The Nexus of Hybrid Power Plants and Policy – IEA Task 50

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Photo by Dennis Schroeder, NREL 55200

IEA Task 50 Objectives & Expected Results

- **Why do we need Hybrid Power Plants?**
  - Enhance flexibility of renewable generation
  - Provide reliability for the grid of the future
  - Catalyst in helping achieve renewable electricity and decarbonization targets
- **Objectives and Outcomes:**
  - **Goal:** Accelerate the development and deployment of hybrid power plants
- **Work Packages –**
  - **WP1:** Collection of research results, state-of-the-art and expert consensus
  - **WP2:** Reference hybrid plant – Will include a reference design with hydrogen
  - **WP3:** Overview of technology and design/operation algorithms
  - **WP4:** Electrical Design, Control, and Market/Grid Services
  - **WP5:** Outreach and Collaboration with TCPs, Tasks, and R&D

Work Package 1 – Challenge & Goal

- **Challenge –**
  - Hybrids are highly complex systems that must be customized based on site and application-specific needs
  - There is no definition or clear taxonomy as to what a hybrid plant currently is
  - Terminology is not used consistently across sectors

- **Goal –**
  - Identify language and define what a hybrid plant is, and to coordinate preferred language to develop consistent terms across the research field
  - Development of hybrid power plant terminology
  - Establish a global understanding of what hybrids are
    - What technologies should be included?

