



The Scale for Economic Milk Powder Production: A NZ Perspective

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GEA Process Engineering

*A world leader in liquid processing, drying,
powder processing and handling*

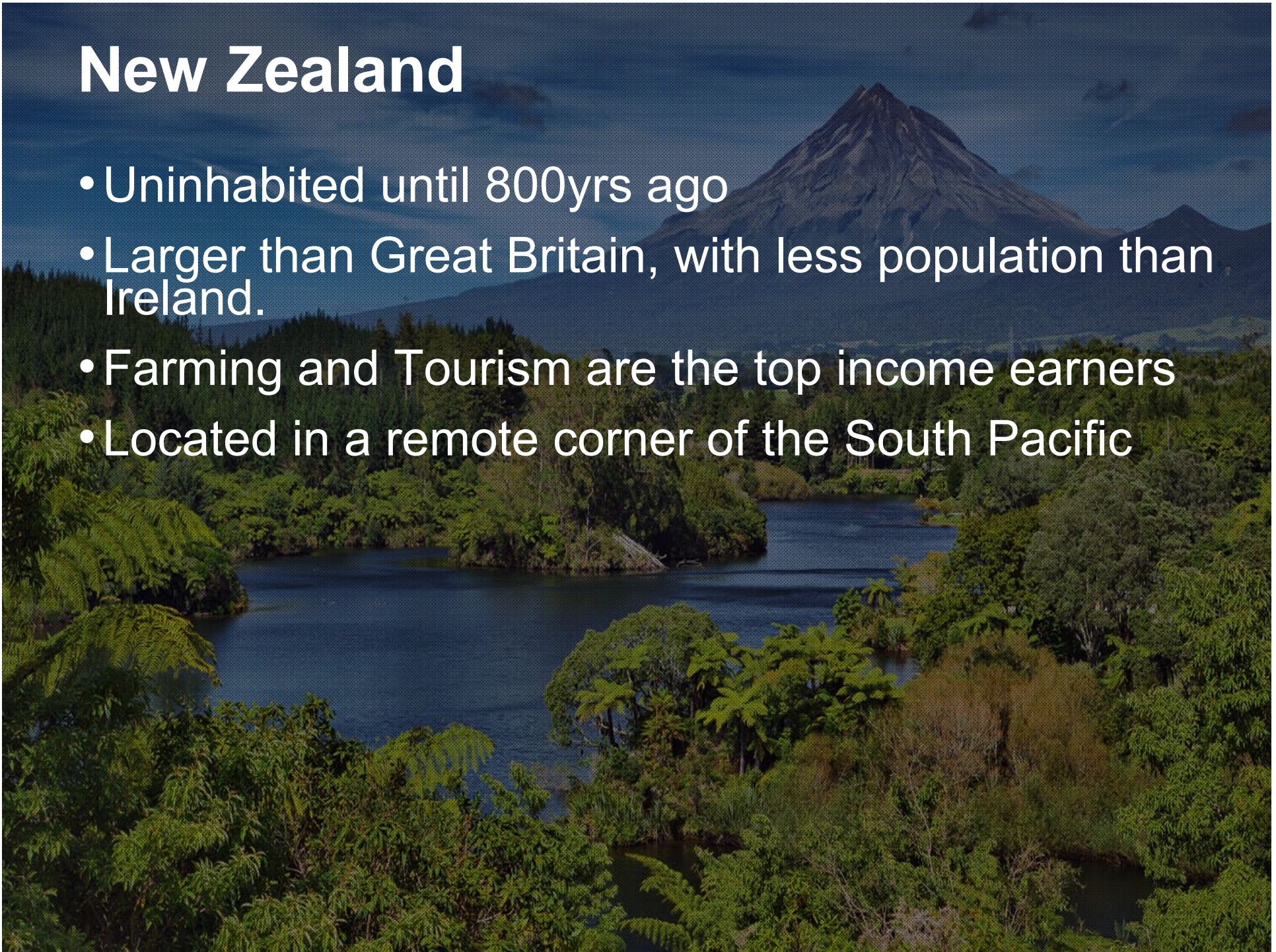
Agenda

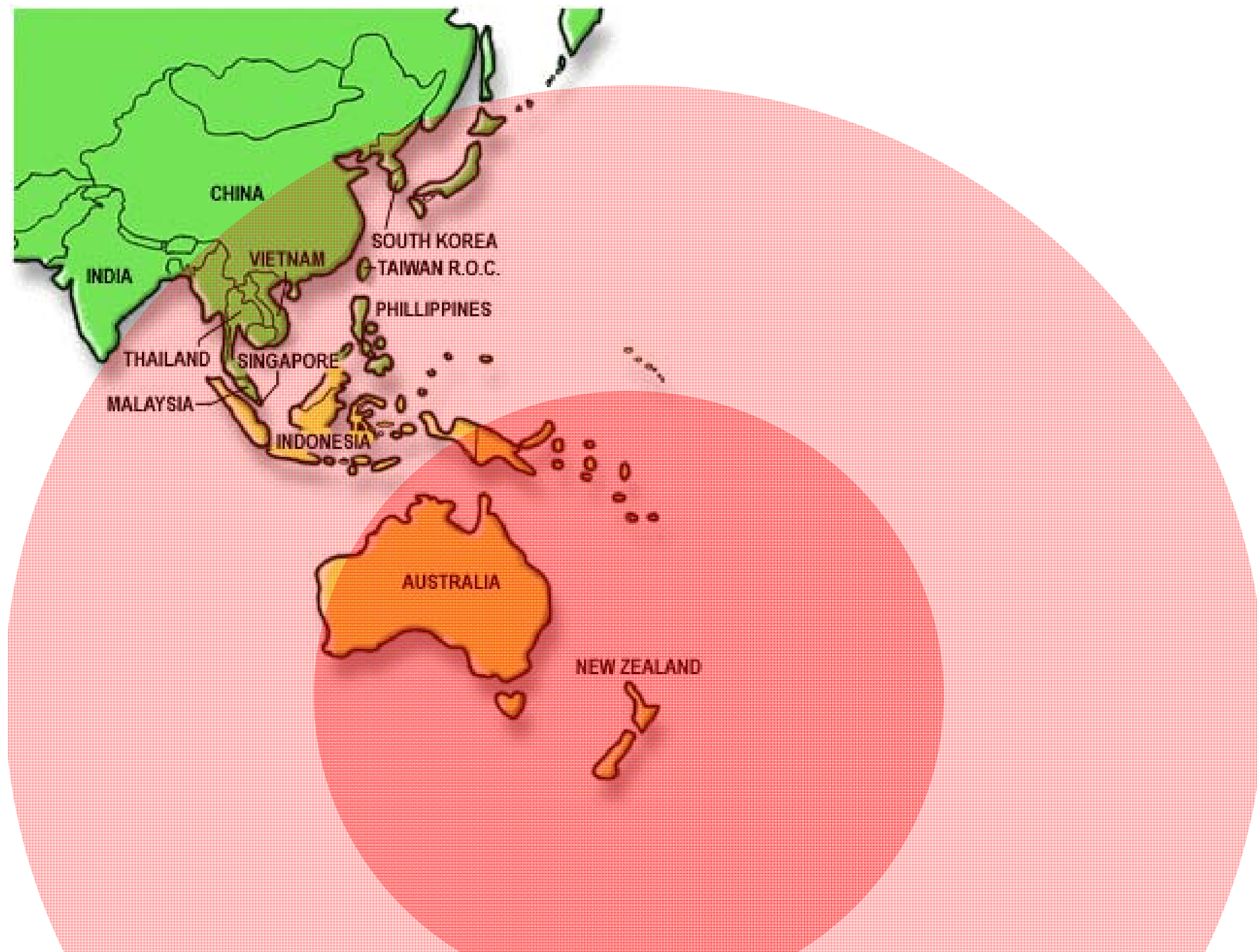
1. Overview of NZ Milk Industry
2. Trends in NZ Milk Powder Projects
3. Optimal Dryer Size
4. Future?
5. Questions & Discussion



New Zealand

- Uninhabited until 800yrs ago
- Larger than Great Britain, with less population than Ireland.
- Farming and Tourism are the top income earners
- Located in a remote corner of the South Pacific



