RADIATA PINE ELECTROPOLES

GOLDPINE

WHY WOOD?

WHY RADIATA?

WHY RADIATA

1.8m
HECTARES OF EXOTIC FOREST

6.2m
HECTARES OF NATIVE INDIGENOUS FOREST

90%
OF PRODUCTION FOREST IS RADIATA PINE

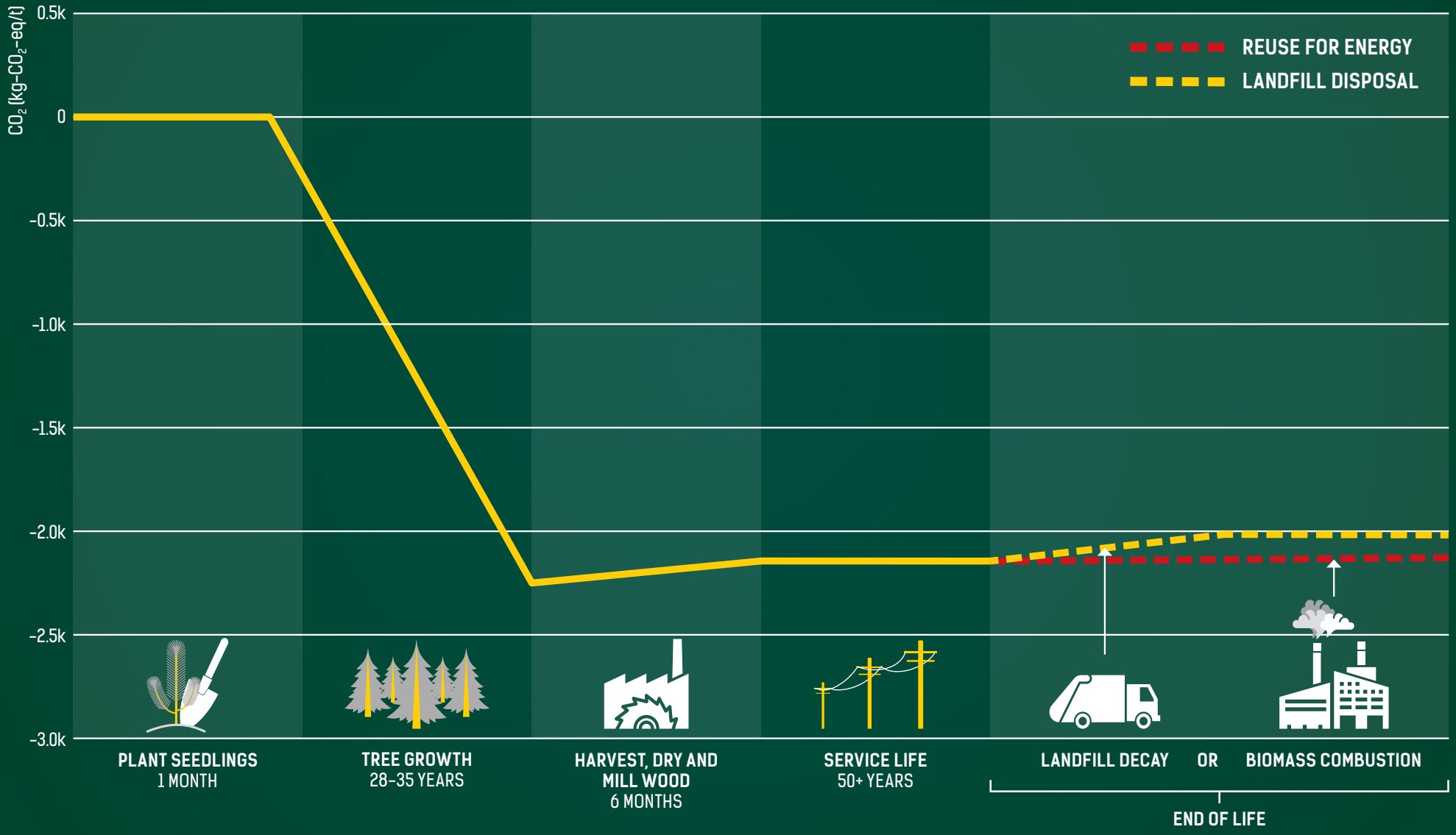
35k
FORESTRY EMPLOYEES IN NEW ZEALAND

$6.7b
1.6% OF NEW ZEALAND'S GDP

3rd
LARGEST EXPORT

CARBON

TOTAL (BIOGENIC AND FOSSIL) GREEN HOUSE GAS BALANCE FOR PRESERVED WOOD

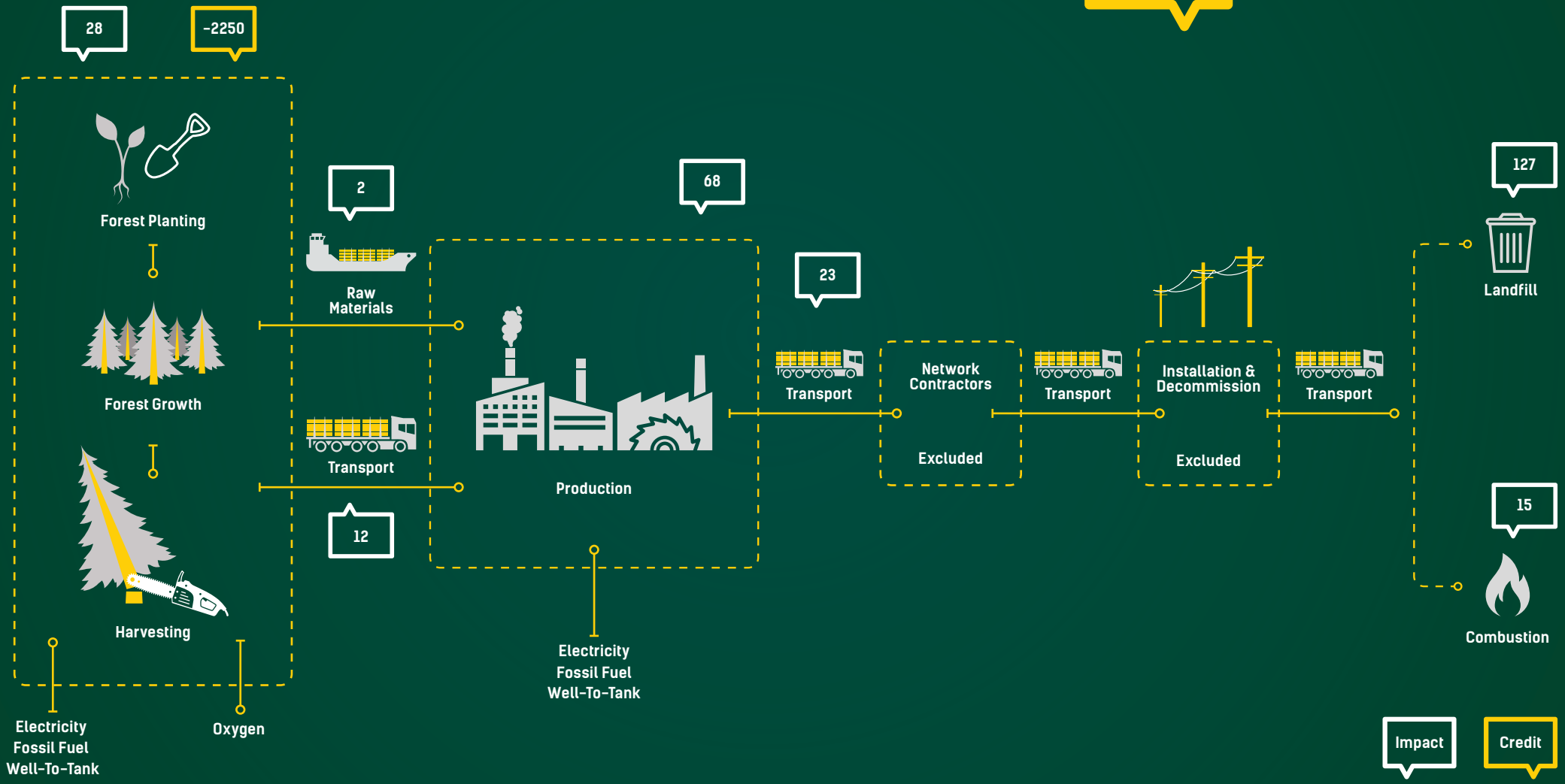


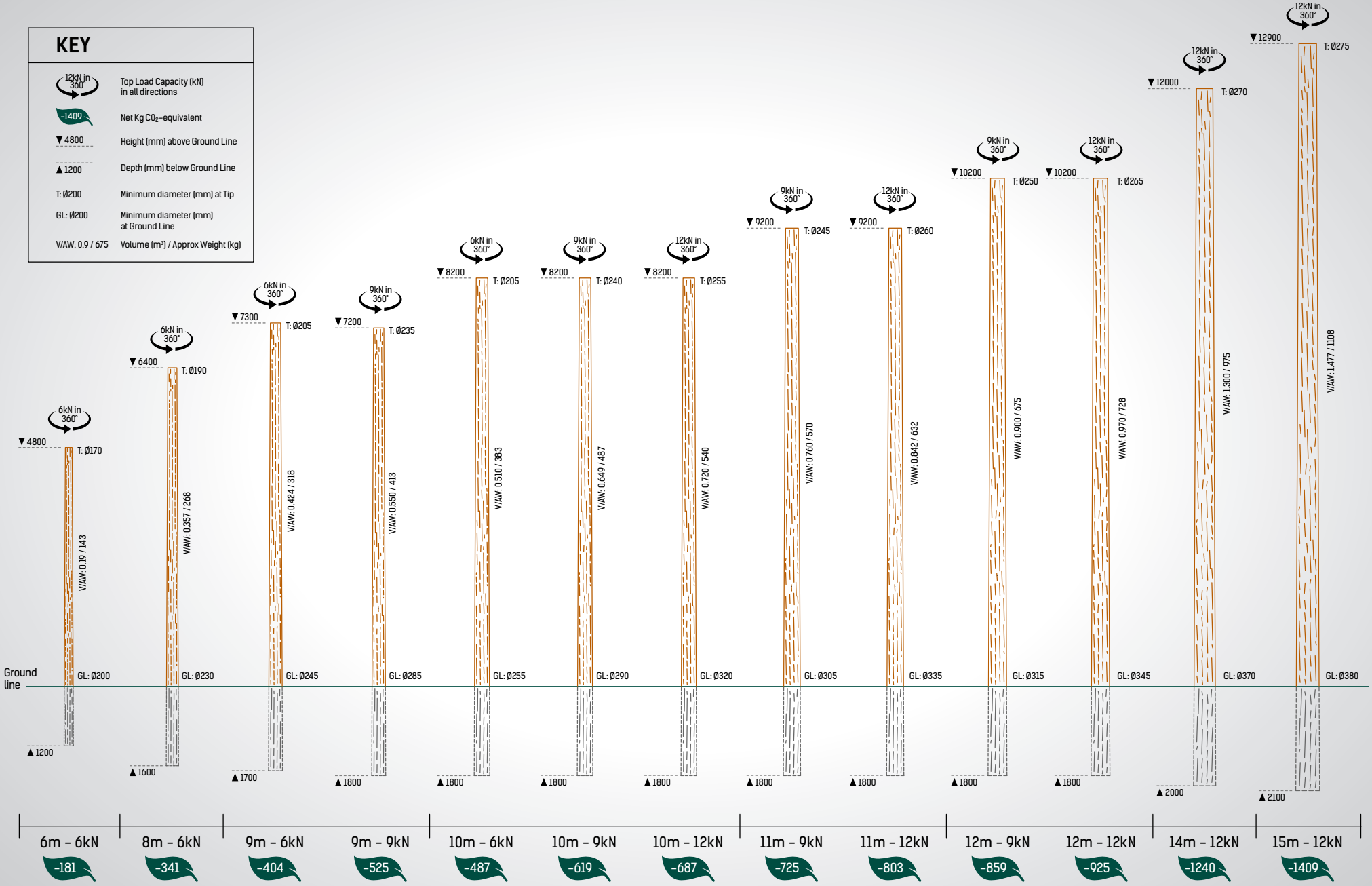
WOOD POLE EMISSIONS

Emissions for wooden pole production expressed as kg CO_2– eq/t

–1975

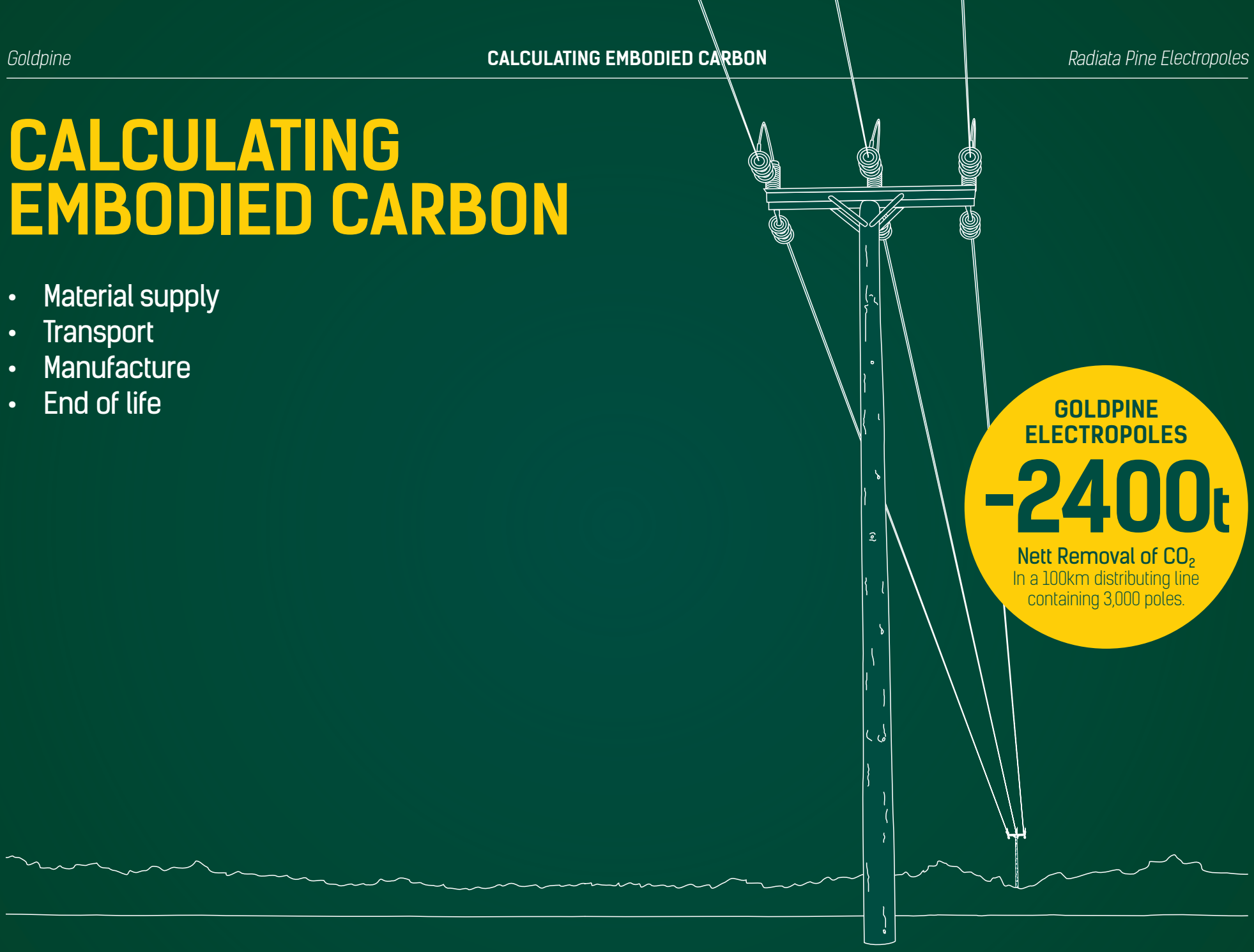
Net kg CO_2– eq/t
*** EOL landfill**




KEY
