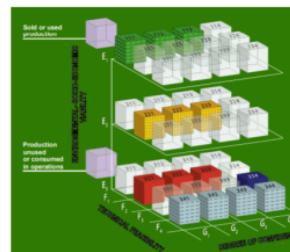




# Practical Application Of the UNFC –

# For Policy and Decision Makers

Matthias Hartung



VIRTUAL WORKSHOP

How the United Nations Framework Classification for Resources (UNFC) can help channel investments into energy and resource projects for sustainable development

11 March 2021 17:00 - 18:30 CET



# Bringing the UNFC 'Adoption to Life'



UNECE

- To-date, UNFC has been adopted mainly for **disclosure & reporting**
- UNFC is also to **compare & contrast across resource types:**
  - Policies
  - Portfolios
  - Projects } Impact on {
  - People
  - Planet
  - Prosperity
- To demonstrate this capability, a **Minimum Viable Tool** is built
  - Based on an established Resource Data Management System
  - Populated with realistic project data
  - Aimed for practitioners to use and improve
  - Supporting UNFC adoption and further gaps identification
  - For **well-informed decisions on sustainable resource management**

# Roadmap to the Minimum Viable Tool



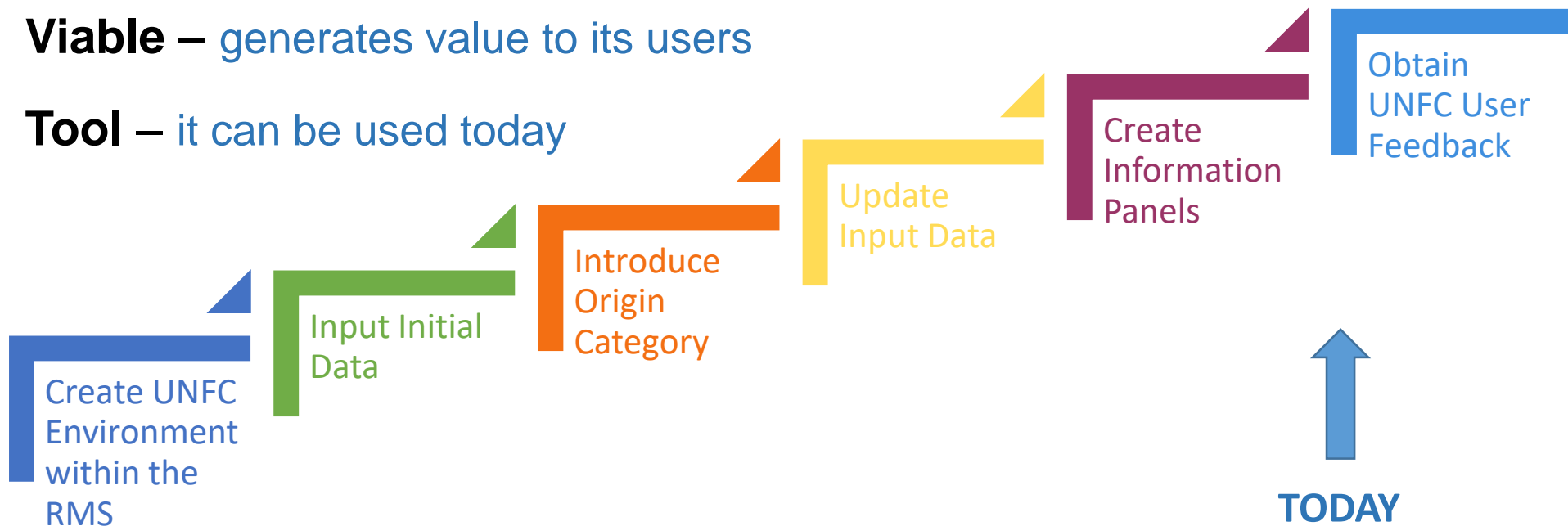
UNECE

## Minimum –

- Starts with resources volumes/forecasts, cash flow, employment, CO2 intensity
- Extendable - for other socio-economic and environmental quantities or criteria
- Scalable – from projects to portfolios to policies

**Viable** – generates value to its users

**Tool** – it can be used today



# UNFC – Standard Reporting Template

(1)



UNECE

REPORTING

Reserve > UNFC\_ARR

DISCARD DELETE/ARCHIVE

Template Name\* UNFC\_ARR

Description\* Annual Reserves & Resource Reporting - UNFC Classification

01/01/2010 - 31/12/2060

Reporting Frequency\* Yearly

ATTRIBUTES VARIABLES

search...

