

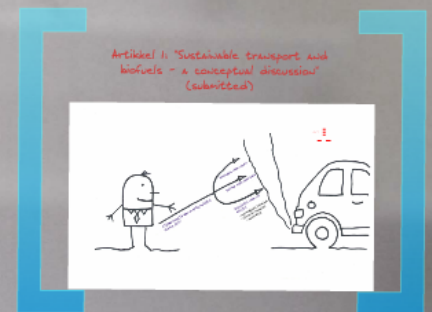
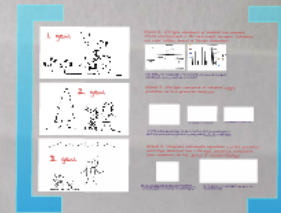
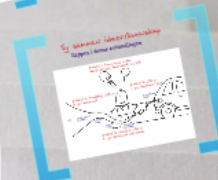
Livsløpsanalyse (LCA) av 1. til 3. generasjons biodrivstoff

Ph.d. avhandling av Geoffrey Gilpin,
Vestlandsforskning

Takk for din oppmerksomhet

Kontaktinformasjon: Geoffrey Gilpin
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6851 Sogndal
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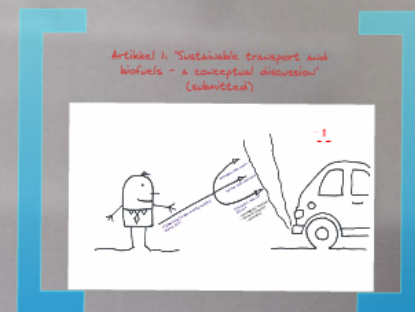
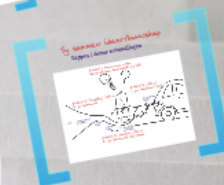
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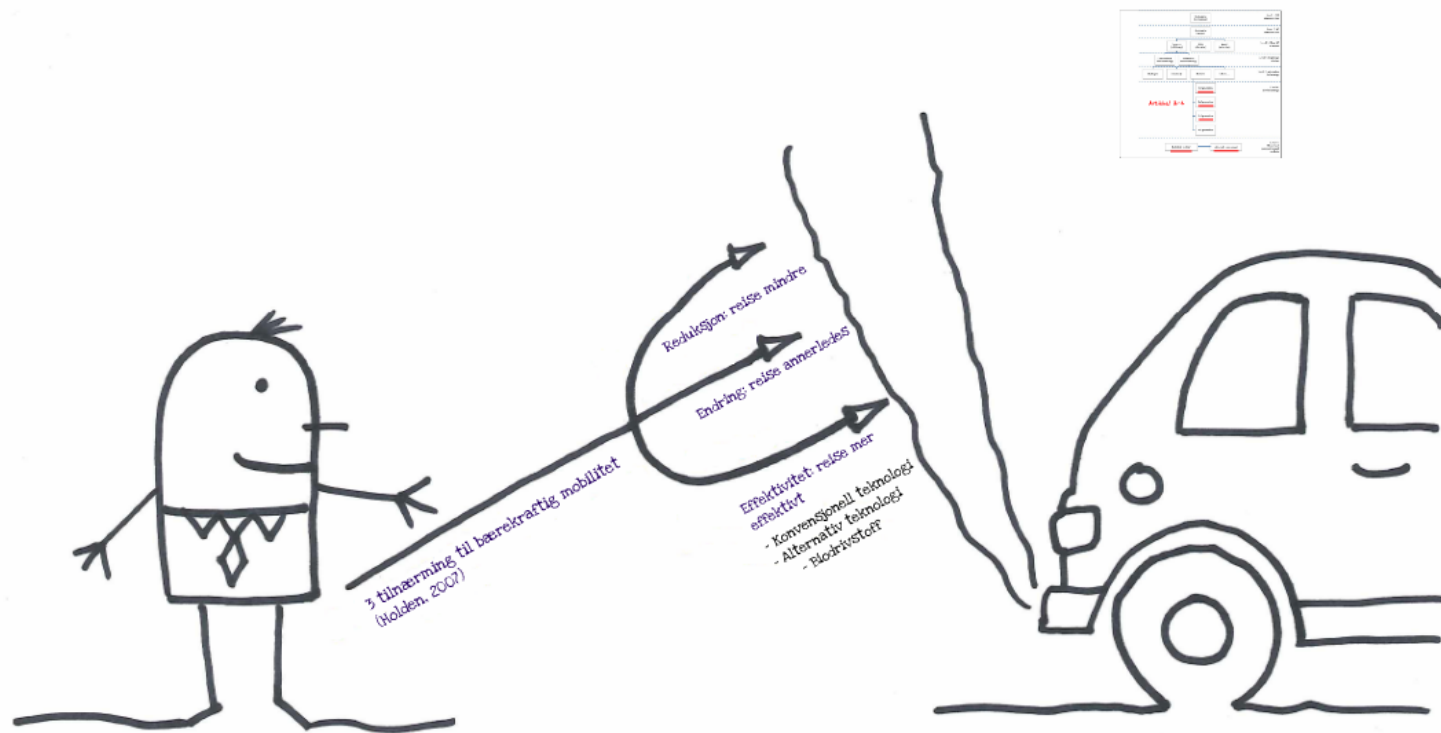
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Artikkel 1: "Sustainable transport and biofuels - A conceptual discussion" (submitted)





3 tilnærming til bærekraftig mobilitet
(Holden, 2007)

