Context - Malawi Renewable Energy Acceleration Programme (MREAP)

The Scottish Government commissioned a Scoping Study on Supporting Community Energy Development in Malawi in 2011 and the outcomes pointed to a range of programme activities that the Scottish Government might support.

Those recommendations were taken forward in the form of the Malawi Renewable Energy Acceleration Programme. MREAP was managed by the University of Strathclyde, had seven main partners, governed by a Programme Steering Group (co-chaired by the Government of Malawi Department of Energy Affairs and the University of Strathclyde) and was funded to the total of £2.26m. MREAP project activities ran from January 2012 – March 2015.

The following summary is extracted from the final report to the Scottish Government prepared in May 2015.

SUMMARY OF MREAP ACHIEVEMENTS

At many levels from Community to Academia to Government, MREAP has been a catalyst for the use of renewable energy to improve the lives of Malawians, particularly the rural poor. Nearly 80,000 now have improved access to energy services as a result of MREAP. In a country where less than 1% of the rural population has access to electricity, this is a transformational change. A light in the home, in a school and at a health centre may seem basic but it is, in fact, a critical first step for improved livelihoods for families, improved education for young pupils, and better care for new mothers and babies. MREAP with its network of dedicated partners have touched the lives of many communities throughout 16 districts in Malawi. We have empowered communities to own and manage projects. We have created a momentum in the Government of Malawi’s Ministry of Natural Resources, Energy and Environment and the Department of Energy Affairs who lead the energy policy development; MREAP has demonstrated the potential benefits community energy can provide. Academic institutions in Malawi are training communities on the use of renewable energy, how to manage projects, and how to keep them sustainable. A new Masters in Philosophy in Renewable Energy degree has been created under MREAP and 13 students are on track to finish their studies in 2015. The MPhil programme is the first of its kind in Malawi and is a fundamental building block towards improving the research and leadership capacity in the country; these students will be the next generation of leaders in their field. MREAP has produced a wealth of knowledge on highly relevant subjects such as the process of setting up sustainable off-grid renewable energy projects in Malawi, feasibility for commercial scale wind, gaps and challenges in sustainability of off-grid solar PV projects, and produced a multi-language toolkit to help communities get a start for themselves. The ambitions of Sustainable Energy for All (SE4ALL) in Malawi cannot hope to be achieved with projects operating in isolation or disconnected from the enabling environment within the country. MREAP has shown that integration of project deployment, capacity building, institutional support, and knowledge creation can be complementary and accelerate the process of change.
The Scottish Government International Development (SGID) Policy supports the Malawi driven development agenda over six key areas including sustainable economic development – of which renewable energy is an important component. MREAP was designed to accelerate the use of renewable energy in Malawi through multiple work streams coordinated through a programme steering group. While energy is not specifically addressed in the Millennium Development Goals (MDGs), it is widely accepted that the provision of energy is crucial to the success of the named goals. The recent UN Sustainable Energy for All initiative as selection as a Sustainable Development Goal (No. 7) which replaces the MDGs in 2015, formalizes energy’s critical role.

Increased modern energy access and use of renewable is likewise a goal of the Malawian Growth and Development Strategy II. Though it makes reference to increased use of renewables, does not lay out any specific plans to achieve higher penetration rates (beyond large scale hydro projects). There is a distinct gap with respect to off-grid electric supply and community energy, which MREAP has sought to provide experience and learning. In areas MREAP has worked in, it has created awareness at the community, district, and national levels and the experience serves as critical evidence for future policy making, especially with regards to rural electrification and biomass management. Finally, the provision of the wind energy bankable yield report by MREAP is a crucial enabler for larger scale wind in Malawi.

By the provision of improved energy access to nearly 80,000 people, MREAP has provided benefits in many forms for Malawians who are energy impoverished – from lighting at households, schools, and health centres, to the increased use of more efficient cook stoves that reduce the amount of inhaled particulates if used correctly. MREAP has support approaches that empower communities to achieve real change through the use of renewable energy technologies.

MREAP has therefore supported SGID by the direct provision of energy access for Malawians and the support of the enabling environment through documented case studies and experiences in community energy.

