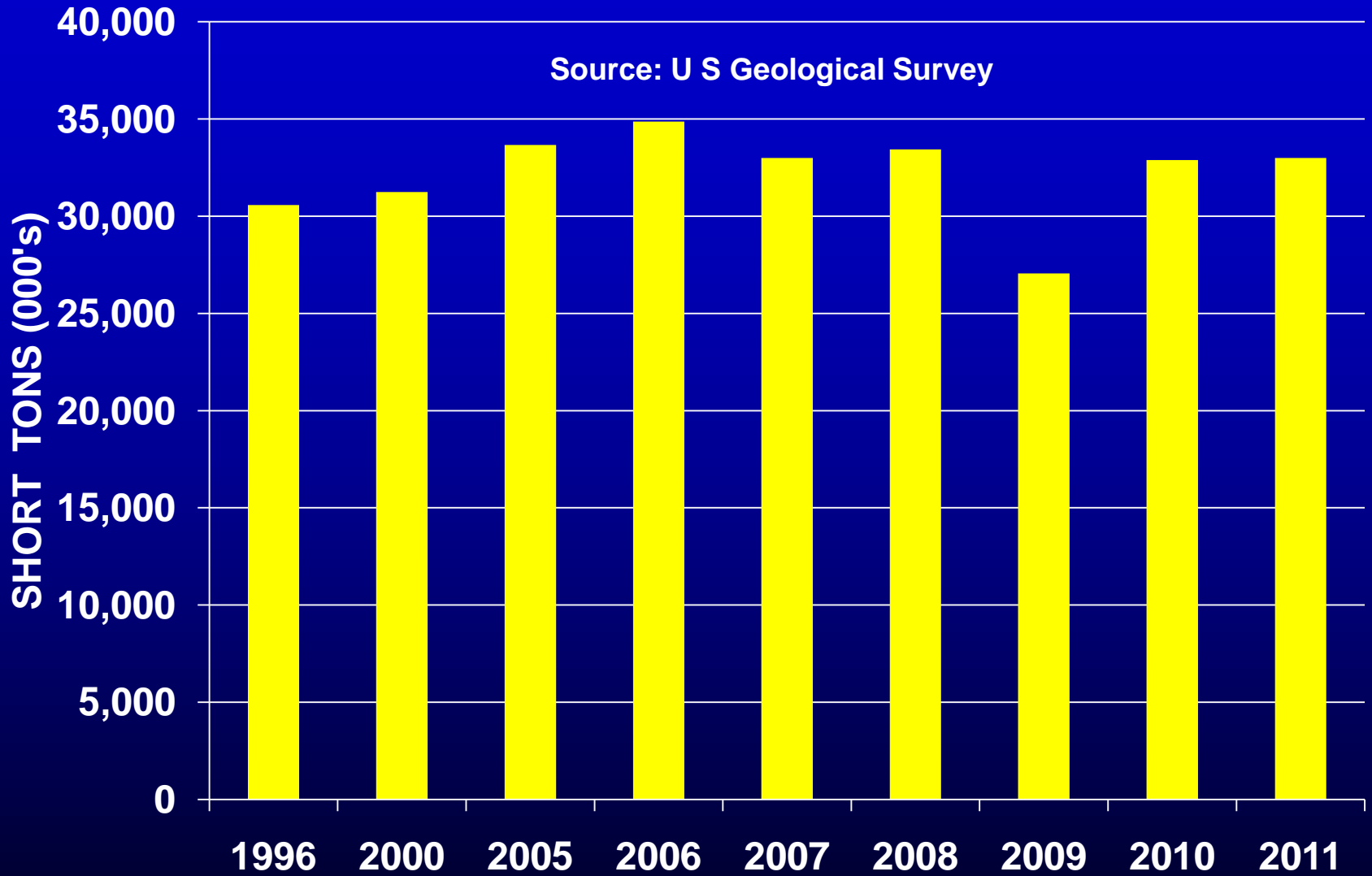


A large, conical pile of sand dominates the center of the image. In the foreground, a green metal conveyor belt system with rollers is visible, extending across the width of the frame. The background shows a clear blue sky with scattered white clouds. The overall scene is an industrial sand processing or storage site.

