# Salt of the Earth Energy LLC


Joe Veytia
Chief Executive Officer

Stan Conley
Vice President - Utilities


Part of the La Quinta Channel industrial complex

# TEXAS DESALINATION CONFERENCE

**Austin, Texas**

**September 30, 2015**

# SEE Desalination Advantages

- **Fresh water and chemicals**
  - Desalination that converts salt to chloralkali chemicals
  - Chlorine Dioxide Biocides & Disinfectants from salt
  - The low cost production method for desal and chemicals
  - 1/3 the cost of conventional desalination
  - Competitive with ground and surface water
  - No brine discharge
  - Subsurface Intake

# Salt of the Earth Energy LLC

## The Business Model

**Desal Plants**
**(Chemicals + Fresh Water)**

**Biocide Plants**
**(Chlorine Dioxide based mixtures)**

- New Paradigm – Water sells Chloralkali Chemicals
- Major Chloralkali Chemical markets:
  - Petroleum Refining & Fracking
  - Steel and Aluminum refining
  - Water and Wastewater plants
  - Paper Mills
  - Meat Rendering Plants
  - Fruit & Vegetable Processing

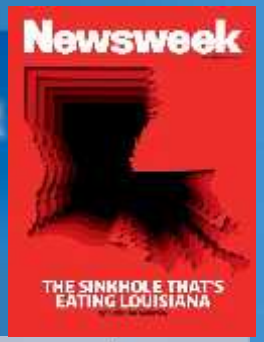
# Problems with Conventional Desalination and Solution Mining for Brine

Intake

Brine


Carbon Dioxide


Sinkholes



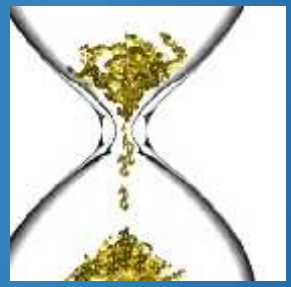

CapEx

OpEX


Infrastructure

Time

Permits



# Endangered Species Litigation

## Less Water for Industry in Future Droughts

Whooping Cranes

Federal 5th Circuit Court Case (2013)

The Aransas Project vs Bryan Shaw (TCEQ)

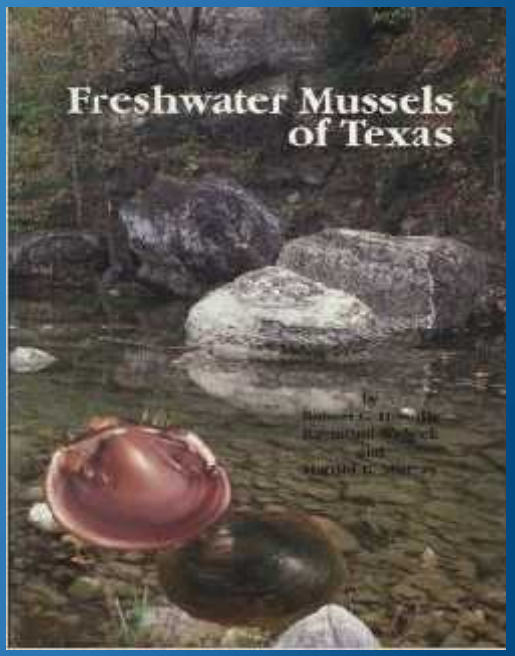
Finding: High salinity caused by diminished flows of Texas rivers causes damage to wildlife habitat

Major Impacts: New mandates for minimum river flows

Conventional Desal is less viable -

Elevates salinity causing marine life mortality

Freshwater Mussels

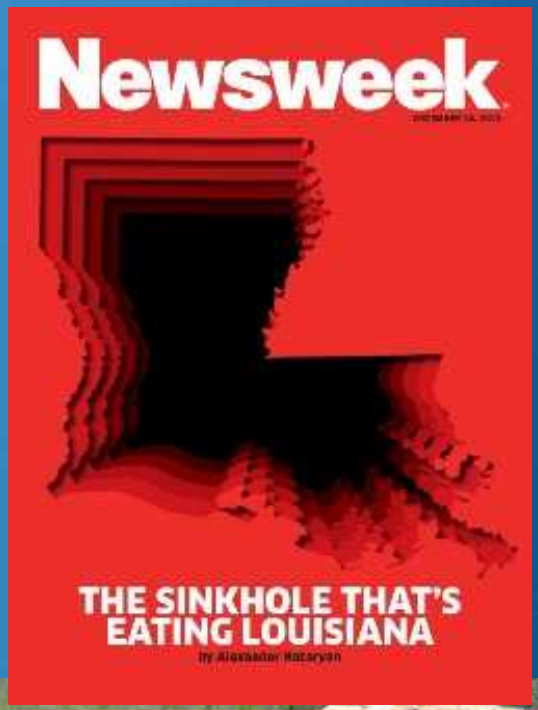



Kemp Ridley's Sea Turtle

# Solution Mining Hazards

## Bayou Corne, Louisiana Sinkhole

With SEE Technology, the ocean is a safe and affordable salt alternative to Solution Mining hazards.


# Simplified Process Overview

Raw Sea Water

Pure Salt Water

Pretreatment Step
(Purification to pure brine)

Desalination and Chemical Production
Fuel Cell Power Savings

**High Purity Fresh Water**

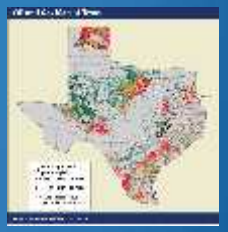
Chloralkali Chemicals for sale

-Liquid Chemicals
- -Caustic (Sodium Hydroxide)
- -Bleach
- - Hydrochloric Acid
- - Chlorine Dioxide based Biocides

- Gaseous Chemicals
- -Hydrogen
- -Oxygen
- -Chlorine Dioxide
- -Chlorine

# Sea Water Intake Impact

## A Subfloor Intake System



***Ocean floor used as a filter***



***No fish, larvae, or other marine life harmed during intake.***

# SEE Desal/Chemical Process

**Subfloor Intake** → **SEE Pretreatment** → **Desalination & Chemicals** → **Fresh Water**

**SEE Pretreatment** → Minerals

**Desalination & Chemicals** → Hydrogen → ORC Electrical Power

Sodium Hydroxide

Chlorine Dioxide → Chlorine → Oxygen

***1st Generation Chemicals***

***Power Recovery***

Chlorine Dioxide → Chlorine Dioxide Biocides Water & Wastewater Disinfectants (StimCide)

