REPUBLIC OF TRINIDAD AND TOBAGO
MINISTRY OF ENERGY AND ENERGY INDUSTRIES

TECHNICAL GUIDANCE DOCUMENT – GD 05

VERFICATION SCHEME FOR HYDROCARBON PRODUCTION AND PROCESSING FACILITIES

STATUTORY INSTRUMENT
HEALTH, SAFETY AND ENVIRONMENTAL/MEASUREMENT DIVISION

CONTENTS

1.0 INTRODUCTION

This guidance document, GD 05, is a subset of the legal framework governing the approval of energy-based facilities with specific emphasis on hydrocarbon production and processing facilities that are either onshore or offshore.

The principles established within are universal and can be applied, if the MEEI so determine, to petrochemical, refineries, liquefaction and marketing facilities provided suitable adjustments are made accordingly.

The document outlines the Ministry of Energy and Energy Industries (MEEI) requirements for guiding the work to be performed by the Certified Verification Agent (CVA) who shall scrutinize, appraise and validate the fitness or acceptability of the proposed production and/or processing facility for approval purposes.

2.0 OBJECTIVE

In this aspect of the verification scheme, the CVA will be required to verify the adequacy of the layered protections barriers and the overall integrity associated with production and processing technologies utilized at the facility under examination.

Based on the assurances established, the MEEI is provided with relevant proof that the facility has the required characteristics and ability to cope with internal and external influences that carry the potential to impact negatively on the performance of the facility throughout its operating life and place resources, revenue earning capability of State, people, property and the environment at risk.

In achieving this objective the CVA shall evaluate the phases in the development of the facility as listed in Section 4.0 of this document, so as to ensure that risks are properly identified, evaluated and addressed for resolving concerns associated with integrity and health, safety and environmental (HSE) performance of the facility.

3.0 APPLICABILITY

This guidance document is applicable to all hydrocarbon production and processing facilities that intend operate within the territorial jurisdiction of Trinidad and Tobago and become enforceable once the MEEI rules accordingly.

The content of this guidance document is primarily intended to facilitate the approval of Class “A” type or new built facilities that handle either onshore or offshore production and processing of produced hydrocarbons. The general principles laid forth herein can be adapted and applied to the other facility classes from B to E as outlined in GD 02.

The following are examples of energy-based facility or infrastructure that will be required to conform to this guidance document.

i. Fixed land based facilities e.g. Crude import and export terminals, Slugcatcher/condensate stabilization facilities, Gas compression stations, petrochemical plants, Retail and Marketing Installation, LPG bottling plants, Liquefied Natural Gas (LNG), Gas to Liquid facilities, etc.

ii. Fixed offshore facilities e.g. offshore production/processing/compression platforms, sub-sea facilities etc.

iii. Floating systems e.g. Floating Production Storage and Offloading (FPSO) vessels, Well test barges, etc.

Based on principles established within, the State can also mandate the use of this guidance document for verifying any other facilities that fall under process type operations but not necessarily directly associated with the energy sector e.g. hydrogen plants at steel manufacturing operations that use methane as a feedstock, ethylene complex, etc.

Once ruled upon by the State, the use of this document as reference tool for verifying the non-standard downstream energy-based facilities will require certain adjustments that must be noted and addressed accordingly in the resultant verification plan.

4.0 ENGAGEMENT OF CVA SERVICES

Unless indicated otherwise, the MEEI will have full engagement of CVA services for verifying matters in the following development phases of the facility under review:

- Planning
- Design
- Manufacturing/Procurement
- Construction
- Commissioning

The engagement of the CVA services to provide requisite technical assurances in all of the areas listed above shall be guided by the MEEI concerns and requirements as per Verification Programme for GD 05.