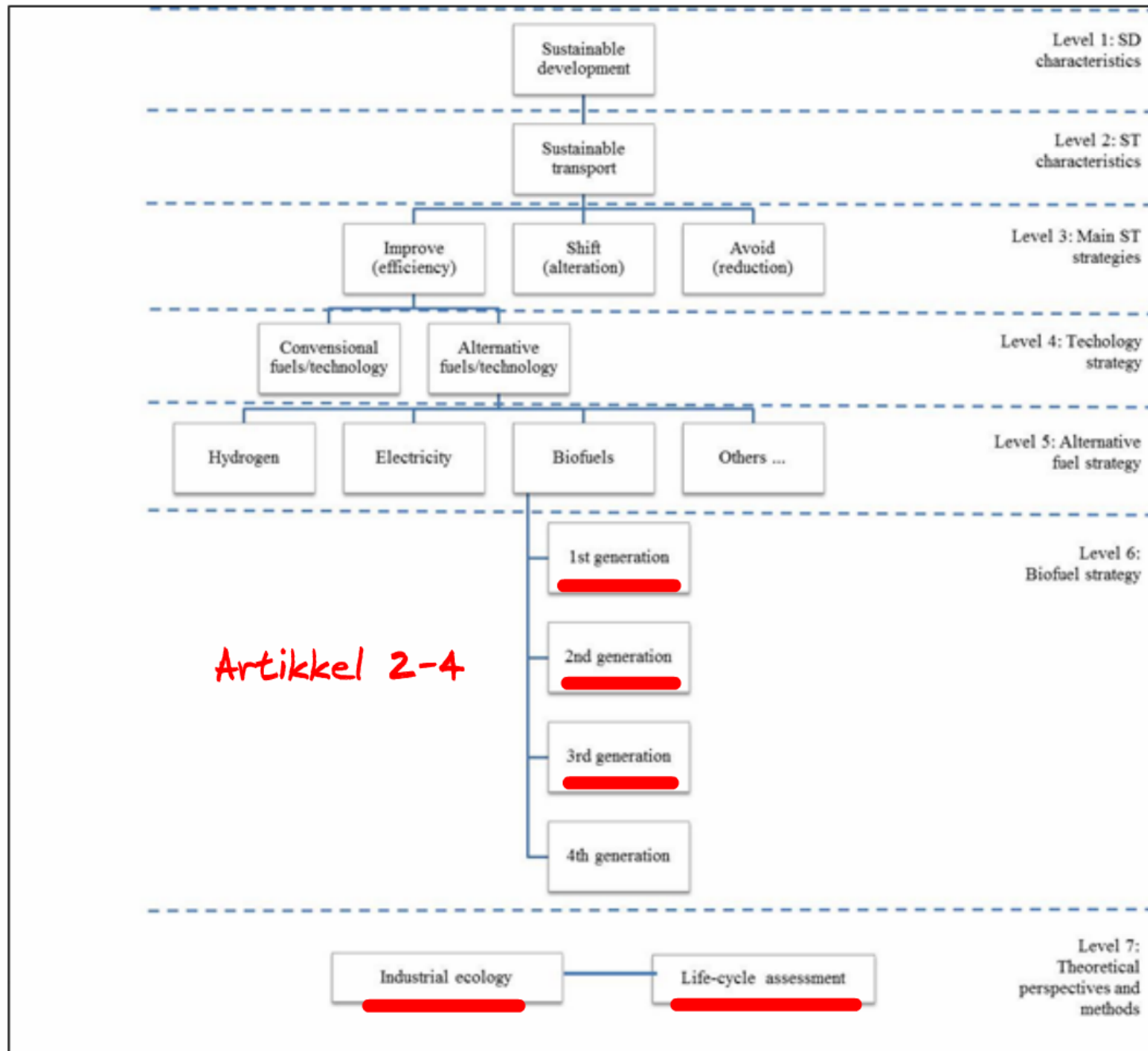
mobilitet

Reduksjon: reise mindre

Endring: reise annerledes

Effektivitet: reise mer effektivt

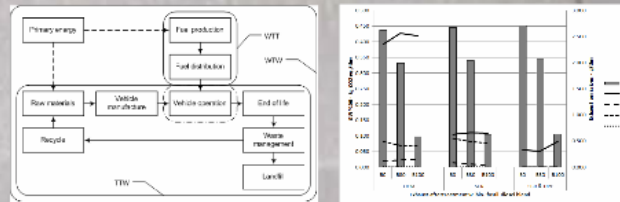
- Konvensjonell teknologi
- Alternativ teknologi
 - Biodrivstoff



1. gen.



Artikkel 2. "Life-cycle assessment of biodiesel and advanced exhaust aftertreatment in EU road freight transport" (submitted and under revision, Journal of Cleaner Production)



Main finding: "the combination of environmental measures in transport embodies both synergy and trade-off effects"

2. gen.



Artikkel 3. "Life-cycle Assessment of industrial enzyme production for 2nd generation bioethanol"

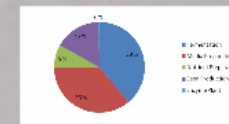


Fig. 1. Forgrundsprosesser, bidrag mot GWP100



Fig. 2. Bakgrundsprosesser, bidrag mot GWP100

Hovedfunn: Enzymproduksjon kan bli en flaskehals i 2. gen. produksjon av bioethanol mht. høyt energiforbruk og manglende tilgang til vekstmedium.

3. gen.



Artikkel 4. "Integrated multi-trophic aquaculture and 3rd generation macro-algae bioethanol from a life-cycle assessment perspective" (near completion, aim Intl. Journal of Industrial Ecology)



Plan: Collect LCI data from dis-aggregated studies of: atlantic salmon, blue mussel, macro-algae, and biorefinery. Synthesize and combine that from a cross-industry perspective to provide a preliminary indication of the environmental sustainability of this process