***2nd Generation Chemicals***

Chlorine → **HCl Fuel Cell** → Hydrochloric Acid

Chlorine → **Alkali Fuel Cell** → Bleach (NaOCl)

# SEE Technology vs Conventional Desal

## Competitive Advantages

| Feature Comparisons | SEE Technology | vs | Conventional Desal |
|---|---|---|---|
| Water Price | Less than $2.00 K gal | | $5.00 - $6.50 K gal |
| Revenue Sources | 6 (water + 5 chemicals) | | 1 (water only) |
| Power Recovery | Yes | | No |
| Salt Costs | None | | 10% of OPEX |
| Capital Cost | X | | 2X |
| Operating Costs | X | | 2X |
| Brine Discharge | None | | 50% of Volume |
| Minimum Plant Size | 1 MGD | | 10 MGD |
| Permitting Difficulty | Easy | | Controversial |

# SEE's New Disinfectant for Utilities

## Chlorine Dioxide ($ClO_2$) Mixtures

***SEE DISINFECTANT ADVANTAGES:***

***Broader Microbial Spectrum including Giardia & Cryptosporidium***
***Requires less chemical 0.5 ppm vs 4 ppm***
***No carcinogens (Trihalomethanes)***
***Liquid vs gas containers***
***Far less hazardous***
***Recycled from Waste Brine***
***Sustainable***

# SEE's Revolutionary StimCide

## 5 Chemical Functions in 1

- Biocide
- Corrosion Inhibitor
- Descalant
- Hydrogen Sulfide Scavenger
- Production Stimulant

**Saves Time and Money**

**Upgrades Sour Crude**

**Multiplies Production = Makes More Money**

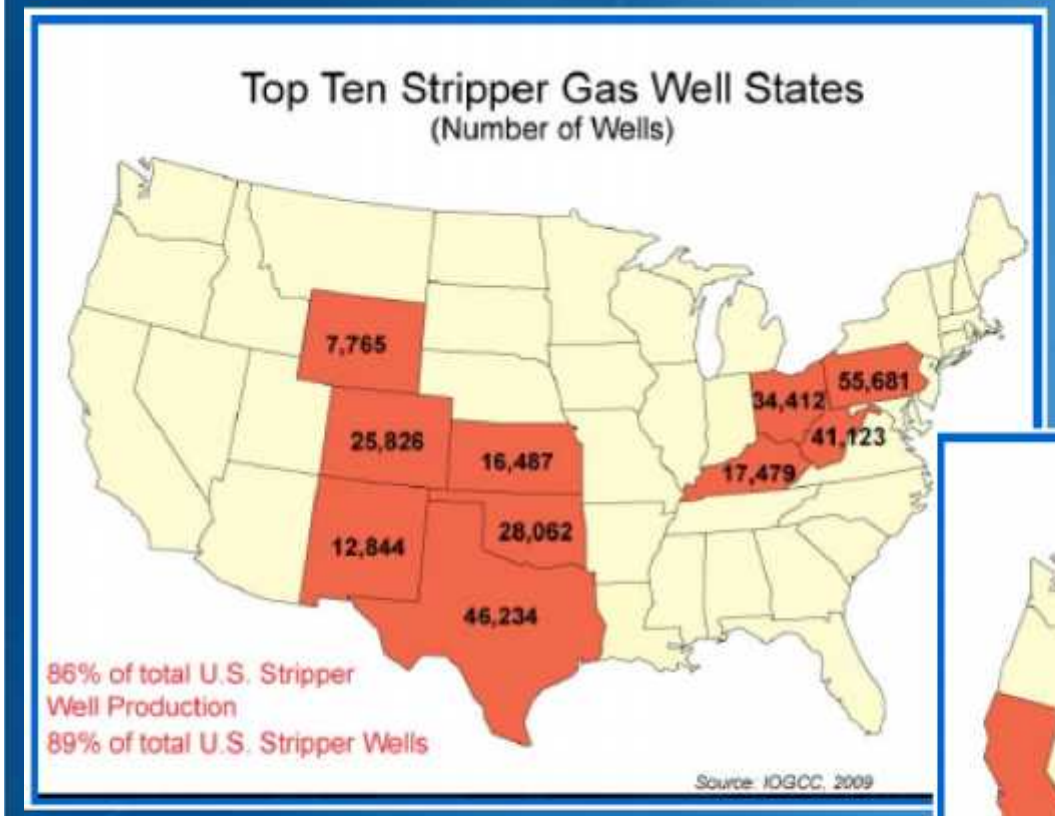
**Recycled Brine Sustainaable, EcoFriendly**

# SEE Biocide Oil Well Testing Results

## Actual results from gas and oil stripper wells


- *Location: Kansas Mississipian Formation*
- *Prior Production Status:*
  - *Well Site 1: Natural gas well with no production*
    - *Iron Oxide scale problems*
  - *Well Site 2: Oil well with 0.75 barrel per day production*
    - *H2S & Iron sulfide scale problems*
- *SEE Biocide Application:*
  - *27 gallons of SEE Biocide + 10 barrels of water*
  - *One day of circulation and residence time*
- *Production results:*
  - *Natural gas well – 78 MCF/day , $7,776 per month*
  - *Oil Well – 20 BPD initially settling to 5-6 BPD*
- *US Market Opportunity: 650,000 oil/gas stripper wells in US*
- *Currently stripper wells produce 930,000 BPD (2.9 BPD/well ave.) could potentially be increased to 5 million BPD ($68 Billion/yr increase at $50/barrel)*

