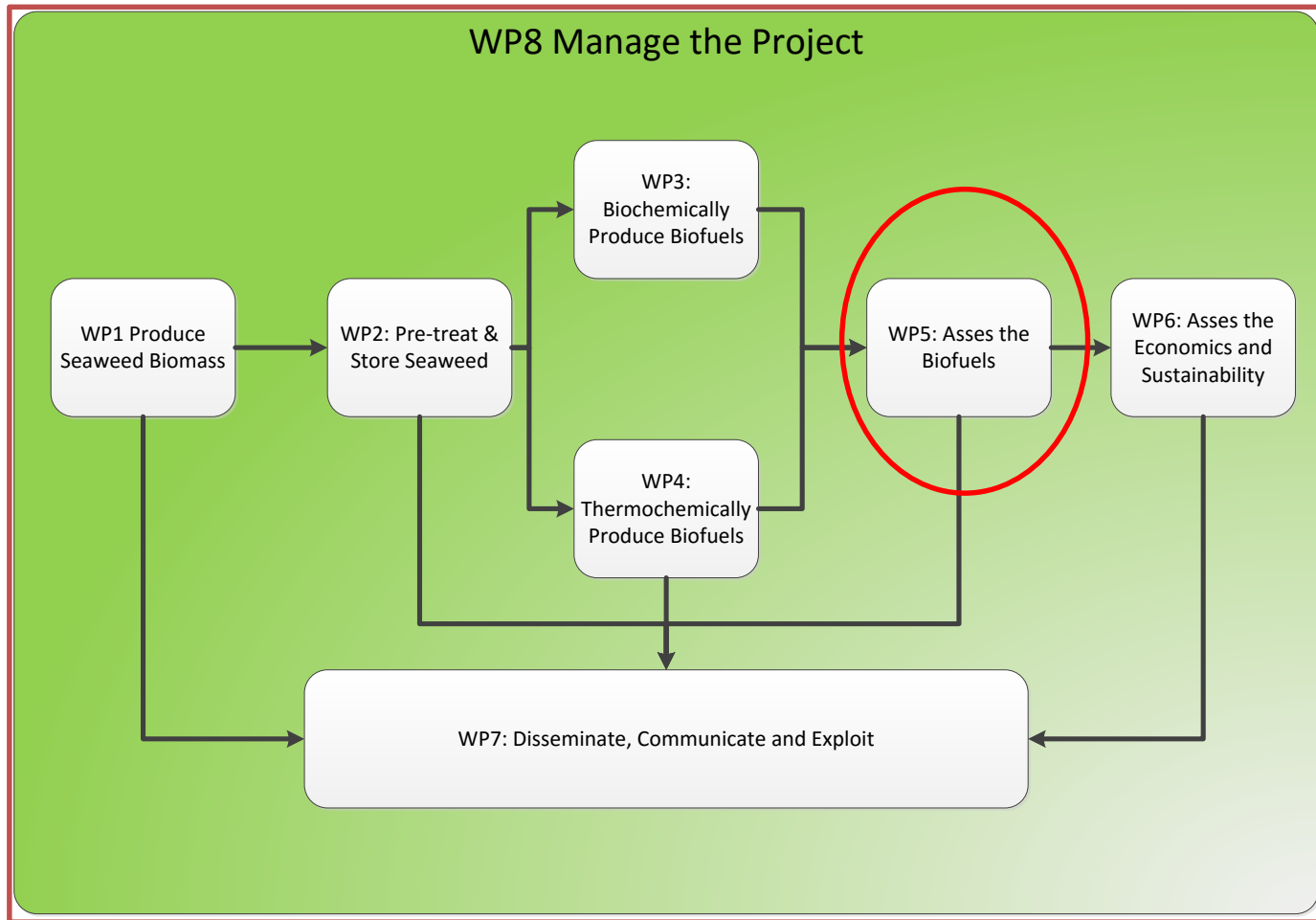


# WP5: Fuel suitability and by-product application tests

2<sup>nd</sup> Progress Meeting, January 10-11  
Wageningen, The Netherlands



# WP-5 flow



# Objectives

- To determine the suitability of the produced fuels in the use of combustion engines
- To perform a combustion engine test with selected fuels from WP 3 and 4
- To assess the use of the residues from the fractionation and fermentation processes, specifically the protein and the mineral fractions

