International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

# Blue Energy Scalable Renewable Energy Pilot Plant Industry

**Vishal V R Nandigana**

Department of Mechanical Engineering, Head of Membrane Technology and Deep Learning laboratory,
Fluid Systems Laboratory, Indian Institute of Technology Madras,
Chennai 600036, India, Founder of Blue Fma PVT LTD *
*Corresponding author: *nandiga[at]iitm.ac.in, https://bluefma.today*

**Abstract:** ***In this paper, we build a scalable, kW/m$^2$ renewable energy pilot plant industry, at CFD laboratory, IIT Madras, using electrolyte solution, like Potassium Chloride solution (KCl) solution, a simple electrolyte solution to generate power of kW in a square meter area for use in applications like 1000 km/hr automobiles in land, and trains. The membranes used for generating the kW power is Graphene/Cu membranes, with Graphene membrane of 0.345 nm sandwiched and bonded to copper membrane of 18 μm. The Graphene/Cu membrane has multiple small mm size holes to allow electrolyte solution to transport through the membrane and generate kW power. The reservoirs are made of fructose material (food material) of size 2.5 cm to sandwich the Graphene/Cu membranes. One reservoir is filled with fresh water (no electrolytes) and another reservoir is filled with KCl solution. The asymmetric electrolyte distribution across the circuit generates kW power in a square meter area. The power is calculated using the voltage induced by asymmetric electrolyte distribution across the reservoirs and the resulting generated current yields a power of kW in a square meter power plant. The novel renewable energy scalable technology is patent approved and the pilot plant industry is legally approved industry under the industry name, Blue Fma, and the industry supplies power under payment fee and can be bought under payment from https://bluefma.today***.

**Keywords:** Blue Energy, Membrane Technology, Graphene, Energy, Pilot Plant Industry

## 1. Introduction

Blue Energy is a renewable energy technology recently worked and demonstrated in 2016 in our earlier work [1] to show single layer atomic scale membrane like $MoS_2$ or Graphene (< 1 nm) length of the membrane will reduce the resistance of electrolyte transport and yield giant flow rates of electrolyte transport resulting in giant power density in a square meter. However, till date, the technology was not scalable until now where we show for the first time, the technology is scaled and demonstrates kW/m$^2$ power and is patent approved and legally the pilot industry is approved and registered under legally approved name, Blue Fma and the industry supplies power under payment fee and can be bought under payment from https://bluefma.today

The technology uses the novel phenomenon of electrokinetic transport inside nanofluidic membrane size thickness lengths of < 1 nm, called single layer atomic layer size membranes. The scalable membrane of such single layer atomic layer size membranes for scalable pilot plant industry makes the membrane technology permissible to build a pilot plant industry at CFD laboratory, IIT Madras.

The holes made inside the nano/micrometer length membranes, in this paper we used Graphene/Cu are 1 mm to 2 mm holes across 18 mm height. The Graphene/Cu is then sandwiched with Silicone (food material) of 3 mm thickness for bonding with the fructose reservoirs. The Fructose reservoirs sandwiched between Silicone/Graphene/Cu membranes with holes made inside Graphene/Cu is the scalable membrane technology yields kW/m2 power using single atomic layer membranes [2-3].

## 2. Blue Energy Scalable Pilot Plant Industry

### A. Schematics of Blue Energy Plant

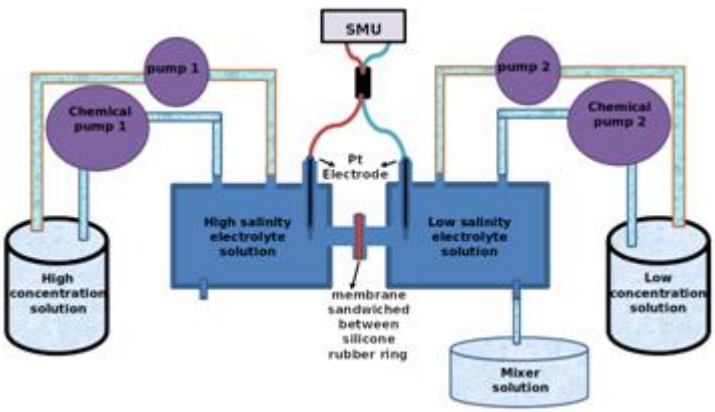


**Figure 1:** Schematic of Blue Energy plant

Fig. 1. shows the schematics of blue energy plant with asymmetric electrolyte solution across fructose reservoirs, sandwiched with Silicone/Graphene/Copper membranes. The electrolyte solution and water is pumped and controlled using automated peristaltic mechanical and computer controlled automated system. A total of 4 pumps are used to carefully control the flow of electrolyte solution and water into the fructose reservoirs and to ensure stable flow transport inside the Silicone/Graphene/Cu membranes. The diameter of the Silicone hole is 15 mm. Two Pt electrodes are used and a automated computer controlled and computer displayed set up voltage unit, SMU, displays the voltage and current readings to calculate the power.