# Top 10 Oil & Gas Stripper Well States






**2008 DOE Stripper Well Data:**

2 TCF of Natural Gas = 25 Mill US Homes, 10% US
Enough Oil for 50% of US Airline consumption

1993-2003 142,000 wells plugged/abandoned
Loss of $3 Billion in revenue

# SEE Biocide vs Competition

## SEE Competitive Advantages

| Feature Comparisons | SEE Biocide | vs | Conventional ClO2 | NaHOCl | Glutaraldehyde |
|---|---|---|---|---|---|
| Price | Lowest | | Highest | Average | Average |
| Microbial Biocidal spectrum | Widest | | Very Wide | Wide | Wide |
| Contact time | Shortest | | Very Short | Average | Average |
| H2S, FeS Reduction | Yes | | Yes | Some | None |
| Residual time | Longest | | Long | Average | Average |
| Production Location | As desired | | Onsite Required | Onsite | Offsite Factory |
| Ease of Use | Easy | | Most Complicated | Complicated | Easy |
| Transportability | Yes | | No | No | Yes |
| Transportation Costs | Low | | Low | Low | Highest |
| User Investment | None | | Yes ($500K) | None | None |
| Ground water risks | None | | None | Low | Highest |
| Human Toxicity | Very low | | Very low | Very low | High |
| Animal/Aquatic Life Toxicity | Very low | | Very low | Very low | Highest |
| Explosion Risk | None | | Highest | None | None |
| Price volatility | Lowest | | Highest | Average | Average |
| Sustainable/Eco-Beneficial | Yes | | No | No | No |

# Offshore Platform Opportunities

## Reduced Decommissioning Costs  Possible Well Production Restarts

### Decommissioning North Sea platforms to cost $66.3 B

Murchison Platform, North Sea, slated for removal

Decommissioning North Sea oil and gas facilities is projected to cost £40.6 billion ($66.3 billion) over the next 25 years in the North Sea, Oil & Gas UK says.

According to Oil & Gas UK when the time is right, oil companies will seek to decommission as efficiently and cost effectively as possible while ensuring they meet their safety and environmental obligations.

The issue will take centre stage when Oil & Gas UK and Decom North Sea jointly host the Offshore Decommissioning Conference 2014 next month (October 7- 9) at the Fairmont in St Andrews.

- **SEE StimCide Descaling effect reduces environmental costs in decommissioning costs of contaminated pipe.**
- **Production stimulation effects could retart older Non Productive Offshore Oil Wells and increase Producing ones.**

# The Better Way

## Financial & Environmental Reasons

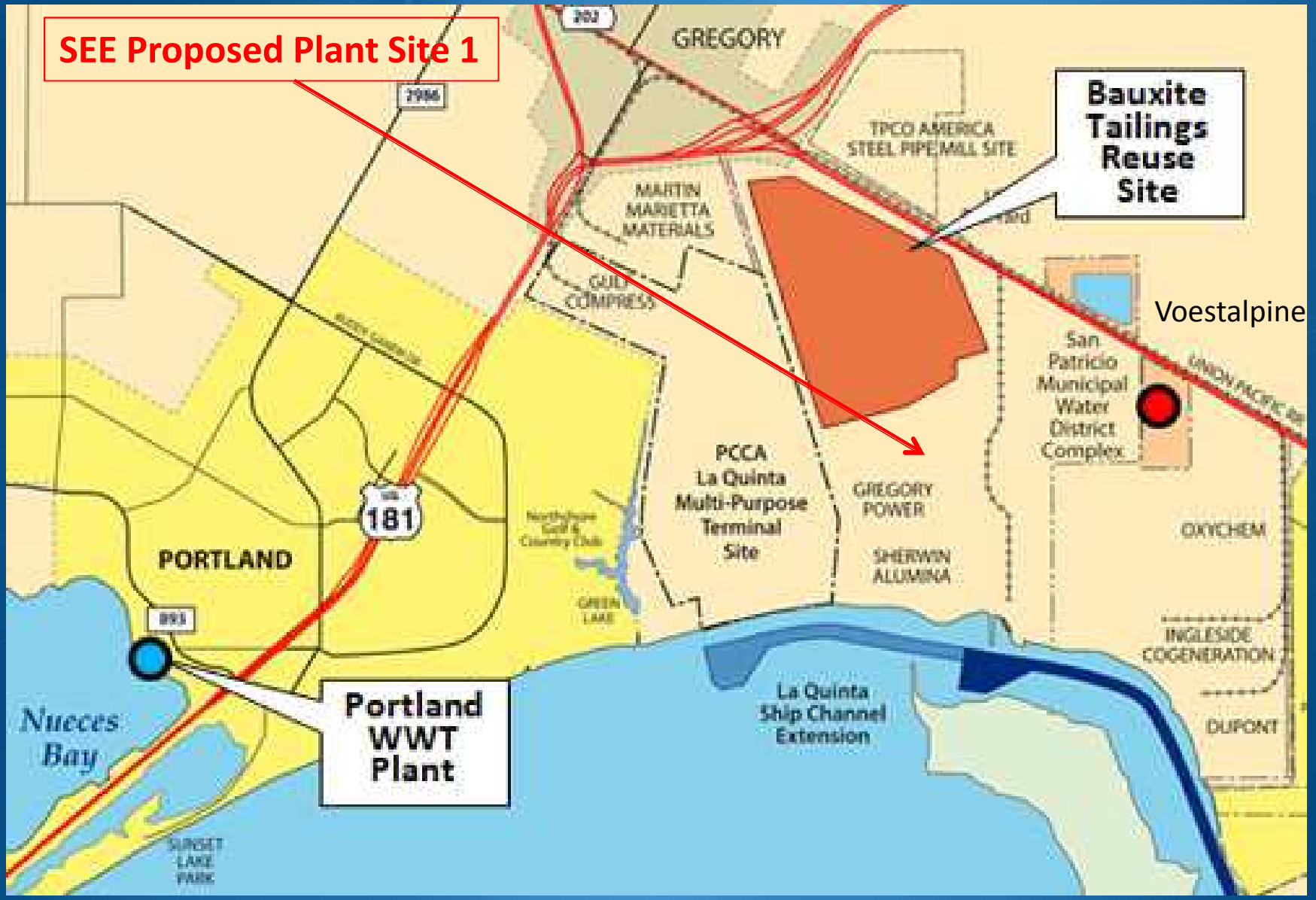
Financial Reasons

- Water costs far less – under $2.00 per 1,000 gallons (vs $5.00 -$6.50)
- High value commodity chemicals
- Less electricity – nearly 50% less
- SEE Plants have lower CAPEX and OPEX
- Shorter chemical transportation distances
- Local/Texas job creation


