

Challenges and Opportunities for Natural Gas Delivery

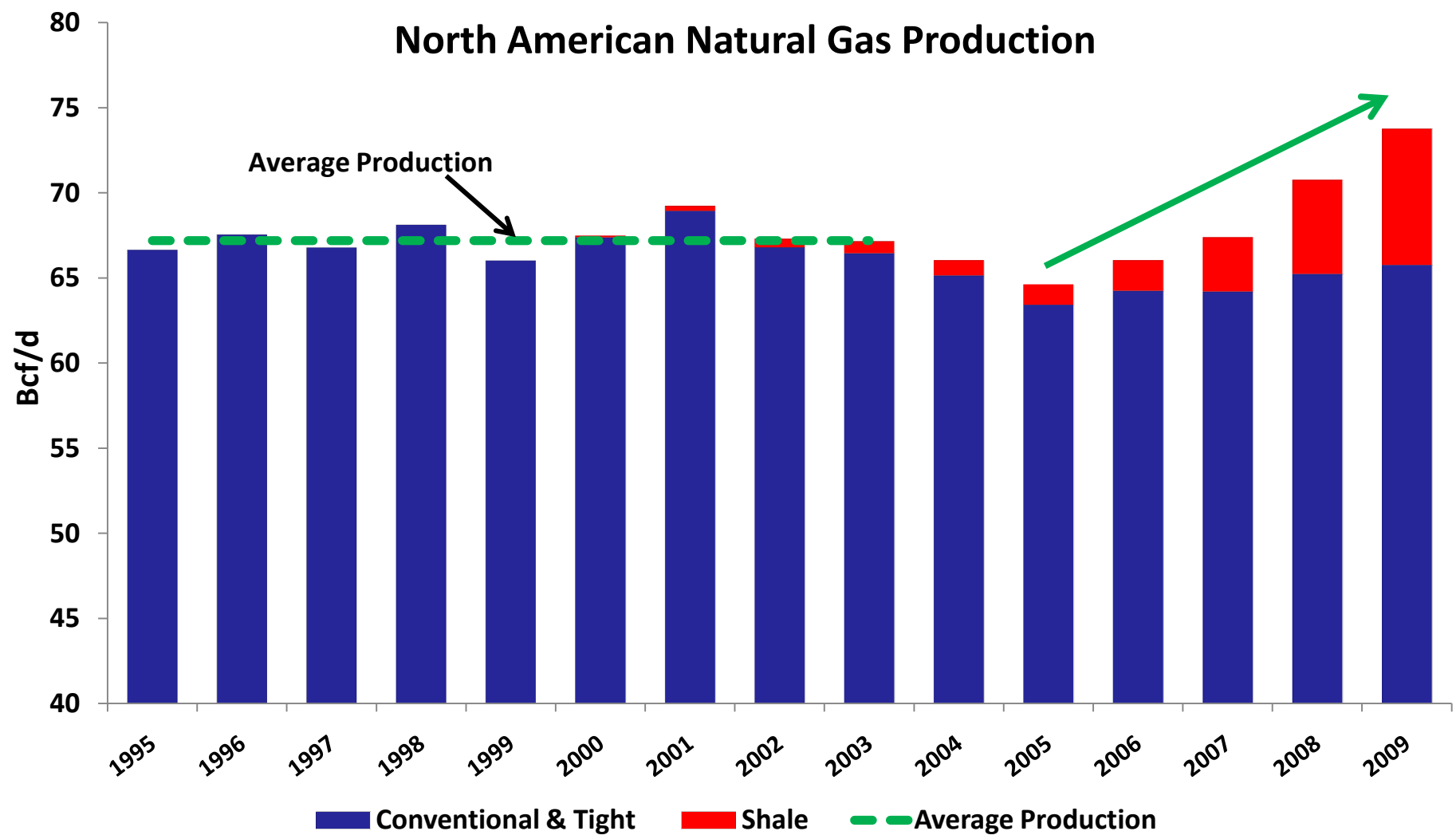
Insight Information –
Natural Gas Forum

April 26, 2010
Calgary, AB

Stephen Letwin

**EVP, Gas Transmission and International
Enbridge Inc.**

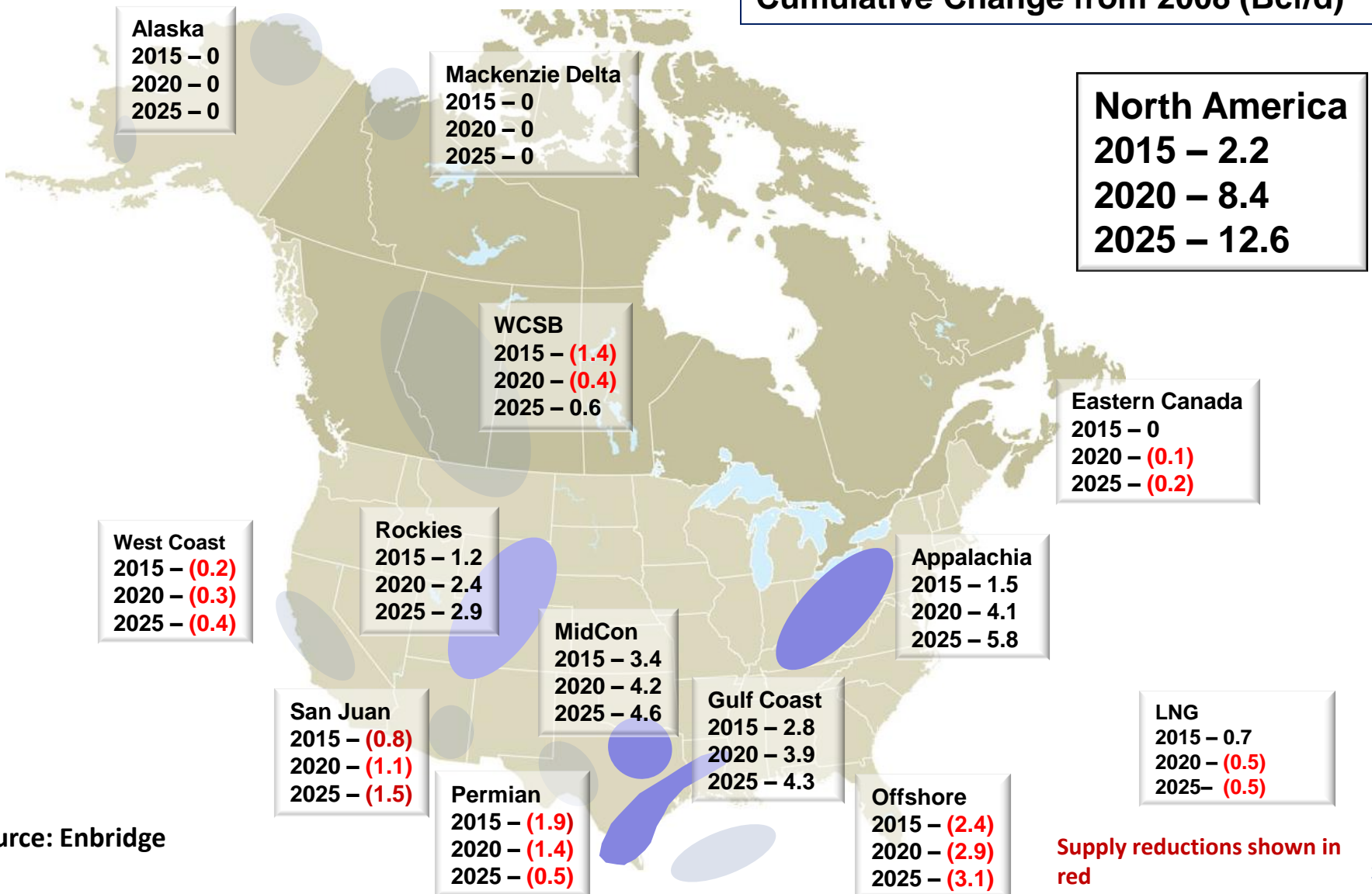
Shale gas has transformed the North America gas market; gas production is no longer a constraint



