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### Economic Commission for Europe

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**Expert Group on Resource Classification**

**Eighth session**

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Item 7 of the provisional agenda

**Governance of the United Nations Framework**

**Classification for Fossil Energy and Mineral**

**Reserves and Resources 2009**

### **Recommendations for possible future changes to the G-axis name, category definitions and supporting explanations**

**Prepared by the G-axis Working Group on behalf of the Bureau of the Expert Group on Resource Classification**

*Summary*

At the seventh session of the Expert Group on Resource Classification, it was requested that recommendations for possible future changes to the G-axis name, category definitions and supporting explanations be submitted to the eighth session and be considered in any future update of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009).

This draft document has been prepared by the G-axis Working Group on behalf of the Bureau of the Expert Group. It incorporates the results of a survey of members of the Expert Group on Resource Classification, which provided the input to a recommendation regarding a proposed change to the G-axis name. In addition, the G-axis Working Group has considered and developed recommended text changes to the G-axis category definitions and supporting explanations, with a view to rendering them more generic and hence applicable to the expanded scope of UNFC-2009.

## I. Introduction

1. This draft document has been prepared by the G-axis Working Group on behalf of the Bureau of the Expert Group on Resource Classification. At its seventh session, the Expert Group requested that recommendations for possible future changes to the G-axis name, category definitions and supporting explanations be submitted to the eighth session and be considered in any future update of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 (UNFC-2009) incorporating Specifications for its Application, ECE Energy Series No. 42.
2. The membership of the G-axis Working Group is shown in Annex I.
3. This document incorporates the results of a survey of members of the Expert Group, which provided the input to a recommendation by the G-axis Working Group for a proposed change to the name of the G axis. In addition, the Working Group has considered and developed recommended text changes to the G-axis category definitions and supporting explanations, with a view to rendering them more generic and hence applicable to the expanded scope of UNFC-2009.

## II. Background and objectives

4. When UNFC-2009 was developed, it focussed on providing a system that could be used to relate the classification of solid minerals with the classification of oil and gas (petroleum)<sup>1</sup>. Since then, the system has been expanded to address renewable energy resources<sup>2</sup> and injection projects<sup>3</sup>. Consequently, it has become evident that certain titles and definitions within UNFC-2009 are insufficiently generic to accommodate these new applications. This has led to some confusion regarding the correct interpretation of the texts in some cases.
5. An example of a title that is insufficiently generic is the name of the G axis, which currently is Geologic Knowledge and Potential Recoverability. In addition to the lack of relevance of geology to most renewable energy resources, the problem has been further exacerbated by a tendency to abbreviate the title further, to Geologic Knowledge. An example of the same problem in the category definitions is the reference to a “deposit” (in the definition of G1, for example).
6. The objectives of the G-axis Working Group were to investigate, consider and make recommendations for possible changes to (i) the title of the G axis and (ii) the definitions and supporting explanations for the G-axis categories. Subject to Bureau approval, the recommendations were to be presented to the Expert Group on Resource Classification at its eighth session with a view to their possible adoption in a future revision of UNFC-2009.

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<sup>1</sup> As set out in UNFC-2009 incorporating Specifications for its Application, ECE Energy Series No. 42, Part II, Section III.

<sup>2</sup> Specifications for the application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 to Renewable Energy Resources, September 2016 (ECE/ENERGY/2016/4).

<sup>3</sup> Specifications for the application of the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 to Injection Projects for the Purpose of Geological Storage, September 2016 (ECE/ENERGY/2016/5).

### **III. Survey of members of the Expert Group on Resource Classification**

7. In September 2016, with the help of the secretariat of the United Nations Economic Commission for Europe (ECE), the G-axis Working Group carried out an internet-based survey of the membership of the Expert Group on Resource Classification. The survey requested suggestions for a possible name change for the G axis and was therefore able to solicit ideas from a much broader body of experts than within the Working Group alone. The participation of members of the Expert Group in this process was greatly appreciated by the Working Group. As agreed at the beginning of the process, all responses were to be treated as confidential and therefore there shall be no attribution to individuals in this report.

