

Denumire: REALIZARE SISTEM DE PRODUCERE SI STOCARE A ENERGIEI ELECTRICE DIN SURSE REGENERABILE DE TIP SOLAR PENTRU CONSUM PROPRIU AL COMUNEI PERIAM, JUDETUL TIMIS

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Unitatea Administrativ Teritorială
COMUNA PERIAM - Jud. Timiş
REGISTRATURĂ GENERALĂ
Nr. 7/35
ziua 04 luna 10 an 2026

Beneficiar: COMUNA PERIAM

Proiect Nr.: 410/2026

Faza: S.F. (Studiu de fezabilitate)

Den. Proiect: REALIZARE SISTEM DE PRODUCERE SI STOCARE A ENERGIEI ELECTRICE DIN
SURSE REGENERABILE DE TIP SOLAR PENTRU CONSUM PROPRIU AL COMUNEI
PERIAM, JUDETUL TIMIS

Amplasament: Comuna Periam, judetul Timis; cinci instalatii pe acoperisurile cladirilor publice
deservite



eP aTNge fRPU_aYaTk edY

Of Ůc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_N bRdWZ

Px xFcQMŮMbcQ dŮdeQZ PQ ac_ Pf OQcQ dŮde_ OMcQ MQ^ QcSŮQYQOecŮQ PŮ df cdQ cQSQ^ QcMŮQ PQeŮd d_YM: aQ^ ecf O_ ^df Z
ac_ acŮ MY O_ Z f ^ QŮaQcŮWZ 5Vf PQef Y eŮZ Ůd

Sa NNR QR PNbNf

_ 7 zv G	@98; 9; B
St tG	dR71d v vx yx st s x2
Qz 7b zv G	dRNYV NdR eŮf RZ QR bda QgPRdR eVef aPNdR N R_ RdTŮVRYPf dŮPR QŮ egdeR dRTR_ RdNOŮR QR f Ů ea YNd bR_ fdg Pa_egZ bda bdŮ NY PaZg_RV bRdWZ 5WŮQRf gY f Ů Ů
Oz z vt	PaZg_N bRdWZ
b zv t z z t G	dO _ SMf d eQOT^ _ Y_ Sj dcY
P x v z t zG	a x x u x5 x x vx x s x5s x x
Qt t z tu t	9D797 9; B



eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMbQdldeQZ PQac_ Pf OQcQdlde_ OMbQMq^ GcSQUYQOecWQPU dfcdQcGSQ^ GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

SvN QR dReba_eNOWY Nf V

V zt x v z t z G

dO _SMf d eQOT^ _Y_ Sj dcY

Os xs csv x ^ 7: @Et 5Msv5V v7Msv

M s x M^cQ O: M^ 7: ED: 98: = 7C7 9; =

M s F Tx Zs x gs x



Rtu tzt x v z t z G

dxy xu F z7Tx Q gs x

dO _SMf d eQOT^ _Y_ Sj dcY

Os xs csv x ^ 7: @Et 5Msv5V v7Msv

U ss x xu ux F z7Z Ps

dO _SMf d eQOT^ _Y_ Sj dcY

Os xs csv x ^ 7: @Et 5Msv5V v7Msv

Qxu us s s M^cQz sv W5W5



cx x s F z7Rx x Mx s v

WRx x Mx s v

Os xs csv x ^ 7: @Et 5Msv5V v7Msv





eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdldleQZ PQac_ Pf OQcQdldle_ OMcQMqQ^ QcSldQYQOecldQPd df cdQcQSQ^ QcMNUQPQeld d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

PgbdV_e

:7V t z z t z x u z v xz zA
:7 Px xs t xu vx xA
:7 _ v s u s vx u xv x 8 xA
:7 _ v s vx u xv x xu vs 8 x sA
:7 Nx xyus x xA
:7 A Qst s v vx yx st s xA
:7 B _ zs s xs y u s s s x xA
;7e t t z z t zvz t zt z zB
;7 R vs x s xs x x x s s s xB
;7 O x s usv vx y s s xB
;7 d s s x x zx us x u x t ux vx x xC
;7 O s x s x ; u xu xC
;7 A O x x s x us u x xu u x sD
;7 B ax x vx v x s x x s s xs v u xE
;7 C xz vx s x s x x s xE
=7evz t z v 6zv vz t t t z zE
=7 as u s s xs s s x xE
=7 Px u x xs x us s x x x9
=7 O x x s x s x x xD
=7 R vs x s xs x us xz x x s x vx xyx sE
=7 A S syu vx xs s x s x xE
A7N t t vz t z v 6zv vz9
@7 Osv vx s s s v s s vx xyx s9
@7 g x st s u s ux s vx svs s x9
@7 d s s s xz s xs y u s s:
@7 d x st s xs uss vx xv:
@7 A a v u s agSld v x s xs x x zx us;
@7 B Ms sy s uss x st s xs x s s@
@7 C Ms s u 6xyusu s xB
@7 D Ms s vx x t s xB
@7 E c u s vx zx s xB



eP aTNge fRPU_aYaTk edY

Of lf_c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMbQdldleQZ PQac_ Pf OQcQdUde_ OMcQM MQ^ GcSQUQYQOecWQPu df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

B7evz t zv t xt xvt z z; C

A7 O s s s ux s s xZX xs x; C

A7 Px u x xs x us s ux s xu s vs; C

A7= a u s v us x u 6xu u; D

A7@cx xus xs ux x y vs x sx; E

A7A d x xv x y s s x; E

C7g ut 5t z zv t zx; E

B7 cxz ts u s s s xs us; E

B7 d s s usvs s s usv x vx x x=9

B7= csu vs xs s x xs s t us=9

B7@cxz x x s xs vx xv zs s xs s x=9

B7A cx xus xs u P^dT xuu vx s s=9

D7V z z t zt5z t t zt t zt z z=:

C7 _ zs s xs x x s=:

C7 a z s vx tx x x y u x=:

C7= _ x s x x x s s=;

C7@Z s xs x s x v st s xs=;

C7A Uy s x t u s x==

E7P v zv t xt z vz==

N_Rj N N7OdRhWd f RdZ VP eVPa_egZ bdRhV V_Nf=@

M7 S sv s 6 vs x xux s x u=@

M7 Yux x x u ax s 6 vs x xux s x u=A

M7= ds s Yux 6 vs x xux s x u=B

M7@du s s us x x 6ld us W6 vs x xux s x u=C

M7A du s s us x x 6ld us W6 vs x xux s x u=D

N_Rj N O7eVg YNdVbhTV eVOYN_fgdVR_RdTRf VR@9

N7 S sv s 6 v u x sv s x@9

N7 Yux x x u ax s 6 v u x sv s x@

N7= ds s Yux 6 v u x sv s x@

N7@du s s us x x 6ld us W6 v u x sv s x@=

N7A du s s us x x 6ld us W6 v u x sv s x@@

N7B N s s xz s s xu 6 d:@B



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_N bRdWZ

Px xFcQMlMcQdldleQZ PQac_ Pf OQcQdUde_OMcQMq^ QcSldQYQOecldQPd df cdQcQSQ^ QcMNUQ PQeld d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

NCN s s xz s s xu 6 d;@C

N_Rj N P7ePURZ R fRU_aYaTVPR RYRPfdVPR 6 e: eVe;@D

O7 d: 6 S sv s@D

O7 d: 6 Yux x x u ax s@E

O7 d: 6 ds s YuxA9

O@d: 6 du s s us x x 66 us WA:

OAd: 6 du s s us x x 66 us WA;

OB d: 6 S sv sA=

OC d: 6 Yux x x u ax sA@

OD d: 6 ds s YuxAA

OE d: 6 du s s us x x 66 us WAB

O79 d: 6 du s s us x x 66 us WAC

N_Rj N Q7ePURZ R fRU_aYaTVPR fRdZ VPR 6 e: eVe;AD

P7 d: 6 S sv sAD

P7 d: 6 Yux x x u ax sAE

P7 d: 6 ds s YuxB9

P@d: 6 du s s us x x 66 us WB:

PAd: 6 du s s us x x 66 us WB;

PB d: 6 S sv sB=

PC d: 6 Yux x x u ax sB@

PD d: 6 ds s YuxBA

PE d: 6 du s s us x x 66 us WBB

P79 d: 6 du s s us x x 66 us WBC



eP aTNGe fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdUdeQZ PQac_ Pf OQcQdUde_ OMcQMqQcSQUQYQOecUQPU df cdQcQSQcQcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ l

:7V t z z t z x uzv xz z

:7 Qz zt uzv xz z

dRNYW NdR eVf RZ QR bdaGgPRdR eVef aPNdR N R_ RdTVRYRPf dVPR QV egdeR dRTR_ RdNOWR QR fV
eaYnd bR_ f dg Pa_ egZ bda bdVg NY PaZ g_ RVbRdWZ 5Vg QRf gY fV V

:7 a x t v t xz v zx z 8 z

U x x x O s ax s 5 vx e 7_t xu xs xs s u u s s t v t x vx v ux x s
x x z x x xu ux v s s s5u us x xz s s x x vx x vx us v s x usv x t ux
vx x x7 U x x s x x s s s 5 s xu s x x x s s s x s yxus x usv x5 s x x
u syx x sux x s7

U x s s x x s z s xs x u vx us x ux x xs vx x x z x xzx x st x s x x
u 7d s s x y u x xv us s x x s x usv 7M x s xs v x xs s t us
s s x s xs x5 x s z s xs u s x s x x us x v u s s s x x z s v t s
ts x u uv u ux x xs7

:7 a x t xz v zx z zv xt 8 z t

U x s x x s s v xu vx O s ax s 7_ zs s xs y s s 5u sus xs us 5sv s xs
xu s x x s xs x s x x xs xs s s x tx xyus 5 u x s x u x x x7^
x x u t xu x s s x yxus x u x s x z usG v ux xs5 us xs s xs
x x z x s s sux xs x t ux7

:7 Oz z vt z z

Nx xyus x x O_ Z f ^ MaQcWZ 5 vx e 7d vx x x S sv s5Yux x x u ax s 5ds s
Yux 5du ss us xx Udu us W du ss us xx Udu us W d x x x y sux5su s xx
x ux s us x y u s sux u u t xu x7

Q x z s v s x x vx s s u s tx xyus 7R u s xs s s x x z s s s
x x u x t ux vx x x5ys s u ts xs vx s x usv 7O s xs x z us x x x vx s
x s s s s us su s s u x vx us v s7

:7 Rtu t x xz z tu t z

Rz z	Qt z xz xz vt z
a xu s zx x s	dO _ SMf d eQOT^ _ Y_ Sj dcY
Ux yus x	Of Uc_ =B; EBE; CGV; 8DE98; 9: B
dxv u su	Os xs csv x 7:@Et 5Msv5 vx MsvG yyuxL zs 7u
dxy xu	z7Tx Q gs x
^ s xu 8ys s	@98; 9; B 8 d776 d v vx yx st s x
O su vx x s x u	BBEC8; @9E7, 9; B



eP aTNge fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdUdeQZ PQac_ Pf OQcQdUde_ OMcQMq^ GcSQUQYQOecWQPd df cdQcQSQ^ GcMNUQPQela d_YM: aQ^ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eUz U

Rz z	Qt z xz xz vt z
Ps s x st s	9D7.97; 9; B
O vx us u	: Qf c l A5-@-@ x

Ps x x zx x ux x x zx ux s x usv x s v x vx tx xyus 7d v x s v u vs x x
vx s x5 x x x vx us u 5 x s x x v x s x x ux x7d sys s s us s5
sys s v t s x v x vx yus xs usvs s s s x yus v yx x s x us u x x
u x s s x7

a v u s y sus sv s s s s y vs x s x s agS U x u yz s x s s s x7
Q s s xs x x ysu s x sux s x u x u s t x x ux s 5u t s x x u ux s x sz xzs x s
s s7gs x x ux sv s x s x x x x u ux s x s s y sux7

:Ca t t zt v t t t z z

P z t	Zt z xz z z t e:	S v z
a v ux x y s us	; BD v xG @599 h POG :AE h MD	O u s s x su x 5u xu s x s st x zx x s x s x usv 7
d us x x xu u us	=:A h s GAC5 h	O u x x YPa5u u s vs u v s s NZ d8aOd8QZ d7
Uus x	A x xG=D95A99 h x u	a x vx us v s sx 6s s xz s x s s vx us x7
dx u x u	B:97@5= h x u8s	Q x z s s vx us x s s vx x x7
Q x z x x us s s	B@7A@-5-E h x u8s	Q x z s s zx x s x5u s s xs vx x vx A. 7
Ox x x x xu us x s s	:CE7QC h 8s	O s s s x vx us v s s s v x s x7
cxs s x	:: Gx xu x B	Q xu x x @6EG u vx x usv ux ; 7

Rxus x s s t s x x u u x vx u x u 5 x s x5ts x x u x 5 st vx x ys s5
s s x u us 7O s vs us s xs s u 5s us us xs ts x x v
y su7Q x z s v t s x s x x zx s s su v t v xu s s usv 7
dx s s xs y us s s s x x x x x x s s x t xu x7 M s xs s s s z s
sux xs xz vx suux s xu s x x5x vx s x x zx us5 x5 s s x s x s v t s 7_
vxyxu x us s x xs ux s x s s v xu 7



eP aTNGe fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ GcS lQJYQOec lQ P U df cdQcQS Q^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l M Y O_ Z f ^ QJaQc WZ 5Vf PQef Y e l Z l d

;7e t t z z t zvz t zt z z

;7S xt z t zt z z z t t t z

Osv x t ux xs s x x u x s x vx us x x zs x s s x5u v t x sv s s x5
vs x tx xyus 7U v ux xs x vx us v s s y s x u vx us x 6 ux x x
x xu us x x s7Muxs s ux x x x y vs x us su s y sux s us s us x7

M ux xs v x s sx 6s s5 s s x y sus su s x x s xs x x z x s t x s x
s x x z x s x sux xs usv x7a s vx us v s s y x s x x z x v s x x x us x szx x u5 s
y su v ux x x z s x xu us xux s s x s v y u s xs s7Mu s vx s xs s s xs
x x z x s x x x s x s x5 xx x x x z x v t x7

d s s s x v s ux s u x x x sux xs u u s s s x x7d: xs s v x ^6 x e_aO
vx AA9 h ts x YRaGd; xs s v x aQcO t ysus x us6 us vx A99 h ts x ^Z O7M t x x
u v x sx 6s s xz xs s s s x s x x u s x us x7P y x x xs x x x xs
y sus5u x s5 x y s s us s vs x x x s x x ux7

dux s ys s x x x x s x x xs x u x u u x s7O s s s s xs s sux xs
usv sux xs x x z x x us s s5s yx us v yx x x x v x ux s s s v xv ux xs
x u t u7a xu x x zs s us uux x d: s d; Gux x v s ux s s x s s x7

;7P z t vtx xz t t z

d v x x u s u 6usv s TS 7E9C8; 9: B5u v yus x u x s x s ust x7
Osv vx y s s x x x R v x vx s x5a z s 6u x x : 6 d x xzx x st x vx x x z x
us xs x x z x5 x us su s vx v ux x s x x z x x xu ux s x5u us x xz s s5
x s u x s t ux5u y S v u s syx x _Z Q 7: 9BB8; 9; B7

a xu u t s us su s vx v ux x5 us x s x s x x z x7Rxus x ts x x x x xz s s
s s y sux syx x x usv 7Uus us xs v x xs s t us x x vx su s s5s y vx us us x x x
u v s vx x x s y su s s7

Os su s xs vx xyx s s x s s x st x x us v x s x s x s x v x
u x u s x s x s x u x s x s 7Os su s xs xu x x s
sux x vx x s x x s s7a x xs aOd x x sv s zs s s v us vx us su s x y s us7

d us xs x x s s s s x xs y sus vx xyx s5 x x z s s s u x s s x x v s x
x v s s x7Q x z s st s5 s s vx sv s u xs vx vx us us x5x x x x s s x s s7ax
x x x vx x vx us v s5 x y s s x x s vx xyx s x x ux =5A95 x u s xv x
s us s x us s s s7



Px xFcQMUMcQdUdeQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS WQYQOecWQPU df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

;7e t t z z z vt z v z u vz xz z z

M x s xs xxu us s usv x x xs ss ss x 7 ^ x x x u xu xs s s x
st zx x sx5 s xx u s x 5u u u x vxv us x x s s x x x x s s7U xz s xs x us
x xs xs s s ss x u sv s s x5 xz vx xyx s AA8@A z svx O7

ax x x xzx us v x s x xu x s s ux u u x x vx x vx us v s7dx s
s sv x x v x x s s u x vx y u s x x s s5 u ysu s x7Ux yus xs
t xu x v sux x x x ysux vx x u usvs s5 ys s s s xs x x OR u
vx yus u xus s u s x 7

auzv	Y vt t z	P vtxt t	V z t z
S sv s	ax s 5 vx e	@9DE96O:	Rg 4 us x 4 avO5 us
Yux x x u ax s	ax s 5 vx e	@9DC96O:	Rg 4 us x 4 avO5 us
ds s Yux	ax s 5 vx e	@9DC96O;	Rg 4 us x 4 avO5 us
du ssus xx l6l us W	ax s 5 vx e	@@9DE6O:	Rg 4 us x 4 avO5 us
du ssus xx l6l us W	ax s 5 vx e	@@9DE6O;	Rg 4 us x 4 avO5 us

S sv s5u x vx u ss ux s xs s z s xv us s5 s ss vx s xs s
y u xs7_ zs sxs us x ss xx x ux vx u u s xxx 5u 5 x s t u 7
Zs s xs u xxu us x vx usv s x xv us vx s sxs v u x y sux7

;7AP t z t z;; v zv z

U x s vx x x s x x s s x6vxux t x s s u x vx x s s x7gs x x s x h
x x s y xxu u x s s sxs ux s d:7cx s sxs x s xs s s x
s s x vx v x s x s x yxus x x vx us v s7

O s x u x sv s s x xux s u s x v s s s y vx x s s x x
us vx7 Q x z s s s s x x x x s s s z s vs sG y s sv s zs us s x
x s s x xu s s x s v u x s x us7gs x s x t s x x x s x s
x xu s x x s xs s 7

Y t	T tx t 1 i 2	Yvz z z v 1 i 2	et t Yvz 1 i 2
l s x	B7-@C5::	E7D: @5==:	; DBA59A
Rxt s x	ATC=; 5DCA	D7DB@AAC	; ADD5-CE
Zs x	=7, BE5; @	A79AA5DBC	:7@CB5 C;
M x	=7B@5 @E	@DE; 5DCA	:7@ DBA:
Zs	=9C5=D	@CA5DB	: =DE@=
U x	; EC5D:	@B95DEB	: =@5B:



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GP aZg_ N bRdWZ

Px xFcQMlMcQ dldleQZ PQ ac_ Pf OQcQ dUde_ OMcQ MQ^ GcS lQYQOec lQ P U df cdQ cQS Q^ GcMNUQ PQ eld d_ YMb aQ^ ecf O_ ^ df Z
ac_ actl MY O_ Z f ^ QJaQc WZ 5Vf PQef Y elZ ld

Y t	T tx t 1 i 2	Yvz z z v 1 i 2	et t Yvz 1 i 2
U x	=9C3=D	@CA5DB	: =D5E@=
M z	=9C3=D	@CA5DB	: =D5E@=
dx x t x	; EC3D:	@B95EB	: =@5EB:
_u t x	=7 BE5; @	A79AA5DBC	: 7@CB5 C;
^ x t x	B7@ 5=BB	E7@EC3=E	; 7OC=5 B=
Pxux t x	B7=@C5:=	E7D: @5=;	; 7DBA5C9B
fafNYN_gNY	=B7DF;	BB7=AA	: C7C9

Y t	ev t t vt W 1 i 2	ev t t vt W 1 i 2
l s x	@E:; 5EDB	CD: A5DDA
Rxt s x	@7@=C5D@	C79AE5@ E
Z s x	; 7A=95BC@	@7; B5=: @
M x	; 7@E5=E	=7DEB5@=
Z s	; =D5D:	=CD5E@C
U x	; =95ED	=BB5; =
U x	; =D5D:	=CD5E@C
M z	; =D5D:	=CD5E@C
dx x t x	; =95ED	=BB5; =
_u t x	; 7A=95BC@	@7; B5=: @
^ x t x	@CA@5: D	C7AB=5BB=
Pxux t x	@E:; 5EDC	CD: A5DD@
fafNYN_gNY	; D7D9;	AA79DA

Y t	P z t t 1 i 2	b x v z Sh e: 1 i 2
l s x	=: 7CAA5@ D	A7CEB5@;
Rxt s x	; D7BD; 5: =	: 97=E95==
Z s x	: B7=AD5A:	: B7D@A7A;
M x	: A7D=: 5 @C	: B7@CC5D:
Z s	: 7A=E5BAB	; 97@E95E; B
U x	: 7@DE5EE9	; =7CB5C;
U x	: 7A=E5BAB	; : 7E=D5DD
M z	: 7A=E5BAB	: E7ED@5B;



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldleQZ PQac_Pf OQcQdUde_OMcQMq^GcSldQYQOecldQPU dfcdQcQSQ^GcMNUQ PQeld_d_YM: aQ^ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Y t	P z t t 1 i 2	b x v z Sh e: 1 i 2
dx x t x	:7@DE5EE9	:B7 =; 50@B
_u t x	:B7=AD5DA:	:: 7ADC5 D=
^ x t x	=97C=:59A9	D7C=A50C
Pxux t x	=:CAA59; ;	@7@C 59@B
fafNYN_gNY	:DF7D,	:DD7=; C5 F:

O x s s s s s v x x x z x v s ux x x us s x x x yx u s s yxus x s7ld s5
u vx us x x x v us 5 ux x s s s x x s xv sG s s5 v u s vx s x x yxu x
ux x xs us7cx xs s t us us xs s us u x x y u s x s x sux x 7
e s s s yxus t xu x x s t s s x y sux s sux xs usv 7^ x x u xs u
x s x s s u sux xs x x z x s x vx us v s7e s x s s x vx v x s x s s =A7CE; 5
AA7=@@5: B7B95; C7C9; @@79C@ h 5 x xu :CE79C, h x xu 7

;BPz z zt z vt v z zv v z t

Ptx z	e t t t t 1 ; 2	Vt z 1 2	h 1 =2
S sv s	@CA599	=599	:7@ A5999
Yux x x u	:7 A95AD	=509	@B; C5@B
ds s Yux	; =9599	=509	DA: 5999
du s s us W	=@E59	=509	:7 E=5A; 9
du s s us W	BDB599	=599	; 7AD5999

d syx xx s x us su x xs s s x us x5 su x x v t x x v x7ax yxus x
usv x5 us x x us u s us v x sys s s s xs s7^xux s vx x x x us
x x z s s s s v u xF s us su x xs s u s xs vx us u 5 s s v s x s x u vx
us x xz s 7
N s s s v zx x x z s sy s s s vx x x z s x us s s7Z s s xs vx x vx A.
x x s us s z s vs s5s yx us bpzx l :5A bp 7O x xu u x x x vx x s v
x x z s s zx x s x x y s s x x s s x FQpx l bpzx 8 dO_a7Muxs s vx s x x x
suxxs ts s x x zx us s x us u x x xu 7

Ptx z	c 1 i 8t 2	c t t 1 i 8t 2	ePab e:	Rzzv v 1 i 8t 2
S sv s	:: :7D@5=	:: :CE==5E	=5AC@=A	=A7CE;
Yux x x u	:DD7.C95=9	:EC7ACD;	=5AC999	AA7=@@



eP aTNGe fRPU_aYaTk edY

Of Wfc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMqQcSdUQYQOecWQPd dfcdQcQSQ^ GcMNUQPQela d_YM: aQ^ecf O_ ^dfZ
ac_actW MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Ptx z	c 1i &t 2	c t t 1i &t 2	ePabe:	Rzzv v 1i &t 2
ds s Yux	AA7EE:5B@	AD7CE:5 =	=5B=D9C	:B7B9
du s s us W	E@7DBB=	ED7DEA5EB	=5AC999	; C7C9;
du s s us W	:@E7DA:5B=	:AC7=@@5:	=5AC999	@@79C@
fafNY	C:979A:5==	CA97BA=5-F	6	:DF79D;

cr z J:5B cr HRrz5xPJcr z 8ePabHRrz5 zv J t Rrz5xP

gs x x x z x ux s s x s x v x s x x u ux x s h x x 7ax y s s x x s
xu s x s s s s t vx x vx u x s v x x x z s x us s s x x z s x x u us
u s s x 7Qs x x s s v x O_a s s x s x x s s x x s s v x us u u v x
ysu x v x s x s xu x x u ux7

U ux s x x z x u5 vx x s s s s x u x u s t x s x 6s s x x vx :99. 7cxz s
x x s vx x s v s x s s u x x u s v u t s u s us5u xz vx x y s AA8@A z s v x O7cx x s s
x x u us x y u s x s x x s x x y s s v u x y s u s y u x s7

;7Cbz z xz x z t z z t t z t x v z

V t t z	P xz x z t z 1i &t 2	b x v z e: 1i &t 2	b x v z 8 v 1. 2
S sv s	=A7CE;	=A7C; EE; @	EE5D=
Yux x x u	AA7=@@	A@E: D5 :C	EE5 =
ds s Yux	:B7B9	:A7DCE5EBB	ED5 C
du s s us W	; C7C9;	; C7; D5 CB	EC5E=
du s s us W	@@79C@	@=7BBE59B	EE59D
fafNY	:DF79D;	:DD7; C5 F:	FF5D=

Rxus x u x s x x x z s vx s s s x7 ^ x x x s s u u s x
s x s x s s x z s s x s s t x u x s x u x7a xu y x x u u u x us x vx v ux x
u 5u us x s y x s y x u s7

cs v u x s s x y s s v x u x s x x 95EE9; A:5 t sz vx v x s x vx :597Mux
s vx u x s x s s s s us su s s u ux x x s yus s7U y u v x x s x
vx x s s us vx x s s s s x Gx x s v t s s 5v s y u s x s us 7

;Ddz xz t z t z z t z

cxz vx y u s x x x ux vx s 5u s u y u us s x x u u x vx s
t v xu s s s u t u x x s s7Nx xyus s x x v x x s u x s x s vx v t x s u x s





eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdUleQZ PQac_ Pf OQcQdUle_ OMcQMqQ^ QcSQUQYQOecWQPd df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eUz U

d:5 s s x us s ss x u vx x 8 x sxx5 us xs vx :99 h x vx x vx
us v s vx :; A5D9 h x u7Qu s x xx x u xu xs s s ss x s x usv 5u x s s x suux
x x x x7

ds s Yux 5u @9DC960; 5s x sys s s us s vx ;=959 ; s x s vx =59 7
g s t s x u x x DA:599 =7ax su x syx x x xs s ;@ v x y sux
d:5 s s x us s ss x u vx x 8 x sxx5 us xs vx =9 h x vx x vx
us v s vx =B59 h x u7Qu s x xx x u xu xs s s ss x s x usv 5u x s s x suux
x x x x7

du ss us xx 6lg us W5u @9DE60: 5s x sys s s us s vx =@E59 ; s x s vx =59
7g s t s x u x x :7E=5A; 9 =7ax su x syx x x xs s @ v x y sux
d:5 s s x us s ss x u vx x 8 x sxx5 us xs vx A9 h x vx x vx
us v s vx B; 5E9 h x u7Qu s x xx x u xu xs s s ss x s x usv 5u x s s x suux
x x x x7

du ss us xx 6lg us W5u @9DE60; 5s x sys s s us s vx BDB59 ; s x s vx
=59 7g s t s x u x x ; 7AD599 =7ax su x syx x x xs s BB v x
y sux d:5 s s x us s ss x u vx x 8 x sxx5 us xs vx CA h x vx
x vx us v s vx DCE9 h x u7Qu s x xx x u xu xs s s ss x s x usv 5u x s s x
suux x x x x7

=77, a t t z t v z v t u t z t v z v t t z

k x x vx u x vx xs s ys s vx suux t u 7ax s x x x s x s x x vx us v s x
s xs s s xxx vx s s x xy s x s s x 5v s x x vx x u suux s st x us x7O vx
s s v vxz s x u x u s x x su s x s yx us s s zs x x x5 s x s syx x vx
u u s x7

U x sxx5 st x tsx x xs s xs s x x ux x s x5u xu x ys s vx xu s 5 u
xus ux suux xs s 7dx s s xs ss x xs vx zx s suux t x x s 7
Os x vx suux s xu s x x y x us s x s x x vx vx s x7

M s s xs x su x xs s u s xs x s s s x x 7Uu xx s xs s vx s xs zx x s s
suux x x7Z s x xs xs s u x x x x s ux u s t x x s x s u x5u y s x
s u xysux xs x s x s s s x s 7^ x xs s v x x v x x x x u s s x 7