**B. Blue Energy Real Plant Assembly**

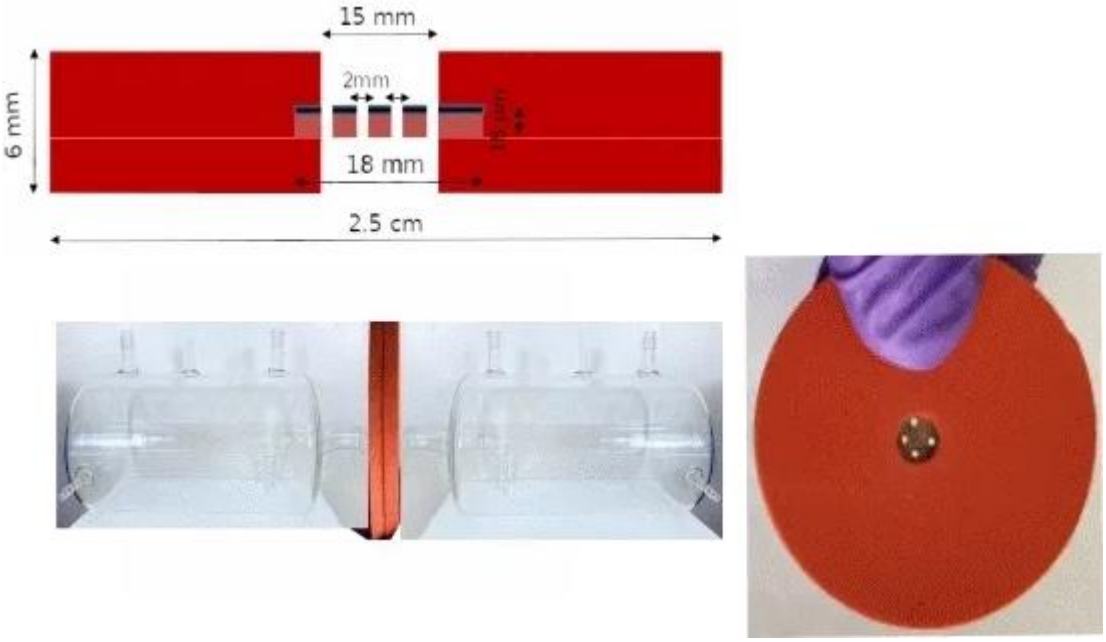


**Figure 2:** Fructose reservoirs sandwiched with Silicone/Graphene/Cu membranes for blue energy

Fig. 2. shows the blue energy real plant assembly of Fructose reservoirs sandwiched with Silicone/Graphene/Cu membranes yielding membrane technology to generate kW power in a square meter. Multiple holes (4) are made into the 15 mm Silicone membrane and the diameter of each hole in the Graphene/Cu membrane is 2 mm. The thickness of the Silicone membrane is 3 mm, and the height of the Silicone membrane is 2.5 cm equal to the height of the fructose reservoirs. The thickness of the Graphene/Cu membrane is 18 μm yielding fast transport of electrolyte solution yield a power kW in a square meter.

**C. Blue Energy Plant Physical Industry**

Fig. 3. shows the blue energy physical industry plant at CFD, laboratory, IIT Madras, Chennai, India, scalable renewable energy plant industry yields kW power in a square meter. The renewable energy scalable technology is patent approved and the pilot plant industry is legally approved industry under the industry name, Blue Fma, and the industry supplies power under payment fee and can be bought under payment from https://bluefma.today

**Figure 3:** Blue Energy plant industry

## 3. Conclusions

Here, we build a scalable, kW/m$^2$ renewable energy plant industry for use in applications like 1000 km/hr automobiles in land, and trains. Our novel renewable energy with single atomic layer membrane technology is patent approved and the pilot plant industry is legally approved industry under the industry name, Blue Fma, and the industry supplies power under payment fee and can be bought under payment from https://bluefma.today

## 4. Acknowledgments

MHRD STARS research grant [STARS/ APR2019/ NS/148/ FS], SERB CRG-Exponential technology grant CRG/2020/001684, Support for enterpreneurial and managerial development of MSMEs for Blue Fma PVT LTD, IoE-CoE C-MNBF grant, SB20210808MEMHRD008509 .

## References

[1] Jiandong Feng, Michael Graf, Ke Liu, Dmitry Ovchinnikov, Dumitru Dumcenco, Mohammad Heiranian, Vishal Nandigana, Narayana R Aluru, Andras Kis, Aleksandra Radenovic, Single layer $MoS_2$ nanopores as nanopower generators , Nature 536 (7615), 197-200.
[2] Les Johnson and Joseph E. Meany, Graphene: The Superstrong, Superthin, and Superversatile Material That Will Revolutionize the World, 2018.
[3] T. Suntola, Atomic Layer Epitaxy, Chapman and Hall publishers, 1990.