



Verification of Blue Source's Greenhouse Gas Emission Reductions for
PetroSource's Pikes Peak Geologic Carbon Sequestration Project

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1.0 Executive Summary

Blue Source is an active supplier of emission reductions (ERs) sourced from geologic sequestration, conservation, transportation, and avoidance projects and companies. More recently, the company is actively involved in financing and developing these kinds of projects. PetroSource Energy Company, hereafter referred to as “PetroSource” is an active gatherer, transporter and marketer of CO₂, and related CO₂ equivalents, sourced from industrial vent stacks for use in enhanced oil recovery (EOR) projects, a process which the Intergovernmental Panel on Climate Change (IPCC) has recognized as a method of sequestering CO₂ that would otherwise be vented to the atmosphere (IPCC 1996).

In 2004, PetroSource completed the 32-mile Sierra Madera pipeline to enable transport of CO₂ captured from the vent stack of the Pikes Peak gas plant for delivery at McCamey to EOR operators in the Permian basin. PetroSource installed over 13,000 hp of compression adjacent to the gas plant, including 9,000 hp of gas engine-driven compressors and about 4,500 hp of electric drive compressors. PetroSource also gathers vent-stack CO₂ from other gas plants (Grey Ranch, Terrell, and Mitchell) in the region and delivers those volumes to EOR operators at McCamey.

The purchasers of PetroSource’s vent-sourced CO₂ can obtain underground-sourced CO₂ from reserves at McElmo Dome where it is compressed and transported to the oil fields through the Cortez, Central Basin, and Canyon Reef Carriers (CRC) pipelines. Therefore, the use of vent-sourced CO₂ will replace an equivalent volume of underground-sourced CO₂ and also avoid emissions that would have resulted from its compression and transport.

Emission reductions from the project are documented in a protocol entitled “*Blue Source’s Greenhouse Gas Emission Reduction Protocol for PetroSource’s Capture of Vent-Stack CO₂ at Pikes Peak in Combination with Enhanced Oil Recovery Operations,*” which is the subject of this verification. This protocol was prepared according to Blue Source’s quantification protocol that was registered with ERT in January 2007.

Mr. Ronald Collings with Ruby Canyon Engineering Inc (RCE) visited the Pikes Peak plant site on December 19, 2007 to view the equipment referenced in the protocol including the electric drive compressors, the gas engine-driven compressors as well as the monitoring and metering equipment used to capture the volumetric and gas composition data. Also visited were the sites where the Sierra Madera and the Val Verde lines connect and the McCamey pump station where the custody transfer of the gas takes place.

This verification is based on data obtained from PetroSource and Blue Source. RCE obtained hardcopy records of metered gas volumes for both sold (injected) gas and fuel gas as well as records for electrical usage at the Pikes Peak and the McCamey gas transfer site. These records were used to spot check values reported in the protocol.

Estimates of baseline emissions, actual (project) emissions, and ERs were verified based on established emission estimation techniques, conservative estimates, accurate/reliable data sources, and documented methodologies.

Verification findings indicate that all significant emission sources that materially affect the ERs are included within the scope of the project. Both direct emission sources that contribute to emissions within the project boundaries and indirect emission sources that contribute to emissions outside the project boundaries were included. Applicable source characteristics (e.g., fuel flow rates, heating values, electricity usage, etc.) that contribute to emissions were considered.

Emission reduction estimates by month are consistent over the creation period. Baseline emissions that are based on metered gas volumes are consistent month-by-month. Emission factors and methodology used to calculate actual emissions are also consistent by source type.

Data collection, management, and review procedures are applied at site and corporate levels. The sources of data are documented and records appropriately maintained.

This verification report documents the carbon dioxide equivalent (CO₂e) ERs from the project between October 2004 (start of Pikes Peak operations) and September 2007 time-period. During this period, approximately 1.6 million metric tonnes (Mt) of carbon dioxide equivalent (CO₂e) ERs were created by the project. Emission reductions associated with PetroSource's operations at other facilities (i.e., Grey Ranch, Terrell, and Mitchell) are not included in this verification report.