<table>
<thead>
<tr>
<th>Output/Outcome (including indicator)</th>
<th>Baseline data</th>
<th>Progress made against each indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output/Outcome: MREAP programme</strong></td>
<td><strong>Outcome indicators:</strong> Accelerate the growth of community and renewable energy development in Malawi through multiple, targeted and coordinated activities with good potential to provide a platform for that growth.</td>
<td></td>
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<tr>
<td>Evidence of coordination between existing structures and existing committees (Village, community and District levels)</td>
<td>Evidence of greater coordination with Village / District recognition of effective energy investment plans and associate technical support</td>
<td>The Process Evaluation states that an analysis of evidence suggests the CEDP projects have contributed to an improvement in quality and relevance of education and that over time this could lead to improvement in zonal level results. An analysis of District Education Plans (DEP) provided evidence that CEDP projects are targeting the most vulnerable and underperforming schools. However, it appears that the process of engaging with District level officials in relevant sectors (health, education, social welfare) has been unsystematic. Where Primary Education Advisers have been engaged there has been a modest amount of influence on them, which in turn has supported an increased awareness of the benefits of energy.</td>
</tr>
<tr>
<td>Village renewable energy for community infrastructure (schools / clinics and water) linked to needs assessments and village/district plans</td>
<td>3 village level plans prepared around RET use which are linked to the District planning / investment strategies on energy and poverty reduction.</td>
<td>No village level plans developed; note this workstream was removed with SG approval.</td>
</tr>
<tr>
<td>Community-based needs based planning and facilitation is recognised as appropriate tool for the design of village/ community RETs</td>
<td>Demonstration that community facilitation leads to effective installation with appropriate business plans for long term O&amp;M. Approach recognised as appropriate to context of Malawi.</td>
<td>Process evaluation states the process taken by CEDP is appropriate and includes business plans (though sustainability is not necessarily assured). Efficacy of the projects is currently early to judge, though indications at this stage is that there are contributions towards improvement human, social, ecological capital as expressed by the Sustainable Livelihoods outcomes</td>
</tr>
<tr>
<td>Outcome: CEDP</td>
<td>Effective community renewable energy deployments are facilitated by capable stakeholders who support &amp; empower communities to develop and own renewable energy projects and in so doing support the effective development of the renewable energy sector to provide development benefits for Malawian communities (the M&amp;E framework has A needs based sustainable application of small scale decentralised Renewable Energy Technologies for households and communities)</td>
<td></td>
</tr>
<tr>
<td>% growth of fund for operations and maintenance over time</td>
<td>No fund</td>
<td>Fund established in 12 CBOs, unclear if all funds are sustainable</td>
</tr>
<tr>
<td>Increased retention of school teachers and health clinic workers</td>
<td>Community energy study indicated a problem with new teachers / teacher retention (anecdotal)</td>
<td>Benefits to teachers and health clinic staff from lighting Teacher Retention Survey states higher teacher satisfaction</td>
</tr>
<tr>
<td>Output/Outcome: ISP</td>
<td>Institutional Support Programme - Malawian institutions have evidence and systems to support the effective development of the renewable energy sector to provide development benefits for Malawian communities.</td>
<td></td>
</tr>
</tbody>
</table>
ISP4 - Support to development of renewable energy strategy and Scotland-Malawi policy development

| ISP4                | Support to development of renewable energy strategy and Scotland-Malawi policy development | No relevant baseline | No policy framework is in place, though we have facilitated process to bring Scottish Government Support to Malawian Department of Energy and provided key background documents on how Malawi can engage with the international community especially with respect to SE4ALL. |

ISP – Financial Training and Funding Support Research provided for Community Energy Malawi


Output/Outcome: CEDP

| Output/Outcome: CEDP | Community Energy Development programme - |

| CEDP1 - Community Energy Support Network and Tools |

| CEDP1.1 Design and make widely accessible a community RE project toolkit | [1] No toolkit available | The toolkit was published and launched in June 2014. The toolkit is comprised of a primary toolkit (written document for those with higher literacy levels e.g. development workers and Government officials) and a secondary toolkit (a booklet detailing how to maintain and fix systems and a series of diagrams with key messages from the primary toolkit aimed at those with lower literacy levels). The toolkit has been distributed to all CEDP CBOs and key sector stakeholders and is available on the CEM website (see Project Discussion and Narrative section) |