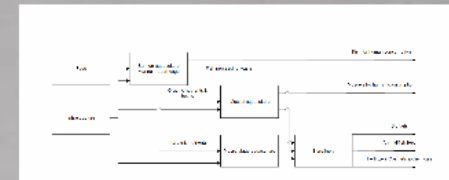
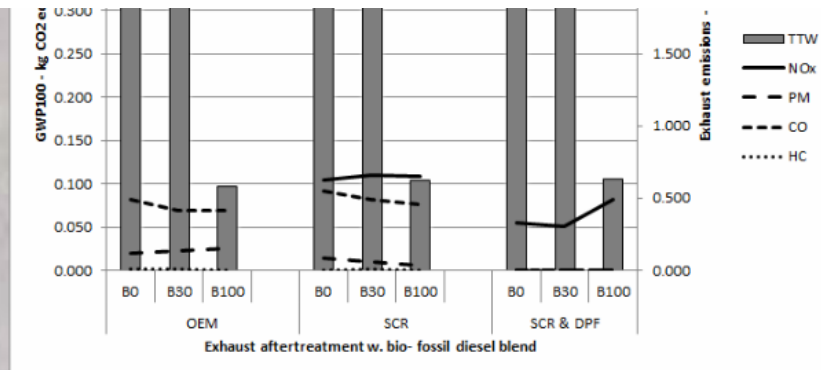
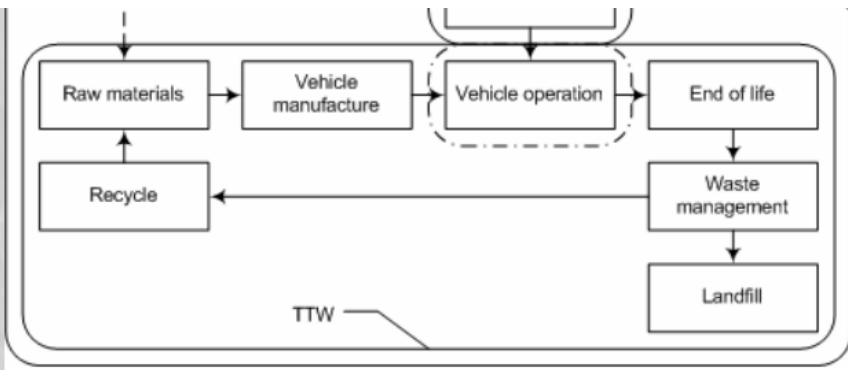


Fig. 2 Integrated multi-trophic aquaculture system with combined biorefinery



Main finding: "the combination of environmental measures in transport embodies both synergy and trade-off effects"

Artikkel 3. "Life-cycle Assessment of industrial enzyme production for 2nd generation bioethanol"

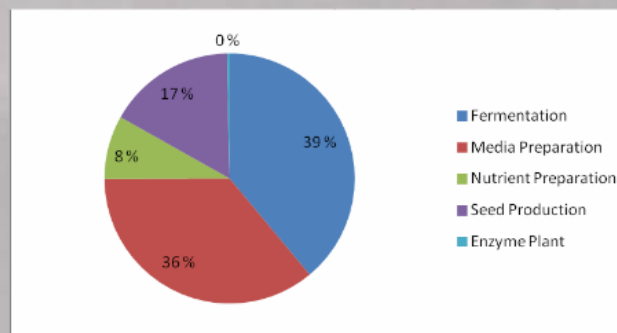
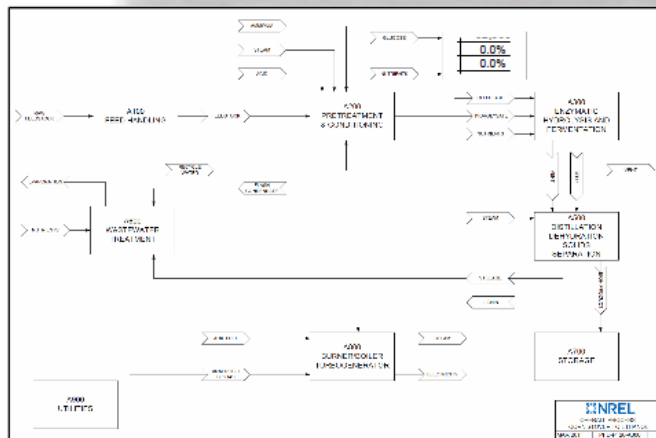


