



IEA Bioenergy
Technology Collaboration Programme



Workshop Task 39 and Task 44

“Dimensions and options of flexible energetic use of biomass”

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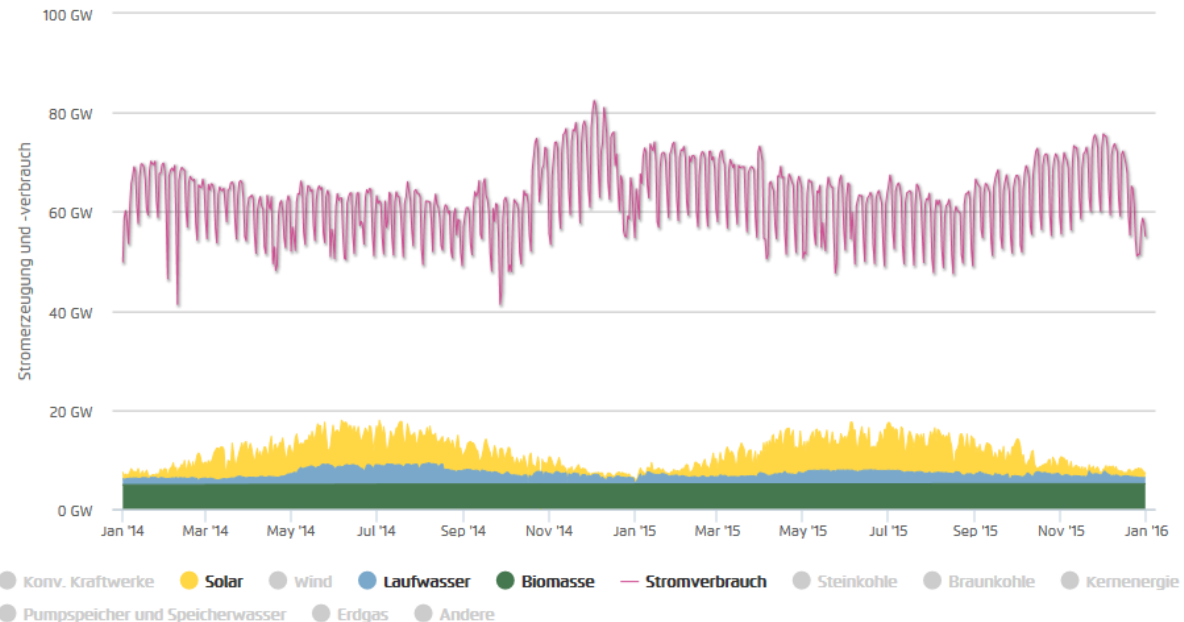
25/11/2020 (3-5 pm CEST)

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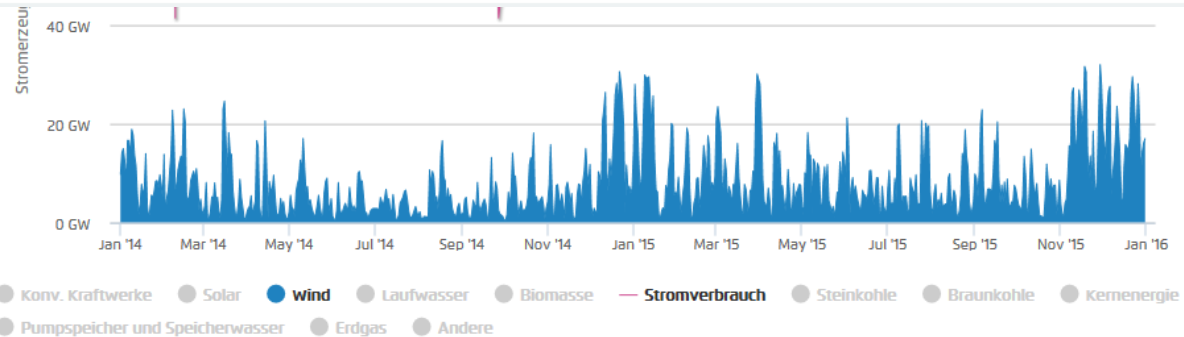
Renewable electricity today

- **Biomass:**
Today base load
 - **PV:** mainly in summer
 - **Wind:** whole year, but variable
 - **Hydropower:** mainly in summer
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- Future requirement:
Flexibility
(positive/negative ancillary service), energy storage