2.0 Project Description

The Pikes Peak plant is located 18 miles south of the city of Ft. Stockton on Hwy. 385 in Pecos County, West Texas. The plant has been in operation since 1972. ROC gas took over operation of the facility in March 2002. This plant processes raw natural gas containing approximately 65% CO₂. The CO₂ must be removed to below 2% of the gas stream before sales to the local pipeline.

ROC gas uses a Selexol gas treatment process at the facility to separate CO₂ from the gas stream. Prior to implementation of the CO₂ capture project, all of the separated CO₂ was discharged to the atmosphere via the plant's CO₂ vent stack. Approximately 30 million cubic feet of CO₂ per day was vented prior to the compression and transmission project.

PetroSource completed the 32-mile Sierra Madera pipeline in 2004, connecting the Pikes Peak gas plant with the Val Verde pipeline system which transports CO₂ from other gas plant vent stack sources in the area. PetroSource installed over 13,000 hp of compression, including 9,000 hp of gas engine-driven compressors and about 4,500 hp of electric drive compressors. In October 2004, PetroSource began delivery of vent-source CO₂ from the Pikes Peak facility to the North Cross, South Cross, Sharon Ridge Canyon, SACROC, and Cogdell Unit leases. Further expansions included deliveries to the Yates Unit in Pecos County via the Pecos connector in December 2004 and to the Mid Cross Unit in

Crockett County in November 2005. The ERs were generated between October 2004 (start of Pikes Peak operations) and September 2007.

3.0 Seller's Assumptions

The main assumptions used in the protocol to calculate the ERs are listed below:

- Combustion emissions from natural gas-fired engine-driven compressors were estimated from monthly fuel consumption rates fuel composition data.
- Carbon dioxide emissions were conservatively estimated by assuming all the carbon in the fuel is converted to CO₂. Methane emissions from the combustion exhaust were calculated from AP-42 emission factors that are published by the U.S. Environmental Protection Agency (EPA).
- Electricity consumption for the facilities (i.e., compressor and pump stations, and for the pump at McCamey) were based on monthly electricity usage metered at each facility.
- Electricity usage for McElmo Dome compression was estimated at 800 kW/MMscf of gas compressed, based on previous discussions with McElmo Dome operations (CO₂) required to compress gas personnel. This value is consistent with calculation of compressor work required to compress CO₂ between Dome operating pressures of 800 psig (suction) and 2,100 psig (discharge).
- Indirect emissions from electric drive compressors and pumps used at Pikes Peak and the CO₂ pump at McCamey were based on state-specific emission factors for emissions of CO₂, CH₄, and N₂O from electric utilities that were compiled by the U.S. Energy Information Administration (EIA). Some differences in emission rates can be expected by the use of generator-specific emission factors (i.e. factors based on the mix of fuels and technologies used for electricity generation by the supplying utility). However, the effect of this change on calculated ERs is insignificant. For e.g., a 50 percent increase in the utility CO₂ emission factor results in about 0.6 percent change in calculated ERs.
- A global warming potential (GWP) of 21 for CH₄ and 310 for N₂O was used in the estimation of the total CO₂ equivalent emissions. This is consistent with current guidance from the IPCC.

4.0 Real

For the PetroSource sequestration project, the emission reduction is real because it represents an actual and recognizable action that resulted in direct reductions of CO₂ emissions, which were previously vented to the atmosphere. PetroSource purchases and secures waste CO₂ gas from the vent stacks of natural gas processing plants. PetroSource acquires the commodity CO₂ and exclusively performs the service of capturing the CO₂. The CO₂ gas is sold to crude oil producers for enhanced oil recovery, which is a recognized sequestration technology (Climate Change 1995, 1996). These same crude oil producers have viable alternative purchase opportunities of CO₂ sourced from underground CO₂ reserves, the primary source of injectant CO₂ in the Permian Basin.

