An open-source tool for tariff design and assessment

Energy Consumers Australia Board Meeting
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Motivation – *tariffs, economic efficiency vs a social construct*

Australian Energy Market Commission

AEMC

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New rules for cost-reflective network prices

27 November 2014

The National Electricity Rules will be changed from 1 December 2014 to require regulated network companies to structure their prices to better reflect the consumption choices of individual consumers.

Under these changes, network prices will reflect the costs of providing the electricity to consumers with different patterns of consumption.

The new rules follow extensive consultation over the past year, and take into account submissions received when the draft rules were released in August.

AEMC Chairman John Pierce said the prices we pay for electricity would actively respond to the different ways people choose to use it under these new rules.

"These changes put consumers at the centre of future decision-making about energy," he said.

"By having prices that reflect the costs of different patterns of consumption, we are giving consume clearer choices as we develop a more efficient, incentive-based network regulation framework.

- A 'basic' flat rate tariff (without any 'risk relief') is significantly more appealing to consumers than:
  - any form of *capacity* pricing, even with a money-back guarantee or automatic enabling technology; and
  - *real-time* pricing without any such 'risk relievers'.
- *Real-time* pricing must come with a compelling money-back guarantee in order to approach the appeal of a basic flat rate tariff, or have even a chance of being accepted.
- Even with the prospect of a risk-free trial, or an enabling device to help maximise the advantages of the new plan, there is limited consumer interest in shifting to novel, demand-based pricing structures like *capacity* pricing.
- A *flat rate* tariff offer with money-back guarantee achieves an unparalleled level of consumer acceptance, unmatched by any other combination of tariff and risk relief.
- Only a limited set of cost-reflective pricing offers seem to rival consumer acceptance of flat rate tariffs, specifically:
  - *peak time rebates* with the offer of a free automation device (aimed at easing management and maximising consumer benefit from the tariff); and
  - *time of use* tariffs, or *critical peak* pricing, when accompanied by the money-back guarantee (aimed at alleviating consumers' perceived risks in trialling the new offer).

… + a changing context for energy users

From clients

- Early tailored industrial and commercial (lighting) applications with *service oriented contracting arrangements*

..to citizens

- Electricity as an essential public good – rural electrification with *socially constructed tariffs*

..to consumers

- The vertically integrated utility of growing size and scope with overall *cost-recovery, socially constructed, tariffs*

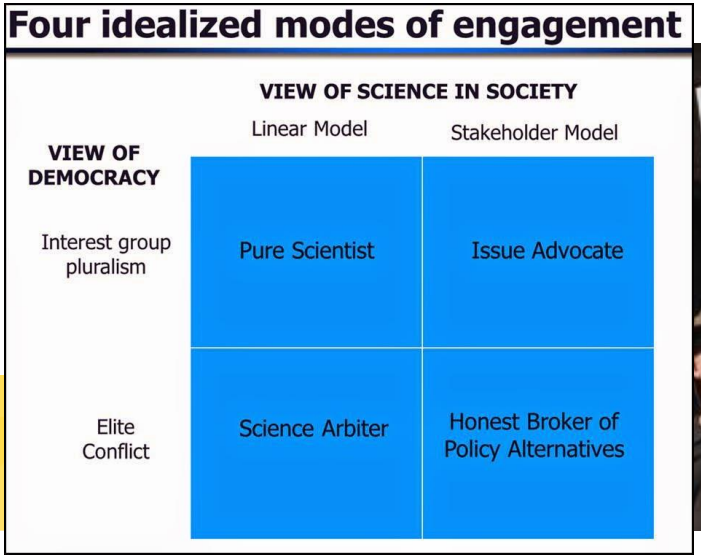
..to customers

- Electricity industry 'reform', liberalisation, restructuring with *more mkt oriented energy 'pricing', more cost-reflective network tariffs*

..to perhaps now partners, competitors, or even 'deserters'?

- *A chance for real consumer engagement on their own terms, to achieve personal as well as social goals*

Universities and impact…
or is that advocacy



UNSW Home › About Us › UNSW 2025 Strategy

UNSW's 2025 Strategy

UNSW's 2025 Strategy positions the university as a global leader in change and innovation, with an altruistic desire to transform the lives of people and communities.

