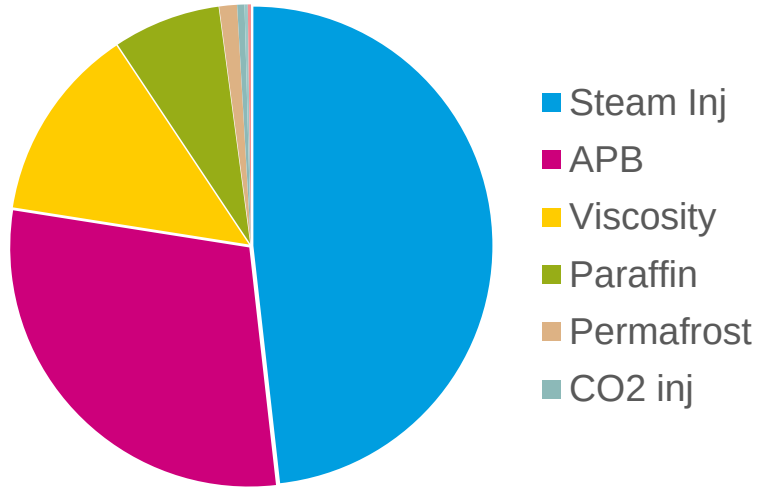
VIT COMPONENTS



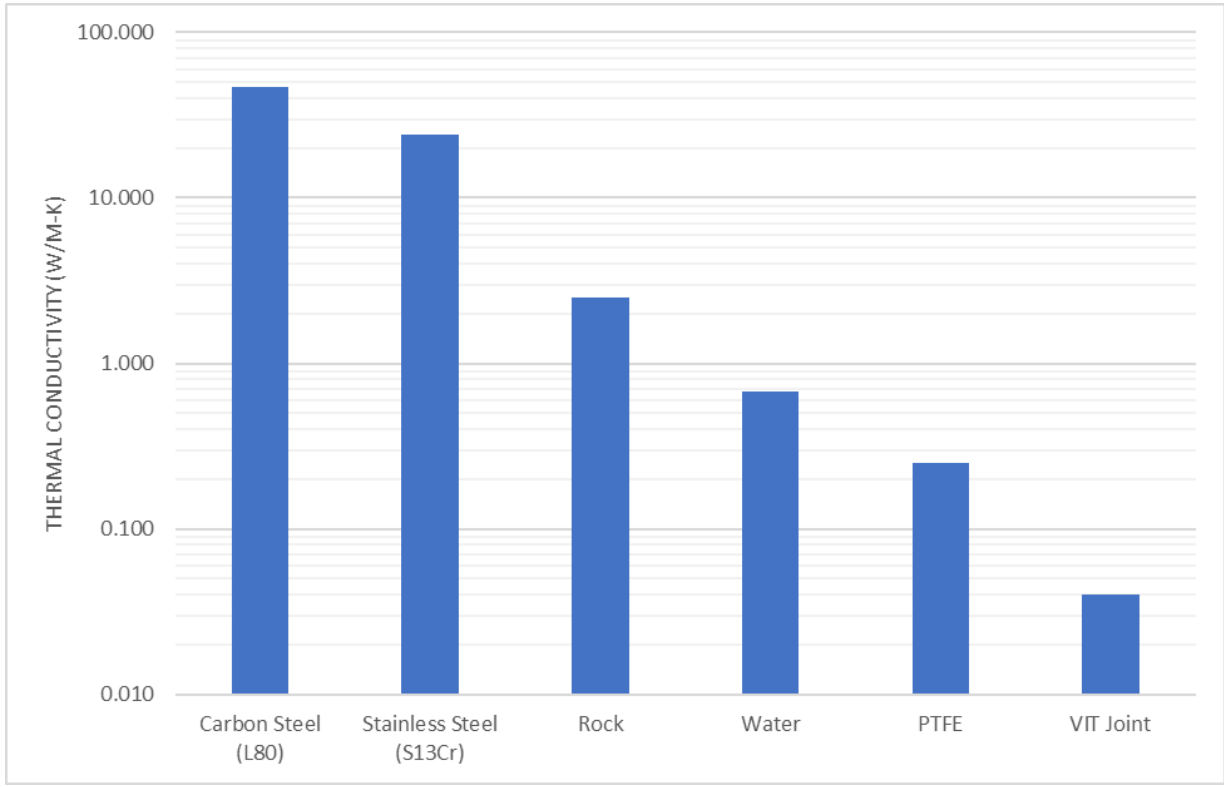


VIT HISTORY

- Over the past 25 years, over **2.4 million feet** of VIT successfully installed and run worldwide