To estimate baseline emissions, project emissions, and the ERs created, data obtained from PetroSource and Blue Source were verified. These included:

- monthly metered volumes of vent-sourced CO₂ gas at McCamey;
- electricity and fuel usage data for the Pikes Peak compressor stations and the McCamey pump station; and
- the composition of the sold (injected) gas and the composition of the fuel gas.

Calculations of baseline emissions, project emissions, and net ERs were verified and are based on PetroSource's 100% equity interest in the project for the creation time-period. The equity interest value is based on verbal communication. A sample calculation for April 2007 is included in the following sections.

4.1 Baseline Emissions

Baseline is defined as the volume of CO₂ equivalent emissions that would have been released from the industrial vent-stacks to the atmosphere in the absence of the project's operations. In the creation report, the baseline calculation was based on the CO₂ and methane gas volumes metered further downstream in the pipeline at the point of sale for enhanced oil recovery. The approach is appropriate as the sales meter readings already account for any CO₂ gas losses that occur within the compressor stations, the pump station, and length of upstream pipeline.

Baseline emissions also include indirect CO₂e emissions that would have occurred from electricity used to compress underground-sourced CO₂ volumes (equal to PetroSource's vent-sourced volumes) at McElmo Dome for transport to the oil fields in West Texas. These emissions are avoided in the post-project scenario but would have occurred in the absence of the project, and therefore, these emissions are included in the project baseline.

In summary, baseline emissions include the gross gas volume, which is the volume of CO₂ and methane that is sold by PetroSource for injection into the enhanced oil recovery production wells, and avoided indirect emissions from electric-drive compressors at McElmo Dome.

4.1.1 Calculation Methodology

The net emission reductions by month are calculated using the following equation:

$$\begin{aligned} \text{ERs} &= \text{Baseline Emissions} - \text{Project Emissions} \\ &= (\text{BE}) - (\text{PE}) \end{aligned} \quad (\text{Equation 4-1})$$

where:

- ER = Net emission reduction (expressed as tonnes CO₂e per month);
- BE = Baseline Emissions (tonnes CO₂e per month); and
- PE = Project emissions (tonnes CO₂e per month).

Using the schematic shown in Figure 4-1 of the project protocol, baseline emissions are calculated as,

$$BE = (GV_{PP,B} + IND_1) \quad \text{(Equation 4-2)}$$

where:

- $GV_{PP,B}$ = Gross volume of gas for the Pikes Peak baseline (calculated from equations 4-2 and 4-3 below, tonnes CO₂e); and
- IND_1 = Indirect emissions that would have occurred from electricity usage to compress underground-sourced CO₂ volume (equal to $GV_{PP,B}$) for transport from McElmo Dome to the oil fields (expressed as tonnes CO₂e);

The baseline volumes are calculated using equations 6-3 and 6-4,

$$GV_{PP,B} = PP_{frac} \times GV \quad \text{(Equation 4-3)}$$

$$\text{and } PP_{frac} = GV_{PP} / (GV_{PP} + GV_{OCS}) \quad \text{(Equation 4-4)}$$

where,

- PP_{frac} = Ratio of Pikes Peak volumes to total volumes supplied to McCamey;
- GV = Total volumes metered at sales meters at McCamey and sold for EOR (based on monthly metered volumes and converted to tonnes CO₂e);
- GV_{PP} = Gross volume of gas supplied by the Pikes Peak plant (based on monthly metered volumes); and
- GV_{OCS} = Total volume of gas supplied by other compressor stations (i.e., Mitchell, Terrell, and Grey Ranch, based on monthly metered volumes).

The approach for estimating PE takes into account losses and emissions associated with PetroSource's operations to capture, compress, and transport CO₂ to the injection wells, as defined below:

$$PE = CMB + IND_2 + IND_{3,PP} \quad \text{(Equation 4-5)}$$

where:

- CMB = Combustion emissions associated with compression of CO₂, tonnes CO₂e;
and
- IND_2 = Indirect emissions associated with electricity usage for Pikes Peak compressors, tonnes CO₂e;
- $IND_{3,PP}$ = Indirect emissions associated with electricity usage at McCamey that is associated with Pikes Peak volumes, tonnes CO₂e.

The emissions associated with combustion of natural gas to compress the CO₂ for transport is estimated based on a mass balance approach, assuming all carbon in the fuel is converted to CO₂. Methane and N₂O emissions from the combustion exhaust were based on EPA AP-42 emission factors (USEPA 2000). Calculated emissions were converted to a CO₂ equivalent (CO₂e) basis, using a Global Warming Potential (GWP) of 21 for methane and 310 for N₂O.

This approach is conservative as it assumes all carbon in the fuel is converted to CO₂ while simultaneously accounting for methane emissions in the exhaust, leading to double counting the carbon that remains in the exhaust as unburned methane.

4.1.2 Sample Calculation (April 2007)

The calculation procedures and algorithms are discussed using a detailed sample calculation for the baseline volume (GV_{PP}), avoided emissions (IND₁), project emissions (PE), and the net ERs for the month of April 2007.

The volumes supplied from the other compressor stations (GV_{OCS}) is calculated as

$$\begin{aligned} \text{GV}_{\text{OCS}} &= 761,811 \text{ (Terrell)} + 675,558 \text{ (Grey Ranch)} + 0 \text{ (Mitchell)} \\ &= 1,437,369 \text{ Mscf} \end{aligned}$$

Using Equation 4-4, the fraction of Pikes Peak volume (744,340) is calculated as,

$$\begin{aligned} \text{PP}_{\text{frac}} &= (744,340)/(744,340 + 1,437,369) \\ &= 0.34117 \end{aligned}$$

The total gas volumes metered at the custody transfer meters at McCamey (GV) were calculated as the sum of the CO₂e sales metered to South Cross, North Cross, Mid Cross, Yates (Pecos Connection), and the production leases served by the CRC pipeline. The CO₂ and CH₄ concentrations in the gas were based on measured values for each month. A GWP of 21 was used for methane.

$$\begin{aligned} \text{GV} &= (\text{Sales to South Cross} + \text{Sales to North Cross} + \text{Sales to Mid Cross}^1 \\ &\quad + \text{Sales to Yates}^1 + \text{Sales to CRC}^2) \\ &= (\text{Sales volume}) \times [\text{CO}_2 \text{ fraction} + 21 \times \text{CH}_4 \text{ fraction}] \\ &= (1,104,070 + 242,020 + 27,860 + 324,895 + 450,760) \times 10^3 \text{ scf gas} \times \\ &\quad \left(\begin{aligned} &0.9638 \frac{\text{scf CO}_2}{\text{scf gas}} \times \frac{\text{lb mole CO}_2}{379.3 \text{ scf CO}_2} \times 44 \frac{\text{lb CO}_2}{\text{lb mole CO}_2} \times \frac{\text{tonne}}{2205 \text{ lb}} + 21 \times \\ &0.0294 \frac{\text{scf CH}_4}{\text{scf gas}} \times \frac{\text{lb mole CH}_4}{379.3 \text{ scf CH}_4} \times 16 \frac{\text{lb CH}_4}{\text{lb mole CH}_4} \times \frac{\text{tonne}}{2205 \text{ lb}} \end{aligned} \right) \\ &= 134,350, \text{ tonnes CO}_2\text{e} \end{aligned}$$

Sequestered volumes associated with the Pikes Peak baseline (GV_{PP,B}) were calculated using Equation 6-3,

¹ No sales to Mid Cross and Yates Units during October 2004

² Includes sales to Sharon Ridge, Oxy Cogdell, and SACROC.

$$\begin{aligned}
 GV_{PP,B} &= 0.34117 \times 134,350 \\
 &= 45,836 \text{ tonnes CO}_2\text{e}
 \end{aligned}$$

Baseline Emissions that would have occurred if underground-sourced CO₂ were purchased from McElmo Dome rather than vent-sourced CO₂, were calculated based on the electricity required to drive the McElmo Dome compressors. Fresh CO₂ from McElmo Dome would have to be compressed to approximately 2,300 psig and transported to the EOR sites. Electric-drive compressors for these operations would require about 800 kW-hr/MMscf based on discussions with McElmo Dome operations personnel (personal communication with PetroSource personnel) and would generate indirect emissions (IND₁) at the power supplier's facility.

