Architectures for Community Energy Schemes: understanding the technical and commercial challenges of linking local demand and generation

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Outline

- Distributed Energy Scheme (DES) – technical and regulatory/commercial challenges

- DES architectures:
  - ➢ Physical Private Wire
  - ➢ Virtual Private Wire
  - ➢ Demand Aggregator
  - ➢ Local Energy Market

- Conclusions

Accelerating Renewable Connections (ARC)

- Objective
  - ➤ Accelerate connections of renewable generation to the distribution network
- Funding Mechanism
  - ➤ LCNI Tier 2
- Value
  - ➤ £8.4 million over 4 years (2013 – 2016)
- Trial Area
  - ➤ East Lothian and Scottish Borders
- Project Partners – www.arc-project.com

Distributed Energy Scheme (DES)

University of
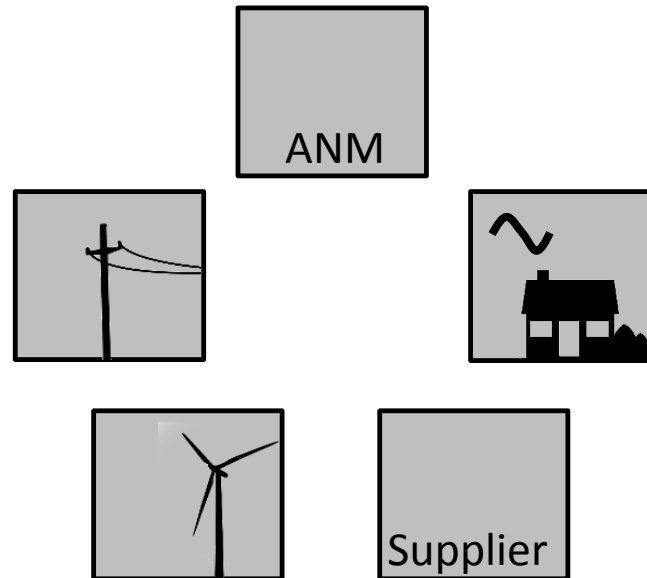**Strathclyde**
Engineering

ANM

Supplier
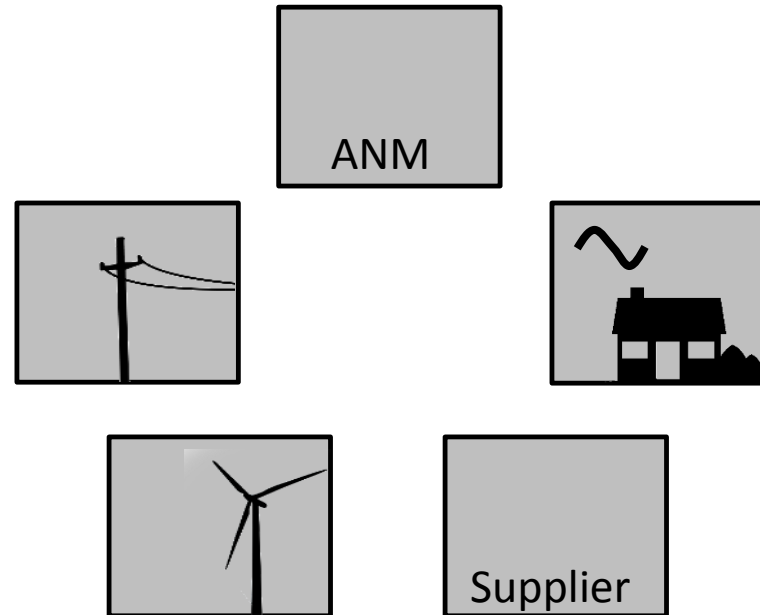
How should these five actors interact under ARC?

Technical challenges

Within ANM?

Private Wire or Virtual Private Wire?

Single large demand, or many small demands?

ANM

Supplier

New or existing electrical demand?

