

OPTIMAL POWER FLOW COMPUTATIONS USING KNITRO



“Knitro corresponds perfectly to Tractebel Engineering expectations of the current state-of-the-art. It helps us a lot in developing our Security Constrained Optimal Power Flow applications.”

*Ludovic PLATBROOD,
Design Engineer – Power System Consulting
Tractebel*

Business Case: Tractebel Engineering – Optimizing electricity transmission system management

Tractebel Engineering is a Belgium-based, international energy and service company specializing in gas, electricity generation and management, and engineering. Tractebel is a subsidiary of GDF SUEZ Energy Services.

Tractebel Engineering develops analysis and planning tools, such as Optimal Power Flow solvers (OPF), for large-scale power grids. Potential applications of OPF are the estimation of the grid state (voltages and phase angles), contingency analysis and remedial actions, voltage stability analysis, total transfer capacity estimation and security-constrained economic dispatch. Such applications are computationally extremely demanding and require a powerful nonlinear solver able to handle very large optimization problems.

Knitro is a numerical solver especially designed to solve such challenging, large-scale nonlinear optimization problems.

The solver has been developed by Ziena Optimization. Artelys distributes and supports Knitro worldwide.

Knitro is able to handle nonlinearities in power flows equations, and therefore allows for the calculation of the output of generating units at minimum cost, taking into account both resistive and inductance-based line losses, real and reactive power and all other features of AC power flows that cannot be captured by (approximate) DC OPF computations based on linear optimization techniques.

Knitro is a high performance, robust, easy to use and versatile (three different and complementary algorithms are available) tool.

Tractebel chose Knitro for the computation of large-scale AC OPF. Its features make it a very powerful tool in Energy Management Systems (EMS), from short-term operational computations to long-range planning studies.

Project objectives:

- Power Loss Minimization
- Security-constrained economic dispatch (base-case dispatch that can be adapted to contingency states without loss-of-load)

Key advantages of Knitro:

- Efficient large-scale computations thanks to two different state-of-the-art interior point algorithms based on sparse linear algebra
- Additional active-set algorithm adapted to medium-size problems with good warm-restart capabilities



In brief:

Client: Tractebel Engineering – **Location:** Brussels –BELGIUM – **Project partners:** Ziena Optimization – Artelys - **Project summary:** Optimizing electricity transmission system management

Tractebel Engineering key figures: Tractebel is a worldwide company present in more than 20 countries with projects in 80 countries. With 3,300 employees, the company's revenue in 2009 was € 460 million.



info@artelys.com
www.artelys.com

Artelys S.A. – 12 rue du Quatre Septembre – 75002 PARIS – FRANCE
Artelys Corp. – 150 N Michigan Avenue, Suite 800 –CHICAGO, ILLINOIS 60601 – USA