

Bioenergy Working Group Progress Report

**Expert Group on Resource Classification
Seventh session
Geneva, 26 – 29 April 2016**

Bioenergy Working Group

Membership

Name	Company	Bioenergy Area of Expertise / Interest
Doug Berven	POET	Corn ethanol and advanced biofuel technologies
Raffaella Cristanetti	DuPont	Advanced biofuel technologies
Richard Hamilton	Ceres	Agricultural biotechnology for bioenergy
Mike McCurdy	Leidos Engineering	Engineering and finance across a range of bioenergy technologies.
James Primrose (chair)	BP	Sugarcane and advanced biofuel technologies
Benoit Charpentier	Total	Advanced biofuel technologies
Gustav Grob	International Clean Energy Consortium	Advanced conversion of waste resources
James Leitheiser	Eco Plant Bamboo	Forestry Biomass for Bioenergy

Governance

- Reports to the Task Force on Application of UNFC-2009 to Renewable Energy.
- Chair / Taskforce reviews any deliverables (intermediate or final) prior to onward submission (as required) to EGRC.
- Will seek advice/ input as appropriate from TAG.

New members

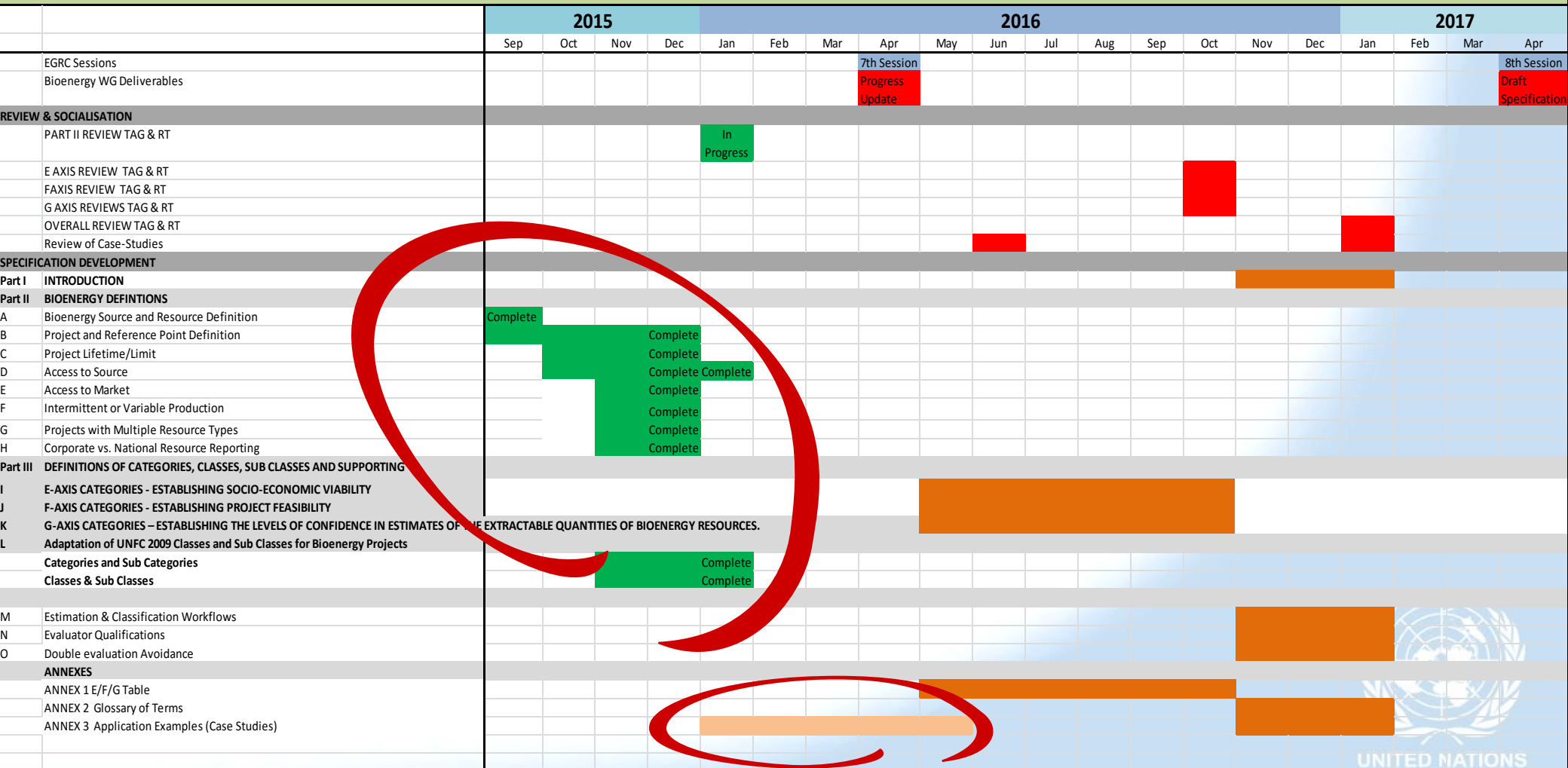
Terms of Reference – Key Objectives.