We are now one of the leading research and teaching-intensive universities in the world, known for innovative, pioneering research and high quality education with a global impact.

Updated in 2020, the Strategy's ideas and initiatives are the result of wide-ranging consultation underpinned by three strategic priorities:

- **Academic Excellence**

Quality research driving new discovery, and excellent teaching – coupled with a well-rounded and inspiring student experience. Our programs deliver the workforce-ready graduates and upskilled workers required in our modern world.

- **Innovation and Engagement**

Enterprise, partnership and the exchange of knowledge between universities and the broader community creating new opportunities for job creation.

- **Social Impact**

Improving the quality of life for people, in Australia and around the world, through partnerships, thought leadership and engagement with decision makers, sustainable development and a commitment to equity, diversity and inclusion.

The Sydney Morning Herald

NATIONAL UNIVERSITY

OPINION

Critical test of academic freedom for Australian universities

By Elaine Pearson
August 4, 2020 — 1.54pm

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TODAY'S TOP STORIES

CORONAVIRUS PANDEMIC
Vaccine may become a requirement of travelling; alert for flight to Sydney
2 hours ago

CCP INFLUENCE
Hong Kong's school system in turmoil, while Australian principal quits

CHINA RELATIONS
China 'a big gorilla' that 'will punish us', Labor frontbencher says

The University of New South Wales (UNSW) boldly urges students to "bring your difference".

Unfortunately, my recent experience suggests that the university might be more interested in damage control than an open marketplace of ideas. But this is a test of academic freedom that UNSW can't afford to fail.

Our approach – Open data, tools, processes

Energy scientists must show their workings

Public trust demands greater openness from those whose research is used to set policy, argues **Stefan Pfenninger**.

The global transition towards a clean and sustainable energy future is well under way. New figures from Europe this month show that the continent is on track to reach its goal of a 20% renewable-energy share by 2020, and renewable capacity in China and the United States is also rising. But many technical, political and economic uncertainties remain, not least in the data and models used to underpin such policies. These uncertainties need open discussion, and yet energy strategies all over the world are based on research not open to scrutiny.

Researchers who seek, for example, to study the economic and energy model used by the US government (called NEMS) are met with a forbidding warning. On its website, the Energy Information Administration, which is developing the model, pronounces: "Most people who have requested NEMS in the past have found out that it was too difficult or rigid to use."

At least NEMS (National Energy Modelling System) is publicly available. Most assumptions, systems, models and data used to set energy policy are not. These black-box simulations cannot be verified, discussed or challenged. This is bad for science, bad for the public and spreads distrust. Energy research needs to catch up with the open-software and open-data movements. We energy researchers should make our computer programs and data freely accessible, and academic publishing should shun us until we do.

Our community's models are relevant to policy because they explore alternative scenarios that remain hidden, like the costs of technologies, can largely determine what comes out of such models. In the United Kingdom, opaque and overly optimistic cost assumptions for onshore wind went into models used for policymaking, and that may well have delayed the country's decarbonization.

This closed culture is alien to younger researchers, who grew up with collaborative online tools and share code and data on platforms such as GitHub. Yet academia's love affair with metrics and the pressure to publish set the wrong incentives: every hour spent on cleaning up a data set for public release or writing open-source code is time not spent working on a peer-reviewed paper.

Nevertheless, some academic-led projects are pushing towards more openness. The Enipedia project is building a worldwide open database on power plants, with data such as their locations and emissions. The Open Power System Data project gathers data such as electricity consumption from government agencies and transmission-network operators, and pushes for clarity on the licensing under which these data are made available. The Open Energy Modelling Initiative is emerging as a platform for coordinating and strengthening such efforts.

Regulation can also help. The European Union has mandated open access to electricity-market data, resulting in the creation of the ENTSO-E Transparency Platform to hold it, and there are good arguments for the creation of national

BLACK-BOX SIMULATIONS CANNOT BE VERIFIED, DISCUSSED OR CHALLENGED.

openmod open energy modelling initiative

Openmod in a nutshell

The Open Energy Modelling (openmod) Initiative promotes open energy modelling in Europe.

Energy models are widely used for policy advice and research. They serve to help answer questions on energy policy, decarbonization, and transitions towards renewable energy sources. Currently, most energy models are black boxes – even to fellow researchers.