Fig. 1 Forgrunnsprosesser, bidrag mot GWP100

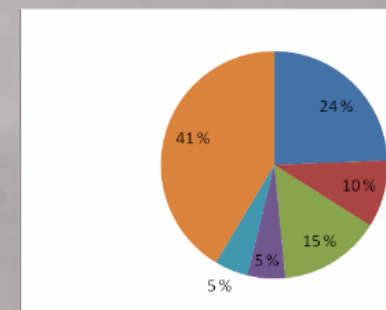
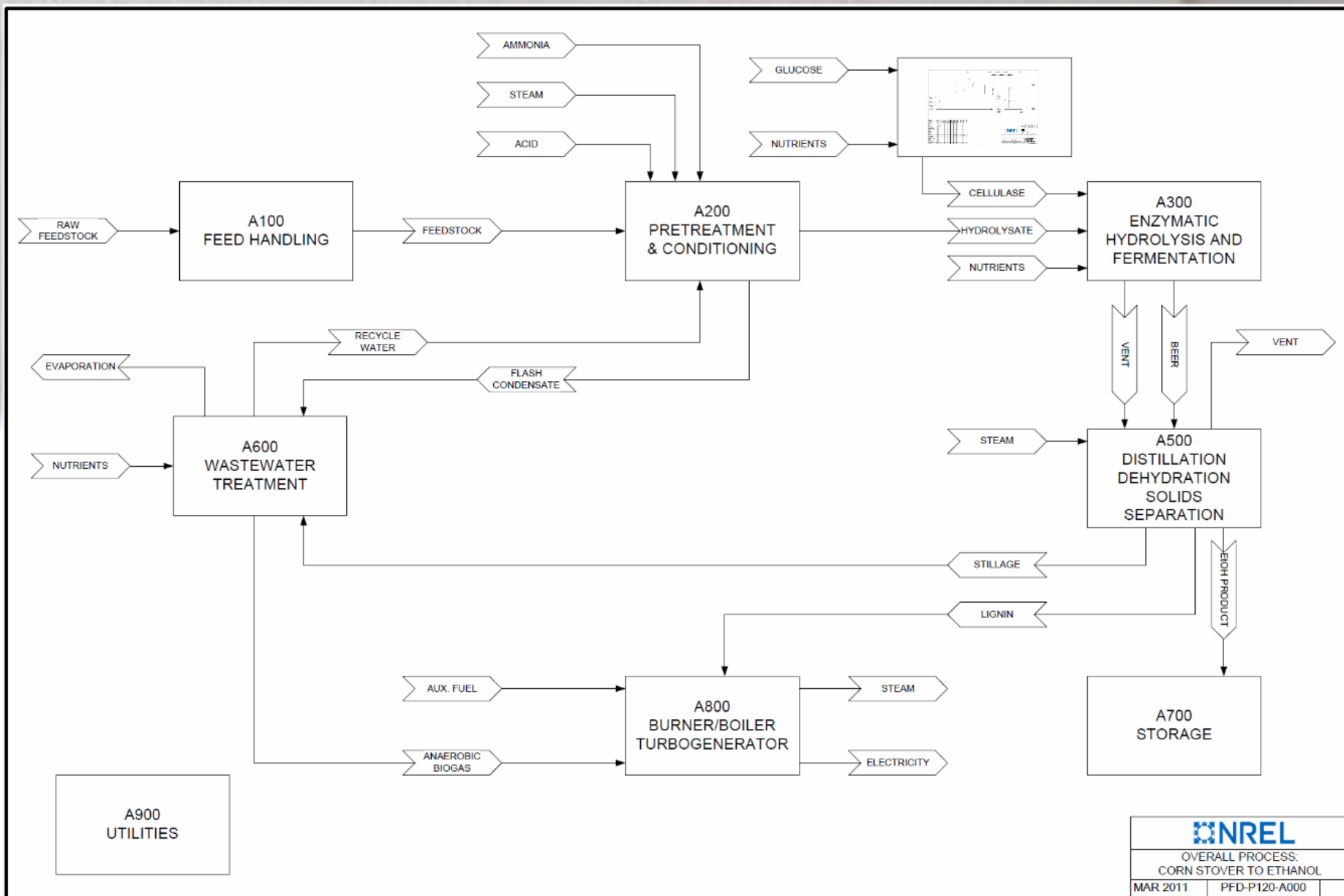
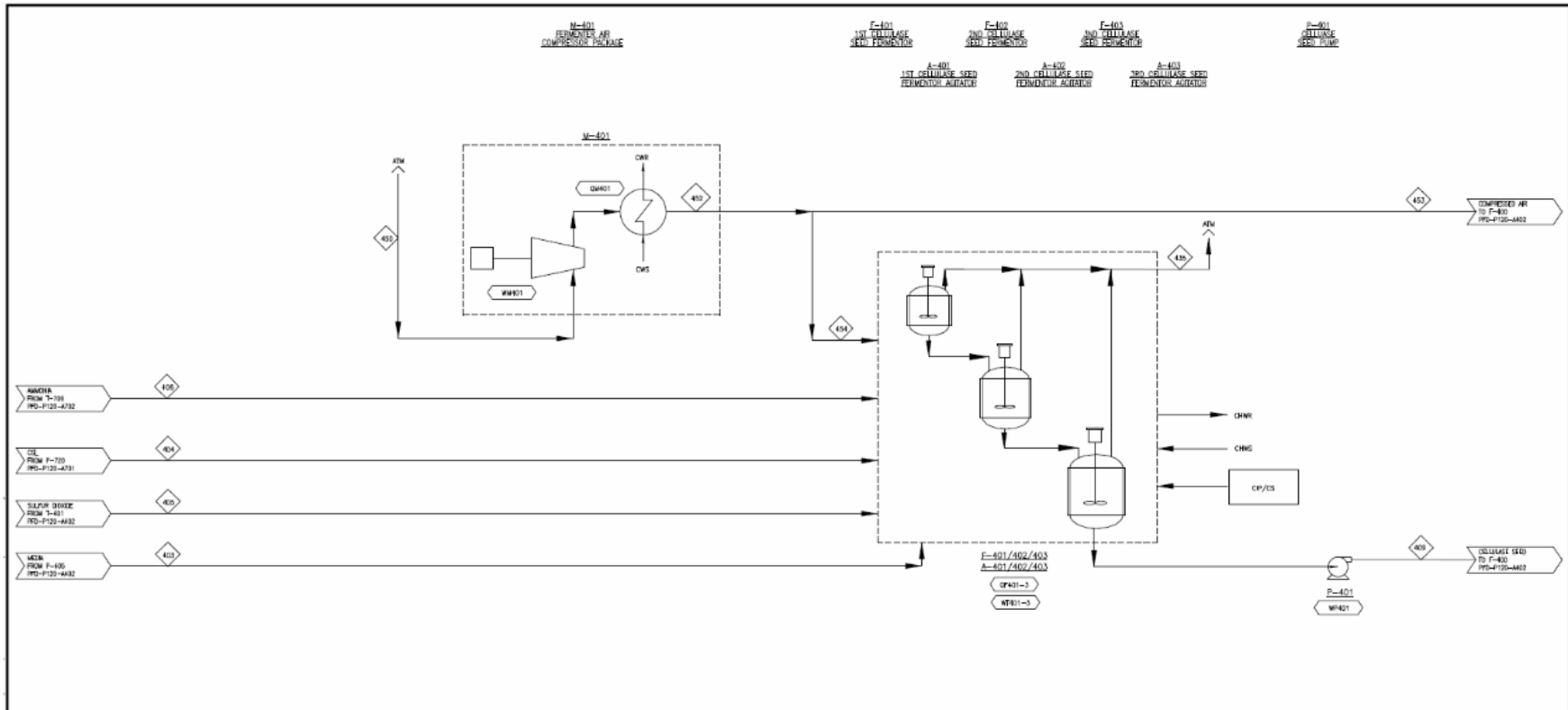


