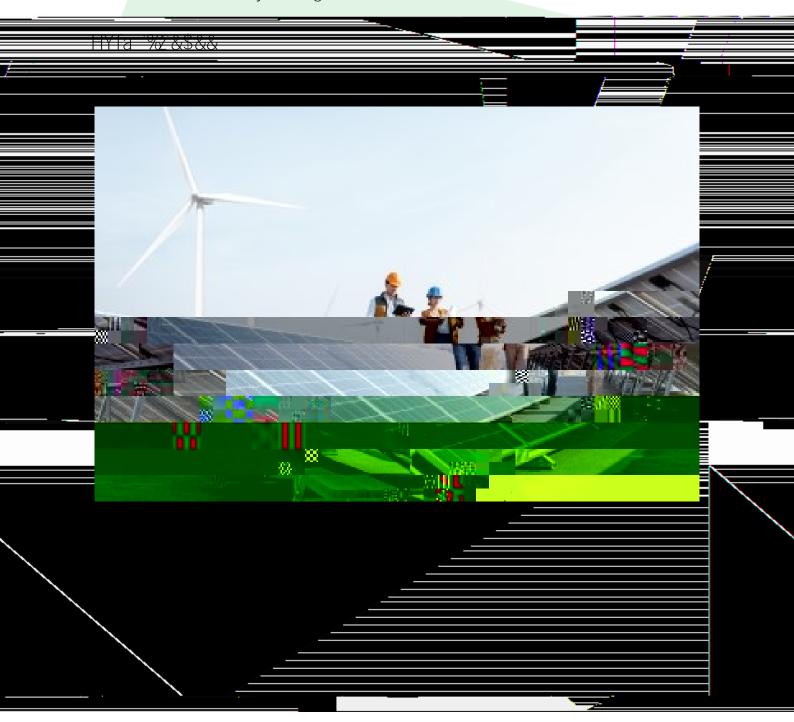


# **SOLA5053**

K ]bX 9bYf[ m7cbj YfhYfg



# 7ci fgY<sup>\*</sup>Cj Yfj ]Yk

## GHJZZ:7cbHJWhi8YHJ]`g

## 7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]m	@cWUh]cb	D\cbY
A Yf]bXY?Um	<u>a " Um4 i bgk "YXi "Ui</u>	D`YUgY'Ya U]`hc a U_Y'Ub Uddc]bha Ybh	H9H6 fcca &%)	- \$*) <sup>-</sup> )) &\$

## 8Ya cbghfUhcfg

B Ua Y	9a U]`	5j U]`UV]`] <b>m</b>	@cWUhjcb	D\cbY
8]a]lf]'@Uncg	X]a ]hf]g"`Uncg4 i bgk "YXi "Ui	D`YUgY`WcbHJWhj]U A G`HYUa g`cf Ya U]`		
G\i _`U'DcXXUf	g"dcXXUf4 i bgk "YXi "Ui	D`YUgY`WcbruWij ]U A G`HYUa g`cf Ya U]`		
FcV'l bXYfk ccX	fcV"i bXYfk ccX4 i bgk "YXi "Ui	D`YUgY`WcbruWij ]U A G`HYUa gʻcf Ya U]`		

## GWXcc`7cbHJWhi±bZcfa Uhjcb

GWkcc``cZD\chcj c`Hu]WUbX`F YbYk UV`Y`9bYf[ m'9b[ ]bYYf]b[

9a U]`.'gdfYYhYUW\]b[4 i bgk "YXi "Ui

.

7ci fgY 8YHJ]`g
l b]hg^cZ7fYX]h*
Giaa UfmcZh\Y 7ci fgY

## 5XX]hcbu`7cifgY ≠bZcfa Uhlcb

## 7 fYX]hidc]bhq

 $H\g^{g}\g^{U}^{*}ib]hcZWYX]hflc7EWcifgYUbXi]bjcjYg^{V}hkYYb^{(i!*'\cifg'dYf'kYY_fh.\#EcZZJWY!hc!ZJWYWWCbhJWYWG')} \\$ 

H\Y`bcfa U``k cf\_`cUX`YI dYWfUhjcbg`cZU`ghi XYbh'UfY`UddfcI ]a UhY`m`&) `\ci fg`dYf`hYfa `Zcf`YUW\`I C 7 ž ]bWi X]b[ `WUgg`WcbhUWfi\ci fgž'ch\Yf``YUfb]b[ `UWfjj ]hJYgž'dfYdUfUhjcb`UbX`hJa Y`gdYbh'cb`U```UggYggUV`Y k cf\_"

Mci 'g\ci `X'U]a 'hc'gdYbX'UVci h'\* '\#k 'cb'h\]g'Wci fgY"'H\Y'UXX]h]cbU``h]a Y'g\ci `X'VY'gdYbh]b'a U\_]b[ 'gi fY h\Unmci 'i bXYfghUbX'h\Y'`YWh fY'a UhYf]U`ž'Wca d`Yh]b[ 'h\Y'gYh'Ugg][ ba Ybhgž'Z fh\Yf'fYUX]b[ ž'UbX'fYj ]g]b[ Zcf'UbmYl Ua ]bUh]cbg"

## 7 cbhJWhi\ci fa

 $H\[g'Wci\ fgY'Wca\ df]gYg'h\ fYY!\ Zci\ f'\ci\ fg'cZ\ Zcfa\ U``WcbhUWidYf'k\ YY\_"'H\Y'h]a\ ]b[\ 'UbX'fcca\ g'UfY'[\ ]j\ YbVY`ck "'Hi\ YgXUm'UfY``YWfi\ fY'WUggYg'fk ]h\ 'UXX]h]cbU```YWfi\ fYg']b'k\ YY\_g'&\ Zcf'fYj\ ]g]cb'cZ\_Ym'UgdY\Wgz'ei\ Ygh]cbgz'[\ fci\ d'k\ cf_'UbX'Ugg][\ ba\ Ybhg''\ 5````YWfi\ fYg\ k\ ]```VY'[\ ]j\ Yb'cb`]bY'j\ ]U'hYUa\ g.$ 

#### GC@5)\$)''A G'HYUa q'@b''

@YWhifYg#Kcf_g\	k YY_	H]a Y	@cWUh]cb	BUa Y'; fci d
cd				
@YWn fY	%) ž'+!%\$	Hi YgXUm'%\$!%&	C b`]bY	
@YWnifY	&!' ž'* ž'-!%\$	H\i fgXUm'%&	C b`]bY	
K cf_g\cd	%1 %\$	K YXbYgXUm'%!%	6`cW_\ci gY'; %*	K %\$5
•	(!) ž'+	: f]XUm'%\$!%%	G96'6&+	
•	*	: f]XUmi&!)	H9H6; %*#cb`]bY	
K cf_g\cd	%1 %\$	Hi YgXUm'!)	C b`]bY	H%) 5
•	(!) ž +	: f]XUmi%%1 %&	Cb`]bY	•
•	*	: f]XUmi&!)	Cb`]bY	•
K cf_g\cd	%1 %\$	K YXbYgXUm'&!(	6`cW_\ci gY'; *	K %(5
	(!) ž +	: f]XUmi&!'	E i UX'; \$(*	
•	*	: f]XUm'&!)	H9H6; %*#cb`]bY	•

 $\label{eq:continuity} D`YUgY`fYZYf`hc`mci f`WUgg`h]a YhUV`Y`Zcf`h\Y``YUfb]b[`UWf]j]h]Yg`mci `UfY`Ybfc``YX`]b`UbX`UhhYbX`cb`mh\cgY WUggYg"5XX]h]cbU``fYj]g]cb`gYgg]cbg`k]``VY`\cghYX`Xi f]b[`ghij UWUbX`WcgYf`hc`h\Y`YI Ua "$ 

K YY\_'\* 'U```[ fci dg'k ]```Wca Y'hc[ Yh\Yf'Zcf'U'fYj ]g]cb'gYgg]cb'UbX'[ fci d'k cf\_

