DIMP - 2016

Guidance Document for Development of a Data Integrity Management Program for Gulf of Mexico Operations

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1 General

1.1 Purpose and Objective

The federal government receives oil and gas royalties based on production volumes provided on the Oil and Gas Operations Report (OGOR). OGOR's are provided by each Operator on a monthly basis for each active lease or agreement. The Office of Natural Resources Revenue (ONRR) receives OGOR's from approximately 2,000 Operators. Federal agencies expect operators to have controls in place to ensure the production data being reported is accurate and timely. There are industry standards on measurement, allocation, and flow calculations, but there is no industry standard covering the analysis and editing of production volume data. The ONRR expressed interest in the industry developing a best practice for ensuring the accuracy of production measurement and reporting.

Production reporting is one of the responsibilities Operators have to internal management, investors, business partners and agencies that regulate our industry. It is important that companies have a data integrity management process in place to ensure the production related data reported is accurate since this data is used for revenue determination, royalty payments, reservoir management, performance reporting and regulatory reporting. Inaccurate data can have a negative impact on the company's finances and reputation. This document outlines key practices and considerations associated with the management of production related data from the measurement source through the OGOR report provided to federal agencies. An operating company should evaluate and, where relevant, implement these practices. There are a number of industry standards that provide guidance in these areas that will minimize the risk of incorrect data coming from measurement equipment. The API Committee on Production Measurement and Allocation (CPMA) has been rewriting API MPMS 20.1 – Allocation Measurement. The rewrite of 20.1 may result in additional production data assurance recommendations or requirements that should be considered once the document is published.

Production reporting begins with acquiring the raw data (e.g. volumes), then processing that data (e.g. allocations) and concludes with producing the necessary reports (e.g. OGOR). Errors at any point in this data flow that are not identified and corrected can impact the accuracy of the production data being reported. The amount of automation built into the process and the complexity of the processing steps varies with each company. Regardless of a company's specific structure, certain controls should be in place to ensure the accuracy of the data throughout the process. This document will provide an outline of process elements that begin with the data gathering equipment and end with the issuance of a production report. For each item listed, recommendations will be provided as to how the risks for that specific activity can be managed. It is up to each operator to evaluate their specific risks and what controls are necessary to provide reasonable assurance the production data being reported is correct. The data integrity management process should include elements of prevention, detection and correction. This document offers recommended procedures to achieve these goals.

1.2 Controls Overview

Internal controls have always been a key part of a company's way of doing business. With the passage of the Sarbanes-Oxley Act in 2002 with an effective date of 2006, it became a mandate for all publically traded companies. The Committee of Sponsoring Organizations' (COSO) is a national organization created back in 1985 whose goal is to provide thought leadership dealing with three interrelated subjects: enterprise risk management, **internal control** and fraud deterrence. COSO defines internal control as a process, affected by an entity's board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives relating to operations, **reporting and compliance**. COSO also defines internal controls as having five components.

1. Control Environment
2. Risk Assessment
3. Information and Communications
4. Control Activities
5. Monitoring

COSO states control activities are the actions established through policies and procedures that help ensure that management's directives to mitigate risks to the achievement of objectives are carried out. Control activities are performed at all levels of the entity, at various stages within business processes, and over the technology environment. They may be preventive or detective in nature and may encompass a range of manual and automated activities such as authorizations and approvals, verifications, reconciliations, and business performance reviews. Segregation of duties is typically built into the selection and development of control activities. Where segregation of duties is not practical, management selects and develops alternative control activities.

In the context of this document, the control framework should be designed to provide reasonable assurance the production data being reported is correct. Risks of error will exist in the initial creation of the data points that feed this process, when these data points are transferred from one repository to another and when the data is modified/processed. Typically the risk of error rises when the following conditions exist:

- Movement, modification or processing of data is manual vs. electronic
- Complexity is high
- Volume of transactions is high
- Changes are made to equipment, systems, processes or people

The following exercise can help ensure a company has the necessary controls in place. The first step is to outline the data elements and their flow from the source to the production report being issued. Using that outline, then identify the key risks that exist for the key data elements, processing steps and IT systems involved prior to populating the production report. These risks can range from equipment error, to programming error and human error. Once those risks have been noted, an evaluation should be made as to the likelihood of an occurrence and potential impact if it were to occur. Risks with a low chance of occurrence and with little impact may require little to no controls in place specific to that risk, but if the chance of occurrence is high or the impact is material, then there should be a more substantial control in place. Then document what controls are in place that focus on reducing the risks a material error might occur or a means in place to identify if it did. It is important that controls in place address both the prevention and detection of errors.

Examples of preventative controls:

- Standard documented procedures
- Training
- Electronic data transfer
- Approvals
- System security

Examples of detective controls:

- Variance analysis
- Supervisory Review
- Reconciliations
- Audits

It is important that risk and associated controls be reviewed periodically as conditions tend to change which may impact risks. These reviews can be formal internal or external audits or they may be less formal internal reviews. Changes such as implementation of a new IT system, material changes in personnel or material changes in the volume of work load can all lead to higher levels of risks in the process. The company should then review the existing controls to ensure they are still appropriate and complete given the changes identified.