| CEDP 1.2 Establish a database of RE Projects | [2] No inventory established | The CEDP M&E Database capturing CEDP project data is available (based on M&E framework) is available upon request. An inventory pilot was completed and is part of the 2012 Community Energy Evaluation. Project Data has been shared with CONREMA network. |


| CEDP1.4 For stove projects / solar lantern: numbers that have been sold with usable guarantees of replacement if fail within first year. | In target locations, no stoves or lanterns were available. | Sold Stoves: 325 | Lanterns: 465 |
| | | Returned Stoves: 37 (11% of sold) | Lanterns: 14 (3% of sold) |
| | | Replaced Stoves: 21 (57% of returned) | Lanterns: 19 (90% of returned) |

| CEDP2 - Strategic Energy Partner Projects - Provision of support from MREAP to enable scale up and expansion of activities of MuREA; Mzuni; Concern Universal. |

| CEDP 2.1 Solar PV installations targeting health and education facilities in Chikwawa District (WASHTED) | No Solar PV installations operating at selected locations (Gumbwa, N’dakwerwa, Chithumba, Dolo) in Chikwawa | 4 projects installed at 4 separate locations including 4 schools and 4 health centres. 5 CRED Systems revitalized. Sustainability challenges, interventions, and remaining issues documented at 5 CRED sites. An estimated 5,282 people have access to renewable energy through project (3,140 Females, 2,388 Males). |

| CEDP 2.2 A micro-hydro, micro-grid installation powering 400 homes, business and community facilities in Mulanje (MuREA) | Bondo Micro-hydro scheme not operational | Scheme partially operating as of Nov 2014. Cannot confirm good O&M procedures in place. An estimated 3,409 people have access to renewable energy through the project as of Dec 2014. |
| CEDP 2.3 Biogas installations targeting sustainable cooking with reduced dependence on charcoal and wood fuel for communities near dairy cattle farms (Mzuzu) | Baseline 2 pilot schemes | 4 digesters fully commissioned including a digester at an orphan care centre. 8 digesters installed and undergoing initial feeding (exp. Fully commissioned by June 2015) |
| CEDP 2.4 A combined programme of regional efficient cookstove manufacture and distribution, forestry management and solar PV for schools (Concern Universal) | No baseline available. | 5 schools with classroom systems, solar home systems, and community power centres (equivalent to charging stations) in Mtsumuke, Chawanda, Mchima, Makanjila and Mgombo. >8 forest management plans established with legal mandate to look after local resources. 15 stove production groups started, promotion in 100 villages in TA Kalembo, STA Amidu, and STA Kachenga. 8,209 Stoves were distributed under the monitoring period (ending Jan 2014 for this sub-project). -- est. 43,836 people benefiting from access to improved cookstoves. 24 teaching staff benefitting through lighting in classrooms. 24 teaching staff benefitting through lighting at homes. 5,142 students benefitting from access to lighting at schools. All activities in Balaka district. No data is available on fuel savings usage. Solar PV Sustainability report indicated relatively strong sustainability performance of Mtsumike (included in the survey works) compared with similar project. The model includes multiple income sources (mobile phone charging, 12V car battery charging, TV shows, night room rentals). Though these are good signs, long-term sustainability has not been fully ascertained. |
| CEDP 3.1 Number of CBO’s / Projects in place through MREAP support and with relevant software (cofinance / bank accounts, businesses in place) | 46 projects have been grant funded and installed in Malawi by 12 Community Based Organisations (CBOs). Each CBO has a bank account, established an energy committee and has set up social enterprises (i.e. mobile phone charging) to cover the ongoing costs of the systems. All projects were operational prior to the severe flooding event in January 2015 with 6 projects known to have been affected and requiring repair. |
| CEDP 3.2 Beneficiary numbers: Schools/pupils/teachers Clinics / patients / medical staff / Households (solar lanterns / cookstoves) Others (CBO staff) / Data disaggregated as a minimum by male / female | Beneficiary data has been collected from all CEDP projects. Beneficiaries can be disaggregated as follows: Students – 7,242 male and 7,260 female Teachers – 180 male and 42 female Teacher’s households with lighting systems - 266 (unspecified) Employees (from revenue generating activities) 11 male, 1 female Customers receiving energy services – 487 male and 448 female Households benefitting from cook stoves – 1650 persons Households benefitting from solar lanterns – 2474 persons Mothers and babies benefitting from lighting when they give birth – 378 Totals: Unspecified: 4390 Male: 7920 Female: 8129 Total: 20439 |
| CEDP 3.3 Establish a local organisation to support community developed RE projects | CEM registered and operating From January 2015. However no core funding beyond end March 2015 |
| Output/Outcome: WEPP | WEPP1-4: Effective wind power resources are deployed by capable stakeholders within government, civil society, communities and private sector to support the effective development of the renewable energy sector to provide development benefits for rural communities. |
WEPP1 - Initial Wind Power Feasibility Study  
WEPP2 - Site selection and measurement  
WEPP3 - Feasibility study and capacity development  