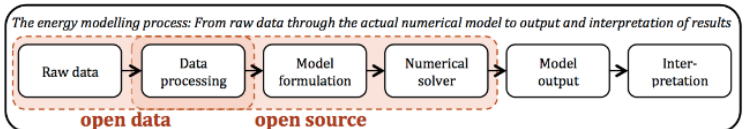
"Open" refers to model source code that can be studied, changed and improved as well as freely available energy system data.

We believe that more openness in energy modelling increases transparency and credibility, reduces wasteful double-work and improves overall quality. This allows the community to advance the research frontier and gain the highest benefit from energy modelling for society.

We, energy modelers from various institutions, want to promote the idea and practice of open energy modeling among fellow modelers, research institutions, funding bodies, and recipients of our work.

The idea of openmod

The energy modelling process: From raw data through the actual numerical model to output and interpretation of results



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Home > Open Source Tools

Open Source Tools

CEEM's researchers believe in the value of open source modelling in the Energy and Environmental research space. In this regard, we have developed a series of open source tools which are listed below. For a list of some of our under development tools you can refer CEEM's Github page.

NEMOSIS - NEM Open Source Information Service:

Open-source access to Australian National Electricity Market data.

Links: Github

NEMO - National Electricity Market Optimiser Tool:

NEMO, the National Electricity Market Optimiser, is a chronological dispatch model for testing and optimising different portfolios of conventional and renewable electricity generation technologies. It has been developed since 2011 and is maintained by Ben Elliston through his PhD at CEEM. NEMO is available under a free software license (GPL version 3) and requires no proprietary software to run, making it particularly accessible to the governments of developing countries, academic researchers and students. The model is available for others to inspect and to validate results.

Links: Github, OzLabs

TDA - Tariff Design and Analysis Tool:

We have developed a modelling tool to assist stakeholders wishing to contribute to network tariff design in the Australian National Electricity Market. It is an open source modelling tool to assist stakeholders in assessing the implications of different possible network tariff designs, and hence facilitate broader engagement in the relevant rule making and regulatory processes in the NEM. Our tool takes public energy consumption data from over 5000 households in NSW, and allows users test a wide range of existing, proposed and possible tariffs structures to see their impacts on network revenue and household bills. Demographic survey data of the households allows you to explore the impacts of these tariffs on particular household types – for example, families with young children. The tool can also show how well different tariffs align these household bills with a households' contribution to network peak demand. The tool and data are open source – you can check, validate and add your own data sets; test existing or even design your own tariffs, and validate and even modify the underlying algorithms.

Links: Project page, Github, Researchgate

Local Solar Sharing Scheme Model:

Intended for modelling embedded networks, local solar and peer to peer electricity networks. This software was developed by Naomi Stringer, Luke Marshall and Rob Passey at CEEM. A working build with a simple user interface for OSX can be found here.

Links: Github

NemLite - Open Source model of NEM Dispatch Engine:

Intended to replicate the performance of the National Electricity Market Dispatch Engine (NEMDE).

Links: Github

Tariff Design and Assessment Tool:

AP814 and then AP944

Progressively greater ambition…

PROJECT OVERVIEW			
Grant no	**AP 814**	**Date of report**	**11 / 01 / 2018**
Grant recipient	UNSW		
Project title	Tariff Assessment Tool		

