

Modeled Impacts of Incremental Application for Permit to Drill (APD) Processing for Energy Policy Act Pilot Project Offices

EXECUTIVE SUMMARY

Advanced Resources conducted provisional analyses for the U.S. Department of the Interior that examined the effects of the Energy Policy Act of 2005 pilot project in seven selected Bureau of Land Management (BLM) field offices (Miles City, Buffalo, Rawlins, Vernal, Glenwood Springs, Farmington, and Carlsbad). Funding for the pilot project is anticipated to be \$19MM per year. Advanced Resources was requested to analyze the potential impacts of the first five years of the pilot program.

It is estimated that the project would, within two years, obviate the backlog of APDs present in the pilot offices, which stood at almost 3100 at the end of FY2005. Analytical results demonstrate that significant potential benefits to the nation from this incremental funding for BLM for five years, including:

- Increases in production (up to over 1,000 billion cubic feet-equivalent (BCFe)/yr) and reserves,
- Significant incremental economic value (of up to \$20.4 billion) and greater royalties, and
- Increases in jobs (peaking at slightly over 14,000 per year).

The major impact of the assumed APD processing activities is to accelerate production by moving it earlier in time and by capturing benefits within 15 years. Although the results are robust, implementation of the pilot project might present challenges, including rig availability, possible pipeline constraints, hiring of APD-knowledgeable staff, and the politics of land access.



ADVANCED RESOURCES INTERNATIONAL, INC.

MEMORANDUM

To: Abe Haspel, DOI; Thomas Lonnie, Kermit Whitherbee, and Tim Spisak, BLM

Date: November 3, 2005

From: Jeffrey Eppink, Advanced Resources International

Re: Modeled Impacts of Incremental Application for Permit to Drill (APD) Processing for Energy Policy Act Pilot Project Offices

1.0 Background and Rationale

As a result of the passage of the Energy Policy Act of 2005 (EPACT) in August of this year, the Secretary of the Interior is directed in Section 365 of the Act to establish a pilot project to improve Federal permit coordination. The pilot comprises the following BLM field offices (FOs): Miles City, Buffalo, Rawlins, Vernal, Glenwood Springs, Farmington, and Carlsbad.

The Office of the Secretary of the Department of the Interior (DOI) and Bureau of Land Management (BLM) requested quick-turnaround analytical assistance from Advanced Resources to assess the benefits that could accrue from the first five years of incremental funding to BLM pilot FOs. The funding is anticipated to be \$19MM per year. The project is estimated to obviate, within two years, the backlog of APDs present in the pilot offices, which stood at almost 3100 at the end of FY2005.

Given the prospect for high natural gas prices, in the absence of increased APD processing capacity and funding for BLM, it is unlikely that the backlog could be worked off as additional APDs are generated. Conversely, the increased production resulting from drilling could act to increase supply and moderate prices for the nation. In order to estimate the production effect of reducing the number of pending APDs, land access issues also need to be considered.

1.1 Implications from Historical Drilling Trends. BLM indicates that about 84 percent of all APDs that are submitted become approved. Further, data from BLM's Automated Fluid Minerals Support System (AFMSS)¹ for the Energy Policy and Conservation Act (EPCA) inventory basins² for the last five years indicate that 82 percent of the productive wells completed on Federal lands³ are natural gas wells. Table 1 shows an indicative summary of the AFMSS data.

¹ The AFMSS data were available to the project from the EPCA Phase II Inventory. AFMSS had been queried in March 2005 for the EPCA Inventory.

² The wells analyzed are a subset of the total number of APDs during the time period. Excluded are non Rocky Mountain region wells, non approved APDs, Indian APDs, and non-geographically unique wells (e.g., re-entered wells).

³ Includes split estate minerals. Excludes Indian minerals.

Table 1. Indicative AFMSS Data for EPCA Basins

Status	'00 to '04	Portion of APDs issued
Expired	21	0.2%
Dry Hole	863	7.0%
Prod Gas	9,390	75.9%
Prod Oil	2,093	16.9%
APDs issued	12,367	100.0%

Although modest drilling for oil has occurred, such drilling does not appear to be growing significantly; except for the Vernal BLM FO, incremental oil drilling has remained flat over the last five years.