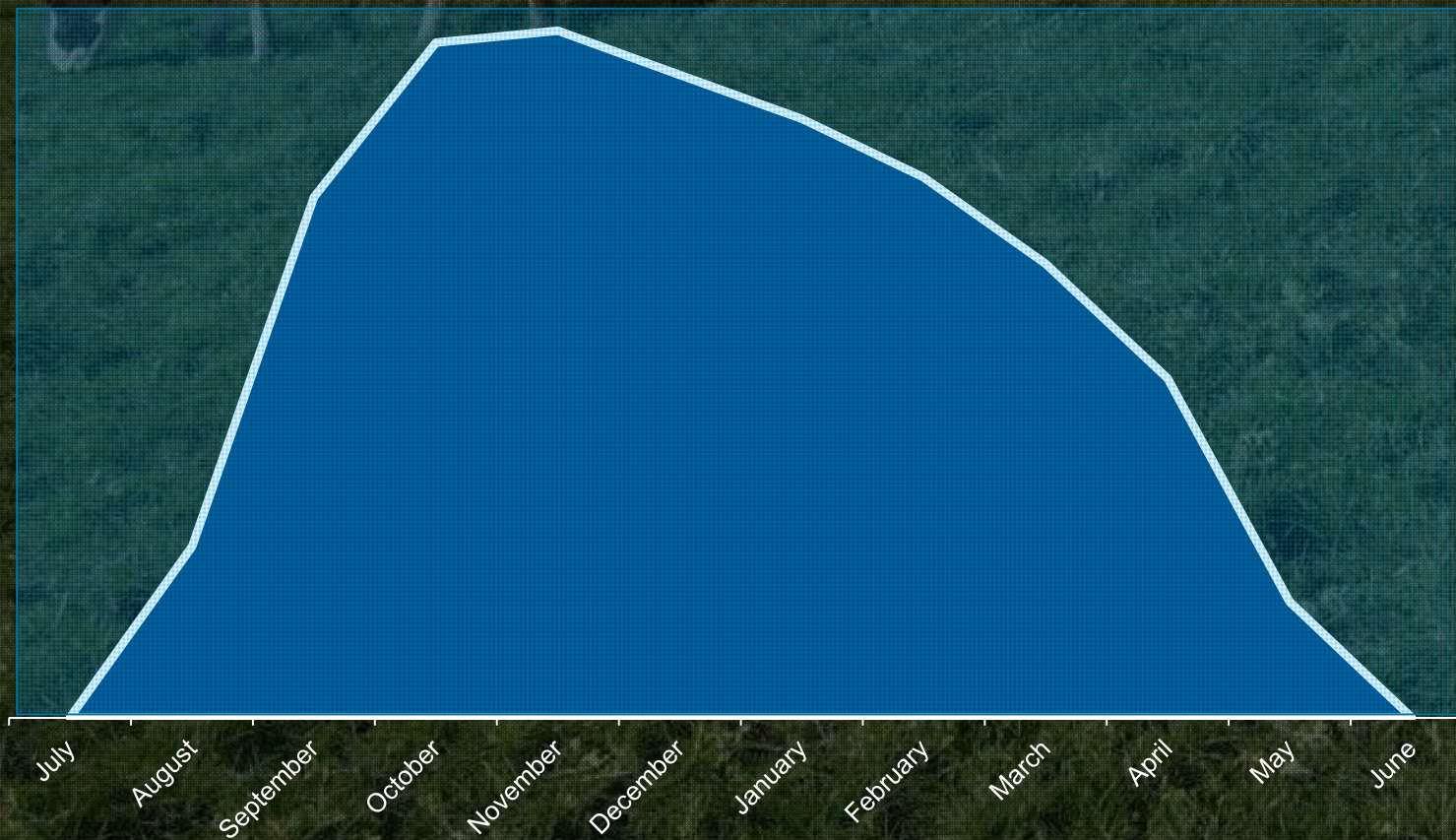


NZ / Ireland Dairy Comparison

	New Zealand	Republic of Ireland
Population	4.4M	4.6M
Mean Temp.	10-16°C	8-10°C
Land Area	270,000km ²	70,000km ²
Land in Pasture	135,000km ²	32,000km ²
No. of Cows	5M	1M
Milk Production	18.6MT/yr	5.5MT/yr

NZ Dairy Processing Characterised by:

1. Pastoral based seasonal milk production



Industry Comparison

Source: IDF 2011		N.Z. (2011/12)	Ireland	EU-27	U.S.	China
Total Milk Production	TPY	19M	5.5M	150M	87M	36M
Total Cows	No.	5M	1M	23M	9M	13M
Cow Yield	TPY	3.6	5.3	6.5	9.6	2.8

NZ Dairy Processing Characterised by:

1. Pastoral based seasonal milk production
2. Large farms

Industry Comparison



Source: IDF 2011		N.Z.	Ireland	EU-27	U.S.	China
Total Cows	#	5M	1M	23M	9M	13M
Cows per Farm	#	400	56	28	170	<10

Industry Comparison

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A photograph of a dairy farm scene. In the foreground, a large black and white cow is grazing. In the background, a herd of other cows is scattered across a vast, green pasture. The sky is overcast with grey clouds. The text is overlaid on the upper left portion of the image.

NZ Dairy Processing Characterised by:

1. Pastoral based seasonal milk production
2. Large farms
3. **Large centralised processing sites**

Consolidation of NZ Companies

- 1930 400 Dairy Companies
- 1983 36 Dairy Companies
- 2001 3 Dairy Companies
- 2010 6 Dairy Companies
- 2012 8 Dairy Companies



NZ Dairy Companies



	2010/11 Peak Milk (m ³ /day)
1. Fonterra Co-operative	75,000
2. Open Country Ltd	4,000
3. Westland Co-operative	2,000
4. Synlait Ltd	2,000
5. Miraka Ltd	1,000
6. Tatura Co-operative	250
7. Dairy Goat Co-operative	170
8. Gardians Ltd	-

NZ Dairy Processing Characterised by:

1. Pastoral based seasonal milk production
2. Large farms
3. Large centralised processing
- 4. Milk Powder / Export Focus**

Industry Comparison

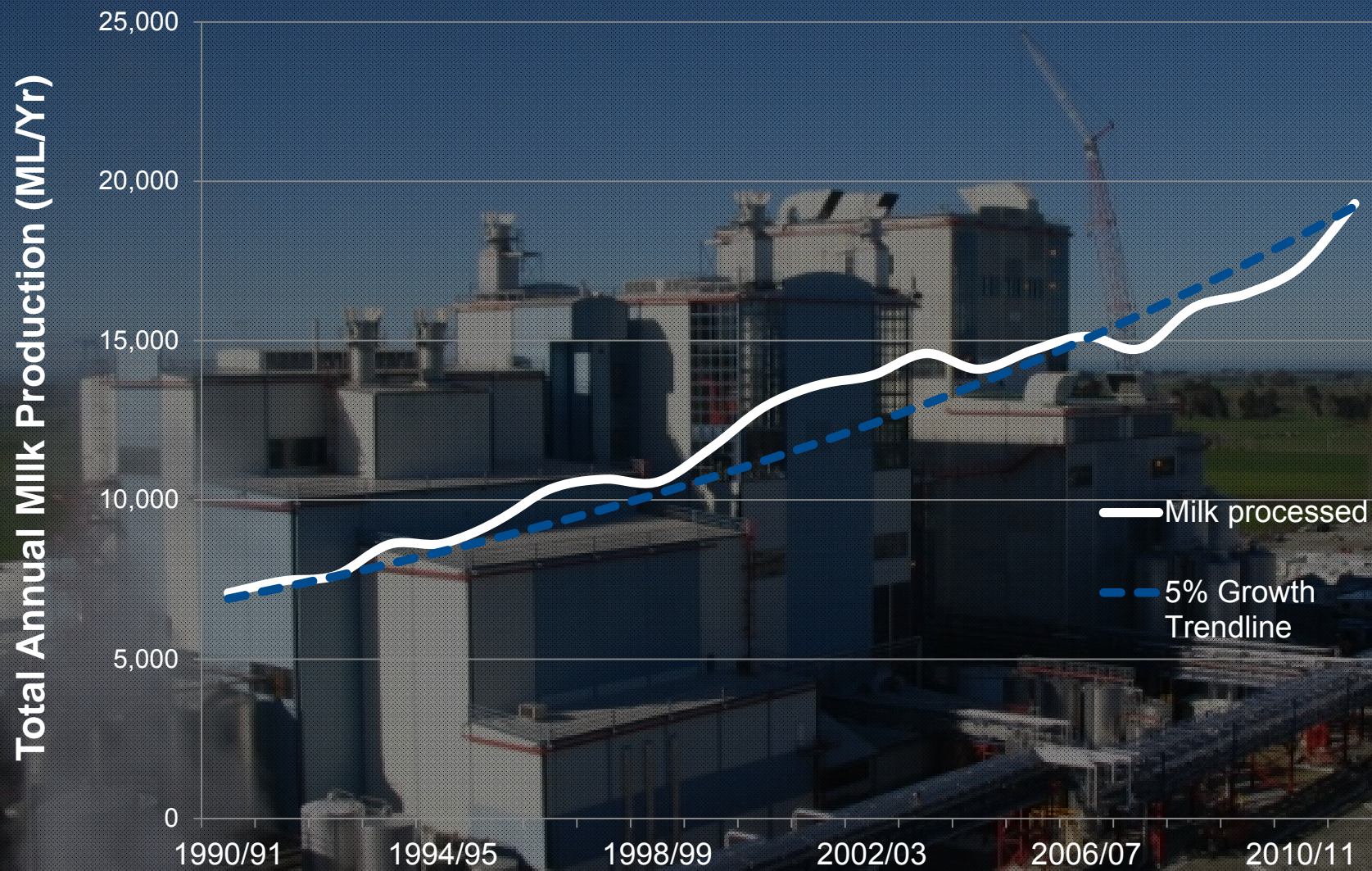
Source: IDF 2011		N.Z.	Ireland	EU-27	U.S.	China
Total Milk Production	MT/yr	17	5.5	150	87	36
Milk to Milk Powder	%	60%	15%	10%	8%	25%
Milk to Export	%	95%	62%	10%	6%	0.2%



