

Draft for discussion

- Project
 - Project timeline is driven by IPCEI submission
 - Workstreams
 - Regulatory (GR)
 - Stakeholder Engagement / Communication
 - preparing public announcement
 - Stakeholder engagement plan
 - Commercial (partnering, structuring)
 - H2 Market development
 - Interaction with NL-D H2 collaboration study work
 - Technical/Economics (Business case)
- IPCEI
 - Timeline
 - Yearly rounds
 - Proposal due April 2020
 - IPCEI status Valid for 10 years
 - DG Grow / Comp not aligned on project timeline
 - Grow = fast ; Comp = multiple years before IPCEI status can be granted
 - A consultant is being asked to prepare a timeline
 - MinEZK (+ German equivalent) have the lead
 - TBA: process detail (Action ...)
 - Key Criteria
 - First industrial development
 - Fundamentally different
 - 100% funding gap can be subsidized
 - State aid / subsidy addition exemptions possible
 - Pathway to EU co-financing
 - Question: Can multiple similar projects obtain IPCEI status in the same year?
 - Proposal should make clear
 - What companies are willing to commit
 - What is required from governments to make this happen
 - Required Regulation (market growth, wind plots, transport, award)
 - Unique sellingpoints
 - Funding gap
 - NL gvmt climate vision should be aligned with project narrative
 - Draft policy by end 2019
 - Influencing opt
 - NL-D H2 cooperation
 - Competition drive – IPCEI status for a WftN type project can only be granted once. Our expectation is that to be successful, we need to obtain IPCEI status in 2020.
- Wind
 - OFW e-costs are expected to fall to € 30 – 50 / MWh by 2040 (IEA)
 - Excl connection to shore (10 - 20 €/MWh)
 - OFW e-costs nu in de orde van € 60/MWh
 - There is 11.5 GW planned in the NL OSW route map (NL)
 - No account for H2 production
 - ~10 GW wind required for 1.0 Mt H2 production (IEA)
 - 0.7 GW OFW north of Groningen planned until 2030
 - ? Wet Wind op Zee
 - Blix study indicates ~10-15 GW potential north of Groningen Check met (10)(2e)

- Multiple x-border OFW projects identified
 - Joint declaration on energy transition (NL-D)
 - NL-D will work with EC to eliminate development barriers
 - Load factor wind ~50%
 - Key decision – electricity for H2
 - All to H2
 - Langste bedrijfstijd naar H2
 - Peak load to H2
- H2 conversion
 - Efficiency (10)(2g): no significant further improvements anticipated (Check (10)(2e))
 - CAPEX – room for improvement due to scale-up and technical developments
 - Today e-costs determine 75% of H2 costs
 - SRMC H2: € (10)(2g) /kg @50/MWhe (NB: OPEX H2 conversion only)
 - Grey H2 market price ~1.3 €/kg
 - Grijs waterstof => CO2 prijs werkt door: CO2 prijs + (10)(2g) /ton => H2 prijs + (10)(2g) /kg (Check)
 - Blauwe waterstof kost TBA
 - Onshore / offshore
- Transportq
 - Missing: Gasunie pack
 - Existing network has enormous capacity : 10 – 15 GW per branch
 - TBA: minimum throughput
 - Branch to Germany could become available per [2026 TBC]
 - Investments required to convert (specify)
 - Cost levels transport + storage : (10)(1c) (Check)
 - Assumed utilization: 7000 hr (feedstock) + 4000 hr (heat)
 - 2 branches can be made available in NL by [2023]
 - Eastern branch – Chemelot / D
 - Western branch – Botlek / Ijmuiden – Zeeland
 - Initially, no / limited booster compression – delivery @10 bar
- Storage
 - 4 salt cavern opportunities identified in N-NL
 - 1 under construction
 - 1 planned
 - 2 identified
 - 300 GWh / cavern
 - Post 2035 more salt oppt
 - Line pack (hourly flex)
- Value Chain - flex
 - Industrial customers typically require baseload (7000 hr for feedstock; 4000 hrs industrial heating – Gasunie)
 - Flex allocation is key to an optimal economical and reliable development. Principle allocation options (can be mixed)
 - Import electricity from the grid (maximises electrolyser usage)
 - H2 storage
 - Line pack
 - Low Carbon H2
 - Spike H2 in gas grid
- Market
 - NL markt 0.8 Mtpa (current)
 - H2 market potential – DNV report (in progress)

Draft for discussion

- H2 Market growth
 - Steel / Chemicals / transport
 - Requires mix of regulation / incentives
- D market ???
 - Report in progress (Gasunie)
- Market segments
 - Hard to abate segments
 - Chemicals
 - feedstock, large volume
 - BASF / Shell / Exxon / Yara / DSM
 - Steel
 - business with upside,
 - economically vulnerable - shrinking market
 - Tata / TK
 - Transport
 - Smaller volumes
 - Market to be developed
 - OEM
 - Power
 - Net balancing – requires incentives
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- Market determines value chain (development timeline, structure)
- Green H2 cannot compete with grey H2 for a long time to come
- Market development requires government intervention
- Regulatory, mix of:
 - Pricing mechanisms
 - Standards
 - Subsidies
 - Incentives