- Country
- Company
- Region
- Production Station
- Field
- Well
- Completions

Selected Attributes

United Kingdom DEMO

Selected Variables

Field Well

REPORTING TEMPLATE

Unit SI

MATERIAL TYPE

Oil NAG Employment AG GHG Condensate

Fix Units Set during data loading

Level well

Input Frequency Monthly

UNFC\_111

Oil NAG Employment AG GHG Condensate

ADD CATEGORY

Normally not present in PRMS Classification

# UNFC – Standard Reporting Template

(2)



UNECE

REPORTING

Unit: SI

MATERIAL TYPE: Oil, NAG, Employment, AG, GHG, Condensate

Fix Units (selected) / Set during data loading

Level	Input Frequency	Oil	NAG	Employment	AG	GHG	Condensate
well	Monthly						
well	Monthly						
well	Monthly						
field	Yearly						
field	Yearly						
field	Yearly						
field	Total_Entry						
field	Total_Entry						
field	Total_Entry						
field	Total_Entry						

UNFC\_111, UNFC\_112, UNFC\_113, UNFC\_221, UNFC\_222, UNFC\_223, UNFC\_321, UNFC\_322, UNFC\_323, UNFC\_334

Reporting Classification Categories

Different Reporting Levels

Different Input Frequencies

# Quality Assurance Reporting



UNECE

FLUXBLE | Energy Energy Server

> Reserve > Reporting Template

DISCARD SUPPORTING DOCUMENTS SAVE SUBMIT

ARR2019\_PRMS\_20200817

General Information

Company  
Energy

Comment

Reporting Template

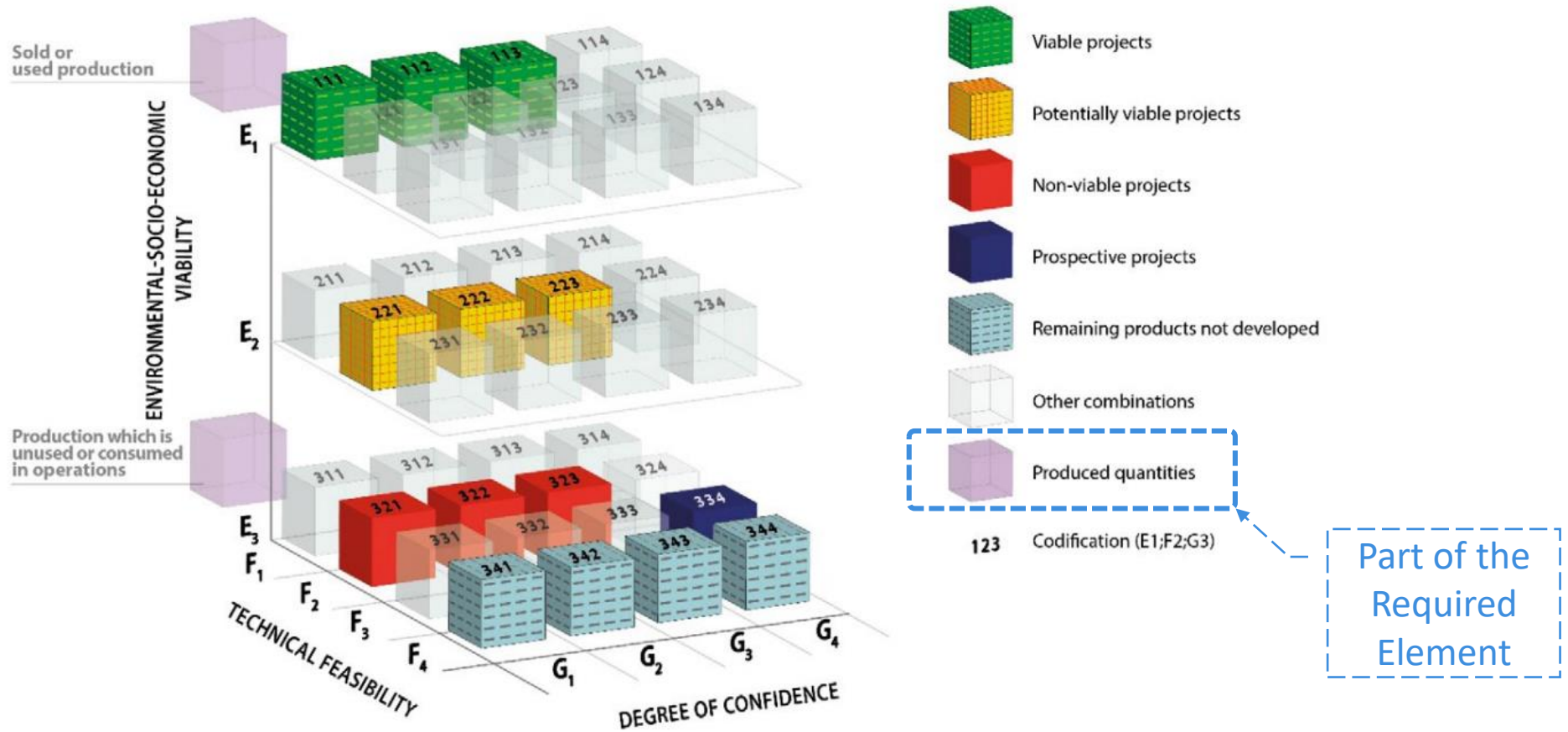
company	field	well	Reporting Period	date mm/dd/yyyy	category	Oil m <sup>3</sup> /d	NAG m <sup>3</sup> /d	AG m <sup>3</sup> /d	Condensate m <sup>3</sup> /d	Comment
Energy	██████████	██████████	2018	01/01/2018	00PRMS - 1PDP	██████████	0	0	0	
Energy	██████████	██████████	2018	01/01/2019	00PRMS - 1PDP	██████████	0	0	0	

UNFC  
Quality  
Assessment  
Report