NZ Dairy Processing Characterised by:

1. Pastoral based seasonal milk production
2. Large farms
3. Large centralised processing
4. Milk Powder / Export Focus
- 5. Strong Milk Growth**

NZ Milk Production



Source: Dairy NZ

NZ Milk Production

19,000 Million Litres/Year = 90 Million Litres/d Peak Milk

5% Growth = Extra 4.5 Million Litres at Peak each Year

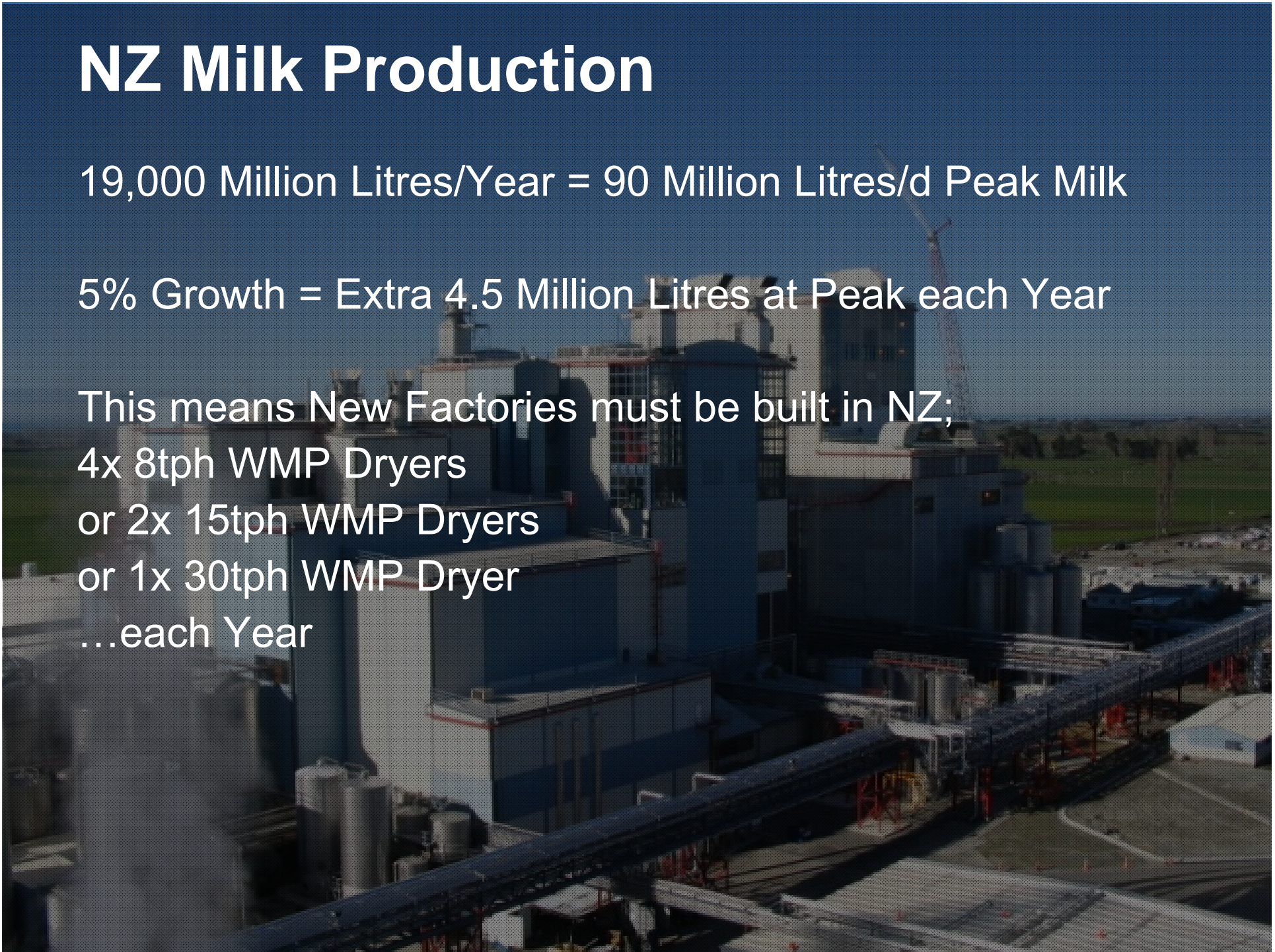
This means New Factories must be built in NZ;

4x 8tph WMP Dryers

or 2x 15tph WMP Dryers

or 1x 30tph WMP Dryer

...each Year



NZ Milk Growth

DRIVERS:

↑Farmer Payments

ACHIEVED BY:

↑Farm Productivity

↑Cow Productivity

↑Dairy Conversions

↑Irrigation Schemes

BARRIERS:

↓Water Supply

↓Environmental Impacts

↓Fonterra Share Cost

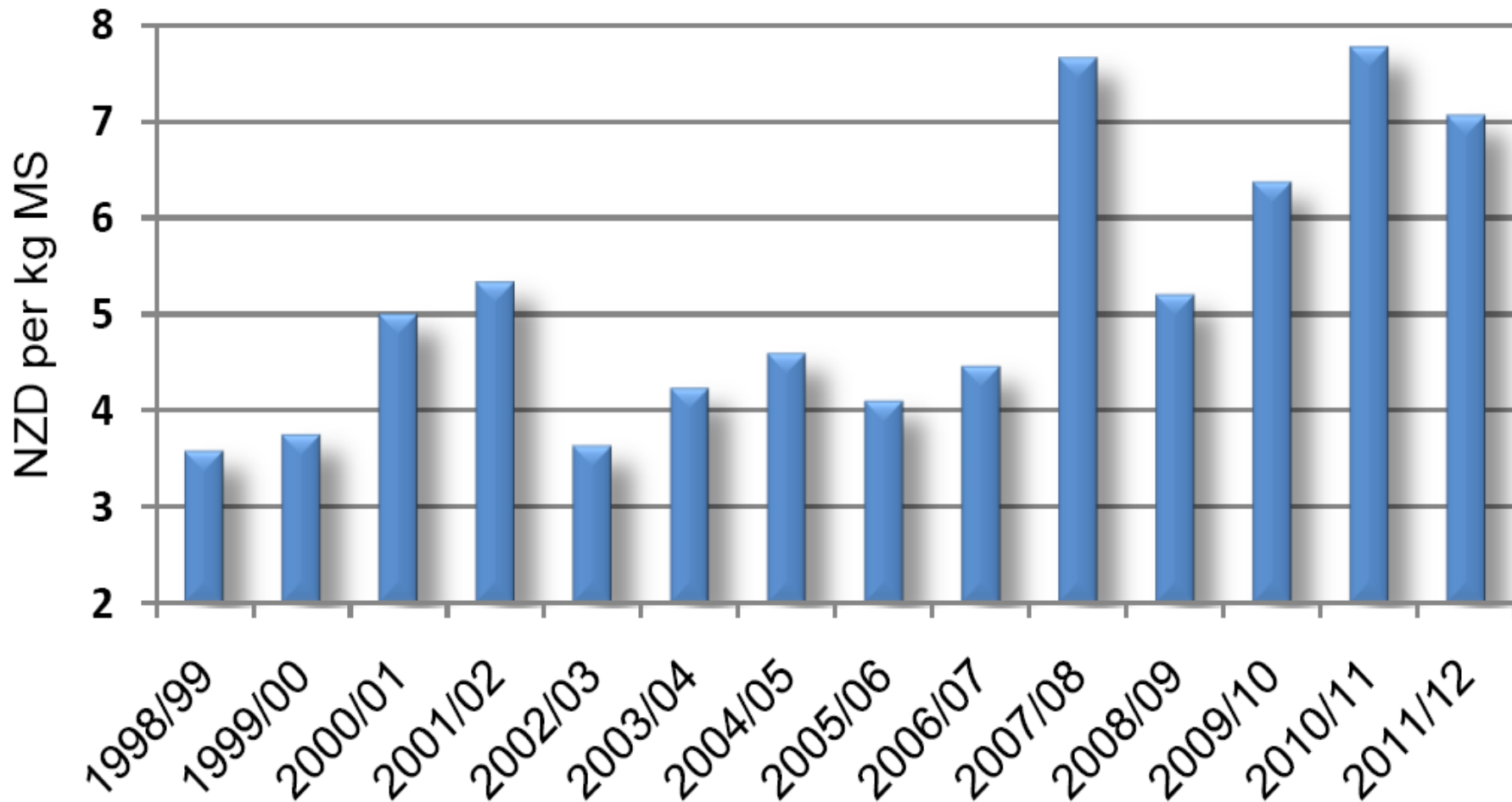
↓Alternative Land Use

↓Urbanisation

↓Land Cost



Fonterra Milk Payments



Source: LTO International Milk Price Comparison Annual Report 2010 (www.milkprices.nl).

