Local Electricity Sharing

Open source modelling software overview

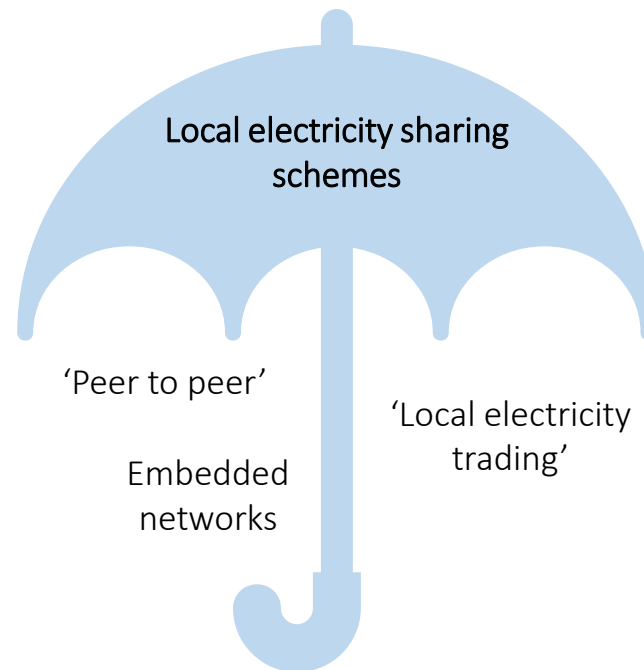Naomi Stringer, Luke Marshall, Rob Passey,
Anna Bruce, Iain MacGill

Overview

- 'Local electricity sharing scheme', a definition
- How it works
  - Energy flows and allocation rules
  - Financial flows
  - Usage priorities
- Case study: Byron Bay Arts and Industrial Estate
- Proposed updates

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Local electricity sharing schemes

'Local electricity sharing scheme' is a broad term for any contractual structure under which locally[1] generated (or stored) electricity can be shared[2] between consumers within some subset of the grid.

Local electricity sharing schemes

'Peer to peer'

Embedded networks

'Local electricity trading'

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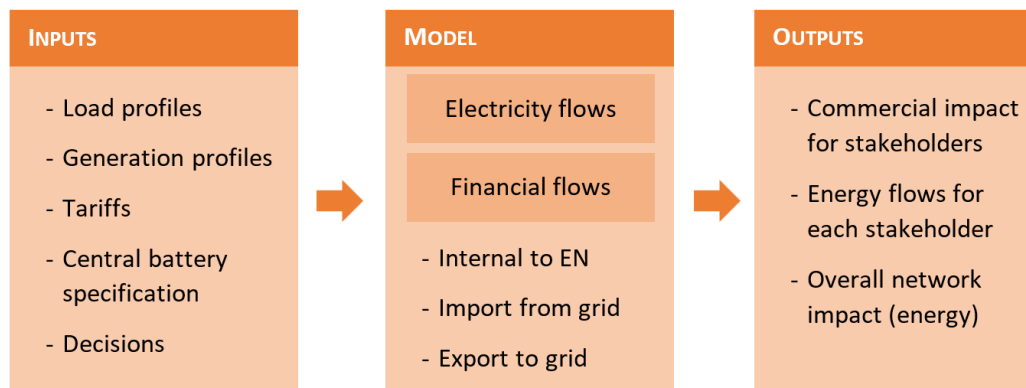
Local electricity sharing schemes

Possible benefits:

- Network services

- Community engagement

- Improved resiliency

- Improved link between technical and financial outcomes?

**Costs and benefits must be assessed on a case-by-case basis**

High level overview

INPUTS	MODEL	OUTPUTS
- Load profiles	Electricity flows	- Commercial impact for stakeholders
- Generation profiles	Financial flows	- Energy flows for each stakeholder
- Tariffs	- Internal to EN	- Overall network impact (energy)
- Central battery specification	- Import from grid	
- Decisions	- Export to grid	