# UNFC Categories in 3D



## UNFC Categories and Examples of Classes



# Resource Categories – Flattened in 2D

## Opening and Closing Balance of Resource Volumes



UNEP

HYDROCARBON RESOURCES [*10 <sup>6</sup> m <sup>3</sup> ]		CLOSING BALANCE															
		Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344	
		1,665	370	96	116	188	75	89	20	4	9	91	6,847	1,239	1,627	535	
OPENING BALANCE	Np	1,641	1,641														
	111	402	25	351									26				
	112	99		94										5			
	113	152			113											39	
	221	96				96											
	222	24					24										
	223	48						48									
	321	20							18					2			
	322	5								4					1		
	323	9									8					1	
	334	69										49					20
	341	6,576					48						6,528				
	342	1,200						39						1,161			
	343	1,440							12						1,428		
344	338															338	
Revisions																	
Transfers				19	2	4	44	12	28	2	0	1	35	291	72	159	177
Extensions & Discoveries												7					

Annually Reported Categories

EMPLOYMENT [FTE/year]		CLOSING BALANCE														
		Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344
			2,908	756	915	1,098	287	603	156	33	73	715				
OPENING BALANCE	Np															
	111	3,158	194	2,760												
	112	777		737												
	113	1,193			886											
	221	754				754										
	222	189					189									
	223	379						379								
	321	157							141							
	322	38								30						
	323	74									66					
	334	539										382				
	341															
	342															
	343															
344																
Revisions																
Transfers			148	19	29	344	98	224	15	4	7	278				
Extensions & Discoveries													55			

Deteriorating

Maturing



# Resource Reclassification

Learning by Doing - Origin Categories needed?