Indirect CO₂ emissions were based on the most recent data on average grid factor (lb CO₂/MWh generation) for the State of Colorado, which was obtained from EPA eGRID2006 Version 2.1 published in April 2007 (USEPA 2007). The factor is based on the mix of fuels and operating hours of generating capacity during 2004. Emission factors compiled by the U.S. Energy Information Administration (EIA) (USDOE, 2002) for the State of Colorado were used to calculate indirect CH₄, and N₂O. The total CO₂e emissions were calculated using a GWP of 21 for CH₄, and 310 for N₂O.

$$\begin{aligned}
 \text{IND}_1 (\text{energy}) &= 0.34117 \times (1,104,070 + 242,020 + 27,860 + 324.895 + 450,760) \text{ Mscf gas} \\
 &\quad \times \frac{0.800 \text{ kW - hr}}{\text{Mscf gas}} \times \frac{\text{MW}}{1000 \text{ kW}} \\
 &= 587 \text{ MW - hrs}
 \end{aligned}$$

$$\text{CO}_2 \text{ emissions} = 1,986 \frac{\text{lb}}{\text{MW - hr}} \times \frac{\text{tonne}}{2205 \text{ lb}} \times 587 \text{ MW - hrs} = 528 \text{ tonnes}$$

$$\text{CH}_4 \text{ emissions} = 0.0127 \frac{\text{lb}}{\text{MW - hr}} \times 587 \text{ MW - hr} \times \frac{\text{tonne}}{2205 \text{ lb}} = 0.003 \text{ tonne}$$

$$\text{N}_2\text{O emissions} = 0.0289 \frac{\text{lb}}{\text{MW - hr}} \times 587 \text{ MW - hr} \times \frac{\text{tonne}}{2205 \text{ lb}} = 0.008 \text{ tonnes}$$

$$\begin{aligned}
 \text{IND}_1 (\text{April 2007}) \text{ CO}_2\text{e} &= 528 \text{ tonnes} + (21 \times 0.003 \text{ tonnes CH}_4) \\
 &\quad + (310 \times 0.008 \text{ tonnes N}_2\text{O}) \\
 &= 531 \text{ tonnes CO}_2\text{e}
 \end{aligned}$$

Total baseline emissions were calculated using Equation 4-2,

$$\begin{aligned} \text{BE} &= 45,836 + 531 \\ &= 46,367 \text{ tonnes CO}_2\text{e} \end{aligned}$$

4.2 Project Emissions

As a result of the emission reduction projects and subsequent annual expansions to each project, direct and indirect emissions result from fuel and electricity for the compressors and pumps used to transport and inject waste CO₂ for EOR purposes. These emission leakages were estimated based on actual monthly fuel and electricity usage data obtained from PetroSource.

Combustion emissions (CMB) due to fuel usage in the engine compressors were calculated from the measured fuel consumption rates and fuel analysis data. The fuel analysis provided information on fuel composition (i.e., percentage of methane, ethane) of the fuel and fuel properties (i.e., density, heating value). The CO₂ emissions from fuel combustion were conservatively estimated by assuming that all the carbon in the fuel is converted to CO₂ during the combustion process and discharged to the atmosphere.

Based on the fuel analysis data, the moles of CO₂ emitted from the combustion of a mole of fuel was calculated for each month. An example calculation is shown in Table 4-2 for the April 2007 data.

