

## **TUTORIAL #2**

***Sunday, May 1, 2005, Time: 1:00PM to 5:00PM***

***Location: 2A23 Engineering, University of Saskatchewan***

**Tuition fee: \$30.00**

(Tuition fee includes notes, refreshments during coffee break and transportation between the conference hotel and workshop)

## **PSCAD/EMTDC Transients Simulation Workshop**

*Dr. Dharshana Muthumuni*

*Simulation Research and Support Engineer*

*Manitoba HVDC Research Centre*

### **Contents:**

The workshop will cover the following. The participants will have the simulation examples loaded on their workshop computers. After a brief explanation, they will open and run these examples to understand the basic considerations.

- 1) Short Discussion on the fundamentals of transient simulation.*
- 2) Simple hands on tutorial to develop a simulation case in PSCAD/EMTDC.*
- 3) Discussion of simulation examples in the following areas*
  - a) Traditional power system studies*
    - 1) Transient over voltage studies*
    - 2) Transient Recovery over voltage studies*
    - 3) Transformer inrush*
    - 4) Faults*
    - 5) Ferro- resonance*
  - b) Distribution network examples*
    - 1) Grounding issues*
    - 2) Lightning strikes on distribution transformers*
    - 3) Capacitor bank resonance*
  - c) Motors and generators*
    - 1) Induction machine*
      - Starting issues*
      - Soft starting mechanisms*
      - Application in wind farms (doubly fed machines)*
    - 2) Synchronous machine*

- *Stability examples*
- *Sub synchronous resonance*

*d) Power electronics*

- 1) *HVDC converters*
- 2) *SVC*
- 3) *Motor drives*

*e) Power quality*

- 1) *Voltage flicker and fluctuations*
- 2) *Harmonics*
- 3) *Filters*

*f) Wind farm application examples*

*g) Distributed generation*

- 1) *Diesel*
- 2) *Wind*
- 3) *Solar cells and batteries*
- 4) *Fuel cells*

*h) Other examples*

- 1) *All electric ships*

**Speaker Biography:**

**D. Muthumuni (M'00)** obtained his Ph.D. degree from the University of Manitoba in 2001. He is employed as a Simulation Support and Research Engineer at the Manitoba HVDC Research Centre. Dr. Muthumuni's research interests include power systems transient simulation issues, simulation of magnetic core saturation effects in machines and transformers and wind power integration issues. At the Centre he has taken an active role in developing new models of power system apparatus for transient simulation studies, as well as being actively involved with providing technical support to users.