WEPP1, 2 & 3 completed, albeit later than originally planned due to delays in customs clearance and transport in Malawi.  
Note: WEPP3 work-stream was reduced significantly due to adjustment of scope/timescales associated with the delay of install of masts.  
> No site specific detailed feasibility studies were completed (as agreed with SG)  
> DoEA elected persons and Malawi Met Office participation in identification and validation of sites and provision of data for the initial feasibility study.  
In addition, National commission of Science and Technology participated in site visits for the Initial Feasibility Study.

WEPP4 - Bankable energy yield assessment  
WEPP4 is expected after a full 12 months’ data collected, with report to be submitted June/July 2015.

Output/Outcome: RECBP  
Renewable Energy Capacity Building programme - Higher Education Institutions, trainers and entrepreneurs have the knowledge of renewable energy to support the effective development of the renewable energy sector to provide development benefits for rural communities.

RECPB1 – Training - Additional / enhance curriculum and courses with RET focus / Workforce training with scholarships  
1 curriculum offered by Mzuzu University  
> Courses offered at Mzuzu University and WASHTED  
> 8 Handbooks developed by WASHTED  
> 3 new courses held in two locations; Chikhwawa and Mulanje  
> 150 people trained in renewable energy: Appreciation of RE and Design / Install / Maintenance of RE tech in rural communities.

RECPB2 – Research Programme – (1) Students on scholarship programme.  
(2) Evidence generation and research publication supporting the RE sector in Malawi  
(1) No MPhil programme in place.  
(2) No baseline  
(1) MPhil programme established at University of Malawi Polytechnic. 13 MPhil students on track to complete studies and programme by end of 2015.  
(2) Reports and publications produced referencing MREAP:  
> Solar PV Sustainability Study (forthcoming)  
> Remote monitoring of off-grid renewable energy Case studies in rural Malawi, Zambia, and Gambia (2012)  
> Eternal Light: Ingredients for Sustainable Off-Grid Energy Development (2014)  
> An integrated approach to energy for development: Case study of the Malawi Renewable Energy Acceleration Programme (2013)  
> Effectiveness of Remote monitoring rollout in Chikhwawa (2015)  
> Policy support options for Community Energy in Malawi (2015)  
> Methodology for Needs Analysis for community energy projects (2015)  
> Teacher Retention Study (2015)  
> Solar PV system design for community energy projects in Malawi (2015)

RECPB3 – Entrepreneurship - fund to stimulate RE activities / Malawi awards?  
learning from all grants with individual reports and overall learning paper on entrepreneurship and RE M-RET award  
14 Grants Awarded:  
> 1x proof of concept  
> 1x Business Plan  
> 12x Commercialization  
Case study for selected projects

RECPB4 – Remote Monitoring - Advanced prototyping and small-scale deployment  
Designs for Remote monitoring  
RECPB4 - Remote monitoring installed and functional at 4 locations in Chikhwawa. Remote monitoring Report Produced

RECPB5 – Enhance Data Management - Fully scope out the user requirements, possible architectures, implementation options and associated costs of options for enhance MREAP data Management.  
Pilot inventory through evaluation work. User requirement report to be prepared. Include possible alternative linkages and process.  
Solar PV Data provided to conruema network for inclusion in the database.
**RISKS IDENTIFIED IN THE ORIGINAL PROJECT APPLICATION AND ACTIONS TAKEN IN RESPONSE**

