

**A UCU report on the new cross-party
consensus and the Americanisation
of UK higher education**

Privatising Our Universities

February 2010

UCU
Universities and College Union

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" \$ ' & "

4 :./9 8+658: =+ 9.5= :.' :.+8+ /9 :.+8+ /9 45= ' *4-+85;9)8599 6'8:?)549+49;9 5<+8 :.+ ,':+
5, \$;4/<+89/!/+9 =./). =/22 2+* :5 :.+ 68/<':/9':/54 5, 5;8 ;4/<+89/? 9+):58

CH< H<9 \$56CIF CJ9FBA9BH 5B8 H<9 ,CFM CDDCG=H=CB 5F9 7CAA=HH98 HC 5 J=G=CB C: 98I
K<=7<

DI6@=7 :IB8=B; :CF IB=J9FG=H=9G K=@ @ GH5;B5H9 CF :5@ @ 5B8 IB=J9FG=H=9G K=@ @ 69 :C
=B7CA9 GHF95AG 9=H<9F :FCA 8CB5H=CBG CF :FCA GHI89BH :99G

5G H<9M 697CA9 7CBGIA9FG C: 98I75H=CB H<9 J=9KG 5B8 DF9:9F9B79G C: GHI89BHG 5F9 ;=J
K9=;<H =B >I8;=B; H<9 EI5@=HM C: 98I75H=CB

5G H<9 9LD5BG=CB C: DI6@=7 IB=J9FG=H=9G G@CKG 8CKB ;F95H9F 9B7CIF5;9A9BH K=@ @ 6
IB=J9FG=H=9G HC C::9F H<9=F CKB 89;F99G

/9 5@GC G<CK H<5H H<9G9 DC@=7=9G K=@ @ 7F95H9 5 IB=J9FG=HM GMGH9A :5F ACF9 @=?
5H H<9 DFC6@9AG 7IFF9BH@M HFCI6@=B; H<9 -+ 98I75H=CB GMGH9A HC G<CK H<5H H<9 7C
7CI@8 69

5B =B7F95G=B; @M IB5::CF856@9 98I75H=CB GMGH9A H<5H 8C9G @=HH@9 HC K=89B D5FH=7
<5F89F :CF DCCF9F D9CD@9 HC 5779GG <=;< EI5@=HM <=;<9F 98I75H=CB

=B7F95G=B; :=B5B7=5@ =BGH56=@=HM =B H<9 IB=J9FG=HM G97HCF K=H< ACF9 IB=J9FG=H=
H<9 H<F95H C: DF=J5H=G5H=CB

H<9 89J5@I5H=CB C: -# <=;<9F 98I75H=CB 5G IB=J9FG=H=9G 7<5G9 5 F9DIH5H=CB ;CJ9FB98 6
DF9:9F9B79G F5H<9F H<5B 57589A=7 GH5B85F8G

5 ;FCK=B; DF=J5H9 G97HCF 5;;F9GG=J9@M A5F?9H=B; 5 DCCF9F DFC8I7H 5H <=;< DF=79G HC
HC G5H=G:M G<5F9<C@89FG

/9 5@GC BCH9 H<5H 5H H<9 J9FM H=A9 K<9B \$56CIF 5B8 H<9 CBG9FJ5H=J9G D@5B HC =ADC
H<=G GMGH9A H<9F9 =G ;FCK=B; IB95G9 K=H<=B H<9 -+ 56CIH H<9 GIGH5=B56=@=HM C: H<9
GMGH9A

"!& !&%

8/<':/9/4- 6;(2/);4/<+89/!/+9

=E 0=B6 >/@B73A E7:: ;/93 C<7D3@A7B73A ;=@3 @3:7/<B =< >@7D/B3 4C<27<5

365=+8/4- :.+ 9;:*+4:)549;3+8

=E B63 ;/8=@ >/@B73A E7:: :=19 C<7D3@A7B73A 7<B= / 03/CBG 1=<B3AB 4=@ ABC23<BA

'::+4/4- ;6 :.+ 685,/: 3'1/4- 9+):58

=E 0=B6 ;/8=@ >/@B73A E7:: AC0A727A3 B63 5@=EB6 =4 >@=47B ;/97<5 C<7D3@A7B73A

!+,+8+4)+9

\$ (& % !
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! (\$ % & % "\$ \$! &
"! # \$ (& ' ! !

