



Petroleum Technology
Transfer Council
Timely, informed technology decisions...

Evolution of Exploration, Drilling & Completion Concepts for Appalachian Basin's Trenton-Black-River Play

By

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Appalachian Basin PTTC

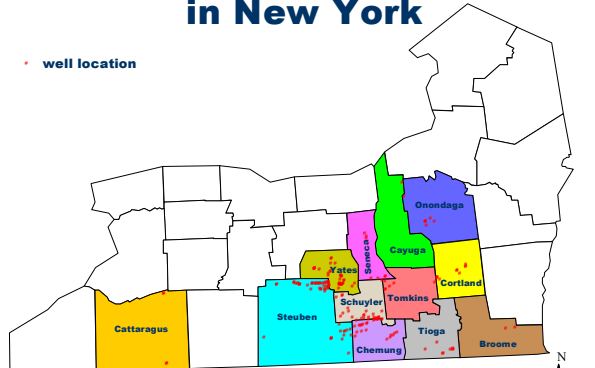
Pacific Section AAPG-Western Region SPE
May 22, 2003



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Recent Trenton-Black River wells in New York

• well location



60 0 Miles



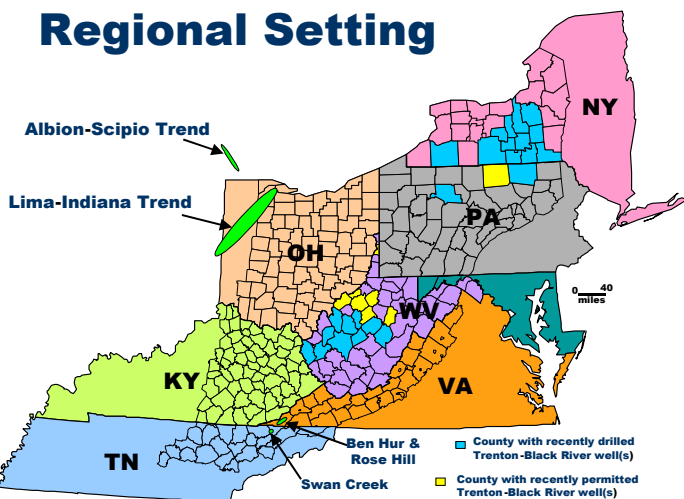
Glodes Corners Road field, Steuben County, NY



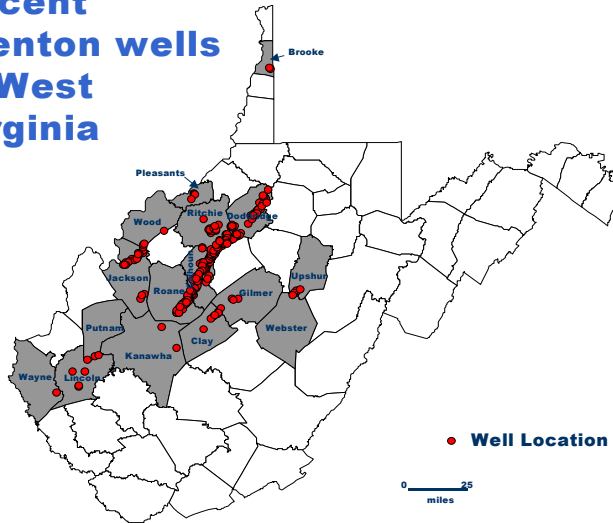
13 wells ;1 dry. Depths: 6,600 – 7,700 feet
Cumulative production through 2001; total 7.3 Bcf

From: <http://www.dec.state.ny.us/website/ohms/notices/cnr/mapglode.gif>

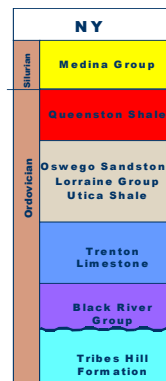
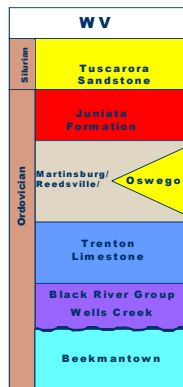
Regional Setting