Germany, 2014 - 2015

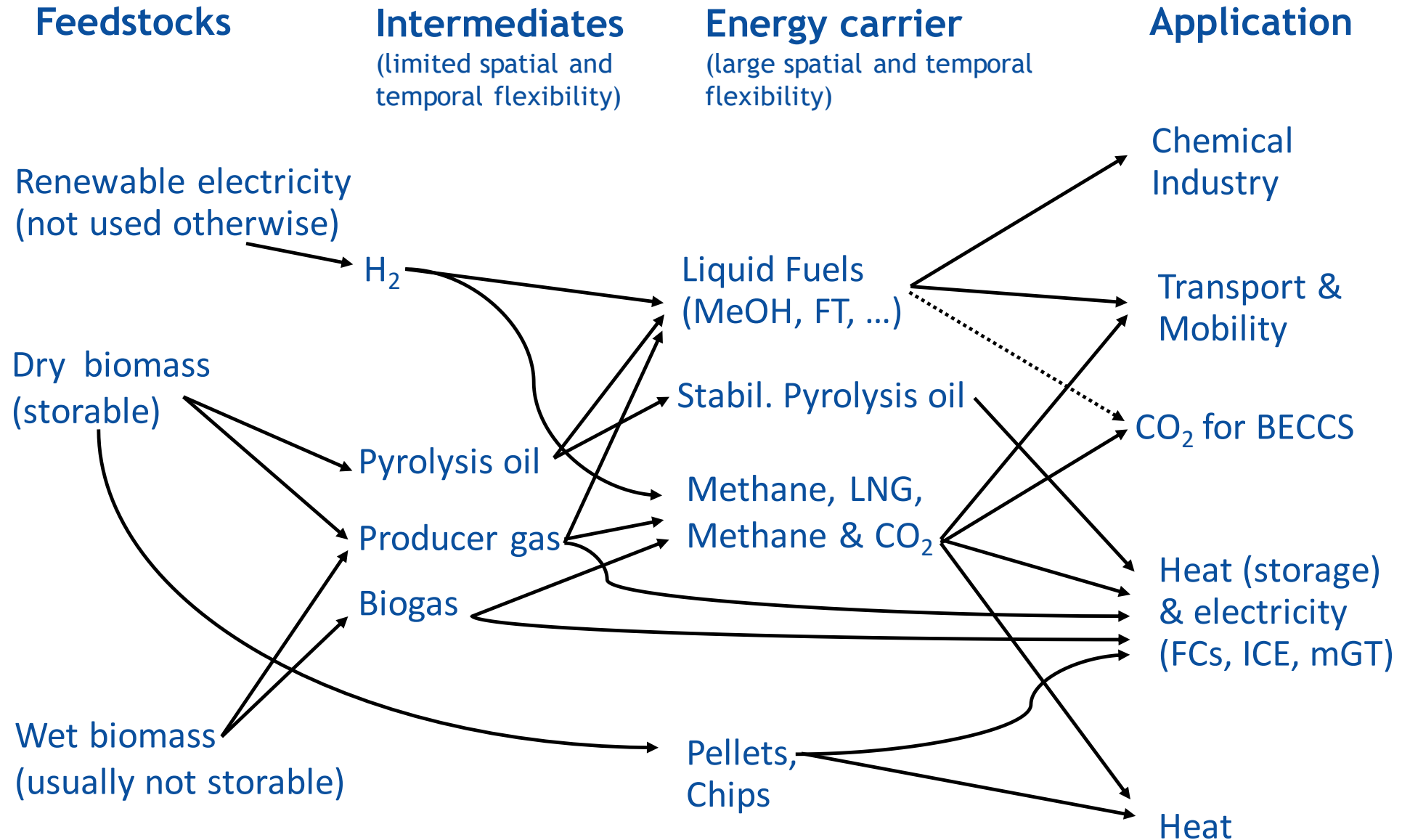


Agora Energiewende; Stand: 05.04.2016, 22:10



