Cf`UbXc'AU[]W9mY'; UaY!7\Ub[]b[HfUXY'Zcf'5``!GhUf'HfUY'Mcib[°

$\label{eq:hardenergy} \begin{array}{l} H\ Y\ C\ f\ Ub\ Xc\ A\ U[\]WU]a\ hc\ Yb\ Ub\ W\ h\ Y\ f\ c\ ZY\ b\ gY\ Vm \\ hUf[\ Yh]b[\ HfUY\ Mc\ i\ b[\]b\ U\ d\ c\ h\ bh]U\ hfUX\ Y\ k\]h\ h\ Y\ 5\ h\ Ub\ hU \\ < Uk\ g" \end{array}$



Cf`UbXcžI b]hYX`GhUhYg'!`H\Y`Cf`UbXc'AU[]WUfY`Z]bX]b[h\YagY`j Yg`Uh`U`Wfi W]U``WfcggfcUXg`Ug`h\Ym`UhhYadh`hc`Y`Yj UhY h\Y]f`dYfZcfaUbWY`UbXž`i`h]aUhY`mž`h\Y]f`d`UmcZZ`gYUh]b["`8Ygd]hY ghUfh]b[`h\Y`gYUgcb`k]h\`dfca]g]b[`g][bg`Zfca`f]g]b[`ghUfg`DUc`c 6UbW\Yfc`UbX`: fUbn`KU[bYfž`h\Y`AU[]Wg`]bUV]`]hm`hc`Z]bX`h\Y]f cZZYbg]j Y`f\mh\a`\Ug`\]bXYfYX`dfc[fYgg"`K]h\`U`XYZYbgY`h\Uh`]g i bXci VhYX`m`gc`]Xž`h\Y`bYYX`hc`fYgc`j Y`h\Y]f`UXa]b]ghfUh]j Y]ggi Yg`k]h\`gWcf]b[`\Ug`VYWcaY`dUfUacibh"`5WVcfX]b[`hc`Gdcfhg =``i ghfUhYXž`h\Y`hYUag`Zfcbh`cZZ]WY`]g`_YYb`cb`Vf]b[]b[`]b`U dfcj Yb`g\ch!aU_Yf`hc`hifb`h\Y]f`ZcfhibYg`UfcibX"

H\Y'df]a Ufm'bUa Y'VY]b['ZcUhYX'Ufci bX']g'HfUY'Mci b[ž'dc]bh [i UfX'Zcf'h\Y'5h`UbhU'<Uk _g"'Mci b[g'fYa Uf_UV`Y'dfck Ygg'Ug'U ZUW]`]hUhcf'k Ug'Yj]XYbh'h\fci [\ci h'h\Y'gYUgcbž`YUX]b['h\Y YU[iY'k]h\'Ub']a dfYgg]j Y'%%"* Ugg]ghg'k \]`Y'Uj YfU[]b['&("& dc]bhg'dYf'[Ua Y"'<]g'g\cch]b['bi a VYfg'hY```U'ghcfmž'hccž'h\ci [\ bch'k]h\ci h']a dYfZYWh]cbg/`\Y'fYWcfXYX'U'h\fYY!dc]bh'g\cch]b[fUhY'cZ'' (i "'FY[UfX`Yggž'\]g'UXX]h]cb']g'gYYb'Ug'U'g][b]Z]WUbh Vccgh'hc'Ub'i bhYbUV`Y'g]hi Uh]cb'k \YfY'h\Y'A U[]WfUb_YX'bYUf'h\Y Vchhca ']b'cZZYbg]j Y'ci hdi h``Ugh'gYUgcb"

$HfUXY'HU^{g'} < YUh'I d$

H\Y'gdYW'`Uh]cb'gi ffci bX]b['U'dchYbh]U``hfUXY']bhYbg]Z]Yg'k]h\ h\Y'fYWYbh'dfcdcgU``gi [[Ygh]b['h\Uh'h\Y'<Uk _g'a][\h'Wcbg]XYf'U dUW_U[Y'XYU``]bj c`j]b['\$U`Yb'Gi [[gž'5bh\cbm'6`UW_ž'\$/hh'<ck UfXž UbX'U'hcd!%\$!dfchYWhYX'Z]fgh!fci bX'd]W_']b'&\$&+"'H\]g'gWYbUf]c k Ug'YW\cYX'Vm'Gdcfh]b['BYk gž'k \]W\'\][\`][\hg'h\Uh'h\]g'hfUXY Wci `X'VY'a i hi U``m'VYbYZ]W]U`": cf'h\Y'A U[]Wž'UWei]f]b['U'dfc`]Z]W gWcfYf``]_Y'Mci b['Wci `X'fYj]hU`]nY'h\Y]f'ghi hhYf]b['cZZYbgY'UbX]a dfcj Y'h\Y]f'hfU[]Wh\fYY!dc]bh'g\cch]b['k cYg'h\Uh'Wcbhf]Vi hYX hc'U'X]ga U``fUb_]b['Ug'cbY'cZ'h\Y'Vchhca !Z]j Y'cZZYbgYg']b'h\Y &\$&(!&) 'gYUgcb"

K \]`Y`Mci b[g`XYZYbg]jY`g_]``g`\UjY`VYYb`eiYgh]cbYXž'h\Y`AU[]W dcggYgg`U`XYYd`fcghYf`h\Uh`WUb`XYZYbX`kY```Ybci [\`hc Wca dYbgUhY`Zcf`Ubm`XYZ]W]YbW]Yg`\Y`a][\h`Vf]b["`5bU`mghg VY`]YjY`h\Uh`U`cb[g]XY`6UbW\Yfc`UbX`K U[bYfž`k\c`\UjY`g\ckb dchYbh]U``Ug`cZZYbg]jY`Wcbhf]Vi hcfgž`Mci b[g`d`Uma U_]b[`Wci`X fYg\UdY`\ck`h\Y`A U[]WUddfcUV\`[UaYg"`=b^if]Yg`\UjY`WYfhU]b`m]a dUWhYX`h\Y`hYUa_g`XmbUa]Wgž`Vi h`h\]g`ghfUhY[]Wg\]Zh`]g`j]YkYX Ug`U`Vc`X`ghYd`hckUfXg`d`UmcZZ`WcbhYbh]cb"

: i hi fY[·]7cbg]XYfUh]cbg

5g'< ccdg'K]fY'dc]bhg'ci hž']Z'h\Y'hfUXY'k YfY'hc'hfUbgd]fYž'Mci b[k ci `X'Vf]b['k]h\`\]a 'bch'i gh'hU`Ybh'Vi h'h\Y'VUW_]b['cZ'U'fcVi gh WcbhfUWh \Uj]b['g]['bYX'U'Z]jY!mYUfž'~&%) 'a]``]cb'YI hYbg]cbž'\Y]g'Vci bX'hc'YUfb'Ufci bX'~ (*'a]``]cb'bYI h'gYUgcb"Cb'hcd'cZ'h\Uhž \]g'd`UmYf'cdh]cb'Zcf'h\Y'&\$&*!&+'gYUgcb'Wci `X'Wca d`]WUhY a UhhYfg'Zcf'h\Y'A U[]W]Z'h\Ym'k]g\'hc'_YYd'\]a ``cb[!hYfa" # g'k cfh\ bch]b['h\Uh'Ug'cZ'bck ž'Mci b['\Ug'mYh'hc'fYei Ygh'U hfUXY'Zfca '5h`UbhUž'k \c']g'W'ffYbh`m'g]hi UhYX']b'U'd`UmcZZ'gdchž hm]b['h\Y'hk c'hYUa g'WcgY`m'Ug'h\Ym'Wcc``m'YmY'YUW\'ch\Yf']b'h\Y ghUbX]b[g"'=Z'h\Y'gYYXg'UfY'gYk b'Zcf'Ub'Cf`UbXc!5h`UbhU a UhW\i dž'h\Y'ghU_Yg'k]``'VY']bWfYX]V`m'\][\ YgdYW]U``m'Zcf'h\Y A U[]Wź'k \c'\Uj Y'VYYb'mYUfb]b['hc'VfYU_'dUgh'h\Y'Z]fgh'fci bX'cZ h\Y'd`UmcZZq'q]bWY'&\$%\$"

K]```h\YgY`k \]gdYfg`cZ`U`hfUbgZcfa Uh]j Y`hfUXY`dUb`ci hž`cf`UfY h\Ym`a YfY`m`h\Y`XfYUa g`cZ`ZUbg`\i b[fm`Zcf`W\Ub[Y3`Cb`m`h]a Y k]```hY```Ug`h\Y`B65`g\ck g`ei]f_g`i bZc`X`h\]g`cZZgYUgcb"`CbY h\]b[g`gi fY.`h\Y`A U[]Wg`di fgi]h`cZ`U`[Ua Y!W\Ub[]b[`d`UmYf``]_Y HfUY`Mci b[`Wci`X`XfUa Uh]WU``m`fYg\UdY`h\Y]f`Zi hi fY`cb`h\Y`Wci fh"

8YhU]`g	
Cfh	Cf`UbXcžIb]hYX`GhUhYg
EiY``Yb	• k k k "g]"Wca
	• k k k "gdcfh]b[bYk g"Wca
	• \ccdgk]fY"Wca

6Ygi WXYb'G]Y'i bg'Ui Z'a Y]b!k]Yb"bYh