<table>
<thead>
<tr>
<th>Nomenclature</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D</td>
<td>two-dimensional</td>
</tr>
<tr>
<td>3D</td>
<td>three-dimensional</td>
</tr>
<tr>
<td>A</td>
<td>Ampere, area (m$^2$)</td>
</tr>
<tr>
<td>Ac</td>
<td>annual expenses (Rs.)</td>
</tr>
<tr>
<td>Ah</td>
<td>Ampere hour</td>
</tr>
<tr>
<td>ALCC</td>
<td>annual life cycle cost</td>
</tr>
<tr>
<td>ANN</td>
<td>artificial neural network</td>
</tr>
<tr>
<td>ASCS</td>
<td>additional suction creation system</td>
</tr>
<tr>
<td>B</td>
<td>impeller width (m), best efficiency point</td>
</tr>
<tr>
<td>BCR</td>
<td>benefit/cost ratio</td>
</tr>
<tr>
<td>BEP</td>
<td>best efficiency point</td>
</tr>
<tr>
<td>BGET</td>
<td>border green energy team</td>
</tr>
<tr>
<td>bhp</td>
<td>brake horse power</td>
</tr>
<tr>
<td>BR</td>
<td>blade rounded</td>
</tr>
<tr>
<td>BWRO</td>
<td>brackish water reverse osmosis</td>
</tr>
<tr>
<td>C</td>
<td>prediction coefficient, constant</td>
</tr>
<tr>
<td>CFD</td>
<td>computational fluid dynamics</td>
</tr>
<tr>
<td>Co</td>
<td>initial cost (Rs.)</td>
</tr>
<tr>
<td>CRF</td>
<td>capital recovery factor</td>
</tr>
<tr>
<td>CSHN</td>
<td>combined suction head number</td>
</tr>
<tr>
<td>CW</td>
<td>civil works</td>
</tr>
<tr>
<td>D</td>
<td>impeller diameter (m), cross-diffusion term</td>
</tr>
<tr>
<td>d</td>
<td>annual discount rate (%)</td>
</tr>
<tr>
<td>dB</td>
<td>decibel</td>
</tr>
<tr>
<td>DC</td>
<td>direct current</td>
</tr>
<tr>
<td>EGE</td>
<td>energy generation equipment</td>
</tr>
<tr>
<td>ERDs</td>
<td>energy recovery devices</td>
</tr>
<tr>
<td>ESP</td>
<td>engineering studies program</td>
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<tr>
<td>ETC</td>
<td>environmental tectonics corporation</td>
</tr>
<tr>
<td>F</td>
<td>coefficient</td>
</tr>
<tr>
<td>( \vec{F} )</td>
<td>body force (N)</td>
</tr>
</tbody>
</table>
f  frequency (Hz)
f/s  feet per second
FEM  finite element method
FFT  fast Fourier transform
ft  foot
FVM  finite volume method
G  generation
GVA  guide vane angle
GW  gigawatt
g  acceleration due to gravity (m/s²)
H  head (m), depth of draft tube (m)
h  head correction factor
HPRTs  hydraulic power recovery turbines
Hz  Hertz
I  current (A), unit tensor
IGC  induction generator controller
IRR  internal rate of return
IS  Indian standard
ISO  international organization for standardization
K, K₁  constant
k  turbulent kinetic energy (m²/s²)
KBL  Kirloskar brothers limited
kHz  kilohertz
kW  kilowatt
kWh  kilowatt hour
L  sound level (dB), equipment life, length of draft tube
LPM  liter per minute
lps  liter per second
m  meter
\( \dot{m}^+ \)  vaporization rate per unit volume (kg/s-m³)
\( \dot{m}^- \)  condensation rate per unit volume (kg/s-m³)
MATLAB  matrix laboratory
mm  milli meter
MNRE  ministry of new renewable energy
MRF  moving reference frame
MW  Megawatt
N  rotational speed (rpm)
n  rotational speed (rps), number of samples
NACA  National advisory committee for aeronautics
N_p  number of phases
NPV  net present value
N_s  specific speed
P  power (W)
p  static pressure (N/m²), number of poles
Pa  Pascal
PAT  pump as turbine
pcd  pitch circle diameter (m)
PISO  pressure-implicit with splitting of operators
PRVs  pressure reducing valves
psi  pound per square inch
PV  photovoltaic
PVC  polyvinyl chloride
Q  Discharge (m³/s), sound intensity (µPa)
q  discharge correction factor
R  radius of blade rounding (m)
r  volume fraction
RNG  renormalization group
RO  reverse osmosis
rpm  revolutions per minute
rps  revolutions per second
S  source term
s  second
SHP  small hydropower
SIMPLE  semi-implicit method for pressure-linked equations
SIMPLEC  semi-implicit method for pressure-linked equations-consistent
SS  stainless steel
SST  shear stress transport
SWRO  seawater reverse osmosis
t  blade thickness (m), time (s)
TaTEDO  Tanzania traditional energy development organization
TWh  terawatt-hour
U  velocity (m/s)
u  tangential velocity of impeller (m/s)
UNIDO  United Nations industrial development organization
UR  unrounded
URANS  unsteady Reynolds-averaged Navier-Stokes
US  United States
USD  United States dollar
usgpm  United States gallons per minute
V  voltage
v  absolute velocity
VOS  variable operating strategy
W  relative velocity
WDN  water distribution network
Y_M  contribution of the fluctuating dilatation
Z  datum head (m)

Greek symbols
α  angle made by absolute velocity, phase, inverse effective Prandtl number
β  blade angle, phase
Γ  effective diffusivity, mass flow rate per unit volume
γ  specific weight (N/m³)
ε  turbulent dissipation rate (m²/s³)
η  efficiency (%)
µ  viscosity (Ns/m²), micrometer
π  power number, constant
ρ  density of water (kg/m³)
σ  Thoma’s cavitation factor, turbulent Prandtl number
\( \phi \)  discharge number
\( \varphi \)  impeller diameter
\( \chi \)  relation between best efficiency and specific speed of pump
\( \psi \)  head number
\( \Omega \)  characteristic swirl number
\( \omega \)  specific dissipation rate \( (m^2/s^3) \)
\( \overline{T} \)  stress tensor
\( \partial \)  partial differential operator
\( \Delta \)  change in parameter
\$ \)  dollar sign

**Subscripts**

1  inlet
2  outlet
atm  atmosphere
av  average
B  vapor bubble
b  blade, best efficiency point, buoyancy
BEP  best efficiency point
con  condensation
cr  critical
crit  critical
e  kinetic energy losses, exit
f  fundamental, flow component, fluid
g  Generator, vapor bubble
h  hydraulic
i  hydraulic losses in impeller, instantaneous, input
k  turbulence kinetic energy \( (m^2/s^2) \)
l  leakage
m  motor, mechanical losses
n  net
nt  net
nuc  nucleation
| o | overall, reference standard, output |
| p | pump, peak |
| r | relative, rated value |
| s | specific |
| T | turbine |
| t | turbine, turbulent |
| u | tangential direction |
| v | volute losses, vapor bubble |
| vap | vaporization |
| w | whirl component |