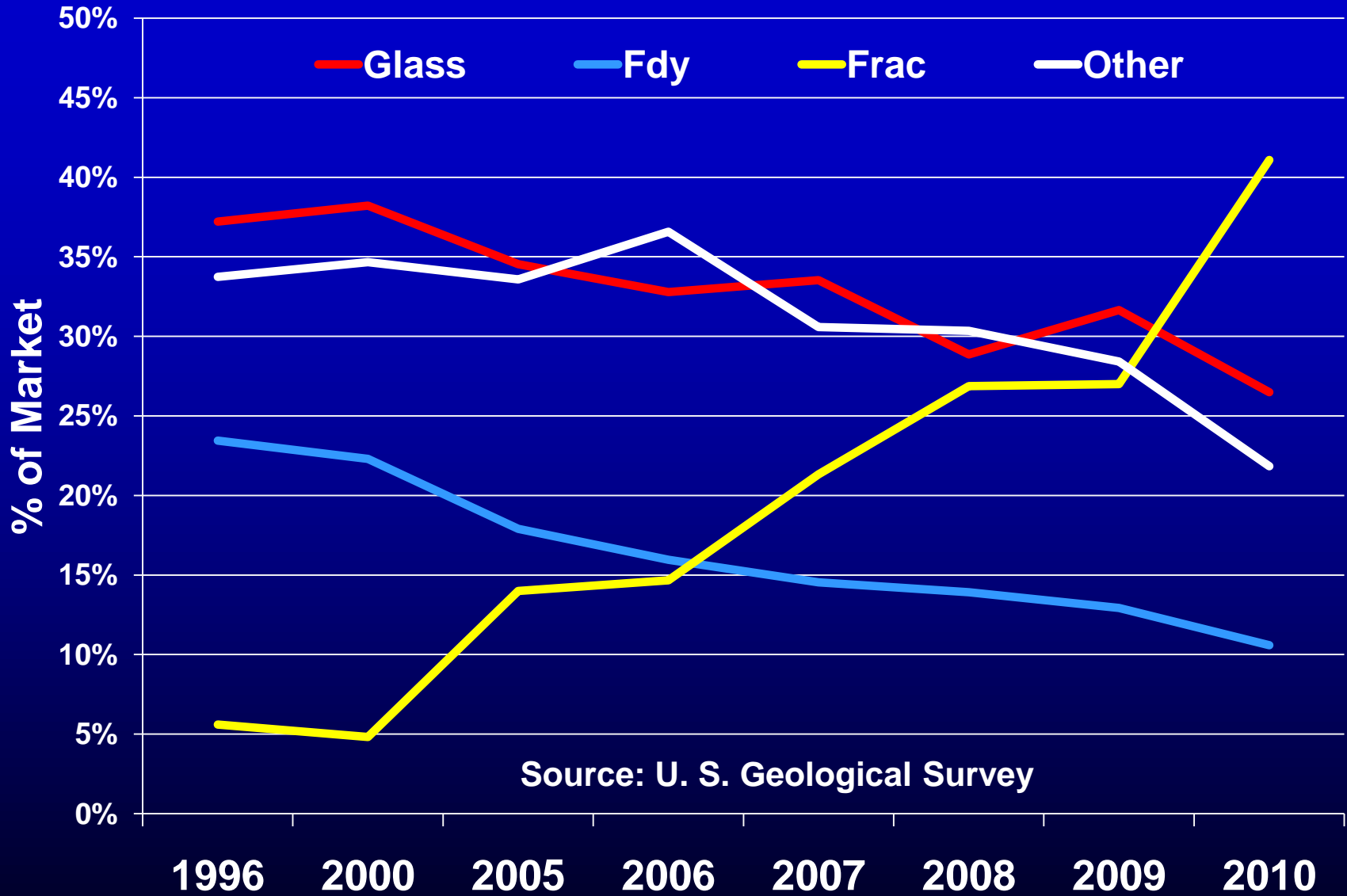
# What's Happening with the Sand Supply?

Sara Joyce  
Badger Mining Corporation

# U S INDUSTRIAL SAND MARKET



# U S Silica Sand Market by Tons

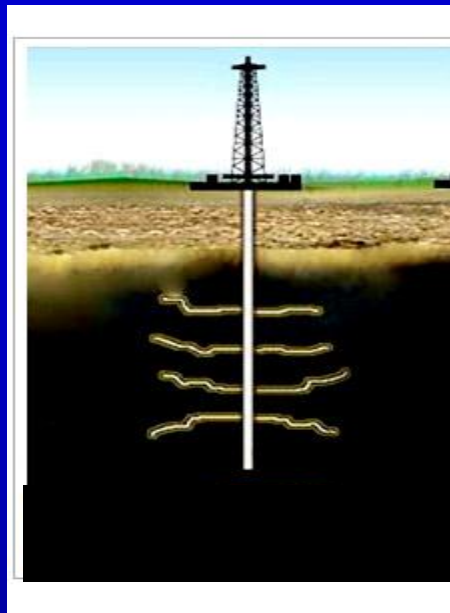


Source: U. S. Geological Survey

# What is Hydraulic Fracturing?

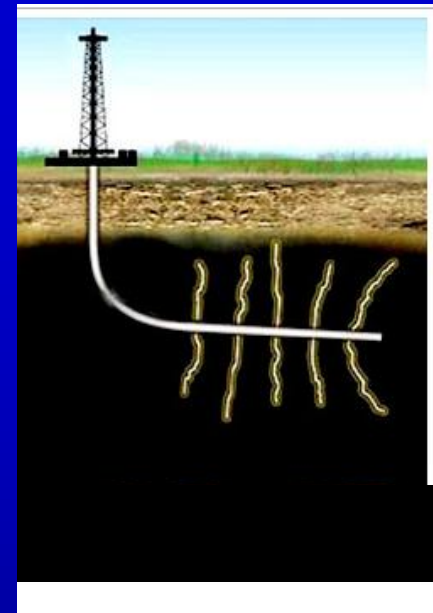
- **Process which is used to assist release of natural gas and oil from rock/shale**
- **Drill the well**
- **Case the well**
- **Perforate the well**
- **Place Proppant in the well (fracking!)**
- **Let oil or gas flow**





**Vertical Wells**

- **Straight down into the earth**
- **Wells are perforated near the well bore**
- **Use coarse grades (1630,2040,3050)**
- **Conventional**



