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Concepts for distributed primary biomass conversion and central refining

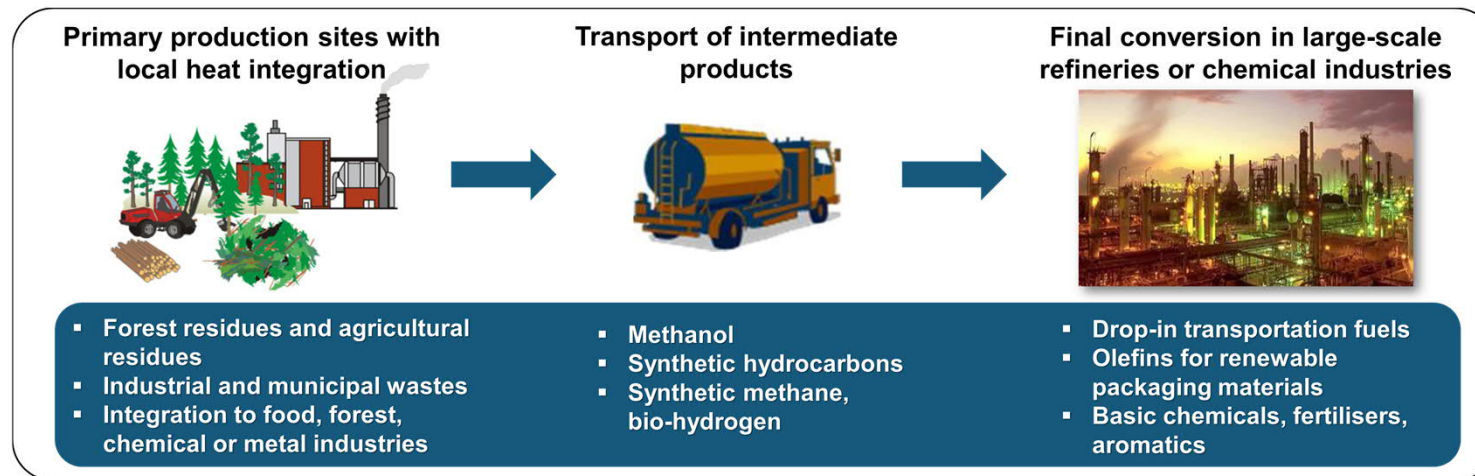
Sanna Tuomi, VTT

COMSYN / FLEXCHX Webinar
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Outline

- Double integration principle
- Demand for flexible production of heat, power and transportation fuels
- FLEXCHX concept
- Gasification concepts for small-to-medium scale production of transportation liquids

Double integration principle in synthetic fuels production



PRIMARY CONVERSION

- Distributed production of FT syncrude in small-to-medium scale gasification/synthesis units located close to biomass resources
- Integrated to local district heating networks or heat-consuming industries (overall efficiency > 75-80 %)

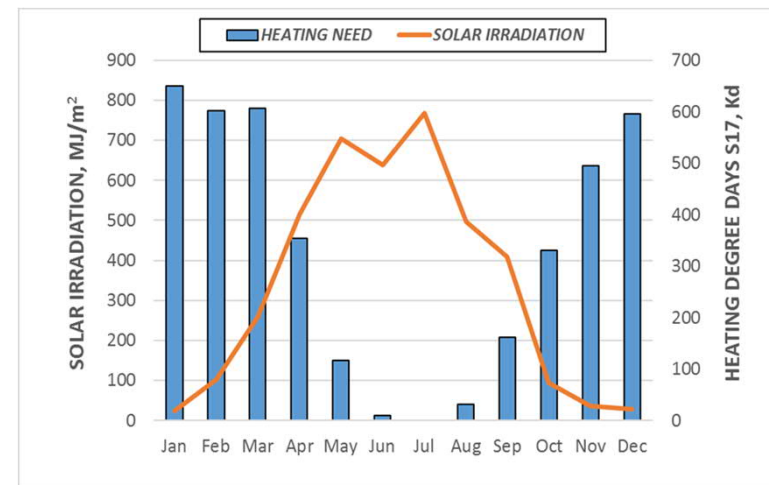
FINAL CONVERSION

- Final refining of FT products into drop-in transportation liquids takes place in existing oil refineries
- Advantages: benefits from economies of scale, product portfolio can be tailored according to market demand

