# Standard vocabulary used for performance indicators / Termes standards utilisés pour les Indicateurs de performance

| Version | Date | Modification | Auteur | Vérificateur | Approbateur |
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| 01 | 15/10/2013 | Monitoring specifications addition | A.PAILHES | C. FILIPE | K. NESTA |
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*State:*

Ci-dessous, la liste des termes à employer pour les indicateurs de performance / Hereunder, the list of names to use for performance indicators of solar projects.

Termes issus d'un développement interne Schneider Electric ou externe à =S=, ces termes sont recommandés dans tout plan ou document technique ayant pour objet les indicateurs de performance / Schneider Electric supply or from outside =S=, these terms shall be employed in each document relating of performance indicators. The highlighted standardized terms (CEI, IEC) shall be used in priority / les termes normatifs (CEI 61724, IEC 61724) surlignés devraient être utilisés en priorité.

# I) GENERAL GLOSSARY

| English<br>French | Formula / formule | Comments / commentaires |
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| | | |
| METEROLOGY / METEOROLOGIE | | |
| $G_I$ | / | - Global irradiance, in the plane of the array ($W.m^{-2}$)<br>- Irradiance globale dans le plan des modules ($W.m^{-2}$) |
| $G_{I,ref}$<br>$G_{ref}$ | / | Reference irradiation (=1000 W/m² for STC, power by unit surface)<br>Irradiance de reference (=1000W/m² à STC, puissance surfacique) |
| $H_I$<br>$H_i$ | / | Solar energy measured during $\Delta t$ time (unit: Wh/m², energy by surface unit) by a solar sensor (pyranometer or else) in the plane of the array<br>Energie solaire mesurée pendant un temps $\Delta t$ par un capteur solaire (pyrano ou autre) unité: Wh/m², énergie par unité de surface, dans le plan des modules ($W.m^{-2}$) |
| $G_H$ | | Global horizontal irradiance ($W.m^{-2}$)<br>Irradiance globale horizontale ($W.m^{-2}$) |
| $H_H$ | | Global horizontal irradiance coming from the weather station (Wh/m²)<br>Irradiance horizontale (Wh/m²) |
| $T_{am}$, $T_a$ | / | - ambient air temperature in a radiation shield (°C)<br>- température de l'air ambiant sous abri (°C) |
| $S_W$ | / | -wind speed ($m.s^{-1}$)<br>-vitesse du vent ($m.s^{-1}$) |
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| PHOTOVOLTAIC ARRAY / CHAMP DE MODULES PHOTOVOLTAIQUES | | |
| $V_A$ | / | - Array output voltage (V)<br>- Tension en sortie de champ (V) |
| $I_A$ | / | - Array output current (A)<br>- Courant en sortie de champ(A) |
| $P_A$ | / | - Array output power (kW)<br>- Puissance en sortie de champ (kW) |
| $P_0$, $W_c$, $P_c$, $P_p$ | / | - array's rated output power (kW)<br>- Puissance crête nominale du champ (kW) |
| $T_m$ | / | Module temperature (°C) |

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| | | Température du module (°C) |
| $\Phi_T$ | / | Tracker tilt angle (degrees) |
| $\Phi_A$ | / | Tracker azimuth angle (degrees) |
| PV string | / | - Modules mounted in serial including pv string overcurrent protection device and pv string disconnection device<br>- Ensemble de modules montés en série (protections surintensité et interrupteur comprises) |
| PV array | / | - Strings mounted in parallel (including pv array overcurrent protection device and pv array disconnection device) or pv sub-arrays<br>- Ensembles de strings montées en parallèle (protections surintensité et interrupteur comprises) ou de sous-champs constituant un champ |
| PV sub-array | / | - the portion of an array that can be considered as a unit<br>- partie du champ ayant les mêmes caractéristiques que le champ lui-même (sous-champ) |
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| UTILITY GRID / RESEAU ELECTRIQUE | | |
| $V_U$ | / | - Utility voltage (V)<br>- Tension du reseau électrique (V) |
| $I_{TU}$ | / | - Current to utility grid (A)<br>- Courant injecté sur le réseau électrique (A) |
| $I_{FU}$ | / | - Current from utility grid (A)<br>- Courant consommé sur le réseau électrique (A) |
| $P_{TU}$ | / | - Power to utility grid (kW)<br>- Puissance injectée vers le réseau électrique (kW) |
| $P_{FU}$ | / | - Power from utility grid (kW)<br>- Puissance consommé sur le réseau (kW) |
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| ELECTRICAL ENERGY QUANTITIES | | |
| $E_A$ | / | - array energy (unit: kWh)<br>- energie produite par le champ (unité: kwh) |
| $E_{TUN}$, $E_{real}$, $E_{prod}$, $E_{réelle}$, $E_{prod}$ | / | - Real energy = produced energy = sold energy measured at the plant battery limit by the energy meter (unit: kWh)=Energy To Utility Net ($E_{TUN}$).<br>- Energie réelle = énergie produite = énergie vendue mesurée au poste de livraison par l'appareil de mesure (unité : kWh) |
| $E_{FUN}$, $E_{consommée}$ $E_{sout}$ | / | - consumed energy from grid (from utility net) (kWh)<br>- énergie consommée sur le réseau (kWh) |