PROJECT OUTCOMES: ***outline the project outcomes during the reporting period***

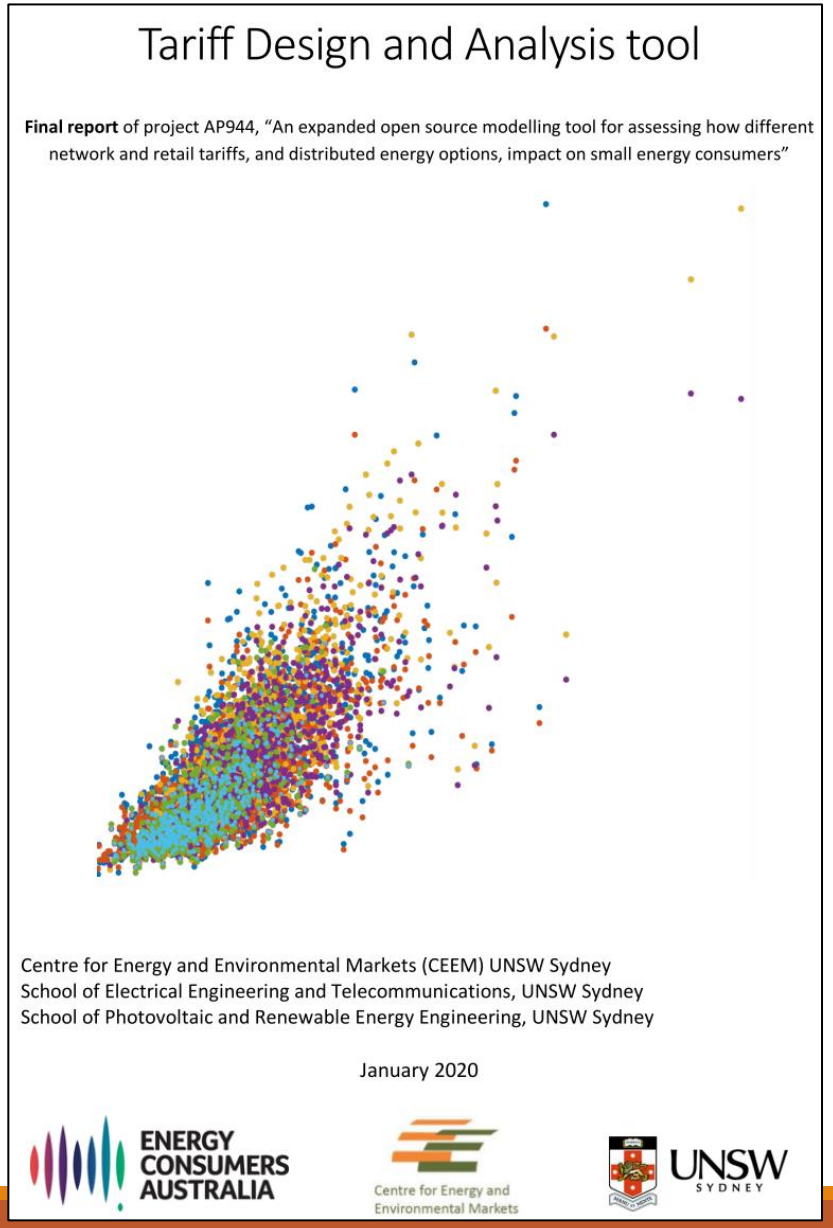
Describe the intended project outcome/s, and whether they were met. Where the outcomes were different from those proposed in the grant application, explain the reasons for the variation

The research project aimed to provide **tools and stakeholder engagement** in order to build **knowledge and capacity for effective evidence-based advocacy around network tariff design and regulation**.