Source: EIA, NEB

Unconventional gas provides opportunities to diversify supply and transportation routes

Cumulative Change from 2008 (Bcf/d)

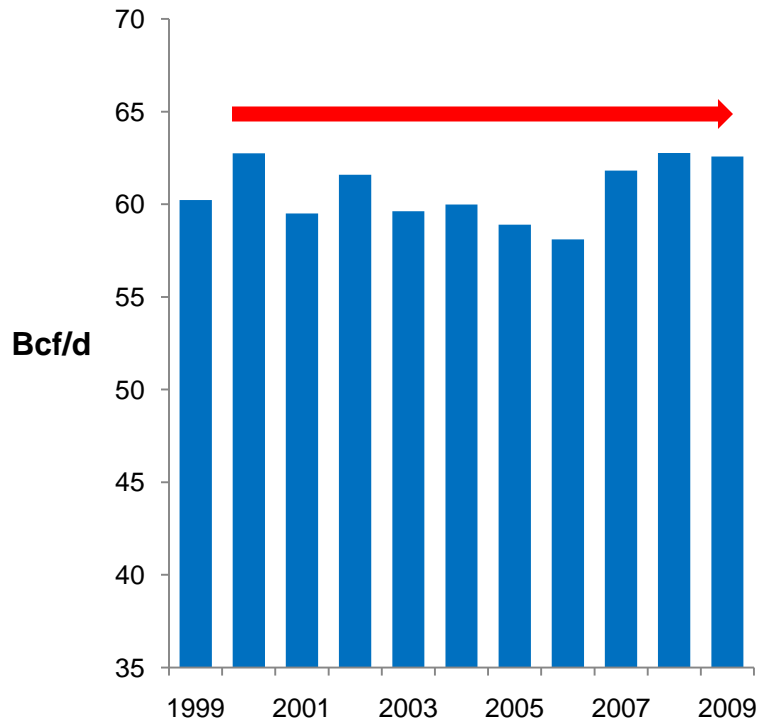


Source: Enbridge

Supply reductions shown in red

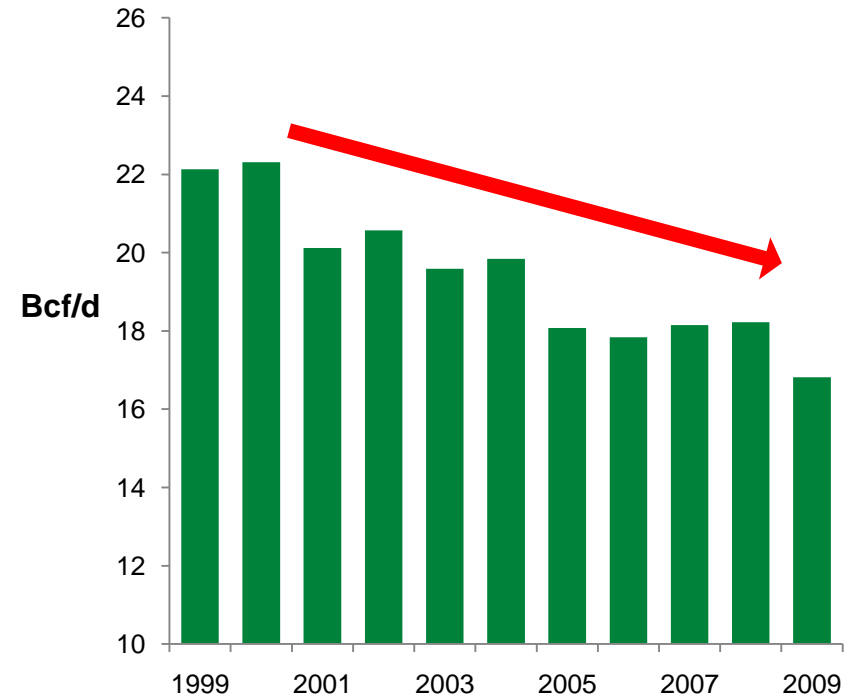
While gas supply expands, declining industrial demand has moderated overall gas demand growth

Total U.S. Gas Consumption



■ U.S. Natural Gas Total Consumption (Bcf/d)