1. To develop the BioEnergy Specifications and to provide a draft document for the application of UNFC-2009 to bioenergy for discussion and review at the EGRC in April 2017 and the final text in April 2018.
2. To develop case studies on the Application of the UNFC-2009 to BioEnergy to help inform the development of the Bioenergy Specifications and to use for gaining interest from and for general education of stakeholders.
3. To expand the Working Group with relevant, interested and knowledgeable stakeholders, ideally from different backgrounds (energy “producers”, government and non-governmental organizations and financial/reporting) and to actively work on identifying a suitable organization that can act as the long-term “owner” for the BioEnergy Specification.



Work Plan

BioEnergy WorkPlan (updated April 2016)



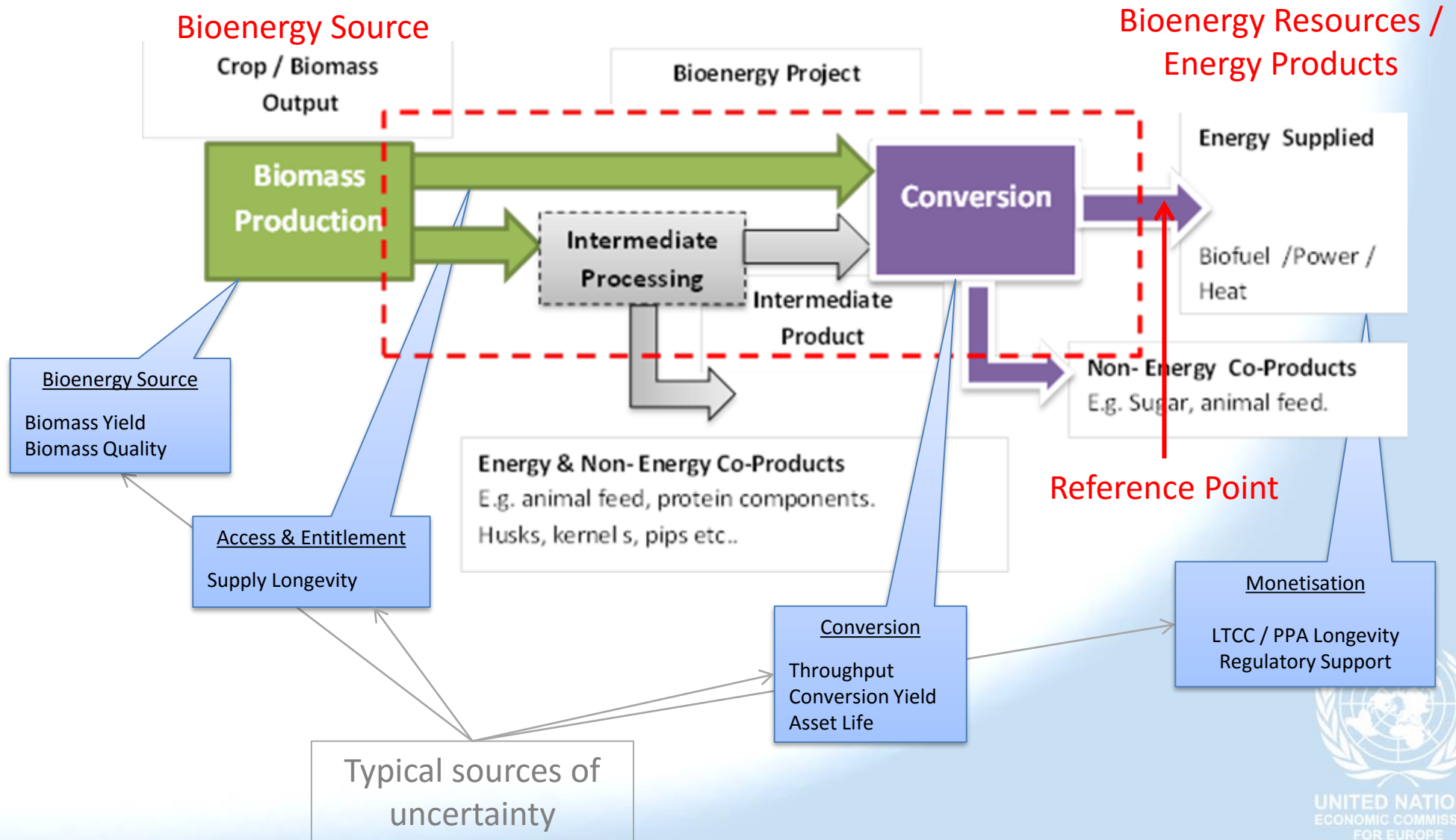
Key
 Delivery deadlines
 Workstream complete
 Workstream in progress
 Workstream planned / or yet to start



