

Natural Gas for Electricity Generation – In Holland?

Holland Board of Public Works

October 7, 2011

Good News vs. Bad News

Good

- U.S. gas resource large
- Diverse supply and storage access for MI
- Gas burns clean (CO₂ +)
- HBPW has experience with gas
- Siting/construct gas-fired generation “easy”

Bad

- Fracking issues:
 - Fugitive emissions, water use, truck traffic, chemicals, seismic
- Boom and bust
- Gas price volatility
- Imbalances
- No on-site gas inventory
- Pipe space to HBPW unclear

Filling in Some Background

- The US consumes 23 Tcf in a year
- US produces 20 Tcf – rest from Canada
- If all coal generation in US converted to nat gas, would consume 37 Tcf -- even with 20% renewables and low load growth
- 450,000 wells in US – 30,000 drilled 2010
- Shale is said to be transformative in increasing production/eliminates need for LNG/+ jobs
- US Market grows to 30 Tcf by 2030 ... flat supply curve out past 600 Tcf, but ... footprint less “clean”

US has LOTS of Natural Gas in Ground

- Question is whether and at what price to produce it
- Producers focusing on shale because ...
 - Wells cost more due to fracking but high early production rates + revenues from oil-associated liquids allow quicker ROI and higher netback
 - Leases bought before Great Recession expire if not drilled; producers drilling even with low prices because some revenue better than no revenue
- Hard to believe that bigger market won't require higher prices – shape of supply curve plus fracking concerns

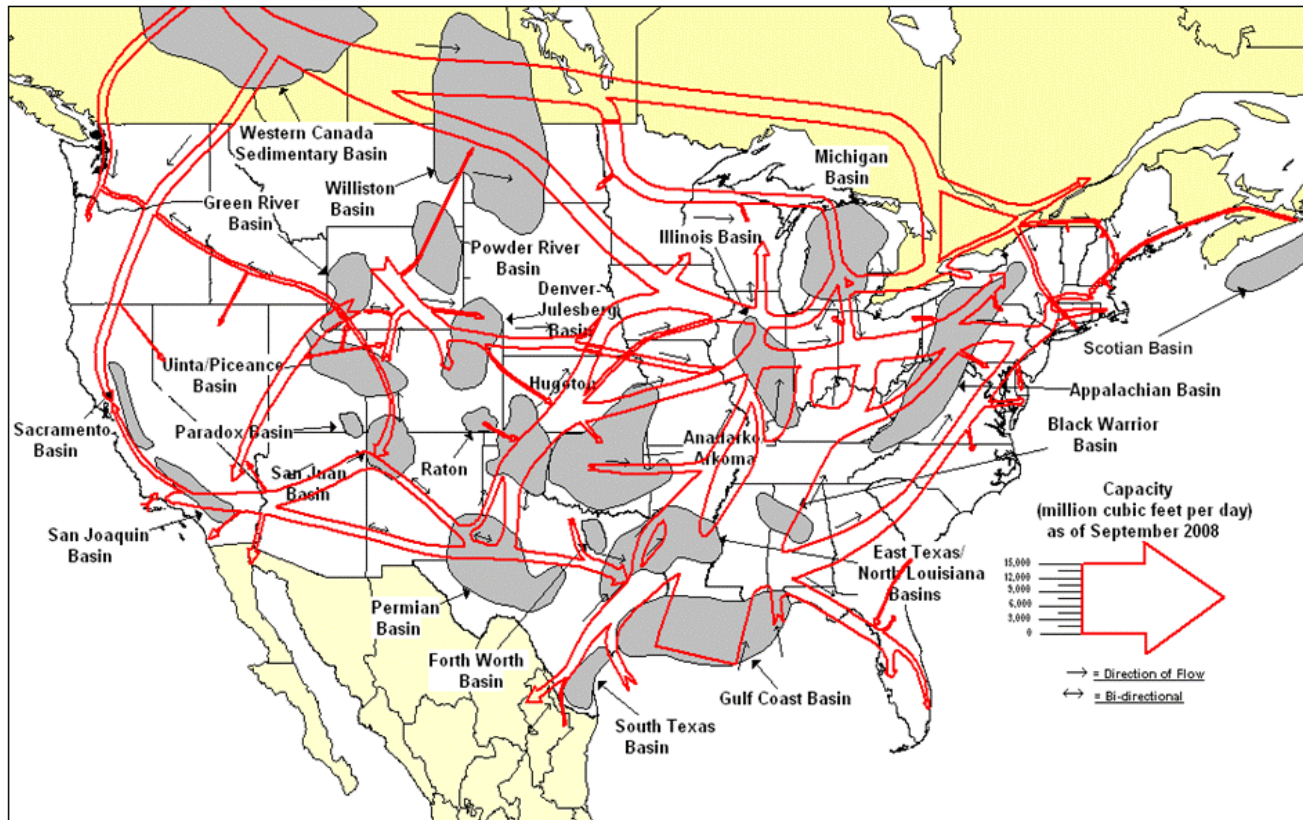
Hydraulic Fracturing Changes Nat Gas “Benign” Environmental Footprint

