

A “Clean Hydrogen from Natural Gas Alliance” Proposal – why it is in mutual benefit for the EU and Russia

<proposal for creation of the platform>

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The 31-th meeting of WS2 GAC, online, 18.09.2020

“The future will be what we make it. And Europe will be what we want it to be.”

- **Ursula von der Leyen, President of the European Commission, State of the Union Address by President von der Leyen at the European Parliament Plenary, 16 September 2020**

It seems, current EU mainstream H2 vision is more costly for EU than some existing alternative vision(s) => how to find a cost-effective long-term sustainable solution => to balance “want” & “make”

State of the Union 2020



“The future will be what we make it. And Europe will be what we want it to be.”

Ursula von der Leyen, President of the European Commission

[Read the full address >](#)

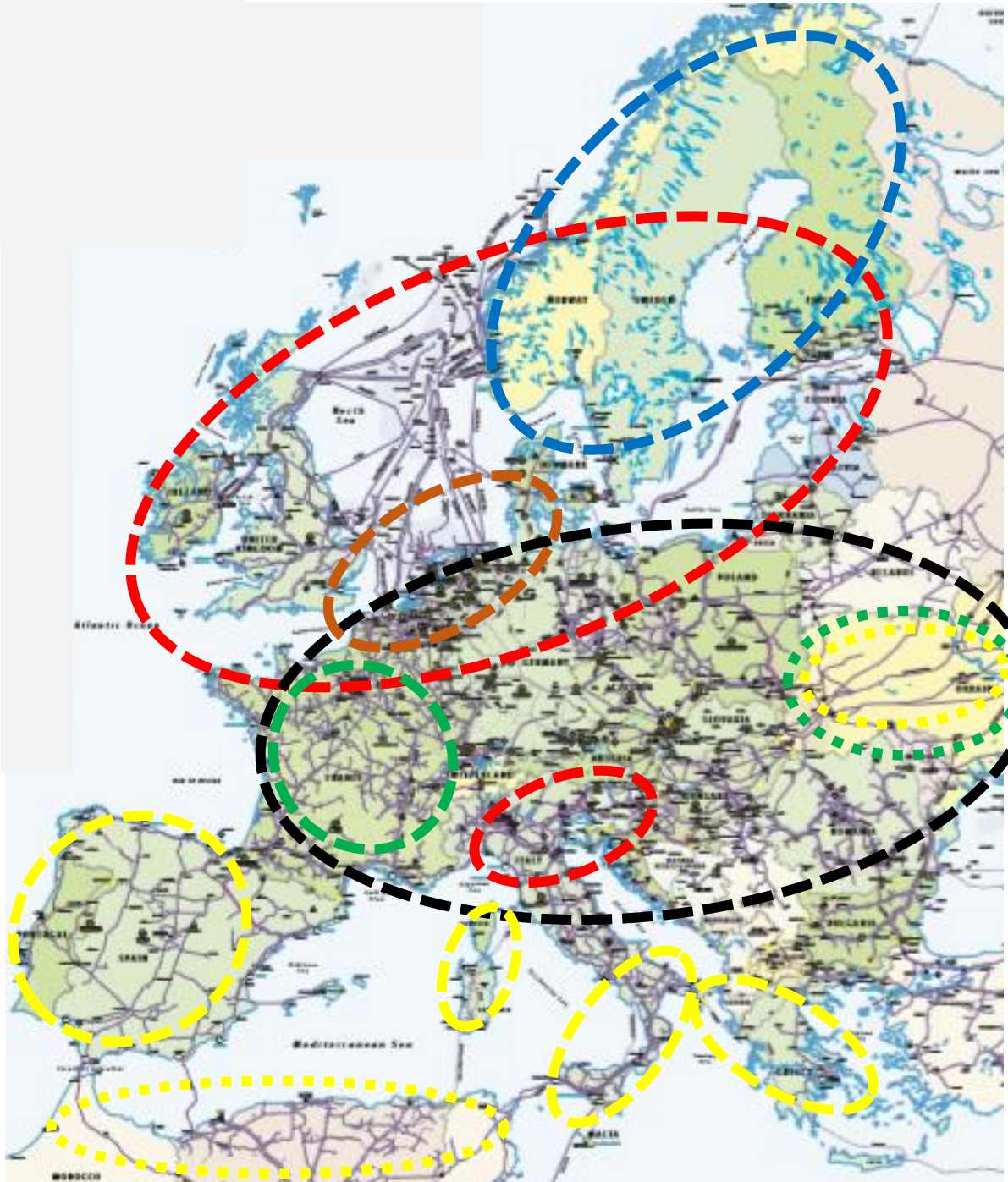
https://ec.europa.eu/info/strategy/strategic-planning/state-union-addresses/state-union-2020_en