Demand flexibility 'owned' by specific generator?
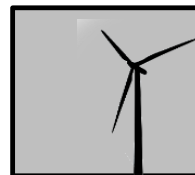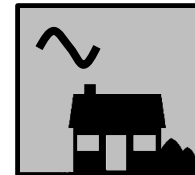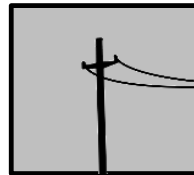
Is flexibility in demand needed?

How should these five actors interact under ARC?

Regulatory/commercial challenges

Private agreement outside supply arrangements?

Local Supply company?

Licence-exempt, licence-lite (or fully licenced)?

ANM

Sleeving agreements?

Relative quantity and time-structure of curtailment?
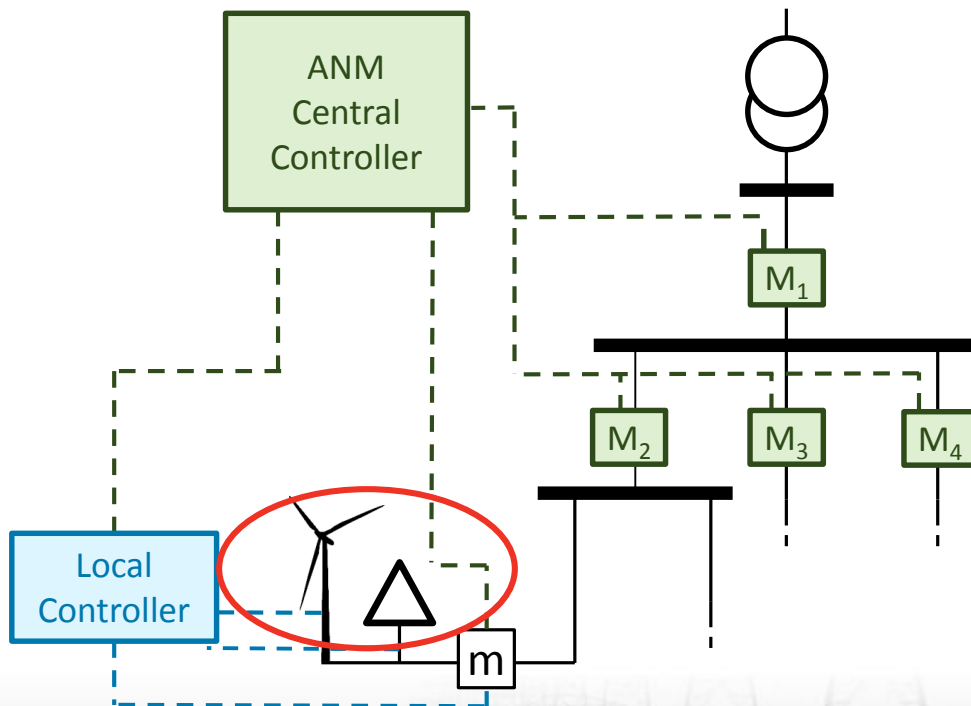
Supplier

Benchmarking?

How should these five actors interact under ARC?

Physical Private Wire

| Physical Private Wire	Suitable for private network systems. A single network connection for combined NFG and flexible demand system.

- ANM monitors single connection point.
- Private network responsibility of private owners.
- Local controller implements ANM set point through demand flexibility or generation curtailment.
- Private commercial arrangements between NFG and flexible demand.

