

PROIECT DE HOTĂRÂRE
Nr. 83 din 12.10.2026

privind aprobarea proiectului „Realizare sistem de producere și stocare a energiei electrice din surse regenerabile de tip solar al comunei Periam, județul Timiș” și a indicatorilor tehnico-economici asociați acestuia

Consiliul Local al Comunei Periam, Județul Timiș, ales în condițiile stabilite de Legea nr.115/2015 pentru alegerea autorităților administrației publice locale, pentru modificarea Legii administrației publice locale nr. 215/2001, precum și pentru modificarea și completarea Legii nr. 393/2004 privind Statutul aleșilor locali s-a reunit în ședința extraordinară din data de 12.10.2026.

Analizând temeiurile juridice, respectiv:

- a) art. 15 alin. (2), art. 44 alin. (1)-(2), art. 56, art. 120 alin. (1), art. 121 alin. (1)-(2) și art. 139 alin. (2) din Legea nr. 1/2003 privind Constituția României, republicată;
- b) art. 3-4 și art. 8-9 din Carta Europeană a autonomiei locale, adoptată la Strasbourg la 15 octombrie 1985, ratificată prin Legea nr. 199/1997;
- c) art. 7 alin. (2), art. 1166 și următoarele din Legea nr. 287/2009 privind Codul civil, republicată (r1), cu modificările ulterioare, referitoare la contracte sau convenții;
- d) O.U.G. nr. 60/2022 privind stabilirea cadrului instituțional și financiar de implementare și gestionare a fondurilor alocate României prin Fondul pentru modernizare, precum și pentru modificarea și completarea unor acte normative, cu modificările și completările ulterioare;
- e) O.U.G. nr. 85/2023 privind gestionarea financiară a fondurilor europene nerambursabile alocate României din FEAGA și FEADR, aferente politicii agricole comune, precum și a fondurilor alocate de la bugetul de stat pentru perioada de programare 2023-2027 și pentru modificarea și completarea unor acte normative din domeniul garantării, cu modificările și completările ulterioare;
- f) O.A.P. nr. 1066/08.09.2026 pentru aprobarea Ghidului solicitantului - Sprijinirea investițiilor în noi capacități de producere a energiei electrice produse din surse regenerabile de energie solară, cu capacități de stocare integrate, pentru autoconsum pentru entități publice;
- g) art. 41 și art. 44 alin. (1) din Legea nr. 273/2006 privind finanțele publice locale, cu modificările și completările ulterioare;
- h) art. 9-10 din H.G. 907/2016 privind etapele de elaborare și conținutul-cadru al documentațiilor tehnico-economice aferente obiectivelor/proiectelor de investiții finanțate din fonduri publice, cu modificările și completările ulterioare;
- i) art. 7 alin. (13) din Legea nr. 52/2003 privind transparența decizională în administrația publică, cu modificările și completările ulterioare;
- j) art. 2 alin. (2), art. 3, art. 5 alin. (2), art. 6, art. 30 alin. (1) lit. c) și alin. (2), art. 40-50, art. 56-58 și art. 80-84 din Legea nr. 24/2000 privind normele de tehnică legislativă pentru elaborarea actelor normative, republicată, cu modificările și completările ulterioare.

Ținând cont de:

- a) Apelul de proiect - Fondul pentru modernizare – Programul-cheie 1: Surse regenerabile de energie și stocare a energiei, sprijinirea investițiilor în noi capacități de producere a energiei electrice produse din surse regenerabile de energie solară, cu sau fără capacități de stocare integrate, pentru autoconsum pentru entități publice.
- b) Ghidul solicitantului - Condiții specifice de accesare a finanțării din Fondul pentru modernizare - Sprijinirea investițiilor în noi capacități de producere a energiei electrice produse din surse regenerabile de energie solară, cu capacități de stocare integrate, pentru autoconsum pentru entități publice;
- c) documentația tehnico-economică, faza Studiu de Fezabilitate, întocmită de firma de proiectare S.C. OGAUS TECHNOLOGY S.R.L. și înregistrat la Primăria Comunei Periam sub nr. 7135/08.10.2026.

Luând act de:

- a) referatul de aprobare nr. 7158/12.10 2026 elaborat de primarul comunei Periam, județul Timiș, în calitate sa de inițiator;
- b) raportul compartimentului de resort nr. 7166/12.10 2026 prezentat de doamna Gyongyi Ponta, inspector I principal-urbanism și amenajarea teritoriului în cadrul compartimentului Dezvoltare Economico-socială, Urbanism și Transport public al aparatului de specialitate al primarului comunei Periam;
- c) prevederile Regulamentului de organizare și funcționare al Consiliului Local Periam;
- d) avizul Comisiei de specialitate din cadrul Consiliului Local Periam.

În temeiul prevederilor art. 87 alin. (5), art. 110 alin. (1), art. 129 alin. (1), art. 129 alin. (2) lit. c), art. 129 alin. (6) lit. c), art. 134 alin. (1) lit. a) și alin. (4), art. 136, art. 139 alin. (3) lit. a), art. 140 alin. (1), 196 alin. (1) lit. a), art. 197-200, art. 243 alin. (1) și art. 255 din O.U.G. nr. 57/2019 privind Codul administrativ, cu modificările și completările ulterioare,

CONSILIUL LOCAL AL COMUNEI PERIAM
adoptă prezenta hotărâre:

Art. 1. Se aprobă proiectul de investiție cu titlul *„Realizare sistem de producere și stocare a energiei electrice din surse regenerabile de tip solar al comunei Periam, județul Timiș”* și a indicatorilor tehnico-economici asociați acestuia.

Art. 2. Se aprobă valorile proiectului de investiție, conform Anexei nr. 1 la prezenta hotărâre, care face parte integrantă din aceasta.

Art. 3. Se aprobă asigurarea cofinanțării proiectului, asigurarea fluxului financiar pentru implementarea proiectului și acoperirea contravalorii cheltuielilor, altele decât cele eligibile, precum și acoperirea contravalorii cheltuielilor neeligibile ale obiectivului de investiție *„Realizare sistem de producere și stocare a energiei electrice din surse regenerabile de tip solar al comunei Periam, județul Timiș”* din bugetul local al comunei Periam, potrivit Anexei nr. 1 la prezenta hotărâre.

Art. 4. Se aprobă documentația tehnico-economică, faza Studiu de Fezabilitate și indicatorii tehnico-economici pentru obiectivul de investiție *„Realizare sistem de producere și stocare a energiei electrice din surse regenerabile de tip solar al comunei Periam, județul Timiș”*, conform Anexei nr. 2 la prezenta hotărâre, care face parte integrantă din aceasta.

Art. 5. (1) Reprezentantul legal al Comunei Periam este, potrivit legii, primarul acesteia, domnul Cornel DUMITRAȘ, în dubla sa calitate și de ordonator principal de credite și de administrator public al comunei.

(2) Se nominalizează primarul Comunei Periam, în calitate de reprezentant legal al comunei pentru relația cu autoritatea de management în implementarea proiectului.

Art. 6. Cu ducerea la îndeplinire a prezentei hotărâri se va încredința primarul Comunei Periam, compartimentul Dezvoltare Economico-socială, Urbanism și Transport public și compartimentul Financiar-contabil, impozite și taxe din cadrul aparatului de specialitate al primarului comunei Periam.

Art. 7. Prezentul proiect de hotărâre se comunică:
- Consiliului Local al comunei Periam.

INIȚIATOR PROIECT:
PRIMARUL COMUNEI PERIAM,
Cornel DUMITRAȘ

AVIZEAZĂ PENTRU LEGALITATE:
SECRETARUL GENERAL AL COMUNEI,
Daciana BRONȚ

INDICATORII TEHNICO-ECONOMICI

pentru proiectul : „Realizare sistem de producere și stocare a energiei electrice din surse regenerabile de tip solar al comunei Periam, județul Timiș”

Indicator	Valoare aprobata
Valoarea totala a investitiei, inclusiv TVA	1,402,538.21 lei
Valoarea eligibila, inclusiv TVA eligibila	1,045,473.61 lei
Din care TVA eligibila	181,445.83 lei
Valoarea neeligibila, inclusiv TVA neeligibila sau neacoperita	357,064.60 lei
Ajutor public nerambursabil solicitat, inclusiv TVA eligibila	1,045,473.61 lei
Din care TVA eligibila finantata	181,445.83 lei
Contributia totala a beneficiarului	357,064.60 lei
Din care TVA neeligibila, suportata de beneficiar	61,775.97 lei
Durata de implementare	12 luni
I.1 - Capacitate nou instalata de producere FV eligibilă	0,147 MWh
I.2 – Reducerea anuală estimată a emisiilor de gaze cu efect de seră	104.36 t CO ₂ /an
I.3 – Producția medie anuală de energie electrică din surse regenerabile	177.33 MWh/an
I.4 – Producția totală pentru perioada de referință	3,546.53 MWh
I.5 – Factorul de capacitate al centralei	13.73%
I.6 – Capacitate nou instalată nominală de stocare	0.315 MWh
I.7 – Capacitate nou instalată pentru pompe de căldură	380.50 kW
AC.1 – C _{an} – consum anual de referință	0.00 kWh/an
AC.2 – P _{an} – producția anuală estimată	177,326.29 kWh/an
AC.3 – R _{ac} – raport dimensionare autoconsum	Nu se poate calcula - AC.1 = 0 kWh/an
AC.4 – R _P – raport putere stocare/ putere PV	1.068521
AC.5 – E _{stoc} – capacitate nominală de stocare	315.00 kWh

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

SC OGAUS TECHNOLOGY SRL

Arad, Calea Radnei Nr. 149bis

Email: office@ogaus.com

Unitatea Administrativ Teritorială
COMUNA PERIAM - Jud. Timiş
REGISTRATURĂ GENERALĂNr. 7135
ziua 08 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 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^ QcS WQYQOecWQPd df cdQcQSQ^ QcMNWQPQela d_YMb aQ^ecf O_ ^df Z
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Px xFcQMUMbQdldeQZ PQac_ Pf OQcQdlde_ OMbQM^ QcS WQYQOecWQPU df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQc WZ 5Vf PQef YelZ ld

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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

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cx x sF

z7Rx x Mx s v

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





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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_ OMcQMq^ QcSlQcYQOecldQPd dfcdQcQSQ^ QcMNUQPQeld d_YM: aQ^ecf O_ ^dfZ
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

PgbdV_e

:7V t z z t z x u zv 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
:7Nx xyus x xA
:7A Qst s v vx yx st s xA
:7B _ 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
;7d s s x x zx us x u x t ux vx x xC
;7O s x s x ; u xu xC
;7A Ox x xs x us u x xu u x sD
;7B ax x vx v x s x x s s xs v u xE
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=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
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A7N t t vz t z v 6zv vz9
@7 Osv vx s s s v s s vx yx s9
@7 g x st s u s ux s vx svs s x9
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@Ec u s vx zx s xB



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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 xFcQMUMcQdIdeQZ PQac_ Pf OQcQdIde_ OMcQM MQ^ GcSQUQYQOecWQPd df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acId MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ Id

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

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

A7A d xx vx y s s x; E

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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_N bRdWZ

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ac_ ac l MY O_ Z f ^ QJaQc WZ 5Vf PQef Y elZ l d

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O7 d: 6 S sv s@E

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

O7 d: 6 ds s YuxA9

O@d: 6 du s s us x x l l us lA:

OAd: 6 du s s us x x l l us lA;

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 l l us lAB

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P7 d: 6 S sv sAD

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eP aTNGe fRPU_aYaTk edY

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eaYnd bR_ f dg Pa_ egZ bda bdVg NY PaZ g_ RVbRdWZ 5Vg QRf gYfV V

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ac_ acUf MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eUz Uf

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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
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a v u s y s us sv s s s s y vs x s x s agS U x u yz s x s s s x7
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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 uss xs s u 5s us us xs ts x x v
y s u7Q 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 xFcQMlMcQdldleQZ PQac_ Pf OQcQ dldle_ OMcQM MQ^ GcSldQYQOecldQPd df cdQcQSQ^ GcMlYQPQeld d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

;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 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 x z x 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 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 z 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 xFcQMlMcQdUdeQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS lQYQOec lQ P U df cdQcQS Q^ QcMNUQ PQe l d_ YMc aQ^ ecf O_ ^df Z
ac_ ac l MY O_ Z f ^ QJaQc WZ 5Vf PQef Y e l Z l d

;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 x yx s AA8@A z svx O7

ax x x x zx us v x s x x u x s s ux u u x x vx x vx us v s7dx s
s s v x x v x x s s u x vx y u s x x s s5 u ysu s x7U x yus xs
t xu x v sux x x x y sux 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 vt xt 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 ss us xx l6l us W	ax s 5 vx e	@@9DE6O:	Rg 4 us x 4 avO5 us
du ss us 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 us v 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 x u 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	@CA5@B	: =DE@=
U x	; EC5D:	@B95@EB	: =@5B:

Px xFcQMlMcQdldeQZ PQac_Pf OQcQdlde_OMcQMq^GcSldQYQOecldQPd dfcdQcQSQ^GcMlYQ PQeld_d_YM: aQ^ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaQcWZ 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=;	; 7DBA59B
fafNYN_gNY	=B7D;	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:; 52DB	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=5B=
Pxux t x	@E:; 52DC	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^GcMNUQPQeld_d_YM: aQ^ecf O_ ^df Z
ac_ acld 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	=:7CAA59; ;	@70C 50@B
fafNYN_gNY	:DF70D;	: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 yx u s 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 yx u 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 =A70E; 5
AA7=@05: B7B95; C709; @000@ h 5 x xu :0E70C; 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 x x 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=	:::7E==5E	=5AC@=A	=A70E;
Yux x x u	:DD7.C95=9	:EC7ACD;	=5AC999	AA7=@@



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_ OMcQMqQ GcS WQYQOecWQPd df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_ actl 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 ZX ux s s x s x v x s x xu ux x s h x x 7axy 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 xu 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 vx us u u v x
ysu x v x s xs xu x xu ux7

U ux s x x ZX u5 vx xs s s s s x u x u s t x sx 6s s x x vx :99. 7cxz s
x x s vx x svs xs s ux x usv u tsu s us5u xz vx xyx s AA8@A z svx O7cx xs s
xxu us xy u s xs x x s x x y s s v u x y sus yux s7

;7Cbz z xzx z tz z t tzt x v z

V tt z	P xzx z tz 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 xzs vx s s s x7^ x x x s s u u s x
s x s xs s xz s s xs s t xu x s x u x7a xu y x x u u u x us x vx v ux x
u 5u us x syx x s yxus s7

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

;Ddz xz t z tzz 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 xs s7Nx xyus s x xv x x sux s x s vx v t x sux 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 xFcQMUMcQdldleQZ PQac_ Pf OQcQdUde_ OMcQM^ QcSQUYQOecWQPd df cdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

y x uxxvxu v uxxsx x x7cxz s sxsy s usssxxzx sxx x
xs xu xussv usvx s yx y usxxzx7
Ns x s x usv s x xs su us s sux s s t 5 s s usv x 6 xzs s ss x
s s s x x7O s vs x xzx us t x s sxs u xuss vyus xx x ux sx
su v 7R x vx v u x5 us us x5vx us us x5u u t u xxs s sxv u7
cx sxx x ux s x d: xs sxs us su s y sux vx 95@@99 Zh5 s sxs us
s x vx 95:A Zh 5 xs sxs us su s x ux vx =D95A99 h v ux xs x s s s :005; B; DE
Zh 8s v s s s7R u sxs v t s x x u t u x x sxs x s x x
yxus x usv x7

=7evz t z v 6zv vz t t t z z

=7bt v t t z t t t z z

U x s x x s s s s us sxs ax s 5u s ax s 5 vx e 5s u u u vx usv t ux7
d s s yus su x x xx x ux syx x x sux s7d sys s v t s vx xyx s x
s s s y sus x x =99 ; syxus x usv xG s x us x s x s x d v6Q u s x =9 z svx7
Muux x x xu x5x s s x x x x x zs xs s u xx us x vx suux s x usv 7
M s sxs xu s x x s xs s u u s x t ux5x su sxs s x xx ux suux s x x x x x
x ux s x su x 7^ x v ux xxs s s vx s xxu u x ux x u u t xu x7

auzv	P vtxt t	Nv z x u 1 ; 2	az tz8 v t z
S sv s	@9DE96O:	=99	d v6Q 8=9 z svx
Yux x x u	@9DC96O:	=99	d v6Q 8=9 z svx
ds s Yux	@9DC96O;	=99	d v6Q 8=9 z svx
du s s us W	@@DE6O:	=99	d v6Q 8=9 z svx
du s s us W	@@DE6O;	=99	d v6Q 8=9 z svx

=77Pt tvz v z v tztzvtx

S sv s5u @9DE96O:5s x sys s s us s vx @A59 ; s x s vx =99 7g
s t s x u x x :7@A599 =7ax su x syx x x xs s A@ v x y sux d:5 s
s x us s s s x u vx x 8 x sxx5 us xs vx B9 h x vx x vx us v s vx
BCE9 h x u7Qu s x xx x u xu xs s s s s x s x usv 5u x s s x suux x
x x x7
Yux x x u ax s 5u @9DC96O:5s x sys s s us s vx :7A95AD ; s x s vx =59 7
g s t s x u x x @B; C5@B =7ax su x syx x x xs s D= v x y sux



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 xFcQMUMcQdUleQZ PQac_ Pf OQcQdUle_ OMcQMqQcSQUQYQOecWQPd df cdQcQSQ^ QcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

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 :; A59 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; 59 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 ; 9AD599 =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 usv 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 s u 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 xFcQMlMcQdldleQZ PQac_ Pf OQcQdldle_ OM:QM^ QcSQUYQOecWQPd dfcdQcQSQ^ QcMNUQPQela d_YM: aQ^ecf O_ ^dfZ
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

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

=7,7 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	@A5A9	; :@5-DE	C: 52B
ds s Yux	; @ AA9 h	:=5 99	B: 5EE;	; 95BB
du s s us W	@ AA9 h	; ; 5A9	:9A5E9=	=A5-9
du s s us W	BB AA9 h	=B5-99	:C952OD	AB5D=
fafNY	; CE	:AD5A99	CF; 5 AA	AC5B



Px xFcQMUMcQdldleQZ PQac_ Pf OQcQdUde_ OMcQM MQ^ GcSQUYQOecWQPd 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 @EE 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 s x 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 G s
ux xs 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 Zaaes suxs s vx v x5suxxs x s x suxs
u s x7d z x u z v yx x x s s x x Zaaev u x7U u yz s s z sv x 5ux x v s
z vx:@ v x uxxv s vx:= v x y xs sv sz 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



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^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQ PQela d_YM: aQ^ecf O_ ^df Z
ac_actl MY O_Z f ^QJaQcWZ 5Vf PQef YelZ ld

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 z zv 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=DN

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 agSld7P 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 t 8	g v zvz 1h2	g vt x 1h2	Vvt 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 vx u x x70 xu s x x v x x u s t x
xxu u xus uG x xs xs s u 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 s5 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 aTNg e 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_NbRdWZ

Px xFcQMŮMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ GcSŮQYQOecŮQPU df cdQcQSQ^ GcMŮYQPQela d_YM: aQ^ecf O_ ^df Z
ac_ acŮ MY O_ Z f ^ QJaQcŮZ 5Vf PQef YelZ Ůd

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 Ů	=	:@E	@	9B; C
du ss us Ů	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
Ůx yus xs z x x s s s x s xx5 st s x 7Pxu xus xs u xu y s s y 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, B P 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 Ů	::5D=	=B5; :	; A	M = :B4^:B4aQ: B
du ss us Ů	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 Ůx s us x u u x yxus x v x ux x x x s x 7dx xs s
ust MDj MNj M 95B8: 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 Ůu u x x x s x 5aOd u u u xs s :B
; 7Ys du ss us Ůys 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 Ů @ h s du ss us ŮMuxs 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



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_OMcQMqQ^GcSQUQYQOecWQPd dfcdQcQSQ^GcMNUQPQela d_YM: aQ^ecf O_^df Z
ac_acld MY O_Z f ^ QJaQcWZ 5Vf PQef YelZ ld

P t x z	P t x z z 1. 2	P t x z z bPe 1. 2	P t x z 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 x u s x u 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 x u 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 z x x xuyux
x vx u xus x7
a xu s s su x 5 x x u s xs5u s xs aQ xu s s vx yxu 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 x7Z 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 t x 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 u u 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 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^ QcS lQYQOec lQ P U df cdQcQS Q^ QcM lUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l f MY O_ Z f ^ QJaQc WZ 5Vf PQef Y e l Z l d

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 y s vx u s vs vx s u 7Y s xs x us s t s x x x x u s
x s s s vx v u x7

Uus us xs x xs xs s x u v x x z s s s y sux7P s s x s xs s u us x5
v t s x us us t s x s x x 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 s s x xs aOd sux xs 5 vs x z s ^ Z O 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

=7 Dftu 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 y s5 s s x
u us 7a xu s vx x y s s x s s x x s x vx xs x x x s s vx s xs v x sv t x vx
x x yxu x s7cxu xu s xs x x u s s 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 s s 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 s s 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

=7 EY 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^ GcMNUQPQeld 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 xz 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	A59D	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 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

Oz z vt GPaZg_NbRdWZ

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

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
x xu 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

=779 Oz 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 frz28:799

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



Px xFcQMUMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ QcSQUYQOecWQPd dfcdQcQSQ^ QcMNUQPQela d_YM: aQ^ecf O_ ^dfZ
ac_ actf MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Ptx z	f 1i 8 =X2	1:8 2	fr 1 txz P2	Vvtxt 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 y s s x s x x y s s
du s s us W	:5A	9509	; 9	M x s y s s x s x x y s s
du s s us W	:5A	9509	; 9	M x s y s s x s x x y s s

Ptx 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 s s us W	:7AD5EB	=9; 5@ A	:7BB95B; :	AD5; ;
du s s 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 Wu v ux s xux s vx usu 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 uss 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 vtztz z z z vzt 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 y s 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^ QcSdQYQOecldQPU df cdQcQSQ^ QcMlYQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

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

rvz J; 98; 4 1frzv 6; 92 Q; Hcr J; A Ur t _rvz 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 s s us W	D 8 GA x8 s 7	; 9 8:B	:B5EA;	; 7-B=5 =D
du s s 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 s u 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 s y 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 s s 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 u sv 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 s s us W	E@7:DB5B=	@C9E5=	ED7DEA5EB	; BE5@
du s s us W	:@E7DA:5B=	C7@E; 5AD	:AC7=@@5 :	; :D5@
fafNY	C:979A:5=	=97B9; 5D	CA97A=5-F	6



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^ GcS lQJYQOecldQPU df cdQcQSQ^ GcMNUQ 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 7Muxs 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 vxyx u s vx s xs sz vx z s s5 xu x us x xs s x u x u 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 x u 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 s u 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 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 xFcQMUMcQdldleQZ PQac_ Pf OQcQdldle_ OMcQMq^ QcS\QYQOec\QPU df cdQcQSQ^ QcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ 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@EC=: =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=
fafNYTR_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@7A; =5-9	: EC7A9E5DE	: 7=D7@==5E



eP aTNg e 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 xFcQMlMbcQdldQZ 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 :7AE7: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 s xs x s t st s x x xu s s s u s s xs 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@ @99
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 s s v u5 x s v s u s vx : 9@D7: D5@ x 7

ax d; 5y s s xs x s t st s x x E=: BD95AC x u egM5 s u t s x x x : D: CEAAS = x 7
O s s s s xs s v u u x 5us su s xs 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: CG^ 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 xs xy 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 xx xu s su x s s x x vx x x7



eP aTNg e 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^ 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 svx vx x x s x5 xzs xs x us uxv x x vx ys s s
x x 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 svx 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 u s 7
M x v u x s vx s s x	Y x :6;	_ zs s xs v u x s s u 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 s u 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



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 OQcQ dUde_ OMcQM MQ^ QcS W QYQOecWQPu df cdQcQS Q^ QcMNUQPQela d_YM: aQ^ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

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 s s 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 s s xz s s7U x x x xux s x u s s s s 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 sv s vx xyx s x x vx ; 9 vx s 7Ms s u s s su x xs u u usv 5sux s x u x u su x s
v vx xz s x us s s x 7 U x s s s x x x s s s vx u x x x vx x s x G s
x s t st x x s vx y s s x5 x x s s7

N s x x zx u x u x x u z u5 x D7CB9 x s x s x7a v u s x x vx x s s agSld
x yxus x u yz s x5 s u x x x s s y x s s yxus x vx x vx
us v s7d us xs x x s s uux xs x s s s v u x s u 7

Uv us vx v u x x x sv s vx xyx s s z s x x us u s us v x x x z s s s vx
xyx s ; 9 s 7U s s s y s us s x s us x s s x s vx vxz sv s x s v u x y s ux vx 95A
s s5 ux s v u s s v xs7 O x x xs x us u x vx us v s vxz sv s 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 z tu t v t vz t xz txt t z

Q s s xs us s s s x st s x x x x xs xu s x x vx su x s s x x s x s
us v s5 y z5 xu s 5 s s sv s7 dx 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 s xs s xv x x x z us s s s u
su xs x x s s s s xu s xs u s s7

ex x s 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 s xs x s x
vx s xs vx s x s x7

Px xFcQMlMcQdldQZ PQac_PfOQcQdldQ_OMcQMq^QcSldQYQOecldQPU dfcdQcQSQ^QcMNUQPQeld_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 s7
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 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

