Working draft proposal for the Feed-in Tariff scheme for small scale hydro

Submitted to the Department of Energy and Climate Change

INTRODUCTION

This proposal is a response to the 2012 consultation on the Feed-in Tariff and to messages from the Minister of State at the 9th February and 27th March round table meetings at DECC encouraging stakeholders to take a wider look at the way the FiT arrangements could be modified to operate more effectively.

The proposal aims to take advantage of the particular benefits of small scale hydro, without damaging the case for larger scale hydro, by identifying changes which will improve the FiT structure. These changes could be implemented in either the current or subsequent FiT reviews. I am also submitting a direct response to the consultation questions from the Micro Hydro Association, whose interests I represent.

I would welcome the opportunity to discuss the proposal which also takes account of contributions from a number of members of the Micro Hydro Association and other stakeholders.

Gavin King-Smith - Administrator Micro Hydro Association - April 2012

SUMMARY

There is a wealth of **unexploited water resource** in the UK, suitable for small scale hydropower schemes. These schemes can be designed with high efficiency but development is occurring slowly (55 schemes <50kW capacity totalling only 0.64MW capacity commissioned in the two years of the FiT). The potential capacity of such schemes has not yet been quantified for the UK as a whole but is likely to run into tens or low hundreds of megawatts.

More than other renewable energy technologies, micro hydro schemes offer a long-term and **cost-effective addition to the UK's energy infrastructure (1-4p/unit over a 50-100 year lifetime)**.

This proposal suggests ways of improving the FiT structure and procedures in a way which will **remove barriers to the implementation of micro hydro schemes and will reduce FiT costs**:

supporting capital investment whilst delivering a better deal for the consumer

increasing value for money for the FiT subsidy

avoiding scheme downsizing to gain higher tariffs

stimulating employment and skills development

addressing accreditation issues through self regulation

reducing red tape for faster, simpler development.

Because the proposed changes will require some structural modification to the FiT scheme there are concerns in the industry that they should not be applied to hydro schemes in the pipeline so as to provide a period of financial stability. We suggest that some of the proposed mechanisms could be developed and piloted alongside the present FiT structure on an optional basis for new schemes.

THE CASE FOR MAKING SPECIFIC PROVISION FOR MICRO HYDRO

Micro hydro technology generates "free" and clean electricity which is particularly beneficial in rural locations. More than other renewable energy technologies, micro hydro schemes offer a long-term and effective, albeit small, addition to the UK's energy infrastructure. The schemes have these characteristics:

- *longevity* (50-100 years),
- *low maintenance and refurbishment costs*,
- *high efficie*ncy (load factors of 35-100% and lifetime capital cost/kWh generated of 1-4p[2])
- *low impact* (small footprint, buried pipe and cable, housed turbine with low noise, negligible effect on ecology and hydrology[1])
- *mature technology* (including recent improvements in materials, engineering and electronic control)
- *local energy security*
- limited number of locations for deployment (so *no runaway costs of support*)
- *opportunities for farmers, landowners, and rural communities* to take a direct stake in the transition to a low carbon economy
- *employment opportunities* for technical and construction people

The EA conducted an exercise in 2009 to identify locations for prospective low head hydro schemes and in Scotland two exercises identified the potential for large and small scale schemes. However, neither of these studies revealed in any detail the large potential for micro hydro, particularly in high head locations. Although in national or global terms the energy available from UK watercourses suitable for micro hydro is small, development of this resource will produce rapid and efficient reduction in carbon emissions and will rapidly recover capital investment costs.

At present scheme development is occurring slowly on an ad hoc basis, often as a result of word of mouth recommendation. Growth is hampered by lack of readily available finance, over-regulation and grid weaknesses, and by lack of skilled and experienced designers, installers and turbine manufacturers. This proposal considers ways to improve the situation, with the following benefits:

- *supporting capital investment whilst delivering a better deal for the consumer:* stimulating micro hydro development by providing up-front support for capital investment and simultaneously reducing long-term costs to the consumer

- *increasing value for money for the FiT subsidy:* altering the balance of support in favour of micro hydro schemes by taking account of their high load factors and longevity which together provide the best cost/unit energy generated compared with

[1] the potential ecological and hydrological effects of any hydro scheme are assessed by the environment agencies; any possibility of significant impact on local ecology or on other uses of water is mitigated through abstraction and impoundment licence conditions.

other renewable energy technologies, and hence obtaining the best value for money for the FiT subsidy

- *avoiding scheme downsizing to gain higher tariffs:* avoiding the problems with capacity banding by relating tariffs to energy generated, not to maximum capacity
- *stimulating employment and skills development*: creating jobs and opportunities for design and engineering skills development by providing apprenticeships and specific training
- *resolving accreditation issues:* developing an approach to accreditation of hydro schemes for FiT eligibility which encourages development but recognises the diverse and specific nature of micro hydro installations; this would also reduce Ofgem's workload
- *reducing red tape for faster, simpler development*: taking an integrated and proportionate approach to micro hydro scheme planning, development, and regulation which simplifies and accelerates implementation through registration.