### Gi a a UfmiUbX'5 la g'cZh\Y'Wci fqY

H\Y'di fdcgY'cZh\]g'Wci fgY']g'hc'dfcj ]XY'ghi XYbhg'k ]h\'Z bXUa YbhU`\_bck `YX[Y'UbX'fY`Yj Ubhig\_]``g'Zcf Yb[]bYYfg'XYg][b]b['UbX'XYj Y`cd]b['k]bX'YbYf[mgmghYa g"''#ik]````Uf[Y`mZcW'g'cb'[f]X!WcbbYWfYX'k]bX ZJfa g"''Ghi XYbhg'k]``VY'[]j Yb'Ub'cj Yfj ]Yk 'cZk]bX'YbYf[mhYW\bc`c[mžYl d`cf]b['h\Y'UXj UbWfg']b'k]bX hi fV]bY'XYj Y`cda Ybhcj Yf'h\Y'mYUfg"''5b'i bXYfghUbX]b['cZh\Y'k]bX'fYgci fW''UbX'W\UfUWfYf]gh]Wg'cZ k YUh\Yf'd\Ybca YbU'fY`Yj Ubh'hc'k]bX'hi fV]bY'dYfZcfa UbW'']g']bj Ygh][UhYXž'U'cb['k]h\'ci hi]b]b['h\Y UYfcXmbUa]Wdf]bW]d`Yg'UbX'a YW\Ub]Wg'cZh\Y'k]bX'hi fV]bY"''Hi fV]bY'g]h]b['UbX']bHY[fUh]cb']ggi Yg'UfY

Wej YfYX'Ug'k Y```Ug'h\Y'k ]XYf'geW]U``UbX'YWebca ]W]ggi Yg'UggcW]UhYX'k ]h\'k ]bX'ZJfa g"'`5```h\Y'hcd]Wg
Wej YfYX'[ ]j Y'VUW\_[ fci bX']bZcfa Uh]cb'bYWfggUfmZcf'Wea d'Yh]cb'cZh\Y'a U'@f'XYg][ b'dfc'YWh-'WfYUh]b[ 'U
Z ```k ]bX'ZJfa 'ZYUg]V]`]hmghi Xm'

## Gh XYbh YUfb]b[ ci h Xa Ya

5 hih\Y`YbX`cZh\Y`Wci fgY`ghi XYbhg`g\ci `X`VY`UV`Y`hc.

- %" 9I d`U]b`h\Y`\_Ymi bXYfm]b[ 'gW]YbWY`cZk ]bX`YbYf[ mž'UbX`Yb[ ]bYYf]b[ 'UgdYWg`cZk ]bX`h fV]bYg`UbX k ]bX`ZJfa gž'UbX`h\Y]f`]bhY[ fUh]cb`]bhc`dck Yf`gmghYa g"
- &" 6Y`UV`Y`hc`XYa cbghfUhY`\_YmihYW\b]ei Yg`UbX`g\_]``g`fYei ]fYX`Zcf`XYg][ b]b[ `UbX`g]h]b[ `k ]bX`YbYf[ m gmghYa g`Ug`k Y```Ug`dYfZcfa `U`Z ```k ]bX`ZJfa `UgqYgga Ybh'
- ' " < Uj Y`U`[ ccX`i bXYfghUbX]b[ `cZh\Y`k ]XYf`YWcbca ]WzgcW]U``UbX`Ybj ]fcba YbhU``UgdYWg`cZk ]bX YbYf[ migmghYa g"

## Gm`UVi q

HYWcifgYk] "WcjYfhcd] Wg ] bWiX] b[...

- H\Y`bUh fY`cZh\Y`k ]bX`UbX`]hg`i gY`Zcf`h\Y`dfcXi Whjcb`cZa YVXUb]\WJ``UbX`Y`Y\Wf]\WJ``YbYf[ m
- 7 ca dcbYbhq'cZk ]bX'hi fV]bYq
- K ]bX'hi fV]bY'UYfcXmbUa ]Wa
- A YWXUb]WU`XYg][ b cZWca dcbYbhg
- 8 ]ZZYfYbh[ YbYfUhcf hmdYg
- Dck YfigmghYa 'WcbbYWhjcbicZk ]bXihi fV]bYg
- CdYfUhcbu``Wcblfc``cZk]bX'hifV]bYa
- K ]bX'hi fV]bY'UbX'k ]bX'ZUfa 'd`Ubb]b[ 'UbX'XYg][ b'Wcbg]XYfUh]cbg']bWi X]b[ 'Wca a i b]hmdYfWfdh]cbg UbX'Ybj ]fcba YbHU']ggi Yg
- K ]bX'YbYf[mYWcbca ]Wq