5.0 VERIFICATION PLAN

In developing a Verification Plan to address matters required of this verification scheme, the CVA shall be guided by GD 02 which list the components as follows:

i. Elements for Verification Process – Phases or aspects of the project to be verified
ii. Matters to be appraised – Topics, themes or areas that are to be examined based on concerns or known problems.
iii. Verification Activities – Description of assessment methodologies, type of examinations, surveys, monitoring and checks to be performed
iv. Level of involvement – Description of how the CVA will prioritize its resources and time to pursue verification activities as per ranking process in DNV Risk Based Verification Standard
v. Assurance Deliverables – Expected outcomes from verification examinations or activities

Because the verification plan will serve as proof of the efforts made by the State to assess and ensure the "Fit-for-Purpose" acceptably of the facility prior to use, the CVA is reminded that the finalized Verification Plan must be submitted to MEEI for official acknowledgement before any clearance can be given for the CVA to pursue the verification assignment.

Other information to be affixed to the Verification Plan should include but not limited to scheduling program for checks or surveys, sources of information, types of verification methodologies available versus that chosen or preferred, etc.

Generally the DNV Risk Based Verification Standard should guide the determination of the CVA's level of involvement. Where continuous presence for verification checks or surveys is required at certain critical stages such witnessing of acceptance test on ESD or firewater system, the CVA shall be obligated to ensure the presence of adequate verification personnel.

The following Table 1C demonstrates an illustrative representation of a possible format and type of data that the MEEI expects in a Verification Plan. Note, the table has deliberately omitted the "level of involvement" due to space constraint.

It must be noted that if the facility under review is a fixed offshore structure, then the structural aspects will be handled by the guidance document GD 03 and hence is the subject of a separate verification plan.

However, if the facility is an onshore facility, then the verification will have to take into account all aspects of the facility which incorporates civil, mechanical, process, electrical & instrumentation, etc.

Table 1C: Illustration of a Verification Plan for an onshore facility

No	Elements of Verification Process	Matters to be appraised	Verification Activities	Assurance Deliverables
1.	Planning	a) Development concepts b) Feedstock quality c) Foundation– Geophysical and Geotechnical d) Earthquake e) Surface hydrology and Hydrogeology f) Spatial Configuration g) Environmental conditions – meteorological, oceanographic, climatic changes, etc h) Risk Assessment Report i) Fire and Explosion modeling	a) Examine soundness of preferred concepts b) Check for geological faults, unstable terrain, soil liquefaction etc. c) Check for worst case anticipated environmental conditions d) Check electrical conductivity of soil at location e) Review risk mitigation strategies f) Assess data from modeling of fire and explosion	a) Project conformance to sound industry practices b) Site is suitable where facility is to be located c) Foundation where facility is to located has load bearing capability d) Major onsite and offsite risks associated with facility's operations are properly identified and assessed e) Lessons learned throughout the evolution of the energy industry are being applied for continuous improvement f) Adaptation strategies to deal with anticipated impacts from climate change are acceptable
2.	Design	a) Design Basis and Principles b) Process system- HAZOP, P&ID's, etc c) Electrical & Instrumentation – Control system, electrical power demand and distribution, electrical hazard classification d) Mechanical equipment e) Drainage, effluent treatment and discharge f) Bunding g) Structural and foundation design - framing and supports h) Fire fighting i) Depressurization and relief- venting vs flaring j) Specifications of	a) Check calculations for rating of equipment b) Check HAZOP for completeness, correct configuration and compliance with codes c) Check calculations for power demand rating specified for cables, d) Check that earthing design is appropriate for electrical conductivity of soil at location of facility e) Check all calculations on stress analysis	a) Facility has been properly designed in conformance with best industry practices b) Design is in compliance with governing industry standards c) Applied technologies (conventional and new) are appropriateness for the anticipated service d) Facility will be capable of operating at specified limiting conditions without failing e.g. MAOP e) Provisions for corrosion prevention are adequate f) Layers of protection being built into the facility, to ensure associated risks will be controlled to a level as low as reasonably practicable, are effective and adequate. g) Materials and equipment determined for