- Potentially useful for quantifying impacts of 'pseudo' embedded networks / minigrids
  - Fringe of grid areas & constrained networks
  - Optimise technologies (distributed generation, batteries, DSM etc)
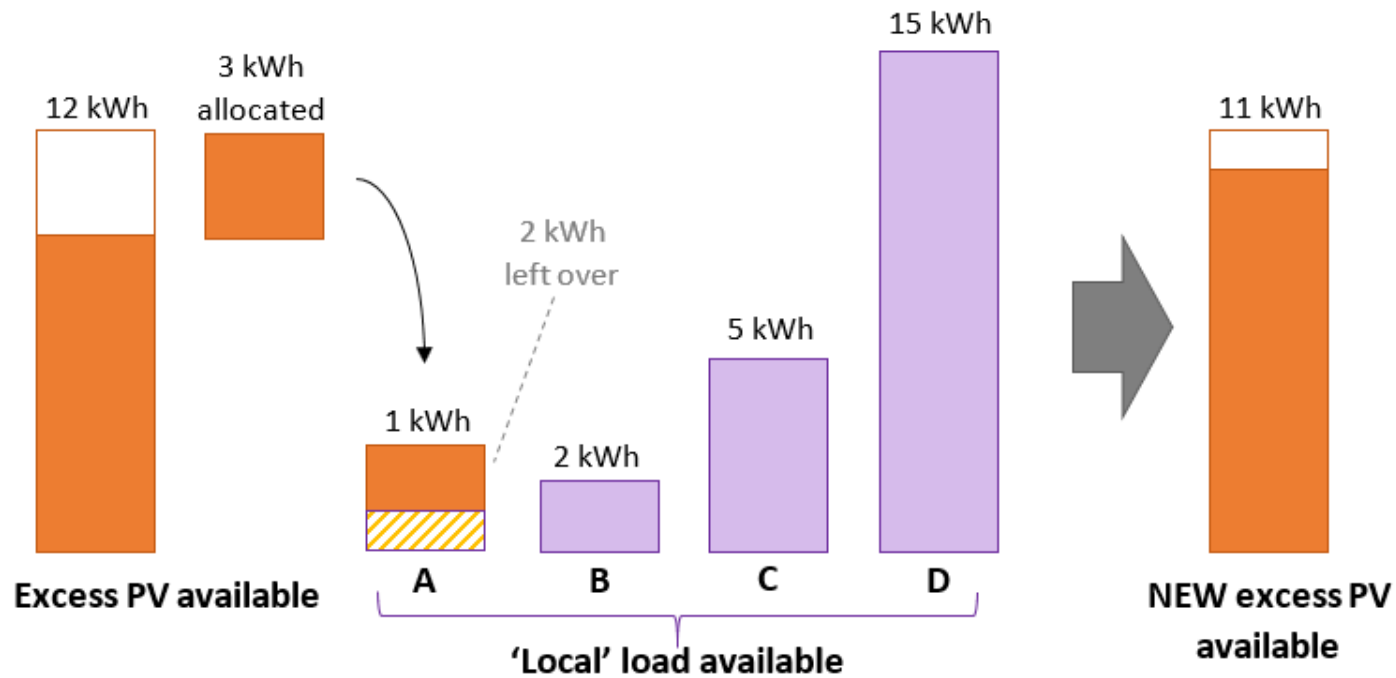 - Tariff