# Cook Inlet Gas Study - An Analysis for Meeting the Natural Gas Needs of Cook Inlet Utility Customers

prepared for




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**Due to the uncertainties of drilling and producing activities of operating and exploration companies and what Alaska state agencies do and do not do in influencing those activities, this study should be considered a best estimate based on current data. It was prepared using generally accepted engineering and geological predictive methods. As such, Petrotechnical Resources of Alaska can make no warranty as to actual future Cook Inlet gas drilling and production.**

**Executive Summary prepared by Cook Inlet Utilities**

ENSTAR Natural Gas Company, Chugach Electric Association, and Anchorage Municipal Light and Power (Cook Inlet Utilities) commissioned Petrotechnical Resources of Alaska (PRA) to study Cook Inlet natural gas reserves and forecast annual natural gas production. We asked PRA to estimate the cost of the development necessary to meet the immediate needs of Cook Inlet utility customers from 2010 to 2020. The PRA study includes a review of estimated reserves and deliverability of Cook Inlet gas wells drilled between 2001 and 2009, scenarios for potential development activity, a review of a December 2009 Alaska Department of Natural Resources (DNR) reserves analysis, and an analysis of when it might be necessary to rely on non-Cook Inlet natural gas sources, such as liquefied natural gas (LNG) imports or other in-state resources.

In the future, Cook Inlet utility customers should expect to pay more for the gas used by Cook Inlet Utilities to generate heat and electricity. PRA examined results from all of the gas wells drilled in Cook Inlet between 2001 and 2009 and determined that producers spent approximately $1.0 to $1.2 billion in development costs to add reserves of approximately 519 billion cubic feet (Bcf) of natural gas. If the current trends for well success rates and costs continue, producers will need to spend two to three times that amount, an estimated $1.9 to $2.8 billion, to meet projected Cook Inlet utility demand from 2010 to 2020. Producers will invest the necessary capital in future drilling activity only if they have a reasonable expectation of a return that is competitive with other investment opportunities. In order to assure continued drilling activities, increased development costs must be reflected in the market price utilities pay for the gas and ultimately pass onto their customers. Cook Inlet Utilities will also require storage services to deliver gas to their customers on the coldest days and enable producers to optimize gas production rates. The estimated cost of a storage facility is $150 to $200 million[1]. These storage costs will also be borne by utility customers.

[1] Storage cost estimates based on ENSTAR's development assessment.

