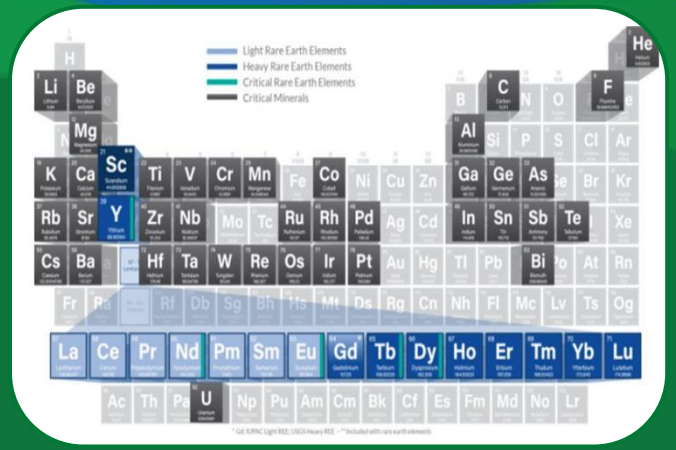
U.S. DEPARTMENT OF ENERGY
Fossil Energy and Carbon Management

U.S. DOE Webinar
Greenhouse Gas Supply Chain Emissions Measurement, Monitoring, Reporting and Verification Framework

October 11, 2024



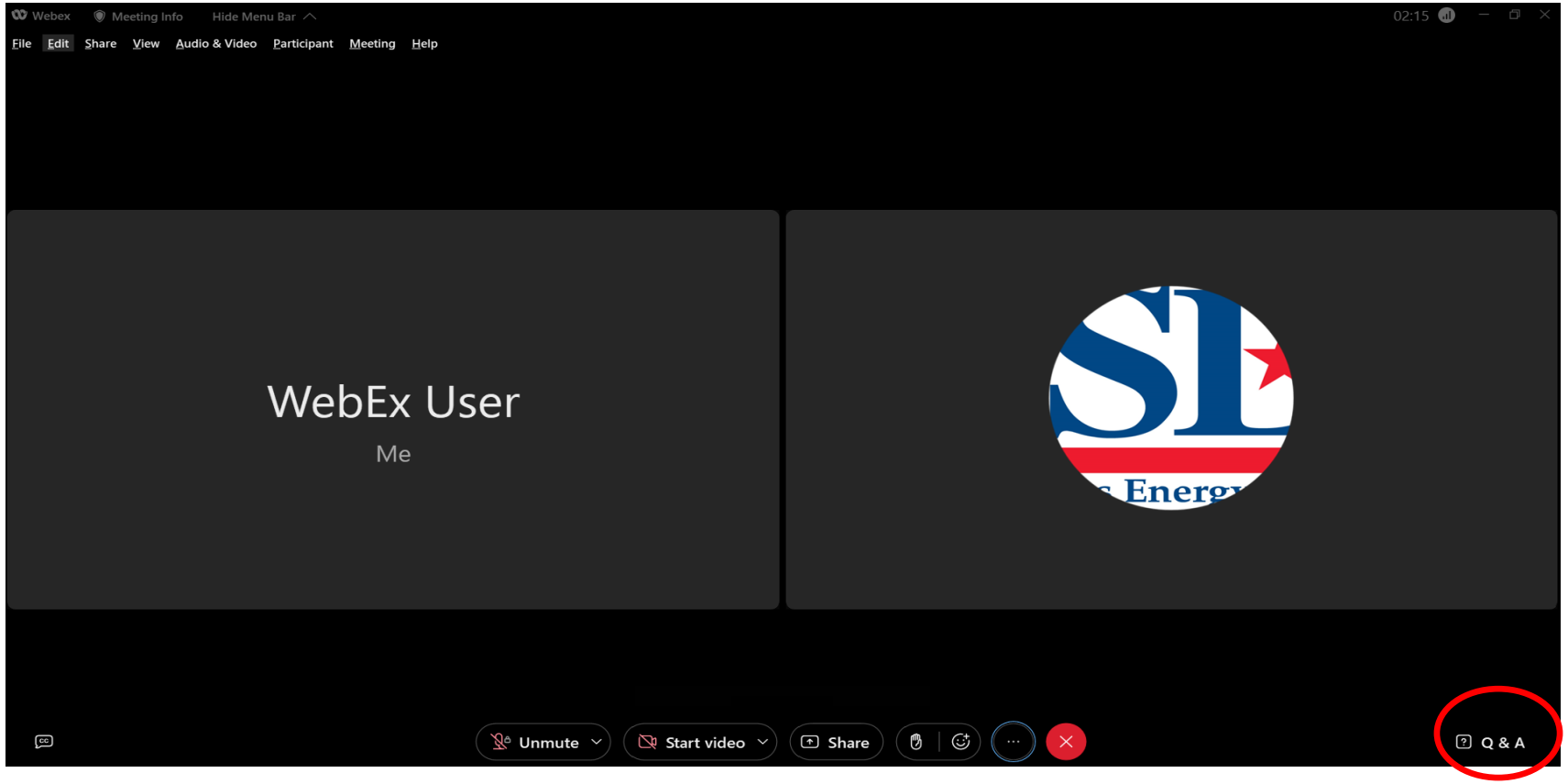


Logistics

- The webinar will be about 1.5 hours; there will be approximately 60 minutes of remarks and slide presentation followed by Q&A.
- Please submit your questions and comments using the Webex Q&A feature throughout the presentation and we will respond at the end of the presentation.
- If you have technical difficulties, please email Ernest Wyatt (ewyatt@usea.org).
- If your questions are not addressed during the webinar, they can also be submitted via email to FE-30correspondence@hq.doe.gov.
- The slides will be shared with all participants and posted to FECM's MMRV Framework website.

How to Participate in the Webex Q/A

Attendees can ask questions to all panelists who will answer and moderate those questions during the Q&A session.



1. Select the Q&A feature in WebEx in the lower right corner (circled in red above)

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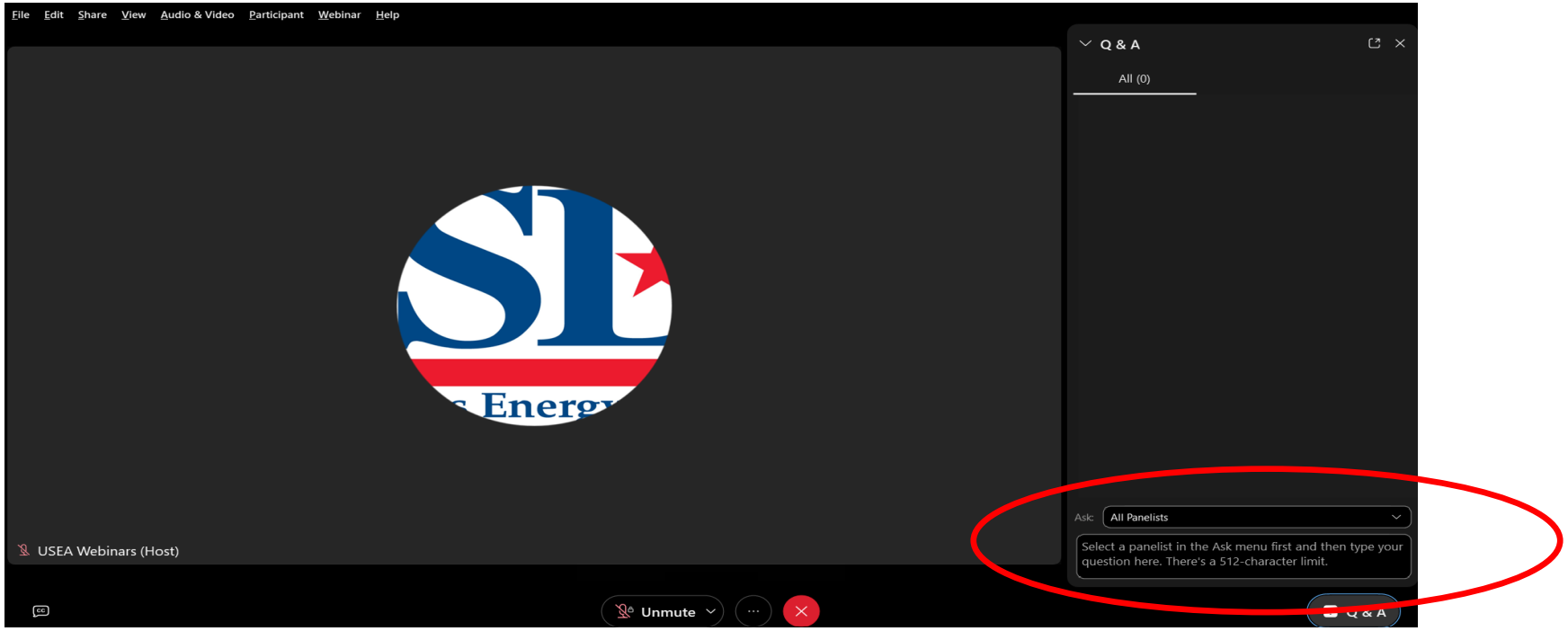

2. Select “All Panelists” from the drop-down menu. Type your question into the Q&A text box and press “Enter” (circled in red above)