design to drive uptake and optimise operation for all stakeholders
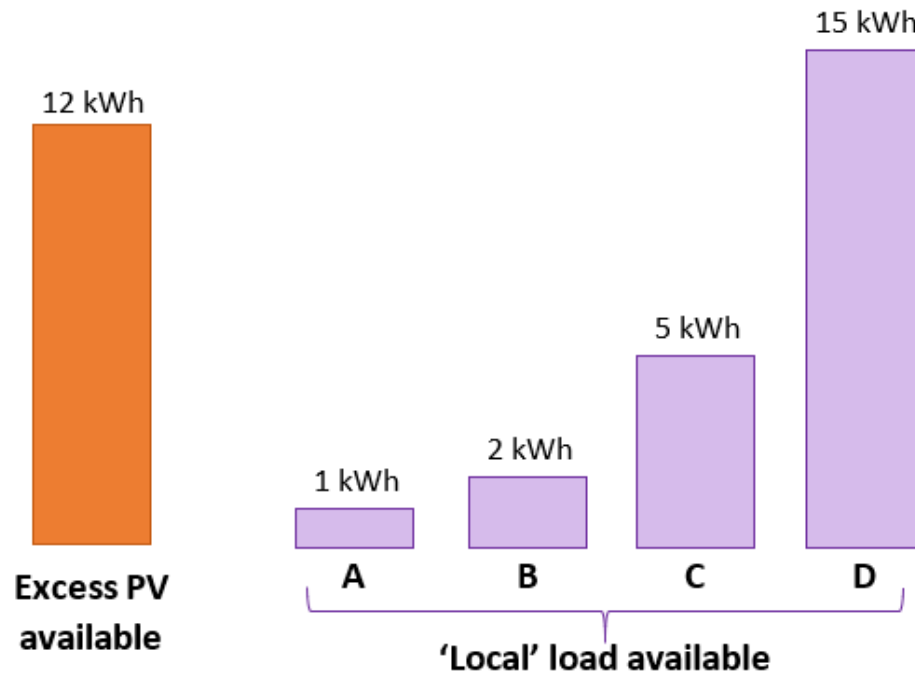
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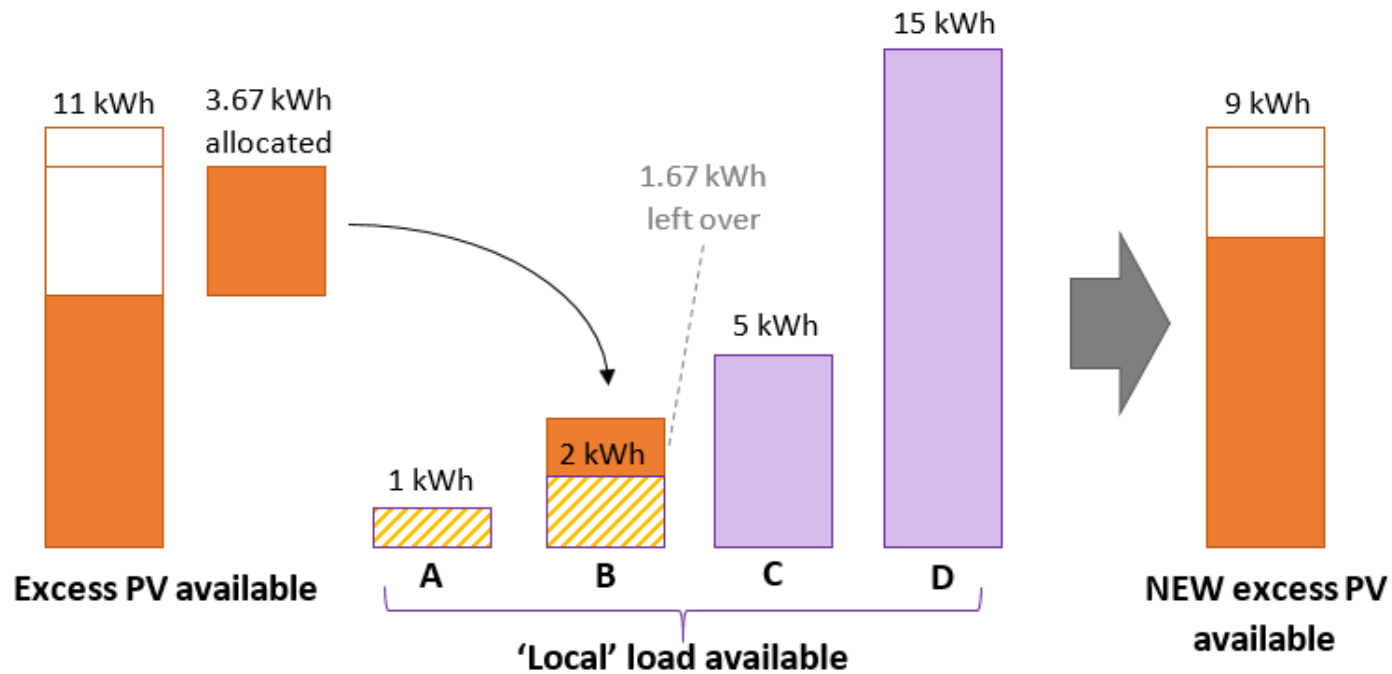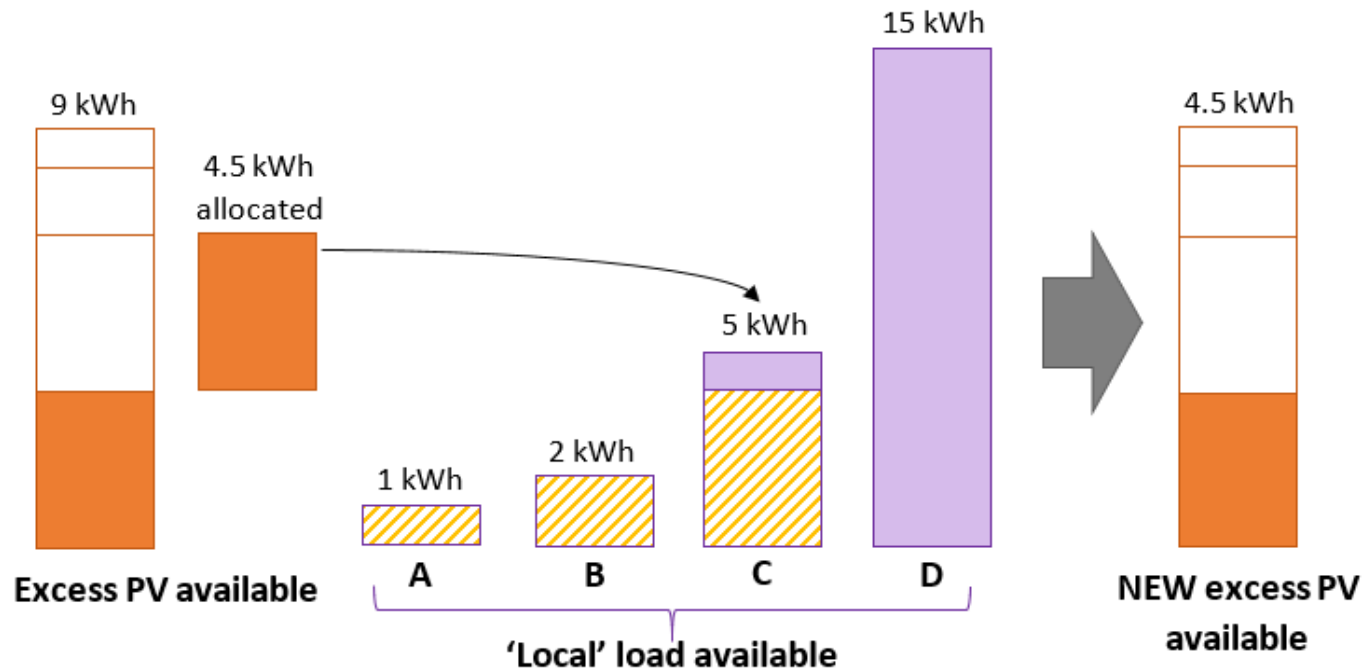
Electricity flows