Table 4-1: CO₂ emitted from fuel combustion for fuel used for compression at the Pikes Peak plant

Component	Mole Fraction	Mole CO ₂ /Mole Component	Mole CO ₂ in flue gas
Nitrogen	0.01517	0	0.00000
carbon dioxide	0.02726	1	0.02726
Methane	0.95693	1	0.95693
Ethane	0.00046	2	0.00092
hexane +	0.00018	6	0.00108
Total	1.00000		0.98619

4.2.1 Sample Calculation (April 2007)

The CO₂ emissions for April 2007 were then calculated as shown below:

$$\text{CMB} = (\text{Fuel usage}) \times (\text{heating value}) \times (\text{CO}_2 \text{ emitted based on the carbon balance, assuming complete combustion})$$

$$= \left[\begin{aligned} &(23,727) \text{ MMBtu} \times \frac{10^6 \text{ Btu}}{\text{MMBtu}} \times \frac{\text{scf fuel}}{967 \text{ Btu}} \times \frac{\text{lb mole fuel}}{379.3 \text{ scf fuel}} \\ &\times 0.986 \frac{\text{lb mole CO}_2}{\text{lb mole fuel}} \times 44 \frac{\text{lb CO}_2}{\text{lb mole CO}_2} \times \frac{\text{tonne}}{2205 \text{ lb}} \end{aligned} \right]$$

$$= 1,273 \text{ tonnes CO}_2$$

The CH₄ emissions were calculated from U.S. Environmental Protection Agency (EPA) AP-42 emission factors for gas-fired engines (USEPA, 2000).

For example, the CH₄ emissions from the combustion sources for April 2007 are calculated as:

$$\begin{aligned} \text{CH}_4 \text{ Emissions} &= (\text{emission factor}) \times (\text{fuel usage}) \\ &= \left[(1.45) \frac{\text{lb}}{\text{MMBtu}} \times (23,727) \text{ MMBtu} \times \frac{\text{tonne}}{2205 \text{ lb}} \right] \\ &= 15.6 \text{ tonnes CH}_4 \end{aligned}$$

Finally, the CO₂ equivalent (CO₂e) emissions for combustion sources were calculated using a GWP of 21 for methane.

$$\begin{aligned} \text{CMB (April 2007) CO}_2\text{e} &= \text{CO}_2 + (21 \times \text{CH}_4) \\ &= 1,273 + (21 \times 15.6) \\ &= 1,601 \text{ tonnes CO}_2\text{e} \end{aligned}$$

Indirect CO₂ emissions were based on the most recent data on average grid factor (lb CO₂/MWh generation) for the State of Texas, which was obtained from EPA eGRID2006 Version 2.1 published in April 2007. Emission factors compiled by the U.S. Energy Information Administration (EIA) (USDOE 2002) for the State of Texas were used to calculate indirect CH₄, and N₂O. The total CO₂e emissions were calculated using a GWP of 21 for CH₄, and 310 for N₂O. The indirect emissions represent the emissions due to the generation of electricity required to operate the Pikes Peak compressor station (IND₂) and a portion of the electricity usage at the McCamey pump station (IND_{3,PP}). These emissions were calculated from actual electricity usage data as reflected in the electric utility bills for each station

$$\text{Emissions} = (\text{emission factor}) \times (\text{electrical usage})$$

$$\begin{aligned}
\text{Electricity usage} &= \text{Electricity usage at Pikes Peak} + \text{Portion of McCamey station's} \\
&\quad \text{electricity used for Pikes Peak volumes} \\
&= 1,230,446 + 0.34117 \times 212,776 \\
&= 1,303,039 \text{ kWh}
\end{aligned}$$

$$\text{CO}_2 \text{ emissions} = 1,472 \frac{\text{lb}}{\text{MWh}} \times (1,303,039) \text{ kWh} \times \frac{\text{tonne}}{2,205 \text{ lb}} \times \frac{\text{MW}}{1,000 \text{ kW}} = 870 \text{ tonnes}$$

$$\text{CH}_4 \text{ emissions} = 0.0077 \frac{\text{lbs}}{\text{MWh}} \times (1,303,039) \text{ kWh} \times \frac{\text{tonne}}{2205 \text{ lbs}} \times \frac{\text{MW}}{1,000 \text{ kW}} = 0.0046 \text{ tonne}$$

$$\text{N}_2\text{O emissions} = 0.0146 \frac{\text{lbs}}{\text{MWh}} \times (1,303,039) \text{ kWh} \times \frac{\text{tonne}}{2205 \text{ lbs}} \times \frac{\text{MW}}{1,000 \text{ kW}} = 0.0086 \text{ tonne}$$

$$\begin{aligned}
\text{IND}_2 + \text{IND}_{\text{PP}} (\text{April 2007}) &= 870 \text{ tonnes CO}_2 + (21 \times 0.0046 \text{ tonnes CH}_4) \\
&\quad + (310 \times 0.0086 \text{ tonnes N}_2\text{O}) \\
&= 873 \text{ tonnes CO}_2\text{e}
\end{aligned}$$