Fig. 2 Bakgrunnsprosesser





COMPONENT	UNIT	403	404	405	406	407	408	409	410	411	412
TOP FLOW	kg/hr	750	0	0	0	770	1,680	20,693	20,693	20,001	1,690
PERMEATE SOLIDS	%	0.5%	25.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
SOLUBLE SOLIDS	%	15.3%	34.7%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%	0.0%
TEMPERATURE	°C	40	20	20	20	20	20	20	20	20	20
PRESSURE	PSI	3.0	1.0	3.0	3.0	2.0	1.0	1.0	3.0	3.0	3.0
PERMEATE FLOW	kg/hr	0.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0
PERMEATE	kg/hr	565	4			714	37	630	630	600	30
GLUCOSE (G)	kg/hr	121				12	0				
PERMEATE (G)	kg/hr										
OTHER SOLIDS (G)	kg/hr										
SUGAR (G)	kg/hr										
ORGANIC SOLIDS (G)	kg/hr	0	2			2	0				
PERMEATE SOLIDS (G)	kg/hr										
AMMONIA	kg/hr	0			6	0	0				
AMINO ACIDS	kg/hr										
SULFURIC ACID	kg/hr										
PURIFIED	kg/hr	0				0	0				
OTHER ORGANICS	kg/hr										
CARBON DIOXIDE	kg/hr	0				0	0				
METHANE	kg/hr	0				0	0	7,440	7,440	7,055	304
O ₂	kg/hr	0				0	0	1,167	24,604	24,604	23,237
N ₂	kg/hr	0				0	0				
COSOLVENTS	kg/hr										
ETHANOL (E)	kg/hr										
OTHER ALCOHOLS (E)	kg/hr										
AMMONIA (A)	kg/hr										
AMINO ACIDS (A)	kg/hr										
PERMEATE (P)	kg/hr	3	2			7					
GLUCOSE (G)	kg/hr	1				34					
OTHER SOLIDS (G)	kg/hr										
PERMEATE SOLIDS (G)	kg/hr	0	0			0	0				
CARBON SOLIDS (G)	kg/hr	130	0			73	0				
CO ₂	kg/hr	0	0			0	0				
CH ₄ (20°C)	kg/hr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



Heat Stream	Capacity (Work Stream)	kW	Capacity
CH401	1.172 (W401)	1400	1.211
CP/CS	0.460 (W401)	0	0.000
WT401-3	0.232 (W401-3)	232	0.200

Harris Group Inc.
Engineering for Optimum Performance
 www.harrisgroup.com

Scale: NONE
 Project: E&D
 Author: JRM
 Designer: JRM
 Checker: JRM
 Engineer: JRM

NATIONAL RENEWABLE ENERGY LABORATORY
 GOLDEN, COLORADO

2011 BIOCHEMICAL DESIGN REPORT
PROCESS FLOW DIAGRAM
SECTION A400
CELLULOSE SEED FERMENTATION

Project No: 30083.00
 Drawing No: PFD-P120-A401

Rev	Date	By	Description
0	4/27/11	JRM	ISSUED SHEET TABLE
1	4/27/11	JRM	ISSUED FOR 2011 DESIGN REPORT
2	4/27/11	JRM	ADDED SHEET TABLE
3	12/22/09	JRM	ISSUED FOR DESIGN REPORT