Recent Trenton wells in West Virginia



STRATIGRAPHY



NY

VS

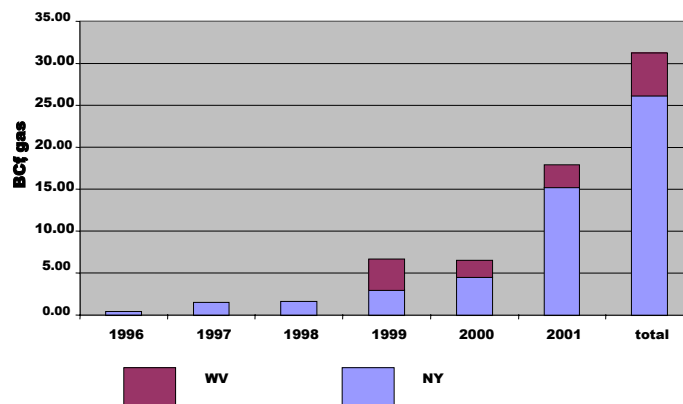
WV

- | | |
|---|--|
| <ul style="list-style-type: none"> • About 194 wells or sidetracks permitted by 16 operators in 12 counties • 148 wells or sidetracks drilled • Six month permit period | <ul style="list-style-type: none"> • Over 270 wells permitted by 41 operators in 17 counties • 24 wells drilled • Two year permit period |
|---|--|

Importance to NY

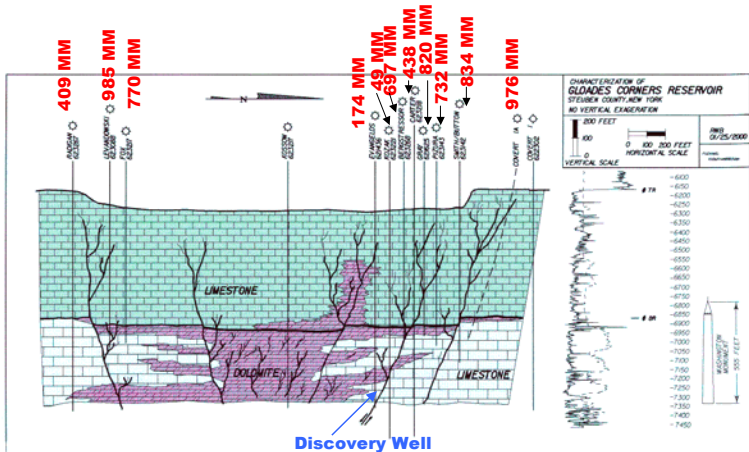
- | 1986 | 1999 |
|--|--|
| <ul style="list-style-type: none"> • 34.8 Bcf produced • 89% from 4800 wells, Medina-Queenston • 0 Trenton Wells | <ul style="list-style-type: none"> • 16.1 Bcf produced • 73% from 5600 wells, Medina-Queenston • 18.5% from 15 Trenton wells |

Total Annual Gas Production, Trenton-Black River, NY & WV



Purpose of this talk: to weave together...

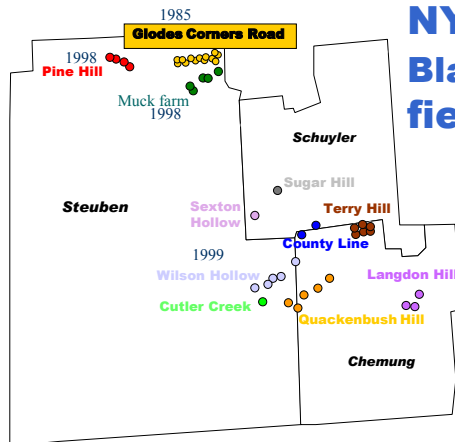
- Technical thought that has evolved during the play
- Description of PTTC's role in advancing knowledge



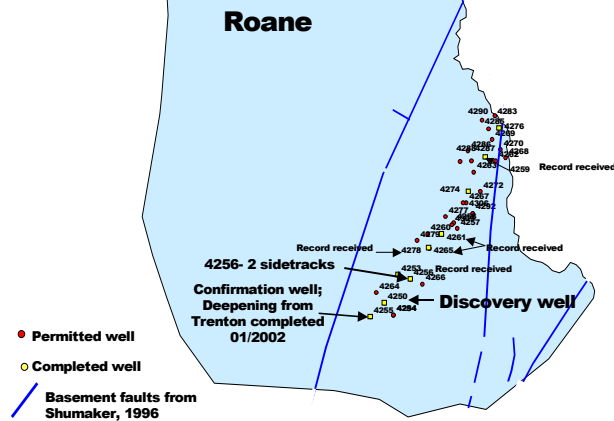
Glodes Corners Road field model with cumulative production through 2001

