Update on BEG's Sloan Foundation project

Future production
from top four shale gas plays

Mapping geological drivers
of best producing areas

Eric Potter, Svetlana Ikonnikova, Qilong Fu,
Katie Smye, Susan Horvath, Forrest Roberts

BUREAU OF ECONOMIC GEOLOGY

Goal: predict the production performance over a 20-year period for the top four shale gas plays in the U.S.

- 2 1/2 year project funded by Sloan Foundation
- Concludes in 4Q 2013
- 5 journal articles currently submitted for Barnett portion of study
- Special session at forthcoming URTEC conference in Colorado
- Working on final play (Marcellus) currently

Impact

- Reality check on the shale gas boom
  - How substantial?
  - How long sustained?
  - How profitable?
- Did not address:
  - How safe, how environmentally friendly, true EROI (energy return on energy invested), etc

---

Team
~16 people

- 6 geologists including 1 student and 1 post doc
- 4 petroleum engineers (1 student)
- 5 economists (2 students)
- 1 GIS/mapping/database expert
- Age range 22 to 80+
- 5 nationalities
- 2 cities
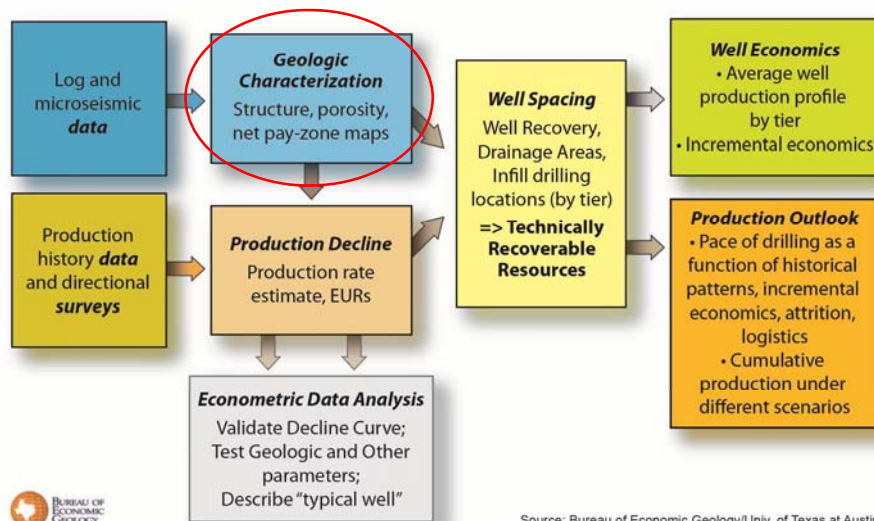- 4 departments in 2 universities

Terminology

- Keep in mind others may not know terms you use…
  - Permeability means nothing to economists;
  - Externalities means nothing to geologists;
  - Devonian means nothing to engineers.
- The same terms may have different meanings for different people, e.g.
  - matrix may mean something that has nothing to do with numbers….

Future shale gas production rates

- Difficult to forecast because of interactions of geology, price, recovery per well, spacing, refracs, technology change, costs, drilling pace, well attrition, and accessibility
- Forecasting starts with aggregating single-well data like this:

Example Well #1
8.5 years of data;
65% decline in first year

Example well #2
1 year of data;
64% decline in first year

Work Flow: Barnett Shale Basin Assessment

Source: Bureau of Economic Geology/Univ. of Texas at Austin
QAe1589(a)

Geologic drivers

- Total Organic Carbon, thermal maturity, and brittleness (fracability) are all important…
- *Porosity x thickness (Phi*h)* is reliable indicator of sweet spots once a play is identified
- We map this from publically available downhole logs
- In some plays, need to modify (reduce) Phi*h to account for clay, which reduces well productivity

Barnett production tied to Phi*h
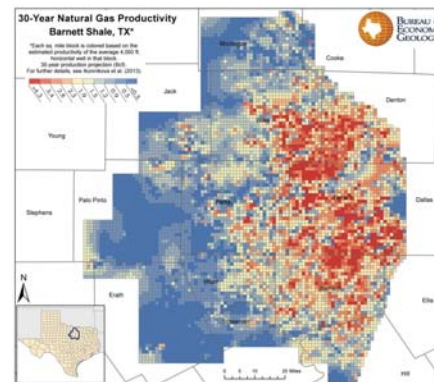
Phi*h map of Barnett
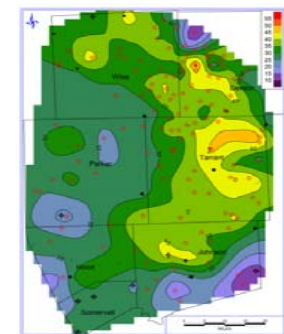
Barnett Shale 30-year productivity
Prediction, normalized
to 4000' horizontals