		Materials of Construction		procurement are acceptable
No	**Elements of Verification Process**	**Matters to be appraised**	**Verification Activities**	**Assurance Deliverables**
3.	Manufacturing/ Procurement	a) Material Specification b) Quality Control for manufacturing process c) Transportation, material handling and storage d) Storage of safety critical devices e) Factory acceptance tests	a) Review purchase orders for correct specifications b) Examine manufactured vessels for defects c) Check critical orders for damages d) Witness factory acceptance tests on ordered equipment	a) Materials of Construction complies with required specifications b) Equipments have passed factory acceptance test c) Equipment ordered are free of material and workmanship defects d) Damaged equipment and materials of construction accounted for prior to construction
4.	Construction	a) Site preparation (pre-construction) b) Equipment and piping integration c) Foundation design d) Placement, alignments and orientation of equipment and packages e) Adjustments and changes to original design	a) Monitor construction works b) Check site for required elevation and gradient c) Examine records on piling to confirm required penetration resistance d) Check to ensure that equipment are properly aligned and oriented e) Participate in HAZOP exercises for changes from AFC design	a) Site is stable and capable of supporting the loads of plant equipment and packages b) Facility has been constructed to AFC plan c) Adjustments or changes to original AFC design are acceptable d) As-built facility is in compliance with agreed requirements of Development Plan e) Defects or problems encountered have been rectified and are acceptable
5.	Commissioning	a) Acceptance tests – hydrotest, function tests, etc b) Acceptance criteria c) Repairs procedures for problems encountered d) Loop checks e) As-built drawings f) Power supply reliability g) Emergency shut down (ESD) h) Labeling of equipment and pipeworks	a) Monitor commissioning activities b) Check commissioning punch list to confirm that all required test are completed c) Examine hydrotest procedures for any shortcomings d) Check controls system to ensure that it is capable of performing as intended e) Review instrumentation	a) Instrumentation and controls have been properly commissioned b) Teething problems eliminated c) Pre-start up safety review successful d) Facility satisfies performance expectations for introduction of first hydrocarbon e) ESD functional f) Fire sensor/ gas detection and alarm functional g) All equipments and systems checked as per punch list

			f) loop check register Witness test on ESD system	

6.0 VERIFICATION SCHEME

Early involvement of CVA is critical for the success of the verification scheme and hence the duty holder shall make every effort to retain the services of a CVA at the earliest possible period.

Once the services of the CVA has been confirmed, the CVA shall be responsible for verifying and documenting whether appropriate methods and procedures are prepared, approved and followed and that proper decisions have been made by the persons in authority. Any new technology or changes to standard industry practices that may be employed will also have to be appropriately analyzed.

In undertaking a verification assignment to evaluate a hydrocarbon production and processing facility "Fitness-for Purpose", the CVA shall be guided by appropriate codes and standards, which shall be listed in the submitted Verification Reports. Monitoring, checks and surveys in the verification process shall also be guided by the Verification Plan. Any new technology or changes to standard industry practices that may be employed must be appropriately analyzed.

In achieving the end deliverables, the CVA must be prepared to work concurrently with the Ministry, Contractors and duty holder in the identification of any discrepancies, deviations, flaws, damages or unacceptable conditions and ensure that the corrective action(s) or measure(s) taken are appropriate and acceptable to guarantee that the facility under evaluation can comply and fulfill its intended purpose in a safe, health conscious and environmentally responsible manner.

Regarding submission of verification reports, the MEEI will allow certain verification reports to be combined for submission purposes but the sequence of evaluation must be strictly adhered to. Combinations permitted include:

- Planning and Design
- Manufacturing/Procurement and Construction
- Commissioning

In addition to this Guidance Document GD 05, the CVA may also be guided by other pertinent Verification Standards. If reference is made to another Verification Standard other than those that have official recognition from MEEI, then the CVA will have to present the standard to MEEI for formal acceptance.

7.0 VERIFICATION PROGRAMME

In pursuing assessment of matters as per Verification Plan for submission in verification reports, the CVA shall be guided by the under mentioned concerns and requirements of the MEEI, which should be regarded as the minimum and not necessarily the only foci of interest.

a) Planning Verification

Planning is a critical stage in the development process of a facility that influences all other phases of the project. Oversights or failure to get this phase correct means that deficiencies could be carried up until the last phase or point of detection, after which decisions would have to be made to rectify the problem, which may be costly, or opt to leave alone and learn to adapt.

