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<b>Title</b>	<b>:-</b>	<b>Assessment and Enhancement of Available Transfer Capability under Deregulated Environment</b>

## **ABSTRACT**

Indian power sector has taken a new shape with enactment of EA 2003 and the recent initiatives taken by Government of India. The utilities widely adhere to bilateral and open-bidding transaction models to achieve full scale benefits of electricity industry deregulation i.e. to achieve customer satisfaction and promote competition. This research work has contributed towards proving that the index Available Transfer Capability (ATC) can be used in these models to monitor and enhance system security alongside controlling the access of electricity buyers and sellers to the transmission network.

This necessitates real-time determination of ATC with an acceptable accuracy considering a wide variety of transaction points (source-sink bus pair), base case and outage i.e. contingency scenarios. Secure operation of power systems has been a challenging task in the monopolistic structure as well as the emerging competitive structure of the electricity supply industries. System security must be ensured by the system operator while permitting an open access to transmission network to all the participants and allowing the contractual power flow.

Available Transfer Capability (ATC) is the transfer capability remaining in a physical power transmission network for further commercial trading. To maximize the utilization/usage of existing transmission system, ATC of a transmission system needs to be evaluated accurately. ATC of a transmission system can be limited by various static constraints, such as

line flow limit, bus voltage limit and dynamic constraints, such as small signal stability limit, transient stability limit and voltage stability limit. The system operator needs to post the ATC values at short intervals on the web based system for its optimum commercial use. This necessitates the fast assessment of static ATC. Flexible AC Transmission System (FACTS) controllers, such as Static Synchronous Series Compensator (SSSC), Thyristor Controlled Series Compensator (TCSC) and Unified Power Flow Controller (UPFC), are becoming increasingly popular in the power system networks for providing reactive power supports and/or to control line real and reactive power flows. These controllers also help in enhancing the ATC of the transmission systems. This thesis addresses the issue of fast and accurate calculation of static ATC. It also deals with enhancing the static ATC by using FACTS controllers.

## **Findings**

A summary of the main findings of the research work carried out in this thesis and main contributions of the thesis are as following:

- Suggested various ATC determination methods along with their unique characteristics/advantages.
- Proposed a method/approach to incorporate the effect of reactive power flows in transmission system, resulting in significant error reduction in linear ATC.
- Development of a method that first determines the reactive power flows using the exact circle equation for the transmission line complex flow, and then determines ATC using active power distribution factors and its (i.e. ATC) enhancement using different FACTS devices/Controllers.