

# ANALYSIS OF PRACTICAL EXPERIENCE ON INTEGRATION OF GEOINFORMATION SYSTEMS FOR MANAGEMENT OF ELECTRICAL GRID ASSETS

D. A. Utts, S. V. Svechkarev

National Research Tomsk Polytechnic University, Tomsk, Russian Federation

E-mail: [utts\\_d@outlook.com](mailto:utts_d@outlook.com), [svech@tpu.ru](mailto:svech@tpu.ru)

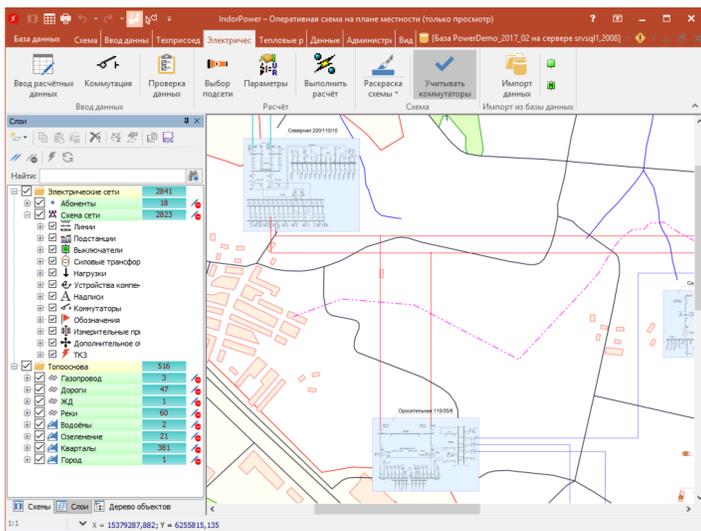
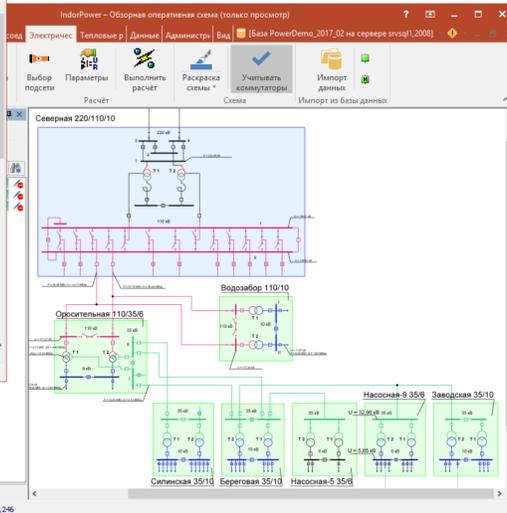


Figure 1. Example of GIS software



Geographic information systems (GIS) are currently employed by many distributed generation owners and distribution grid operators in Russia. Use of such systems allows to perform the following tasks:

1. Improving the organization level and manageability of electrical network enterprises.
  2. Management of repairs and equipment maintenance.
  3. Simulation of normal and forced modes of electrical networks.
  4. Performing calculations of short-circuit currents, determining relay protection and automation settings, checking the selectivity of the protection settings.
  5. Solution of network development problems involving GIS technologies.
  6. Automatic generation of periodic reporting documentation.
  7. Determination of the optimal routes for the movement of the repair crews, taking into account the condition of roads, the load capacity of bridges, etc.
- Figure 1 shows an example of GIS software (IndorSoft, Russia), with the ability to create a database of power equipment on a digital terrain map and dispatch schemes.

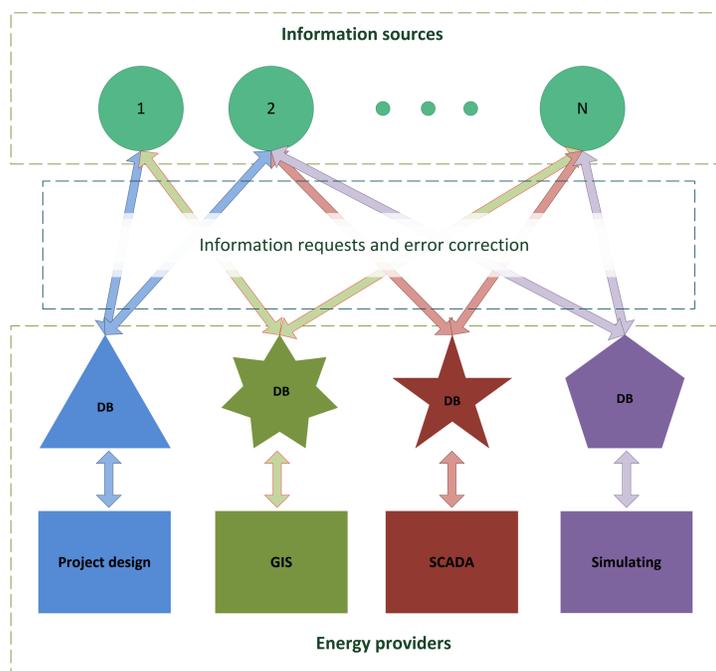


Figure 2. Functional diagram of the current data input on the parameters of electrical equipment

Each software offers its users a set of reference data of electrical equipment parameters obtained from different sources (Figure 2). This leads to the following problems:

1. **Inaccuracy of information from several sources.** Multiple duplication of information leads to errors in duplicate sources.
2. **Inaccessibility of information.** Experience in the search for parameters of electrical equipment shows that it is almost impossible to find the necessary data.
3. **Diversity of information representation.** In various directories, the same parameters are represented in different forms. The heterogeneity of the presentation of information requires certain knowledge on their redefinition, which is also a source of error.
4. **A large set of specialized directories.** In most cases, users have to use a large set of specialized directories in which information is provided according to their own rules.
5. **Obsolescence of information.** The rate of appearance of new products on the market is increasing, especially this is due to the use of microprocessor devices. Therefore, the reference information quickly becomes obsolete, it needs to be constantly updated.