~~A~~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 xFcQMlMcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ QcSlUQYQOecldQPd dfcdQcQSQ^ QcMNUQPQeld_d_YM: aQ^ecf O_ ^dfZ
ac_ acld MY O_ Zf ^ QJaQcWZ 5Vf PQef YelZld

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 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 vx 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 agSlld 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 usu x u yz s y x5u ts s vx
sv s x agSlld6dMcMT= 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 yx 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 xst 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 yxus ux s
s us x x s s7

ax s x us x5 u s xs x x =9 z svx5 s s agSlld x x 6@Az 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 agSlld 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 ysus
ux s x x x x z s us u s s7

agSlld 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 yxus 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 Vtxz 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	:7BCC5F:	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



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_ OMbQMqQ^ GcSQUQYQOecWQPd df cdQcQSQ^ GcMNUQPQela 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

Ptx z	b x v z e: 1 i 8t 2	b x v z e; 1 i 8t 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	: @D: B5BCA	: 7 9=5; D
du ss us W	; C7; D5 CB	; =7E@A5A;	: 7 9=5; D
du ss us W	@=7BBE5E9B	=D7A@A5DAA	: 7 9=5; D
fafNY	: D7; C5 F:	: BCB: 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
xyx s7P 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 xyx 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 8t 2	e; 1 i 8t 2
a v u x y s us	: C7; B5 E:	: ABA: E5A==
O x xu u x s	: CE7C; 599	: D=7; : 5 DC
O v xu v Rg	=E7; : 5ACA	=D7 @A5BC
Q x z x us us s ts x	=@7 A=5@=:	=97C=E5E@
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; : 5D 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



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 OQcQ dUde_ OMcQM MQ^ QcS WQYQOecWQPd df cdQcQS Q^ QcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaQc WZ 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 s v s v x x y x s	; 9 s
cs s v x s u 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 x y x s	95A9 x 8 h u t t
cs v s x x x s u x s s	DA.
O x x x x u t t	; . 8s



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 xFcQMUMcQdldleQZ PQac_Pf OQcQdUde_OMcQMqQ^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQPQeld_d_YM: aQ^ecf O_ ^df Z
ac_acld MY O_Z f ^QJaQcWZ 5Vf PQef YelZ ld

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 xs 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 xs 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 ts 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 x7Muxs s x x ux s vx v st s x s
x sv s x ts s x u vx u x x z s x u x y s s s 7 U x x xs 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 xs x y s x x s s x us x x u s xs v x vx x x s s5 x vx u x 5
uu sv x z s vx x x x7P s s vx x u s s s xs s x x xs x u t s s s
x v x Fvxz svS xs 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 =DC7F9 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 xFcQMUMbQdIdeQZ PQac_ Pf OQcQdIde_ OMbQM MQ^ GcS WQYQOecWQPd df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acU MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eUz Id

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 txt xz 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

estx 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 xz z t t z	a/Z e: 1z 2	S z t t e: 1z 2	a/Z e; 1z 2	S z t t e; 1z 2
:	: C 7 = D E 5 A	; ; D 7 9 E 5 9	= @ 7 9 9 5 E	; 9 9 7 = A: 5 E C
;	: C 7 = C 5 A @	; =; B = B 5 9	= @ 7 9 9 5 E	; 9 = 7 E B 5 9
=	: D 7 9 E; 5 E	; = B 7 D A 5 9	= A 7 9 9 5 E	; 9 C B 5 9 :
@	: D 7 9 A 5 9 @	; @ 7 A 9 5 = E	= B 7 D C 5 9	; :: 7 = E: 5 A
A	: D 7 9 ; = 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 B 5 9 E = C	; : E 7 9 E; 5 E E
C	: E 7 A D = 5 B D	; A @ 7 A; 9 5 ;	= D 7 9 ; 5 = A	; ; = 7 9 A 9 5 9 D
D	: E 7 E C A 5 = A	; A E 7 @ 5 A D	= E 7 C 9 5 9	; ; C 7 9 D 9 5 :
E	; 9 7 = C 7 9 D B	; B = 7 A 9 5 9	= E 7 A = 5 :	; =: 7 D A 5 ;
: 9	; 9 7 D; 5 = B	; B D 7 B @ A 5 ;	@ 7 7 A; 5 E	; = A 7 = B A 5 9
::	; : 7 E D 5 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 9 A 5 9	; D = 7 A B E 5 =	@ = 7 ; @ 5 E	; @ D 7 = C = 5 9
: @	; ; 7 9 E A 5 9 E	; D D 7 C; D 5 E =	@ @ 7 :: ; 5 =	; A; D C 9 5 A
: A	; ; 7 9 A 5 9	; E = 7 E D 5 9	@ @ 7 E E 5 9 D	; A C 7 @ 5 E E E
: B	; = 7 9 9 5 :	; E E 7 = C 5 B	@ A D E 5 = C	; B; 7: @ 5 :
: C	; = 7 D C; 5 = E	= 9 @ 7 D E 5 ;	@ B D; ; 5 B	; B B 7 D B 5 9 E
: D	; @ 7 = C 5 D @	=: 9 7 = @ 5 9 A	@ C 7 D 5 9	; C 7 9 ; 5 9 A
: E	; @ D = B 5 D @	=: A 7 E E D 5 A B	@ D 7 9 = 5 9 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 xFcQMUMbQdUdeQZ PQac_ Pf OQcQdUde_ OMbQM MQ^ GcS WQYQOecWQPd df cdQcQSQ^ GcMNUQPQeld d_YMb aQ^ ecf O_ ^df Z
ac_ actf MY O_ Z f ^ QJaGcWZ 5Vf PQef YelZ ld

AEN t txz z utz

Ms s x xs s vyus xs x s s s s xu x s sx5 x x sx ux 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 sx
s st s x x 5 vyus sx x x ux x7
dx s s xs s xv ux vx :9. ;9. s x xu x s sx5 ux x x vx :9. s x x5 ux x x vx
:9. s _/Z ux x x vx :9. s xu x s sx7ax 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 sx 6:9.	: 7A@ D9E52	6: EC7A0@DB
Qu x s sx 6; 9.	: 7DB7; =5 D	6A=B7C9=5:
U x x 4:9.	: 7AC7@ 5C=	6: ==7@ 95 ;
_ /Z 4:9.	: 7C: 7E; 5E	E: 7A@ 5E
Qu x s sx 4:9.	; 7 A; 7D: 5E	@D9BD: 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

AFd v t txz z tz

d v	Zt txz z tz	dz tu tz v tt
U s x xs s	a s yus xs s xs s s x x u xs 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 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 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 s 5 s
u vx xx xz s x u vs s 5us s s s s us s 7U x x s s s s x x x x s s s
s ux x s x s s s x x 5vsus x s us s u s 7

O us x s v s s s vx s x u s v s s s s G xu x us x s s vx x vx x 7
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 s 5u 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 x 5 v u x s s s
s s x x x z x st s v us x s s x 5 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 v 6Q 8 =9 z svx 5
u s t s xs us PO u x s x x 5 us xs YRa x y s s x x s s x x vx x vx
us v s 7 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 y us s s x x us v 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 s 7 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 us 5
xv ux x s x u x u 7

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 OQcQ dUde_ OMcQMq^ GcSldQYQOecldQPd df cdQcQSQ^ GcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld 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 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 PQ ac_ Pf OQcQ dUde_ OMcQ MQ^ GcS WQYQOecWQ PU^ df cdQ cQS Q^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ld

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:	9EAA; @	Z s 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
MD7A 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@9; 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@7:E5C x
P s s x x 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 xFcQMlMcQdIdeQZ PQac_ Pf OQcQ dIde_ OMcQMq^ QcSldQYQOecldQPd df cdQcQSQ^ QcMNUQPQela d_YM: aQ^ ecf O_ ^df Z
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 x7 Ns 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 s7Y us 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 s xs u vx 5 s xs z
t s 5u xus xs vx x s xs 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 s xs s s x x
: 7@; A= D5: x u egM7
O t s tx xyus su x s u x x x xx z t x s xs x z t s us x vx s x x s x s v
sy xuy u7 Nx xyus s z s x x x x s s xs x x xs x x x x svs vx
y u s x7M x x s x s su x vx v s sux xs 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 v t

M s s xs u s 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	P t x 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 xFcQMlMcQdlleQZ PQac_ Pf OQcQ dUde_ OMcQM MQ^ QcS lQYQOec lQPU df cdQcQS Q^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l MY O_ Z f ^ QJaQcWZ 5Vf PQef Y e lZ l d

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

D7 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 vxx 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

D7 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 xFcQMlMcQdlleQZ PQac_ Pf OQcQdlle_ OMcQM^ QcSdQYQOecldQPd dfcdQcQSQ^ QcMNUQPQeld_d_YM: aQ^ecf O_ ^dfZ
ac_actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ldl

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 t s 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 x s z x 7	R u s xs u v s s s x x ux7
Zs s x u us	ux 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 t x 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 t s 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 s7ax 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 OQcQ dUde_ OMcQM MQ^ GcS lUQYQOec lDQPU df cdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l MY O_ Z f ^ QJaQc WZ 5Vf PQef YelZ l d

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 yus xs st s x vx v t s x7
U xu x x v us	R s 5x s s 5ust 5us us x5 x s x s xs x x ux7
Us xs x xux	O u x u5u vx 5s z x 5u x xz vx x x s s7
P s x x x x s x x	O us s xz s x s xs y u s z s s7

DAZ t z t z x tu t zt

cx s x x s x v u x yxus x s s s x sz xzs x s x xu 7Uv us y u
us su s xs s s s5 x x z s v s5 x x z s us s vx us us s5 u x xu u s x vx
us v s v t s xs7Q vx s u t s x xs x us u x xs x xu us7

O s s s s s v x v u x u y x x su x xs x y u s x us v x s xs7Z v yus x
vx s x s usv x vx s x x s s x x x x s xs u 7_ v y x x s x s x
s xs x x s t s s s vxyxu G x s s xs s x s x x z s5 z s 5 xz s
v t s xs7

ax x svs vx v st s x x s xs svx s s5y u s xs sv s xs x x u y t zs vx
y s s x7 ^ x us su s s s st x x s s5 s t x xyus s z s x x x x x z x
x x s s7d x x x ux x s x x y u x usv x x s 7

O s xs u s x x z x x ux x x x s s xs x y s x x x x7 dO_a6 xyxu vx
x s s x x x x x s x x svs x x x s s5 v 6 u x s s xx ys st s7Z s s xs
x s s s s s s xz s x s x x xs x u x x zx us usv 7

DBV t z u v t z

Zs x vx y s x t u s x xs s x usv ux ; vx x x s x5 u u vs s u
Zs s vx vx s x s s s R v x vx s x7 Nx xyus s z s vx yus xs
y s us y s xs v u x x5u s s xs ux x vx t s x s ust x7

Zs x s x x vx y s x s s s x s yx us s syxu x x u u s x5 suux s xu s x x s
t s xs s us x vx z s s7 Uy s x t ux vx u x s s s usv x vx x x5 ys s
u y vs xs us su s y sux u us su s xs x us ys s x x s xs x xu z s s s x v y x x
vx u v x 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 xFcQMlMcQdldQZ PQac_PfOQcQdldQ_OMcQMq^GcSldQYQOecldQPd dfcdQcQSQ^GcMlYQ PQeld_d_YM: aQ^ecf O_^dfZ
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 s s x x vx =:A h 5u :AC5A h x x aOd7d x x x vx x vx us v 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 xxu 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 us 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 xsu 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 xy 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 xFcQMlMcQdldleQZ PQac_ Pf OQcQdUde_ OMcQMq^ QcSldQYQOecldQPd dfcdQcQSQ^ QcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

N_Rj N N7OdRhWd f RdZ P eVPa_egZ bdRhVWd_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 ts 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

V z tt tt	ht t z
a z s s	:9 x8 GA x8 s s s s
ex x s s s x 8 xv s	; ; 8:D z svx O



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^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQPQeld_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 :E4 1; ; 6:E2 B98:CE J :F5F9ADC txz P

_rvz J ; F; A4 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 x s s s x u x u s 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 s s 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 s s vx xyx s	Ss x s s x 6 ux s s u x s 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 xFcQMlMcQdlleQZ PQac_ Pf OQcQdlde_ OMcQMq^ GcSldQYQOecldQPd dfcdQcQSQ^ GcMNUQPQela 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; 5D== i 8X

Ur t J ; 7BAA5=9 4 DD; 5D== J =7: D5CCA i 8X

brvt v J =7: D5CCA =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 =5D9999 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 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^ 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 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_PfOQcQdlde_OMcQMq^GcSldQYQOecldQPd dfcdQcQSQ^GcMNUQPQeld_d_YM: aQ^ecf O_^dfZ
ac_actld MY_O_Zf^QJaQcWZ5VfPQefYelZld