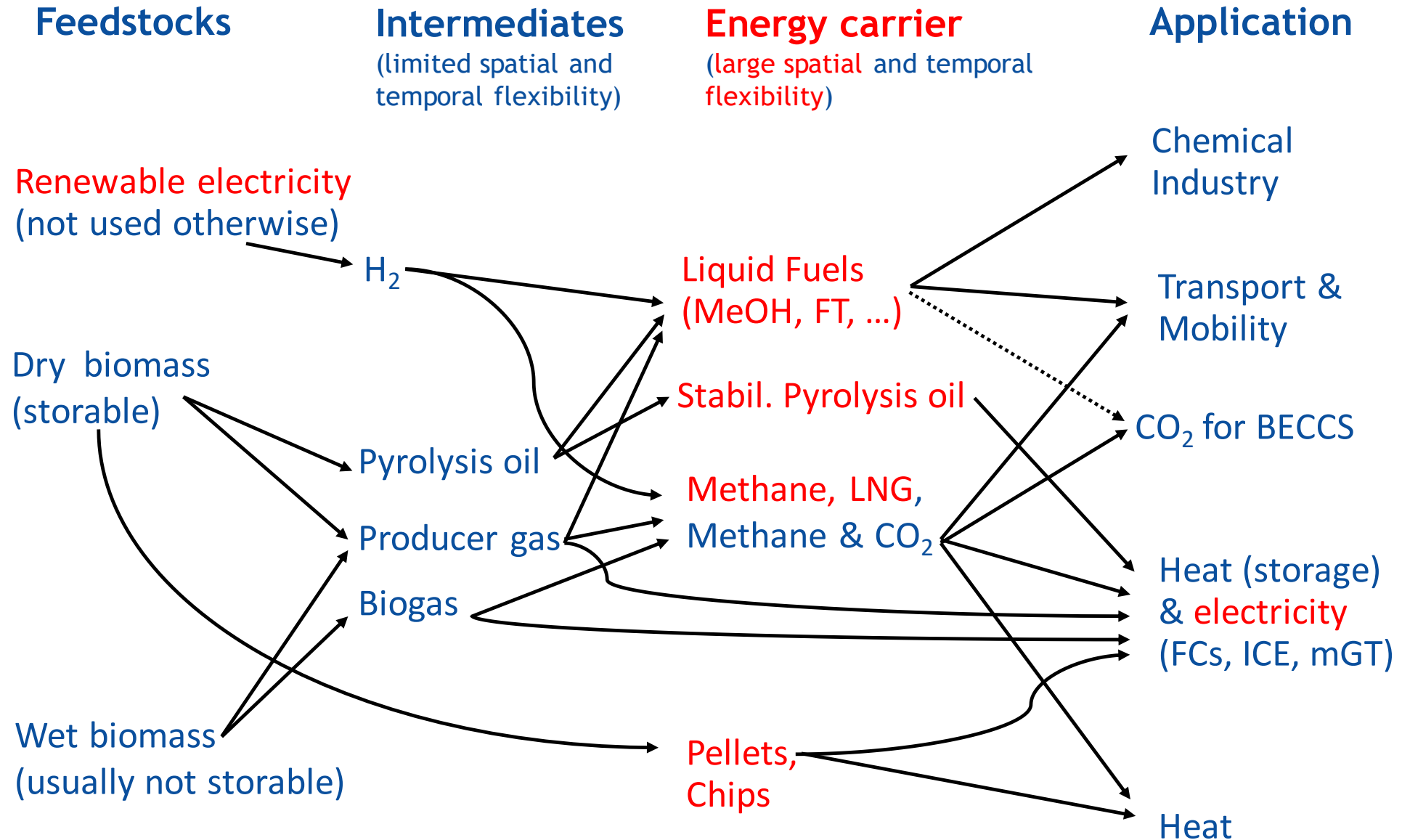
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Flexibility in biomass related energy conversions