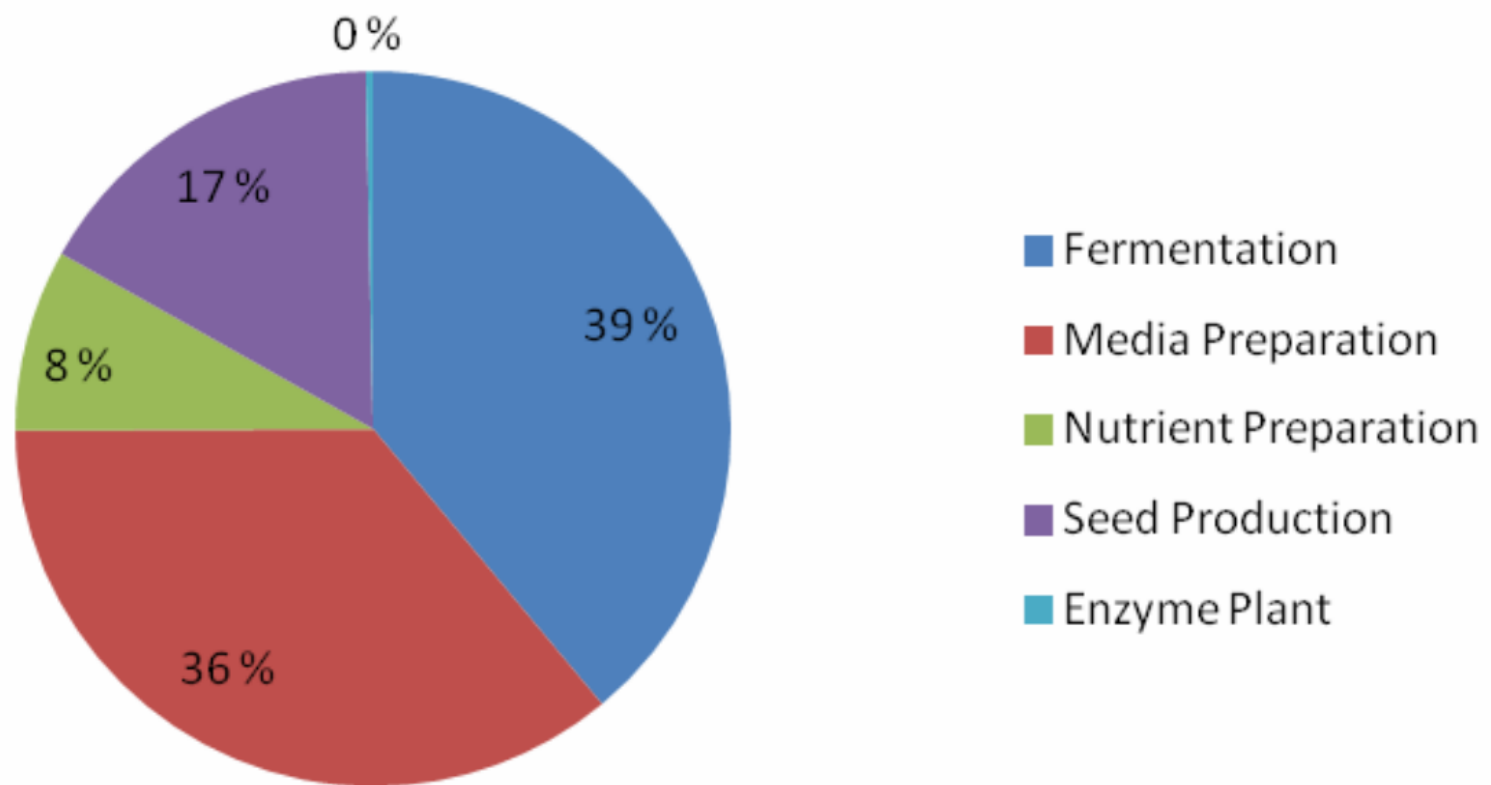


Fig. 1 Forgrunnsprosser, bidrag mot GWP100

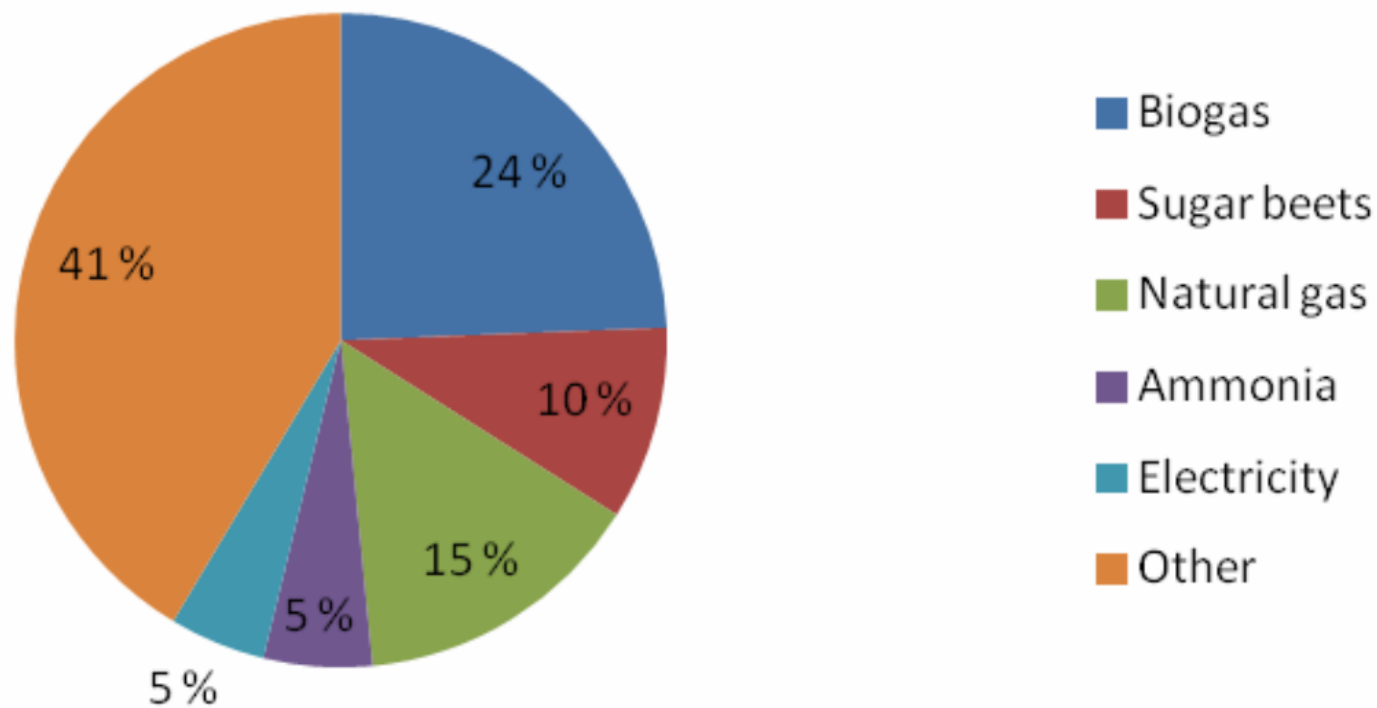


Fig. 2 Bakgrunnsprosser, bidrag mot GWP100

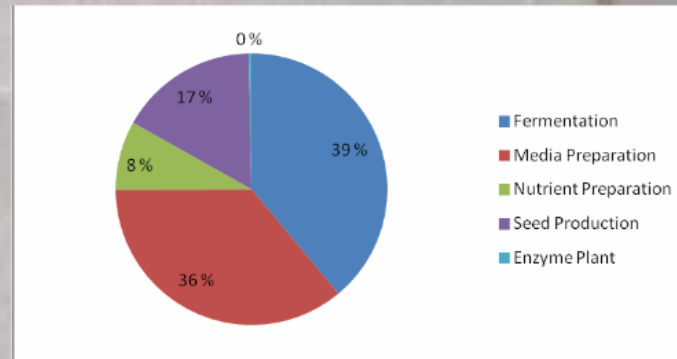
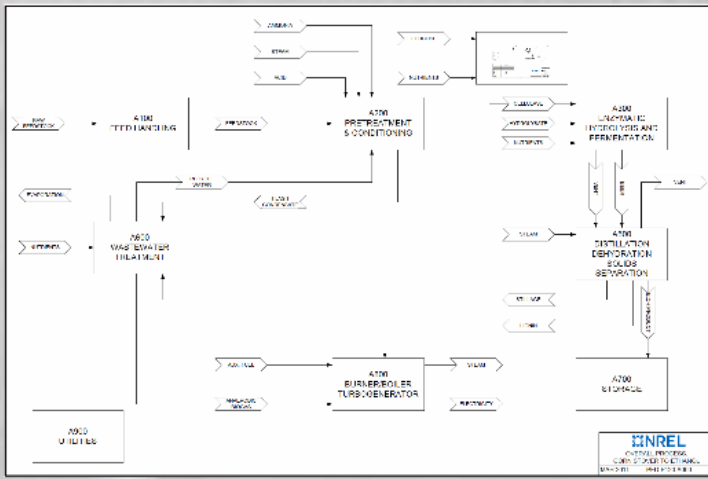


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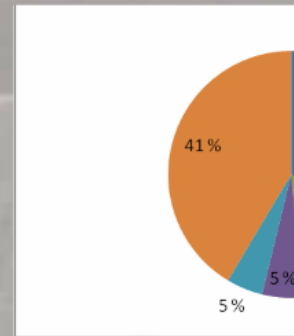
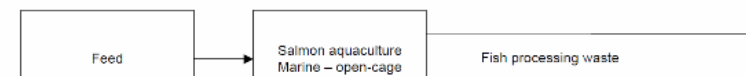


