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Process Engineered Fuel

A Recycling Opportunity for Unrecyclable Plastics

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Collection and transport

Recyclables, organics and waste



Resource recovery

Waste hierarchy and circular economy



Disposal infrastructure

Managing landfills and residual waste



Energy generation

Converting landfill gas to electricity



Education

Awareness on waste minimisation



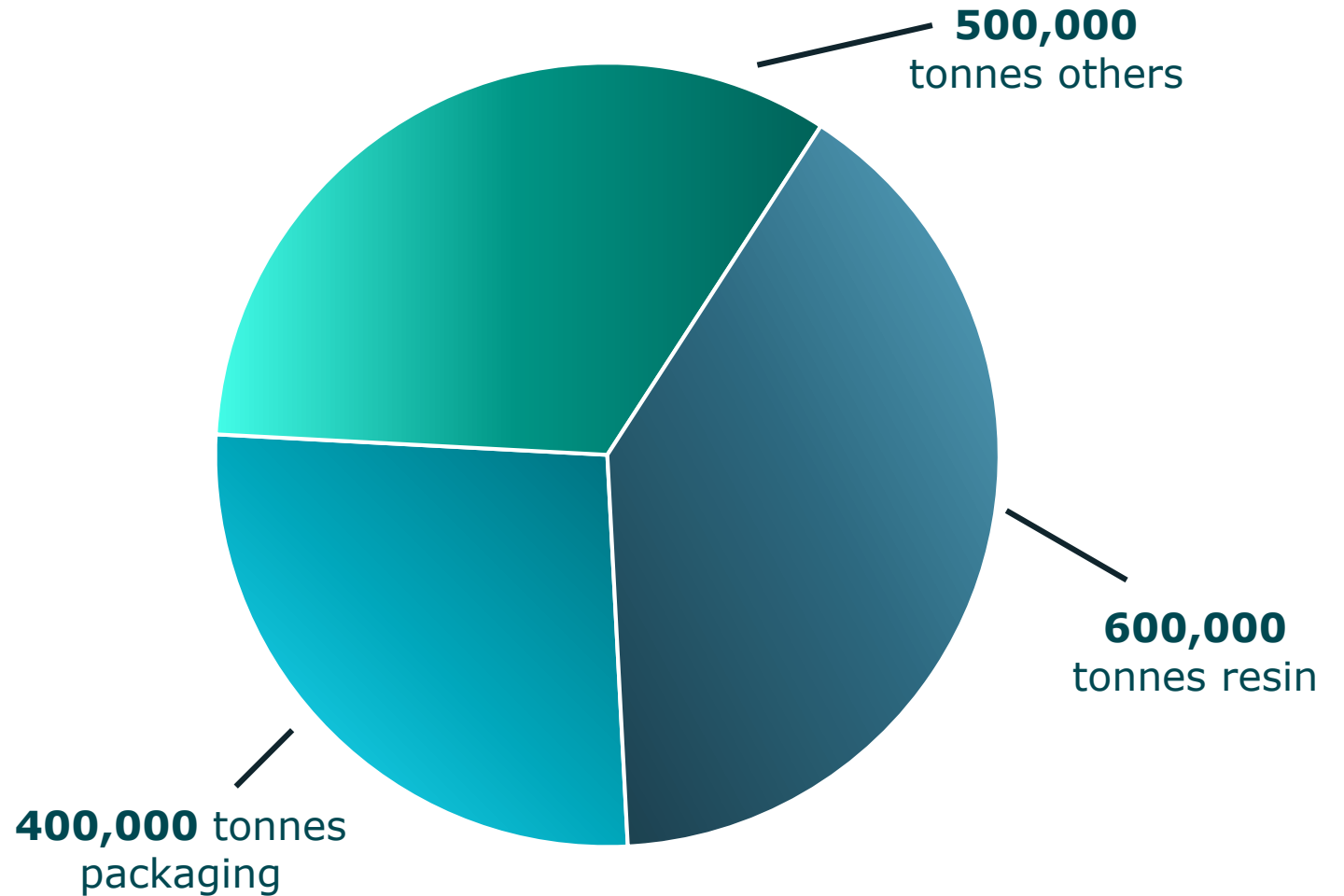
Technical solutions

Managing hazardous and liquid waste

Plastics in New Zealand

1.5 million tonnes

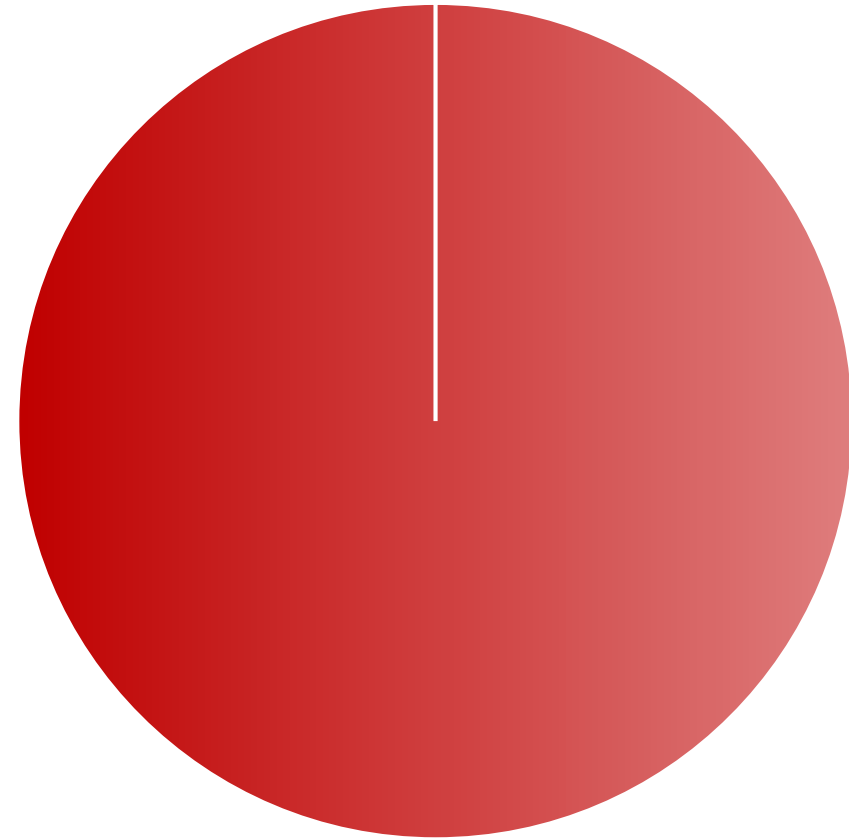
of plastics are imported in New Zealand every year



Plastics in New Zealand

380,000 tonnes

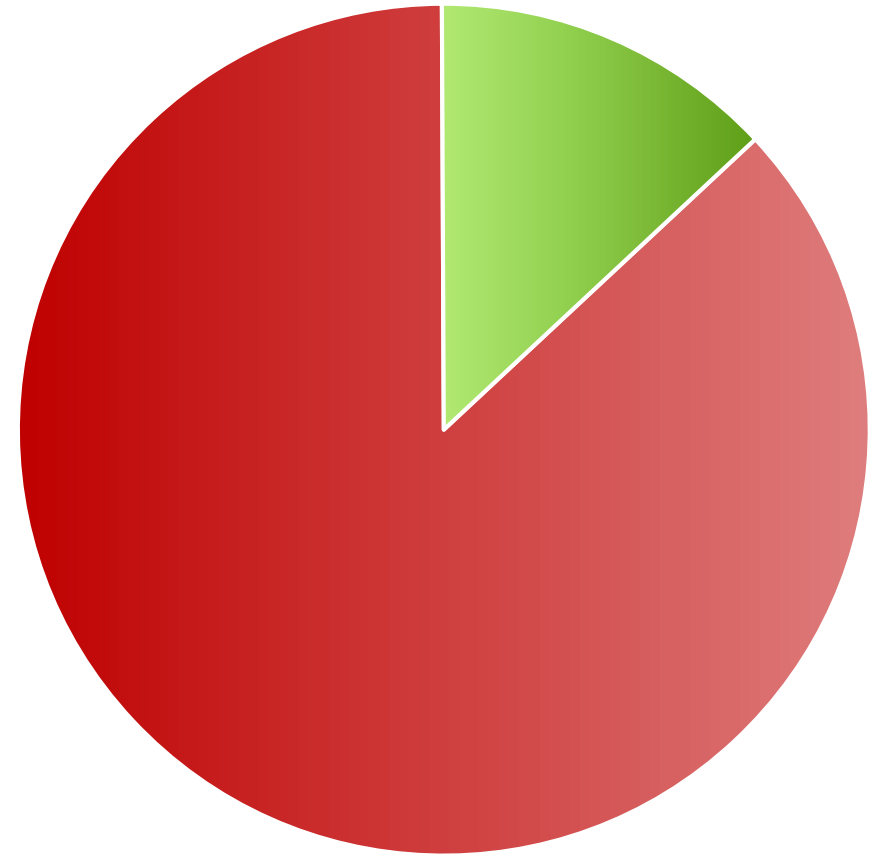
**of plastics waste is generated in
New Zealand every year**