8. A detailed statistical analysis of the respondents is included in Annex II. In summary, there were 72 responses representing stakeholders from a broad cross section of both resource type and organization type. Only 6 respondents (8 per cent) did not support a change to current name for the G axis. 66 (92 per cent) of the respondents suggested a total of 142 suggestions for alternative names for the G axis.

9. A complete list of suggestions for a revised G axis name is provided in Annex III (one suggestion has been removed for being potentially inappropriate, although probably unintentionally so). It should be noted that in the survey introduction, the Working Group expressed a preference for names that started with the letter G, but indicated that alternatives would also be considered. Additional comments received are recorded in Annex IV.

10. After much deliberation, the Working Group concluded that based on the diverse nature of the responses, supported by its own deliberations, it was not possible to come up with a generic name that was simultaneously sufficiently concise to enable its use as a title while effectively defining the use of the G axis across a range of resource types. In addition, the range of responses received did suggest that within the Expert Group community there was not unanimity on the definition and role of the G axis.

11. Therefore, the Working Group concluded that the most effective way forward would be to simply rename the G axis as the “G axis” and to provide a more comprehensive explanation of the purpose of the G axis. This approach would appear to avoid the issues of abbreviated titles while enabling clearer guidance on the definition and role of the G axis to be provided in UNFC-2009.

### **IV. Recommendation for name change to G axis title**

12. At the next update of UNFC-2009, the G-axis Working Group recommends that the current G axis title is dropped and replaced with “G axis”. Separately, it is recommended that a more comprehensive explanation of the purpose of the G axis is provided (see Section V), so that issues associated with abbreviated and/or non-generic titles can be completely avoided.

13. If the Working Group’s recommendation to remove any title other than “G axis” is accepted, it is further recommended that a similar approach is seriously considered for the E and F axes.

## V. Recommendation for text providing explanation of the purpose of the G axis

14. Further to the Working Group's recommendation to replace the title of the G axis, it is recommended that the following generic text is adopted in order to provide an explanation of the purpose of the G axis:

*“The G axis is used in conjunction with the E and F axes to classify the estimated quantities of a commodity that are associated with a specific Commodity Source in a specific geographic location. Classification is based on the level of knowledge and/or confidence in specific criteria which, for solid minerals, petroleum and geothermal energy, correspond to geological knowledge and potential recoverability. For other commodities, where geology may not be relevant, the criteria will include uncertainty in both the availability of the Commodity Source and in the subsequent extraction or conversion into a saleable product. Details of relevant criteria are addressed in Bridging Documents (where available) and in commodity-specific specifications. Commonly, there will be more than one G Axis category applicable to that specific Commodity Source, and to estimated recoverable quantities associated with that Commodity Source, reflecting the distinction between quantities that can be estimated at different levels of confidence based on consideration of the relevant criteria. Estimates of recoverable quantities of the commodity reflect the application of an extraction and/or conversion Project or Projects to that Commodity Source, or to potential storage in the case of Projects designed for such purposes.”*

15. In the above paragraph, the terms “Bridging Document” and “Project” are defined in UNFC-2009<sup>4</sup>. In addition, a guidance note on the definition of a Project has been published<sup>5</sup>. A new term “Commodity Source” is proposed by the Working Group in order to provide a generic descriptor that would encompass the terms deposit, accumulation and Renewable Energy Source, as well as providing terminology that could be applied to possible future applications of UNFC-2009.

16. The Working Group proposes the following definition of Commodity Source:

*A Commodity Source is the initial form in which a commodity of potential economic interest is found, or from which such a commodity may be derived. In the case of solid minerals, the Commodity Source would generally be termed a mineral deposit, whereas for oil and gas it would be an accumulation or reservoir. For renewable energy sources, it is the primary energy (e.g. the earth's thermal energy, energy from the sun, wind, biomass, river flow, tides, waves) available for extraction of (and conversion into) energy products, such as electricity, heat and biofuels.*

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<sup>4</sup> As defined in UNFC-2009 incorporating Specifications for its Application, ECE Energy Series No. 42, Part II, Annex I.

<sup>5</sup> Guidance Note to support the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 Definition of a Project.

