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## NOMENCLATURE

$A_c$	aperture area/collector area	$m^2$
$C_F$	Fuel cost/unit	-
$C_{FOM}$	Fixed O&M cost/unit	-
$C_{VOM}$	Variable O&M cost	-
$d$	Discount rate	%
$e$	Escalation Rate	%
$\dot{E}_{xs}$	Exergy input through solar radiation	-
$f$	Dilution factor	-
$h_s$	Specific enthalpy of extraction steam	$\text{kJ/kg}$
$h_w$	Specific enthalpy of feedwater	$\text{kJ/kg}$
$k$	Incidence angle modifier	-
$m_s$	Mass flow rate of extraction steam	$\text{Ton/h}$
$\dot{m}_f$	Mass flow rate of coal	$\text{kg/s}$
$n$	Life of power plant	Years
$P_G$	Generator output	$\text{kW}$
$P_{Net}$	Net annual energy generated	$\text{kWh/kW}$
$P_s$	Pressure of extraction steam	$\text{MPa}$
$Q_{abs}$	Heat absorbed by receiver tubes	$\text{W}$
$Q_{LD}$	Incident solar energy falling on the aperture of solar field	$\text{W}$
$Q_u$	Useful heat gain by heat transfer fluid over the solar field	$\text{W}$
$Q_{loss\_HCE}$	Heat losses per unit length in heat collection element (HCE)	$\text{W/m}^2$

$Q_{loss\_piping}$	Thermal losses in the piping system of the solar field	W/m <sup>2</sup>
$\dot{Q}_s$	Input energy to solar field	W/m <sup>2</sup>
$\dot{Q}_c$	Output energy from solar field	W/m <sup>2</sup>
$T_a$	Ambient temperature	K
$T_i$	Inlet temperature of solar field	K
$T_o$	Outlet temperature of solar field	K
$T_s$	Temperature of extraction steam	K
$T_{sun}$	Temperature of Sun	K
$W$	Width of mirror aperture	m
$\dot{W}_{net}$	Net electric output	MWe
$x$	Row shadow factor	-
$\beta$	Collector tilt angle	°
$\delta$	Declination angle	°
$\eta$	efficiency	%
$\eta_c$	Collection efficiency of solar collector	%
$\eta_o$	optical efficiency	%
$\phi$	Latitude angle	°
$\theta$	Incidence angle	°
$\theta_z$	Zenith angle	°
$\omega$	Hour angle	°
$\psi_c$	Specific exergy of coal	MJ/kg



## **LIST OF ABBREVIATIONS**

ACC	Annualized Capital Costs
ACoE	Annualized Cost of Electricity
APC	Auxiliary Power Consumption
APH	Air preheater
CC	Capital Cost
CERC	Central electricity regulatory commission
CFPP	Coal-fired power plant
CLFC	Compact linear Fresnel collector
CLFR	Compact linear Fresnel reflector
CPP	Coal power plant
CRF	Capital recovery factor
CRS	Central receiver system
CSP	Concentrated solar power
DCC	Direct capital costs
DNI	Direct normal irradiance
DSG	Direct steam generation
EnPI	Energy performance index
ETC	Evacuated tube collector
EV	Evaporator
ExPI	Exergy performance index
FC	Fuel cost
FCC	Fixed capital cost
FOM	Fixed operation & maintenance cost
FPC	Flat plate collector
FWH	Feedwater heater
GCV	Gross calorific value
HP	High pressure
HPFWH	High pressure feedwater heater
HTF	Heat transfer fluid

ICC	Indirect capital costs
IP	Intermediate pressure
LCoE	Levelized cost of electricity
LF	Levelizing factor
LP	Low pressure
LPFWH	Low pressure feedwater heater
MTBE	Matrix thermal balance equation
NREL	National renewable energy laboratory
PCC	Post carbon capture
PP	Power plant
PTC	Parabolic trough collector
PTC	Parabolic trough collector
RH	Reheater
SAM	System advisor model
SAPG	Solar aided power generation
SCHPG	Solar-coal-hybrid power generation
SCHPP	Solar-coal hybrid power plant
SCR	Selective catalytic reduction
SD	Solar dish
SH	Superheater
SM	Solar multiple
SPP	Simple payback period
STE	Solar thermal energy
SWH	Solar water heater
TMCR	Turbine max continuous rating
TMY	Typical Meteorological Year
TPP	Thermal power plant
TSS	Thermal storage system
UHR <sub>Net</sub>	Net unit heat rate