European Research Infrastructure supporting Smart Grid Systems Technology Development, Validation and Roll Out

TRANSNATIONAL ACCESS
USER PROJECT FACT SHEET

USER PROJECT

Acronym	HaRMoNic
Title	Enhanced Generic Load Modelling using Harmonic Profiles
ERIGrid Reference	**02.013.2016**
TA Call No.	**2**

HOST RESEARCH INFRASTRUCTURE

Name	Distribution Network and Protection (D-NAP) Laboratory, Glasgow,		
Country	United Kingdom		
Start date	**27/11/2017**	**Nº of Access days**	**15**
End date	**15/12/2017**	**Nº of Stay days**	**24**

## USER GROUP

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1. USER PROJECT SUMMARY (objectives, set-up, methodology, approach, motivation)

Scope of HARMONIC is to develop generic models of active distribution networks and microgrids, applicable for dynamic simulations over a wide range of operating conditions.

Special emphasis is given on data processing, filtering and smoothing techniques, in order to investigate their efficiency, accuracy and impact on the developed load models and subsequent parameters. Moreover, a generic modelling procedure is proposed, supported by a disaggregation technique based on the analysis of the network harmonic profile of the examined network to enhance and improve the accuracy and applicability of the derived models.

Experimental measurements are used to investigate, develop and evaluate the proposed methodology under real-world operating conditions. The proposed methodology is a three-step approach (as shown in the Figure) including first the processing and analysis of the recorded responses, next the fine-tuning of the model parameters from measurements using proper identification techniques and finally the generalization of the derived models, in order to apply to a wide range of operating conditions. In the latter different techniques, e.g. statistical analysis are combined with network decomposition information obtained from the analysis of the corresponding harmonic profile.
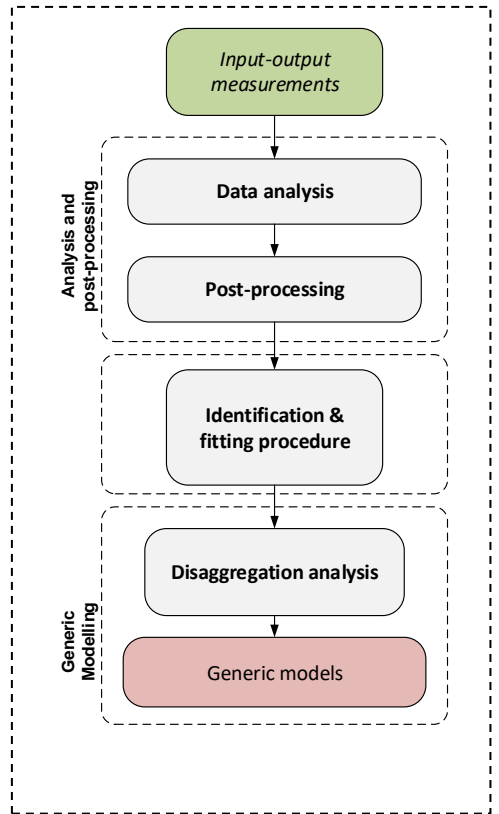
2. MAIN ACHIEVEMENTS (results, conclusions, lessons learned)

The main achievements of HaRMoNic are listed below.

Achievement 1: *Comprehensive online and event-oriented identification and modelling procedure*

HaRMoNic proposes a complete parameter identification procedure, consisting of several supporting processing procedures, to derive accurate models of active distribution networks and microgrids based on measurements. The included processing and analysis routines will improve the quality of the measured responses and thus the accuracy of the derived models.

Achievement 2: *Enhance simulations for validation and verification using low-order models of electrical power system components*

The derived electrical power system models are characterized by low complexity; thus, they can facilitate and reduce the computational burden of the simulation procedure of the overall power system, due to the short computation time and the small memory consumption requirements.

Achievement 3: *Incorporate a new generic modelling procedure to develop and update models of active distribution networks and microgrids*

HaRMoNic integrates generic modelling techniques as new procedures for the calculation of the model parameters, suitable to be applied for a wide range of operating conditions. The proposed methodology is taking advantage of measurements. The proposed procedure combines the use of dynamic responses to calculate the model parameters as well as harmonic network profiles to decompose the aggregated load to simpler specified groups of systems components. The proposed tool can be applied to a wide range of operating conditions to analyze the dynamic performance of active distribution networks and microgrids, e.g. in stability studies.

Therefore, HaRMoNic contributes to facilitate and improve the development of smart grids, involving researchers from the energy domain, while targeting to develop an integrated modelling procedure oriented to smart grid environments by adopting an online and event-oriented procedure to develop generic load network models from measurements. Therefore, in a general framework, the proposed project contributes to the achievement of the targets set by the ERIGrid project, in the frame of the Horizon 2020 Programme.

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3. PLANNED DISSEMINATION OF RESULTS (journals, conferences, others)

Dissemination results include the writing:
- A conference paper, possibly to 2019 IEEE PowerTech Milan (PowerTech 2019).
- A journal paper possibly to IEEE Transactions on Power Delivery or IET Generation Transmission and Distribution.