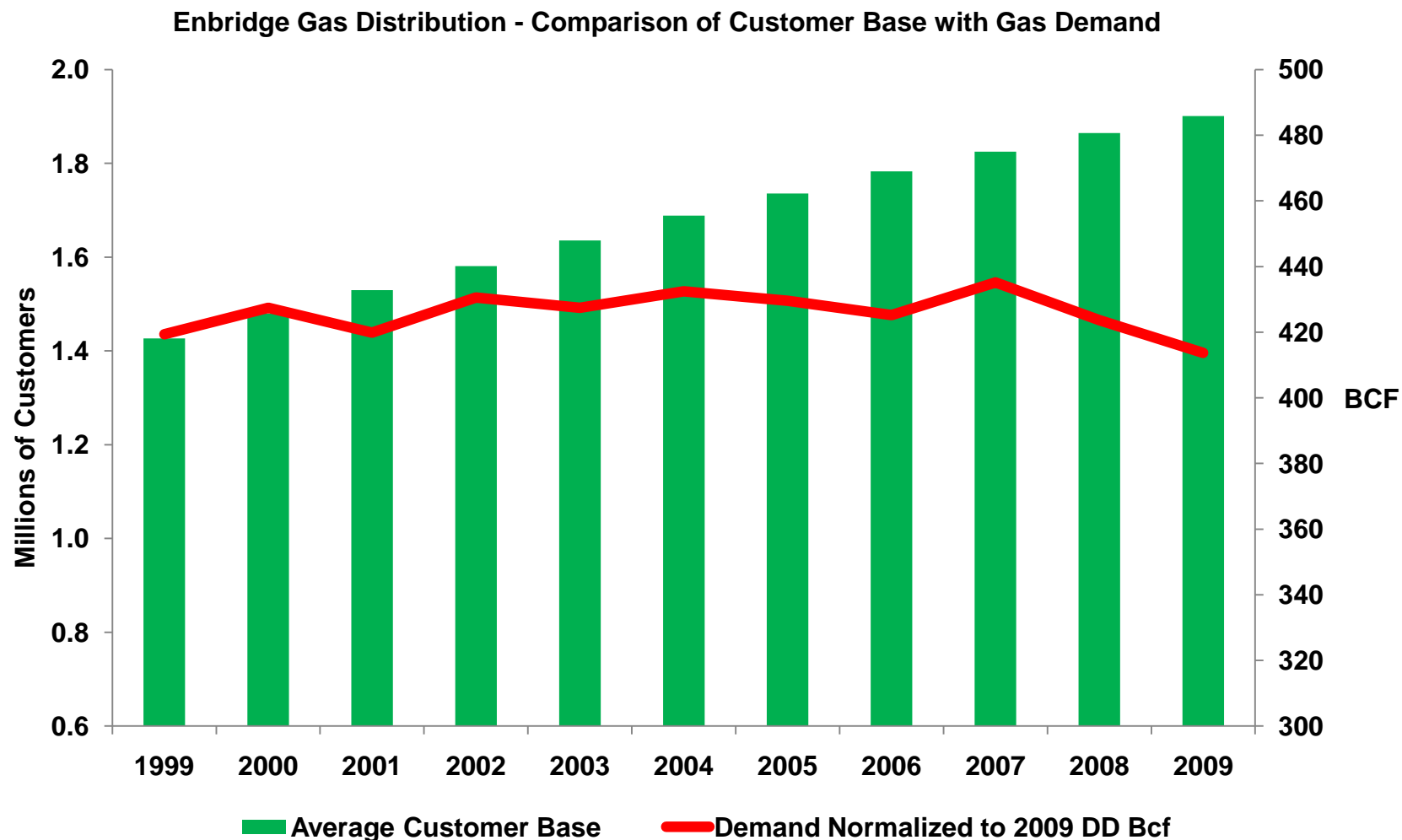
U.S. Industrial Gas Consumption



■ U.S. Natural Gas Industrial Consumption (Bcf/d)