UNEP

HYDROCARBON RESOURCES [*10 <sup>6</sup> m <sup>3</sup> ]	CLOSING BALANCE															
	Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344	
	1,665	370	96	116	188	75	89	20	4	9	91	6,847	1,239	1,627	535	
<b>OPENING BALANCE</b>																
Np	1,641	1,641														
111	402	25	351									26				
112	99		94										5			
113	152			113										39		
221	96				96											
222	24					24										
223	48						48									
321	20							18				2				
322	5								4				1			
323	9									8				1		
334	69										49				20	
341	6,576				48							6,528				
342	1,200					39							1,161			
343	1,440						12							1,428		
344	338														338	
Revisions																
Transfers			19	2	4	44	12	28	2	0	1	35	291	72	159	177
Extensions & Discoveries												7				

EMPLOYMENT [FTE/year]	CLOSING BALANCE														
	Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344
	2,908	756	915	1,098	287	603	156	33	73	715					
<b>OPENING BALANCE</b>															
Np															
111	3,158	194	2,760												
112	777		737												
113	1,193			886											
221	754				754										
222	189					189									
223	379						379								
321	157							141							
322	38								30						
323	74									66					
334	539										382				
341															
342															
343															
344															
Revisions															
Transfers			148	19	29	344	98	224	15	4	7	278			
Extensions & Discoveries															55

Other Origin Categories to be reported

# Classification for All Quantities

Resource Volumes, Employment, Emissions, Finance, ...



UNECE

HYDROCARBON RESOURCES [*10 <sup>6</sup> m <sup>3</sup> ]		CLOSING BALANCE															
		Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344	
		1,665	370	96	116	188	75	89	20	4	9	91	6,847	1,239	1,627	535	
OPENING BALANCE	Np	1,641	1,641														
	111	402	25	351									26				
	112	99		94										5			
	113	152			113											39	
	221	96				96											
	222	24					24										
	223	48						48									
	321	20							18					2			
	322	5								4					1		
	323	9									8					1	
	334	69										49					20
	341	6,576					48						6,528				
	342	1,200						39						1,161			
343	1,440							12						1,428			
344	338															338	
Revisions																	
Transfers			19	2	4	44	12	28	2	0	1	35	291	72	159	177	
Extensions & Discoveries												7					

Equivalent GHG [*10 <sup>6</sup> Tonne]		CLOSING BALANCE														
		Np	111	112	113	221	222	223	321	322	323	334	341	342	343	344
		632	140	37	44	53	14	29	8	2	4	35				
OPENING BALANCE	Np	623	623													
	111	153	9	133												
	112	38		36												
	113	58			43											
	221	36				36										
	222	9					9									
	223	18						18								
	321	8							7							
	322	2								1						
	323	4									3					
	334	26										18				
	341															
	342															
343																
344																
Revisions																
Transfers			7	1	1	17	5	11	1	0	0	13				
Extensions & Discoveries												3				

# Dashboard

## Projects Overview & Details



UNECE

FLUXBLE | Energy Energy Server English

Venture Search Add Venture

**ADD FILTER**

Select Continent/Country | ▾

Select Resource Type | ▾  
*HC, Solar, Wind, Geothermal, Hydro*

Select Resource Classes | ▾  
*111, 112, 113*

Select Resource Range | ▾  
*0.5 – 1.0 Exajoule*

Select Social Measure | ▾  
*Employment-Operational > 50,  
Employment-Construction > 1,000*

**COMPARE**

Select Projects | ▾

**PROJECT DETAILS**

GLASS POINT MIRAAB SOLAR TO STEAM

Continent: Asia

Country: Oman

Resource Type: Solar

Lifecycle Duration [years]: 20

UNFC Resource Estimate – Project Units [MW]

111 1,050	112 250	113 500
--------------	------------	------------

Lifecycle Resource – 111 [Exajoule]: 0.66

Eqv. CO2 Emissions [g/MJ]: 13.9

Construction Duration [years]: 3.5

Employment-Construction [FTE]: 1,100

Employment-Operational [FTE]: 75

Financing Request [MM\$]: 90

# Dashboard

## Compare & Contrast Projects



UNECE

FLUXBLE | Energy Energy Server

Venture

Search Add Venture

### PROJECT COMPARISON

- Continent
- Country
- Resource Type
- Lifecycle Duration [years]
- UNFC Resource Estimate:
- Lifecycle Resource – 111 [EJ]
- Eqv. CO<sub>2</sub> Emissions [g/MJ]
- Construction Duration [years]
- Employment-Construction [FTE]
- Employment-Operational [FTE]
- Financing Request [MM\$]