A.Konoplyanik, 31th WS2 GAC meeting, online, 18.09.2020

Consolidated European business view

- Climate target plan must be based on free market fundamentals and multilateral cooperation. Press Release. // EUROCHAMBRES (Association of European Chambers of Commerce and Industry), Brussels, 17 September 2020
- EUROCHAMBRES President Christoph Leitl: *“The EU has the world’s most ambitious climate policy framework. We must transform these targets into business opportunities, then other regions will follow suit.”*
- In addition to a positive effect on the climate, the underlying premise of any climate policy measure needs to be its impacts on the productivity and competitiveness of European businesses. For this reason, EUROCHAMBRES argues that the proper implementation of existing legislation, guaranteeing planning and investment security, must take precedent over further amendments. Moreover, when and where to invest in climate action should be based on cost-efficiency in order to produce the best results. Multilateral cooperation is therefore essential to combat climate change.


Approximate potential areas of preferential use of key H2 production technologies in Europe under state regulation based on “technological neutrality” principles



 P2G wind  P2G hydro

 P2G solar  P2G nuclear

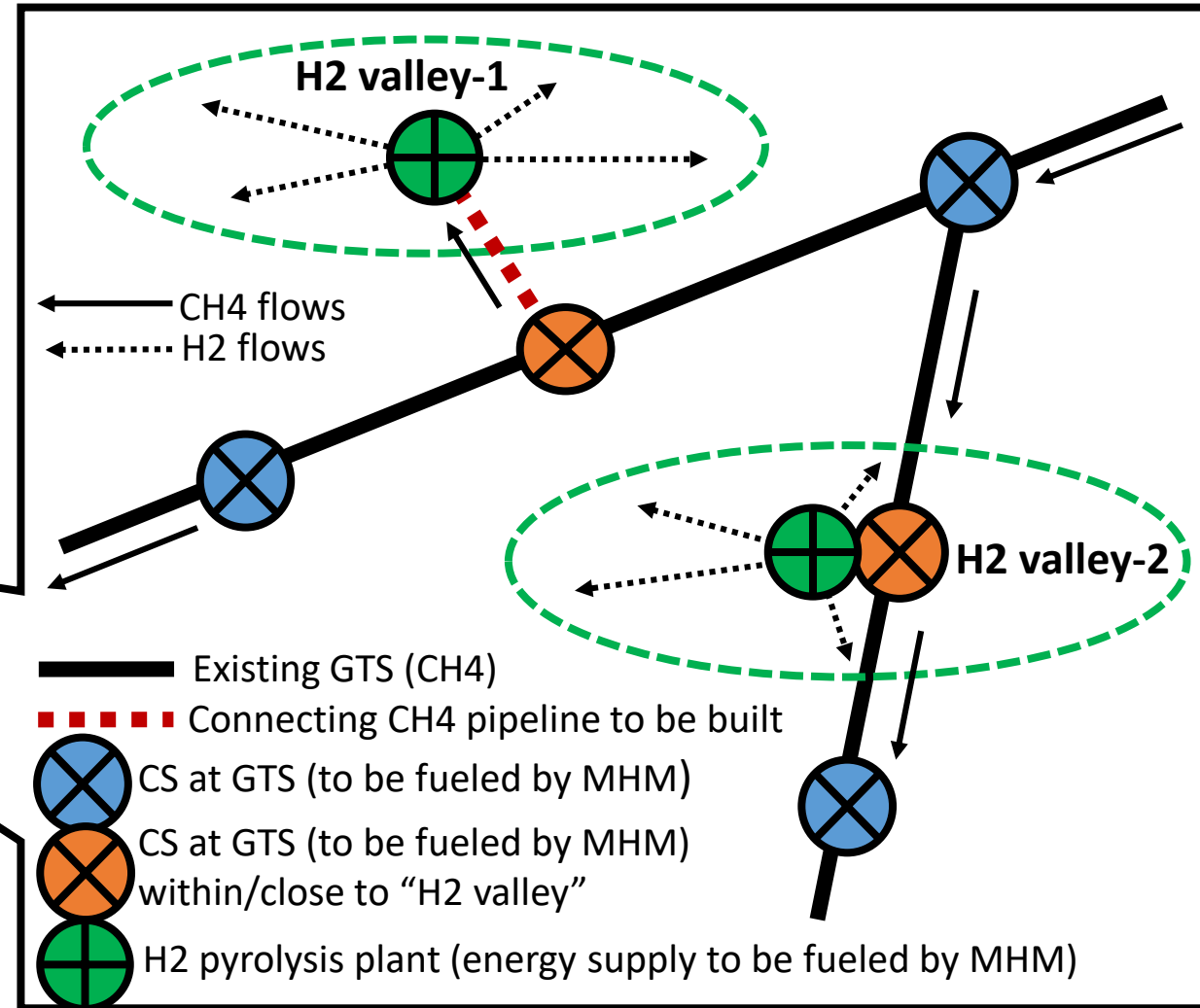
 MSR/ATR plus CC(U)S

 Methane pyrolysis, plasma-chemical method et al w/o CO2 emissions (to incorporate both Step 2 & Step 3 of Cooperative RF-EU gas decarbonisation measures from “Three Step Aksyutin’s Path”) => based on existing cross-border gas grid

Electrolysis based on different primary electricity sources

Source: dashed lines - A.Konoplyanik, based on conversations with Ralf Dickel; dotted lines - Ukraine & North Africa are added based on “The 2x40GW Green Hydrogen Initiative Paper” Hydrogen Europe study for illustration purposes with the observation of **this author’s skepticism** in regard to long-distance transportation of H2 produced in these (or any other remote/beyond the EU) geographical areas; source of map – ENTSG

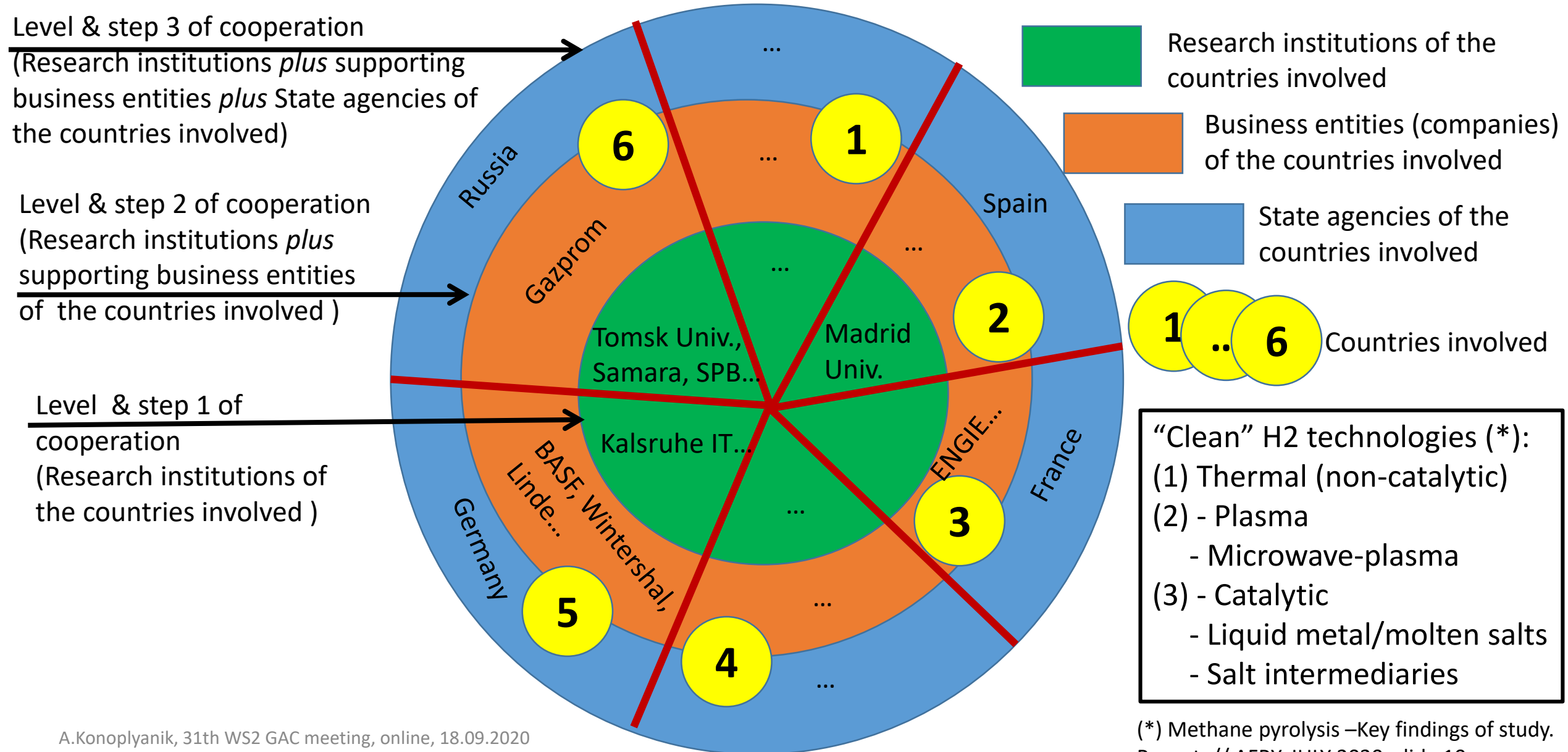
Approximate scheme of clean H₂ production from natural gas placement within existing cross-border RF-EU gas value chain (gas grid) inside the EU close to prospective “hydrogen valleys”



