Synthetic Refrigerant Stewardship Milestone 3: Report 2

Identify options for mandatory product stewardship

This scoping report has been prepared by the Synthetic Refrigerant Stewardship Working Group as part of a process to develop an industry led product stewardship programme for synthetic greenhouse gas refrigerants in New Zealand.

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1. INTRODUCTION

1.1. What is Product Stewardship?

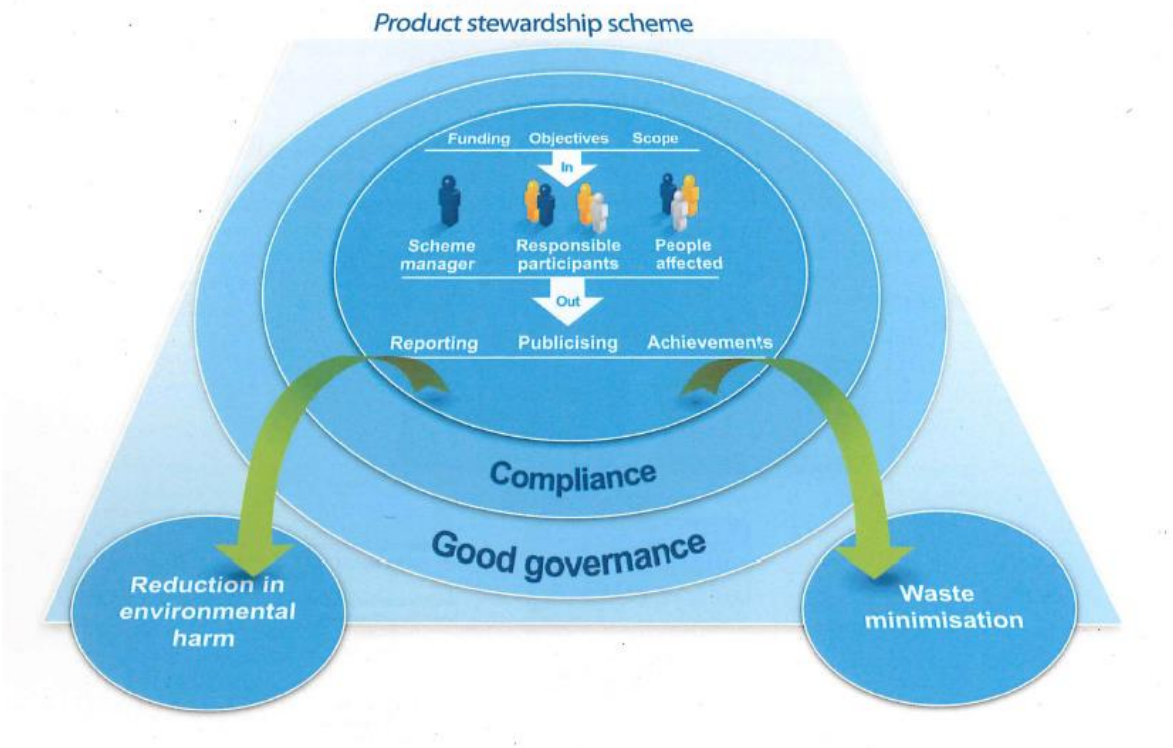
Product stewardship is a “cradle to cradle” methodology that helps reduce the environmental impact of manufactured products. Under product stewardship schemes (PSSs), producers or manufacturers, brand owners, importers, retailers, consumers and other parties accept responsibility for the environmental effects of their products – from the time they are produced until the end of their useful life and are recycled or disposed.

There are many definitions of product stewardship, but the one of most relevance to New Zealand industry is that provided in Part 2 of the Waste Minimisation Act 2008, which states:

The purpose of this Part is to encourage (and, in certain circumstances, require) the people and organisations involved in the life of a product to share responsibility for

(a) ensuring there is effective reduction, reuse, recycling, or recovery of the product; and

(b) managing any environmental harm arising from the product when it becomes waste.



Product stewardship scheme participants take responsibility for the environmental effects of their products and take these costs into account when making decisions about the production, purchase and disposal of their products. This means more efficient and responsible use of resources, rather than dealing with the waste problem at the point the product is thrown away. For some products where they pose a high risk to the environment or human health the PSS may focus on improving the management and ensuring appropriate disposal over recycling and reuse.