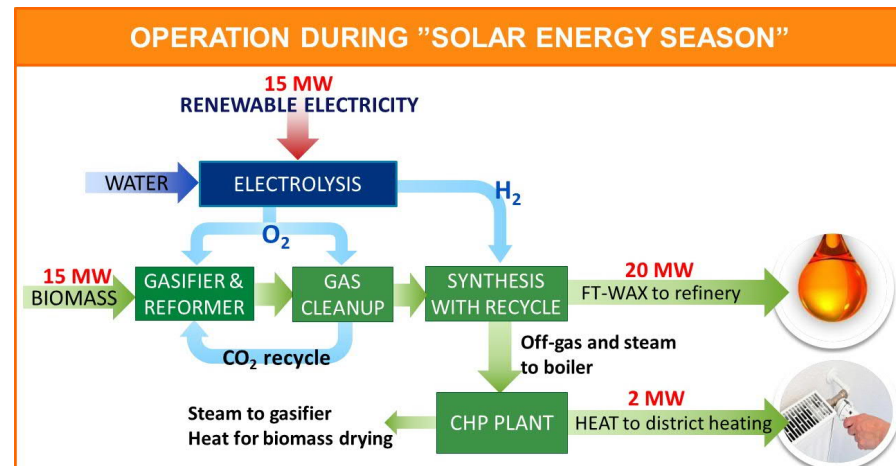
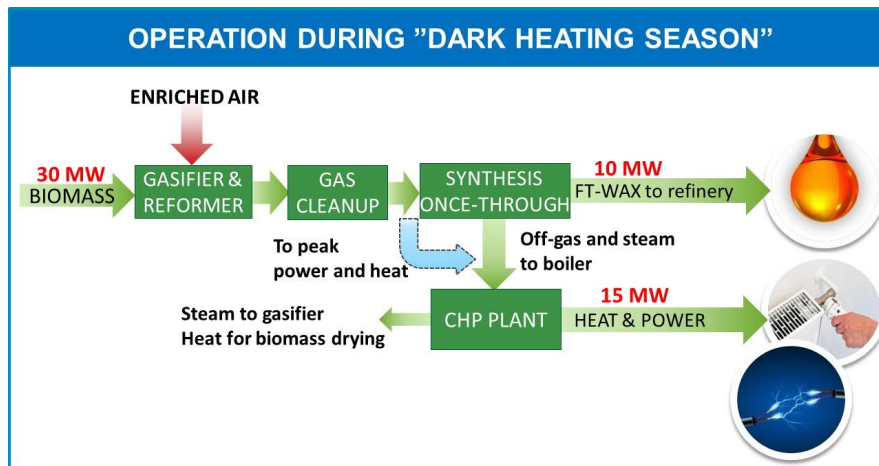
Demand for flexible production of fuels, heat and power – background

ENERGY TRANSITION

- The share of variable renewable energy (wind and solar) is strongly increasing and will become the main source of electricity production in Europe by 2050.
- One specific challenge of the energy system especially in Northern and Central Europe is the **poor match between the availability of solar energy and the demand for heating**.
- Thermal power plants (originally designed to operate as baseload units) are facing challenges in the changing energy system and should be operated flexibly – **balancing power production and electricity storing needed**.
- Decarbonisation of the transport sector, particularly the ‘difficult-to-electrify’ sectors (heavy duty, aviation, maritime), will largely base on the use of **advanced biofuels**.



