Thomas MacDonald

Employment

2022– **Senior Consultant, Energy Markets**, *Aurecon*, Sydney, Australia
Consultant specialising in energy markets, electrification, and broad technoeconomics of electricity in Australia. Working with the Decarbonisation team, I have:
- **Advised international and domestic clients on fundamentals, commercial interactions, and market trends of Australian electricity markets (NEM and WEM)** across topics including grid connection, market-settled products, price trends, requirements and obligations for market registration and trading, and derivative contracts for electricity sale, supply, and hedging.
- **Led development of Linear Programming models in Python (LP optimisation) to simulate optimal market trading of NEM energy assets**, estimating revenue potential and opportunity costs of capacity reservation for non-market services. Built constrained optimisation models for integrated systems such as standalone and hybrid (AC or DC-coupled) BESS, V2G-enabled EV fleets, green hydrogen production, electric smelters, gas turbines, CST+TES solar thermal, data centres, and other energy assets.
- **Developed technoeconomic capacity investment models to optimise overall configurations and operational behaviour of energy assets**, such as private REZ industrial precincts involving tradeoffs between generation, network infrastructure, hydrogen production, energy and hydrogen storage, and downstream industrial processes.
- Built financial models (Excel) to benchmark value of energy assets and development scenarios.
- Developed many original NEM analyses and data products using Python and SQL to obtain and analyse data from the AEMO Market Management System (MMS).
- Co-developed and maintained a dispatch trading model of the NEM (using IES' Prophet software) based on the AEMO Integrated Systems Plan with original extensions to improve fidelity of hydro topology and incorporate stochastic variations of environmental inputs.

2020–2022 **Postdoctoral Research Fellow**, *UNSW School of Physics*, Sydney, Australia
Postdoctoral research on exciton spin physics and excitonic logic, relevant to next-generation solar panels and some forms of quantum computing. This work combined experimental measurements, mathematical modelling (analytical model-building and numerical simulations of classical and quantum dynamics in Python), and theoretical analysis of logic and computing.
- Independently managed a research theme within the larger group.
- Experimental studies (spin resonance) of excitonic materials.
- Built analytical models of excitonic processes using mathematical skills (calculus, linear algebra).
- High performance computing on local and national computing clusters (NCI Gadi, UNSW Katana).
- Published research in top journals on and presented work at local and international conferences.

Education

2016–2020 **PhD in Chemistry**, *UNSW School of Chemistry*, Sydney, Australia
Research on directing the movement of molecules in solution. Themes included control of molecules with light, molecular logic, emergence of complex systems from simple interactions. Thesis available.
- Granted **UNSW Dean's Award for an Outstanding PhD Thesis**, awarded to candidates that "*...produce a thesis that requires only minimal corrections, receives outstanding and/or excellent levels of achievement for all examination criteria, and [...] is in the top 10% of PhD theses*".
- Research funded through award of competitive RTP Scholarship
- Developed new experimental techniques and data analyses in physical chemistry.
- Built mathematical models for chemical interactions, programmed numerical simulations (Python), and used experimental data to fit and understand intermolecular processes.
- Published research in high-impact journals and presented at major conferences.

2018 **PhD Research Exchange**, *University of Groningen*, Groningen, Netherlands
Research on new molecular devices with Prof. Ben Feringa, 2016 Nobel Laureate in Chemistry.

2011–2014 **Bachelor of Science (Honours in Chemistry)**, *University of Sydney*, Sydney, Australia
First Class Honours in Chemistry. Other courses in Physics, Mathematics, Engineering, Linguistics.

References

References provided on reasonable request.

91 Dudley St, Punchbowl, NSW 2196

📱 *0448 308 641* • ✉ *macdonald.thomas1@gmail.com* • 🌐 *tscmacdonald.github.io*
in *tscmacdonald* • ○ *tscmacdonald*