1. Goal

It is the goal of ENTERPRISE PRODUCTS COMPANY to ensure that a gas measurement program is developed, conducted and maintained to achieve established objectives and standards for measurement accuracy. Gas measurement directly impacts revenues by determining the quantity of gas for which we receive revenue for gathering, treating, processing, and transporting. To accomplish our tasks Gas measurement coordinates with other departments including commercial, engineering, operations, accounting, and regulatory affairs. Our objective is to make sure that we employ industry accepted procedures and standards thereby minimizing uncertainty in gas measurement and allowing us to verify that we can accurately account for every Btu of gas gathered, treated, processed, and transported.

Corporate policies cannot exist or be successfully deployed in an autonomous and independent manner. Accordingly, compliance and compatibility with other relevant policies and procedures must be continually reviewed and monitored. Among the most important of these are Safety; Security; Regulatory; Information Technologies, including data retention/destruction; Accounting; Legal, including contracts administration; and Human Resources. Any potential conflicts between policies and procedures should be identified and reconciled in a timely fashion.

Enterprise Products Company strives to employ policies and processes that are necessary to obtain the desired results, consistent with established goals, without incurring costs that exceed the potential benefits of the program. To that aim, our gas measurement policies and processes are presented in the sections which follow.

2. Definitions

2.1. Meter Class

Each meter shall be designated under one or more meter classes, with the most stringent policy applying to any meter that falls under multiple classes.

2.1.1. Operational Meter

An operational meter is any meter that is not used to allocate revenue or production.

2.1.2. Fuel Meter

A fuel meter may be an operational or custody meter depending upon how the fuel is being used and by whom.

2.1.3. Receipt Meter

Any meter measuring gas from one or more wells having similar ownership, and for which there is no other meter downstream shall be considered a receipt meter.

2.1.4. Check Meter

Any full measurement station metering the same gas flow as the custody meter without any significant production equipment between the two meters shall be considered a check meter.

2.1.5. Check EFM

Any Electronic Flow Meter (EFM) installed on and sensing output from the same primary element as the custody meter shall be considered a check EFM.

2.1.6. Custody Meter

Any meter from which the total volume to or from ENTERPRISE PRODUCTS is measured shall be considered a custody meter. This includes both meters operated by Enterprise Products and meters operated by a third party entity that delivers gas to or receives gas from an ENTERPRISE PRODUCTS system.

2.2. Meter Type (Primary Element)

2.2.1. Orifice

An Orifice meter shall mean any meter tube, fitting, orifice plate and adjunct equipment as described by American Gas Association (AGA) Report 3/API MPMS Chapter 14.3.

2.2.2. Ultrasonic

An ultrasonic flow meter shall mean any meter tube, fitting and adjunct equipment where the fitting is a proprietary element consisting of a pressure containing housing enclosing one or more ultrasonic transducer pairs that measure discreet velocities along defined sample paths. The meter integrates the results to indicate velocity and volume flow based on indicated velocity multiplied by the area of the meter body and subsequently produces a signal proportional to such volume flow. It shall be installed according to the manufacturer's recommendations and AGA Report 9.

2.2.3. Linear-type Meters

Other Primary measurement elements including diaphragm, rotary, or other pulse outputs shall be installed and measured per AGA Report 7.

2.3. Recorder Type (Secondary)

2.3.1. Chart Recorder

A chart recorder shall mean any electromechanical meter which records measured variables on a paper chart for further processing and volume calculations at a later date. If the paper chart is used only to make field volume determinations and is not processed, it shall be deemed a flow indicator.

2.3.2. Electronic Flow Meter (EFM)

An Electronic Flow Meter shall mean a flow computer connected to transmitters on one or more primary measurement devices to calculate and log flow information on-site for download, verification and review.

2.3.3. Other

Other measurement recording and calculation devices may be added to this policy, as needed, once they have been reviewed for acceptability and the standard has been modified to include them.

2.4. Meter Volume Categories

2.4.1. High Volume

High volume shall mean average deliveries in excess of 5,000 Mcf/day, on average, over the preceding six-month period or expected deliveries in excess of this amount for a new meter installation.

2.4.2. Intermediate Volume

Intermediate volume shall mean average deliveries in excess of 500 Mcf/day, but not in excess of 5,000 Mcf per day on average, over the preceding six-month period, or expected deliveries within of this range for a new meter installation.

2.4.3. Low Volume

Low volume shall mean average deliveries less than or equal to 500 Mcf/day, on average, over the preceding six-month period, or expected deliveries in this amount for a new meter installation.

2.5. Meter Inspection and Calibration

2.5.1. Meter Test

Meter tests include 1) inspection of the primary and secondary meter devices for proper size and operation, 2) testing and verification or calibration of the parts of the secondary devices and verification of the EFM configuration used to measure flowing parameters from which the volume and energy are determined, and 3) proper documentation of the above inspections and tests. Meter tests are performed by properly trained ENTERPRISE PRODUCTS employees or contract personnel.

2.5.2. Witness Test

Witness testing is the act of observing and participating in the meter test and inspection of measurement facilities, and the determination of those physical and chemical properties of natural gas, which may affect either its measurement or price.

2.6. Gas Quality Determinations

2.6.1. Spot Sample

A spot sample shall mean a periodic gas sample obtained, properly labeled and either sent to a lab on a timely basis or analyzed using a portable chromatograph. The analysis determines the components of the natural gas and calculates the gross properties of the gas stream.

2.6.2. Composite Sample

2.6.2.1 A composite sample is a representative gas sample obtained by utilizing a device which collects small quantities of the gas stream over a period of time or flow proportional methods. The sample is to be properly labeled and sent to a lab on a timely basis for analysis of the components and calculation of the gross properties of the gas stream.

2.6.2.2 Timed

A timed composite sample is obtained by collecting small quantities of gas at predefined time intervals where this interval is set to almost fill the sample container over the desired sampling time.

2.6.2.3 Proportional-To-Flow

A proportional-to-flow composite sample is obtained by collecting gas at pre-programmed volume intervals in order to be more representative of the aggregate gas flow over the sampling time.

2.6.3. Online Gas Chromatograph

An online gas chromatograph is a device that collects small samples of the gas stream at timed intervals for continuous on-site analysis of the components and calculation of the gross properties of the gas stream.

2.6.4. Analysis Type

2.6.4.1. Hexanes (C_6)Plus

The sample is analyzed through the pentane components utilizing an aggregate "Hexanes Plus" (C_6+) component with the C_6+ split determined by contract, regional averages, or per company or industry practice.

2.6.4.2. Nonanes Plus (C_9+)

the sample is analyzed through the nonane components utilizing an aggregate "Nonanes Plus" (C_9+) component.

2.6.4.3. Extended Analysis

The sample is analyzed through decane or heavier components. These analyses should be summarized as a standard "(C_6+)" or "(C_9+)" analysis before being used for measurement purposes.

2.6.4.4. Field Test

Special field tests conducted to analyze the gas composition for the presence of specific individual components in the gas stream. Examples of these components are: hydrogen sulfide (H_2S), oxygen ($O_{2)}$, sulfur (S_2) and water vapor.

2.7. Custody Meter Auditing

Custody Meter Auditing is a detailed process of verifying gas deliveries, on a Mcf and MMBtu basis, where calculations are performed by an outside measurement source.

2.8. Other Terms

2.8.1. Contract Day

A time period of 24 consecutive hours beginning at the time specified in the contract (contract hour) except for the days which are adjusted for Daylight Savings Time. Contract Day is typically regulated by North American Energy Standards Board (NAESB).

2.8.2. Contract Hour

The Contract Hour means the hour of the contract day on which the accounting period begins and ends. Typically this is regulated by NAESB and/or by contract.

2.8.3. Measurement Close-Out Date

Measurement Close-Out Date represents the last day that production and revenue accounting can accept finalized measurement data on a system or meter.

3. Policy Review

This Gas Measurement Policy should be regularly and thoroughly reviewed to ensure that it is still meeting the stated goals. Specifically, the Regulatory, Contract, Scheduling, and Meter Volume categories should be reviewed to determine if changes are needed to meet requirements. Regulatory and Contract review should be conducted any time there is a change to applicable regulations or in the contract. Meter Volume categories should be reviewed as needed, but no less than once every two years. Finally, the individual meters should be checked to determine if there have been changes in its Meter Class due to operational changes and/or Meter Volume category due changes in measured volumes.

Stakeholders in measurement policy include Measurement, Operations, Accounting, Contracts and Land departments, as well as Corporate Management. Each should be asked for input during the review process.

4. Regulatory and Contractual Requirements

This policy establishes minimum standards for the measurement of natural gas by Enterprise Products Company. Where specific contract or regulatory requirements exist that are more stringent than those listed in the standard policy, the more stringent requirements shall be deemed to be part of the policy and supersede the standard requirements. A copy of these special requirements shall be made available as needed in order to identify the meters covered by them. In order to facilitate this section of the policy, the measurement and quality sections of the gas contracts should be made available to the measurement department for review.

5. Test and Sample Scheduling

Indicated below is the recommended frequency for testing and sampling gas flows at each meter point by meter class and volume category. This schedule should be followed as minimum standard. Operational conditions can affect metering; therefore, if specific meters are routinely found out-of-calibration and no equipment problems exist, then they should be tested more frequently.

Gas Sample and Meter Test Scheduling

Meter Tests	**High Volume**	**Intermediate Volume**	**Low Volume**
Custody Meters (Non-Operated)	Witness each test	Witness each test	Witness at least one test per quarter or each test if tested less than quarterly
Custody Meters (Operated)	Monthly	Quarterly	Biannually
All Others	Monthly	Quarterly	Quarterly or Biannually

Primary Element Inspection	**High Volume**	**Intermediate Volume**	**Low Volume**
Custody Meters (Non-Operated)	2 years	TBD	TBD
Custody Meters (Operated)	2 years	TBD	TBD
Check Meters and EFMs	2years	TBD	TBD
All Others		TBD	TBD

Gas Sampling (Spot)	**High Volume**	**Intermediate Volume**	**Low Volume**
Custody Meters (Non-Operated)	Witness sample each test and at least once per quarter	Witness each test and at least one sample per quarter	Witness Sample each test and at least one sample Quarterly or Biannually
Custody			
All Others	Monthly	Quarterly	Quarterly or Biannually

6. Meter Inspection and Calibration /Verification

All meter inspections and calibrations/verifications should be performed by properly trained personnel and follow AGA, API Manual of Petroleum Measurement Standards (MPMS) and the manufacturer's recommendations where applicable. All Enterprise Products safety procedures shall be followed. The inspections should be properly documented and the test reports sent to the measurement department, on a timely basis, whether problems were noted or not. The frequency of these tests depends upon Meter Class and Meter Volume categorization.

6.1. Primary Element

General observations of the measurement station should be made at the time of the meter test to note any conditions such as leaks, physical damage, general housekeeping, corrosion, or other conditions which are likely to create safety, measurement or operational problems. These conditions should not only be noted on the test report, but corrective action(s) should be taken to resolve any problem. All meters should be properly sized to measure current flow rates.

6.1.1. Meter Bypass

Piping that enables gas to bypass any meter should be avoided. If operationally required, a locked and tagged valve should be in place to block the bypass when not in use. Before the bypass is used, a procedure, approved by the Measurement Department, for estimating the volume that bypasses the meter should be in place.

6.1.2. Orifice

An orifice meter test should include an orifice plate inspection or documentation explaining why the plate was not inspected. If necessary, the lease operator should be contacted so that the plate can be inspected at least once annually.

6.1.3. Ultrasonic

Manufacturers of these technologies generally supply maintenance software for the instrument which provides detailed analysis of path velocities, flow and drive asymmetry, in addition to specific performance metrics associated with the particular device. Generally speaking, removal of the meter body for servicing is unnecessary; however, transducer replacement, cleaning, or re-initialization of the transducer acoustic bond may be required.

6.1.4. Primary Element Inspection (all elements)

At a minimum, Primary Elements should be cleaned and inspected per the schedule. When possible, the elements should be cleaned more often if the routine meter tests indicate potential problems (such as fouling of the orifice plates or sensing leads).

6.2. Secondary Element

For all secondary element types, the initial calibration of all sensing elements should be verified and documented before any recalibration is performed. Thorough leak tests should be part of each inspection.

If the device is electronic and the transmitter(s) is found to be significantly out of calibration on two successive tests, the transmitter(s) should be retested within a week to determine if they are malfunctioning. If a transmitter is not malfunctioning, then consideration should be given to testing this particular meter on a more frequent basis.

The "as found" and "as left" conditions (flow parameters), the observed "as found" calibrations, and documentation of any adverse flow conditions that might affect measurement, should be documented on the meter inspection and calibration report.

6.2.1. Chart Recorder

Chart recorders should have additional tests performed to ensure the proper Pen Friction and Pen Lag (spacing). The inking system should be refilled or replaced as needed. Clock batteries should be checked and replaced, as needed.

6.2.2. Electronic Gas Meter

Electronic Gas Meters should have their configurations checked and a spot volume calculation should be performed to determine if they are indicating a representative flow rate. All meters should be configured and maintained in compliance with API MPMS Chapter 21.1.

7. Gas Quality Determination

All gas samples should be taken and processed according to Gas Processors Association (GPA) standards and API MPMS, where applicable.

7.1. Spot Sampling

Spot sampling should be performed according to the Meter Test and Sampling schedule. Sample results should be applied to all flow indicators as soon as practical. Spot samples should be applied to all meter data effective the first of the month following the month the sample is taken unless superseded by special circumstances or contract.

7.2. Composite Sampling

Composite samples should be obtained on a monthly or quarterly schedule as required. Sample results should be applied to all flow indicators as soon as practical. Composite samples should be applied to meter data according to the contract or Enterprise asset preference. Monthly samples should be taken as near to the end of the month as is practical, while allowing enough time for the sample results to be used before the measurement data has been closed. Proportional-to-flow composite samplers should be used whenever possible versus timed composite samples.

7.3. Online Gas Chromatograph

Online chromatographs should be installed and maintained according to GPA standards and API MPMS, where applicable. In addition, the calibration gas used for online chromatographs should closely match the composition of the gas being analyzed.

Results from an online chromatograph should be applied to a meter's final volume on a daily basis. Where possible, an online chromatograph should feed directly into an EFM device so that the most representative gas quality is used for the initial calculations. Where this is not possible, the online chromatograph data should be applied to the EFM at least daily.

7.4. Field Test

If these tests are conducted, they should be properly documented. The results may or may not need to be included in the analysis used for volume and energy determinations.

7.4.1. Hydrogen Sulfide (H_2S)

When the H_2S content is determined to be in excess of 100 ppm (0.01 mole %), the concentration should be noted on the sample tag for purposes of inclusion in the standard "Hexanes Plus" analysis.

7.4.2. Water Vapor/Moisture Content

Water vapor concentrations are difficult or impossible to determine by gas sampling and need to be tested in the field. Care must be taken on any field test to avoid contamination with outside air as the air often has many times the water

concentration of natural gas. Whether water vapor content should be reported on the sample tag for inclusion in the gas composition depends upon the contract's specified methodology for handling this component.

7.4.3. Oxygen (O_2)

If there is a vapor recovery system, or if the pipe upstream of the meter is operating at or near a vacuum, periodic testing for the presence of O_2 in the gas stream should be conducted to check for leaks in the upstream piping system. The presence of O_2 in the system should be documented as this may affect maintenance cycles on the piping system.

7.4.4. Other

Any other gas quality test that is performed should be judged on a case-by-case basis regarding whether the specific component should be included in the normal gas analysis. If the component is routinely present in the gas stream, the chromatography method should be changed to always test for its presence if it is possible to accurately do so.

8. Volume and Energy Determination

Orifice meter volumes should be calculated according to AGA Report 3/API MPMS 14.3 guidelines. Linear meter volumes should be calculated according to AGA Report 7. Ultrasonic meters should be installed and operated according to AGA 9 and AGA 10. Volumes based on proprietary flow elements should be calculated according to the manufacturer's recommendations. In all cases, corrections to the ideal gas laws (i.e., compressibility) should be made according to AGA Report 8 Detail methodology. All EFM volumes and calculations should be in accordance with API MPMS 21.1.

9. Data Collection

9.1. Chart Recorders

The flowing parameters should be taken so that a volume is calculated and logged by the lease operator each day he/she is on site. Charts should be pulled, properly labeled and sent in to the chart integration department or company at least once per chart rotation. Operational comments should be included when required. The charts should be pulled on the first contract day of the month. This final chart-pull may need to be delivered overnight to meet close out requirements.

9.2. Electronic Gas Meters

Electronic meters should be installed and operated according to API MPMS 21.1. Wherever practicable, communications should be installed on Electronic Gas Meters and the full measurement log downloaded at least once per day to a central site for review. Otherwise, personnel will need to be scheduled to collect the measurement logs from each Electronic Gas Meter site in the first few days following the first contract day of the month. These collections need to be made after the contract hour and in the time frame before the measurement log is overwritten, or sooner if required to meet close-out requirements.

10. Data Retention

All measurement data, including field logs, charts, measurement logs, inspection and calibration reports, and gas analyses should be retained for a minimum of six (6) years, or longer if required by contract, regulation or pending litigation.

11. Communications Between The Office and Field

Effective communication between the field and office are an essential part of an effective measurement program. It is recognized that measurement personnel are typically at a meter site only once per month. Therefore, an effective measurement policy begins with operations (Company or third party) reporting measurement problems and anomalies to the measurement department. Appropriate means must be undertaken to communicate measurement problems affecting either field measurement or custody transfer.

12. Gas Measurement Verification

ENTERPRISE PRODUCTS is committed to ensuring that we receive/give proper credit for every Btu of gas gathered, treated, processed and/or transported. The primary goal of a gas measurement verification process is to properly account for accurate quantities in the proper accounting month and reduce lost and unaccounted for gas. Therefore, every effort shall be made to notify the non-operated custody meter business party of any issues with the measurement as soon as possible so the discrepancy can be resolved before the measurement month is closed out. Any such notification should be documented to facilitate an audit finding if the discrepancy is unable to be resolved. In order to accomplish this goal, we have the following processes:

12.1. Contract Review

The measurement and gas quality sections of each gas contract are the foundation of a gas measurement verification process and should include appropriate and specific language. Provisions for meter station design; volume and energy determinations; inspection and calibration/verification requirements; adjustment specifications; sampling; auditing; and dispute resolution; etc. should be included. Where chart recorders are used for custody transfer measurement, the contract provisions should be reviewed to ensure that the language allows proper verification of the gas quantities and reasonable resolution of any resulting disputes. Where the option exists, electronic flow measurement (EFM) is preferred for the purposes of custody transfer measurement. Every effort should be made to give Enterprise Products custody measurement responsibility.

12.2. Witness Testing

Witness Testing and concurrent gas sampling is an integral part of a gas measurement verification process and a representative of ENTERPRISE PRODUCTS should be present to witness each custody meter inspection conducted by the third party except as indicated in the Scheduling Table.

12.3. Check Measurement

Check Measurement allows for the identification and resolution of most gas measurement problems. Check Meters have the ability to identify more problems than Check EFMs because they don't share the same primary element with the Custody Meter. Check Meters should be installed on all new High and Intermediate Gas Volume measurement points and existing stations should be upgraded as it becomes practical. Where it is impossible to install Check Meters, the third party should be contacted to determine if it is possible to use Check EFMs at all High and Intermediate Gas Volume measurement points. Where an Intermediate Volume transfer point becomes Low Volume, any check measurement should be kept in service to continue to monitor the gas volumes.

12.4. Check Versus Custody Verification

Where Check Measurement exists, each month the check measurement quantities should be compared to the custody measurement quantities in order to identify those stations where a custody meter audit is warranted according to the Scheduling Table.

12.5. Custody Meter Auditing

Custody meter auditing should include a review of contract information; meter inspection and calibration reports; gas analysis data; meter characteristics; meter events; meter alarms; flow data; calculation; equipment sizing; check meter data; and errors of omission or commission.

