SYNFUELS AMERICAS

The Interplay of Renewables and Hydrogen

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Decarbonization

- The goals of COP-27 and the decarbonization of the energy sector can only be achieved through the integration of wind, solar and water power technologies.
- However, when compared with conventional power plants, there are significant difference.
- The challenges and technological solutions associated with renewables are still very rarely discussed.
- We needs to be transparent and honest when discussing options of renewable energy integration.

Renewables

- The environmental and economic benefits of using renewable energy include:
  - Generating energy that produces no greenhouse gas emissions and reduces some types of air pollution.
  - We are diversifying our energy supply and reducing dependence on imported fuels.

Advantages of Renewables

- Reduced greenhouse gases.
- Improved public health.
- Inexhaustible energy.
- Jobs and other economic benefits.
- Reduced dependence on imported energy sources.

Disadvantages of Renewables

- The electricity generation capacity is still not large enough.
- Renewable Energy can be unreliable.
- Low-efficiency levels.
- Requires a huge upfront capital outlay.
- Takes a lot of space to install.
- Currently storage is short term and expensive.
- Not always a commercially-viable option.
- It still generates pollution.

Challenges of Renewables

- The greatest challenge with intermittent renewable energy will be the integration related to its fundamental characteristics
  - Variability and uncertainty.
  - Intermittency

Integration

- There are still many challenges with the integration of larger quantities of electricity from non-dispatchable intermittent Renewable Energy sources.
- One option is the installation of *energy storage devices* to balance the fluctuations in power production.

Hydrogen

- In power generation, hydrogen is one of the leading options for storing renewable energy:
  - Hydrogen production can be used in gas turbines to increase power system flexibility.
  - Ammonia could also be used in coal-fired power plants to reduce emissions.

Hydrogen Production

- Hydrogen can be produced from diverse, domestic resources.
  - Most hydrogen is currently produced from fossil fuels
    - Specifically natural gas through SMR.
    - But Gasification has the potential to produce the most economical hydrogen.
  - Electricity from the grid or from renewable sources such as wind, solar, geothermal, or biomass is being used to produce hydrogen.
  - In the longer term, solar energy and biomass could be used more directly to generate hydrogen.

Challenges with Hydrogen

- The production of hydrogen is not our current challenge, but, the safe storage of large quantities of hydrogen needs to be addressed
  - Hydrogen storage and transportation is one of the key challenges in order to realize the full potential of hydrogen
  - There are several methods for hydrogen storage, each having its own advantages and limitations.
    - Compressed hydrogen gas storage
    - Liquid hydrogen storage
    - Metal hydride storage
    - Carbon nanotube storage
    - Chemical hydrogen storage

Hydrogen Storage

- Hydrogen storage has critical challenges.
- While progress has been made in developing various hydrogen storage methods, each method has its own advantages and limitations.
- To overcome the challenges associated with hydrogen storage, we need to invest in the continued research and development required to improve the efficiency, scalability, cost-effectiveness, and **safety** of hydrogen storage.

Impact of Green Energy

- We have seen the impact of the rush to Green Energy's on the EU.
- We need to be pragmatic.
- The integration of Renewable will for the near future require base loaded Fossil Fuel or Nuclear power plants until we have innovative energy storage.
- We also need to be aware of the unintended consequences.

Conclusion

- Today we find:
  - Developed countries are the primary innovators of renewables
  - Citizens are paying more for energy because of renewable mandates
- *Developed countries are promoting their green energy solutions and policies to developing countries that will only increase their energy costs.*
- *This approach could be viewed as a new form of northern hemisphere "Colonialism" forcing our ideologies and policies onto the underdeveloped world with no regard of the impacts.*

The Reality

- We need to re-think what we are doing!
  - 44% of the world CO_2 emission are from two countries
  - 61% of the world CO_2 emission are from five countries
  - **91% of the remaining world counties are 1% or less CO_2 emitters**

- **Renewables are our future not our present!**
  - **Wind and Solar need long term storage options**
  - **Hydrogen need safe large volume storage options**

Current Public & Political Frustration and there is
Resulting Renewable Resentment

Massive Riots

Thousands of Druze rioted in Golan Heights against a wind project, Aussie farmers seek solar ban, Renewable Rejection Database tally hits 574

Druze residents protesting a wind project near the village of Majdal Shams in the Golan Heights, June 21, 2023. Photo

Credit: Israel police

Vast majority of Tory grassroots oppose 2030 petrol car restrictions

Sir Tony Blair warned against asking the public to do a “huge amount” to tackle climate change, saying Britain’s unilateral policies have no real impact in light of China’s rising CO_2 emissions.

"Don’t ask us to do a huge amount when frankly whatever we do in Britain is not really going to impact climate change."

UK Prime Minister Rishi Sunak makes climate activists seethe in bold move for energy independence

One expert says Biden should follow UK example:

'Natural gas is not an enemy

A frustrated commuter pushes a Just Stop Oil protester out of the way as the demonstration blocked his van. (Just Stop Oil/Local News X/TMX)

Thank you