For producers[1] this includes planning for and if necessary, paying for, the recycling or disposal of the product at the end of its useful life. This may be achieved by redesigning products to use fewer harmful substances, to be more durable, reusable and recyclable and to make products from recycled materials.

For retailers and consumers this means taking an active role in ensuring the proper disposal or recycling of an end of life product. Product stewardship shifts the physical and financial responsibility of waste disposal away from local government to the producers and users of products.

Many countries around the world have product stewardship legislation including Canada, The European Union Member States, Japan, Korea, Norway, many States in the USA, Australia and New Zealand.

There are many ways that stewardship for SGG refrigerants could be achieved for New Zealand and these will have their advantages and disadvantages. This report will assess potential options and determine what is the preferred option of the Working Group using the available information.

We have chosen to focus on three main options.

1. Current status quo
2. No product stewardship schemes.
3. Co-designed with supporting regulations

This report will consider each option and compare the main aspects of the life of the SGG refrigerants from the moment they enter the country to the moment they leave or are destroyed.

[1] producer means a person who—
(a) manufactures a product and sells it in New Zealand under the person's own brand; or
(b) is the owner or licence holder of a trademark under which a product is sold in New Zealand; or
(c) imports a product for sale in New Zealand; or
(d) manufactures or imports a product for use in trade by the person or the person's agent

2. OPTION 1: CURRENT STATUS QUO

2.1. Overview

The current situation for the stewardship of refrigerants is mixed and varied. There is a single product stewardship scheme operating in NZ. RECOVERY is a voluntary scheme that is accredited by the Ministry for the Environment under the Waste Minimisation Act 2008.

RECOVERY is funded by a fee that is paid by the majority of bulk SGG refrigerant importers. This fee funds the aggregation, transport and disposal of SGG refrigerants deposited at specific locations around the country. The service is free to all holders of SGG refrigerants regardless of whether the producer or holder has paid the advanced disposal fee to RECOVERY.

We are not aware of any other organisations that collect SGG refrigerants for destruction. This is not surprising given the free disposal that RECOVERY currently provide. However, the reuse of SGG refrigerants removed from decommissioned refrigeration equipment does occur.

A detailed situational analysis of the current regime for SGG refrigerants in New Zealand may be found in the Working Group's first report.[1]

2.2. Import and Export

SGG refrigerants are not developed and produced within New Zealand and therefore, all SGG refrigerants be they in bulk or within refrigerant containing equipment, are imported into New Zealand. Some of this imported product is then exported to other countries either in pre-charged equipment or as bulk SGG refrigerant.

Imported goods such as air conditioning units, fridges and freezers and dehumidifiers are pre-charged with SGG refrigerants. Those that contain Global Warming Potential (GWP) gases are required to pay a levy to the government managed Emissions Trading Scheme (ETS). The importer (or registrant in the case of vehicles, see below) pays this based on the number of units and the SGG refrigerants' GWP potential, the higher the GWP, the higher the levy paid to the ETS. This levy tends to be passed onto the consumer within the purchase price.

Motor vehicles will have SGG refrigerants within their air conditioning units. They are required to pay a levy at the point of registration. The Climate Change (Synthetic Greenhouse Gas Levies) Regulations 2013 determines how much they pay based on the price of carbon and the global warming potential of the SGG refrigerant. If a vehicle is not registered to be driven on NZ's roads, then no ETS levy is collected.

Bulk imports, which can be individual SGG refrigerants or more likely blends of different SGG refrigerants are required to surrender New Zealand Units (NZU) under the ETS when imported into the country[2]. The value of the NZUs surrendered is calculated based on the amount of SGG refrigerant imported and its GWP.

2.3. Manufacture of refrigerant and or equipment

As discussed above there is no onshore production of refrigerants in NZ. However, there is the production of equipment and goods that contain refrigerants which are sold both within NZ and overseas.

SGG Refrigerants that are exported either in bulk or in equipment receive ETS NZU

2.4. Sale

SGG refrigerants are sold within NZ wholesale in bulk, within imported pre-charged goods and motor vehicles or NZ manufactured goods. These sales are carried out by a multitude of different organisations in different sectors and at different locations around the country. They can be direct to the public or through third party retailers.