5:..+ \$ 9 3/4 652:/) '2 6'8:/+9@ += '(5;8 '4* ..+ 549+8<':/<+ 56659:/54@'8+ 9/-4+*
;6:5 =.: :.+? 9++ '9 :.+ 4++* :5);: ;4*/4- :5 6;(2/);4/<+89:/+9

IB <=7563@ ;07B7-8071A9BH DI6@=G<98 =B @5H9 G<CFH@M 69:CF9 <9 5BBCIB798 7IHG C
A=@@=CB :FCA H<9 <=:<9F 98175H=CB 6I8;9H :CF (9H9F %5B89@GCB G97F9H5FM C: GH
6IG=B9GG =BBCJ5H=CB 5B8 G?=@@G A589 =H 7@95F H<5H H<9 &9K \$56CIF ;CJ9FBA9BH 9LD
HC :=B8 :IHIF9 :IB8=B; :FCA H<9 DF=J5H9 G97HCF

#4/<+89:/+9 .<+ +405?+*' (+4/- /4/4)'2)2/3':+ 5<+8 8+)+4: ?+'89 85=.: ('9+* 95
.+'</2? 54 9:':+ ;4*/4-)445:)54:/4;+ '4* :./9)54,854:9 -5<+843+4: '4* ;4/<+89:/+9
=/:. '9+8/+9 5,).'22+4+9 '4:/4/4- +>)+22+4)+ /4 (5: :+)/4- '4* 8+9+8). /9 1+? \$+
8+)+5-4/9+ :': 6+8)6/:' ;4*/4- /9 /3658:4: (: :295 :': /4 :.+);88+4:)/8);39:4)+9
3/4:/4/4- :': 2+<+2 :.85;- 6;(2/)+>6+4*/:;8+ '254+ =/22 (+ +>:8+3+2? *,/);2: "': /9
=.? :.+ *+<+2563+4: 5, ' * /<+89+ 9+ : 5, ;4*/4- 9:8+'39 /9 /3658:4: /; :.+ 7;2/:? 5, /-+8
+*);'/54 /9 :5 (+ 3/4:/4+* '4* /3685<+*C#4/<+89:/+9 =/22 4+*+ :5 9+1+ 5; :5: +8
95;8)+9 5, ;4*/4- ,853 5<+89+9 95;8)+9 '9 =+22 '9 *53+9:/) 54+9 ".+ +>6+8/+4)+ 5, :.+ 2'9:
+)+ 9;--+9:9 :.+8+ /9)549/*+8'(2+)6')/? :5 *5 :./9 += 354+? .9)53+ ,853)8+':
/4- -8+':+8 +)5453/ (+4+;/:9 ,853 :.+ 145=2*+ :.+? -+4+8':+ 58 :.+ :+)/4- +>6+8:/9+
: :.+? 685</' + '4* ,853 6./2'4: .856/) 95;8)+9 5, /4)53+ '4* /4)8+9+* /4: +84'/54'2 +84
/4-9 :/9 '295 :.+ 8+9;2: 5, :.+ -5<+843+4: 9 *+)/9/54 :5 /4:85*);+ <8/(2+ ,++9 =./). '9
-+4+8':+* '4 **:/54'2 @ (4 5, /4)53+ /4:5 :.+ 9+):58 =/:.5; '4? '66'8+4: 4+-:/<+
/36'): 54 ') +99

! : H<9 ;CJ9FBA9BH =G F9@5H=J9@M ;I5F898 56CIH =HG DCG=H=CB =B F9@5H=CB HC F5=G=B
J=9K C: H<9 =ADCFH5B79 C: 9B8CKA9BHG

".+ /-+8 +*);'/54 9+):58 4+*9 :5 *56: '358+):/<+ '4* 685,+99/54'2 '6685'). :5 ;4*
8'/9/4- '4* +4*5=3+4: (:/2*/4- +>625:/4- :.+ 56658;:4:/+9 9: '(2/9.+* (? 5;8 @
3/22/54 3').+* -/</4- ;4* !:8'+-)'22? /4 :.+ 4+>: ?+'89 /-+8 +*);'/54 4+*9 ;,22?
:5 +9: '(2/9. /:9+2, '9' 2+ -:/3: +);9+ ,58).'8: '(2+ -/</4- +96+)'22? ,853 '2;34/ \$+
145= ,853 +>6+8/+4)+ /4 :.+ #! '4*' 54- 54- '4* !5;: .58+ ' :.):'.8: '(2+
-/</4-)'4 3'1+ ' <:/2)54:8(/;:/54 :5 ;;84/4- ' -55* /49:;:/54 /4:5 '4 +>)+22+4: 54+

+C &9K \$56CIF G99G IB=J9FG=H=9G F9G9HH@=B; H<9=F :=B5B79G CB GHI89BH :99G 5B8 D<=
GI7< 5G 9B8CKA9BH G7<9A9G G \$CF8 %5B89@GCB G5=8 =B 5 GD997< CB 96FI5FM

".+ (+9: ;4/<+89/:? 9?9:+39 /4 :.+ =582* '8+ *+ ,/4+* (? ' =/* + 8'4+ +5, 6;(2/)'4* 68/<':+
;4*/4- '4* 8:/9. ;4/<+89:/+9 4+*+ :.+ 9'3+ */<+89/:?