## VI. Recommendations for text changes to the G-axis category definitions and supporting explanations

17. In developing proposed text changes to the G-axis category definitions and supporting explanations, the Working Group placed significant emphasis on the specifications documents published for renewable energy resources and injection projects (refer to footnotes 2 and 3, above). In addition, every effort was made to avoid terminology that might limit the scope of UNFC-2009 to be applied more generally in the future.

18. The proposed text changes are shown in the tables below, alongside the current text in UNFC-2009.

<i>Category</i>	<i>Current Definition</i>	<i>Proposed Generic Definition</i>
G1	Quantities associated with a known deposit that can be estimated with a high level of confidence.	Quantities associated with, or recoverable from, a known Commodity Source that can be estimated with a high level of confidence.
G2	Quantities associated with a known deposit that can be estimated with a moderate level of confidence.	Quantities associated with, or recoverable from, a known Commodity Source that can be estimated with a moderate level of confidence.
G3	Quantities associated with a known deposit that can be estimated with a low level of confidence.	Quantities associated with, or recoverable from, a known Commodity Source that can be estimated with a low level of confidence.
G4	Estimated quantities associated with a potential deposit, based primarily on indirect evidence.	Estimated quantities associated with, or recoverable from, a potential Commodity Source, based primarily on indirect evidence.

<i>Category</i>	<i>Current Supporting Explanation</i>	<i>Proposed Supporting Explanation</i>
G1	For in situ (in-place) quantities, and for recoverable estimates of fossil energy and mineral resources that are extracted as solids, quantities are typically categorized discretely, where each discrete estimate reflects the level of geological knowledge and confidence associated with a specific part of the deposit. The estimates are categorized as G1, G2 and/or G3 as appropriate.	Quantities may be categorized discretely as G1, G2 and/or G3 (along with the appropriate E and F categories), based on the level of confidence in the estimates (high, moderate and low confidence, respectively), as is typically the case for solid minerals, for example.
G2	For recoverable estimates of fossil energy and mineral resources that are	Alternatively, quantities may be categorized as a range of uncertainty as reflected by either (i) three specific deterministic scenarios (low, best and

<i>Category</i>	<i>Current Supporting Explanation</i>	<i>Proposed Supporting Explanation</i>
G3	extracted as fluids, their mobile nature generally precludes assigning recoverable quantities to discrete parts of an accumulation. Recoverable quantities should be evaluated on the basis of the impact of the development scheme on the accumulation as a whole and are usually categorized on the basis of three scenarios or outcomes that are equivalent to G1, G1+G2 and G1+G2+G3.	high cases) or (ii) a probabilistic analysis from which three outcomes (P <sub>90</sub> , P <sub>50</sub> and P <sub>10</sub> ) <sup>6</sup> are selected. In both of these methodologies (the “scenario” and “probabilistic” approaches), the quantities are then classified on the G Axis as G1, G1+G2 and G1+G2+G3 respectively.  In all cases, potentially recoverable quantities are those associated with a defined Project <sup>7</sup> .
G4	Quantities that are estimated during the exploration phase are subject to a substantial range of uncertainty as well as a major risk that no development project or mining operation may subsequently be implemented to extract the estimated quantities. Where a single estimate is provided, it should be the expected outcome but, where possible, a full range of uncertainty in the size of the potential deposit should be documented (e.g. in the form of a probability distribution). In addition, it is recommended that the chance (probability) that the potential deposit will become a deposit of any commercial significance is also documented.	A potential Commodity Source is one where the existence of quantities of a commodity of potential economic interest is based primarily on indirect evidence and has not yet been confirmed. Further data acquisition and evaluation would be required for confirmation.  Where a single estimate is provided, it should be the expected outcome. Further subdivision, comparable to the G1/G2/G3 categories, is optional and is addressed through the use of sub-categories (G4.1, G4.2 and G4.3) as set out in Specification P of UNFC-2009 <sup>8</sup> .  In addition, it is recommended that the chance (probability) that the potential Commodity Source will eventually lead to a commercial Project is assessed and documented.

<sup>6</sup> Where P<sub>90</sub> means that there is a 90 per cent probability that the actual recoverable quantity will exceed this estimate. Similarly, P<sub>50</sub> and P<sub>10</sub> reflect 50 per cent and 10 per cent probability respectively that the actual recoverable quantity will exceed the estimate.