12kN in 360°
Top Load Capacity (kN) in all directions
-1409
Net Kg CO_2-equivalent
▼4800
Height (mm) above Ground Line
▲1200
Depth (mm) below Ground Line
T: Ø200
Minimum diameter (mm) at Tip
GL: Ø200
Minimum diameter (mm) at Ground Line
V/AW: 0.9 / 675
Volume (m³) / Approx Weight (kg)
Ground line
6m - 6kN
-181
▼4800
T: Ø170
V/AW: 0.19 / 143
GL: Ø200
▲1200
8m - 6kN
-341
▼6400
T: Ø190
V/AW: 0.357 / 268
GL: Ø230
▲1600
9m - 6kN
-404
▼7300
T: Ø205
V/AW: 0.424 / 318
GL: Ø245
▲1700
9m - 9kN
-525
▼7200
T: Ø235
V/AW: 0.550 / 413
GL: Ø285
▲1800
10m - 6kN
-487
▼8200
T: Ø205
V/AW: 0.510 / 383
GL: Ø255
▲1800
10m - 9kN
-619
▼8200
T: Ø240
V/AW: 0.649 / 487
GL: Ø290
▲1800
10m - 12kN
-687
▼8200
T: Ø255
V/AW: 0.720 / 540
GL: Ø320
▲1800
11m - 9kN
-725
▼9200
T: Ø245
V/AW: 0.760 / 570
GL: Ø305
▲1800
11m - 12kN
-803
▼9200
T: Ø260
V/AW: 0.842 / 632
GL: Ø335
▲1800
12m - 9kN
-859
▼10200
T: Ø250
V/AW: 0.900 / 675
GL: Ø315
▲1800
12m - 12kN
-925
▼10200
T: Ø265
V/AW: 0.970 / 728
GL: Ø345
▲1800
14m - 12kN
-1240
▼12000
T: Ø270
V/AW: 1.300 / 975
GL: Ø370
▲2000
15m - 12kN
-1409
▼12900
T: Ø275
V/AW: 1.477 / 1108
GL: Ø380
▲2100

CALCULATING EMBODIED CARBON

- Material supply
- Transport
- Manufacture
- End of life



GOLDPINE ELECTROPOLES

-2400t

Nett Removal of CO_2

In a 100km distributing line containing 3,000 poles.