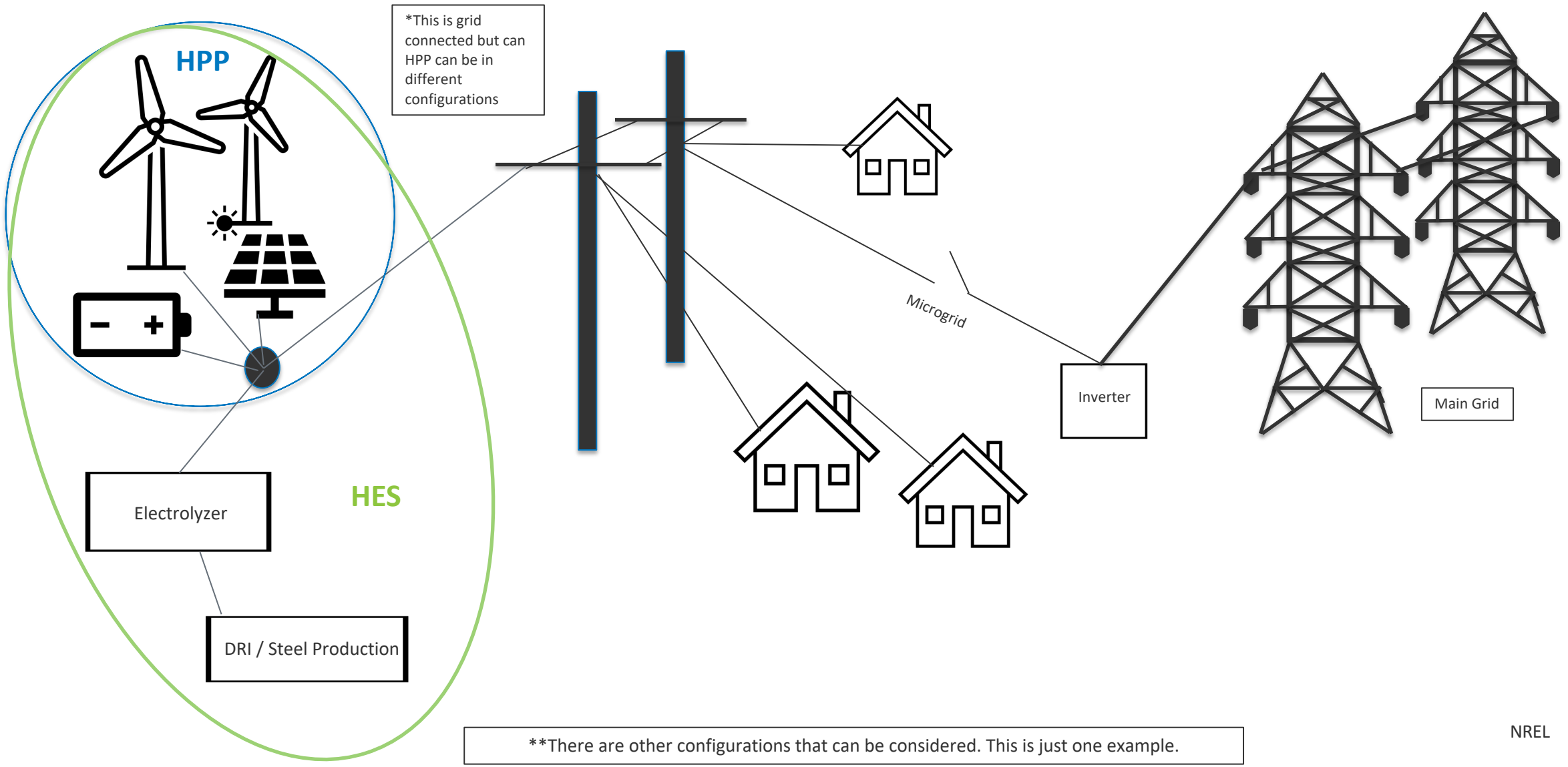
Work Package 1 – Status Update

First in-person meeting, WESC, Monday, May 22nd

Themes from Detailed Discussions

- Taxonomy
- Size
- Benefits
- Services
- End-use
- Storage
- Microgrids
- Technology

Visualization Example



**There are other configurations that can be considered. This is just one example.

Work Package 1 – Result

- **7 different draft definitions to date**
- **Sub definitions will be developed**
  - A hybrid dictionary to define the various subcategories of HPPs
    - Grid-connected
    - Off-grid
    - Islanded
    - Utility-scale
    - Integrated
- **Draft Definition 1.6 –**
  - *"An HPP is a combination of two or more electricity generation and/or two or more storage technologies used to provide electrical power services through coordinated bi-directional power flow."*

