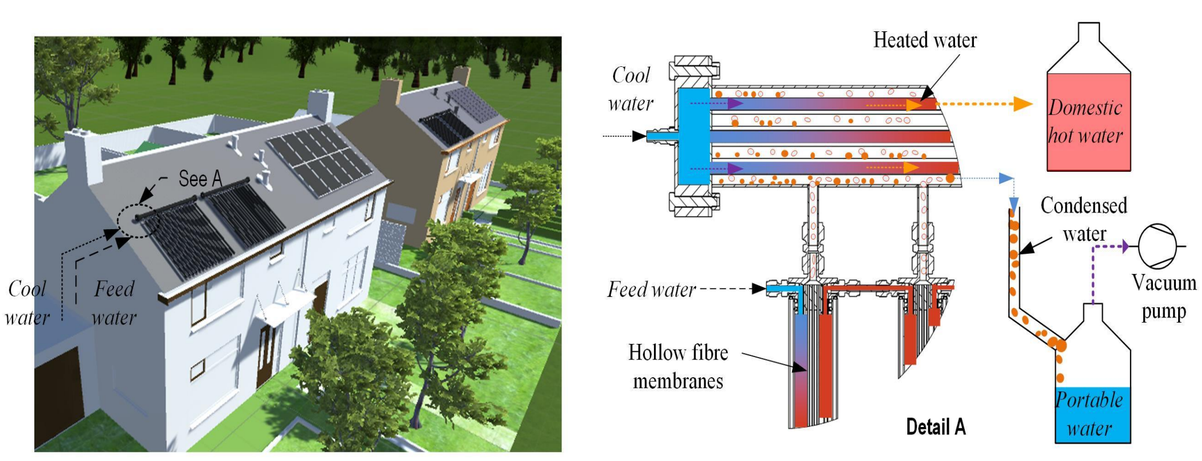
A water distillation system powered by air conditioner waste heat

UNESCO Centre for Membrane Science Technology

DESCRIPTION OF YOUR TECHNOLOGIES

- An integrated solar-driven, membrane distillation system (one which puts bundles of hollow fibre membranes directly inside evacuated solar tubes) was designed for both potable water and thermal energy production
- Using waste condensation heat of air-conditioners for preheating (heating feed water from 15°C to 45°C) and solar thermal (further heating up to 60 °C) to drive an MD unit effectively.
- 一个将膜组件集成在太阳能真空管里的用于产生饮用水及家用热能的膜蒸馏系统；
- 通过使用空调的废热（将进给水从15 °C加热至45 °C）和太阳能热（将进给水从进一步加热至60 °C）一起有效/经济的驱动膜蒸馏系统.



An integrated, solar-driven membrane distillation system

COMPETITIVE ADVANTAGES

- The widespread deployment of air-conditioners can be views as an enormous – and as yet untapped – source of waste energy (i.e. condensation heat).
- Water purifiers have seen rapid growth, ~ 20% annual growth per year in China. At present, home water treatments systems are dominated by Reverse Osmosis (RO)-based water purifiers, which are relatively expensive to purchase (~$500-$1,000 per unit) and operate.
- This project seeks to bring these two market trends together by developing an environmentally-friendly, low costs solution which uses the waste heat of air-conditioners to drive a thermal water treatment system.
- The additional capital cost of the system (upon on the current household solar thermal and air-conditioner system) will be less than RMB 1000 (AU$ 200), with a payback time of ~2 years.

EXPERIMENTAL RESULTS

- This collector system (with a solar absorbing area of 6.5 m^2) integrated with ~0.2 m^2 of membranes can produce ~6 L of drinkable water and ~9.0 kWh of heat energy (at 45 °C) per day.
- A salinity level of 10-100 ppm of water can be produced from a 1,000-35,000 ppm feed water. (This technology also provides opportunities to desalinate high-salinity wastewater or further concentrate RO brine (70~300 g-salt/kg-solution).)

SELECTED RECENT PROJECTS and SUCCESSFUL APPLICATIONS

Grant Description (CIs, title, funding body)	First year	Industrial partners
Taylor, R., Chen, V., **Leslie, G.,** Wang, Y., “Membrane Distillation Development for Concentrated Solar Thermal Systems”, ARC Linkage, LP160100622	2016	Beijing Origin Water; Vast Solar
Leslie, G., Lima, V, Le-Clech, P, In-situ desalination with novel membranes for climate resilient irrigation, ARC, Discovery Project, RG160555	2016	/
Taylor, R., Multi-functional mirco/nano engineered solar thermal collectors, ARC Discovery Early Career Researcher Award, DE160100131	2016	/
G Leslie, Y Wang; Development of mobile groundwater desalination systems;	2016	Tata Trusts

OUR EXPERTS

Name	Discipline	School/Centre
Prof. Greg Leslie 	Professor Greg Leslie is the Acting Director of the UNSW Global Water Institute (http://www.globalwaterinstitute.unsw.edu.au/), and the Director of the UNESCO Centre for Membrane Science and Technology (http://www.membrane.unsw.edu.au/). Prior to joining UNSW, he worked in the public and private sector on water treatment, reuse and desalination projects in Australia, New Zealand, Singapore, Hong Kong and the United States. **Discipline:** Water and wastewater treatment	
A/Prof. Robert Taylor 	A/Professor in the School of Mechanical and Manufacturing Engineering and in the School of Photovoltaic and Renewable Energy Engineering. Drawing on the fields of heat transfer and nanotechnology, he is researching new/novel working fluids and materials for solar systems. Taylor has now published ~100 academic journal papers and has directed the expenditure of ~2.5M AUD around providing a more efficient and economic coupling between solar energy/nanotechnology and utilizable energy for society. **Discipline:** Solar Energy, Thermofluids, and water treatment	

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