



NTPC Simhadri



Green Hydrogen Economy – Options before the Indian Glass Manufacturing Industry



NTPC JET SAR



Kayamkulam Floating



NTPC Rojmal

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Welcome



Congratulations

To you all



Celebrating the past, present and future of glass for a sustainable, equitable and better tomorrow!



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H₂ Blending pilot project at Enbridge, Southern Ontario, Markham



NTPC: India's Largest Power Generating Company



Govt. of India enterprise with **47 years experience** in power sector;

Presence in Thermal, Hydro, Solar, Wind, Hydrogen, Biomass, Waste to Energy, Coal Mining;

Developed projects of capacity **70GW**, **78 Projects** and **Coal Mines**;

Target to reach 130GW by 2032 with **60GW** from RE;

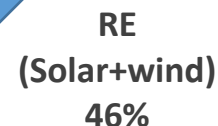
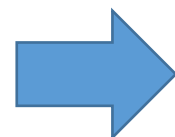
In-house expertise providing end-to-end power plant solutions:

- Engineering & Project Management;
- Procurement;
- Erection, Testing and Commissioning & O&M;

Pool of around **~17000** competent, experience **manpower**;

Strong financials:
\$15.8 Bn revenue in FY-22;
\$16.5 Bn net worth;
\$2.1 Bn Profit;





Emission of Green Houses Gases (GHGs)

- Triggers a global warming which causes a climate change and poses series of threat to an earth atmosphere.
- Immediate action needs to be taken on climate change mitigation and adaptation.
- World recognizes the need in many forums like Kyoto Protocol, Paris Agreement etc.,
- Transformation in Energy production and consumption:
Fossil-based energy → Renewable Energy

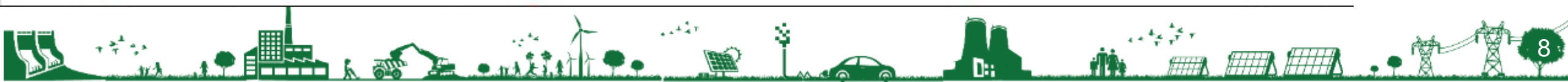


Panchamrit

COP26

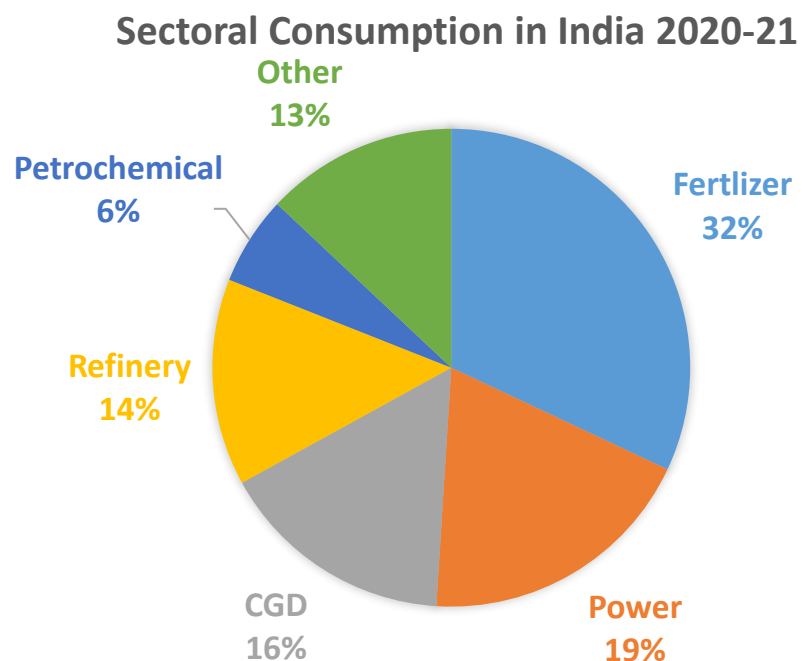


- India will reach its non-fossil energy capacity to 500 GW by 2030.
- India will meet 50 percent of its energy requirements from renewable energy by 2030.
- India will reduce the total projected carbon emissions by one billion tonnes from now onwards till 2030.
- By 2030, India will reduce the carbon intensity of its economy by less than 45 percent.
- By the year 2070, India will achieve the target of Net Zero.