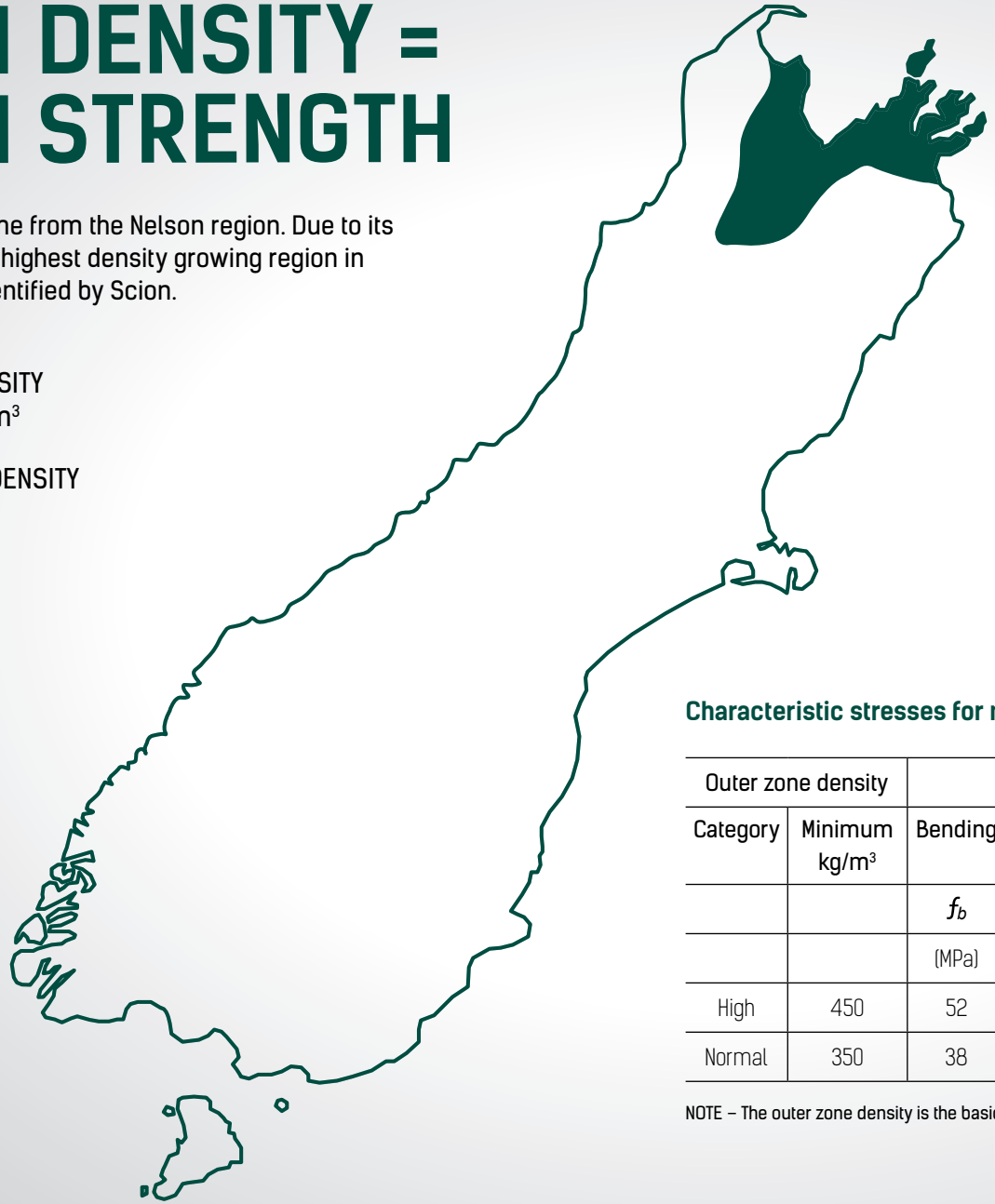
WOOD PROPERTIES FOR STRENGTH

HIGH DENSITY = HIGH STRENGTH

All our trees come from the Nelson region. Due to its climate, it is the highest density growing region in New Zealand identified by Scion.

HIGH DENSITY
> 450kg/m^3

NORMAL DENSITY
350kg/m^3

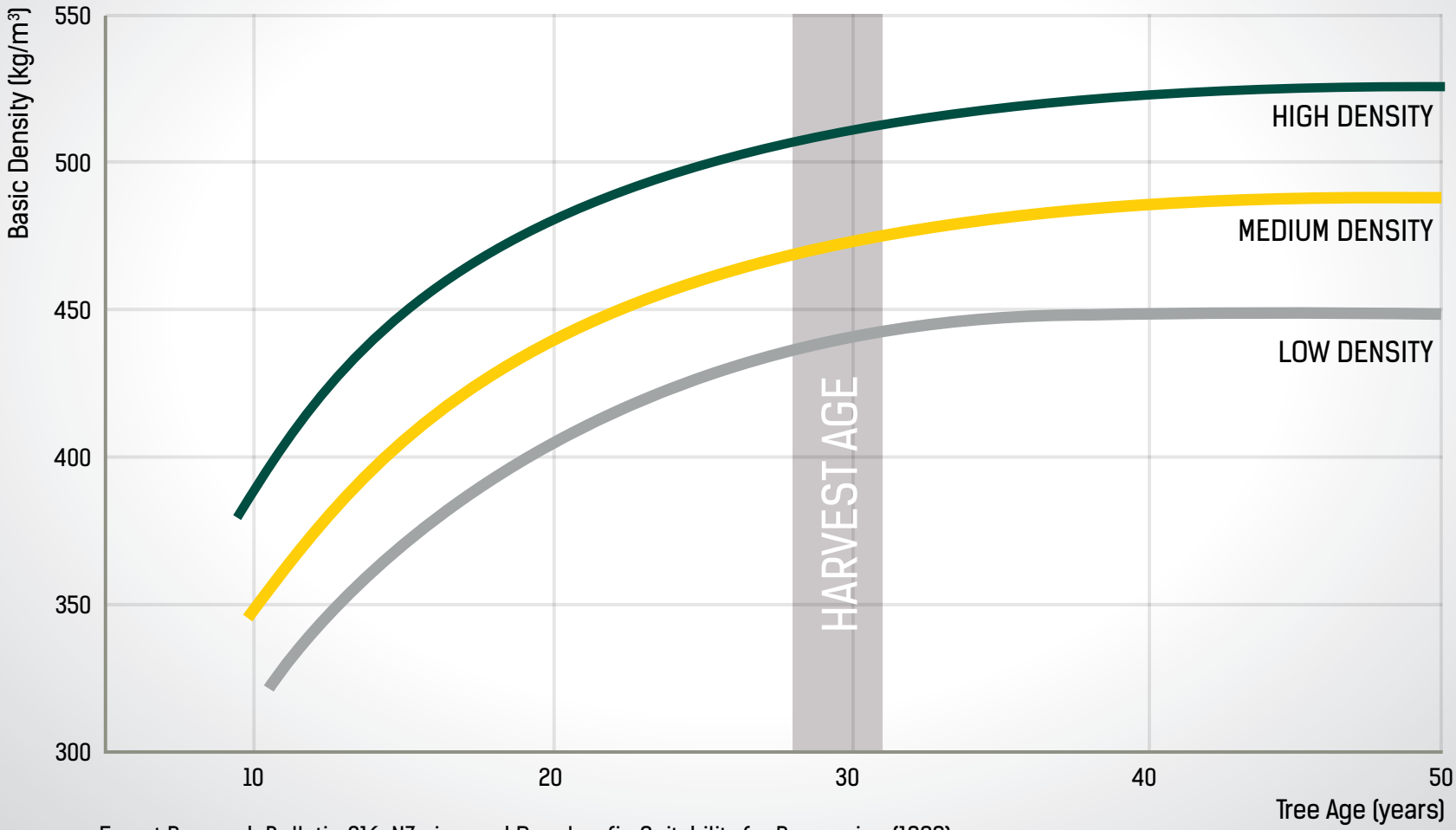


Characteristic stresses for naturally round softwood timbers in the green condition:

Outer zone density		Property					
Category	Minimum kg/m^3	Bending	Tension	Compression parallel	Shear	Compression perpendicular	Modulus of elasticity
		f_b	f_t	f_c	f_s	f_p	E
		(MPa)	(MPa)	(MPa)	(MPa)	(MPa)	(GPa)
High	450	52	31	25	3.5	9.0	12.1
Normal	350	38	23	21	3.1	8.8	8.7

NOTE – The outer zone density is the basic density (oven dry weight/volume in green condition) in the outer 20% of the radius.