=7, Qz v z z t z vt t z z z

=77 P t t z z t t t vz t

Pt tv z vt	e: 6 t t	e; 6 t z t t
M s s x x	A5 x usv x vx x x	A5sux xs usv



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ GcSQUYQOecWQPd dfcdQcQSQ^ GcMNUQPQeld_d_YM: aQ^ecf O_ ^dfZ
ac_actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ldl

Pt tv z vt	e: 6 t t	e; 6 t z t t
Z v x	; BD AA9 h 5^6 x e_aO	; BD A99 h 5aQcO t ysus us6 us
a x x u s s PO	:@599 h	:=@599 h
a x x x s x MD	:AE h	:E9 h
a x x Rg vx xyx s	:@599 h	:=:599 h
d us x s s 8aOd	=:A h 8:AC5A h	=:A h 8:AC5A h
ex z x 8P P 8 s vs x uu	YRa 8 E9. 8 E9.	^ Z O 8 DA. 8 DA.
Q x z x st s	; D=5A9 h	; BC5A h
a x vx Rg		:B5A.
_ x s x 8 u s x	d v6Q 8=9 z svx	d v6Q 8=9 z svx
Os su s x x us	=D95A99 h	=D95A99 h
O x xu u avO	:CE7Q; h 8s	:D=7:; 5 DC h 8s
a v u x y s us	:CC7; B5 E: h 8s	:ABA:E5A== h 8s
gs s x u egM	:7@; 7A=D5: x	; 7@EB=B59 x

M txx ux s u v v ux xs y s us5 us xs x xx vx x vx us v s7ax x usv
x u x u u xGus su s x x x s v s x s x vx vx s x s sux x s 7d: s yus
x xs s s x s v x x sux s s vx vx s x x z s st s s s x s t s x 7
a x xs x s x x x x s s v u vx x xs v x 7Ys yxus x s s x5 x xs vx xyx s
x v us vx us su s x us x x v x PO MD7U d; 5 s du s s us W xyx s x x vx
=9 h 5u x s s x x 5vx us vx v x s x == h 7Ys ux x s x s s s x x d; 5 x xs
PO x x s xs vx x s s7

=7, Z x z5vt t vz t zt tv z

Ptx z	Z x z e:	QP 1 i 2	e t t t x z 1 ; 2	av t z x =99 ; 1. 2
S sv s	A@ AA9 h	; E599	:=E59D;	@B5E
Yux x x u	D= AA9 h	@ABA9	; :@5-DE	C: 52B
ds s Yux	; @ AA9 h	:=5 99	B: 5EE;	; 95BB
du s s us W	@ AA9 h	; ; 5AA9	:9A5E9=	=A5-9
du s s us W	BB AA9 h	=B5-99	:C952OD	AB5D=
fafNY	; CE	:AD5A99	CF; 5 AA	AC5B



Px xFcQMUMMcQdldleQZ PQac_ Pf OQcQdUde_ OMcQM MQ^ GcS WQYQOecWQPU df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Z v x x d: ^6 x e_aO 5u x x s s AA9 h x v 7P x x vx xyx s :5=@
;5OD 5s sys s s s us u x x ;5AD= ;7as s x x xu u s v s t x s
f l @ g5U l :=5 M5f u l @EF g Uu l :=EM7
Os x y x5 x s x d v6Q 7U u x s agSld5s x x 6@A z svx ys s vx d v5 s u s xs
x x =9 z svx ys s vx s s7Z s x s x x u u s s sx s x x v x G x s x us
y s s x x x uxs vx s t x x s 5s us s x x x vxs s x 7
d sys s v x x x s s s xyxu s s s 5 s s s s xux s s u s x u s x x vx suux 7
_ zs s xs us s xs s x x t x x x x x s s5 u zx xs s x 5 suux s x x x x x
su x x s s x ys s vx t su x7Ys ux 5us u s ;:@5-DE ; v ux =99 ; v t Gs
uxxs x usv sys s v x x x s us7
cs xx5ux xx x x vx s x sxz us x u s t 7a u x x vx y s x v x s t s x
s s v 7Yxzs x x xu ux xus ux x s x s vx vx 5u vx x s s
x x x7^ s vx vx s x x suxs d: d; 7

=77V z t z5 t zt v xz z z t t

Ptx z	P z z NP e:	e 6 t x z	Zbbf zvz t z 8 x u z
S sv s	: =9 h	:@4:@4:= 4:=	; 8=
Yux x x u	: A9 h	:@4:@4:@4:@4:@4:=	@8@
ds s Yux	: :A h	:: 4 ;;	; 8 ;
du ss us W	= D h	:@4:@4:=	= 8 B
du ss us W	: @9 h	:@4:= 4:= 4:= 4:=	= 8 @

d z x u xus x s s x x suxs s x Zaae s suxs s vx v x5suxxs x s x suxs
u s x7d z x u z v yx x x s s x x Zaae v u x7U u yz s s z sv x 5ux x v s
z vx:@ v x ux x v s vx:= v x y xs s v s z x vx s x7
Ys ux x s x s x z 5u u vx:@ v x vx:= v x7Ys ss vx v s
z vx ;; v x7Ys du ss us Wux x x z vx:@5:@:= v x s us x ux x
x s x vx D h 7Ys du ss us Wus x x y s v 6 z vx:@ v x s z vx:=
v x7
U x s x x ys s x s z s u x s PO8MD5 s xs u vx x x s s5 xu x
u us s u s szx x x x zx u7O u x x vx x x s x s s x xu x vxv us x7a x xs vx
u x x x x u x s s u x s s xs v x 5u v x vx x x Zaae u u x sv s s 7



Px xFcQMlMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQM MQ^ GcS QYQOecWQPd df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ldl

P tx z	P z z NP e;	QP e; 1 i 2	Sh xz z z t e; 1 i 2
S sv s	; ;9 h	; C599	; C599
Yux x x u	; =9 h	@5A99	@5A99
ds s Yux	: ;9 h	:: 599	:: 599
du ss us W	: @9 h	; 95A99	; 95A99
du ss us W	: =9 h	==599	=9599

=7A Oz t zzv vt QP

brQP J_r x z br x HbrSh5z J 1brQP5brNP2

g v5zvz J_r AF5 :5 9Hg 5t x J_r A; 95EB

V 5t v J:5 B Vv J:5 B :=5 J:D5-DB N

M x s vx x x x x s s s ysu :5 9 x x xs vx u u vx u s xux 95DA x
x xs vx y u s x s us v7Mux ysu x x s x x yus xxu ux su yz s x u xyux
vx us x s x x z x s s x agSul7P x vx x x x x yus x s s x z ux s z
ux s u 7

ex xs s s x s s x :@ v x x x D=D5; g5 t s vx :799 g s x s x s s s x7
d z vx := v x s x f 5usv l @B59 g5 s ux vx :: v x s x @ D59 g7d z x s s x x u s
s xs u s u x 5 ux yxus x u v u vx z s s x v x s x u x 7

P tx z	e 8 t	g v zvz 1h2	g vt x 1h2	Wt v 1N2
S sv s	: = 8: @	D=D5;	@B59	: C5=CA
Yux x x u	: = 8: @	D=D5;	@B59	: C5=CA
ds s Yux	:: 8: ;	C: D5AB	@ D529	: C5=CA
du ss us W	: = 8: @	D=D5;	@B59	: C5=CA
du ss us W	: = 8: @	D=D5;	@B59	: C5=CA

ax v s z s s x x5u x s u s x x; B5 M5 s u x vx u u u u s x x; C5D
M7cx s s xs z x Zaae x xus xx s vxu x x70 xu s x x v x x u s t x
xxu u xus uG x xs xs su s x u xu u s t 7

Ost x s x T:k; k; 6W5v u 5u xu xs vx @ ;7a s s x x xs s s s 5 x
xv ux xs s x t ux5u xu x ys s vx st s x5 u 5 su x sv s x s s7e s x x y s x
vx x vx vx u v u s x x vx u us xv us u zx xs s x vx x su x 7



eP aTNGe fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMqQ^ GcSQUQYQOecWQPu df cdQcQSQ^ GcMNUQPPQela d_YM: aQ^ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

P t x z	e	Y z QP 1 2	ezv z P 1 ; 2	Ptxz z QP 1 2
S sv s	@	; 9:	@	9B=A
Yux x x u	B	=:B	@	9BBA
ds s Yux	;	E9	@	9B:A
du ss us W	=	:@E	@	9B; C
du ss us W	A	; A;	@	9B=D

O u x x P O u v x s s x s x x x s s x u s s s x u v s s u x x v x s x 7
Wx yus xs z x x s s s x s xx5 st s x 7Pxu xusxsu xu yssy u x
vx x x x t s u s x ysux s v s x s s x s u u u v x v x x s s x x s x 7

=7, BP v z NP v x t zt z

P t x z	V z 8 t z 1N2	VbPe 1N2	b v v v 1 i 2	Ptu v v v 1 ; 2
S sv s	@@5DA	@@5DA	=9	M = :B4^:B4aQ: B
Yux x x u	C=5B@	C=5B@	A9	M = =A4^=A4aQ: B
ds s Yux	::5E;	::5E;	:A	M = :B4^:B4aQ: B
du ss us W	::5D=	=B5; :	; A	M = :B4^:B4aQ: B
du ss us W	AD5E: =	AA5 =:	@9	M = ; A4^; A4aQ: B

O u x x x 6 st zx x s 5aOd6 st zx x s st zx x s 6 u vx u x x s yxus x z xs
vx us u vx ; 9 7Ys du ss us Wx s us x u u x yxus x v x ux x x x s x 7dx xs s
ust MDj MNj M 95B: g5u x u v u vx xu x 5 x s s vx x x x s x 7

Ys z sv s s s vx s x xu vx :B ; x ys x 5 x aQ7Ys ux 5ys x x x
s =A ; 5s aQs x :B ; 7Ys du ss us Wu u x x x s x 5aOd u u u xs s :B
; 7Ys du ss us W5ys x x x s ; A ; 5s aQs x :B ; 7

a x x s x s x x aOd u vx s x s s s x x u u u 7Zs szx x
x x zx u xs s x xs u s s x sux u u s s s xs svx v x s xF=9 h s z sv s5A9 h s
ux 5:A h s s s vx 5; A h s du ss us W @ h s du ss us WMuxs s s x y u s s x x
v u s vx x xs s s s vx x su s x s yxus su v 7

P t x z	Ptxz z z 1 2	Ptxz z bPe 1. 2	Ptxz z v v v 1. 2	Y z 8 1 2
S sv s	95BC@	95BC@	95BC@	; 9
Yux x x u	95A: @	95A: @	95A: @	; 9



Px xFcQMUMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQ MQ^ QcS WQYQOecWQPd df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

P tx z	Ptxz z z 1. 2	Ptxz z bPe 1. 2	Ptxz z v v v 1. 2	Y z 8 1 2
ds s Yux	95=C	95=C	95=C	; 9
du s s us W	95D9	95AB;	95AB;	; 9
du s s us W	95ACB	95A@	95ACB	; 9

Osvx x vx x x us u s x x s s x s x x s u x vx u x 5 s x xs us x u s yxus x
7Y s y s s x xu s xu x x vx :5. x 7O u s s x x z x us x ts x x v
ts x x x s s s s v u vx x xs x y su5s z x s x x us v 7
Ys x vx xs s s xux s x s u u u 5u s vs sv s xz z vx s x s x
s xu x7a xu x x xu ux vx x vx x s s su x7O x x v x u v u s x x vx s
s s s s xs s t x suux u s t x5 xzs xs u su x u x vx s zx x xuyux
x vx u xus x7

a xu s s su x 5 x xu s xs5u s xs aQ xu s s vxyxu s s x x s7
dx s s xs x x x x x s s s xs s x x s ux s x x vx x x7 Z s us x x
uxv x vx u vx yus x u u u x x us x y s x s x v x xs s t us5v us PO s v
us x7

=7Ce vt zt z z z v ut z

P tx z	R t t 1 i 2	b bPe 1 i 2	R t u t e: 1 i 2	Q t t t b Sh 1 2
S sv s	B99	=99	A@9	; 9; 9;
Yux x x u	:999	A99	E99	; 5E9B
ds s Yux	=99	:A9	; C9	; 5 C; C
du s s us W	A99	; A9	@A9	; 5 :C=
du s s us W	CA9	=C9A	BC9A	; 9BB:
fafNY	=:B99	:BD9B	; E=9B	; 5=D9

U d:5su s vx 6yx 6y ys 7Ms u xs vx vx us us x s s x s s x x x vx E9. 5 s
s vs x vx uu x x vx E9. 7Q x z s s s vx =:A h x x z s st s vx ; D=5A h s
v u x7P s s vx v x s x x yxus x s s x x x us u s s v x x z s s s s s s x xs
y s us vx xyx s7
Ys yxus x s s s x x s v s s u s x ; 9; 9; ; 5 C; C x5 x s v s6 s x7
P x s xs x x x yus s x s s 5 s s s xs x s x u x7a x xs aOd x x
zx s xs y vx us us x8vx us us x s ts x x s u u x us x7



eP aTNge fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS W QYQOecWQPd df cdQcQS Q^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acUf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

NZ d s xz xs s x x5 x x s x5 u x s xs vx us us x7 aOd xs xs s u x s
t v xu ss5s QZ d u v xs s x xs s u v u s u us7a xu x vx x x s s5
x x su x s s x ys s vx u s vs vx s u 7Y s xs x us sts x x x x u s
x s s svx v u x7

Uus us xs x xs xs s x u v x x z s ss y sux7P ss x s xs s u us x5
v t s x us us ts x s xx x aOd s vx us us x7Px us us xs x ux x xs us s7U
s y su5QZ d u s vs us us xs v x xs s t us7

U d; 5 x x z s ss x xs aOd sux xs 5 vs x z s ^ZO x x x s s s u P P DA
s vs x vx u u DA. 7Q x z s st s x s s x x ; BCCA h 7P y x s v x ux s x x xyxu s s
s xs u z us x x z s s s s xyxu vx us us s us x u s 7

=7Dftu 5 zv 5 t t z v vt

Rxus x s s t u vx s s s s vx x s s x xu x x PO MD5 st vx x ys s5 s s x
u us 7a xu s vx x ys s x s s xx s x vx xs xxx s s vx s xs v x sv t x vx
x x yxu x s7cxu xu s xs x x u ss x xs xs s v s vx xs u v vx st s x s x
x x x7

cs xx v x 5 u x x s ux5us us xx xu s x x u v u s xx vx xu x xz s x
x vx xzs x s s s xu x s s x7 O s xs xzs x s xs s s s x t s x7
a xu x s s x x PO5MD u us u v s x u s xu s ss x u x x xs
s xx 7

O s xs x z us s x x v u s Rg5 x x z s us us s ts x x5 vx us us xs us x u
u t t v xu s u x xs s7f u u vx s s vxv us x x s xs u x vx us v s7
O u x us s u vx su vs x s xs s y u s vx vxu s x5 v u s vx s s xs
x z us7

Ps x x xz s x x s s x ux x u u s s s x x5u vx yus xs xu s x x 5 x svx s vx
y u s x7dx s xs s s ss x 5 vx z s s v yus s s x s x s s x 7
Muux s xs x x s vx s x5 s xu s xxu us vx vx x u vx suux s
s xs s v s s7

=7EY vt xz v v 5 v t xz z z t z z

Y us x vx u u x x x y sux u s x x u x x vx s x su x 5u x5
u x5ux x5y s x s s 7Uus us x x s us x x x x x s x s x usv vx x
x vx x x5 x u s vx x s x7Mus xs s xs s x s xs v x s xx x
vx x su s x s s x 7



Px xFcQMlMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQMq^ GcSldQYQOecldQPd df cdQcQSQ^ GcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

Mu x x x s x s s u z x s x s x s v x s 5 s 5 s svs5 s s x
vx x x s s u s x v s x x s s7d x vx vx x x x s x u s t u
s 5u x x vx y s x sv x s x v x u v s s x x ux7O su x x x x s x v y x
s s x x s x s u z s s ux7
d x s s x ; BD vx s7Y u s x s s x s x s su x u v x s s x s u s x s
s vx xu x7Z s x s x x x vx x s s u ux s x su x 5 s suux x s x
z s x s s x s x x s x7R s x s ust xu s xus us vx x vx x vx x x x x y s z x
s x x 7
f s x x x s x s x x vx us v s x x s s x st x5u x x x x s t s x
x su s x s u s s s u vx 7Qu s x x x x u ux us x s s x x ux7
ax x s x x s x x v s ux x x u ux x s x xus u x s s x5u s s x s y u x
x x x x vx u u x s x s x7
Uu x x usv s x s s x x suux x x7O suux s x x u s x x x s x s
us us x u x vx s x s x x uxG z s s x s x s s s s x x s s y vx u vx
s usv 7^ x x s x s s u s s vx s u y s u s 7
U s x x s vx suux s u x x x s s x u u s x x x x7d x x vx s
x s x x s y x x v x s x y x x x s u s x7Z s us x x vx z s s5 vx yus x s
st us x vx x su s x s s t x7Y u s x vx s v yus y u x s x x x7

=7Fb z x z vt x t z t zt x t vt

P t x z	P t t v t z z 1 i 2	f v v	Qzu 1 =8 2	dtv x
S sv s	BCFE99	d	A5=D	P^ A9
Yux x x u	::; A5D99	Z t u	:95D:C	P^ BA
ds s Yux	=B5999	d	=5EA	P^ =;
du s s us W	B; 5E99	d	A5D	P^ @9
du s s us W	DCFE99	Z t u	C5AAD	P^ A9

d x u u x x vx x vx us v s s x 6s s5u us su s x ux s x x s s s x vx BCE5
::; A5D=B55B; 5E DCE h 7d x x x xz s x s s vx us x u sv s s x7d s x x
s x us su v x s x5 s s s x vx x vx x vx s x us us s x s us x 7
Y s v s us s x x x x x s t x vx x s s x vx x x 5 s x s s s x x s x
x x x7P t s5u x vx us x x x x x x x v s s s x s s y u s7du x s vx
u s u x s s v u x us x u x x us x s vx us v s7



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Qz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdlleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS WQYQOecWQPd df cdQcQS Q^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ldl

O u x x x s z s y u x vx x s s x5y s x5sx x5u x s x s v s s x u x s u x x xs
x 5 sus xs x vx s s x y x v s ux7 M s s xs s xz xs s vxt
x x s x7O x y u xs s s v x vx vxt x x s s s x 5 s x u x
s s x vx x s x vx v t s x y s us7

Qzu v J br z vt 81:5C= Qz tf2HQz tf J BB 6 AB J :9 X

Ys z sv s5vxt x x BCE 8::B= l A5=D =8 Gs ux 5;; A5D 8::B= l :95D:C =8 7Muxxs x s x u v ux
s =5EA =8 x s s vx 5 A5D =8 x du s s us W C5AD =8 x du s s us W
P s x x x s x u x x s x su v x 5v u x vx v s x x v t x x s x7

ex x s s vx x x xz s s u s u5u x x AA z svx O5 s x vx us u x x @A z svx O7R u s xs
s x x s vx s u x x x s us v ux x xs usv x x7Z s szx x x x zx u s x
s x y s v y s u5ys s s u x u y 5 z s s s v x vx
y u s x s x x ux7

M x s xs x xu us s yxus x x x xs s s u u vxv us 5 s s x x s s x us s7a x xs
xxu us x s s s v x x xs x us dO_a x x s s s us x x x x zx uG
v x s xs xu s s x s x xs s vx us su x u x x xu ux s x xu s x 5vx u x
sv vx xz x s x vx y u s x7

e s x x v s ux x x s x x u x s x y s s vx z x vx x s x xus us7Pxz s xs s x
x su s x u s s7_ xs x xt x s s x s s xz x x x x s x x x s xG z us s z x 5
u u s s sus xs s xx xz s x x s s xs s s t 7

=779Oz t vt t zvz t z v

N x s xs s x s s xs x vx s x x s x5 u dc Q^ ;; D=:6:F 9:C5
u s x s s s s u xu x s ust x7Ys x z ts s dR5 x y x x u xyux vx s x
s s s 5ze5 s s vx u t vx sx 5 7O xyux x x x u x vx us u s x s x x
xu s x x s s x s s x s x x x 7

ex x s s x x s s vx us u sv s s x x 6:A z svx O7ex x s x x s x s x z s ;;
z svx O s z sv s5; 9 z svx O s ux u :D z svx O s s s vx 7P y x x x vx x x s s
s x x s u s vx us u 5 v x v y x x u s x x xz x 7

h J Nr t HUr f J f hHUr h J 95=A h

Ur t J Ur f 4 Ur hHbrvt v J Ur t 1fr 6 frz28:7999

P t x z	f 1l 8 =X2	1:8 2	fr 1 txz P2	Vvtx t z zv t z t xz vt v
S sv s	:5A	959	;;	M x s y s s x s x



eP aTNGe fRPU_aYaTk edY

Of UFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ GcS WQYQOecWQPU df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

P tx z	f 1i 8 =X2	1:8 2	fr 1 txz P2	Vvtx t z zv t z t xz vt v
				x y s s
Yux x x u	95A	95A9	; 9	M x s xv x
ds s Yux	:5A	9509	:D	M x s ys s x s x x y s s
du ss us W	:5A	9509	; 9	M x s ys s x s x x y s s
du ss us W	:5A	9509	; 9	M x s ys s x s x x y s s

P tx z	Urf 1i 8X2	Urh 1i 8X2	Ur t 1i 8X2	brvt v 1 i 2
S sv s	:7@EB5 A9	===5BA	:D; E5@A	BCBDD
Yux x x u	; 7A@E=9	CC; 5C==	=7: CBB@	::B5:D
ds s Yux	DE=5AA9	:ED5EB@	:7E; 5A: @	=B5A=
du ss us W	:7AD5EB	=9; 5@ A	:7BB95B; :	AD5; ;
du ss us W	; 7B95E99	@D:5B9	; 7@ 5B9	E; 5@C;

ax z sv s5g l @CA =l :7@ A =7cx s Tpe l :5A :7@ A l :7@EB5 A9 h 8W Tpg l 95==@ 9509
:7@ A l ===5BA h 8W/O xyux s x x :D; E5@A h 8W5 s apus u l :D; E5@A =C8:799 l BCBDD h 7
ax ux 5g l :7 A95AD =5 l @B; C5@B =7O xyux z ts x x 195A 4 95==@ 95A92 @B; C5@B l
=7: CBB@h 8W/P yx x s vx x x s s vx =A W u v ux s xux s vx us u vx ::B5:D h 7ax s s vx
5v yx x s vx x x s s x x == W5 s x uxxv su vx u s s x x =A W7
Mux usu yus x s xzs s v x zx x s us s5 s yx x uz ts5 u t vx sx
s u s vx us x7Q x x v ux s u s x us s usv us su sxs s s s x vx s7
Q x z s s s s x x us u s s x s s 5 t s u s u xz vx s x7

=7,7: W vt zt z z z z vz t tz ut v t v

Ps x x vx x s x ^; 98; l ; E; @W x P; ; l :D@ x7^; 98; x s s v yx x x ys s vx
x x s s x s s vx xyx s vx ; 9 z svx O5 x x vxy vx sz x x vx ; ; z svx O7Mux x
s vs x s x us u x u s s x v u vx x s x x z us y s s s xs
v u x y sux7



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ GcSQUYQOecWQPU df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ldl

ax xz s s x u s x x x s s s x5 x x s s xv s z s s s s s7
S sv s xs s xz s :9 x8 5A x8 s s s sG ux u x5D x8 5A x8 s s s sG s s vx
5:; x8 5B x8 s s s s7U x x xs s x x s x xv x v stx7Mux xs
x x x vx x s s x s x x s 5 xz s vx x x s s7

r t z J r r t 8:CEHfrzv J fr zx 4 r t z 1fr t 6 fr zx 2

rv J; 98; 4 1frzv 6; 92 Q; Hcr J; A Ur t _rv 8: 999

Ptx z	b t t	f t 8 zx 1 txz P2	f zv t z 1 txz P2	_ zv t z 1X z2
S sv s	:9 8 GA x8 s 7	; ; 8:D	:E5E9	; 7CA5@D
Yux x x u	D 8 GA x8 s 7	; 9 8:B	:B5EA;	; 7-B=5 =D
ds s Yux	:; 8 GB x8 s 7	:D 8:@	:A5C @	; 7=A5@ E
du ss us W	D 8 GA x8 s 7	; 9 8:B	:B5EA;	; 7-B=5 =D
du ss us W	D 8 GA x8 s 7	; 9 8:B	:B5EA;	; 7-B=5 =D

ex xs sxu sx s x vx s s x s x u x x :BD xsx s s s 7Q x z s x x sv u
y su s x vx u s x5vx s x u x v ux xs x x s x s x x vx s u s ^pxu 7Z x x xs
x x xs xv x x x sy u s xs x s x s s u x s x xs s s7

Ys z sv s5 x xs s xu sx s x x :D 4 1; ; 6 :D2 A98:BD l :E5E9@CB z svx O7 ^pxu l ; 7; @ 4
1:E5E9@CB 6; 92 :D@l ; 7CA5@CB:E W x7Q x z s s x s v xu F; @ :D; E5@ A ; 7CA5@CB:E 8: 999 l
:; :D@5; ECB h 8s 7

Ys ux u 5 x xs s xu sx s x x :B 4 1; 9 6 :B2 @98:BD l :B5EA; =D: z svx O5 s ^pxu l
; 7-B=5 =D9EA W x7Ys ss vx 5epxu l :@ 4 1:D 6 :@ Q; 8:BD l :A5C @ DB z svx O5 s ^pxu l
; 7=A5@ DAC W x7Rxus x s s x x x us s u u xyux T usv 7

Ptx z	c vt v t 1 l 8t 2	Zt t z z 1 l 8t 2	c z 1 l 8t 2	P zv v 1 l 8 ; t 2
S sv s	:; :D@5=	B7@E; 5B	:; C7E==5E	; AB5A:
Yux x x u	:DD7:C95-9	E7@9D5A;	:EC7ACD5D;	:A95@C
ds s Yux	AA7EE:5B@	; 7CEE5AD	AD7CE:5 =	; @-5@
du ss us W	E@7:DB5B=	@C9E5=	ED7DEA5EB	; BE5@
du ss us W	:@E7DA:5B=	C7@E; 5AD	:AC7=@@5 :	; :D5@
fafNY	C:979A:5=	=97B9; 5D	CA97A=5-F	6



Px xFcQMlMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS lQJYQOecldQPU df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Zs s xs vx x vx A. xyxus v yx x s v x x x z s s vx us x x x z s x us s z x x s x v
x s vx us u 7Mxs s x x z x x x u s b p z x s x vx s xs s dO_ a7^ x svs z s us vs s
x vx vx A. s u x x u u x u y v s x x z s x us s s u v u s y s us7

O x s u v ux s u x x x u ux s s x vx v x s x s x d:7 ax d; x s xs s sux xs
x x z x x us s s5 s dO_ a x x =5A9 x s x x x x5 x s v :D=7:; 5DC h 8s 7 M yx 5
u s s s x y s x v yus syx x x vx x x s x u x us s7

=77; N t t z t z t t v z t z x z v t z

U xz u v u x s s5 s u s us s x x s x s s u s x v x u v y s u7d us us
ts x s s s s s vx x x s vx s x vx us us x7P s s z x xs sux x x5x x z s x s s
xs s su v t v x u s5 v x vx y u s x x 7

U x s x x u ux x x s s x vxus v u s5ts x s s x x u s s s sz s s vx
us us x7P yx x s x x x s s v x xs s t us7d x u v xs s us xs usv vx x x s
s x s t x ts x x y u s vx us x x x s7

Ys vxyxu s vx s xs sz vx z s s5 xu x us x xs s x u xu s x syxus 7
_ xs u s vs s QZ d t x s s s s vx xu x7cxu xs y u s x x x x s
s s x v x sv xu x s vx xu xus x s xu s x x 7

M s s xs x us s x x ux x xs usv 5 x x s s vx x u v x x7dx s x x vx
y su s x s x x sv x s x x u y 7U xz s xs x s s s s
x x z x x x u ux s x x z x x ux x x s xs x y s x x x x xs x x s s x7

=7P z z t z t z z z

Q s s xs x x x s s x5 s vs s vx 9D797; 9; B7gs x ys s egM5egM s x u egM x vx s x
v u7O vx us u x x A5=@ x 8Qf c7O x u v xs s xs s s t y s ux5s us 5s
x x ux5s su v s x u xux s x x x s 7

=77 e v t xz z z t 6 e:

Pt	St t fhN1z 2	fhN1z 2	P fhN1z 2
:7_t x xs s x s s xs x x	959	959	959
; 7M z s xs s	959	959	959
=7a xu s x s x s x us	:D: 7A9959	=D7: A59	; :EB: A59
@7U x s vx ts s	BCA7 9=59	:@ 7E; 5B=	D: B7EEA5B=
A7M x u x x	DD7= C5B	:D7= C5 B	:9B7C0@E;
B7a tx x z ux x x	959	959	959
C7Z s s vx t z x x x s	; :@7 CA5A	@@ECB5E:	; AE7A; 5B
f afNYTR_RdNY	:7BF7: C5A:	; A=7; :5E9	:7A9; B=E5:



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQMqQ^ GcS WQYQOecWQPU df cdQcQSQ^ GcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

=77 e v t xz z z t 6 e;

Pt	St t fhN1z 2	fhN1z 2	P fhN1z 2
:7_t x xs s x s s xs x x	959	959	959
; 7M z s xs s	959	959	959
=7a xu s x s x s x us	:D: 7A9959	=D7: A59	; :EB: A59
@7U x s vx t s s	: 7@EC7: =59	=: @7@=A5=	:D: 7@D5=
A7M x u x x	: @D; E5DC	=AB9: 5AC	; :97@=: 5@
B7a t x x z ux x x	959	959	959
C7Z s s vx t zx x x s	@E7C9=5 A	DD7=C5BD	A9CD@95=
f afNYTR_RdNY	; 7 D=7AC5;	ADC7 EF5FE	; 7DA7C=C59

=77 V z t xz ut t vt z xz v v 6 t

P z t e:	St t fhN1z 2	fhN1z 2	P fhN1z 2
@7 O u s s	BE7: D59	: @7A=A5DD	D=7CA=5DD
@7 Z s s x5xu s x x x z ux y u s x	=; 7B959	B7CEA5B9	=E7AA5B9
@7 f s x5xu s x x x z ux y u s x us x xux s s	AC=7B; A59	:: 97@B: 5 A	BE@9DB5 A
e_eMY OMald_Y @	BCA7 9=59	: @7CE; 5B=	D: B7EEA5B=
P s Fu u 6 s	:9: 7ACD59	; : 7=: 5=D	:: ; 7E9E5=D

U x s vx t s s x s s u s x vx u u s s vx s xu s x x vx y s xs 7
d u x vx x x5 s x x vx ust 5 xz s xs st 5 xz s xs s s s xu x s s
x xs s x yxus x usv x7Os s x u x s x u ux x ; BD vx s u u yz s x
us x vx u x x us x7

O x x x x xus x5s x s x us5 uxv vx su x5 s szx x y s x zs s x
s x t xu s 7Z s s vx t zx u x x x v x x x x s x s y s us v u ys s vx
xu s x x x us x x yxu vxy xGx x x s us su s x x zx ux x s x7

=77AS t t zt v u t uz z vt

Pt z z e:	St t fhN1z 2	fhN1z 2	P fhN1z 2
gs s x s s	: 7AE7: B5@	; @=7; : 59	: 7@9; 7A=D5 :
O x x x z t x	E@97A; =5-9	: EC7A9E5DE	: 7=D7@==5E



Px xFcQMlMbcQdldleQZ PQac_ Pf OQcQdUde_ OMcQM MQ^ QcS WQYQOecWQPu df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Pt z z e:	St t fhN1z 2	fhN1z 2	P fhN1z 2
O x x xx z t x	; :D7OE=5:	@A7C:5E:	; B@7A9A59;
R s s x x s t st s	DBB7=OD5DD	:D: E=E5AB	: 9@D7=:D5@
O t x x ss	; E; E=C5A=	B: 7; D; 5 @	=A@7; E5DC

:7A9; B=E5; J :7BAE7:E5AA 4 =BA7:F5DD z 5 v fhN

=BA7:F5DD J; CA7B9B9; 4 EFD:A5B z 5 v fhN

O t s x ss u vx u x x x xx z t x s xs x z t s xsu x s vx s x s t st 7
R s sxs x s t st s x x xu sssu s sxs ss x z t s7U d:5 s xs x z t s xsu x s x x
DE7C: @CA x u egM5 s u x x x xx z t x ; B@7A9A59; x u egM7

asy s x xu u x vx us v s x x :7997999 Qf c8Z h 7M us us su s vx 95@0099
Zh5 x s :B; 7@ Qf c5 x xu DBB7=OD5DD x ys s egM s u vx usu 7O x s egM syx x s
s x x x vx ssv u5 x s v s u s vx :9@D7:D5@ x 7

ax d; 5y s sxs x s t st s x x E=:BD95AC x u egM5 s u t s x x x :D:CEAA5A= x 7
O s s s s xs s v u u x 5us su sxs x z t s sy xuyu7_ us su s x MD s s x
s xs s s s us su s xs y s us x z t s7

=7AS xt z t zt z vt z z z t z xz z z t

Q z	dz z z t z 8 z z t	N vt z
U x t ux	TS 7E9C8; 9: B5u v yus x s ust x	d u s dR5 ux s 5 v us 5vx zx x s 7
R s s x	_ Z Q 7:9BB8; 9; BGS v u s M u cQd x x s t ux	Os su s 5 us x5u x s v us 7
U ss x xu ux	U06; 9::5 v yus _ v 7EAE8; 9; =	O u x5 xu 5xzs x s s s z s s7
Uus x	U: =6; 9: A5 u v yus x _ v 7 :C98; 9; =	U xz s xs x5u u s s5 xz s z s s7
ds u s x us	dc Q^ :; D=:6: F; 9: OG^ M; 9; ; Gu xu x OE: s ust x	a x vx s x x s x7
Q x z x x us	Z u 99:6; 9; ; 5s t s s _ v 7 :B8; 9; =	N s x x zx u x z s x u x u7
ax y s s avO	dc Q^ :@; AG x s dc Q^ :@A:	ax y s s x x s x y s s s u x vx x s x7
d u	dc Q^ :EE9Gdc Q^ :EE:5u s x x x s s x s ust x	Ns x x xu s su x s s x x vx x x7



Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ GcSldQYQOecldQPd df cdQcQSQ^ GcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaGcWZ 5Vf PQef Y elZ ld

Q z	dz z z t z 8 z z t	N vt z
dxu s x s ux v	a ::D8:6; 9; A5s ts _ v 7 ; BC8; 9; A	M s s x5suux 5 xu s usv x x x7
csv s x v u x	agSld5V cx xs u Ox x5O s Q xs s	d s s x s x v u x sv s x s x7

M us xs xz x x s x x s s s s s s x x xF x x x su x 5 us x x xu u us x
x ux sx 6s s xz s x ss x x x7U x x x z tsx s x t x s vxuss x x u 5 s
dO_a x x x x s s O_a u s7O us s u s s x x s x s x x5 s 5
u x x5 xu x txx7

=BT t v xz zt t z t z z

P s s vx x x s x x x ::; 5v x us x B x x xu x7d v vx yx st s x vx zx x s
s s x svx xu su sx7U x svsvx x x s x5 xzs xs x us uxv x x vx ys s s
xx x 5s x xu s x x z s s s x @6E7

Q xu s x usv x s x zs s x y s s s s x x5u s s xs z s x u t ux7
P s s ys x vx x xu x s s x s x s x x x5 s v s x yxus y 7Zs szx x 5
s xs y s xs x u s x ux x ::; 7

Nv t z 8 z t t	b t z z z t z	P
dR vx zx x s	ax svsv xu su ss	R vs x s xs x x s v us 7
d v vx x x	Y s :	c v us z syux v zx x u5 s us 7
M x v u x s vx s s x	Y x :6;	_ zs s xs v u x s su zx xs uxv 7
a uxv vx su x	Y x :6=	O su s xs u s 5t x u 7
a xu x u vx s vx x xu x	Y x :6=	P u x s s x us vx x xu x s x sv s x7
gx yus x x us s xu	Y s =	O x u s v u x s x vx x xu x7
O u 5 s xu s x x	Y x @6E 6 B	d 5 s xx5 ss Rg5 us x x x ux7
M x s x us v zx x	Y x @6E	f s xs xs s u s su us s 7
a tx5 x x y u x u vx x	Ys y s s xs x xu x s s s ::;	ex s x xz s s5 xvs x5 x u vx x sv s s7



Px xFcQMlMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS lQJYQOec lQPU df cdQcQS Q^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l f MY O_ Z f ^ QJaQc WZ 5Vf PQef Y elZ l d

Nv t z 8 z t t	b t z z z t z	P
Zs szx x 5 s x t u s x	Y x:6;;	f s xs z x y u y s u s 5 s s x7

d uux xs x z us x xFvx s xs y vx u 5 xzs xs 5 s u 5 s xs
u u x 5 ss xs v x xu s x x 5 xs s xs su v x ux5 t x x x u ux v s ux5
u yz s xs u x x s xs y u ss xz s s7U x x x xux s x u s s ss x x x x
x zs xs s u s 5u x s s xs u u x x s xs s x s z s s7

A7N t t vz t z v 6zv vz

AZ Ptx xz t t t x t t xz z z t

ax svsv vx xyx s x x vx ; 9 vx s 7Ms s u ss su xxs u u usv 5suxs x u x u suxs
v vx xz s x uss s x 7 U x s ss x x x s s s vx u x x x vx x s xG s
x s t st x x svx y s s x5 x x s s7

Ns x x zx u x u x x u zu5 x D7CB9 x s x s x7a v u s x x vx x ss agS l d
x yxus x u yz s x5 s u x x x s s y x s s yxus x vx x vx
usv s7d us xs x x ss uux xs x s s s v u x s u 7

Uv us vx v u x x x svsv vx xyx ss zs x x us u s us v x x x z s s ss vx
xyx s ; 9 s 7U s s s y s u s s x s us x s s x s vx vxz svsv x s v u x y sux vx 95A
s s5 ux s v u s s v xs7 O x x xs x us u x vx usv s vxz svsv x u
s x7

d: d; x s s x x s s5u u yz s x vx x x5 x vx us x 7P yx x s vx v u x
x x t s s us xs z ux z ts x x x s d:7O yz s s M05u x 5 s xs
x y s s su s s xyxu x v u x t s yxus ux s 7

AZ h ztu t v t vz t xztxt t z

Qs s xs us s s s xst s x x x xxs xu s x x vx su x s s x x s x s
usv s5y z5 xu s 5 s s svsv7dx s s xs s xyxu x x s s y u s 5 s 5 z s x
v t s 5 xu s x x ux xz s x x7^ x xu sxs s xv x x x z us s ssu
su xs x x s s s s xus xs u ss7

ex xs x v us x xv u x xs s s xx s v x u s s szx x x u s u x x
us 7dx s xs s x s xs x s s s v x vxzs s x vx sx s x xu s x x 7NZd aOd
xs s y u s xs sys s v x x u sv Gx s s xs x x t u sxs x s x
vx s xs vx s x s x7



Px xFcQMlMcQdldQZ PQac_ Pf OQcQ dUde_ OMcQMq^ QcSldQYQOecldQPd df cdQcQSQ^ QcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

U x xux5 ss xsx6s sy u xs su u v x x sx s st x u uu vxvxz sx7es xxx
v s ux x xs xu x s z x 5s s svxvxz sxx xx su ss z s s7d x vx s s sx
s xs s xu x vx vxt x xs s x s x xs xu ssv s x xxs s x s 7
gs s sv s u s x xx vx y s x s 7Z s xs s x u x vx s u s x5
s us x vx suux x su s xs s x s s tx x7Qu s x xxx xu ux x s s xs s x s xx vx
u zx x xu s s7Qs s x vx x s x x v u x s s x7

Stv xz v	Rzv u	Zt t z t t
ex x s v us x	cxv ux xs x Rg u s xs ts x	gx s x5 s vx x u 5 s xz x x s x x us7
Uz x 8vxz s x	Mxu s xs s xx y s xs z x x suux x	U s x5 xu x s z x 5u xu s x x su s x u s s7
gs 8 s sv s	d u s xs y s u	M u s x s s s xs zx x x vx s 7
a xu s x x	as vx xs s x s s x s	Qs s 5us us x svxu s x s s xs x su s s x 7
Px us us s yx ux	d s x vxus s	Qu x s s x xu u v s x PO5MD u us 7
U x x xs x x x	_ xs x s s x s us x xu ux	M 6 s s x5 xu s u u x xu xu s x u s s7

Zs x s us x x s x s s s x x x7U x x xs s x x s s x s xs y s 5x s x s xs5
vxzs s x vx sx 5 s s s xx y u s xs xu 7P s x x x x x z ux x x x5u
vx x s s x x x xz s xs xus us xxu us s xs x s y u s s x7

AZ-e t t t z t zt v t t

Q x z s x xu us x x s s u t s s s s x s yxus x usv 7d xx s u u x
x s s x s s x x z us5 s xzs s u x xs s t us s s x s u us vx su vs x7Oxx u u
s s t y xs s ux s s x xu us u s u z u y x u ust vx v t x
s s x usv 7

ax s xs x us5 su v x sx 6s s x x vx s s t x vx x x 7d x x u
sv s s x s xs s 5 s xzs x x x u xs u ux x xs vx us x7R u x vx xu x s
x x5sx x5y s x u x s x s v s s x s xs s u u y u s s s s x7

O u x x x ux u x7M x s xs u s s x x x xs x x xs u s s5 u
x z u u 7Y us x x x s s xs y s x vx s s x s x s xs x x uxG
s yx vx us v s x xs xs s v sx x x 7



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcSldQYQOecldQPd df cdQcQSQ^ QcMNUQPQeld d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

Y us x s st su v x zs xs su x s s xs u u x 5 x s s xs x u x s
s x s 7U x x x t u xs s suux x u vx zx s7M s s xs xu s x x s xs s
x x vx s x s x usv s x x vx x su s x7

AAe z tu tzt vtt xz zx

dx u x x zx u x x s us usv u y u x xv us ss s7U x s s x x st s xs
y u s 5u y x u s xs x x z x xzx x st x sux xs s t ux7 Mux s x u x
t ux x x u v s vx su s xs x x z x v vx ss 7

Z s x su x s yus syx x s x usv x x x u ux xs s x x x x x x ux7
_ zs s xs x xu x x xs s s xs s z 5 sy s x x s x x t x7U
x s s x x s x x s s s xs s x x s x s x xs t s us x u s s x
u s x7

a v u s y s us s x u y s s vx x s s s s x 7cxv ux xs x x x us u s s v us
z s s us v u x s s x7Mux v us x x x x s us x s u x s x x u u
vx s s s xu s x x u us xv ux x s s s s u s vx zs x s u x7

Px x x v s x x s s u xu s x x s s7Z v x x5 x s x x su s s s x vx
xvs x us x x s s s s u s x xs v 7Os us x x x x ux x s x s
vx x s suu vx s x5s x x x s u u y z yu xs s xv x s u x x 7

ABb x v t bhTV x z tzt z z z vt

ABZ Qt z z t t z

Ps x x vx v u x sv s x s s u y agSld 6 a suSx z s us Uy s d x s V
cx xs u Ox x5O s Q xs s7Os u xs s x u x x us u x u yz s y x5u ts s vx
sv s x agSld6dMcMT= vs x x x z ux QcMA7_ z syu x x u vx x u s
x x 7

dx s vx us u y x x s x x z u vx x y x s ;9; :5u D7CB9 s s x7Qs u x ts s s s vx
s x s xu G x x s s s v s x st s u xv x s s s us u s s x s s7
cx x x x z u xz s x x u ux u u s 5s x xs5zx x s x vx x y xus ux s
s us x x s s7

ax s x us x5 u s xs x x =9 z svx5s s agSld x x 6@A z svx5u x s x s d v6
Q 7Z vx s xs x us s v x xs s s x s7ex z s vx us u agSld x x u u s G
x y s s s s s us x x vs s vx x xs s PO7 ^ x x sv s zs x s s us z t y sus
ux s x x x x z s us u s s7

agSld y xs s x xs x xu us a h u x x x sv s x s v x 5 h 8 ;7Q x z s
x s s x x a : 8 : 9997Usv x xs s s x x s u x x v xu x5v y x x y xus x5 xz s x



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldleQZ PQac_ Pf OQcQdUde_ OMcQMq^ QcSlQJYQOecWQPu df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

x x sxx 7a v u s s s ux s s s t x sz xzs xs x x z x 5 xs sv x
u x xs s s ys s s vs x x7

bt t z	e:	e;
Ns s vx sv s x 8 x x	agSlld6dMcMT= 8 QcMA	agSlld6dMcMT= 8 QcMA
dx s vx xyx s	D7CB9 x s x s x	D7CB9 x s x s x
Sx x x	R Gd v6Q G=9 z svx	R Gd v6Q G=9 z svx
a x vx z tsx Rg	:@	:B7A.
a x x POu s s	:@599 h	:=@599 h
Usv x x z tss s	:7AAB5E: h 8 ; 8s	:7AAB5E: h 8 ; 8s
a v u x s s s v s xz s x MD	:C7; B5 E: h 8s	:AB7A:E7A== h 8s

AB7 Vtx z zt t t t t

Y t	T ut t 1 i 8 ; 2	Q zv t 1 i 8 ; 2	Q t 1 i 8 ; 2	dz zv t t 1 i 8 ; 2
ld s x	@5ACD	; @5:E	; =5ECB	95D=
Rxt s x	DB5B=9	AA5ED	=95 AE	95DC=
Zs x	:@95AC	DB5B=C	A: 5EO@	:7A@A
M x	:@95=DE	C=5 ; ;	BA5@, =	:50@@
Zs	:CE5E	:9@5C=	C; 5; :	; 5; A
U x	; ; ; 5C=	:=: 50AA	CD5 ==	; 5DA
U x	; 9; 5; =	:: @50:	CO@EB9	; 5BB;
M z	:D; 50@9	:: A5AC=	B@5DAD	; 5=9E
dx x t x	:@@5A@B	DC5BE:	AA5E=	:5BB;
_u t x	:9C509	BB5EAE	=E509:	:5:9
^ x t x	C=5A9=	@B5BDC	; B5=:	95BD@
Pxux t x	=C5EB=	:C5=9B	; 95 D;	95=CB
fafNYN_gNY	:7BBC5F:	F=A5; ;	C9=5:=	:E5BBC

Usv x xs z tss s s s s x x :7AAB5E: h 8 ; 5y s s v E=@5; ; h 8 ; u x s v xu s5
B9=5E= h 8 ; u x s v y s :D5AAB h 8 ; u x s xyxu s s7Usv x xs us su x xs s x x z s
s s uvx s x s xs vx sys sG v u s x xu us s s s x u vx x s s x xs5 x x s s
x vx x x 7



Px xFcQMUMMcQdldleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ GcS QJYQOecWQPd df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

gs sxs s s s sv x x x x5 s x x vxux t x7 Muxs s x s s x x us
v yx x x x v x v u s s s ux x xs vx us x7 Mu s v yus s xs s s s x x z x
v t x5 y s x x s s x x s x7

ABZ b x v t z t t t z z v t t t vz t

P t x z	b x v z e: 1 i 8 t 2	b x v z e; 1 i 8 t 2	b x v z zv vt e: 1 i 8 i t 2
S sv s	=A7; E5; @	=: 7A=C5: D	: 7 9=5; D
Y ux x x u	A@E: D5 :C	@D7@C5==	: 7 9=5; D
ds s Yux	: A7DCE5EBB	: @9: B5BCA	: 7 9=5; D
du s s us W	; C7; D5 CB	; =7@A5A;	: 7 9=5; D
du s s us W	@=7BBE59B	=D7A@A5DAA	: 7 9=5; D
fafNY	: D7; C5 F:	: BC7: F5==	: 7 9=5; E

a v u s xuyus d: x x s s : 7 9=5; D h 8 h 8s x s x x z us zx x us vx
yx s7 P yx x x x st x v x usv v x x PO v yx x7 Q x z s x s s x x v t s
v u us x u v xu 5ts x x x xs s t us7
ax d; y x x PO s u x vx vx x vx : B5. 7O x s MD x x s s s x yxus x
s s s x 5 u su vx x xs x xs s yx s us su s 7O s s s s x vx xu
s xs s sux xs zx x x sux s x u x u5s yx us x s x x u s st x7

ABA O t z z z v t t v t zt vt

S z z z v	e: 1 i 8 t 2	e; 1 i 8 t 2
a v u x y s us	: C7; B5 E:	: AB7: E5A==
O x xu u x s	: CE7C; 599	: D=79; ; 5 DC
O v xu v Rg	=E7; : 5ACA	=D7 @A5BC
Q x z x us us s ts x	=@7, A=5@=:	=97C=E5@
Q x z x vx us us s us x u	=97EB; 5AB@	; B7 A; 5 A;
U v x xs	: 9E7DC5B;	:: D7B: @DBE
Q x z x s s x xs	: 9@9A: 5 DA	DCB=@AC;
a x vx us x	=7@; 5B: C	@B; : 5@ D

Rrv J RrSh5x zv 4 RrORee5v 4 Rr

RrSh J RrSh5x zv 4 Rr vt vt z 4 Rr t z 4 Rr t t



Px xFcQMlMcQdlleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS WQYQOecWQPd df cdQcQSQ^ QcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

U d:5x x z s y s y u s u v y s u t s x x x =E79; :5ACA 4 =97EB; 5AB@I BE7ED@5=E h 8s 7
P y x s s s s u x x x s v x :CE79C; h 8s x x x s s v x x s s t u s 7Mu x x s y u s s u x x v
x x u s x x x v x =E59D. G s s s v u x 8u x x x v x EE59=. x x v u s v y x 7
Y s s s s u s 5x x z s u s u s v x u s u s x x x x s s x s u s s s s s v x u s u s x x
u x y s x s v x 7a x v x x x s v x u z u 5u s v s x v x u u s x s
s s s t s x G x u x u 6 u s v x x s s v s s v s u s s x s y s s v y x s v x u x s s s 7
Y s x s x u s x x s d: x x :9@79A:5DA h 8s 7Qs x s x v x x x u x s s s
v u s s u x x x x u s x v s 7cxz u x u s v x x z s s x x x v u v x s u x x y y u x 7M s s
y s u s s s v s z s x v s u x s s x x z x s s s y s x v x x t x x y u 7
N s x x u s u s x x u v y s u 5 s t s x x v x x x z x v x u s u s x v x x s 7a x x s
s s v x s x x s s s x x x s s s s x y x u s x s s t 5 s x s s y u s
z s x x v x s u v s x s u x 7

P t x z	b z z t t t t t z t e; 1 i 2	b z z t t t t t z t e; 1 i 2
S s v s	; @5@E	; :5A==
Y u x x x u	=C5ACA	==59EA
d s s Y u x	:95DB@	E5ABA
du s s u s W	:D5AAD	:B5-@@
du s s u s W	; E5DCE	; B5=:B

N s x s x v x s s x x u s v x x u x x s x s x s x x z x u s 7gs x x s
x v x s y s x s y x u s s t x G v y x x x v x v v x h s s x s s s y s x v y u s
x x z s s s s s s v x s x 7

ACN t t t v t t z t u t z t z t t

ACZ V z z x z t z t

bt t z	V z t x z vt v
ax svs vx xyx s	; 9 s
cs s vx su s s x	A.
Q x z x x x u u s v x x s	:59 x 8 h
O x x x x x x z x x x u u s	; . 8s 5 u x s v u s ;
a x x x z x u t t v x xyx s	95A9 x 8 h u t t
cs vs x x x s u x s s	DA.
O x x x x u t t	; . 8s



eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdUeQZ PQac_ Pf OQcQdUe_ OMcQMq^ QcSQUYQOecWQPu dfcdQcQSQ^ QcMNUQPQela d_YM: aQ^ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eUz U

bt t z	V z t xz vt v
Pxz svS x v u x Rg	95A. 8s 5v s ;
_ x s x x x s s	:5A. v x s y s egM s :
O x x x x s x x x s s	; . 8s
Q x z x s s x xs	Rs s x x s s us u
O vx us u	A5=@=@ x 8Qf c

a x x x x z x s x x v x x x x x s x s s x y s u s x 5 s y x u su s x z s s s x x
x svS vx xyx s7O s s s s x x sux s x u vx us x7O u x s vx xyx s x
v x x s v x x z s x us s s5 s vs x x x x u t t 7
R s s x s x s t st s x x x vx s s us s vx su x x s x x s x7Qs x x xz s s v x
tx xyu vx x s x y x u s s 7O x x z x x s x v x x s s s x x s s vx x s x x x s s7
Q x z s y s u s u s s v x u x x z s vx us us s v t s x x s s x vx v s 7
ax x s vx u s u u vx s s x s s x u s x x u v s s vx x u s s x vx us x svS
vx xyx s vx ; 9 vx s 5 u v x x s s x x s x x s x7Mux s x x ux s vx v st s x s
x sv s x t s s x u vx u x x z s x u x y s s s 7 U x x x s x v us5
x x x vx x ux u st x x s s x t z x vx x s x7
Z x x x s x y s x x s s x us x x u s x s v x vx x x s s5 x vx u x 5
u u sv x z s vx x x x7P s s vx x u s s s x s s x x x s x u t s s s
x v x Fvxz svS x s y s u s x x s s s x u x s x x z x us s s s x y s u s x7

ACZ P z t t z t z z v z z z v

P z v x z z z t J CA9BA= 895EB 95B J =DC7DF9 z 8t

P z zv v e: J :9F7DEDEC; :5 9 J :=9F9B5A= z 8t

Rz z 6 t :	e: 1z 8t 2	e; 1z 8t 2
O u x s s sux s x u x u	=CB7CE959	=CB7CE959
O x x z x x x u us x s s v x xs	:=97E9A5@=	:@ 7=@@
P y x s t s s u x x z x ux	; @ADD@AC	;=@@A; 5B
_ x s x x x s s	:C7-DE5CA	=@7.995E
P y x s x s v s x s x x x s s	; ; D7@E@D;	; 997-A: 5EC

O x u u x s x x xyx s u s s s x x u x x z x u s s s5 ux s s x vx y su
ux7O x x u s x vx us v s x x u ux s u xu 7a s x5u s s s



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldleQZ PQac_ Pf OQcQdUde_ OMcQM MQ^ GcS lQYQOec lQ P U df cdQcQS Q^ GcMlUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l f MY O_ Z f ^ QJaQc WZ 5Vf PQef Y elZ l d

y s u s s x x u x u x u x x u u s s t 5 s v y x x s v x v s u s s u x
v x x x u u s x 7

U s :5t z x v x x s x d: u v x x x z s x x u u s v x x s v x : = 9 7 9 A 5 9 x x s x s x x s s
v x : C 7 = D E 5 A x 7 N x x y u s s z s u s x s s s y x x x y u s 5 x x x x 7
P t s x s s s x x s s x s s v x x u x t z x s x x s x 7

AC7= S z z z t x t x z z z t

M 9 u v x x s s s 7 R R 8 0 y x x s s x s s s s x x 5 s y R 8 W y x x
u t s t x x y u s 7 U s v x x s s x 5 v y x x s t s s u x x z x u x x v s s u x s x s
x x s s 7 R x s u s s x u s u s x u y s u : 8 1: 4 9 5 A 2 s 7

est x s x s x s u x x v x x s x s y x s s x x u x v s u x s 7
Q s u v x x x x v x u s s x v x x 5 v x z s v s x x x s s 7 g s s x s s s x x x x
x s s s s y u s u s x v u x x s u y u 7

N x z z t t z	a / Z e: 1 z 2	S z t t e: 1 z 2	a / Z e; 1 z 2	S z t t e; 1 z 2
:	: C 7 = D E 5 A	; ; D 7 E 5 D;	= @ 7 9 9 5 E	; 9 9 7 = A: 5 E C
;	: C 7 = C 5 A @	; =; B = B 5 @	= @ 7 D; 5 9	; 9 = 7 E B @ D E
=	: D 7 E; 5 E	; = B 7 D A @ 5 @ B	= A 7 @ C 5 D @	; 9 C B @ @ 5 :
@	: D 7 @ A @ 5 @	; @ 7 A 9 5 = E	= B 7 D C 5 @ 9	; :: 7 = E: 5 A
A	: D D; = 5 ;	; @ 7 A; A 5 B B	= B 7 E: : 5 @	; : A 7 9 B 5 E D
B	: E 7 E E 5 B D	; @ E 7 D: 5 C C	= C 7 B @ E 5 = C	; : E 7 E; 5 E E
C	: E 7 A D = 5 B D	; A @ 7 A; 9 5 ;	= D 7 @ 9; 5 = A	; ; = 7 A 9 5 @ D
D	: E 7 E C A 5 = A	; A E 7 @ 5 A D	= E 7 C 9 5 @ 9	; ; C 7 D 9 5 D:
E	; 9 7 = C @ 5 D B	; B = 7 D A 9 5 @	= E 7 E A = 5 D:	; =: 7 D A 5 ;
: 9	; 9 7 D; 5 = B	; B D 7 B @ A 5 ;	@ 9 7 A; 5 D E	; = A 7 = B A 5 @
::	; : 7 E D 5 9 9	; C = 7 A; D 5 E @	@ 7 A B C 5 E @	; = E 7 B; ; 5 A 9
::;	; : 7 B; : 5 E B	; C D 7 A 9; 5 E A	@ 7 = E E 5 = 9	; @ = 7 E A D 5 ;
: =	; ; 7 A @ 5 @ 9	; D = 7 A B E 5 =	@ = 7; @ 5 E	; @ D 7 = C = 5 @ =
: @	; ; 7 @ E A 5 @ E	; D D 7 C; D 5 E =	@ @ 7 ::; 5 =	; A; D C 9 5 A
: A	; ; 7 @ A 5 @ 9	; E = 7 E D @ 5 @	@ @ 7 E E @ 5 @ D	; A C 7 @ @ E 5 E E
: B	; = 7 @ 9 @ 5 :	; E E 7 = C 5 B	@ A 7 D E @ 5 = C	; B; 7: @ 5 :
: C	; = 7 D C; 5 = E	= 9 @ 7 D E 5 ;	@ B 7 D; 5 B	; B B 7 D B @ 5 @ E
: D	; @ 7 = @ E 5 D @	=: 9 7 = @ 5 @ A	@ C 7 D @ 5 A 9	; C 7 9; 5 @ A
: E	; @ D = B 5 D @	=: A 7 E E D 5 A B	@ D 7 9 = 5 @ C	; C B 7 B; E 5 ;



eP aTNGe fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdUdeQZ PQac_ Pf OQcQdUde_ OMcQMq^ GcSQUQYQOecWQPu df cdQcQSQ^ GcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaGcWZ 5Vf PQef YelZ ld

AEN t t xz z u t z

M s s x xs s v yus xs x s s s s xu x s s x5 x x s x u x x vx x s x
x x s s7dux s vx ts s s xs s s x x x zx ux y s us x vxus s x7ex xx x s s s x
s st s x x 5 v yus s x x x ux x7

dx s s xs s xv ux vx :9. ;9. s x xu x s s x5 u x x x vx :9. s x x5 u x x x vx
:9. s _/Z u x x x vx :9. s xu x s s x7ax yxus x us x s xs s ux x s x x x7
gs x xzs x x s x x x s s x us x s x vx x t s x5ys s u ts xs s vx ts s7

fz	hN_S8P e: 1z 2	hN_S8P e; 1z 2
Ns s	: DEC7, EA5AA	: @ 7A=5-E
Qu x s s x 6:9.	: 7A@ D9E52	6: EC7A0@DB
Qu x s s x 6; 9.	: 7DB7; =5 D	6A=B79=5:
U x x 4:9.	: 7AC79@ 5C=	6: ==7@ 95 ;
_ /Z 4:9.	: 7DC 7DE; 5DE	E: 7A@ 59E
Qu x s s x 4:9.	; 7 A; 7D: 5BE	@D97BD: 5B@

Sx s xs s st s x xs xs s x x s s5 s xs v u x 5u u x s
s xs u xs x vx x s s x7Nx xyus s xs s x vx s v u s s u x x vx x x z x
x ux5s yx us x s sux s s s s y u s s s u x x x vx xyx s7

AF d v t xz z t z

d v	Zt t xz z t z	dz tu t z v t t
U s x xs s	a s yus xs s x s s s x x u x s xs u y x vx x xu x7	Z s szx x vx xu x xu s
P u s x u t u	a z s s xs u s s su v x x xs suux x 7	Nx xyus x xu s
Z s xu x s	O y s 5x s s 5u x xu 7	Q xu s 5s x s x us5 v zx x
a v u x v yx s vx x s x	f s xs x x z x 5s s x 5 t v t s 7	_ x s s s
R u s x x us xyux s	cxz s u s u5xu t s xs x s s s xs x x s 7	cx st x s s x x us
Pxyxu x ts x x 8 x	dx s s x us s5 xu x x x vx x ux7	ax s s s
M s x x s u vx x s x	Q vx s x v us s x x z x x x s x 7	Nx xyus



eP aTNGe fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdldleQZ PQac_ Pf OQcQdUde_ OMcQM^ QcSQUYQOecWQPd df cdQcQSQ^ QcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

d v	Zt t xz z t z	dz tu t z v t t
Muux xs s	Os us x u x5 s us x5u suux s x s 7	Nx xyus x s

O u x x zs s x v s s x xu x x s s 7Qu s x xx vx yus x v v s5s
u vx xx xz s x u vs s5us s s s s us s7U x x s s s s x x x x s s s
s ux x s x s s s x x5vsus x s us s u s7
O us x s v s s s vx s x u s vs s s sG xu x us x s s vx x vx x7
a x vx xs u us x x x vx s xs x u u u s s s xs xu x 7cx s xs
y u s x ysux u s5u s s xs s x x x x 7

B7evz t zv t xt xvt z z

B7 P t t t vz t t z z zt z

dux s xu s vs x x d:7 d s xs s sux xs u u su x 5 u ; BD v x vx AA9 h 5
xs xs s : @3299 h PO7O s s u d; 5s x us su s x y sus vx xy s s s x5 v u x s s s
s s x x x z x st s v us x s s x5 s s v sux xs us su s x x us x x u t u
s s s 7

Mxzx xs x us s x xv x x xz s xs us s s x 5 zx x s u s d v6Q 8 =9 z svx5
u s t s xs us PO u x s x x5 us xs YRa x y s s x x s s x x vx x vx
us v s7 P x s xs s xs s u x s xx y u s x s x u u x 5 ys s u s xs
s yuss s x x usv 7

d: v ux : C7; B5 E: h 8s ys s vx : AB7: E5== h 8s d; 7O xxu u x s x x : CE7C;
h 8s ys s vx : D=7; 5 DC h 8s 5 x sux xs x x z x x us s s7 U y u x s x x
: 9E7DC5B; h 8s d: : 7B: @5BE h 8s d; 7Mux x v y x x x vx u x y s s x x z x us5
xv ux x s x u x u7

B7 Qz v z zt z vt t vz t zv t xt

auzv	Sh QP 8 NP 1 i 2	ORee t 8 bPe	e z bxP 1 i 2	R z zv v bxP 1 i 8 t 2
S sv s	; E59 8 =9	B9 h 8 =95 h	BC59	=A7E;
Yux x x u	@A5A 8 A9	:99 h 8 A95 h	:; A59	AA7=@@
ds s Yux	: =5 9 8 : A	=9 h 8 : A5 h	=B59	: B7 B9
du s s us W	; ; 5A 8 ; @	A9 h 8 ; A5 h	B; 59	; C79;



eP aTNge fRPU_aYaTk edY

Of lf_c_=B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldleQZ PQac_Pf OQcQdUde_OMcQMq^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQPQeld_d_YM: aQ^ecf O_^dfZ
ac_actld MY O_Z f^QJaQcWZ 5Vf PQef YelZ ld

auzv	Sh QP 8 NP 1 i 2	ORee t 8 bPe	e z bXP 1 i 2	R z zv v bXP 1 i 8 t 2
du ss us W	=B5-9 8 @	CA h 8=C5A h	DC5E9	@@9C@
fafNY	:AD5A9 8:BF	=:B i 8:BD8 i	=E95B9	:DF7D,

d s u vx u x vx su x 5 v xx5 x s xx5ust x PO MD5 st x5 s s xs5 xu x5
xzs xs s s s 5u us x5 us xs xx x ux7csu v v s u x x x s t x vx
x s s x s s s x x s x x x x7^ x us su s s x x s s 7

O s vs x x zx us us s xs s u us us xs ts x x v y su5 s su v
t v xu s zx xs s v y x s ys s vx ux x xs s s xx7M x s xs v x xs s t us x x s s s7ax
s xs x us5s s s xs s x x x x s x5vxt ux x xs usv 5 xz vx xyx s AA8@A
z svx O7

B7= b v t x vt z v 6zv v

B7=7 Vx vt xz vt tv t z5 x v z zx

P x	Vx vt	e:	e;	g t z
U	Os su s x s s s vx v ux x	95@@@9	95=:999	Z h
U	cxv ux xs s s s s x vx zs x u xyxu vx x s	:9@5-ABA	E; 5::C	O_ ; 8s
U=	a v u s xv x s s s vx x x z x x xu us	:C5; B; DE	:AB5:EA==	Z h 8s
U@	a v u s s s x ; 9 vx s	=7@B7; ACD9	=7=95-E9BB9	Z h
UA	Rsu vx us su s x	:=5C==;	:=5B=E=	.
UB	Os su s x s s s s vx us x	95=:A999	95=:A999	Z h
UC	Os su s xs s s s x x vx us v s	=D95A99	=D95A99	h

V7 J t 1brQP55brNP528:7999 J 95ADA99 Z i

V7 J V7= 95BEEB J :9A5-BCB; : Pa; 8t H7A J V7= ; 9 J =7ACB; BDE9 Z i

VB J V7= 81V7 EDC92 :99 J :=5D==:F=.

Uv us U= xs s x x z s s s s vx xyx s s s agSld u x s vx s s x s z s 7
a v u s v t s x s x x x sy s s s x xu sx h 5 s v us vx z s s xs s xu s
x x s Z h 7Q x z s vx us x x x s s5 s x xs x vx us v s x x x us7



eP aTNGe fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_N bRdWZ

Px xFcQMUMcQ dldleQZ PQ ac_ Pf OQcQ dUde_ OMcQ MQ^ GcS WQYQOecWQ PU^ df cdQ cQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eU l d

B77 Vxvt xz x z t z t v

Vxvt 8 t z	e:	e;	ez vt z
MD7 6 u u x x v x s	9 h 8s	9 h 8s	ax x xs s u x s s avO7
MD7 6 v u x x s s	:CC7; B5 DE h 8s	:AB7A:E5== h 8s	Q x z x s s s vx xyx s agSld7
MD7 6 s s u u	6	6	cs s x us u uG x s xs s s s ux x xs x s s7
O x xu u x s	:CE7C; h 8s	:D=7:; 5 DC h 8s	Ox x xs s s s v x s x7
cs v u x 8 u x s	9EE9; A:	9DA; @	Zs x yus s vx v x s xG sz :597
MD7 6 x x us x 8 x x Rg	:5BDA; :	:5 9; ; E9	cs x x xs aOd us su s xs Rg vx xyx s7
MD7 6 us x s s	=:A h	=:A h	Q x z s s s s ux u u ts x 7
P s s s s sz xzs s	; 5=C9@ x	; 5C@AD9 x	gx yus xs x xs xs s x s s x yxus x s s x7

O x s s s x vx yus us s s x v 7cs s s vx v x s x x x x x s
x s s vx s ts s x u vx vx xs y us s x x z x y s x us 7Muxs s vx s x x x
s xsu xuss v u x5 s ts x u t u x xs s7

B77 Vxvt t v xz x t t

Vxvt e:	ht t z
gs s x s s ys segM	:7AE7:B5@ x
egM	; @7; :5D9 x
gs s x s s u egM	:7@; 7A=D5: x
O u 6 s ys segM	:9:7AD59 x
O u 6 s u egM	::; 7E9E5-D x
M x s t st u egM	:7@D7:D5@ x
O t x x u egM	=A@; :E5C x
P s s x x s	::



eP aTNge fRPU_aYaTk edY

Of lf_c_=B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdldeQZ PQac_Pf OQcQdlde_OMcQMq^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQPQela_d_YM: aQ^ecf O_^dfZ
ac_acld MY O_Z f^QJaQcWZ 5Vf PQef YelZ ld

Vxvt e:	ht t z
P s s x xu x	B 5 x @6E
Ps s x st s	9D7.97; 9; B

BA dz zv t zt vz z xt z t z

cx x s xus us st sxs x s z s x xx vx s u s t x u su x x
x xu s x x 7Uus us x s xxx x x s x5s y s x5 t s x x s s x
s x s x7Z s t u xs s x su s xs s x v yus vx s s s 7
dxu sxs s ux v x x s s s s s s xs xu s x x x x ux5 x s s xs u u x 5suux
s s s s s vx x x x5 s xs suux t u x x xs us vx x x x7Ns x x s
s xz x x x s x x s xu s y u s sys s v x sv 7
dz s s suux t sxs x s s x s z s x xu s s u su x xu u5 u s xs aQ5
xu x s s x5 s us x suux u s7Yus x s s x s zs s x xu 7 Muux
s usv s s x x s s vx x x x ux vx y x vx x xu x7
lx s5 s s s xs xu s xv st vs x zx sxs u vx 5 sxs z
t s 5u xus xs vx x sxs u s s s szx y z yu7Qu s vx x x z x x xs xs s
v u s s s5 s yx vx us v s v sx xz s x 5ys s u y vs xs x x z x x ux u uxs
x xu us7

BB e z z xz t t z

R s sxs x x d: x x u s s v s t u x s t st u s5 s s x vx :7@7: D5@ x
u egM5 u t s tx xyus 5 s s x vx =A@:E5C x u egM7 gs sxs s s x x
:7@; A=D5: x u egM7
O t s tx xyus su x s u x xx xx z t x s xs x z t s us x vx s x x s x s v
sy xuyu7Nx xyus s z s x xx x x s s xs x x xs x x x sv s vx
y u s x7M x x s x s su x vx v s suxs u x s s s v x x x s s
xu x 7

C7g ut 5t z zv t zx

C7 dz ut v t t t zt vt

M s sxs us x x s usv x t ux v ax s 5 vx yus x u x usvs s x x x s x7
U x x s xs s su x x x x x ux s x u x 5ys s xs s xs su y su s 7
R u x usv s s x7



eP aTNge fRPU_aYaTk edY

Of lfC_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMbQdldleQZ PQac_ Pf OQcQ dldle_ OMbQM MQ^ QcSldQYQOecldQPd df cdQcQSQ^ QcMNUQPQela d_YMb aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Y us x x xz xs s xz vx s s x s ust x x s usv x x x x7P u x s x vx
ts 5 v x vx x x s x x syx x x x zx xs s usv x x s 5 z syu 7d s
x us s dR x x vxy s u yz s x vx v ux x5 us x5 su v x x xu ux x x x ux
vx u x7

Z s s xs s suux s s s x x x x5x su s xs s x x x ux us x vx x x x7d x5
s x s x xu s x x x s s s x x x x ux7 d sys s vx xyx s v t s x
y s ux x vx =99 ; x yxus x su x 7

C7 e t t vtxt t t vtx z xz z z

_ 7	Ptx z u vt	Vz vt z vtxt t t	V z z z
:	S sv s	@99DE96O:	Rg x su x 5 us x x sx 6s s
;	Yux x x u ax s	@99DC96O:	Rg x su x 5 us x x sx 6s s
=	ds s Yux	@99DC96O;	Rg x su x 5 us x x sx 6s s
@	du ss us x x l6lg us W	@9@DE6O:	Rg x su x 5 us x x sx 6s s
A	du ss us x x l6lg us W	@9@DE6O;	Rg x su x 5 us x x sx 6s s

Wx yus xs usvs s s x x x x s s s x vx u 5s yx us ux s s svx s s s s t xu x
x ux v u x5u s vsus s s sux x s xyx x vx us x y us s7Muxxs xz s x x s us s u
du ss us W du ss us W

d sys s us s x x s s s us u x u5 s sys s v t s s su x x x s s s
s s s xs v x 7^ s usvs s x x y us vx yus s u vx x x z x x xu us7
Q vx s x x s xs su x vx sv x usv x5 s s s Rg5ts x s s x us syx x x7

C7 dtv xt zt t z zt t u vt

O xus xs x xs xs s s x x u us5 st zx x s s yxus x usv 7U xz s5 x x
y u xs s s s x u x xs s t us5u xu vx x ys s s s x t v xu ss7a x x s x
s x s s t s y x vx s x x s x v s x x x s x s s vx x xs s t s s
s vx su vs x7

asy vx @99 h x u vx v ux x v usv z s x x s s s x x vx x su s x
s t s yxus s s s x 7Q s s xs x xu s x xs s t s s s su v s x u u x us x7
QZ du v xs sy su aOd5s xu svx x ys s xs xs svxu xu s xs s x vx xs x x x7

Ys x u u x u x x s xs s x x vx v x s x vx =95A95:A5; A @9 h x u x u u
ss d:7dx s xs vx s x t x xu x s su x 7Q x z x v x x x z x s x x
s z s x vx sv us5 x x s s x xz s s x7



Px xFcQMlMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMqQ^ QcSldQYQOecldQPd dfcdQcQSQ^ QcMlUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

CA dz z z t zt xz zx t t zt t z

_ zS sxs s x x x svS s s x x v t x s usv x t ux7 dx vx xs s xx vx
vx s x s 5 x xxs s us x x sx x z s xs s s x s yx us s yx s
su s s su s usv 7Z s x s x x vx xs s u v us x syxu xs s x x s us x
vx suux 7

M tssxx5 x vx u v u s x5xx x xx x s ux ux xs x vx x u xus x x s s xvs x x
y u s x7 dx x s sts v sxs s x sx x su x s x sxs vx s s s s7 du xx5
xu s x xx vx v us x u s x s s x s x u s x vx xu s x xuyux7

U x s s x5u s sxs v x x xs xs su x vx u s t x u sys s x vx s 7^ x
y x u t s x us x vx x s v xx5xs s x s x vx u xus x s s x 7U x x x s
ts x u u x x y z yux xs s x vx x s u xx 5u zx sxs u s s s u x x
u x7

CB dz zv t zt v Q_eU z vv xz t t

a u vx s x vus v x yus t xu xx vx xv x x s s x x xu x5x s s x
u s x x v 7Z s x xz s x s x us zs sxs x s s 5u x st s v ux
x tx xyus 5x xu s x s vx x ux7

O t s s s x sxs u ts u s ux x sv v ux xs x x z x s x sxs x sx 6s s7
Ms sxs x x x xxs y u s z s x s x xs x x x5 xu s 5 s z x 7Mux x
t xu x xu s s x u x vx v u x vx us yxus x s 7

auzv xz zx	Zt t vt z z z
Mx sxs u ts u s ux	a v ux x s s5 us x us us s v Rg5 x vx us v s s xs x x z x 7
Ms sxs s u ts x u s ux	gx s x5 xu x x us s us 5y s 5x s s xu x s z x 7
f sxs v st s s s x	O u x x ux u x5 x x u s s5x su s x z s s u vx Qu s s x x st s7
Qu s u u s s	Qu s x x suux t x x x uxQu xu s x x s s sG xvs x u s s s v x 5ts x xu s x x x xu ux7
a x x xs u s	Y sxs sy z G xu x y s s vx u zx G x x u s x s u u x x y z yux7
N v x s x xu x x	R xs su x x x x s x x uxG sxs u s x x s s x ts s x7



Px xFcQMlMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQM MQ^ QcS lQYQOec lQPU df cdQcQS Q^ QcMlYQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ l

Zs x x xu s u u s s u v s s xs vx yus xu s x x 5s v u x s x vx x ux s
s x u x x u s x v 7Z v x x su s s s us vx x u s x s x xus x7
_ x s x vx vx syxus x x zs xs s u x s s xs u u x s s xs z s s u x x 7
kz t s x s x x s x s x s s s x s t s x7Muux x x s x
u s x x sys x v xu s xu s s s x su s u vx 7U x x x ux x s xs s xu s ys s
vx u xus ux suux xs s 5 u x z s s s 7

D7V z z t zt5z t t zt t zt z z

DZ a t t zt z z t

Nx xyus zs xs s x x s xs x st vx xu u x s x x ux5y s us x
sv s x7Q xu s s vx vx xs s xs u s 5vx x xus xs u yz s vx u us s 7
M x s x us v zx s s x u x xu s x svs ux s x x s x x u s 7
a s yus xs x s s s x x st x x v xs s 5 x x vx vx s x5 s x svxx vx
u xus x s s s x x x x7 d x s x su s x xv us s x x5 s x x x
z s s x u s 7Rxus x y x x xvs u v vx z s s s ys z s vx u 7
Wx yus xs xu s x x x x s s s vx s xux s s s s s xvs xs x s s x7dx s x x
u x vx s v x s 5 x s x5ts x 5 st x x x ux s x yxus x usv 7Q u x s xs
v u x s s vx x s s x x us s xs s v s s u u x s s s s 7
a z x x x s y u y s us 5 x su s s s s x x7Uu vx xs x x s u vx x xs
y u x s u s x s 5s yx us x x x vx x vx us v s s yx su x s s s s
ux x x vx s s s s t s x7d s s x v u x x x vx su x5 xux x5 tx xvs x7

DZ b t xz uz z z v z

a z s vx tx s x x y u s xs z s s yxus x u x x s s s s t xz s 7
gx yus x vx xux x su s s x x xu x x y u x7 Qx u ts x x x vx
v x s x s x dR5u u y s xs s xs u x s s x s x7
ax PO x x yus vx yus xs z 5 s s xs 5u s xs 5 s s 5 x x u x x7ax MD x
s x x u x vx s ys x 5 xu x5 u s xs aQ5 xzs x xu x s x y u s xs
s s s s vx x s s x7d x xus x uxv x vx u x s s u s x x vx s x s x7

e z 8z t t	b uz vz vt	dz t t
d u su x	R s 5 vx 5x s s 5suux x su s xs s x 7	Z s st s s xs xu x usv 7
O u x PO	a s s x5vx yus x5 s x u s t s xs u x 7	d z u xus x u y u yz s x 7



Px xFcQMlMbcQdlleQZ PQac_ Pf OQcQdlle_ OMcQM^ QcSdUQYQOecldQPd dfcdQcQSQ^ QcMNUQPQeld_d_YM: aQ^ecf O_ ^dfZ
ac_actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

e z 8zt t	b uz vz vt	dz t t
O u x MD x ys s	a xu 5ys x5 x s s x s 6 s s x7	R u s x z s s s x u x xs s7
Yxzs x s s s	O s xs aQ xzs xu x s xG s s x xu ux7	a xu x s vxyxu u x u x7
NZ d 8aOd	Y x vx u x 5 x x5 x x s s s x vx us us x7	cx xu s xs v x vx y u s x s ts x x7
QZ d	a s 5 us us x x u Rg s xs u u u 7	R x x zx ux u s x7
csu v x ux	Qs x s x5u u s x5sx x5 x 6 x xu 7	U xz s xs x u u usv 7
M s s x x us	cxz s u s u5ux x x5 x x s 5vxz s x xu xs z x 7	R u s xs u v s s s x x ux7
Zs s x u us	Wx yus xs x x z x 5 s s s x suux s s 7	Q vx s v u s x s s s x x7

ex s xs QZ d u vx s x u v u x s s x vxus ux x xs5 s x vx vx us us x us x s u s
s x vx x vx x s u us x x x s x x s xs x 7Uus us xs v x xs s s x vx su s s7
a xu x us x s s x s x xz x7

a xvs xs x s s x u vx u x vx s x5 u x x x5 vx yus xs xu s x x 5 xz s x x sv x
uxv x vx x x x7ax s tx xyus x x x u xs s s s x5 xu s x xs
s s x u su s xs x ux6 5ys s x x xs s x s s s u u x 7

~~DZ~~ a z t z z z t t

_ x s xs x x zs s s x ux x u u s s s x x5u s x ux s s s s x s x 7dx s x u
v u s y s us5x x z s us us s vx us us s5 s xs vx us us x s ts x 5u x vx
us v s5 x x z s s s x xs7 Ms x x x zs x x xu s x u u us x x
zx x xs s7

U xu x x v ux u v s xs v x 5 y s 5 x s s ust 5 u s x s x x ux
vxzs s x vx sx 7dx s x x st x s vx x s xus ux5u y s 7U x x x x su x
x xs xs s u xu x u s s x ys s u s xs xu s s s v x 7

ax us x x s x u x x s x5 s xs vx us us x5 u x x x x x x NZ d7 P x vx
vx us us x x x aOd s s x vx x s xs s 7ax s x us x s x u vxt 5
x x s x5y s xs5sx xs x su s xs u vx 7a xu s s z x s s x su s xz vx
x s s x7



eP aTNGe fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdlleQZ PQac_Pf OQcQdlle_OMcQMq^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQPQeld_d_YM: aQ^ecf O_ ^df Z
ac_actl MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ld

a z s vx x x s s x svs xs s u v vx y u s x u xu s x x 7_ x s x
xyxu s x5 s s x u x x x u t s x usv x ux6 u x xz vx x s s x7
N zx vx x s x s z s u s xs x x x x 7

bz xv t z xz t t z	Nv t z
f s x u x s	O x s s s x 5 v u x 5 u s t s x 7
Ox s s x s s	N s x u s v x x xu Gvx y u s x s t s x vx v t s x 7
U x u x x v u s	R s 5 x s s 5 u s t 5 u s u s x 5 x s x s x s x x u x 7
Us x s x x u x	O u x u 5 u vx 5 s z x 5 u x xz vx x x s s 7
P s x x x x s x x	O u s s xz s x s x s y u s z s s 7

DAZ t z t z x t u t z t

cx s x x s x v u x y x u s s s x sz x z s x s x xu 7 U v u s y u
us s u s x s s s s 5 x x z s v s 5 x x z s u s vx u s u s 5 u x x u s x vx
us v s v t s x s 7 Q vx s u t s x x s x u s u x x s x x u s 7

O s s s s s v x v u x u y x x s u x s x y u s x u s v x s x s 7 Z v y u s x
vx s x s u s v x vx s x x s s x x x x s x s u 7_ v y x x s x s x
s x s x x s t s s s v x y x u G x s s x s s x s x x z s 5 z s 5 x z s
v t s x s 7

ax x svs vx v st s x x s x s s vx s 5 y u s x s s v s x s x x u y t z s vx
y s s x 7 ^ x u s s u s s s st x x s s 5 s t x y u s s z s x x x x x z x
x x s s 7 d x x x u x x s x x y u x u s v x x s 7

O s x s u s x x z x x u x x x s s x s x y s x x x x 7 d O_a 6 x y x u vx
x s s x x x x x s x x svs x x x s s 5 v 6 u x s s x x y s st s 7 Z s s x s
x s s s s s s x z s x s x x x s x u x x z x u s u s v 7

DBV t z u v t z

Zs x vx y s x t u s x x s s x u s v u x ; vx x x s x 5 u u v s s u
Zs s vx vx s x s s s R v x vx s 7 N x x y u s s z s vx y u s x s
y s u s y s x s v u x x 5 u s s x s u x x vx t s x s u s t x 7

Zs x s x x vx y s x s s s x s y x u s s s y x u x x u u s x 5 s u u x s x u s x x s
t s x s s u s x vx z s s 7 U y s x t u x vx u x s s s u s v x vx x x 5 y s s
u y v s x s u s s u s y s u x u u s s u s x s u s y s s x x s x s x x u z s s s x v y x x
vx u v x v x x s s x 7



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldQZ PQac_ Pf OQcQdld_ OMcQMq^ GcSldQYQOecldQPd dfcdQcQSQ^ GcMNUQPQeld d_YM: aQ^ecf O_ ^df Z
ac_actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

E7P v zv t xt z vz

dx xu s vs xs sxs ux s d:5u u u ss y sux x su x 5 us x YRa xz s s
x x vx x vx us v s sx 6s s5 x x u x t ux v usv x s s s x7O yz s s s xs s
x s xs d v6Q 5 u s xs vx =9 z svx v t vx su x vx =99 ; x usv x7
Os su s xs y sus s x x vx :@C599 h PO5u :AE h MD :@C599 h x x vx xy s7
d us xs ss x x vx =:A h 5u :AC5A h x x aOd7d x x x vx x vx usv s s us su s x
x us s s vx =D95A99 h xz s x us 5 xz vx xy s AA8@az svx O7
Ox x xs x xu us x s s vx v x s x x x :CE79C; h 8s 5 x s s v x u x u s ux u u
usv xy s s x x s s x 7a v u s y sus x s s x x :CC7; B5 E: h 8s 7cs
s s v u x8ux x x5t s y u us xz s s xs u x us s s y u v ux s s x x s s 7
Y us x x xs xs s ; vx x x s x5u s x vx x xu x x s @6E7U xz s xs
usv x x x x s xs s y u x5suux x x5x su s xs s x ss x x s x vx x x7O
suux 5 xu x x xu ux v s ux x x s s s s x y u s x x7
Q s s xs xu s vs s xs s u 5 us us xs ts x x u v y su xz s
x u y u x vx ux x xs usv 7 M x s xs v x xs s t us x x x s x u s x7
Z s xs x s s s s us su s x s xs x s x x x xs x u x x zx u7