Based on the Ministry's experiences, this has been the source of concern encountered with project and which this section shall seek to address.

The aspects of the planning verification should cover as per minimum:

i) Evaluation of preferred technology

In determining if a proposed facility is acceptable, the CVA shall look at all pertinent Front End Engineering Design (FEED) Studies to assess the preferred and alternative development options available to the duty holder.

The CVA shall review and verify the validity of findings from FEED Studies as well as other pertinent reports that guided the planning of the facility decisions of duty holder.

ii) Environmental Design Basis

Verify that the anticipated physical environmental conditions, normal and extreme, that could induce damaging or integrity compromising forces or conditions on the facility, are a true representation of the conditions anticipated over the life of the facility.

Historical environmental data shall be weighted against projections of climatic change data to assess the need for pursuing more stringent adaptation strategies.

The CVA shall specify their source(s) of cross-referencing information used in verifying the validity or appropriateness of the historical environmental data used by the duty holder.

The United Nations' Intergovernmental Panel for Climate Change (IPCC) will be a recognized source of climate change data for referencing purposes. Use of other sources must get MEEI acceptance.

The CVA shall ensure that due planning consideration was made that can enable facilities to adapt or cope with future predictions on intensification of extremes in oceanic and atmospheric conditions.

Special consideration shall be given to the influence of extremes on the design phase in relation to elevation of facility, coastal infrastructure such as loading terminals on piers/jetties, spacing of equipment, tie down of elevated process equipment, strength of storage tanks, etc.

iii) Suitability of site location

The Site Selection Analysis must be reviewed to assess physical attributes of the intended site and should cover as per minimum:

- Soil borings surveys (wet and dry seasons)
- Geotechnical data and interpretation
- Seismic data and interpretation
- Surface Hydrology and Hydrogeology data
- Coastal studies

In this aspect of the verification exercise the CVA should seek to establish assurance that the foundation at selected site is stable, free of fault and has the required load bearing capacity or can be made to achieve desired load bearing capacity with appropriate foundation works.

The CVA shall assess alternative sites in relation to the preferred site.

iv) Life cycle forecasting

The CVA shall review forecasting studies, which attempts to trends of anthropogenic and industrial growth and development needs around intended facility. These studies shall be superimposed on Risk Assessment studies to determine changes or variances in risk levels of life of facility and assess life cycle strategies to deal with the issues, such as:

- Maximum inventory of hydrocarbon or chemical products that can be stored at site.
- Safety setback distances
- Emergency routes
- Firewater utility demand from offsite sources
- Etc.

v) Spatial Configuration

The CVA shall review proposal for layout of spatial configuration of the facility to assess acceptability of preferred option.

Assessment of spatial configuration shall be guided by the results of studies on certain failure modes inclusive of but not limited to:

- Fire and explosion modeling and field experiments, where applicable
- Flare radiation analysis
- Blow down scenarios associated with dense vapors and liquid carry
- Air dispersion modeling on propagation of toxic gases or substances
- Impacts from drop objects

The CVA shall weight the results of these studies against the emergence response provisions to determine acceptability of spatial configuration of facility.

Lessons learned throughout the evolution of the energy industry as well as recommended practices from research studies should be cited.

vi) Historical review

In evaluating the planning phase the CVA shall conduct a holistic assessment of performance of the facility under review with the intention to uncover associated problems and lessons learned from a global perspective so as to ensure that the duty holder has been properly apprised of any concerns.

The CVA shall also examine the files on similar assets to ensure that problems unique to Trinidad and Tobago are being addressed.

vii) Challenges to project

Every project will have unique challenges that must be addressed when planning for the facility. Proposed solutions to deal with challenges must be evaluated to determine acceptability.

viii) New Technology

In keeping with advancement in the energy sector, the duty holder may pursue the use of new technologies in preference to the conventional technologies for economic and operational reasons.