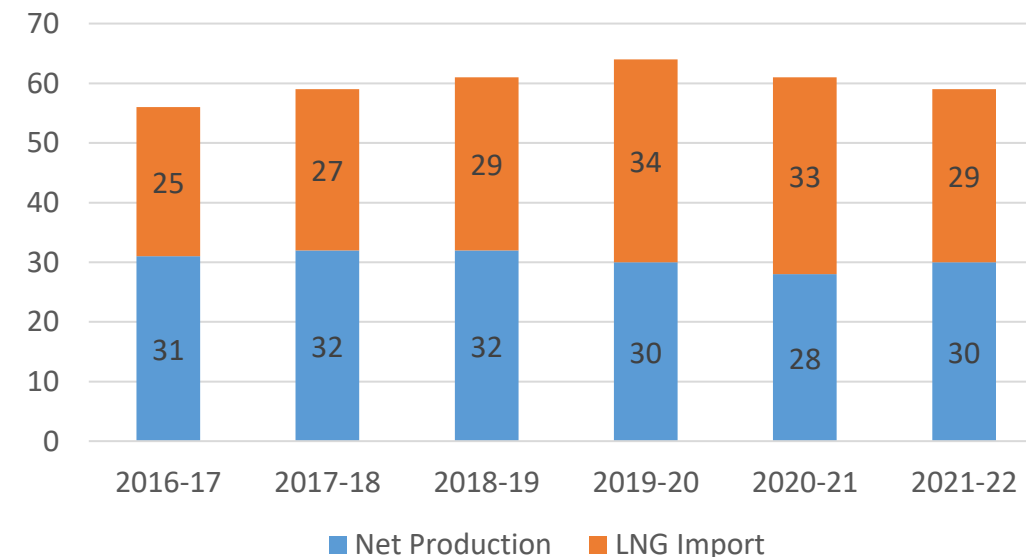


Natural Gas – In India

- In 2021-22
 - Natural Gas production : ~30 BCM
 - LNG Import : ~ 29 BCM



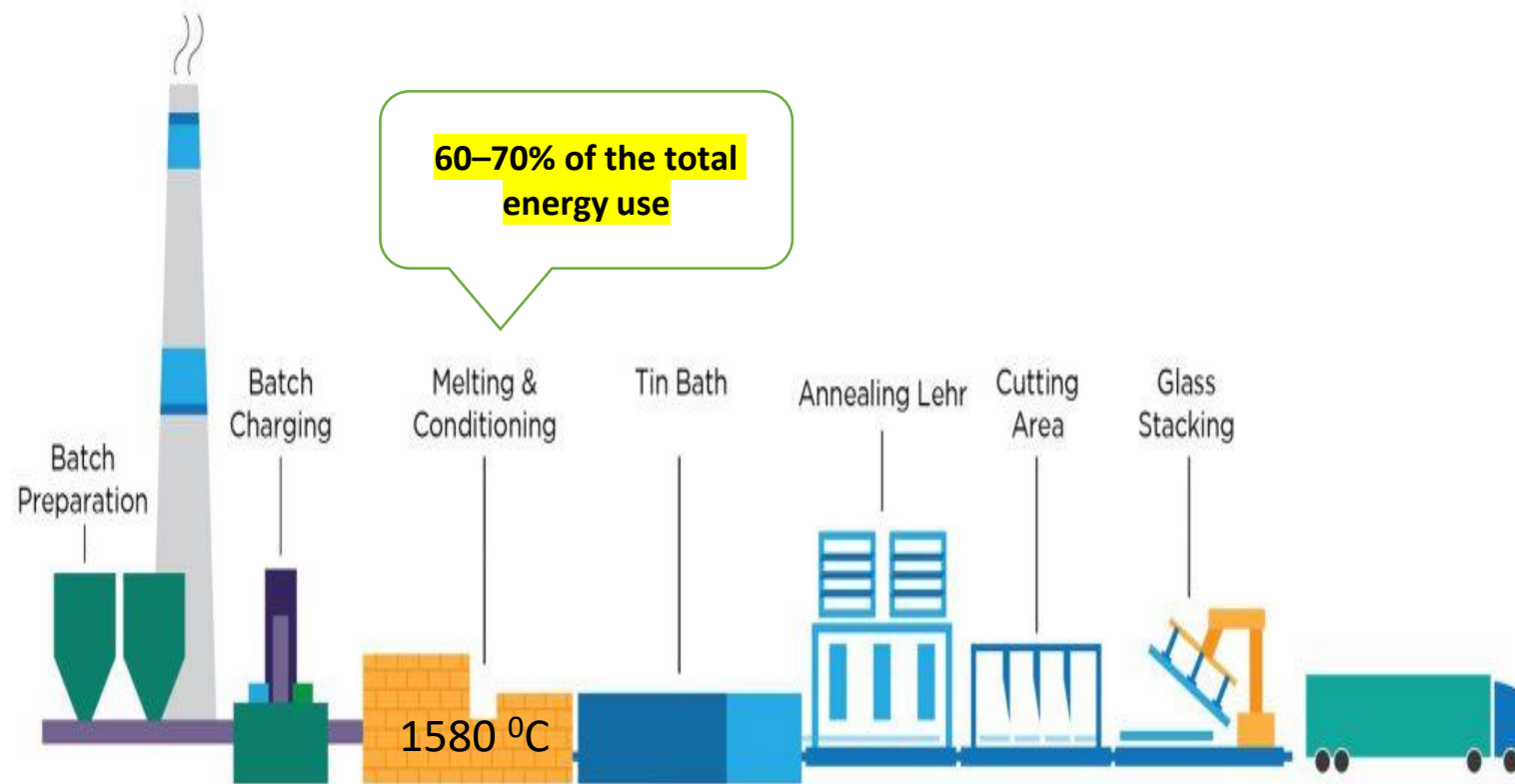
**Natural Gas Production and LNG Import
(in BCM)**



- Annual Consumption:
 - Industrial & manufacturing - 555 MMSCM
 - City/local NG distribution - 9230 MMSCM

Source: Petroleum Planning & Analysis Cell, MoPNG





Glass manufacturing process

- Energy intensive industry and energy consumption is a major cost driver.
- Av energy cost as % of manufacturing cost is ~ 40 %.
- Primary source of energy consumption in most of the glass making furnace with natural gas firing.
- Blending of hydrogen gas with natural gas at a particular composition level will help us for this transition by reducing the GHGs emissions without change in the infrastructure.



Glass Industry

- Piped natural gas (PNG) is widely used as fuel in boilers, furnaces, etc.,
- PNG carbon footprint: 54 kg/MMBtu (Less than by 12% LPG, 25% Diesel and 30% FO)