**Horizontal Wells**

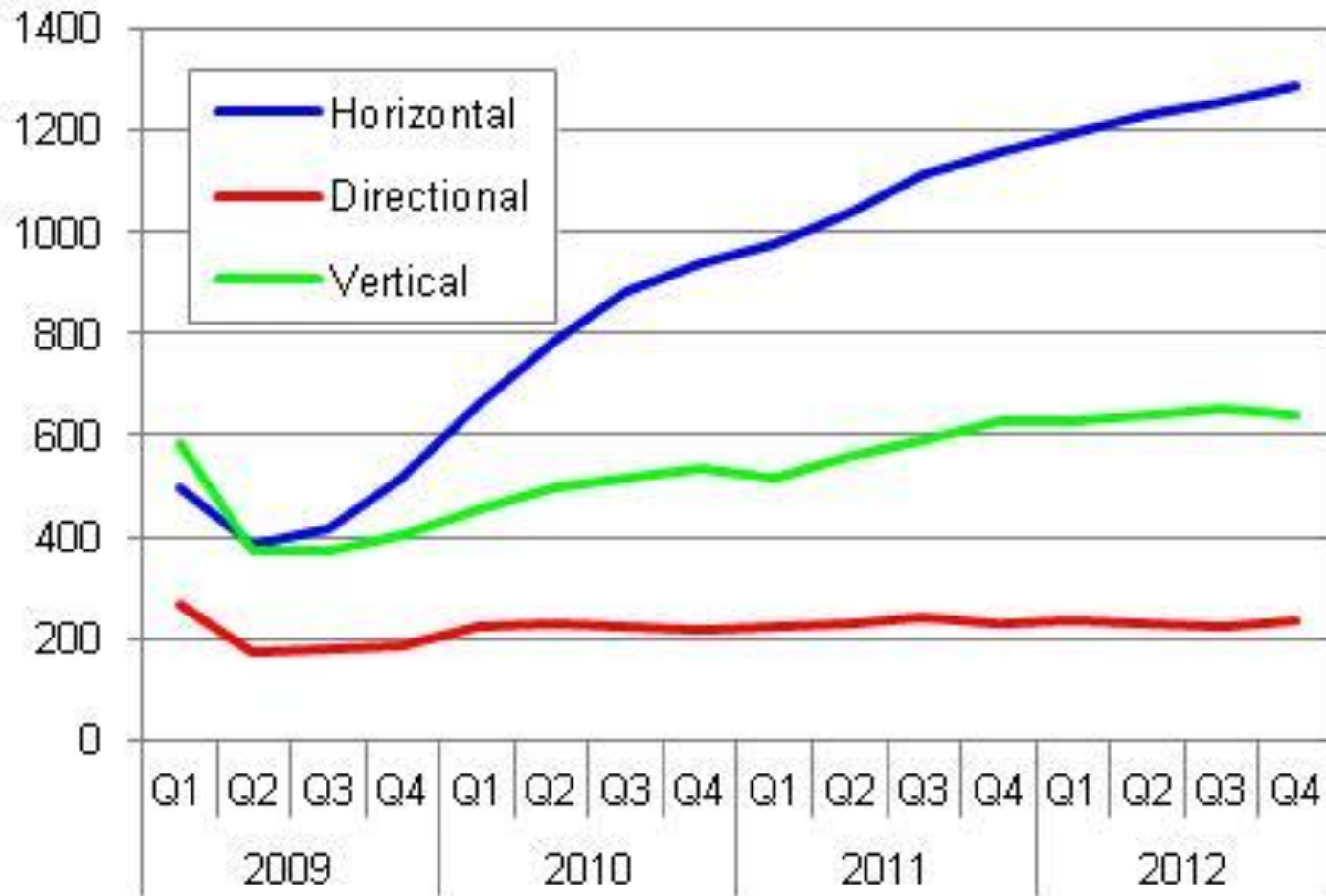
- **Down, then sideways**
- **Perforated along horizontal leg**
- **Use MUCH more sand**
- **Use finer sand in natural gas wells (4070)**
- **Unconventional**

**Frac Consumption has increased dramatically over the last 5 years due to the advancement of the horizontal drilling process which:**

- **Improves recovery in shale plays**
- **Reduces environmental footprint**
- **Makes massive new areas feasible for exploration and drilling of oil and gas**
- **Can access hard to reach areas**
- **Requires up to 5X sand over conventional**
- **Commonly uses 40x70 grade (similar to 50/55 GFN)**