MIRAAH SOLAR	GREATER BARIK	ATATÜRK DAM
Asia	Asia	Asia/Europe
Oman	Oman	Turkey
Solar	Hydrocarbon	Hydro-Electric
30	35	50
[MW] 1,050	[MMSTB] 180	[MW] 2,500
0.99	1.06	3.94
13.9	10.3	5.1
3.5	2.0	5.0
1,100	900	3,500
75	150	90
90	35	120

# Dashboard

## Solar to Hydrocarbon Comparison




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FLUXBLE | Energy Energy Server

Venture

Search Add Venture



### PROJECT COMPARISON

Continent	Country	Resource Type	Lifecycle Duration [years]	UNFC Resource Estimate:	Lifecycle Resource – 111 [EJ]	Eqv. CO <sub>2</sub> Emissions [g/MJ]	Construction Duration [years]	Employment-Construction [FTE]	Employment-Operational [FTE]	Financing Request [MM\$]
Asia	Oman	Solar	30	[MW] 1050	0.99	13.9	3.5	1,100	75	90
Asia	Oman	Hydrocarbon	35	[MMSTB] 169	0.99	23.0	2.0	900	150	35

Based on reported saving of 300,000 tons of CO<sub>2</sub> emissions each year

# Dashboard Forecasts

## Testing Policies



Sensitivities on Example Project with No CO2-Tax, \$30/t, \$50/t, \$100/t CO2

FLUXBLE | Energy Energy Server

Economics Cases Scenarios

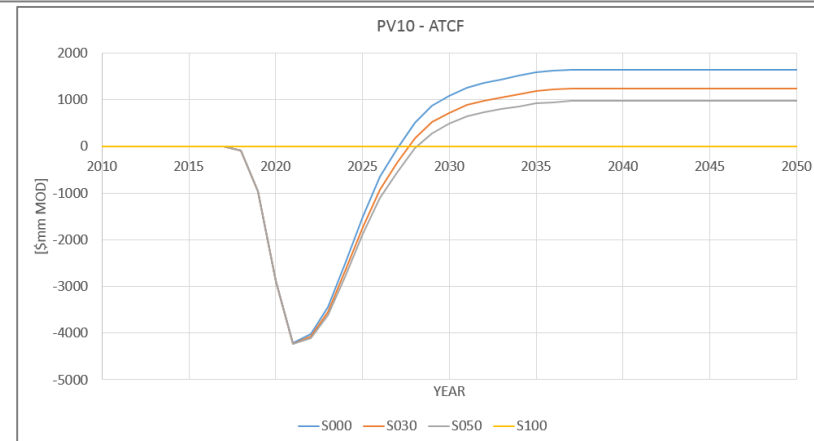
Cases Parameters Fiscal Terms

Search Project

- UNFC 08 Mar 2021 - 5:44 AM
  - S000\_UC102A
  - S030\_UC102A
  - S050\_UC102A
  - S100\_UC102A
- UNFC\_UC102A\_HC 08 Dec 2020 - 10:53 AM

Key Metrics Upstream	NPV [\$mm, Net Share]		DPI 10%	IRR [%]	Total Production mmboe	UTC [\$/boe RT]		Payout Time [MOD]	Max. Exposure [MOD, Net Share]	COP
	ATCF NPV0	ATCF NPV10				0%	10%			
Total Project S000_UC1	8469	1646	0.315	15.971	406	29.845	15.104	7.132	2335	2037,000
Total Project S030_UC1	7548	1239	0.237	14.619	406	31.920	15.903	7.355	2335	2037,000
Total Project S050_UC1	6934	968	0.185	13.671	406	33.304	16.437	7.518	2335	2037,000
Total Project S100_UC1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