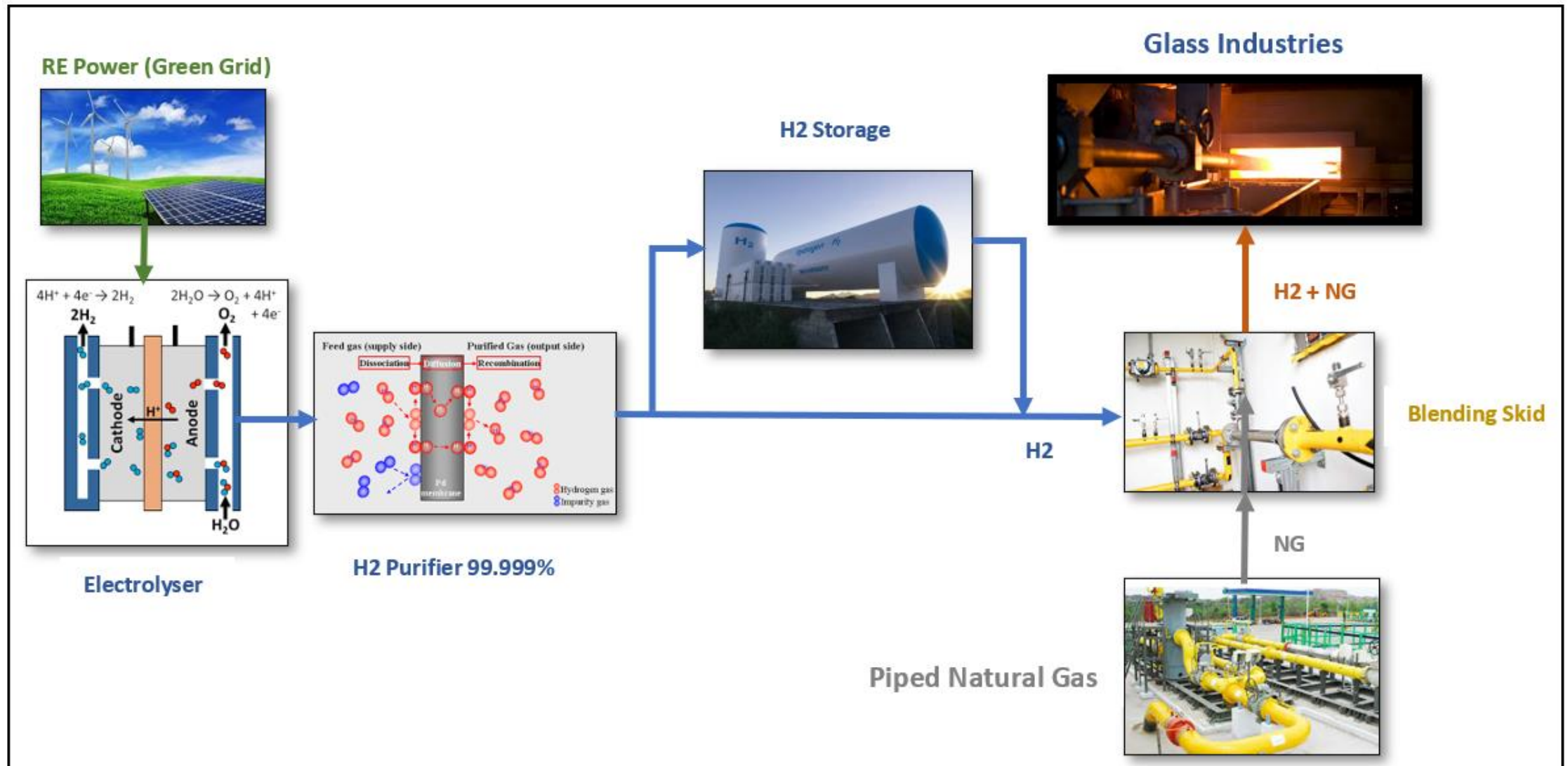
Firozabad (Taj Trapezium Zone)

- Natural gas cluster (M/s GAIL Gas Limited): 342 industrial and 18000 domestic (PNG)
- Average glass production of small and medium industries: 1500 tonnes per day (TPD)
- Total CO2 emissions
 - No hydrogen blending: ~ 530 TPD
 - Hydrogen blending of 20% vol/vol: ~ 495 TPD (emission level is reduced by 6-7%)
 - Annual reduction in CO2 emissions is around 12000 TPA

Source: Centre for the Development of Glass Industry, Firozabad



Sustainable Glass production with carbon reduction



International Experiences in H2 Blending



International Experiences in H2 in Glass Industry





Pilkington Glass trial

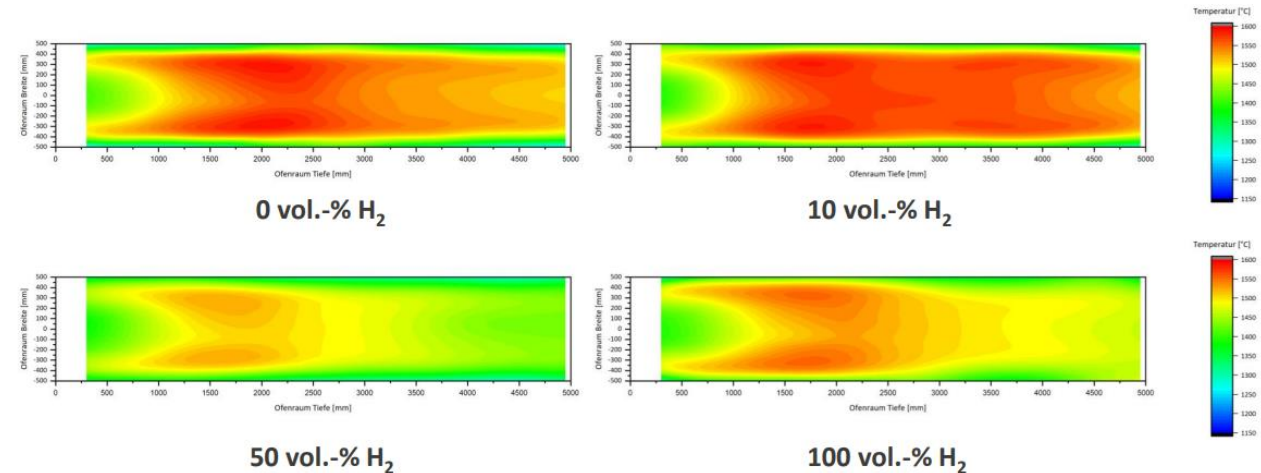


- Pilkington, Greengate site, UK
- 2 TPD hydrogen
- Firing 100 % hydrogen in part of the furnace
- Run safely on the hydrogen blend, without compromising on quality standards or operational performance.