Allocation rules

Model uses a 'quota' allocation rule

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Model uses a 'quota' allocation rule
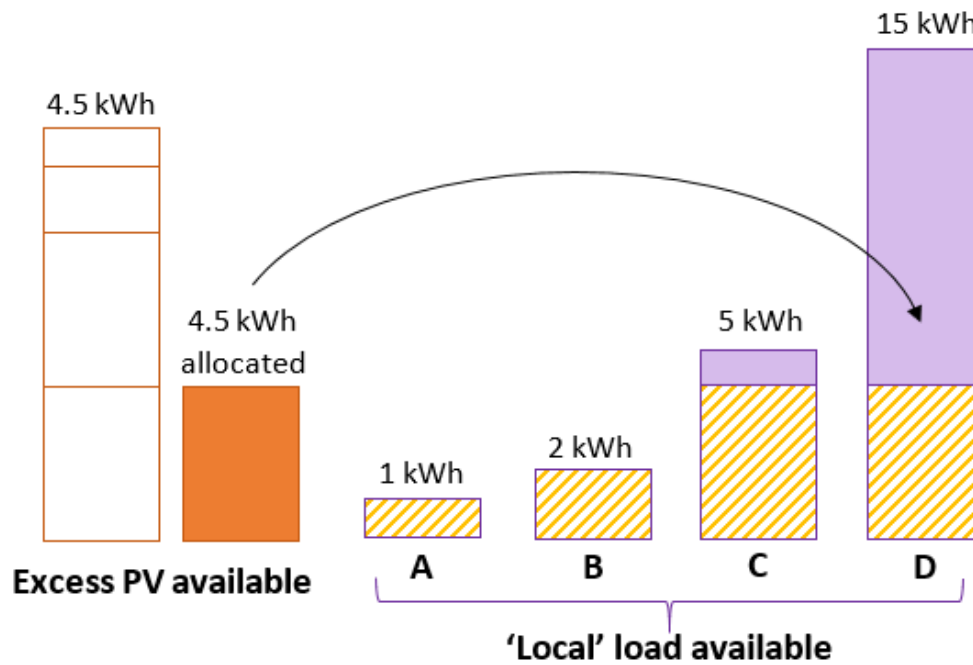
Allocation rules

