!"#\$%&'(%\$)*+*,'%-./.,.%

%%

C@G2/!./T'!@40P040,C'

@**&6%9**)L%**:**')6<'+9)6%**:**'

<u>@&6%9)L%:')6<'+9)6%:'1D6<8<'</u>

.

- . / .,.EM \$REM=',>*4,4(EM ?REM \ 4C4EWcRM [REWUM .(.EW bRWN4I40'2*5>%?'/21,.,*'5.0%#''0CW&'(MG'340P].C43M d(.0%W4.3*5>% [0145SJ% \$CC4CC/45,CR% [15343%]J%06:%#%D%8'&I',<DL)%#&6)?'CL#86L8'>' 5JCJ'A80)9% * 86%'&I',<DL)%#&6%,'%B'1,+4(5%G4,+'3*C,%H5*I4(C*,J%0\$1>1C,%8:8:%X%c10J% 8:8F<R%#',.0%.A.(3%UVWW0WXY'0="<R%
- \ 4C4E%cR% [RE% . / .,.E% \$ RE%B.4eE%VRE%U% \ 4C4E%WR% \$ % ? ' / 2(4+45C*I4%G4.C1(4% ' &%W4.3*5>% [@145SJ_% H5*,*5>%.53%BS.@*5>% \$ SS1(.SJE%W.,4E%.53%=('C'3JR% [15343%]J%06:%#%D%8'&I', <DL)%#&6)?' CL#86L8'>'5JCJ'A80)9% * 86%'&I', <DL)%#&6%, '%H5*I4(C*,J% ' &% d (4> '5%0c1@J%8:8:%X%c154% 8:8;<R%# ',.@%.A.(3%UYQZWWQZ[W%0S'P="<R%
- K.)4(E%NRE% . / .,.E%\$RE%V.(C'5E%TRE%W*S+.(3CP#1,'(E%?R%T5>0*C+%V4.(54(%!'S.]10.(J%\$Sf1*C*,*'5% \4L,%g454(.,*'5%0TV!\$%8R:<R%[15343%]J%06:%#%D%8'&I',<DL)%#&6)?'CL#86L8'>'5JCJ' A80)9% * 86%'&I',<DL)%#&6%,'%B'1,+4(5%G4,+'3*C,%H5*I4(C*,J%0\$1>1C,%8:8:%X%c10J%8:8;<R% #',.0%.A.(3%UYQZWWQW\Z%0S'P="<R%
- . / .,.EN \$ REN V*,,04ENNRENK.)4(ENBREN a *>+,EN \$ REN UN [.(/ 4(ENNRN \$ NW4C4.(S+H=.(,54(C+*2N,'N" / 2('I4N - . / .,.EN \$ REN V*,,04ENNRENK.)4(ENBREN a *>+,EN \$ REN UN [.(/ 4(ENNRN \$ NW4C4.(S+H=.(,54(C+*2N,'N " / 2('I4N,+4N`I.0*,JN'&N=(4P-N?0.CC(''/N=(.S,*S4CRN[I5343N]JN06:%#%D%8'&I',<DL)%#&6)?' CL#86L8'>'5 JCJ'A80)9% * 86%'&I', <DL)%#&6N0c10JN8:6Z%X%c154%8:8:<RN#',.0%.A.(3%U\XX (RN 0="<%
- \4C4E\cR\[R\U\-./.,E\\$R\G4.C1(*5>\d(.0\\4.3*5>\[0145SJ_\?'/21,4(*e43\d(.0\\4.3*5>\ TI.01.,*'5\\0?d\UT<\[15343\]J\\06:\#\D\\8'&I',<DL)\#&6)?'CL#86L8'>'5JCJ'A80)9*86\\'&I' ,<DL)\#&6\\,'\\H5*I4(C*,J\\'&\\d(4>'5\\0\$1>1C,\8:6;\X\\c10J\\8:6Z<\\#',.0\\.A.(3\\UYJ]3'0B1]P .A.(3\\,'\\BGH\\UZ[^0[VY<\0S'P="\\&'(\\,+4\\2('^4S,E\\.53\\="\\&'(\\C1]P.A.(3<\\
- \$ @%d,.*].E%BRE% \$ @@ '(E%cRE% b ' I.5 ' &&E%=RE%U% . / .,.E% \$ R%=('^4S,%[d ?HB_%TL2@ ' (*5>%W#"% */2@4 / 45,.,*'5%A*,+%.%& 'S1C% ' 5%C,1345,C%(4S4*I*5>%#*4(%F%.53%C24S*.@%431S.,*'5R%[15343%]J%06:%#%D%8'&I',<DL)%#&6)?'CL#86L8'>'5JCJ'A80)9% * 86%'&I',<DL)%#&6%,'%B ' 1,+4(5% G4,+'3*C,%H5*I4(C*,J%Oc1@J%8:6M%X%c154%8:86<R%#',.@%.A.(3%UYJ] 3 %OS 'P="%& ' (%,+4%2('^4S,<R%
- . / .,.E% \$R%TL. / *5*5>%,+4%I.@*3*,J%'&%S1((*S101 / P].C43%C,.53.(3*e43%04.(5*5>%.53%.CC4CC / 45,% CJC,4 / R% [15343%]J%0:%)%#&6%0B42,4 /]4(%8:6;%X% \$1>1C,%8:6M<%,'%B'1,+4(5%G4,+'3*C,% H5*I4(C*,JR%#',.0%.A.(3%U\V[QZ^Z%0="%&'(%,+4%2('^4S,<R%
- [''(/.5ENKRNG4.C1(*5>NW4.3*5>N=('>(4CCN*5NB,(1>>0*5>N\$3'04CS45,CRN[15343N]JN06:N#/NDN8'&I' ,<DL)%#&6)?'CL#86L8'>'5JCJ'A80)9N*86N'&I',<DL)%#&6N,'N[0'(*3.NB,.,4NH5*I4(C*,JN 0G.(S+N8::YNXN[4](1.(JN8:68<RN#',.0N.A.(3NUYJ_3RN0B1]P.A.(3N,'NH5*I4(C*,JN'&Nd(4>'5N UYXZ0_YY<N0G4,+'3'0'>*C,N&'(N,+4N2('^4S,EN.53N="N&'(N,+4NC1]P.A.(3<RN
- . / .,.EM \$R%N*&&4(45,*.0%",4 / %[15S,*'5*5>%\$5.0JC4C%&'(%B,1345,C%A*,+%#4C,%\$SS' / / '3.,*'5C%'5% \\$T=%,4C,%*,4 / CR%[15343%]J% -)%#&6)?'@86%89'I&9', <DL)%#&6'C%)%#:%#L:'>'5JCJ' A80)9% * 86%'&I', <DL)%#&6%, '%[0'(*3.%B,.,4%H5*I4(C*,J%0c10J%8::F%X%G.J%8::9b%\$A.(3% \1 /]4(_%WY:8K:F::89<R%#',.0%.A.(3%UW_0Y]Z%0="%&'(%,+4%2('^4S,<R%

4L4S1,*I4\&15S,*'5 +,,2C_773'*R'(>76:R6:6i7^R^'C.,R8:88R8:ZY;Z\\

- i9RM .(.EW bREM . / .,.EW \$ REWT / (4EWTREM `*. 'EWOREWUW \ 4C4EWcRM [RM#RM08:8F<RM=(43*S,*5>W'(.0%(4.3*5>W &0145SJW]JW]4,A445PA '(3WC*045S4W,* / 4CW1C*5>W5.,1(.0%0.5>1.>4W2('S4CC*5>W.53W(.53' / W & '(4C,W.0>'(*,+ / RM +,,2C_77AAAR2CJS+'0'>*4P.),1400RS' / 7&*04.3 / *57W43.),*'57c'1(5.0472,. / j8:8FP 67=#\$Gjj6P8:8Fj8j)'(R23&W
- i; R%V1*E%=R%=RE%U% . / ., E%\$R%08:8F<R%D.(/ '5*e*5>%.CC4CC/45,C%'&%4I4(J3.J%(.S*.0%3*CS(*/*5.,*'5% 4L24(*45S4C_%#+4%/10,*>('12%4I4(J3.J%(.S*.0%3*CS(*/*5.,*'5%CS.04%0GTWNB<R% R%+,,2C_773'*R'(>76:R66MM76:MF6Y668F66i8F9M%
- iFRM .(.EW b REM . / ., .REM `*. 'EWOREM=',>*4,4(EM \ REWU\ \ 4C4EWcRM [RM#RM08:8F<RMTf1.,*5>\ '(.@M(4.3*5>\ &@145SJ\CS'(4C_M\$\ / '34@P].C43\.22('.S+RM RM +,,2_773LR3'*R'(>76:R66MM7::6F6i; ;8866;Z688\M
- i 8R%K1*E%GR%#RE%=',>*4,4(E%?R%cRE%U%-./.,E%\$R%08:88<R%=45.0*e43%0*)40*+''3%/4,+'3C%&'(%/'340*5>% S'15,%3.,.R% 6:R6:Z:7:8ii;MiFR8:88R86:F6:6%
- i:RNB'5>ENCREN''2EN REN b.5RENCRENV1*EN=RN=REN . / .,.EN \$ RENUN * / ENBRN bRN08:86<RN=.,+A.JCN0*5)*5>N 4,+5*SN3*CS(* / *5.,*'5N.53N3(1>P1C*5>N244(N.&&*0*.,*'5CN,'N1534(.>4N3(*5)*5>NC,.,1CN. / '5>N G4L*S.5P'(*>*5N.3'04CS45,CRN '50*54N21]0*S.,*'5RN+,.2C 773'*R'(>76:R6:FM72+.:::9::NN
- 9YRM .(.EM b REM . / .,.EM \$ REM g .004>'CEMTREM=.,.(.2*S+.J.,+. / EM ? REM=',>*4,4(EM ? RMCRM08:86<RM ? 'I.(*.,4M].0.5S4M.CM.Mf1.0*,JM*53*S.,'(W&'(M2('245C*,JMCS'(4M.5.0JC*CRM RM 0;<EMFM:PFZMRM

+,,2C_773 '*R'(>76:R86:F6742 '3RYYF9M6

- 9ZRNW.5S+4(EM ? REMC'1(*04CEWTREWGSN'5.03EWWREM . / ., EM \$ REWUNC.S)C'5EWGRM08:86<RNB40&P]0./4W*5M \$ 3'04CS45,CMA+'N+.I4W]445NB4L1.00JN\$]1C43_N[.S,'(NB,(1S,1(4M.53NN*&&4(45,*.0M ?'((40.,4CM'&M\$]1C4PC24S*&*SM.53Ng0'].0NG4.C1(4CRM 21]0*S.,*'5RM+,,2C_773'*R'(>76:R66MM76:MF6Y66866:8MiF8NM
- 9MR%W.]*5E%VR% \$ RE% G *@4CE%WRE% . / ., .E% \$ RE% (*C+5.5E% \$ RE%T@]10')P?+.(S.24E% G RE%B,4A.(,E% g RE%U% ?'/2,'5E% G R%#R%08:86<R%N4I40'2/45,E%*,4/%.5.0JC*CE%.53%*5*, .e%(40*.]*0*,J%.53%I.0*3*,J% '&%,+(44%&'(/C%'&%.%/10,*204PS+'*S4%/45,.0%+4.0,+%0*,4(.SJ%.CC4CC/45,%&'(%S'004>4% C,1345,C%0GDV \$ PS<R% R%3'*_%6:R6:6i7^R2CJS+(4CR8:86R66FZYM%)
- 99RNDC*4+ENGRENUN-./.,EN\$RN08:8:<RNTL./*5*5>N,+4%2(4PC4(I*S4%CS+''0%2(*5S*2.0CkN*/2('/2,1%C244S+%C)*00%A*,+N.%/.5J

- 9;RM .(.EM b REW UM . / .,.EM \$ RM08:8:<RM G 10,*04I40M*,4 / M(4C2'5C4M / '340MA*,+M+4,4('>454'1CMA*,+*5P S01C,4(MI.(*.5S4CRM#+4Mc'1(5.0M'&MTL24(* / 45,.0MT31S.,*'5RM=1]0*C+43Md50*54M[*(C,RM +,,2C 77AAAR,.53&'50*54RS' / 73'*7&10076:R6:Z:7::88:YMFR8:8:R6Z9Z:69M
- 9FRNB.5'ENGRENK.)4(ENNRNVREN?'00.e'ENGRENV4EN\RENUN-./.,EN\$RN08:8:<RNG4.C1(*5>N,+4H4L2(4CC*I4N 0.5>1.>4H.53HI'S.]10.(JN'&NV.,*5'NT5>0*C+H04.(54(CH1C*5>N+.53H,(.5CS(*]43HC244S+H3.,.H .53H.1,'/.,43HCS'(*5>RH
 - E% %0F<E%88YP89iR%Nd"_%6:Ri6;Z7"c"#\$BR8:8::Yj6F0F<R:::F%%
- 98RM \ 4C4E%cRM [RM \$ REMUN . / .,.EM \$ RM08:8:<RM \$ 33(4CC*5>%,+4%0.(>4%C,.53.(3%4(('(%'&%,(.3*,*'5.0%?KGP W_%TC,*/.,*5>%,+4%S'53*,*'5.0%C,.53.(3%4(('(%'&%.%/'340P].C43%4C,*/.,4%'&%?KGPWRM R%=1]0*C+43%d50*54%[*(C,R%

+,,2C_773'*R'(>76:R66MM769F;9:Z;8:YFMZ:6%

96R%K.)4(E%NR%VRE%G.E%DRE%-./.,E%\$RE%?'5(JE%cR%GRE%U%='0.5S'E%=R%08:8:<R%N4I40'2/45,%.53% 2('/*C4%'&%.%I'S.]10.(J%*5,400*>45,%,1,'(*5>%CJC,4/%&'(%C4S'53P>(.34%V.,*5L%T5>0*C+% 04.(54(CR%))20.7721*D'(5.75,760F)C02FD8+8+PCV(200F)

+,,2C_773 '*R'(>76:R6:Z:769FY698FR8:8:R6Mi896Y)

- 9:RNV*.5>ENOREN . / .,.EN\$RENUNV*ENcRN08:8:<RND*4(.(S+*S.0NK.J4CN.22('.S+N,'N4C,*/.,4N,+4N,(4.,/45,N4&&4S,N&'(N(.53'/*e43NS'5,('0043N,(*.0CRN ENZ:EN6:Y:P666;RN3'*6:R66MM7::6F6i;;8:Y:YZZ9N
- ; YRM .(.EM b REM . / ., EM \$ REM=',>*4,4(EM ? REMUM \ 4C4EMcRM [RM \$ RM08:8:<RMTC,* / .,*5>% / '340P].C43% '(.0% (4.3*5>%&0145SJ_MK.J4C*.5%.22('.S+RM Z; MPZiYRM3'*_6:R66MM7::6F6i;;6YY::8:ZM
- ; ZRNB,4A.(,EN g REN . / .,.EN \$ REN G *04CENWREN g(.53'*,ENTREN G.5340].1 / EN [REN` 1*55EN ? REN UNW.]*5ENVRN 08:6Y<RN=(43*S,*5>N / 45,.0N+4.0,+N+402NC44)*5>N'(*45,.,*'5CN./'5>N3*I4(C4N 1534(>(.31.,4CRN) EN EN8M6P8Z:RN
- ; MR% \$ 0% d ,.*] . E%BRENV . 5E%=RENK .) 4(E% RE% \$ 00 ' (E%CRENW*I . CE%KRE% b ' I . 5 ' &&E%=RE%U% . / .,. E% \$ R%08 : 6Y<R% T04 / 45,.(J%,4.S+4(kC%)5 ' A043>4% ' &%(4C2 ' 5C4%, ' %*5,4(I45,* ' 5%* / 204 / 45,.,* ' 5_% \$ % 2(40* / *5.(J%&.S,'(%.5.0JC*CR% E%F;P9FR%
- ; i RMK.)4(EMBREM . / ., EM\$ REW a (*>+,EM=REW[.(/4(EMNRMUW)*224(,EMWRM08:6Z<RMHC*5>%2('245C*,JMCS'(4% /.,S+*5>%,'%4C,*/.,4%,(4.,/45,%4&&4S,C%'&%.&,4(CS+''0%2('>(./C%'5%,+*(3%>(.34%(4.3*5>% '1,S'/4CE% %66MP68; %
- ;9RM=.,.(.2*S+.J.,+. / EM ? RM UM . / .,.EM \$ RM08:6Z

!"#\$%&'(%\$)*+*,'%-./.,.%0123.,43%'5%6678978:8;<%

8ZRN=.,.(.2*S+.J.,+. / EN ? REM - . / .,.EN \$ REWUN - .5^.5.A.C44EMBRN08::Y<RM?('CCP04I40M,A'PA.JM 3*&&4(45,*.0M*,4 / N&15S,*'5*5>N.5.0JC*CM / '340M]JN / 10,*04I40MW.CS+N / '340*5>RMM EN EN69P86RM

8MR% V*E% DRE% V44E% NRE% = &4*&&4(E%BR% "RE% - . / .(,.E% \$ RE% - 1 / ,424% \$ R% # RE% U% W 'C.3 'E% c

4

!"#\$%&'(%\$)*+*,'%-./.,.%0123.,43%'5%6678978:8;<%

- ?+1E% RVRE%U% . / .,.E% \$ R%08::M<R%#4C,%4f1.,*5>%A*,+%,+4%2(4C45S4%'&%N"[R%"5%TR%B/*,+%U%WR% B/*,+%0T3C<R% %022R%FY:P
 - ;:;<R% G.204% g('I4E% G _%c \$ G%=(4CCR%)
- 6FRNc*. 'ENDEM a .5>ENBRENUN . / .,.EN \$ RN08::9<R TL20'(*5>N,+4%2'CC*]*0*,J%'&%1C*5>N+*4(.(S+*S.0%) >454(.0*e43%0*54.(% / '340%,'% / '340%0'S.0%*,4 / %34245345S4R%) EN ENF66PF86R%

#+*C%2.24(%A.C%.@C'%21]@*C+43%.C%.%]'')%S+.2,4(h%

- c*. 'ENDEN a .5>ENBRENUN . / .,.EN \$RN08:: M<R TL20'(*5>N,+4N2'CC*]*0*,JN'&N1C*5>N+*4(.(S+*S.0N) >454(.0*e43N0*54.(N / '340N,'N / '340N0'S.0N*,4 / N34245345S4RN"5NTRNB / *,+NUNWRNB / *,+N 0T3C<RN G.204Ng('I4ENG_Nc\$GN=(4CCRN)
- 68R%K4(4,I.CE%BR% \ RE%U% . / .,.E% \$ R%08::9<R%#+4%G10,*04I40%G4.C1(4 / 45,%G ' 340_%"5,(' 31S,* ' 5%, ' % ,+4%B24S*.0%"CC14R% E% E%8;MP89;R%
- 66R% a *0)4E%NR%cRE% . / .,.E% \$RE%U%?.C+E%BR%cR%08::9<R%G'340*5>%,(4., / 45,% / ',*I.,*'5%*5%C1]C,.5S4P .]1C*5>%A' / 45%A*,+%S+*03(45R% E% E%6F6F96F8FR%
- 6:R% .+(. / .5E% \ RE%U% . / .,.E% \$ R%08::;<R%"5S(4.C*5>%,+4%2(4S*C*'5%'&%C1]CS.@4%CS'(4C%]J%1C*5>% '1,P'&PCS.@4%*5&'(/ .,*'5R% R% E%;:MP;8iR%
- YRM . / ., .EM \$ REWUM ! .1>+5EMKRM RMO8::;<RM \$ 5M*5,('31S,*'5M, 'W3*&&4(45,*.0M*,4 / W&15S,*'5*5>M .5.0JC*CRM EW;YPiYRM
- ZRN g 45SENTRNUN . / .,.EN \$ RN08::;<RNT&&4S,N'&N&403N,(*2N'5NC,1345,CKNCS*45S4N.S+*4I4/45,_N\$ N/4,.P .5.0JC*CRN EN 0 <EN686P68;RN
- MRN g '0345EN \$RBREN#4545].1 / EN g RENUN . / .,.EN \$ RN08::;<N \$ &&4S,P(40.,43%24(&'(/.5S4ke'54C_N \$5% *34'>(.2+*SN / 4,+'3%&'(%0*5)*5>N.&&4S,N,'%24(&'(/.5S4RN EN EN;8Pi:RN

iR% - *,C.5,.CE% \$RE% g*00*>.5E%#R%NRE%U% - . / .,.E% \$R%08::F<R%?'004>4%A' / 45%A*,+%4.,*5>%3*C'(34(C_% B40&PW4>10.,*'5E%V*&4%B.,*C&.S,*'5E%.53%='C*,*I47\4>.,*I4%\$&&4S,R% E% E%FZ6PFY9R%

9RM - . / ., EM \$ REM#4545].1 / EM g REMD.5*5EM b RM08::8<RM"53*I*31.0%o'54%'&M d 2,* / .0%[15S,*'5*5>% 0"od[<_M \$ M=('].]*0*C,*SM?'5S42,1.0*e.,*'5RM 6ZYP8:ZRMM

;RN - . / .,.EN \$ RN08::6<RN",4 / N.5.0JC*CN]JN,+4%+*4(.(S+*S.0N>454(.0*e43N0*54.(N / '340RN EN ENMYPYFRN

- FR%N4@I.E%cREMG.,+*4C45E%BR%gR%U%-./.,E%\$R%08::6<R%HC4%'&%*004>.0%3(1>C%./'5>%/',+4(C%*5%,+4%H5*,43%B,.,4C_%\$%/10,*P04I40%.5.0JC*C%'&%*53*I*31.0%.53%S'//15*,J%04I40%*5&0145S4CR% E% E%i6;Pi89R%
- 8R%K'A4(E%KR%VRE%U%-./.,E%\$R%08:::<R%[.S,'(C%*5&@145S*5>%C,1345,%C.,*C&.S,*'5%A*,+%'5@*54% S'1(C4CR% E% 0F<E%98P9iR%
- $\begin{array}{l} 6 \texttt{R}\texttt{K4S} + 4 \texttt{C}\texttt{W}\texttt{W}\texttt{H}\texttt{B}\texttt{J}\texttt{5}, +4 \texttt{C}\texttt{W}\texttt{W}\texttt{C}\texttt{4}. \\ (\texttt{S}+\texttt{W}\texttt{g}(\texttt{'}\texttt{12}\texttt{R}\texttt{W}\texttt{0}\texttt{6}\texttt{Y}\texttt{Y}\texttt{Z}<\texttt{R}\texttt{W}\texttt{G}\texttt{4}>. \\ \texttt{P}\texttt{W}\texttt{4}\texttt{A}\texttt{K}\texttt{'}\texttt{'})\texttt{C}\texttt{W}\texttt{'}\texttt{5}\texttt{W}\texttt{4}, \texttt{P}.\texttt{5}.\texttt{G}\texttt{J}\texttt{C}\texttt{C}\texttt{R}\texttt{W} \\ \texttt{E}\texttt{W}\texttt{M}\texttt{M}\texttt{M}\texttt{P}\texttt{Y}\texttt{8}\texttt{R}\texttt{W} \end{array}$

.8I8988<'@&6I8986L8'B9&L88<#6K:'

.

8R%c*.'E%DE% a .5>E%BRE%U% - . / ., .E%\$R%08::M<R

- =.,.(.2*S+.J.,+./E%?RE%U%-./.,E%\$R%08:6M<R%TI.01.,*'5%'&%\$]*0*,J%TC,*/.,4C%1534(%8=V%K*P &.S,'(%#4C,04,%G'340R%=.24(%2(4C45,43%.,%,+4%.551.0%/44,*5>%'&%,+4%\.,*'5.0%?'15S*0%'5% G4.C1(4/45,%*5%T31S.,*'5E%B.5%\$5,'5*'E%#OE%\$2(*0%8:6MR%q\.,*'5.0*%)
- .(.EM b REMUM . / .,.EM \$ RM08:6M<RMK.J4C*.5MG'340*5>%'&MG10,*04I40M",4 / MW4C2'5C4%G'340%A*,+% D4,4('>454'1C% a *,+*5Pg('12%!.(*.5S4RM=.24(%2(4C45,43%..%,+4%.551.0% / 44,*5>%'&%,+4% \.,*'5.0%?'15S*0%'5%G4.C1(4 / 45,%*5%T31S.,*'5E%B.5%\$5,'5*'E%#OE%\$2(*0%8:6MR% q\.,*'5.0r%
- $\label{eq:started_criterion} $$ 4C4EhcRM [RM#REM . / ., EM $ REM . +5EhcRM08: 6M<RM=(43*S, '(CM '&WV 'AM $>(44 / 45, MK4, A445)) $$ 1, ' / ., 43%B244S+%W4S '>5*,*'5%.53%D1 / .5%BS '(4CRM=.24(%2(4C45, 43%, ., %, +4\%.551.0%) / 44,*5>% '&%, +4\% \ .,*'5.0% ? '15S*0% '5%G4.C1(4 / 45, %*5%T31S.,*'5EMB.5% $5, '5*'EM#OEM $2(*0% 8:6MRMq \ .,*'5.0r%) $$$
- . / .,.EN \$ REN V . 5EN=REN UN g . 004> 'CENTRNO8 : 6M<RNTI .01 .,* '5N '&NS 'I .(* .,4NC4044S,* '5NC,(.,4>*4CN*5N 2('245C*,JNCS'(4N.5.0JC*CRN=.24(N2(4C45,43N.,N,+4N.551.0N / 44,*5>N '&N,+4N#4L.CNH5*I4(C*,JN T31S.,* '5.0NB,.,*C,*SCN.53N=CJS+' / 4,(*SCEN \$ 1C,*5EN#OENG.(S+N8:6MRNqB,.,4rN
- -./., EN \$ REN -.(.EN b REN=.,.(.2*S+.J.,+./EN ? REN UNV.5EN=RN08:6i<RNTI.01.,*'5N'&N.5.0JC*CN .22('.S+4CN&'(N,A'P2.(,N/*L,1(4N/'340CRN=.24(N2(4C45,43N.,N,+4N.551.0N/44,*5>N'&N,+4N) \$ /4(*S.5NT31S.,*'5.0NW4C4.(S+N\$CC'S*.,*'5EN a.C+*5>,'5ENN ? EN \$ 2(*0N8:6iRNq \.,*'5.0rN)
- \ 4C4E%cR% [R%#RE% \$ @ '5e 'E%cRE%U% . / .,.E% \$ R%08:6i<R%? ' / 2.(*5>%2.CC.>4%@45>,+%.53%+1 / .5% ICR% C244S+%(4S'>5*,*'5%CS'(*5>%'&%'(.@%(4.3*5>%&@145SJR%=.24(%2(4C45,43%.,%,+4%.551.0% / 44,*5>%'&%,+4% \$ / 4(*S.5%T31S.,*'5.0%W4C4.(S+% \$CC'S*.,*'5E% a .C+*5>,'5E%N?E% \$2(*0% 8:6iR%q \ .,*'5.0r%
- . / .,.EM \$ RN08:69<RNN4I40'2*5>N,+4%54L,%>454(.,*'5%'&%'(.0%(4.3*5>%&0145SJ%.CC4CC/45,R%"5I*,43% 2(4C45,.,*'5%.,%,+4%.551.0%/44,*5>%'&%[0'(*3.%T31S.,*'5.0%W4C4.(S+%\$CC'S*.,*'5E%d(0.53E% [VE%\'I4/]4(E%8:69R%qB,.,4r%
- \ 4C4ENcRN [RN#REN . / ., .EN \$ REN \$ 0 '5e 'ENcRN08:69<RNTL20'(*5>N,+4N4I*345S4N'&NC244S+N(4S'>5*,*'5N.53N C+'(,4(N2.CC.>4N045>,+N*5NS'/21,4(*e43N'(.0N(4.3*5>N&0145SJR)=.24(N2(4C45,43N.,N,+4N .551.0N/44,*5>N'&N,+4NB'S*4,JN&'(N,+4NBS*45,*&*SNB,13JN'&NW4.3*5>EN - '5.END"ENc10JN8:69RN q \ .,*'5.0rM
- c*. 'ENDREN . / ., EN \$ RENUNO*4EN ? RN08:6; <RN \$ N / 10,*04I40NS('CCPS0.CC*&*43N,4C,04,N / '340N&'(NS' / 204LN 0'S.0N*,4 / N.53N24(C'5NS01C,4(*5>N*5N*,4 / N(4C2'5C4N3.,.N / '340*5>RN"5I*,43N2.24(N2(4C45,43N .,N,+4N \$ 3I.5S4CN*5NG10,*04I40NG'340*5>N&'(NT31S.,*'5NW4C4.(S+NS'5&4(45S4EN?'004>4N =.()ENGNEN\'I4 /]4(EN8:6;RNq\.,*'5.0rN
- . / .,.EN \$ RN08:6;<RN#+4N(40.,*'5C+*2)]4,A445N&.S,'(N.5.0J,*SN.53N*,4 / N(4C2'5C4N,+4'(JRN"5I*,43N 2(4C45,.,*'5N.,N,+4N\$3I.5S4CN*5NW4C4.(S+NA4C*>5CNBJ / 2'C*1 / N0#\$WN"B<ENN45,'5EN#OEN \ 'I4 /]4(EN8:6;RNqB,.,4rN
- $c^{*}.$ ' E%DREM . / . , . E% \$ REM ! . 5% a *4E% \$ REM U%

=.,.(.2*S+.J.,+. / E% ? REM \$ 534(C ' 5E% NREM U% - . / .,.E% \$ RN08:6F<R% G ' 5*, '(*5>% / .,+4 / .,*SC% .S+*4I4 / 45,%31(*5>%,+4% / *3304%CS+' '0%,(.5C*,*'5_% \$ 5%.220*S.,*'5% '&%0.,45,%,(.5C*,*'5% .5.0JC*C%0V#\$<R%=.24(%2(4C45,43%.,%,+4%"5,4(5.,*'5.0%? '5&4(45S4%'5%T31S.,*'5.0%W4&'(/ E% B*4 / %W4.2E%?. /] '3*.E%G.(S+%8:6FR%q"5,4(5.,*'5.0r%

c*. 'ENDREW - . / .,.EN \$ REW ! .5% a *4EN \$ REWU%V1 'EN b RN08 : 6F<RN \$ % / 10,*04I40%,4C,04,% / '340%&'(% / 10,*204%
+*4(.(S+*S.0%04I40C%'&%24(C'5%S01C,4(*5>%4&&4S,CR)=.24(%2(4C45,43%.,%,+4%.551.0% / 44,*5>%'&%
\.,*'5.0%?'15S*0%'5%G4.C1(4 / 45,%*5%T31S.,*'5ENB.5%[(.5S*CS'EM? \$ EN \$ 2(*0EN8:6FR%)
=...(.2*S+.J.,+. / EN ? REWU% - . / ...EN \$ RN08 : 68<RNT&&445,*.0%*,4 / %3*CS(* / *5.,*'5C%)</pre>

 $\begin{array}{l} K*0*(EN,GRN-REN,UN-./.,EN,SRN08::Y<RNB*/10,.54'1CN4C,*/.,*'5N'&N3*&&4(45,*.0N*,4/N&15S,*'5*5>N&'(N/2,5*&4C,N>('12CN.53N0.,45,NS0.CC4CRN='C,4(N2(4C45,43N.,N,+4N.551.0N/44,*5>N'&N \ .,*'5.0N/2'15S*0N'5NG4.C1(4/45,N*5NT31S.,*'5ENB.5NN*4>'EN'2 & EN $2(*0N8::YRNg \ .,*'5.0rN) \\ \end{array}$

D.A,+'(54ENDRNcREN[1)1+.(.ENDREN=.()ENBP a REN - . / .,.EN \$ RN08::Y<RN \$ 5N*5I4C,*>.,*'5N'&M3*&&4(45,*.0M) 24(&'(/.5S4N'5N(4.3*5>N,4C,N*,4/CN&'(NT5>0*C+N0.5>1.>4N04.(54(CRN=.24(N2(4C45,43N.,N,+4N) .551.0N/44,*5>N'&M\$ / 4(*S.5NT3IS.,*'5.0NW4C4.(S+N\$CC'S*.,*'5ENB.5NN*4>'EN?\$EN\$ 2(*0N) 8::YRNq\.,*'5.0rN

! . 1>+5E%KR% - RE% ? +4 ' 5>E% b R% [RE%U% - . / . . . E% \$ R%08 : : Z<R%

RN=.24(%2(4C45,43%.,%,+4%.551.0%

[1)1+.(.EMDREWUM-./.,.EM\$RW08::Z<RW

$$\label{eq:RN} \begin{split} \mathbb{R} &= .24 (\$2(4C45, 43\% ...\%, +4\% ...551 ...\% / 44, *5>\% '\&\% \setminus ...*' 5...\%? '15S*0\% '5\% G4..C1(4 / 45, \% *5\% T31S...,*'5E\% \setminus 4A\% b '()E\% G..(S+\% 8::ZR\% Q ...,*' 5...\%) \end{split}$$

 $\label{eq:started_st$

! . 1>+5E%KR% - RE% - . / .,.E%\$R%08::M<R%

RN=.24(N2(4C45,43N.,N,+4N.551.0N/44,*5>N

'&% \$ / 4(*S.5%T31S.,*'5.0%W4C4.(S+% \$CC'S*.,*'5E%?+*S.>'E%"VE% \$ 2(*0%8::MR%q \ .,*'5.0r% - . / .,.E% \$RE%K.14(E%NR%cRE%U%G*J.e.)*E% b R%08::M<R% R%=.24(% 2(4C45,43%.,%,+4%.551.0% / 44,*5>%'&% \$ / 4(*S.5%T31S.,*'5.0%W4C4.(S+% \$CC'S*.,*'5E%?+*S.>'E% "VE% \$ 2(*0%8::MR%q \ .,*'5.0r%

?+4'5>E% b R% [RE% U% - . / . , . E% \$ R%08 : : M<R%

 $R_{h}=.24(h2(4C45,43h.,h,+4h))$

.551.0% / 44,*5>% '&% \$ / 4(*S.5%T31S.,*'5.0%W4C4.(S+%\$CC'S*.,*'5E%?+*S.>'E%?\$E%\$2(*0%8::MR%q\.,*'5.0r%

- . / .,.E% \$REMU%K.14(E%NR%cR%08::M<R% \$%5',4%'5%,+4%(40.,*'5C+*2%]4,A445%&.S,'(%.5.0J,*S%.53%*,4 /% (4C2'5C4%,+4'(J% / '340CR%=.24(%2(4C45,43%.,%,+4%.551.0% / 44,*5>%'&%[0'(*3.%T31S.,*'5.0% W4C4.(S+% \$CC'S*.,*'5E%#./2.E%[VE%\'I4 /]4(E%8::MR%qB,.,4r%
- =.() EMBREMB+*5EM"REMUM . / ., EM \$ RM08:: M<RM

R%=.24(%

2(4C45,43%.,%,+4%.551.0%/44,*5>%'&%[0'(*3.%T31S.,*'5.0%W4C4.(S+%\$CC'S*.,*'5E%#./2.E%[VE% \ 'I4/]4(E%8::MR%qB,.,4r%

K*@*(E% G R% - RE% - * / E% WRE% U% - . / .,.E% \$ R%08 : : M<R%

= (4C45,..,*'5%,.%,+4%'245*5 > %A'()C+'2%'%,+4%B,..,*C,*S.%.53%\$22%*43%G.,+4/..,*SC%BS*45S4C%'5C,*,1,4

!"#\$%&'(%\$)*+*,'%-./.,.%0123.,43%'5%6678978:8;<%

 $\begin{array}{l} ?+1 \texttt{Eh} - \texttt{REh} \, \texttt{Uh} - . \ / \ ., \texttt{Eh} \$ \texttt{Rh08} :: \texttt{F<R} \\ + 4 \texttt{h} .551 . \texttt{Oh} \ / \ 44, \texttt{*}5 > \texttt{h'} \And \$ \ / \ 4(\texttt{*}S . \texttt{5h} \texttt{T31S} ., \texttt{*'5} . \texttt{Oh} \texttt{W4C4} . (\texttt{S+h} \$ \texttt{CC'} \texttt{S*} ., \texttt{*'5} \texttt{Eh} ? + \texttt{S} .> '\texttt{Eh} \$ 2(\texttt{*}\texttt{Oh} \texttt{8} :: \texttt{FRh} \ q \setminus ., \texttt{*'5} . \texttt{Oh} \texttt{rh} \end{array}$

c*. 'E%DR%U% - . / .,.E%\$R%08::F<R%

RM=.24(%2(4C45,43%.,%,+4%.551.0%/44,*5>%'&%

\$ / 4(*S.5%T31S.,*'5.0%W4C4.(S+%\$CC'S*.,*'5E%?+*S.>'E%\$2(*0%8::FR%q\.,*'5.0r% \$]400E%\REWWJ.5E%BREWU%-./.,E%\$R%08::F<R% - . / .,.E% \$ R%06YYY<R%

-./.,.E%\$R%06YYZ<R%

Rh=.24(h

R%

 $\label{eq:constraint} \begin{array}{l} 2(4C45,43\%.,\%,+4\%\$551.0\%G44,*5>\%'\&\%\$/4(*S.5\%T31S.,*'5.0\%W4C4.(S+\%\$CC'S*.,*'5E\%B.5\%N*4>'E\%\$2(*0E\%GYY2R\%q\.,*'5.0r\\ \end{array}$

4, !@G0-+'

%

@&D9:8:'4)DK\$%')%'C&D%\$896' 3 8%\$&<#:%' 5 6#789:#%;'

=Bb%iF8F%B,(1S,1(.%Tf1.,*'5%G'340*5>% TNH%MF8;%\$3I.5S43%#'2*SC%*5%B,(1S,1(.%Tf1.,*'5%G'340*5>% TNH%MF66%`1.5,*,.,*I4%B,.,*C,*SC%&'(%T31S.,*'5.0%W4C4.(S+% TNH%MF68%"5,4(/43*.,4%`1.5,*,.,*I4%B,.,*C,*SC%&'(%T31S.,*'5.0%W4C4.(S+% T=V%MF96%BJC,4/.,*S%"5f1*(J%""%7%`1.5,*,.,*I4%"5f1*(J%

@&D9:8:'4)DK\$%')%'56#789:#%;'&I'298K&6'

%

TNVN%i6:%B,(1S,1(.%Tf1.,*'5%G'34%""% TNVN%i6:%D*4(.(S+*S.%V*54.(%G'34%""% TNVN%i6:%D*4(.(S+*S.%V*54.(%G'34%""% TNVN%i6:%"5,('31S,'(J%B,.,*C,*SC% TNVN%i6:%Tf1*,J%.53%\$S+*4I4/45,% TNVN%i6:%G4.C1(4/45,%U%\$CC4CC/45,%""% TNH?%i6;%T31S.,*'5.%B,.,*C,*SC%"%

@&D9:8:'4)DK\$%')%'1?&9#<)'C%)%8'56#789:#%;'

%

$$\label{eq:stable} \begin{split} &TN\,[\,\$9\,;\,:\,:\,\$K\,.\,C^*S\!\$N4CS(^*2,^*I4\!\!\$,.53\!\!\$"5\&4(45S4\!\!\$B,..,^*C,^*SC\!\!\$\,\$\,22@^*S\,.,^*\,'5C\!\!\% \\ &TN\,[\,\$9\,;\,:\,8\!\!\$\,\$\,3I\,.5S43\!\!\$\#\,'\,2^*SC\!\!\$\,\$\,5\,.0JC^*C\!\!\$\,^*\&\,!\,.(^*.5S4\!\!\$ \\ &TN\,[\,\$9\,;\,:\,i\,\&G\,10,^*I\,.(^*.,4\!\!\$\,\$\,5\,.0JC^*C\!\!\$\,\$\,$22@^*S\,.,^*\,'5C\!\!\% \\ &TN\,[\,\$9\,;\,F8\!\!\&\,G4\,.C1(4\,/\,45,\!\!\$\#\!+\!4\,'\,(J\!\!\$''\!\!\& \\ &TN\,[\,\$9\,;\,F3\!\!\&\,G4\,.C1(4\,/\,45,\!\!\$\#\!\!+\!4\,'\,(J\!\!\$''\!\!\& \\ &S\,.6\!\!\!\&\,5\,.6\!\!\!\&\,5\,.6\!\!\& \\ &S\,.6\!\!\!\&\,5\,.6\!\!\!\&\,6\,$$

<u>B&:%><&L'CDO897#:#&6</u>'

6RMO*5%`*.'%0dS,']4(%8:86%X%G.J%8:8F<% • [153*5>%\$>45SJ_%"TBE%HRBR%N42.(,/45,%'&%T31S.,*'5% 8R%g'e34%B*(>.5S*%0\'I4/]4(%8:88%X%S1((45,<% • [15343%]J%B'1,+4(5%G4,+'3*C,%H5*I4(C*,J%

B\$JAJ'A#::89%) %#&6'CDO897#:#&6'

%

6ZR\\$5+\#+1\V4\0B2(*5>\8:88E\BGHE\?+.*(<\

• H,*0*,J%'&%,+4%?.1C.0%"5&4(45S4%\$22('.S+%,'%G43*.,*'5%\$5.0JC*C%A*,+%K*5.(J%d1,S'/4C%%

6MR%D.'%G.%0[.00%8:6YE%BGHE%?+.*(<%

• TI.01.,*'5%'&%,+4%H,*0*,J%'&%"5&'(/.,*I4%=(*'(C%*5%K.J4C*.5%BTG%A*,+%C/.00%C./204C%%

6iR% \$53(4A\BS+.24(\%0B2(*5>\%8:6;E\%HdE\%?+.*(<\%

• "5&'(/.,*I4%=(*'(%N*C,(*]1,*'5C%*5%G10,*04I40%V*54.(%g('A,+%G'340C_%N4/'5C,(.,*5>%,+4%HC4%'&%K.J4C*.5%H23.,*5>%&'(%[*L43%T&&4S,C%

• T&&4S,C%'&%G'34@%B24S*&*S.,*'5%T(('(%*5%",4 / %W4C2'5C4%#+4'(J%0"W#<%K.C43% ?'/21,4(*e43%?@.CC*&*S.,*'5%#4C,%HC*5>%B4f145,*.@%=('].]*@*,J%W.,*'%#4C,%

%

- 8R% A.5>P044%?+1%0B2(*5>%8::8E%[BHE%?+.*(<%
 - \ '5P4f1*I.045, % g ('12%#4C, %Tf1., *5>%A*, +%, +4%=(4C45S4% '&%N*&&4(45, *.0%", 4 / % [15S, *'5*5>% 0N" [<%
- %
- 6R\ \ *@1&4(\\ R\\ ? . 2 . (\\0B2(*5>\\8 : : 6E\\ [BHE\\ ? + . *(<\
 - \$5.0Je*5>%G10,*3*/45C*'5.0%W4C2'5C4%N.,.%B,(1S,1(4%W42(4C45,43%]J%H5*3*/45C*'5.0% "W#%G'340C%
- <u>P#:#%#6K'CL\$&?)9'CD0897#:#&6'</u>
- %

" YR\B.(J5J.\B' / C'5>\0c.51.(J\8:86\X\G.J\8:88<\

• [153*5>%.>45SJ_%"TBE%HRBR%N42.(, / 45, % ' &%T31S.,* ' 5%

ZR/g '5S.%HC,.%0c1@J%8:6Z%X%c154%8:6Y<

• [153*5>%.>45SJ_%#HK"#\$ - E%#1()4J%

C,.P0@,'

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C&D%\$896' 3 8%\$&<#:%' 5 6#789:#%;'

<u>56#789:#%;</u>'

- G''3JNg(.31.,4%?'15S*0N0/4/]4(EN8:8:NXNS1((45,<%
- G''3J%g(.31.,4%?'15S*0%C1]S'//*,,44%&'(%15*I4(C*,JP04I40%>(.31.,4%&400'AC+*2%C404S,*'5C%0/4/]4(E%8:86E%8:88E%8:8F<%
- \$?T\"5,4(5.,*'5.@*e.,*'5\?'//*,,44\0/4/]4(E\8:8F\X\S1((45,<\
- g(.31.,4%?'//45S4/45,%G.(C+.0%08:88<%
- ? '1(C4\TI.01.,*'5\? ' / /*,,44\0 / 4 /]4(E\8:6MP6Z<\
- ?'@'5*.@%g('12%[.S10,J%B1(I4J%?'//*,,44%0/4/]4(E%8:6YP8:8:<%

' 1?&9#<)'C%)%8'56#789:#%;'

56#789:#%;'

- g(.31.,4% = '@*SJ%?' / /*,44h%B1]PS' / /*,44%&'(%,+4%g = ?%(4I*4A%'&%,+4%N4 / '>(.2+J%2('>(. / %08::i<%)))
- H5*I4(C*,J%V*](.(J%?'//*,,44%08::6P8::;<%

%

<u>@&??8K8'&I', <DL)%#&6'</u>

- #451(4%U%=('/',*'5%?'//*,,44%0/4/]4(E%8::M<%
- [.S10,J%?'15S*0%0S+.*(P404S,E%8::;h%S+.*(E%8::9<%
- TI.@1.,*'5%?'//*,,44%0/4/]4(E%8:::<%
- ?1((*S101 / M?' / /*,,44W0.0,4(5.,4W / 4 /]4(EW8:::<

<u>A80)9% * 86% '&I', <DL) %#&6)?'B:;L\$&?&K;'b'/8)96#6K'C;:%8 * :'</u>

- B4.(S+%?'//*,,44%&'(%.5%'245P(.5)%&.S10,J%2'C*,*'5%*5%G4.C1(4/45,%U%B,.,*C,*SC%OS+.*(E% 8::F<%
- B4.(S+%?'//*,,44%&'(%,A'%.CC*C,.5,%2('&4CC'(%&.S10,J%2'C*,*'5C%*5%G4.C1(4/45,%U%B,.,*C,*SC%0/4/]4(E%8::9E%8::i
- B4.(S+%?'//*,,44%&'(%.%&.S10,J%2'C*,*'5%*5%=('>(./%TI.01.,*'5%0/4/]4(E%6YYYE%8:::<
- \$551.0%TI.01.,*'5%?'//*,,44%0/4/]4(E%6YYYE%8:::E%8::FE%8::;h%?+.*(%8::i<
- \$3%+'\$%\$'//*,,44%&'(%>(.31.,4%C,1345,%(4\$(1*,*5>%06YYYE%8:::<%
- \$3%+'S%S'//*,,44%&'(%S'/21,*5>%&.S*@*,*4C%&'(%G4.C1(4/45,%U%B,.,*C,*SC%C,1345,C% 06YYYE%8:::<%%

% %

4\$8'B9&I8::#&6'

<u>.8I8988<'`&D96)?',<#%#6K'</u>

\$CC'S*.,4%T3*,'(%08:6;%X%8:6i<R%

R%

8:69% H5*I4(C*,J%'&%#4L.CE%B.5%\$5,'5*'% % % 8:6;% =1(314%H5*I4(C*,J% % % 8:6F% H5*I4(C*,J%'&%G*554C',.% % % 8:68% H5*I4(C*,J%'&%#4L.CE%B.5%\$5,'5*'%