Instructions

Complete cells in grey(inputs)
This will consist of selecting from drop down boxes or in
The TCO considers two types of grid scenario which shou
Stable grid float application: Stable ambient temperatu
Unreliable grid cycling: Unstable grid, warm ambient te

Definition of Terms & Parameters

Type of battery
Technology
Nominal Capacity (Label Rating) (Ah)
Service Life @ 20°C in Float Application
Cost/block
Battery Capex cost ratio
Number of blocs per string
Number of parallel strings
Installed battery capacity (Ah)
Installed battery capacity (kWh)
Total battery cost
Capex cost / 100Ah
Capex cost/ kWh
Depth of discharge
Cycles per day (Unreliable Grid)

TCO TERM
Currency
Transportation & installation costs
Overhead
Interest rate
Maintenance costs (cost per year)
Energy cost / kWh
Temperature
No. of Sites

Usable capacity (kWh)
Battery Lifetime energy throughput (kWh) (Unreliable Grid only)
No. of Battery Investments (Initial + Replacements over TCO term)
Investment over TCO Term

a) Annuity of investment

Float current (A)
Battery energy consumption / year (kWh)
Battery energy consumption cost / year
b) Maintenance and service costs /year

Total cost of ownership / year (sum a&b)
Total cost of ownership / year / kWh
TCO ratio

Savings per site
Total Savings

putting the values relative to the TCO scenario being investigated
ld be used depending on the grid conditions of the site
e, compensation to float voltage for any temperature fluctuation. No or very little cyclic use.
mperature with uncontrolled cyclic use. Medium to High cyclic use with multiple outages per week

Drop down box to select the battery technology range of interest
Dependent on the product range selected this maybe TPPL or Standard AGM such as PbCa or PbCaSn AGM technology
Insert battery capacity of interest which is being used as part of the sizing of the system
Insert either the design life of chosen battery range in stable 20°C controlled conditions or the estimated service life @ estimated optimum life (Typically for Telecom 80% of the Design Life)
Cost per 12V monobloc (in chosen currency)
Ratio calculated relative to the cost per bloc. This is normalised to the cost of the bloc from the first column
Enter number of blocs per string from sizing
Enter number of string per battery from sizing
Calculated relative to the nominal capacity of the battery and sizing (No. of blocs per string & No. of parallel strings) in A
Calculated relative to the nominal capacity of the battery and sizing (No. of blocs per string & No. of parallel strings) in k
Relative to the number of blocs in the battery and the monobloc cost
Relative to the total battery cost and 100Ah available
Relative to the total battery cost and battery capacity in kWh
Enter the % amount of battery capacity utilised during a typical outage (dependent on battery sizing & site conditions)
Enter typical frequency of power outages

The period over which the TCO calculation is based (typically 10 years for stable grid and 5 years for unreliable grid)
Currency can be selected from pull down menu. Monetary values will need to be entered & adjusted in this currency
Cost to transport and install batteries
Cost of procurement, storage of batteries
Interest rate applied to the battery investment over the service life term of the battery. Can be set to zero to show cash i
Cost to carry out regular maintenance checks on the batteries
The local cost of energy which will impact the ongoing running costs
Typical operating temperature of the batteries
Total number of sites to be considered in the roll out of this TCO scenario

Amount of capacity of the battery utilised relative to the nominal capacity and depth of discharge
For cyclic application in unreliable Grid application. Multiplication of the useable battery capacity and number of cycl typical depth of discharge
Number of battery purchases that will be required over the TCO term. Dependent on TCO term and service life of the ba
Sum of the Battery cost + Transport & Installation Cost + Overhead multiplied by the number investments required in t

Investment per year over the TCO term. Dependent on the Battery Investment, Interest rate and TCO term

Float current dependent on the battery technology and battery capacity. TPPL assumes a float current of 20mA/100 Ah 35mA/100 Ah
Energy consumption of the battery during float over the period of a year.
Dependent on the energy consumption of the battery from float charge per year and depending on the local energy cost
Total cost of energy and servicing per year