Incremental drilled wells are most likely to be located in the Rocky Mountain region; BLM data show that 93 percent of current pending APDs are in Rocky Mountain states. Advanced Resources estimates that over 85 percent of the oil and gas resources in the Rocky Mountains are unconventional natural gas. Although complete resource-specific drilling statistics for all types of natural gas resources are not available, it is anticipated that additional Federal wells are highly likely to be unconventional natural gas wells.

1.2 Modeling Approach. The conclusion to be drawn from the discussion above is that incremental wells that could be drilled on Federal lands are likely to be natural gas wells in unconventional resources in the Rocky Mountain region. As such, it is appropriate in this analysis to model incremental impacts on a natural gas-equivalent basis by examining unconventional resources.

2.0 Methodology

2.1 Model. Modeling necessitated the use of an engineering/geologic and econometric-hybrid approach of the type available with the Unconventional Gas Recovery Supply Submodule (UGRSSM), a component of the Energy Information Administration's (EIA's) Oil and Gas Supply Model. EIA's UGRSSM was developed by Advanced Resources, which calls its version of the model "MUGS" (Module for Unconventional Gas Supply). MUGS uses modified resource data from U.S. Geological Survey's (USGS) 1995 assessments, and cost data from various sources, including American Petroleum Institute's Joint Association Survey.

In addition, MUGS incorporates results from the EPCA Phase I Inventory⁴ to integrate Federal land access factors. The EPCA Inventory currently provides estimates of undiscovered technically recoverable resources and proved reserves of oil and gas as well as an inventory of the extent and nature of limitations to their development (generically called "Federal lands access"). EPCA access data are available for the Rocky Mountain region and are incorporated in MUGS.

MUGS provides sound analytical modeling features appropriate for this analysis because the model:

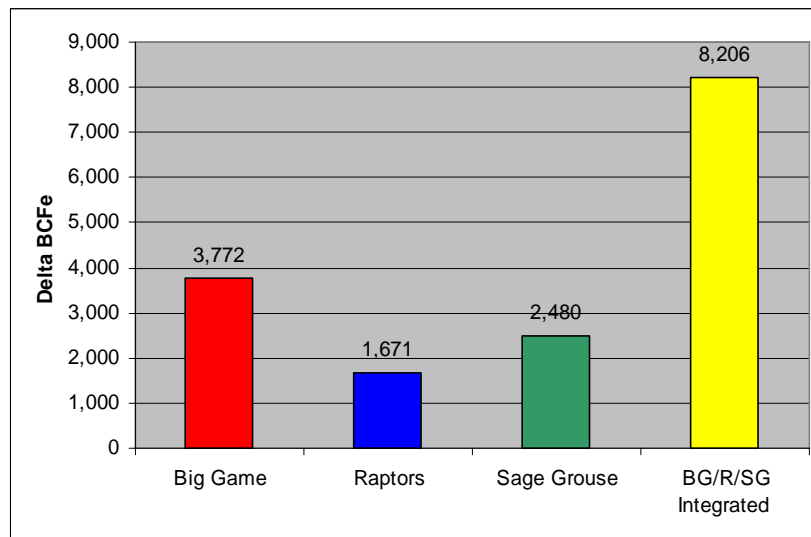
⁴ See <http://www.doi.gov/epca/> for the EPCA Phase I report.

- Accounts for 87 percent of natural gas resources in the lower-48 states relative to USGS (1995) assessments,
- Incorporates resource limitations relative to drilling,
- Employs specific, typical well performance curves by resource play,
- Performs project economics for drill/no drill decisions,
- Covers the Rocky Mountain region, and
- Underpins the Department of Energy (DOE) National Energy Modeling System (NEMS) model for natural gas.

2.2 Access. Assessing Federal lands access is a complex issue. Actually the term “access” is somewhat of a misnomer. In fact, a minority (albeit significant) of resource-bearing Federal lands are “inaccessible” in that they cannot be leased—the more significant issue revolves around the restrictions associated with leasable lands, where the majority of the undiscovered resource exists. These restrictions are primarily a function of timing limitations associated with various wildlife species, foremost among which are big game, raptors and sage grouse.