## Objective

Creating a unified information resource in Russia, providing users with information about the documented data of equipment in a convenient form (tables, parameter libraries, CIM-objects libraries).

As a result of the work done, the concept of creating a single information resource of reference information of electrical equipment based on CIM-models (Figure 3) was formulated to solve the following problems:

1. Storage of reference information.
2. Correction of erroneous data, constant monitoring.
3. Standardization of data representation (use of certain terms and mathematical models).
4. Providing Users with the latest version of unified information.
5. Receiving information from the information producers and adding it to the library. Collecting the information from open sources.

Figure 4 shows a fragment of the editor of CIM-objects (JSC "Monitor Electric", Russia).

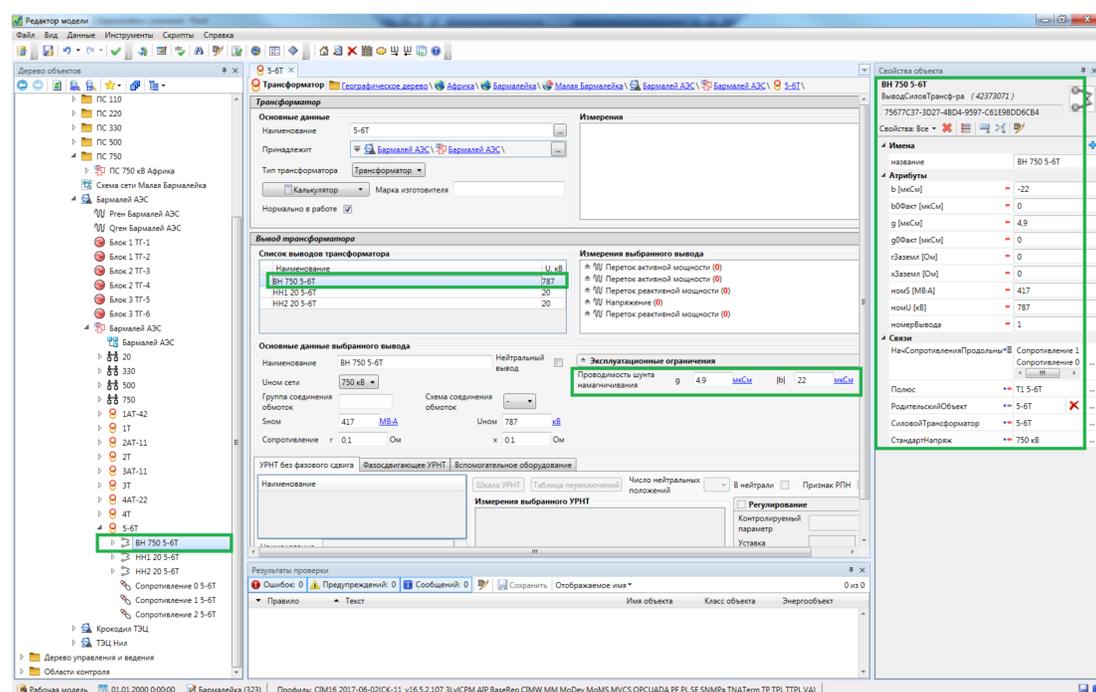


Figure 4. CIM object editor example

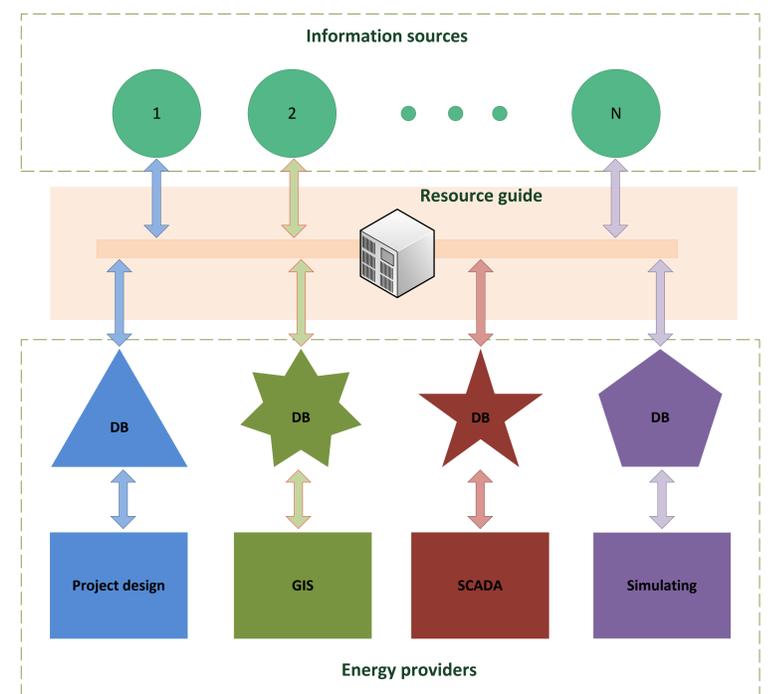


Figure 3. Functional diagram of data input of electrical equipment parameters through common reference of CIM-objects

**Materials and Methods:** The main method is structural analysis based on the paradigm of object-oriented programming and the design of distributed information systems.

**Conclusions:** The obtained results will allow reducing overall costs and time of GIS based systems integration at electrical grid utilities of Russia.

## Partners:

- JSC "Monitor Electric", Russia.
- «IndorSoft», Russia.