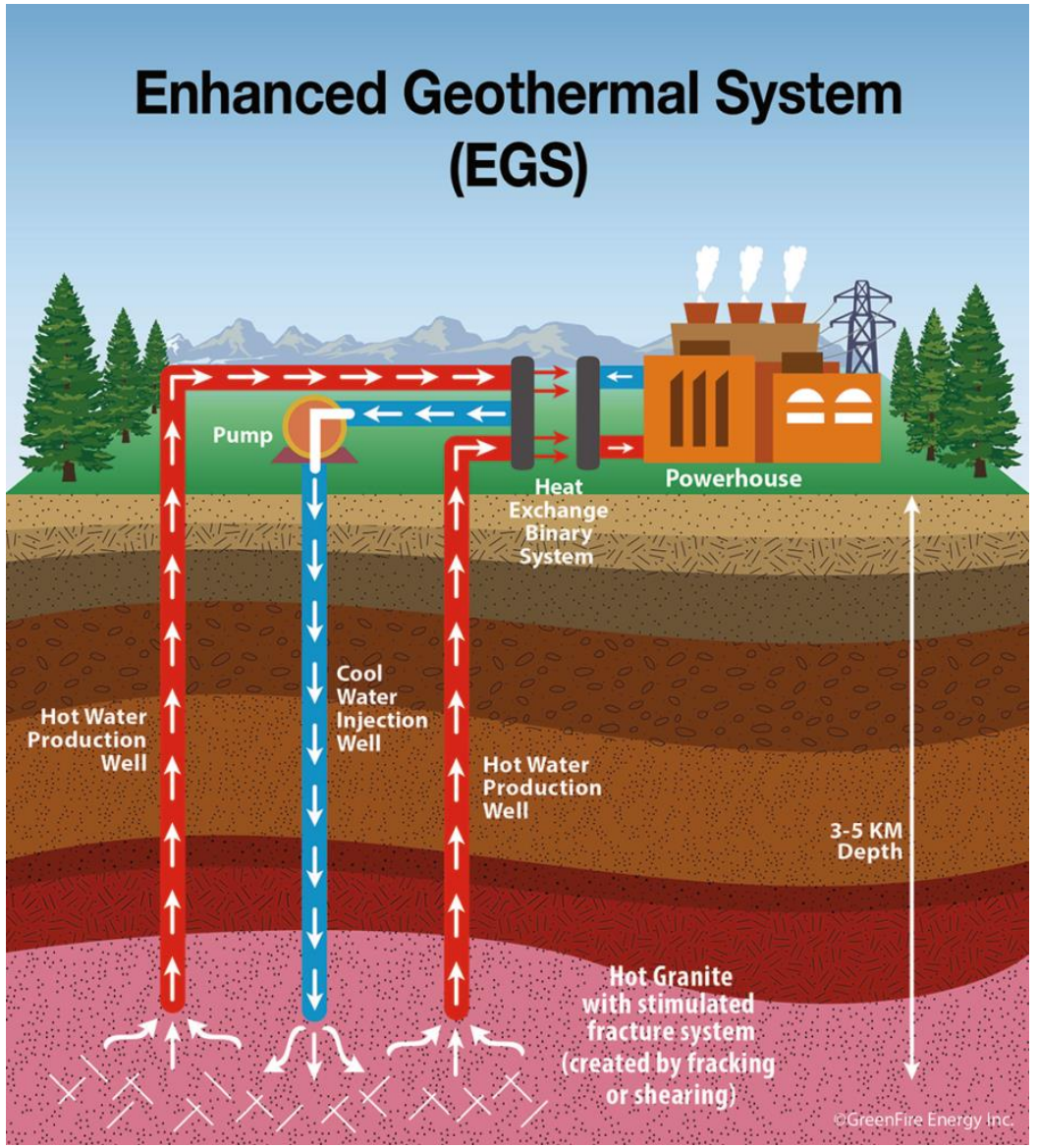
- Multiple uses
  - Steam injection
  - Annular pressure buildup (APB) prevention
  - Flow assurance / Paraffin prevention
  - Permafrost protection



