

## United Kingdom Generic Distribution System

### Introduction

Meeting the government's objectives for distributed generation by 2010 requires the development of new tools, methods and technologies. Research, development and testing of these new tools, methods and technologies require appropriate test platforms.

The United Kingdom Generic Distribution System (UKGDS) provides common resources for the simulation and analysis of the impact of distributed generation. It provides test and demonstration platforms that provide a means of consistent comparison of novel technical solutions. The purpose of the UKGDS is to help facilitate the innovation that is essential to meet 2010 objectives, within the Centre, within DNOs and elsewhere in the academic, industrial and utility sectors.

The UKGDS comprises multiple network models that are representative of UK networks but suited to the testing and evaluation of new concepts. These are of varying scope and complexity to provide a suitably broad resource. Appropriate characteristic load profiles and typical generation patterns are also provided to support temporal analysis.

### Standard Data Format

Within the project a new data format was developed to represent the UKGDS models. This facilitates the creation of conversion tools to different proprietary formats and enhances the opportunities for sharing the UKGDS.

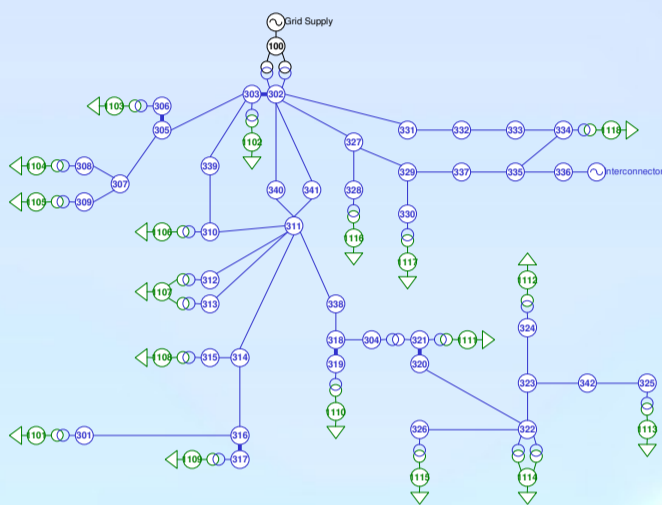
Defining the data format required an assessment of the requirements that it must fulfil. This included an assessment of the data required to perform the desired analysis in three proprietary software formats. The use in other projects, possible future extensions and the availability of data also influenced the standard format to some degree.

### Ofgem LTDS Consultation

As a primary source of data, the Long Term Development Statements (LTDSs) issued by Distribution Network Operators (DNOs) in Great Britain were reviewed. The review served as a contribution from the Centre to the Ofgem consultation on LTDSs.

#### UKGDS1-EHV1

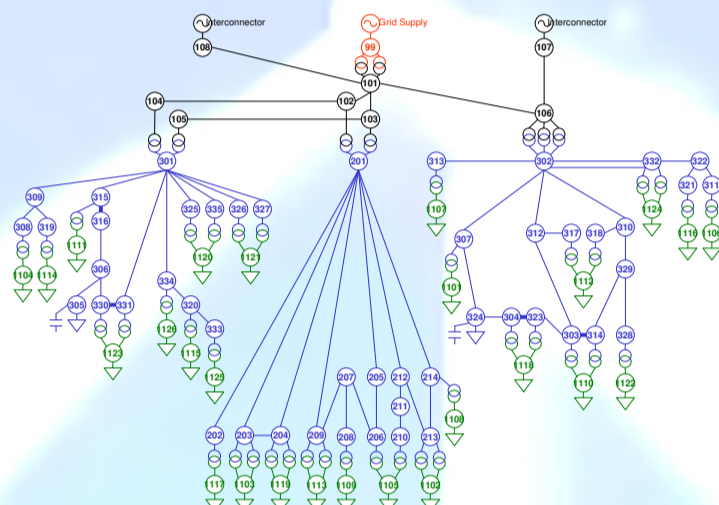
"The small rural network with a sub-sea cable"



The EHV1 model is a 33kV rural network fed from a 132kV supply point. The network has long lines, including a sub-sea cable between buses 318 and 304, leading to voltage problems at the extremities of the network. The high-level characteristics of this model are as follows: rural area; long circuit length; low customer density; overhead construction; radial topology; and small overall size.