12.6. Audit Scheduling

12.6.1. Check Measurement Available

Where check meters are available, they should be used to determine when a Custody Meter Audit is required. In addition, High Volume category meters should be audited at least once per year to verify that there are no systematic errors affecting measurement that would fall under the percentage requirement for an Audit-on-Exception.

Where only Check EFMs are available, all volume category meters should be audited at least once per year.

Audit-on-Exception audits will be performed any time the monthly volume or energy on the check measurement differs from the custody measurement by a percentage in excess of that specified in the contract.

12.6.2. No Check Measurement Available

Where no check measurement is available, High Volume Sales Meters should be witnessed monthly, Intermediate Volume Sales Meters should be witnessed at least quarterly and Low Volume Sales Meters should be witnessed at least yearly. If witnessing identifies any problems, the previous month(s) should be audited to properly bracket and quantify the problem.

12.7. Dispute Resolution and Volume Reconciliation

Where an unacceptable difference is identified through the audit process, a volume adjustment request will be sent to the appropriate third party contact. This includes a description of the problem and a determination of the error in DTH and percent. Once the original measuring party acknowledges an error, a confirmation report should be sent to the accounting department. The accounting department should verify that the proper adjustment has been made.

12.8. Metering Problem Resolution

Where a problem or potential problem with the custody measurement is identified but is impossible to quantify, ENTERPRISE PRODUCTS will work with the third party to resolve the issue so that it does not continue to affect measurement. This includes equipment upgrades, if necessary, to eliminate the problem.

12.9. Reciprocity

For Check Meter points, ENTERPRISE PRODUCTS shall allow the third party to witness meter calibrations, if desired, and provide the check meter data (Charts or EFM logs), to facilitate measurement problem resolution.

For Custody Meters, ENTERPRISE PRODUCTS will cooperate with the other party to provide the necessary information and reviews to facilitate the verification of volumes and help to resolve measurement disputes.

13. Appendix

These references serve as guidelines for procedures to implement this policy and should be reviewed to see if any updates or modifications are necessary. Documents should be added to the appendix as required.

13.1. AGA Report No. 3 – *Orifice Metering of Natural Gas*

13.1.1. Part 1 – General Equations and Uncertainty Guidelines

13.1.2. Part 2 – Specification and Installation Requirements

13.1.3. Part 3 – Natural Gas Applications

13.1.4. Part 4 – Background, Development, Implementation Procedure, and Subroutine Documentation for Empirical Flange-Tapped Discharge Coefficient Equation

13.2. AGA Report No. 7 – *Measurement of Natural Gas by Turbine Meters*

13.3. AGA Report No. 8 – *Compressibility Factors of Natural Gas and Other Related Hydrocarbon Gases*

13.4. AGA Report No. 9 – *Measurement of Gas by Multipath Ultrasonic Meters*

13.5. API Manual of Petroleum Measurement Standards (MPMS) Chapter 14.1 – *Collecting and Handling of Natural Gas Samples for Custody Transfer*

13.6. API MPMS *Chapter 21.1 – Electronic Gas Measurement*

13.7. GPA Standard 2145-09 – Table of Physical Constants for Hydrocarbon and Other Compounds of Interest to the Natural Gas Industry

13.8. GPA Standard 2166-05 – *Obtaining Natural Gas Samples for Analysis By Gas Chromatography*

13.9. GPA Standard 2172-09 – *Calculation of Gross Heating Value, Relative Density, Compressibility and Theoretical Hydrocarbon Liquid Content for Natural Gas Mixtures For Custody Transfer*

13.10. GPA Standard 2161-00 – *Analysis for Natural Gas and Similar Gaseous Mixtures By Gas Chromatography*

13.11. GPA Standard 2286-95 – *Tentative Method of Extended Analysis for Natural Gas and Similar Gaseous Mixtures by Temperature Programmed Gas Chromatography*

13.12. North American Energy Standards Board (NAESB) – Please refer to NAESB.org for additional information regarding industry standards regulating contracts and accounting.