U u 5

Uz7Tx Q





eP aTNGe fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMqQcSldQYQOecldQPd dfcdQcQSQ^ QcMNUQ PQela d_YM: aQ^ecf O_ ^dfZ
ac_actl MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ld

N_Rj N N7OdRhWd f RdZ P eVPa_egZ bdRhVW_Nf

N x s vx s x s vs x x z x x ux5 x x x x ux x u x us u s s x yxus x usv x7
O xyux z ts s s x x z s xv x x vx vx s x s x dR7gs x vx x
^; 98; l ; E; @W x P.; l :D@ xGx x s s x x s s vx us u x x 6:A z svx O7
Q x z s s x x z s s z x x s x v u x7Zs s xs vx x vx A. x x s us s z s vs s5 s
x x z s x xu us x x s s s s bpxz 8dO_a7O x xu us s vx v x s x x x s h x
x 7Ps x x z x x ux x u x u vx t s s x s v x vx tx xyus 7

NZ T tx t 6xt z zvz t z v

bt t z	ht t z
O usvs s	@99DE96O:
d sys s s us s	@CA99 ;
Us x s	=99
g us	:7@ A999 =
d s u x s s vx xyx s	Ss x s s x 6 ux s s u x s s
P t x x x s	csv s s xGxz vx xyx s AA8@A z svx O
ex x s s x s s s s	; ; z svx O
ex x s s x x s s vx us u	6:A z svx O
ze 6 x s xu s x s s s x x	:9A h 8l = W2
cs s vx u t vx sx	999 :8

h J ADB99 =99 J :7; B999 =

Urf J :9B :7; B999 J :7FC5 B9 i 8X

Urh J 95==A 95D9 :7; B999 J ===5CB i 8X

Ur t J :7FC5 B9 4 ===5CB J :E; F5:B i 8X

brvt v J :E; F5:B =D 8:999 J CDDEE i

O xyux Tpe x x s s yx z ts s x s5 s s s us 7 O x s Tpg
x x s u t vx sx 5u us su s xs x us us vx 95=@ h 8l = W2 ds u s vx us u x x
vx x s s s v yx x s vx x x s s s xz vx xu 5 x s s vx t s s s 7

NZ T tx t 6z z zt tt z tzt z

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eP aTNGe fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldeQZ PQac_Pf OQcQdlde_OMcQMq^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQ PQeld_d_YM: aQ^ecf O_ ^dfZ
ac_actl MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ld

V z t t t t	ht t z
Rsu s s s s s s s xz s	95 ECB:E
ex x s s xu s x s	:E5E9@CB z svx O
Ps x vx x vx xyx s	^; 98; l ; E; @W xGP.; l :D@ x
S svx6 x xu s x x	; 7CA9@CB:E W x

frzv J :E 4 1; ; 6 :E2 B98:CE J :F5F9ADC txz P

_rvz J ; F; A 4 1:F5F9ADC 6 ; 92 :EA J ; 7DB9ADC:F X z

cr J ; A :E; F5A:B999 ; 7DB9ADC:F 8:799 J ;; :EA:5= i 8t

cr z J :9B ;; :EA:5= J ;; DF==5F i 8t

Rrz 5: J ;; DF==5F 8 =BDA=B: J =BDF; 99F i 8t

dz t 8 z t z	ht t z
O x xu u s s d: s s v x s x	=A7CE; h 8s
O x xu u s s d;	=B7A; 5 DB h 8s
Os su s x x us s x	BCFE99 h
e s 8u u x	Mk 6s s 8d
cxz 8 x	AA 8 @A z svx O
Pxt vx us u	A5=D =8
csu v v s u	P^ A9
a vx xs ss x u x us t savO	:99.
O x u xuyu	; AB5A: h 8l ; s 2

ex x s s xv s x x xz s s z svx x6 x xu s x xGx x z s x x s v u ysu s x
vx u s x7Zs s xs vx x x xvxs u s bpzx x s us x s s Qpx7csu v x x
xs xs s s s s t x vx x s s xv x x x 5u s s xs ss x x s x x x x7

N7 Yvz z z vbz t 6xt z zvz t z v

bt t z	ht t z
O usvs s	@9DC96O:
d sys s s us s	:7 A95AD ;
Us x s	=509
g us	@B; C5@B =
d s u x ss vx xyx s	Ss x s s x 6 ux ssu x ss



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdlleQZ PQac_ Pf OQcQdlde_ OMcQMq^ GcSldQYQOecldQPU dfcdQcQSQ^ GcMNUQPQeld_d_YM: aQ^ecf O_ ^dfZ
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

bt t z	ht t z
P t x x x s	csv s s xGxz vx xyx s AA8@A z svx O
ex x s s x s s s s	; 9 z svx O
ex x s s x x s s vx us u	6:A z svx O
ze 6 x s xu s x s s s x x	95A h 8l = W2
cs s vx u t vx sx	95A9 :8

h J :7 B95BE =5D9 J AT; D5AC =

Urf J 95BB AT; D5AC J ; 7BAA5=9 i 8X

Urh J 95==A 95B9 AT; D5AC J DD; 5== i 8X

Ur t J ; 7BAA5=9 4 DD; 5== J =7: D5CA i 8X

brvt v J =7: D5CA =B 8: 7999 J ::C5: E i

O xyux Tpe x x s s yx z ts s x s5 s s s us 7 O x s Tpg
x x s u t vx sx 5u us su s xs x us us vx 95=@ h 8l = W2 ds u s vx us u x x
vx x s s s v yx x s vx x x s s s xz vx xu 5 x s s vx t s s s 7

N7 Yvz z z v bz t 6 z z z t t t z t zt z

V z t t t t	ht t z
a z s s	D x8 GA x8 s s s s
ex x s s s x 8 xv s	; 9 8 :B z svx O
Rsu s s s s s s s xz s	95 =D9EA
ex x s s xu s x s	:B5EA; =D: z svx O
Ps x vx x vx xyx s	^; 98; l ; 7E; @W xGP.; l :D@ x
S svx6 x xu s x x	; 7-B=5 =D9EA W x

frzv J :C4 1; 9 6 :C2 A98CE J :C5B; =E: txz P

_rvz J ; 7; A 4 1:C5B; =E: 6 ; 92 :EA J ; 7-C=5 =E9FB X z

cr J ; A =7: D5C=CE; ; 7-C=5 =E9FB 8: 7999 J :EE7D95-9 i 8t

cr z J :5B :EE7D95-9 J :FD7BDE5E; i 8t

Rrz 5e: J :FD7BDE5E; 8 =BD9999 J BB7-AA5 9C i 8t

dz t 8 z t z	ht t z
O x xu us s d: s s v x s x	AA7=@@ h 8s
O x xu us s d;	AB7@A:5@= h 8s



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ QcSldQYQOecldQPd dfcdQcQSQ^ QcMNUQPQeld d_YM: aQ^ecf O_ ^dfZ
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

dz t 8 z t z	ht t z
Os su s x x us s x	:: A599 h
e s 8u u x	Mk 6s s 8Z t u
cxz 8 x	AA 8 @A z svx O
Pxt vx us u	:95D:C =8
csu v v s u	P^BA
a vx xs ss x u x us t savO	:99.
O x u xuyu	:A95C h 81 ; s 2

ex xs s xv s x x xz ss z svx x6 x xu sx xGx xz s x x sv u ysu s x
vx u s x7Zs s xs vx x x xvxs u s bpx x s us x s s Qpx7csu v x x
xs xs s s s s t x vx x ss x vx x x 5u s s xs ss x x sxx x x7

NZ et t Yvz 6xt z zvz t z v

bt t z	ht t z
O usvs s	@99DC96O;
d sys s s us s	; =959 ;
Us x s	=59
g us	DA: 599 =
d su x ss vx xyx s	Ss x s s x 6 ux ssu x ss
P t xx x s	csv s s xGxz vx xyx s AA8@A z svx O
ex xs s x ss ss	:Dz svx O
ex xs s x x ss vx us u	6:A z svx O
ze 6 x sxu sx sss x x	:5A h 81 = W2
cs s vx u t vx sx	959 :8

h J ; =959 =59 J EB: 599 =

Urf J :5B EB: 599 J EF=5B9 i 8X

Urh J 95==A 95D EB: 599 J :FE5FCA i 8X

Ur t J EF=5B9 4 :FE5FCA J :7F; 5B: A i 8X

brvt v J :7F; 5B: A == 8 :799 J =C9B= i

O xyux Tpe x x s s yx z ts s x s5 s s s us 7 O x s Tpg
x x s u t vx sx 5u us su s xs x us us vx 95=@ h 81 = W2 ds u s vx us u x x
vx x s s s v yx s vx x x s ss xz vx xu 5 x s s vx t s s s7



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdlleQZ PQac_ Pf OQcQ dUde_ OMcQMq^ GcSldQYQOecldQPU df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaGcWZ 5Vf PQef YelZ ld

NZ et t Yvz 6 z z z t t t z t z t z

V z t t t t	ht t z
a z s s	:: x8 GB x8 s s s s
ex x s s s x 8 xv s	:D 8:@z svx O
Rsu s s s s s s s xz s	95@ DAC
ex x s s xu s x s	:A5@ DB z svx O
Ps x vx x vx xyx s	^; 98; l ; E; @W xGP;; l :D@ x
S svx6 x xu s x x	; 7=A5@ DAC W x

frzv J :A4 1:E 6 :A2 D; &CE J :BDA; EC txz P

_rvz J ; F; A4 1:BDA; EC 6 ; 92 :EA J ; 7=B5; EBD X z

cr J ; A :7F; 5=E99 ; 7=B5; EBD 8 :799 J BB7F:CA i 8t

cr z J :5B BB7F:CA J BEDF:5 = i 8t

Rrz 5: J BEDF:5 = 8 =5=E9D J :C7C959; i 8t

dz t 8 z t z	ht t z
O x xu u s s d: s s v x s x	:B7B9 h 8s
O x xu u s s d;	:B7EC3@ E h 8s
Os su s x x u s s x	=B599 h
e s 8u u x	Mx 6s s 8 d
cxz 8 x	AA 8 @A z svx O
Pxt vx us u	=5EA =8
csu v v s u	P^=;
a vx xs ss x u x u s t savO	:99.
O x u xuyu	; @=5@ h 8l ; s 2

ex x s s xv s x x xz s s z svx x6 x xu s x xGx x z s x x s v u ysu s x
vx u s x7Zs s xs vx x x xvxs u s bpzx x s us x s s Qpx 7csu v x x
xs xs s s s s t x vx x s s x vx x x 5u s s xs ss x x s x x x x7

NA ev t t vt z z V6H vt W6xt z zvz t z v

bt t z	ht t z
O usvs s	@9@DE6O:
d sys s s us s	=@E59 ;



eP aTNge fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldleQZ PQac_ Pf OQcQdldle_ OMcQMqQ^ QcSldQYQOecldQPU dfcdQcQSQ^ QcMNUQ PQeld_d_YM: aQ^ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

bt t z	ht t z
Us x s	=5C9
g us	:7 E=5A; 9 =
d s u x s s vx xyx s	Ss x s s x 6 ux s s u x s s
P t x x x s	csv s s xGxz vx xyx s AA8@A z svx O
ex x s s x s s s s	; 9 z svx O
ex x s s x x s s vx us u	6:A z svx O
ze 6 x s xu s x s s s x x	:5A h 8l = W2
cs s vx u t vx sx	95C9 :8

h J =AF5C9 =5D9 J :7 F=5B; 9 =

Urf J :5B :7 F=5B; 9 J :7=BE5FCi 8X

Urh J 95==A 95D9 :7 F=5B; 9 J =9; 5A; B i 8X

Ur t J :7=BE5FC 4 =9; 5A; B J :7C95C; : i 8X

brvt v J :7C95C; : =B 8:7999 J BE5;; i

O xyux Tpe x x s s yx z ts s x s5 s s s us 7 O x s Tpg
x x s u t vx sx 5u us su s xs x us us vx 95==@ h 8l = W2 ds u s vx us u x x
vx x s s s v yx x s vx x x s s s xz vx xu 5 x s s vx t s s s 7

NAev t t v t z z W6 vt W6 z z z t t t z t z t z

V z t t t t	ht t z
a z s s	D x8 GA x8 s s s s
ex x s s s x 8 xv s	; 9 8:B z svx O
Rsu s s s s s s s xz s	95 =D9EA
ex x s s xu s x s	:B5EA; =D: z svx O
Ps x vx x vx xyx s	^; 98; ; l ; 7E; @W xGP;; l :D@ x
S svx6 x xu s x x	; 7-B=5 =D9EA W x

frzv J :C4 1; 9 6 :C2 A98:CE J :C5FB; =E: txz P

_rvz J ; 7; A 4 1:C5FB; =E: 6 ; 92 :EA J ; 7-C=5 =E9FB X z

cr J ; A :7C95C; 9FDC ; 7-C=5 =E9FB 8:7999 J FAZECC= i 8t

cr z J :5B FAZECC= J FE7EFB5FC i 8t

Rrz 5b: J FE7EFB5FC 8 =5D9999 J ; DD9:5FAF i 8t



eP aTNGe fRPU_aYaTk edY

Of lFc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQM MQ^ QcS WQYQOecWQPU df cdQcQSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ldl

dz t 8 z t z	ht t z
O xxu us s d: s sv x s x	; C09; h 8s
O xxu us s d;	; D7 AB599 h 8s
Os su s x x us s x	B; 599 h
e s 8u u x	Mk 6s s 8d
cxz 8 x	AA 8 @A z svx O
Pxt vx us u	A59D =8
csu v v s u	P^ @
a vx x s s s x u x us t savO	:99.
O x u xuyu	; BE59 h 81 ; s 2

ex x s s xv s x x xz s s z svx x6 x xu s x xGx x z s x x s v u ysu s x
vx u s x7Zs s xs vx x x xvxs u s bpx x s us x s s Qpx7csu v x x
xs xs s s s s t x vx x s s xv x x x 5u s s xs s s x x s x x x x7

NB ev t t vt z z V6 vt W6 xt z z v z v t z v

bt t z	ht t z
O usvs s	@9@9DE6O;
d sys s s us s	BDB59 ;
Us x s	=59
g us	; 7AD599 =
d s u x s s vx xyx s	Ss x s s x 6 ux s s u x s s
P t x x x s	csv s s xGxz vx xyx s AA8@A z svx O
ex x s s x s s s s	; 9 z svx O
ex x s s x x s s vx us u	6:A z svx O
ze 6 x s xu s x s s s x x	:59A h 81 = W2
cs s vx u t vx sx	959 :8

h J CE039 =59 J ; 7BE599 =

Urf J :5B ; 7BE599 J ; 7C9599 i 8X

Urh J 95==A 959 ; 7BE599 J AE:5C9 i 8X

Ur t J ; 7C9599 4 AE:5C9 J ; 7A; 5C9 i 8X

brvt v J ; 7A; 5C9 =B 8:799 J F; 5AD; i



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_N bRdWZ

Px xFcQMUMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQM MQ^ GcS WQYQOecWQPd dfcdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

O xyux Tpe x x s s yx z ts s x s5 s s s us 7 O x s Tpg
x x s u t vx sx 5u us su sxs x us us vx 95=@ h 81 = WZ ds u s vx us u x x
vx x s s s v yx x s vx x x s s s xz vx xu 5 x s s vx t s s s 7

NB ev t t v t z z Vh vt W6 z z z t t t z t z t z

V z t t t t	ht t z
a z s s	D x8 GA x8 s s s s
ex x s s s x 8 xv s	; 9 8 : B z svx O
R su s s s s s s s xz s	95 =D9EA
ex x s s xu s x s	: B EA; =D: z svx O
Ps x vx x vx xyx s	^; 98; ; E; @W xGP; ; :D@ x
S svx6 x xu s x x	; 7-B=5 =D9EA W x

frzv J :C4 1; 9 6 :C2 A98CE J :C5B; =E: txz P

_rvz J ; F; A 4 1:C5B; =E: 6 ; 92 :EA J ; 7-C=5 =E9FB X z

cr J ; A ; CA; 5C9A99 ; 7-C=5 =E9FB 8: 999 J :AFEB: 5= i 8t

cr z J :5B :AFEB: 5= J :BD7-AA5: i 8t

Rrz 5: J :BD7-AA5: 8 =BD9999 J AA7DA59E i 8t

dz t 8 z t z	ht t z
O x xu u s s d: s s v x s x	@@9C@ h 8s
O x xu u s s d;	@@EAA5@ E h 8s
Os su s x x us s x	DC E99 h
e s 8u u x	Mk 6s s 8Z t u
cxz 8 x	AA 8 @A z svx O
Pxt vx us u	C7AAD =8
csu v v s u	P^ A9
a vx xs ss x u x us t savO	:99.
O x u xuyu	; :D@ h 81 ; s 2

ex x s s xv s x x xz ss z svx x6 x xu s x xGx x z s x x s v u ysu s x
vx u s x7Zs sxs vx x x xvxs u s bpx x s us x s s Qpx 7csu v x x
xs xs s s s s t x vx x s s xv x x x 5u s sxs ss x x s x x x x7



Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQM^ QcSdUQYQOecWQPd df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

N_Rj N O7eVgYNdVbhTV eVOWN_fgdVR_RdTfVPR

d s xy x u agSld6dMcMT=5vs x x x z ux QcMA5 z syu zx x sy s d v6Q 8=9
z svx7 cx x x x z u xz s x s s s s vx D7CB9 x s x u x7 estxxx vx s
s xs sv u sv x xs s 5 v u s x x u us u x s 7
ax d: xy x u v x vx AA9 h x vx z tsx Rg vx :@ G x d; 5 v x vx A99 h x vx
vx :B7A. 7 N s u vx u x s MD us xs yxus ux s 7 Q x z s us us s ts x x x x
s s s s v x u v xu 7

OZ T tx t 6 x v z txt z

bt t z	e:	e;
a x x PO s s	; E99 h	; C999 h
a x x x s x MD	=9 h	@9 h
_ x s x 8 u s x	d v6Q 8=9 z svx	d v6Q 8=9 z svx
d sys s v t s	=99 ;	=99 ;
a x vx Rg	:@	:B7A.
Ns s vx sv s x	agSld6dMcMT=	agSld6dMcMT=

Y t	Vtxzz ut t 1 i 8 ; 2	b x v z e: 1 i 2	b x v z e; 1 i 2
ld s x	@5ACD	: 7BCDCE	: 79=95D@C
Rxt s x	DBB=9	; 7E=5A=@	: 7D@CDDDD
Zs x	:@95AC	=7E@5 @A	; 7EEA5ED9
M x	:@95-DE	=7=: 95AB	; 7E=95AD9
Zs	:CE5C:E	@7; D5BE	=7B@5=: @
U x	; :; 50C=	@7C 95; @	@7AC5@AB
U x	; 9; 5-; =	@@ 95-D:	=7E9: 5C9E
Mz	:D; 50@9	@9; B5D9:	=7AA@5=: :
dx x t x	:@5A@B	=7C9500C	; 7DDC999
_u t x	:9C5009	; 7A=B5 @@	; 7=7DBA9
^ x t x	C=5A9=	: 7CB95=;	: 7AA=5B9A
Pxux t x	=CEB=	E995DD;	CEA5CB
fafNYN_gNY	: 7BBCDF:	=B7D, F5; A	=: 7B=7DB: E



eP aTNGe fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldleQZ PQac_ Pf OQcQdUde_ OMcQM MQ^ GcS QJYQOecWQPU df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

a v u s xuyus d: x x :7,9=5; D h 8 h 8s 7Os u x s s x x z s s s u v x s v x x x z s x x u s
v s7a x x s x u s s x v x u s v s x x u x s s v x v u x y s u s5u
y v s x s x s u x x x x u u x7

OZ Ttx t 6ut t e:

Y t	P 1i 2	Sh x zv 1i 2	ORee t v 1i 2	V 1i 2	Y t z1i 2
ld s x	B7=@5::	DB; 5:D	=995D99	A7D@5E@	9599
Rxt s x	A7C=; 5DCA	:7EE5DE:	O@D5 CC	=7D@59B	B; 5 ; @
Zs x	=7, BE5; @	:7D@5E@B	:7, @B59E	E=D5=BE	E::5@E
M x	=7B@5 @E	:7BB5A9A	:7A=5=C	D@@59C	DBE5BA9
Zs	=9C5=D	:AA5DEC	:A; 5 @	9599	=7CBA5DAB
U x	; EC5D:	:AE5E;	:D5B; 9	9599	@7=EB5=AB
U x	=9C5=D	:B95=:9	:@C5D D	9599	@79EB5 B;
Mz	=9C5=D	:A; 5::	:AA5B; B	9599	=7C9; 5 D9
dx x t x	; EC5D:	:: C5DB	:C95B; A	9599	; 7EA@5=D@
_u t x	=7, BE5; @	E; E5=DD	:7E=5@;	:7, @B5E9=	@=B5BD=
^ x t x	B7@ 5=BB	:7: @5D9C	ADD5EB	@7@=E5=B=	9599
Pxux t x	B7=@5:=	C9A5E=;	:CA5@AA	A7@BA5; A	9599
fafNY	=B7D; 5999	DE: D5EEC	C79D95EAC	:: 7F9=5 CE	:: 7FB5:A

Zt zt tt 8xz vt z	ht t z
Q x z x s s 8 st s	B959 8 A@5 h
a x x aOd	=95 h
Uus us x v Rg	B7C BE; @ h 8s
Px us us x us x u	B79C95D@B h 8s
P s s s s s x xs Rg	; 5; 9; x
Mu x x y us s ux x	=D5D9.

N s s x x y u s xs us s s x x u 7 Q x z s vx us us s v ts x x x x s t s
u sux x s usv 7P yx x s ys s vx ux x x x x x s s v x xs5 s x x s su v
t v xu s7a x vx x vx us x s s s s vx us us x s s x us u u z u7

OZ Yvz z z vbz t 6 x v z txt z

bt t z	e:	e;
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eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldeQZ PQac_Pf OQcQdlde_OMcQMq^GcSdQYQOecldQPd dfcdQcQSQ^GcMlYQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

bt t z	e:	e;
a x x PO s s	@A5BA9 h	@5A99 h
a x x x s x MD	A9 h	B9 h
_ x s x 8 u s x	d v6Q 8=9 z svx	d v6Q 8=9 z svx
d sys s v t s	=99 ;	=99 ;
a x vx Rg	:	:B5A.
Ns s vx sv s x	agSld6dMcMT=	agSld6dMcMT=

Y t	Vtxzz ut t 1 i 8 ; 2	b x v z e: 1 i 2	b x v z e; 1 i 2
ld s x	@5ACD	:7CEA5C@	:7AD@5A9
Rxt s x	DB5B=9	=7; :C5D@9	; 7D@95 C=
Zs x	:@95AC	A7; :C5D9	@B9@5E==
M x	:@95=DE	A7.9=5 9;	@A9@5@ 9
Zs	:CE5C E	B7=@B5C9	AB9: 5@AB
U x	; ; : 50C=	C7; =E5B=A	B7=E95B@
U x	; 9; 5; =	B7CE@5 DE	A7EEC5C
Mz	:D; 50@9	B7DE5=@	A7@B=59D
dx x t x	:@@5A@B	A7@; C5=9B	@7@=C5@ A
_u t x	:9C50C9	=7DED5=99	=7@@95DDD
^ x t x	C=5A9=	; 7C9A5=DD	; 7=DC5E@E
Pxux t x	=C5EB=	:7=D@5BE9	:7; ; ; 5 :B
fafNYN_gNY	:7BBC5DF:	BA7F:E5 :D	AE7ADA5=

a v u s xuyus d: x x :7.9=59; D h 8 h 8s 7Os u x s s x x z s s s uvx s vx x x z s x x u s
v s7a x xs x us s x vx us v s x x u x s svx v u x y s us5u
y vs x s xs ux x x xu ux7

O7 Yvz z z vbz t 6u t t e:

Y t	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2	V 1 i 2	Y t z 1 i 2
ld s x	ED: @5=:	:7; D50@	@B; 5=DE	D7@; =5EE	95999
Rxt s x	D7DB@5AAC	:7DA: 5D9B	:7EA5A: C	A7D: C5 =A	=C5BD;
Zs x	A79AA5DBC	:7BC5@9	; 79@950@B	:7=5E5 D:	:7 @B5DC9
M x	@7DE; 50CA	:7D9: 5=@	:7DD=5EE=	:7 9C50@	:7 9A5=A=



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_N bRdWZ

Px xFcQMlMbcQdlleQZ PQac_ Pf OQcQdlde_ OMcQMq^ GcSdUQYQOecWQPU df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eUz ld

Y t	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2	V 1 i 2	Y t z 1 i 2
Z s	@CA5D@B	; @95=CB	; =A5@C9	95999	A7CD@BDE
U x	@B95@EB	; @B5; A	; : @5=C	95999	B7CA@B9
U x	@CA5D@B	; @C3DAD	; ; C5EDD	95999	B7, E=5::
M z	@CA5D@B	; =A5B=	; @95BD=	95999	A7BDC5A@
dx x t x	@B95@EB	:EB5=D	; B=5DAE	95999	@7A=D5C@
_u t x	A7AA5DBC	:7@=A5@@	:7DB5:=	:7D=@5A::	A@C3BDB
^ x t x	E7@EC5=E	:7C; 95AC9	E9=5E@=	B7DC=5; C	95999
Pxux t x	E7D: @5==;	:7DC5@CB	; BC5@E;	D7@AE5=B@	95999
fafNY	BB7-AA5999	::; 7BCD5=DF	F7D; ; 5-CA	==7BBA5 BD	=; 79FB5CAC

Zt z t t t 8xz vt z	ht t z
Q x z x s s 8 st s	:9959 8 E959 h
a x x aOd	A959 h
Uus us x v Rg	:97CAA5E; h 8s
Px us us x us x u	ETC; ; 5-B@ h 8s
P s s s s s x xs Rg	; 5E9B x
Mu x x y us s ux x	=E5=C

N s s x x y u s xs us s s x x u 7 Q x z s vx us us s v ts x x x x s t s
u su x x s usv 7P yx x s ys s vx ux x x x x x s s v x xs5 s x x s su v
t v xu s7a x vx x vx us x s s s s vx us us x s s x us u u z u7

OZ et t Yvz 6 x v z txt z

bt t z	e:	e;
a x x PO s s	: =5 99 h	::; 5999 h
a x x x s x MD	: A h	; 9 h
_ x s x 8 u s x	d v6Q 8=9 z svx	d v6Q 8=9 z svx
d sys s v t s	=99 ;	=99 ;
a x vx Rg	: @	: B5A
Ns s vx sv s x	agSld6dMcMT=	agSld6dMcMT=

Y t	Vtx z z ut t 1 i 8 ; 2	b x v z e: 1 i 2	b x v z e; 1 i 2
-----	------------------------	------------------	------------------



eP aTNge fRPU_aYaTk edY

Of lfC_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMbcQdldleQZ PQac_ Pf OQcQdUde_ OMcQMqQ^ GcSldQYQOecldQPd dfcdQcQSQ^ GcMlYQ PQeld_d_YM: aQ^ ecf O_ ^dfZ
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

Y t	Vtxzz ut t 1 i 8 ; 2	b x v z e: 1 i 2	b x v z e; 1 i 2
ld s x	@D5AD	A: E5AD	@AD5A@
Rxt s x	DBB=9	E=95B9	D; :5 D@
Zs x	: @5AC	: 7A9D5AA=	: 7=: 5A@C
M x	: @5=DE	: 7@CA5B; A	: 7=9; 5@D9
Zs	: CE5C E	: D=A599D	: B: E5BEA
U x	; ; 5@C=	; 7E=5=DD	: D@C5AD
U x	; 9; 5=; =	: 7EB@B: @	: C=@5E=
Mz	: D; 5@9	: 7DE5BDE	: 7ACE5BE@
dx x t x	: @5A@B	: 7A=5BCE	: 7 D=5::
_u t x	: 9C5C9	: 7; C5 :E	EE@5EAB
^ x t x	C=5A9=	CD; 5 D:	BE95@E:
Pxux t x	=C5EB=	@995=E;	=A=5@;
fafNYN_gNY	: 7BBCDF:	: 7EDF5@C	: A7: C5CDB

a v u s xuyus d: x x :7,9=5; D h 8 h 8s 7Osu x s s x x z s s s uvx s vx x x z s x xu us
v s7a x xs x us s x vx us v s x x u x s sv x v u x y sus5u
y vs x s xs ux x x xu ux7

OZ et t Yvz 6 u t t e:

Y t	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2	V 1 i 2	Y t z 1 i 2
ld s x	; 7DBA59A	=DA5E; :	: =; 5B=9	; 7=@5A@	9599
Rxt s x	; 7ADD5=CE	A=E59; =	=@B5DBE	: 7C9; 5@DB	B59; B
Zs x	: 7@CB5 C;	@DD5C; ;	B9B5DD@	=D95BBB	==B5E9C
M x	: 7@ D5BA:	A; @5D@9	AAE5=D;	=@@5@ D	=; D5=; D
Zs	: =D5E@=	C95AB	BD5DDC	9599	: 7C: 5; =
U x	: =@5@B:	C: 5DA=	B; 5B9D	9599	: 7EA: 5C D
U x	: =D5E@=	C; 5=B:	BB5AD=	9599	: 7D: D5 C;
Mz	: =D5E@=	BD5B@@	C95 EE	9599	: 7B@=5BA
dx x t x	: =@5@B:	AC5@9=	CC5AE	9599	: 7=: 95D; B
_u t x	: 7@CB5 C;	@ D5=:	A=95B=@	A; C5A9C	: =E5C9E
^ x t x	; 7C=5 B=	A995DC;	; AE5DD	; 7@=5=9=	9599
Pxux t x	; 7DBA59B	=: A5B9B	CB5=9C	; 7@C=5E=	9599



eP aTNGe fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_N bRdWZ

Px xFcQMlMcQ dldleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ GcSldQYQOecldQ PU^ df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

Y t	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2	V 1 i 2	Y t z 1 i 2
fafNY	:C7C9599	=B: =B=;	; ZBD5=:	FDEF5=D	F7 9C9DB

Zt z t t t 8xz vt z	ht t z
Q x z x s s 8 st s	=95 8; C9 h
a x x aOd	:A5 h
Uus us x v Rg	=7B95-B9 h 8s
Px us us x us x u	; DAC5=: h 8s
P s s s s s x xs Rg	; 5 Q, C x
Mu x x y us s ux x	=E5@ .