**Most activity has been in pursuit of natural gas!**

## U S Drilling Activity by Rig Type



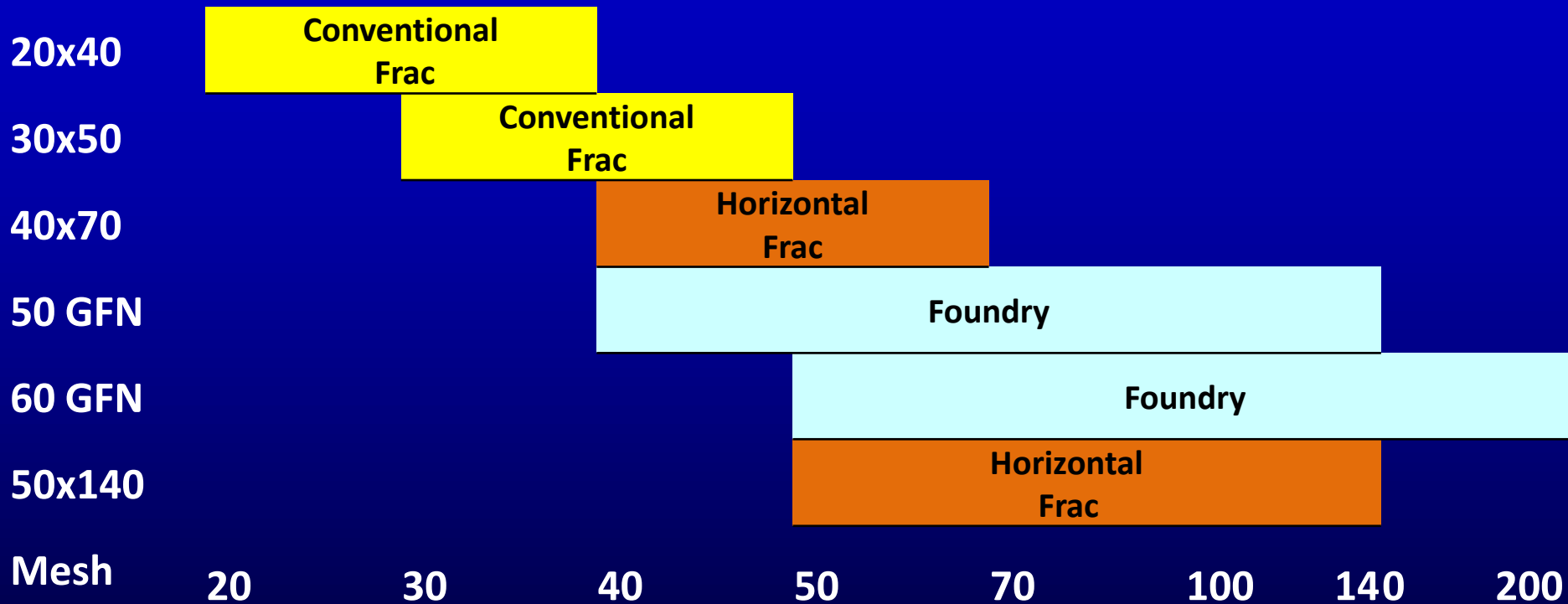
Sources: BHI, Spears

# What makes a good proppant:

- **High purity**
- **Round grains**
- **Two screen**
- **Crush resistant**
- **No fines (NTU's)**
- **Large quantities**



