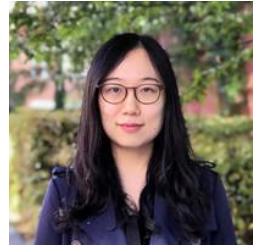




# **Renewable energy-hydrogen based microgrid for sustainable Arctic communities**

**Qianwen Xu, Assistant Professor in sustainable power systems and microgrids, KTH**  
**Mengfan Zhang, Postdoc in sustainable power systems and microgrids, KTH**

# About me

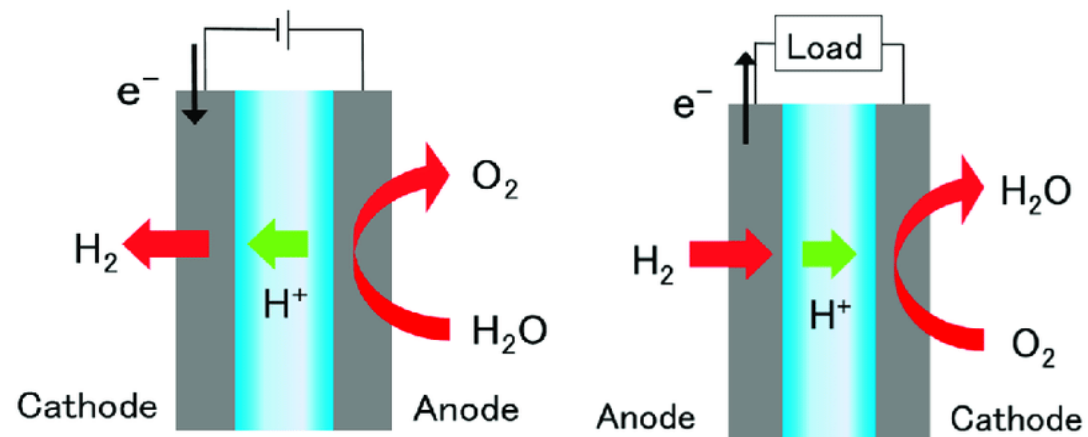
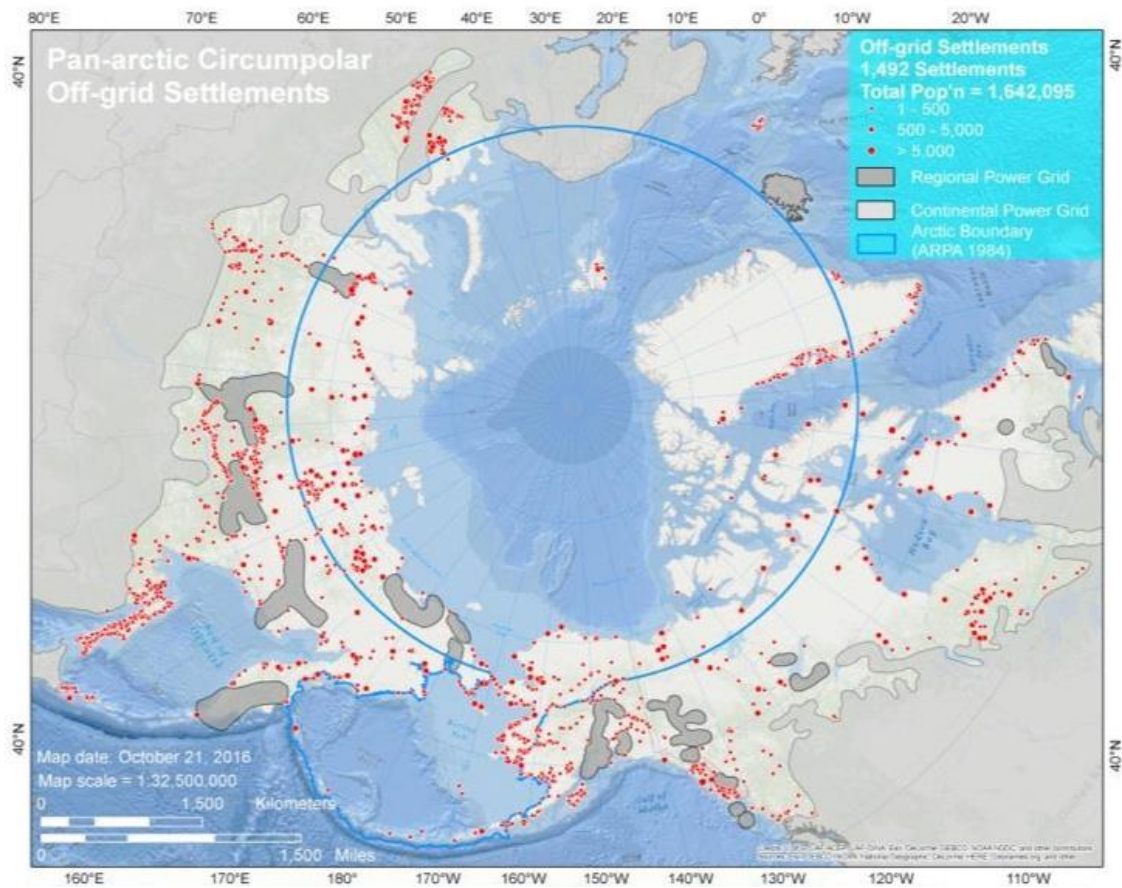