Hydrogen Blending at BV Glas & GWI, Germany

- BV Glas (the Federal Association of the German Glass Industry) and the GWI research institute in Essen (GWI)
- North Rhine-Westphalia, Germany
- Firing 100 % hydrogen in part of the furnace
- Checking on glass quality and combustion parameters.



Source: BV Glas, DWI



Rationale behind the Hydrogen Usage in Glass Industry

- First mover advantage in India
- Designing configurations for H₂ blending
- Improve ESG parameter
- Glass Quality and Operating Parameters



News

Source : The Hindu: Business Line

Govt planning to blend 15 per cent green hydrogen with piped natural gas

New Delhi, December 30 | Updated On: Dec 30, 2021



The move is in line with India's ambitious target of becoming carbon neutral by 2070

The government is planning to blend 15 per cent green hydrogen with piped natural gas (PNG) for domestic, commercial and industrial consumption. The move is in line with India's ambitious targets for reducing greenhouse gas emissions and becoming carbon neutral by

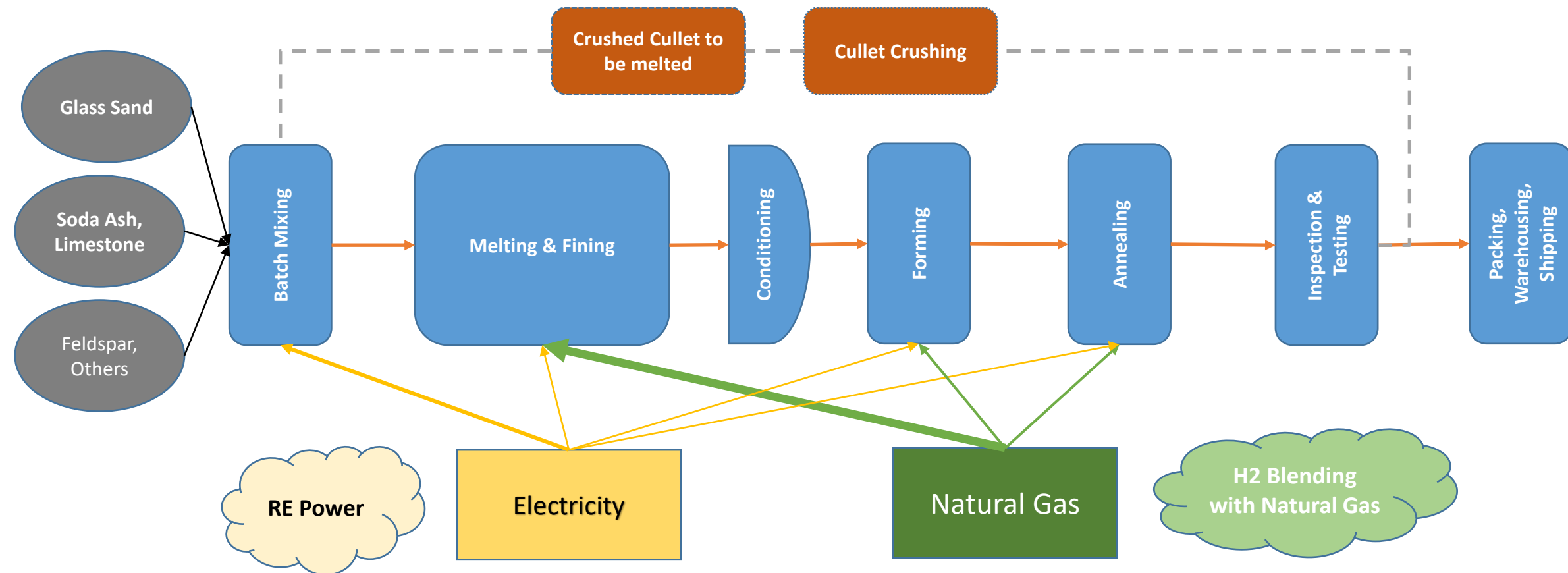
2070. This initiative will be part of the government's National Hydrogen Energy Mission aimed at generating hydrogen from green power sources.

Earlier this year, Power Minister R K Singh had announced that the

Discussion initiated with CSIR For using Hydrogen in Indian Glass industry



Grey to Green – An option for a Glass Industry



GREY TO GREEN





Let's drive sustainability together
and create value for our business





Migratory Birds at NTPC Dadri

Thank You



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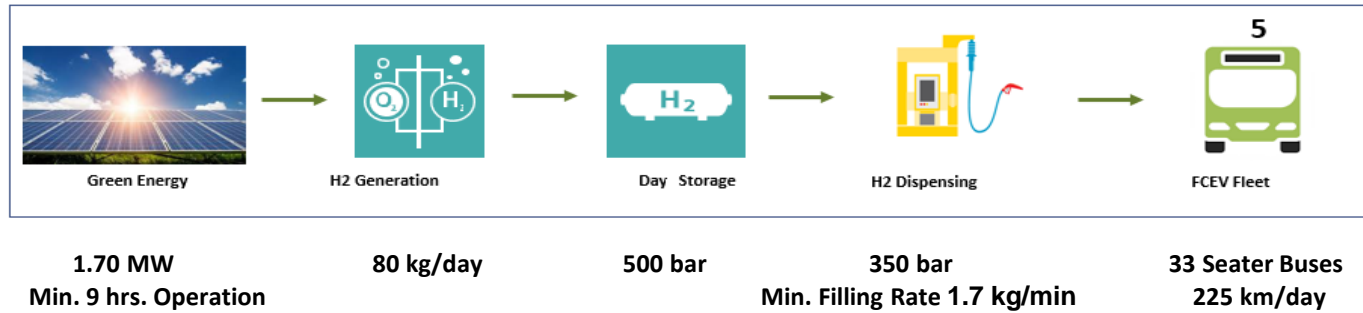
By 2030

