Reconductoring Economic and Financial Analysis (REFA) Tool

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Project Statement

Berkeley Lab has developed the first version of the Reconductoring Economic and Financial Analysis (REFA) tool.
REFA allows transmission planners to understand financial, environmental and economic benefits of reconductoring upgrades, using traditional or advanced conductors.
The tool allows grid planners and utilities to demonstrate the entire lifetime value of reconductoring projects, providing potential justifications for projects with higher Capex.

Motivation

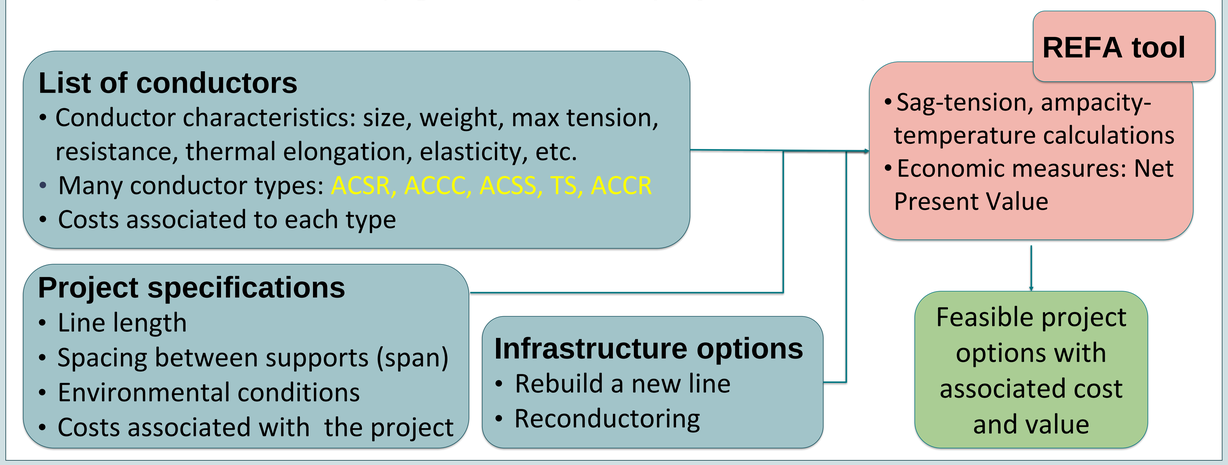
Existing tools are designed to compare the benefits of different conductor applications. **They typically do not allow a cost-benefit analysis over the lifetime** of the conductor's operations.
Interviews with utilities/experts, review of relevant state-of-the-art on the topic, and collection of costs and lifetime data indicate that utilities and grid operators opt for reconductoring with advanced conductors in very specific situations, namely:

- When sag is binding (clearance issues);
- When there is still significant remaining lifetime in towers.

Current REFA Functionalities

The current version of the REFA tool runs a cost-benefit analysis of a line upgrade project for different infrastructure investment options, including full rebuild or reconductoring.
In practice, for a given analysis, the user can:

- Specify the location of the line upgrade project, for the tool to retrieve basic line information from available geographic and transmission system data;
- Obtain a set of **all feasible conductors** for the specific project by using the **standard sag-tension and temperature-ampacity** calculations as constraints;
- Compare infrastructure investment options (reconductoring or rebuild) for each project, considering the full **net present value** of a project;
- Compare the **economic performance of different conductor types** (conventional and advanced conductors) for each application and identify least-cost solutions;
- Capture **the value of advanced conductors under different conditions**, including:
  - Technical project requirements (capacity, clearance);
  - Project applications (e.g. reconductoring or rebuild);
  - Value streams (e.g. cost of losses);
  - Economic parameters (e.g. cost of capital, project horizon).



Comparison To Existing Tools

Compared to other software, REFA allows for:

- Cost-benefit analysis;
- Life-cycle assessment;
- An intuitive and user-friendly project specification and display of results.

What REFA does not do ?

The objective of the REFA tool is to provide **a simple and practical calculation** of the overall economic and financial performance of reconductoring solutions, including advanced conductor technology solutions. As such, REFA does not conduct:

- System-specific transmission expansion planning optimization;
- Detailed studies on material properties;
- Field testing on accelerated aging.

Planned Improvements

For the upcoming beta version of the REFA tool, work will be directed to:

- Add more conductor types and sizes;
- Introduce infrastructure investment options such as voltage upgrade and circuit addition.

The goal is to have a fast, simple, and intuitive version 1 of the tool that can be used by grid planners and further improved in future activities.

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