Plastics in New Zealand

**≈ 68,000 tonnes
(only 15%)**

**of plastics waste is recycled in
New Zealand every year**



Plastics in New Zealand

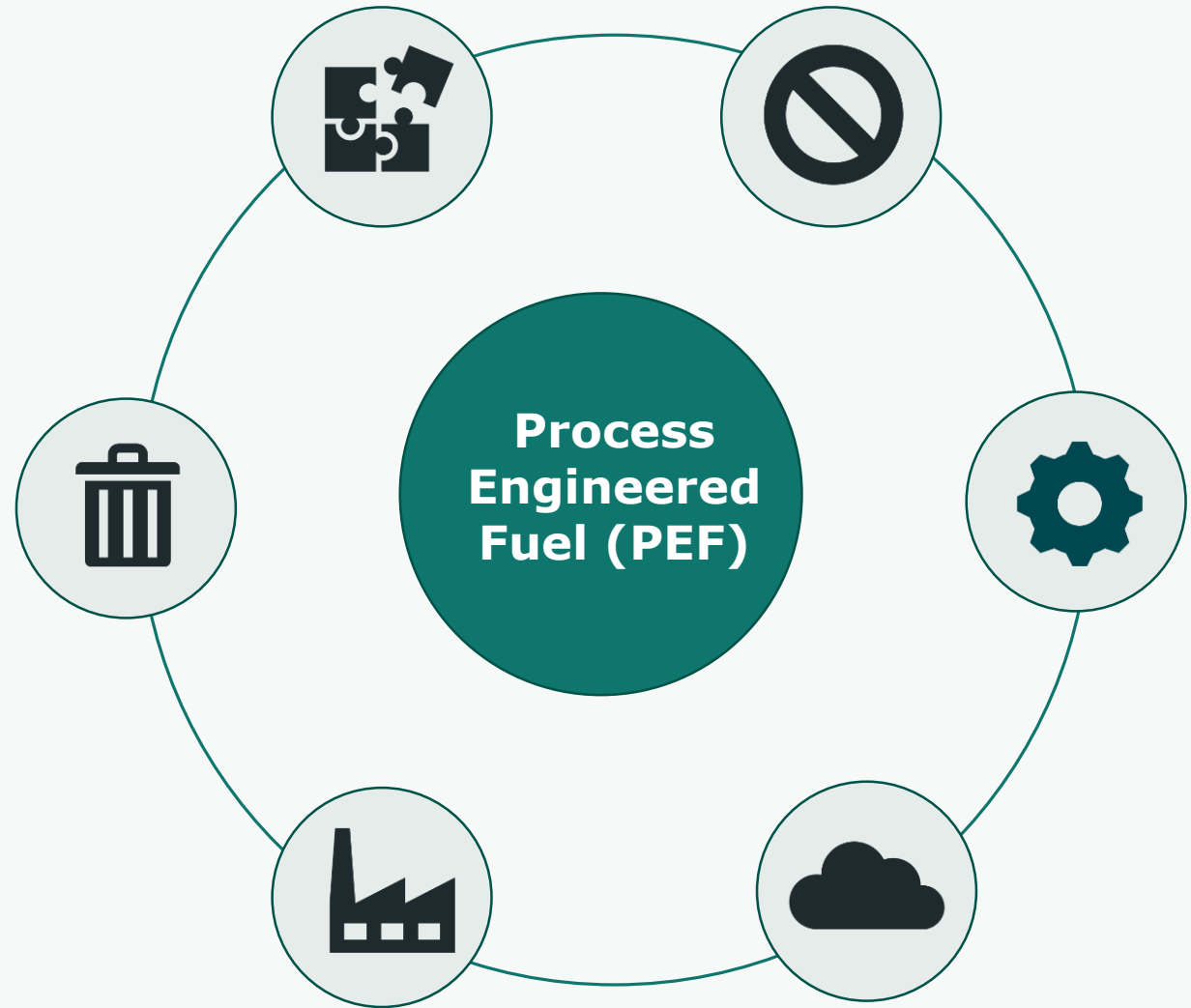
≈ **68,000 tonnes**
(only 15%)