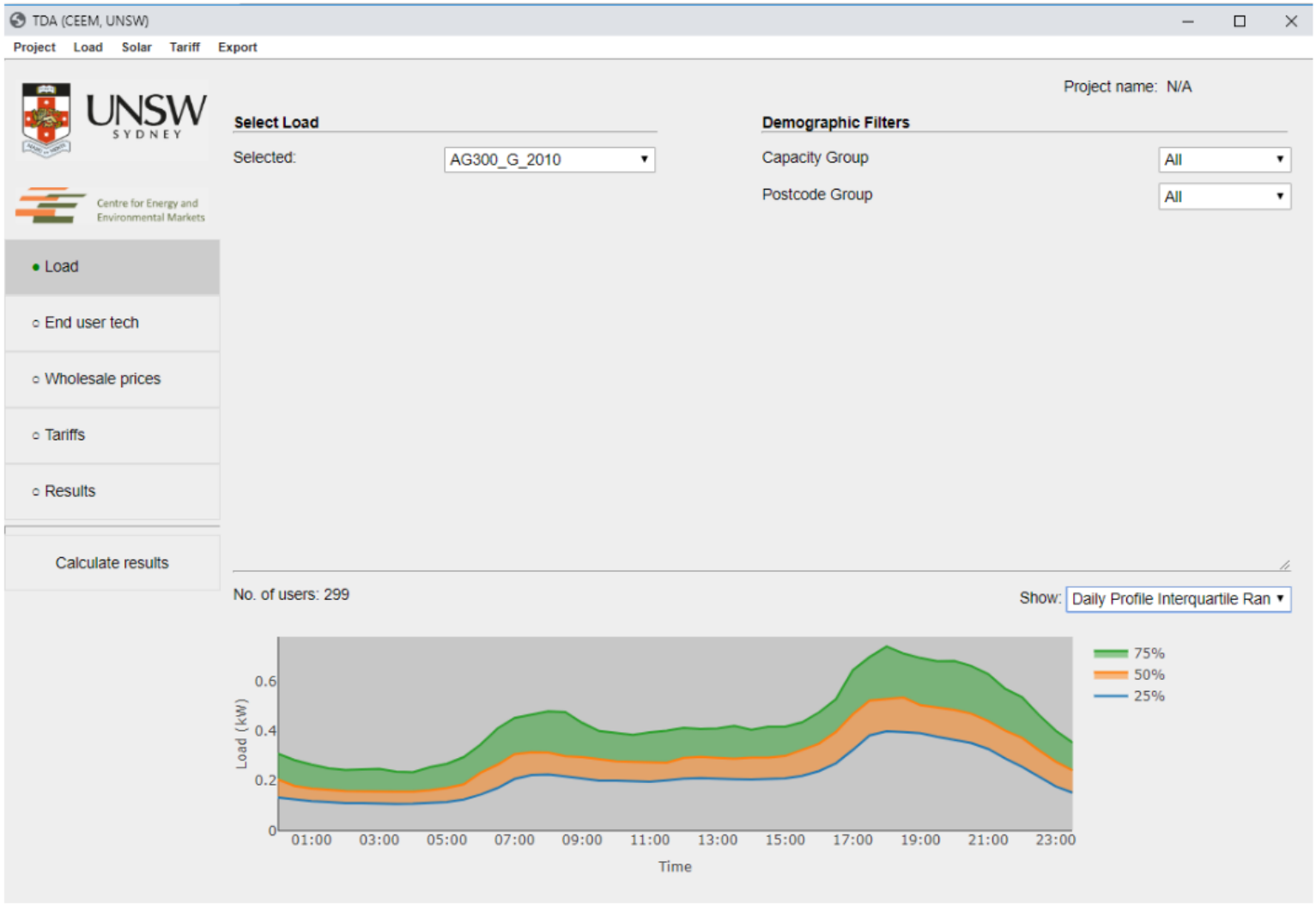
An open source tool was developed with stakeholder input via the reference committee, at three workshops in Canberra, Sydney and Melbourne, and made available for free download via the CEEM website.

Stakeholder engagement was established via the reference committee, the workshops and direct consultations with key stakeholders. Knowledge and capacity for stakeholders to engage in advocacy was built via:

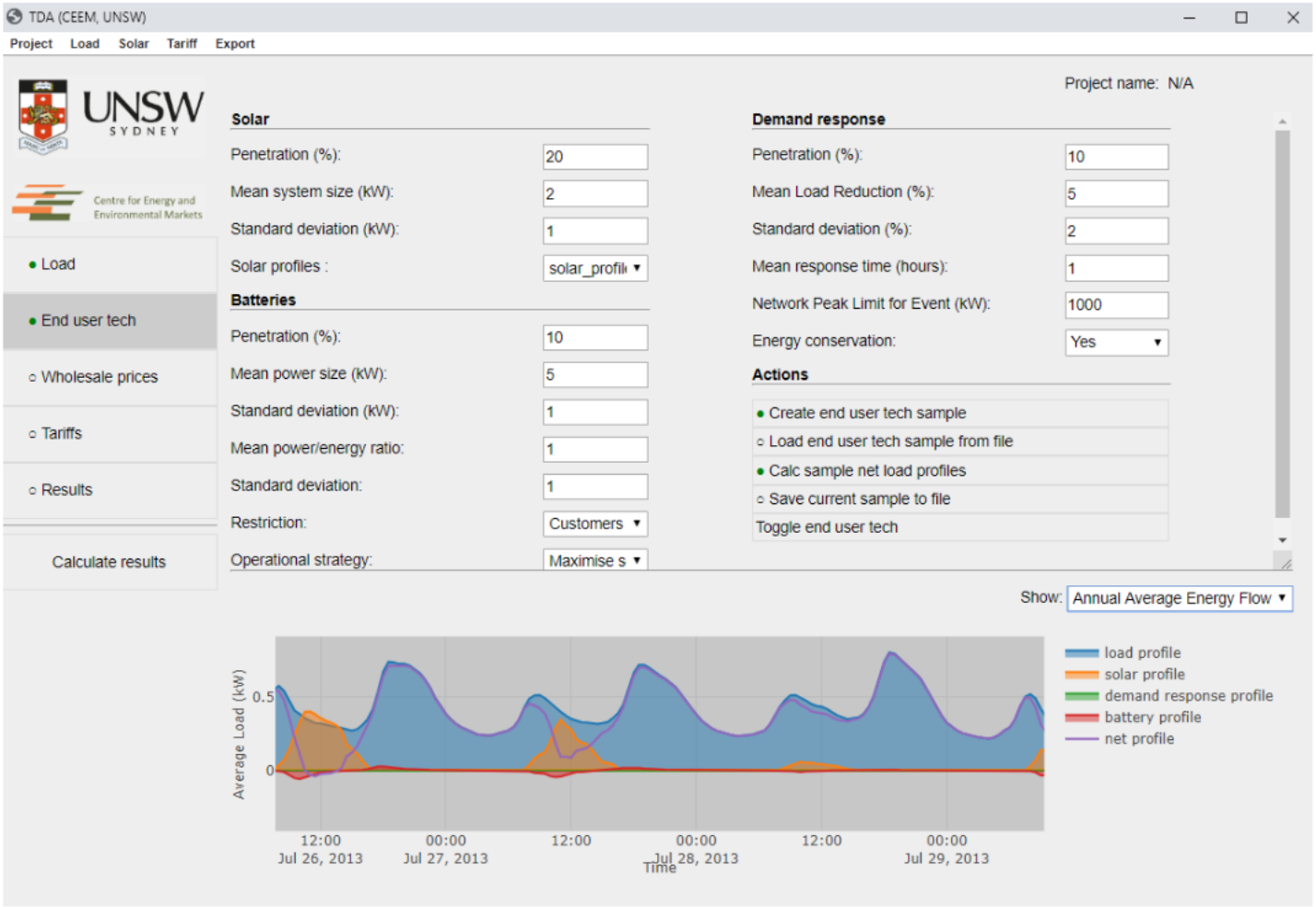
- a series of presentations of industry perspectives and discussion around the challenges and opportunities of tariff design at the project workshops
- demonstration and training around the tool at the workshops and during further focused training with key stakeholders
- dissemination of peer reviewed research papers on tariff design and regulation using the tool as the basis for the analysis.



Python version features



Python version features



Outputs – *wide range of possible tariff analyses and their impacts on consumers*

EQ TSS Analysis - 2019

Aim is to determine the customer impacts of Energy Queensland's network tariffs proposed for the 2020/25 Revised Tariff Structure Statement [1]

Residential and small business customers using less than 100MWh/year

Also Life Support customers, and worked with CSIRO to assess impact on customers segmented according to demographic characteristics

Focus on the impacts on customers of shifting from energy-based network tariffs towards tariff structures with TOU energy and kW demand charges