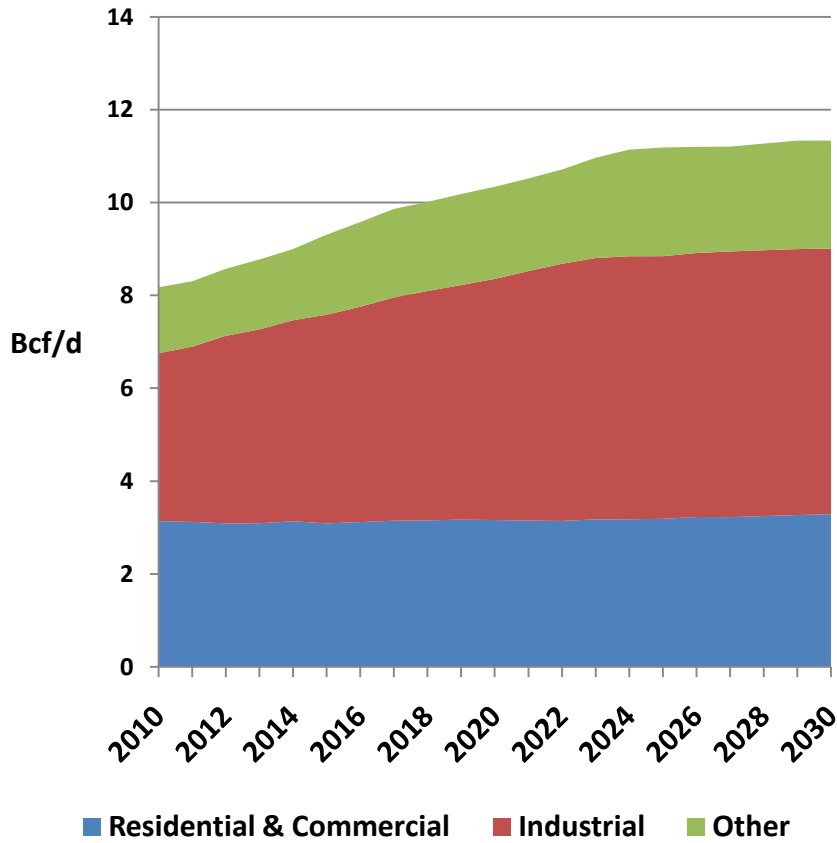
Source: EIA

Improved efficiencies and conservation are also moderating gas demand growth

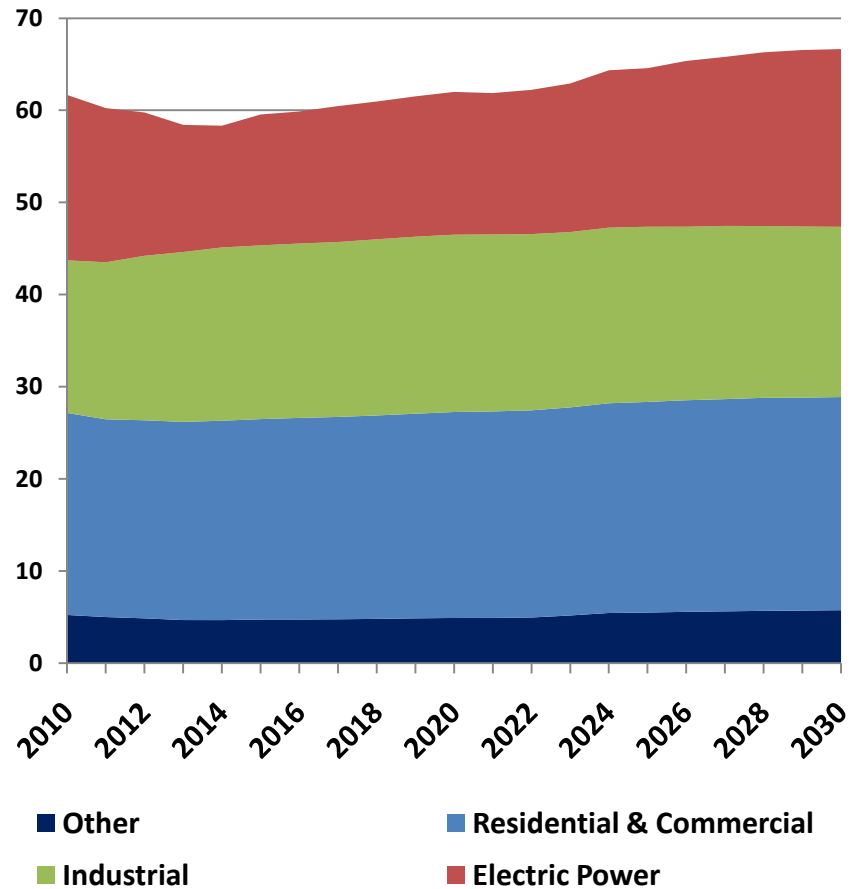


Growth in power-generation will lead growth in North American gas demand

Canadian Demand by Sector

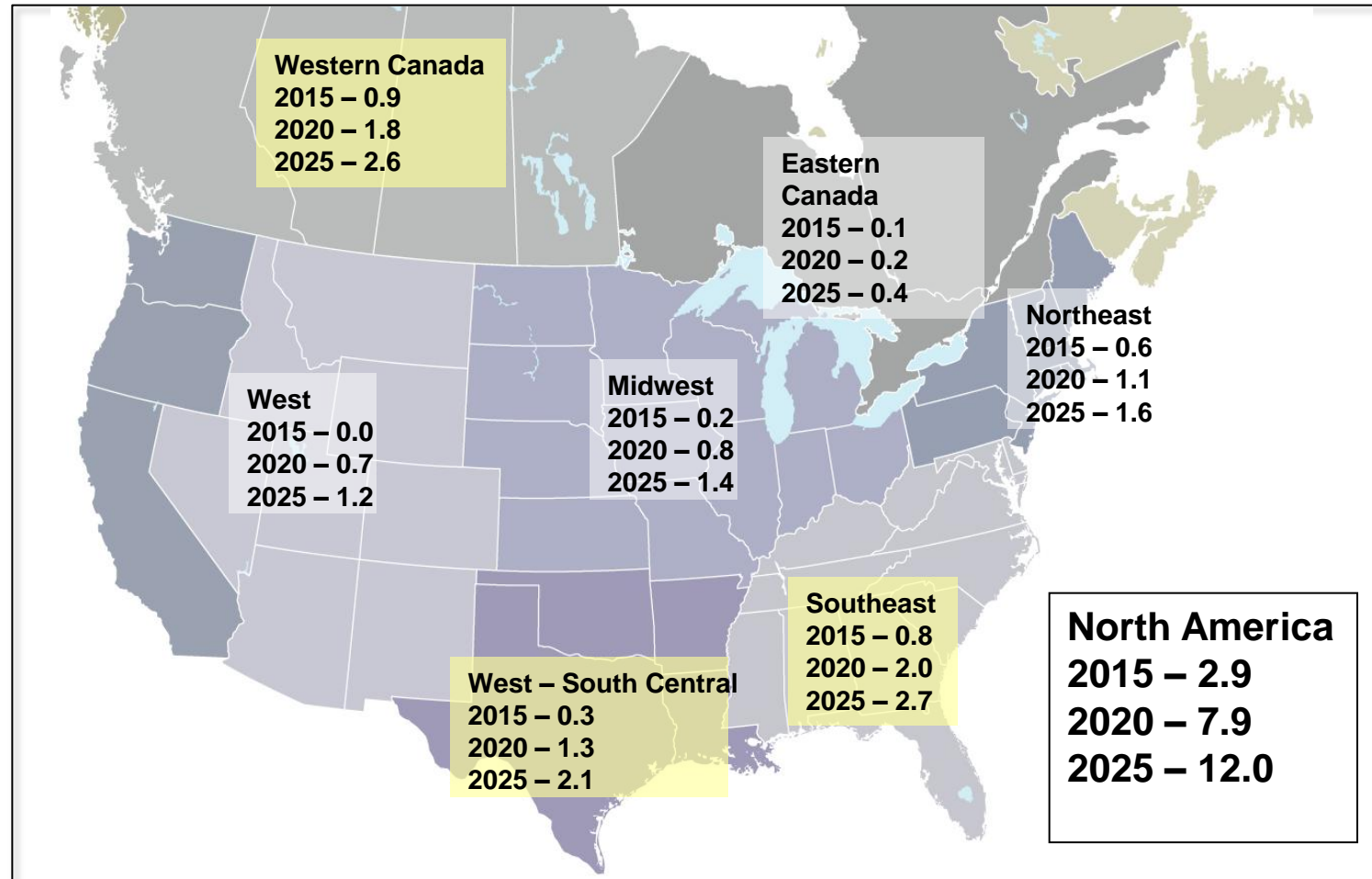


U.S. Demand by Sector



Gas demand growth will be uneven – gas-fired generation and petrochemicals in the South and oil sands in Canada will lead the way