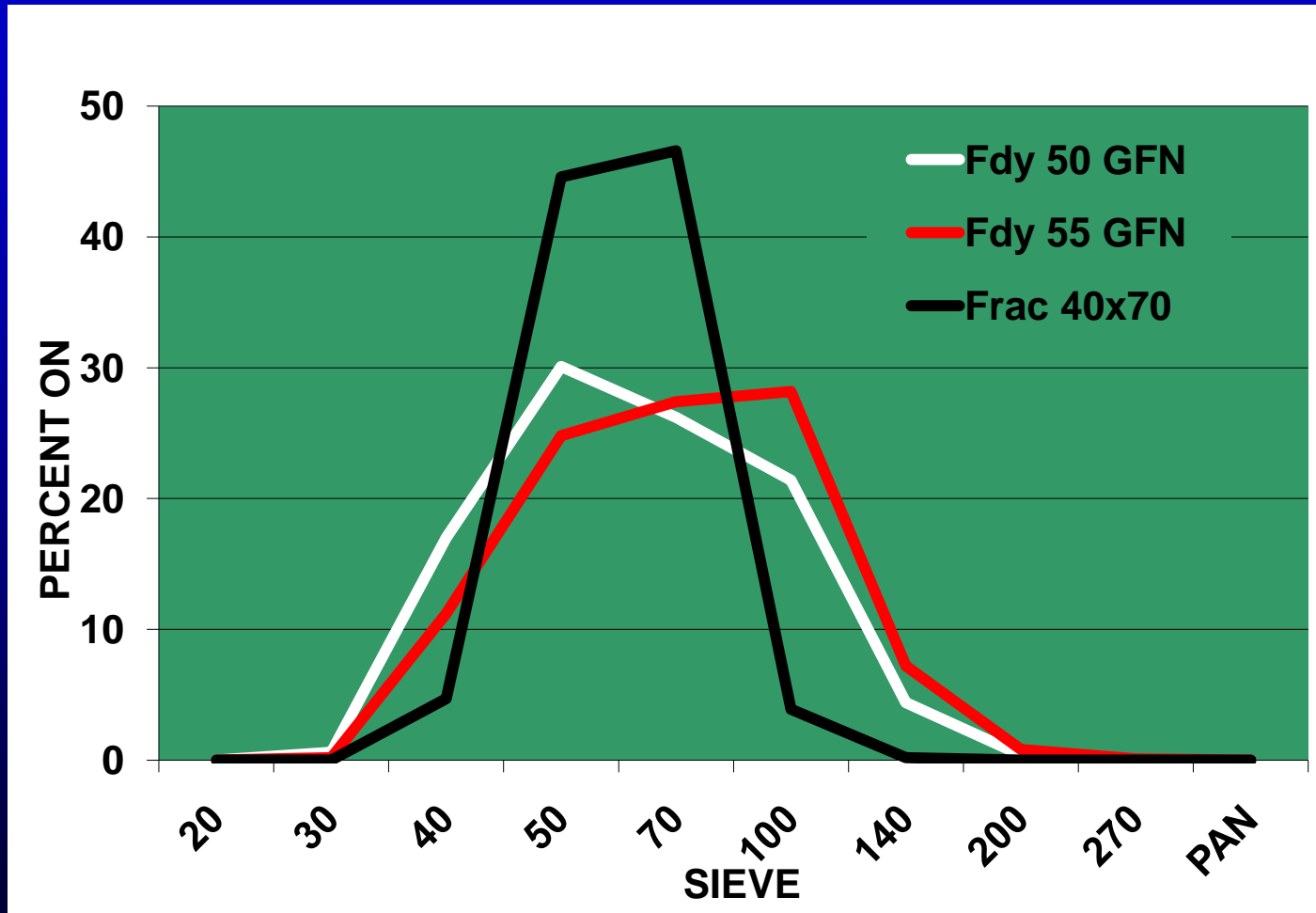
# Industrial Sand Application Ranges



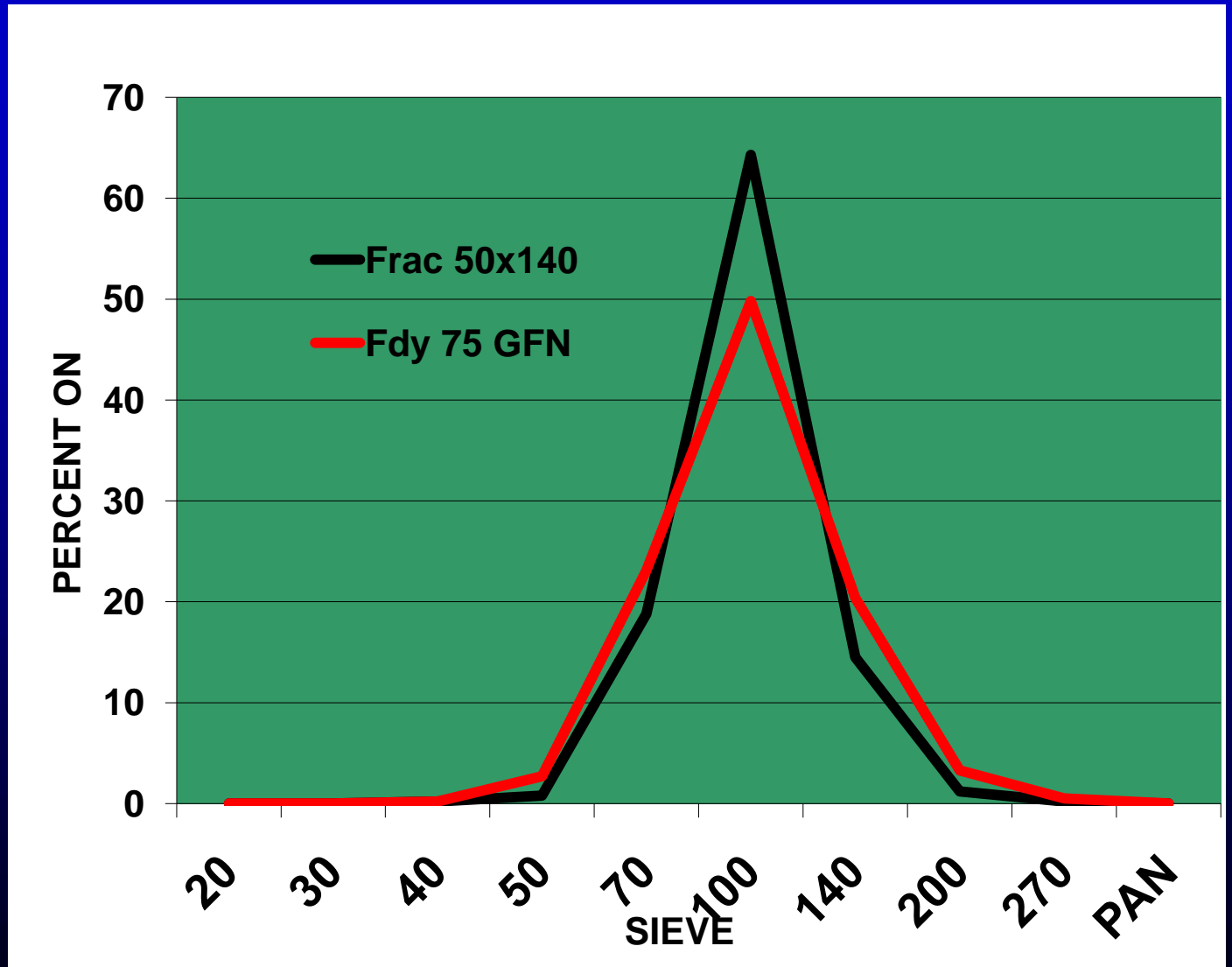
# **API/ISO SAND SPECIFICATION**

**Grade 4070 means that 90% of the sand is below 40 mesh but above the 70 mesh.**

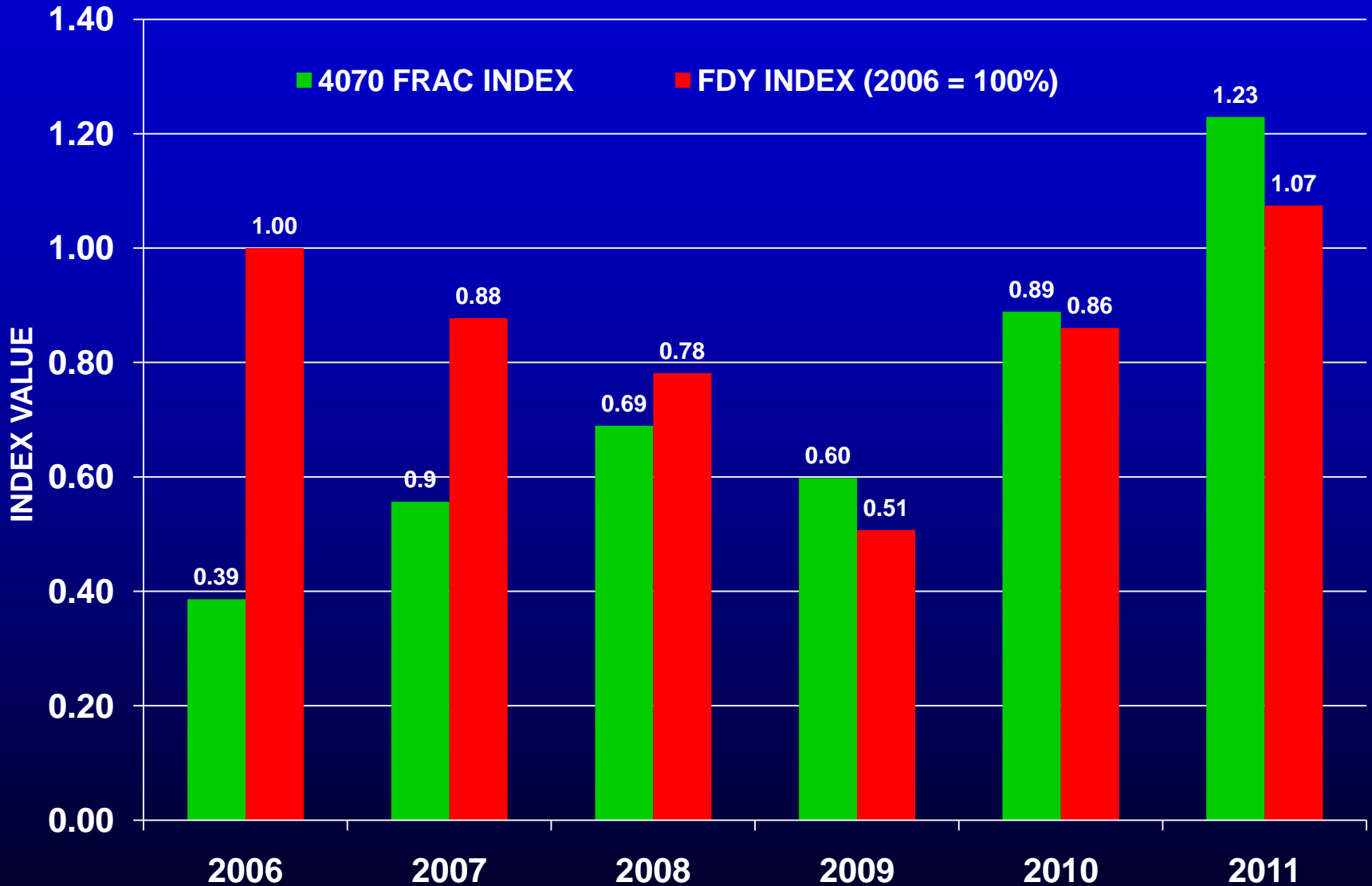
# Foundry vs Frac Grades



# Foundry vs Frac Grades



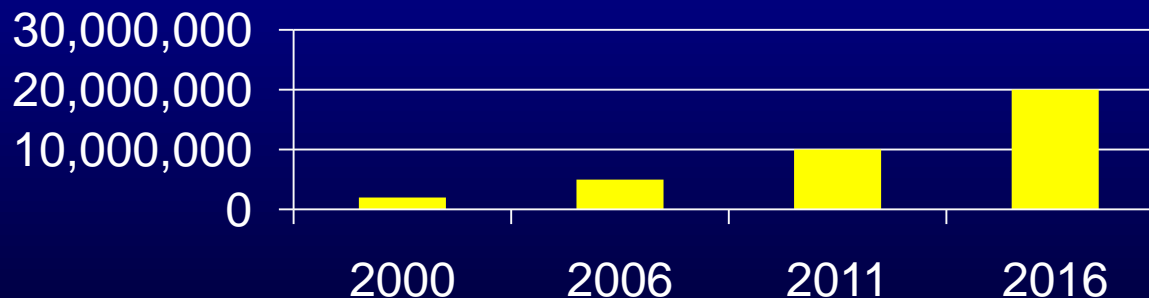
# Tons of Frac 4070 vs All Foundry Grades



# Where is this going????

- **High frac demand to continue**
- **Average frac sand price remains well above other industrial users**
- **Suppliers diverting capacity to frac**
- **Suppliers adjust process to create more frac**
- **New capacity dedicated entirely to frac**