New Processing Plants - Trends

Year	Company	Site	Dryer Name	Supplier Company	Dryer Type	Powder Rate (TPH)
2001	Fonterra	Clandeboye	P2	Niro	MSD 2000N	15
2001	Fonterra	Lichfield	WPC	Stork	Widebody	2
2002	Fonterra	Edendale	D2	Niro	MSD 2000N	15
2002	Westland	Hokitika	D3	Stork	Widebody	7
2003	DGC	Hamilton	D1	Niro	MSD 160N	1
2003	Fonterra	Edendale	D3	Niro	MSD 2000N	15
2004	Fonterra	Clandeboye	P3	Stork	Widebody	25
2005	Fonterra	Te Awamutu	Dryer A	Stork	Widebody	9
2005	Fonterra	Te Awamutu	Dryer B	Stork	Widebody	4
2006	Westland	Hokitika	D6	Stork	Widebody	6
2007	NZ Dairies	Waimate	D1	APV	Spray Bed	6
2007	OCD	Awarua	D1	Niro	MSD 1000N	8
2007	OCD	Waharoa	D2	Niro	MSD 1000N	8
2007	Synlait	Dunsandel	D1	Niro	MSD 1000N	8
2008	OCD	Wanganui	D1	Niro	MSD 1000N	8
2009	Fonterra	Edendale	D4	Stork	Widebody	28
2010	Miraka	Taupo	D1	Niro	MSD 1000N	8
2011	Fonterra	Darfield	D1	Niro	MSD 2000N	15
2012	Fonterra	Darfield	D2	Niro	MSD 4000N	30

New Processing Plants - Trends

New Start-up Companies

- Limited Dairy Process Experience
- Financed by Overseas Investors
- 6-8tph Dryer Output
- Fast-tracked Project <12months
- Focus on Minimising Investment Cost



Low Cost Plant Approach



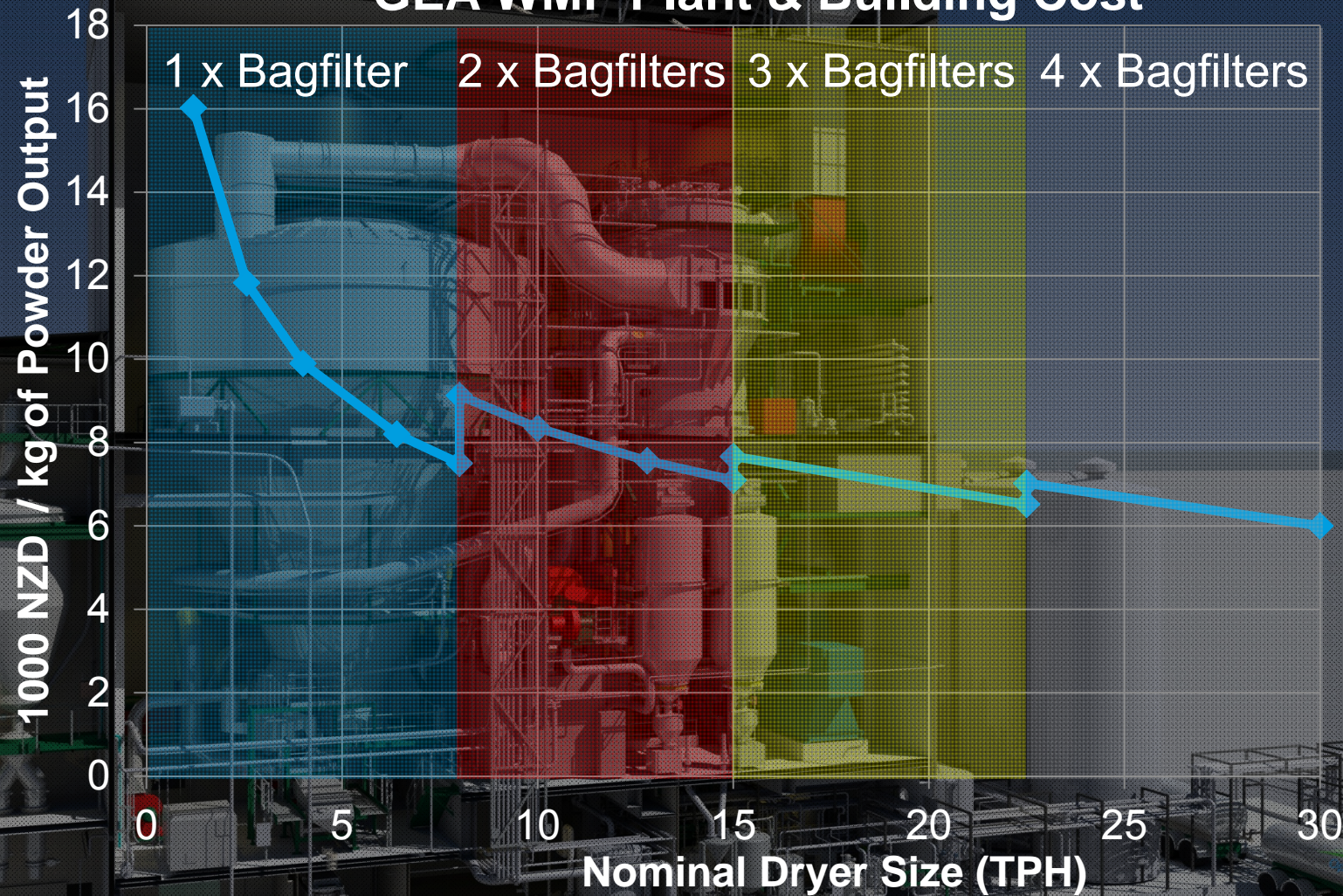
1. Choose a cost efficient size to minimise \$/T



Low Cost Plant Approach



GEA WMP Plant & Building Cost



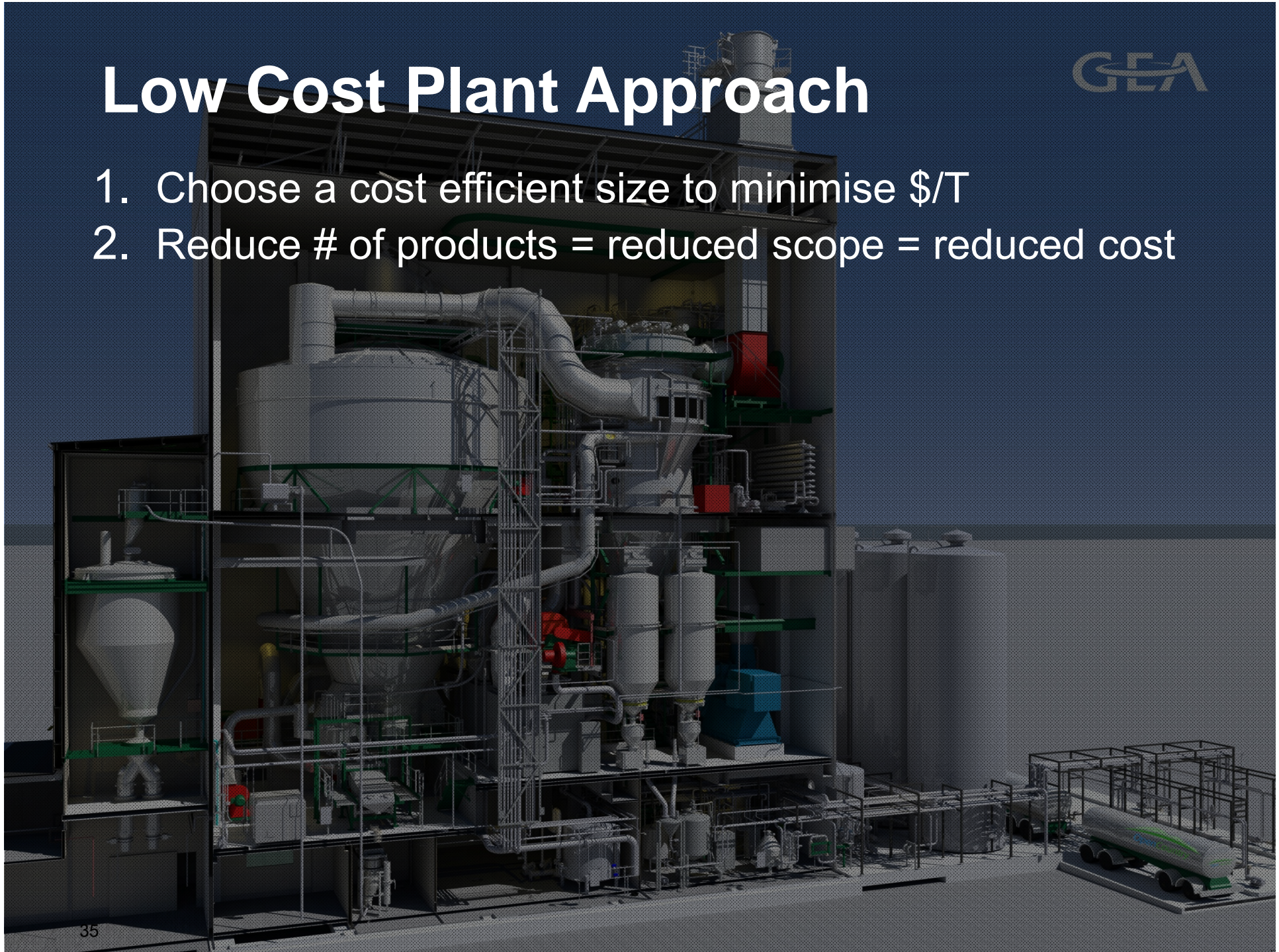
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2005	Fonterra	Te Awamutu	Dryer A	Stork	Widebody	9
2005	Fonterra	Te Awamutu	Dryer B	Stork	Widebody	4
2006	Westland	Hokitika	D6	Stork	Widebody	6
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Low Cost Plant Approach