1.3 Data Flow Map

Each organization performing offshore operations should develop a data flow map which depicts their data acquisition, handling, validation, and storage processes. Data flow maps vary between companies and organizations, but each should be similar to the map portrayed in figure 1, below.

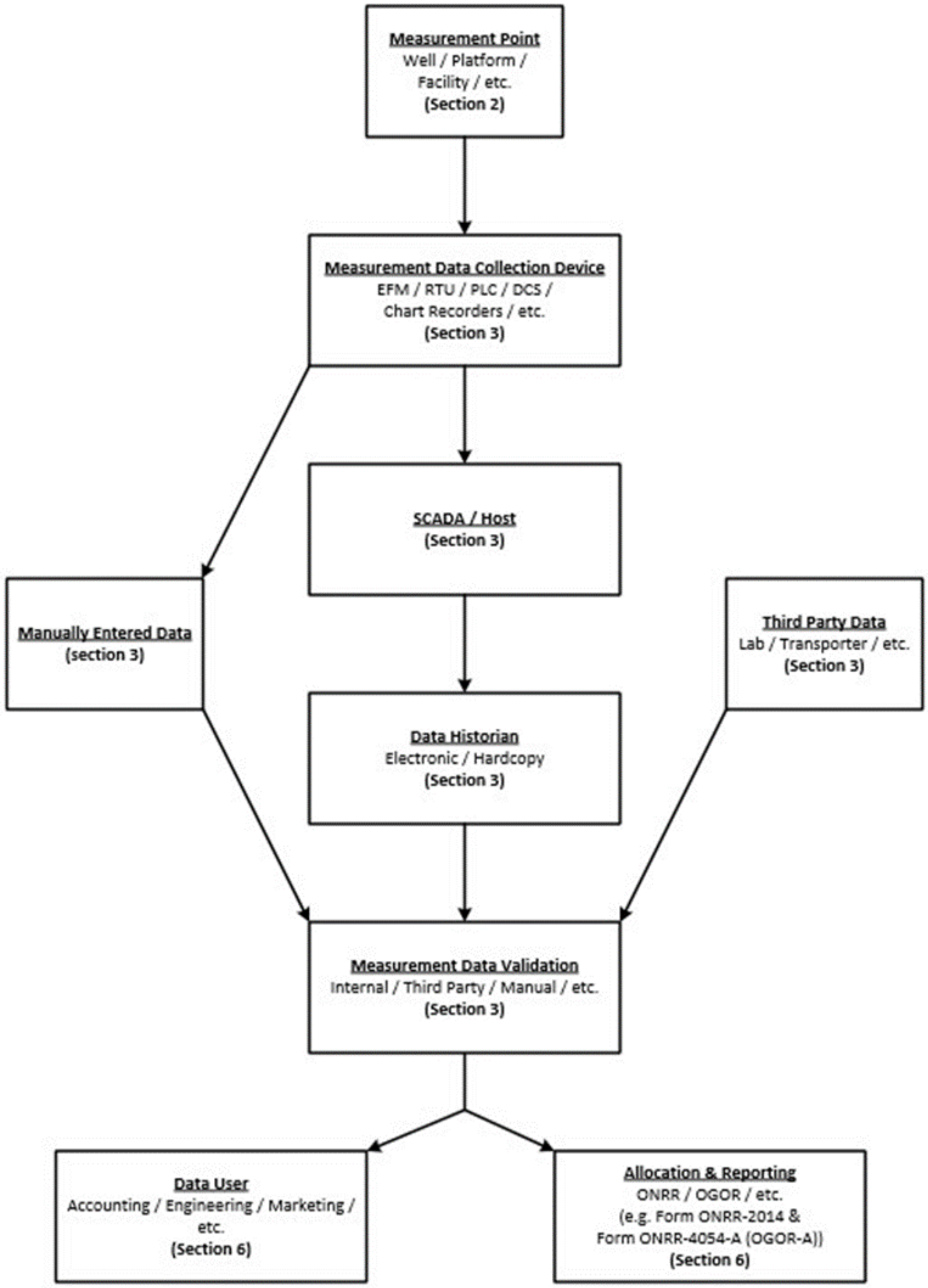

Figure 1: Data Flow Map

2 Equipment (e.g. meters, sensors, samplers, and flow computers)

There is always a risk that the output from measurement related equipment could be wrong. This risk can typically be attributed to one of the following:

- Improper application of technology
- Improper installation of equipment
- Lack of required maintenance / calibration
- Equipment malfunction

There are a number of industry standards that provide guidance in these areas that will minimize the risk of incorrect data coming from measurement equipment.