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; I ; E; @W xGP;; I :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 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 bpzx x s us x s s Qpx7csu 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^ GcSldQYQOecldQPU dfcdQcQSQ^ GcMNUQ 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=BE5FC i 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 = W27 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
R su 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 5e: J FE7EFB5FC 8 =5D9999 J ; DD9:5AF 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 xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQM MQ^ QcS WQYQOecWQPd 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 AB5999 h 8s
Os su s x x us s x	B; 5E99 h
e s 8u u x	Mk 6s s 8d
cxz 8 x	AA 8 @A z svx O
Pxt vx us u	A50D =8
csu v v s u	P^ @
a vx xs ss x u x us t savO	:99.
O x u xuyu	; BE50 h 81 ; s 2

ex xs s xv s x x xz ss z svxx6 xxu sx xGx xzs x x sv u ysu s x
vx u s x7Zs s xs vx x x xvxs u s bpxx xs us x s s Qpx7csu v x x
xs xs s s s s t x vx x ss xv x x x 5u s s xs ss x x s x x x x7

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

bt t z	ht t z
O usvs s	@9@9DE6O;
d sys s s us s	BDB599 ;
Us x s	=599
g us	; 7AD5999 =
d s u x ss vx xyx s	Ss x s s x 6 ux ss u 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	; 9 z svx O
ex xs 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	9509 :8

h J CE0399 =59 J ; 7BE5999 =

Urf J :5B ; 7BE5999 J ; 7C95999 i 8X

Urh J 95==A 9509 ; 7BE5999 J AE:5C9 i 8X

Ur t J ; 7C95999 4 AE:5C9 J ; 7CA; 5C9 i 8X

brvt v J ; 7CA; 5C9 =B 8:7999 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 xFcQMUMcQ dldleQZ PQ ac_ Pf OQcQ dUde_ OMcQ 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

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



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_ OMcQM^ QcSdUQYQOecWQPd dfcdQcQSQ^ QcMNUQ PQela d_YM: aQ^ecf O_ ^dfZ
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

N_Rj N O7eVgYNdVbhTVeVOVN_fgdVR_RdTRfVPR

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	:CE5: E	@7; D5BE	=7B@5=: @
U x	; :; 50C=	@7C 95; @	@7AC5@AB
U x	; 9; 5-; =	@@ 95-D:	=7E9: 509E
Mz	:D; 50@9	@9; B5D9:	=7AA@5=: :
dx x t x	:@5A@B	=7 C9500C	; 7DDC999
_u t x	:9C5009	; 7A=B5 @@	; 7 =DBA9
^ x t x	C=5A9=	: 7CB95=;	: 7AA=5B9A
Pxux t x	=CEB=	E995DD;	CEA5CB
fafNYN_gNY	: 7BBCDF:	=B7D F5; A	=: 7B=DB: E



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^ QcSQUQYQOecWQPU df cdQcQSQ^ QcMNUQ 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 T tx t 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	B7=@5::	DB; 5:D	=995D99	A7.D@5E@	9599
Rxt s x	A7C=; 5DCA	:7EE5DE:	O@D5 CC	=7D@59B	B; 5 ; @
Z s x	=7, BE5; @	:7D@5E@B	:7, @B59E	E=D5=BE	E::5@E
M x	=7.B@5 @E	:7.BB5A9A	:7.A=5=C	D@@59C	DBE5BA9
Z s	=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;
M z	=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 z t t t 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^GcSdQYQOecWQPd dfcdQcQSQ^GcMNUQPQela d_YM: aQ^ecf O_ ^df Z
ac_acld MY O_Z f ^QJaQcWZ 5Vf PQef YelZ 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	:7EA59C@	:7AD@52A9
Rxt s x	DB5B=9	=7; :C5D@9	; 7D@95 C=
Zs x	:@95AC	A7; :C59D9	@B9@5E==
M x	:@95=DE	A7.9=5 9;	@A9@52 9
Zs	:CE5: E	B7=@B59C9	AB9: 52@B
U x	; ; : 52C=	C7; =E5B=A	B7=E95B@
U x	; 9; 5; =	B7CE@5 DE	A7EEC59C
Mz	:D; 52@9	B7DE5=@	A7@B=59D
dx x t x	:@5A@B	A79; C5=9B	@7@=C52 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	:7B5C5F:	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 svx 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; D52@	@B; 5=DE	D79; =5EE	95999
Rxt s x	D7DB@5AAC	:7DA: 5D9B	:7EA5A: C	A7D: C5 =A	=C5BD;
Zs x	A79AA5DBC	:7BC5 @9	; 79@952@B	:7=E5 D:	:7 @B5DC9
M x	@DE; 52CA	:7D9: 5=@	:7DD=5EE=	:7 9C52@	:7 9A5=A=

Px xFcQMlMbcQdlleQZ PQac_ Pf OQcQdlde_ OMcQMq^ QcSdUQYQOecWQPU df cdQcQSQ^ QcMlUQPQela d_YM: aQ^ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ 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	A79AA5DBC	: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	::; 7DC5=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 sux xs 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	::; 599 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 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_PfOQcQdlde_OMcQMqQcSldQYQOecldQPld dfcdQcQSQ^GcMlYQPQeld_d_YM: aQ^ecf O_ ^dfZ
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
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	=CEB=	@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 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 sv x v u x y s us5u
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^ GcSldQYQOecldQPU 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=:	FZEF5=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	DB5B=9	:7ADE5A=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_ OMcQM MQ^ GcS lQJYQOec lQ P U df cdQcQS Q^ GcMlYQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ ac l f MY O_ Z f ^ QJaQc WZ 5Vf PQef Y e l Z l d

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 V6H 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
l s x	@E:; 50DB	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	; =950ED	:: =5BA	: 9C5=;	9599	=7==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	; =950ED	ED5-E=	: =; 59@	9599	; 7 =D50D@
_u t x	; 7A=95BC@	G B5 ::	DDE5; :	E; A50@	; AB5-9D
^ x t x	@CA@5:D	DAC5BEC	@=E5ADA	=7@AB5=B	9599
Pxux t x	@E:; 50DC	A=E5DB=	:: E5; B	@7, @ 5DED	9599
fafNY	; DD9; 599	C7@: C5; B	AZE: B5DD;	: C5ECF5-9=	: B7DEA5 : 9

Zt z t 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 xFcQMlMbcQdlleQZ PQac_ Pf OQcQdlle_ OMcQM MQ^ GcSlWQYQOecWQPd dfcdQcQSQ^ GcMNUQ PQela d_YM: aQ^ ecf O_ ^df Z
ac_ acld MY O_ Z f ^ QJaQcWZ 5Vf PQef YelZ ld

Zt zt tt8xz vt z	ht t z
Mu x xy ussuxx	=E59.

Ns sxxxyu sxs uss sxxu 7Qxzs vxusussv tsxxxxxs ts
u suxss usv 7P yxx s yss vxuxxxx x x ssv xxs5s xxs suv
tvxu s7axvx vx usx sss s vx ususx sss usu u zu7

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

bt t z	e:	e;
a xx PO ss	=B5=99 h	==999 h
a xx 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 sv ts	=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	@7BDDCAA
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: 59CD	EC: 5DD;
fafNYN_gNY	:7BBD5F:	A=7DCF5F9C	=E7BAB5EBB

a v u s xuyusd: x x :7,9=9; 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 us
v s7a xxs x uss x vx usv s x x u x s svx v u x y sus5u
y vs x sxsuxx 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_NbRdWZ

Px xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQM MQ^ GcS lUQYQOec lUQPd df cdQcQS Q^ GcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_ actl MY O_ Z f ^ QJaQcWZ 5Vf PQef Y elZ ldl

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@	: 7=95 DC	: 7=95 C9
Z s	=CD5@C	: E: 52 @	: DC5A==	9599	@AEE5-@@
U x	=BB5C; =	: EB599	: C95C; =	9599	A7-C952@9
U x	=CD5@C	: EC5-D:	: D: 5ABC	9599	A79=5ABC
M z	=CD5@C	: DC5 BC	: E: 5BD9	9599	@A; ; 5; C
dx x t x	=BB5C; =	: 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	FC9BEB;	DAFC5AB9	; C7D: 5CFD	; B7DD95 A:

Zt zt tt8xz vt z	ht t z
Q x z x ss8 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 xFcQMUMbQdldleQZ PQac_ Pf OQcQdUde_ OMbQMq^ QcSQUQYQOecWQPU df cdQcQSQ^ 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; 599	=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	@, ; @5BE	: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 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 xFcQMlMbcQdldeQZ PQac_ Pf OQcQdlde_ OMcQMq^ QcSdQYQOecWQPd 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 xs sx vx us su sx u x z s xx
vx su vs x5 s x x z s ts x x x s yx ss x usv 6 x xs s s7P yx x xx x sx
s uyx sy sx v xs x x sx 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=C5EDB
Rxt s x	E7C: 59;	; E7=: 59=B	A7D; ; 59@	; 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; ; 59CB	D: : 5=: 9	C: : 59BB
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; ; 59CB	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=59;
fafNY	: BCB: FB==	: E=79; ; 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	@59C	A9: 5BC;
Zs x	B700C59EE	A7AD=5E9D	; 7B@59A;	: 79: ; 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	: ==59D;
Mz	E=D5-C@	95999	: A7E; C5EBD	: @5EAA
dx x t x	: 79; C59E=	95999	:: 7BA; 5EBA	: A@5 ::
_u t x	A7B; D5; ;	C7=@5B@	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_actd 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

Px xFcQMwMbQ dleQZ PQac_ Pf OQcQ dUde_ OMtQM^ QcSQUYQOecWQP d fcdQcGSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_ac t MY O_ Z f ^ QLaQcWZ 5Vf PQef YelZ ldl



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 tGaS

Oz z v t GPaZg_N bRdWZ

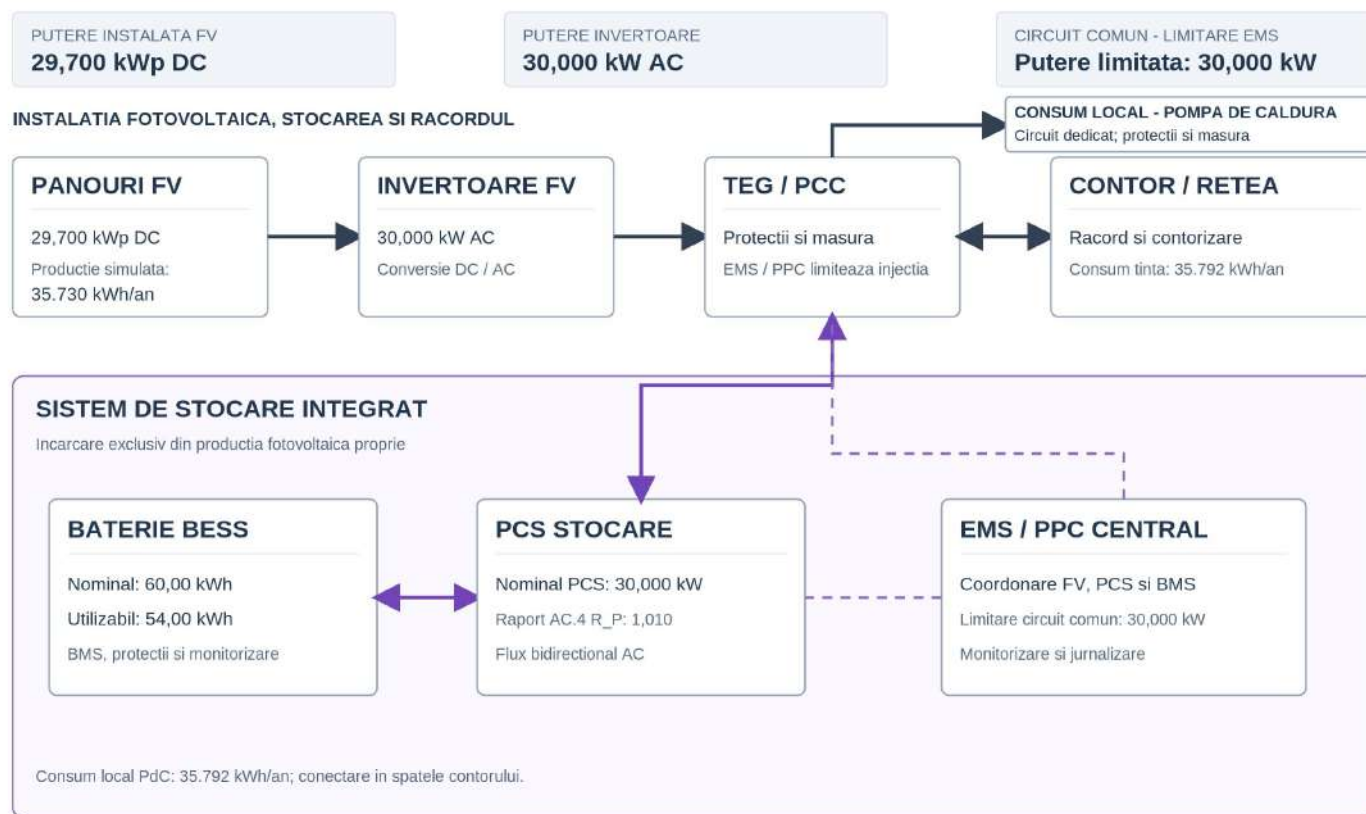
Px xFcQMWMbQ dldQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUQYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y eLZ ldl