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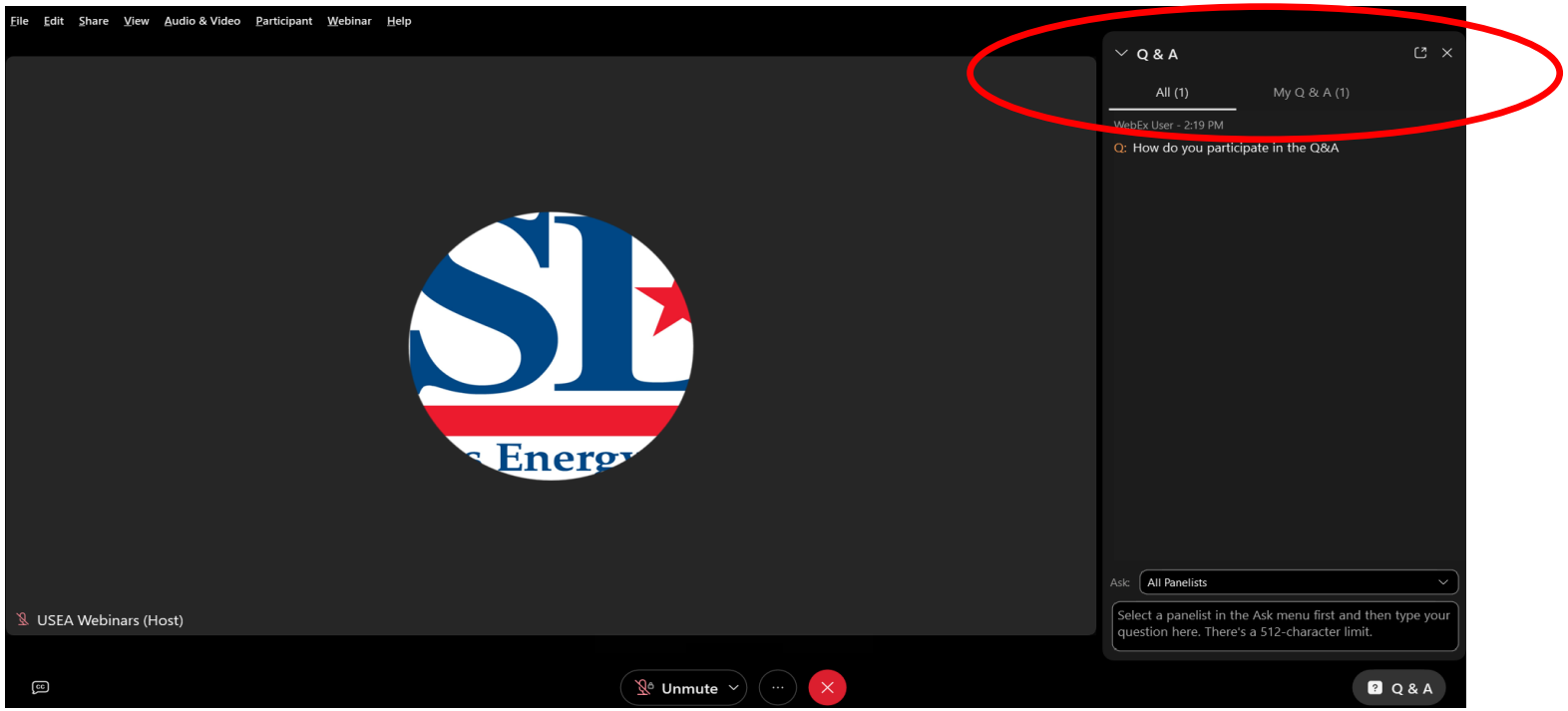


3. Your submitted question will now appear in the Q&A (circled in red above)

Agenda

- An overview of the MMRV Framework scope and structure
- A review of the areas of focus for 2024
- Technical progress updates since March 2024 webinar
- Planned next steps for the MMRV Framework
- Questions and Answers

Welcoming Remarks

Brad Crabtree
Assistant Secretary
Office of Fossil Energy and Carbon Management
U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY
Fossil Energy and Carbon Management

Overview of MMRV Framework

Measurement, Monitoring, Reporting, and Verification (MMRV) Introduction

- MMRV is a multi-step process **used to account for the GHG emissions and emissions intensity** associated with specific emissions sources across the supply chain.
- There is **considerable activity underway related to MMRV of methane, carbon dioxide, and other GHG emissions associated with delivered natural gas.**
- However, there is **currently no consensus regarding what purchaser, regulator, or other stakeholder expectations** should be for a company making a claim about the GHG intensity of delivered or contracted gas.
- In response, **FECM is working with international partners to develop a shared and broadly credible global framework for estimating GHG emissions across the international supply chain for natural gas.**

- **DOE is not introducing a regulatory standard** for natural gas, nor will DOE be certifying natural gas in the marketplace.
- **DOE is working with other countries on an international framework for the MMRV of GHG emissions associated with the global natural gas supply chain** that can be used by both buyers and sellers or by individual governments.
- **DOE's efforts align with the Biden Administration's U.S. Methane Emissions Reduction Action Plan** and pledge that the U.S. will work with global partners to reduce the world's methane emissions.

Working Group Areas of Focus in 2024

1. The MMRV Working Group will advance comparability by **reviewing/building upon existing standards and protocols to provide a consistent set of technical criteria for reporting emissions and operating data at various levels of availability**.
2. Comparability will be further supported by **using transparent and consistent tools for estimating GHG supply chain emissions and data quality** from pre-production through final delivery of the natural gas.
3. To provide comparable and reliable information, the Working Group **will support independent third-party verification** of the accuracy and representativeness of the emissions data and the aggregate supply chain emissions intensity.
4. It will also **support accreditation** to ensure that certifiers are independent of the reporting entity and are technically qualified to conduct reviews.

MMRV Framework Participants

Country / Region	Agency / Department
Argentina	Secretariat of Energy
Australia	Department of Industry, Science and Resources
Brazil	National Agency of Petroleum, Natural Gas & Biofuels, Ministry of Mines & Energy
Canada	Natural Resources Canada
Colombia	Ministry of Mines and Energy
European Commission	Directorate-General (DG) - Energy
East Med Gas Forum	Secretariat
Egypt	Ministry of Petroleum & Mineral Resources
France	Ministry for the Energy Transition
Germany	Federal Ministry for Economic Affairs and Climate Action

Country / Region	Agency / Department
India	Ministry of Petroleum and Natural Gas
Italy	Ministry of Environment & Energy Security
Japan	Ministry of Economy, Trade and Industry
Korea	Ministry of Trade, Industry and Energy
Malaysia	Ministry of Economy
Mozambique	National Petroleum Institute
Nigeria	Nigeria Upstream Petroleum Regulatory Commission
Norway	Ministry of Petroleum and Energy
United Arab Emirates	Ministry of Energy and Infrastructure
United Kingdom	Department for Energy Security and Net Zero
United States	Department of Energy, Dept of State, Environmental Protection Agency

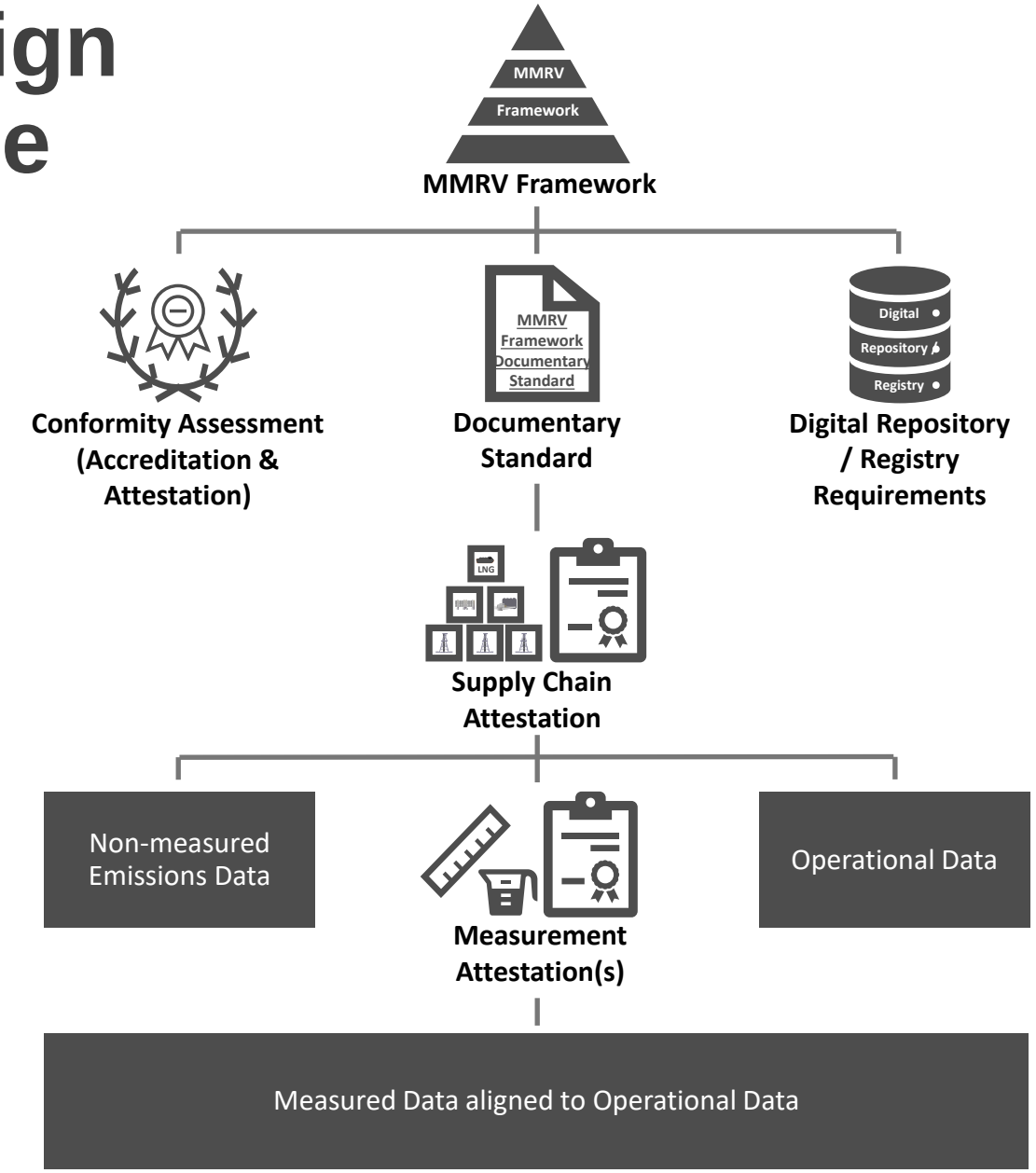
Note: Government and regional entities listed on this slide have been participating in Working Group discussions. Inclusion on this list should not be interpreted as a commitment to endorse or use the framework or other work products of the Working Group.