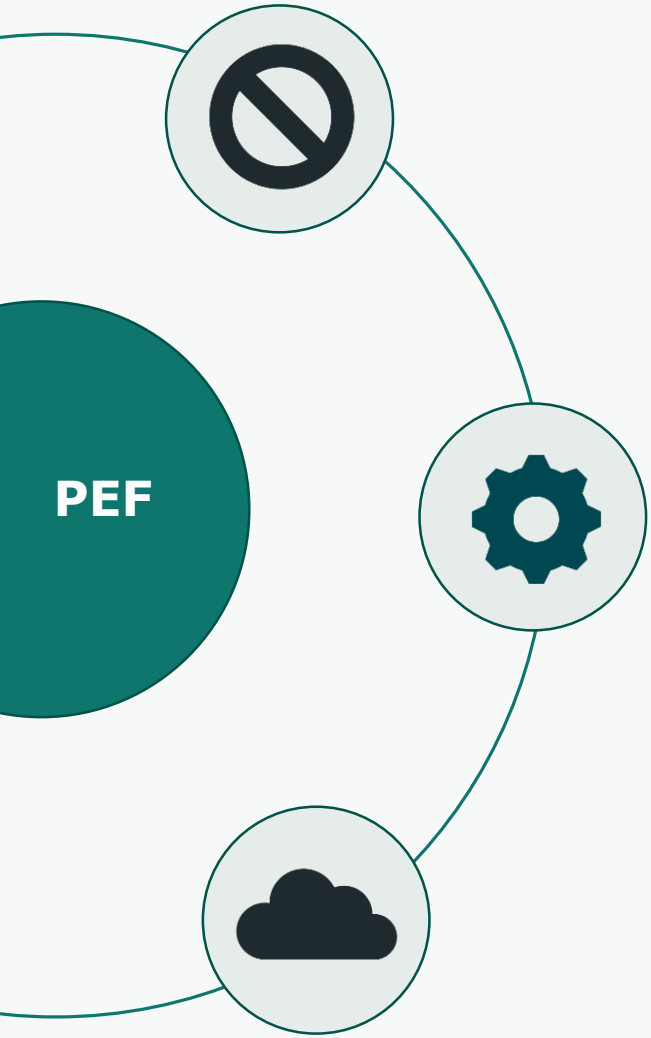
**of plastics waste is recycled in
New Zealand every year**