From: <http://www.dec.state.ny.us/website/ohms/notices/cnr/cnrrptcg.gif>

Location of NY Trenton-Black River fields



Details of discovery well area, Cottontree field



Discovery Well for Cottontree field

- **Roane County permit 4250**
- **Frederick C. Parker 20097**
- **Completed June 28, 1999**
- **Total depth 10,371 feet**
- **Final open flow potential 50 MMcf**
- **SI tubing pressure 5750 psi; BHP 6600 psi**
- **Pay 10,255-10,271 feet in Black River**



Confirmation well for Cottontree field

- **Roane County permit 4255**
- **Juanita Groves 23975**
- **Completed 10/15/1999**
- **Total depth 9,712 feet**
- **Final open flow potential 28 MMcf**
- **SI tubing pressure 4897 psi**
- **Pay 9,658 to 9,712 feet in Trenton**
- **Deepening to Black River completed 01/12/2002**



Trenton - Black River Time-line 1

- 1985 First CNR Discovery, Steuben County, NY
- 1996 Glodes Corners Road discovery goes on-line
- 1998 Muck Farm and Pine Hill discoveries, NY
- 1999 Wilson Hollow field, NY & Cottontree field, WV
- 1999 First PTTC workshop on the play



PTTC ACTED QUICKLY....

“The Challenge of Drilling in the Trenton-Black River Group”

November 11, 1999
Morgantown, WV

ATTENDEES: > 100
13 States & Canada



OVERVIEW:

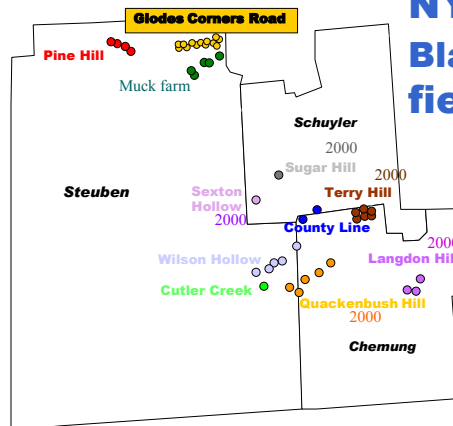
- Exploration methods & models
 - Albion-Scipio; eastern Canada
- Regional Geology
- How to drill, complete & produce

BOTTOM LINE

Recognition that fractures associated with basement faults served as conduits for dolomitizing fluids that enhanced matrix permeability and now serve as permeability pathways

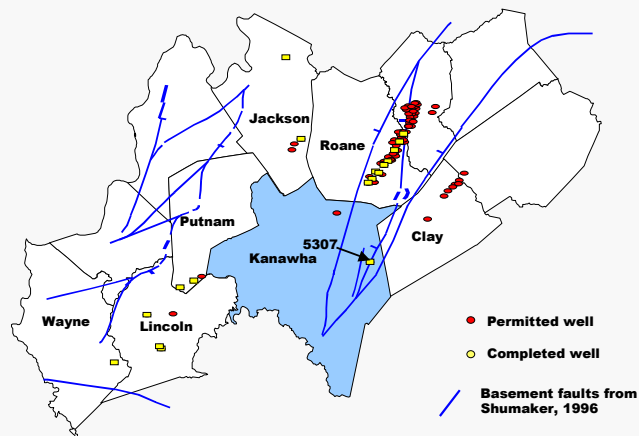
* L. Cole

Location of NY Trenton- Black River fields



Cumulative Production from NY Trenton-Black River Fields

Field Name	Discovery year	Cumulative Production, Bcf	Number of wells
Cutler Creek	2001	0.621	1
County Line	2001	0.004	1; only 3 months
Glodes Corners Road	1995	7.3	11
Langdon Hill	2000	0.47	1
Muck Farm	1998	3.8	4
Pine Hill	1998	0.21	3
Quackenbush Hill	2000	5.5	3
Sexton Hollow	2000	none yet	1
Sugar Hill	2000	none yet	1
Terry Hill South	2000	1.21	5
Wilson Hollow	1999	5.3	5



Details of Kanawha County well area

Kanawha County discovery

- **Kanawha County permit number 5307**
- **Completed 03/13/2000**
- **Total depth 9591 feet**
- **Final open flow potential 15 MMcf**
- **SI tubing pressure 4,575 psi**
- **Pay 9481 in the Black River**
- **Gas contained 300 ppm H₂S**

Trenton – Black River Time-line 2

- | | |
|------|---|
| 2000 | 5 new fields, Schuyler & Chemung counties, NY |
| 2001 | 2 new fields, Steuben & Chemung counties, NY |
| 2001 | Second PTTC workshop - sold out ! |
| 2001 | Second workshop, Round 2 + core workshop |



AND THEN AN UPDATE...