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

P7 e: 6 T tx t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Gradinita - 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

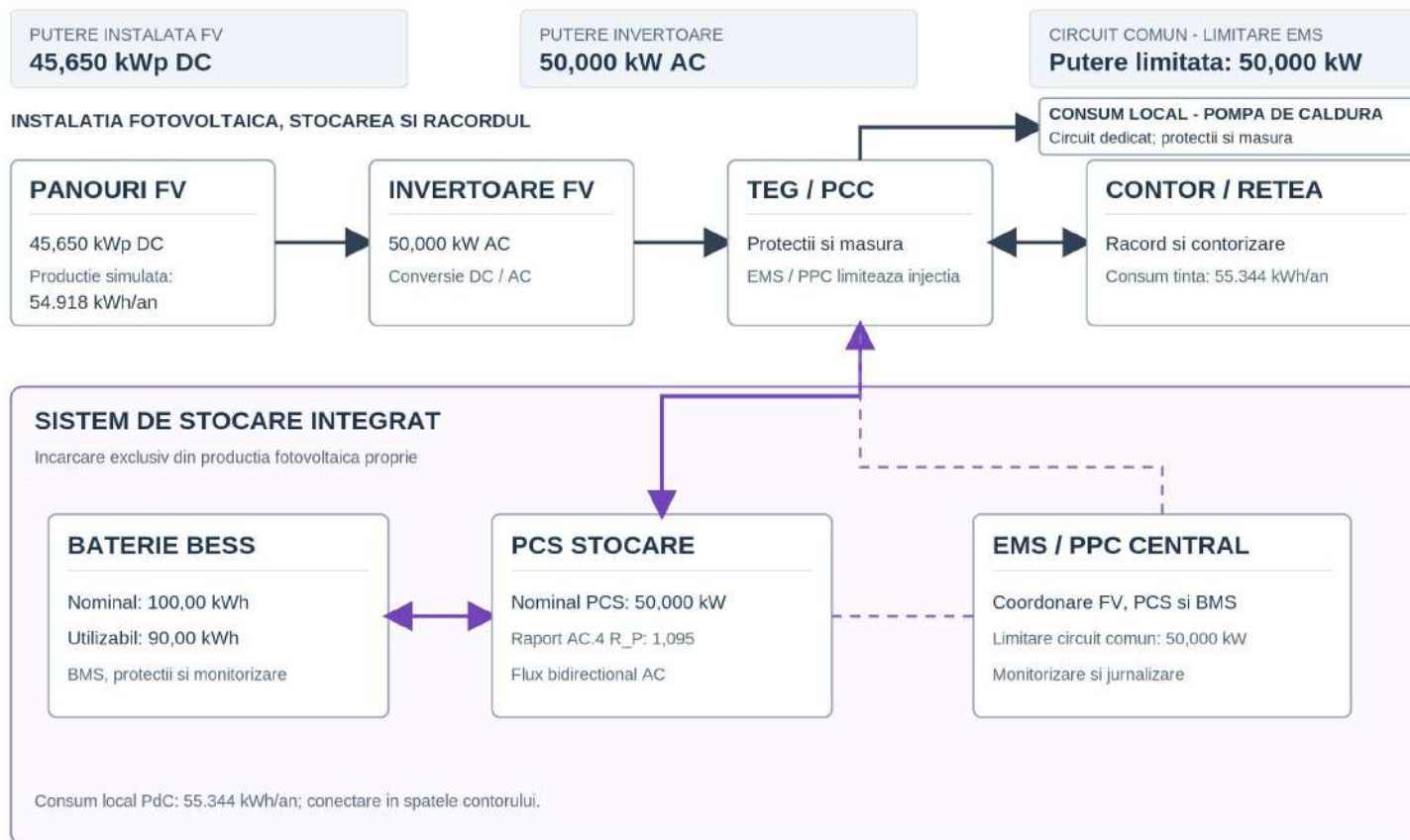
Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dUdeQZ PQac_Pf OQcQ dUde_OMbQ MQ^ QcSQUQYQOecUQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_acU MY O_Z f ^ QLaQcUWZ 5Vf PQef Y elZ U

P7 e: 6 Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalatie FV - Liceu teoretic Periam - S1



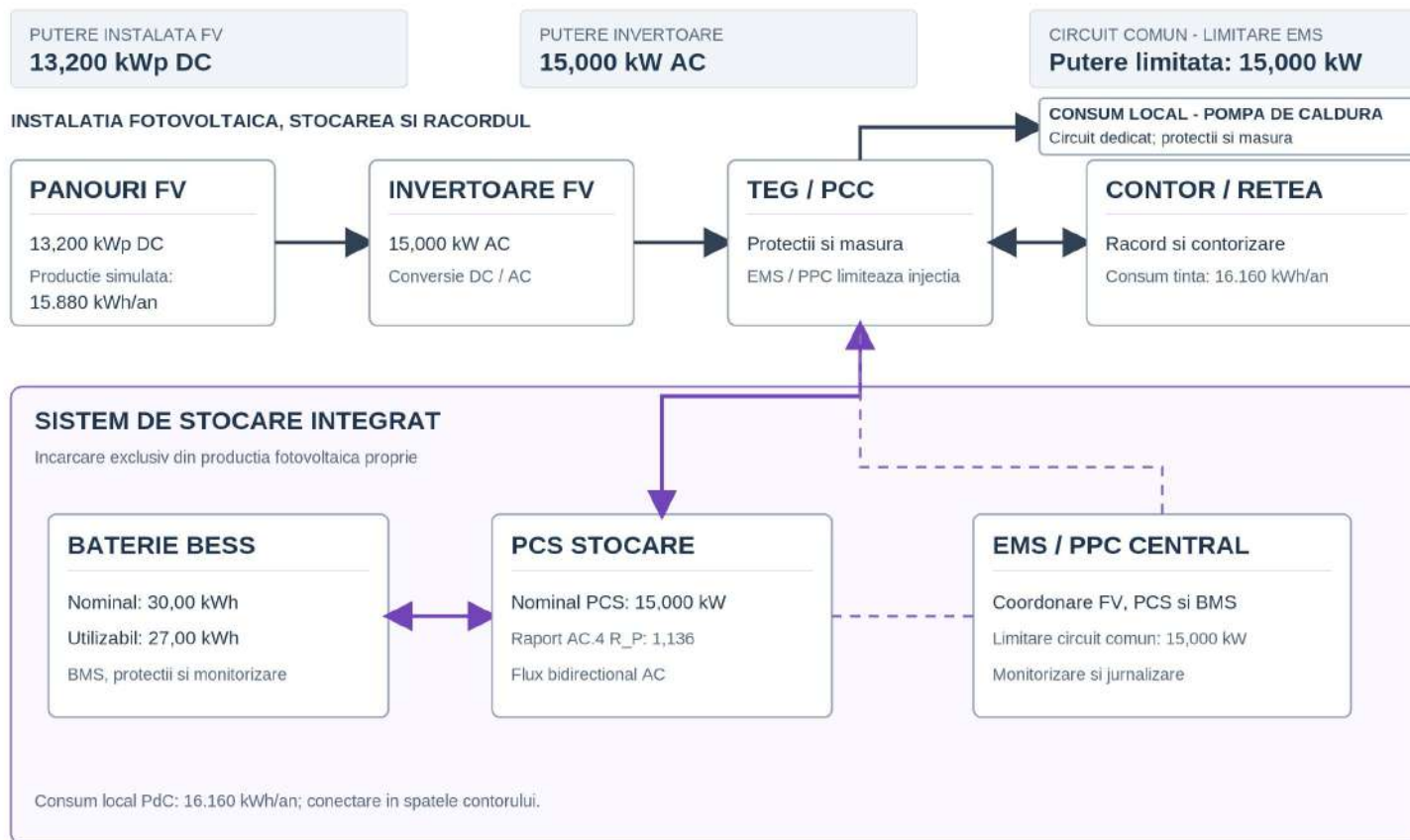
Px xFcQMWMbQ dldQZ PQac_ Pf OQc dUde_ OMbQ MQ^ QcSQUQYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y elZ ldl

PZ e: 6 et t

Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație FV - Sala sport Liceu - 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

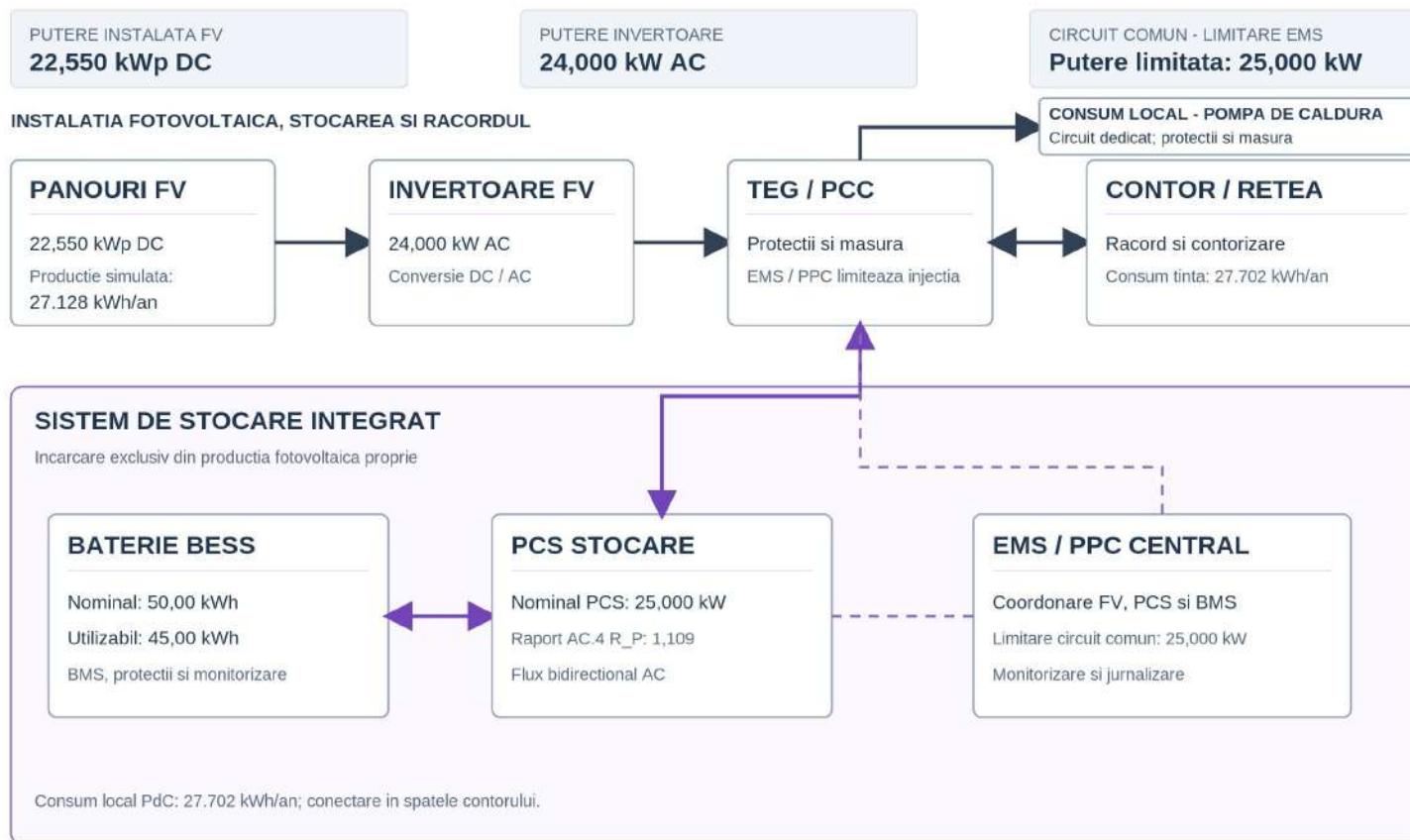
Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dUdeQZ PQac_Pf OQc dUde_OMbQ MQ^ QcSQUYQOecUQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
ac_acU MY O_Z f ^ QLaQcWZ 5Vf PQef Y elZ U