The following are the key items that should be considered when planning, installing and maintaining measurement equipment

2.1 Measurement Process Flow Diagrams (MPFD)

A measurement process flow diagram should be developed for each asset. This diagram should be a simplified process flow diagram showing the inlets, outlets, and any necessary processing equipment of the facility. It should include all major measurement equipment used in the allocation process. The Bureau of Safety and Environmental Enforcement (BSEE) surface commingling drawing or something similar should be used as the MPFD. For a platform where well test is the allocation methodology and there are no allocation BSEE Facility Measurement Points (FMP's), then a MPFD might not be required.

2.2 Adherence to Regulations, Contracts and Industry Standards

1. The regulations issued by the Department of Interior, as published in the Federal Code of Federal Regulations (CFR) that deal with measurement of oil and gas production generally reference the American Petroleum Institute's (API's) Manual of Petroleum Measurement Standards (MPMS) and other industry standards for custody transfer and allocation measurement. Unless a BSEE variance is approved, the standards should be used as the minimum requirement of a measurement and allocation system.
2. Pipeline companies vary on requirements for meter stations (oil and gas) and how producers will be in compliance with their contract/agreement. The pipeline agreement should not conflict with the BSEE requirements unless the pipeline agreement has more stringent guidelines.
3. Sampling techniques whether they are spot, composite or a Gas Chromatograph (GC) should be in accordance with applicable standards.
4. Flow computers should be verified for the correct flow measurement calculations and for compliance with API, GPA and contractual agreements. Historical data must be archived and meet audit trail requirements.
5. Chart recorders (where applicable) should be installed and maintained in accordance with applicable standards and manufacturer's recommendations. Chart integration and volume calculations should use correct parameters (e.g. static, differential, and temperature ranges) as annotated on the recorder's calibration report.

2.3 Design of Measurement System

1. Application of Correct Technology
    a. Confirm equipment is manufactured for the site specific product and if present, will tolerate abnormal products such as H_2S, paraffin, high temperature, etc.
2. Operating flow ranges should be considered along with pressures and temperatures. Take into consideration the full life cycle of the facility.
3. When choosing meters and electronics always make sure they have adequate allowances for maximum and minimum measurement flow rates/ volumes.
4. Refer to applicable standards such as manufacturer and API.

2.4 Installation

1. Ensure the equipment matches approved design.
2. Reference the appropriate facility drawing.
3. Verify the equipment matches approved BSEE surface commingling drawings.
4. Ensure the equipment is installed per manufacturer guidelines.

2.5 Operation

1. Normal Operations will be observed and verified through the data flow map in place.
2. Abnormal Operations / Process Upsets
    a. The operator should understand how an abnormal operation or a process upset might impact a measurement system. The operator should understand what options are available as a contingency when a measurement system is impacted by an abnormal operation or process upset. Any contingencies used should be documented.

2.6 Operations and Maintenance Plan

Measurement equipment should be maintained in accordance with industry standards, company specific best practices, regulatory guidelines, and manufacturer recommendations. A company should develop a means to ensure all measurement related equipment is maintained at a proper interval and is performing as designed.
One option is the use of an equipment list. A Measurement equipment list can be used as a method to track equipment that should be maintained to assure proper measurement data for the allocation process. If a list is used, then it should include all measurement equipment used in the allocation process including all BSEE FMP's listed in the BSEE meter database. All measurement equipment showed in the MPFD should be included in this list as well as any secondary devices such as temperature transmitters, pressure transmitters, flow computers, etc. that may not be shown on the MPFD.

At a minimum, the equipment list should have the type of measurement equipment, the operating range, use of the device (i.e. custody transfer, allocation, well testing, surveillance), and maintenance frequency. The list can also include additional information such as model number, serial number and other basic identification information. See table 1 for examples of equipment list elements for various types of equipment.

Table 1. Example of equipment list entries

Turbine Meters	Differential Meters	Static Pressure Transmitter	Temperature Transmitter
Tag number	Tag number	Tag number	Tag number
Pipe Size	Pipe Size	Type	Type
Pressure rating	Pressure rating	Manufacturer	Manufacturer
Type	Type	Model	Model
Manufacturer	Manufacturer	Range	Range
Model	Model	Maintenance Frequency	Maintenance Frequency
Low flow range	Low DP		
High flow range	High DP		
Article I. Nominal K-factor	Minimum beta ratio		
Linearity	Maximum beta ratio		
Repeatability	Plate thickness if applicable		
Maintenance Frequency	Maintenance Frequency		

2.7 Review Measurement Performance

The measurement equipment should be assessed periodically to verify the equipment is functioning as designed. It is important to verify if the measurement equipment is operating within its designed operating range during normal operating conditions. If the measurement equipment is operating outside of the operating range, then the operator should assess what can be done to get the equipment back into the operating range (i.e., change dump valve, change orifice plate size).

A system material balance is a way to understand the performance of the entire measurement system. The material balance should be developed using the expected range between the inflow and outflow of the system. Multiple system material balances might be developed such as sales meters to inlet separators and inlet separators to producing wells. System material balances may be developed to assess both the quantity and quality of the production. An out-of-tolerance upper and lower limit should be set for each system material balance. This is the range the Operator should work towards staying within on a daily, weekly, and/or monthly basis. The system material balance should be trended over time to get an understanding of the overall performance of the measurement systems.