<table>
<thead>
<tr>
<th>Risk realised</th>
<th>Action taken</th>
</tr>
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<tbody>
<tr>
<td><strong>RECBP</strong>: Malawian academic institutions resource and staffing availability to develop and deliver new courses</td>
<td>Development of MPhil programme - Revision of timelines for the development of MPhil programme (later) so the academic procedure of establishing this programme could complete in order. Delivery of MPhil programme – Academics were identified from other University of Malawi colleges and Mzuzu University to fill the lack of the qualified supervisors needed for the programme.</td>
</tr>
<tr>
<td><strong>WEPP</strong>: Delivery to Malawi and installation of wind measurement masts Medium – transit or customs delay or damage in transit a possibility</td>
<td>Reduced scope to two wind measurement masts; agreed no-cost extension for Bankable Yield reporting.</td>
</tr>
<tr>
<td><strong>RECBP</strong>: Lack of suitable bids for entrepreneur fund</td>
<td>Provision of mentoring from Polytechnic staff to advise grant winners. Granted a higher than anticipated of relatively larger commercialisation (12x) grants rather than business plan awards (1x) /proof of concept grants (1x).</td>
</tr>
<tr>
<td><strong>CEDP</strong>: Successful agreement for engagement with Opportunity international Bank</td>
<td>The provision of loans was removed – CEDP only offered grants which are less difficult to manage. A new organisation and required processes were developed from the ground up to handle grant funding process (with the oversight of CES) – called Community Energy Malawi.</td>
</tr>
<tr>
<td><strong>RECBP</strong>: Administration of scholarship and entrepreneur funding</td>
<td>Strathclyde worked with WASHTED to develop REEF grant process, evaluation approach, as well as M&amp;E approach. In retrospect, we would recommend further capacity building with the granting organisation itself to ensure adequate promotion of the programme, a more streamlined granting process, higher standards of acceptance, and more robust M&amp;E.</td>
</tr>
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</table>

**SOME EXAMPLES OF EFFECTIVE PARTNERSHIP WORKING WITHIN MREAP**

MREAP consisted of 10 partners: 4 in Scotland and 6 in Malawi (including CEM here as a unique organisation). Within the programme there were many useful cross-overs of knowledge and experience that were complementary to the programme outcomes.

- The relationship between CES and the Strategic Energy Partners (Mzuni, Washted, MuREA, and Concern Universal) was critical in building up the knowledge of CEM’s development officers on renewable energy technologies and ensured the community engagement process was appropriate for Malawi and effective. SEP currently sit on the board of CEM in an advisory role.
- IOD PARC and the University of Strathclyde were key in the development of skills and tools needed to implement the M&E Framework. This was critical for producing evidence and learning from the programme.
- The focus of REEF and the MPhil programme developed WASHTED could be described ‘community renewable energy’, which is direct result of the MREAP motivation and interaction with MREAP partners including other SEPs. As a result, several research projects were focused on improving technologies used MREAP e.g. (Solar PV, micro-hydro, biogas) and the REEF projects had similar focus in many cases e.g. Biogas, Solar PV
- Strathclyde, IOD PARC, and WASHTED were partners in the joint publication of several academic papers (see logframe for list of publications)

Outside of the interaction between core MREAP partners, we interacted with the wider community effectively:

- The programme steering group meeting provided a forum for discussion and learning channelled to the wider sector. Throughout the years, the PSG meetings were attended by: Department of Energy

- The partnership between Community Energy Malawi and the 12 communities based organisations themselves deserves special mention. The inclusive, bottom-up engagement approach taken by CEM with the communities has led to a strong sense of ownership and empowerment with these projects.
- Though limited in its scope, SgurrEnergy and the Malawian Department of Energy Affairs conducted capacity building for wind feasibility during the initial feasibility study.

**MREAP Sustainability**

There are two aspects to sustainability for MREAP: Sustainability of the results of the programme, and the sustainability of the Community Energy Projects themselves.

**Sustainability of CE Projects**

Key factors demonstrating programme sustainability across the CEDP portfolio and approach are: strong quality control through MERA accredited contractors and inspectors; clear roles and responsibilities between CBO and EMC; strong emphasis from the start on building and sustaining community ownership; conducting business planning and starting small social enterprises (solar lantern sales and/or cookstove production) to generate income for O&M of main system; and crucially that all social enterprises are generating income at 6 months.

The analysis of system sustainability during the process evaluation found that 93% of the total number of CEDP systems reviewed are functional. Questions remain however over the readiness of the local markets for the systems but at the household level people are already benefiting from increased lighting and improved energy efficiency.