Proposed road map/action plan for collaborative efforts on clean H2 from CH4 for RF-EU actors (non-exclusive starting list)

- 1) Programme of phased transition of compressor stations (CS) on cross-border RF-EU GTS from methane to MHM as fuel gas:
 - On existing CS for gas transportation
 - On future facilities nearby/at existing CS for energy supply for clean H2 production
- 2) Investigation of marketing issues for solid carbon as a by-product of pyrolysis & similar technologies
- 3) Forming of “Clean Hydrogen from Natural Gas Alliance”:
 - Identification of participants - those who are interested to join efforts,
 - Their readiness to joint efforts and acceptable forms of collaboration for each one,
 - Their potential input into collaboration,
 - Requested/desired support measures (types, level, etc.)
- 4) Identification of key potential barriers => Issues related to methane leakages:
 - methodology, terminology, correctness of comparative calculations on pipeline gas & LNG, etc.
 - Since it is that issues that are step-by-step being raised in the EU as more important in their negative climate effect compared to CO2 emissions => might act as a growing (potential-?) barrier for natural gas as one of the key sources for EU decarbonisation (for clean hydrogen production)

Possible structure of [Russia-EU] cooperative consortia on RD&D for "clean" H2 production from methane (w/o CO2 emissions)



Comparison of two Clean H2 Alliances proposals (with no CO2 emissions in H2 production)

Items	EU Clean H2 Alliance (08.07.2020)	Proposed RF-EU Clean H2 from CH4 Alliance
Targeted H2	Renewable H2 (current EU mainstream)	Clean H2 from natural gas (totally ignored in EU)
Feedstock & its inland limitation in EU	Water => natural limits	Natural gas => no limitations with diversified multiple import supplies by pipelines & LNG
Energy supply for H2 production	Renewable electricity (wind, solar): <ul style="list-style-type: none"> - Interruptible (difficult to finance), - Non-interruptible only with electricity storage (yet non-available) - RES-electricity clean, but its upstream equipment production chain not clean 	MHM-fueled CCGT at/close to CS on existing GTS: <ul style="list-style-type: none"> - non-interruptible (easy financeable) - MHM not as clean as RES-electricity, but 30% less CO2 than in gas-fired turbines, its upstream equipment production chain not clean - open issue of methane leakages
Location of H2 production units	Where intensive sun & wind => far beyond the EU => far away from EU H2 consumption centers	Close to/in EU H2 consumption centers (H2 valleys)
Triggering effect for H2 cost-reduction	Economy of scale (obligatory) + learning curve (at the production site) => maximum increase of unit production capacity required =>	Adequacy of production capacity to demand levels + learning curve => no need in obligatory economy of scale
H2 unit production capacity	=> Increase to technically achievable maximum (GW-level)! ...from today's kW/100'skW/MW(?)	Selection of optimal sizes close to demand(s) in "H2 valleys" (100'kW to MW-level) ?
Long distance H2 transportation	Badly needed	No need
H2 distribution lines	Needed (in sum-total longer)	Needed (in sum-total shorter)
Existing cross-border GTS (CH4)	Risk to become a stranded asset	Continued to be used, no risk of stranded asset; prolongation of economic life
Scope	Internal EU	Internal 'Broader Energy Europe' (incl.RF-EU)