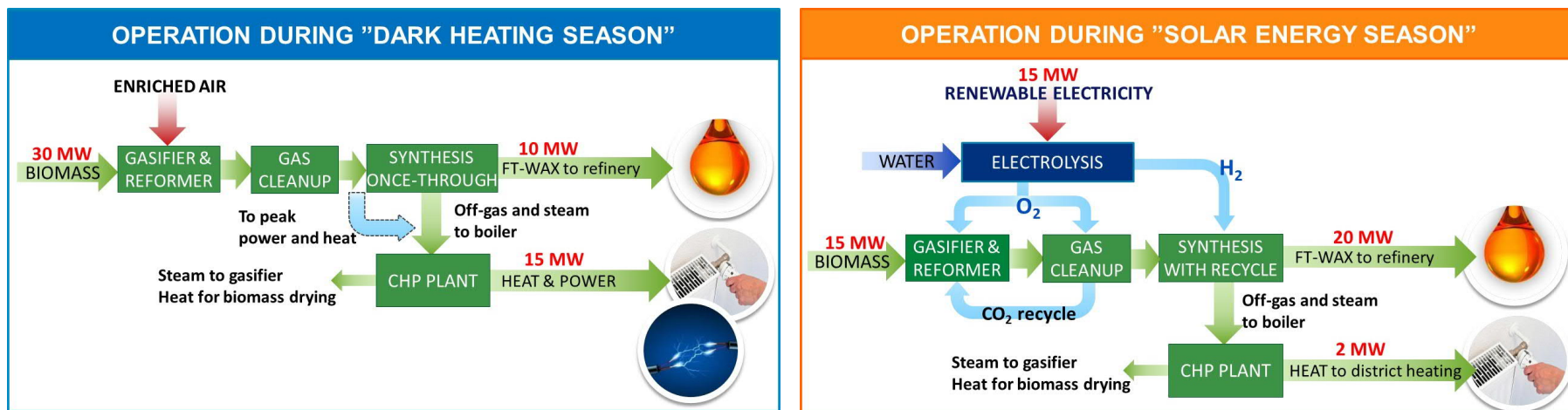
FLEXCHX: Hybrid process for flexible production of power, heat and transport fuels



The **FLEXCHX** concept addresses these challenges by:

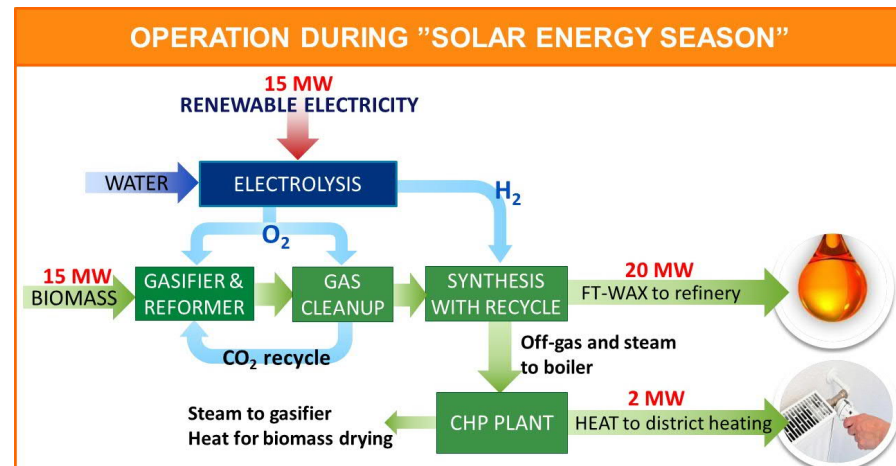
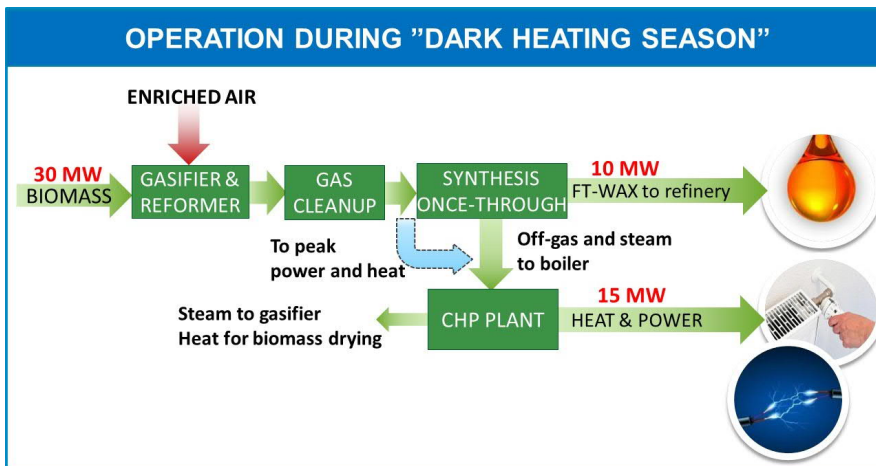
- 1) offering CHP and district heating companies new business possibilities in combining fuel and heat production, and
- 2) providing balancing capacity for the future energy system.