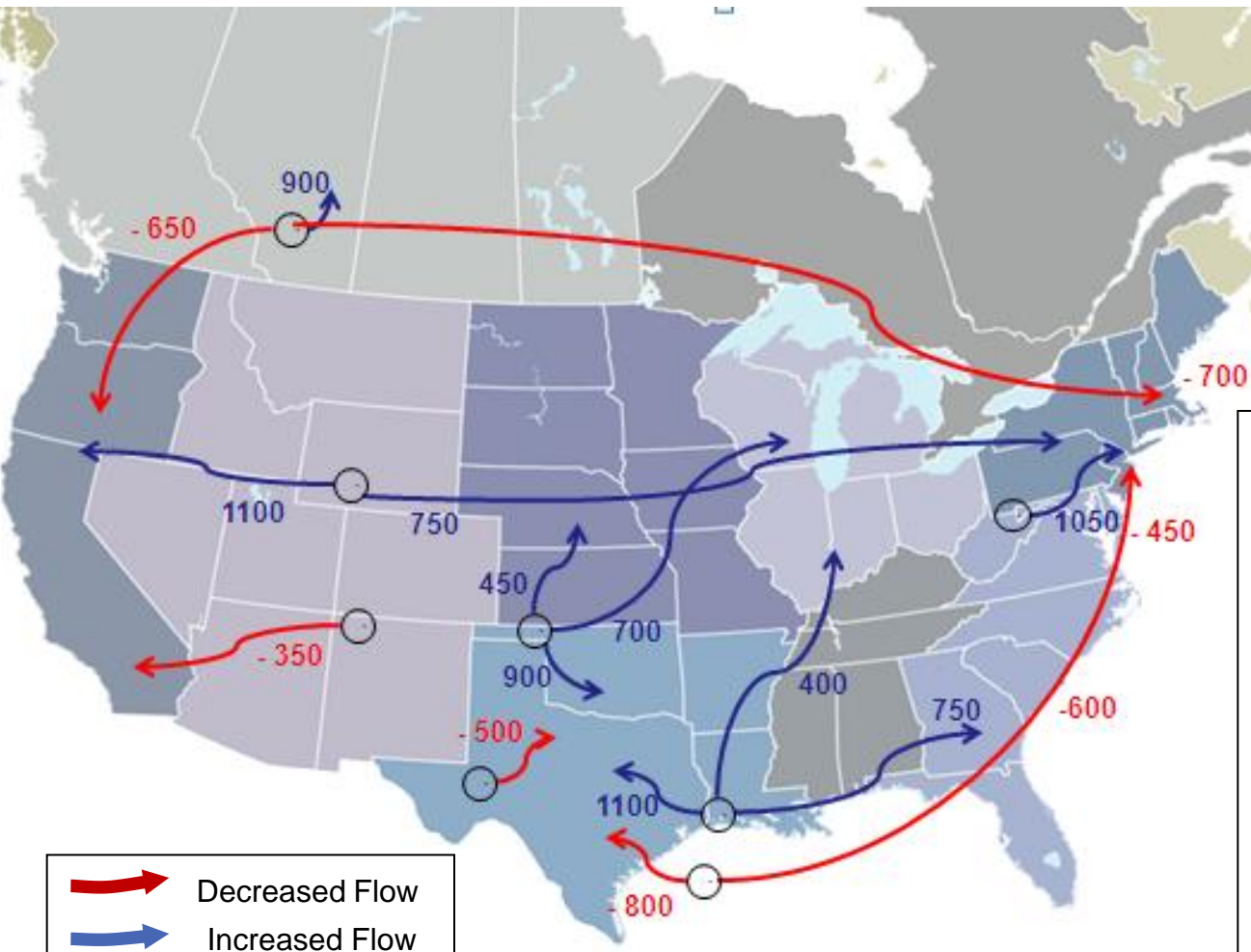
Cumulative Demand Change from 2008 (Bcf/d)





Source: Enbridge

Gas flow patterns will change, as shale gas takes prominence over traditional sources

Net Changes in Regional Flows 2009 – 2015. (Only flows > 300 Mmcf/d shown).



 Decreased Flow
 Increased Flow

- Emerging Marcellus shale play pushes back Canadian & GOM supplies in Northeast market
- Midcontinent/Gulf Onshore offsets declining Offshore supplies in Southeast and East Coast
- Rockies gas replaces declining Southwest and Canadian supplies.
- Increased levels of shale supply limit LNG imports