,<9 CBG9FJ5H=J9G <5J9 5@GC 699B 75F9:I@ BCH HC H5?9 5B 95F@M DCG=H=CB CB K<9H<9
F5=G98 =B H<9 K5?9 C: H<9 FCKB9 F9J=9K 6IH H<9M 5F9 9EI5@ @M 7CAA=HH98 HC H<9 =895
G<CI@8 69 89D9B89BH CB GHI89BH 7CBHF=6IH=CBG !B "IB9 G<58CK G97F9H5FM :CF 6IG=
=BBCJ5H=CB 5B8 G?=@@G 5J=8 /=@ @9HHG G5=8

=+2)53+ :.+ 8+2/93 =./). '9 2+* 6+562+ :5 ') +6: :':)5 6'?3+4: /9 .+8+ :5 9:'? '4*
:': :.+ 8+</+ = 3;9: (+ 358+ '(5;: :.+ 9.'6+ '4* 2+<+2 5, :':)5 6'?3+4: :.'4 '(5;
=.+.:+8 /: /9 :.+ 8/-: /'*+ ? '6'8:?' '9 9./;+* /9 659:/54 (+);9+ =+ 8+)+5-4/9+ ,++9 '8+
.+8+ :5 9:'?

,<9 CBG9FJ5H=J9G 5F9 >IGH 5G ?99B =: BCH ACF9 GC HC =B7F95G9 IB=J9FG=HM 89D9B89
=B7CA9 ,<9M 69@=9J9 H<5H A5?=B; IB=J9FG=H=9G ACF9 89D9B89BH CB 9B8CKA9BHG K=@
;FCKH< C: GI779GG:I@ IB=J9FG=H=9G G /=@ @9HHG <5G G5=8

4+ /3658:'4: 8+'954 =.? 3+8/)'4 ;4/<+89:/+9 '8+ /4 ' 9:854+8 ,/4'4)'/2 659:/54 /9
(+)'9+ :.+? 8+)+/<+ ,8 358+ *54':/549 ,853 /4* /</' ;29 '4* :.+? '8+ (+::+8 ': (/2*/4- ;6
+4*5=3+4:9 4* :.': /9 (? 45 3+'49 8+9:8/):+* :5 :.+ <? +'-;+ ;4/<+89:/+9 4 /4:+8+9
:/4- 8+658: ,853 :.+ !;:54 "8;9: 65/4:9 5;: :.': &.:+ 35*+2 ,58 # ;4/<+89:/+9 9.5;2* (+
#! 9:':+ ;4/<+89:/+9 =./). ?+'89 '-5 8'/9+* <+8? 2/::2+ ,853 <52;4:'8? -/</4-

IB 588=H=CB =B:@I9BH=5@ ;FCIDG 7@CG9 HC H<9 CBG9FJ5H=J9 (5FHM <5J9 GI;;9GH98 H-
IB=J9FG=H=9G G<CI@8 BCH 69 A9F;98 CF 65=@98 CIH 6IH 7CI@8 69 H5?9B CJ9F 6M DF=J5H
(C@=7M L7<5B;9 H<9 F=;<HK=B; H<=B? H5B? 7@CG9@M 7CBB97H98 HC 5J=8 5A9FCB G D

77CF8=B; HC H<9 @5H9GH DI6@=G<98 :;IF9G DI6@=G<98 =B <=;<9F 98I75H=CB =
K9F9 5H =AA98=5H9 F=G? 5B8 K9F9 =B 75H9;CFM :CF 4=BGH=HIH=CBG @=?9@M HC 69 5
:IHIF9 IB@9GG 57H=CB =G H5?9B 6M H<9 =BGH=HIH=CB K=H<=B H<9 :CF975GH D9F=C8 =9
M95F 5B8 H<9 :C@ @CK=B; H<F99 :=B5B7=5@ M95FG

/<9B (9H9F %5B89@GCB IBJ9=@98 <=G 7IHG HC IB=J9FG=HM :IB8=B; -# IB=J9FG=H=9G F9G
H<5H 5FCIB8 IB=J9FG=H=9G A=;<H :579 7@CGIF9 :FCA H<9 7IH =B :IB8=B;