- The cookstove producer groups’ sustainability will depend on increasing adoption rates and rolling out appropriate marketing.
- Currently there are problems because some of the community members are failing to pay off their outstanding balances for the lanterns. Adopting a commercial model for CBOs takes time for people to accept, many people thought the lanterns were a donation. It also appears that management of the solar lanterns (i.e. social enterprise) may be best done by a local entrepreneur in the community.
- Six CEDP systems have been identified as damaged as a result of the severe flooding in Malawi in January 2015 which raise questions as to the readiness of all projects to withstand extreme weather effects.
- However it is the vulnerability of CEM, with no core funding at present to take it past March 2015, which has the potential to undermine all the gains in capital (as per sustainable livelihoods model). If core funding is not found then the analysis of lifecycle costs suggests that 2 out of 3 projects could fail before 3 years, all factors remaining equal.

It is too early still to judge the sustainability of the CEDP projects given the evaluation was carried out with only 6 months of performance data and projects themselves can have lifetimes lasting over a decade, so it was recommended that a follow up evaluation is done in 2 or 3 years’ time to validate the initial results. The results also need to be understood in context. The Solar PV sustainability study found that for lighting loads, only 42% of 188 rooms surveyed throughout Malawian public service institutions were meeting usage.
expectations. It bodes well for the sustainability of CEDP projects that they exhibit a strong sense of community ownership and are realizing financial performance which far exceed comparable community energy off-grid projects surveyed.

### Sustainability of Results of the Programme

MREAP provided key “non-direct” results that will improve the enabling environment, many of which are long-lasting. A list of “Learning Products” created under MREAP is shown below with a short description. These documents provide useful knowledge to the community energy sector and have been shared widely.

- **Community Renewable Energy Toolkit** for Malawi – Aimed to people and communities looking for more information on how to develop a community energy project in Malawi. The primary toolkit (a large written document) was aimed more at development workers, the secondary toolkit (small booklet and a series of images) captured key messages from the primary toolkit and was aimed at community members with lower literacy levels
- **Community Energy Data** collected on the Sustainability of the Solar PV System in rural schools and Health Centres as well as the CEDP Projects has been shared with the Cooperation Network for Renewable Energy in Malawi (CONREMA) database
- **MREAP Process Evaluation** – provides a critical perspective to judge the CEDP process experience
- **Solar PV and Teacher Satisfaction Study** in rural Malawi
- **Off Grid Solar PV Sustainability at Community Institutions in Malawi**
- **MREAP Policy Options to Support Energy for Development**
- **Malawi Wind Energy Bankable Yield Report** (DUE 6/2015) – This will form the basis for development of large scale wind in two locations in Malawi
- **Improvements sustainability of off-grid community solar PV through remote monitoring**
- **Improved design for Solar PV installations in Malawi**
- **Entrepreneurship in Malawi through the REEF Programme**
- **Development of Malawi’s first Renewable Energy MPhil programme**
- **Methodology for Solar PV Needs Assessment**
- **System Revitalization Report**
- **Case studies on Biogas, Solar PV, Micro-hydro**

In addition we have facilitated and contributed to networks which create and strengthen relationships between key stakeholders in Malawi including the Department of Energy Affairs, practitioners, Malawian communities, and educators. Our Programme Steering Group Meetings allowed MREAP partners to regularly engage with the Department of Energy Affairs to ensure results / learning was being transferred to our colleagues. The Community Energy Conference in 2014 brought Malawian communities together, for the first time ever in Malawi, to discuss real impacts and challenges of Community Energy Projects. This was also attended by Scottish representatives in community energy, Malawian academics, Malawian Government, UNDP, and NGOs working in community energy in Malawi. Finally, through the efforts of the Institutional Support strand, we facilitated a round table between Scottish Government and Malawian Government to establish a formal support mechanism. Though no secondee has been appointed as yet, we were critical in establishing the need for this relationship.

Further information may be obtained from MREAP webpages hosted by University of Strathclyde, or from the MREAP Programme Lead – Peter Dauenhauer [peter.dauenhauer@strath.ac.uk](mailto:peter.dauenhauer@strath.ac.uk)  0141 444 7266.

[Report prepared by Peter Dauenhauer and George Bell, Department of Electronic & Electrical Engineering, University of Strathclyde, Glasgow.]