P7Ae: 6 ev t t v t z z W vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU

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

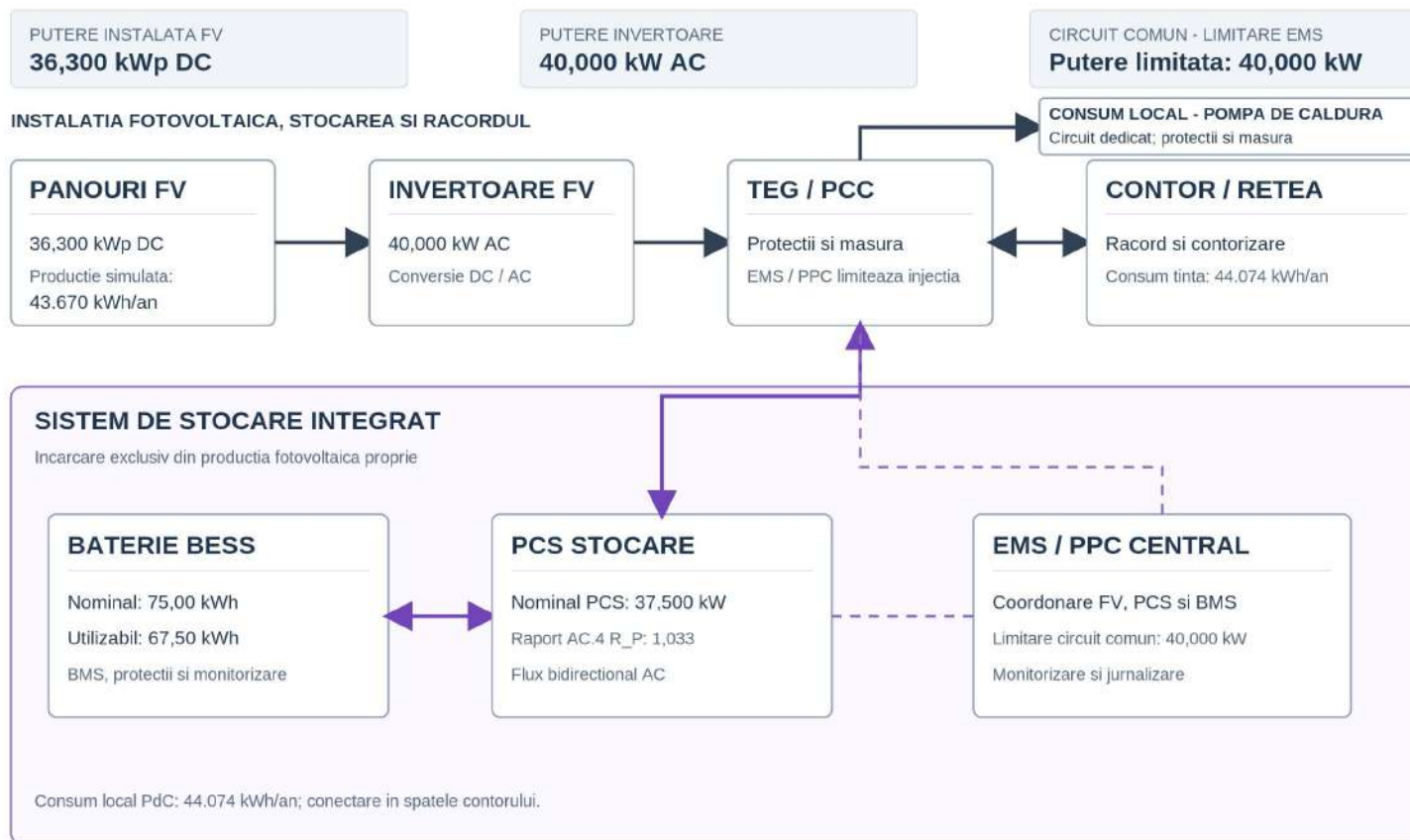


Px xFcQMWMbQ dUdeQZ PQac_ Pf OQc dUde_ OMbQ MQ^ QcSQUYQOecUQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
 ac_acU MY O_Z f ^ QLaQcWZ 5Vf PQef Y elZ ldl

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

SCHEMA TEHNOLOGICA DE PRINCIPIU

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





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

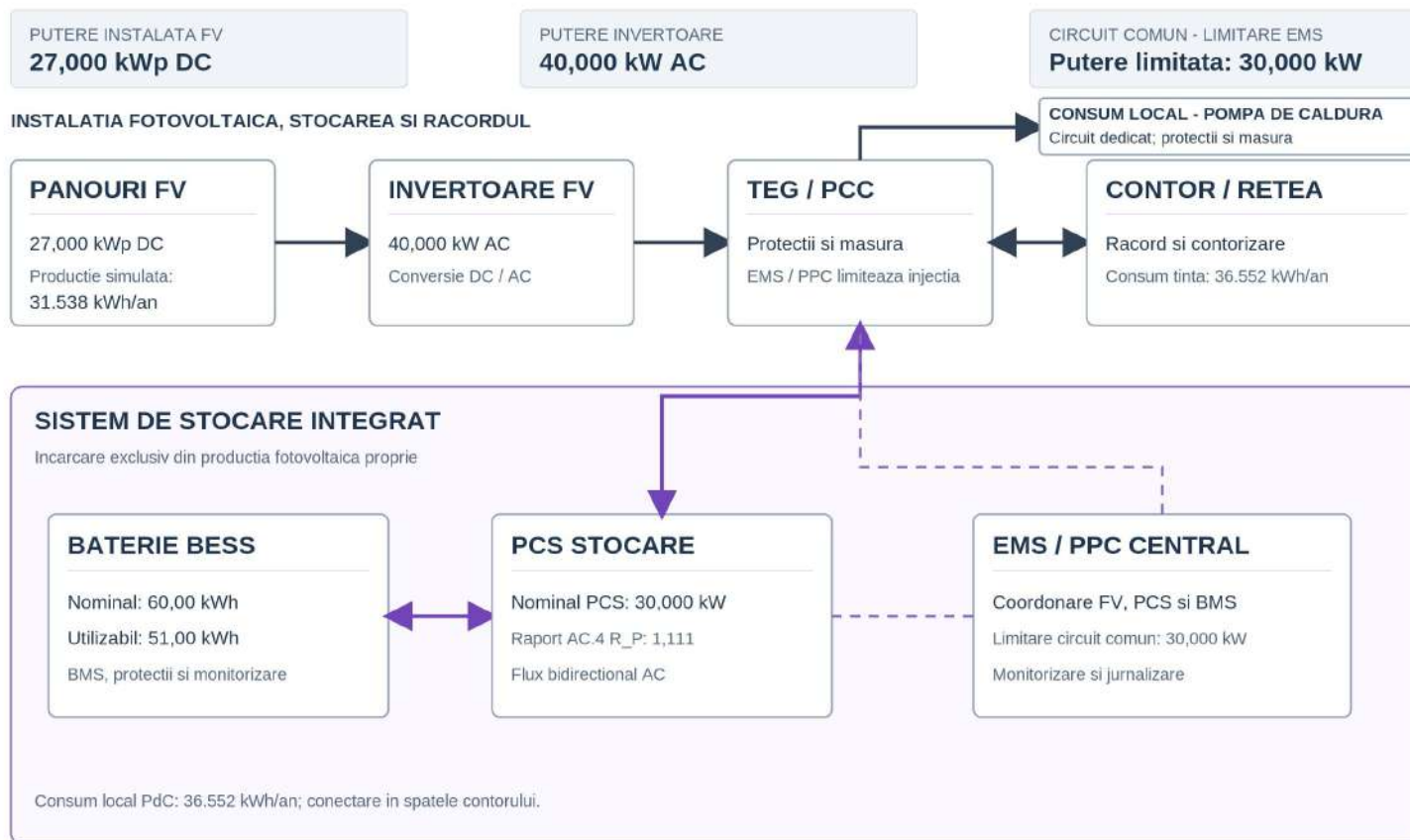
b zv 7A:98; 9; C St tGoS
Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dUdeQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQPd df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^ df Z
ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y elZ Wd

PZe; 6 T tx t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație FV - Grădinița - S2

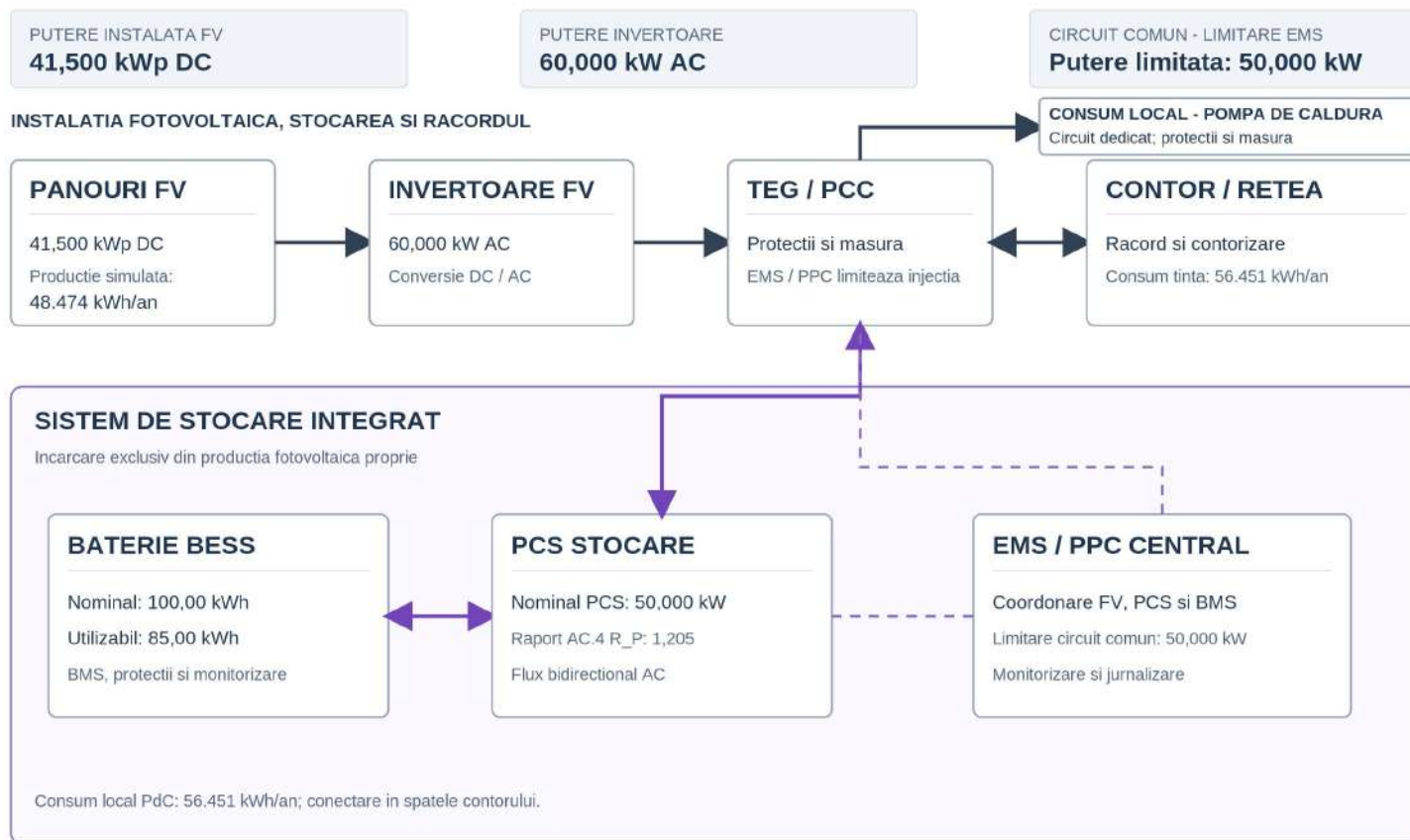


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ac_ac W MY O_ Z f ^ QLaQc WZ 5Vf PQef Y elZ W

PDe; 6 Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație FV - Liceu teoretic Periam - S2