/<5H9J9F H<9=F HF19 :=B5B7=5@ DCG=H=CB 7IFF9BH@M -# =BGH=HIH=CBG <5J9 699B G<
C: H<9 G@IAD=B; 75D=H5@ A5F?9HG B8CKA9BHG 5B8 =BJ9GHA9BHG HC;9H<9F CB@M 57
=B7CA9 C: 5 -# IB=J9FG=HM 5H DF9G9BH

-+ IB=J9FG=HM 89D9B89BH CB 9B8CKA9BHG :CF C: =HG =B7CA9 5B8 G99=B; 5 7IH =B =HC
7CI@8 :579 5 7IH =B =B7CA9 C: 5FCIB8 C: =HG CJ9F5@@ =B7CA9

(9H9F %5B89@GCB <5G G5=8 4(I6@=7 :IB8=B; 7IHG 5F9 H<9 F9;F9HH56@9 7CGH HC H<9 -# C
65B?=B; G97HCF 5B8 ;9HH=B; H<9 7CIBHFM H<FCI;< H<9 F979GG=CB !: CB HCD C: H<9 7IHG
:IB8=B; -# IB=J9FG=H=9G <58 H5?9B 5 <=H C: 5 :IFH<9F =B H<9=F =B7CA9 :FCA 9B8CKA9BH
A5BM ACF9 A=;<H 69 =B 85B;9F C: 7@CGIF9 CF H5?9CJ9F :FCA H<9 DF=J5H9 G97HCF

B8 C: 7CIFG9 5 A5>CF 8=:9F9B79 69HK99B DI6@=7 :IB8=B; 5B8 H<5H 89D9B89BH CB H<9 75D
=G H<5H <CK9J9F =AAIB9 H<9 D5FH=9G A5M G99A HC @C66M=B; H<9 75D=H5@ A5F?9HG 5
=B8=:9F9BH

H H<9 J9FM H=A9 K<9B H<9 DC@=7M C: 5@ @CK=B; -+ IB=J9FG=H=9G HC 6I=@8 ID @5F;9 9
D9FA5B9BH 5B8 G=;B=:75BH =B7CA9 GHF95A <5G 699B 9LDCG98 6M H<9 7F5G< =B H<9 75D
A5>CF D5FH=9G 5F9 DFCDG=B; HC A5?9 -# IB=J9FG=H=9G ACF9 89D9B89BH CB H<=G IBGH
/9 69@=9J9 H<5H H<9 F9GI@H K=@ @ 69 HC =B>97H A5GG=J9 :IFH<9F :=B5B7=5@ =BGH56=
98I75H=CB G97HCF DCGG=6@M @958=B; HC H<9 7C@ @5DG9 5B8 CF DF=J5H=G5H=CB C:

7CBG=89F H<9AG9@J9G 5B 4!JM)\$9559;4/<+89/?)5;2* (+ (+=++4 :8++ '4* ,/<+ :/3+9
=.!:/: /9 45=

<+8'+ '44;'2/9+*)59: 5, ./-.+8 +*);':/54 /4 :.+ \$"
)536'8+* =/:. :.+);88+4:)59: /4 :.+ \$



(I6@=7 IB=J9FG=HM 7C@@@9;	%=@@=CB	O	O
(F=J5H9 BCH :CF DFC:=H	*IGG9@@ FCID	O	O
(F=J5H9 :CF DFC:=H	((O	O

CK9J9F =H G BCH >IGH H<9 9LD9BG9 C: 5 -+ 7C@@@9;9 98I75H=CB H<5H G H<9 =GGI9 ,<9 7CGH
98I75H=CB =G ;FCK=B; F5D=8@M

#.+)59: 5,)522++ + :./: /54 /4 :.+ \$" .'9 -85=4 ': ,5;8 :/3+9 :.+ 8':+ 5, /4,2':/54 /4 :.+ 2'9:
?'+'89 77CF8=B; HC H<9 &5H=CB5@ 9BHF9 :CF (I6@=7 (C@=7M =B =;<9F 8I75H=CB G 6=5BBI5
\$3/AC@7<5 +> 69HK99B 5B8 H<9 7CGH C: 7C@@@9;9 5B8 HI=H=CB :99G FCG9 5G
7CAD5F98 K=H< H<9 CBGIA9F (F=79 !B89L F=G9 C: CJ9F H<9 G5A9 D9F=C8

#.+)59: 5, ./-.+8 +*);':/54 .'9 '295 -85=4 :5)549;3+ '4 '9:54/9./4-2? ./-. 685658:/54 5,
, '3/2? /4)53+ ,5?=B; =BHC 577CIBH :99G @=J=B; 7CGHG 5B8 577CAAC85H=CB 5B8 GI6HF57H=
DFCJ=898 6M 6IFG5F=9G ;F5BHG H<9 & ((75@7I@5H9G H<5H =B