<sup>7</sup> Guidance Note to support the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources 2009 Definition of a Project.

<sup>8</sup> UNFC-2009 *incorporating* Specifications for its Application, ECE Energy Series No. 42, Part II, Section VI.

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## Annex I

### Membership of G-axis Working Group

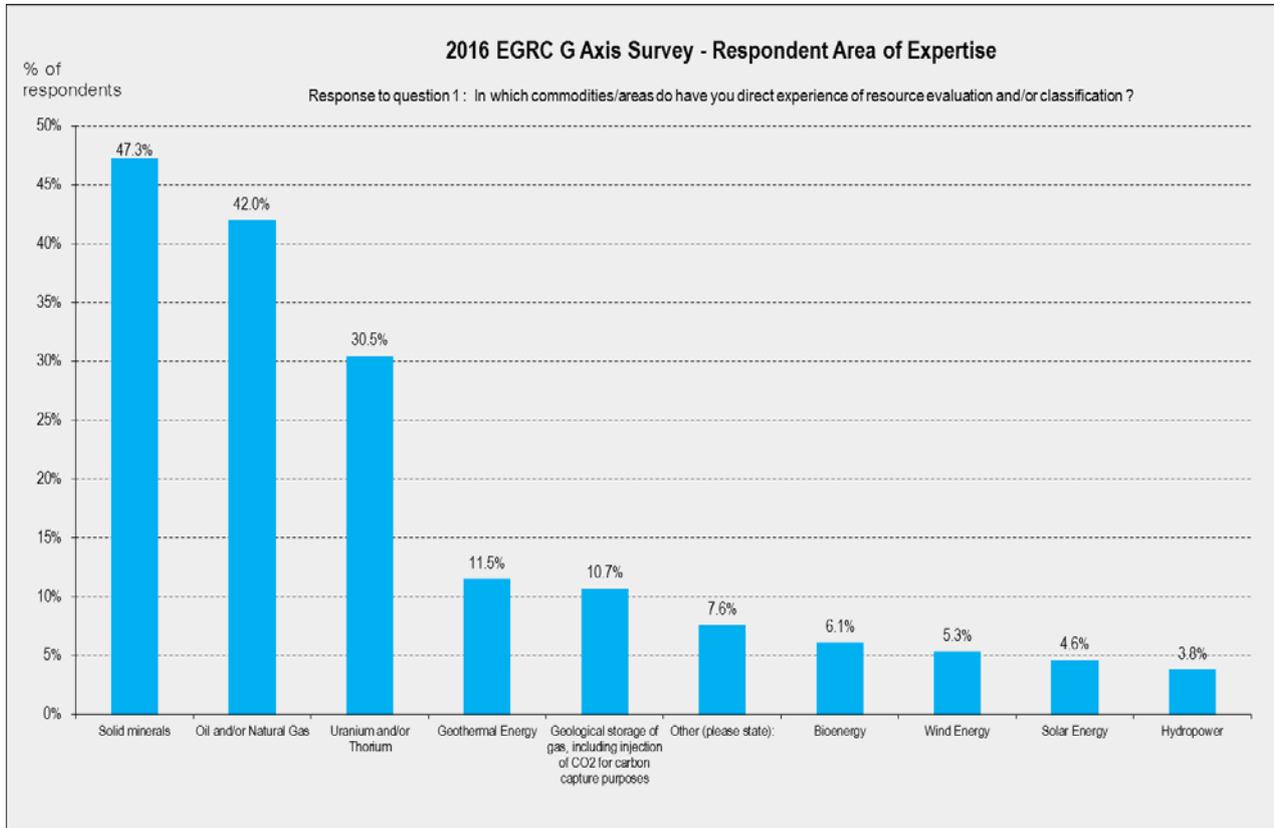
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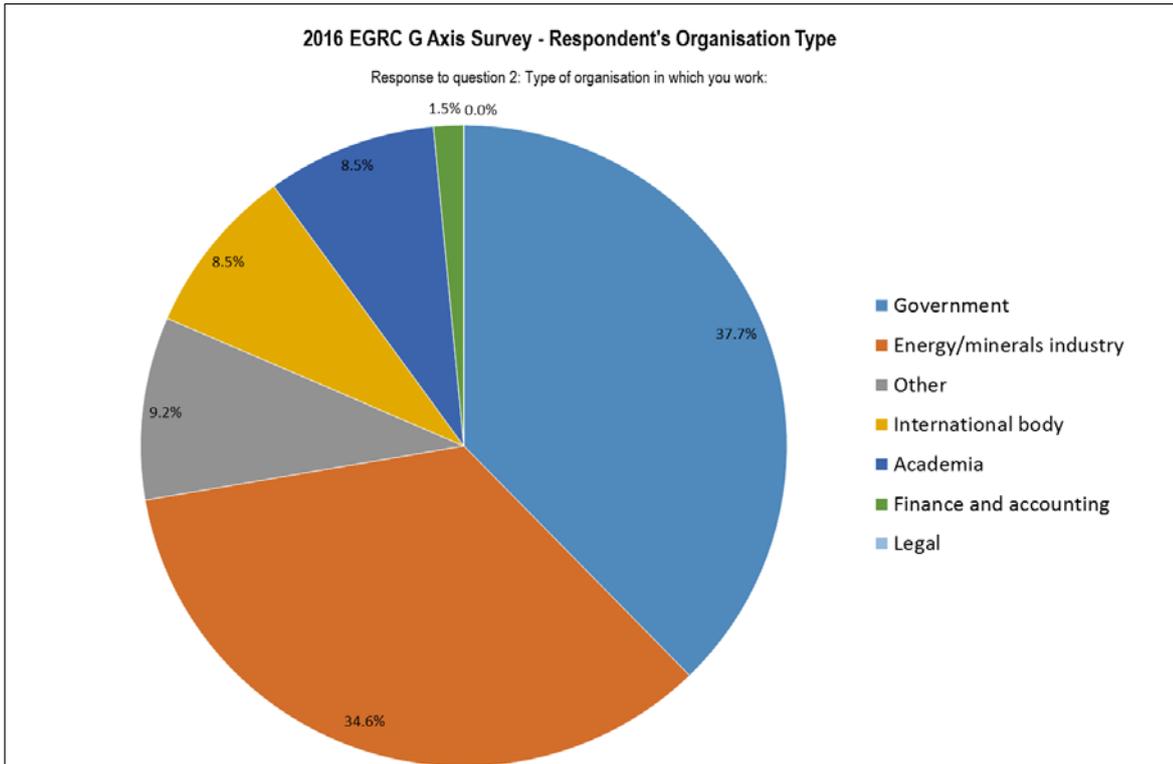
<i>Name</i>	<i>Affiliation / Expertise</i>
James Primrose (Chair)	Private sector, bioenergy, oil & gas
Paul Bankes	Private sector, mining
Vitor Correia	Professional association, geology
Gioia Falcone	Academia, geothermal
Isabel Fernandez	Professional association, geology
Michael Neumann	Professional association, geology
Jim Ross	Private sector, oil & gas