TCO per year = Sum of the Annuity of investment + Maintenance & Service Costs
TCO per year divided by the useable battery capacity
Ratio between each of the different product types. This is normalised to the first battery type being studied

Total savings per site relative to the scenario in the first column. Red, yellow and Green colours indicate good-better-be
Total savings dependent on the savings per site and the number of sites

Total Cost of Ownership (TCO) Calculator

EnerSys Power/Full Solutions

Site/Application details

Type of application	Telecom
Type of grid	Stable/ reliable

Battery details

Type of battery	PowerSafe SBS XL	PowerSafe SBS EON	PowerSafe V-FT	
Technology	TPPL	TPPL	TPPL	
Nominal capacity (Label Rating)	170	170	170	Ah
	20	10.6	8.5	
Cost/block	570	462	392	$
Number of blocs per string	4	4	4	
Number of parallel strings	4	4	4	
Installed battery capacity (Ah)	680	680	680	Ah
Installed battery capacity (kWh)	32.64	32.64	32.64	kWh
Total battery cost	9120	7392	6272	$
Battery Capex cost ratio	1.0	0.8	0.7	
Capex cost / 100Ah	1341	1087	922	$
Capex cost/ Kwh	279	226	192	$
Depth of discharge	80	80	80	%

TCO details

TCO term	10	years
Currency	$	
Transportation & installation costs	300	$
Overhead	1115	$
Interest rate	0	%
Maintenance costs (per year)	28	$
Energy cost / kWh	0.6	$
Temperature	35	°C
Temperature	95	°F
No. of Sites	300	

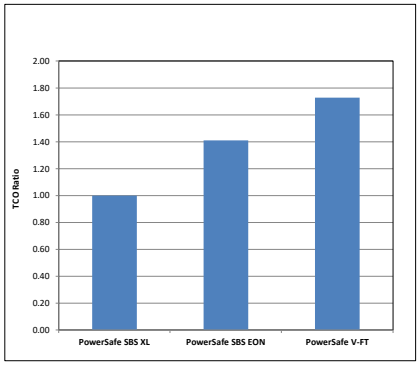
TCO Results

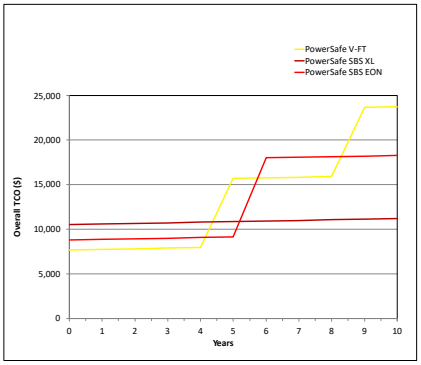
Type of battery	PowerSafe SBS XL	PowerSafe SBS EON	PowerSafe V-FT	
Usable capacity kWh	26.1	26.1	26.1	
Calculated Service Life (years)	10.0	5.3	4.3	
No. of Battery Investments (Initial + Replacements over TCO)	1	2	3	
Investment over TCO Term	**10535**	**17614**	**23061**	$
a) Investment / year	**105**	**176**	**231**	$
Maintenance costs (per year)	28	28	28	$
Float current (A)	0.03	0.03	0.03	
Energy cost / Kwh	0.60	0.60	0.60	$
Battery energy consumption / year kWh	65	65	65	
Battery energy consumption cost / year	39	39	39	$
b) Maintenance and energy costs / year	**67**	**67**	**67**	$