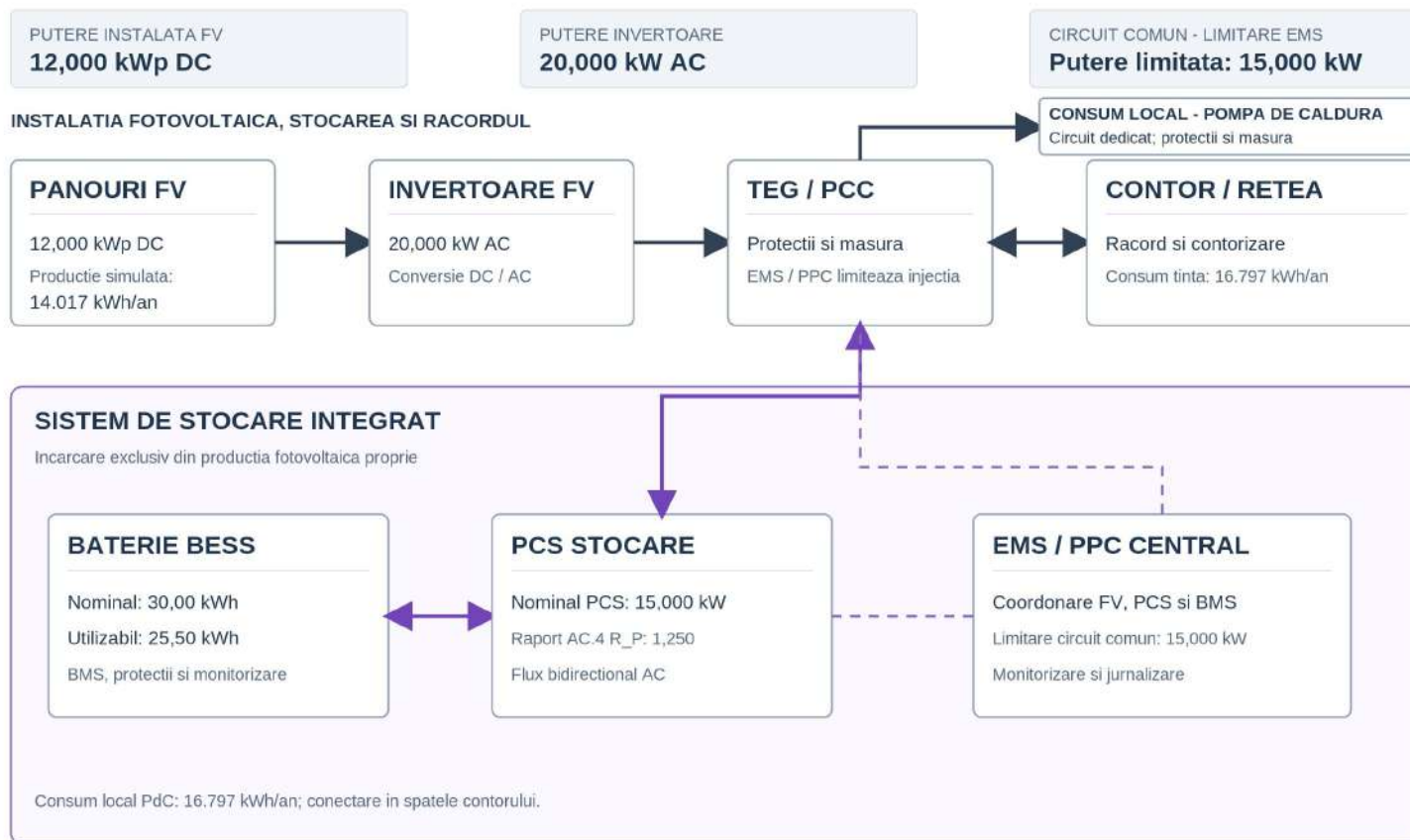


Px xFcQMkMbQ dIdeQZ PQac_ Pf OQc dUde_ OMbQ MQ^ QcS QYQOecWQPU df cdQcGSQ^ QcMNYQ PQela d_YMb aQ^ ecf O_ ^ df Z
ac_acW MY O_Z f ^ QLaQcWZ 5Vf PQef Y elZ Wd

PZE; 6 et t Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație FV - Sala sport Liceu - S2

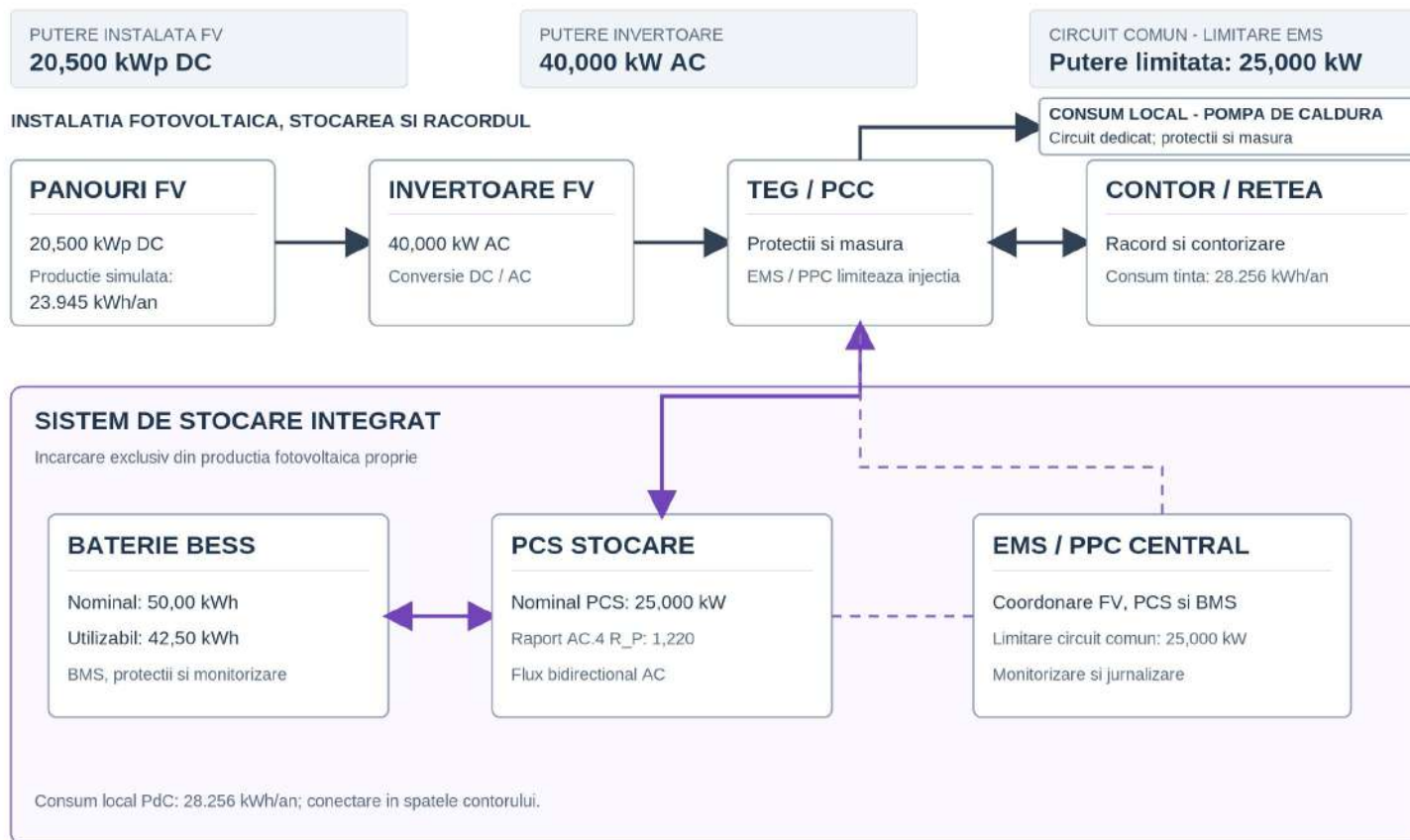


Px xFcQMWMbQ dUdeQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUQYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
 ac_acW MY O_ Z f ^ QLaQcWZ 5Vf PQef Y elZ W

PFe; 6 ev t t v t z z W vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU

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

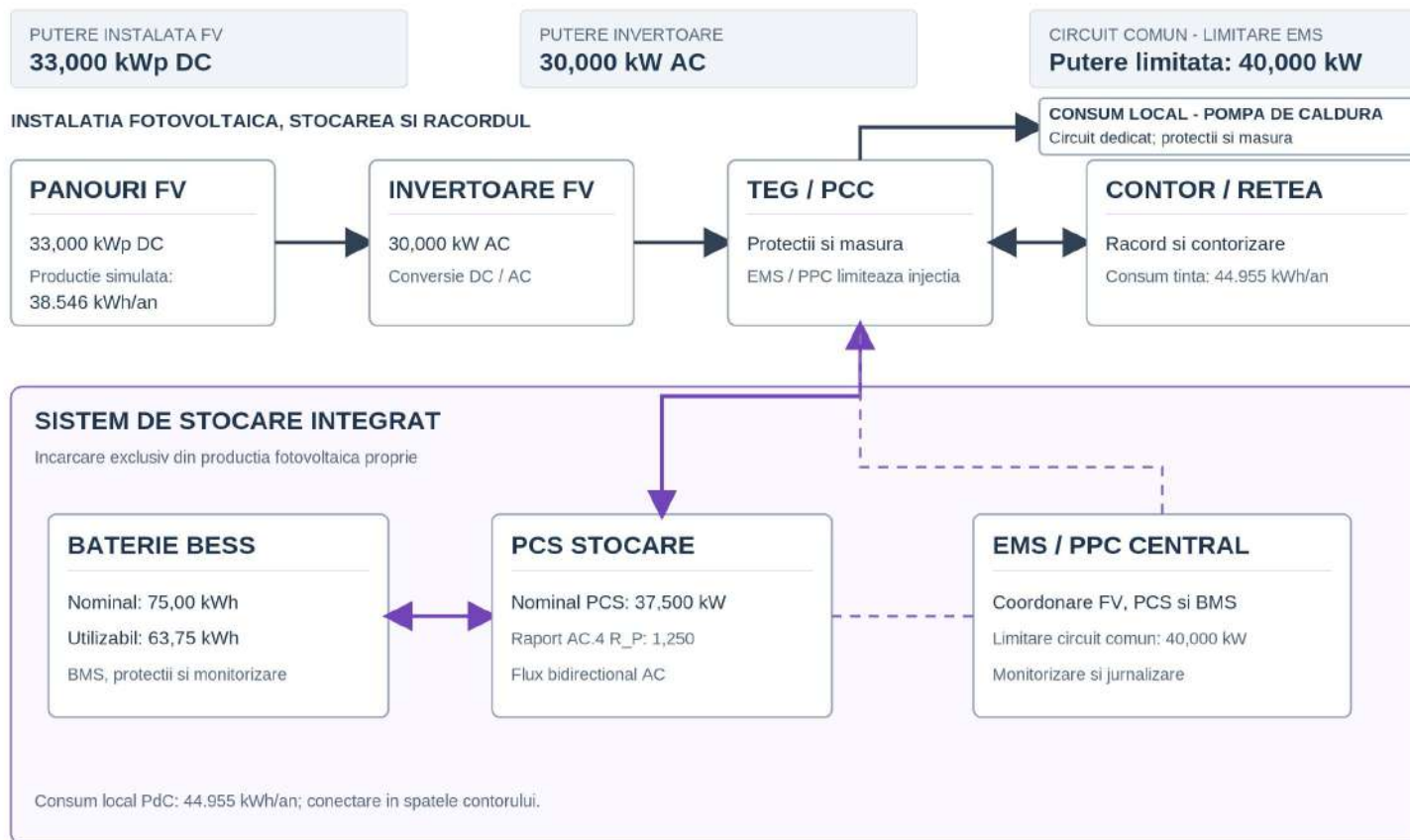


Px xFcQMWMbQ dUdeQZ PQac_Pf OQcQ dUde_OMbQ MQ^ QcSQUYQOecUQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ecf O_ ^df Z
 ac_acU MY O_Z f ^ QLaQcWZ 5Vf PQef Y elZ ldl

P79 e; 6 ev t t v t z z VV vt W

SCHEMA TEHNOLOGICA DE PRINCIPIU

Instalație 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 tGoS

Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dUdeQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUQYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acU MY O_Z f ^ QLaQcWZ 5Vf PQef Y eU ldl