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## Annex II

### Statistical analysis of survey of Expert Group on Resource Classification





## Annex III

### List of suggestions for the name of G axis

Responses sorted in alphabetical order, recorded as received/unedited. One response not recorded, as potentially being inappropriate.

Capacity	Geological knowledge and full use
Confidence / Certainty	Geological Knowledge and Potential Development
Confidence Level	Geological knowledge
Energy Resource Knowledge and Potential Usability	Geological Potential Recovery
Enviromental can be common and applicable for all type of resources	Geological quantities
G	Geological Resources and Exploration Knowledge
G SET Geologic Subsurface Engineering Tool	Geological Resources and Potential Recoverability
G SKBT - Subsurface Knowledge Base Took	Geomaterial and recoverability
Gaia Potential	Geophysical knowledge
Gain of Potential Resource	Geophysical potential
Gelogical Resources Level of Confidence	GEORECON
Generability (i.e. the technical feasibility to generate, or to recover)	Georesource and recoverability
General Confidence in Estimates	Georesource Knowledge and Certainty
General informations available	Georesource Potential
General Knowledge and Potential Utility	Georesource Potential (>> term not coined otherwise, but has be stretched to include solar energy: <a &amp;ie='utf-8&amp;oe=utf-8"' href="https://www.google.com/search?q=georesource+potential">https://www.google.com/search?q=georesource+potential"&amp;ie=utf-8&amp;oe=utf-8</a> )
General knowledge, including geology, landuse, biological aspects	Geographical Knowledge and Potential Deliverability
General occurrence	Georesource Potential Estimation and Certainty
General Physicality and Certainty in Estimates	Georesource Potential Knowledge (>> assessent of the "potential" integrates evaluation of "recoverability")
General Resource Estimation Knowledge	Georesources