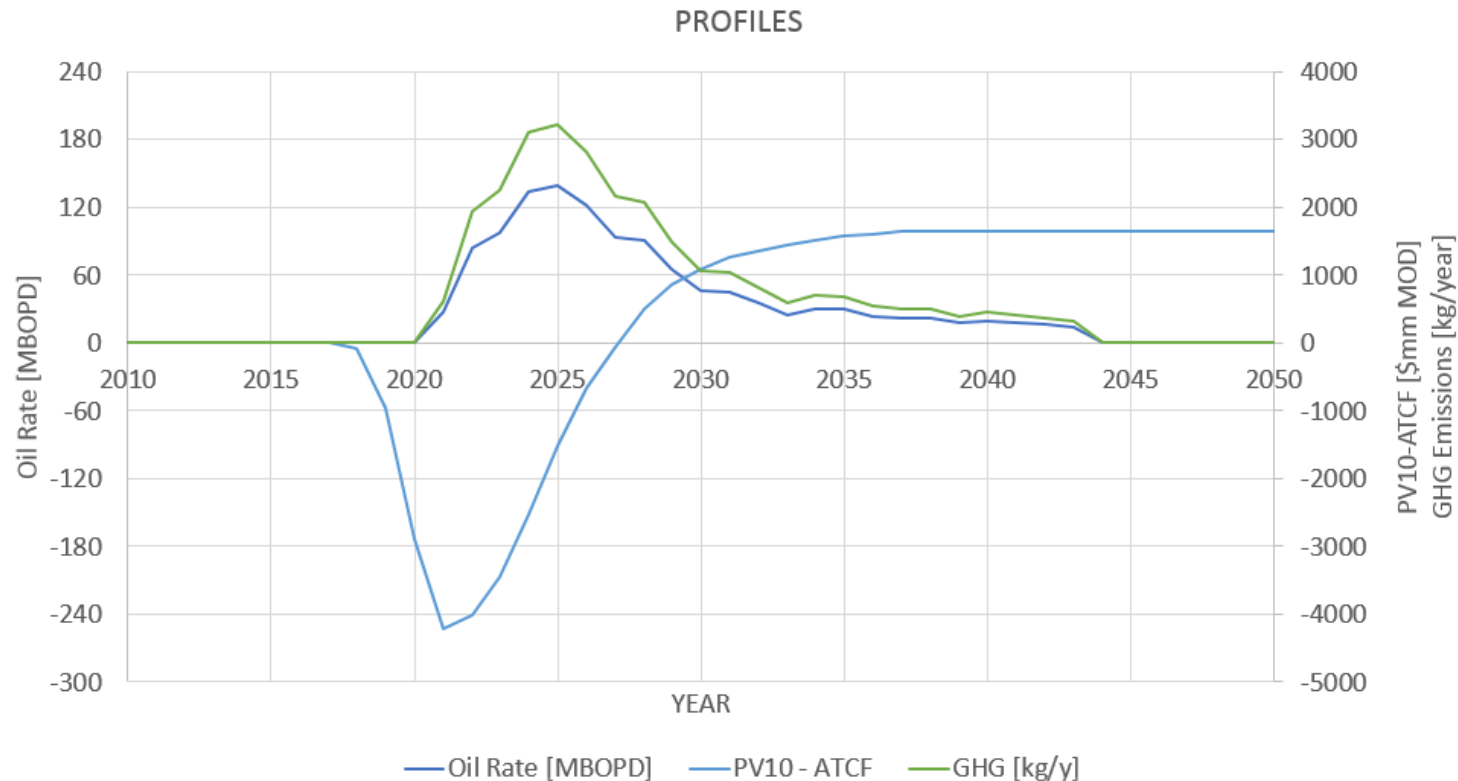
Example indicates project at \$100/t CO2 tax is impaired



# Requirements for Testing Policies



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## Requirements:

- Production profile for each resource category
- Cashflow profile for the project;
- GHG profile calculation in line with agreed sustainability reporting standard

# Contributing Factors to Eqv. CO<sub>2</sub> Emissions



UNEP

## Solar

- Source: <https://www.nrel.gov/docs/fy13osti/56487.pdf>
- Study conducted by National Renewable Energy Laboratory (NREL)
- Study aims to provide more precise estimates of life cycle GHG emissions from PV systems
- Contributing Factors to Eqv. CO<sub>2</sub> Emissions:
  - Mining and fabrication of PV Panels;
  - Mining and fabrication of power lines;
  - Mining and fabrication of panel reinforced foundation;
  - Logistics of material and construction staff;
  - Potential loss of vegetation that converts CO<sub>2</sub> to oxygen due to space occupation and shade creation.