MMRV Framework Structure

The MMRV Framework is being advanced by a **Working Group** of participating government principals who have delegated work to a **Technical Group** of government staff. The Technical Group will solicit expert feedback from a **Stakeholder Representative Group**. In addition, participating governments will solicit broad feedback from stakeholders in individual jurisdictions to report back to the Technical Group.

Areas of Focus for 2024

MMRV Design Architecture



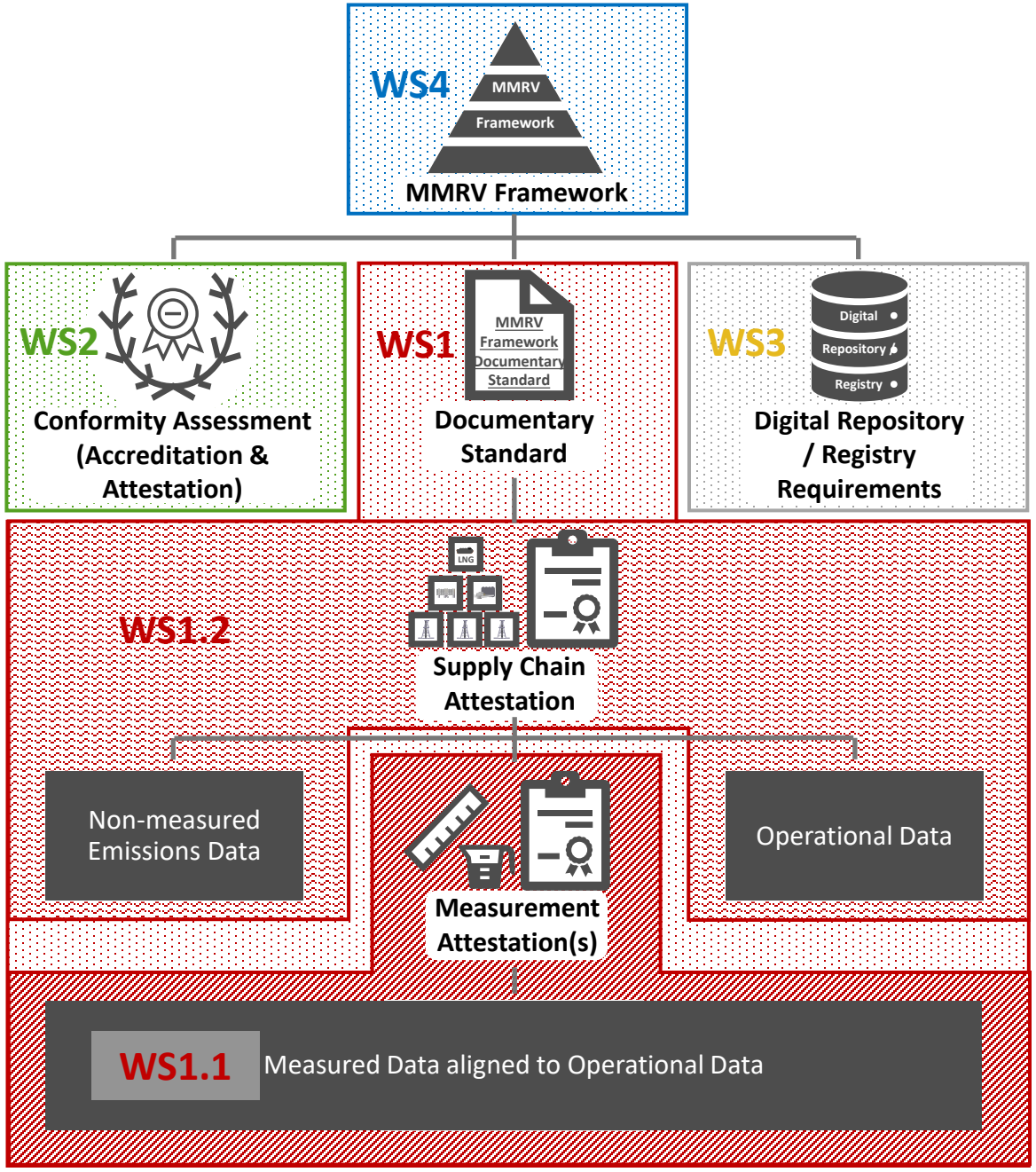
WS1: Criteria & Data Tools
- WS1.1: Measured Emissions
- WS1.2: Supply Chain Aggregation

WS2: Accreditation & Attestation

WS3: Attestation Management

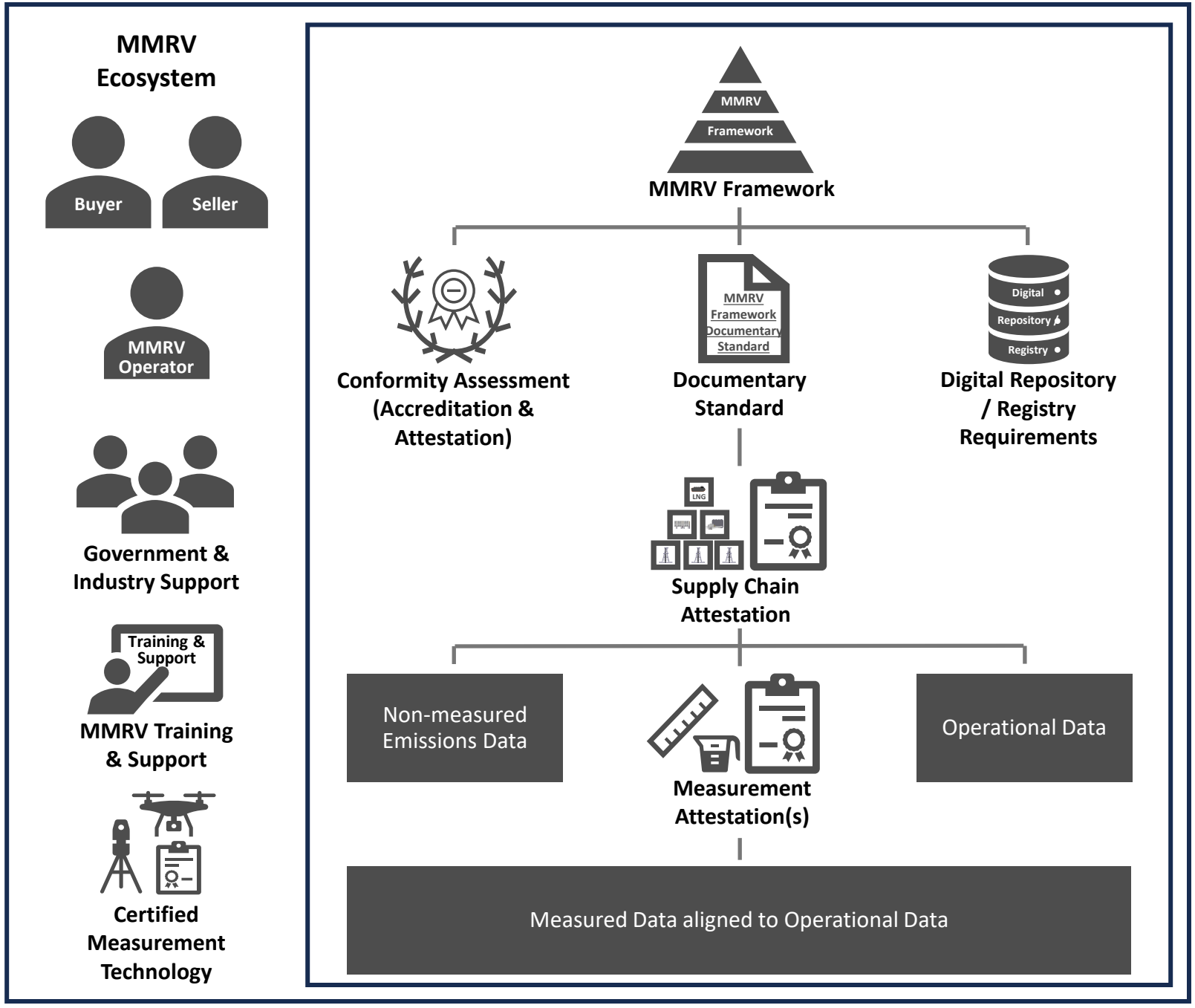
WS4: MMRV Framework Coordination & Training Support

WS = Work Stream



Work Stream / MMRV Timeline Goals

- WS1: Active
- WS2: Active
- WS3: Will begin in Q4
- WS4: Active


MMRV Ecosystem
Buyer
Seller
MMRV Operator
Government & Industry Support
Training & Support
MMRV Training & Support
Certified Measurement Technology
MMRV
Framework
MMRV Framework
Conformity Assessment (Accreditation & Attestation)
MMRV Framework Documentary Standard
Documentary Standard
Digital
Repository
Registry
Digital Repository / Registry Requirements
LNG
Supply Chain Attestation
Non-measured Emissions Data
Measurement Attestation(s)
Operational Data
Measured Data aligned to Operational Data