DI6@=7 <=<9F 98I75H=CB 7CGH C: A98=5B :5A=@M =B7CA9
5 DF=J5H9 IB=J9FG=HM 7CGH C: A98=5B :5A=@M =B7CA9

:: 5,)5;89+ 6558, '3/2/+9 6'? 358+ :.'4 =+2:./+8, '3/2/+9 \$CK =B7CA9 :5A=@=9G =B H<9 -+ 75B
BCK 9LD97H HC 7CBGIA9 C: H<9=F =B7CA9 CB 5 DI6@=7 7C@@@9;9 98I75H=CB 5G CDDCG98
K<9F95G H<9 F=7<9GH :5A=@=9G GH=@@ 7CBGIA9 @9GG H<5B C: H<9=F =B7CA9 CB 7C

77CF8=B; HC H<9 &5H=CB5@ 9BHF9 :CF (I6@=7 (C@=7M =B =;<9F 8I75H=CB H<9 7CBG9EI9B
CB DF=J5H9 HI=H=CB :99 =B7CA9 5B8 <C@8=B; 8CKB DI6@=7 9LD9B8=HIF9 <5G 699B 5 @CB; H
=B7F95G=B; @M 8F5G8'58':/54 5,)522++ + ',58*(/2/:?K<=@9+)54:/4;':/54 5, :.+ :8+4*9 5,
:.+ 2'9: 7;'8:+8)+4:;8? =5;2* 62')+ ./-.+8 +*);':/54 (+?54* :.+ 8+)'49 '4*
=5;2* -8+'2? +>)+8(':+ :.+ *+(; :8*+49 5, :.59+ =.5 *5 +4852

,<9 9BHF9 G (F9G=89BH (FC:9GGCF (5HF=7? % 5@=5B-55M6845H8 ?+'89 =+
=54 :.'<+ '4 ',58*(2+ 9?9:+3 5, ./-.+8 +*);':/54

+CA9 7CAA9BH5HCFG <5J9 GI;;9GH98 H<5H H<9 =B:@5H=CB C: H<9 7CGHG C: 7CI@8 A5?9 =
6I66@9 HC 6IFGH 5:H9F H<9 DFCD9FHM A5F?9HG G "CG9D< FCB=B 5B8 CK5F8 CFHCB <5J9

2:5;- 7;+9:/549 '(5;: :.+ 35;4:/4- 68/)+9 5,)522++9 .'<+ (++) 8'/9+* ,58 358+ :.'4
?'+'89 '4* 0;9: ', += 68/<:'+)522++9 .'<+)259+* :.+ 9:'1+9 '4* <52;3+ 5, :.+ =84/4-9 '8+
35;4:/4- 42? *;8/4-')8:/)'2 353+4: /4 +)5453/) /9:58?)'4 54+ =84 5, (:(2+9 '4*
9;--9: :.' :.+ *?' 5, 8+)154/4- ,58 ./-.+8 +*);':/54 /9 /4 ,'): *8'=/4- 4+8

BCH<9F 7CGH C: F=G=B; HI=H=CB 7CGHG =G H<9 DI6@=7 D9F79DH=CB C: IB=J9FG=H=9G
F9@95G98 =B 96F15FM 6M H<9 & ((

&"::*+4: +>6+):!:/549 '8+ '295).'4-/4- #. +? =/22 /4)8+'9/4-2? *+3'4* ./-. 7;'2/?: 685</9/54
.:! :.+? !.+39+2<+9 '8+ ;4*/4- */8+):2? !.85;- .,++9 '9 =+22 '9 !.85;- !>+9 "+)8+:'8? 5, 9:'!+
,58 /445<':/54 '4* 91/229 5.4 +4.'3 +(8;'8?

!B7F95G=B; 89D9B89B79 CB DF=J5H9 :!B8=B; :!B85A9BH5@@@M 5@H9FG H<9 F9@5H=CBG<=D
DFCJ=89FG 5B8 GHI89BHG CBGIA9FG C: 98I75H=CB BCK <5J9 H<9 DCK9F HC 89H9FA=B9 H<9
IB=J9FG=H=9G 5B8 H<9 A5=B D5FH=9G <5J9 :C@@CK98 H<9 @C;=7 C: H<=G 89J9@CDA9BH :5
DC@=7=9G H<5H K=@@ A5?9 GHI89BHG H<9 5F6=H9FG C: EI5@=HM !: H<9G9 DC@=7=9G 5F9
CJ9FH<FCK H<9 =895 H<5H 57589A=7 GH5B85F8G 75B 69 A5=BH5=B98 6M D99F F9J=9K
,<9 &9K \$56CIF ;CJ9FBA9BH <5G 7CAA=HH98 HC =B7F95G=B; H<9 A5F?9H =B:CFA5H=CB 5J5=@
GHI89BHG =B A5?=B; H<9=F 7<C=79G @@ IB=J9FG=H=9G K=@@ 69 9LD97H98 HC