Bioenergy Specification Part II – Definitions

- **Bioenergy Source**
- **Bioenergy Energy Product**
- **Treatment of Non-Energy Products**
- **Project and Reference Point Definition**
- **Project Lifetime/Limit**
- **Access and Entitlement to Bioenergy Source.**
- **Access to Market**
- **Intermittent or Variable Production**
- **Projects with Multiple Resource Types.**

Characteristics of a Bioenergy Project



Case Study / Example Development

Bioenergy Case Study Matrix

Case Study Objectives / Characteristics												
	Status	Bioenergy Source Type	Project Maturity			Energy Products (Sales & Non Sales)				Non Energy Products	Bioenergy Source Access and Entitlement Uncertainty	Regulatory Uncertainty
			Existing Operation	Investment Project	Exploration Project	Bioliquids	Biogas	Biopower	Bioheat			
Sugarcane Ethanol	Complete	Non-Fungible Crop	X	X		X		X	X	X		
Corn Ethanol	Refreshed	Agricultural Commodity	X	X		X				X	X	
Renewable Diesel	Complete	Agricultural Commodity	X			X	X				X	X
Miscanthus Cellulosic Ethanol	Complete	Advanced Feedstock			X	X						
Biopower from Wood	In development	Forestry Residues	X	tbc				X	tbc		tbc	tbc

- Biomass Access / Purchase Agreements
- Regulatory Uncertainty

Case Study / Example - ARA Renewable Diesel (Hypothetical)

• Background

- Location: Rotterdam, NL
- Capacity: 100 ktpa
- Start-up: 2013
- Assessment: Jan 2016

