



## Web Consultation – benefits and drawbacks of developing the FlexPlan grid planning tool as a cloud-based service

The FlexPlan project aims at creating an innovative grid-planning methodology and a corresponding tool considering the opportunity to introduce new storage technologies and flexibility resources in electricity transmission and distribution grids as an alternative to traditional grid investments, such as building new lines or reinforcing existing ones.

With the definition of the new grid-planning methodology finalized (see our recently published deliverable: [Probabilistic optimization of T&D systems planning with high grid flexibility and its scalability](#)), one of the current key activities of the project is to design, develop and test an efficient grid-planning software implementing the defined methodology.

The newly defined grid-planning methodology is very ambitious and has for objective to go beyond the state of the art of current planning methodologies by integrating the following innovative features:

- evaluation of the **best planning strategy** by simultaneously analysing a large number of expansion candidates provided by a pre-processor
- **integrated** planning of **transmission** and **distribution** networks
- **simultaneous** assessment of **medium** and **long-term** planning over three target years
- full incorporation of **cost-benefit analysis** criteria into the objective function
- integrated **environmental analysis** (air quality, carbon footprint and landscape constraints)
- **probabilistic contingency analysis** methodology replacing the traditional N-1 criterion
- consideration of the impact of the **variability** of the annual **time series** of renewable energies and load through a Monte-Carlo process.

This ambitious methodology makes the implementation of the planning software a challenging activity and induce that a significant amount of data will need to be sent to and processed by the tool (in particular transmission and distribution grid data as well as Monte-Carlo variants of yearly load and generation time-series for three different grid years).

In order to ease the development and testing process of the planning software, the consortium has therefore decided to develop the FlexPlan grid planning tool as a cloud-based service. This choice therefore means that the tool will be hosted in the Amazon Web Services (AWS) cloud and available to the users through a web Application Programming Interface (API) and later through a Graphical User Interface (GUI).

On one hand, the development of the FlexPlan planning tool as a cloud-based service is bringing many benefits for both the users and the developers. Some of the advantages which can be straightforwardly identified are:

- easy deployment for the developers and seamless integration for the users (no installation/deployment needed for the users)
- possibility of automated, frequent and seamless updates allowing an agile process between the users and the developers to quickly and easily include new requirements
- automatic detection of technical and availability issues



- easy access for the development team to error information and context, easy reproduction of bugs, easy deployment of fixes
- easy scaling and resizing of the hardware
- contractual and technical facility to bundle license-based closed source external libraries (IBM ILOG CPLEX) allowing to reach higher performances

On the other hand, the choice to develop the FlexPlan planning tool as a cloud-based service also means that the data processed by the tool has to leave the user's premises to be sent to the cloud in order to be analysed. This operating mode can also bring concerns and drawbacks for the users such as:

- fear that the data is not transferred and processed in a secure way or that the data will be persisted forever by the cloud-based service
- overhead time for data transfer leading to poor performances
- no control by the user on the availability of the solution and no direct access to the logs

As the ultimate goal of the FlexPlan project is to develop a planning software which could really be used by grid planning decision makers, mainly System Operators, the following questions have been identified in order to orient the future choices linked to the development of our service:

1. **[State of Play]** Before going into more detailed questions: is your company already using cloud-based services (such as web applications)? Or do you exclusively use on-premise services? Are there some activities for which your company allows the use of cloud-based services and others for which it is forbidden? Are there some specific data which are not allowed to leave your premises? If you do use cloud-services, what are these services (name, functionality, provider...)?
2. **[Benefits]** In the context of the project, developing the FlexPlan planning tool as a cloud-based service is bringing many benefits in terms of agility, scalability and ease of adoption (described above). If you had to use or participate in the development of the FlexPlan planning tool, would you consider these benefits as valuable? Have you encountered such benefits or additional ones when using/developing another cloud-based service?
3. **[Concerns]** However, from the point of view of the real usage (future exploitation), a System Operator could feel it unacceptable to use a cloud-based service due to security concerns or pose limitations. Then, we must be aware of the implementation of the FlexPlan planning tool in order to comply with security constraints. Would you have these concerns or other ones if you were using the FlexPlan planning tool? What is the current policy in your organization regarding data security?
4. **[Security]** To make the FlexPlan planning tool appropriately secured, HTTPS data transfer is used and the service is protected with IP whitelisting and basic authentication (username + password). Additionally, no data is persisted to drives after processing ("stateless"). Would these security mechanisms bring you confidence to use the FlexPlan planning tool? Do you consider some of them as unneeded? Would you require other security mechanisms to use the FlexPlan planning tool? A foreseen alternative to IP whitelisting was to implement a Web Application Firewall (WAF). Would your answers be different in that case?



5. **[Challenges]** The “stateless” operation of the FlexPlan planning tool prevents us to adopt a database which would simplify a lot the input data management. One of the main challenges that we are facing in the project is therefore the ability to transfer a large amount of data in a reasonable time to the cloud service. Have you already faced similar or different challenges when using/developing another cloud-based service? What workarounds did you use/implement to mitigate your challenges? Would you agree to use the FlexPlan planning tool if your data was saved in a database as long as your request is successfully acknowledged on your side? What would be the conditions?