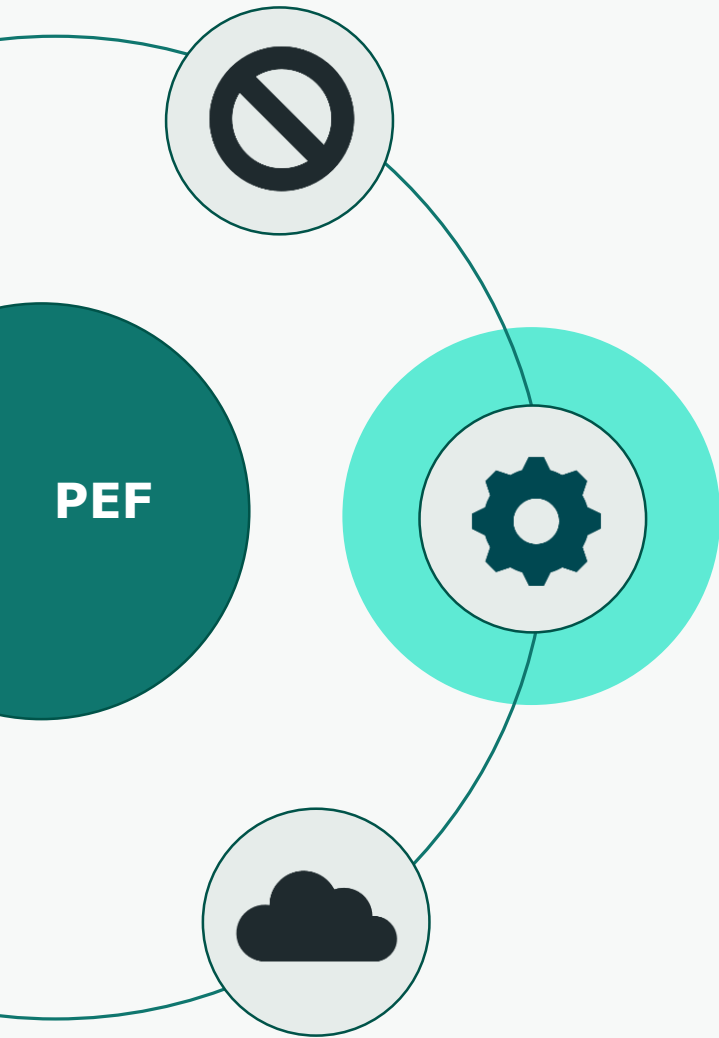
FACTORS

- Limited domestic processing capacity
- Weak end markets for recycled plastic
- Hard-to-recycle streams dominate
- Product design issues (e.g., composites)

Understanding Process Engineered Fuel (PEF)



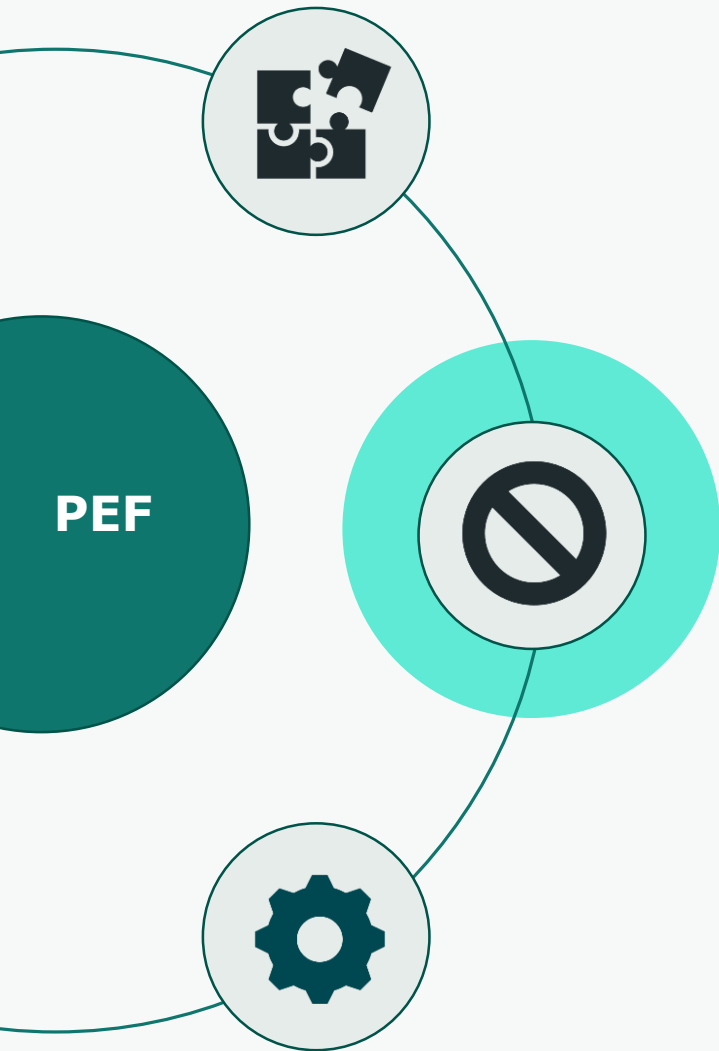




What is PEF?