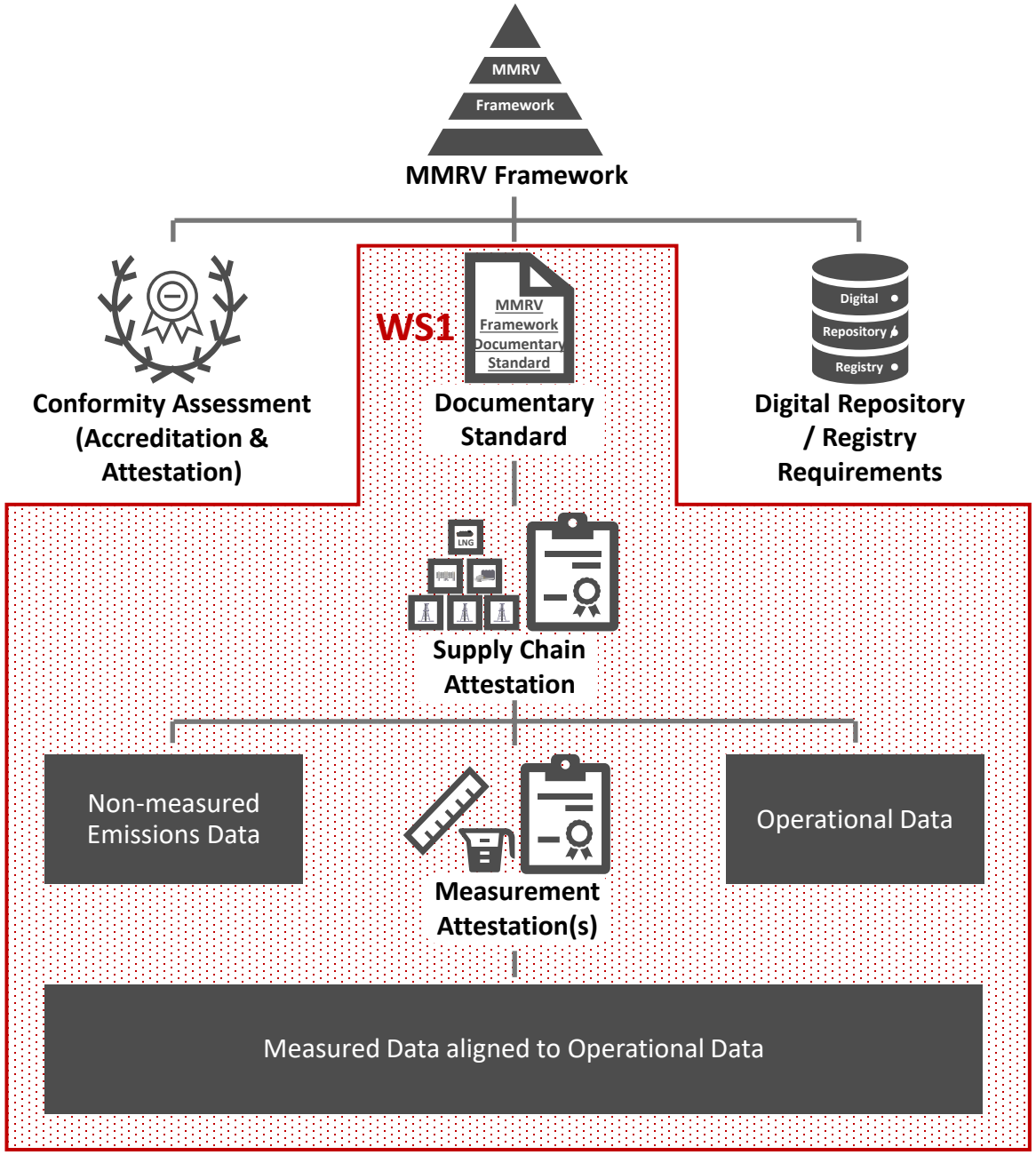
Technical Progress Updates (since March 2024)

WS1: Criteria & Data Tools

WS2: Accreditation & Attestation

WS3: Attestation Management

WS4: MMRV Framework Coordination & Training Support



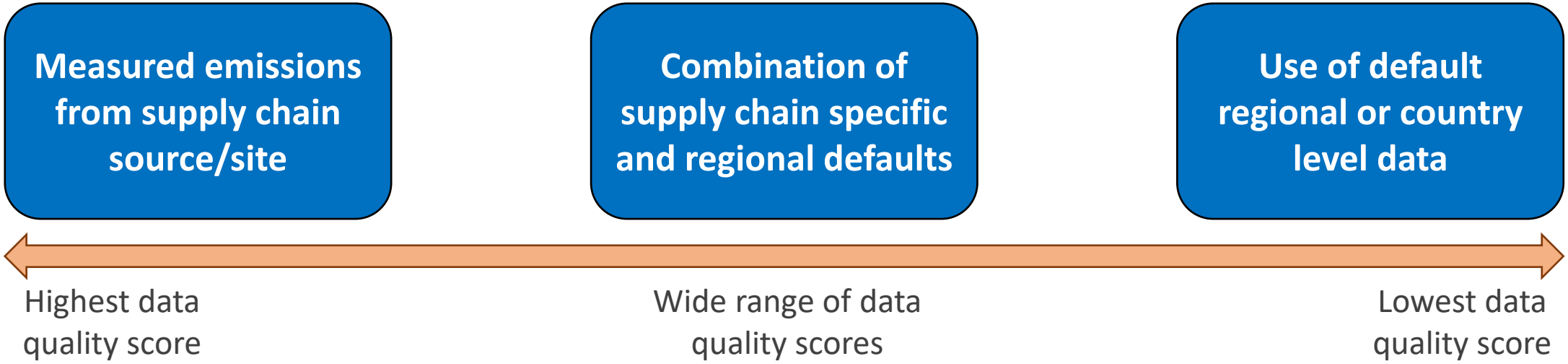
WS1: Criteria & Data Tools

Establishment of Data Quality Metrics and Coordination of WS1 Subgroups

- Establish a data quality metric approach for assessing data quality based on the accuracy and representativeness of the reported data.
- Coordination of WS1 Subgroups
  - WS1.1: Measured Emissions
  - WS1.2: Supply Chain Aggregation

WS1.0 Technical Progress Update

- Developing a data quality concept approach, which includes:
  - Creating a Data Quality Indicator (DQI) score, which will be assigned for each input data source and default data selection.
  - The DQI score will be aggregated and weighted for importance based on the GHG contribution to the total life cycle GHG emissions intensity.
  - The result is the reported Data Quality Metric for Data Reliability and Data Representativeness.
  - This method directly values and incentivizes measured data for key contributors to the GHG emissions profile.



WS1.0 Data Quality Concept Approach

Current GHG Supply Chain Reporting	Proposed GHG Supply Chain Reporting
Single numeric GHG intensity reported (e.g., 20 g CO_2e/MJ delivered)	Single numeric GHG intensity reported (e.g., 20 g CO_2e/MJ delivered)
Various methodologies with different levels of completeness	Consistent methodology to ensure completeness – global framework/standard
Uncertainty data reported sometimes for measured data, rarely for estimated data, some methodologies use semi-qualitative data quality metrics	Aggregate letter grade score (A, B, C, D, F) for data quality metrics, GHG contribution weighted, grading scale valued based on Data Reliability and Data Representativeness
Verified/Third-party certified: high variability (i.e., some data, all data, management practice only, measured data accuracy, etc.)	Utilize MMRV Framework (this effort) to establish measurement and supply chain verification conformity assessment process

MMRV Data Quality Indicator Matrix (proposed)

Indicator		1	2	3	4	5 (default)
Data Reliability		Verified data based on measurement. Reported similarly to Level 2, but with addition to site-level measurements (includes characterization of site-level emissions distribution for a representative population). (e.g., ~ equivalent to OGMP Level 5)	Verified data based on a calculation or non-verified data based on measurements; emissions reported by detailed source type and using specific emission factors (EFs) and activity factors (AFs). (e.g., ~ equivalent to OGMP Level 4)	Non-verified data based on calculation; emissions reported by detailed source type and using generic emission factors (EFs). (e.g., ~ equivalent to OGMP Level 3)	Documented estimate; emissions reported in consolidated, simplified sources categories, using a variety of quantification methodologies, progressively up to the asset level, when available. (e.g., ~ equivalent to OGMP Level 2)	Undocumented estimate; emissions reported for a venture at asset or country level (i.e., one methane emissions figure for all operations in an asset or all assets within a region or country). (e.g., ~ equivalent to OGMP Level 1)
Data Representativeness	**Temporal Correlation**	Less than 1 year of difference from date of data collection.	> 1 year of difference but < 2 from date of data collection.	> 2 years of difference but < 3 from date of data collection.	> 3 years of difference but < 5 from date of data collection.	Age of data unknown or more than 5 years from date of data collection.
	Geographic Correlation	Data from same resolution[a] and same area of study.	Within one level of resolution and a related area of study.[b]	Within two levels of resolution and a related area of study.	Outside two levels of resolution but a related area of study.	From a different or unknown area of study.
	Technology Correlation	Data from technology (source/site) being modeled.	Data from a mix of technologies (source/site).			Data from a different technology (source/site) than being modeled.
	Data Collection Methods	Data from more than 80% of the relevant activity over a sufficiently representative period.[c]	Data from 60-79% of the relevant activity over a sufficiently representative period, or from more than 80% of the relevant market over a shorter period.	Data from 40-59% of the relevant activity over a sufficiently representative period, or from 60-79% of the relevant market over a shorter period.	Data from less than 40% of the relevant activity over a sufficiently representative period, or from 40-59% of the relevant market over a shorter period.	Unknown or data from a small number of sites and from shorter periods.

a Levels of resolution are defined as follows: global, continental, sub-region, national, state/province/region, county/city, site-specific. Production Stage (i.e., natural gas well operations) resolution is defined as the geologic production unit. The first four of these are from the UN geo-scheme [United Nations, 2013].)

b A related area of study is defined by the scope of the applicable supply chain stage the data represents. By default, the area of study is the geographical location of the physical supply chain stage being represented by the data.

c A sufficiently representative (time) period is defined as a sufficiently long duration to stabilize operations (measurement observation) to account for normal fluctuations in variability.