Environmental Reasons

- No brine effluent
- Reliable water supply
- Chemicals from sea salinity
- No threats to endangered species
- No marine bed destruction
- No solution mining hazards
- Safer Oil Well Biocides for Ground Water

# Port of Corpus Christi – 1st SEE Proposed Plant site



# Alumina Plant Aerial Photo

# SEE Commercialization Status

## Recent Significant Events

Recent Commercialization Progress

- Executed 15 yr HCl offtake Agreement with major chemical distributor
- Major distributor alignment for multiple HCl mfring plants & distribution
- Oilfield biocide sales with several oil field service companies
- Ongoing negotiations with large utility to recycle RO waste brine
- Initiating EPA biocide registration
- 2nd Plant site identified in Texas City near Houston
- Negotiations with major petroleum refiner as a caustic offtaker
- Endorsements and support by major environmental groups
- Major research lab and universities collaboration
- Letter of Interest to provide project financing for multiple plants by major US Investment Bank – Jefferies & Company

# Salt of the Earth Energy LLC

## Summary

- Desalination and chloralkali chemical production technology using salt derived from sea water, waste RO brine or produced water
- Scalable, multiple revenues, profitable
- Ideal for industrial locations that utilize chloralkali chemicals and have large water demands – petroleum refineries, petroleum exploration, metal refining, PVC mfrs, water and wastewater utility plants
- Possible platform for water and chloralkali dependent industries
- More chemicals made in Texas for Texas industry (most are imported to TX)
- Sustainable chemical production method that uses brine waste streams
- Chemicals subsidize the cost of desalination yet still produce chemicals very competitively, usually the low cost production method
- Eliminates brine discharge to Texas bays and estuaries

# Thank you for the Opportunity

- **Salt of the Earth Energy LLC**


**Joe Veytia – CEO**

**Stan Conley – VP Utilities**

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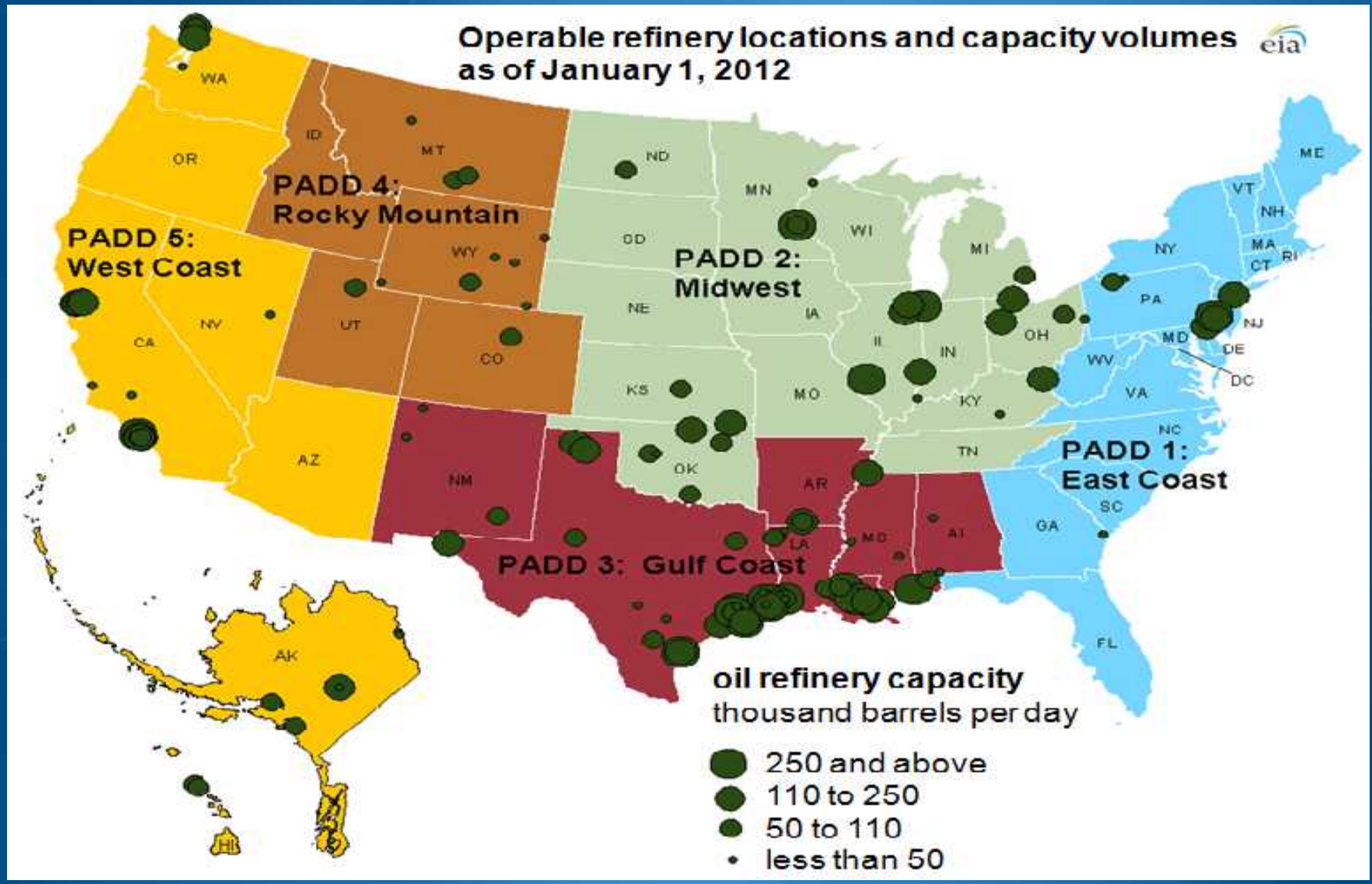
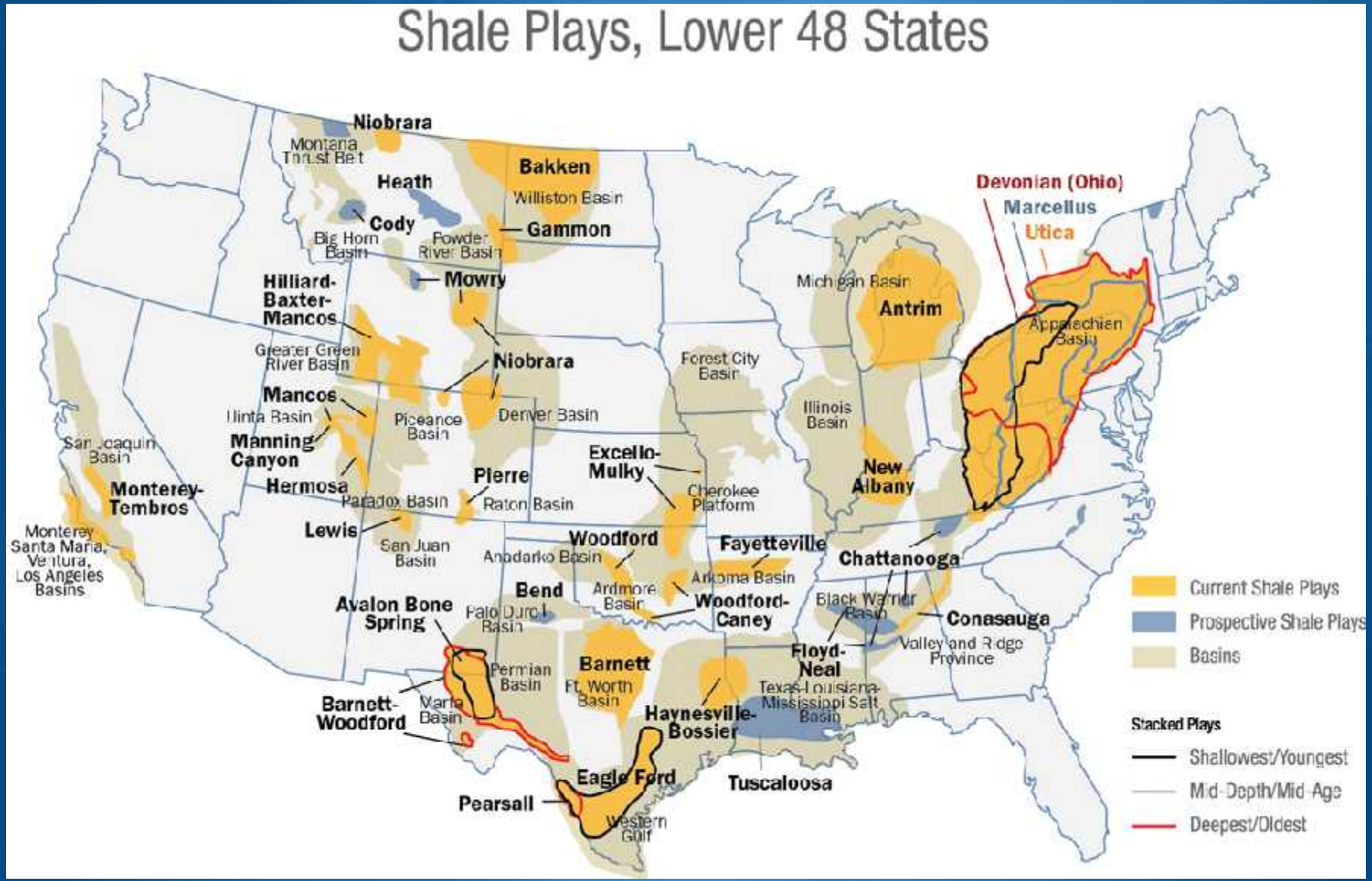
# Supplemental Q&A Slides