Source: Enbridge

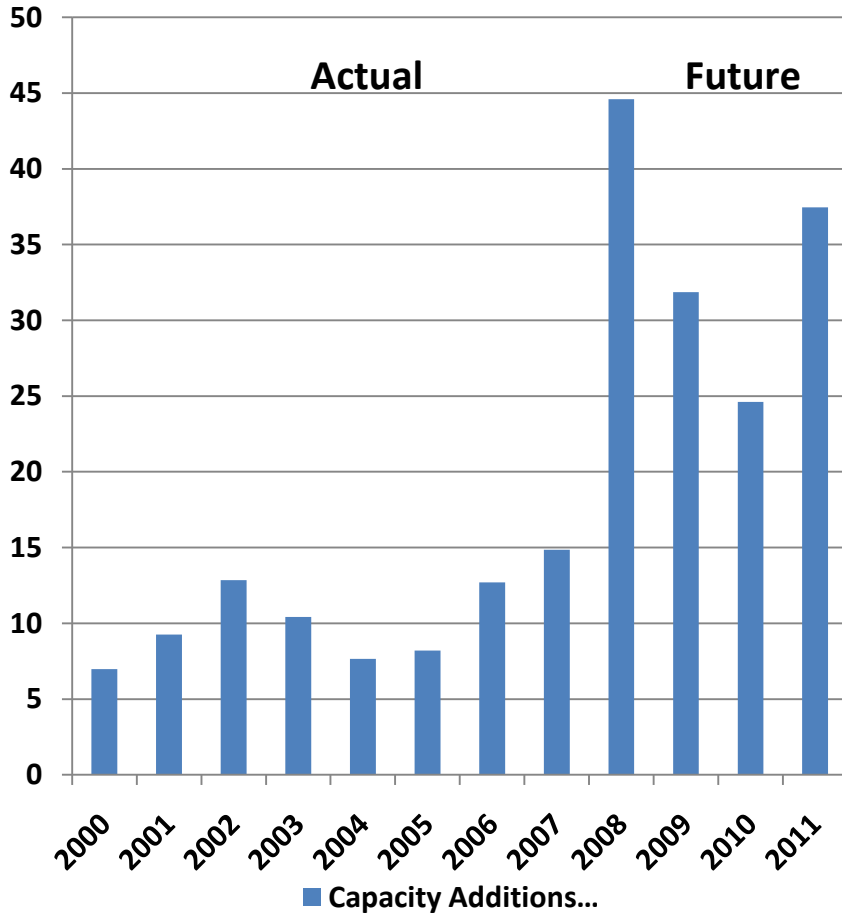
Significant and continuous investment in additional infrastructure will be required as supply dynamics shift

- **The U.S. and Canada will need 29,000 to 62,000 miles of additional pipeline and 370 to 600 Bcf of additional storage capacity.**
- **From 2009 to 2030, US \$133 to \$210 billion (or US \$6 to 10 billion per year) will be needed for pipelines and related infrastructure.**
- **Infrastructure needs are driven by:**
 - the shift to unconventional gas areas from traditional sources, and
 - market growth from power generation
- **Insufficient natural gas infrastructures can lead to price volatility, reduced economic growth, and reduced delivery of natural gas supply.**