WS1.0 Next Steps

- Continue development of the DQI approach:
  - Finalize indicator descriptions and methodology.
  - Test the process.
- Evaluate how to integrate (or not) confidence intervals into/with the Data Quality Metric.
- Incorporate feedback and input from stakeholders.

Work Stream (WS)
Data Quality Indicator (DQI)

WS1: Criteria & Data Tools

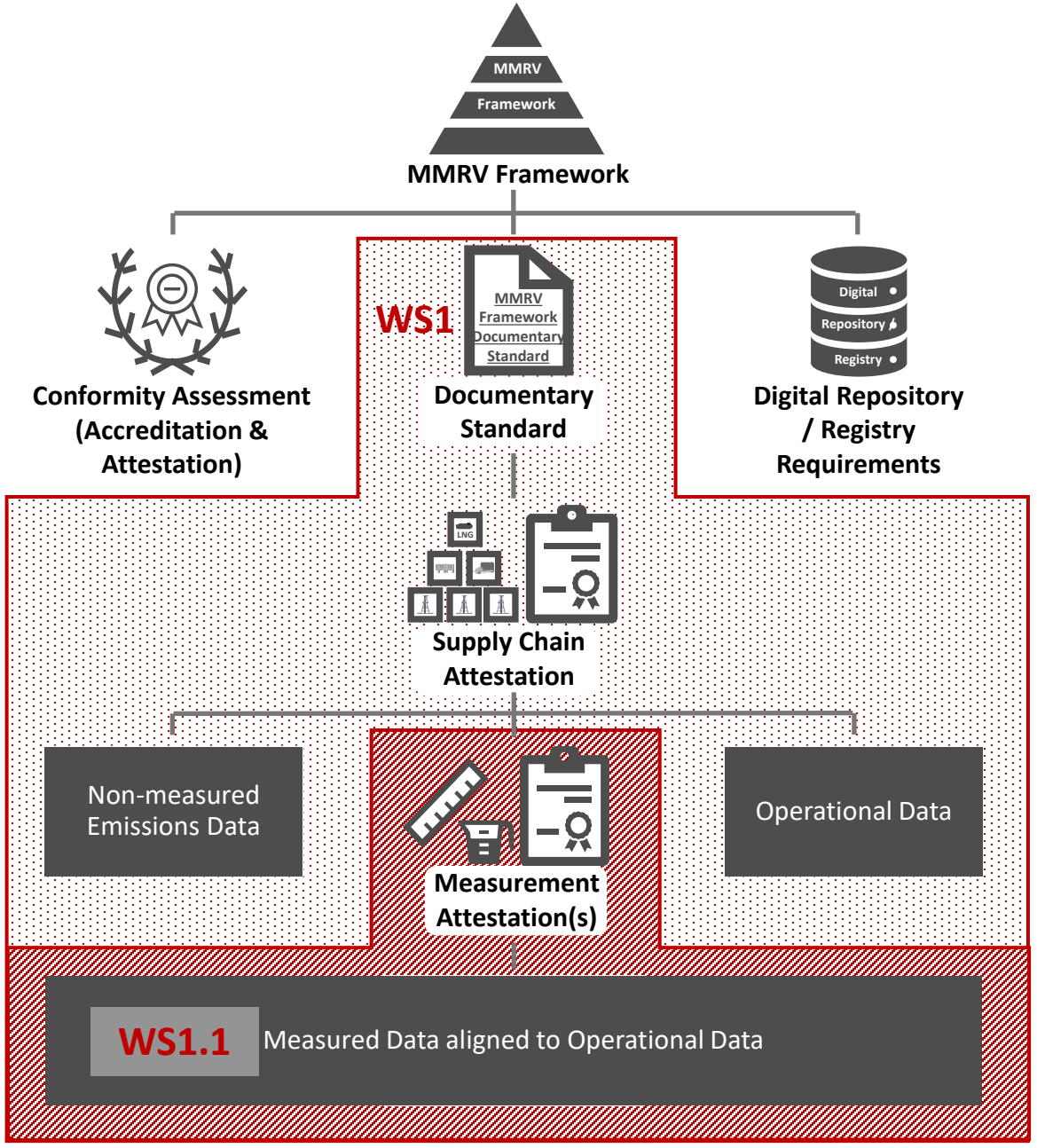
WS1.1: Measured Emissions

WS1.2: Supply Chain Aggregation

WS1.1: Measured Emissions

Technical Criteria for Reporting Emissions and Operating Data

- Value measured data over modeled data – goal is to improve accuracy, completeness, and transparency of reported emissions.
- Review and build upon existing protocols and standards to establish a consistent set of technical criteria for reporting emissions and operating data (e.g., gas throughput) at various levels of data availability.
- Coordinate with WS1 on establishment of data quality reporting requirements.



WS1.1 Technical Progress Update

- Evaluating requirements for reporting emissions and operating data in a manner that:
  - Aligns with the Data Quality Metric Approach (WS1.0) and ensures an accurate assessment of data quality can be provided to the buyer.
  - Provides the data and information needed to calculate the emissions intensity of delivered natural gas (WS1.2).
  - Provides flexibility by leveraging the use of existing methods (i.e., protocols) that companies are already using to collect and report emissions and operating data for other but similar purposes.
- Developing a detailed crosswalk of existing protocols against the key themes of the MMRV Framework (using a few example sources and protocols).
  - Serves as an important first step in developing a strong understanding of existing technical protocols and differences in scope/coverage.
  - Could also form the basis of guidance to operators to understand how closely existing protocols align with the MMRV requirements.

Work Stream (WS)

WS1.1 Crosswalk of Existing Protocols

The crosswalk analysis of existing protocols is structured across five key themes:

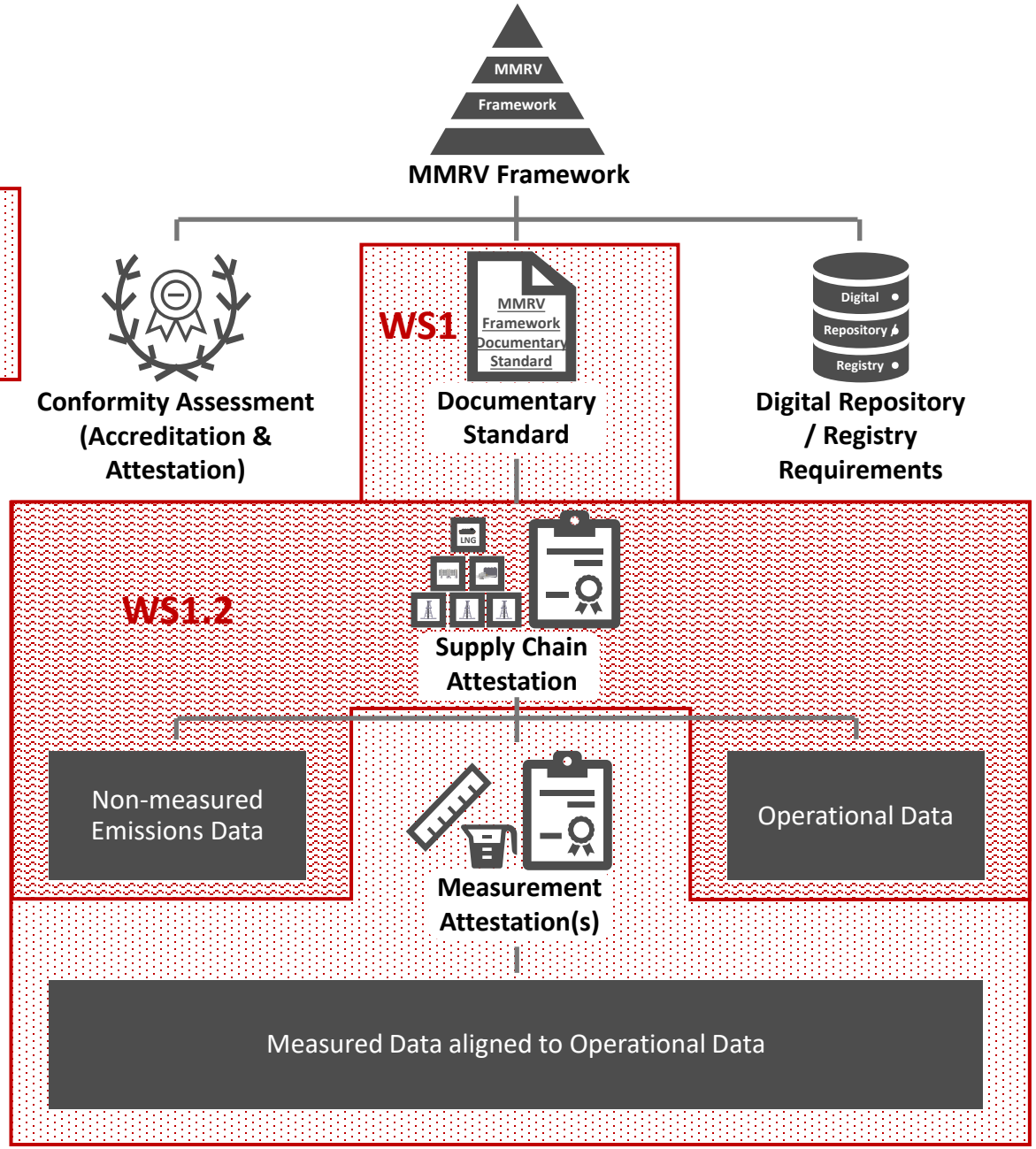
1. Description of Source
2. Terminology
3. Applicability
4. Measurement & Quantification Approach
5. Reporting Requirements