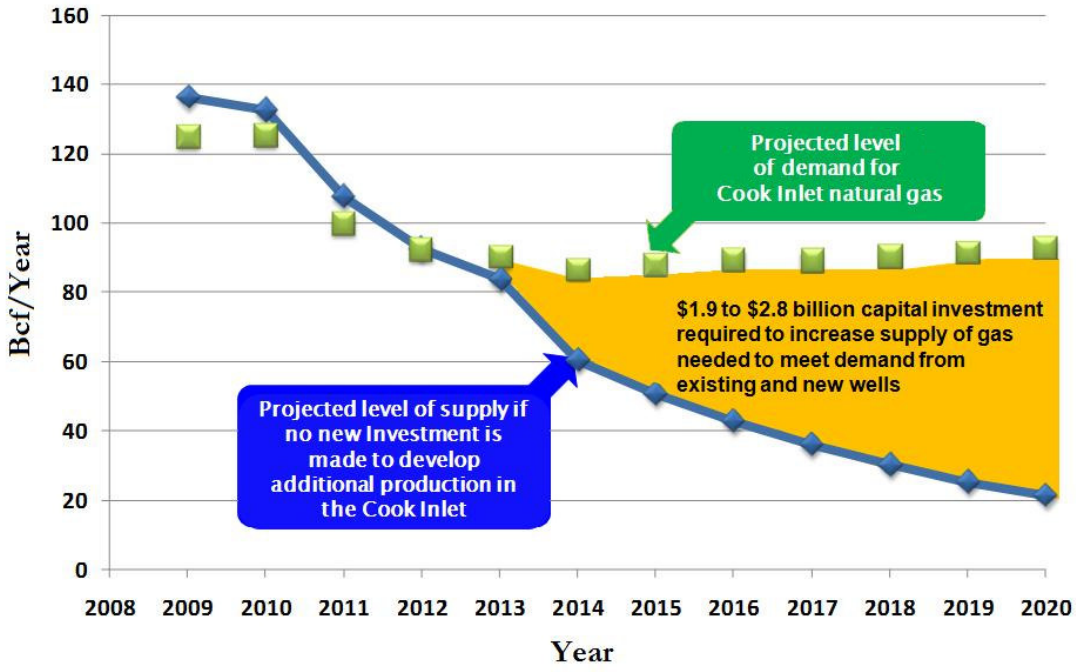


**Figure 1 – Cook Inlet Supply & Demand**

PRA used a decline curve analysis to review the same underlying data analyzed in the 2009 DNR reserves study and reached a similar conclusion regarding when the supply of gas from existing wells will not meet demand[2]. The PRA study took the next step, estimating the cost of bringing the undeveloped gas resources to market[3]. PRA determined that if significant efforts are undertaken to develop gas from the resources identified by DNR and if the current trends in drilling success rates continue, gas might be available through 2020. However, even if an aggressive development effort were undertaken immediately, that effort may fail to bring new gas to market quickly enough to provide needed gas when demand is projected to exceed supply as soon as 2013. Utilities need to plan for an alternative supply to meet their customers' needs. Having undeveloped gas resources in the ground will not enable Cook Inlet Utilities to provide heat and power to their customers. The gas resources will only be developed and brought to market at prices that incentivize the producers to justify their investment. Contracts with these higher prices will require RCA approval.

Cook Inlet Utilities need a viable option if additional Cook Inlet development does not materialize. To provide a stable gas supply, non-Cook Inlet sources such as gas delivered from the North Slope or LNG imports, are alternatives that must be pursued. The "easy" gas has been found in the challenging geology of Cook Inlet. The future costs of developing additional reserves will be substantial. As the cost of continued Cook Inlet gas production increases, alternative gas supply sources may become more economically attractive. Regulatory uncertainty has also discouraged Cook Inlet producers from exploring for and developing Cook

[2] PRA's study estimates remaining reserves of 729 Bcf from existing wells, compared with DNR's forecast of 863 Bcf of Proven Developed Producing reserves.

[3] The DNR study did not address the cost of bringing undeveloped resources to the market. (see DNR Study Figure 14 Description)

Inlet reserves[4]. In the current regulatory environment, two of the three major Cook Inlet producers have publicly stated that they intend to drill only to meet current contract obligations. Future development depends on a change in the regulatory climate to one where consistent standards are applied to approve negotiated utility gas supply agreements, even if those agreements reflect the increased costs of resource development.

The Cook Inlet market is in transition. Current gas fields are in decline and the loss of industrial customers has reduced the producers' incentives to do anything but meet existing contractual obligations. In order for utilities to be able to continue to supply current customers and to accommodate future growth, Cook Inlet Utilities and others must take action.

Immediate Actions Needed:

- New gas supply agreements between Cook Inlet Utilities and Producers must be signed to ensure continued development of Cook Inlet reserves.

- There must be predictable timelines and standards for regulatory approval of gas supply agreements. The Regulatory Commission of Alaska must be willing to approve gas supply contracts negotiated at arm's length, even if prices under those contracts increase.

- Cook Inlet Utilities must develop gas storage to assure deliverability on the coldest days and optimize gas production throughout the year.

- Cook Inlet Utilities should continue raising customer awareness, conservation efforts, and curtailment plans, to prepare for potential shortfalls.

- Additional well-capitalized exploration and development companies must commit to develop Cook Inlet and other Alaska gas reserves.

- To assure certainty of supply, Cook Inlet Utilities must determine how they will bring gas into Cook Inlet within the next five years to ensure the needs of their customers are met. Alternative gas supply sources include LNG imports and North Slope gas delivered by pipeline to south central Alaska.

- Additional regional industrial gas demand must be found to encourage the development of Cook Inlet reserves and spread the increased costs of production.

- Land management processes must be streamlined to encourage and accelerate reserve and infrastructure development.

[4] Recent favorable regulatory decisions on utility gas supply agreements may be a positive sign.