## Education and Professional Experience

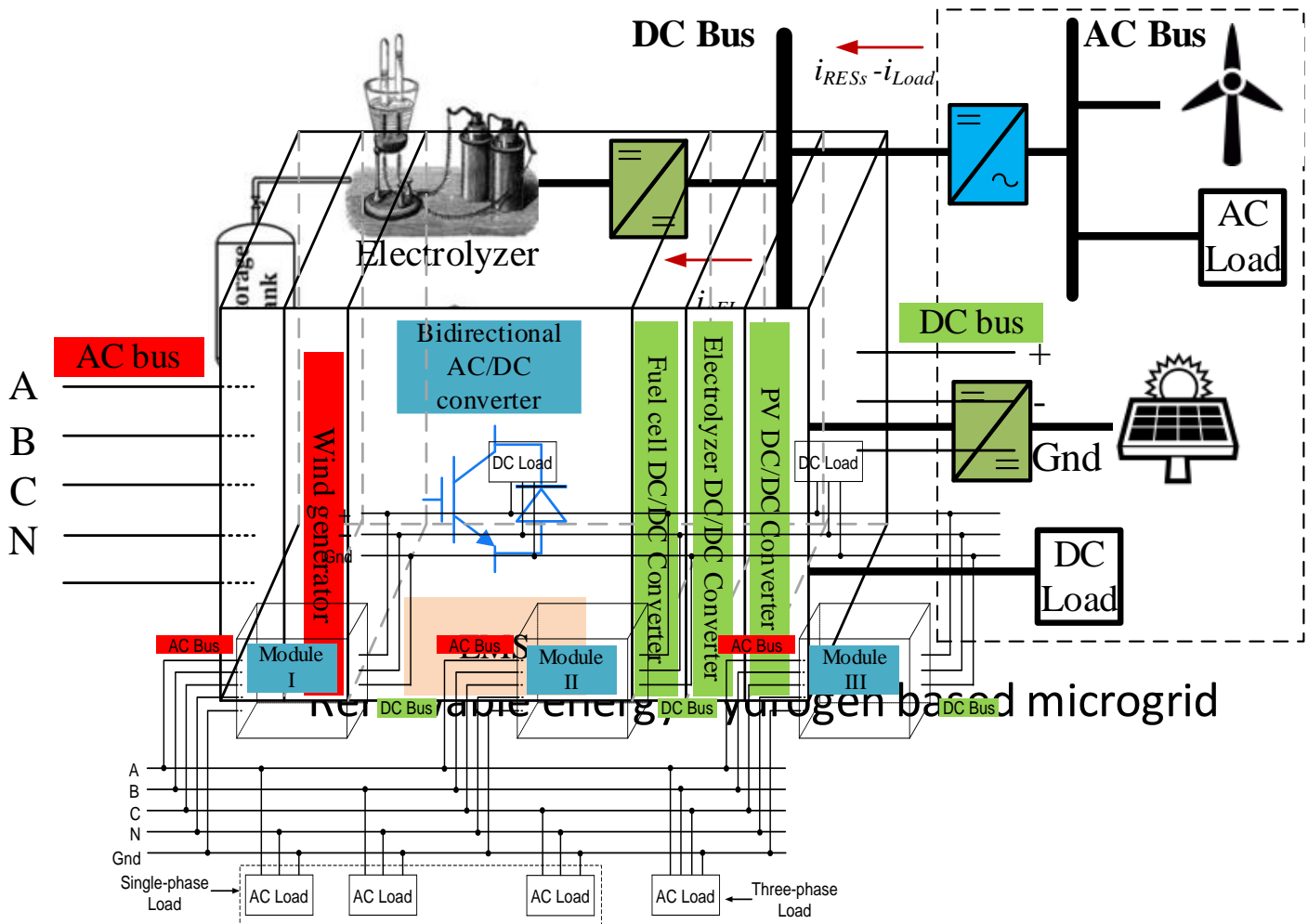
- 2020.9- KTH Royal Institute of Technology Assistant Professor
- 2019.7-2020.8 Nanyang Technological University Presidential Fellow
- 2020.3-2020.6 Imperial College London Visiting researcher
- 2018.11-2019.7 Aalborg University Postdoc
- 2014.8-2018.11 Nanyang Technological University PhD
- 2010.9-2014.7 Tianjin University Bachelor