Five Key Themes	Key Attribute Evaluated
Description of Source	Description of source category
	Definition of source sub-categories
Terminology	Use of consistent definitions for sources and related terminology
Applicability	Clear method to assess materiality
	Collecting source-level data and aggregating to asset/ site level
Measurement & Quantification Approach	Reporting requirement for measurement tech. and methodology design
	Verification of measurement equipment capability
	'Best Calculated' methodology necessary/fit for purpose for a source
	Spatial coverage of source and/ or sub-categories
	Address temporal variability
	Evaluate data gaps
	Covers multiple GHGs
	Assessing assets consistently
	Tolerances for skipping or delaying measurement
	Empirical results at source level and aggregation to asset/ facility/ site level
Reporting Requirements	Documenting data conversion/ modeling
	Accounting for uncertainty of the measured or estimated data
	Disclosing information to public

WS1.1 Next Steps

- Continue the source-specific analysis of existing protocols as compared to the key criteria/themes of the MMRV Framework.
- Develop options for ensuring all sources of emissions have been fully addressed (i.e., completeness requirements for the reported data), including the following categories:
  - Continuous/persistent and expected emissions (normal operating conditions).
  - Continuous/persistent and unexpected emissions (fugitive emissions).
  - Intermittent and expected emissions (routine emissions with variable frequency).
  - Intermittent and unexpected emissions (equipment failure/non-standard operating condition).
- Evaluate potential reporting requirements for assessing “completeness” at the equipment and site level across all segments of the natural gas supply chain.

WS1: Criteria & Data Tools
WS1.1: Measured Emissions
WS1.2: Supply Chain Aggregation



WS1.2: Supply Chain Aggregation
Transparent and Consistent Tools for Estimating GHG Supply Chain Emissions and Data Quality

- Develop a consistent and transparent tool for estimating GHG supply chain emissions using a combination of measured and modeled data capable of supporting varying levels of data representativeness (asset to basin/jurisdictional level).
- Coordinate with WS1 on the establishment of a data quality metric for reporting data reliability (accuracy) and data representativeness of the estimated GHG supply chain emission intensity to provide additional information to differentiate GHG emissions intensity estimates based on "quality" of the data.

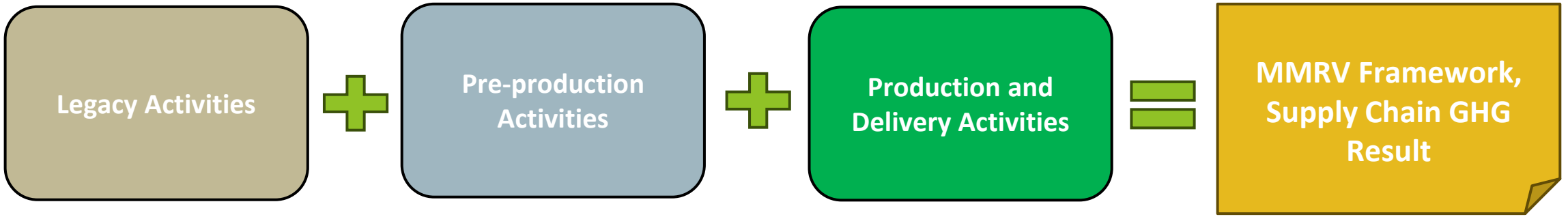
WS1.2 Technical Progress Update

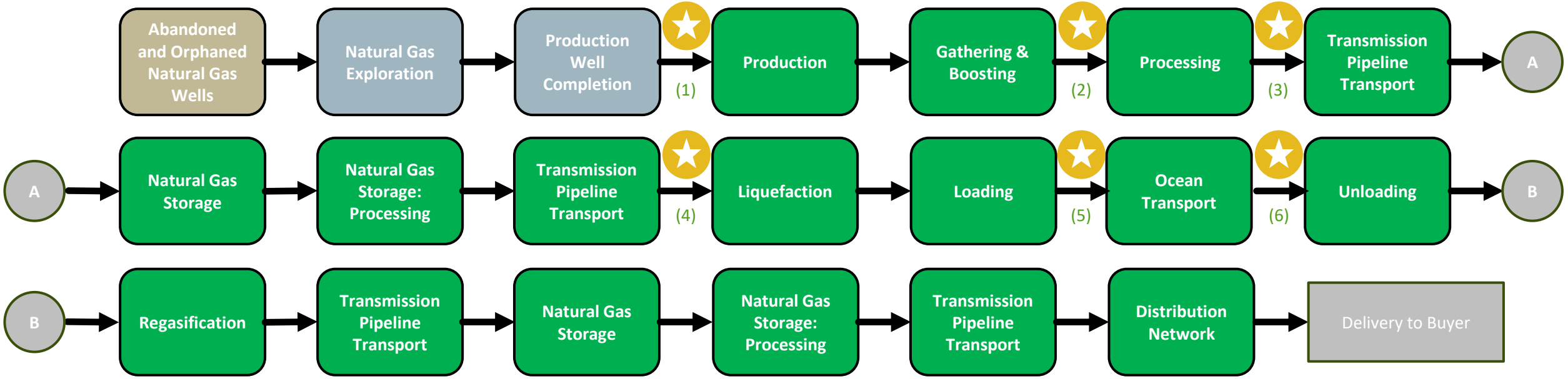
- Developed the supply chain boundary diagram consisting of GHG emissions from direct activities and indirect activities.
- Identified and proposed the supply chain stages and required Points of Supply Chain verification (point of attestation).
    - The “point of verification” is the information that would be supplied to a natural gas market participant (e.g., buyer), may also represent a point of sale/custody transfer to compliment alignment with other GHG reporting requirements.
- Working on clear and specific definitions for each supply chain stage in the boundary diagram to ensure consistency and comparability. Compiling definitions from international and national sources like the Intergovernmental Panel on Climate Change (IPCC), American Petroleum Institute (API), U.S. Greenhouse Gas Reporting Program (GHGRP), and the International Group of Liquefied Natural Gas Importers (GIIGNL).

Work Stream (WS)

WS1.2 Standardized Supply Chain Verification System Boundary Points

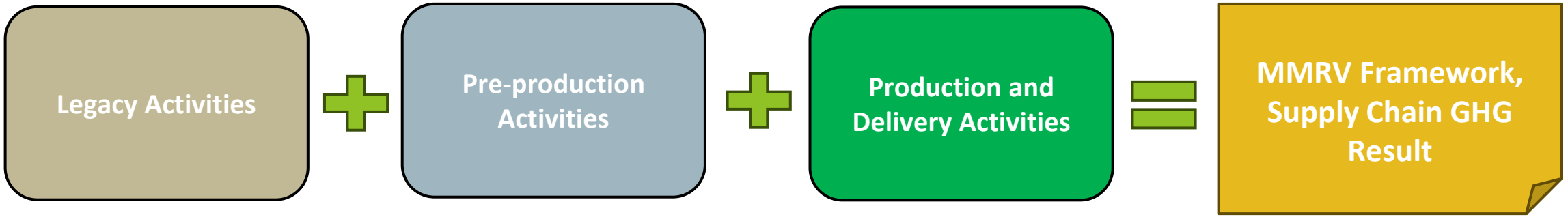
Standardized Supply Chain Verification System Boundary Point

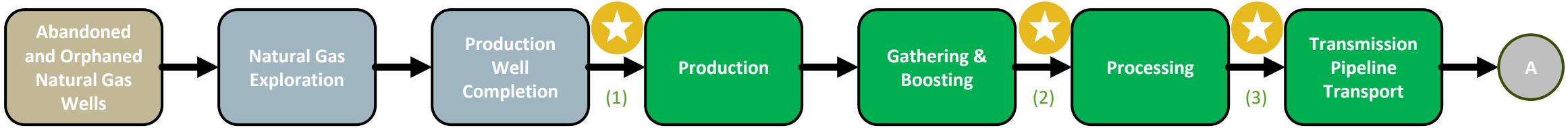


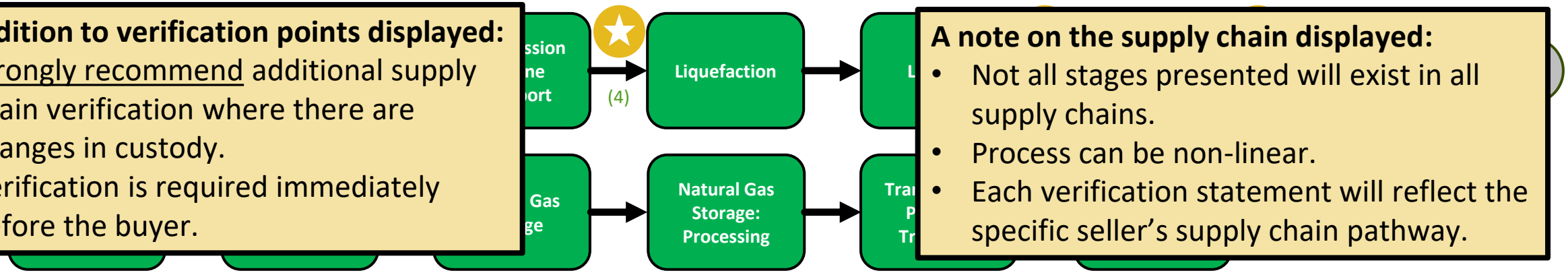


WS1.2 Standardized Supply Chain Verification System Boundary Points

Standardized Supply Chain Verification System Boundary Point







In addition to verification points displayed:

- Strongly recommend additional supply chain verification where there are changes in custody.
- Verification is required immediately before the buyer.

A note on the supply chain displayed:

- Not all stages presented will exist in all supply chains.
- Process can be non-linear.
- Each verification statement will reflect the specific seller's supply chain pathway.