**“Trenton-Black River Exploration and
Production”**

**May 1, 2001
Morgantown, West Virginia**

SOLD OUT; > 200 Responses

Fire Laws reduced to 170



OVERVIEW:

- **Depositional & Structural Setting;
Rome Trough**
- **Regional Activity Updates; including
Kentucky**
- **Development of Hythrothermal
Dolomite Reservoirs.**
- **Production Controls**



BOTTOM LINE:

- Basal sandstone key component
- Dolomite in WV?
- A different play than NY?

Agreed to repeat this workshop in the Fall for the > 50 we turned away (15 states and Canada represented)



CORE WORKSHOP

- Core workshop based on expressed needs of participants at the May 1, 2001 workshop.



TAKING A LOOK AT THE ROCKS...

“Trenton-Black River Core Workshop”

**Ontario HTD Reservoirs
Concluded-good model for NY**

**August 6, 2001
Morgantown, West Virginia
> 60**



THEN ROUND 2...

“Trenton-Black River Exploration & Production Round 2”

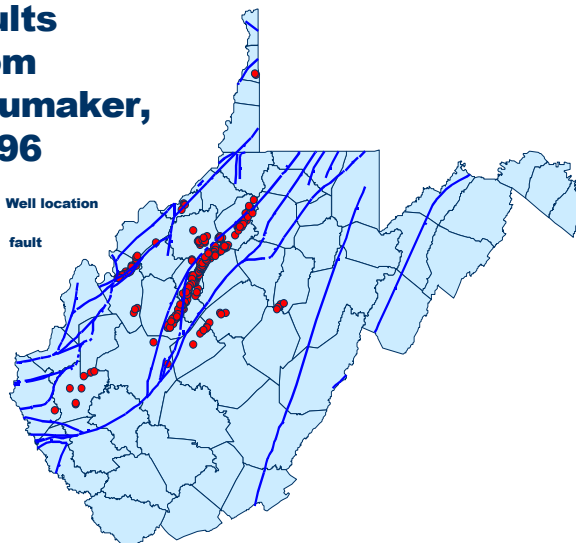
**August 7, 2001
Morgantown, West Virginia
>150; 18 States & Canada**

OVERVIEW

- Geologic parameters that affect E & P
- Planning a practical seismic program
- Current leasing & drilling; Ontario added
- Current Production controls
 - Fractured dolostones in NY; basement faults in WV
- Economics

Basement faults from Shumaker, 1996

- Well location
- fault





Trenton - Black River Time-line 3

- 2002** **Canton, OH workshop focuses on players' perspective**
- 2002** **Combined core workshop and field trip in KY- reservoir models**
- 2002** **Regional Trenton GIS added to PTTC website**



OUR PARTNERS GOT INVOLVED

**“Exploration and Development of the
Trenton-Black River of the
Appalachian Basin”**

April 25, 2002

Canton, Ohio

>160 attendees; 13 states & Canada

PURPOSE:

Provide up-to-date comprehensive look at the play from the perspective of those involved in its exploration & development