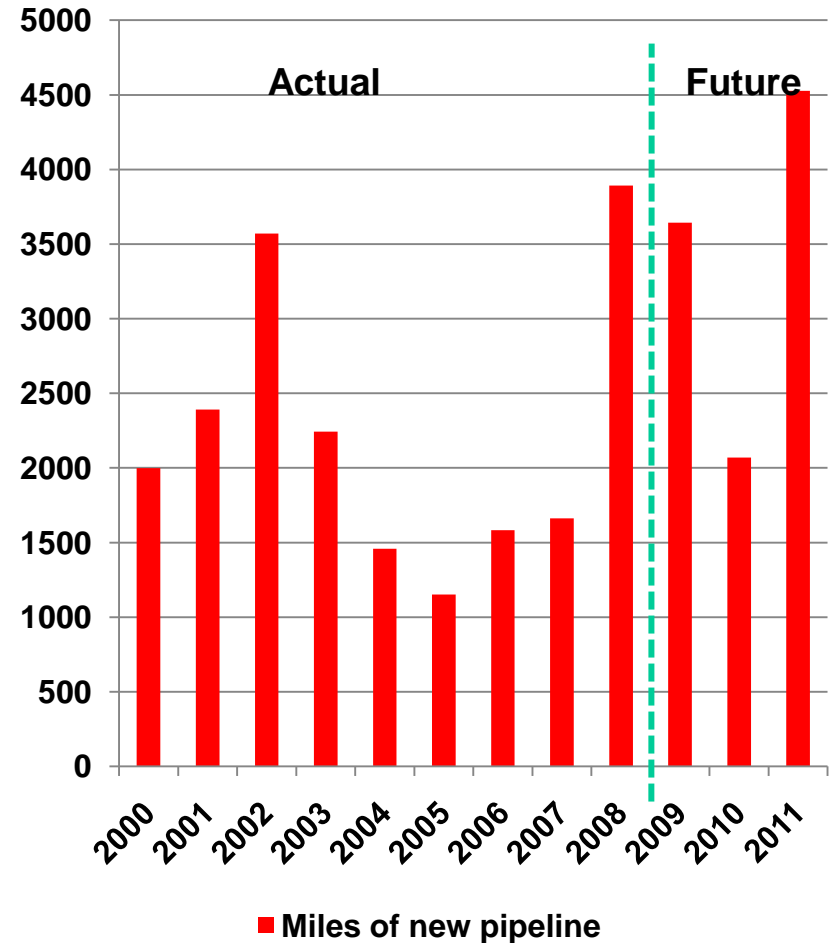
Source: INGAA

Transportation needs will shift from long-haul to short-haul regional systems

U.S. Capacity Additions Bcf/d

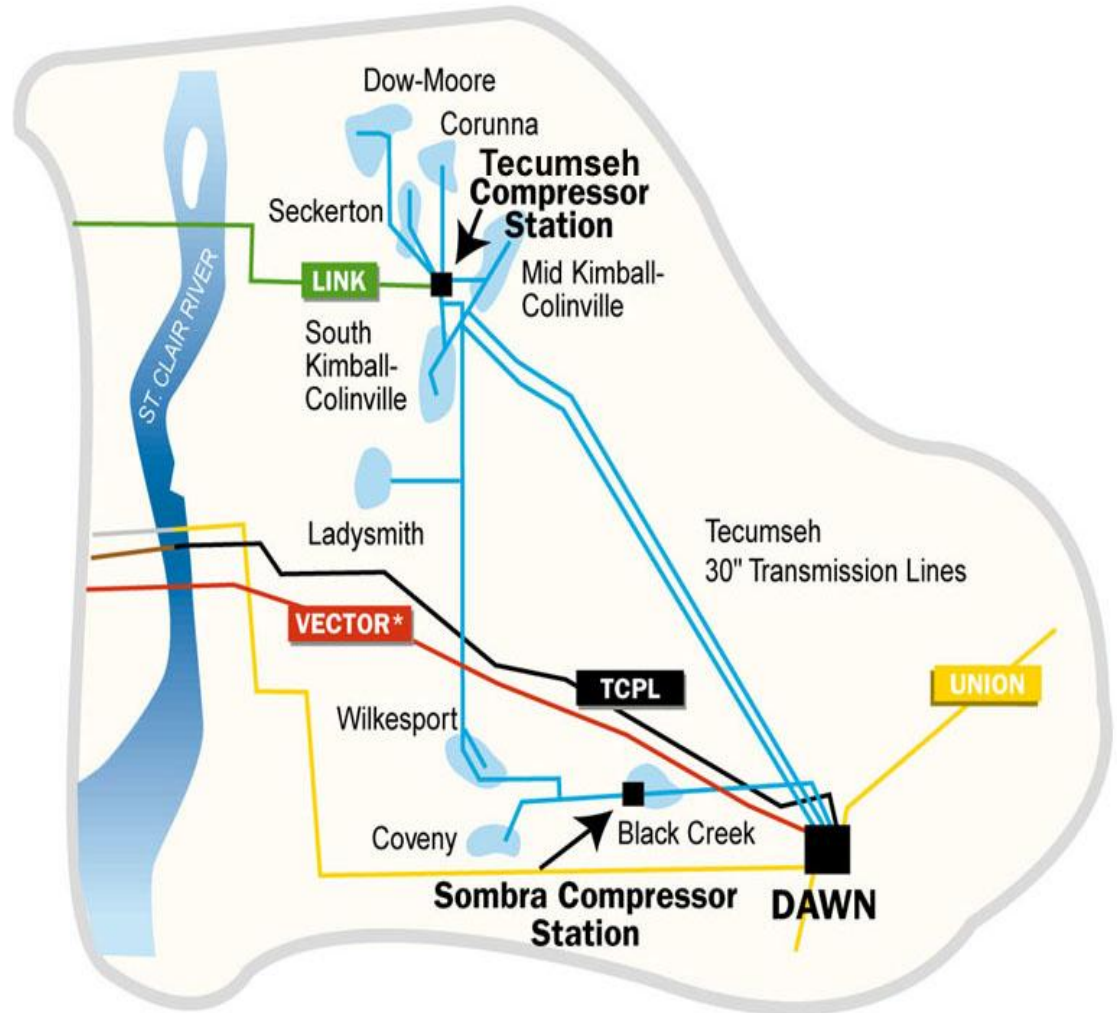


Miles of New Pipeline in U.S.

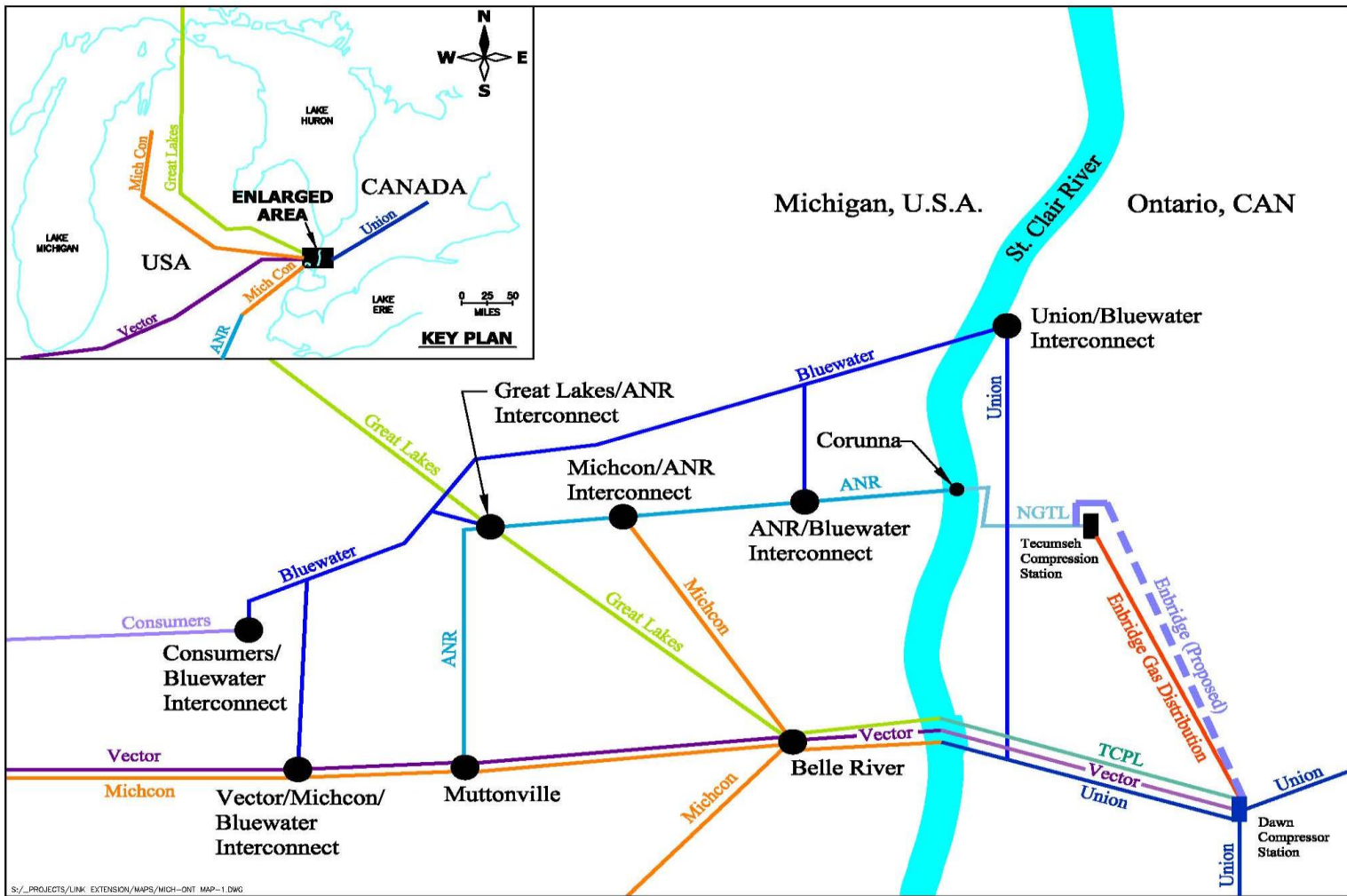


Enbridge Gas Distribution Operates Storage Facilities with links to the Ontario and eastern U.S. markets

