AMENDMENT

Please note that there are some small errors in the signs of equations in the beginning of Section V. Below is the corrected text.

V. CONTROL STRATEGIES

The excitation control law for E_{fi} must maximize the negative value of $\dot{V}$ at any instant in time. This control law will then bring the system back to the equilibrium point as quickly as possible. Substituting the values obtained from (4) into (30) yields

$$\dot{V} = -\sum_{i=1}^{n} D_i \Delta\omega_i^2 - \sum_{i=1}^{n} \frac{1}{T'_{d0i}} \frac{1}{\Delta X_{di}} \left(E_{qi} - \hat{E}_{qi} \right)^2 + \dot{V}_{E_f} \qquad (31)$$

where

$$\dot{V}_{E_f} = \sum_{i=1}^{n} \frac{1}{T'_{d0i}} \frac{1}{\Delta X_{di}} \left(E_{fi} - \hat{E}_{fi} \right)\left(E_{qi} - \hat{E}_{qi} \right) \qquad (32)$$

The first and the second components in (31) are negative semi-definite and always contribute to the overall system damping. The third component is given by (32) and it is this component that is influenced by the excitation control. Equation (32) is determined by the sum over all the generators of

$$\varepsilon_i = \left(E_{fi} - \hat{E}_{fi} \right) \left(E_{qi} - \hat{E}_{qi} \right) \qquad (33)$$

Consequently (32) is at its negative maximum when each of the components of the sum, ε_i, is at its negative maximum. This means that at any instant in the transient state the excitation voltage must be such that, after taking into account any constraints on E_{fi}, (33) is negative and maximal. This condition is satisfied by the control law

$$\left(E_{fi} - \hat{E}_{fi} \right) = -K_i \left(E_{qi} - \hat{E}_{qi} \right) \qquad (34)$$