Participants of RECOVERY pay either $1.5 or $2.5 per kilogram (based on the hazardous properties of the refrigerant) to RECOVERY to cover the costs of disposal at the end of its life. This fee is paid based on the amount of refrigerant sold into the NZ market.

2.5. Equipment Servicing, Installation and Use

Almost every property or vehicle be it commercial or domestic has equipment that contains SGG refrigerants. The installation of many of these is not currently required to be carried out by a suitably trained and qualified technician. Therefore, there are poor installations that leak these GWP SGG refrigerants to the atmosphere.

Given the wide and varied uses for SGG refrigerants there is a wide variety of organisations and individuals who would service and maintain the equipment that contain them. These individuals and organisation have varying levels of training and experience ranging from none to highly skilled. This poses a significant risk of unintentional leaks through poor work and ignorance.

It is considered within the industry that a significant amount of leakage of SGG refrigerants occurs due to poor installation and maintenance.

2.6. Recycling/reuse

SGG refrigerants that are removed from equipment can be a mixture of different refrigerants and be contaminated with other chemicals. In order for these SGG refrigerants to be used in other equipment it is sometimes necessary for them to be reprocessed to remove these contaminants and then separated into their different SGG refrigerants so they can then be recombined at the correct ratios for their next use. To the best of our knowledge, there is no one providing this service within New Zealand

Reuse (where little or no reprocessing occurs) of SGG refrigerants does currently take place in New Zealand. This tends to happen when the owner of larger refrigeration units upgrades one unit and keeps the SGG refrigerant from the decommissioned unit so that it can be used in their remaining units that may require topping up due to leakage.

It can also happen in the motor vehicle sector where SGG refrigerants are removed from one vehicle and used in another or reused within the same vehicle.

2.7. Training and qualifications

There are three refrigerant industry organisations that offer support and training to refrigeration technicians working with SGG refrigerants:

- Institute of Refrigeration Heating and Air Conditioning Engineers
- Refrigerant License New Zealand
- Climate Control Companies Association (CCCA)

A Level 4 Refrigerant and Air Conditioning Trade Certificate is available to qualifying industry trained apprentices. Administered by the ITO Competenz, the course focuses on on-job training with off job block courses all held at Manukau Institute of Technology.

Separately, Unitec offer a short course in Automotive Air Conditioning Installation and Servicing.

There is currently no formal license for refrigerant technicians. Training for an Approved Filler License for Refrigerants is carried out in NZ by training organisations such as Refrigerant License New Zealand and whilst there is a requirement to be suitably qualified for certain activities associated with the installation and decommissioning of SGG refrigerant containing equipment this is not necessary for all aspects of the SGG refrigerant's life cycle. Certification for the Approved Filler License is administered by Worksafe under the HSWA.

2.8. Disposal

RECOVERY is a Charitable Trust (Trust for the Destruction of Synthetic Refrigerants) that has been operating since 1993 and was established to provide a disposal option for ozone depleting refrigerants. It is now focused on providing a disposal option for GWP SGG refrigerants and is governed by representatives from key refrigerant stakeholders such as the dairy, grocery, wholesalers, importers, refrigerant engineers and motor vehicle sectors.

RECOVERY is the only nationwide product stewardship scheme for SGG refrigerants. It is funded by a fee that is paid by participating bulk importers at the time of sale of the refrigerant. The fee is based on the kilogrammes of SGG refrigerant sold which is reported in confidence to Price Waterhouse Cooper (PWC) who aggregate the data for reporting. As it is a voluntary scheme there are no audits carried out to validate the data provided. All funds are managed by PWC.

Not all bulk importers participate in the scheme and none of the pre-charge importers do. It is therefore estimated that approximately only 48% of the refrigerants sold directly or indirectly in New Zealand have a fee paid to enable their safe destruction by RECOVERY. However, due to the nature of refrigerants and the inability to identify the original importer of a refrigerant when presented for destruction, RECOVERY accept all SGG refrigerants for disposal.