To estimate potential production, the access issue must be addressed. In this analysis, acting as a guide for setting EPCA access parameters for the MUGS model, a recent analysis performed for the DOE⁵ by Advanced Resources was used. The DOE work entailed the use of datasets and modeling capabilities developed to support the EPCA Inventory. The DOE analysis quantified the degree to which wildlife resources such as big game, raptor and sage grouse habitat afford opportunity for increasing efficiency and access to resources. Figure 1 illustrates for the Rocky

Figure 1. Example of Resource Changes Relative to Changes in Federal Land Access



Mountain region, the relative impacts from a 10 percent scenario for increasing access. Figure 1 shows various species modeled independently and in an integrated run. The resource changes

⁵ Memo to DOE: “Analyses to Support Oil and Natural Gas Environmental Program R&D Planning Based Upon the EPCA Datasets and Model” by Advanced Resources, June 2005. The DOE analysis was performed to support efforts for evaluating and planning R&D activities related to Federal lands access.

result from the contribution of previously unleaseable lands becoming leaseable, but primarily from leaseable restricted lands becoming less restrictive. Without this increased access, the estimates reported below could be about one-third less.

2.3 Modeling Scenario and Parameters. Parameters and considerations incorporated into the modeling process were established during multiple planning meetings with BLM personnel.

The parameters identified as major tangible levers for modeling are:

- Number of wells that can be drilled, and
- Federal land access parameters from the EPCA Inventory.

The modeling is conducted by setting up the base case, which reflects the *status quo*. The scenario case is then constructed to reflect changes. The difference between the base case and the scenario reflects the impacts due to changes.

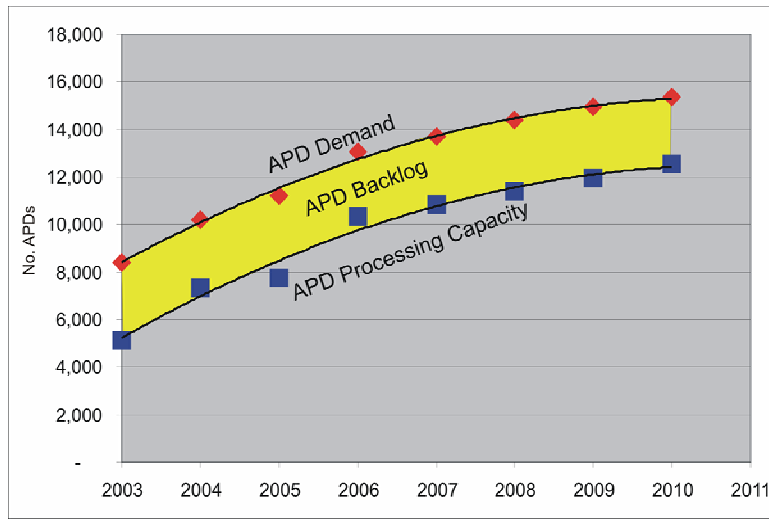
The scenario is modeled under the assumption that the effects from APD processing are “quicker to market” than land access changes because incremental APD processing results in drilling that can immediately increase production. Alternatively, land access changes produce results by increasing resource availability and can ultimately result in greater aggregate production. The scenario constructed for the analysis capture the historic trends observed on issued APDs as cited above, namely, 84 percent of wells that start the APD process are approved and that 93 percent of drilled wells are productive.

Base Case. A base case was set up using a combination of price tracks from EIA’s Short Term Energy Outlook (STEO) and the Annual Energy Outlook (AEO),⁶ projected over 25 years. BLM spent about \$27 million in FY2005 to process about 7700 APDs, and its workload is increasing. Figure 2a shows BLM’s recent historical APD demand, processing capacity and backlog. Advanced Resources has projected these into the future based upon assumptions of modest growth in APD demand of 5 percent per year and increases in BLM APD processing capacity of 3.5 percent per year.⁷

⁶ See EIA’s STEO (<http://www.eia.doe.gov/steo>) and 2005 AEO (www.eia.doe.gov).