**Technical Summary**

ENSTAR Natural Gas Company, Chugach Electric Association, and Anchorage Municipal Light and Power (Cook Inlet Utilities) hired Petrotechnical Resources of Alaska (PRA) to perform a study of Cook Inlet reserves and deliverability. The components of the study included:

- Review the deliverability of Cook Inlet gas wells drilled between 2001 and 2009
- Forecast potential deliverability of future drilled gas wells
- Review Alaska Department of Natural Resources (DNR) reserves analysis
- Analyze timing of demand for a delivery of potential non-Cook Inlet gas sources, such as liquefied natural gas (LNG) imports or other in-state resources

High level findings of the study are:

Cook Inlet Well Drilling Results – 2001 to 2009

- Drivers for Cook Inlet well drilling between 2001 and 2009 included:
    - Newly executed gas contracts
    - Reserves development associated with negotiated gas contracts rejected by the RCA
    - LNG Exports and License Extensions
    - Increasing Regional Natural Gas Prices
    - Industrial Fertilizer Operations
- Results for Cook Inlet well drilling between 2001 and 2009:
    - 128 gas wells were drilled between 2001 and 2009, of which, 105 were completed with an average rate of 3.6 MMSCF/D for the first 12 months of production
        - 97 wells were permitted and drilled as Gas Development wells; 88 of these were completed as gas wells, for a 90.7% success rate
        - 31 wells were permitted and drilled as Gas Exploration wells; 18 were completed as gas wells, for a 58.1% success rate
        - An estimated 519 BCF of gas was developed by these wells
        - Ninilchik, Kenai and Deep Creek Units had the most drilling activity during this period; Ninilchik was very successful; Kenai wells were average and Deep Creek wells were marginal
        - The estimated costs for drilling and facilities of these 128 gas wells are between $1.0 and $1.2 billion

Review of DNR Analysis of Available Reserves

- The DNR completed a Cook Inlet Gas Reserves Study in December 2009
- In the DNR study, reserves and resources are systematically estimated, but as stated in the report, the timing of the development of undeveloped reserves is only an estimate as shown in DNR's Figure 14, a "Hypothetical production forecast for Cook Inlet basin showing increments of reserves and resources identified by engineering and geological analysis discussed in text."
- In the DNR study, the only firm deliverabilities are for reserves estimated by decline curve analysis and material balance. The material balance resources would be realized

through the spending of additional capital for development (Beaver Creek) or for compression (Ninilchik). Timing is determined by economic drivers.

- The DNR study forecasted 863 BCF of Proven Developed Producing reserves compared to the decline curve analysis performed by PRA forecasting 729 BCF[5] of reserves.
    - A major difference in decline curve analysis performed by PRA was apparent at Beluga River Field where the DNR study estimated 377 BCF remaining reserves and PRA estimated 207 BCF.
    - The predicted production from decline curve analysis was similar in both studies; both DNR and PRA showed decline curve analysis predictions from existing wells falling below projected demand in the 2012-2013 timeframe.
- The DNR study forecasted Additional Probable Reserves of 279 BCF based on material balance calculations, while PRA did not perform material balance calculations.
- In both studies, the four (4) Fields identified as having greatest remaining potential and selected for detailed geological analysis were: Beluga River, North Cook Inlet, Ninilchik, and McArthur River Grayling gas sands.
  Reported were:
    - Potential gas resources (from geologic analysis of 4 fields above) estimated to be 353 BCF
    - Possible gas resources of 643 BCF (50% Risked case) estimated from lower confidence pay intervals

<u>Potential of Future Gas Wells in Cook Inlet:</u>

- Drivers required for future Cook Inlet reserve development include:
    - Execution and RCA approval of gas contracts
    - Predictable timeline and standard for regulatory approval of negotiated gas pricing structures
    - Additional regional industrial gas demand, including LNG exports.
    - Additional well-capitalized exploration and development companies committed to develop Alaskan resources
    - Government action to facilitate and accelerate development of necessary infrastructure and permitting
- Challenges facing future Cook Inlet development include:
    - Possible discontinuation of LNG exports from the region
    - Reduced industrial demand (e.g., regional fertilizer manufacturing)
    - Success rates in exploration and development
    - Higher relative regional costs for exploration, development, and production
    - High level of activity in reserve development needed to meet demand
    - Probable decline in production rates from future wells in existing fields
- Minimum requirements to meet demand in Cook Inlet gas market until 2020:
    - A new source of gas, such as imported LNG or other in-state reserves, could be required as early as 2013, if ongoing drilling or drilling success does not continue at the 2007-2009 pace.