There are two levels of fees: the standard rate is $1.50 per kilogram and a higher rate of $2.50 per kilogram for refrigerants with flammable properties. The higher level is due to the additional handling and disposal costs that are required for flammable SGG refrigerants.

RECOVERY contract Patton NZ to receive, consolidate and ship unwanted SGG refrigerants first to Auckland and then to Australia where they are destroyed using plasma arc technology. Patton NZ have three main reception hubs, Auckland, Wellington and Christchurch, where holders of SGG refrigerants can take them for safe disposal. Outside of these centres there is the ability to go to a regional Patton NZ office and have the cylinders couriered to the three main locations or the holder can courier the cylinders themselves.

SGG refrigerants that have flammable properties are sent directly to Auckland in their original cylinders for consolidating with other flammable SGG refrigerants prior to being sent to Australia for destruction. The Auckland hub is the only facility that has the equipment necessary to carry out this consolidation.

When the consolidated shipment is received in Australia it is analysed before being destroyed. This analysis details the composition of the gas destroyed outlining the SGG refrigerants and

concentrations. This information is used by RECOVERY to claim ETS NZU credits for destroying the GWP refrigerants.

Once the consolidated refrigerants have been destroyed in Australia the empty cylinders are returned by ship to Auckland where they are redistributed back to either the Auckland, Wellington or Christchurch Patton NZ branches. This process of shipping cylinders to and from Australia can take a significant amount of time as RECOVERY are required to wait until they have sufficient volume for a full shipment, then space on a ship, time allocated for destruction and space on a ship for the return trip. This can result in a lack of cylinders for consolidation and a backlog developing at the Patton NZ hubs.

This issue could be improved by obtaining more cylinders (which RECOVERY has recently done) or by there being a local onshore destruction option, which is currently not available.

3. OPTION 2: NO FORMAL PRODUCT STEWARDSHIP SCHEME

3.1. Overview

Given that there is currently no legal requirement for producers to develop, operate or participate in a PSS for SGG refrigerants, there is the potential that the current voluntary PSS scheme RECOVERY decides to cease operations.

This would leave holders of SGG refrigerants in New Zealand with no free disposal option.

This is the scenario we have chosen for Option 2 and it considers that all activities and controls are the same as for Option 1 but without a product stewardship scheme for SGG refrigerants.

3.2. Import and Export

SGG Refrigerants will continue to be imported in both bulk and pre-charged units. They will be required to pay their ETS commitments but there will be no fee charged for their stewardship during their life within NZ.

3.3. Manufacture of refrigerant and or equipment

Manufacture of SGG refrigerant and equipment is the same as for Option 1: Current Status Quo

3.4. Sale

The sale of SGG refrigerants is the same as for Option 1: Current Status Quo with the exception that no bulk importers pay a voluntary fee to cover the costs of disposal of SGG refrigerants at the end of their life.

3.5. Equipment Servicing, Installation and Use

The servicing installation and use of SGG refrigerants and equipment is the same as for Option 1: Current Status Quo

3.6. Recycling/reuse

The recycling/reuse of SGG refrigerants is the same as for Option 1: Current Status Quo

3.7. Training and qualifications

The current requirements for training of refrigerant technicians are the same as for Option 1: Current Status Quo.

3.8. Disposal

There is no free (prepaid) disposal option available and all disposal costs must be met by the holder of the refrigerant. Companies may individually decide to export their SGG refrigerants for destruction and receive NZU from the ETS to offset the cost of disposal.

The payment of NZU for the destruction of SGG refrigerants may encourage some to collect and dispose of unwanted refrigerants but given the lack of onshore disposal options it is considered to be unlikely and too involved for most to attempt and so we consider there would be an increase in the amount of SGG refrigerants released into the atmosphere.

4. OPTION 3: REGULATED SCHEME

4.1. Overview

With this option SGG refrigerants have been declared priority products and producers are required to be part of a product stewardship scheme. Regulations have placed controls on the use and management of SGG refrigerants and how they are stewarded within New Zealand.

It must be stated that this is the first stage of a process in designing an SGG refrigerant stewardship system and not the finished product. Many of the nuances that will be required for a successful scheme have not yet been fully investigated and discussed, this will be done during milestone 4.