- A manufactured fuel
- Made from non-recyclable waste
- Replaces fossil fuels in industrial applications.

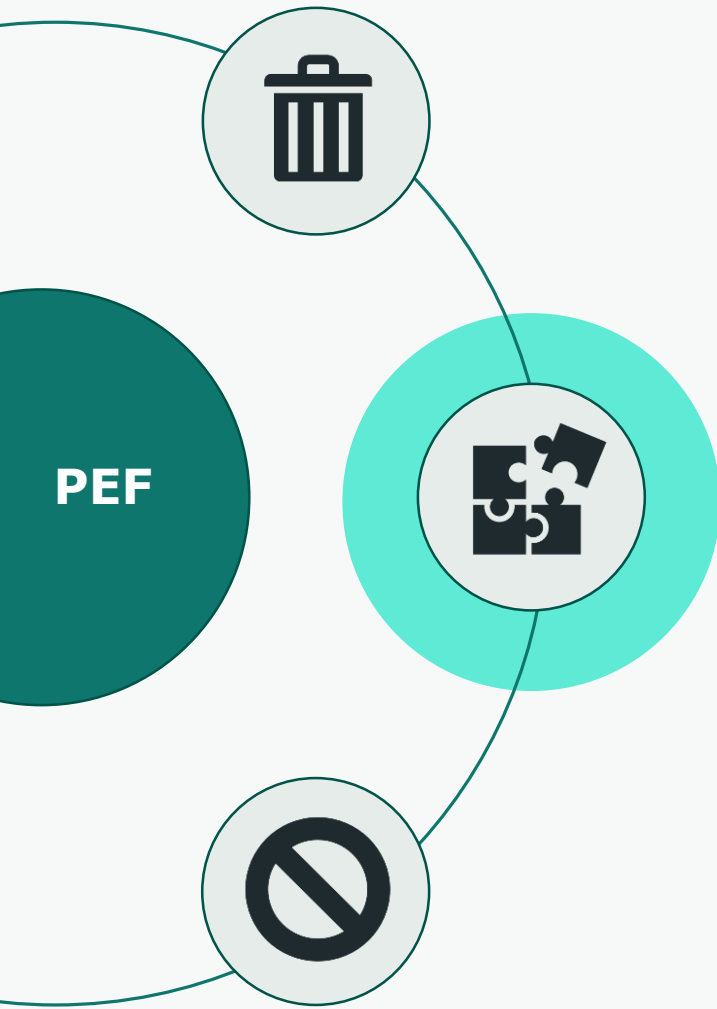




What is PEF not?

PEF is not the same as refuse derived fuel (RDF)

- **Input:** **selected** high energy non-recyclable materials – not mixed waste
- **Processing:** sorting, shredding, drying, **blending** – not basic processing
- **End use:** **industrial** application – not waste-to-energy
- **Calorific value:** **15–20 MJ/kg** – not 8–15 MJ/kg
- **Consistency:** **stable** and controlled – not variable.
- **Moisture:** **5-15%** – not 15-35%