⁷ For years 2007-10. Estimates for 2006 were provided by BLM.

Figure 2a. APD Backlog

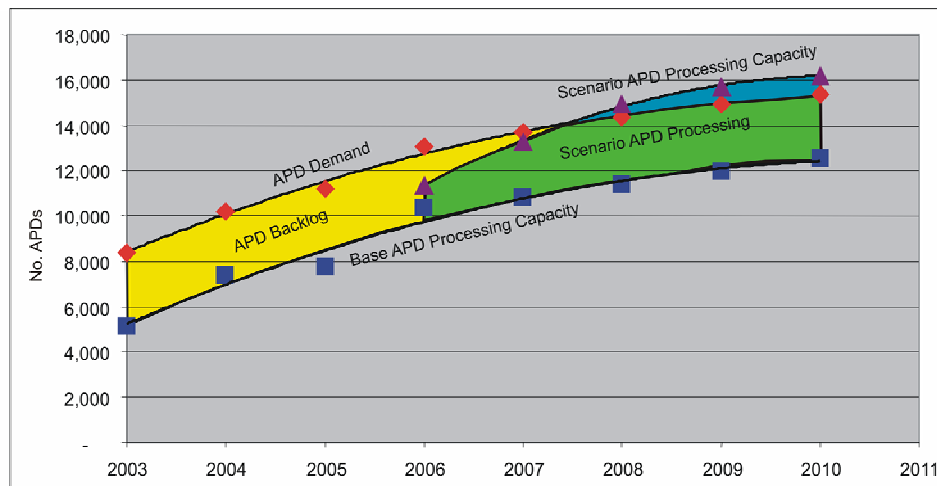


Scenario. The scenario incorporates base case conditions, but represents the incremental impact of additional spending by BLM for the pilot program of an average of \$19MM per year over five years. The majority of funding is devoted to APD processing, which is estimated to cost \$4000 per well based upon historical BLM data. The distribution of future drilling is guided by current “pending well” APD counts in the pilot BLM FOs.

Land access increases by approximately 10 percent (based upon prior analysis of the issue for DOE as described above). The costs for land access planning and implementation were assumed to be \$2.5MM per year. The land access is introduced into the model by resource play by basin as determined by the EPCA Phase I Inventory. The land access changes are incorporated based upon the DOE study, where access was increased by an average of 10 percent during the five years of the scenario for Rocky Mountain basins.

Figure 2b shows the APD processing as a result of the scenario. The static backlog is worked off while the number of APDs submitted also increases following the second year of the pilot project.

Figure 2b. Increased APD Processing Capacity



All MUGS modeling runs were conducted on a natural gas BCF-equivalent (BCFe) basis. Other modeling considerations based on historic trends included the following:

- For every 1000 APDs processed, 780 productive wells will result (see Section 2.2 above),
- Average lag time between APD approval and spud of 3.3 months based on AFMSS data,
- Implementation year: FY2006,
- First production effects year for APD processing: CY2007, and
- First production effects year for land access: CY2008.

2.4 Rigs and Jobs. Although not accounted for explicitly in the model, rig and crew availability were also examined briefly. Short term projections of rig availability were made based on available data⁸ for recent-year trends, and current and expected 2005 rig counts for Rocky Mountain states. Drilling crew requirements were determined based on information obtained from field operator and from national statistics.⁹ Table 2 shows projections based these sources.¹⁰

Table 2. Drilling Rig Availability and Crew Requirement

YEAR	2005	2006	2007	2008	2009	2010
Rig Availability	285	331	364	385	398	407
Crew Requirement	6,273	7,290	7,999	8,466	8,762	8,946

The projected 2005 national rig utilization is 88 percent, a rate that could increase to over 90 percent at which point additional rigs would likely be built or regionally exogenous rigs would be brought into the Rocky Mountain Region. It should be noted, however, that for CBM rigs, which are not separated in the statistics, increasing the rig fleet would be less difficult due to the shallow nature of CBM wells.