The CVA will be required to evaluate any new technology or trade secrets with specific emphasis on its limitations and HSE performance capabilities of the technology under evaluation.

b) Design Verification

In evaluating design calculations and analyses, every check should be separate from the original calculation, not necessarily using a different method unless determined otherwise.

In verification of the design, the CVA shall ensure the results from planning studies are incorporated into the design of the facility.

In addition, the CVA will be required to assess the following:

a) Design Basis

The design principles are soundly based and are in compliance with stipulated planning requirements as well as the applicable laws, codes and standards. The design principles shall be evaluated to ensure that the intent of managing risks for protecting people, property and the environment has not been compromised.

b) Design Assumptions

Designers took into account all pertinent factors in designing the facility, and that assumptions at the different life cycle stages (early, mature and end-of-life) of the facility are soundly based.

c) Design Limitations

Design limitations are clearly defined and the design results never exceeded the specified tolerances or limitations e.g. Maximum Allowable Working Pressure, etc.

d) Transient and Abnormal Conditions

Critical areas of concern identified in the HAZOP studies have been appropriately addressed, and includes transients and abnormal conditions.

- Transients conditions e.g. cold start-up, emergency shut down, hammer effects, Joule Thomsen effect, surge, slugging, thermal expansion, etc.
- Abnormal Conditions e.g. pressure, temperature and flow rate outside normal operating limits

e) Compliance with Codes and Standards

The result of design analyses, process simulations and calculations are correct, appropriate and conform to good engineering practice.

f) Process Operating conditions

Rating of all process equipment inclusive of but not limited to pressure vessels, piping, rotating machinery, heat exchangers, instrumentation and supporting infrastructure are suitable for the anticipated design loads as well as combined loading conditions and accidental loads. The determination of acceptability of the rating should be weighted against the functional purpose, capacity, strength, resistance to corrosion and thermal stresses, protections devices built into the system, etc.

g) Equipment and pipe works compatibility

Interface between mechanical, electrical and instrumentation controls are compatible i.e. no weak links.

h) Safety Critical Elements

Components that constitute safety critical elements on systems controlling emergency shut down (ESD), blow-down or relief, overflow, over-pressure protection, fail-safe valves, fire suppression, emergency power, air intake, over speed, vibration monitoring, …etc. are acceptable for use and service intended.

CVA shall ensure that equipment with high failure probabilities are not assigned in safety critical functions and located to minimize the consequence of failure.

i) Control systems

Assessment shall be made of design of the control system to ensure that the logic and redundancies are workable and capable of safe operation on the facility.

Where remote control in required for normally unmanned installations (NUI), the CVA shall evaluated the acceptability of Supervisory Control and Data Acquisition (SCADA) system.

j) Place of Safe Refuge

Control room or any other building class as a safe refuge such that the wall, roof, doors, windows subjected to explosive forces and high temperature effects such as fires, are properly designed with sufficient residence time to ensure survival of occupants until evacuation is possible.

Aspects of the design to be scrutinized shall include but not limited to the following:

i. Process equipment– production, separation, treatment and disposal
ii. Process Piping – piping supports, accessibility for maintenance and integrity management checks, etc.
iii. Utility systems – chemical injection, hydraulics/pneumatics, etc.
iv. Emergency shut down – subsurface safety valves, ESD stations, etc.

v. Emergency depressurization and relief – blow down piping configuration, vent, flare radiation zones, etc
vi. Import and export risers
vii. Electrical system - power generation, supply & distribution, MCC,
viii. Instrumentation and Control System- loop s and redundancies
ix. Mechanical Equipment – cranes, pumps,
x. Foundation and Structures – pipe supports, matting,
xi. Storage Tanks and bunding
xii. Drainage – storm water, effluent holding tanks
xiii. Control Room – HVAC, MCC room,
xiv. Control systems and software – pneumatic, PLC, DCS, SCADA
xv. Fire fighting provisions – fireproofing, deluge, monitors,
xvi. Rotating machinery – mechanical seals, vibration sensors, over speed
xvii. Earthing and lightning protection systems