- Injects fluid at high pressure to crack the rock -- shale rock pores too tight for trapped gas to flow
 - Uses 4.5 million gallons per well (which must then be disposed of)
 - Is exempt from Safe Drinking Water Act
 - Proppant liquid is 98% water/sand but adds distillates
 - Higher carbon emissions from higher Btu content of the gas and higher fugitive emissions due to flowback of proppant
 - More truck trips = more dust, noise, and emissions
 - Seismic activity: Fort Worth and Arkansas
 - Gas migration into water wells
 - Producers not disclosing local environmental impacts to lessees
 - DOE advisory committee to recommend best practices

Feasibility of Baseload Gas Requires Firm Delivery Capability to HBPW

- Doesn't look like ANR has unsubscribed capacity on ML7 (but shipper meeting says otherwise)
- ANR now offers some more flexible tariff provisions for electricity generators to help balance burn
- On-site inventory not possible so not same control as coal (gas storage expensive and costly)
- HPBW might want gas purchase portfolio in which it holds some firm capacity, buys from a supplier who holds firm and relies some on interruptible (diversify over term, tenor and source)

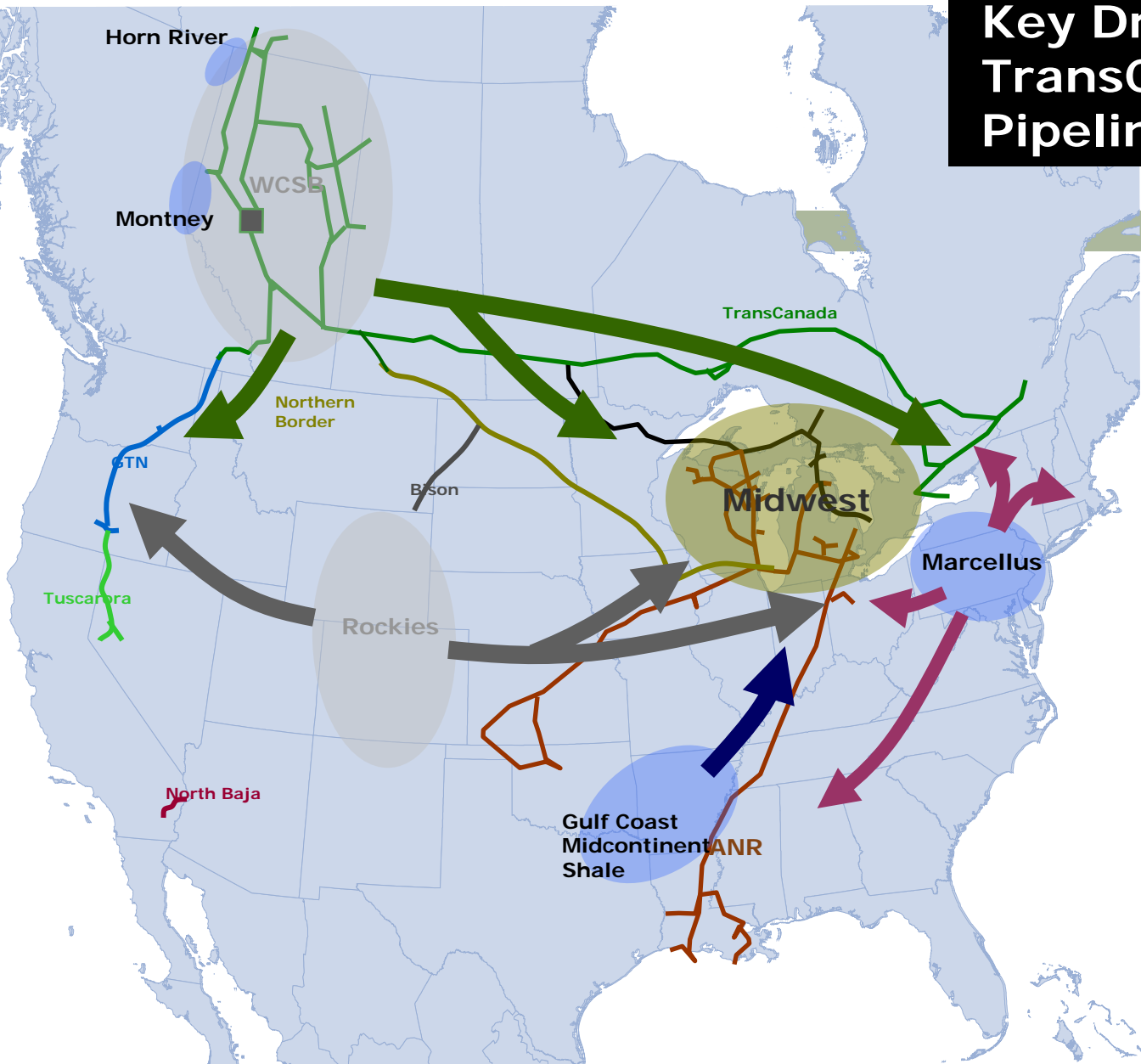
Gas Can Reach Holland From ...



Source: Energy Information Administration, Office of Oil and Gas, Natural Gas Division, GasTran Gas Transportation Information System.

The EIA has determined that the informational map displays here do not raise security concerns, based on the application of the Federal Geographic Data Committee's *Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns*.

Key Drivers for TransCanada U.S. Pipelines



- WCSB and Rockies competition
- Impact of Marcellus
- Trend in shale drilling and production in Gulf Coast
- Gas fired power generation in Midwest
- How does TransCanada U.S. Pipelines position itself to respond to new fundamentals?

Pipes May Need Upgrades

- 30” high pressure pipe explosion killed 9 people & burned 34 homes Sept 2010
 - PG&E took 90 mins to close the gas valves
 - PG&E said pipe seamless BUT was longitudinally seamed and more discrepancies that affect MAOP
 - more auto or remote valves may be required US-wide
- NTSB recommended all pipes confirm records validating MAOP for HCA pipelines
- CA eliminating provision grandfathering MAOP for pipelines built before 1970 -- \$4 Billion

Pipes Serving Michigan Could be Affected by PCB Rule or New Madrid

- EPA considering reduction of PCB use authorization from 50 ppm to 1 ppm – INGAA says will necessitate replacing pipe and compressors: \$\$\$\$
- ANR not one of the 13 settling pipes subject to the 1981 CMP but may get caught by the tighter standard
- 2009 Argonne study expected breaks in all ten pipelines through NMSZ and WSZ – 18% reduction in gas deliveries to Michigan for 1 to 3 months remember in Energy Assurance planning

Will Need to Manage Price Volatility

- Some say volatility will be lower with shale – don't "bet" on it!
- Risk Management not free: transaction cost for counter-party to take risk plus cost to set up and maintain hedging program
- Risk Management cannot REDUCE costs – only flattens peaks and fills valleys

New EPA Rules for E&P, Transmission & Storage Comment Now / Feb 2012

- NSPS for VOCs reduces total by 1/4 and 95% for fracked wells via capture **fugitive emissions** -- CO and WY already requiring “green completions”
- NSPS for SO₂ on gas processing
- air toxics standard for E&P to capture **benzene, ethylbenzene and n-hexane** from wells, compressors, pneumatic controllers, condensate tanks and glycol dehydrators – reduction of 30%
- NSPS \$0 net cost and toxics \$16 million

Summary Thoughts

- Building Gas-fired generation “easy” if pipe capacity is available but is on-going effort to manage
- Clean fuel benefits that may erode with fracking
- Exposure to outside events
- Opportunity to DIVERSIFY ... use of technology
 - Fuel and Capital Cost
 - Emissions Mitigation
 - Regulatory Requirements
 - Introduction of new Supply Technology
 - Consumption patterns and use of Technology to Manage Consumption

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