#### 5 agi a YX'? bck YX[Y

Ghi XYbhgʻg\ci `X`\Uj Y`U`[ccX`k cf\_]b[`\_bck `YX[Y`cZi b]j Yfg]hm`Yj Y``d\mg]Wgʻ`UbX`a Uh\Ya Uh]Wgʻ'`5`VUg]W \_bck `YX[Y`cZYbYf[mgmghYa g`cf`fYbYk UV`Y`YbYf[mhYW\bc`c[]Yg`]g`i gYZ\`"

## : fUXi UhY 5 htf]Vi hYa

## 5ggYgga Ybh

.

## 5ggYgga Ybhici Yfi ]Yk

 $\label{thm:condition} $$HY'UggYgga\ Ybh'cZhY'Wcbg]ghg'cZcbY'a\ U'cf'[fci\ d'Ugg][ba\ Ybhz'k\ cf_g\cd'dUfh]WdUh]cb'UbX'ei\ ]nz'hk\ c'k\ cf_g\cd'Ugg][ba\ Ybhg'UbX'U'Z]bU'Yl\ Ua\ ]bUh]cb'dUdYf''$ 

5ggYgga Ybh	K Y][ \h
K cf_g\cd'E i ]n'k YY_''	)
K cf_g\cd 5gg][ ba Ybh%\UbXYX ci hk YY_ &	%)
Xi Y k YY_')	
K cf_g\cd 5gg][ ba Ybh#E i ]n k YY_ +	)
; fci d 5gg][ ba Ybh-'VfYU_Xck b [ ]j Yb cb	()ı 'fh\]g']bWi XYg'Ub
Ugg][ ba Ybhg\YYh	]bX]j ]Xi U``UbX`dYYf
	UggYgga YbhWta dcbYbhŁ
: ]bU``91 Ua	' \$I
HcM`	%\$\$I

## <u>DfYgYbhUhcb</u>

5 ```gi Va ]gg]cbg`UfY`YI dYWYX`rc`VY`bYUhUbX`WYUf`mgYhci H``Mci f`fYgi `hg`UfY`h\Y`d]bbUWY`cZU```mci f`\UfX k cf\_'UbX'g\ci `X`VY`hfYUhYX`k ]h\ `Xi Y`fYgdYWf`DfYgYbh]b[ `fYgi `hg`WYUf`m[ ]j Yg`h\Y`a Uf\_Yf`h\Y`VYghW\UbWY cZi bXYfghUbX]b[ `mci f`a Yh\cX/Yj Yb`]Zh\Y`bi a Yf]WU``fYgi `hg`UfY`]bWcffYWf'`5```gi Va ]gg]cbg`a i ghVY mdYX! `bc`\UbXk f]hhYb`Ugg][ ba Ybhg`UWWdhYX"`5```gi Va ]gg]cb'a i gh\Uj Y`U`Wcj Yf`g\YYhzghUh]b[ `h\Uhih\Y k cf `]q`mci f`ck b"

#### \hdg.#kkk"ibgk"YXi"Ui#/b[]bYYf]b[#q]hYq#XYZUi`h#Z]Yg#XcWaYbhg#\_fcidWcjYfg\YYh'dXZ

\hdg.#kkk"ibgk"YXi"Ui#Yb[]bYYf]b[#g]hYg#XYZUi`h#]`Yg#XcWaYbhg#bX]j]XiU`WcjYfg\YYh'dXZ

#### A Uf ]b[

A Uf\_]b[ '[ i ]XY`]bYgʻZcfʻUgg][ ba Ybhgi Va ]gg]cbgʻk ]```VYʻdfcj ]XYX`Uhh\YʻgUa YʻhJa YʻUgʻUgg][ ba YbhXYhU]`g hcʻUgg]ghk ]h\`a YYhJb[ 'UggYggUV`YʻfYei ]fYa Ybhg"'Gi Va ]gg]cbgʻk ]```VYʻa Uf\_YX`UVWcfX]b[ 'hc'h\Y`a Uf\_]b[ [ i ]XY`]bYgʻdfcj ]XYX"