# US Petroleum Refineries Map



# US Shale Formations

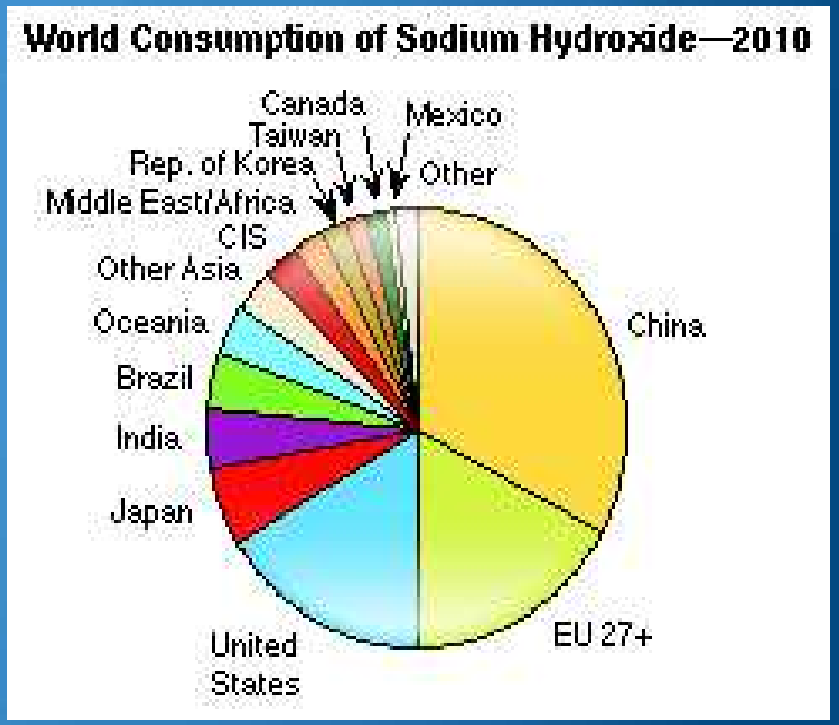


# NaOH – Sodium Hydroxide (Caustic)

## The Uses & Markets

**Uses:** NaOH is used in many industries mostly as a strong chemical base in the manufacture pulp, paper, textiles, drinking water, soap, detergents, aluminum refining, petroleum refining and drilling muds. In petroleum refining, one of it main uses is to remove sulfur from sour crude so that fuels for vehicles do not emit sulfur dioxide that produces acid rain.

**Market:** NaOH is currently manufactured from salt by the chloralkali industry which is an $88.6 Billion industry worldwide consuming nearly 79 million tonnes in 2011. Chlorine is also produced from the same process. NaOH is sold to industry in 50/50 weight to weight 55 gallon (200 liter) barrels. Major producers include DOW, Oxychem, PPG, Olin, Solvay and Formosa.