FLEXCHX: Hybrid process for flexible production of power, heat and transport fuels



- Electrolysis + biomass gasification + Fischer-Tropsch synthesis
- Tri-generation of power, heat and intermediate energy carrier (FT syncrude) for the transport sector
- Two operation modes: "winter mode" and "summer mode"

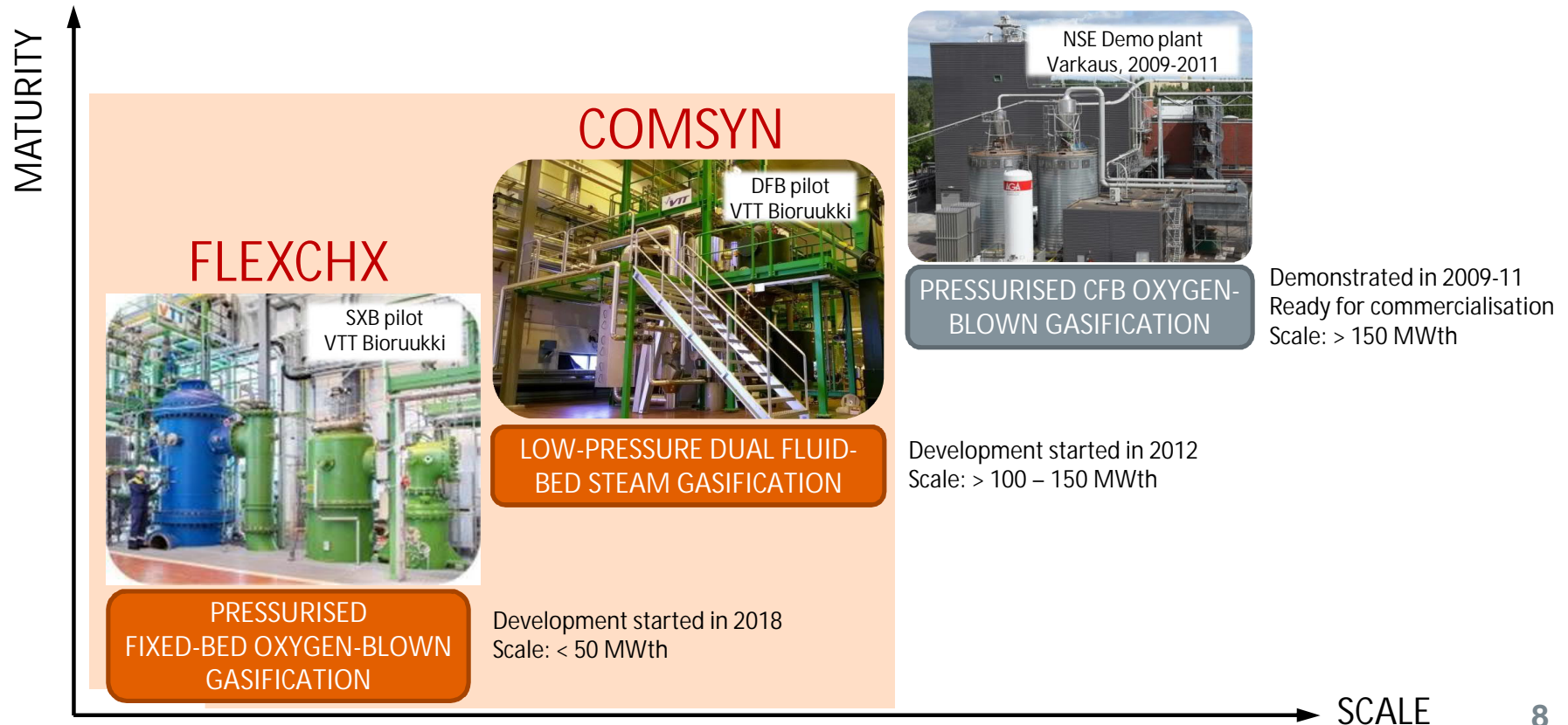
FLEXCHX: Hybrid process for flexible production of power, heat and transport fuels



- Biomass as the only energy source
- Energy conversion efficiency to FT syncrude, heat and power > 80 %

- Biomass and renew. electricity as energy sources
- Energy conversion efficiency to FT and heat > 65 %
- Up to 90 % of biomass carbon converted to FT syncrude.

Gasification concepts for small-to-medium scale production of transportation fuels



Thank you!



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