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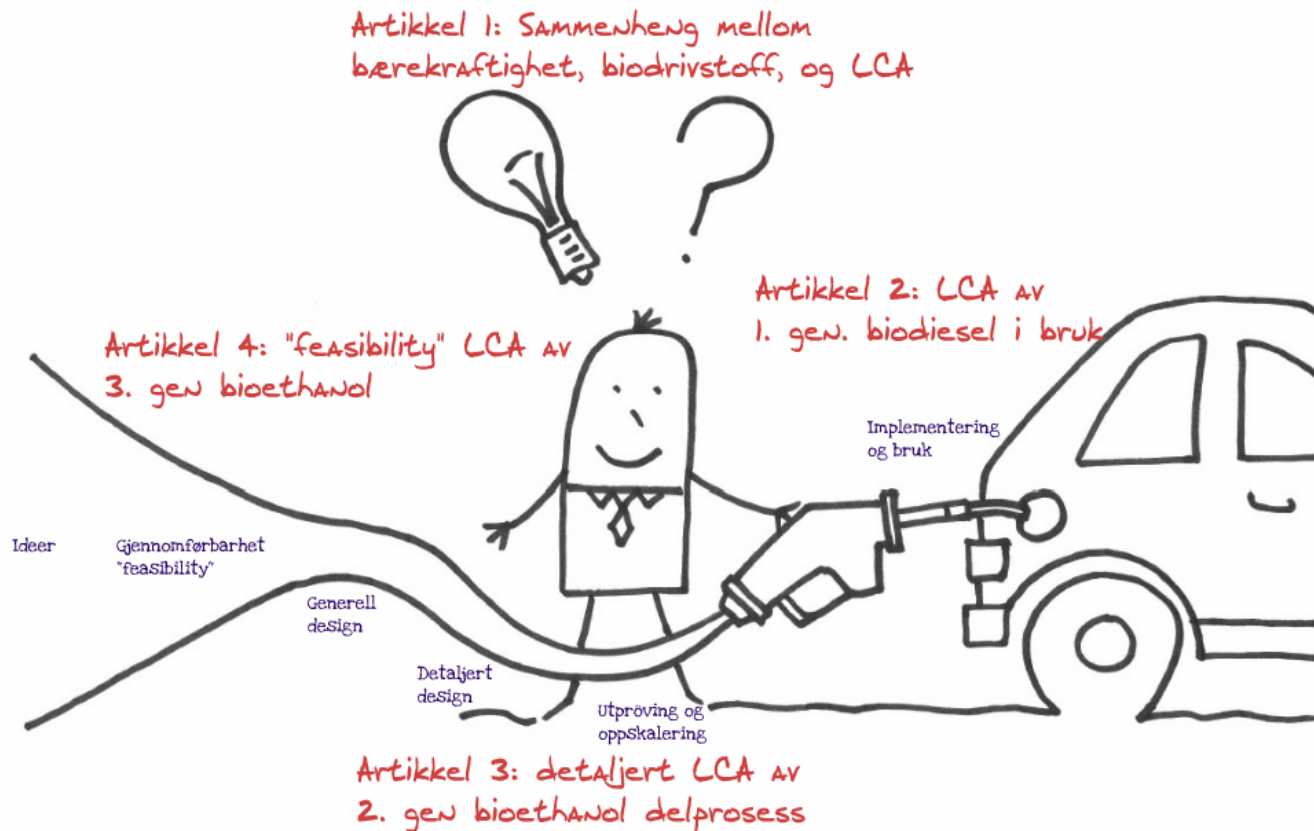
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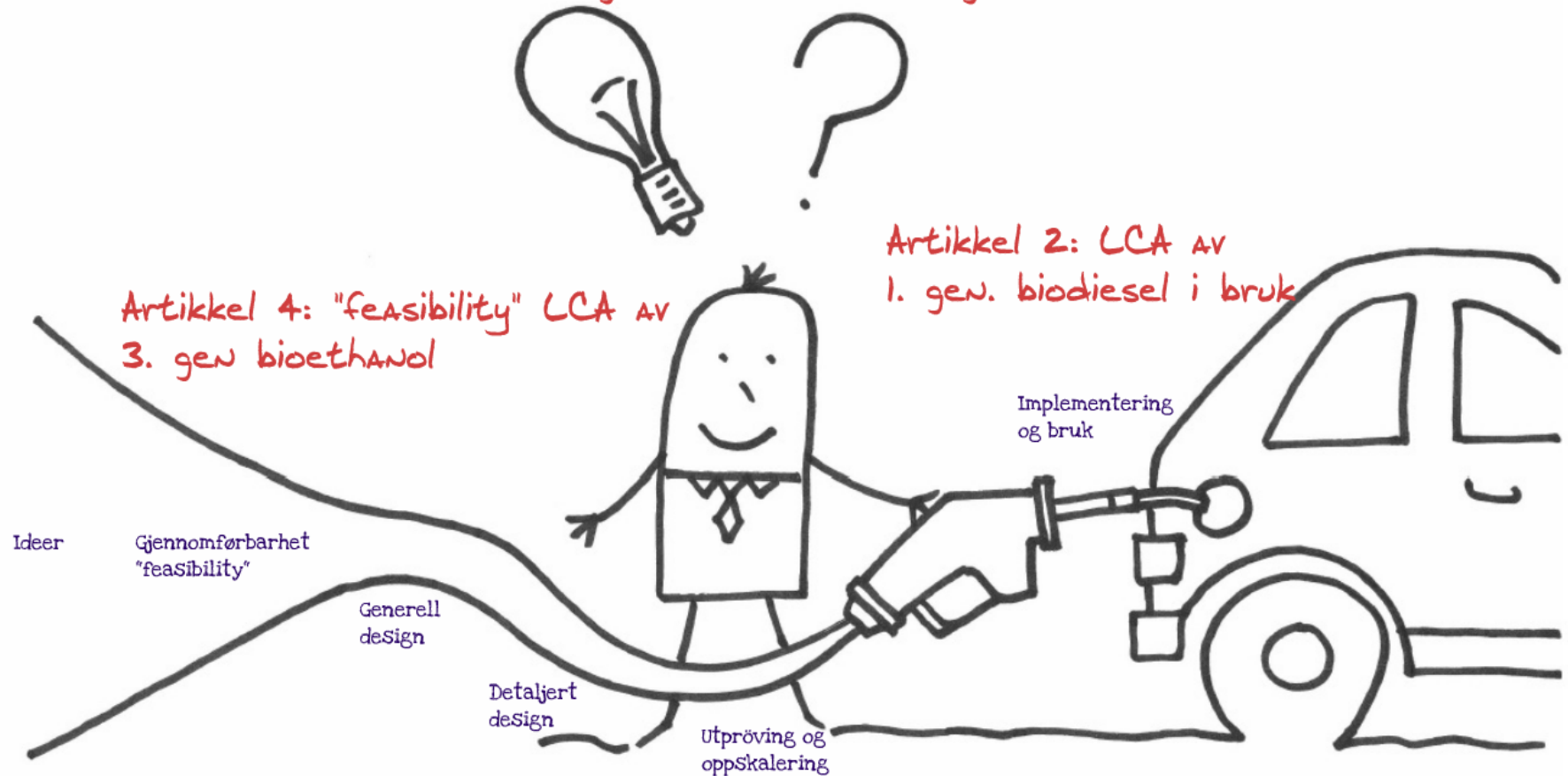