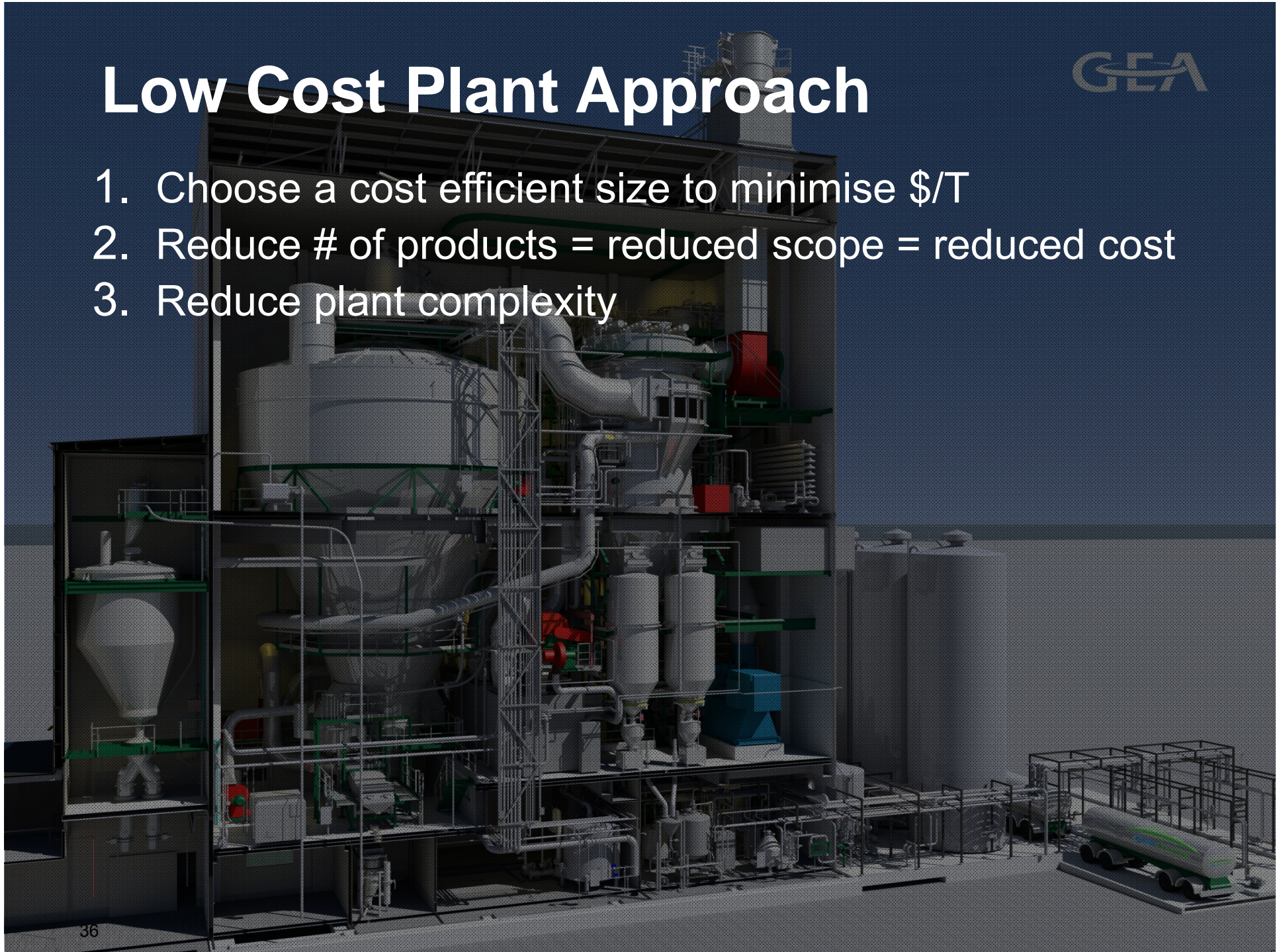
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2. Reduce # of products = reduced scope = reduced cost