c) Manufacturing and Procurement Verification

Manufacturing and Procurement Verification shall relate to the acceptability of systems or components ordered from an external agent, supplier or manufacturer. Acceptance of procured components or packages shall be judged upon the following minimum criteria:

i. Functionality - Ability of system to achieve stated objectives
ii. Reliability – Percentage of time the system will work without failing
iii. Redundancy – Back up or alternative resources to cater for situations where system is vulnerable to damaging forces
iv. Availability – Percentage of time the system will be required to operate on demand
v. Survivability – Ability of system to perform even after being subject to damaging forces or integrity compromising conditions
vi. Fail Safe – Ability of a system or one of its components to go into a safest mode on failure of the system

In this verification phase the CVA shall ensure that:

a) Manufacturers have a proven QA/QC system as demonstrated by the necessary production, assembly and test facilities, qualifications, procedures and competent personnel to guarantee that the ordered system can be manufactured to specified requirements.

b) Systems or equipment with known or suspect track record of high failure probabilities are avoided.

c) Equipment or systems ordered through purchase request satisfies the specifications, developed in the design phase, to fulfill the required performance expectations.

d) Metallurgic properties and characteristics of procured material conform to the design specifications.

e) The methods of packaging, transshipment, offloading, and conveyance to holding site(s) do not cause integrity compromising damages to the ordered equipment.

f) Procedures are in place for registering suspect integrity compromising damages and having project managers properly informed.

g) Repair works follow manufactures recommended guidelines to make salvaged equipment acceptable for use.

h) Equipment are marked, labeled and certified for traceability

i) Factory acceptance tests were executed in the prescribed manner.

Means of assessing acceptability of proprietary or sealed systems should be documented by the CVA.

In manufacturing specific equipment or systems, the manufacturers may wish to recommend changes for improvements or to facilitate efficiency in manufacturing processes. In such cases, the CVA shall ensure that the proposed recommendation do not compromise desired integrity and HSE performance expectations of the ordered equipment or system.

d) Construction Verification

The purpose of the construction verification is primarily to monitor the construction activities of the project to ensure that the facility is built in accordance with the approved design plans, specifications and procedures with minimal deviations that would not compromise the stated purpose.

The CVA shall be responsible for verifying that appropriate methods and procedures for construction and integration of equipment are prepared, approved and followed and that proper documentation control has being maintained.

Construction of a facility incorporates multiple activities, which start with the issued Approved-for-Constructions (AFC) drawings and end with mechanical, civil, electrical completion of the intended facility. Some of these activities are metrology surveys, preparation of project site(s), foundation stabilization, erection of buildings and steel structures, preparation of pipe works, installation and integration of piping and equipment, non-destructive testing (NDT), creation on roadways and drainage, etc.

In construction verification, the CVA shall ensure the following:

a) Materials of construction and concrete are properly set to establish suitable skid mounts for plant equipment.

b) Competent persons continuously supervise all construction work in development of the final facility

c) Process equipments, electrical devices and instrumentation controls are placed in their correct location and orientation.

d) Cold bending, joining, alignment and erection procedures do not stress pipe works beyond desired limits

e) Competent persons are assigned to perform inspections and non-destructive testing (NDT).

f) Certified heavy machinery are used at the construction site to eliminate damages to facility under construction.

g) Tolerances, alignment and dimensional checks are acceptable

h) Correct installation of corrosion protection systems

i) Update to design drawings to reflect final as-built facility

The information for vetting will include but is not limited to the following: -

(1) Specifications of materials of construction e.g. concrete, steel, etc

(2) Quality assurance and quality control procedures of contractors.

(3) Welder and welding procedure qualification, documentation and identification.

(4) Inspection and Non-destructive Testing (NDT) requirements, documentation procedures and evaluation of results.

(5) Completion Certificates

(6) Destructive testing requirements and results on weld samples.

(7) Repair procedures.

(8) Document control and record keeping.

The construction verification activities will require periodic surveys by the CVA and the schedule of these visits shall be determined in consultation with the Ministry.

e) Commissioning Verification

Commissioning is the final phase of the project that seeks to establish confirmation that the facility can function as intended.