3 Data

The output from measurement equipment, flow computers, manual readings, samples and other field activities is data. This data must be managed to ensure its integrity throughout the process. The raw data coming from its source is typically stored in its original form and also used to perform calculations.

3.1 Data Handling and Storage

Appropriate data handling and storage is critical for meeting contractual and regulatory obligations and ensuring the defensibility of the data produced. Each organization should develop a standard practice for the proper data acquisition, handling, and storage as follows:

1. A data handling and storage plan should include, but is not limited to the following:
    a. The source of each data point
    b. The data flow process
        i. The process should be designed to maintain and verify data integrity.
    c. Data security
        i. The process should be designed to safeguard the data from unauthorized access.
    d. Data storage
2. The data should be retained in accordance with company policy, contractual obligations, and regulatory requirements.

3.2 Data Types (volume, mass, pressure, temperature, compositions, etc.)

The available data types vary depending on the measurement device from which it is derived. Not all of the available data from a given device is required for settlement, allocation, and balancing. However, the more data that is collected and is made available, the more defensible the reported measurement will be. The following is a list of the data which might be used for validation of data quality as applicable or available for the application.

3.2.1 Differential Type Gas Meters

- Date and time or date/time identifier;
- Flow time;
- Integral value/Average extension;
- Average differential pressure;
- Average static pressure;
- Average temperature;
- Relative density (if applicable);
- Energy content (if applicable);
- Composition (if applicable).

3.2.2 Linear Type Gas Meters

- Date and time or date/time identifier;
- Quantity (volume, mass, and/or energy);
- Flow time;
- Integral value;
- Meter output (accumulation or average);

- Average static pressure (if required by meter type);
- Average temperature (if required by meter type);
- Relative density (if applicable);
- Energy content (if applicable);
- Composition (if applicable).

3.2.3 *Liquid Meters*

- Opening and closing date and time.
- Meter reading opening (*MRo*) and Meter reading closing readings (*MRc*).
- Product type identifier where multiple products are measured with a single meter.
- Meter bank identifier where there is more than one bank.
- Meter identifier.
- Meter factor (*MF*) or composite meter factor (*CMF*) and/or K-factor (*KF*).
- Average temperature correction factor (*CTL*).
- Average pressure correction factor (*CPL*).
- Observed density and temperature when a sample is used to determine density at base conditions.
- Weighted average pressure (*PWA*).
- Weighted average temperature (*TWA*).
- Weighted average density (*DWA*) or default density, at reference conditions.
- S&W or correction for S&W (*CSW*) where water or sediment exists in nonmarketable quantities.
- Net standard volume (*NSV*).
- Quantity Transaction Record (QTR) identifier (e.g., meter ticket number).
- Gross standard volume (*GSV*).
- Composition (if applicable).

3.3 EFM, PLC, and DCS Calculations and Maintenance

Quantity and quality calculations performed within electronic flow meters (EFM's), programmable logic controllers (PLC's), or distributed control systems (DCS's) shall comply with the applicable API, AGA, or GPA standards. Industry standards are revised from time to time, and so the applicable revision shall be determined by contractual agreement or regulatory requirement. If no revision is specified, the current revision as of the date of commission should be used.

EFM's, PLC's, and DCS's should be verified, calibrated, and/or maintained in accordance with the applicable API, AGA, or GPA standards and manufacturer recommendations. Verifications, calibrations, and maintenance frequencies should be determined based on contractual agreements or regulatory requirements. If no frequency is specified, each company should determine frequency based on equipment stability, volumetric flow rate, and/or accessibility.

3.4 Monitoring Phase

The monitoring phase establishes key metrics for determining when the system is operating outside of acceptable limits. Properly designed metrics provide an indication to the operational personnel when the system is out of tolerance as well as the potential source of error. Each company should perform the following as part of the monitoring phase:

1. Establish Key Performance Indicators (KPI's)

a. KPI's should be specific to each operation.
b. Potential KPI's include, but are not limited to, the following.
    i. System material balances
    ii. Compliance with sampling and measurement maintenance frequencies
    iii. Measurement equipment proving/calibration/verification results
2. Establish frequencies for each KPI.
    a. Frequencies should be based on the risk associated with each KPI and the frequency of the operation being tracked (e.g. daily or monthly).
3. Establish a plan of action for each KPI in the event it falls out of the acceptance criteria.
4. Establish a monitoring program and action plan for repairing. By generating automatic alarms when discrepancies are detected between redundant metering components, maintenance actions can be initiated by the systems themselves. Using the "Review Measurement Performance" and the "Operations and Maintenance Plan" sections of this document, a documented analysis should be developed of the expected system performance under normal operating conditions including:
5. Expected maximum deviation in material balance;
6. Expected minimum detectable measurement error for both custody transfer and allocation measurement systems.