WOOD DENSITY TRENDS BY AGE AND DENSITY ZONE



Forest Research Bulletin 216: NZ pine and Douglas-fir; Suitability for Processing (1999)

BREEDING TRIALS AND BREEDING VALUES

Each tree in a breeding trial has a unique genetic identity and code name. The physical characteristics of each tree that are being genetically improved are measured and data is used to estimate Breeding Values (EBVs), which are used to rank selections against one another. RPBC uses improved field trial designs to reduce the time taken to select, test and confirm superior trees and get them into commercial seed orchards.

TIMELINE

1950 – 1970

Early breeding improvements for growth and form

1970 – 1980

High Density breeding traits identified

1988

Establishment of formal breeding population

1995

High Density breeds planted

2022

Reaching harvest age

TIMBER MILLS IN NEW ZEALAND

IT IS ESTIMATED

2,000

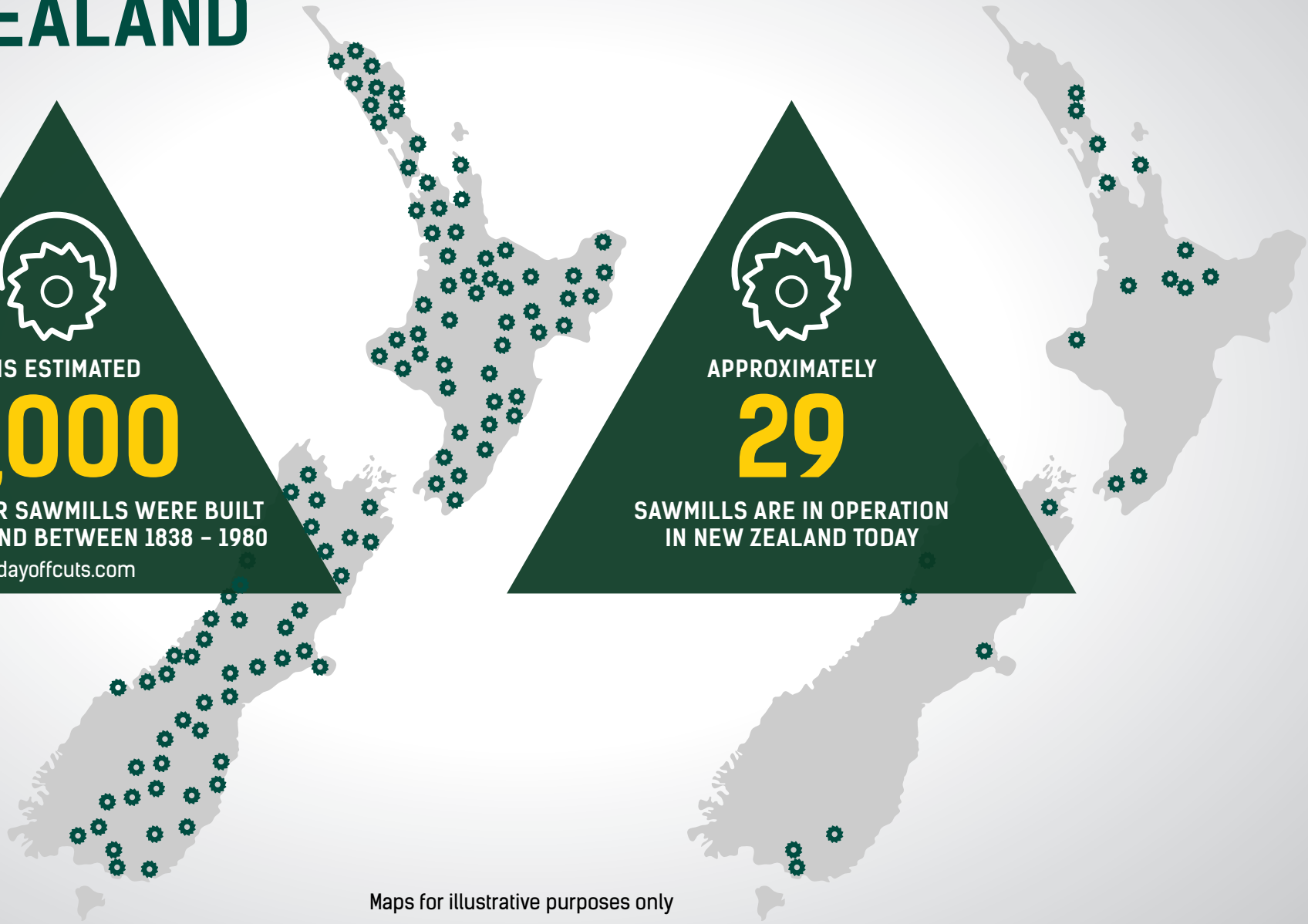
NATIVE TIMBER SAWMILLS WERE BUILT IN NEW ZEALAND BETWEEN 1838 – 1980

fridayoffcuts.com

APPROXIMATELY

29

SAWMILLS ARE IN OPERATION IN NEW ZEALAND TODAY



Maps for illustrative purposes only

TODAY'S POLES

WOOD PRESERVATION PROCESS

Steam is pumped into the cylinder which opens up the wood cells, removing saps and resins to make room for the treatment preservative.