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| $E_{ideal}$<br>$E_{idéale}$ | $E_{ideal} = \frac{H_I}{G_{I,ref}} * P_0$ | - Ideal DC energy / energy obtained during t time, if PV modules were performing at 25℃ without any losses, depending only on irradiation $H_I$ and STC power $P_0$ (unit: kWh)<br>- Energie DC idéale obtenue par un fonctionnement idéal des modules PV à 25℃ ( et sans aucunes pertes) qui dépend uniquement de l'irradiance $H_I$ pendant le temps t et de la puissance STC $P_0$ (unité : kWh) |
| $E_{theoretical}$<br>$E_{théorique}$ | $E_{theoretical} = PR_{ref} * E_{ideal}$<br>(for $PR_{ref}$ method)<br>(cas Méthode $PR_{ref}$) | - $E_{theoretical}$ is Energy which should be produced during unavailability time (Δt). Used with PRref calculation method (kWh)<br>- Energie qui aurait du être produite pendant (Δt) si la centrale n'avait pas eu de défaut. Energie calculée par la méthode PRref (kWh) |
| ENS<br>END | $ENS = E_{theoretical} - E_{TUN}$<br>(for $PR_{ref}$ method)<br>(cas Méthode $PR_{ref}$) | - Energy no supplied (kWh) calculated during unavailability time (Δt)<br>- Energie non distribuée (kWh) calculée pendant temps d'indisponibilité partielle |
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| SYSTEM PERFORMANCE INDICES / INDICATEURS DE PERFORMANCE | | |
| $Y_r$ | $Y_r = \frac{H_I}{G_{I,ref}}$ | - Solar reference yield (unit : h or kWh/kW)<br>- rendement de référence (unité : h ou kWh/kW) |
| $Y_f$ | $Y_f = \frac{E_{TUN}}{P_0}$ | - final PV system yied (unit : h or kWh/kWp)<br>- production normalisée du système (unité : h ou kWh/kWp) |
| $Y_A$ | $Y_A = \frac{E_A}{P_0}$ | - array yield (unit : h or kWh/kW)<br>- production spécifique du champ PV (unit : h or kWh/kWp) |
| $R_P$<br>PR<br>RP | $R_P = \frac{E_{TUN}}{E_{ideal}} = \frac{Y_f}{Y_r}$ | - $R_P$ : performance ratio / rapport de performance<br>Takes into account all losses including equipment failures<br>- $R_P$: rapport de performance<br>Celui-ci tient compte de toutes les pertes y compris les pannes |
| $PR_{cor}$<br>$RP_{cor}$<br>$R_{Pcor}$ | $R_{Pcorr} = \frac{E_{TUN} + ENS}{E_{ideal}} = \frac{E_{TUN} + ENS}{\frac{H_I}{G_{I,ref}} * P_0}$ | - $R_{Pcor}$ : corrected performance ratio<br>Doesn't take into account equipment failure (if plant was performing with a 100% AL)<br>- RPcor: rapport de performance corrigé<br>Le rapport de performance corrigé ne tient pas compte des pannes s'étant produite sur la centrale<br>(correction pour AL=100%) |
| $R_{P,ref}$, $PR_{ref}$ | / | $R_{P,ref}$ is calculated like $R_{Pcor}$ but over a fixed |

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| | | period of 30 days / $PR_{ref}$ est calculé de la meme façon que $R_{Pcor}$ mais sur une période fixée à 30 jours |
| $\eta_{BOS}$ | $\eta_{BOS} = \frac{E_{TUN}}{E_A}$ | - BOS (balance of system) efficiency (%): energy to utility net divided by array energy<br>- Efficacité du BOS (%) |
| UL | $UL = \frac{ENS}{E_{TUN} + ENS}$ | - Unavailability level<br>UL<1 calculated over one day, one month, 6 months, 1 year,…<br>- Niveau d'indisponibilité<br>UL<1 calculé sur 1 jour, 1 mois, 6 mois, 1 an,… |
| AL | $AL = \frac{E_{TUN}}{E_{TUN} + ENS}$<br><br>$AL = 1 - UL$ | - Availability level<br>AL≤1 calculated over one day, one month, 6 months, 1 year,…<br>- Niveau de disponibilité<br>AL≤1 calculé sur 1 jour, 1 mois, 6 mois, 1 an,… |
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| DATA QUALITY | | |
| $\tau$ | / | Reporting period (h) / période d'étude (h) |
| $\tau_{MA}$ | / | Duration of monitoring activity with valide data / durée de monitoring avec données valides |
| $A_{MD}$ | $A_{MD} = \frac{\tau_{MA}}{\tau}$ | Availability of monitored data / taux de dispo des données monitorées |
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## II) MONITORING GLOSSARY