Work force parameters included an estimated 22 workers per active drilling rig and the historic average of 37 wells drilled per rig in the Rocky Mountains to compute direct jobs. Indirect jobs were estimated using Bureau of Economic Analysis (BLS) Employer Costs for Employee Compensation (ECEC), which is about \$60,000 per job per year.¹¹ To compute the amount of indirect jobs, Advanced Resources examined the 2004 income statements for three public companies and determined that the ratio of ECEC expenditures to wellhead revenue is about 25 percent.¹² Advanced Resources has not computed the multiplier effect of these increased jobs.

3.0 Results

The results of the analysis are shown in Figures 3 through 7, which present outcomes for incremental production, reserves, Federal royalties and direct and indirect jobs.

⁸ See World Oil Magazine Feb. 2005—<http://www.worldoil.com/> and Baker Hughes Rig Count data—http://www.bakerhughes.com/investor/rig/rig_na.htm .

⁹ See U.S. Department of Labor statistics-- <http://www.ums1.edu/services/govdocs/ooh20022003/cgs005.htm>

¹⁰ The Rocky Mountain region rig fleet grew by more than 25 percent in 2004, a rate that would be unsustainable in the future, when additional rigs will need to be built or imported.

¹¹ Based on rates from BLS at <http://www.bls.gov/news.release/ecec.t10.htm> .

¹² This ratio was computed based upon examination of the income statements for Burlington Resources, EOG Resources and St. Mary Land and Exploration, which were chosen based upon their Rocky Mountain focus as dominantly domestic, publicly traded producers. ECEC expenses were computed net of royalties, taxes, interest, DD&A and other non-job-related expenses.

Figure 3. Production

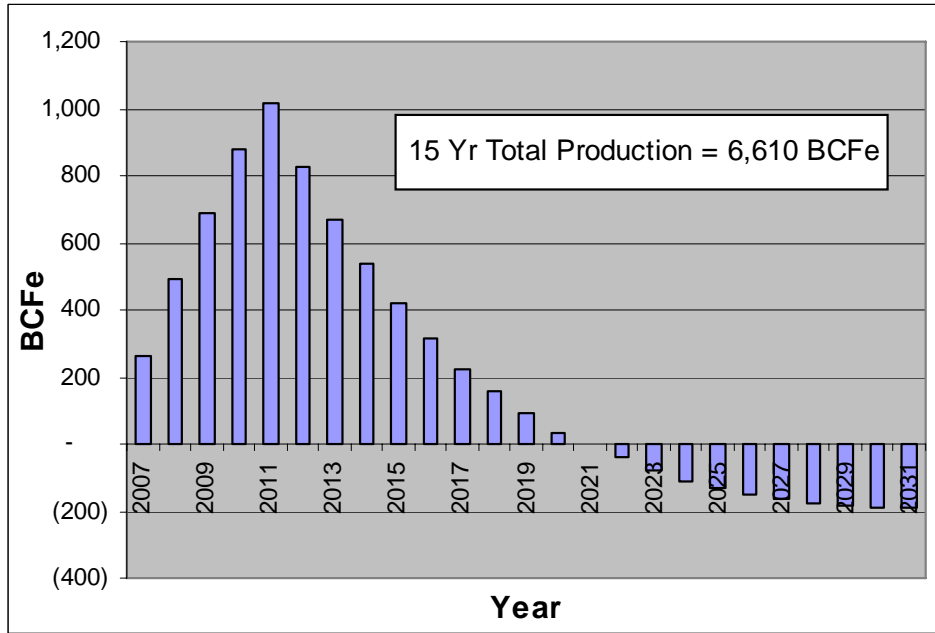
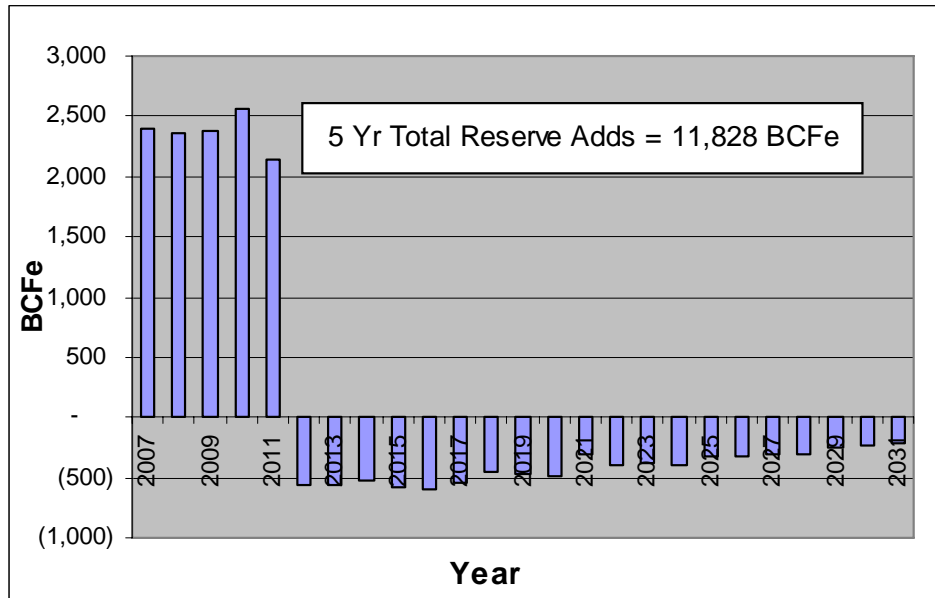