N s s x x y u s xs us s s x x u 7 Q x z s vx us us s v ts x x x x s t s
u su x x s usv 7P yx x s ys s vx ux x x x x x s s v x xs5 s x x s su v
t v xu s7a x vx x vx us x s s s s vx us us x s s x us u u z u7

OAev t t vt z z W6 vt W6 x v z t x t z

bt t z	e:	e;
a x x PO s s	; ; 5A9 h	; 95A99 h
a x x x s x MD	; @ h	@ h
_ x s x 8 u s x	d v6Q 8=9 z svx	d v6Q 8=9 z svx
d sys s v t s	=99 ;	=99 ;
a x vx Rg	:@	:B5A
Ns s vx sv s x	agSld6dMcMT=	agSld6dMcMT=

Y t	Vtx z z ut t 1 i 8 ; 2	b x v z e: 1 i 2	b x v z e; 1 i 2
ld s x	@5ACD	DDB5C, =	CD; 5BD9
Rxt s x	DBB=9	:ADE5A=A	:7@=5; B
Zs x	:@5AC	; 7ACC5:;	; 7, C@5, B
M x	:@5-DE	; 7A; 95DAE	; 7; A5C9
Zs	:CE5C E	=7=@5D9B	; 7CBB5CE
U x	; ; 50C=	=7ACB5 9A	=7AB5ADC
U x	; 9; 5=; =	=7AB5 :A	; 7EB; 509E
M z	:D; 50@	=7AC5-DB	; 7BED5B@@



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdldeQZ PQac_Pf OQcQdlde_OMcQMq^GcSQUQYQOecWQPd dfcdQcQSQ^GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_acld MY O_Z f ^QJaQcWZ 5Vf PQef YelZ ld

Y t	Vtxzz ut t 1 i 8 ; 2	b x v z e: 1 i 2	b x v z e; 1 i 2
dx x t x	: @5A@B	; 7@D=5=BD	; 7E: 5ED:
_u t x	: 9C5C9	: 7E; A5BBB	: 7BEE5C B
^ x t x	C=5A9=	: 7=5B=EC	: 7CE5ADE
Pxux t x	=C5EB=	BD@59=	B9=50@A
fafNYN_gNY	: 7BBC5F:	; DZ; E5 DC	; =7FAB5B;

a v u s xuyus d: x x : 7, 9=5; D h 8 h 8s 7Os u x s s x x z s s s u v x s v x x x z s x x u s
v s 7a x x s x u s s x v x u s v s x x u x s s v x v u x y s u s 5 u
y v s x s x s u x x x x u u x 7

07Aev t t v t z z W6H vt W6u t t e:

Y t	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2	V 1 i 2	Y t z 1 i 2
ld s x	@E:; 5@DB	BB95 E=	; ; A5==	@7; C5B9	9599
Rxt s x	@7@-C59D@	E; ; 5EE;	ADC5 B9	; 7E; B5D=;	: @5=;
Zs x	; 7A=95BC@	D=C5=B=	: 7@: B5@E	BCC5 B;	AEC5@9D
M x	; 7@@E5=E	DEE599C	E=B5EAD	B: =50@	ACE5 : A
Zs	; =D5D:	:: 95 @B	:: C5E=A	9599	; 7DA=5DAB
U x	; =95@ED	:: =5BA	: 9C5=;	9599	=7=5=5-@D
U x	; =D5D:	:: @5=A	:: @5@B	9599	=7.9A5-A;
M z	; =D5D:	:: C5BAD	:: 95A; =	9599	; 7D9B5 9C
dx x t x	; =95@ED	ED5-E=	: =; 59@	9599	; 7, =D5@D@
_u t x	; 7A=95BC@	G B5 ::	DDE5; :	E; A5@@	; AB5=9D
^ x t x	@CA@5: D	DAC5BEC	@=E5ADA	=7@AB5=B	9599
Pxux t x	@E:; 5@DC	A=E5DB=	:: E5; B	@7, @ 5DED	9599
fafNY	; DD9; 5999	C7@: C5; B	AZE: B5DD;	: C5ECF5=9=	: B7DEA5 : 9

Zt zt t t 8xz vt z	ht t z
Q x z x s s 8 st s	A95 8 @A5 h
a x x aOd	; A5 h
Uus us x v Rg	A7=; C5@ h 8s
Px us us x us x u	@D: A5C; h 8s
P s s s s s x xs Rg	; 5 : C= x



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7: @Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMlMcQdlleQZ PQac_ Pf OQcQdlle_ OMcQMq^ QcSlQJYQOecWQPu dfcdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Zt zt tt8xz vt z	ht t z
Mu x x y us s ux x	=E59.

N s s x x y u s xs us s s x x u 7 Q x z s vx us us s v ts x x x x s t s
u su x x s usv 7P y x s ys s vx ux x x x x x s s v x xs5 s x x s su v
t v xu s 7a x vx x vx us x s s s s vx us us x s s x us u u z u7

OB ev t t vt z z Vh vt W6 x v z txt z

bt t z	e:	e;
a x x PO s s	=B5=99 h	==599 h
a x x x s x MD	@9 h	=9 h
_ x s x 8 u s x	d v6Q 8=9 z svx	d v6Q 8=9 z svx
d sys s v t s	=99 ;	=99 ;
a x vx Rg	:@	:B5A.
Ns s vx sv s x	agSld6dMcMT=	agSld6dMcMT=

Y t	Vtxzz ut t l l 8 ; 2	b x v z e: 1 l 2	b x v z e; 1 l 2
ld s x	@D5ACD	: 7; C59D	: 7; AE5E; @
Rxt s x	DBB=9	; 7AD5CB@	; 7; AD5A=9
Zs x	: @95AC	@7 @D5; :	=7BB: 5CA@
M x	: @95-DE	@9AC5EBD	=7AD: 5; 9
Zs	: CE5C: E	A79CB5 C=	@7A@5B;
U x	; ;: 50C=	A7CAB5D: D	A79D: 5==A
U x	; 9; 5-; =	A7@9; 5BDD	@7CDB5CAA
M z	: D; 50@9	@E; : 5B@A	@7=-@5AD
dx x t x	: @5A@B	=7EECB: C	=7A; D5AAA
_u t x	: 9C5009	=7EE5DA=	; 7C=B5; D
^ x t x	C=5A9=	; 7A: 5 C=	: 7ED5DA:
Pxux t x	=CEB=	: 79: 50CD	EC: 5DD;
fafNYN_gNY	: 7BBD5F:	A=7DCF5F9C	=E7BAB5EBB

a v u s xuyus d: x x : 7; 9=5; D h 8 h 8s 7Os u x s s x x z s s s uvx s vx x x z s x xu us
v s7a x xs x us s x vx us v s x x u x s svx v u x y sus5u
y vs x s xs ux x x xu ux7



eP aTNge fRPU_aYaTk edY

Of lf c_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_N bRdWZ

Px xFcQMlMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ GcSQUQYQOecWQPd df cdQcQSQ^ GcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

OB ev t t vt z z Vh vt W6 ut t e:

Y t	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2	V 1 i 2	Y t z 1 i 2
ld s x	CD: A5DA	: 7AC5::	=BA59A	B7-E=5-BE	9599
Rxt s x	C7AE52 E	: 70059C	E; @5AE	@BB95EA=	AC5AD9
Z s x	@9; B5-: @	: 7= @5; C	: 7@DE=:	: 7 @ 5DAA	: 7CA5=@
M x	=7DEB52==	: 7@- @5A;	: 7@-; 5E@	: 79=95 DC	: 79=95 C9
Z s	=CD5@C	: E: 52 @	: DC5A==	9599	@AEE5-@@
U x	=BB5; =	: EB599	: C95; =	9599	A7-C952@9
U x	=CD5@C	: EC5-D:	: D: 5ABC	9599	A799=5ABC
M z	=CD5@C	: DC5 BC	: E: 5BD9	9599	@A; ; 5; C
dx x t x	=BB5; =	: AB5ADE	; ; 95=@	9599	=7B9D59E
_u t x	@9; B5-: @	: 7 @ 5A: A	: 7-AD5-AC	: 7A; A52@	A9=5C
^ x t x	C7AB=5BB=	: 7-BE5ABB	C: 5AEB	A7@D95A9:	9599
Pxux t x	CD: A5D@	DBA5 ; =	; ; ; 5 C9	B7C=D5 E:	9599
fafNY	AA7DA5999	F7C9BEB;	DAFC5AB9	; C7D: 5CFD	; B7DD95 A:

Zt zt t t 8xz vt z	ht t z
Q x z x ss 8 st s	CA5 8 BC5A h
a x x aOd	=C5A h
Uus us x v Rg	D7, E=5D: @ h 8s
Px us us x us x u	C7@EB52A9 h 8s
P s s s s s x xs Rg	; 5BB: x
Mu x x y us s ux x	=D5D9.

N s s x x y u s xs uss s x x u 7 Q x z s vx us us s v ts x x x x s t s
u sux x s usv 7P yx x s ys s vx ux x x x x x s s v x xs5 s x x s su v
t v xu s 7a x vx x vx us x s s s s vx us us x s s x us u u z u7



eP aTNge fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMbQ dldleQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcS UQYQOecUQ PU^ df cdQ cQS Q^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eUZ ld

OTOT t z t t zv 6e:

Y t	b x v z 1 i 2	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2
ld s x	A7CEB5@	=:CAA5@D	@, E@5-DB	:7@DB9AC
Rxt s x	:97-E95==	; D7BD; 5-:=	A7EDC@:E	=7D9; 5-D=
Zs x	:B7D@A5A;	:B7-AD5DA:	A7@; 5BEE	B7@AD5C:E
M x	:B7@C@D:	:A7D=:5@C	A7D; A5@A	A7EBB5B@
Zs	; 97@E95E; B	:7A=E5BAB	CCC@BDE	CB: 5EBC
U x	; =7-CB5C;	:7@DE5EE9	CEB5-=A	BE=5BA@
U x	; :7E=D5DD	:7A=E5BAB	D9: 5E@A	C=C@C:
Mz	:E7ED@DB;	:7A=E5BAB	CB95D@@	CCD@D;
dx x t x	:B7; =; 5@B	:7@DE5EE9	B=B5 9E	DA=5D:
_u t x	:: 7ADC5 D=	:B7-AD5DA:	@B@ 5-E9	ABAC@BAC
^ x t x	D7C=A5@C	=97C=:5A9	A7AB=5A;	; 7E9@5@D
Pxux t x	@@C: 5@B	=:CAA5@;	=7A: @599	DB: 5 A:
fafNY	:DD7; C5 F:	:DF@D; 5999	=F@; 5BDB	=97C; 5BCA

Y t	Vvt vt z Sh 1 i 2	V 1 i 2	Y t z 1 i 2	b z xz ORee 1 i 2
ld s x	:7A9:5CAC	; A7EC@5CB	9599	:AC5@A9
Rxt s x	@, ; @DBE	:D7DE; 5::	:CC5A@@	@; 5@DC
Zs x	C7; AA5 C@	@7@C@5@==	@7BD5A=D	C; 5BDA
M x	B7B=E5-A9	@@=E5 =C	@@; 5C A	BB=5@-A
Zs	:@=D5DE	9599	:D7BCA5@D	E@5E=
U x	CC=5A: @	9599	; :7D9B5; =	CC5 :B
U x	D: E5BCE	9599	; 97=:B5AB@	D: 5EBD
Mz	DB; 5ED	9599	:D7-B: 5; 9	DB5@9@
dx x t x	E@B5CB:	9599	:@B@E5CB	E@5CB
_u t x	B7@B; 5=B	B7@AE5D9@	:7DD=5AAC	B: C5=B
^ x t x	=7C: 5EAE	; ; 7 B=5=9	9599	=:E5D:
Pxux t x	EAB5E@A	; C7-D95C	9599	EAB5EA
fafNY	=A7 B=5A=:	:9F@EDEEC;	:9A7@B: 5 EB	=7A=; 5C D



eP aTNge fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ QcSQUYQOecWQPd dfcdQcQSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_actf MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Mz xzs xs s xs st s yxus s s s x 7e s x s s x vx us su s x u x z s x x
vx su vs x5 s x x z s t s x x x s yx s s x usv 6 x xs s s7P yx x x x x s x
s uyx sy s x v xs x x s x x ss 7



eP aTNge fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMVMbQdUleQZ PQac_ Pf OQcQdUde_ OMbQM^ QcSQUQYQOecWQPU df cdQcQSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eU id

ODO t t z t t zv 6e;

Y t	b x v z 1 i 2	P 1 i 2	Sh x zv 1 i 2	ORee t v 1 i 2
ld s x	A7: B59AB	=; 7A@5B;	@9@959=	: 7=CEDB
Rxt s x	E7C: 59;	; E7=: 59=B	A7D; ; 5@D	; D@ 5D: :
Zs x	: @DBD5E=E	: B7C: D5D: :	A7@ C5=DD	A7C: C5A: @
M x	: @7A@5B:	: B7CE59E@	A7CAD5ACD	A7CE5A@E
Zs	: D79DB5AED	: 7AC=5A=A	CDE5 =;	CD@5=9=
U x	; 97B==59:	: 7A; ; 50CB	D: : 5=: 9	C: : 50BB
U x	: E7=B@5=C	: 7AC=5A=A	D: C5=C	CAB5=ED
Mz	: C7B=E5: A	: 7AC=5A=A	CC=5AC=	CEE5EB;
dx x t x	: @7=: D59C;	: 7A; ; 50CB	B@D5: @	DC@5CB;
_u t x	:: 7: 95=C	: B7C: D5D: :	@7AE; 5DDC	@EE: 5AB9
^ x t x	C7C: 959DA	=: 7@C5 A=	A7@ @5D; 9	: 7EQ; 5A=E
Pxux t x	=7E@B5@=:	=; 7A@5B=	=7 B959CB	AD=5@9;
fafNY	: BCB: FB==	: E=7@; ; 5 ED	=E7AB5CD	; C7 B; 5 B;

Y t	Vvt vt z Sh 1 i 2	V 1 i 2	Y t z 1 i 2	b z xz ORee 1 i 2
ld s x	: 79CA5EA=	; C7=CB59C;	95999	: C: 5D@
Rxt s x	=7=@@5D=	; 97B@D5ACD	@5@C	A9: 5BC;
Zs x	B700C59EE	A7AD=5E9D	; 7B@59A;	: 7@; ; 5EA@
M x	B79=5E@	A7 @ 5=BC	; 7BD; 5ADE	E: @5DD
Zs	: 7=: 599	95999	: B7B@5BBA	: A@5EA
U x	D@95 CB	95999	: D7ED: 5C A	:: A599C
U x	DDE5DD9	95999	: C7BAC5; 9	: ==5@D;
Mz	E=D5-C@	95999	: A7E; C5EBD	: @5EAA
dx x t x	: 7@; C59E=	95999	:: 7BA; 5EBA	: A@5 ::
_u t x	A7B; D5; ;	C7=@5=B@	DDE5; D	DB: 5D; ;
^ x t x	; 7 EA5BBA	; @7D: E5DE@	95999	=@B5@B
Pxux t x	BDB5-AA	; D7B: 95BDA	95999	: 9; 5EA=
fafNY	=97D=F5FA	:: E7C: A5ECF	ED7C=A5BD;	A7C; : 5A: E



eP aTNge fRPU_aYaTk edY

Of Ufc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGeS

Oz z vt GPaZg_NbRdWZ

Px xFcQMUMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ QcSQUYQOecWQPd dfcdQcQSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_actf MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Mz xzs xs s xs st s yxus s s s x 7e s x s s x vx us su s x u x z s x x
vx su vs x5 s x x z s t s x x x s yx s s x usv 6 x xs s s7P yx x x x x s x
s uyx sy s x v xs x x s x x ss 7



eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGaS

Oz z v t GPaZg_N bRdWZ

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ac_actd MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ldl



eP aTNg e fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tG eS

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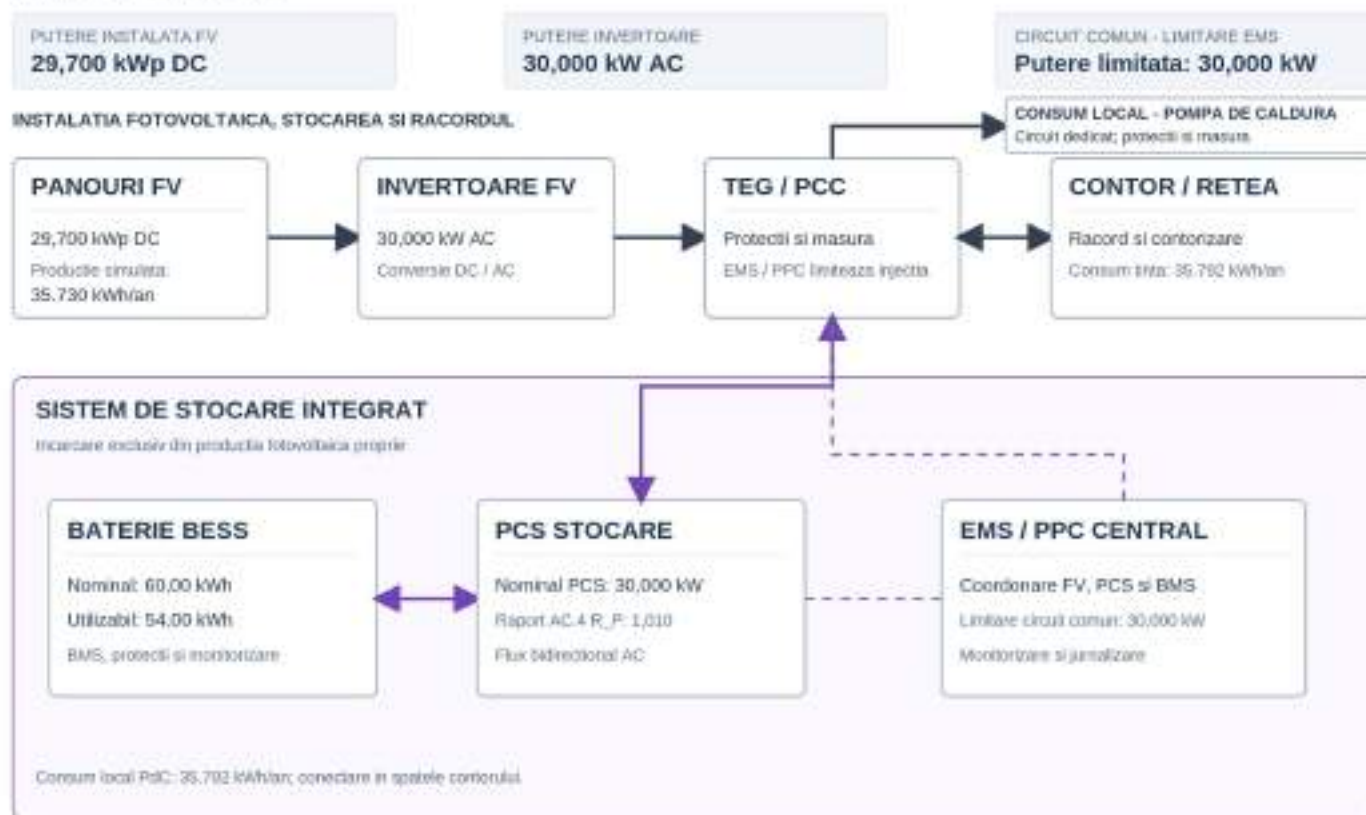
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ac_ acU MY O_ Z f ^ QLaQcUWZ 5Vf PQef Y elZ Udl

N_Rj N P7ePURZ R fRU_aYaTVPR RYRPf dVPR 6 e: eVe;

P7 e: 6 T tx t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație FV - Grădina - S1





oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

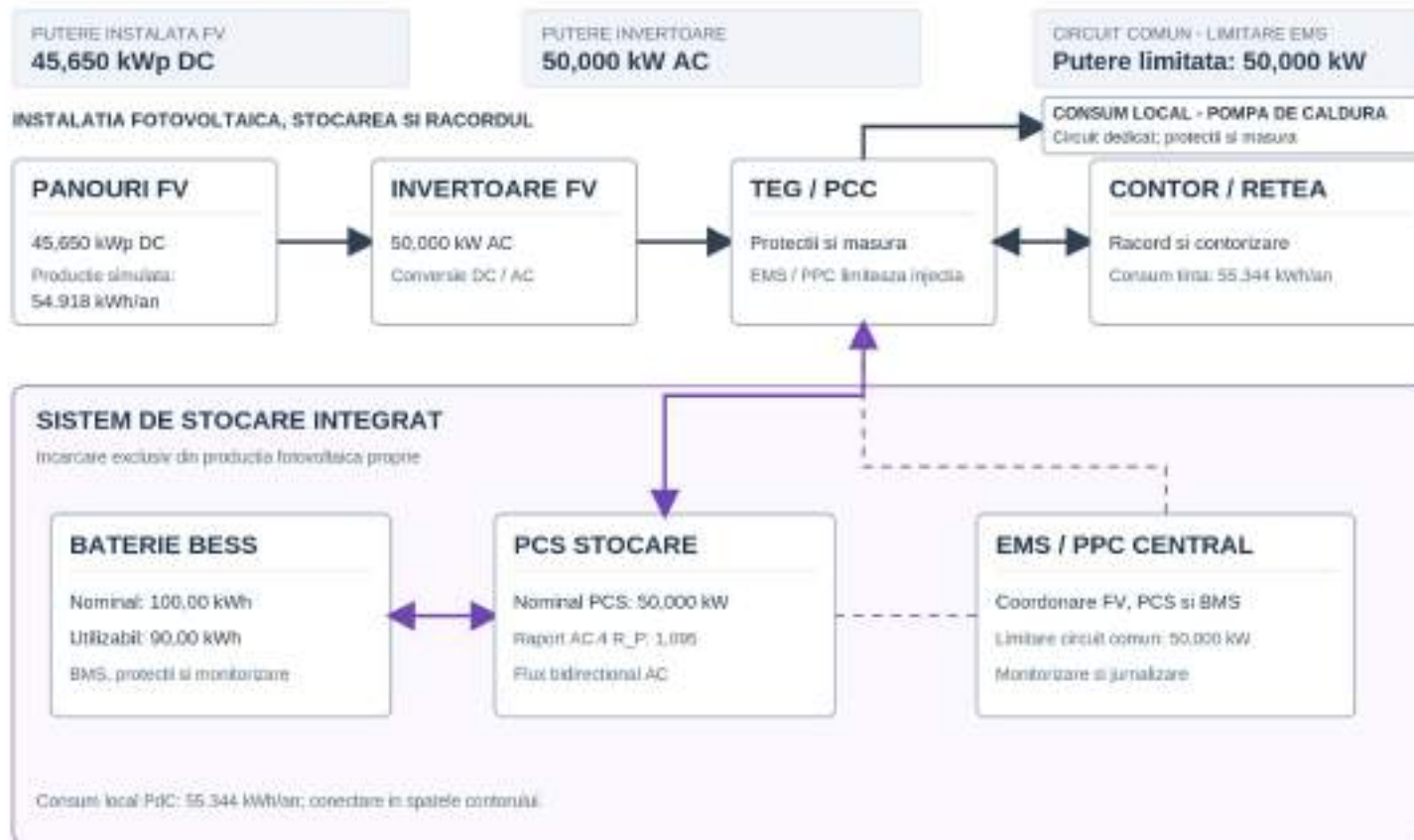
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y elZ W

P7 e: 6 Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Liceu teoretic Periam - S1





oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

Oz z v t GPaZg_N bRdWZ

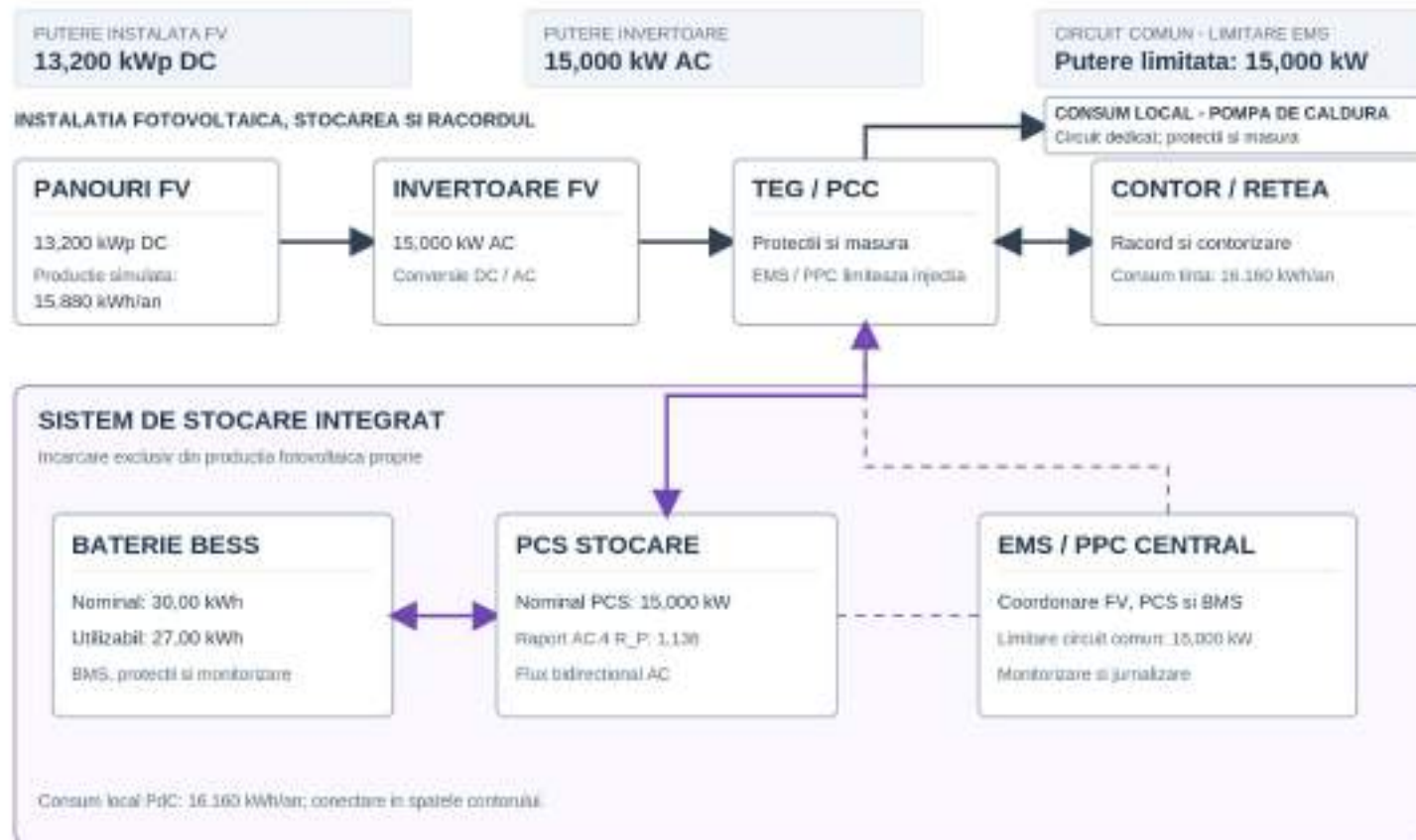
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y elZ Wd

PZ e: 6 et t

Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Sala sport Liceu - S1





OGAUS
Oficiu de proiectare
Oslo, Norvegia

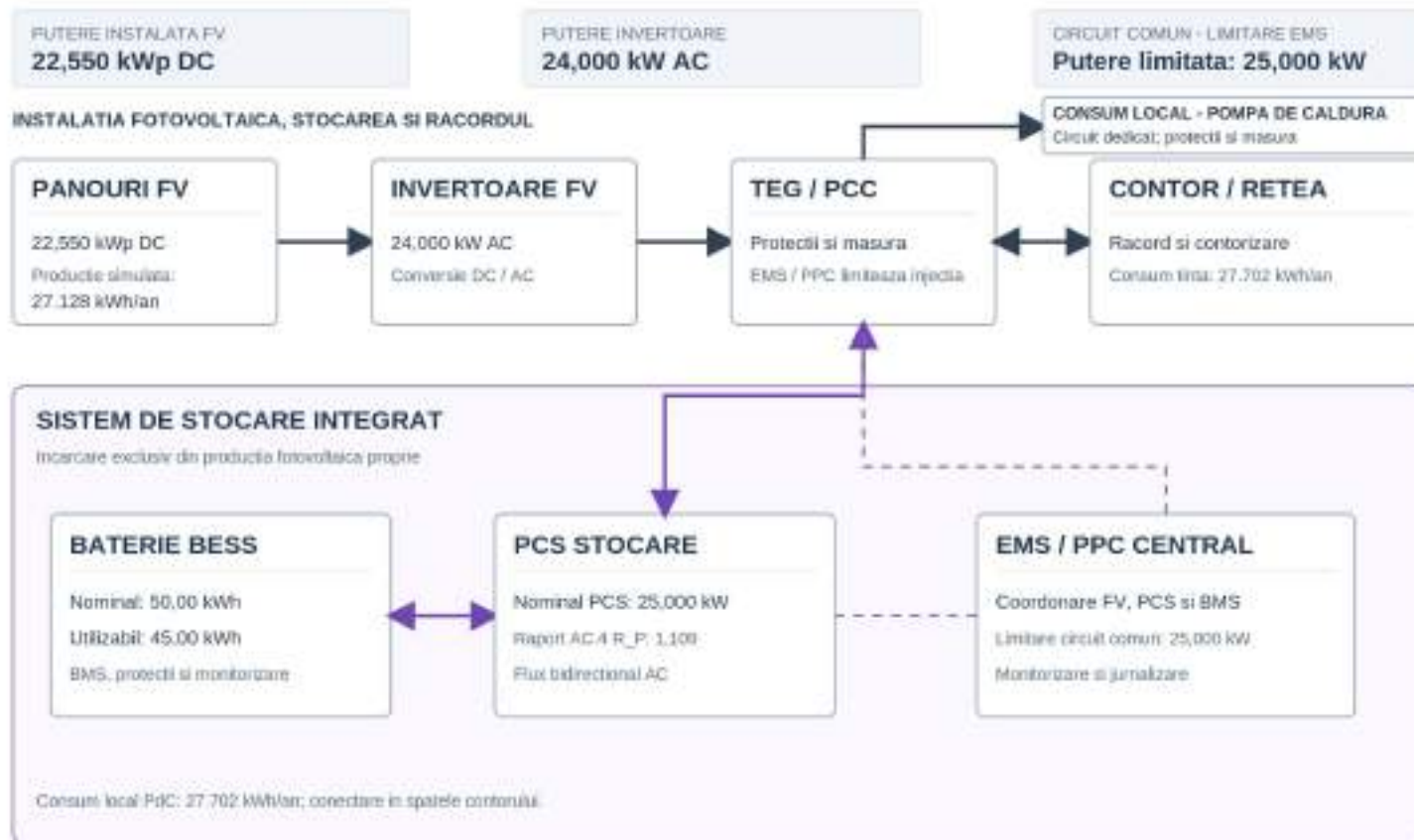
Proiectant: OGAUS
Data: 2024

Proiect de instalare a sistemului fotovoltaic și de stocare a energiei electrice (BESS) pentru o școală din localitatea S1.