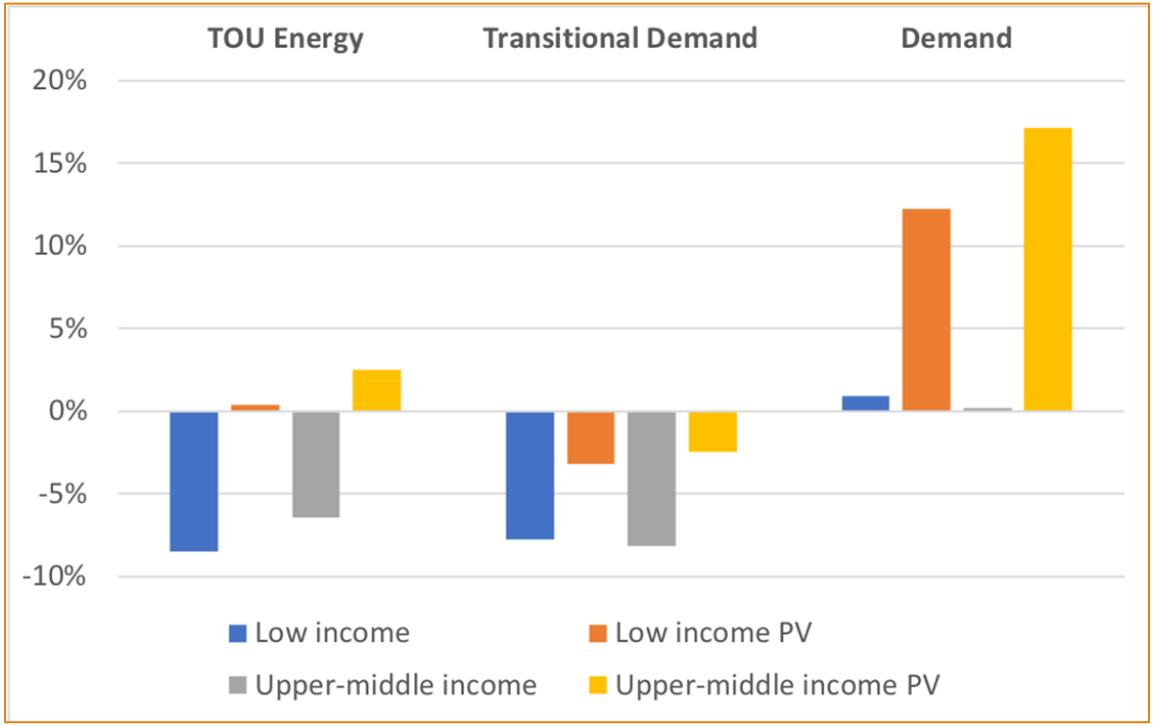


Table 22. Percentage of Customers Better Off and Worse Off When Moving from the Flat Tariff, Life Support, Residential

Tariff	DUOS		NUOS	
	Better Off	Worse Off	Better Off	Worse Off
TOU Energy	62%	35%	62%	35%
Transitional Demand	81%	19%	65%	35%
Demand	15%	85%	23%	77%

Wider outcomes

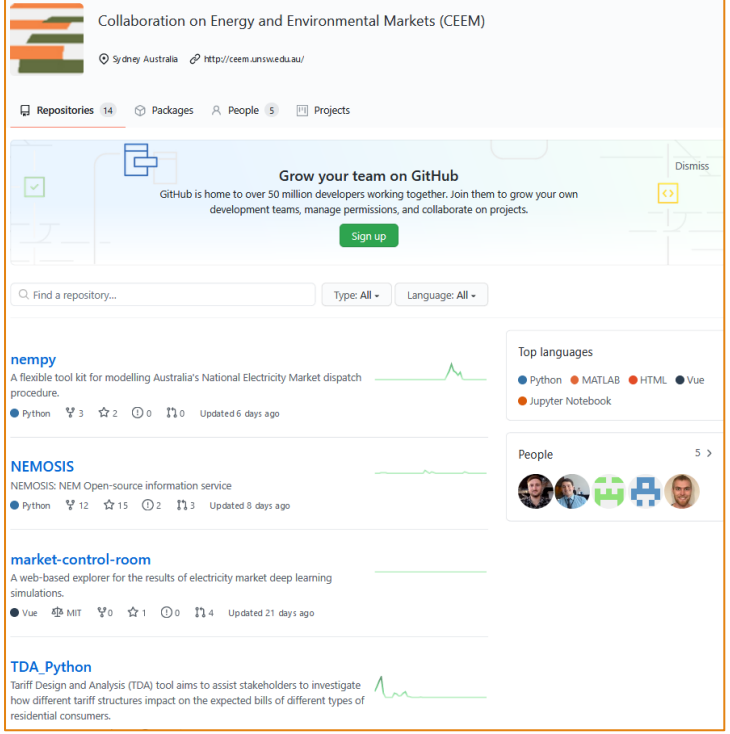
Freely available + documented code repositories