**Frac Tons**



**Foundry is 3 – 4 million tons today**

# Natural Gas Spot Henry Hub

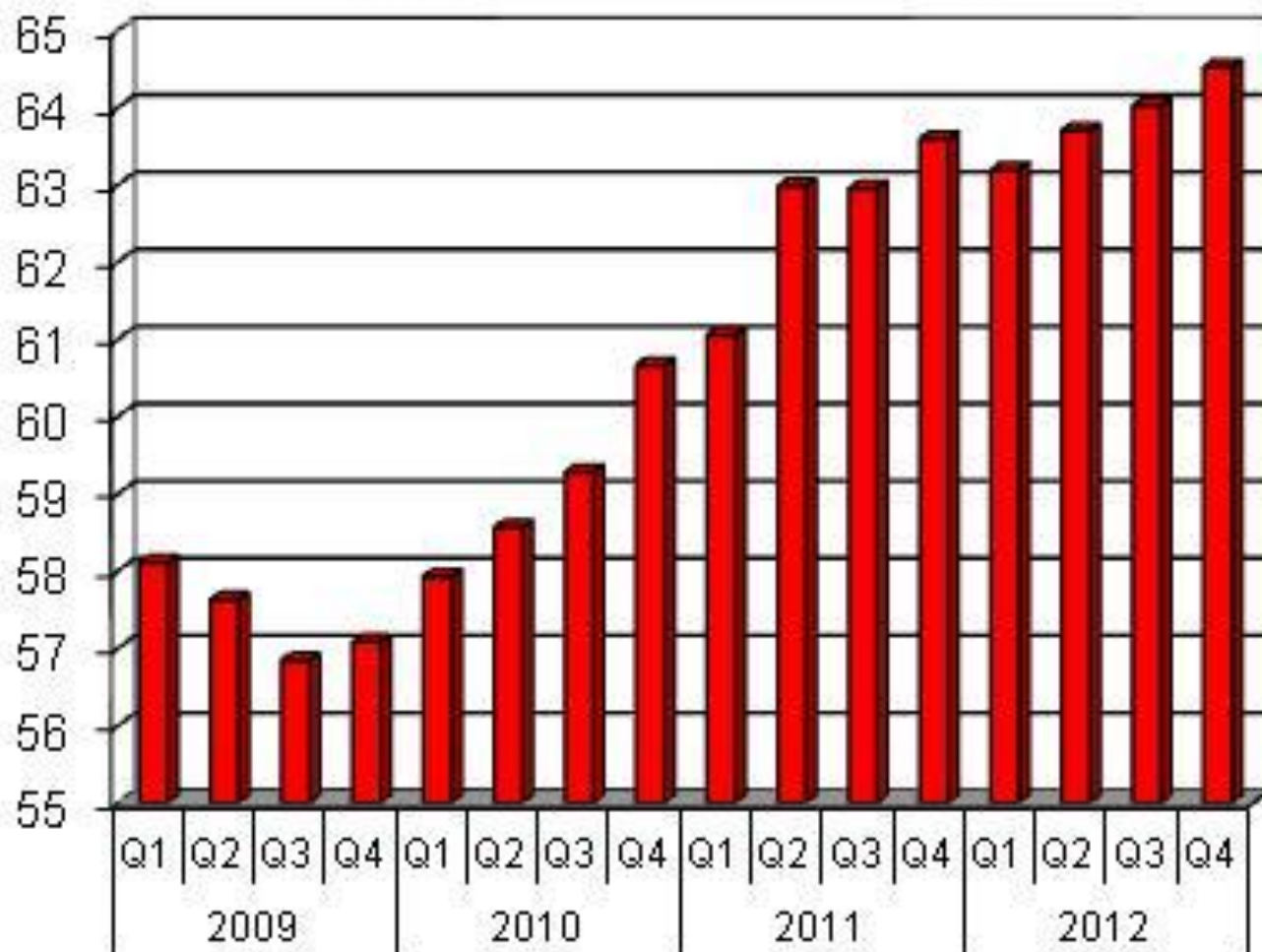


Apr 1, 2011 - Apr 30, 2012

— Close

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## US Gas Production (bcfd)



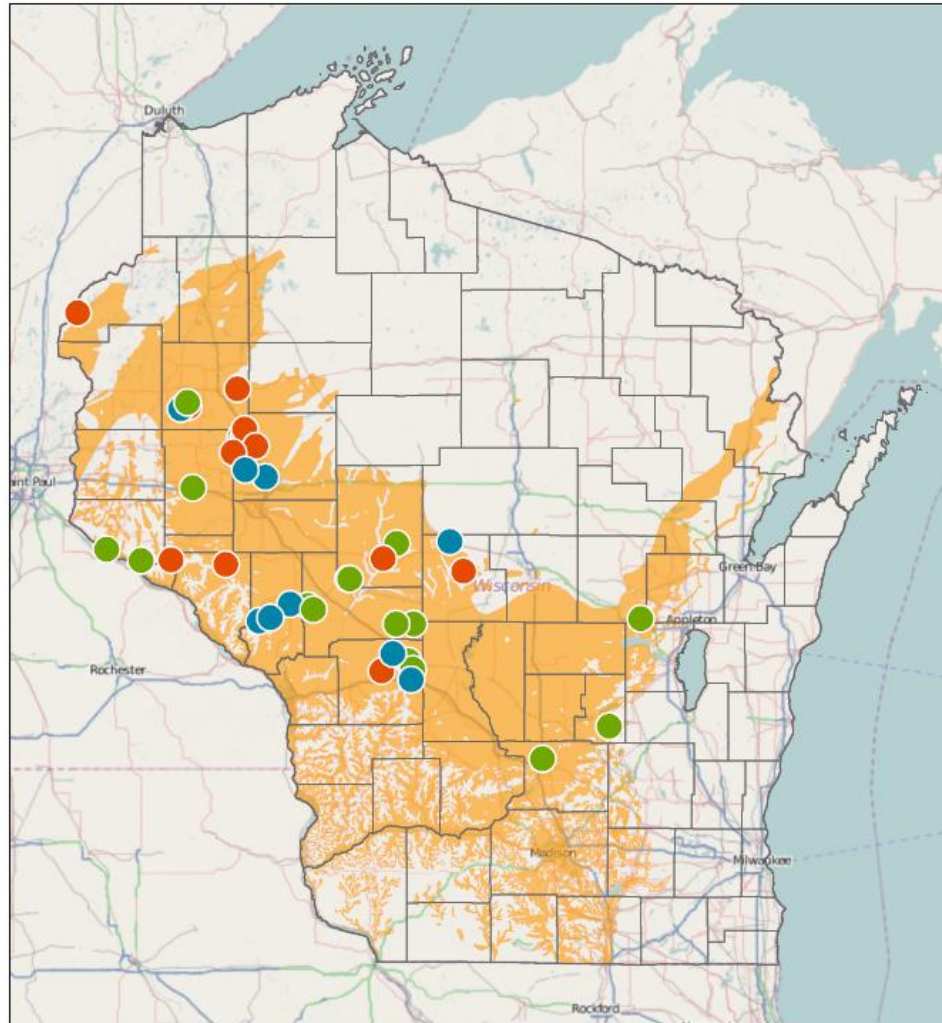
Source: EIA



**Multiple new suppliers in western Wisconsin may help to ease the 4070 shortage!**

- **30 + plants**
  - Many under construction
  - 12 proposed new plants
  - At least 7 to 15 more that are in the development stage
  - ALL ARE DESIGNED TO PRODUCE FRAC