OVERVIEW

Relationship of basement architecture to the play

Seismic acquisition & processing

Seismic signatures of various reservoirs

Integrating gravity & magnetics

Optimal logging and imaging suites

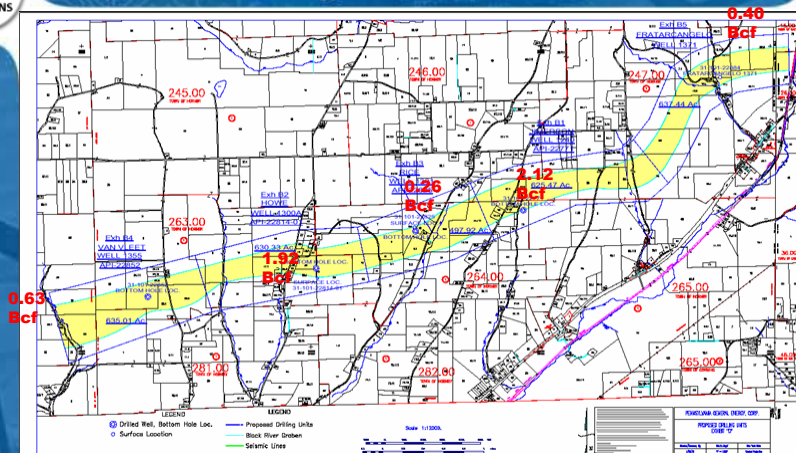
Practical well tests, production data, reserve evaluation

WORTHY OF NOTE:

One vendor hosted evening open house

Approximately 100 viewed walls
papered with maps & seismic lines

Electric atmosphere!

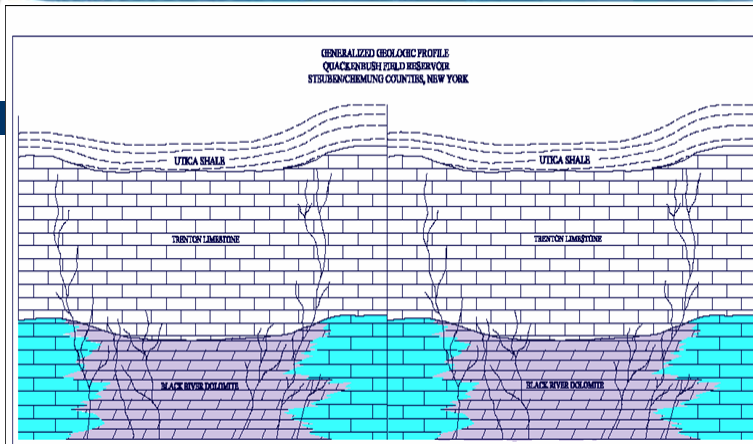


Wilson Hollow field, Steuben County, NY

5 wells; Depths: 9,710 – 10,300; discovered in 1999; cumulative production through 2001- 5.3 Bcf.

From:

<http://www.dec.state.ny.us/website/dmn/BlackRiver/wh.htm>



Quackenbush Hill field model

From: <http://www.dec.state.ny.us/website/dmn/BlackRiver/qh.htm>



ANOTHER WAY TO LOOK AT ROCKS...

**“Outcrop Analogs for Trenton/Black River
Fractured Dolomite Reservoirs-A field trip
and Core Workshop in Central Kentucky”**

June 4

Lexington, Kentucky

Approximately 50 attendees from 10 states.

Field/Core study funded by NYSERDA

Key Points Made:

“Light bulb” outcrop structure a good model for NY reservoir

Compared KY outcrop with key NY core of reservoir rock

Discussed seismic expression of tectonic dolomites in KY

Dolomite development and emplacement of HC in KY

Trenton - Black River Time-line 4

2002 Tr-BR Stakeholders meeting;
Consortium formed

2003 Appalachian Region Success
Story, presented to BOD,
Washington, DC

2003 “Evolution of...Trenton - Black
River Play,” presented in Long
Beach, CA



TECH TRANSFER → RESEARCH

“Trenton-Black River Stakeholders Meeting”

Morgantown, West Virginia
September 25, 2002
By invitation only



THE PITCH:

- Presented a multi-disciplinary research plan for the entire play area
- Requested commitments

\$20,000/company over 2 years

BOTTOM LINE:

- **13 Companies signed within 30 days (260M)**
- **Submitted proposal to DOE 10/25/02**
- **\$1,012 MM DOE; 436M Surveys & WV University**

SUMMARY

- **Still an interesting play, though players decreasing**
- **Good for NY, good potential in WV and PA**
- **Beginning to see activity in PA**
- **First horizontal wells going in NY & PA**



The Play Has Been Good For PTTC

5 Workshops (& Core Workshop)

- 600 attendees
- 400 different attendees

Interviews by trade and news press

Speaking invitations-regional & national



BUT, TO ME, IT'S ALL ABOUT...

COST SHARE!

Industry registration fees = \$46,380

Speaker & hosts = \$148,017

Total Cost Share = \$194,397

The **best** measure of our success



**Petroleum Technology
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**...WE HOPE WE HAVE BEEN
GOOD FOR THE PLAY**