• Project Definition

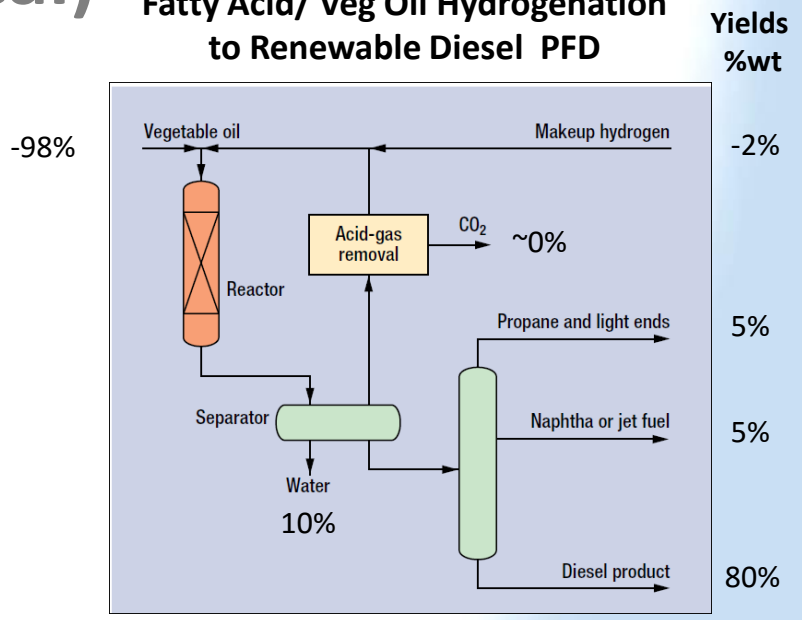
- Bioenergy Sources

1. Palm Oil : 50% of feedstock
2. Animal Tallow (cat. 1) : 50% of feedstock

- Energy Products

Energy Product	Reference Point	Specification	Reporting Units	Supplemental Information
Renewable Diesel	Road/Rail Car Gantry Meter	EN590 (EU Diesel Specification)	Tonnes	The proportion of non-renewable hydrogen factored out of the reported volumes.
BioNaphtha	Road/Rail Car Gantry Meter	<i>Bionaphtha x.x 1.01.2013</i> (ARA Renewable Diesel Manufacturing Specification)	Tonnes	
BioPropane	Pipeline meter	Propane x.x 1.01.2013 (ARA Renewable Diesel Manufacturing Specification)	Tonnes	

Fatty Acid/ Veg Oil Hydrogenation to Renewable Diesel PFD



Case Study / Example - ARA Renewable Diesel

- **Authorisation and Commitment**

- Operating asset / a viable going concern (but dependent on regulatory support).
- All necessary permits and operating licences from the Dutch Government and Rotterdam Port Authority to allow operations.
- Product approvals:
 - Plant and its renewable diesel and bionaphtha production is registered and approved as qualifying biofuels under the relevant Dutch, German, French, and UK legislation.
 - Palm oil certified under the Roundtable of Sustainable Palm Oil (RSPO) scheme.
 - Animal Tallow certified under the International Sustainability and Carbon Certification Scheme.

- **Monetisation of Energy Products**

- **Renewable Diesel:** Mix of annual supply contracts into German and Dutch markets. Pricing at monthly average Platts FAME (biodiesel) quotation + a premium.
- **BioNaphtha:** Single annual supply contract to a French gasoline blender . Pricing at monthly Platts gasoline quotation + a premium.
- **Biopropane:** Single annual supply contract to neighbouring refinery. Supply via pipeline. Pricing at Platts C3 monthly quotation, no “green/bio premium”.

Case Study / Example - ARA Renewable Diesel

- **Quantification**

- Deterministic (scenario) approach.
- Simulation based on businesses operating plan and supporting commercial and technical data. Resultant annual throughput assessed as P50.
- P50 Project lifetime assessed as **10 yrs** based on assessment of longevity of regulatory support.

- **Sources of Uncertainty**

- 1. Annual throughput**

- P90 annual throughput assessed at 85% of operating plan rate due to margin volatility.
- P10 annual throughput assessed at 110% of operating plan rate based on test run results at optimal performance.

- 2. Technical lifetime of the Conversion Asset:**

- P50 25 years based on current maintenance schedule (sustaining capex spend).
- P90 estimate 20 years
- P10 30 years
- At this stage no proposal to re-invest in the plant to significantly extend its operating life beyond 30 years.