WS1.2 Next Steps

- Continuing to finalize supply chain stage definitions.
- Begin written documentation on:
  - Supply chain data aggregation guidance for assimilating (linking and scaling) different levels of Data Representation and data types.
  - Supply chain aggregation reporting requirements for each GHG emissions species and carbon dioxide equivalents Global Warming Potential (GWP).

WS1: Criteria & Data Tools

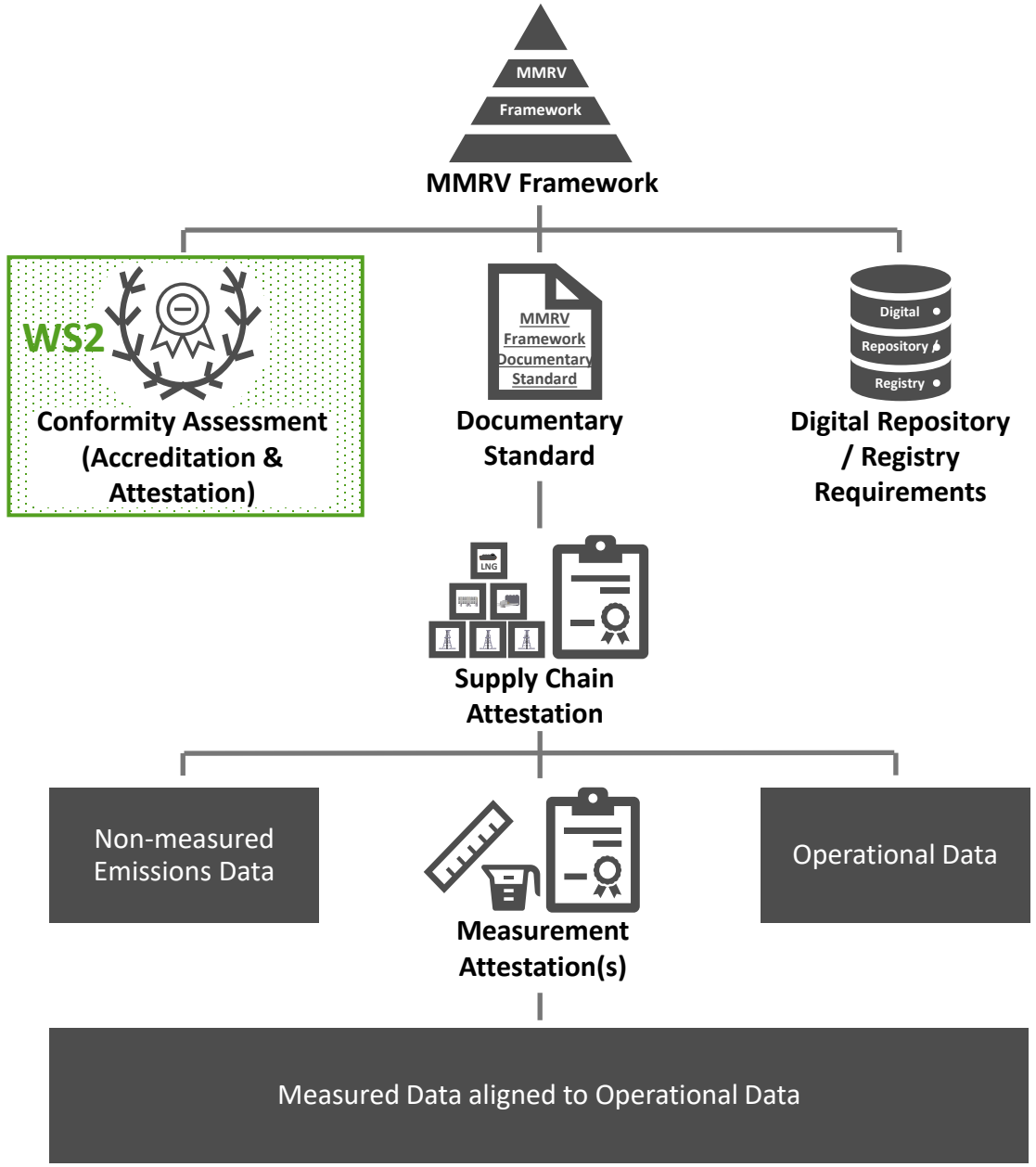
WS1.1: Measured Emissions

WS1.2: Supply Chain Aggregation

WS2: Accreditation & Attestation

WS2: Conformity Assessment (ISO/IEC 17000 series or alternative mechanism) Design and Implementation

- Conformity Assessment Elements
  - International Accreditation System
  - Accreditation Body
  - Accredited Certification Body
  - Accredited Auditor Body



WS2: Accreditation & Attestation

Establish Conformity Assessment requirements and business model for independent third-party certification and accreditation of GHG supply chain emissions and data quality.

- Define the attestation documentation for reporting the GHG supply chain emissions intensity and data quality metrics for the supplied product to the buyer.
- Develop common requirements that an independent certifier would use to assess GHG emissions intensity accuracy, representativeness, and completeness of (1) measured and modeled data inputs and (2) aggregated life cycle supply chain result.
- Establish an accreditation process through which certifiers are confirmed as employing consistent protocols as identified through the framework including a mechanism for independent oversight of the accreditation process.

WS2.0 Technical Progress Update

Key findings from the landscape analysis include:

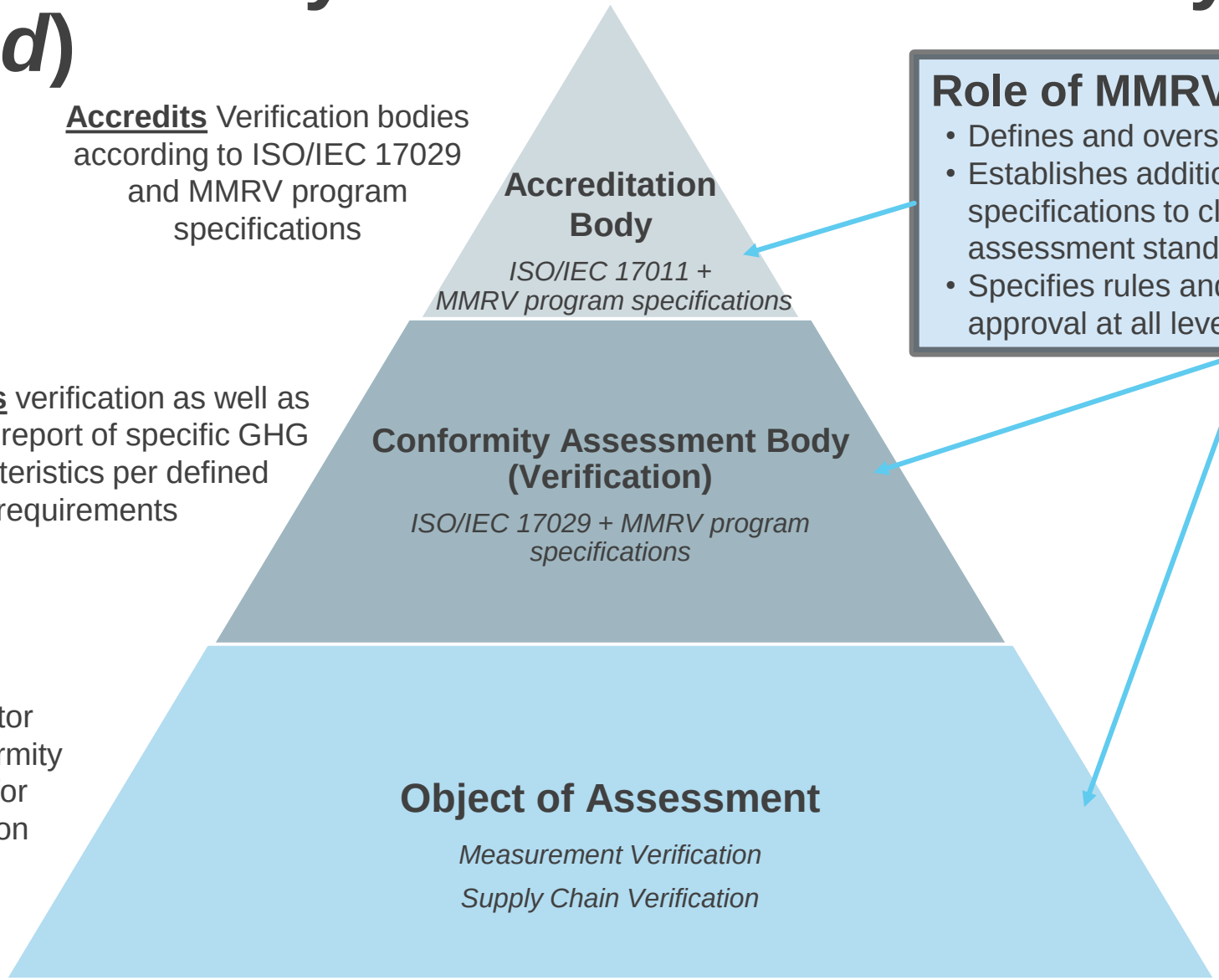
- Most GHG conformity assessment schemes based on:
  - ISO/IEC 17029:2019 – Conformity assessment – General principles and requirements for validation and verification bodies.
    - Note: this standard establishes the general principles absent a specific purpose/application (e.g., GHG supply chain environmental data).
  - ISO 14065:2020 – General principles and requirements for bodies validating and verifying environmental information.
    - Note: this standard builds upon ISO/IEC 17029:2019 to define additional application specific requirements for environmental information, in general.
- Other conformity assessment standards mentioned include:
  - ISO 14064-1:2020 - Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of GHG emissions and removals.
  - ISO 14064-3:2019 – Greenhouse gases – Part 3: Specification with guidance for the verification and validation of GHG statements.
- Most regions have accreditation bodies that are signatories to the International Accreditation Forum (IAF) with scope of ISO/IEC 17029.