# Frac sand: Wisconsin sites



- Active (16)
- In development (11)
- Proposed (14)

■ Sandstone areas of possible interest to frac sand miners

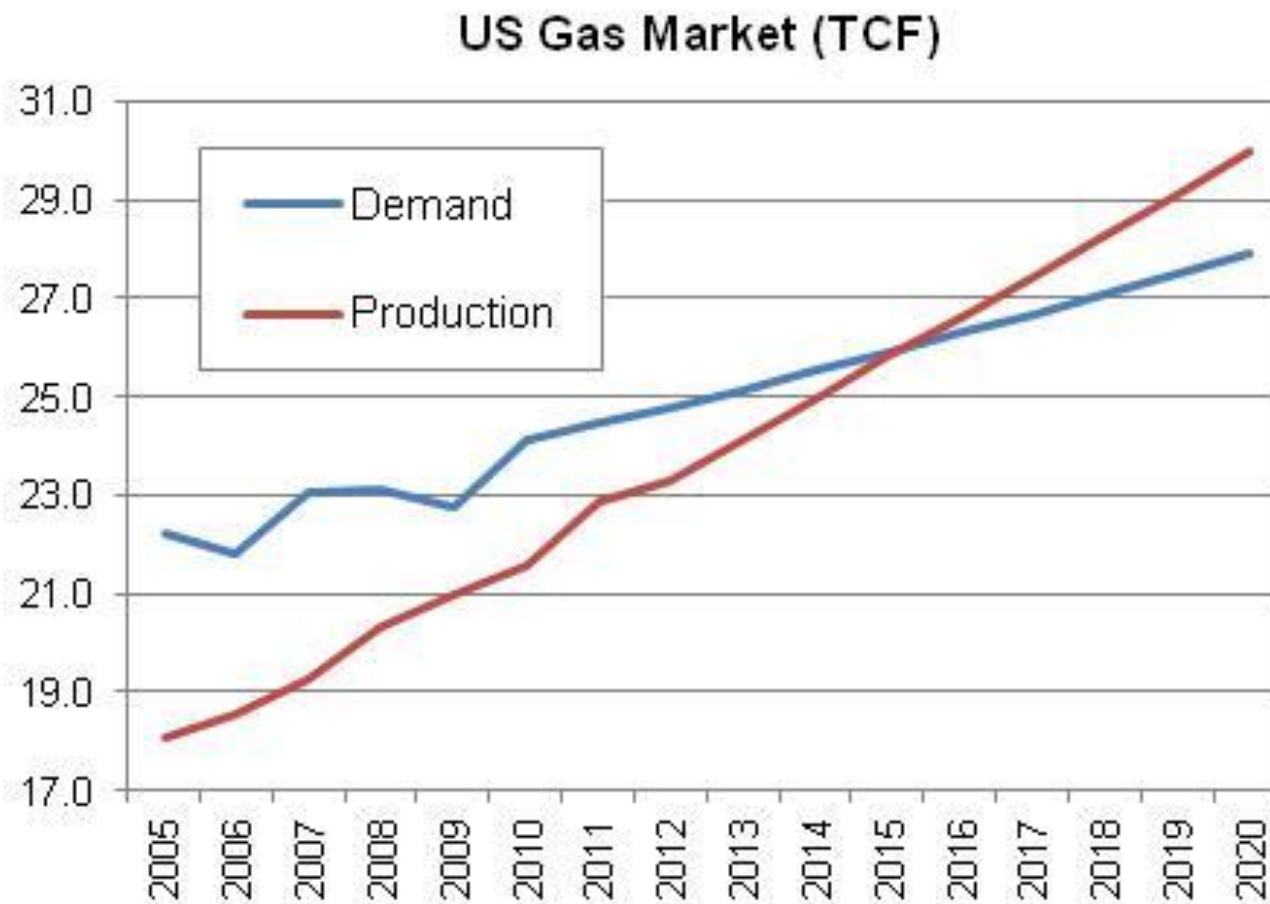
# Issues Facing Sand Plants

- **Capitalization**
- **Permits**
- **Quality/Specifications**
- **Public Backlash**
  - **Environmental**
  - **Damage to infrastructure**
  - **Hours of operation**

# Reduction in 4070 Demand is Temporary:

- **Return of 2007 base industrial demand**
- **Return of normal winters**
- **Increased use to generate electricity**
- **Increased use to fuel fleet vehicles**
- **Supplement to coarser grades**

# US as Exporter!



Sources: EIA; Spears

# Some Good News

- **The energy industry uses many different types of castings**
  - Valves
  - Pipes
  - Pumps
  - Motors
  - Heavy Truck
  - Mining Equipment
  - Drill bits



# More Good News

- **Reliable suppliers continue to supply the metal casting industry**
- **New 4070 suppliers should improve available supply**
- **The metal casting industry is busy and the outlook is good**
- **Strong energy industry activity reduces U S import dependence**
- **Natural gas prices currently very low**

# What can be done?

- **Sand Reclamation**
  - Advances in technology have resulted in better processes that work well
  - The EPA has dropped classification of thermal reclaimers as waste incinerators
  - Most sand from the Midwest reclaims better than other areas
  - Provides other performance advantages



# What can be done?

- **Work closely with your supplier**
  - Advise any increase in requirements
  - Advise of any change in performance
  - Visit supplier facilities

# Summary

- **The sand market will continue to be affected by supply and demand imbalances**
- **Keys to watch:**
  - **Natural gas demand**
  - **Natural gas prices**
  - **Success of new sand suppliers**
  - **Total frac demand**

**THANK YOU!**