

# **A method for evaluating frequency regulation in an electrical grid - Part I: theory**

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## **Abstract-**

**The first part of this two-part paper proposes a technique that consists in the measurement, through phasor measurement units, of bus frequency variations to estimate the rate of change of regulated power, and in the definition of a local index that is able to discriminate between devices that modify the frequency at the connection bus and devices that do not. A taxonomy of devices based on their ability to modify locally the frequency is proposed. A byproduct of such an index is to estimate the inertia or equivalent inertia of the monitored device. The proposed index is shown to be a relevant consequence of the concept of frequency divider formula recently published by the authors on the IEEE Transactions on Power Systems. The properties of the proposed index is illustrated through examples based on the synchronous machine and its controllers.**

**Index Terms- Primary frequency control, inertial response, phasor measurement unit (PMU), converter-interfaced generation.**

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