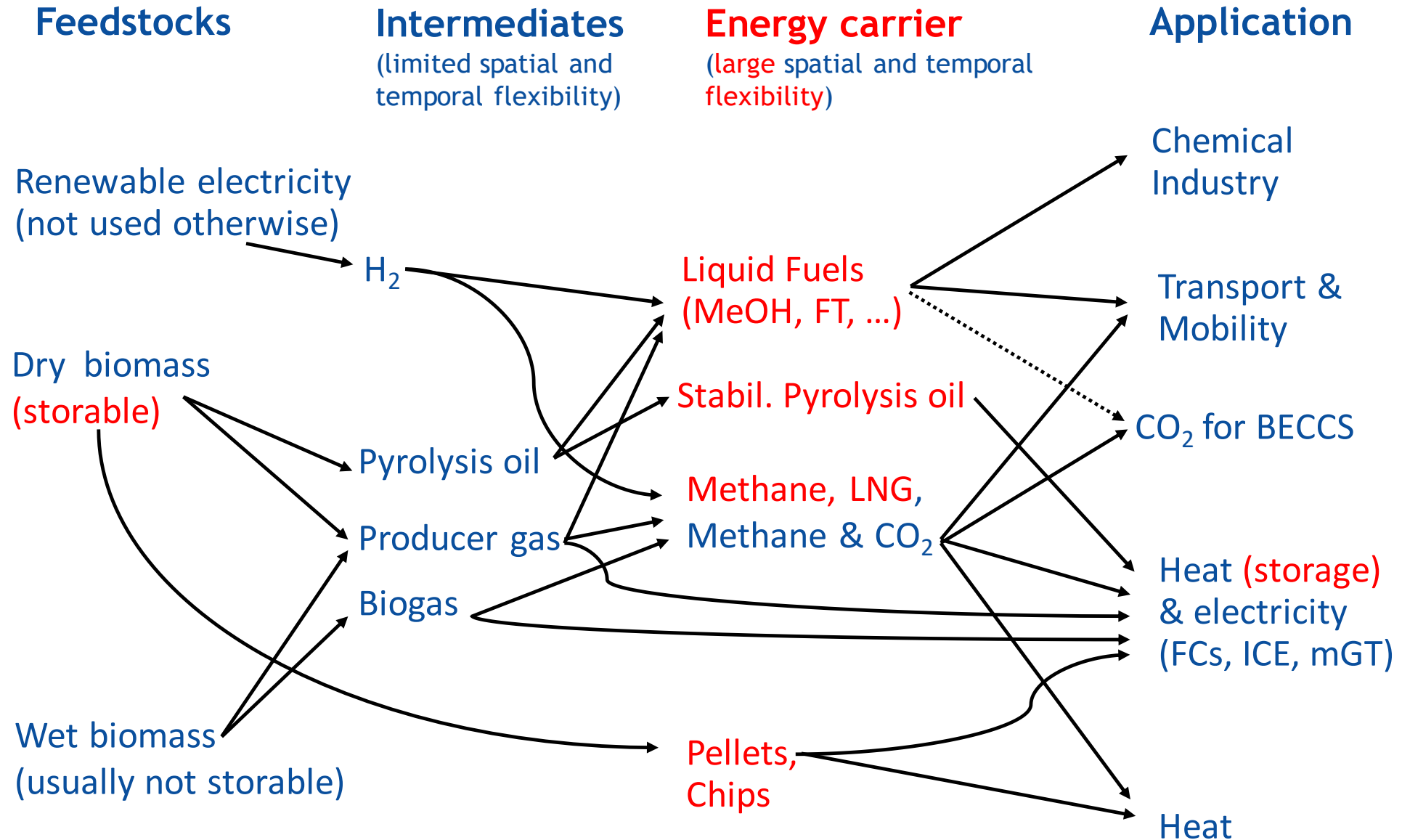
Geographical flexibility in bioenergy

Some forms of bioenergy allows easy transport over longer distances



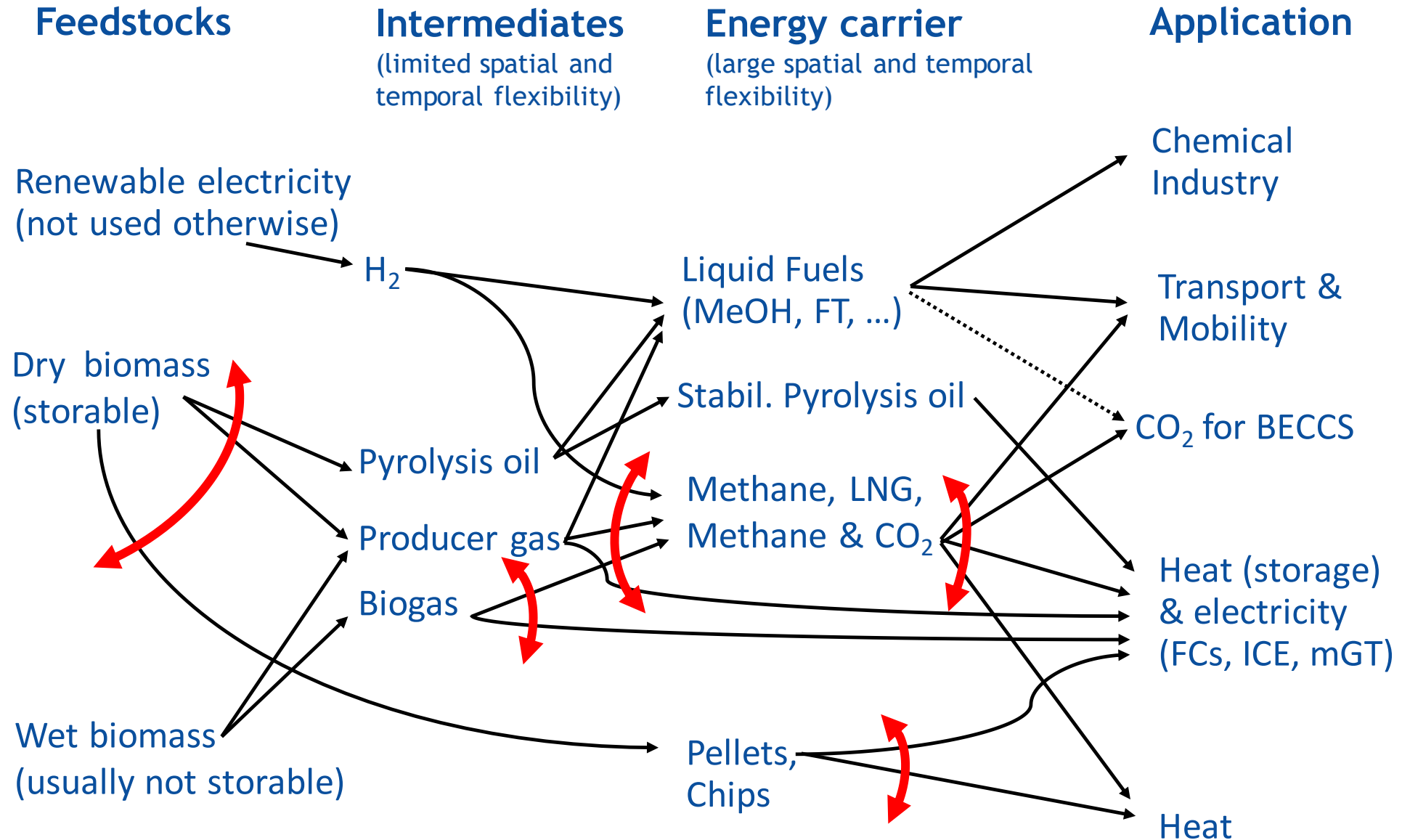
Temporal flexibility in bioenergy

Storable energy forms allow to decide when bioenergy is used



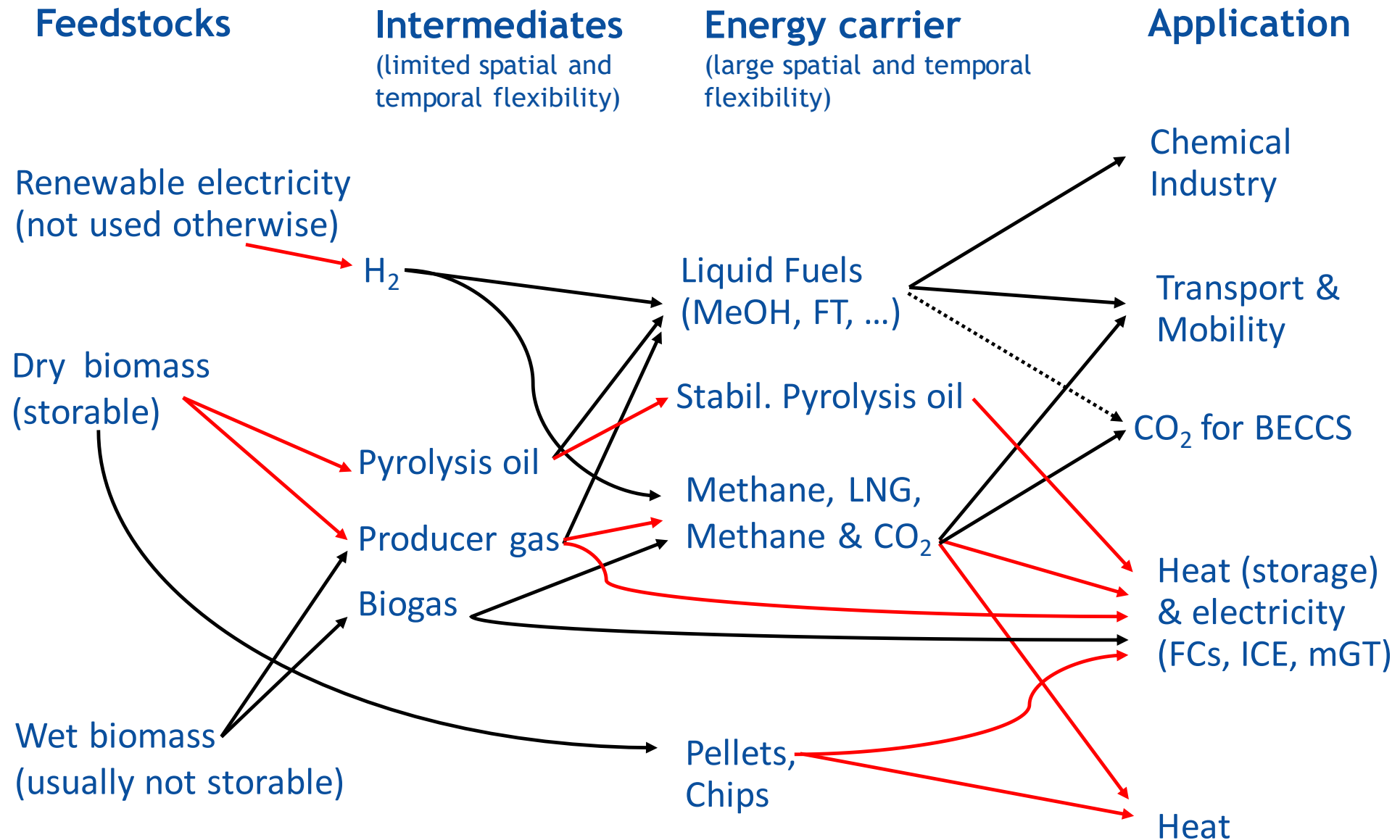
Flexibility in the use of bioenergy

Polygeneration, flexible Power-to-Gas, Biomass swarm



Quantitative flexibility in use of bioenergy

Conversions steps that allow flexible part load changes



Biomass contribution to flexibility in the Energy system

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graph TD; A[Biomass contribution to flexibility in the Energy system] --> B[LONG-TERM FLEXIBILITY SERVICES]; A --> C[SHORT-TERM