5 GW Electrolysers, 0.65 MMTPA Green H₂



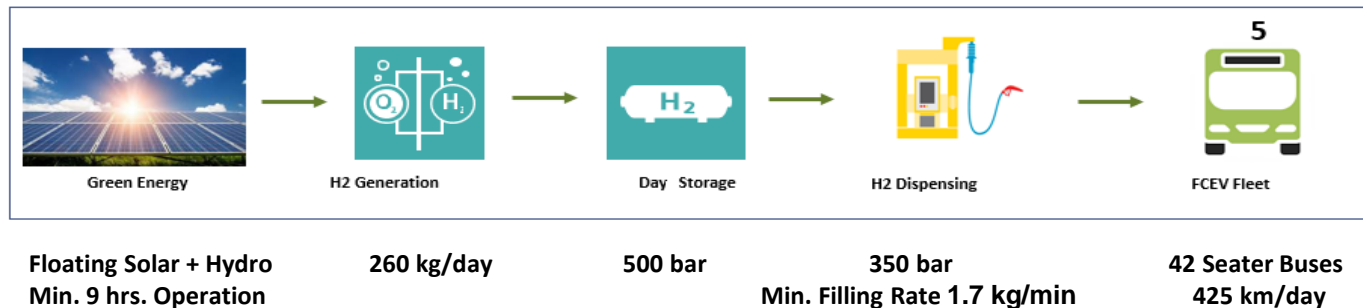
Green Hydrogen – Mobility

Mobility | Leh (Ladakh)



- Implementation is in progress
- \$7.3 Million (Solar & Fuelling Station)
\$2.4 Million (05 FCEV Buses)
- Route: Intracity @ Leh
- 3500m + MSL, Sub-zero temperature for more than 5 months

Mobility | Delhi



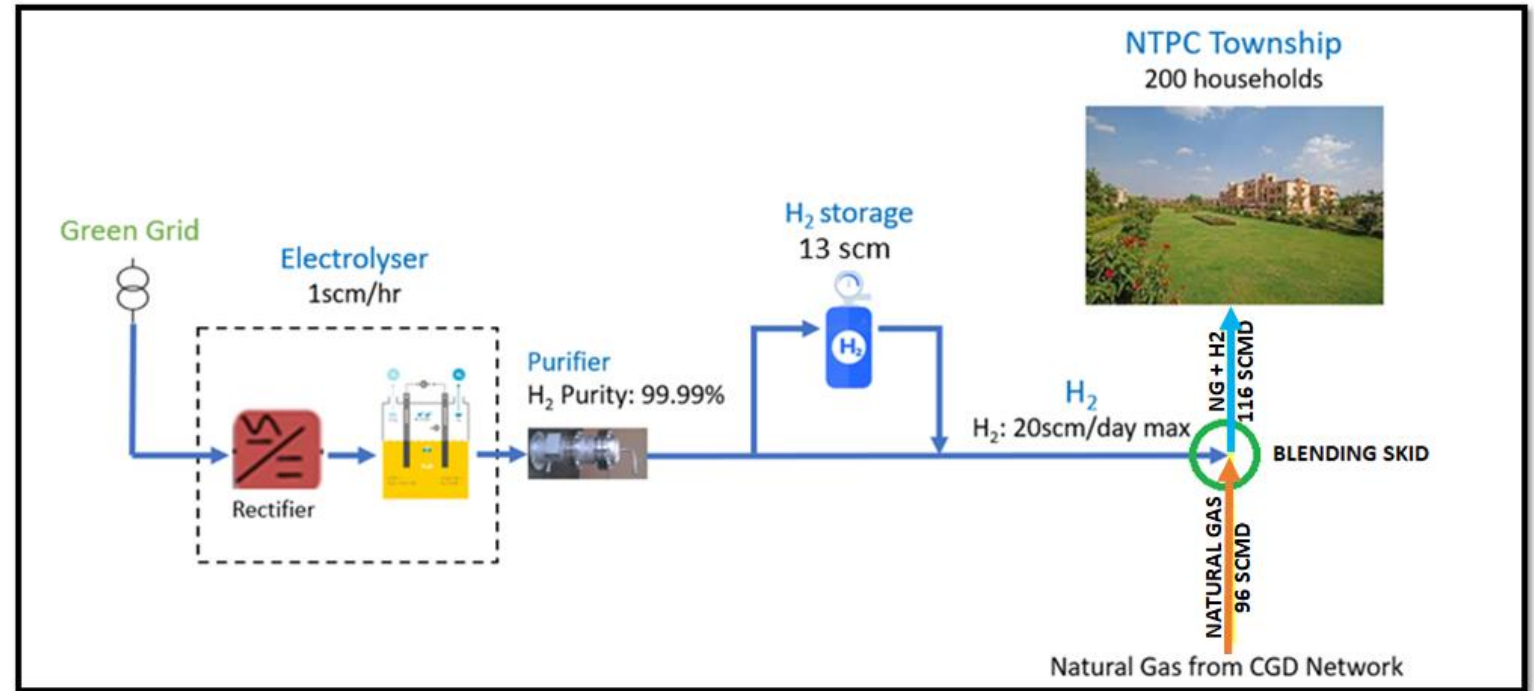
- Proposal is in progress
- Cost: \$8.5 Million (Fuelling Station)
\$2.6 Million (05 FCEV Buses)
- Route: intercity applications
- 200m + MSL, 5-45 °C



Green Hydrogen – Blending

- Collaboration
 - NTPC & Gujarat Gas Limited
- Blending H₂ with PNG
 - 5-20% by volume
- Power (NTPC Kawas)
 - Floating Solar Plant (1MW)
- Electrolyzer
 - Hydrogen – Min 1Nm³/hr.
- Hydrogen Storage
 - 13 Nm³, Min. 10 bar
- Project
 - Cost (pilot) - \$0.37 Million
 - PNGRB – Go ahead approval
 - Hazop Study and Designing phase