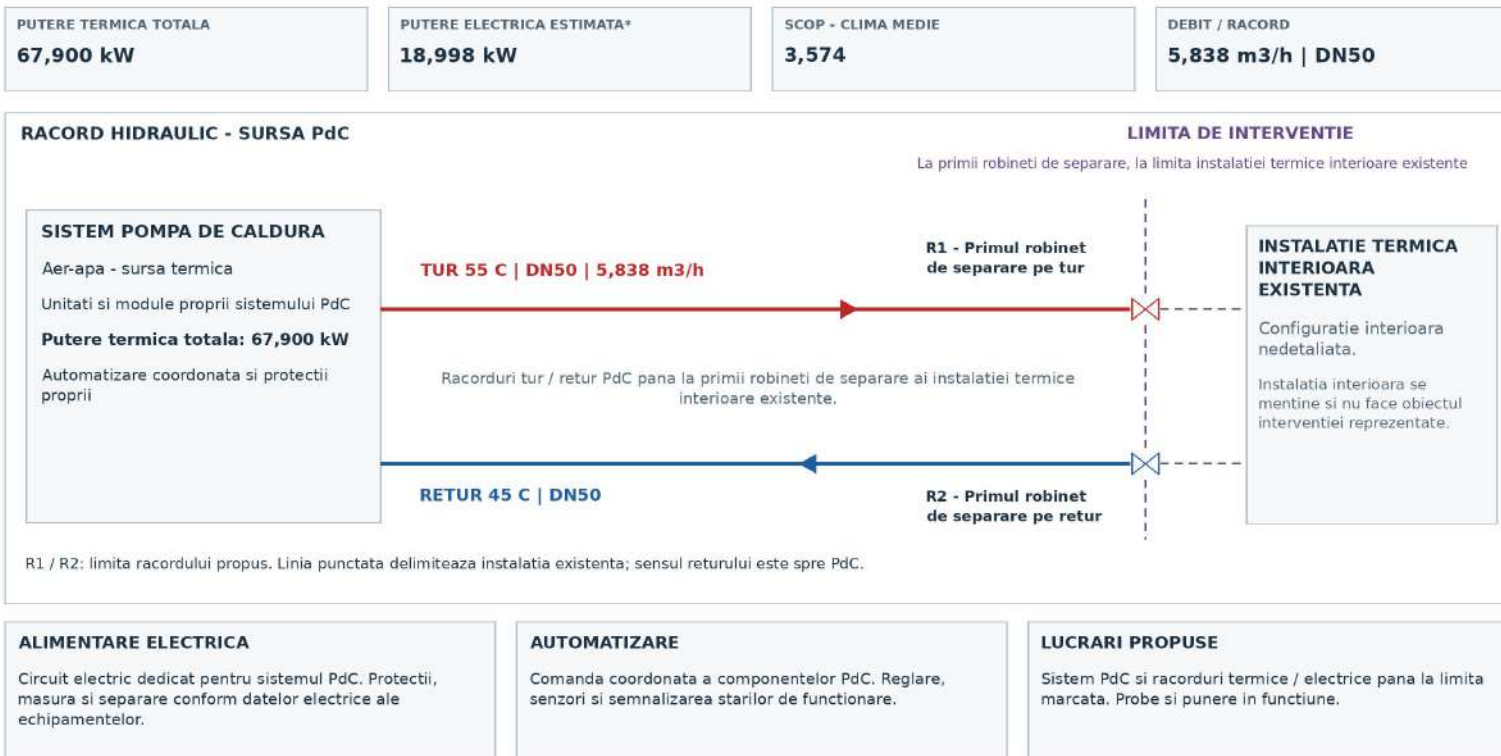
N_Rj N Q7ePURZ R fRU_aYaTVPR fRdZ VPR 6 e: eVe;

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 primii robineti 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 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 tGæS

Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dldleQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acW MY O_ Z f ^ QLaQcWZ 5Vf PQef YelZ ldl

Q7 e: 6 Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S1] Liceu teoretic Periam

Configuratie: 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 primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN65

La primii robineti de separare, la limita instalatiei termice interioare existente

LIMITA DE INTERVENTIE

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 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 tGøS
Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dldleQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQP U df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acU MY O_Z f ^ QLaQcWZ 5Vf PQef YelZ ldl

Q7 e: 6 et t Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S1] Sala sport Liceu

Configuratie: 1 x 36 kW | Sistem Aer-apa

PUTERE TERMICA TOTALA
36,000 kW

PUTERE ELECTRICA ESTIMATA*
9,896 kW

SCOP - CLIMA MEDIE
3,638

DEBIT / RACORD
3,095 m³/h | DN32

RACORD HIDRAULIC - SURSA PdC

SISTEM POMPA DE CALDURA

Aer-apa - sursa termica

Unitati si module proprii sistemului PdC

Putere termica totala: 36,000 kW

Automatizare coordonata si protectii proprii

TUR 55 C | DN32 | 3,095 m³/h

Racorduri tur / retur PdC pana la primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN32

La primii robineti de separare, la limita instalatiei termice interioare existente

LIMITA DE INTERVENTIE

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 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 tGæS

Oz z vt GPæZg_N bRdWZ

Px xFcQMWMbQ dIdeQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQPÜ df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acW MY O_ Z f ^ QLaQcWZ 5Vf PQef Y eLZ ldl

QAe: 6 ev t t v t z z W 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

PUTERE TERMICA TOTALA

62,900 kW

PUTERE ELECTRICA ESTIMATA*

17,619 kW

SCOP - CLIMA MEDIE

3,570

DEBIT / RACORD

5,408 m³/h | DN40

RACORD HIDRAULIC - SURSA PdC

LIMITA DE INTERVENTIE

La primii robineti de separare, la limita instalatiei termice interioare existente

SISTEM POMPA DE CALDURA

Aer-apa - sursa termica

Unitati si module proprii sistemului PdC

Putere termica totala: 62,900 kW

Automatizare coordonata si protectii proprii

TUR 55 C | DN40 | 5,408 m³/h

Racorduri tur / retur PdC pana la primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN40

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 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 tGæS
Oz z vt GPaZg_N bRdWZ

Px xFcQMWMbQ dIdeQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQP U df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acU MY O_ Z f ^ QLaQcWZ 5Vf PQef Y eUZ ldl

QBe: 6 ev t t v t z z VV 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

PUTERE TERMICA TOTALA
87,900 kW

PUTERE ELECTRICA ESTIMATA*
24,622 kW

SCOP - CLIMA MEDIE
3,570

DEBIT / RACORD
7,558 m³/h | DN50

RACORD HIDRAULIC - SURSA PdC

SISTEM POMPA DE CALDURA

Aer-apa - sursa termica

Unitati si module proprii sistemului PdC

Putere termica totala: 87,900 kW

Automatizare coordonata si protectii proprii

TUR 55 C | DN50 | 7,558 m³/h

Racorduri tur / retur PdC pana la primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN50

La primii robineti de separare, la limita instalatiei termice interioare existente

LIMITA DE INTERVENTIE

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.



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TECHNOLOGY

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SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S2] Gradinita

Configuratie: 1 x 67.9 kW | Sistem Aer-apa

PUTERE TERMICA TOTALA

67,900 kW

PUTERE ELECTRICA ESTIMATA*

19,400 kW

SCOP - CLIMA MEDIE

3,500

DEBIT / RACORD

5,838 m³/h | DN50

RACORD HIDRAULIC - SURSA PdC

SISTEM POMPA DE CALDURA

Aer-apa - sursa termica

Unitati si module proprii sistemului PdC

Putere termica totala: 67,900 kW

Automatizare coordonata si protectii proprii

TUR 55 C | DN50 | 5,838 m³/h

Racorduri tur / retur PdC pana la primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN50

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

LIMITA DE INTERVENTIE

La primii robineti de separare, la limita instalatiei termice interioare existente

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 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 tGæS

Oz z v t GPæZ g_N bRdWZ

Px xFcQMWMbQ dldleQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQPU df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acW MY O_ Z f ^ QLaQcWZ 5Vf PQef YelZ ldl

QDe; 6 Yvz z z v bz t

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S2] Liceu teoretic Periam

Configuratie: 1 x 125.8 kW | Sistem Aer-apa

PUTERE TERMICA TOTALA

125,800 kW

PUTERE ELECTRICA ESTIMATA*

35,943 kW

SCOP - CLIMA MEDIE

3,500

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 primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN65

La primii robineti de separare, la limita instalatiei termice interioare existente

LIMITA DE INTERVENTIE

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 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 tGæS
Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dldleQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQP U df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acU MY O_Z f ^ QLaQcWZ 5Vf PQef YelZ ldl

QZ e; 6 et t Yvz

SCHEMA TEHNOLOGICA DE PRINCIPIU - SURSA TERMICA

Pompa de caldura - [S2] Sala sport Liceu

Configuratie: 1 x 36 kW | Sistem Aer-apa

PUTERE TERMICA TOTALA
36,000 kW

PUTERE ELECTRICA ESTIMATA*
10,286 kW

SCOP - CLIMA MEDIE
3,500

DEBIT / RACORD
3,095 m³/h | DN32

RACORD HIDRAULIC - SURSA PdC

SISTEM POMPA DE CALDURA

Aer-apa - sursa termica

Unitati si module proprii sistemului PdC

Putere termica totala: 36,000 kW

Automatizare coordonata si protectii proprii

TUR 55 C | DN32 | 3,095 m³/h

Racorduri tur / retur PdC pana la primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN32

La primii robineti de separare, la limita instalatiei termice interioare existente

LIMITA DE INTERVENTIE

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 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 tGæS

Oz z v t GPaZg_N bRdWZ

Px xFcQMWMbQ dIdeQZ PQac_ Pf OQcQ dUde_ OMbQ MQ^ QcSQUYQOecWQPÜ df cdQcGSQ^ QcMNUQ PQela d_YMb aQ^ ecf O_ ^df Z
ac_acÜ MY O_ Z f ^ QJaQcWZ 5Vf PQef Y eLZ ldl

QF e; 6 ev t t v t z z Vh 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

PUTERE TERMICA TOTALA

62,900 kW

PUTERE ELECTRICA ESTIMATA*

17,971 kW

SCOP - CLIMA MEDIE

3,500

DEBIT / RACORD

5,408 m³/h | DN40

RACORD HIDRAULIC - SURSA PdC

SISTEM POMPA DE CALDURA

Aer-apa - sursa termica

Unitati si module proprii sistemului PdC

Putere termica totala: 62,900 kW

Automatizare coordonata si protectii proprii

TUR 55 C | DN40 | 5,408 m³/h

Racorduri tur / retur PdC pana la primii robineti de separare ai instalatiei termice interioare existente.

RETUR 45 C | DN40

La primii robineti de separare, la limita instalatiei termice interioare existente

LIMITA DE INTERVENTIE

R1 - Primul robinet de separare pe tur

R2 - Primul robinet de separare pe retur

INSTALATIE TERMICA INTERIOARA EXISTENTA

Configuratie interioara nedetaliata.

Instalatia 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 lucrarilor: racordarea sursei PdC la primii robineti 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 Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.

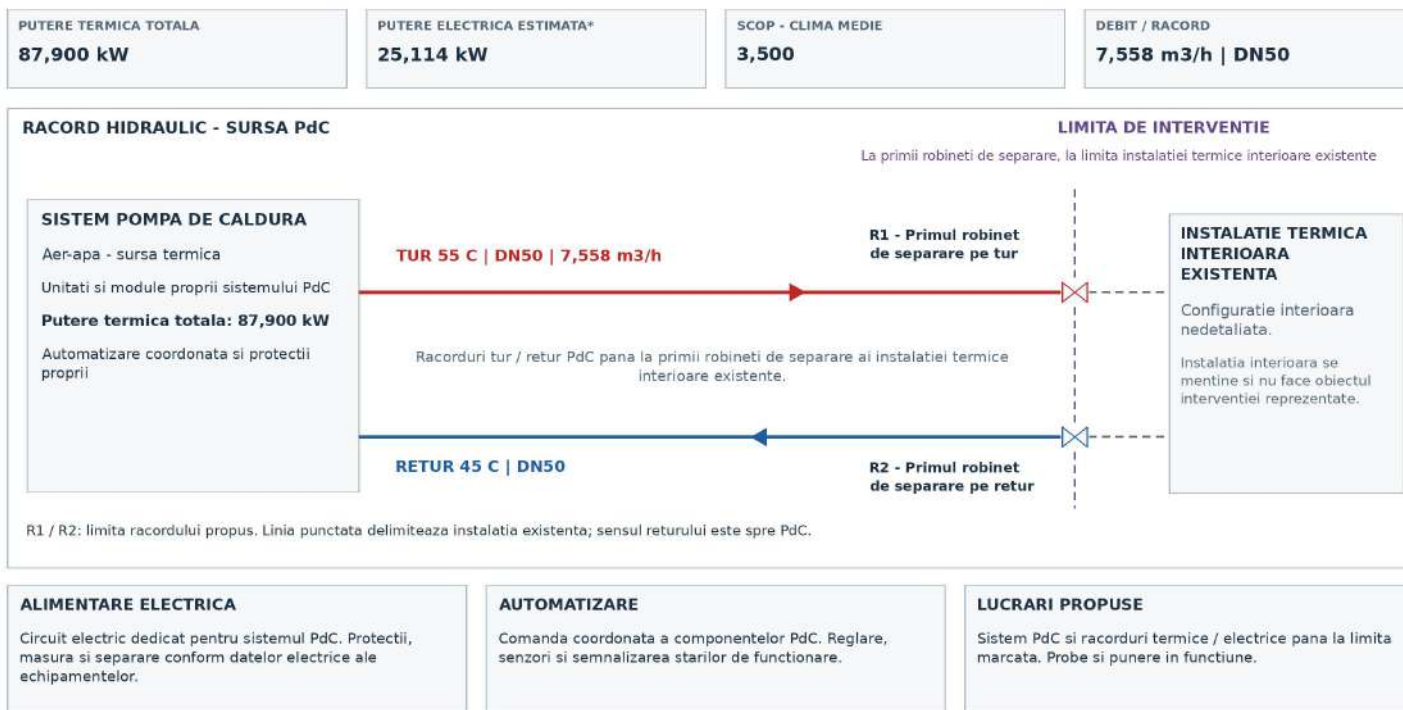
Proiect de instalare
Sistem de încălzire

Schema tehnologică de principiu - sursă termică

Schema tehnologică de principiu - sursă termică

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

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



Limita lucrarilor: racordarea sursei PdC la primii robineti 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 Pth / SCOP, nu putere electrica maxima de dimensionare. Schema de principiu, fara scara.

V v 5 7Uz