Sy SAMMEN ideer/kUNNSKAP

Kappen i denne avhandlingen



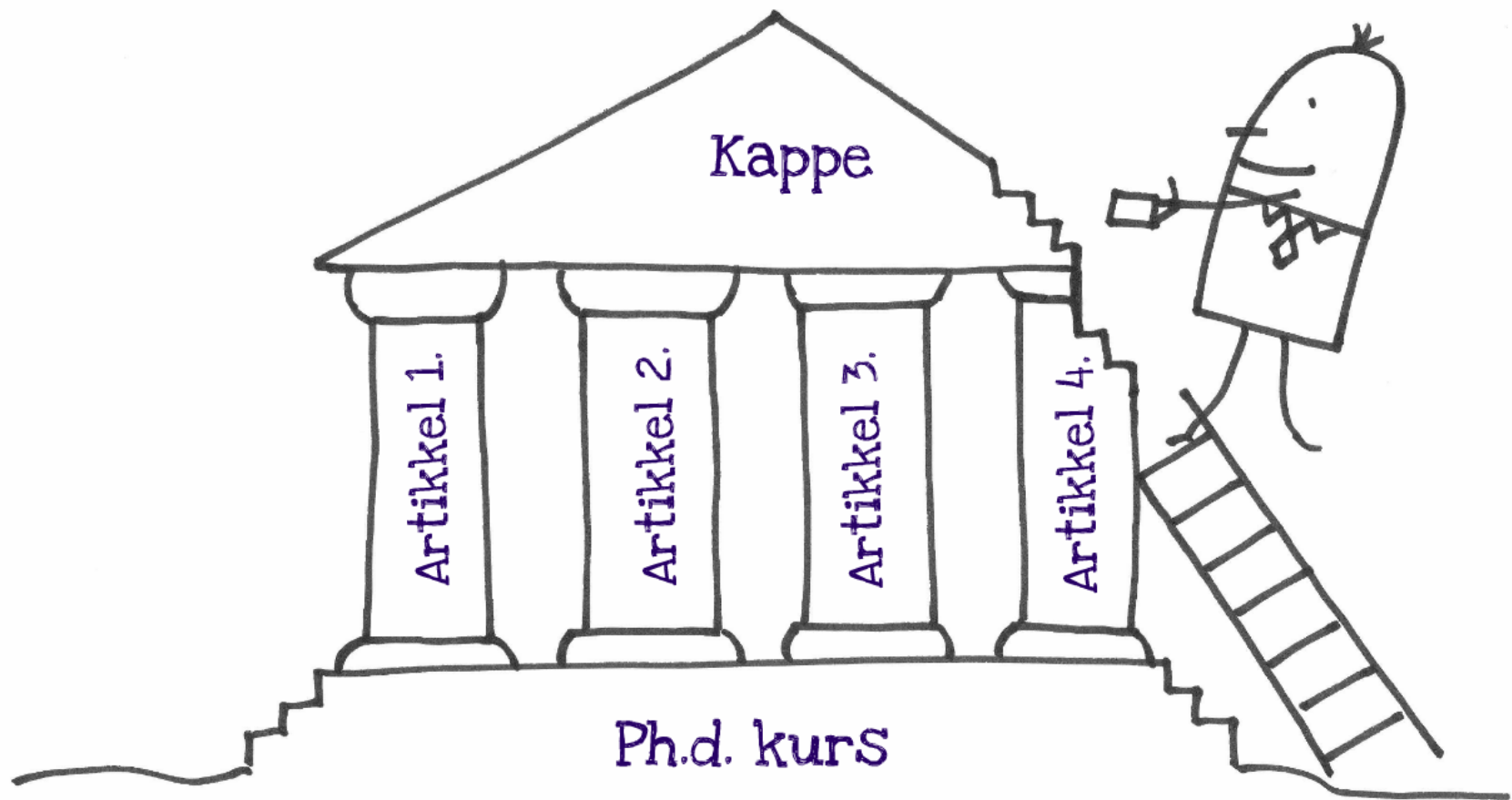
Artikkel 1: Sammenheng mellom bærekraftighet, biodrivstoff, og LCA



Artikkel 2: LCA av 1. gen. biodiesel i bruk

Artikkel 4: "feasibility" LCA av 3. gen bioethanol

Artikkel 3: detaljert LCA av 2. gen bioethanol delprosess



- Contributed to International conferences w. published proceedings: Norway, and EU
- Participated in numerous EU & EEA "biofuel" projects, and proposals
- International Energy Agency - Alternative Motor Fuels Norwegian observer
- International Society of Industrial Ecology - Ph.D. Student board member



Ph.d. kurs

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