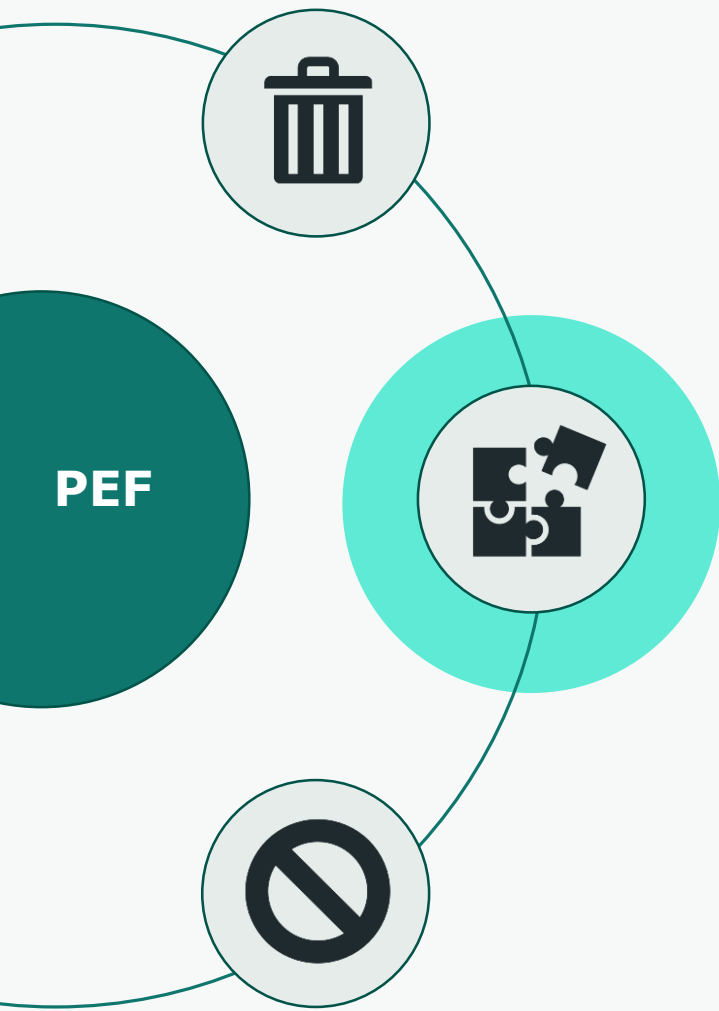
Materials for PEF

Acceptable

- ✓ Non-recyclable waste streams
- ✓ Plastics and packaging materials
- ✓ High energy residual waste

Unacceptable

- x Hazardous or contaminated waste
- x High-moisture materials
- x Chlorinated plastics (e.g. PVC) –avoided to control emissions (dioxins/furans)



Examples

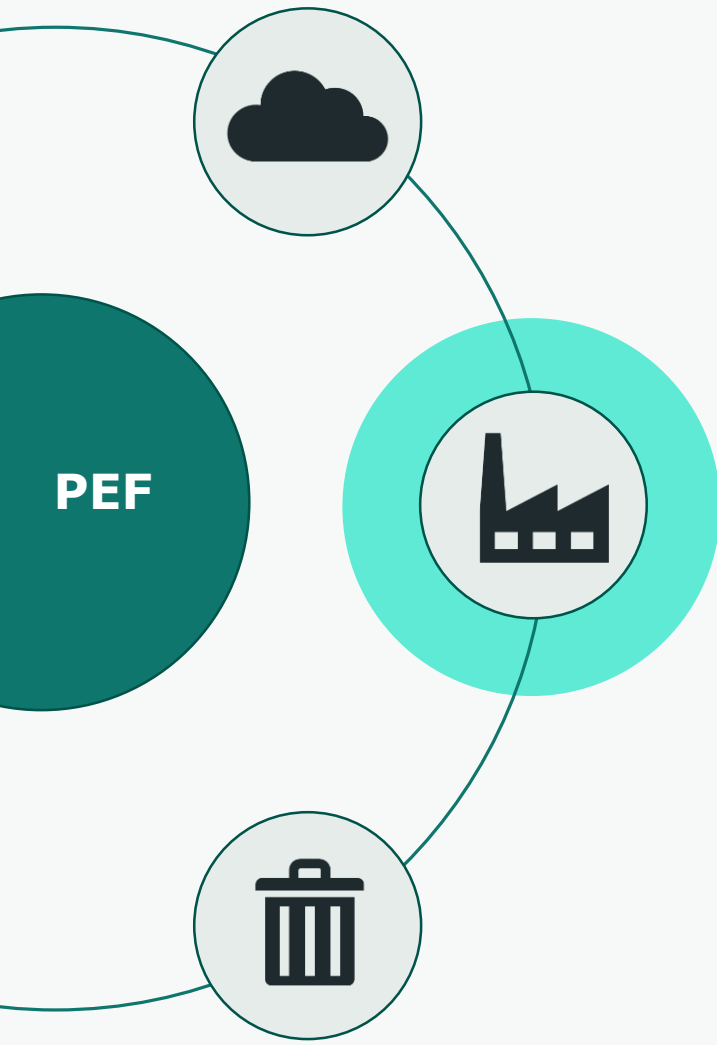
- ✓ Textiles and selected PPE
- ✓ Labels and label backings
- ✓ Multi-layer packaging
- ✓ Protective wrapping and strapping
- ✓ Plastic films and woven bags