The monitoring of flow conditions for changes can provide insight into measurement system performance. Flow conditions which can be monitored include, but are not limited to the following:

1. Volume
2. Velocity
3. Pressure
4. Temperature
5. Relative water fraction
6. Relative gas volume fraction (GVF)

Comparison with historical data can provide an indicator of when input data is outside of typical operating parameters. These input data deviations can then be assessed and efforts taken to correct input data errors before performing allocation calculations and reporting any allocation results.

3.5 Site Security

Offshore facilities are isolated due to their locations. Therefore, typical onshore site security measures are not applicable to offshore operations. Each company should have a program for vetting employees performing work at their offshore facilities.

4 IT Systems

Companies are responsible for implementing their own security measures and should have effective policies to secure and protect systems and data. These measures are to protect from unauthorized data alterations, data losses, outside interference and maintaining confidentiality.

4.1 Security

1. Security plans should be published and an important focus of management. A schedule to review privileges and roles should be part of the plan.
2. A security breach plan should address steps in the event of a security breach based on the type or impact.
3. A cyber-security plan is an important part of securing process, systems and data. Programs should be in place to educate, train and promote security plans.
4. Data backup procedures should be in place.

4.2 Disaster Recovery Business Continuity Plan (BCP)

1. Another important aspect of processes is the planning for contingencies. Operators should maintain dynamic documentation related to contingencies. A disaster recovery plan is a critical part of this item. The disaster recovery plan should be periodically tested to ensure that the plan is still relevant.
2. The plan should address system failure and backup processes.
3. Components of the BCP should include notifications and contacts and also timelines for reporting and defaults.

5 People

The path data takes from its source to the reports issued to users of the production data (e.g. management, partners, investors and ONRR) will almost always include some level of human intervention. With this human intervention come specific types of risks for error. For example, humans can introduce error into the process through simple mistakes such as transposing numbers, pulling data from the wrong source or failing to identify obvious data errors. Although it is impossible to eliminate all human error, steps should be taken to minimize the occurrence by addressing the key drivers of human introduced error.

Operators should provide adequate training to provide staff with the necessary knowledge and skills to execute tasks. There should be sufficient supervision to ensure the staff continues to perform tasks according to established procedures. Training and supervision should be in place whether performed by an employee, a contracted worker or a third party service. If an activity is out sourced for completion, the Operator is accountable for the quality of work no matter who performs the activity.

5.1 Standard Work Practices

Well documented procedures ensure activities are performed in a consistent way, over time, by all personnel. Standard procedures are extremely beneficial in a number of situations but especially when someone has to cover work on a temporary basis or during staff transitions. These procedures can take many forms from an outline of steps to full documents with pictures and examples. The key is to make them effective. Standard procedures should contain enough information on the key aspects of the task including inputs, processing and outputs that would allow someone with little knowledge to accomplish the task with minimal assistance from others. The following are some items to consider when drafting a standard work procedure:

- What data comes into the process, who provides it and when is it expected?
- Once the data is received, what processing must be completed and what tools are used?

- Once the data has been processed, who is it sent to and via what means?

These standard procedures should be centrally accessible and periodically reviewed to incorporate necessary updates or to just make improvements in the level of documentation. Standardized procedure documentation is not a onetime effort; it needs to be kept evergreen through periodic review.

5.2 Training

When new personnel are brought into the production measurement and reporting process, they should be provided sufficient training to ensure they understand the reason for the work they will be performing, how to actually perform the work (roles and responsibilities) and who they can go to with questions. Training can be in many forms such as direct one on one cross training, on the job training from other team members, formal third party provided training, online learning and self-study. There is no one right answer for how best to conduct training, but it is likely a combination of approaches. Each method has its strengths and weaknesses. For example, one on one cross training can provide the most interaction and tailored learning for the trainee but is limited by the knowledge and skills of the trainer. Formalized training can provide more assurance that all aspects are covered by a qualified trainer but can be expensive or difficult to schedule. Although there is no one right way to train, there is one common objective which is to have a person competent to execute the tasks they are assigned.

5.3 Succession Planning

Operators should also make provisions for staff changes or succession planning. The need for succession planning is highest for roles that have high complexity, unique skills or call for higher levels of specific experiences or training. In cases where there is a highly specialized technical staff, what plans are in place to develop someone to be able to take that person's place when they move out of that role? When it is known that someone in this situation will be moving out of the role, a mentoring program could be the best solution. If the loss is sudden and unexpected, the solution may have to come through a recruiting effort. For positions that are less specialized, succession planning may only need to include cross training or on the job training along with standard work procedures.

5.4 Supervision

Supervision should also be a part of an Operator's plan to manage staff and the quality of the work product they produce. It is typically the Supervisor's responsibility to ensure the elements described above such as standard procedure documents, training and succession planning are in place for their department. Another aspect of supervision is the oversight of the quality of the work product. This can be done through many activities such as key performance indicator (KPI) tracking, reviewing a sample of work output and routine performance evaluations. The level of supervision required varies from department to department as well as employee to employee based on a number of factors including experience level of staff, completeness of documented procedures, past performance and pace of change in the business. A supervisor should also be an advocate of continuous improvement. Continuous improvement will be covered in more detail under the Processes section.