# Fuel Tests Ethanol

- Ethanol test
- Type: Spark ignition test, 1.2l turbocharged GDI Engine
- Blend:
- We will test at 10%, 20%, 85%, 100% by volume. Amount: 200l (A standard 200-litre (55 US or 44 imp gal) drum)
- Test procedure:
- During test we will focus on measurement of particulate, black carbon, aldehydes, ketones, polycyclic aromatic HC, secondary organic aerosols from heavy HC and cold start properties. Using a pressure probe, we will analyse indicated efficiency.
- We envision the drivecycles cycles performed will be: U.S. FTP75, Europe NEDC Japan 10.15 and ece r83 type VI (low ambient temperature, CO and HC after cold start.)

# “Ether” (Furanic) Test

- Ether test
- Type: Compression/spark ignition test, engine TBD
- Blend:
- We will regard this as an additive, 100ppm to 1% by volume
- Amount: 2l
- Test procedure:
- During test we will focus on measurement of particulate, black carbon, aldehydes, ketones, polycyclic aromatic HC, secondary organic aerosols from heavy HC and cold start properties. Using a pressure probe, we will analyse indicated efficiency and ignition delay. All depending on the properties of the additive.
- We envision the drivecycles cycles performed will be: U.S. FTP75, Europe NEDC Japan 10.15 and ece r83 type VI (low ambient temperature, CO and HC after cold start.)

# Status

- Advisory Board:
  - Office of Nils Torvalds declined
  - Proviron declined
  - Statoil has declined
  - Shell biodomain has comitted to join
  - Novozymes ?
- Estimated what it would take to produce 20 l. of alcohols

# Scenario summary

	Worst Case	DOA Case
<b>KELPS (ethanol)</b>		
Amount of seaweed (kg. Wet)	1800	485
Extraction net volume (l.)	4500	1250
Concentration factor	0.5	4
<b>Kelps (Butanol, ABE)</b>		
Amount of seaweed (kg. Wet)	1800 (1400)	1200 (900)
Extraction net volume (l.)	5000 (3500)	3000 (2000)
Concentration factor	2.3 (same)	1.5 (same)

# Scenario summary (ethanol)

	Worst Case	DOA Case
<b><i>Palmaria</i></b>		
Amount of seaweed (kg. Wet)	610	483
Extraction net volume (l.)	1500	1200
Concentration factor	1	2.5
<b><i>Gracilaria</i></b>		
Amount of seaweed (kg. Wet)	800	420
Extraction net volume (l.)	2000	1100
Concentration factor	0.5	4



# Scenario summary (Butanol)

	Worst Case	DOA Case
<b><i>Palmaria</i></b>		
Amount of seaweed (kg. Wet)	1200 (860)	920 (680)
Extraction net volume (l.)	3000 (2200)	2300 (1700)
Concentration factor	1.5	1.15
<b><i>Gracilaria</i></b>		
Amount of seaweed (kg. Wet)	1950 (1500)	1000 (720)
Extraction net volume (l.)	5000 (3600)	2500 (1800)
Concentration factor	2.4	1.2

# Scenario summary

	Worst Case	DOA Case
<b>Ulva (ethanol)</b>		
Amount of seaweed (kg. Wet)	4000	800
Extraction net volume (l.)	10000	2000
Concentration factor	20	4
<b>Ulva (Butanol)</b>		
Amount of seaweed (kg. Wet)	9500 (7200)	2000 (1500)
Extraction net volume (l.)	25000 (18000)	5000 (3600)
Concentration factor	12	2.4 (2.4)

# Plan for the next six months

- Action Items:
  - Inventorize major equipment at partners
    - Extraction, fermentation, UF, distillation Units
  - Fuels specs from DTI (water in Ethanol; IBE, ABE, or pure butanol for the blend)
  - Develop furanics scenario's (with WP4)
- Revisit list of candidates for AB
- Coordinate samples for residue valorisation

# DISCUSSION

# Acknowledgement



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