General Resource Estimation Level	Geoscience and Related Parameters
General Resource Potential	Geosciences and quantities
General Resource Potential	geoscientific approach
General Uncertainty	geoscientific considerations
General uncertainty of quantities	Geoscientific Knowledge and Potential Recoverability
Generation Amount	Geoscientific understanding of exploitability
Generation Potential	Geotechnical (practical applications of geological science)
Generic Certinanity in Assesment	Gigawatt
Generic Knowledge	GKPR
Generic Materiality and Confidence in Estimates	Global basis informations
Generic Physical Knowledge and Certainty in Estimates	Global basis informations available
Generic Renewables and Injection Projects	Global Energy Resource Assessment (GERA)
Generic Resource Potential	Global Environmental Knowledge and Potential Recoverability
Generic variation	Global Source
Genesis (i.e. generability)	Grade
Genesis Knowledge and Potential Recoverability	Grade of physical properties
Geo	Grade of Resource Estimation and Recoverability Studies
"Geo" for geology, geothermal, geography (Wind, solar)	Grail (G) (looking for the holy one?)
GeoDataRecover	Grasp of Resource
GEO-DEPOSITS	Green and Fossil Energy Resources
Geognosis (knowledge of the earth)	G-Source
Geognostic	Guarantee of accuracy / success
Geographical Knowledge	Guesstimate certainty
Geographical Knowledge and Potential Recoverability	Knowledge base and potential
geoinformation and potential	Knowledge in Resource Recovery Index (KRRI)
Geo-informations	Knowledge of the resource

Geo-informations available	Knowledge of the resource
Geological - Geophysical Exploration and Reserves Estimates	Level of Confidence
Geological and Energy Potential	Origin
Geological and Engineering Uncertainty Level	Physical properties
Geological and Geophysical Evidence for Recoverability	Probability
Geological and inherent uncertainty	R - for resource knowledge
Geological and inherent variation	Relative Certainty of Source
Geological and Recoverability Studies	Renewable Energy and Fossil Fuel Potentials
Geological and Renewable Knowledge with Potential Recoverability	Resource Availability
Geological and Technical Uncertainty Level	Resource Knowledge and Potential Recoverability
Geological base and recoverability	Resource Knowledge and Potential Recoverability
Geological Circumstances and Environment Conditions	Resource Knowledge and Recoverability Confidence
Geological Conditions and Environment Circumstances	Resource Recoverability
Geological Conditions and Environment Premises	S-axis. Where "S" stands for Source (i.e. Knowledge of Energy Source)
Geological Data Status	Source
Geological heritage and full use	Subsurface and surface environmental issues
Geological Input and Potential Development	Subsurface Resource Knowledge and Reserve Potential
Geological Knowledge	Sustainable potential
Geological Knowledge	Technical potential
Geological Knowledge	Uncertainty
Geological knowledge and Availability	Uncertainty axis
Geological Knowledge and Environment Circumstances	Uranium
Geological Knowledge and Environment Conditions	

## Annex IV

### Other general comments and suggestions received

Survey question 4: If you have any other general comments or suggestions in relation to the G-axis name, please feel free to provide them here:

Responses recorded as received / unedited.

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The name should stress the aim of the axis, namely the confidence assessment on project quantities. Perhaps, it is better to avoid too technical references.

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Sorry - no good ideas.

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I suggest to the G axis name: Knowledge of the resource  
 Knowledge understood as a set of ideas, facts or information learned about the resource and your confidence level because the potential recoverable be established by applying modifying factors (applying simultaneously E axis and F axis.  
 Resources understood as a means to which you can resort to achieve a desired purpose, understood as the origin or principle or object study.