Figure 4. Reserve Adds¹³



¹³ Reserve additions are a direct function of drilling in the scenario. As such the additions are not modeled to occur after the five year term of the pilot project.

Figure 5. Revenues

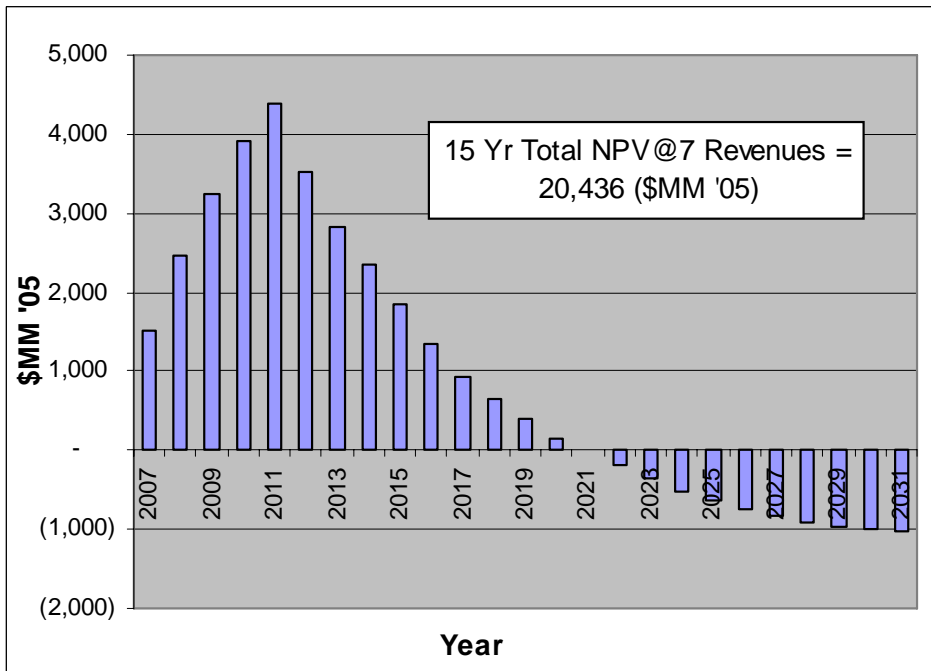


Figure 6. Federal Share of Royalties

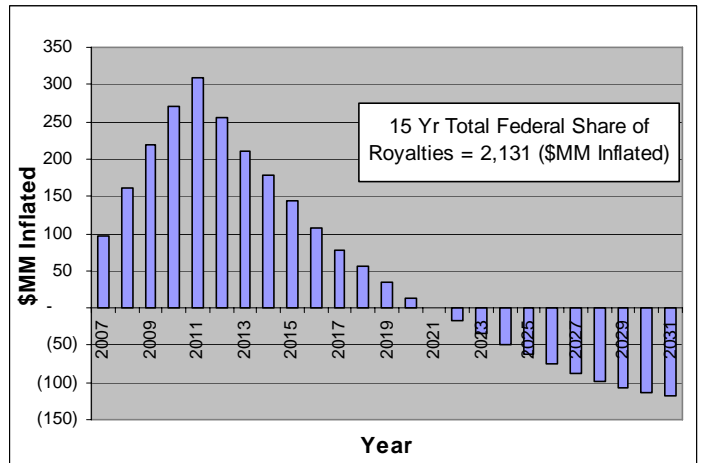
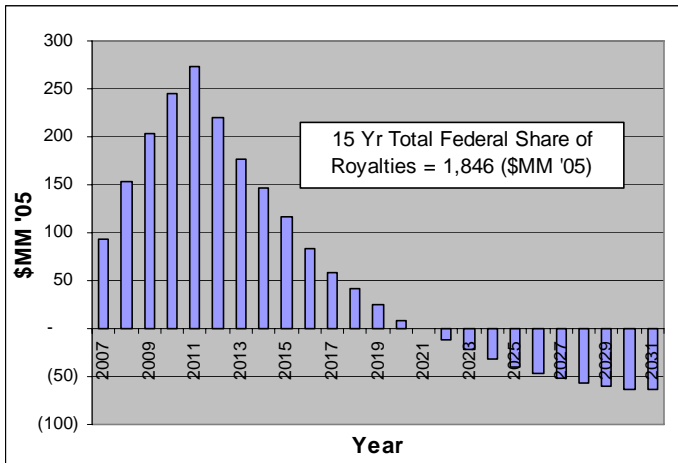
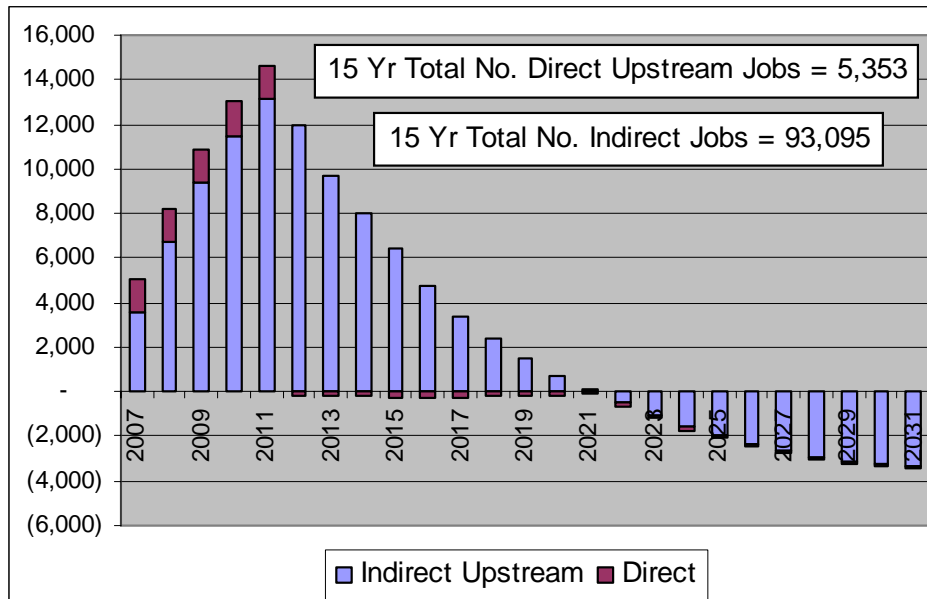


Figure 7. Jobs Generated



4.0 Discussion

Model results, while provisional, indicate that the benefits from the pilot program could be significant for the nation given the modest investment. The major impact of the assumed activities is to accelerate production, moving it earlier in time to capture most benefits within 15 years. The analyses show that there would be a number of impacts:

- Production could be increased, up to over 1,000 BCFe per year,
- Proved reserves would be increased, up to 11,800 BCFe over the five years of drilling that the initiatives would affect,
- The Federal share of royalties would be increased by over \$2.1 billion,
- The amount of incremental economic value, developed as a result of the assumed activities, would represent a net present value (NPV) of \$20.4.1 billion,¹⁴ and
- Jobs would be increased, peaking at over 14,000 per year.