WS2.0 Conformity Assessment Hierarchy (*proposed*)

Accredits Verification bodies according to ISO/IEC 17029 and MMRV program specifications

Conducts verification as well as produces report of specific GHG characteristics per defined requirements

Natural Gas Operator **contracts** with conformity assessment body for validation/verification



Role of MMRV Scheme Owner

- Defines and oversees program
- Establishes additional specific program specifications to clarify ISO/IEC conformity assessment standards
- Specifies rules and procedures for approval at all levels of the program

WS2.0 Next Steps

- Continue development of the conformity assessment process following:
  - ISO/IEC 17029:2019 – Conformity assessment – General principles and requirements for validation and verification bodies environmental information.
  - ISO 14065:2020 – General principles and requirements for bodies validating and verifying environmental information.

WS1: Criteria & Data Tools
WS1.1: Measured Emissions
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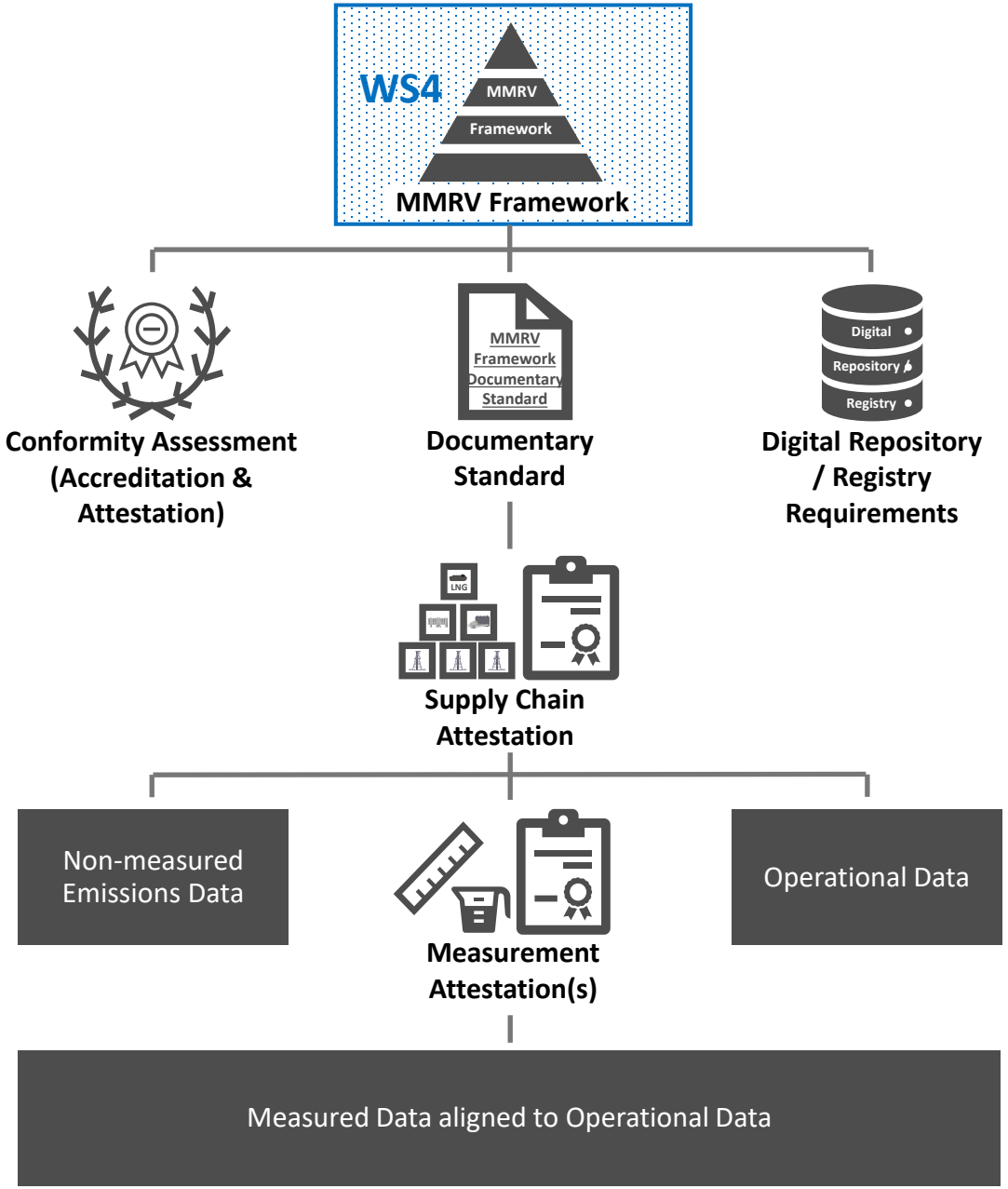
WS2: Accreditation & Attestation

WS3: Attestation Management

WS4: MMRV Framework Coordination & Training Support

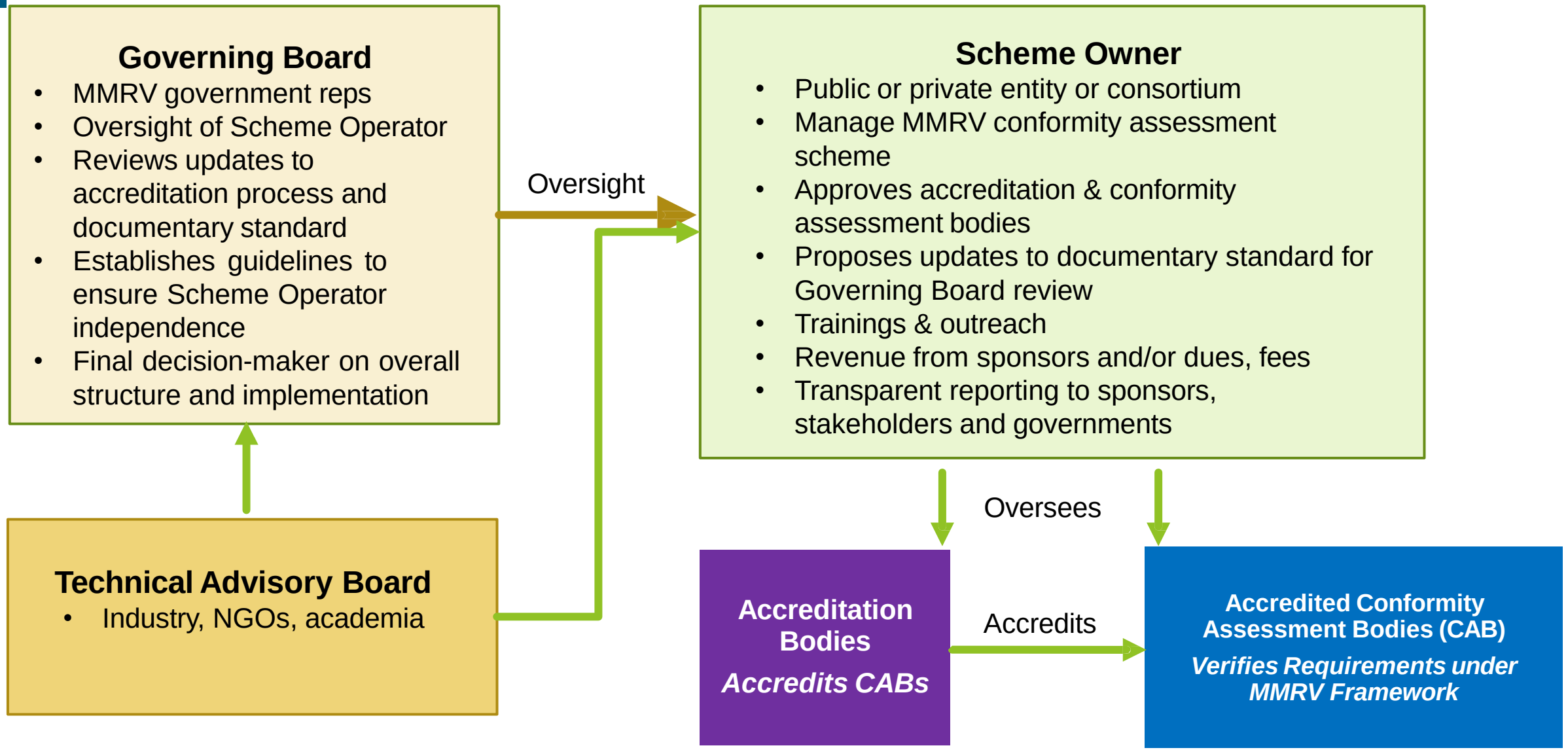


WS4: MMRV Framework Coordination & Training Support

Process for continuous improvement to ensure long-term relevance of MMRV Framework.

- Define requirements and expectations for long-term management of the MMRV Framework.
- Ensure viable business model for MMRV system to enable trust and confidence.
- Identify and enable training support and other resources to ensure acceptance and efficient implementation of the MMRV Framework.

WS4.0 MMRV Scheme Owner & Governing Board (Concept)



WS4.0 Next Steps

- Continue to evaluate options and strategies for transitioning the MMRV Framework from the MMRV Working Group of government principals to the global market for long-term management (of the MMRV Framework).

Next Steps for MMRV Framework

- Remain actively engaged with participating governments to advance the MMRV Framework.
- Goal is to develop a consensus-based voluntary standard for quantifying and reporting supply chain GHG emissions performance and data quality supported by an accredited independent third-party conformity assessment process in 2025.

Stakeholder outreach and coordination will continue throughout the development process – your feedback is important!

Further Information

- **For further information**, visit www.energy.gov/fecm/greenhouse-gas-supply-chain-emissions-measurement-monitoring-reporting-verification-framework
- **For follow-up questions**, please submit them via email to FE-30correspondence@hq.doe.gov

Thank You

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Q&A

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