# HCl – Hydrochloric Acid (Muriatic Acid)

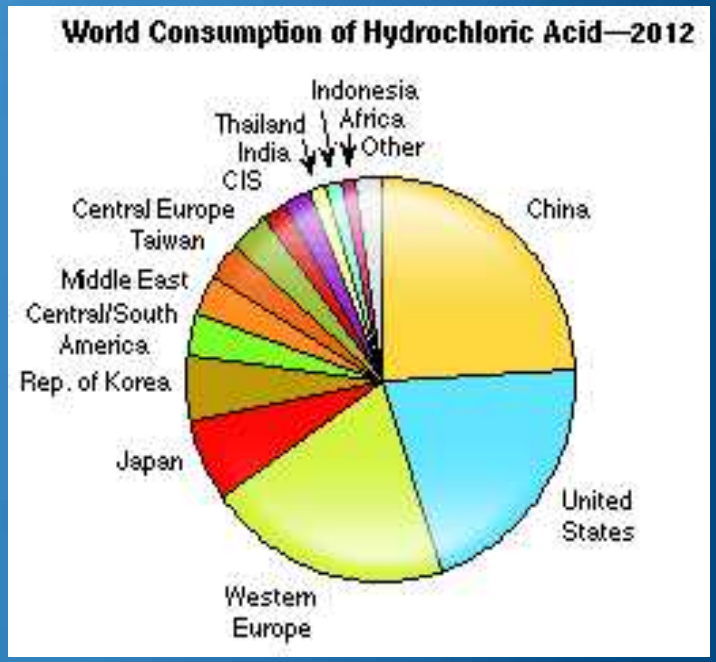
## The Uses & Markets

**Uses:**

HCl is used in the chemical industry in the production of vinyl chloride and dichloroethane for PVC plastics, MDI/TDI for polyurethane, bisphenol for polycarbonate, activated carbon, ascorbic acid (Vitamin C), food processing, pharmaceuticals, descaling, oil shale fracking, pickling of steel, sewage treatment, swimming pools and semiconductors. For pickling steel, HCl is faster and more efficient than Sulfuric Acid (H2SO4). Fracking fluids are 8% chemical additives of which 75% of that chemical volume is HCl.

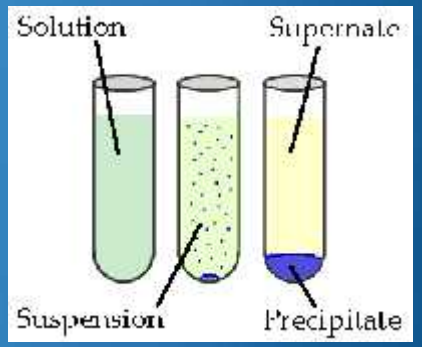
**Market:**

HCl is industrially produced in about 40 processes as co-product and consumed in about 110 chemical manufacturing processes. HCl is produced in solutions up to 38%. Demand has risen rapidly in the last several years due to the rapid increase in oil shale fracking and pipeline steel production especially in the U.S. Major producers are DOW, FMC, Georgia Gulf, Tosch, Akzo Nobel, Tessenderio.



# SEE Brine Purification

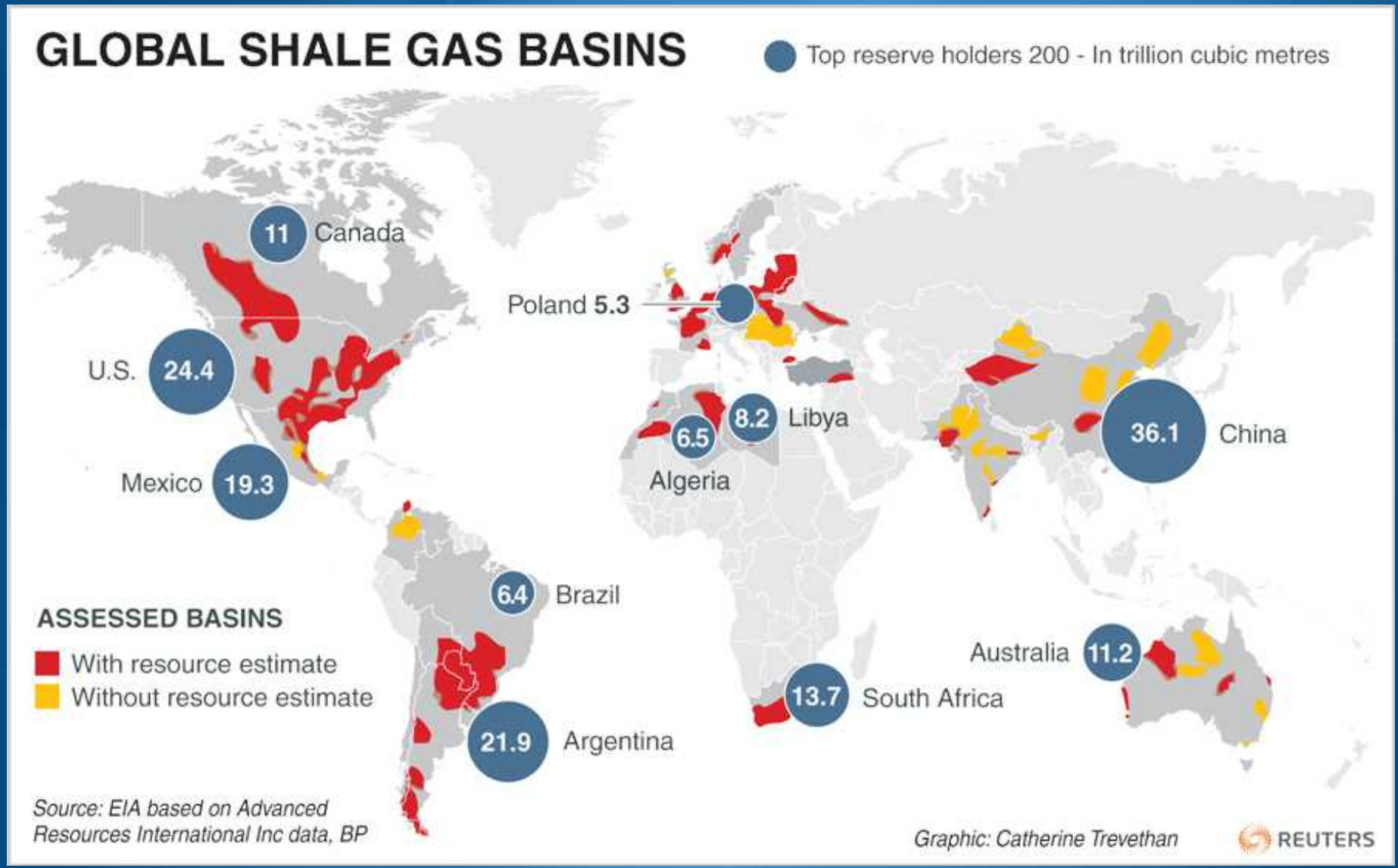
## Multiple Reactive Oxygen Species (descale)