6 Processes

Processes include mechanical and manual activities that utilize or manage data to produce a result. These activities include controls that are defined and, in some instances, cross department lines. It is important to ensure processes are identified and, where practical, documented so they may be utilized as a resource and provide direction for the core businesses. These processes replicate maps that provide guidance for standardization and for that reason they are critical to financial and operations impacts. Processes are what utilize and shape raw data into usable and necessary information (i.e. reports) for the business and those who have vested interests in that business. Processes are usually not the most visible aspect of business but play a critical role.

6.1 Documentation

Documentation of applicable systems is an important resource when processing data. This documentation should be accessible to staff members that work directly in the different areas. For example, a shared drive or a shared website can be used to keep the documentation. The following should be available:

- Guidelines for changes and determination of the impact of regulatory and contractual agreements. This guidance can include language from rules and regulations and it should include where to obtain additional information (e.g. online, training manuals, regulatory agencies).

- Dynamic desk procedures with periodic reviews should be incorporated as a way of ensuring any changes are documented. For example, create versions with numbers and date stamps. Another good practice would be to maintain living documents to account for changes and exceptions affecting regulatory rulings and contractual agreements.

There is a need to differentiate daily versus monthly allocations. The best approach to this would be to illustrate any common items and highlight the differences, and indicate purposes and recipients of both.

Periodic review of current processes will ensure they are still relevant and aligned with regulatory and contractual agreements.

6.2 Interfaces

System interfaces and data flow should be clearly defined and maintained. Documentation about the systems relationships and validation methodology should be clearly stated. Any changes should also be documented timely.

Sources of data either internal, external, or both should be identified. For example, if an interface depends on another party's data, there should be specific instructions related to this dependency.

Types of data, either electronic or manual, related to the interfaces should also be identified and definition of controls in place should be addressed, as well as identification of critical items (show stoppers).

Data integrity - Periodic data quality checks to ensure data is accurate. This should be included as a normal part of the interfaces documentation.

6.3 Allocation

Allocation of hydrocarbon volumes is the process in which commingled flows (Oil, Gas or Water) are proportioned back to sources of that flow. The allocation methodology is driven by Production Handling Agreements (PHA's), Regulatory Commingling Agreements or Buyback Agreements. These agreements are used in conjunction with API Standards as set forth in the Manual of Petroleum Measurement Standards Chapter 20 documents. The allocation process can range from simple single tier allocation of sales volumes to wells based on well tests or can be a very complex multi-tier allocation utilizing a mix of metered volumes, well tests, and compositional analysis as well as process simulation models. Generally, there are daily allocations performed which are estimates used by the business to perform financial accruals, track performance, manage the marketing of the oil and gas, and to report production data to partners. The month end allocation process is the official allocation which is used to record financials, produce official regulatory reporting and report production information to the market.

The risk of error in the allocation process is proportional to the complexity of the allocation methodology and the rate of change to the physical assets on which the allocation model is based. It is recommended that a periodic review be performed to ensure the allocation model is set up in compliance with the governing agreements and matches the current field structure. The frequency and method of this review should be determined based on risk, driven by the factors outlined above.

Data is gathered in many different ways manually and electronically via Run Tickets, Pipeline statements or Third Party allocation documents. Once the data has been obtained, it is used to allocate or distribute volumes according to the previously mentioned documents. These methods of allocation are used routinely to allocate, control, balance and manage ownership of hydrocarbons allocated. This information is used to split up flow into individual products and reported to corporations on a daily basis. All of this information is to be captured and stored for audit purposes based on corporate and/or governmental regulations.

6.4 Prior Period Adjustments

Prior Period Adjustments, (PPA's) are corrections for mathematical mistakes, incorrect reporting, missing data, omissions, oversights and other things that were incorrectly accounted for in a previous accounting period. PPAs should not include normal corrections or adjustments that are a result of the use of estimates that are inherent in the accounting process. This is governed and stated in paragraph 24 of Accounting Principle Board (APB) Opinion # 9. The materiality of an adjustment would be determined by the sector or intended sector of a business entity and should comply with Generally Accepted Accounting Principles (GAAP) as stated in Financial Accounting Standards No. 16.

PPA's are processed in compliance with PHA Agreements, Commingling Agreements and Federal Regulations. Processing a PPA is dictated by audit regulations as directed in the PHA or Comingling agreement. They are generally reviewed and approved of by the supervisor, manager and the interest or industry partners. When processing a PPA it is beneficial to all parties to process the adjustment as timely as possible.

The key risk associated with a PPA is that the identified error is not corrected through the entire process which ends with updated financials and updated external reporting. Companies should consider implementing measures that will help ensure identified material errors are handled through the entire process.