*Above naming is used with specific indexes according the type of physical values (simulation, measurements,...)*

- "Date": Hour, day or month depending on the type of report (day, month or year)

### METEROLOGY

*General naming:*

- "$H_I$": Global incident irradiation of the site in the plane of the array (Wh/m²)

*Specific naming:*

- "$H_{I(xxx)}$" with xxx=measured or xxx=base
  - "$H_{I(measured)}$": Sum of irradiance measurements from site for a day / month
  - "$H_{I(base)}$": Global horizontal irradiance of the site (typical irradiance database value)

### PHOTOVOLTAIC ARRAY

*General naming:*

- "$E_A$": Sum of the DC energy from Array to the inverters of the site

*Specific naming:*

- "$E_{A(uu)}$" with: uu = PB (PVbox)
  - "$E_{A(PB)}$": Sum of the DC energy from Array to the PVBox

### ELECTRICAL ENERGY QUANTITIES

*General naming:*

- "$E_{TUN}$": active energy produced by the site
- "$E_{R,TUN}$": reactive energy produced by the site
- "$E_{FUN}$": active energy consumed by the site
- "$E_{R,FUN}$": reactive energy consumed by the site
- "$E_{OUT}$": Active energy produced by an equipment
- "$E_{IN}$": Active energy consumed by an equipment
- "$E_{aux}$": Sum of auxiliary energies of the site

*Specific naming:*

- "$E_{TUN(xxx,yy)}$" with: xxx = measured / estimated / base
  yy = availability level (AL)
  - "$E_{TUN(estimated,100\%)}$": simplified estimation of produced energy calculated with real meteo measurements, based on full availability.
  - "$E_{TUN(base,100\%)}$": Typical energy Grid, refers to the estimated production by a simulator tool such as PV Syst (energy produced estimated for the day / month for site or for PV Box) with typical meteo data.





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- o "$E_{TUN(measured,AL)}$": Produced energy measured by energy meter (at the Grid Box or at the PV Box) (coming from Schneider Electric energy meter) corresponding to real availability AL.

- "$E_{OUT(uu,xxx)}$" with: uu = PB (PVbox) or GB (Gridbox)
  xxx = measured / estimated / base
  - o "$E_{OUT(GB)}$": active energy produced by the GridBox (no detail how obtained, by default=measured)
  - o "$E_{OUT(PB)}$": active energy produced by the PVBox (no detail how obtained, by default= measured)
  - o "$E_{OUT(PB,measured)}$": active energy produced by the PV Box, measured

- "$E_{IN(uu)}$" with: uu = PB (PVbox) or GB (Gridbox)
  - o "$E_{IN(GB)}$": Active energy consumed by the GridBox
  - o "$E_{IN(PB)}$": Active energy consumed by the PVbox

- "$E_{aux(xx)}$" with xx=GB or PB
  - o "$E_{aux(PB)}$": Sum of auxiliary energies of the PVBox
  - o "$E_{aux(GB)}$": Sum of auxiliary energies of the GridBox.

## SYSTEM PERFORMANCE INDICES

### *General naming:*

- "AB": Name of AB
- "$R_{IN}$": Average ratio of currents from array boxes divided by the nominal current of IN (with N from 1 to 16).
- "DCBox / DCP": Name of DCBox and the DCP Name
- "$R_{P,Ref}$": reference performance ratio of the day (if AL calculation method based on $R_{P,Ref}$ used)
- "$ENS_U$": Energy Not Supply not due to Schneider Electric
- "$ENS_C$": Energy Not Supply due to Schneider Electric
- "AL": Global Availability
- "$AL_C$": Availability of the PV Farm due to contractor responsibilities
- "$R_P$": (global) performance ratio
- "$P_0$": total peak power (kWp)
- "$P_f$": unoperating peak power during the failure period
- "$L_{P0}$": available peak power (0 to 100%)
- $$L_{P0} = \frac{P_0 - P_f}{P_0}$$

### *Specific naming:*

- "$R_{P(xxx,yy)}$" with xxx = measured / estimated / base
  yy = AL / 100%
  - o "$R_{P(measured,AL)}$": measured performance ratio corresponding to real availability AL: it is the true performance ratio according IEC 61724 standard (failures are taken into account).
  - o "$R_{P(measured,100\%)}$": performance ratio with ENS Day (corresponding to full availability)
  - o "$R_{P(PB)}$": PV Box performance ratio (taking into account only the energy produced by the PV box)





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