PEF vs Landfill

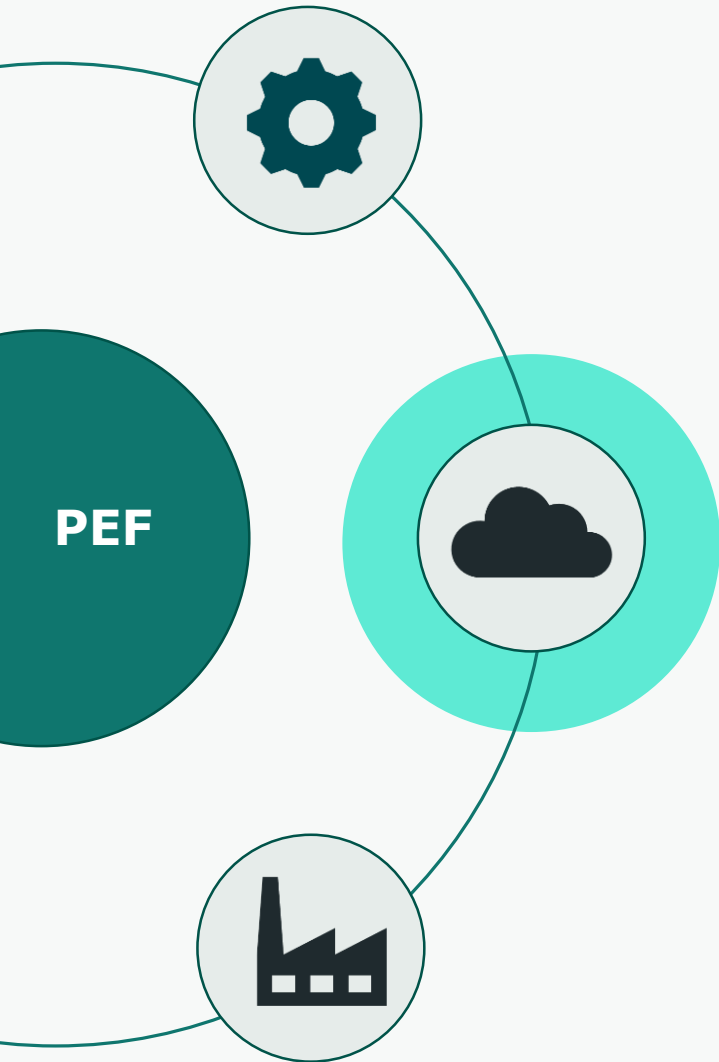


- Reduces waste to landfill
- Higher in the waste hierarchy (recovery vs disposal)
- Avoids landfill-related emissions (e.g. methane)
- Avoids leachate and long-term environmental risks



PEF in Cement kiln vs Incineration

- Higher temperatures ($\approx 1400-1600^{\circ}\text{C}$ vs lower WtE)
- Contaminants captured in-process (via limestone)
- No separate ash disposal (ash used in cement)
- Direct coal replacement (not just waste treatment)
- Uses existing infrastructure (no new facilities required)



Emissions

- **No methane emissions (vs landfill)**
- **Chlorinated inputs controlled (e.g. dioxins/furans)**
- **Fossil carbon – displaces coal use**
- **Lower impact than landfill disposal**
- **Regulated industrial emissions**
- **>50% emissions reduction vs coal (based on LCA)**

Case Study

Partnering with Health NZ — turning difficult healthcare waste into a usable resource

- **COVID-related healthcare waste diverted from landfill**
- **Non-recyclable PPE and test kits safely managed**
- **Converted into PEF for use in cement kilns**
- **Displaces fossil coal in industrial processes**

Enviro NZ's PEF Collection Service

- Collection services in Auckland, Waikato, Christchurch currently – additional regions to be covered
- > 3,000 tonnes per year capacity – set to increase with demand

Summary

- PEF offers recycling opportunity for some non-recyclable materials
- It produces fuel to replace imported fossil fuel in cement kiln
- It offers significant benefits over landfilling and incineration
- By excluding PVC, it reduces harmful emissions
- Many examples of successful application of PEF for waste reduction



Thank you

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