Secondment Report

FELLOW: Dr Alessandra Bigongiari – Keele University (**Task 2.5**)
DATES: 02/02/2015-07/04/2015
HOSTING INSTITUTION: Ansaldo Energia
SECONDMENT LOCATION: Ansaldo Energia, Via Nicola Lorenzi 8, 16152 Genova (Italy)

Aim of the secondment: The secondment at Ansaldo Energia was meant to complement the theoretical and numerical work that I have been doing at Keele University with applications to industrial gas turbines. Dmytro Iurashev, the TANGO fellow who is doing his PhD at Ansaldo Energia, has been doing numerical work applied to industrial gas turbines and we planned to compare his results with those obtained at Keele, to validate the two different methods and modeling approaches.
Technical work: The first one-two weeks of the secondment were spent in the presentation and discussion of recent results obtained at Keele and at Ansaldo Energia, to the staff involved in TANGO.
Dmytro has been working on flame models to be applied to a BRS burner. He has been using an open source CFD code, Open FOAM, and performed RANS simulations reproducing the experimental geometry used at TUM. The analysis performed at Keele instead, makes use of the Green's function of the burner in 1D. The latter does not directly model the hydrodynamic region (where turbulent or 2D processes may be present) and the flame, which is represented through a heat release rate correlation. The advantage of using a 2D-3D solver is the possibility to test different flame models and reproduce multi-dimensional processes in complicated geometries. However this approach requires an important computational effort, which could be significantly reduced by restricting the range of relevant parameters. This can be achieved using the Green's function approach, which can rapidly provide the stability maps and time evolution of the perturbation for a 'network model' where the acoustic input of different 3D features is included via a correlation.
Therefore, to compare the two models we have analyzed the response of the flame to acoustic perturbations, studying the Flame Transfer Function (FTF) of the BRS burner, using as starting point the FTF measurements performed at TUM by Komarek. I have found an analytical expression for the FTF, extracted a heat release rate relationship to be used in my model and performed time-evolution simulations. The best representation of the delayed response of the flame was found when assuming the presence of a distribution for the time lag(s). At the same time Dmytro has been testing different flame models and flame parameters to extract the FTF.
Hosting arrangements: I was provided with a desk and computer in the same office as Dmytro. The workspace where I have been staying was mostly organized as an 'open space', which allowed me to rapidly integrate in my working group and with the rest of the staff on the same floor.
Accommodation and facilities at the hosting institution: The hosting institution has conventions with some hotels in the area but for a long stay as a secondment it is preferable to find a short-term rental.
During my stay I could use the canteen at Ansaldo premises and the shuttle bus to reach the nearest metro station.
In addition, I was allowed to use a conference room with Wi-Fi access to communicate with my supervisor in Keele.