**Rembrandt Koppelaar - 05 May 2018 – V3.0**

**Solar-PV and Solar-CSP Energy Input Summary Values from Spreadsheet with ALL values for 1 GW systems**

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NOTES: I still need to look at natural gas start-up energy costs in detail

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**Symbols**

/year

(approx.. range 600 – 1000 W/m2)

(assumed 15% in all calculations)

(1,000,000,000 for 1 GW plant)

(range 1.3 to 2.7)

**Formula’s**

1. CSP Aperture energy adjustment factor:
2. Formula for CSP parabolic trough excl. storage :
3. Formula for CSP-Parabolic trough + 12 h molten salt:
4. Formula for CSP-Power tower + 12 h molten salt:
5. Raw Materials extracting and processing to components (one-off):
6. Construction + Decommissioning (one-off):
7. Transport of materials (one-off):
8. Operation & maintenance (per YEAR):
9. All inputs (Lifetime):

**EXAMPLE Calculation Energy ADJUSTMENT FACTOR**

CSP parabolic trough excl. storage : = 15.02

CSP-Parabolic trough + 12 h molten salt:

CSP-Power tower + 12 h molten salt:

**ENERGY INPUT FORMULA’S**

**Solar-PV poly-crystalline 17% efficiency**

TOTAL ENERGY INPUT:

**Solar-PV mono-crystalline 24% efficiency**

TOTAL ENERGY INPUT:

**Solar-CSP Parabolic Trough no storage (ADJUSTED FOR VARIABLE DNI VIA CSP APERTURE ENERGY ADJUSTMENT FACTOR)**

1. 3,390 + 82 + 22,143 + 1,726 + 19,689 + 2,588)

TOTAL ENERGY INPUT:

**Solar-CSP Parabolic Trough no storage (Value from paper)**

TOTAL ENERGY INPUT:

**Solar-CSP Parabolic Trough 12 hours of storage (ADJUSTED FOR VARIABLE DNI VIA CSP APERTURE ENERGY ADJUSTMENT FACTOR)**

1. 4,867 + 116 + 28,874 + 2,115+ 26,065 + 3,426)
2. Correction :

TOTAL ENERGY INPUT:

**Solar-CSP HelioStat Power Tower 12 hours of storage (ADJUSTED FOR VARIABLE DNI VIA CSP APERTURE ENERGY ADJUSTMENT FACTOR)**

1. 4,692 + 32 + 25,567 + 3,007+ 16,677 + 2,192)

TOTAL ENERGY INPUT: