



Jinko ESS Liquid Cooling Solution of Micro-grid AC- coupled System

250kW/645kWh Li-ion BESS Project in Lebanon

Case Study

Project Overview

The project is situated in a rural area of Lebanon, characterized by extensive land and low population density where grid power is not available, and the facility is running only on diesel generators.

This project is designed to provide a reliable and efficient energy storage solution for the micro-grid system.

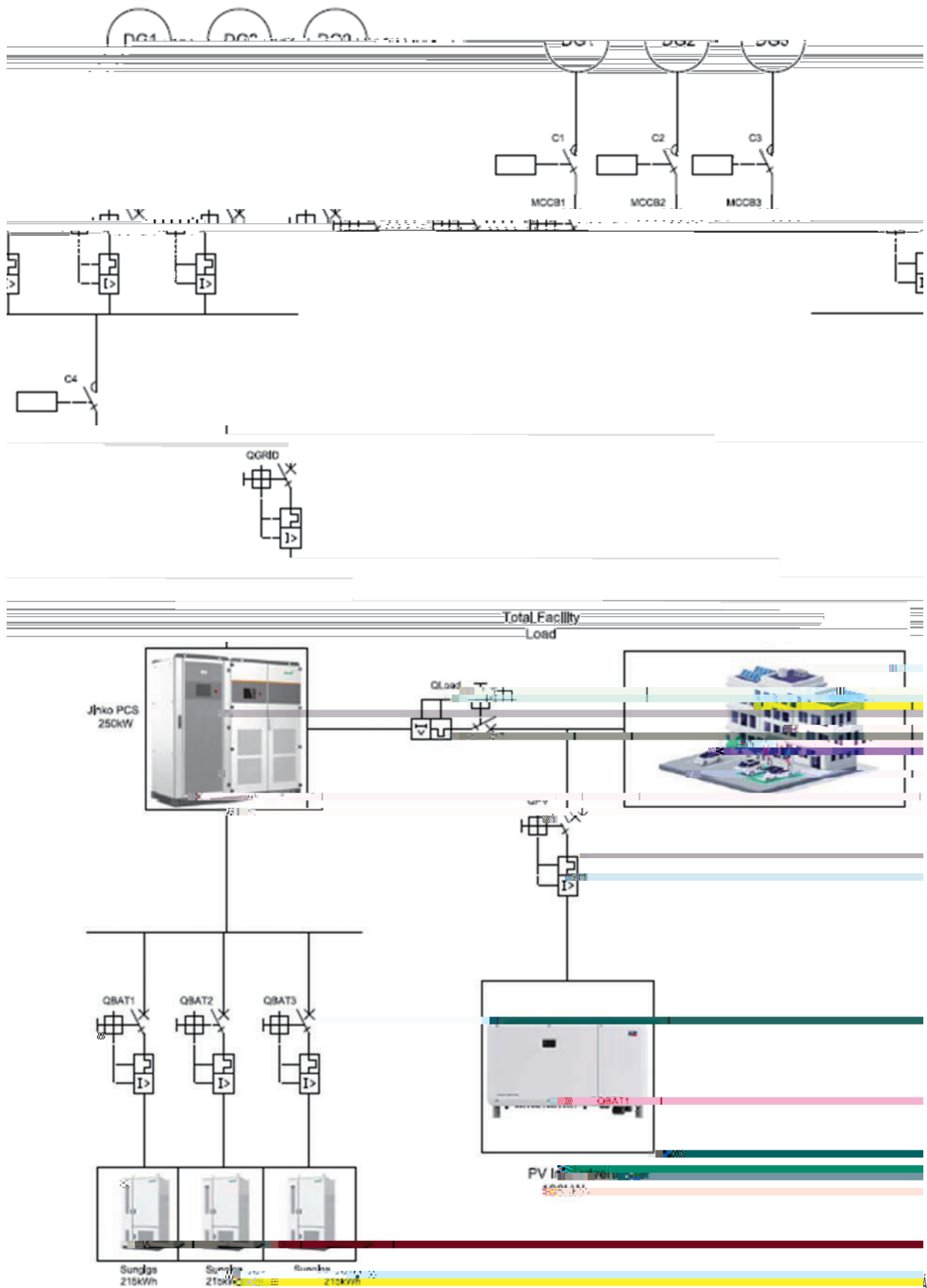


Fig. 1 Single Line Diagram of Micro-grid AC-Coupled System

H\Y'Gc`ih]cb`

Cfqrvkpi" 867mYj" Lkpmq" UwpIkie" gpgti{" uvqtcig"ecdKpgvu."vjg"enkGpv"ykn"dgpghkv"htqo"vjg" kpjgtgpv" cfxcpvcigu" qh" kvu" kpvgitcvgf" fgukip." ukornkhkgf" kpuvcncvkqp" cpf" ockpvgpcpeg" rtqegfwtgu." yjkg" cejkxkpi" c" jkij" ngxgn" qh" u{uvgo"kpvgitcvkqp0"

Vjg" 867mYj" GUU" u{uvgo" ku" fgukipgf" kp" ecdkpgvu"eqphkiwcvkqp."kpvgitcvgf"ykvj"fkhhgtgpv" uwd"u{uvgo"u"vq"fgnkxgt"qrvkocn"rgthqto"cepg"cpf" uchgv{0" Vjgug" kpenwfg" dcwgt{" tcemu." dcwgt{" opcigogpv" u{uvgo" *DOU+." nkswkf" eqqnkpi" u{uvgo." hktg" uwr rtguukqp" u{uvgo." rpygt" eqpxgtukqp" u{uvgo" *REU+ " cpf" gpgti{" opcigogpv"u{uvgo"*GOU+0"

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Gcej" dcwgt{" tceM" qh" 437mYj" eqpukuvu" qh" 7" dcwgt{" rcemu" qh" 37508X" tcvgf" xqncig" eqppgevgf" kp" ugtkgu" vq" tgcej" c" vqvcn" 98:X0" Cnqpiukfg" c" jkij" xqncig" dqz" *JXD+" eqpukvki" qh" gngvtkecn" rtqygevkv" hqt" jkij" cpf" nqy" xqncig" etkewk" cpf" c" dcwgt{" enwuvgt" wkv" *DEW+" tguqpukdng" hqt" eqngevki" cpf" rtqeguuki" fcvc" tgegkxgf" htqo" vjg" dcwgt{" rcem" wkvu0"

Dcwgt{"Opcigogpv"U{uvgo"

Vjg" uqnwvkqp" cfqrvu" c" DOU" ykvj" vyq" uvcig" ctejkvgevwg" wukpi" ECP" dwu" eqo" owpkecvkqp" dcwgt{" opcigogpv" wkv" *DOW+ " cpf" dcwgt{" enwuvgt" wkv" *DEW+0"

Vjg" DOW" ku" kpvgitcvgf" kpvg" gcej" rcem" vq" oqpkvt" vjg" egm" xqncigu." vgo" rgtcvwtg" cpf" ewttgpv0" Vjg" DEW" ku" kpvgitcvgf" kpvg" vjg" JXD" uw" o" ctk|kpi" vjg" fcvc" tgegkxgf" d{" vjg" DOWu0"

Vjg" DOU" ku" tguqpukdng" hqt" tgcn" vkog" fgvevkqp" qh" vjgtocn" cpf" gngvtkecn" rctcogvgtu" *xqncig." ewttgpv." vgo" rgtcvwtg." gve00+." ceewtcvg" guvko" cvkqp" qh" dcwgt{" uvcvg" qh" ejctig" *UQE+ " cpf" uvcvg" qh" jgcnvj" *UQJ+ " ykvj" cwwq" ecnkdtcvkqp" cpf" uwr rqtv" qxgt/ejctig" rtqygevkv." qxgt/fkuejctig"

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Vjg" DOU" ecp" u" ykhvn{" kuqncvg" nqecn" hcwnvu." tgrqtv" hcwnv" kphqtocvkqp" cpf" rtqxkfg" tgcn" vkog" cncetou0"

"""""""""" Fig. 2 BMS Communication Topology

Nkswkf"Eqqnkpi"U{uvgo"

Vjg"uqnwvkqp"cfqrvu"cnkswkf"eqqnkpi"u{uvgo."ykej" eqpukuvu"qh"nkswkf"eqqnkpi"jqv."nkswkf"vtcpuokukqp" rkrngkpg"cpf"dcwgt{"nkswkf"eqqnkpi"rncvg."cpf"onwv/ oqfg"tghkpgf"vjgtocn"opcigogpv"eqpvtqn"nqike"vq" ockpvckp"pqto"cn"vgo"rgtcvwtg"cpf"ko"rtqvg"u{uvgo" eqpukvgpe{"cpf"nkhgk"og0" Vjg" nkswkf" eqqnkpi" wkv" jcu"cnqy"tcvgf"ecrcekv{"rh"6mY0"

Hktg"Uwr rtguukqp"U{uvgo"

Vjg" hktg" uwr rtguukqp" u{uvgo" kpvgitcvgf" ykvj" kp" vjg"



Fig. 4: PCS Single Line Diagram

Gpgti {"Opcigogpv"U{uvgo "*GOU+"}

Vjg"GOU"kpvgitcvgf"ykvj"vjg"GUU"u{uvgo"qhhtu"
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 gpuwtg"ghhkekgpv"cpf"tgnkcdng"qrgtcvkqp0"Kv"ugtxgu"
 cu" c" egpvtcn" eqpvtqn" wpkv" vjcv" qrvk o k |gu" gpgti {"
 hnqy." gpjcpegu" u{uvgo" rgthqto cpeg." cpf"
 gpcdngu"ugc o nguu"kpvgitcvkqp"ykvj"gzkuvkpi"UOC"
 RX"kp xgtvgtu0"

Vjg" GOU" rtqxfkgu" tgn/vk o g" o qpkvqtkpi" cpf"
 eqpvtqn"qh"vjg"u{uvgo."cnnqy kpi" wugtu"vq" o qpkvqt"
 etwekn" rctcogvgtu." uwej" cu" uvcvg" qh" ejctig"
 *UQE+." uvcvg"qh" jgc n v j" *UQJ+." cpf" r q y g t" hnqy 0"
 Vj tqw i j" c" wugt/htk g p f n {" xkuwcn" k p v g t h c e g ." wugtu"
 ecp" fktgevn {" o p c i g" c p f" c f l w u v" u { u v g o " u g v k p i u ."
 g p u w t k p i " q r v k o c n " r g t h q t o c p e g " c p f " o c z k o k | k p i "
 g p g t i {" w v k n k | c v k q p 0 "

Vjg"GOU" rnc {u" c" etkvekn" tqng"kp" qrvk o k |kpi" vjg"
 qrgtcvkqp"qh"vjg"GUU"u{uvgo"vq" gpuwtg"ghhkekgpv"
 o p c i g o g p v " d g v y g g p " R X " k p x g t v g t u . " d c w g t {"
 ecdkpgvu"cpf" F I u"gzkuvkpi"qp"ukvg0"

Vjg"DOU."REU"cpf"RX"kp xgtvgtu"ctg"eqppgevgf"
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 ku"eq o o w p k e c v k q p " y k v j " v j g " g z k u v k p i " F I " v j t q w i j "
 j c t f " y k t k p i " e q p h k i w t c d n g " f t {" e q p v c e v " d c u g f " q p "
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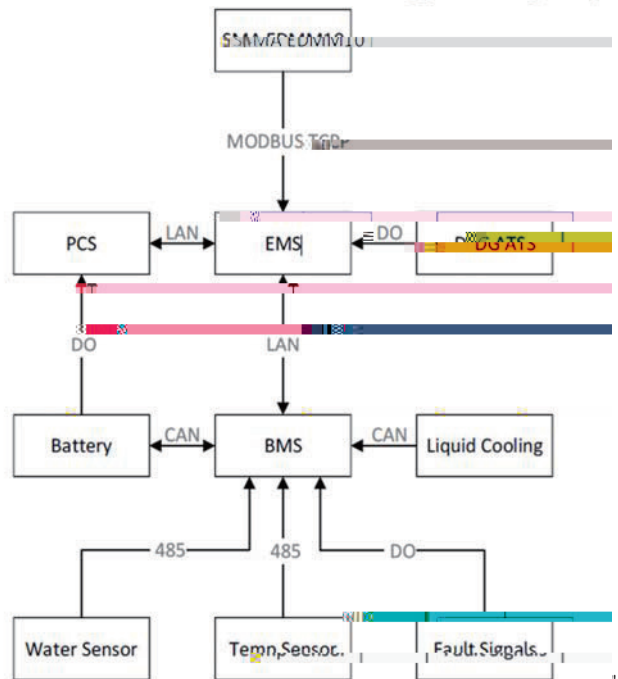


Fig. 5: EMS Communication Topology

CdYfUh]cb'@c [JW'

Vjg"u{uvgo"yknn"twp"kp"qhh"itkf"oqfg"fwtkpi"vjg"
fc{"yjgp"vjg"REU"uykvejgu"vq"itkf"hqto"kp"
oqfg"vq"ikxg"vjg"RX"kp"xtvgtu"eqpuvcp"xqncig"
cpf"htgswgpe{"vq"ejctig"vjg"dcwvgtku"cpf"hgff"
vjg"hceknkv{"nqcf0"

Cu"vjg"RX"ecrcekv{"qh"3:2mY"ku"nguu"vjcp"vjg"
oczko"o"cnnycdng"ejctikpi"ecrcekv{"vjg"
GOU"yknn"ugpf"322'"rpygt"ugvrqkp"vq"RX"
kp"xtvgtu"yjgp"vjg"dcwvgt{"UQE"ku"dgvyggp"2"
cpf";2'0"

Cv";2'"UQE."vjg"GOU"yknn"uvctv"nko"kvkpi"vjg"
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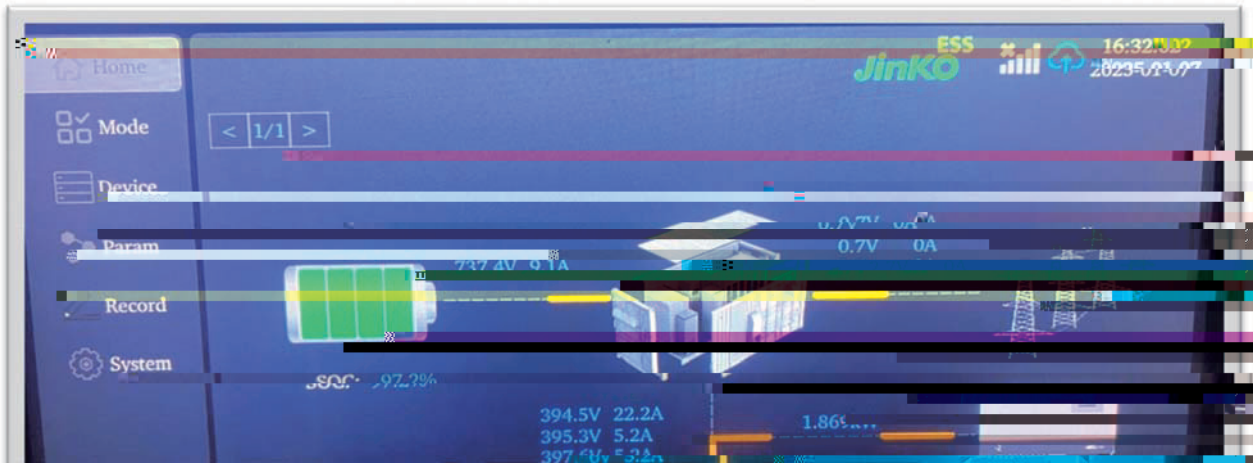


Fig. 5: EMS HMI Display

Fig. 6: EMS PV Inverters Power Limit Thresholds.

Acb]hcf]b ['GmghY a g'

UEW"Oqpkvqtkpi"

Vjg" uqnwvkqp" ku" gswkrrgf" ykvj" qpg" UEW"
eqppgevgf"vq"vjg"5"dcvgt{"ecdkgvu"vq" o qpkvqt"
cpf"eqpvtqn"cmn"eqppgevgf"uwdu{uvgo u"*eqqkpi"
u{uvgo." HUU." DOWu." DEWu." gve í +" cpf"
rtqkfg" tgcñ" vkog" fcvc" hqt" enwvgt" cpf" egmu"
xqncig."vgo rgcvwtg"cpf"ewttgpv"cu"ygm"cu"vjg"
"

"
"

cu" vjg" cnetou" nqi" cpf" twppkpi" uvcvwu" qh" vjg"
Uwp Iki c"ecdkgvu0"

Vjg"UEW"ku"eqppgevgf"vq"enqwf"xkc"NCP"ecdng"
eqppgevgf" vq" vjg" enkgpv" tqwvgt0" Vjg" UEW" ku"
ceeguugf"tgo qvgn{"vj tqw i j"XRP0"

▪

Fig. 6: SCU Cloud Monitoring Display



Fig. 8: EMS Cloud Monitoring Platform

8UhU'5bU`mg]g'

42 ' ÖUQEÖ;2"

Vjg"RX" kpxgtvgtu"ctg" yqtmkpi"cv" 322 ' "cevkxg"
 rqygt"ugvrqkp"ukpeg"vjg"u{uvgo"UQE" ' "ku"nguu"
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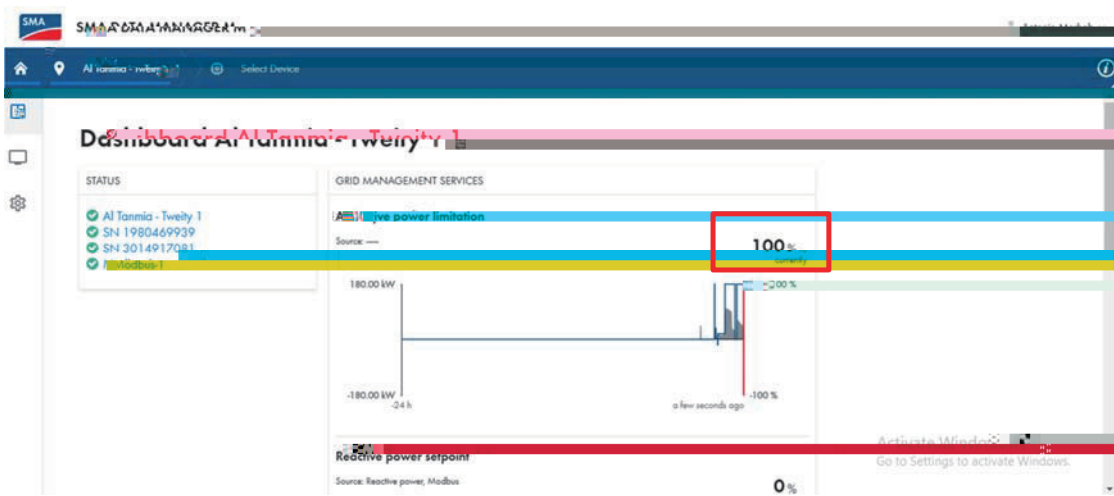


Fig. 9: SMA Monitoring platform showing 100% setpoint received from EMS

"
"
;2 ' ÖUQEÖ;7"

Kp"vjku"ecug"RX"kpvgvtvgtu"ejctikpi"rqygt"ykm"
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vcmkpi"kpvg"eqpukfgtcvkqp"c"nqcf"rqygt"qh"
57mY0"Cu"ujqyp"kp"hkivtg"32"dgnqy."vjg"RX"
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RX"vqvcn"ecrcekv{"yjkj"ocmgu"ugpug"dcugf"qp"
vjg"nqcf"rqygt<"

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