G Axis Review Working Group
Progress Report

Expert Group on Resource Classification
Seventh session
Geneva, 26 – 29 April 2016
**G Axis Review WG - Terms of Reference**

**Mandate:**
- The EGRC 6th Session determined that there was a need to review the G axis name, category definitions and supporting explanations to better reflect the needs of the renewables sector without compromising their applicability to solid minerals and petroleum (paras 38 - 40).

**Terms of Reference:**
- To form a G Axis Review Working Group consisting of expertise from the Renewable Energy sector, the current sectors covered by the classification (Oil & Gas, and Minerals), and generic expertise in the interpretation and application of the UNFC-2009 framework.
- To review the current G axis category definitions and supporting explanations, including the relevant sections in the proposed Renewable Energy Specification.
- To propose suitable modifications, if required, that would better reflect the needs of the proposed Renewables Energy specifications without compromising their applicability to solid minerals and petroleum.
- To propose suitable G axis name change(s), if required.
- To report back at the 7th EGRC session (April/May 2016) on progress/proposals.

**Working Group:**

**Interactions:**
- Renewable Taskforce
- Geothermal and Bioenergy WG

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<tr>
<th>Name</th>
<th>Expertise</th>
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<tr>
<td>James Primrose (Chair)</td>
<td>Renewables (Bioenergy)</td>
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<td>Paul Banks</td>
<td>Minerals (CRIRSCO)</td>
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<td>Gioia Falcone</td>
<td>Renewables (Geothermal)</td>
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<td>Jim Ross</td>
<td>Oil &amp; Gas (PRMS)</td>
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38. The Chair noted that feedback from presentations on UNFC-2009 indicated the need for additional guidance regarding the G axis and the use of a Competent Person. Feedback had also been received regarding the naming of both the F and G axes.

39. The Expert Group recommended that any abbreviation of the G axis to “Geological knowledge” should be avoided and the full name “Geological knowledge and potential recoverability” be used wherever and whenever possible.

40. The Expert Group recommended that the G axis name, category definitions and supporting explanations be reviewed in detail during the next update of UNFC-2009 and one or more proposals developed for modifications that would better reflect the needs of the renewables sector without compromising their applicability to solid minerals and petroleum.
Key Findings

   - Confirms conclusion of Renewable Taskforce
   - Informed by further work on the Geothermal and Bioenergy Specifications.

2. Clearer guidance required on the application of uncertainty/levels of confidence.
   - Guidance contained in the bridged documents for fossil energy and solid minerals.

3. Ambiguity/confusion can be caused by the shortened name “geological knowledge”.
   - Sole focus on geological and/or sub-surface risks.
   - Potentially not unique to Renewable Energy Projects.
   - Expert Group has recommended that the full name “Geological knowledge and potential recoverability” be used when possible.

4. UNFC terminology not immediately transferable to non sub-surface resource projects.
   - A secondary issue, that is dealt with in the Renewable Energy Specification.
   - However a reminder that in the longer term as UNFC coverage widens a potential need to adopt more generic terminology.
Deliverables

1. Provision of guidance to Geothermal and Bioenergy WGs on the use and application of the G Axis.
   - Invaluable context and guidance from the Oil & Gas, and Mineral sectors.
   - High degree of interaction and engagement between the G Axis WG, the Renewable TF, and the Geothermal/ Bioenergy WG, and TAG.

   - Improved guidance on the treatment of uncertainty under the G Axis.
   - Explicit reference to the established approaches for determining estimates for G1, G2 and G3.
     • Incremental Approach
     • Scenario Approach
     • Probabilistic Approach
   - In principle all 3 approaches are open for Renewable Energy projects. In practice, Scenario or Probabilistic are likely to be the most appropriate.
   - “Elegant” solution that does not affect the existing bridging documents between UNFC-2009 and PRMS/CRIRSCO.
Sources of Uncertainty – Misunderstandings/Misuses – Geothermal Projects

(Young et al., 2015)
Sources of Uncertainty – Bioenergy Projects

Bioenergy Source
- Biomass Yield
- Biomass Quality

Access & Entitlement
- Supply Longevity

Conversion
- Throughput
- Conversion Yield
- Asset Life

Monetisation
- LTCC / PPA Longevity
- Regulatory Support

Bioenergy Source
- Energy & Non-Energy Co-Products
  - E.g. animal feed, protein components, husks, kernels, pips etc.

Conversion
- Energy Supplied
  - Biofuel / Power / Heat

Monetisation
- Non-Energy Co-Products
  - E.g. Sugar, animal feed.
Sources of Uncertainty – Bioenergy Source

Exogenous Factors
- Climate
- Water availability
- Soil quality and condition
- Pest and Pathogen Risks
- One off Weather Events (floods, drought, frost, lightning strike (fires), high winds, crop knock down).

Indigenous Factors
- Irrigation Decisions (in year and strategic investment).
- Crop Inputs (fertiliser, soil improvement, crop control chemicals)
- Crop Variety Decisions
- Planting / ratoon* management decisions
- Harvesting Decisions
- Storage Decisions
- Precision Agriculture
- Agronomy Programs

Parameterisation Options

Historic Data
- Project Specific
- Country/ Regional Databases

Crop Development Programs
- Public Research Institutes
- Germ-plasm Providers
- In house research

Yield Modelling

Ratoon = number of harvests between re-planting of a semi-perennial crop.
Forward Work Program

• Renewable Energy Specification Revisions.
  – Provide guidance / feedback if further comments / revisions to Specifications are made.

• Review of G Axis naming convention - proposals to be developed.
  – *De Minimis*: current full shortened name “Geological knowledge and potential recoverability”
  – WG to consider and develop options for future possible inclusion as part of a general UNFC 2009 review.

• Recommendation that WG continues to exist to act as a source of expertise on G Axis related issues while the Geothermal and Bioenergy Specifications are developed.