Financing Micro-generation: Some Options for the Future

Dr. Jim Watson
Tyndall Centre for Climate Change Research & SPRU, University of Sussex, UK

New Challenges for Energy Decision Makers
26th Annual IAEE Conference, Prague, Czech Republic, 4-7 June 2003
Overview

Work in progress on the possibilities for owning and operating micro-generation within households

– Brief overview of micro-generation and implications
– Three models for micro-generation ownership and operation
– Initial economic analysis
– Some considerations for future work
The Tyndall Centre comprises nine UK research institutions. It is funded by three Research Councils - NERC, EPSRC and ESRC - and also receives some support from the DTI.
Micro-generation could be the most radical form of energy system decentralisation:

- Many technology ‘evangelists’ focusing on micro-turbines, fuel cells, solar PV, Stirling engines etc.
- Would blur distinction between energy supply and demand
- Consumers become more active participants in energy system development and operation?
- 4 million micro-CHP units in the UK alone by 2010?

Key questions: What are the possibilities for micro-generation, and what are the implications of these?
# Possible Models for Micro-Generation

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Company Ownership</th>
<th>Leasing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Householder:</strong></td>
<td><strong>Energy Supplier:</strong> Operation to help Energy Supplier balance supply and demand (could take into account Householder preference)</td>
<td><strong>Energy Supplier:</strong> But possible transfer to Householder at end of leasing period</td>
</tr>
<tr>
<td><strong>Company Ownership:</strong></td>
<td><strong>Householder</strong> gets cheaper energy in return for hosting micro-generation. <strong>Energy Supplier</strong> avoids buying wholesale electricity, and can balance their system more cheaply?</td>
<td><strong>Shared:</strong> Operation to help Energy Supplier balance supply and demand, taking into account Householder preferences</td>
</tr>
<tr>
<td><strong>Leasing:</strong></td>
<td><strong>Householder</strong> saves money on energy bills, and spreads capital costs. <strong>Energy Supplier</strong> retains some operational control and recoups capital investment through lease payments.</td>
<td><strong>Householder</strong> saves money on energy bills, and spreads capital costs. <strong>Energy Supplier</strong> retains some operational control and recoups capital investment through lease payments.</td>
</tr>
</tbody>
</table>

---

**Plug and Play**

**Householder:** Operation according to Householder needs for power and heat

**Householder** saves money on energy bills, but has to pay capital cost. **Energy Supplier** loses kWh sales, and may provide clear terms of grid access and buyback rates.

**Energy Supplier:** Operation according to Householder needs for power and heat

---

**Shared**

**Householder** saves money on energy bills, and spreads capital costs. **Energy Supplier** retains some operational control and recoups capital investment through lease payments.

---

**Leasing**

**Householder** saves money on energy bills, and spreads capital costs. **Energy Supplier** retains some operational control and recoups capital investment through lease payments.
Implications of Models

• Different economics. For example, different tax rates apply to different players in the energy system

• Different IT and control system requirements. Some might require new investment for communication/control signals between companies and consumers (models 2&3)

• Different levels of consumer involvement - from a passive consumer (model 3) to an active participant in energy system development and operation (model 1)

• Different levels of control for energy distribution companies - e.g. ‘centralised’ control (model 3) to a loss of control (model 1)
The Tyndall Centre comprises nine UK research institutions. It is funded by three Research Councils - NERC, EPSRC and ESRC - and also receives some support from the DTI.

The Economics of Plug and Play: Two UK Case Studies

Solar PV

Micro CHP
The Tyndall Centre comprises nine UK research institutions. It is funded by three Research Councils - NERC, EPSRC and ESRC - and also receives some support from the DTI.

The Economics of Plug and Play: Two UK Case Studies

**Solar PV**

*Payback period: 35 years*

- Size: 1.5kWp
- Cost: £8,600+VAT (50% paid by government)
- Renewables subsidy of £45 per year

**Micro CHP**
The Economics of Plug and Play: Two UK Case Studies

Solar PV
Payback period: 35 years
- Size: 1.5kWp
- Cost: £8,600+VAT (50% paid by government)
- Renewables subsidy of £45 per year

Micro CHP
Payback period: 14 years
- Size: 1.1kWe/5kWth
- Cost: £2,500+VAT
- No government grants or subsidies

The Tyndall Centre comprises nine UK research institutions. It is funded by three Research Councils - NERC, EPSRC and ESRC - and also receives some support from the DTI.
Complicating Factors

- Maintenance costs - might be £150 per year for micro-CHP
- Technical standards for connection & installation
- Availability of renewables subsidies to householders
- Reform of electricity network regulation could provide further incentives in some areas

Problem of comparisons:
- Claimed micro-CHP paybacks of 3-4 years in other studies
- These can be misleading - they assume a ‘forced purchase’ and compare only with a normal central heating boiler
Impact of Tax Changes

What happens if consumers can use tax allowances in the same way as companies?

<table>
<thead>
<tr>
<th></th>
<th>Solar PV</th>
<th>Micro-CHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>No tax allowance</td>
<td>35</td>
<td>14</td>
</tr>
<tr>
<td>22% tax payer</td>
<td>29</td>
<td>11</td>
</tr>
<tr>
<td>40% tax payer</td>
<td>22</td>
<td>8</td>
</tr>
</tbody>
</table>

The Tyndall Centre comprises nine UK research institutions. It is funded by three Research Councils - NERC, EPSRC and ESRC - and also receives some support from the DTI.
How is Energy Company Investment Different?

- Access to tax allowances
- Capital costs reduced by bulk purchasing
- Micro-CHP operating costs reduced with cheaper bulk gas
- Micro-generation fleet could help distribution network control

But

- Company investment requires long term relationship with consumer - is this possible in a liberalised market?
- Economics still poor - 10 year payback for micro-CHP?
- Will consumers accept centralised control of their generator?
Conclusions

Micro-generation could be revolutionary, with far reaching effects on consumer-supplier relationships

Still not clear whether consumers or companies will take the lead in micro-generation investment. Are consumers interested?

Behind the hype, these technologies have long payback periods which are a significant barrier to investment

A level playing field for taxing energy investment could help - this would also help all demand side investments

Many other considerations - need further research particularly for energy company ownership and leasing models

Tyndall Centre for Climate Change Research

The Tyndall Centre comprises nine UK research institutions. It is funded by three Research Councils - NERC, EPSRC and ESRC - and also receives some support from the DTI