SUPPORT FOR CAPITAL INVESTMENT AND A BETTER DEAL FOR THE ELECTRICITY CONSUMER

The current FiT mechanism fails to address the difficulty that many face in obtaining up-front development capital for micro hydro schemes (typically 10-15kW capacity) at capital costs which can range from £5,000 for very small self-build schemes to over £200,000[2]. This level of funding can be difficult to obtain for individuals and has contributed to the limited the rate of uptake of the FiT scheme for micro hydro (see APPENDIX).

This proposal suggests that the high capital cost-effectiveness of micro hydro, coupled with the high load factors achievable (typically 40 - 65%[2]) could be used more directly than is the case in the present FiT structure. The proposed approach would divert notional FiT payments into a funding scheme to cover capital costs. Once capital costs have been recovered for a scheme, there will be an opportunity to reduce the overall FiT scheme costs to the consumer by paying a reduced tariff which would still be attractive to the scheme owner and the industry.

Two options are proposed:

1. provide loans from a protected element of the proposed Green Investment Bank fund
2. provide loans from the Green Deal fund

In both cases, the loan would be repaid, with interest, from the notional FiT payments due to the scheme owner in the early years. Typical payback periods for well-designed micro hydro

[2] calculated from a sample of almost 300 scheme designs based on basic materials, components, and labour costs with 25% uplift for business overheads and a further 25% profit uplift in the supply chain – (see APPENDIX)

schemes would be 2-6 years from start of operation (assumes cost of finance is 3%)[2]. The loan would need to commence during the development period (1-3 years from conception) and following preliminary accreditation.

There would be no cost to the fund, so we suggest that a proportion could be set aside for this purpose. There should also therefore be no issue with contravening European funding legislation as has been the case with grant funding.

The scheme owner would benefit in the capital repayment period from the use of free electricity and thereafter would receive a reduced FiT – e.g. 9p/kWh generated, indexed for the remainder of the 20 years of the scheme, plus 3.1p/kWh exported, also indexed. The scheme owner would continue to benefit after the 20 years, not only from "free" electricity, but also from negotiating the sale of 100% renewable source electricity to suppliers.

This approach would reduce the cost of the FiT to the electricity consumer but still provide a good incentive for people to install hydro schemes on viable watercourses. It should also act to keep capital costs low as this would reduce the time generators had to wait for the FiT payments to begin.

Where people wished to invest their own capital, the capital loan approach could be offered as an alternative option to the standard FiT package.

In a number of cases, particularly in rural hilly areas where schemes are most likely to be cost-effective, 11kV power lines may need to be upgraded to connect one or more schemes at their optimum capacity. In such cases, the "savings" in FiT subsidy could perhaps be put towards the costs of upgrade, though this is a wider issue to be addressed with network operators.

In order to retain certainty for a reasonable period, particularly for the larger, longer timescale, hydro developments already in the pipeline, we propose that the present FiT structure be continued for the next 3-4 years when we understand the FiT scheme will again be reviewed. This will also provide time for the new approach to be considered and refined by all stakeholders and any necessary orders to be drawn up. The new approach could be offered as an option in the intervening period.

VALUE FOR MONEY FOR THE FIT SUBSIDY

When determining any cap on funding for differing technologies by a mechanism such as the capacity-based trigger, the cost-effectiveness of the consumer investment should be a prime consideration.

The present DECC proposal uses a lifetime of 25 years for hydro schemes. In the case of micro hydro the industry believes, and history demonstrates, that a more appropriate figure would be 50-100 years (maybe even longer for high head schemes where any necessary turbine and generator replacement is not a significant proportion of capital cost).

Taking 75 years, the capital cost/kWh electricity generated in a lifetime for micro hydro is estimated to be 1-4p (today's prices). This is probably the lowest cost obtainable for small scale renewable energy generation for the foreseeable future. The trigger mechanism should

therefore be weighted in favour of micro hydro development and the installed capacity cap set at a higher level so that any rate of development that can be achieved will be supported. As has been proposed by the British Hydropower Association, no degression for micro hydro should be applied until the trigger capacity has been reached.