- Tariff APIs
- Energy consumer databases

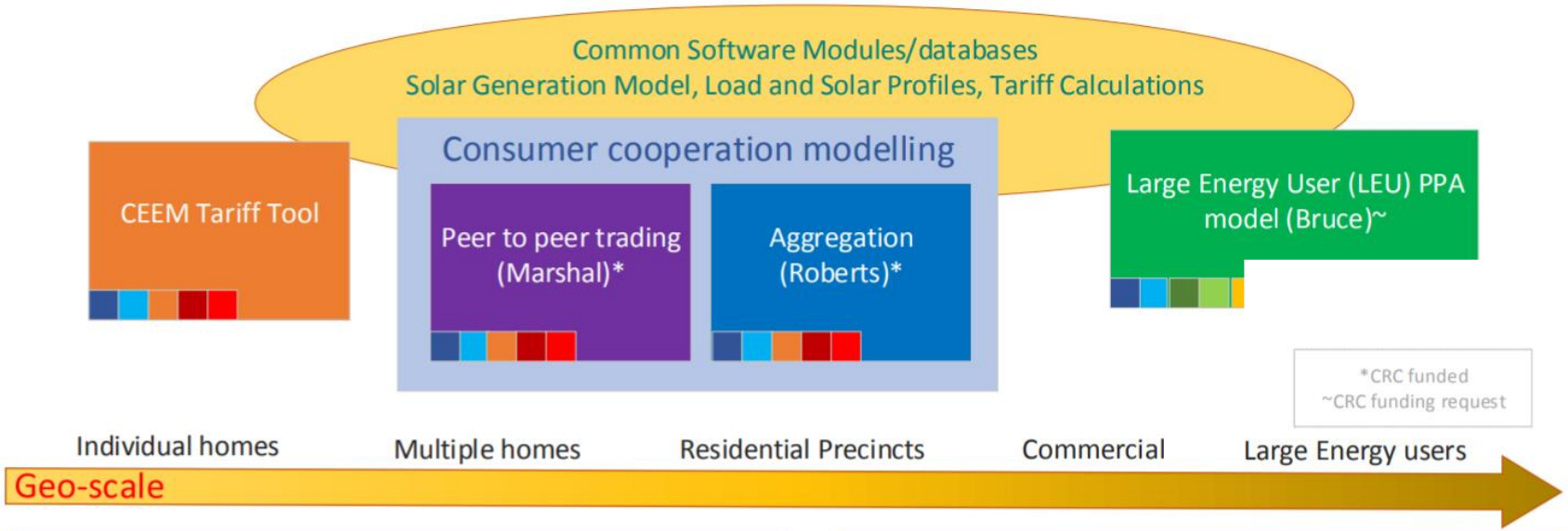
Ongoing research and student projects on tariff design, consumer value of DERs

Tool incorporated into UNSW teaching – *Energy Policy*

Parts of code being incorporated into other open-source consumer oriented tools – e.g. Sunspot



SPREE/CEEM open-source Distributed Energy Resource modelling tools



Project Aims

- Models energy and financial trading in local communities
- Evaluates: Energy flows, Carbon accounting, Financial flows
- Models energy and financial flows in embedded networks
- Models economic effects of different household and network tariffs

Expected User Groups

- Local Government
- Energy Retailers
- Medium to Large energy users
- Consultants
- Buyer's groups
- Energy Networks
- Community Groups
- Regulators

…and a broader framework for progress

UsersTCP

User-Centred Energy Systems

About Us

The User-Centred Energy Systems mission is to provide evidence from socio-technical research on the design, social acceptance and usability of clean energy technologies to inform policy making for clean, efficient and secure energy transitions.

Annexes

About Business Models and Systems

This Annexfocuses on identifying measures and instruments that support the creation and uptake of user-centered energyservices and new energy business models.

About Hard-to-Reach Energy Users

This Annexenables participating countries to improve outcomes byapplying lessons learned from collaboration with other countries and global experts...

About Social License to Automate

This Annexbuilds case studies of leading automated demand side management projects to understand key social, organisational, economic and regulatory determinants of successful engagement and...

Learn more

About Global Observatory on Peer-to-Peer Energy Trading

This Annex (the Observatory) is a forum for international collaboration to understand the policy, regulatory, social and technological conditions necessaryto support the wider deployment of P2P...

Learn more

About Energy Sector Behavioural Insights Platform

The Energy Sector Behavioural Insights Platform brings together government policymakers and other experts to share knowledge and experiences applying Behavioural Insights to energy...

Learn more

About Gender & Energy Annex

The Gender & EnergyAnnexwill gather researchers from the fields of gender and energyin a global network to analyse energypolicy and technologies from gender perspectives and provide recommendations for policydesign and implementation.

Many thanks from the SPREE/CEEM Distributed Energy Modelling and Analysis Team

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