- ~100 Bcf of capacity
- 10 storage pools
- Pipeline Interconnects
 - Union (Dawn)
 - TCPL
 - Link
 - Vector



EGD is developing storage & transportation options to meet market needs, including shale gas and gas fired generation



Growth in Gas-Fired Generation will impact delivery and storage services

▪ Large Fluctuating Loads

- 500 MW combined cycle plant = 4,000 to 5,000 GJ per hour
(100,000 to 200,000 GJ per day)
- Dispatched by the ISO

▪ Active management needed

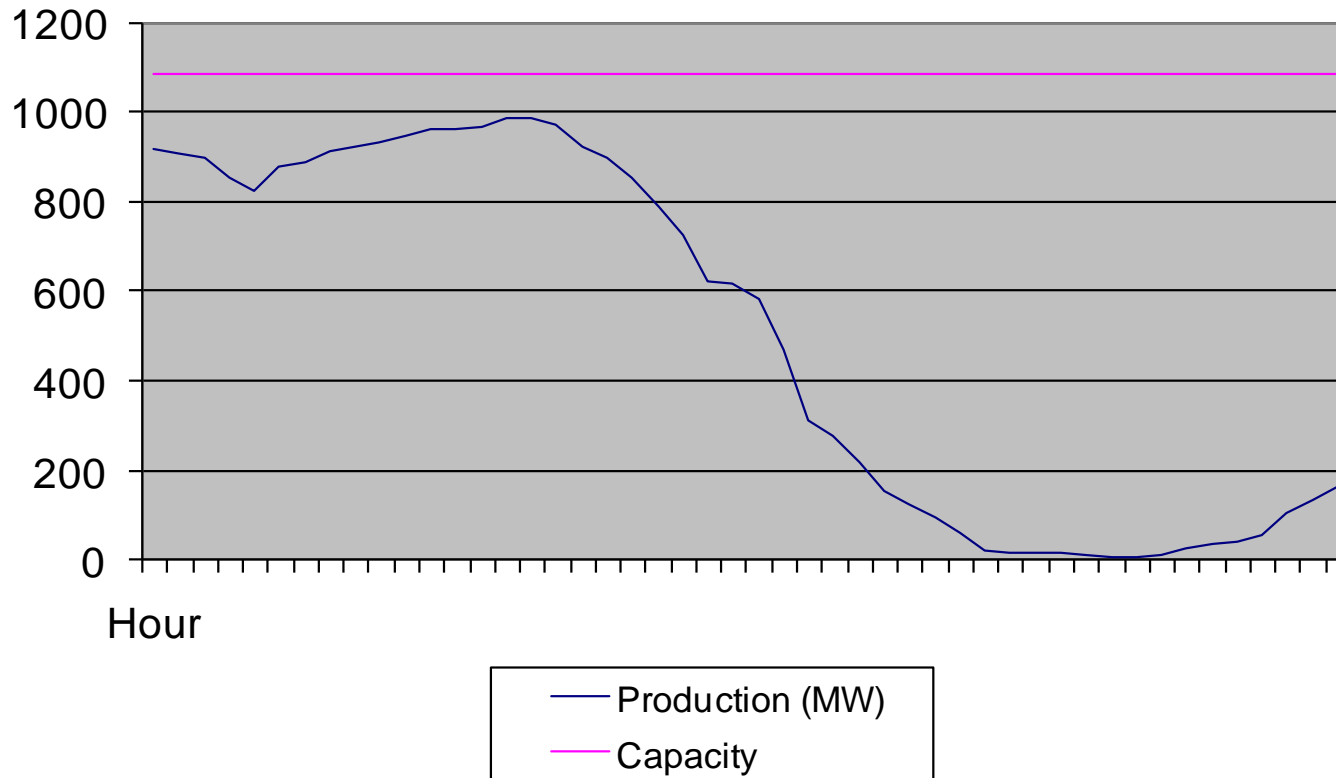
- Pipeline supply / spot purchases
- Hourly fluctuations in price of power

▪ What storage services are needed?

- Flexibility – acquiring and disposing of gas, transportation and storage
- Intraday Flexibility to match supply and demand
- Balancing Services to handle intra-day fluctuations
- Higher injection and withdrawal capability (ie., high deliverability storage services)

Increase in intermittent renewable generation prompts more load-following gas generation

Ontario wind production Oct 31 to Nov 1 2009



Natural Gas Vehicles may be an opportunity to expand gas markets in the future



- Enbridge Gas Distribution (EGD) has been building and supporting the natural gas vehicle (NGV) market in Ontario for over 20 years.
- NGV's account for 75% of EGD's 825-vehicle fleet – the largest such fleet in Canada.
- Enbridge benefited in 2007 from \$916,000 in cost savings across the whole fleet (\$1,447 per NGV per year) and reduced carbon dioxide emissions by an estimated 680 tonnes.

Replacing heavy diesel fleet with LNG trucks offers environmental benefits, if barriers can be overcome



- Long-haul trucks are one of the fastest growing sources of GHGs, accounting for 24%
- Barriers face the trucking industry's entry to LNG:
 - Need for liquefaction facilities
 - LNG refueling locations
 - Capital/conversion cost premiums
- Pilot projects proposed to confirm the viability of “blue corridors”
- Role for government in policy and fiscal measures

In conclusion, the industry simply needs demand!

- **Unconventional gas is a “game-changer”**
 - Resource base is vastly expanded
 - Diversity in supply sources and transportation options is increased
 - Gas prices will be moderate
- **Investment in infrastructure is critical**
 - More pipelines are required to deliver gas from unconventional sources to markets
 - Expansions to storage capacity
- **North American market is demand-constrained**
 - Power generation will lead growth, but resource endowment can support more
 - Is this the time for NGVs?