STEP 1: STEAM

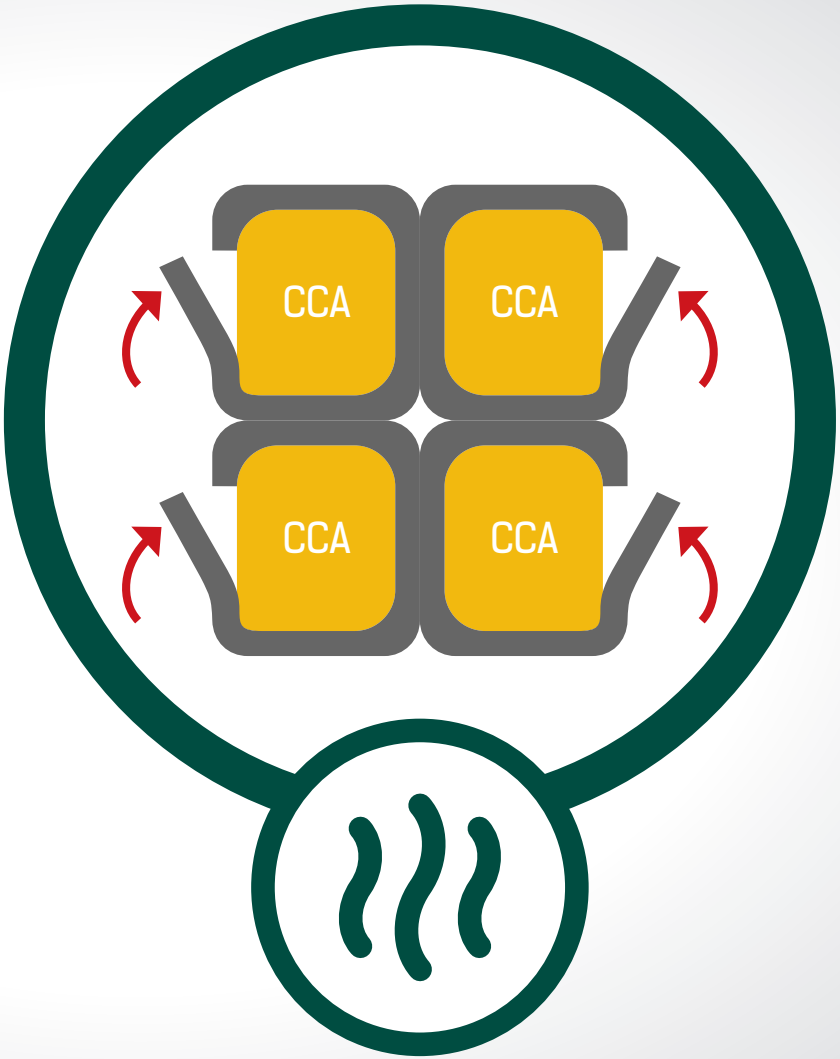
WOOD PRESERVATION PROCESS

Wood preservative is pumped into the cylinder and put under pressure, forcing the wood preservative into the wood cells.

STEP 2: TREAT

WOOD PRESERVATION PROCESS

Heat is applied to the wood which ensures the fixation reaction properly occurs.



STEP 3: HEAT FIX

GOLDPINE ELECTROPOLE

Timber Properties (bending, AS/NZS 7000)

Ø =	0.95	
k1 =	1.00	duration of loading (wind)
k2 =	1.00	moisture content
k8 =	1.00	stability S - use 1.0
k21 =	0.75	shaving
k22 =	0.85	steaming
k20	1.00	
f'b =	50	MPa (S4)
Z =	0.0982d^3	

ØM = **$\emptyset\ k_1\ k_2\ k_8\ k_{20}\ k_{21}\ k_{22}\ [f_b\ Z]$**

Calc. Top Load

NZS 3603 (1993)	f'b =	52 Mpa

As in Goldpine Calculations (using 0.6m from pole top)

Electropole Class B & A - Calculated Top Load (Ultimate)

Pole :Length (m) / GL to Butt (m)	**8** / 1.6	**9** / 1.7	**9.5** / 1.8	**10** / 1.8	**11** / 1.8	**12** / 1.8	**Class Load**	**Ultimate Limit**
Class B: 9kN GL Diam (mm)	275	285	290	290	305	315		
Calc. Top Load (kN)	10.7	10.3	10.2	9.5	9.8	9.7	9kN	9kN
Class A: 12kN GL Diam (mm)			315	320	335	345		
Calc. Top Load (kN)			13.1	12.8	13.0	12.7	12kN	12kN

*** Note - Calculated values without k_d, or k_d = 1.0*

As in Goldpine Calculations (but using 0.1m from pole top)

Electropole Class B & A - Calculated Top Load (Ultimate)