The costs of the initiatives are very low; less than 1¢ per thousand cubic feet (MCF) of added reserve, which is negligible compared to the current wellhead natural gas price of well over \$10 per MCF.

4.1 *Potential Limitations and Comments.*

Resources. The scenario is not resource constrained during its term of implementation. The drilling resulting from the processing of APDs in the modeled scenario can be accommodated by the resource base in the Rocky Mountain region; however, increases in access to Federal lands would be required to achieve the estimated production levels. The scenario acts to bring online significant production by increasing overall resource availability compared to the base case. Because increases in access would last beyond the five years of drilling modeled, it is likely that positive production would result from wells drilled in 2011 and beyond, which is not captured in the analysis. Improved modeling could be made with a more thorough examination of discrete plays where potential wells could be drilled.

Drilling Capacity. The estimated 1,000 to over 3,000 additional APDs per year (about 80 percent of which result in drilled wells) in the scenario represent an increase of about 7 percent to over 25 percent of the projected drilling capacity for the Rocky Mountain region. The question arises with regard to drilling infrastructure limitations—are enough rigs available to handle the additional drilling?

Examination of recent rig capacities for the Rocky Mountain region (see Table 5 above) reveals that attempts to increase drilling may face significant constraints.¹⁵ Anecdotal evidence indicates that rig availability is tight. One operator indicates that his operations in one basin in particular are not APD-constrained, but are rig-constrained. Another operator is examining the feasibility for bringing in Chinese rigs and crews to loosen up the market in the Rocky Mountains.

¹⁴ NPV at a discount rate of 7 percent, \$2005

¹⁵ To a significant degree, the future drilling constraint depends upon what portion of future APDs are CBM related. Expansion of the rig fleet is more easily achieved for CBM wells. However CBM wells result in less production per well than other resource types.

Pipeline Capacity. A brief survey of industry trade journals indicates that interstate “out-of-region” expansions of the pipeline system have been announced amounting to about 5 BCF per day of capacity, which may be adequate to handle the increased production, assuming the growth comes largely from Federal lands.¹⁶ Fewer intra-regional expansions have been announced, which may lead to bottlenecks in gas transportation within basins.

Processing of APDs. The physical processing of the additional volume of APDs may be problematic. BLM processed about 7700 APDs in FY2005, so the scenario would represent a significant increase in BLM’s APD workload. Finding qualified staff to process the additional ADPs may represent a challenge for BLM.

Land Access. The streamlining of access to accommodate drilling is challenging. The goal is to make the lease stipulations and conditions of approval that impact drilling more efficient while not compromising environmental values. Based upon work for the EPCA Inventory, Advanced Resources believes that such a goal can be achieved, given the modest changes required. In the analysis, 2.3 years were assumed from onset to modeled impacts, which would seem to be an adequate amount of time to implement a program for increased access. However, increasing access will require interagency agreements, public hearings, and would likely face environmental opposition and require additional EISs, which might significantly slow down or impair such streamlining.

Cannibalization of Nonfederal Prospects. If industry concentrates on prospects associated with Federal lands, it may be that fewer projects occur on nonfederal lands, resulting in less of a net gain in production for the nation than the model results suggest.

4.2 *Next Steps.* Given how recently the EPCAT pilot project was established, the issues and questions raised by this provisional analysis provide logical next steps to examine the above issues more thoroughly. A longer term, ten-year assessment of the impacts could be made. In addition, the Department of the Interior has at its disposal capabilities to model possible explicit outcomes for the pilot program including targeted APD processing for high-yield prospects. Such a targeted approach could result in greater production for the nation.

¹⁶ How much of this capacity increase may represent double-counting has not been established in the analysis.