CHALLENGES IN GASIFICATION
INVESTA AS A STEPPING STONE FOR THE SOLUTIONS
ENERGY INNOVATION PARK
CURRENT SITUATION
ENERGY INNOVATION PARK
PLANNED SITUATION
ENERGY INNOVATION PARK
FUTURE SITUATION
SHARED R&D PROGRAM
5 R&D PROGRAMS

- GREEN ENERGY PRODUCTION
- GREEN GAS PRODUCTION
- BIOMASS PRE-TREATMENT
- GASIFICATION AND GAS CLEANING
- GREEN CHEMICALS AND BIOFUELS PRODUCTION
COMPLEXITY
WHEN CONNECTING TO SYNTHESIS

EF
LARGE SCALE, PRESSURE, OXYGEN/STEAM, FEEDSTOCK LIMITED

DIRECT GASIFICATION
REASONABLE SCALE, AIR/OXYGEN, ATMOSPHERIC, FEEDSTOCK FLEXIBLE

INDIRECT
REASONABLE SCALE, AIR, ATMOSPHERIC, FEEDSTOCK FLEXIBLE

SUPER CRITICAL
MODULAR, HIGH PressURES, FEEDSTOCK FLEXIBLE (WET)
COMPLEXITY
WHEN CONNECTING TO SYNTHESIS

LARGE VARIATION IN FEEDSTOCK
1. COMPOSITION
2. AVAILABILITY
3. SHAPE
4. IMPURITIES
5. ...

LARGE DIFFERENCES IN MOISTURE CONTENT

FEEDING APPROACH
**COMPLEXITY**

**WHEN CONNECTING TO SYNTHESIS**

- **DRY FEED POWDER**
  - EF GASIFICATION
  - ASU

- **DRY FEED LARGER MATERIAL**
  - DIRECT GASIFICATION
  - INDIRECT GASIFICATION

- **SLURRY FEED**
  - SUPER CRITICAL GASIFICATION

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**ASH COMPONENTS**

**TAR**

**HT GAS CLEAN-UP**

**LT GAS CLEAN-UP**
COMPLEXITY
WHEN CONNECTING TO SYNTHESIS

- **Methanation Reaction**: $\text{CO} + 3\text{H}_2 \rightarrow \text{CH}_4 + \text{H}_2\text{O}$
- **Methanol Reaction**: $\text{CO} + 2\text{H}_2 \rightarrow \text{CH}_3\text{OH}$
- **DME Reaction**: $3\text{CO} + 3\text{H}_2 \rightarrow \text{CH}_3\text{OCH}_3 + \text{CO}_2$
- **FT Reaction**: $n\text{CO} + (2n+1)\text{H}_2 \rightarrow C_n\text{H}_{2n+2} + n\text{H}_2\text{O}$

*Many different routes possible based on this simplified flow chart.*
INVESTA TO BOOST GASIFICATION

SWEDISH EXAMPLE
SFC

AUSTRIAN EXAMPLE
BioEnergy 2020+
IEA BIOENERGY TASK 33
GASIFICATION OF BIOMASS AND WASTE

- Promote commercialization of biomass and waste gasification
- Monitor, review and exchange information on gasification research, development, and demonstration
- Encourage cooperation among member countries and industry
- Audience of policymakers, technology providers, users, researchers, public
TAKE AWAY MESSAGES

DEVELOPING GASIFICATION BASED VALUE CHAINS IS COMPLEX AND DIFFICULT BUT NOT IMPOSSIBLE

INVESTA INVITES YOU TO JOIN THIS INITIATIVE, TO ACCELERATE THE INNOVATIONS NEEDED FOR COMMERCIAL SUCCESSES

SOME OF THE GOOD EXAMPLES OF DEVELOPING VALUE CHAINS ARE THESE JOINT EFFORTS SWEDEN AND AUSTRIA
CHALLENGES IN GASIFICATION
INVESTA AS A STEPPING STONE FOR THE SOLUTIONS