'</ * \$/22+::9 :.+!.!*5= #4/<+89:/+9 !+)8+:'8? /9 =581/4- =/:. /)8595,: 54 ' =+(9/:+
::': =5;2* -/<+ 9'2'8? /4,583':/54 ,58 -8*;' :+9 ,853 +'). *+-8++)5;89+ '4* 8+)58*
9;:*+4:9 </+=9 5, :.+ /8 +>6+8/+4)+ 5, ./-.+8 +*;)':/54 ".+ 685659+* =+(9/:+ =./). .9
(++4 ;4*+8 *+<+2563+4: ,58 953+ 354:.9 =5;2* (;/2* 54 :.+ ':/54'2 !:;*+4: !;8<+?
=./). '919 ,/4'2 ?+'8 ;4*+8-8*;' :+9 :5 8':+ :.+ 7;'2/:? 5, :+')./4- 54 :.+ /8)5;89+
".+ 542/4+ ,583': =5;2* '225= /4* /</'* ;2 9;:*+4:9 :5 -/<+ :.+ /8 </+=9 5, :+')./4- 9:'4*8*9
'4* :.+ 7;'2/:? 5, ,++*(')1 54 :.+ /8 =581 ".+ 685659+* =+(9/:+ =5;2* '295 685</'*+ 358+
+:/2+ /4,583':/54 :.'4 ;4/<+89:/+9);88+4:2? 6;(2/9. 54 -8*;' :+ +3625?3+4: 8':+9 '4*

'4 ': :+/8)522++ '4 +>)+22+4: 54+ (? 3+8/)'4 9:'4*8*9 =5;2* (+ =58: 45 358+
:.'4 ' ': :/9 54+

\$/: :+ 9;(9+7;+4: +>6+8/+4)+9 <+ .' 3 45 254-+8 9;868/9+*': :/9 8+3'81 : 9 :8;+8
:.'4)'4 (+/3'-/4+*

%)+\$\$(/ (%*() (%* **) % *) * ** , #&' \$ % * & \$ (" * % (
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CK9J9F ((C @ @ 9 ; 9 G F979 = DH C : 89 ; F99 5K5F8 = B ; DCK9FG = B A5F?98 5 B9K 89D5FHIF9
H < 9 : = FGH : CF DFC : = H 7CAD5BM HC 9BH9F H < = G F9HF = 7H98 A5F?9H ((< 5J9 6I = @ H 5 < = ; < @
6M 89 @ = J9F = B ; @ 5K 7C BJ9FG = CB 7C IFG9G HC K95 @ H < M = HM @ 5K : = FAG 5B8 < 5J9 IG98 H
DCK9FG HC 6F5B7 < CIH = BHC DFC : 9GG = CB5 @ 5B8 6IG = B9GG IB89F ; F58I5H9 5B8 DCGH ; F58
H < 9 = F GHF5H9 ; M 8C7IA9BH 9LD @ 5 = BG

". + 3'81+ : ; 58 2' = '4* (; 9/4+99 * + - 8++ 9 /4 . : + # /9 9/ - /4 , /) '4 : 85 ; 4* 9 : ; * + 4 : 9
'8+) ; 88 + 4 : 2 ? 9 : ; * ? /4 - ; 58 9 ;) . ' 7 ; ' 2 ; /) ' : / 54 5 , . : + 3 ' : 659 : - 8 * ; ' : + 2 + < + 2 " . +
659 : - 8 * ; ' : + 3'81+ : /9 = 58 : . @ (4 '44 ; ' 22 ? ' 4 * / : /9 /4 : 5 : /9 3'81+ : . : ' : = + ' 8 +
2 ; 4) . /4 - ' ; 9/4+99 !) . 552

((< 5J9 : C7IG98 CB BCB HF58 = H = CB5 @ GHI89BHG 5B8 K = @ @ = B = H = 5 @ @ M 7CBH = BI9 HC 8
: 8 /4 : /2 , 5) ; 9 = /22 (+ 54 . : + 659 : - 8 * ; ' : + 3'81+ : ' /3/4 - ' : 6'8 : /3 + = 581/4 - ' * ; 2 : 9
; ; 22 : /3 + /4 : + 84 ' : /54 ' 2 9 ; ; * + 4 : 9 = . 5 ' 8 + ' 28 + ' * ? . + 8 + /4 . : + # ' 4 * 4 + = - 8 * ; ' : + 9 9 + + 1/4 -
: 5 + 4 : + 8 . : + 685 , + 99/54 ' 2 = 582 *

IH = H = G 7 @ 95F H < 5H H < = G = G BCH H < 9 9B8 ; 5A9

; 8) 58 + 62' 4 /9 ' 3 + * ' :) . / + < /4 - (8 + ' 1 + < + 4 8 ; 4 8 ' : + /4 ' 4 * = + 9 + + < + 8 ? 9 / - /4 , /) '4 :
65 : + 4 : /2 , 58 ') + 2 + 8 ' : /4 - 685 ; / : (2 + - 85 = : . (+ ? 54 * . : : 65/4 : ' 9 5 ; 8 8 + 6 ; : ' : /54 (+) 53 + 9
+ 9 : (2/9 . + * /4 . : /9 3'81+ : ' 4 * . : + (; 9/4+99 - /49 : 8) : /54

IH K5G DFC656 @ M H < = G DCH9BH = 5 @ H < 5H 5HHF57H98 H < 9 5HH9BH = CB C : H < 9 ; = 5BH - + 98
IB " I @ M H < = G M95F ((C @ 8 = B ; G D @ 7 K5G 6CI ; < H 6M DC @ @ C @ C 65 @ 5 GI6G = 8 = 5FM C : H
; = 5BH DC @ @ C ! B7 K < = 7 < = G CKB98 6M H < 9 DF = J5H9 9EI = HM : = FA 5F @ M @ 9 FCID
, < = G = G GMADHCA5H = 7 C : 5 K = 89F ACJ9 6M - + DF = J5H9 98175H = CB 7CAD5B = 9G = BHC - # < = ;
5HHF57H98 = B 5 @ @ @ = ? 9 @ = < CC8 6M H < 9 DFC656 = @ = HM C : = B7F95G = B ; CDDCFHIB = H = 9C
B9LH ; CJ9FBA9BH CF 9L5AD @ 9

' ; 8 + ' : + K < = 7 < BCK CD9F5H9G CJ9FG95G IB = J9FG = H = 9G CB H < F99 7CBH = B9BHG 5G K9 @
/5 @ 89B IB = J9FG = HM CD9F5H9G 5 D5FH9FG < = D 89 @ = J9F = B ; CB @ = B9 7C IFG9G K = H < \$ = J9
' 8 + + 8 * ;) : /54 < 5J9 CD9F5H98 H < 9 A9F = 75B IBH9F7CBH = B9BH5 @ - B = J9FG = HM = B \$ CB8CB
' 62' 4 CD9F5H9 C @ 6CFB C @ @ 9 ; 9 = B \$ CB8CB 89 @ = J9F = B ; @ 5K 7C IFG9G 5G K9 @ @ 5G C
K = H < & CHH = B ; < 5A , F9BH @ 5G ; CK 5B8 + < 9 : = 9 @ 8 IB = J9FG = H = 9G F97FI = H = B ; = BH9FB5H = CB
D5H < K5M DFC ; F5AA9G ! B # 5D @ 5B GH5H98 H < 5H = H K5G = BH9F9GH98 = B G99 ? = B ; 89 ; F9
DCK9FG : FCA H < 9)

CK9J9F H < 9F9 5F9 GH = @ @ G = ; B = : = 75BH C6GH57 @ 9G HC H < 9 : IFH < 9F ; FCKH < C : H < 9 : CF D

** '(, * '(& , () % * ' (*) * & & * & # ' * \$ (& -

;(2/) 9;(9/*/+9

, < 9 6 = ; ; 9GH C6GH57 @ 9 HC H < 9 9LD5BG = CB C : H < 9 DF = J5H9 G97HCF = G H < 9 = F = B56 = @ = HM
(C @ = 7M L7 < 5B ; 9 K < = 7 < 5G K9 < 5J9 G99B = G 7 @ CG9 @ M @ = B ? 98 HC H < 9 CBG9FJ5H = J9 (5F
DF = J5H9 : CF DFC : = H 7CAD5B = 9G G < CI @ 8 69 5 @ @ CK98 HC 8F5K 8CKB GH5H9 : IB8 = B ; 5G = F

; 88 + 4 : 2 ? 68 / < ' : + 685 < / * + 89) ' 445 : 8 +) + / < + ; ; 4 * /4 - ; 853 ' 4 * . : /9 /9 . : + 359 :
9 / - /4 , /) '4 : 5 (9 : ') 2 + : 5 . : + /8 + 4 : 8 ? /4 : 5 . : + / - . + 8 + * ;) : /54 3'81+ : 62') + 5 = + < + 8 . : +
- 5 < + 843 + 4 :) 5 ; 2 * 952 < + . : /9 685 (2 + 3 (? 5 , + 8 /4 - ') 54 : 8) : : 5 ' 685 < / * + 8 : 5 : ' 1 + 5 < + 8 ' 22 58

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,<5H A95BG H<9M <5J9 5B =B 6I=@H =AD9F5H=J9 HC F5=G9 :99 @9J9@G G K9 G5K 95F@=9
:CF DFC:=H G97HCF 5F9 :5F <=<9F H<5B =B H<9 DI6@=7 IB=J9FG=H=9G CF H<9 @CK9F =B
6M H<9 DF=J5H9 :CF DFC:=H G97HCF H<9 8=GD5F=HM =G D5FH=7I@5F@M 57IH9 5G H<9M
=BGH=HIH=CBG H<9AG9@J9G :CF H<9=F GHI8=9G H<5B H<9M KCI@8 :FCA DI6@=7 IB=J9FG
H<9 5J9F5;9 HI=H=CB :99 7<5F;98 6M 5 :CF DFC:=H DFCJ=89F 50195FIB8
H<9 5J9F5;9 J5@I9 C: 5 :989F5@ ;F5BH :CF @CK =B7CA9 :5A=@=90195F5FCIB8
,<9 8=:9F9B79 =G A589 ID :CF A5BM 6M H5?=B; CIH @C5BG %CF9 H<5B C: GHI89BHG =B :
<=<9F 98I75H=CB A5?9 IG9 C: DF=J5H9 @C5BG HC :IB8 H<9=F 98I75H=CB
,<=G @95J9G H<9A JI@B9F56@9 HC <95JM 896H 6IF89BG D5FH=7I@5F@M 5G GCA9 DF=J5
<5J9 5 HF57? F97CF8 C: 9B7CIF5;=B; GHI89BHG HC H5?9 CIH DF=J5H9 @C5BG IB89F 5;F99A9

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!) \$"%% # \$&* "!% !% % ! & \$! % & "!" \$ ' & "!

H<F95H HC H<9 @=J9@=<CC8 C: CH<9F :57I@HMU5B8 =H FIBG 7CIBH9F HC H<9 7CB79DH=CB
H<9 B979GG5FM 9@9A9BHG C: <=< EI5@=HM 98I75H=CB

/-.:5;). 7;'2/:?'99;8'4)+

\$ (&% ! "\$'! (\$% & %

!) \$"%% # \$&* "!"%'% ! & \$!% & "!" \$ ' & "!

77CF8=B; HC H<9 F9DCFH H<9 -B=J9FG=HM C: (<C9B=L 4GMGH9A5H=75@ @M 5B8 =BH9BH

(<C9B=L 58J=GCFG A=G @958 GHI89BHG 5G HC H<9 HFI9 7CGHG C: 7CIFG9G

(<C9B=L HIHCFG 8C BCH ;=J9 :998657? CF 5GG=GH5B79 K=H< KCF?

!B H<9 %3E =@9 *7;37CJ9F98 H<9 7CAD5BM G HFCI6@9 5B8 =BH9FJ=9K98 HKC GHI89BHG C

(<C9B=L CH< GH5H98 H<5H H<9M <58 F979=J98 @=HH@9 =BGHFI7H=CB :FCA @97HIF9FG K<

7CB79BHF5H98 CB G9HH=B; H<9 GHI89BHG 5GG=;BA9BHG =B 4@95FB=8;79;5AG45B9 C: H<9A

2+'84/4- ,853 '4 ');:'2 :+').+8 ?5; 8+ :+')./4- ?5;89+2,

'B9 :CFA9F (<C9B=L GHI89BH K<C 7CBH57H98 - - G5=8

&" .+ 2'9: 9:8'= ,58 3+ ='9 =. +4 ='9 /4 3? 9?).525-?)2'99 '4* 3? /49:8;):58 ='9 54 '

)8;/9+C'4* 953+.5/4B 1 TfG1(5=83<'-)6(+*)-219(:)4(5)(5)5;219(:)49502 793.7008972 cm 0.01 0.924

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'-+

EEE 07A 5=D C9 E>1=<B3<B C>:=/2A >C0:71/B7=<A 7563@
;07B7=<A >24 D

EEE 07A 5=D C9 E> 1=<B3<B C>:=/2A >C0:71/B7=<A 7563@
;07B7=<A >24 D

EEE 2/D72E7::3BBA 1= C9 A>3316 B=
C<7D3@A7B73A C9 4C<27<5 B63 4CBC@3

'-+

5J=8 /=@ @9HHG GD997< +A5G<=B; H<9 IB8=B; "5A "5FG 4C12Mb4CB GD95A 32=B; ID

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