#### 91 Ua lbUhcbq

Mci 'a i gh'VY'Uj U]'UV'Y'Zcf'U``'ei ]nnYgž'hYghg'UbX'YI Ua ]bUh]cbg"

: ]bU`YIUa ]bUh]cbg'Zcf'YUW\'WcifgY'UfY'\Y`X`Xif]b['h\Y'Ib]jYfg]hmYIUa ]bUh]cb'dYf]cXg.': YVfiUfm'Zcf GiaaYf'HYfaz'AUm'Zcf'H%z'5i[igh'Zcf'H&z'UbX'BcjYaVYf#8YWYaVYf'Zcf'H'"

D'YUgY'j ]g]ha m BGK 'Zcf'Dfcj ]g]cbU`'9l Ua ]bUh]cb'h]a YhUV`Y'di V`]g\ 'XUhYg"

: cf'Z ft\Yf']bZcfa Ut\cb'cb'Yl Ua gž'd'YUgY'gYY't\Y'<u>9l Ua g</u>'k YVdU[Y"

## 7 U'W 'Uhcfa

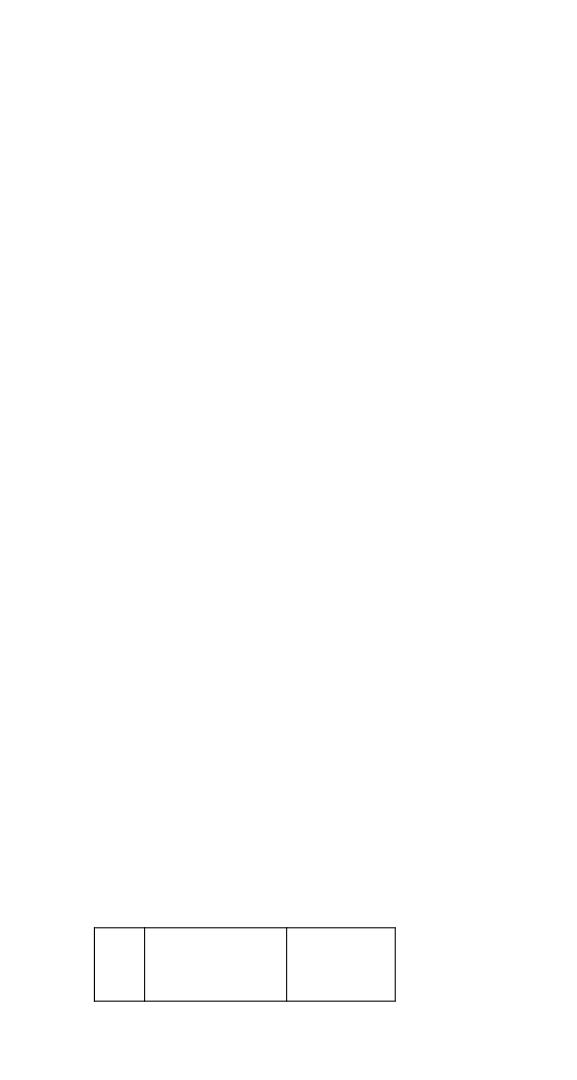
Mci 'k ]```bYYX'hc'dfcj ]XY'mci f'ck b'WU'W `Uhcf'cZU'a U\_Y'UbX'a cXY``Uddfcj YX'Vmil BGK 'Zcf'h\Y Yl Ua ]bUh]cbg"'H\Y'`]ghcZUddfcj YX'WU'W `Uhcfg']g'Uj U]`UV`Y'Uh

#### ghi XYbh'i bgk "YXi "Ui #Yl Ua !Uddfcj YX!WU'W 'Uhcfq!UbX!Wca di hYfq

#i]gˈmci fˈfYgdcbg]V]`]mircˈYbgi fYˈh\Uhmci fˈWbˈW``Uhcfi]gˈcZUbˈUddfcj YXʻa U\_YʻUbXʻa cXY`žʻUbXʻhcʻcVhJ]bʻUb "5ddfcj YX"'gh]W\_YfʻZcfi]hZfca ˈh\Y`<u>9b[]bYYf]b[ˈGh XYbhGi ddYfʻGYfj]\Wgʻ7 YbhY</u>ʻdf]cfʻhcʻh\YʻYI Ua ]bUh]cb" 7 UʻW `UhcfgʻbchVYUf]b[ `Ub`"5ddfcj YX"'gh]W\_Yf`k]``bchVY'U``ck YX`]bhcʻh\YʻYI Ua ]bUh]cbʻfcca "

.

5ggYgga Ybh'tUg_		
	_	



# FYgci fWYg

DfYgWf]VYX F Ygci fWYg

## Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

K cf\_'gi Va ]hhYX``UhY`k ]h\ci hUb`Uddfcj YX`YI hYbg]cb`Vmh\Y`Wci fgY`WccfX]bUhcf`cf`XY`Y[ UhYX`Ui h\cf]hm]g gi VYWihc`U``UhY`dYbU`hmcZ)ı 'a Uf\_'fYXi Wf]cb`dYf`XUmz`Wcbg]ghYbhk ]h\`ch\Yf`GDF 99`Wci fgYgz`UbX WUddYX`Uh) `XUmg`f%&\$`\ci fgŁz`UZhYf`k\]W\`U`gh XYbhWUbbchgi Va ]h\Ub`UggYgga Ybh'

 $\label{thm:condition} $$HY^`UhY`dYbU`hm]g`Udd`]YX`dYf`WU`YbXUf`XUmif]bWi X]b[`k YY_YbXg`UbX`di V`]W\c`]XUmgŁ'h\Uhih\Y UggYgga Ybh]g`cj YfXi Y''`H\YfY`]g`bc`dfc!fUhU`cZh\Y``UhY`dYbU`hm`Zcf`gi Va ]gg]cbg`a UXY`dUfhk Umih\fci [\'UXUm'$ 

K cf\_'gi Va ]hhYX'UZhYf'h\Y''XYUX`]bY'Zcf'UVgc`i hY'ZU]''']g'bchUWWdhYX'UbX'U'a Uf\_'cZnYfc'k]``'VY'Uk UfXYX Zcf'h\Uh'UggYgga Ybh']hYa "

cf'gca Y'UggYgga Ybh']hYa gž'U'``UhY'dYbU`hma Umbch'VY'Uddfcdf]UhY"'H\YgY'UfY'WYUf'm']bX]\WUhYX']b'h\Y Wci fgY'ci h']bYz'UbX'gi W\'UggYgga Ybhg'fYWY]j Y'U'a Uf\_'cZnYfc']Zbch'Wca d`YhYX'Vmh\Y'gdY\\JZ]YX'XUhY" 91 Ua d'Yg']bWi XY.

U"''K YY\_`mcb`]bY`hYghg`cf``UVcfUhcfmk cf\_`k cfh\`U`ga U```dfcdcfh]cb`cZh\Y`gi VYWha Uf\_žcf

V"''C b`]bY ei ]nnYg k \YfY Ubgk Yfg UfY fY`YUgYX hc gh XYbhg cb Wca d`Yhlcbžcf

····cf

X""DUgg# U]"UggYgga YbhHJg\_g"

## 5 WUXYa ]W<cbYghmUbX D`U[]Uf]ga

 $\label{thm:continuous} IBGK ``Ug`Ub`cb[c]b[`Wcaa]haYbhhc`ZcghYf]b[``U`W``hifY`cZ`YUfb]b[`]bZcfaYX`VmUWUXYa]W]bHY[f]hm'`5``IBGK `ghiXYbhg`UjY`U`fYgdcbg]V]`]hmhc`UX\YfY`hc`h\]g`df]bW]d`Y`cZUWUXYa]W]bHY[f]hm'D`U[]Uf]gaibXYfa]bYg`UWUXYa]W]bHY[f]hmUbX`]g`bchhc`YfUhYX`UhIBGK "`B'SY[Sde_SfG@EI[eVW{`WSege[YfZW_aXSekagdai`ž$ 

Mci 'UfY'U'gc'fYa ]bXYX'h\UhWUfYZ ``h]a Y'a UbU[ Ya Ybh]g'Ub']a dcfhUbhdUfhcZgh XmUbX'cbY'cZh\Y ]XYbh]Z]YX'WUi gYg'cZd`U[ ]Uf]ga ']g'dccf'h]a Y'a UbU[ Ya Ybh'Gh XYbhg'g\ci `X'U``ck 'gi Z]W]Ybh'h]a Y'Zcf fYgYUfW\žXfUZ\]b[ 'UbX'h\Y'dfcdYf'fYZYfYbW]b[ 'cZgci fW/g']b'dfYdUf]b[ 'U```UggYgga Ybh'hUg\_g''

₹d`U[]Uf]ga i]gʻZci bXi]bimci fik cf\_ik \Ybimci 'UfYi]bʻZ[fghmYUfžimci fi`YWi fYfik]``cZYfimci 'Ugg]ghUbWYihc
]a dfcj Yimci fi'UWUXYa]Wg\_]``g'''H\Yma UmUg\_imci ihci`cc\_'Uhigca Yicb`]bYifYgci fWygžiUhhYbXih\Yi@YUfb]b[
7 YbhfYžcfigca Yh]a YgifYgi Va]himci fik cf\_ik]h\h\YidfcV`Ya iZ[l YX'''< ck Yj Yfia cfYigYf]ci gi]bghUbWygi]biZ[fgh
mYUfžigi W\ugighYU`]b[iUbch\Yfighi XYbhgik cf\_icfidUm]b[igca YcbYihciXcimci fik cf\_žia UmVYi]bj Ygh][UhYX
i bXYfih\YiGhi XYbhA]gWcbXi WhDfcWYXi fYg''

FYdYUHYX'd`U[]Uf]ga 'fYj Yb']b'Z|fghmYUfłź'd`U[]Uf]ga 'UZHYf'Z|fghmYUfźcf'gYf]ci g']bghUbWYgža Um'U`gc'VY ]bj Ygh][UhYX'i bXYf'h\Y'Gh XYbhA ]gWcbXi WhDfcWYXi fYg"'H\Y'dYbU'h]Yg'i bXYf'h\Y'dfcWYXi fYg'WUb']bWi XY U'fYXi Whcb']b'a Uf\_gž'ZU]`]b['U'Wci fgY'cf'Zcf'h\Y'a cghgYf]ci g'a UhHYfg'fi]\_Y'd`U[]Uf]ga ']b'Ub'\cbci fg h\Yg]gŁYj Yb'gi gdYbg]cb'Zfca 'h\Y'i b]j Yfg]mm''H\Y'Gh XYbhA ]gWcbXi WhDfcWYXi fYg'UfY'Uj U]`UV'Y'\YfY.

kkk"[g"i bgk"YXi"Ui #dc]Wn#XcWa Ybhg#ghi XYbha ]gWcbXi WhdfcWYXi fYg"dXZ

# 5 WUXYa] W + D Zcfa Uh]cb

7 ci fgY '9j U`i Uh]cb 'UbX '8 Yj Y`cda Ybh'

# 5ddYbX]l. '9b[]bYYfg'5i glfU`]U'f95Ł'DfcZYgg]cbU`'9b[]bYYf'7ca dYhYbWm GHJbXUfX

Dfc[fUa '±bhYbXYX'@YUfb]b['CihWca Yg	
?bck `YX[Y'UbX'g_]```VUgY	
D9%"%7cadfY\Ybg]jYžh\YcfmVUgYX`ibXYfghUbX]b[`cZh\Y`ibXYfd]bb]b[`bUhifU``UbXd\mg]\W'`g\\Yb\W`g`UbX`h\Y`Yb[]bYYf]b[`ZbXUaYbhU`g'Udd`]\WV`Y`hc'h\Y`Yb[]bYYf]b[`X]g\\]d`]bY	
D9%"&"7cbWYdhi U``i bXYfgHJbX]b[ 'cZh\Y'a Uh\Ya Uh]Wgž'bi a Yf]WJ``UbU`mg]gž'gHJh]gh]Wgž'UbX Wca di hYf'UbX']bZcfa Uh]cb'gW]YbWYg'k\]W\`i bXYfd]b'h\Y'Yb[ ]bYYf]b[ 'X]gW]d`]bY	