Proiectant: OGAUS

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație FV - Școala clasele I-IV localitatea S1





oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

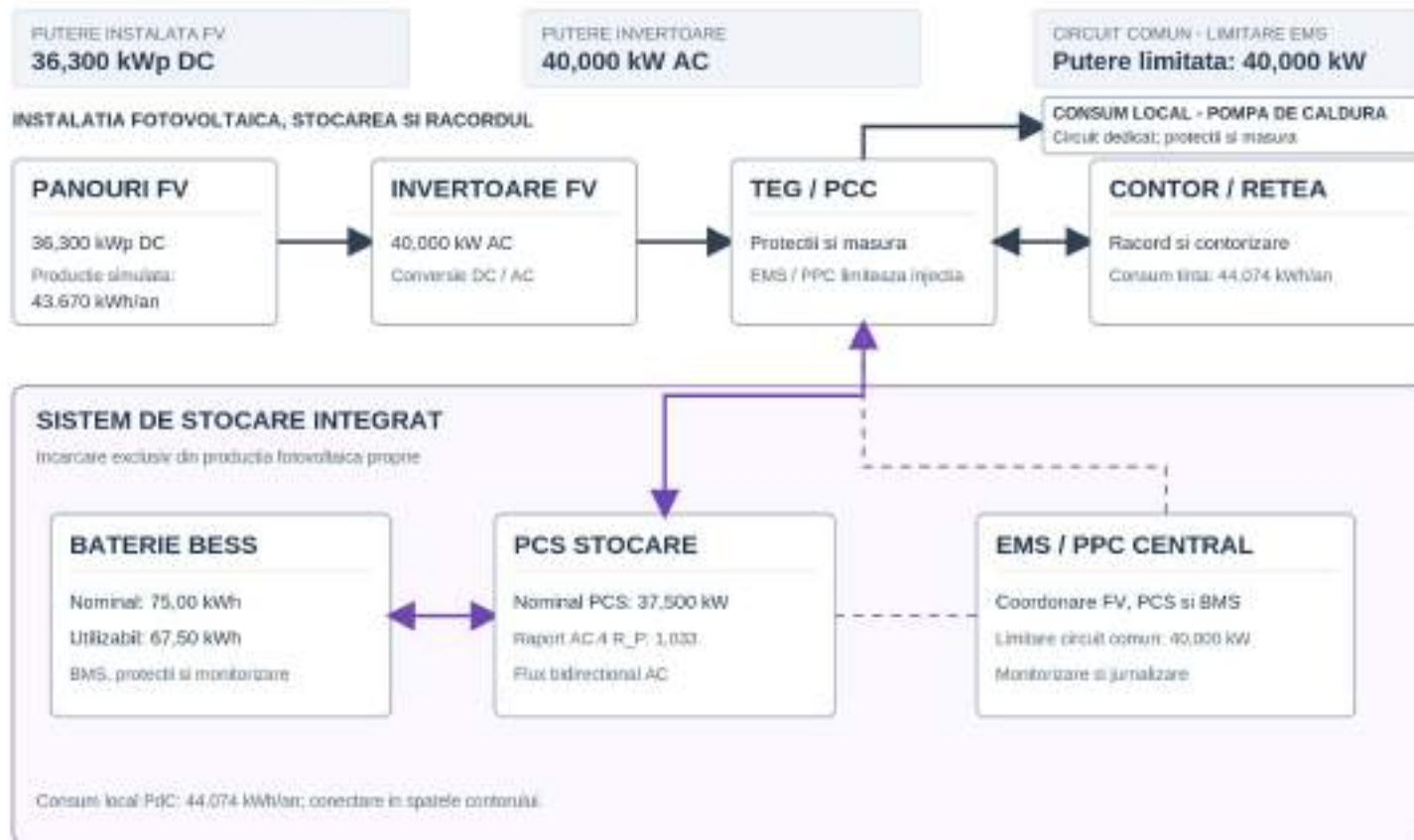
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y elZ W

PBe: 6 ev t t v t z z Wv vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Scoala clasele I-IV local III - S1





eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

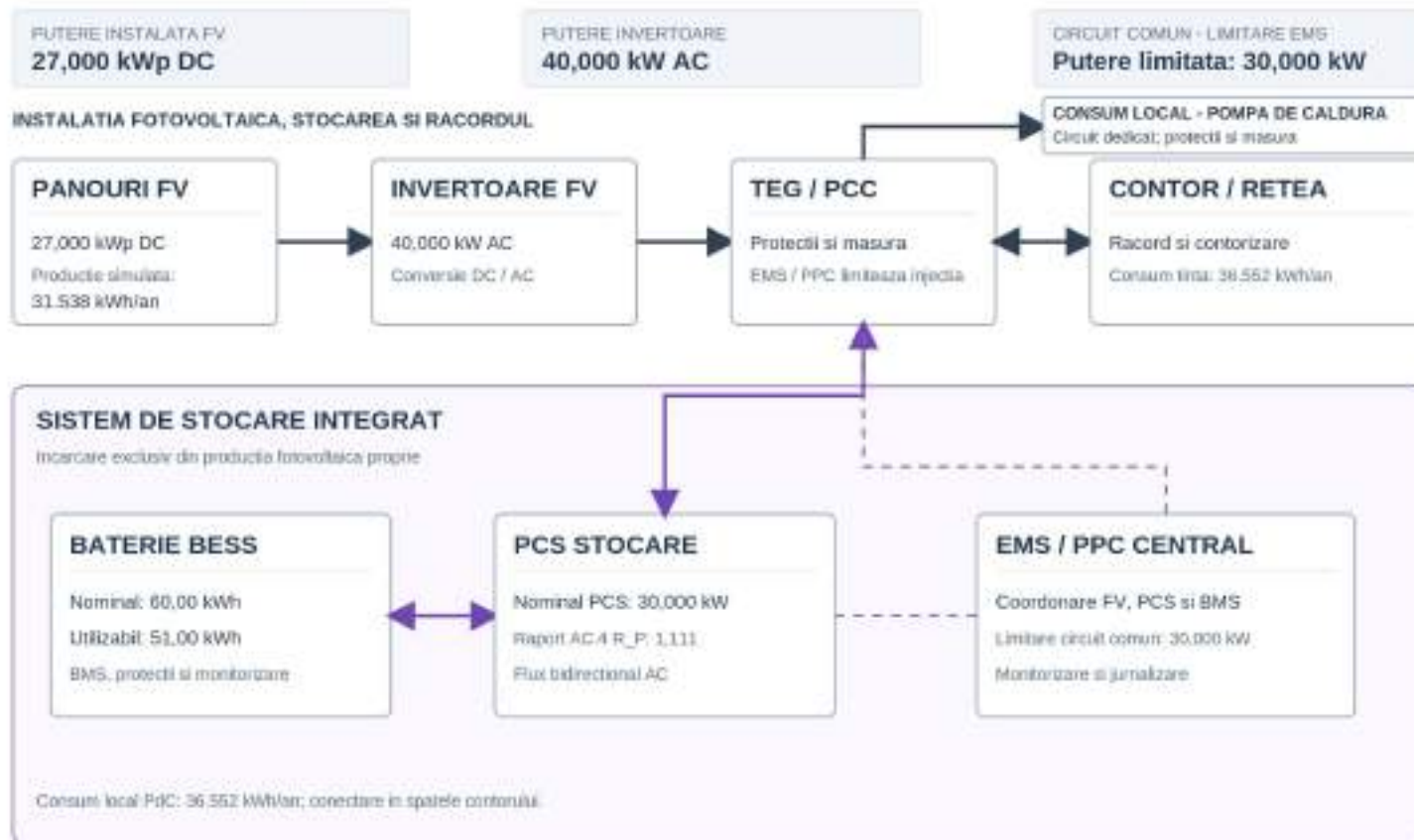
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y elZ Wd

PZe; 6 T tx t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație FV - Grădinița - S2





eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

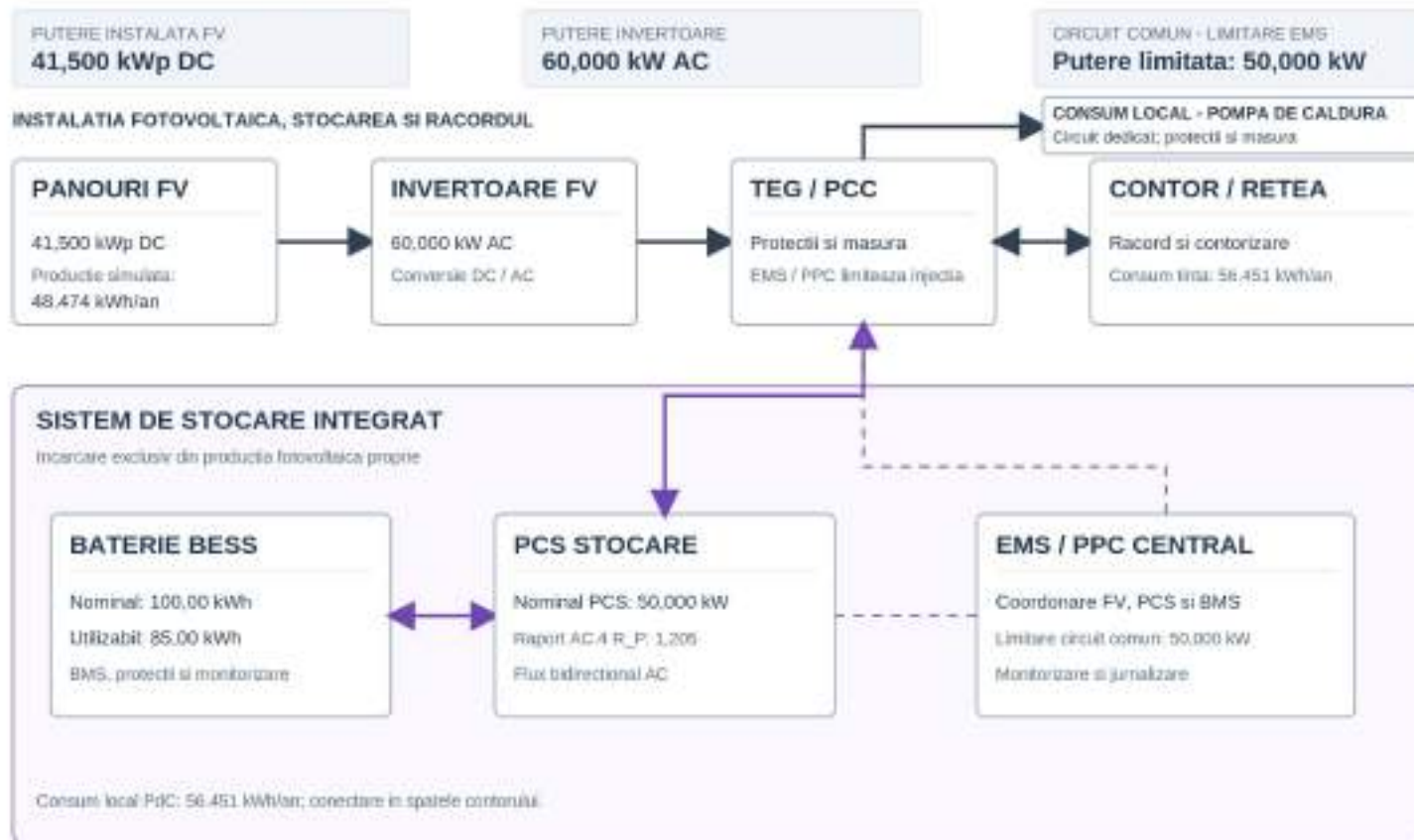
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y elZ W

PDe; 6 Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Liceu teoretic Periam - S2





oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

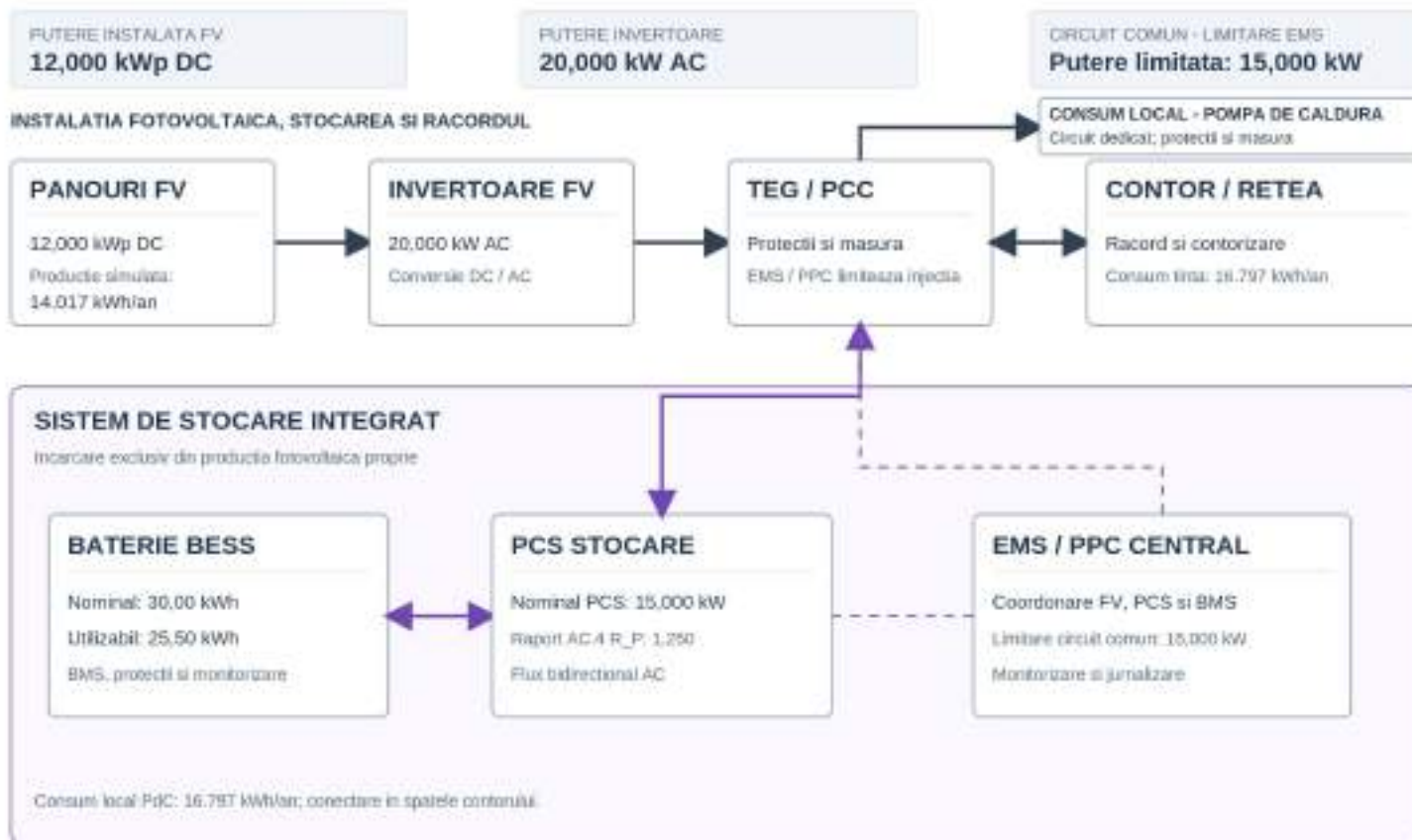
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y elZ W

PZE; 6 et t Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Sala sport Liceu - S2





oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

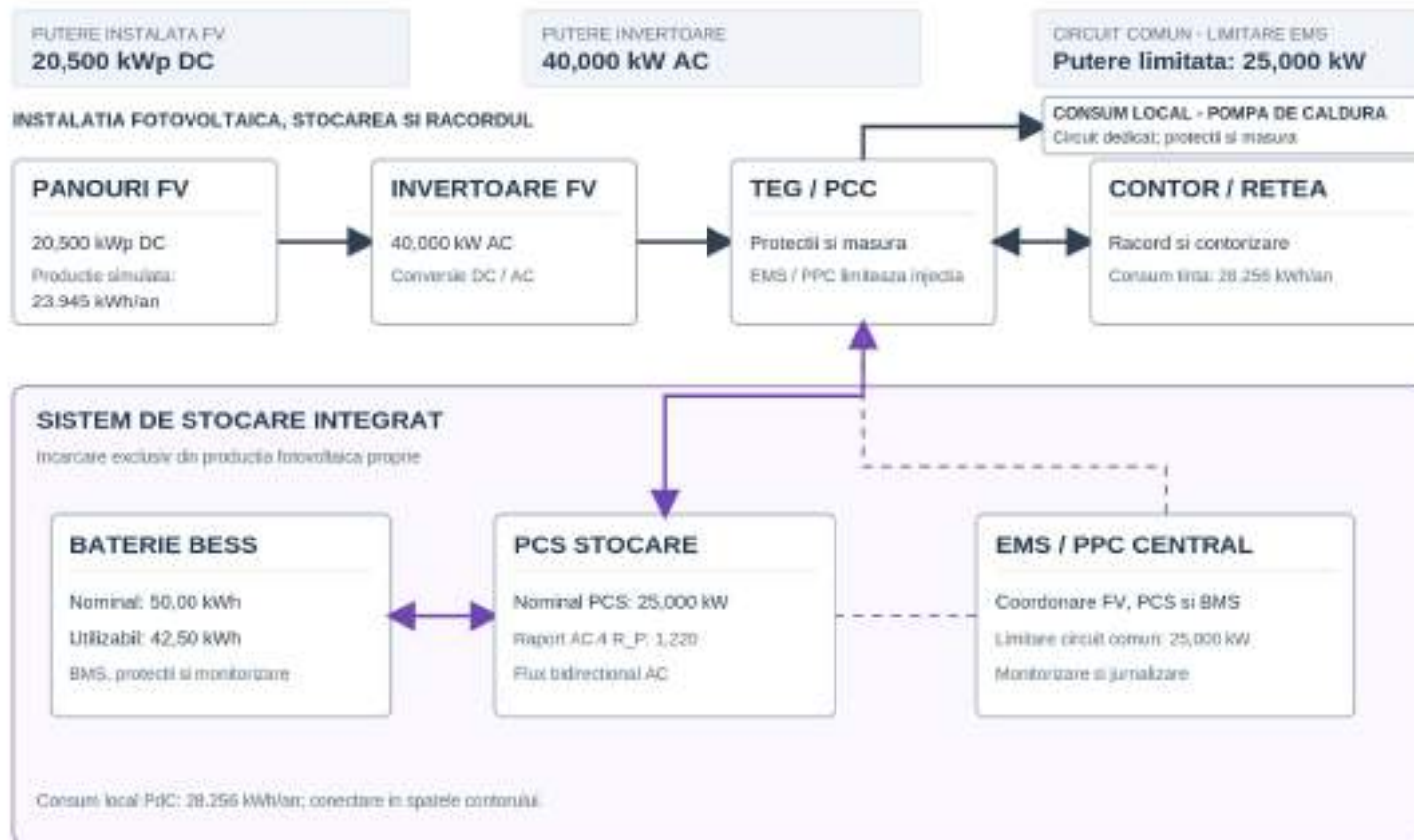
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y elZ W

PF e; 6 ev t t vt zz W vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Scoala clasele I-IV local ii - S2





OGAUS

OGAUS

OGAUS

OGAUS

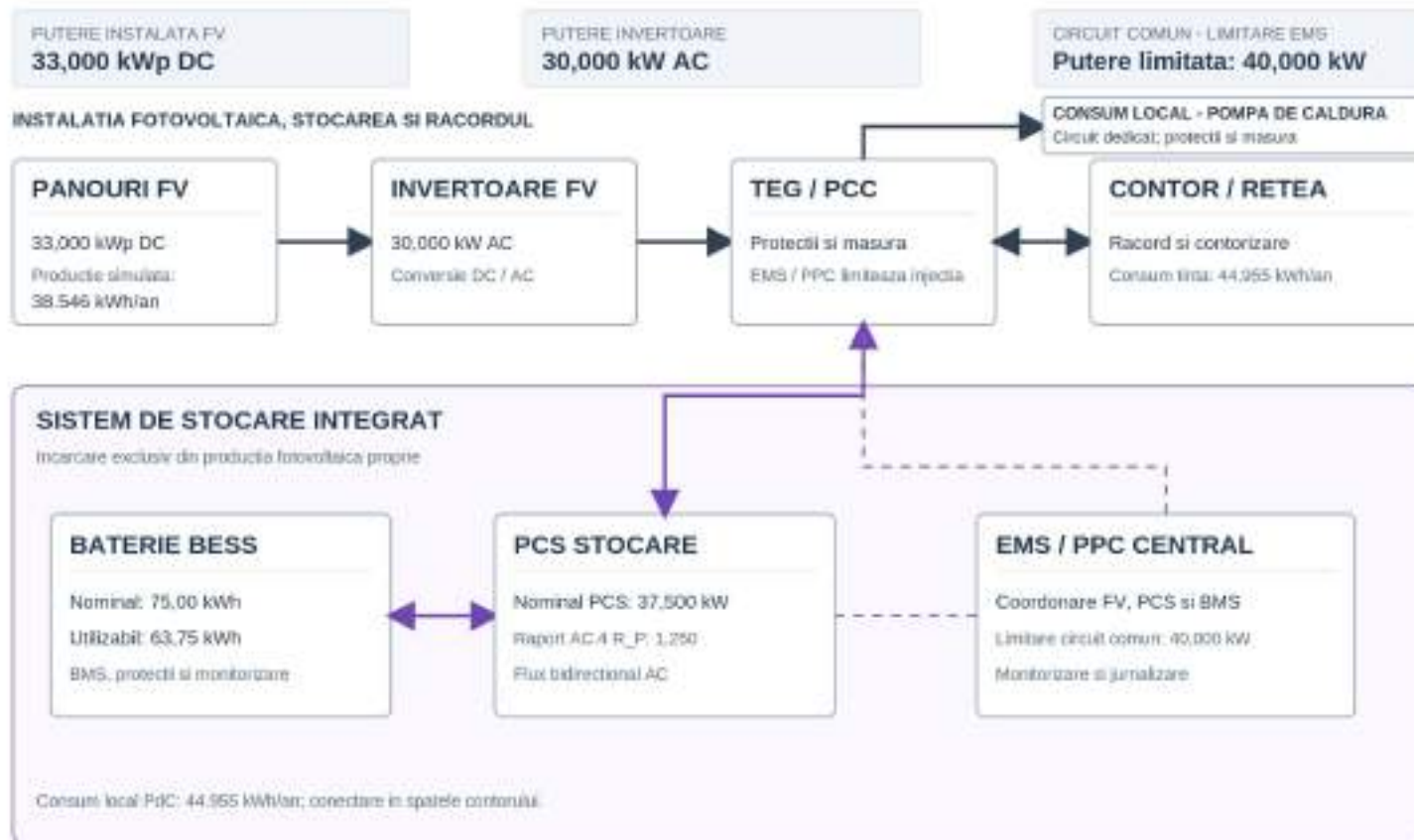
OGAUS

OGAUS

OGAUS

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Scoala clasele I-IV local III - S2





eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGøS

Oz z v t GPaZg_N bRdWZ

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ac_acU MY O_Z f ^ QJaQcWZ 5Vf PQef Y eUZ ldl

N_Rj N Q7ePURZ R fRU_aYaTVPR fRdZ VPR 6 e: eVe;

QZ e: 6 T tx t

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S1] Gradinita

Configuratie: 1 x 67.9 kW | Sistem Aer-apa



Limita lucrarilor: racordarea sursei PdC la primul robinet de separare de pe tur si retur, la limita instalatiei termice interioare existente. Instalatie interioara se mentine si nu face obiectul interventiei.

* Putere electrica estimata din Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scară.



oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

Oz z v t GPaZg_N bRdWZ

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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y eIZ ldl

Q7 e: 6Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S1] Liceu teoretic Periam

Configurație: 1 x 125.8 kW | Sistem Aer-apa

PUTERE TERMICA TOTALA

125,800 kW

PUTERE ELECTRICA ESTIMATA*

35,238 kW

SCOP - CLIMA MEDIE

3,570

DEBIT / RACORD

10,817 m³/h | DN65

RACORD HIDRAULIC - SURSA PdC

SISTEM POMPA DE CALDURA

Aer-apa - sursa termica

Unitati si module proprii sistemului PdC

Putere termica totala: 125,800 kW

Automatizare coordonata si protectii proprii

TUR 55 C | DN65 | 10,817 m³/h

Racorduri tur / retur PdC pana la primul robinet de separare si instalatiei termice interioare existente.