Virtual Private Wire

| Virtual Private Wire	Flexible Demand and NFG have separate connections and power flows between them across the distribution network. Flexible demand and NFG contribute to the same constraint.
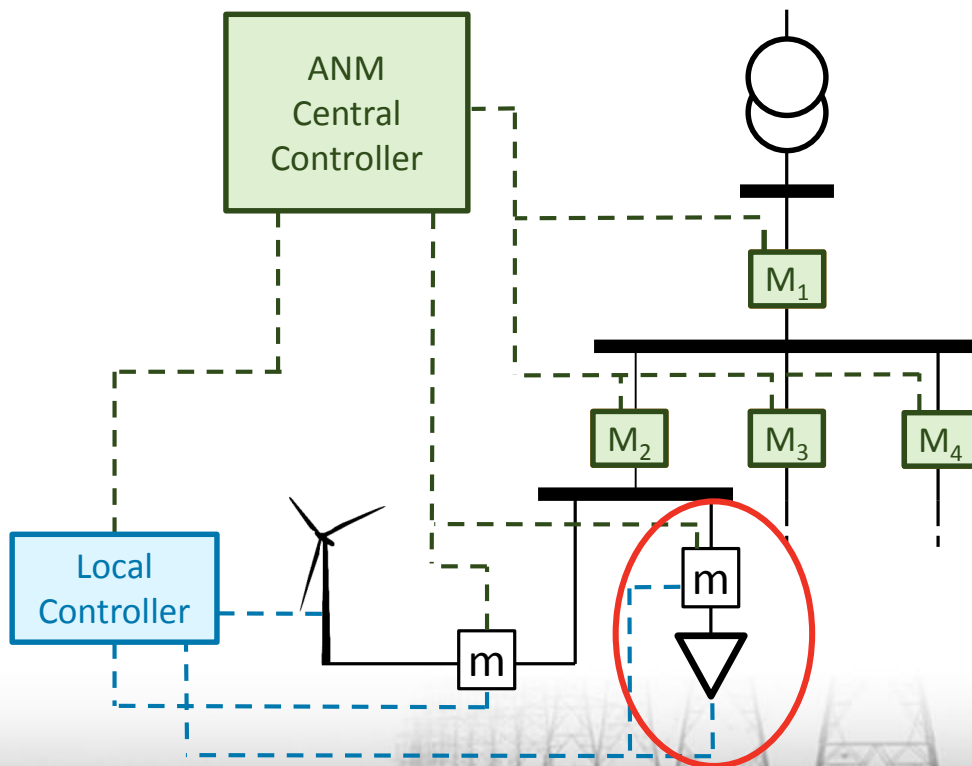
- ANM sends single control signal to local controller for VPW network.
- Control achieved as in behind-the-meter system.
- ANM monitors flexible demand connection and calculates combined contribution to constraint.
- Rebate payments or a community supply company.

Demand Aggregator

Demand Aggregator

Flexible demand spread across the distribution network.
Demand not associated with a particular NFG.
An 'aggregator' controls multiple demand units in groups.
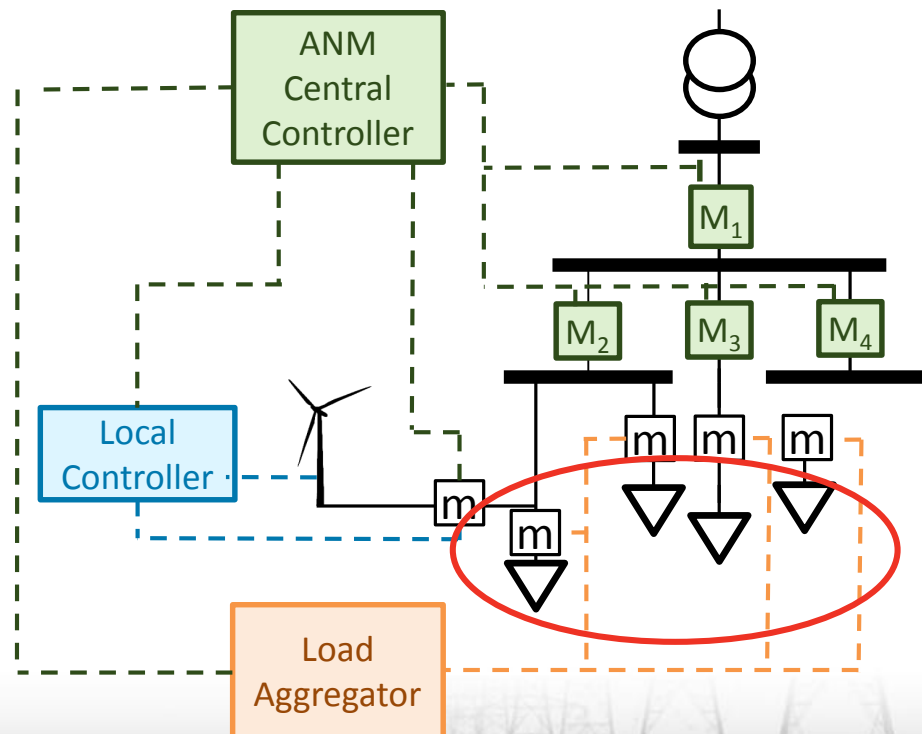
- ANM monitors aggregated demand via aggregator.
- ANM defines set-points for demand groups and communicates to aggregator.
- ANM instructs demand ahead of real time (dependent on demand response time).
- ANM continues to curtail NFG.