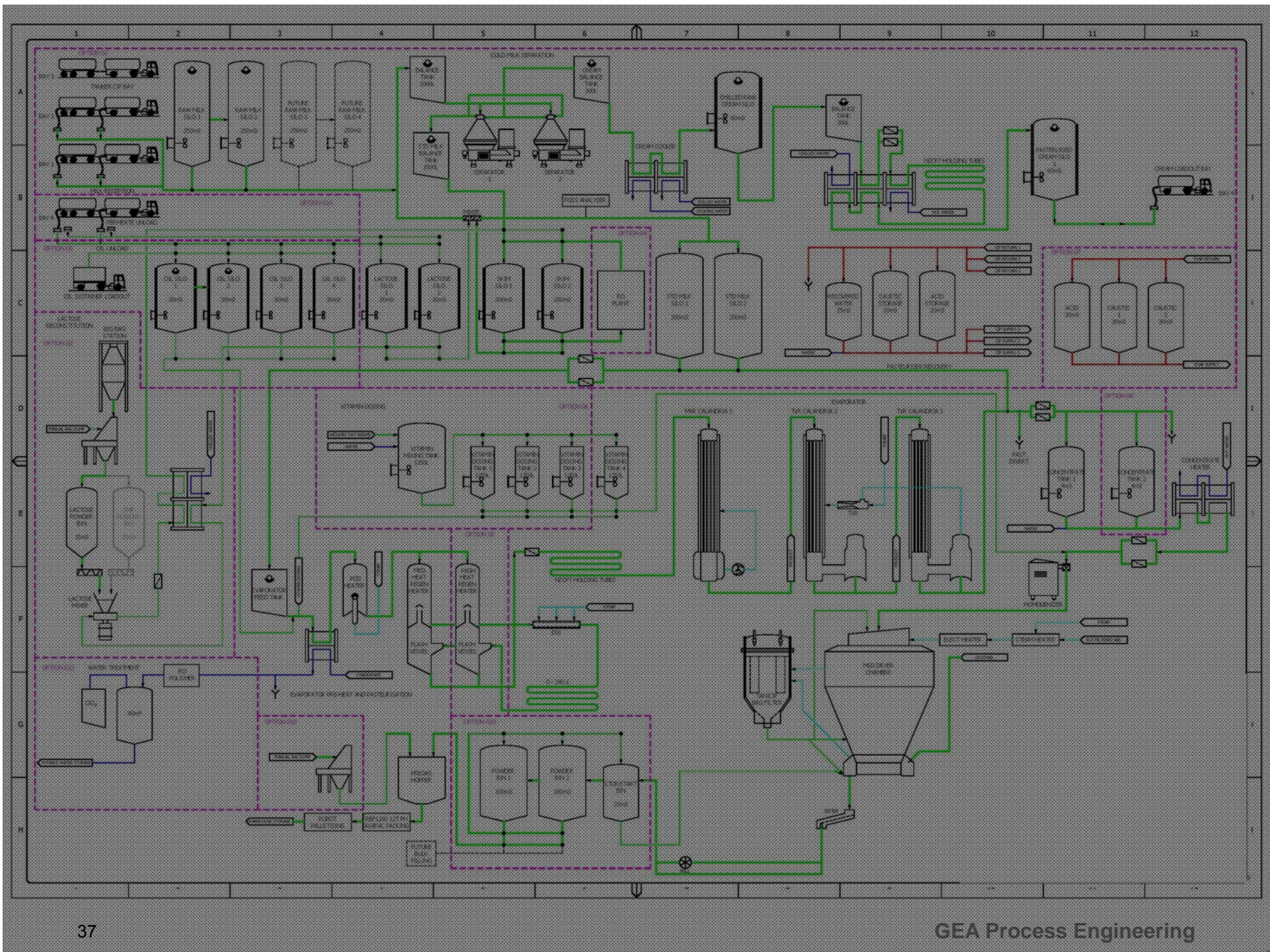


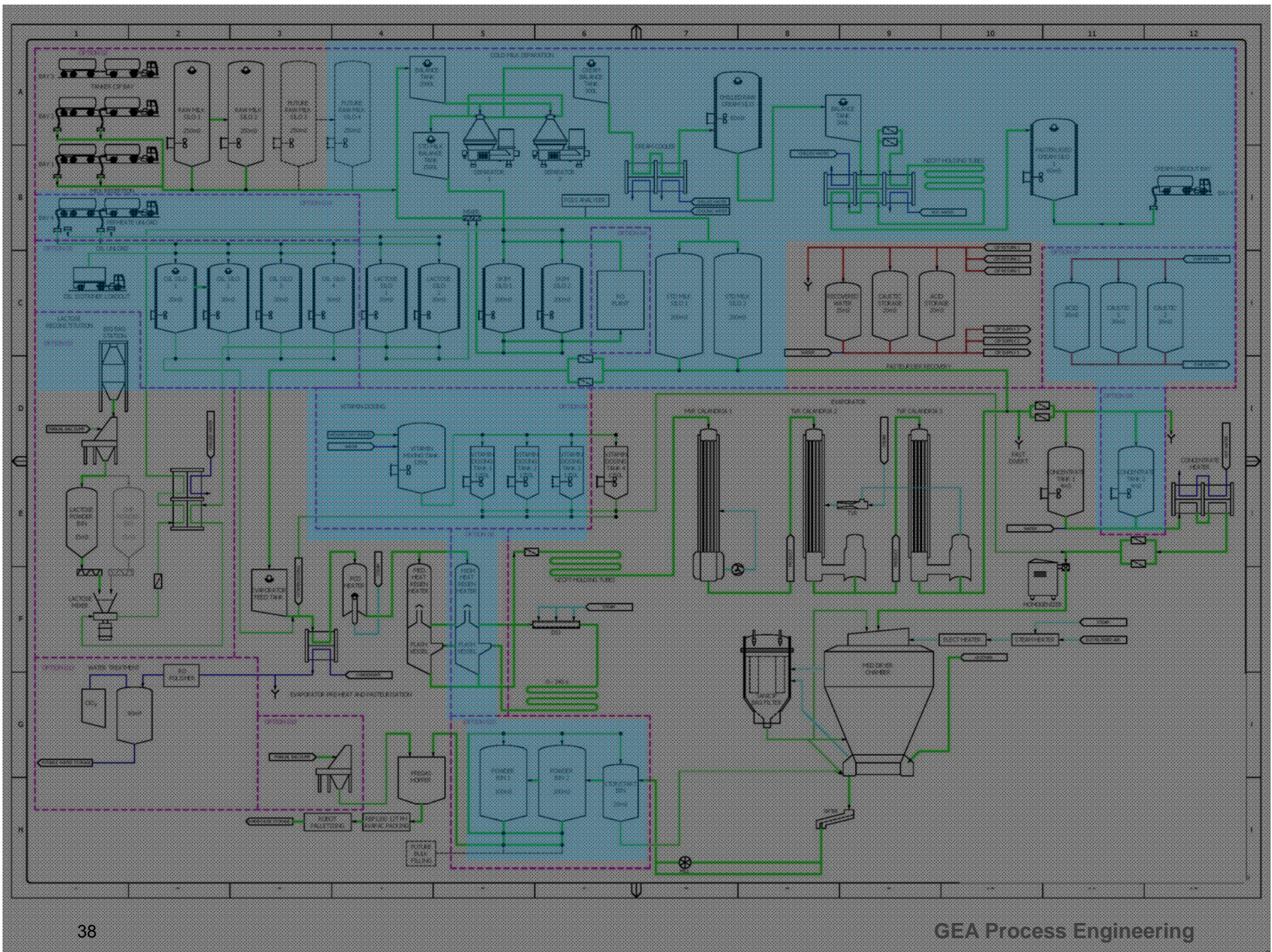
Low Cost Plant Approach

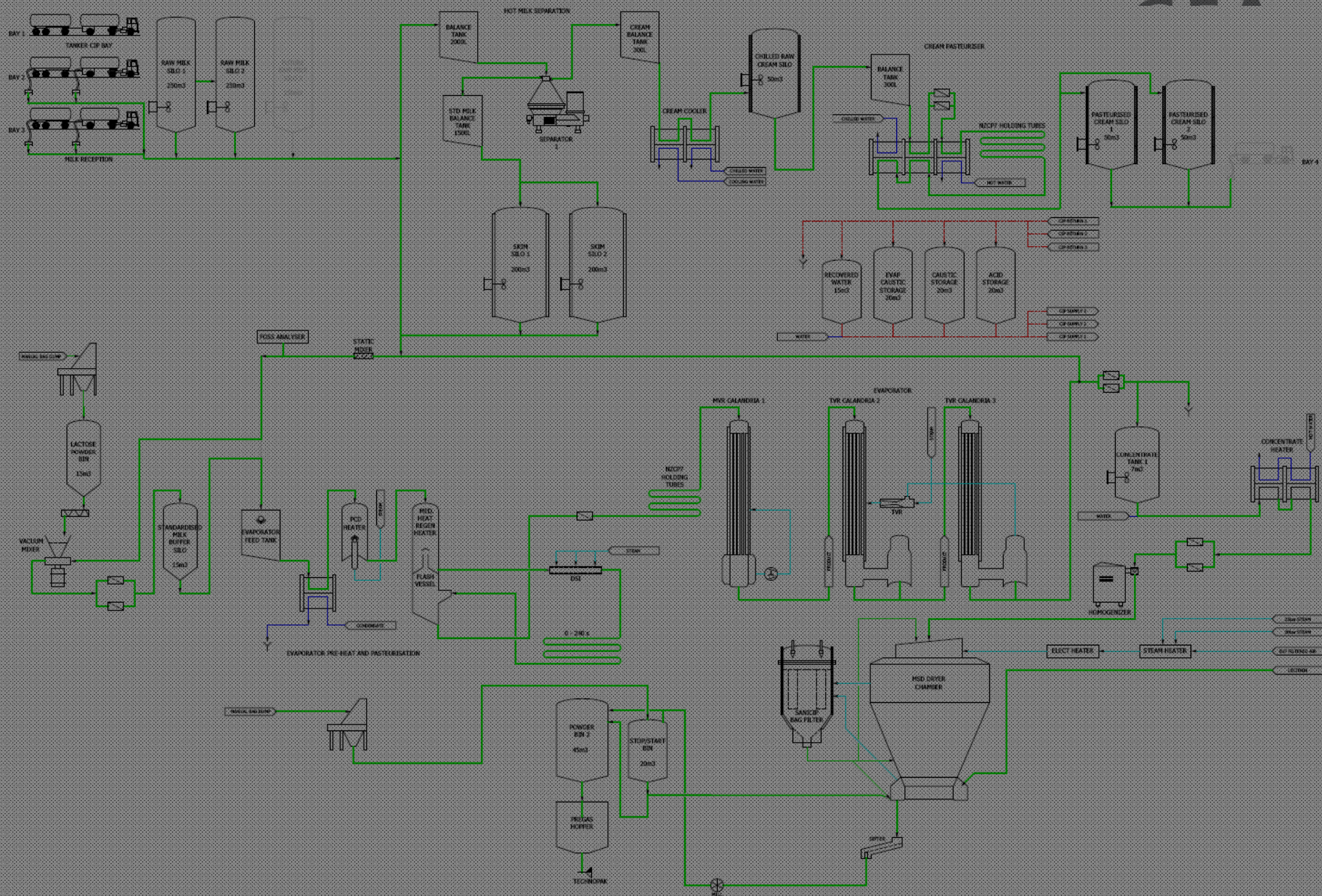


1. Choose a cost efficient size to minimise \$/T
2. Reduce # of products = reduced scope = reduced cost
3. Reduce plant complexity