[5] 762 BCF in Report included 33.7 BCF estimated for 4 remaining 2009 Wells

- Gas storage will maximize Cook Inlet gas deliverability potential and more closely match local demand curves and production rates.
- To meet projected demand for the next decade, 185 new wells will be needed, which is a 45% increase over the number of wells drilled in the 2001-2009 period
- Development costs for this time period are estimated at $1.85 to $2.8 billion, an increase in total capital investment of 54-180%
- To incent this substantive increase in investment levels, or to bring a new source of gas to Cook Inlet, utility customers should expect to pay significantly higher gas prices

Figure 2 shows recent history and future wells estimated to meet CI gas demands through 2020. The well count assumes average well performance of 2007-2009 wells, with initial rates and developed reserves degraded by 4.3% per year.

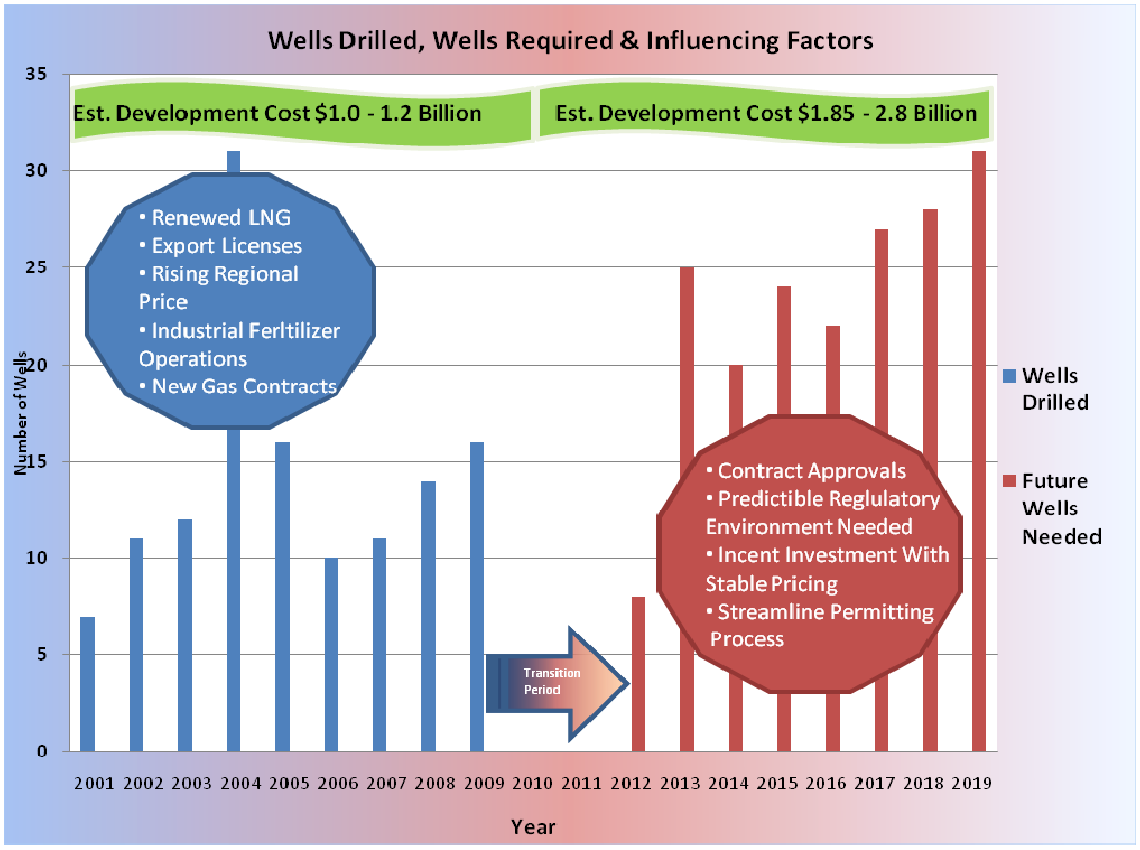


**Figure 2:Wells Drilled, Future Wells Required & Influencing Factors**