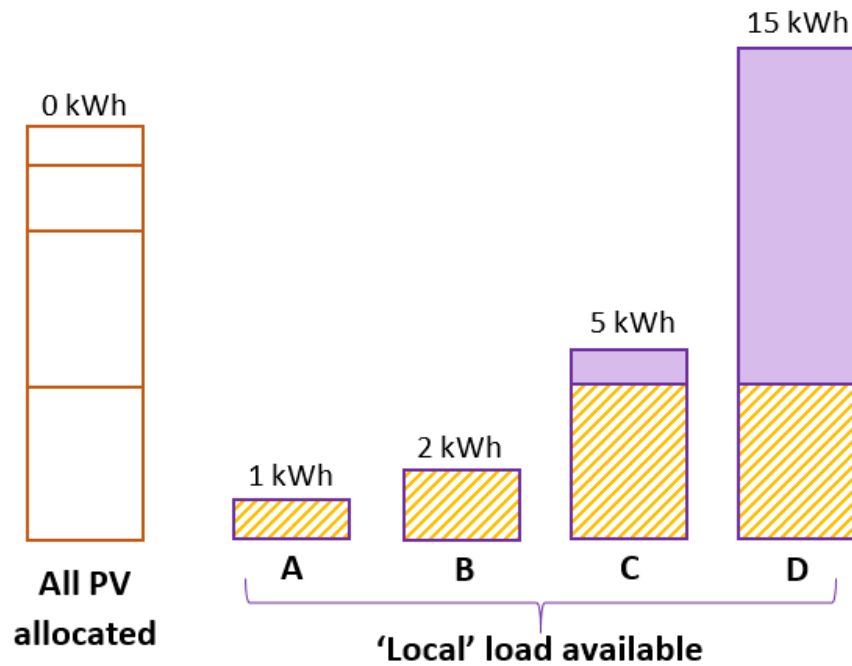**Model uses a 'quota' allocation rule**

Allocation rules

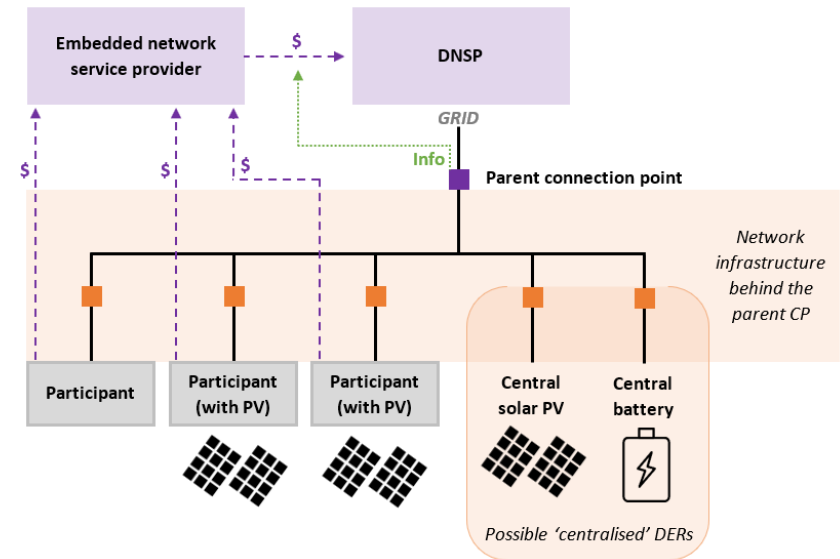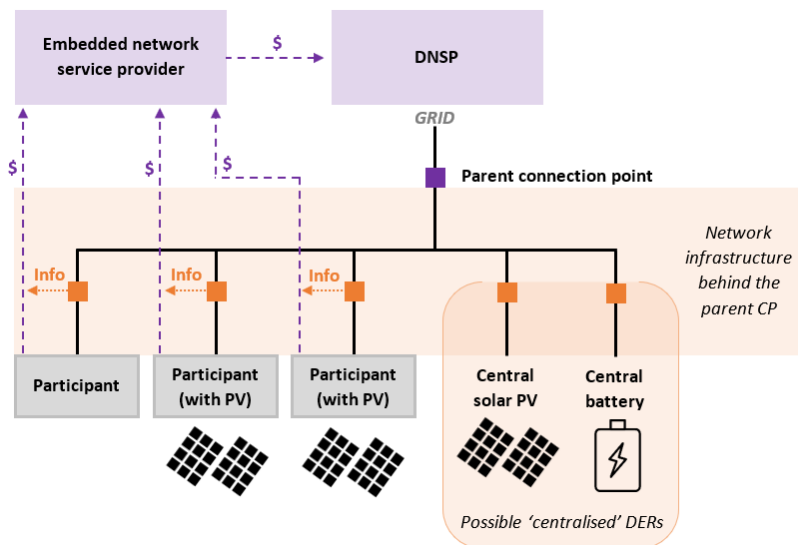**Model uses a 'quota' allocation rule**

Allocation rules

Model uses the 'quota' allocation rule

Financial flows

- Financial calculations for each of the seven energy flows
- 'Local' tariffs
- Information from individual connection points, not parent connection point

Usage priorities

- PV owner
  - PV electricity first used onsite
  - Excess is then distributed amongst other customers
  - Then to the battery
  - Then exported to the wider grid

- Consumer
  - Uses local solar first
  - Then battery electricity
  - Then from the wider grid

Model Inputs

- For each customer
    - Solar capacity (kW)
    - Battery capacity (kWh and kW)
    - Load profile (half hourly)
    - Network and retail tariffs

- General
    - Central solar capacity (kW)
    - Central battery capacity (kWh and kW)
    - Local trading tariffs
        - Local solar
        - Central battery
        - Central solar
    - Unitised solar profile (half hourly)

Model Outputs

- For each customer (half hourly, energy and financial)
  - Solar export revenue
  - Solar import cost
  - Fixed daily charge
  - TUOS payments
  - DUOS payments
  - NUOS payments (TUOS + DUOS + environmental fees)
  - Variable costs (NUOS + retailer costs)
  - Central battery payments