RETUR 45 C | DN65

La primul robinet de separare, la limita instalatiei termice interioare existente

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configurație interioara nedetalata.

Instalatie interioara se mentine si nu face obiectul interventiei reprezentate.

R1 / R2: limita racordului propus. Linia punctata delimiteaza instalatia existenta; sensul returului este spre PdC.

ALIMENTARE ELECTRICA

Circuit electric dedicat pentru sistemul PdC. Protectii, masura si separare conform datelor electrice ale echipamentelor.

AUTOMATIZARE

Comanda coordonata a componentelor PdC. Reglare, senzori si semnalizarea starilor de functionare.

LUCRARI PROPUSE

Sistem PdC si racorduri termice / electrice pana la limita marcata. Probe si punere in functiune.

Limita lucrărilor: racordarea sursei PdC la primul robinet de separare de pe tur si retur, la limita instalatiei termice interioare existente, instalatie interioara se mentine si nu face obiectul interventiei.

* Putere electrica estimata din Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.



oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

Oz z v t GPaZg_N bRdWZ

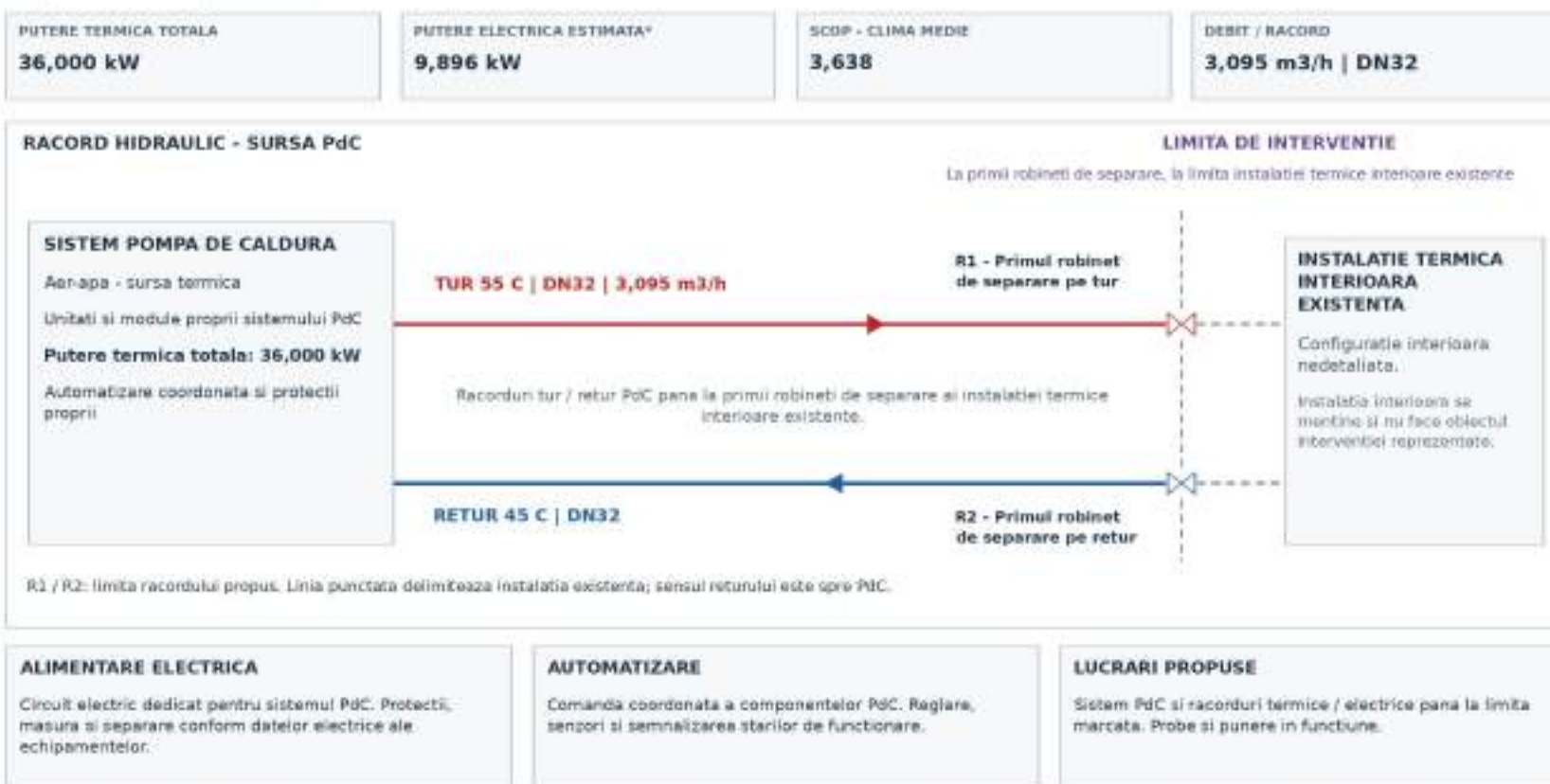
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ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y eUZ ldl

Q7 e: 6 et t Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S1] Sala sport Liceu

Configurație: 1 x 36 kW | Sistem Aer-apa



Limita lucrărilor: racordarea sursei PdC la primul robinet de separare de pe tur și retur, la limita instalației termice interioare existente, instalația interioară se menține și nu face obiectul intervenției.

* Putere electrică estimată din Pth / SCOP, nu putere electrică maximă de dimensionare. Schema de principiu, fără scară.



oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

Oz z vt GPaZg_N bRdWZ

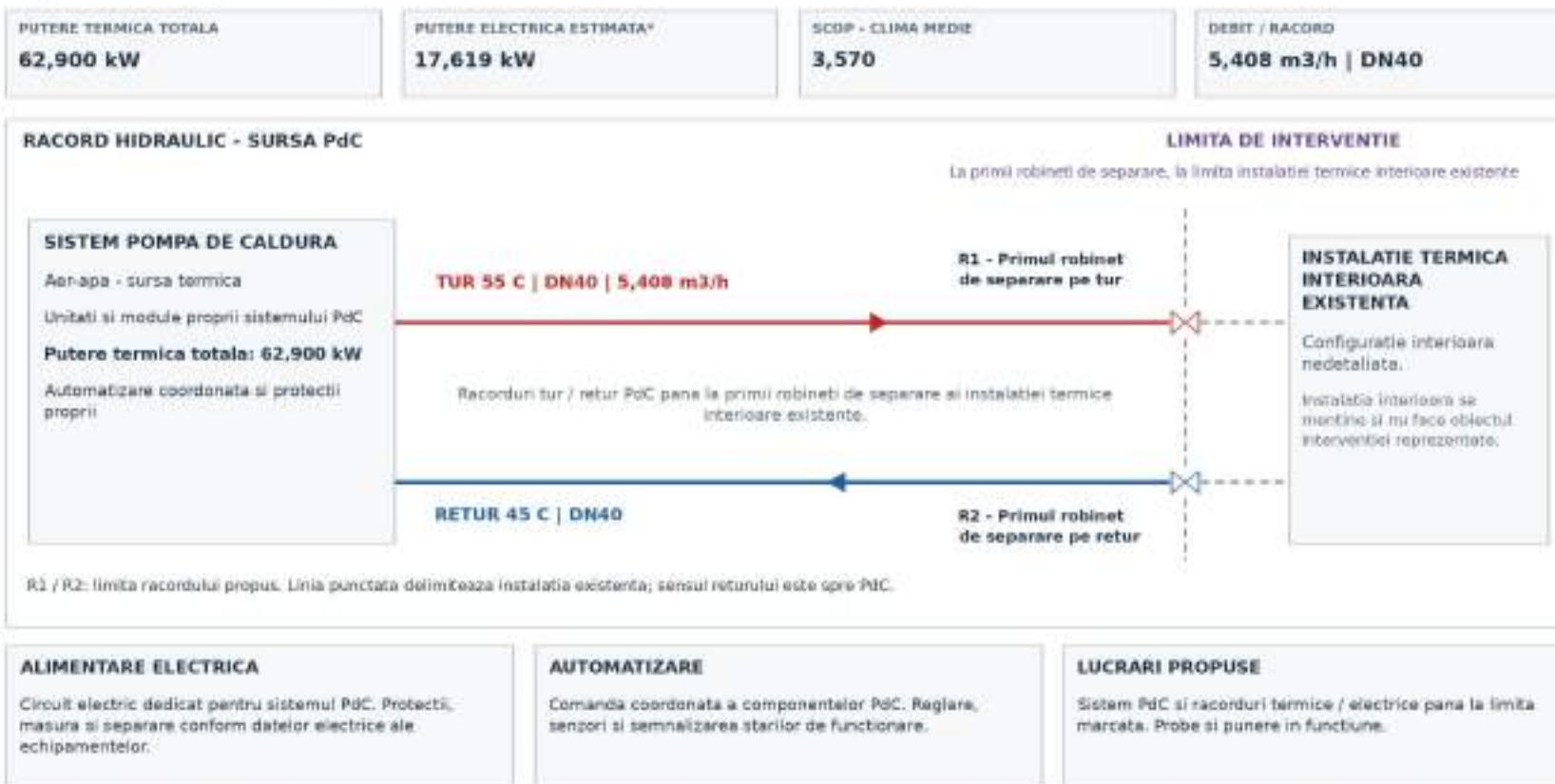
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ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y eUZ ldl

QAe: 6 ev t t v t z z Wv vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S1] Scoala clasele I-IV local II

Configuratie: 1 x 62.9 kW | Sistem Aer-apa



Limita lucrurilor: racordarea sursei PdC la primul robinet de separare de pe tur si retur, la limita instalatiei termice interioare existente, instalatie interioara se mentine si nu face obiectul interventiei.

* Putere electrica estimata din Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.



oP aTNge fRPU_aYaTk edY
Of Wc_ =B; EBE; C V; 8DE98; 9:B
Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS
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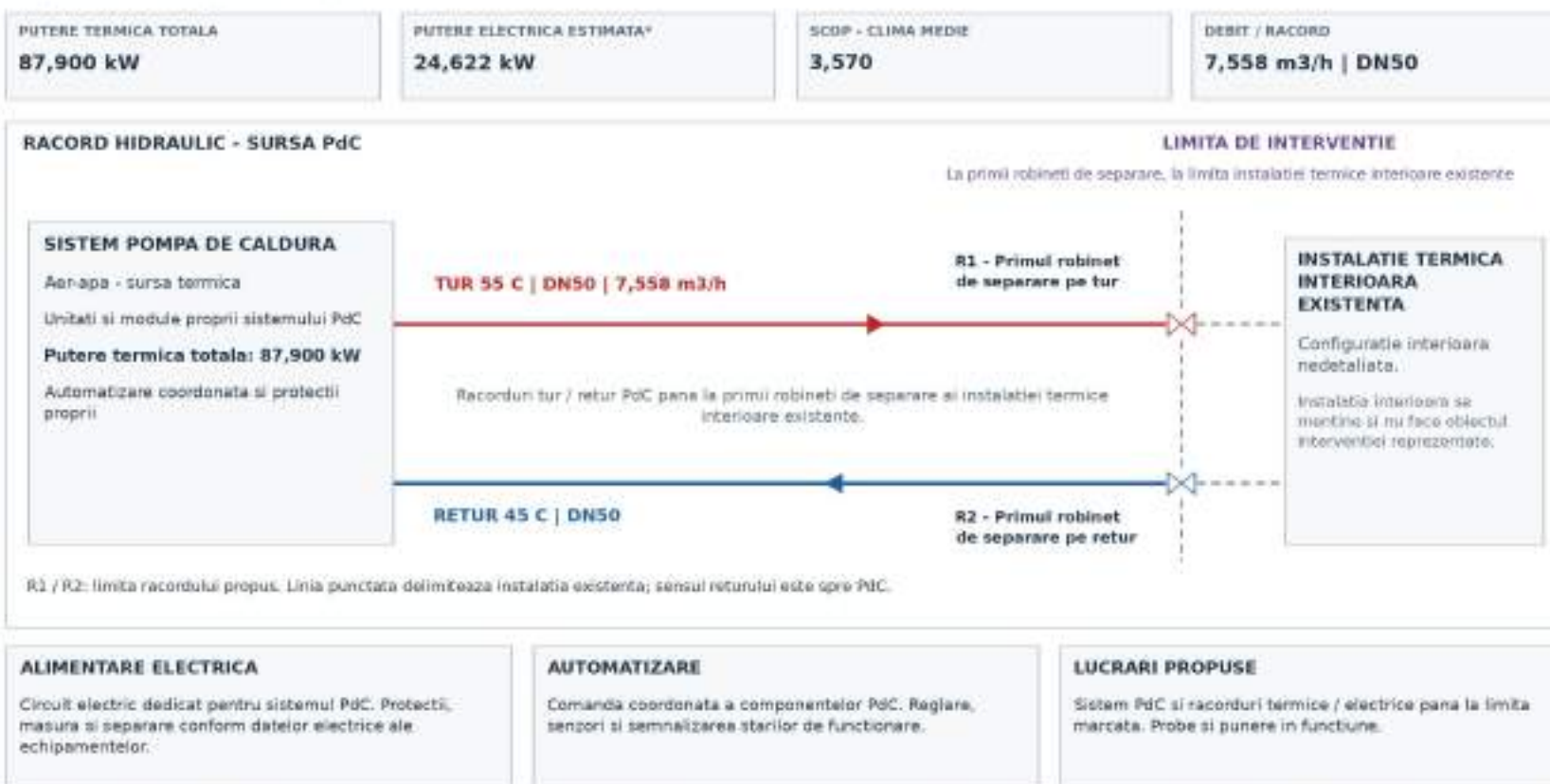
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ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y eUZ ldl

QB e: 6 ev t t v t z z Wv vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S1] Scoala clasele I-IV local III

Configuratie: 1 x 87,9 kW | Sistem Aer-apa



Limita lucrurilor: racordarea sursei PdC la primul robinet de separare de pe tur si retur, la limita instalatiei termice interioare existente, instalatie interioara se mentine si nu face obiectul interventiei.

* Putere electrica estimata din Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.



oP aTNge fRPU_aYaTk edY
Of Wc_ =B; EBE; C V; 8DE98; 9:B
Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS
Oz z v t GPaZg_N bRdWZ

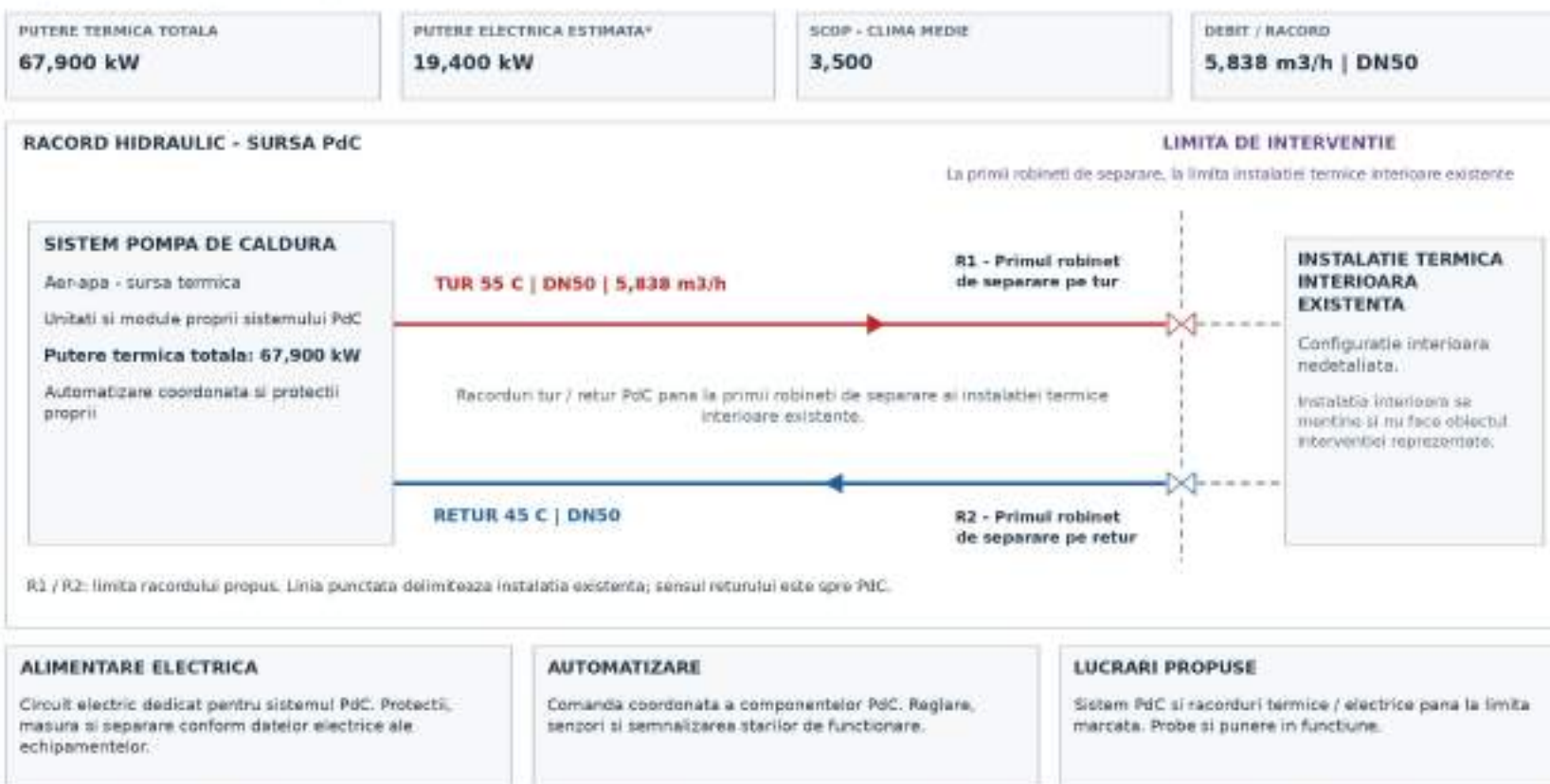
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ac_acU MY O_Z f ^ QJaQcWZ 5Vf PQef Y eUZ ldl

QZe; 6 T tx t

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S2] Gradinita

Configurație: 1 x 67,9 kW | Sistem Aer-apa



Limita lucrărilor: racordarea sursei PdC la primul robinet de separare de pe tur și retur, la limita instalației termice interioare existente, instalația interioară se menține și nu face obiectul intervenției.

* Putere electrică estimată din P_{th} / SCOP, nu putere electrică maximă de dimensionare. Schema de principiu, fără scară.



oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

Oz z v t GPaZg_N bRdWZ

Px xFcQMkMbQ dIdeQZ PQac_Pf OQcQ dUde_ OMbQ MQ^ QcSQUQYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y eUZ ldl

QDe; 6 Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S2] Liceu teoretic Periam

Configurație: 1 x 125.8 kW | Sistem Aer-apa



Limita lucrărilor: racordarea sursei PdC la primul robinet de separare de pe tur și retur, la limita instalației termice interioare existente, instalația interioară se menține și nu face obiectul intervenției.

* Putere electrică estimată din Pth / SCOP, nu putere electrică maximă de dimensionare. Schema de principiu, fără scară.



oP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

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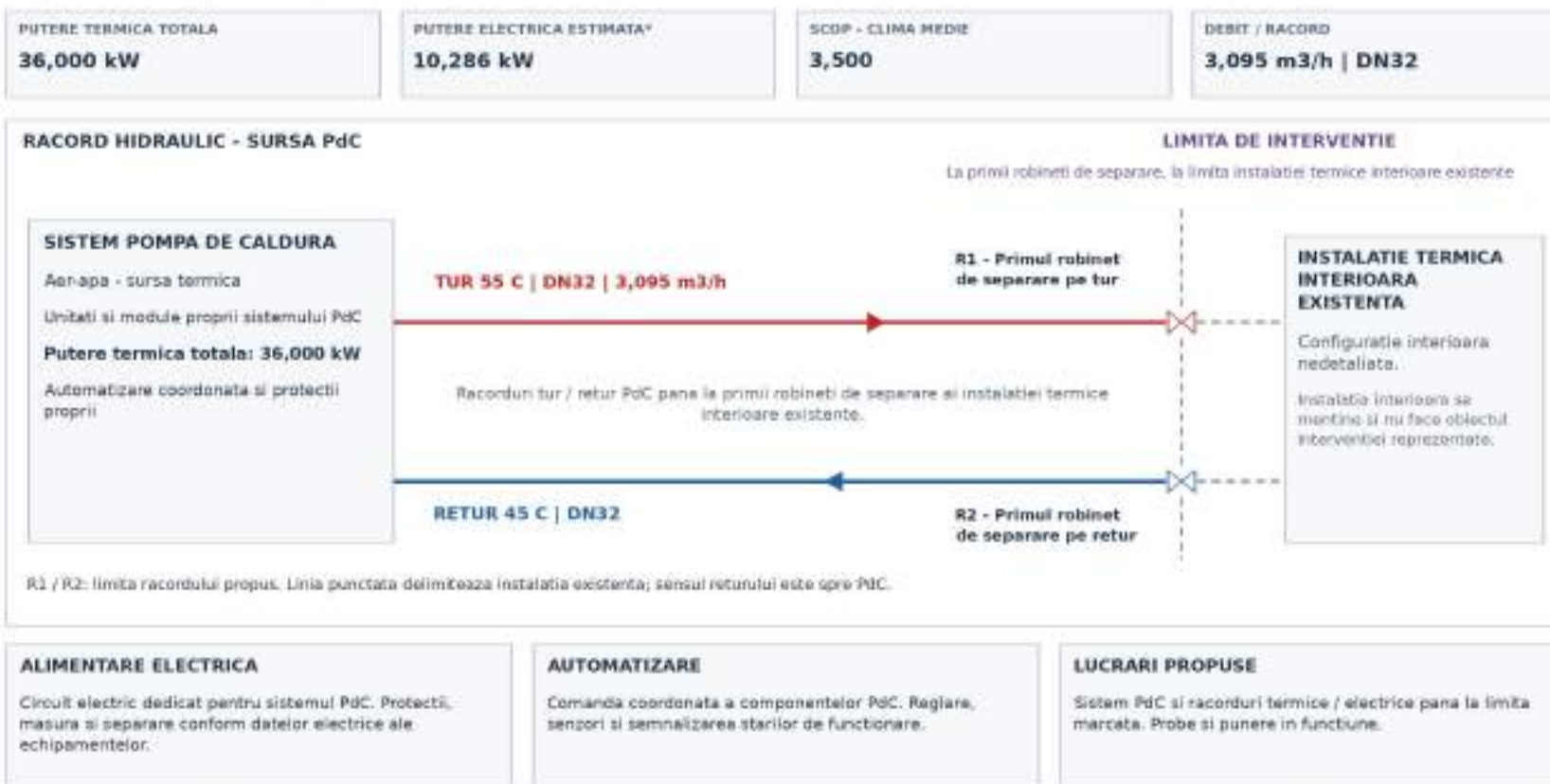
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ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y eUz Wd

QE e; 6 et t Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S2] Sala sport Liceu

Configurație: 1 x 36 kW | Sistem Aer-apa



Limita lucrărilor: racordarea sursei PdC la primul robinet de separare de pe tur și retur, la limita instalației termice interioare existente, instalația interioară se menține și nu face obiectul intervenției.

* Putere electrică estimată din P_{th} / SCOP, nu putere electrică maximă de dimensionare. Schema de principiu, fără scară.



eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9:B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGoS

Oz z vt GPaZg_N bRdWZ

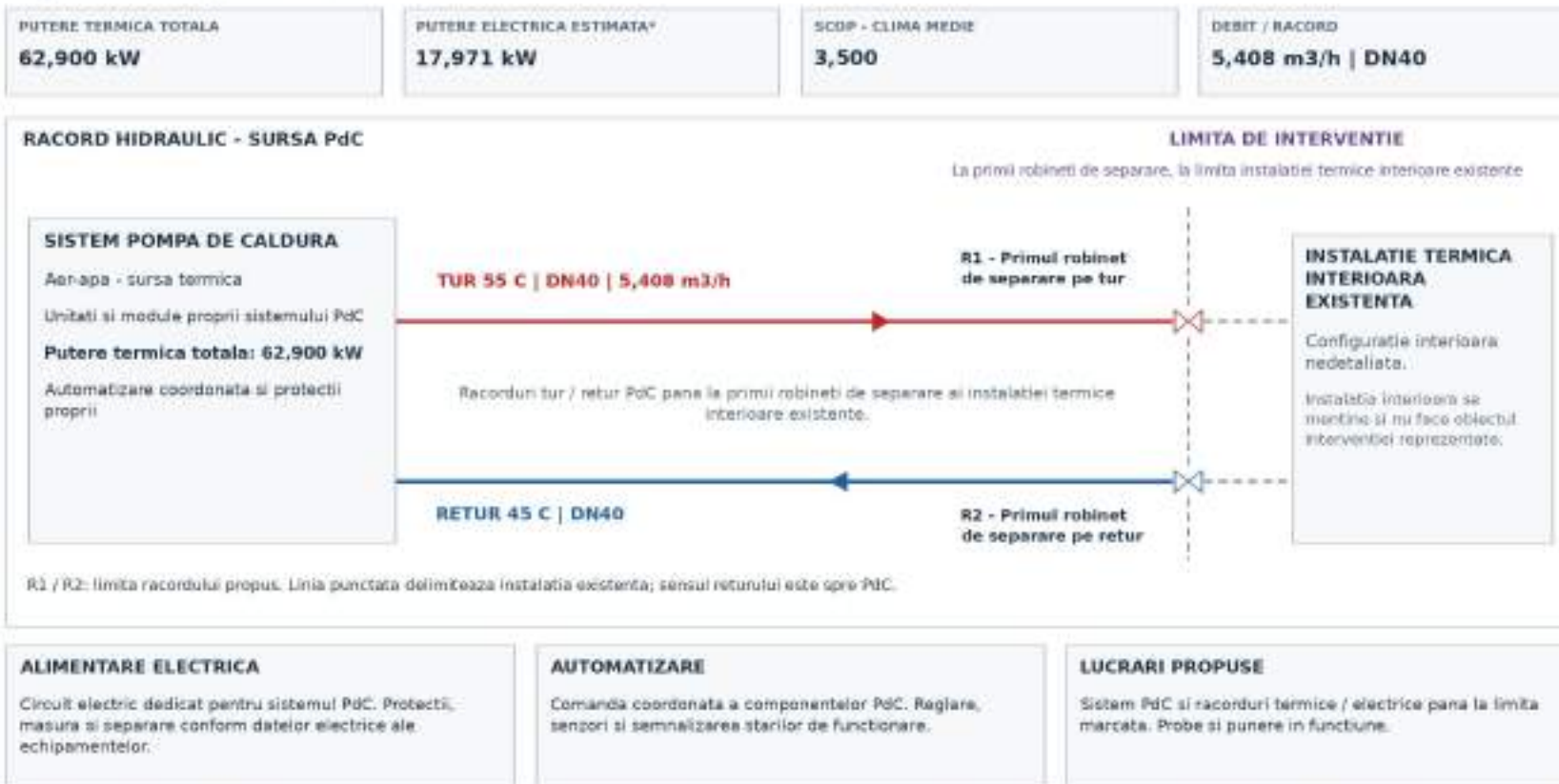
Px xFcQMWMbQ dIdeQZ PQac_Pf OQcQ dUde_OMbQ MQ^ QcSQUQYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y eUZ ldl

QF e; 6 ev t t v t z z W vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S2] Scoala clasele I-IV local II

Configuratie: 1 x 62.9 kW | Sistem Aer-apa



Limita lucrurilor: racordarea sursei PdC la primul robinet de separare de pe tur si retur, la limita instalatiei termice interioare existente, instalatie interioara se mentine si nu face obiectul interventiei.

* Putere electrica estimata din Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.



eP aTNge fRPU_aYaTk edY

Of Wc_ =B; EBE; C V; 8DE98; 9: B

Os xs csv x ^ 7:@Et Msv5V v7Msv

b zv 7A:98; 9; C St tGøS

Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dUdeQZ PQac_Pf OQc dUde_OMbQ MQ^ QcSQUYQOecWQPU df cdQcGSQ^ QcMNYQ PQela d_YMb aQ^ ecf O_ ^ df Z
ac_acW MY O_Z f ^ QJaQcWZ 5Vf PQef Y eLZ ldl

QZ9 e; 6 ev t t v t z z Wv vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [52] Scoala clasele I-IV local III

Configuratie: 1 x 87,9 kW | Sistem Aer-apă



Limita lucrarii: racordarea sursei PdC la primul robinet de separare de pe tur si retur, la limita instalatiei termice interioare existente. Instalatia interioara se mentine si nu face obiectul interventiei.

* Putere electrica estimata din PdC / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.

V v 5 7Uz

