A) General Information

Acronym: ROSEDN

Title of the User-Project:	**Robust State Estimation using Smart Meters for Distribution Networks with a Large Penetration of Distributed Energy Resources**
TA Call:	
Host Research Infrastructure:	**RSE- DER TF**
Starting Date:	**July 31 2012**
End Date:	**August 3 2012**
Lead User :	**Jianzhong Wu**
Organization:	**Institute of Energy, School of Engineering, Cardiff University**
Additional Users:	**-**

B) Summary of the User-Project

Smart meters, with the associated ICT infrastructure, can greatly improve observability of distribution networks with high penetrations of distributed energy resources (DER). Improved observability will allow the networks, and the DER, to be controlled more effectively and utilization of the assets improved. State estimation is a technique to clean up errors in measurements and estimate the system state. The measurement configuration (type, location, accuracy of measurements) has a large impact on the estimate quality. Based on the test facility (DER-TF) provided by RSE, a robust state estimation method developed in Cardiff was tested to provide robustness in both measurement space (considering the error distribution) and factor space (considering the measurement configurations). Three test systems were set up based on the DER-TF considering the network topology and DER connection to implement three operation scenarios which have been investigated in the proposed project. Each test system was operated for 1 day and all operating information has been collected and processed by the state estimator (measurements were recorded for every 10 seconds). Detailed analysis has been carried out both on site in RSE and in Cardiff to investigate the technical feasibility and key technologies of using robust state estimation to increase the observability of the distribution system, especially with smart meters and large DER penetration. The research work has been undertaken successfully based on the close collaboration between the investigator from Cardiff and the experts in RSE. The test results are very promising. A technical report for the DERri project describing the research work and the output has been submitted. The research output is being summarised in one research paper collaborating with RSE. The link between Cardiff University and the DERri consortium has been further strengthened by the proposed research, and will contribute to an integrated European research capability.

C) Main Achievements

a. The performance of the robust state estimator has been validated;

b. The impact of measurements configurations on the state estimation output was quantified;

c. The necessity of the introduction of state estimator into the future network operation was demonstrated.

d. The collaboration between RSE and Cardiff was strengthened.

D) Dissemination of the Results

The research output from the ROSEDN project is being summarized in a research paper which will

be submitted in peer-reviewed journals/conferences, and will be disseminated in the project meetings of other related research consortium, e.g. EPSRC HubNet, Top and Tail, and IOSM. The investigators will disseminate the ROSEDN findings in future EU centered international conferences, e.g. CIRED and IEEE PES ISGT Europe.

E) Use of the Resources (Expected)

Nr. of Users involved:	**1**
Access Days:	**4**
Stay Days:	**4**