An SGG refrigerant Product Stewardship Organisation (PSO) has been established that is in general responsible for:

- setting the fee (based on a dollar per kilogram amount) to be paid by the importers of SGG refrigerants - the model for collection of Fees either at the time of import or sale is still to be developed.
- collecting the data from the importers about the net amount of SGG refrigerants they have imported, (this data will be consistent with that provided by the ETS)
- contracting the product stewardship scheme(s) to deliver an effective and efficient PSS within NZ
- collecting the required fees from producers of SGG refrigerants for the stewardship through their life to disposal
- paying product stewardship schemes for the collection and disposal of unwanted SGG refrigerants
- auditing product stewardship schemes
- validating the importers declarations with the data held by the EPA
- set targets for the recovery of SGG refrigerants by the PSS(s)
- receive the ETS units from the PSS(s) that they received for the destruction of SGG refrigerants – the specific best mechanism to achieve this will be determined during the next phase of the project for milestone 4.

PSS(s) are responsible for the collection, transport and safe disposal of SGG refrigerants. This can be a single scheme for the whole country or multiple schemes that are geographically bound or focus on individual sectors such as the automotive industry. They will be set performance standards by the PSO and will be paid based on the amount of SGG refrigerant that they destroy. Given these payments will be in arrears there is the possibility of the PSO providing a management fee to the PSS to contribute to operating and scheme promotional costs.

The PSS(s) may be operated by non-profit, profit or social enterprise organisations.

The PSS(s) will receive ETS credits for the destruction of GWP SGG refrigerants. It is proposed that these units will be given to the PSO who will use it to potentially adjust the fee collected from the producers.

The reason it is proposed to that the credits go to the PSO rather than remain with the individual schemes is to ensure a fair level playing field for competing PSSs. Given the variety of SGG refrigerants in use within NZ there is the potential that competing schemes could

collect the same amount of refrigerant only to find that one has significantly more high GWP refrigerant than the other. This would mean that they would receive a financial windfall from the ETS. A windfall that would not be returned to the producers in the form of reduced stewardship fees but remain with the PSS. To ensure a fair level playing field if the ETS credits are given to the PSO then no scheme is advantaged or disadvantaged by the ETS but the benefits of the ETS credits can assist further PSS work or reduce producer fees.

It is considered essential that the PSO, as the fee setting body, receives the credits for SGG refrigerant destruction. This may be via a contractual relationship where the PSO maintains ownership of all refrigerants collected or through another mechanism. The detail of this will be determined in the next phase of the project.

4.2. What refrigerant gases should be included in a regulated product stewardship scheme?

There are many refrigerant gases with different uses and potential impacts on human health and the environment so it is important that we specify the type of refrigerants that would be included in any potential regulated product stewardship scheme.

The stewardship of refrigerants has come to the fore due to the potential for certain refrigerants to have impacts on the ozone layer and/or the climate. There has, in recent years, been a shift towards lower GWP SGG refrigerant for some uses and it is expected that this transition will continue especially with the implementation of the phasedown of HFC in the coming years. However, whilst the bank of refrigerants will comprise more and more of lower GWP refrigerants the PSS will be unlikely to know what the composition of SGG refrigerants they collect are and therefore will not be able to distinguish between low and high GWP SGG refrigerants.

Therefore, it is considered that for the time being all SGG refrigerants should be included as priority products and required to be part of a PSS regardless of their GWP.

4.3. Import/ Export

The aim of any advanced stewardship fee is to assist in the management of a product through its life within New Zealand and to cover the full cost of disposal.

There are a number of points where a fee could be applied but for efficiency it should be done where it avoids replication and interacts with as few parties as possible. Given the requirement to declare when these products are imported into, and exported from the country, for the ETS this would be the most logical point to apply any advanced stewardship fee.

The fee should only apply to those SGG refrigerants that remain in the country as those exported will not require stewardship within NZ.

For the import of bulk refrigerants and non-vehicular pre-charged goods this requirement duplicates what is required for the ETS. However, the ETS levy is placed on vehicles at the point of registration rather than importation. The Working Group considers that all refrigerant containing goods should be included and the advanced stewardship fee be applied at the point of import unless the good is a vehicle where it should be applied at registration. To clarify this would be for all vehicles regardless of whether an ETS levy is applied to that vehicle.