Hydrogen Generation and Blending System



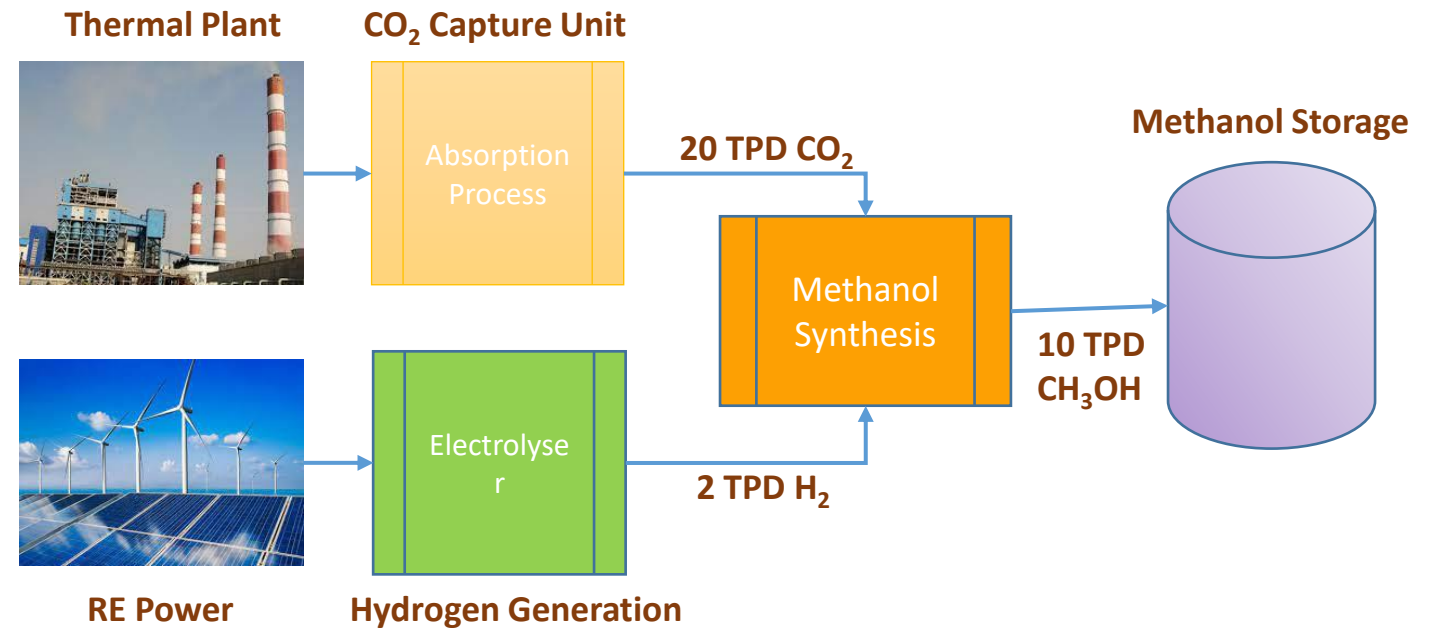
Upcoming Blending Project

- NTPC Solapur and Solapur Town
- NTPC Ramagundam



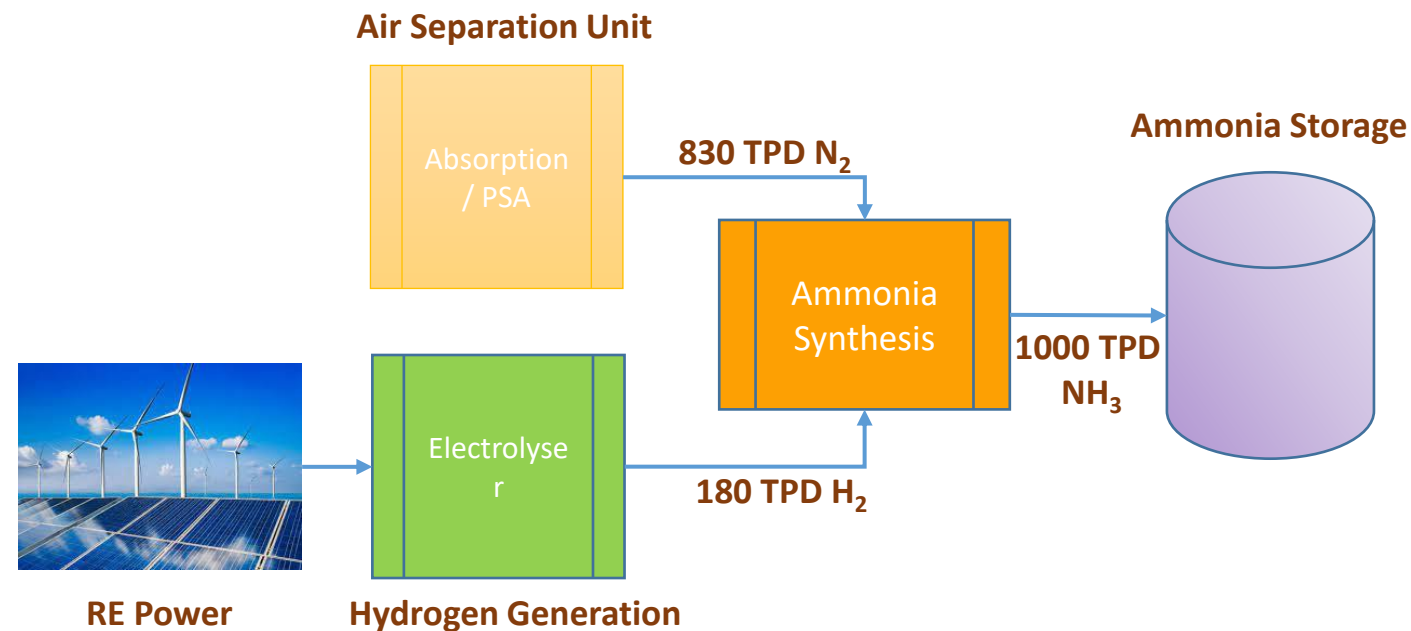
Methanol: 10 TPD Flue Gas - CO₂ to Methanol Plant (FG-CTM)