- Utilities
  - TNSP revenue
  - DNSP revenue
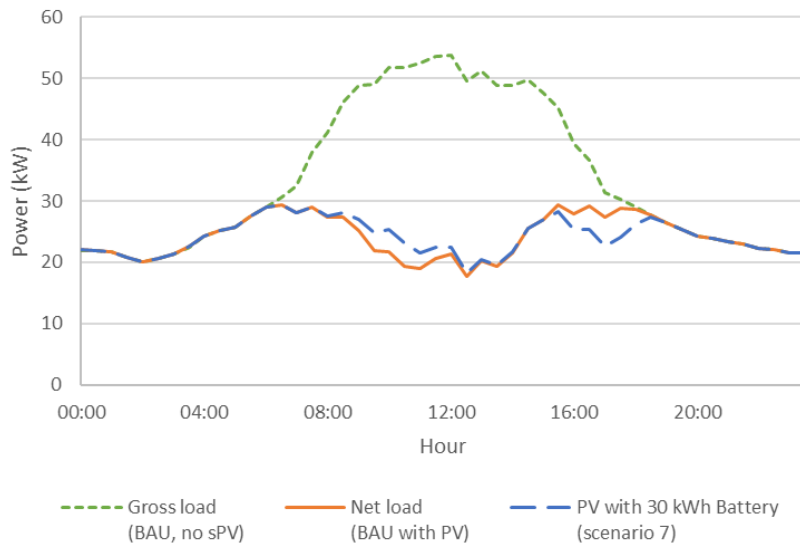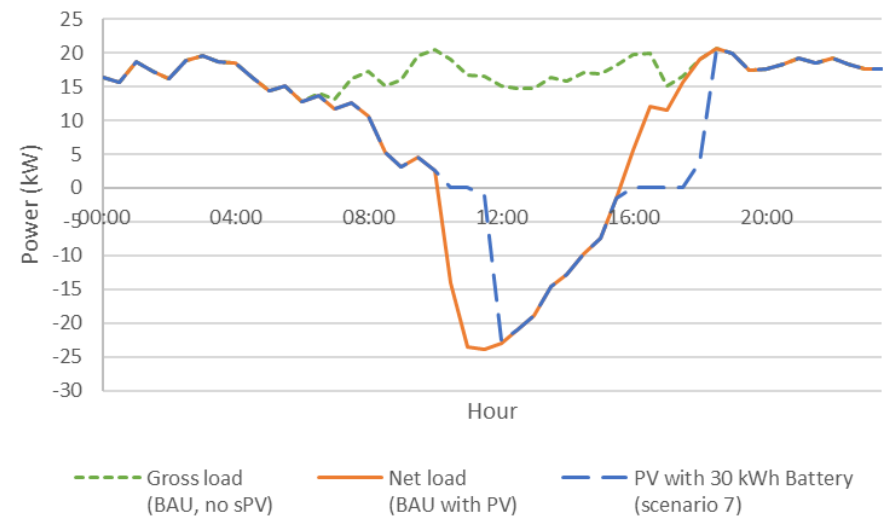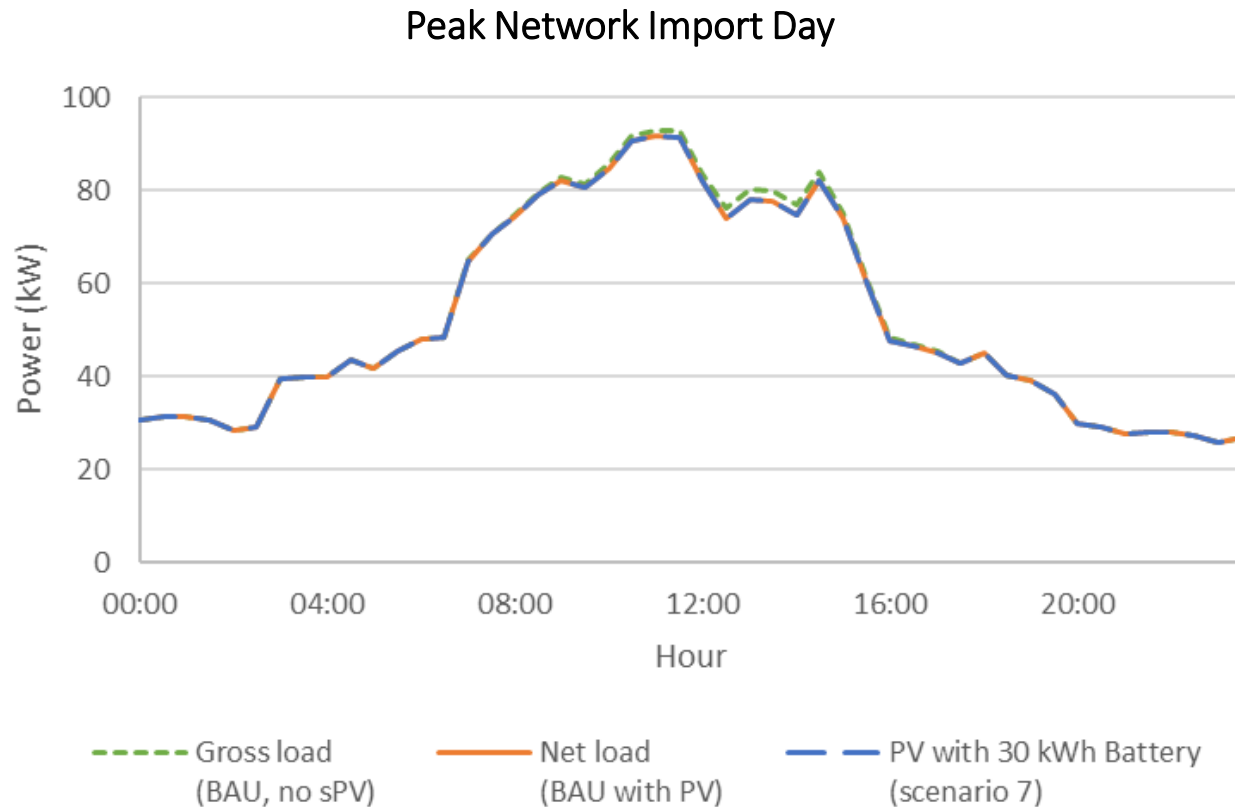 - Retailer revenue
  - Battery revenue