Case Study / Example - ARA Renewable Diesel

3. Feedstock Supply Access and Entitlement

- Palm Oil:
 - 50% sourced via a 5 year supply deal that has a further 2 years to run. At this stage it is assessed that there is a high probability (P90) that this contract will be renewed for a further 5 years, and a P50 probability for further renewals thereafter.
 - 50% sourced via a mix of annual supply deals and spot arrangements. Therefore there is a P90 confidence level that this can be assured for a further 3 years. Thereafter, ongoing supply from this tranche of volume is a P50 confidence level.
- Animal Tallow
 - 100% of ARA Renewable Diesel's tallow requirement is sourced via a single 4 year supply deal that has a further 1 year to run (P90 assessment).
 - Introduction of a food based biofuel cap into EU legislation, means that there is there is a low confidence, P10 that this supply contract can be renewed economically for another 4 years.

4. Regulatory Support Exposure / Uncertainty

- Economic viability is highly dependent on regulatory support.
- The relevant legislation is the EU Renewable Energy Directive which sets out biofuel targets out to 2020. This has been promulgated into EU member state legislation, including the Dutch, and German markets that the plant supplies, that have in each introduced biofuel mandates/targets out to 2020.
- P90 assessment that sufficient regulatory support required for economic viability will exist to 2020 (5 years).
- P50 assessment that sufficient regulatory support required for economic viability will exist to 2025 (10 years).
- P90 assessment that sufficient regulatory support required for economic viability will exist to 2050 (35 years).



Case Study / Example - ARA Renewable Diesel

E Category Classification and Sub Classification

Category	UNFC-2009 Definition	Reasoning for classification
E1	Extraction and sale has been confirmed to be economically viable	The plant is an operating viable concern, with all necessary approvals, authorisations and commercial contracts in place.
Sub-category	UNFC-2009 Definition	
E1.2	Extraction and sale is not economic on the basis of current market conditions and realistic assumptions of future market conditions, but is made viable through government subsidies and/or other considerations.	Economic viability is dependent on regulatory support, specifically German, Dutch and French biofuel targets/mandates. The uncertainty on future evolution (post 2020) of this legislation is considered in the G Axis categorisation.
Category	UNFC-2009 Definition	Reasoning for classification
E3	Extraction and sale is not expected to become economically viable in the foreseeable future or evaluation is at too early a stage to determine economic viability.	Considers the difference of the total energy supplied to the plant as defined by the cumulative lower heating value of the palm oil and animal tallow supplied and the cumulative energy (lower heating value) of the energy products extracted / produced.
Sub-category	UNFC-2009 Definition	
E3.3	On the basis of realistic assumptions of future market conditions, it is currently considered that there are not reasonable prospects for economic extraction and sale in the foreseeable future.	At this stage there is no realistic prospect of increasing the conversion of the palm oil/animal tallow supplied into final energy products.

G Category Classification and Sub classification

Category	UNFC-2009 Definition	Reasoning for classification
G1	Quantities associated with a known deposit that can be estimated to a P90 level of confidence. Supply Contracts	Annual production at 85% of operating plan projections (P90 estimate of performance) for a period of 3 years. The period of 3 years is the aggregate P90 estimate of the confidence in securing supply based on the assessment of the supply contracts. The P90 estimates for the period of regulatory support (5 yrs to 2020), and the technical life of the asset (20 yrs) are not constraining factors.
G1 + G2	Quantities associated with a known deposit that can be estimated to a P50 level of confidence. Regulatory Support	Annual production at 100% of operating plan (P50 estimate) for a period of 10 years (to 2025). The period of 10 years is the P50 estimate of the future longevity of sufficient biofuel regulatory in ARA Renewable Biodiesel key markets required for economic viability. The P50 estimates for the aggregate longevity of supply contracts, 13 years, and the technical life of the plant 25 years are not constraining factors.
G1 + G2+G3	Quantities associated with a known deposit that can be estimated to a P90 level of confidence. Conversion Plant Life Time	Annual production at 110% of operating plan (P90 estimate) for 30 years. The period of 30 years is the P90 estimate of the technical lifetime of the plant. The P90 estimates of the longevity of the supply contracts (35 years) and regulatory support (35 years) are not constraining factors.