6.5 Management of Change

The industry should assign specific roles for the management of change process. One person should be the team leader who conducts regular meetings to make sure pertinent information is communicated to all.

Acquisition and Divestiture (A&D) is an integral part of the industry and specific roles and procedures should be clearly defined. Additionally, a central repository for pertinent documents should be set up with adequate security; for example, full access should be granted only to those employees directly related to the A&D function.

Modifications of allocation methodology may require a management of change. Allocation methodology should follow regulatory and contractual agreements. In addition, accurate representation of the physical flow should be available during the allocations systems setup process. Examples that would require a management of change are:

- Abandonment of wells
- New wells
- Communitization or Unit changes
- Equipment malfunctions
- Natural disasters affecting measurement equipment and or/ communications
- Operational changes affecting well facilities and or equipment
- Allocation methodology changes approved by all parties due to technological advances

Systems upgrades should be fully tested and validated to make sure allocations and regulatory functions continue to perform properly.

Regulatory changes should be timely addressed with directly impacted staff members. In addition, the Operators should ensure that the systems involved in the regulatory process can accommodate the changes.

6.6 Continuous Improvement

Continuous improvement is a necessary process since technology and regulatory changes occur often. Operators should incorporate guidelines to take advantage of technological advances that can improve the accuracy and timeliness of the allocation and regulatory reporting processes.

System upgrades are necessary to address the changing regulatory and contractual environment. Operators should incorporate this item into their continuous improvement plan. One important aspect is the testing of system upgrades along with the training of staff members on how to properly test and validate the upgrades.

6.7 Data Validation (QA/QC)

The purpose of data validation is to provide some level of assurance as to the accuracy of the data entering a process or system or a data point that is the result of a process.

Data validation can be either direct or indirect. A direct means requires that one knows what a data point should be and there is a step to ensure the value is as expected. This can be done when data is transferred from one system or tool to another to ensure that data point did not change or get dropped during the interface. Another example would be the action to ensure the allocated sales for a system ties back to the sales statement or sales tickets. In many cases this type of data validation can be automated such as in a system to system data interface.

Indirect data validation can be done in many ways such as by using trend analysis, system balancing, and upper and lower limits. In these cases, it is important that the person performing the validation have enough knowledge of the process and activity to be able to assess if the validation point being reviewed appears to be acceptable or not.

6.7.1 Data Correction When Errors Are Determined

If data is lost or errors outside of the acceptance criteria occur on any given measurement point then values should be determined or estimated. Methods for determining or estimating values include, but are not limited to the following:

1. By using recorded values from check measurement equipment that was accurately registering;
2. By correcting the error if the error can be ascertained by calibrations, tests, or mathematical calculations, or;
3. By estimating the values, based upon values under similar conditions during a period of time when the equipment was registering accurately.

Note – Acceptance criteria should be based on the materiality of the potential error, contractual agreement, or regulatory obligations.

7 Reporting

Reporting requirements exist for internal and external parties. These reports can be defined by regulations or contracts but can also be one off custom reports. The federal government, Office of Natural Resources Revenue (ONRR) has specific reports for production, disposition activity and also for royalties paid. These reports are in place so the ONRR can account and validate revenues and payments received for the extracted natural resources from federal lands and offshore areas.

An organization will also have many other reports that are both standard and custom designed. These reports are defined by operating agreements, shared data agreements and internal and external partners. Regardless of the content of the report or who the report is for, the report must have certain characteristics. The report should clearly communicate the intended information, meet any regulatory or contractual requirements and must be accurate. Steps should be in place to validate these elements when a new report is created or when material changes have been made to the report itself or its data source.

7.1 ONRR-OGOR

It is the responsibility of the operators to report monthly production and disposition information electronically on the Oil and Gas Operators Report (OGOR).

Detailed instructions for reporting can be found on the ONRR website. http://onrr.gov/ReportPay/Handbooks/default.htm

Monthly Allocated results for the volumes and dispositions are to be reported on the OGOR along with identifying facility and metering points. ONRR uses these references to validate the volumes reported on the OGOR through the Liquid and Gas Verification System (LVS, GVS). More information on the LVS and GVS process is located on the ONRR website. http://www.onrr.gov/ReportPay/pdfdocs/mprh/MPRH-Chapter-7.pdf

Operators are accountable for verifying the accuracy of the oil and gas volume dispositions and reported sales on the OGOR. The operator is also responsible for providing current and amended purchaser statements to BSEE. These reported OGOR volumes should reconcile to the purchaser statements (LACT tickets, and Meter volumes statements). BSEE and ONRR will collect and run comparison reports to validate and reconcile. It is the responsibility of the Operator to respond to any identified exceptions between OGOR's and the LVS and GVS reports within an expected time frame.

Operators should have a process in place to verify allocated volumes, reported OGOR's and purchaser statements and ensure all facility measurement and metering points are accurate.