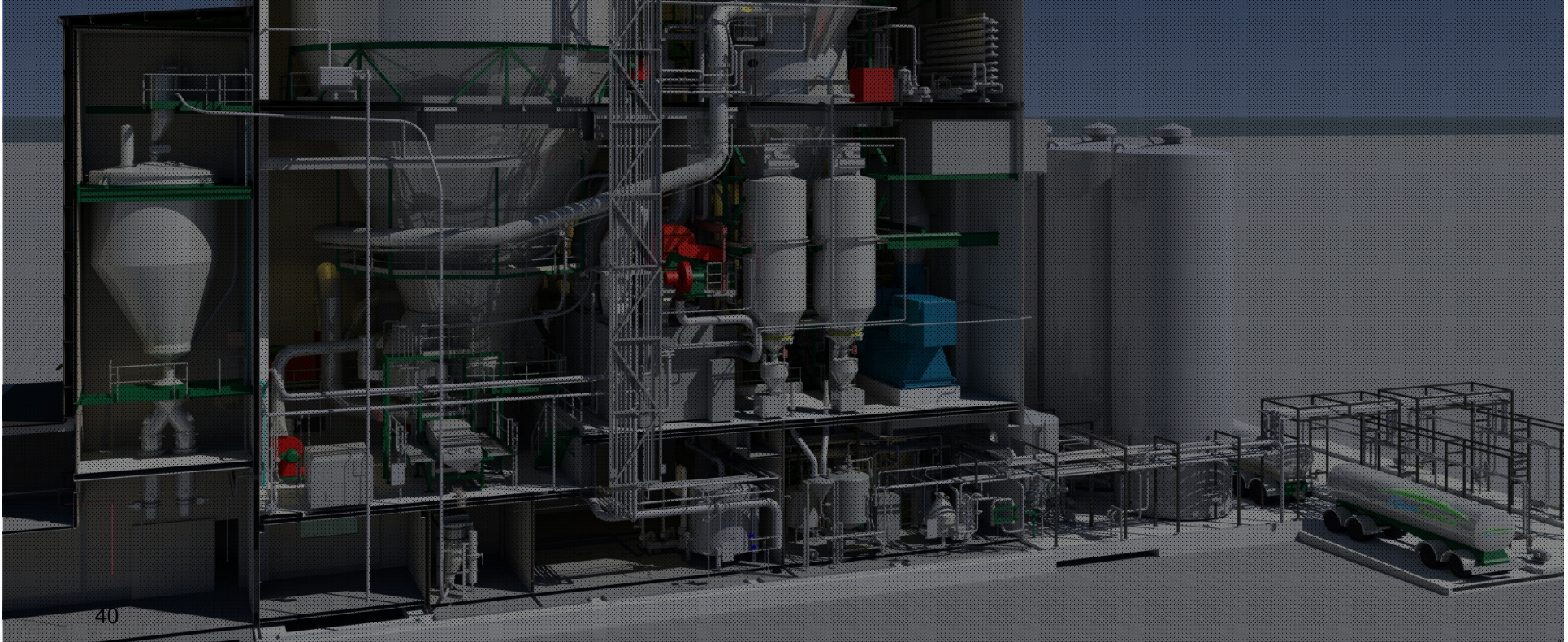




Low Cost Plant Approach



1. Choose a cost efficient size to minimise \$/T
2. Reduce # of products = reduced scope = reduced cost
3. Reduce plant complexity
4. Efficient and compact layout = reduced building cost



Low Cost Plant Approach



Low Cost Plant Approach



1. Choose a cost efficient size to minimise \$/T
2. Reduce # of products = reduced scope = reduced cost
3. Reduce plant complexity
4. Efficient and compact layout = reduced building cost
5. Use Standardised design

Low Cost Plant Approach

GEA

	Potential Savings
	%
Engineering	21%
Evaporator Equip.	0%
Dryer Equip.	7%
Powder Equip.	64%
Wet Process Equip.	53%
Services Equip.	50%
Electrical & Automation	32%
Plant Installation	36%
Building & Civil Works	22%
TOTAL	30%

Low Cost Plant Approach

GEA

OCD - Awarua

Year: 2007

Dryer: MSD 1000 = 8tph

Products: WMP, IWMP

Milk Capacity: 1.2ML/d

Construction Time: 12months

Scope: Milk Reception to Packing



Low Cost Plant Approach

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OCD – Wanganui

Year: 2008

Dryer: MSD 1000 = 8tph

Products: WMP, IWMP

Milk Capacity: 1.2ML/d

Construction Time: 10 months

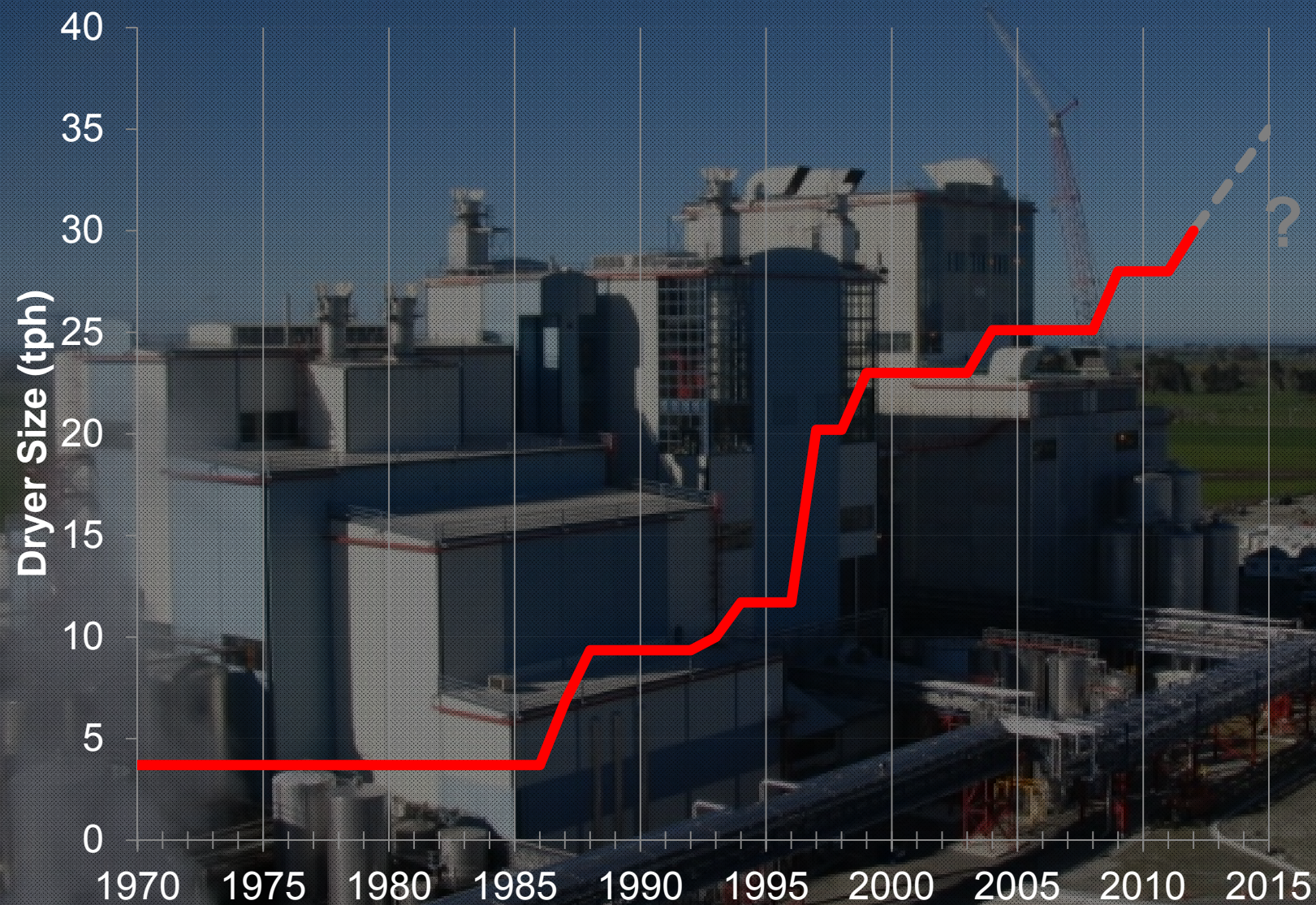
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New Processing Plants - Trends