- Location: NTPC Vindhyachal, MP
- Carbon Capture Unit
 - 20 TPD CO₂ from thermal plant flue gas
 - Energy efficient amine absorption process
- Hydrogen Generation Unit
 - Generating 2 TPD Hydrogen
- Methanol Production Unit
 - Conversion of CO₂ to Methanol
 - Catalytic hydrogenation process
- Project
 - Cost: \$8.6 Million
 - Under implementation



GREEN AMMONIA: 1000 TPD

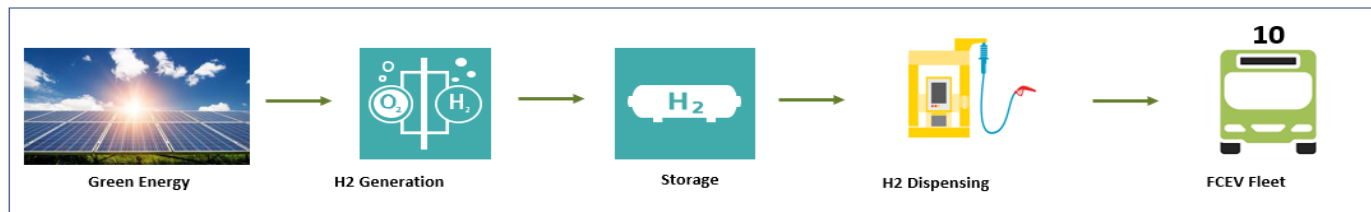
- Location: Bhuj, Gujarat
- Air Separation Unit
 - Generating 830 TPD Nitrogen
 - Absorption/PSA process
- Hydrogen Generation Unit
 - Generating 185 TPD Hydrogen
- Ammonia Production Unit
 - Haber Bosch process
- Project
 - Estimated Cost: \$1.2 Billion
 - DPR Study is in progress



NTPC's pilot projects on Hydrogen



Mobility - Leh (Ladakh) and Delhi



Hydrogen blending in Natural Gas (5-20% by volume) - Kawas



Forthcoming H2 Blending Project in NTPC

- NTPC Ramagundam
- NTPC Solapur

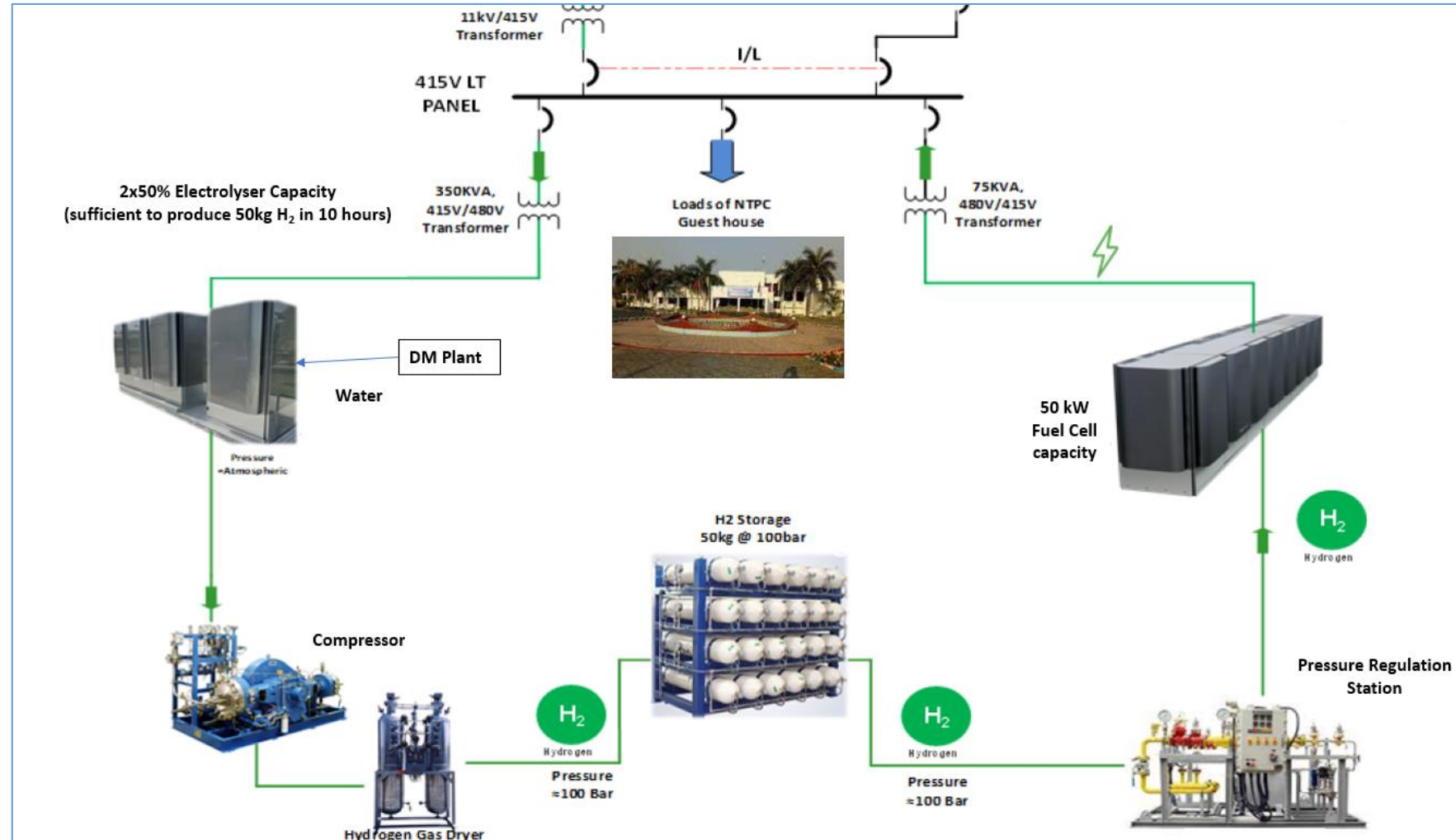
Green Ammonia and Green Methanol



Green Hydrogen – Microgrid

Hydrogen Energy Storage System | Simhadri (Visakhapatnam)

