A) General Information

Acronym:	**SWT-AFPM**
Title of the User-Project:	**Comparison of locally manufactured AFPM generator technologies for wind applications and field testing of small wind turbines**
TA Call:	**31st March 2013**
Host Research Infrastructure:	**Institute of Communication and ComputerSystems-National Technical University of Athens (ICCS-NTUA)**
Starting Date:	**02/9/13**
End Date:	**14/9/13**
Lead User :	**Jon Sumanik-Leary**
Organization:	**The University of Sheffield, UK**
Additional Users:	**Kimon Silwal (KAPEG, Nepal), Tom Wastling (The University of Sheffield, UK)**

B) Summary of the User-Project

Axial Flux Permanent Magnet (AFPM) generators are used in locally manufactured wind turbine technology to provide access to electricity to remote communities that are out of reach of conventional centralised grid infrastructure. The aims of this DERri-funded research project are:

- To compare AFPM generators constructed using neodymium and ferrite magnetic material using the bench testing rig at the ICCS-NTUA and procedure documented during the previous DERri-funded project, AFPM-W-H.
- Power Performance test in the field for the neodymium magnetic material small wind turbine in NTUA's test site. Production of the small wind turbines' power curve, power coefficient and energy yield for different mean wind speeds.
- Operation and maintenance guidelines for users and installers of the technology, by direct comparison of simple testing techniques that can be conducted in the field with only basic tools (multimeter, camera, timer etc.) with those conducted in the laboratory.

C) Main Achievements (Expected Results)

Neodymium magnets create a much more powerful field than ferrite, so much less magnetic material is required, making neodymium generators lighter and smaller. However, corrosion problems can be severe and the only source for the raw material is China, making prices extremely volatile and raising questions about the sustainability of the continued extraction of this rare earth metal. This study will provide concrete data with which to compare these two options in terms of technical performance, economics and sustainability.

Both neodymium and ferrite generators rated at 850W were tested at the ICCS-NTUA bench testing facility (see Figure 1) and the neodymium generator was installed at a small wind turbine test site to collect data from the field (see Figure 2).

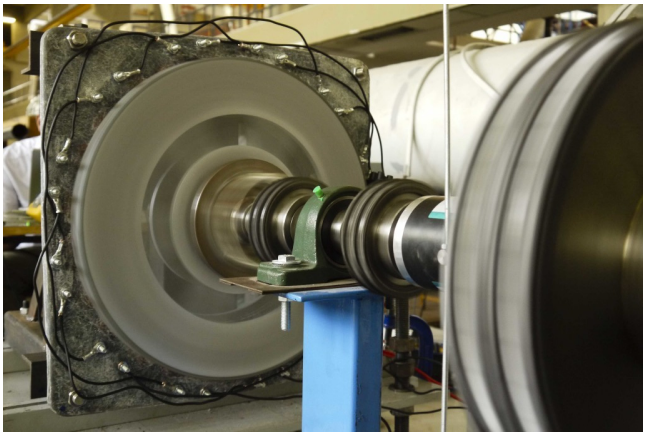

Figure 1: 850W ferrite generator under test at the ICCS-NTUA laboratory.

Figure 2: Installation of the neodymium generator at the small wind turbine test site.

D) Dissemination of the Results (Planned)

An introduction to the project has already been posted on the web site of the international association, WindEmpowerment. When completed, the technical report will be available for download from this site, alongside that of the previous DERri project, AFPM-W-H. To gain further exposure, a webinar is also planned through this platform after submission of the results to a relevant peer-reviewed academic journal, such as Wind Engineering. The results of the study will also contribute to a field guide for AFPM wind turbine installers to enable them to characterise the performance of the machines they are installing and diagnose any potential faults.

E) Use of the Resources (Expected)
Nr. of Users involved: 3
Access Days: 10
Stay Days: Jon Sumanik-Leary (15), Kimon Silwal (16), Tom Wastling (14).