#### UKGDS1-EHV2

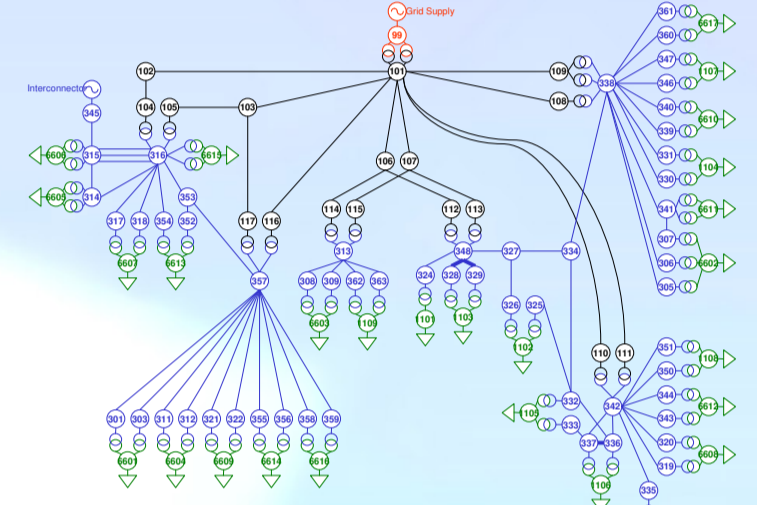
"The large rural network"



The EHV2 model is a large rural network with interconnection at 132kV and three separate 33kV sub-networks. Some of the 33kV networks are looped but voltage problems still arise and are alleviated with shunt capacitors. The high-level characteristics of this model are as follows: rural area; long circuit length; low customer density; mixed construction; radial topology; and large overall size.

#### UKGDS1-EHV3

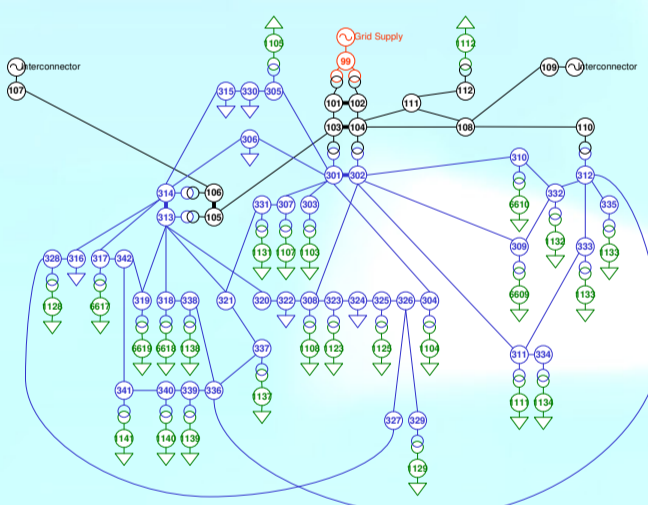
"The radial suburban network"



The EHV3 model represents a suburban area with mixed construction. The topology is mostly radial but with some interconnection within the network and links to neighbouring 33kV networks. The high-level characteristics of this model are as follows: suburban area; medium circuit length; medium customer density; mixed construction; radial topology; and large overall size.

#### UKGDS1-EHV4

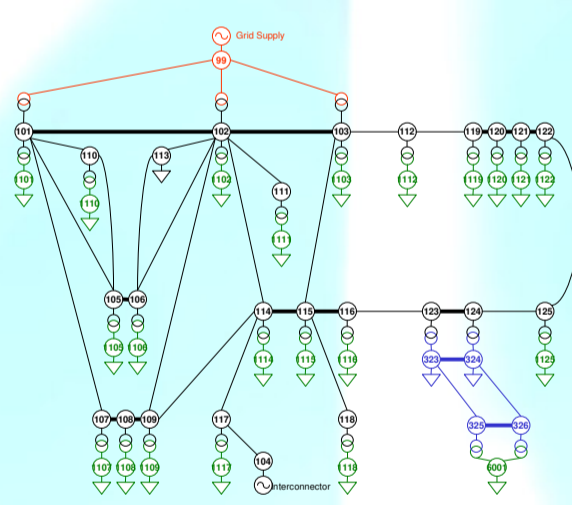
"The meshed suburban network"



The EHV4 model represents a suburban, meshed network. There are interconnections to neighbouring networks at 132kV. The high-level characteristics of this model are as follows: suburban area; medium circuit length; medium customer density; mixed construction; meshed topology; and small overall size.