vallourec® NewEnergies

VIT IN GEOTHERMAL

- Enhanced Geothermal Systems (EGS)
  - Opportunities to insulate and maintain production temperatures from bottomhole to surface

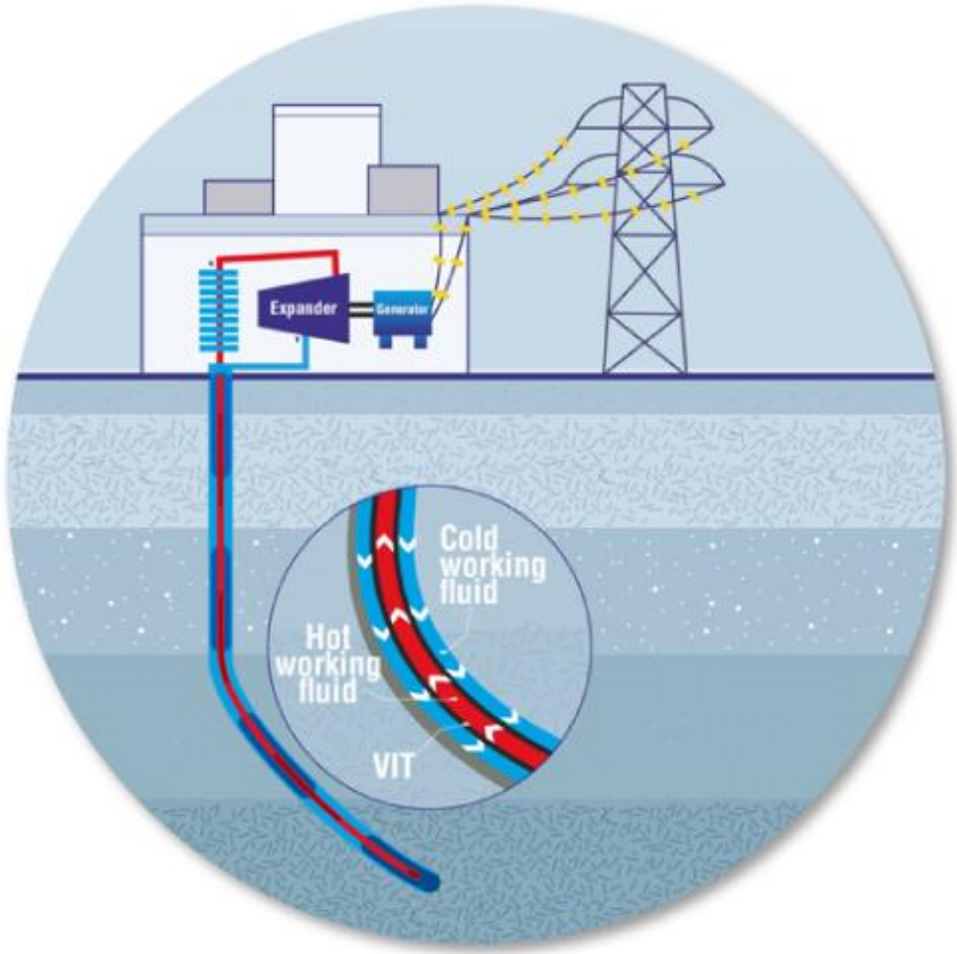


Source: GreenFire Energy Inc

vallourec® NewEnergies

VIT IN GEOTHERMAL

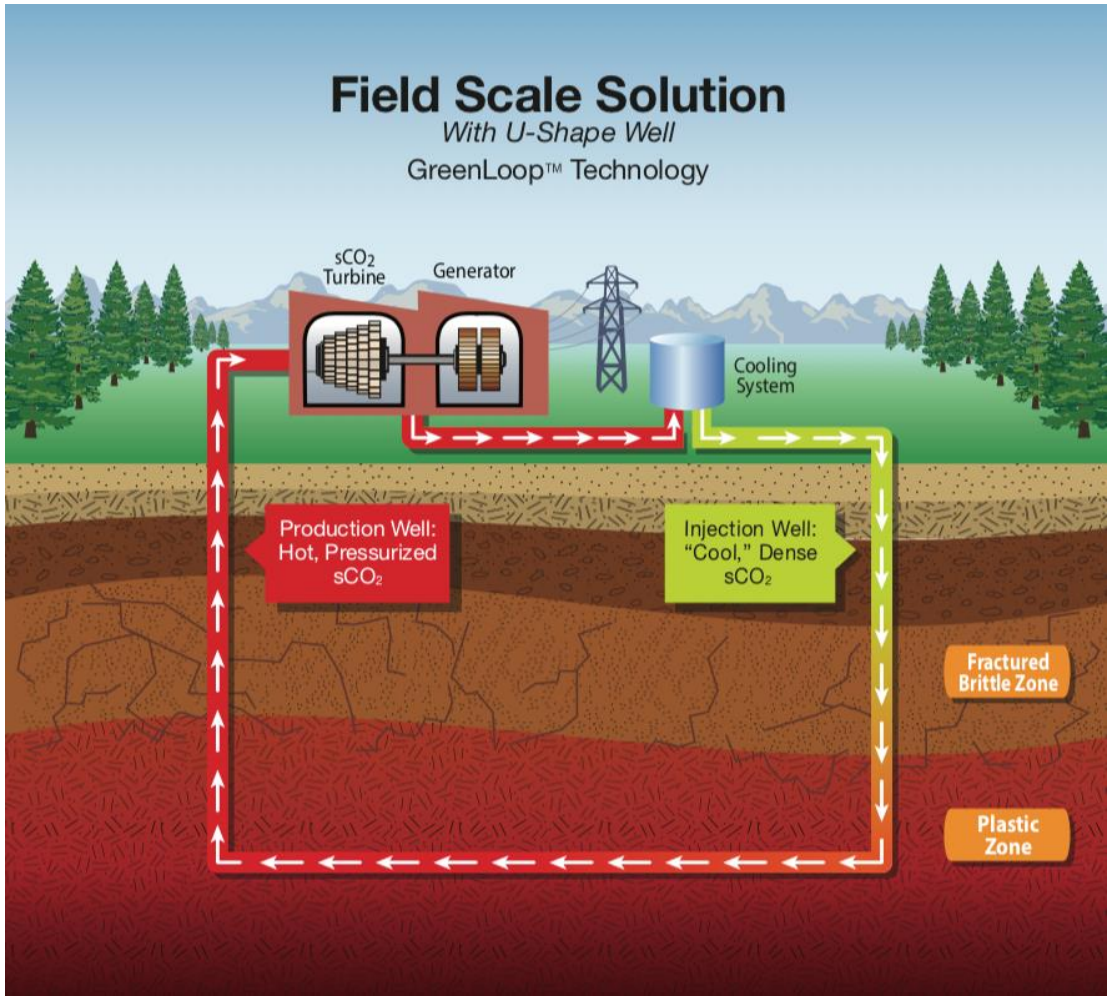
- Advanced Geothermal Systems (AGS)
  - Closed loop, single bore
    - Minimal drilling costs, small footprint
    - No interaction between formation and working fluid
    - Allows for variance of working fluid (ammonia, super critical CO2, etc)
    - Essential for these systems to insulate flow between annulus and production



vallourec® NewEnergies

VIT IN GEOTHERMAL

- Advanced Geothermal Systems (AGS)
  - Closed loop, U shape
    - Optimizing heat transfer during injection while minimizing heat losses during production