## Research

- **Research interests:** Modeling, control and optimization of microgrids, sustainable power systems and power electronic systems
- **15 first-authored** journal papers in top IEEE transactions
- **PI** for 4 national projects and 1 international project, including VR starting grant.
- **Vice Chair** in IEEE Power and Energy Society & Power Electronics Society, Sweden
- **Associate editor** for IEEE Transactions on Smart Grid
- **Associate editor** for IEEE Journal of Emerging and Selected Topics in Power Electronics



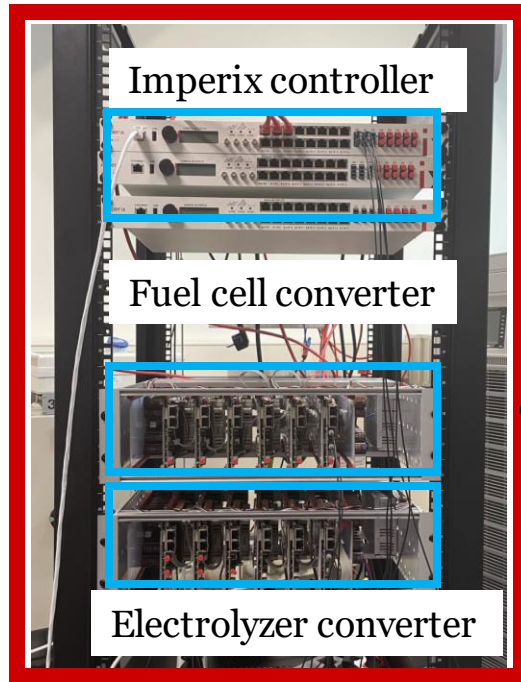




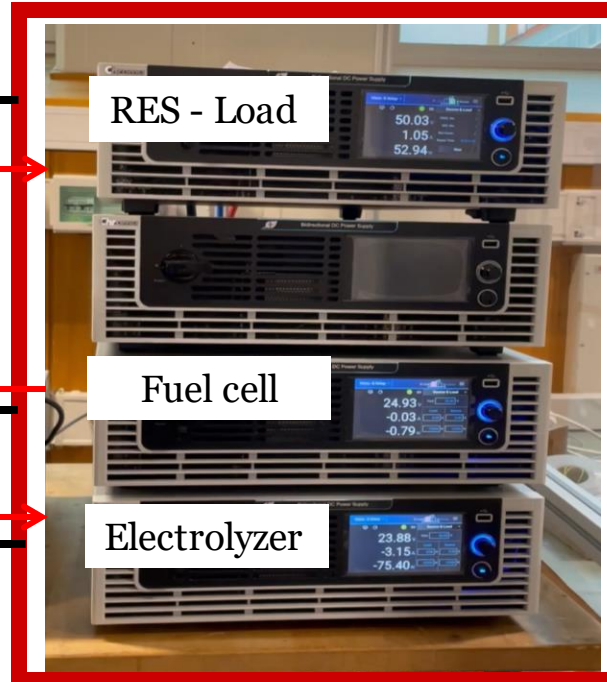
- Efficient electro → Advanced design and control interface converter
- Low in → Real-time coordination and stabilization
- Stable econ → Advanced energy management
- Complex expe → Standardized modular microgrid hardware solution

# Preliminary experiment setup

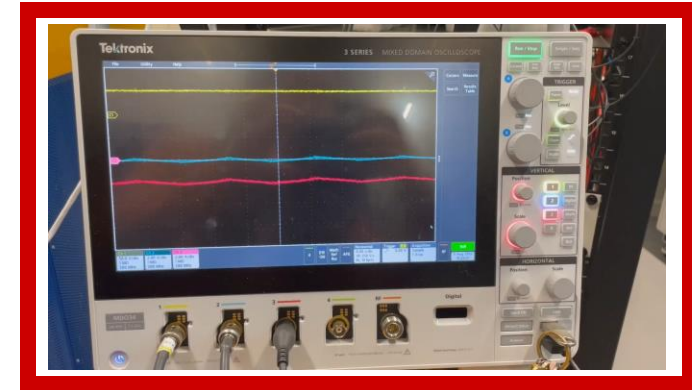
## Converter



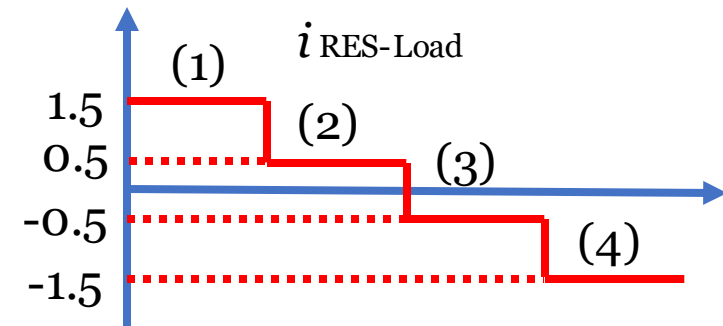
## Source/Load



## Monitor



- $v_{dc}$  (Bus voltage)
- $i_{FC}$  (Fuel cell output current)
- $i_{EL}$  (Electrolyzer output current)



The results demonstrate our capability in achieving the proposed work

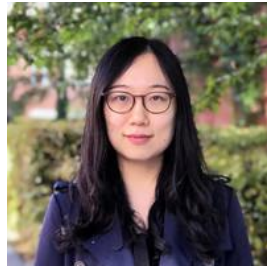


# Expected outcome

The expected outcome is to design a 100% renewable energy system to achieve self-sufficient Arctic community with zero emission.

- Advanced control strategies to maximize the utilization of renewable energy in Arctic region.
- A novel energy management system to significantly reduce the cost
- An integrated modular microgrid hardware solution with interface converters to achieve rapid deployment, ease of expansion and replicability to various Arctic communities in Nordic region.
- The proposed RES-hydrogen microgrid solution can be directly deployed in different Arctic communities of Nordic countries.
- It can make full use of RESs in Arctic regions of Nordic countries, and extra hydrogen can be exported for use in industry (e.g., steel, mining) and transportation (e.g., ship, truck) by Nordic countries.
- The solution needs different components from different vendors in different Nordic countries, thus facilitate the collaboration of all Nordic countries.

# Thank you very much for your attention!



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