Enova case study

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Enova Case Study: Impact of Battery

Average Day

Peak Solar Export Day

Legend:
- Gross load (BAU, no sPV)
- Net load (BAU with PV)
- PV with 30 kWh Battery (scenario 7)

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Enova Case Study: Impact of Battery

Peak Network Import Day

Legend:
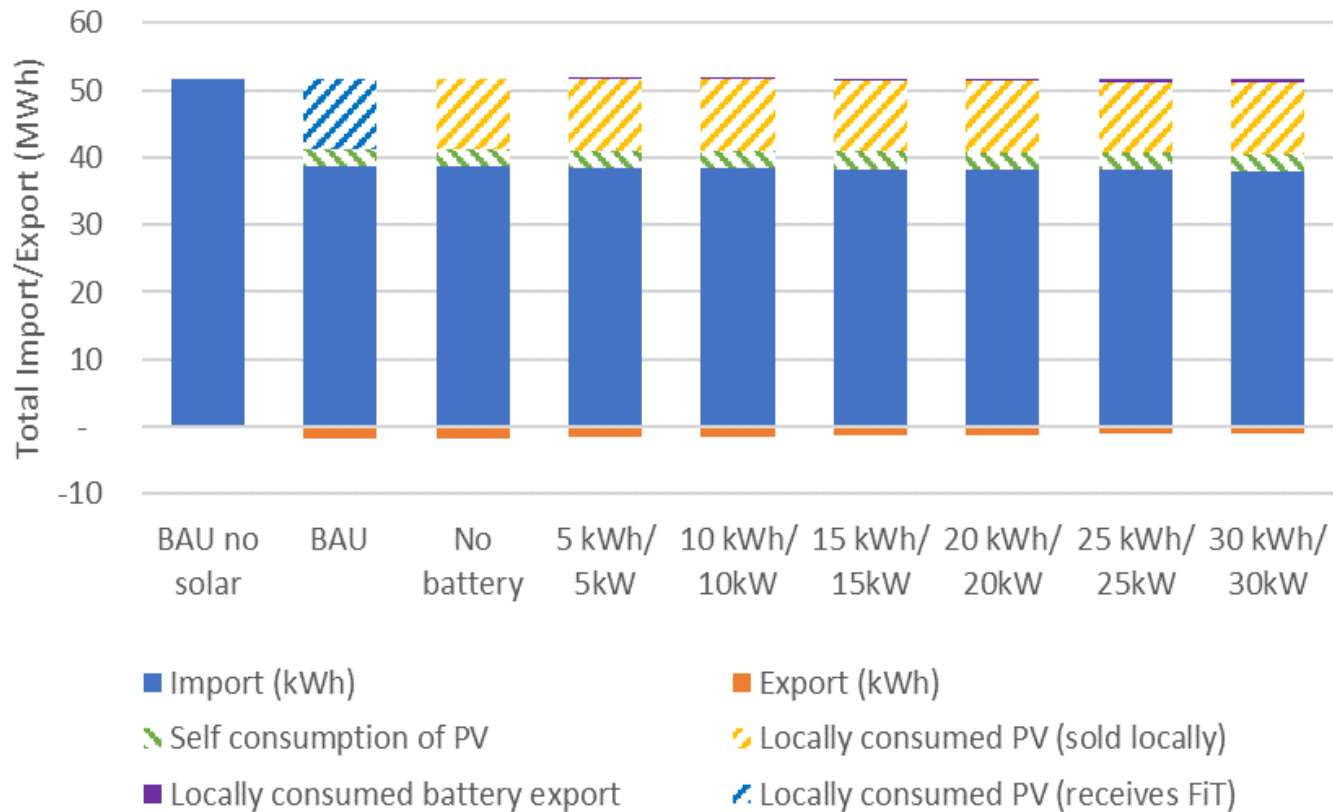- Gross load (BAU, no sPV)
- Net load (BAU with PV)
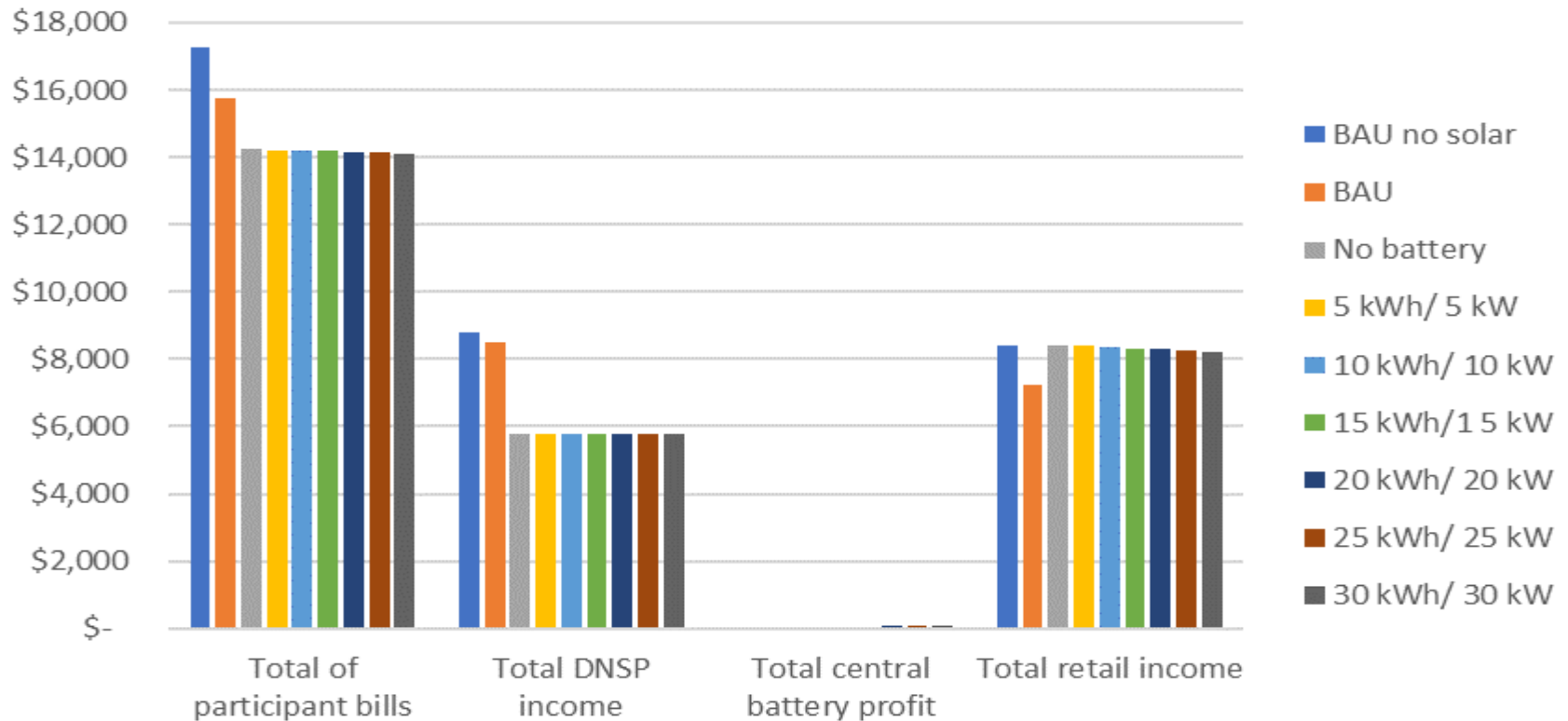- PV with 30 kWh Battery (scenario 7)

Enova Case Study: Battery Sizing

Network Use - Varying Scenarios

Enova Case Study: Financial Modelling

Financial Outcomes for Stakeholder Groups - Varying Scenarios

Proposed developments

- Response to price signal rather than priority order
  - e.g. if it's cheaper to buy grid electricity than local solar (such as on TOU off peak) then buy grid electricity

- Expand tariff capabilities
  - Demand network tariffs
  - Adjust tariff values
  - Ability to 'create' tariffs
  - Reference a greater data base
  - International tariffs?

- Ability to apply 'parent connection point' tariff

- Simple financial model for central battery and solar

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Thank you!
Q&A