

Announcing WeakLinks Professional™

- ✓ *Evaluates the stability of power transfers across vast interconnected systems*
- ✓ *Identifies and ranks the stability constrained links within the network*
- ✓ *Uses a solution technique that's field proven, fast and robust*
- ✓ *Is suitable for off-line and real-time applications*



Energy Consulting International, Inc. (ECI) together with ECI-Europe Co., S.R.L. announced new products and services that will help system operators to enhance the operating reliability of transmission systems and reduce the risk of blackouts due to instability. In addition to the field-proven QuickStab® Professional, ECI is now offering the WeakLinks Professional™ software. Powered by WeakLinks Finder™, this application evaluates the stability margins across user-defined and/or program-identified transmission paths and detects the stability constrained links within the power system.

"The ability to transfer power across vast interconnected networks without getting too close to the power system's stability limits has been, and continues to be, a key concern for the reliable operation of modern transmission systems", said Dr. Ing. Marius Pomarleanu, developer of WeakLinks Finder™. "In addition to conventional security assessment, it is of paramount importance to evaluate the maximum transfer capability across certain transmission paths when load increases and/or generation outages in a system area need to be compensated by raising the generation elsewhere, a common scenario in electricity market operations."

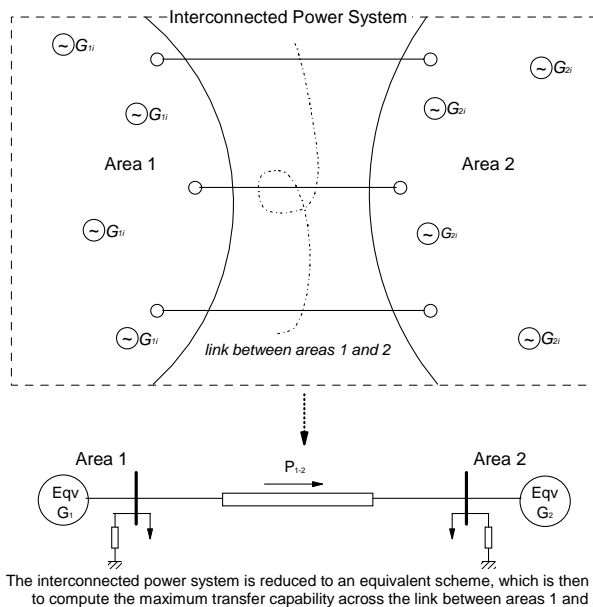


Figure 1 -- A "link" separates the interconnected power system in two areas

Problem Statement

A "link" identifies a group of transmission lines that form a topological cut-set, i.e., their removal splits the network in two areas, one on each side of the link. The maximum power that can be transferred across the link is limited by thermal and stability constraints. The stability constraint is referred to as the link's *stability reserve* and can be quantified by the additional amount of power that can be sent from one side to the other side without causing instability. This *indicator* can be expressed either in MW or in percentage from the maximum link loading.

The concept of "stability constrained link" is similar to the concept of "congestion path" but it is concerned with stability, rather than thermal, violations. Stability constrained links may appear in any multi-area power system where large MW blocks are transferred between weakly interconnected areas. This is often the case in longitudinal transmission networks that span distinct system areas with significant load-generation unbalances.

The analysis of recent blackouts due to instability revealed that most of them follow a similar pattern:

- Large MW blocks are transferred from areas with inexpensively priced energy toward areas where the load demand had increased due to an actual increase in load, or perhaps because one or several local generating units are outaged
- As a result, certain links get loaded closer and closer to their stability limits and their stability reserves get smaller and smaller

- At this moment a forced outage takes place
- Since the link was already operating within a small margin, the incident quickly evolves into a cascading event, the physical phenomena leading to blackout are triggered, and the widespread disturbance becomes unavoidable.

The detection of critical links is intrinsically difficult. To begin with, the search of all the possible links entails a graph topological procedure that may find hundreds of thousands of links even for moderately sized networks. Then, a stability criterion needs to be applied to compute the maximum transfer limit of each link. Finally, the most dangerous links must be identified.

Solution

This complex problem is solved quite expeditiously by WeakLinks Finder™, which is the computational engine of WeakLinks Professional™. Given a load-flow case or a state estimate, the program:

- Detects the links, computes the stability reserve for each one of them, and ranks the links in the order of their distance to the maximum transfer capability between the areas connected by the link
- Recommends a control strategy, i.e., *raise* or *lower* the MW output of certain machines, which can help increase the stability reserve of each link
- Performs the same calculations on *user-defined links*. The speed of the algorithm makes it possible to almost instantly evaluate postulated power transfers between areas known *a priori* to have stability limitations -- as often as needed, for each transaction, off-line, and in real-time.

Unique Features and Benefits

WeakLinks Professional™ is offered both as a stand-alone package and seamlessly integrated with the field-proven QuickStab® Professional. QuickStab® is used in real-time and off-line to quantify the risk of blackout due to voltage and steady-state instability and stands out because of its speed and intuitive graphics.

Together, WeakLinks and QuickStab® form a fast, versatile and indispensable tool that can assist utilities to avoid the penalties, loss of revenues, and inconvenience caused by blackouts due to instability.

Contact Us

For additional information or to schedule a demo please visit our web <http://www.eciqs.com> or contact us by phone (212) 913-9154, e-mail info@eciqs.com or in writing: *Energy Consulting International, Inc.*, 405 Lexington Avenue 26th Floor, New York, NY 10174.