EMPLOYMENT AND SKILLS DEVELOPMENT

There are very few self-build proprietors, sole practitioners and small organisations now implementing successful micro hydro schemes. The latter two groups are experiencing demand beyond their capacity, especially given the difficulties they face with environmental and planning regulation and delays, and with gaining access to the grid. Solar and wind technology installers are beginning to seek opportunities in the micro hydro sector but find that they lack the experience or skills needed.

There are therefore opportunities for creating apprenticeship and employment in the areas of scheme design, project management, turbine and controller design and construction, civil works, ecological survey. There is also a need for specific technical courses in micro hydro scheme design. These opportunities would provide a boost to the economy.

ENERGY GENERATION-BASED TARIFFS

One of the difficulties with the current capacity banding for hydro is that schemes can easily be designed with a specific capacity in order to gain the highest tariff, so schemes will often be designed with a DNC of just under 100kW or just under 15kW. Capacity is not a measure of efficiency and the banding does not make for the optimum use of water resources.

There are already instances of this[3] and retaining the tariff structure as proposed would result in much of the available water resource being under-utilised.

Our proposal is to set FiT tariffs which would pay generators at a rate depending on the actual energy generated. Schemes would be rewarded for generating maximum energy but at a gradually reducing tariff to account for the economies of scale available to the larger schemes. This method will be transparent and simple to operate by electricity suppliers who already have to collect actual generation figures.

ACCREDITATION

There is at present no resolution of the issue of how, or to what extent, micro hydro schemes should be accredited for FiT eligibility.

The MCS approach has not proved appropriate for micro hydro for several reasons including:

- the site-specific nature of every scheme
- the differing nature of the technology suitable for each site

[3] e.g. in a recent survey by River Energy Networks, data from 6 installers showed that about 7.5 GWh/yr will be lost from output of 30 schemes completed or in hand, due to downsizing to just below tariff bands.

the very limited number of individuals, whether sole traders or in small to medium enterprise firms, with sufficient technical experience and skills to design, manufacture components for, and install, let alone accredit, micro hydro schemes.

The majority of the micro hydro sector of the industry is recommending adoption of the ROOFIT process for accreditation for the foreseeable future, and there are also opportunities for simplifying ROOFIT procedures.

One alternative approach has been proposed by a Certification Body, Gastec, which would replace installer and product accreditation with scheme accreditation, considering both the design and the implementation of a scheme. This is a sound approach, and may appeal to some proprietors seeking technical assurance, but it could add a considerable inspection cost to every scheme. There is also still an issue of how such an accreditation body would be staffed given the scarcity of experienced people.

In this proposal we suggest that, at least for the next few years, while the industry is gaining experience with developing small scale schemes, consideration is given to incorporating some self-regulation in the form of expert peer review. The following paragraphs outline how such a process might be organised.

The most critical stage for review is the detailed design and equipment selection stage, so a review could be carried out on the basis of a site visit, documentation review, and expert assessment of the design, proposed materials, and components (i.e. scheme sizing, intake/dam and screening, pipework, turbine, control and grid connection). The outcome of the design review would be a straightforward checklist with comments from the expert on any issues requiring attention and a notice of provisional FiT eligibility (to be subject to confirmation during Ofgem site accreditation). Some material drafted by a small team originally involved in the MCS standards working group (and subsequently consulted by Gastec) could be developed to support the review process.

A post implementation review (at or shortly after the commissioning stage) could assess whether the design had been correctly implemented and whether any variations were justified. This would result in a final statement of FiT eligibility or a report on any issues requiring rectification.

This is a safe approach since the main concerns for hydro schemes are electrical connection, environmental, heritage, and planning regulation, all of which are already fully controlled through Ofgem and other national and local government agencies. It should also result in a reduction of Ofgem's workload. There is already adequate legal protection for purchasers of equipment and services. This is not likely to be a field in which "cowboys" can progress far with a scheme and the proposed expert review should prevent any such situation occurring.

The industry itself could invite a small pool of willing people with the skills and experience to review schemes and would establish a process to allocate reviewers to schemes and to avoid conflicts of interest. There could be a small fixed fee for reviewers plus expenses for site visits. To some extent, the Micro Hydro Association has already been affording voluntary independent evaluation of some scheme proposals and we understand that Renewable

Energy Networks are already undertaking a role similar to this on behalf of generators for low head schemes.