### *Review of Solubility Rules:*

| | | | | |
|---|---|---|---|---|
| **Chlorides $Cl^-$** | + | silver ($Ag^+$), lead ($Pb^{2+}$), mercury ($Hg^{2+}$), copper ($Cu^+$), thallium ($Tl^+$) | → | *Insoluble Precipitants* |
| **Hydroxides $OH^-$** | + | Any cation except : alkali ions ($Li^+$,$Na^+$,$K^+$,$Rb^+$,$Cs^+$,$Fr^+$), $H^+_{(aq)}$,$NH_4^+$,$Sr^{2+}$,$Ba^{2+}$,$Ra^{2+}$,$Tl^+$ | → | *Insoluble Precipitants* |
| **Carbonates $CO_3^{2-}$**<br>**Phosphates $PO_4^{3}$** | + | Any cation except : alkali ions ($Li^+$,$Na^+$,$K^+$,$Rb^+$,$Cs^+$,$Fr^+$), $H^+_{(aq)}$,$NH_4^+$ | → | *Insoluble Precipitants* |
| **Sulfates $SO_4^{2-}$** | + | Any cation except : calcium ($Ca^{2+}$), strontium ($Sr^{2+}$), barium ($Ba^{2+}$), silver ($Ag^+$), lead ($Pb^{2+}$), radium ($Ra^{2+}$) | → | *Insoluble Precipitants* |

# Global Shale Resource Estimates



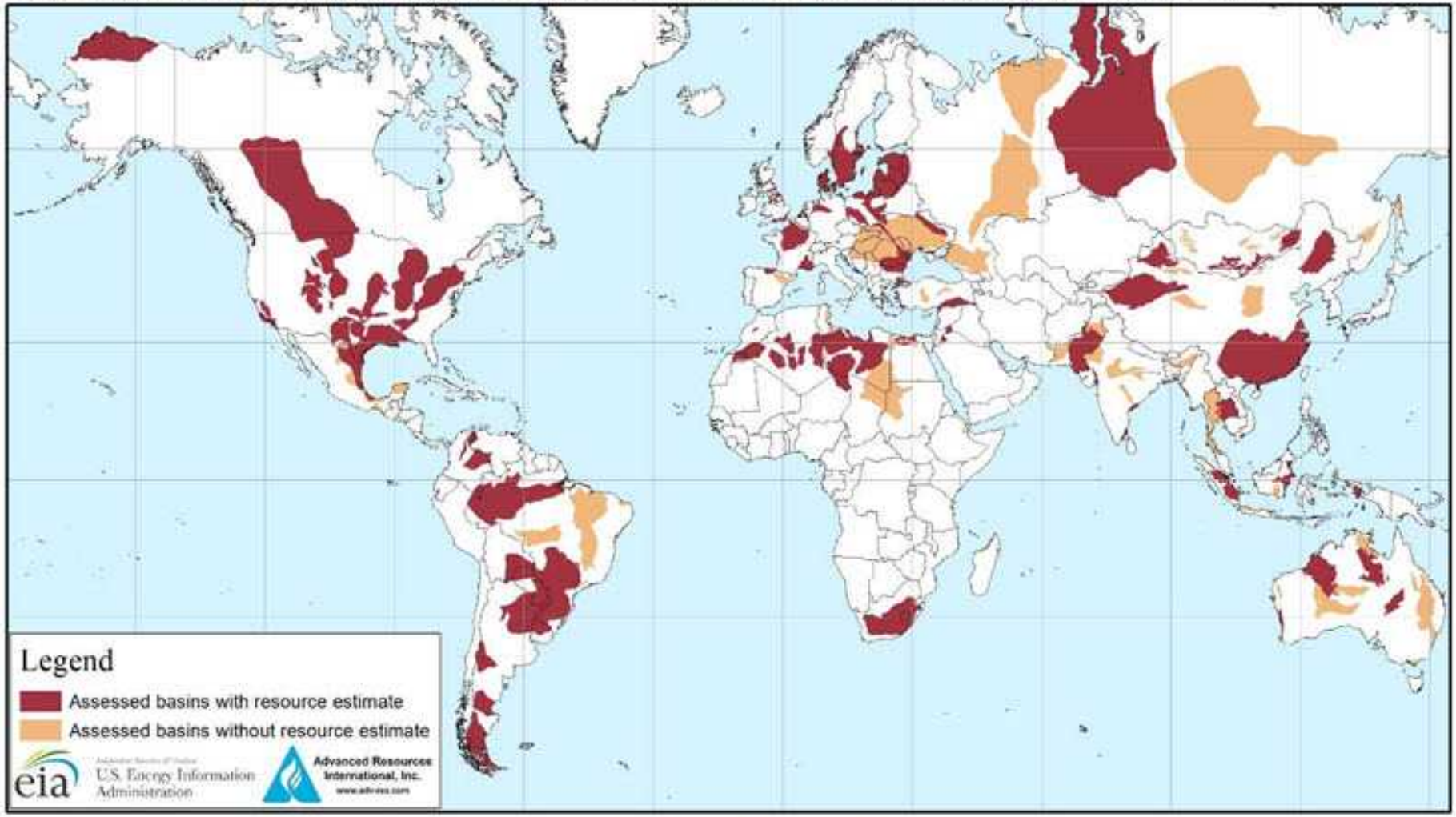
# Merits of SEE Biocide – "Stim Cide"