Documentation is to be retained for a minimum of 7 years. Audits may require records to be maintained longer and until released by the Secretary of Interior. These documents may include all volume source documents, design documentation, prover calibration and certification, all operating and reporting procedures and subsequent revisions through a management of change process, KPI's, data map and process flow diagrams, training certifications, and requirements for archiving data.

7.2 ONRR-PASR

The Production Allocation Schedule Report (PASR) is a corroborative report. This report is filed monthly by the designated operator of a Facility Measurement Point (FMP) who handles production from a Federal lease/agreement which is commingled with production from other sources prior to measurement for royalty determination. It provides allocation information used to corroborate the accuracy of the reported production and sales volumes commingled for Federal offshore production. Additional information for completing the PASR can be found here http://onrr.gov/ReportPay/pdfdocs/mprh/MPRH-Chapter-6.pdf

7.3 ONRR-2014

Royalty reporting Form ONRR-2014 is the Report of Sales and Royalty Remittance.
ONRR's efforts to improve data accuracy from reporters have incorporated upfront system edits to validate reported data. There is also an inventory of Data Mining tools and reports to validate accuracy and compliance. Reporters should also have similar review processes to avoid reporting errors and discrepancies between the OGOR and Royalty Reports. Additional information for completing the 2014 can be found here http://onrr.gov/ReportPay/PDFDocs/ogphb3.pdf

7.4 Other Stakeholders Reporting

Operators also provide production information to partners and other third party stakeholders. Usually contractual agreements require that daily and monthly data be shared with partners. The recipients of this data use it for financial accruals, marketing, and operational decision-making purposes. Monthly data is also shared with other federal agencies.

8 Relevant Documents

The following documents are intended as reference only. Portions of select documents may be useful for the development of data quality assurance programs. The documents in their entirety may not applicable for offshore measurement and allocation operations.

Gaseous Measurement:

- AGA 3 / API MPMS 14.3 – Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids; Concentric, Square-edged Orifice Meters
- API MPMS 14.1 – Natural Gas Fluids; Collecting and Handling of Natural Gas Samples for Custody Transfer
- API MPMS 20.1 – *Production Allocation Measurement*
- API MPMS 21.1 – *Flow Measurement Using Electronic Metering Systems, electronic Gas Measurement*
- GPA 2145 – Table of Physical Properties for Hydrocarbons and Other Compounds of Interest to the Natural Gas and Natural Gas Liquids Industries
- GPA 2166 – Obtaining Natural Gas Samples for Analysis by Gas Chromatography
- GPA 2172 – Calculation of Gross Heating Value, Relative Density, Compressibility and Theoretical Hydrocarbon Liquid Content for Natural Gas Mixtures for Custody Transfer
- GPA 2261 – Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography

Liquid Measurement:

- API MPMS 3.1A – *Standard Practice for* the Manual Gauging of Petroleum and Petroleum Products
- API MPMS 3.1B – *Tank Gauging; Standard Practice for Level Measurement of Liquid hydrocarbons in Stationary Tanks by Automatic Tank Gauging*
- API MPMS 3.3 – *Tank Gauging; Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Pressurized Storage Tanks by Automatic Tank Gauging*
- API MPMS 4.2 – *Proving Systems; Displacement Provers*
- API MPMS 4.5 – *Master Meter Provers*
- API MPMS 4.8 – *Operation of Proving Systems*
- API MPMS 5.6 – *Metering; Measurement of Liquids Hydrocarbons by Coriolis Meters*
- API MPMS 6.1 – *Metering Assemblies Section 1; Lease Automatic Custody Transfer (LACT) Systems*
- API MPMS 8.2 – *Sampling; Standard Practice for Automatic Sampling of Liquid Petroleum and Petroleum Liquids*
- API MPMS 8.3 – *Standard Practice of Mixing and Handling of Liquid Samples of Petroleum and Petroleum Products*
- API MPMS 20.2 – *Production Allocation Measurement Using Single-Phase Devices*

  - (20.2 is in the ballot and revision phase at API, will be published around May 2016)
- API MPMS 21.2 – *Flow Measurement Using Electronic Metering Systems; Electronic Liquid Volume Measurement*
- GPA 2103M – *Tentative Method for the Analysis of Natural Gas Condensate Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography (modified for application)*
- GPA 2174 – *Obtaining Liquid Hydrocarbon Samples for Analysis by Gas Chromatograph*
- GPA 2198 – *Selection, Preparation, Validation, Care and Storage of Natural Gas and Natural Gas Liquids Reference Standard Blends*
- ASTM D-2001M – *Depentanization of Gasoline and Napthas, modified for product*
  - Or ASTM D-86 – *Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure*
- ASTM D-4052 – *Standard Test Method for Density and Relative Density of Liquids by Digital Density Meter*
- UOP-158 – *Molecular Weight Determination Using Freezing Point Osmometer*
- Manufacturer Recommendations – *Installation, Operation, and Maintenance*
  - Many of the relevant guidance documents state to refer to the manufacturer recommendations for specifics on Installation, Operation, and Maintenance