Local Energy Market

Local Energy Market	All NFG and flexible demand units take part via bids and offers. Market cleared for each period, results passed to ANM scheme for implementation.
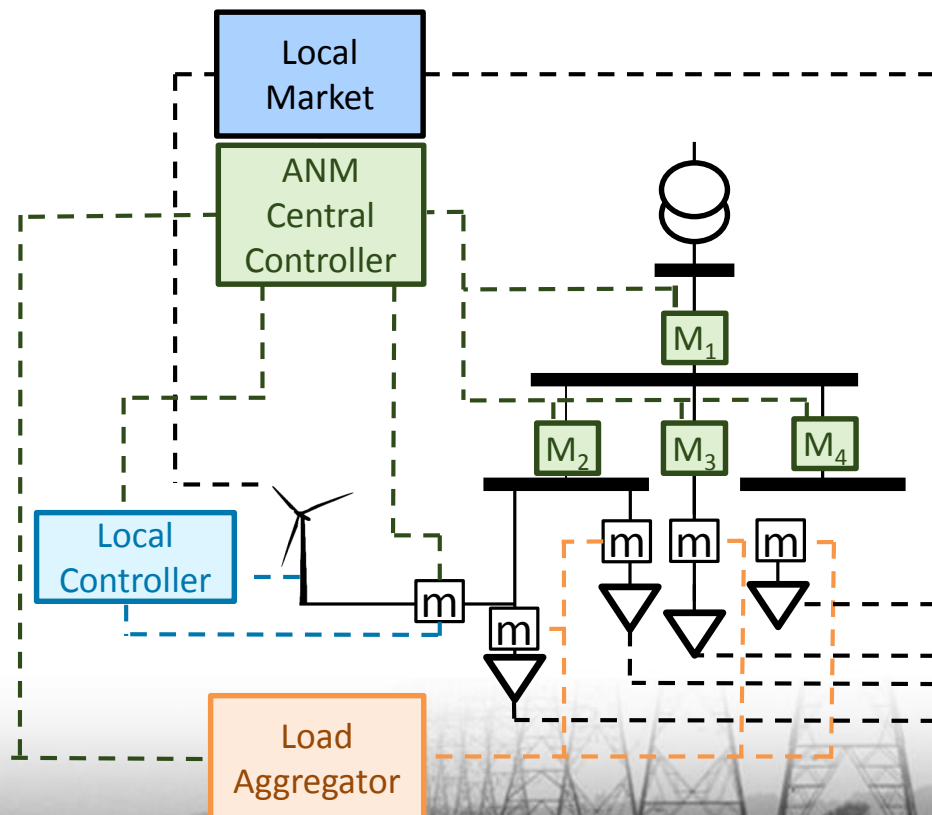
One potential market:
- Initial dispatch of NFG via LIFO and notification of expected curtailment.
- Curtailed NFGs offer, and flexible demand (via aggregators) bid.
- Market cleared for additional generation.
- Market operator informs ANM schemes of additional generation and demand.

Conclusions

- Regulation of the distribution and supply of electricity are a significant barrier to the development of small schemes.

- The type of demand coupled to DG significantly affects the design of any scheme.

References

- Gill, S., Plecas, M., Kockar, I., *Coupling Demand and Distributed Generation to Accelerate Renewable Connections: Options for the Accelerating Renewable Connections project*, 2014.

  Available at: http://strathprints.strath.ac.uk/50135/

- OFGEM consultation document - *Non-traditional business models: Supporting transformative change in the energy market*

  Available at:

  https://www.ofgem.gov.uk/publications-and-updates/non-traditional-business-models-supporting-transformative-change-energy-market