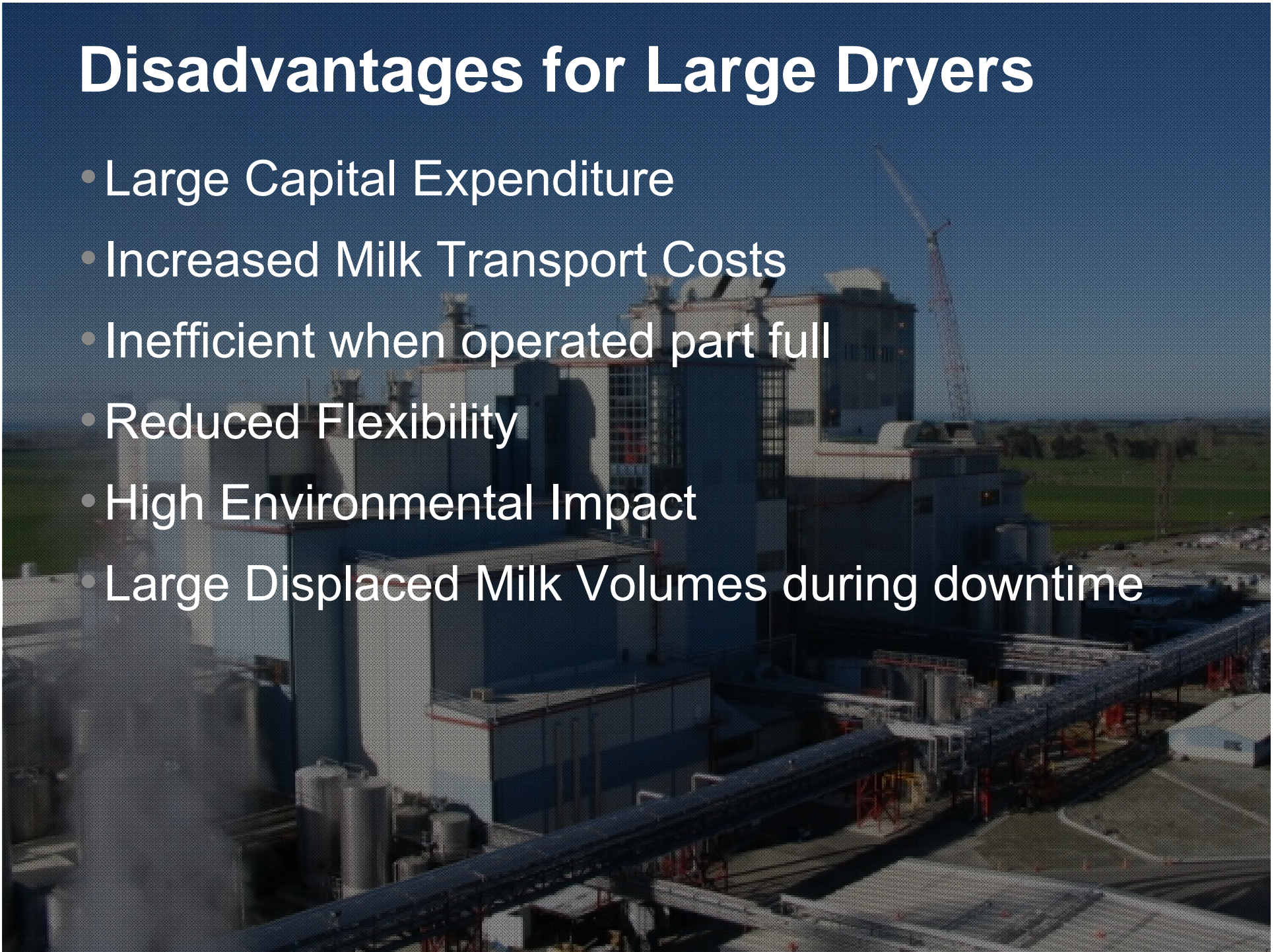
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Milk Powder Dryer Size Development in NZ



Disadvantages for Large Dryers

- Large Capital Expenditure
- Increased Milk Transport Costs
- Inefficient when operated part full
- Reduced Flexibility
- High Environmental Impact
- Large Displaced Milk Volumes during downtime



Drivers for Large Dryers

- NZ's 5% Milk Growth
- Intensive Milk Production Regions
- Single Product Processing Factories
- Continuous / Squared Curve Processing
- Focus on Total Cost of Ownership Approach



Total Cost of Ownership Approach

Capital Cost
vs

1. Operating Cost
2. Yields
3. Project Safety
4. Plant Operability
5. Environmental Impact
6. Plant Utilisation
7. Risk



Risk Minimisation on Large Dryers

- Minimise Risk through Modularisation
 - Most areas can be copied from proven smaller plants
 - Only Dryer Chamber/SFB cannot be modularised
- Use conservative design for scale up
- Check design using CFD tools
- Drying dynamics become easier on larger chambers

Total Cost of Ownership Approach

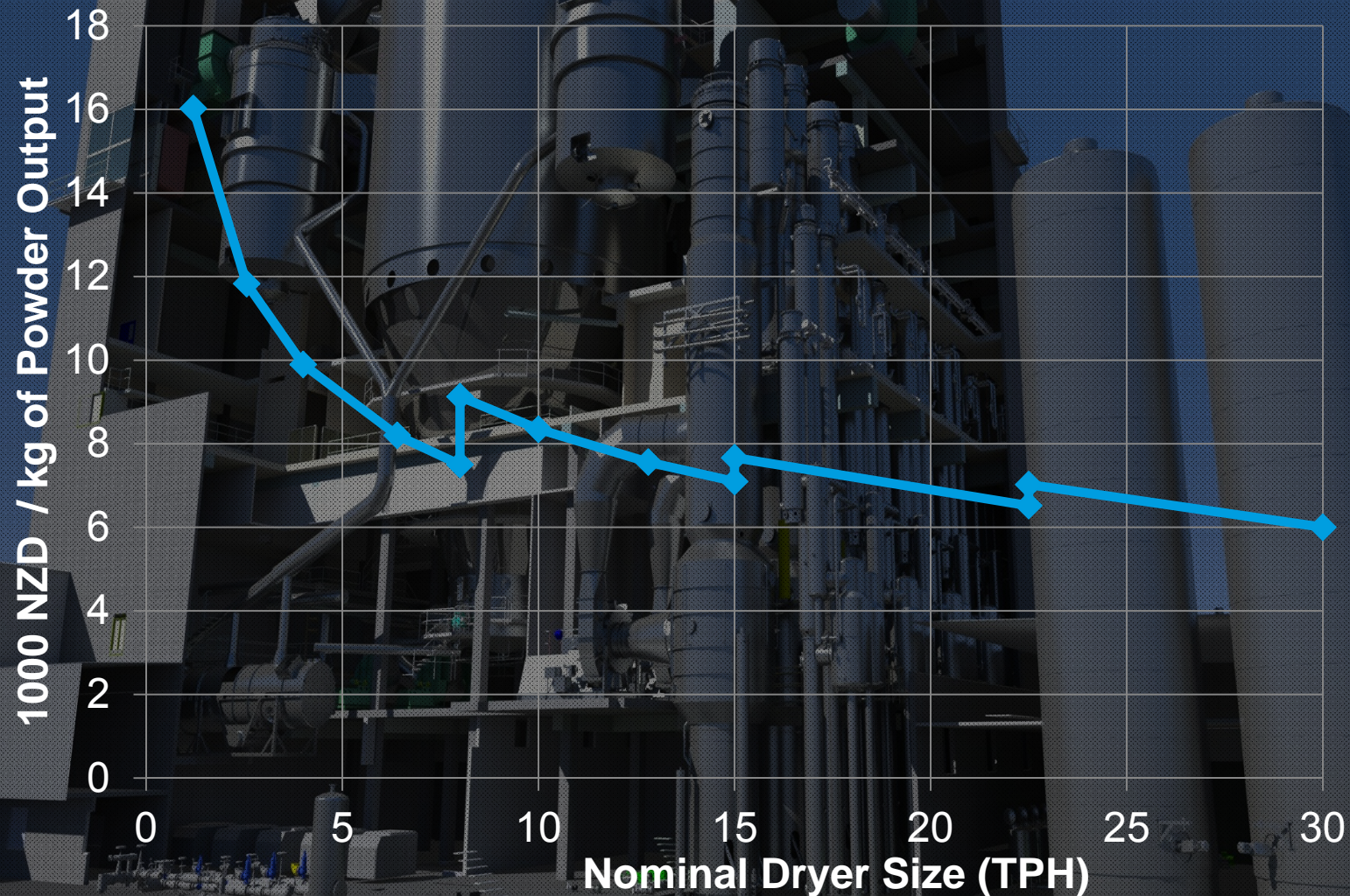
Needs to be...

1. Customer Driven
2. Measureable
3. Communicated Early



Optimum Dryer Size

8tph is minimum economic size for NZ



Optimum Dryer Size

8tph is minimum economic size for NZ

How much bigger depends on:

- Existing Processor or New Entrant
- Milk Growth Rate
- Farm Density / milk collection costs
- Labour Costs
- Availability of finance

30tph is current maximum

- No Engineering Reason why dryers cannot be bigger

Future Trends in NZ Milk Processing?

Short Term:

- Continued Milk Growth
- No Further Increase in Dryer Size
- Direct Investment by Overseas Companies - China
- Larger 2nd Plants by New Entrants

Longer Term:

- Stagnating Milk Growth
- On going plant replacements / consolidation
- New Technology
- Focus on Energy Reduction

Conclusions

1. NZ Dairy growing at 5% over last 20yrs

2. Established Dairy Companies are;

- Building Large Plants to match milk growth
- Taking a total cost of ownerships approach

3. New Processors are;

- Building smaller plants
- Taking a Low Cost Approach

Questions & Discussion?