F Category Classification and Sub classification

Category	UNFC-2009 Definition	Reasoning for classification
F1	Feasibility of extraction by a defined development project or mining operation has been confirmed	A current operational unit.
Sub-category	UNFC-2009 Definition	
F1.3	Sufficiently detailed studies have been completed to demonstrate the feasibility of extraction by implementing a defined development project or mining operation.	
F4	No development project or mining operation has been identified	No feasible technical option to increase unit conversion beyond 90%, due to fundamental stoichiometric constraints.

Constraints vary according to scenario

Case Study / Example - ARA Renewable Diesel

- UNFC-2009-Classification and Quantification

Class	Sub Class	Classification	Energy Products	Quantity	
				Kte	Mbbls*
Commercial Project	On Production	E1.2 F1.1 G1	Renewable Diesel	200	1.5
			BioNaphtha	12	0.1
			Biopropane	12	0.1
			Total	225	1.8
		E1.2 F 1.1 G1 + G2	Renewable Diesel	784	5.9
			BioNaphtha	49	0.5
			Biopropane	49	0.6
			Total	882	6.9
		E1.2 F 1.1 G1 + G2 + G3	Renewable Diesel	2587	19.5
			BioNaphtha	162	1.5
			Biopropane	162	1.8
			Total	2911	22.9
Additional Quantities in Place Associated with Resource		E3 F4 G1	Total Energy Products	25	0.2
		E3 F4 G1 + G2		98	0.7
		E3 F4 G1 + G2 + G3		323	2.3

*BBL Factors	bbl/te
Feedstock	6.988
Renewable Diesel	7.532
BioNaphtha	9.457
BioPropane	11.435

Forward Work Program

2015 / 2016

- Resolution of Methodological Issues.
- Further Case Study Development.
- Promote methodology more broadly
- Seek support from other stakeholder groups
- Identify a long-term “owner” for the BioEnergy Specification.

April 2017

Presentation of **draft text** of specifications for the application of UNFC-2009 to bioenergy

April 2018

Presentation of **final text** of specifications for the application of UNFC-2009 to bioenergy

BioEnergy WorkPlan (updated April 2016)

	2015				2016												2017			
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
EGRG Sessions																				
Bioenergy WG Deliverables								7th Session												8th Session
REVIEW & SOCIALIZATION																				
PART II REVIEW TAG & RT																				
E-AXIS REVIEW TAG & RT					In Progress															
F-AXIS REVIEW TAG & RT																				
G-AXIS REVIEW TAG & RT																				
OVERALL REVIEW TAG & RT																				
Review of Case-Studies																				
SPECIFICATION DEVELOPMENT																				
Part I INTRODUCTION																				
Part II BIOENERGY DEFINITIONS																				
A Bioenergy Source and Resource Definition	Complete																			
B Project and Reference Point Definition				Complete																
C Project Lifetime/Limit				Complete																
D Access to Source				Complete	Complete															
E Access to Market				Complete																
F Intermittent or Variable Production				Complete																
G Projects with Multiple Resource Types				Complete																
H Corporate vs. National Resource Reporting				Complete																
Part III DEFINITIONS OF CATEGORIES, CLASSES, SUB CLASSES AND SUPPORTING																				
I E-AXIS CATEGORIES - ESTABLISHING SOCIO-ECONOMIC VIABILITY																				
J F-AXIS CATEGORIES - ESTABLISHING PROJECT FEASIBILITY																				
K G-AXIS CATEGORIES - ESTABLISHING THE LEVELS OF CONFIDENCE IN ESTIMATES OF THE EXTRACTABLE QUANTITIES OF BIOENERGY RESOURCES.																				
L Adaptation of UNFC 2009 Classes and Sub Classes for Bioenergy Projects																				
Categories and Sub Categories					Complete															
Classes & Sub Classes					Complete															
M Estimation & Classification Workflows																				
N Evaluator Qualifications																				
O Double evaluation Avoidance																				
ANNEXES																				
ANNEX 1 E/F/G Table																				
ANNEX 2 Glossary of Terms																				
ANNEX 3 Application Examples (Case Studies)																				

Key
■ delivery deadlines
■ Workstream complete
■ Workstream in progress
■ Workstream planned / or yet to start



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