About

Provide general information regarding the described key performance indicator (KPI).

Name of KPI *Provide a meaningful, descriptive name for the KPI (e.g., primary energy savings).*	Voltage deviation index
Symbol of KPI *Provide the symbol used to refer to this KPI (e.g., E_{tot}, CTR).*	Vd
Contextual information *Add any information relating this KPI to a specific use case, test case or system configuration.*	A voltage deviation indicates the difference between the nominal voltage and the actual voltage at a given bus in the power system

Classification

Describe the KPI.

Group	☐ economic ☐ **technical** ☐ environmental ☐ other, please specify:
Domain	☐ electrical storage ☐ thermal storage ☐ **electrical network** ☐ thermal network ☐ energy conversion device ☐ other, please specify:
Definition incl. justification *Provide a textual description of the KPI. What does it do and what is it good for? Also explain other*	This KPI is used to evaluate the voltage deviation level compared to the reference value/scenario.

parameters that the KPI / design parameter depends on.	
Significance *Provide an explanation of the significance of the KPI. Why is it important?*	The voltage deviation is used to compare the voltage level at given conditions to the normal operation and/or grid code regulation. In this way, an appropriate measure can take place to tackle the voltage deviation at the given bus.
Calculation *Specify how the KPI is calculated (mathematical equation). Please use in this definition the KPI symbol defined above, e.g.,* $E_{tot} = f(a, b, c)$.	Voltage deviation is normally calculated by comparing the actual voltage to the nominal voltage. The voltage deviation index (VDI) can also be defined as an absolute value of bus voltage deviation compared to 1 per unit. The VDI is based on the sum of N voltage deviations calculated separately for each bus in all systems as given in Equation (1), and generalized in Equation (2): $VDI_j = \|1 - V_j\|$ (1) $VDI_T = \sum_{j=1}^{N} \|1 - V_j\|$ (2) where: N is the number of buses under study Vj is the target value for index calculation
Strengths and weaknesses *What aspects are covered well by the KPI? What aspects does it not cover well?*	This KPI is well-known to be used as the reference to indicate whether the voltage level complies or violates the grid code regulation. It can represent in the percentage or normalized value.
Scoring / categorization *What values of the KPI are typically considered good or bad?*	

Data requirements

This section provides additional information about what data is required to calculate the KPI.

Expected data source *Where do you usually get the data from to calculate this KPI (in real life)?*	Either by the measurement or simulation.
Data collection interval	Normally, it is 15-min interval but depending on the experiment context, it can vary. It depends on the experiment objective whether to investigate at a given time or a period. If

When collecting data to calculate the KPI, how many measurements do you need? And with which time resolution?	it is a period of 24 hours, a peak demand day, a low demand day and high feed-in from DERs should be included for the investigation.
Expected reliability *How reliable is the typically available data for calculating the KPI?*	This KPI is useful and reliable to evaluate the voltage deviation of the system.

Additional Information

Provide any other additional information here.

Similar / related KPIs	Voltage Stability Index (VSI), Voltage Stability Factor (VSF)
Related publications	Danish, M.S.S.; Senjyu, T.; Danish, S.M.S.; Sabory, N.R.; K, N.; Mandal, P. A Recap of Voltage Stability Indices in the Past Three Decades. *Energies* **2019**, *12*, 1544. https://doi.org/10.3390/en12081544 L. Li, L. Wang, C. Sheng, W. Sun and Y. Li, "Analysis on voltage deviation inactive distribution network and active voltage management," *2014 China International Conference on Electricity Distribution (CICED)*, 2014, pp. 1610-1614, doi: 10.1109/CICED.2014.6991978. Casavola, A., Franzè, G., Menniti, D., & Sorrentino, N. (2011). Voltage regulation in distribution networks in the presence of distributed generation: A voltage set-point reconfiguration approach. In Electric Power Systems Research (Vol. 81, Issue 1, pp. 25–34). Elsevier BV. https://doi.org/10.1016/j.epsr.2010.07.009
Additional comments	This KPI varies by the country and the context. It should be discussed for the reference value to compare with the actual voltage. Some may use the grid code value as the reference but the normal operation value can also be applied in some contexts.