## Essentially the best of several biocides including ClO2

1. A mixture of oxidizing/chloralkali biocides
2. Simultaneously generated biocide mixture from salt
3. High percentage of ClO2, with some Ozone (O3), Peroxide (H2O2), Superoxide (O3-), Hypochlorous Acid (HOCl-) and Chlorine (Cl2)
4. Flexible production - onsite generation or remotely in fresh or produced water
5. Attacks microbes in multiple ways
6. Microbes do not develop resistance to all the above biocides
7. Longer residual effectiveness period
8. Very high microbial biocidal spectrum including SRBs, APBs and Superbugs
9. No carcinogenic byproducts (THMs trihalomethanes and HAAs haloacetic acids)
10. Highly water soluble
11. Effective in all pH ranges
12. Strong biocide in low concentrations and fast acting
13. Long shelf life (over 200 days)
14. Long history in water and wastewater disinfection
15. Strong oxidizer - oxidizes $H_2S$ to sulfur and sulfates
16. No equipment investment necessary by user or extensive use training necessary
17. Transportable or low delivery costs because can be produced locally or onsite
18. Green and sustainable when using brine concentrate from desal plants, recycled produced water, or brackish water sources

# World Shale Formations – US EIA

Figure 1. Map of basins with assessed shale oil and shale gas formations, as of May 2013




Source: United States basins from U.S. Energy Information Administration and United States Geological Survey; other basins from ARI based on data from various published studies.

# Southwest Energy Company

## Biocides and Fracking

*"The most dangerous part of the shale frack is the biocide. That is the number one thing the industry is trying to find a way around."*

Steve Mueller – CEO

Southwest Energy is the largest producer in the Fayetteville Shale in northern Arkansas.

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# US Oil & Gas Well Data -2009 EIA


| Oil Rate/d bpd | No. | % | Avg. bpd | Total mm bpy | % | Gas bcf | Gas Rate mcf/d |
|---|---|---|---|---|---|---|---|
| OIL WELLS | | | | | | | |
| <= 10 | 286,109 | 76.9% | 2.2 | 217.3 | 13.2% | 143 | 1.4 |
| <= 15 | 310,552 | 85.4% | 2.9 | 311.5 | 19.0% | 214 | 2.0 |
| Total | 363,459 | 100.0% | 12.9 | 1,642.9 | 100.0% | 1,614 | 12.9 |
| GAS WELLS | | | | | | | |
| | 297,371 | 64.5% | 0.2 | 18.8 | 7.9% | 1,900 | 18.3 |
| | 338,056 | 73.3% | 0.2 | 24.6 | 12.2% | 2,912 | 24.6 |
| | 461,388 | 100.0% | 1.9 | 283 | 100.0% | 23,959 | 148.5 |
| TOTAL | 824,847 | | | 1,925.9 | | 25,573 | |

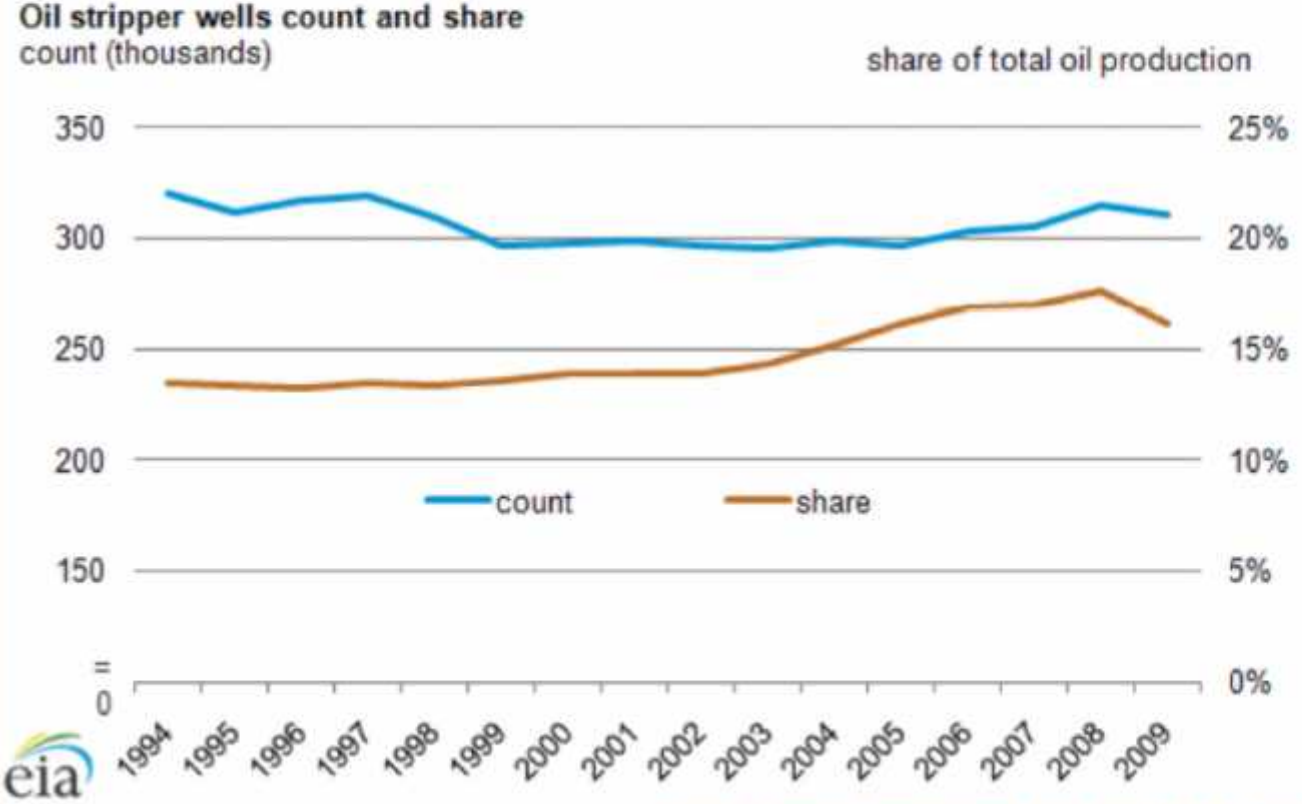
# Stripper Wells produce 16% of US Oil

U.S. Energy Information Administration

## Today in Energy

July 19, 2011

### Oil stripper wells accounted for over 16% of U.S. oil production in 2009




**Source:** U.S. Energy Information Administration, United States Total Distribution of Wells by Production Rate Bracket