- Green Power from Solar project
- Electrolysis
 - Hydrogen – 50 kg/day
10 hours (7AM to 5PM)
- Hydrogen Storage
 - 50 kg @ 100 bar
- Fuel Cell
 - 50 KW
14 hours (5 PM to 7AM)
- Project
 - Cost: \$1.45 Million
 - Implementation stage

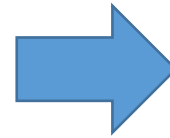
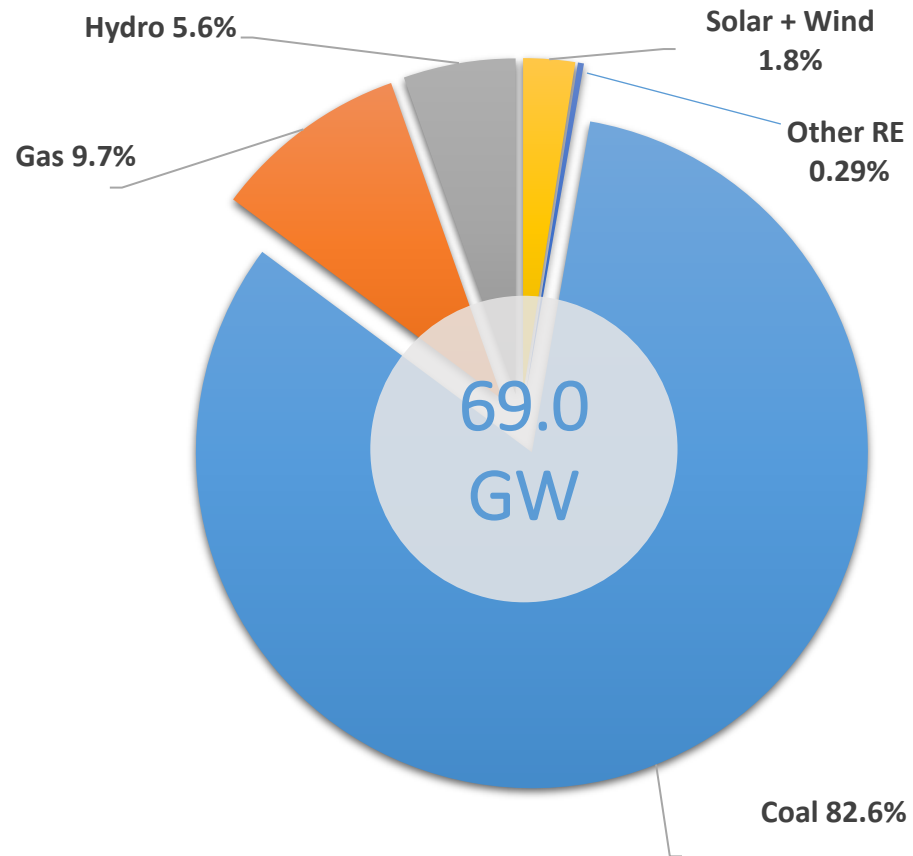


NTPC Long Term Plan

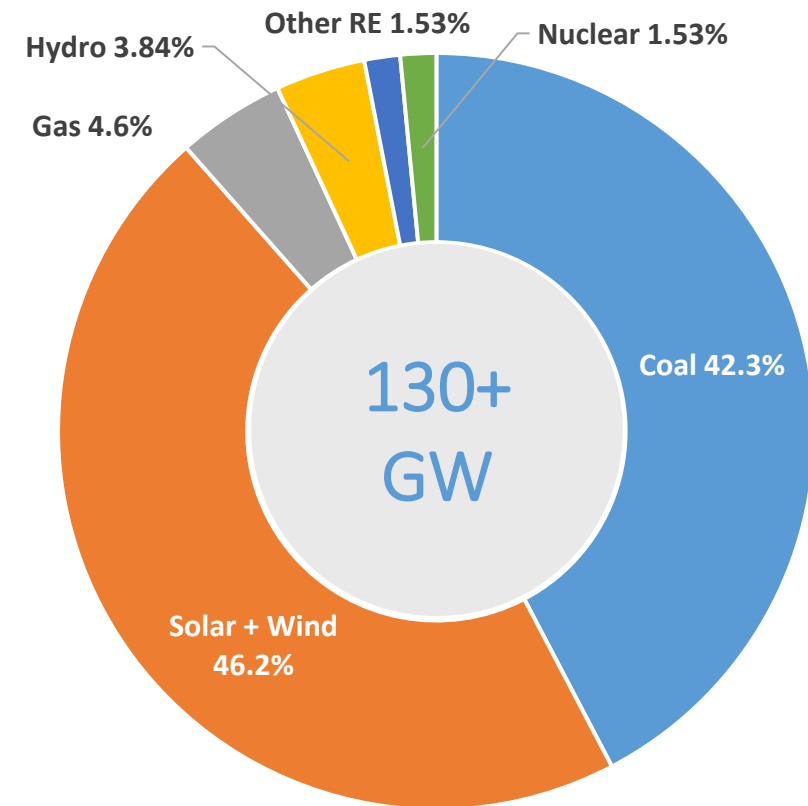
Graph colour need to same- gas should be orange



2022



2032



Renewable Power (Solar & Wind) : 1716MW (2022) → 60000MW (2032)



3/4 slides for glass industry as C&I consumer
to convert their electricity grey to green

GREY TO GREEN