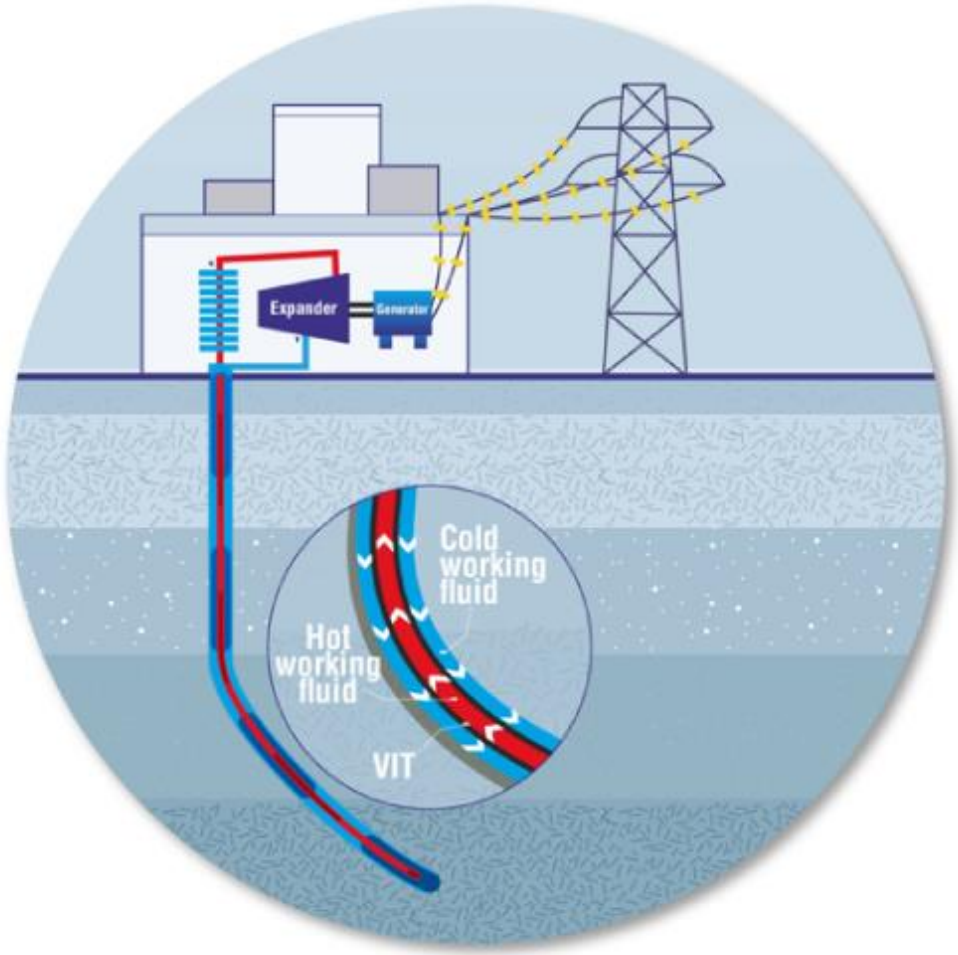


Source: GreenFire Energy Inc

vallourec® NewEnergies

VIT IN GEOTHERMAL

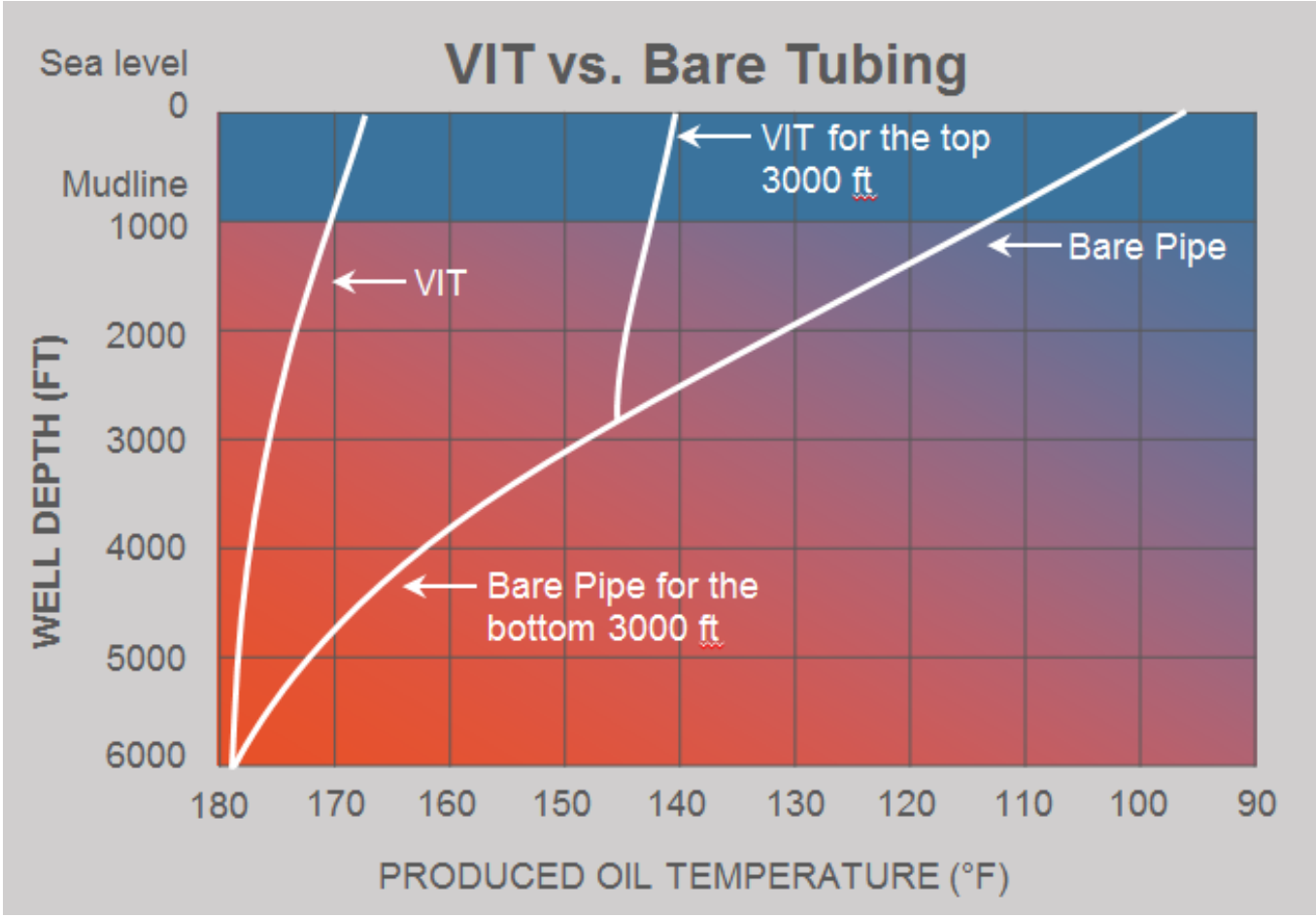
- Non-productive well conversion
  - Low flow geothermal wells
  - Abandoned Oil & Gas wells
- Increased efficiency of thermal storage/battery designs
  - ATES
  - TEN
  - Solar/Wind intermittency leveling



vallourec® NewEnergies

BENEFITS OF VIT IN GEOTHERMAL

- Huge improvement of thermal insulation
  - Maximizing thermal energy extraction
  - Typical 90-95% heat retention
- Self enclosed, robust product
  - No maintenance, no upkeep required
  - 30-year design life
- Currently validated to 350°C
- Easy running; no special equipment needed



vallourec® NewEnergies

ADAPTATION OF VIT IN GEOTHERMAL

- VIT product can be optimized for unique challenges of geothermal
  - Higher temperatures
    - Most OCTG VIT applications are limited below 250°C
    - Geothermal targets are 400°C
  - Longevity
    - VIT used in GOM or SAGD will typically only be installed for 5-10 years
    - 30+ year lifespan needed for economic feasibility in geothermal

vallourec® NewEnergies

THANK YOU

ANY QUESTIONS?

Vallourec® New Energies Contact:

Contact:
Corey Dufrene
Vallourec Thermocase VIT Product Leader
corey.dufrene@vallourec.com
www.linkedin.com/in/cdufrene