

Appendix A

Representation of Unconventional Gas Technology Groups: Adjustments and Parameters

Technology Group	Item	Type of Deposit	Technology Case		
			Slow	Reference	Rapid
1. Basin assessments	Year Hypothetical Plays Become Available	Coalbed Methane and Gas Shales	NA	2016	2013
		Gas Shales	NA	NA	2018
	Proportionate Increase in Share of Hypothetical Play Area Assessed to be Productive (per year)	All Types	NA	NA	0.5%
2. Play specific, extended reservoir characterizations	Decrease in Extended Portion of Development Schedule for Emerging Plays (per year)	Coalbed Methane and Gas Shales	NA	5.0%	7.5%
		Tight Sands	NA	6.3%	8.2%
3. Advanced exploration and natural fracture detection research and development (R&D)	Increase in Percentage of Wells Drilled Successfully (per year)	Coalbed Methane and Gas Shales	0.1%	0.3%	0.6%
		Tight Sands	0.1%	0.3%	0.8%
	Year that Best 30 Percent of Basin is Fully Identified	Coalbed Methane	2017	2017	2012
		Tight Sands	NA	2017	2012
4. Geology technology modeling and matching	Increase in EUR per Well (per year)	Coalbed Methane and Gas Shales	NA	0.1%	0.3%
		Tight Sands	NA	0.3%	0.4%
5. More effective, lower damage well completion and stimulation technology	Increase in EUR per Well (per year)	Coalbed Methane and Gas Shales	0.3%	0.4%	0.6%
		Tight Sands	0.4%	0.5%	0.6%
6. Targeted drilling and hydraulic fracturing R&D	Decrease in Drilling and Stimulation Costs per Well (per year)	Coalbed Methane and Gas Shales	0.3%	0.5%	0.8%
		Tight Sands	0.3%	0.5%	0.5%
7. Advanced well completion technologies such as cavitation, horizontal drilling and multilateral wells	Year Advanced Well Completion Technologies Become Available	Coalbed Methane	2018	2011	2008
		Tight Sands	2016	2011	2011
		Gas Shales	NA	NA	2016
	Increase in EUR per well (total increase)	Coalbed Methane	10.0%	20.0%	25.0%
		Tight Sands	5.0%	10.0%	12.5%
8. Advanced well performance diagnostics and remediation	Expansion of Existing Reserves (per year, declining by 0.1% per year)	Coalbed Methane and Gas Shales	2.0%	3.0%	3.5%
		Tight Sands	1.0%	2.0%	2.5%
9. New Practices and Technology for gas and water treatment	Decrease in Water and Gas Treatment O&M Costs per Well (per year)	All Types	0.6%	1.0%	1.3%
10. Other unconventional gas technologies, such as enhanced coalbed methane and enhanced gas shales recovery	Year Advanced Recovery Technologies Become Available	Coalbed Methane	2018	2010	2010
		Tight Sands	NA	NA	2018
		Gas Shales	NA	NA	NA
	Increase in EUR per well (total increase)	Coalbed Methane	10.0%	25.0%	27.5%
		Tight Sands	NA	NA	10%
		Gas Shales	NA	NA	NA
Increase in Costs (\$1998/Mcf) for Incremental CBM production	Coalbed Methane	1.54	1.03	0.91	
	Tight Sands and Gas Shales	NA	NA	NA	
11. Mitigation of environmental and other constraints on development	Proportion of Areas Currently Restricted that Become Available for Development (per year)	Coalbed Methane	0.3%	1.0%	1.3%
		Tight Sands	NA	1.0%	1.3%
		Gas Shales	0.5%	1.0%	1.3%

NA = not applicable.

Source: Office of Integrated Analysis and Forecasting.