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I suggest to the G axis name: Knowledge of the resource  
 Knowledge understood as a set of ideas, facts or information learned about the resource and your confidence level because the potential recoverable be established by applying modifying factors (applying simultaneously E axis and F axis.  
 Resources understood as a means to which you can resort to achieve a desired purpose.

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I agree with this name

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I couldn't find a suitable synonym for Source that begins with the letter G, but although using "S" would require a change of this axis name, I feel that the term "Source" best represents the intention to now (or in the future) cater for all potential energy sources.

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Please do not split further this axis. This would only add another layer of complexity. Take care to choose a name that does not emphasize only on the geological industry (e.g. mineral resources), dynamic uncertainty (oil & gas), or others such as climate (renewable).  
 Thanks

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no change

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The G-axis also refers not only to geology but also to Earth Systems in general and can be defined in detail consisting of not only solid minerals, petroleum and gas but also geothermal as well as many more resources of the earth as a whole.

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One another name will be an complication for defender the originals of UNFC-2009.

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Geoscientific is better than geological since it includes geometallurgical, geophysical, hydrological, etc. aspects. Also Exploitability - while not quite as politically correct - is more consistent with the economic aspects of the scheme as well as better serves speculative resources

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Create a special G-axis for renewables and injection projects classification using the new suggested name.  
 Keep the old name for the G-axis and continue applying it for solid minerals and petroleum (oil and gas) reserves and resources.

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We reckon UNFC-2009 covers quite wide spectrum of application which includes all type of minerals. But the use of it cannot be classified as adequate in business sphere yet. One of the reasons in our opinion is frequent amendments with the view to enhance and expand it. We deem that the main current purpose of the Expert Group is to match and coordinate UNFC-2009 to the leading Classifications of minerals (reserves/resources/fossil energy) with the aim to increase the application in the business sphere.

I did quite a bit of research into alternative names, but kept coming back to the original meaning of the word, "geology", which despite the fact that this has been narrowed in popular usage to "rocks", means "knowledge of the earth". It actually captures the philosophy of the UNFC, to classify the earth's resources so I would stick with the current name, although I would omit a reference to potential recoverability, which is dealt with by the F axis.

I think that G-axis gives a capacity building to all members in Classification for Fossil Energy and Mineral Reserves Resources to help them to well define all role in the society.

It is suggested that the "G" should be retained, to keep the continuity of "EFG" usage. "Geological Knowledge" can be applicable for almost all forms of energy resources, including renewables (wind, solar, hydro, geo-thermal etc.) and injection projects, where geological system knowledge could be relevant. Bio-energy is one possible exception. Even for solid minerals and petroleum, "Geological Knowledge" has a wider meaning than what is implied in G criteria, i.e., confidence in estimates. "Generic materiality" or "General physical knowledge" could be more appropriate in the effect that what are being considered are the physical or material aspects of the energy resource that is being estimated.

"Potential Recoverability" is also applicable for a wide range of energy resources, with the possible exception of injection projects. However, since all estimates should be for potentially recoverable quantities in UNFC-2009, the need for stating this explicitly may not be required. Instead of this "Confidence in Estimates" implies further clarification on the physical aspects being considered.

G-axis name should give&reflect the Global/General (or basis) informations about all commodities.

That is to say:

- geological for the mineral resources or petroleum;
- availability information (place, estimated quantity available...) for other commodities which geological knowlegde can't be used such as renewable energy and injection projects.

Not native English speaker. Any name needs a good explanation describing how to use the axis

No

If we consider geological knowledge as the basis for G-axis, it is more oriented towards In place volumes rather than reserves and the guidelines for classification along G-axis, do not corroborate with the actual facts. So it would be more appropriate if, the geological factor is excluded and uncertainty is emphasised.

"Gain of Potential Resource" - measures the amount of resource to be added to overall inventory from the potential project. It can apply to oil and gas resources as an estimate of recoverable potential volumes identified as in place. The same is true for mineral resources. For renewables, it measures the capacity to generate resources either over a fixed time period (year, decade) or of the project if it has a fixed lifetime.

Adding a word "resources" will explain and emphasize the practical value of this axis versus academic or special geological studies which may not result to resources estimation.

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Potential resources recoverability is more economic factor, which is in the socio-economic axis.

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Consider G axis as inconsistent.