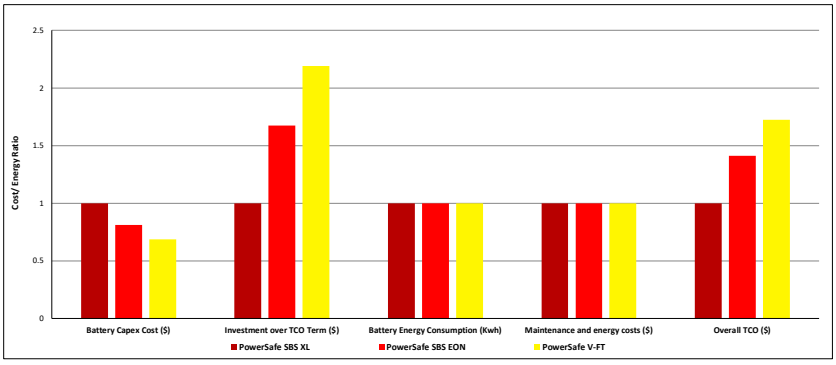
Type of battery	PowerSafe SBS XL	PowerSafe SBS EON	PowerSafe V-FT	
Total cost of ownership / year (sum a&b)	173	243	298	$
Total cost of ownership / year / kWh	6.61	9.32	11.41	$
TCO ratio	1.00	1.41	1.73	

Year	PowerSafe SBS XL	PowerSafe SBS EON	PowerSafe V-FT	
0	10535	8807	7687	$
10	11208	18287	23734	$
Savings per site	0	-7,079	-12,526	$
Total Savings	0	-2,123,700	-3,757,800	$

Total cost of ownership comparison Stable/ reliable applications







Product range	Technology
DataSafe HX	Std AGM
DataSafe HX+	TPPL
DataSafe XE	TPPL
PowerSafe V	Std AGM
PowerSafe V-FT	TPPL
PowerSafe SBS EON	TPPL
PowerSafe SBS XL	TPPL
Standard AGM	Std AGM

Unreliable range		
PowerSafe SBS EON	56918	0.96
PowerSafe V-FT	35553	0.971
Standard AGM	26664.75	0.971

Selected battery range	PowerSafe SBS XL	PowerSafe SBS EON
Design Life at Operating Temperature	7.07	3.75
Cycles at 20°C	#N/A	848
Cycles vs Temperature Factor	0.713774172	0.713774172
Cycles at Operating Temperature	#N/A	605.12
Cycles / day	1	1
Cycle Life at Operating Temperature	#N/A	1.7
Service life (years)	#N/A	1.7

Application (Bold = Default Value)	
Ups	Telecom
DataSafe XE	**PowerSafe SBS EON**
DataSafe HX	**PowerSafe V-FT**
DataSafe HX+	**Standard AGM**
PowerSafe SBS EON	PowerSafe SBS XL
PowerSafe V-FT	
Standard AGM	

Colour Index Chart 1 & 4		
DataSafe XE	0	0
DataSafe HX	167	167
DataSafe HX+	117	120
PowerSafe SBS EON	255	0
PowerSafe V-FT	255	246
Standard AGM	82	82
PowerSafe SBS XL	184	0
PowerSafe SBS XL	184	0
PowerSafe SBS EON	255	0
PowerSafe V-FT	255	246

Annuity Calcs		
PowerSafe SBS XL	PowerSafe SBS EON	PowerSafe V-FT

N/a	N/a	N/a
N/A	N/A	N/A

$$A = I * \frac{(1 + \mathrm{r})^n * r}{(1 + \mathrm{r})^n - 1}$$

A = Payment amount per period
I = value of investment per battery
n = number of periods (years, months)
r = interest rate
S_L = Service life

Currency
€
$
£

Technology	
TPPL	20
Std AGM	35
	20

Selected product range 1
PowerSafe SBS XL
TPPL
20

1.15
1.15
1.2

PowerSafe V-FT
3.01
505
0.713774172
360.19
1
1.0
1.0

0	
167	
121	
0	
0	
82	
0	
0	
0	
0	

A
$A*S_L$

Selected product range 2	Selected product range 3	Grid
PowerSafe SBS EON	PowerSafe V-FT	Stable/ reliable
TPPL	TPPL	Unstable/ unreliable
20	20	

Type
62
92
100
155
170
190

C10 wh
124
184
201
311
342
382