FLEXIBILITY SERVICES]; B --> D[Storage as chemical energy carrier]; C --> E[Back-up (Peak gen.)]; C --> F[Demand Response];
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LONG-TERM
FLEXIBILITY
SERVICES

Storage as chemical
energy carrier

SHORT-TERM
FLEXIBILITY
SERVICES

Back-up
(Peak gen.)

Demand
Response

Long term flexibility service	Short term flexibility service	
Storage as chem. Energie/Upgrading	Back-up/Peak gen.	Demand response
Biogas upgrading	Flexible polygeneration (fuel/heat/power)	Biogas upgrading with H ₂ (biological & catalytic)
Pyrolysis oil stabilisation	Condensing biomass power plant from stored biomass	Fuels from bio-CO ₂ /CO and H ₂
Thermal treatment (e.g. torrefaction)	Bio-CHP with flexible power to heat ratio	Fuels from CO ₂ and H ₂ (biological process)
HTC, HTL, HTG	Microbial fuel cell	Electrons in fermentation
BtL, Wood to SNG	Bioheat production from stored biomass	Flexible H ₂ enhanced biofuels
Enzym. process to biofuels		

Questionnaire on flexible technologies

EXISTING PLANTS OR POTENTIAL FUTURE CONCEPTS

- Performance characteristics?
 - Feedstock(s), output(s), scale, efficiency, flexibility
- TRL
- R&D needs
- Experiences
- Expectations
- How many similar plants exists?
- Cost (CapEx, OpEX)
- Business case
 - Subsidies + incentives?

We need your help!

We have provisionally filled in questionnaires for Pyrolysis oil stabilisation, Wood-to-CH₄ and CO₂/BtL processes:

- Please give feedback
- Please make more suggestions and provide information

Many thanks for your attention