In commissioning verification the CVA shall

- Review the commissioning program to ensure that it satisfies legal and performance requirements.

- Witness commissioning tests and review the results to ensure that acceptance criteria are being met

Should there be any deviations or problems with the facility's ability to satisfy performance expectations, then the CVA shall be responsible for evaluating the cause and notifying the Ministry via interim status reports based on the seriousness of the situation.

If the cause is a localized issue (e.g. flange leak) that can be rectified, then the CVA shall note the actions taken by the commissioning team to rectifying the situation prior to reconvening the test. However, if the cause is attributed to a significant issue (e.g. leaking isolation valve), then the CVA shall appraise repair procedures and methodologies to be employed and advise the Ministry accordingly.

Other commissioning verification matters shall include but is not limited to: -

1) Assessment of equipment used in the commissioning program. Checks on certification records for determining whether gauges for sensing test parameters are acceptable.

2) Review of repair procedures, technology and methodology.

In facilitating the introduction of first gas via provisional approval from MEEI, the CVA shall advise the MEEI of any unacceptable conditions.

Following the introduction of first gas into facility, the CVA shall witness the start up and performance of the facility to be reassured it is capable of performing as intended. The period to witness this activity will be determined by the Verification Plan after which the final verification report can be issued.

8.0 TERMS AND DEFINITIONS

a) "Approval" refers to an official authorization granted by MEEI that confirms acceptability of an energy-based facility for conducting operational activities in the territorial jurisdiction of Trinidad and Tobago.

b) "Facility" or "Energy-based Facility" refers to any infrastructure whether individual or collective assemblage of systems and components used in the production, transportation, processing, storage, and marketing of hydrocarbons resources and its derivatives e.g. fixed offshore platform, refinery or petrochemical plant, sub-sea pipeline, floating production storage and offloading, etc.

c) "Fit-for-Purpose" shall relate to verifying that all related hardware and software systems and components that constitute the facility were properly designed, built, integrated together and tested for acceptance to ensure that the final facility is capable of delivering the required performance expectations.

d) "Operational Preparedness" shall relate to verifying that the status of the elements of the management system for facilitating proper human interface and control of the facility.

e) "Features" shall relate to aspects of the facility that form an integral part or influence in the process stream e.g. ESD, pig launcher and receiver, depressurization and relief, gas detection, etc.

f) "Provisions" shall relate to aspects of the facility that are necessary for supporting loss prevention and control, and operational activities but do not directly influence the integrity or operability of the facility's process stream e.g. pedestal cranes, fire tenders, setback distances, escape routes, safe refuge areas, explosion barriers etc.

g) "Integrity" shall relate to the ability of an engineered system to resist failure by having the required mechanical, civil and electrical performance characteristics to cope with anticipated opposing forces, transients or performance compromising situations or conditions.

9.0 REFERENCES

Recognized verification standards that support this verification scheme are:

1) Det Norske Veritas (DNV) Offshore Service Specification: DNV-OSS-300, Risk Based Verfication

2) Det Norske Veritas (DNV) Offshore Standard: DNV-OSS-E201, Hydrocarbon Production Plant, October 2000

3) Det Norske Veritas (DNV) Offshore Standard: DNV-OSS-307, Verification of Process Facilities, June 2004

4) Det Norske Veritas (DNV) Offshore Standard: DNV-OSS-306, Verification of Subsea Facilities, 2004

5) Det Norske Veritas (DNV) Offshore Standard: DNV-OSS-E201, Verification, Certification and Classification of Gas Export and Receiving Terminals

10.0 QUERIES

Queries on this guidance document can be forwarded to Office of Chief Mechanical Engineer, Health, Safety and Environmental/Measurement Division, who has the responsibility for formulating and managing implementation of this guidance document.

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11.0 ENFORCEMENT

Version: GD 05

Dated: July 2006

This version of the verification scheme supersedes last enforced version and takes legal effect from July 2006, and is applicable to all fixed onshore and offshore energy-based establishments under the jurisdiction of the MEEI.

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