The Inflation Reduction Act – Policy Considerations

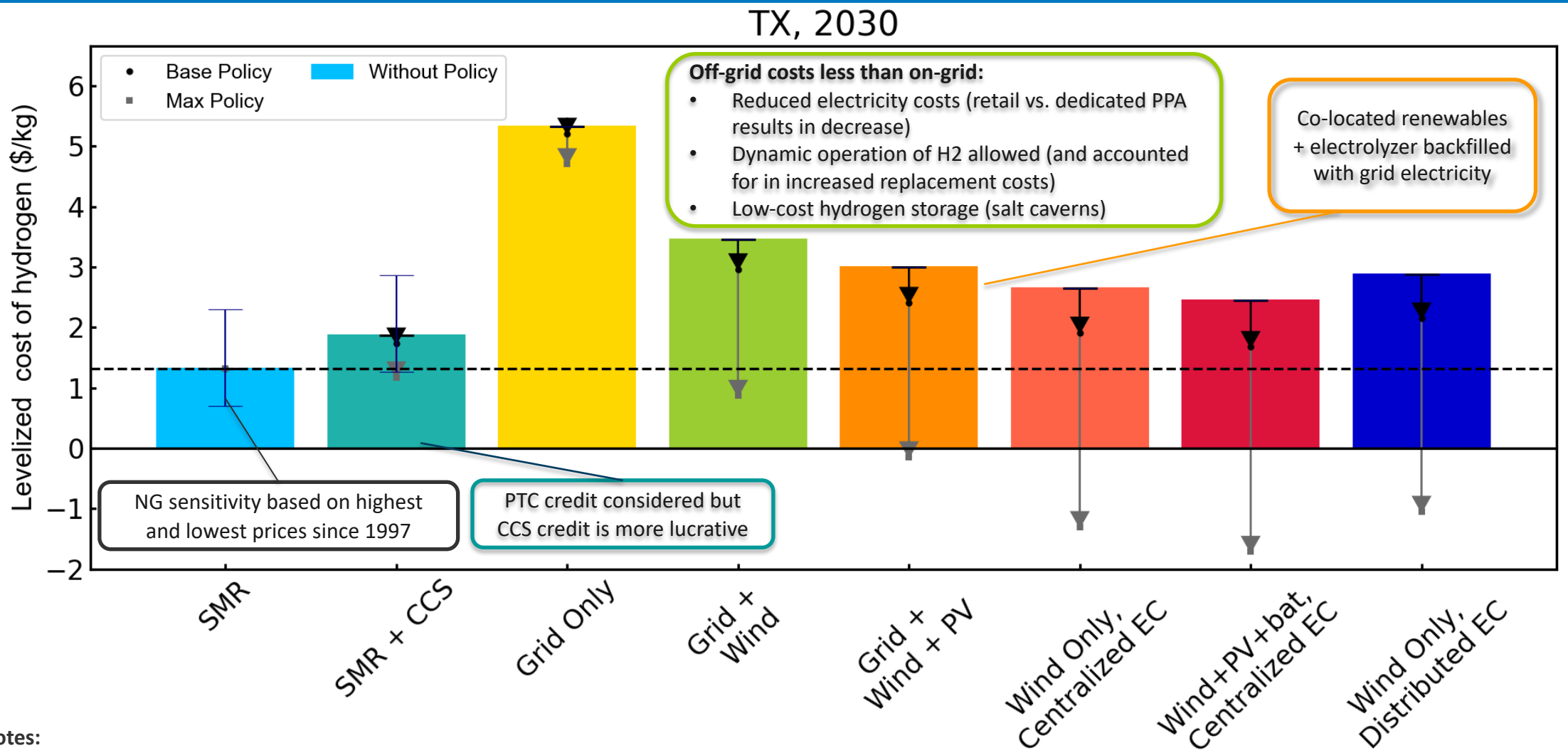
Policy Scenarios

- Three common scenarios:
  - *No Policy* – Baseline
  - *Base* – Lowest 100% value
  - *Max/Bonus* – includes 5X and bonus values
- Stackability of provisions
- Credits applied
  - PTC, ITC, H2 PTC, tech-neutral counterparts, ITC for storage and H2 process
- Additional considerations:
  - Prevailing wage and apprenticeship (5X)
  - Domestic content bonus (10%)
  - Energy community bonus (10%)

Policy	ITC (%)	PTC * ($/kWh)	H_2 PTC ** ($/kg-$H_2$)
No Policy	0	0	0
Base PTC	0	0.003	0.60
Max PTC	0	0.015	3.00
Bonus PTC	0	0.0165	3.00
Base ITC	6	0	0.60
Max ITC	30	0	3.00
Bonus ITC	40	0	3.00

* = 1992 dollars
** = 2022 dollars

Delivered LCOH in Best Location Analyzed: Texas, TY 2030. With Max Policy, All Locations Compete With SMR!



Notes:

- **CCS credit** over **12 yrs** & **H2/wind PTC** over **10 yrs**
- Model does not account for RECs
- Technology year (TY) 2030 corresponds to operational year 2035
- Distributed EC case includes electrical efficiency gains ~4%
- Conversion efficiencies apply to centralized case only (slides in backup)
- Natural gas price sensitivity shown in blue error bars
- **LCOE for TX 2030**
  - Off-grid: 1.3 cents/kWh with PTC
  - On-grid: 8.6 cents/kWh (retail rates)
- **NG:** max: $11.53/mmBtu and min: $2.02/mmBtu

Takeaways

- **IRA policy is a game changer:**
  - Climate policy makes things possible in the USA
  - Battery does change in some locations - policy can drive technology design
    - Incentives can lower costs which can offset increased technology costs
  - More cost-effective than FE-CCUS, advanced nuclear and siloed systems.
  - Integrated H2 will fully qualify for the full clean hydrogen $3/kg PTC
  - Wind & solar can take direct advantage of the full PTC & ITC credits

(Photo by Josh Bauer / Bryan Bechtold / NREL)

Thank you – Questions?

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