## Hydrocarbon

- Source: <https://www.osti.gov/pages/servlets/purl/1485127>
- Study conducted by Stanford University
- HC eqv. CO<sub>2</sub> emissions range between 3-20 g/MJ with a median of 10.3 g/MJ.
- Study focusses on the “well-to-wheels” life-cycle GHG emissions of transport fuels
- Contributing Factors to Eqv. CO<sub>2</sub> Emissions:
  - Mining and fabrication of concrete;
  - Mining and fabrication of steel;
  - Mining, fabrication & operation of heavy machinery;
  - Power generation requirement for operational usage;
  - Logistics of material and construction/operational staff;
  - Potential loss of vegetation that converts CO<sub>2</sub> to oxygen due to space occupation for access roads and facilities;
  - Impact on vegetation of potential spills;
  - Clean up efforts of potential spills.

## Hydro-electric

- Source: <https://www.hydropower.org/greenhouse-gas-emissions>
- Based on UNESCO G-res tool (life-cycle)
- Contributing Factors to Eqv. CO<sub>2</sub> Emissions:
  - Mining and fabrication of concrete;
  - Mining and fabrication of reinforcement steel;
  - Mining, Fabrication & operation of heavy machinery;
  - Decay of submerged vegetation
  - Loss of vegetation that converts CO<sub>2</sub> to oxygen.

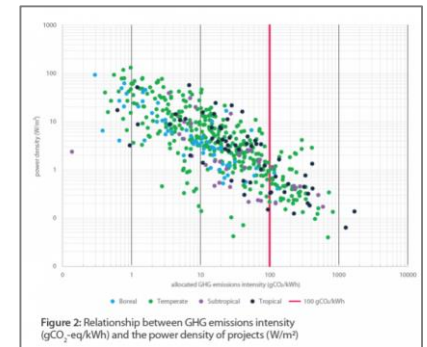


Figure 2: Relationship between GHG emissions intensity (gCO<sub>2</sub>-eq/kWh) and the power density of projects (W/m<sup>2</sup>)



# Learnings from Early Adoption



UNEP

- 3D representation are illegible; **2D representation work well**
- **Reporting requirements** to cover production and (non-)sales volumes, revisions, transfers, discoveries and extensions
- **Single reporting standard set** needed for
  - Carbon intensity
  - Financial reporting
  - Local/in-country employment
  - Other quantities?
- **International Centers of Excellence**
  - For learning by doing
  - Sandbox for practitioners
- **Adopters with project/portfolio data** and use cases needed

# Conclusion



UNECE

- UNFC works to **compare & contrast across resource types:**
  - Policies
  - Portfolios
  - Projects } Impact on {
  - People
  - Planet
  - Prosperity
- **Minimum Viable Tools** exist to build trusted data systems
- **Double-Materiality assessments can become data-driven,** dynamic, and context-driven, using a wider scope of data
- UNFC becomes a **"negotiation" tool** for
  - “Balanced and integrated resource management“
  - Resolving conflict and
  - Create the win-win-win for People, Planet & Prosperity
- **Time to adopt the UNFC**
  - **For well-informed decisions on sustainable resource management**

# Thank you

Matthias Hartung

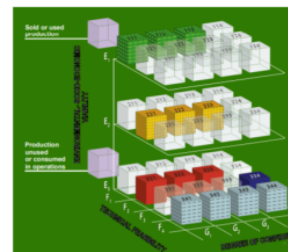
*Executive Consultant on  
Data & Digital Transformation*

And the MVT provided by

TARGET ENERGY SOLUTIONS LTD



**UNECE**



**VIRTUAL WORKSHOP**

**How the United Nations Framework  
Classification for Resources (UNFC) can help  
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11 March 2021 17:00 - 18:30 CET