#### UKGDS1-EHV5

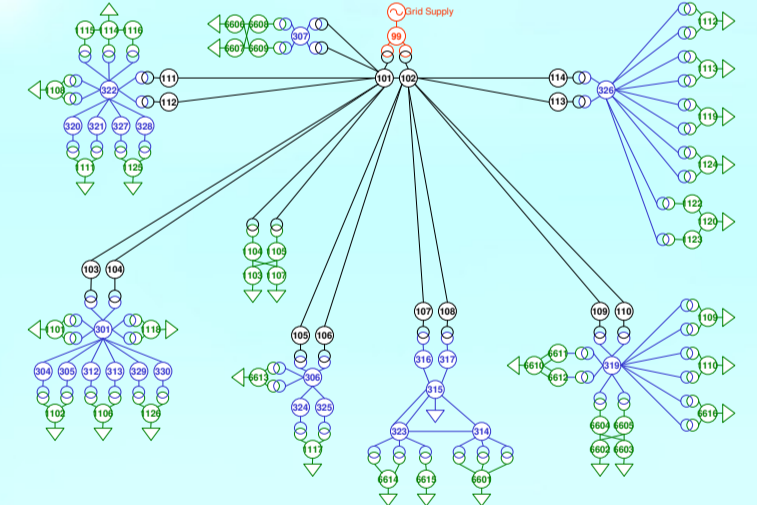
"The meshed urban network"



The EHV5 model is a meshed, urban network with mostly direct 132/11kV transformation but with a disturbing load connected through 33/6.6kV transformers. The high-level characteristics of this model are as follows: urban area; short circuit length; high customer density; underground construction; meshed topology; and small overall size.

#### UKGDS1-EHV6

"The radial urban network"



The EHV6 model represents an underground, urban network. The topology is strongly radial with conventional 132/33kV and 33/11kV transformation. The high-level characteristics of this model are as follows: urban area; short circuit length; high customer density; underground construction; radial topology; and large overall size.

### Further Information and Feedback

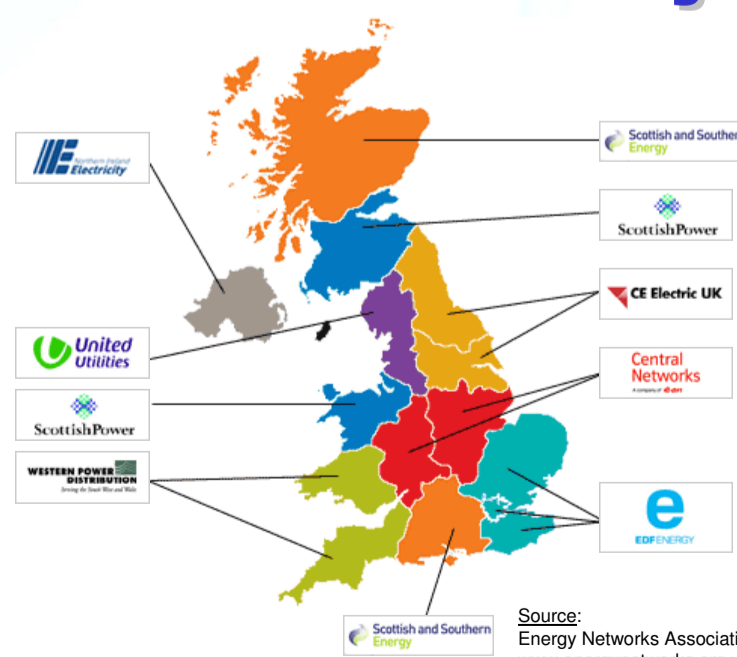
We want the UKGDS to become as widely used as possible. If you require further information or have particular queries then please get in touch. We are interested in how the UKGDS is used so we encourage you to keep us informed of how you are using it. The UKGDS will be updated in response to feedback from users. So all comments on the UKGDS resources, their strengths and weaknesses, are welcome. The intention is to expand the resources available by extending the range of data provided to facilitate other types of analysis. For example, reliability, cost or machine dynamic data may be provided. If you have particular requirements that you would like to see incorporated then please let us know.

Visit the UKGDS web site:  
[www.sedg.ac.uk/ukgds](http://www.sedg.ac.uk/ukgds)

## Typical Networks Project

It was recognised that the Distributed Generation Coordinating Group's (DGSG) Technical Steering Group's (TSG) Work Stream 5 (WS5) project P08a on the "Development of Typical UK Distribution Networks" had strong synergies with the UKGDS project. The objective was to make available a set of real-world network models that are identified as being "typical" and so provide a useful resource for research, development and testing.

Network data is publicly available in the Long Term Development Statements (LTDS). The project was to identify around three Grid Supply Points in each DNO area that together provide a representative sample of what is typical in that area. The data describing these Typical Networks was then to be extracted from the LTDS and presented in a form making it easy to pick up and use.



The identification and preliminary development of Typical Networks was performed within the UKGDS project, proving a useful step in the development of generic network models. The UKGDS standard format was selected as the data format for the Typical Networks. Ultimately, the provision of typical, real-life network models alongside stylised, generic network models will offer a more comprehensive set of modelling resources for those wanting to test and develop new DG-related technologies and methods.