To pilot such a scheme would initially require funding of a part-time individual for administration or it may be possible to find a volunteer. A further option might be for a Certification Body to engage experts from such a pool to provide the expertise on micro hydro design, construction and technical regulatory issues whilst itself operating the process of allocation and providing an assessment of other factors (contractual, commercial, customer service, etc.) on an optional basis.

Liability for addressing any post accreditation issues would be with the designers, installers and manufacturers, not with the reviewers. There could be a procedure for suppliers to raise objections to a reviewer on the grounds of conflict of interest or of lack of experience, skills, or knowledge.

In addition to the above, industry associations could usefully extend the information available on their websites concerning best practice in hydro scheme design, installation, and operation.

INTEGRATED AND PROPORTIONATE APPROACH TO MICRO HYDRO SCHEME PLANNING, DEVELOPMENT, AND REGULATION

A key issue affecting the introduction of micro hydro schemes is the absence of a joined-up and proportionate approach to regulation through planning, environmental, and heritage bodies. This involves many aspects which are inapplicable to micro hydro and can result in long delays as applications are passed between organisations, especially as the numbers of applications are relatively small and require specialist knowledge not yet readily available to the regulatory bodies. The FiT current review provides an opportunity to address this issue.

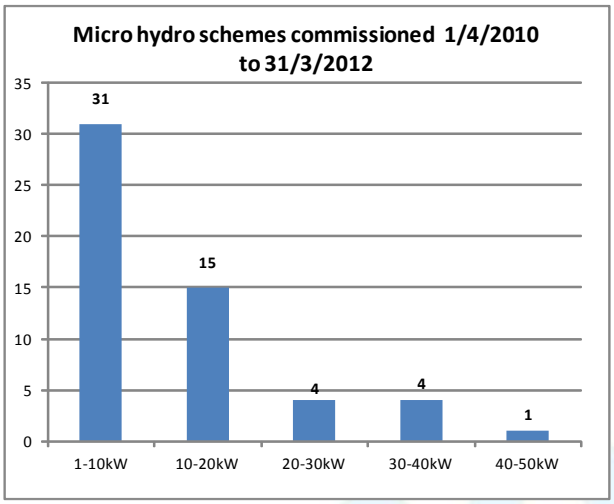
We propose that permitted development rules be applied to small scale hydro schemes (under, say, 100kW capacity). Schemes will be registered for the FiT with Ofgem under ROOFIT. Electrical, environmental, and heritage issues will be addressed during the design stage and can again be covered by registration of scheme designs with DNOs (as for G83 connections), with planning authorities, and with environment and heritage agencies. Registration documents will include sufficient scheme design details for compliance checks which could be conducted on a random basis.

The very smallest schemes, say under 4kW capacity, could safely be exempted from planning and environmental regulation altogether and registered for the FIT through a simplified ROOFIT process with Ofgem. They would also still be notified to the DNO as G83 connections.

ENDS

APPENDIX

Micro hydro scheme FiT uptake to March 2012 (taken from Ofgem report - Feed-in Tariff Installation Report 31 March 2012)



No. commissioned 1/4/2010 - 31/12/2010	16
Capacity (kW)	165.3
No. commissioned 2011	38
Capacity (kW)	472.1
No. commissioned 1/1/12 - 31/3/12	1
Capacity (kW)	2.5
No. commissioned 1/4/2010 - 31/3/2012	55
Capacity (kW)	639.9

Summary of a sample of actual and potential scheme designs as at 21/4/2012

Number of schemes:	290	Realisable energy of schemes (MWh/annum)	
TOTAL design capacity of schemes (kW)	4722		
TOTAL realisable energy of schemes to date (MWh/annum)	25039	**25,039**	
TOTAL Value of schemes from FiT (£000s/annum)	5872		
TOTAL Value of schemes from use of "free" electricity (£000s/annum)	445	(approx 6,000 homes)	
TOTAL Carbon offset of schemes (tonnes CO2/annum)	14865	Scheme average	86 (MWh/annum)
TOTAL Cost of schemes (£000s)*	26484		51 (tonnes CO2/annum)
Average capital payback period (years) incl. cost of financing at 3% and excl. usage benefit	4.5		
Average scheme design capacity (kW)	16.3		
Average scheme realisable energy (MWh/Annum)	86.3		
Average scheme lifetime energy (GWh) -assumes 75 years	6.5		
Average scheme capital cost of lifetime energy (pence/kWh - current prices)*	2.7		
Average Load factor (% average energy per annum ÷ total energy if scheme were able to run at full capacity all year)	60%		

*basic materials, components, and labour costs with 25% uplift for business overheads and a further 25% profit uplift in the supply chain