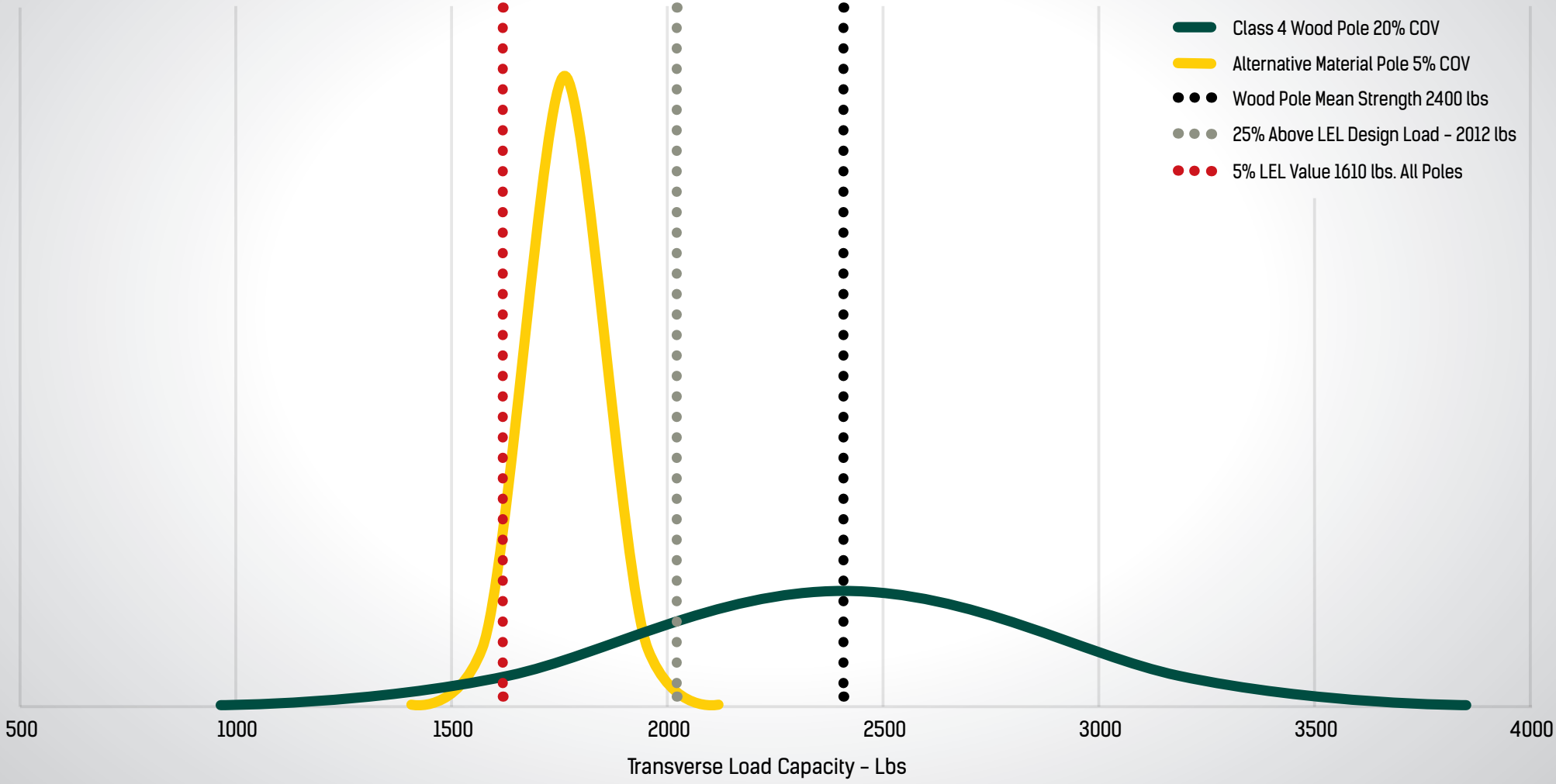
Pole :Length (m) / GL to Butt (m)	**8** / 1.6	**9** / 1.7	**9.5** / 1.8	**10** / 1.8	**11** / 1.8	**12** / 1.8	**Class Load**	**Ultimate Limit**
Class B: 9kN GL Diam (mm)	275	285	290	290	305	315		
Calc. Top Load (kN)	9.8	9.6	9.5	9.0	9.3	9.2	9kN	9kN
Class A: 12kN GL Diam (mm)			315	320	335	345		
Calc. Top Load (kN)			12.2	12.0	12.3	12.1	12kN	12kN

*** Note - Calculated values without k_d, or k_d = 1.0*

SOFTWOOD POLES IN LINE DESIGN

TONY RAPER
TECHNICAL PRINCIPAL – OVERHEAD LINES DESIGN WSP

COMPARISON OF CLASS 4 WOOD POLE WITH A 20% COV TO ALTERNATIVE MATERIAL POLES WITH A 5% COV



Source: North American Wood Pole Council (NAWPC)

THANK YOU

CONTACT:

Aaron Mullins
Sustainability, Electropole and Engineering Specailist
M: 027 496 9716 | **P:** 06 879 5580 | **F:** 06 879 5590 |
E: *aaronmullins@goldpine.co.nz*
A: *Goldpine Industries Limited, 1412 Omahu Road, Hastings*
PO Box 11068, Hastings