Project Emissions during April 2007 were calculated using Equation 4-5,

$$\begin{aligned}
\text{PE (April 2007)} &= \text{CMB} + \text{IND}_2 + \text{IND}_{3,\text{PP}} \\
&= 1,601 + 873 \\
&= 2,474 \text{ tonnes CO}_2\text{e}
\end{aligned}$$

4.3 ERs Created

Emission reduction credits are calculated as the difference between baseline emissions and project emissions. Net ERs created by the project were obtained by multiplying the total ERs by PetroSource's equity interest in the project which happens to be 100%.

The net ER created during April 2007 were calculated using Equation 4-1,

$$\text{Net ER (April 2007)} = \text{BE} - \text{PE} = 46,367 - 2,474 = 43,893 \text{ tonnes CO}_2\text{e}$$

4.4 Summary of Findings

The methodology used in the protocol is appropriate. The calculations are correct and contain no major errors. Both direct and indirect emission sources were included. The month-by-month data are also consistent.

The net emission reduction is summed over each month of operation during the creation period, Oct. 2004 through September 2007. Table 4-2 presents the annual and total GHG

emission reductions (expressed as CO₂e) associated with the Pikes Peak project over the creation period.

Table 4-2. Baseline Emissions, Actual Emissions, and ERs by Year (tonnes CO₂e)

Month – Year	Baseline Emissions			Actual Emissions (Leakages)			Net Emission Reductions (ERs)
	Gross Volume (GV)	Avoided Emissions (IND ₁)	Total	Combustion (CMB)	Indirect (IND ₂ , IND ₃ , PP)	Total (CPL)	
2004 (Oct. - Dec.)	69,084	849	69,933	2,383	451	2,834	67,099
2005 (Jan. - Dec.)	610,161	6,910	617,071	19,014	10,844	29,858	587,213
2006 (Jan. - Jul.)	392,042	4,564	396,606	13,312	7,315	20,628	375,978
2006 (Aug – Dec.)	202,140	2,325	204,465	6,832	4,332	11,163	193,302
2007 (Jan. - Sep.)	396,550	4,581	401,131	14,348	8,151	22,498	378,633
Total (Oct. 2004 - Sep. 2007)	1,669,978	19,228	1,689,206	55,889	31,092	86,982	1,602,224

5.0 Surplus

The surplus nature of these emission reduction credits is demonstrated by a review of applicable state and federal regulations associated with oil production operations. As summarized in Table 5-1, there are no external requirements for controlling or reducing CO₂ emissions. In addition, PetroSource has no voluntary obligations for reducing or controlling CO₂ emissions.

The PetroSource facilities in this study are not subject to any federal or local regulations that require CO₂ emission reductions. Table 5-1 summarizes the regulations that were considered for this analysis. A review of the Texas Natural Resource Conservation Commission (TNRCC) files for the PetroSource facilities did not indicate that any of the facilities had committed to voluntary CO₂ emission reductions.

Although PetroSource must comply with the regulations referenced in Table 5-1, none of these regulations apply to CO₂ or other greenhouse gas emissions.