Thank you for your attention!

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Back up slides

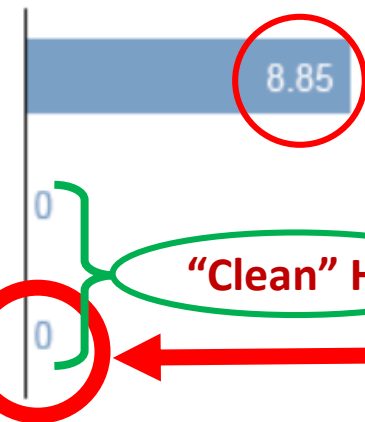
All other conditions being equal, methane pyrolysis (& similar technologies) have clear competitive advantages against two other key technologies in hydrogen production (MSR+CCS & electrolysis) under technologically neutral regulation

CC(U)S is needed!!! => additional imputed costs (CAPEX + OPEX) => add. 20/30+% (*) (CEC: twice as high (**)) => additional element of cost budget => **WORSENS** financeability

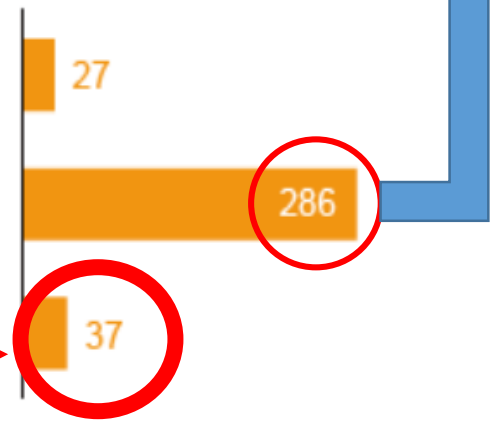
Vision to diminish high-cost energy density – to use excessive RES electricity at zero or negative prices => this leads to unstable (regularly interrupted by natural reasons) RES-based H2 production cycle => prolongation of pay-back periods (of debt-financed CAPEX) => **WORSENS** financeability

Steam reforming of natural gas	$\text{CH}_4 + 2\text{H}_2\text{O} \rightarrow 4\text{H}_2 + \text{CO}_2$
Water electrolysis	$2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
Methane pyrolysis	$\text{CH}_4 \rightarrow 2\text{H}_2 + \text{C}$

CO₂ emissions
in kg CO₂/kg hydrogen



energy demand
in kJ/mol hydrogen*



Source: A.Konoplyanik based on: Dr. Andreas Bode (Program leader Carbon Management R&D). New process for clean hydrogen. // BASF Research Press Conference on January 10, 2019 / (<https://www.basf.com/global/en/media/events/2019/basf-research-press-conference.html>)

- (1) No need in CC(U)S => CAPEX/OPEX saving
- (2) Marketing of carbon black = additional element of revenue budget => start of new investment cycle(s) based on carbon black
- (3) In case of storage, carbon black does not provide same negative effects as CO₂ => **IMPROVES** financeability

(*) René Schutte, N.V. Nederlandse Gasunie. Production of Hydrogen. // Masterclass in Hydrogen, Skolkovo – Energy Delta Institute, Moscow, May 23, 2019 (https://drive.google.com/open?id=1g_4TiiKAKGajziXG8TWjTdpncfipj9x1)
 (**) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions. A hydrogen strategy for a climate-neutral Europe // EUROPEAN COMMISSION, Brussels, 8.7.2020, COM(2020) 301 final, p.4-5, footnote 26 (https://ec.europa.eu/energy/sites/ener/files/hydrogen_strategy.pdf)