G4 (for Exploration) should be modelled on the E and/or F axis

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It has been purely coincidental that we can use EFG as a descriptor, but this reflects very well of the English language but may not as conveniently translate in other languages. Let us not be too precious about trying to keep EFG, although there is a certain amount of elegance to this.

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I see it difficult to find a G name for non-Geological resources.

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None at this time.

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G-axis is a measure of uncertainty in the resource quantity or relative capacity to produce an energy product or achieve a desired goal

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It is recommended that the proposed "G-Axis" of the United Nations Framework Classification (UNFC) keep the "G" character as its original definition for "Geological Knowledge". This will maintain the consistency and continuity from the historic evolution of the UNFC system, while at the same time will provide the flexibility to reflect any new applicable technologies, that may be incorporated in the system, such as those related to earth, ecosystem and environment.

The existing "G-Axis" can be addressed with its current definition "Geological Knowledge" for fossil and mineral resources, while for other projects such as renewables and injection technologies, the Axis can be addressed as "Geographical Knowledge". With regard to term "Geography", according to Cambridge online dictionary is "the study of the systems and processes involved in the world's weather, mountains, seas, lakes, etc. and of the ways in which countries and people organise life within an area". Furthermore, the derivative term "Geographical" as per the same dictionary is "relating to geography, or to the geography of a particular area or place".

Therefore, the recommendation is to expand the existing "G-Axis" definition by adding the "Geographical Knowledge" dimension for the projects related to renewables and injection technologies.

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No specific comments

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I need further information about sandstone deposits

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The use of "Grade" follows the GRRM draft US Geothermal classification code

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A long title may induce to a confusion and may overlap on the E and F axes parameters. this simple and circumscribed title "Geological Knowledge", can be applied to solid minerals and oil, reach all the parameters for determining the final specifications of a deposit :

geological information - volume and nature of exploration activities - tank and deposit geometry - Nature of ore and minerals associations - estimation and classification of reserves and / or resources, etc....

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The term "Georesource Potential" is not coined otherwise ( 9 results in google:

<https://www.google.com/search?q=georesource+potential&ie=utf-8&oe=%22georesource+potential%22#q=%22georesource+potential%22> ) and can be seen to include the ideas of favorability and certainty ( <http://www.nwrc.usgs.gov/techrpt/sta13.pdf> );

In order to accommodate for e.g. injection and solar energy use, "georesources" might have to be interpreted in a wider sense.

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G Axis can be defined in many ways using many words to cover all aspects.

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geophysics is defined as a branch of earth science dealing with the physical processes and phenomena occurring especially in the earth and in its vicinity.

Therefore it includes finite resources, and infinite forces found in nature like wind and solar

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Geo means any kind of surroundings (medium, ambience) on or in the Earth (Geology, Geomorphology, Geography, Meteorology including climate, Soil type etc.)

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No comment

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The G-axis incorporates confidence, likelihood, probability, mean values and variance, all of which have different definitions in a mathematical sense. This was a cause of great confusion when we worked through the geothermal energy problem. Regardless of how the G-axis is defined, clear guidelines are needed to classify deterministic vs probabilistic resource estimates.

It is also worth considering changing the definition of the 'E' axis from 'Economic factors' to 'External factors'.

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In this era of climate change, concerns need to emphasise the Renewables over and above the fossil fuel reserves which we will not be able to extract anyway knowing what the carbon budget is to prevent the planet exceeding the 2 degree Centrigade agree on limit of warming above pre-industrial levels

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G-axis is okay

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Apart from the Geological aspects which is strongly indicative in solid and some oil & gas, we could equally take into consideration the occurrence of some of this renewable's and injection projects that there is no clear knowledge of geology.

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The term "Geoscientific" includes any technical study pertaining to the earth system including geology, atmosphere and hydrosphere.

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I do not think it is terribly important to begin the G-axis name with that letter. Whatever the name, it would still be the G-Axis.

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I stress that Source can be geological, by-product of another process, product of nature other than geological such as Wind, Tidal, Solar, natural Geothermal OR it could be induced geothermal through chemically induced reactions in mineral accumulations such as and including in situ coal combustion.

Some leaching operations are exothermal and may be a source of heat energy.

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