Table 5-1. Regulations Potentially Requiring CO₂ Emission Reductions for PetroSource Facilities

Agency	Rule/Citation	Applicability to PetroSource
Texas Natural Resource Conservation Commission (TNRCC)	30 TAC Chapter 111 Regulation I Control of Air Pollution from Visible Emissions and Particulate Matter	This regulation does not apply to carbon dioxide emissions.
TNRCC	30 TAC Chapter 112 Regulation II Control of Air Pollution from Sulfur Compounds	This regulation does not apply to carbon dioxide emissions.
TNRCC	30 TAC Chapter 115	According to the PetroSource Title V ^a applications,

Agency	Rule/Citation	Applicability to PetroSource
	Regulation V Control of Air Pollution from VOCs	the facilities being reviewed are not subject to this regulation because they are not located in a county that is subject to this rule. Also, this regulation does not apply to carbon dioxide emissions.
TNRCC	30 TAC Chapter 117 Regulation VII Control of Air Pollution from Nitrogen Compounds	According to the PetroSource Title V ^a applications, the facilities being reviewed are not subject to this regulation because they are not located in a county that is subject to this rule. Also, this regulation does not apply to carbon dioxide emissions.
EPA	40 CFR 60 New Source Performance Standards (NSPS)	According to the PetroSource Title V ^a applications, the facilities being reviewed are not subject to any NSPS subpart. Also, this regulation does not apply to carbon dioxide emissions.
EPA	40 CFR 61 National Emission Standards for Hazardous Air Pollutants (NESHAPS)	According to the PetroSource Title V ^a applications, the facilities being reviewed are not subject to any NESHAPS subpart. Also, this regulation does not apply to carbon dioxide emissions.
EPA	40 CFR 63 National Emission Standards for Hazardous Air Pollutants for Source Categories (NESHAPS for Source Categories)	According to the PetroSource Title V ^a applications, the facilities being reviewed are not subject to any subpart of NESHAPS for Source Category. Also, this regulation does not apply to carbon dioxide emissions.

The facility operates under Texas Commission on Environmental Quality (TCEQ) permit No. 1374A (TCEQ 2005) authorized under Title 30 Texas Administrative Code § 116.116 (30 TAC § 116.116). A review of the permit indicates that the facility is subject to specific limits for emission of criteria pollutants; however, there are no limits on CO₂, CH₄, or N₂O emissions. The facility is not subject to any external requirements or voluntary obligations for controlling or reducing CO₂, CH₄, or N₂O emissions.

Since the project is not mandated by law and is not required to control GHG emissions, the project is purely voluntary and associated ERs generated by the project are deemed to be surplus in nature.

6.0 Unique

Emission reductions from PetroSource’s sequestration activities of CO₂ from the Pikes Peak facility during the creation period of October 2004 through July 2006 have been previously registered with ERT. ERs for the August 2006 through September 2007 time period have not previously been registered or claimed.

7.0 Conclusions

A summary of the verifiable ERs created from the project is shown in Table 7-1. CO₂e emission reductions totaling 1,602,224 tonnes were created from the project. Our findings are consistent with the ER claims in the protocol.

Table 7-1. Summary of Baseline Emissions, Actual Emissions, and ERs (tonnes CO₂e)

	Oct. 2004 - Sep. 2007
Baseline Emissions	1,689,206
Project Emissions	86,982
Net ERs	1,602,224

This verification is based on data obtained from PetroSource and Blue Source. RCE obtained hardcopy records of metered gas volumes for both sold (injected) gas and fuel gas as well as records for electrical usage at the Pikes Peak and the McCamey gas transfer site. These records were used to spot check values reported in the protocol.

Estimates of baseline emissions, actual (project) emissions, and ERs were verified based on established emission estimation techniques, conservative estimates, accurate/reliable data sources, and documented methodologies.

Verification findings indicate that all significant emission sources that materially affect the ERs are included within the scope of the project. Both direct emission sources that contribute to emissions within the project boundaries and indirect emission sources that contribute to emissions outside the project boundaries were included. Applicable source characteristics (e.g., fuel flow rates, heating values, electricity usage, etc.) that contribute to emissions were considered.

8.0 Verification

I hereby warrant that this report was prepared by me based on my examination of information and records provided by PetroSource and Blue Source. The findings indicate that the ERs created from the project meet the criteria as discussed in Sections 4.0 to 7.0 of this verification report.

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