The advanced stewardship fee should be set by an independent non-profit Product Stewardship Organisation who will also be responsible for receiving the fee from the

producers, overseeing the product stewardship schemes, validating the data provided by these parties and reporting to the Ministry for the Environment.

For those bulk refrigerants and refrigerant containing goods (either imported or manufactured in NZ) that are exported from NZ a refund of the ASF that was paid by those importers will be required to be paid as there would be no SGG refrigerant to manage or dispose at the end of its life within NZ.

4.4. Manufacture of refrigerant and or equipment

Currently SGG refrigerants are not developed and produced from raw materials within NZ. We have assumed that this will continue to be the case for this option. However, if the production of SGG refrigerants does commence in the future then an advanced stewardship fee will need to be applied to these producers as well as those that import SGG refrigerants and refrigerant containing equipment.

4.5. Sale

The sale of SGG refrigerants is the same as for Option 1: Current Status Quo. However, given their potential impact on the environment it is considered potentially beneficial restricting the sale of bulk SGG refrigerants above (*insert weight here)* to be restricted to those individuals who are suitably trained and qualified.

4.6. Equipment Servicing, Installation and Use

The installation and servicing of SGG refrigerant containing equipment must be carried out by a suitably trained and qualified individual. However, equipment such as domestic fridges and dehumidifiers where the SGG refrigerant is self-contained within the equipment and there is no requirement to charge it with SGG refrigerant would be excluded from the installation requirement. For clarity, any servicing that requires the removal of SGG refrigerants or is likely to result in a release of the SGG refrigerant can only be carried out by a trained and qualified technician.

The Working Group consider it is vital to the success of the scheme that this requirement is fully enforced by the relevant enforcement agency.

4.7. Recycling/reuse

As the phasedown of HFCs continues it is likely that refrigerants will be stored for reuse and potentially recycled. Destruction of ozone depleting and high GWP gases should be encouraged in the short and medium term and regulatory controls placed on who can extract, store, reuse and recycle refrigerants. There is no payment from the PSO for the recycling or reuse of SGG refrigerants. However, as the bank of SGG refrigerants transitions to significantly lower GWP gases this will need to change to encourage reuse and recycling over destruction. This is not considered to be something that will occur for many years given the expected lifespan of many of the current SGG refrigerants in use.

It is considered that the most effective way to determine when this point has been reached would be for the PSO to review the destruction certificates provided by the PSS(s) when claiming the ETS credits. When these show that the collections comprise little high GWP gases then, in consultation with the MfE, there could be a transition from active disposal and destruction to reuse and recycling.

4.8. Training and qualifications

All who install, service, decommission, reuse, recycle or manage SGG refrigerants or SGG refrigerant containing equipment are required to be suitably trained and qualified to a level set by the refrigeration industry.

The advanced stewardship fee is not used to subsidise training courses for technicians. However, it may be used to develop the training courses and course material content as it applies to SGG refrigerants.

4.9. Disposal

Disposal of SGG refrigerants is managed by the PSS(s) under the governance of the PSO who set the targets that the PSS must meet.

PSS(s) will be contracted by the PSO to collect, consolidate, convey and ensure effective destruction of SGG refrigerants. They will be paid a management fee and a fee for disposal based on the amount of SGG refrigerant destroyed.

Under this option there maybe one or multiple PSS established. This could be a single PSS for the whole country, regional PSSs or different PSSs for specific sectors such as the motor vehicle industry

One of the key aspects for any successful PSS is how it encourages holders of the unwanted product to participate in the scheme. Given how easily SGG refrigerants can be disposed of to the atmosphere this will be harder for an SGG refrigerant PSS than for other priority products. It is therefore considered critical that some form of incentive is provided to the holder to participate. It is proposed that one potential tool for the PSO would be to provide a rebate set by the PSO to the holder of the SGG refrigerant at the point where the gas is received by the PSS(s). The rebate would be paid on the kilogrammes of refrigerant delivered not on the size of the container.

Any ETS credits received from the destruction of the SGG refrigerants must be passed back to the PSO. The ETS credits are passed to the PSO rather than the PSS keeping the credits is to ensure a level playing field between schemes (as described above).

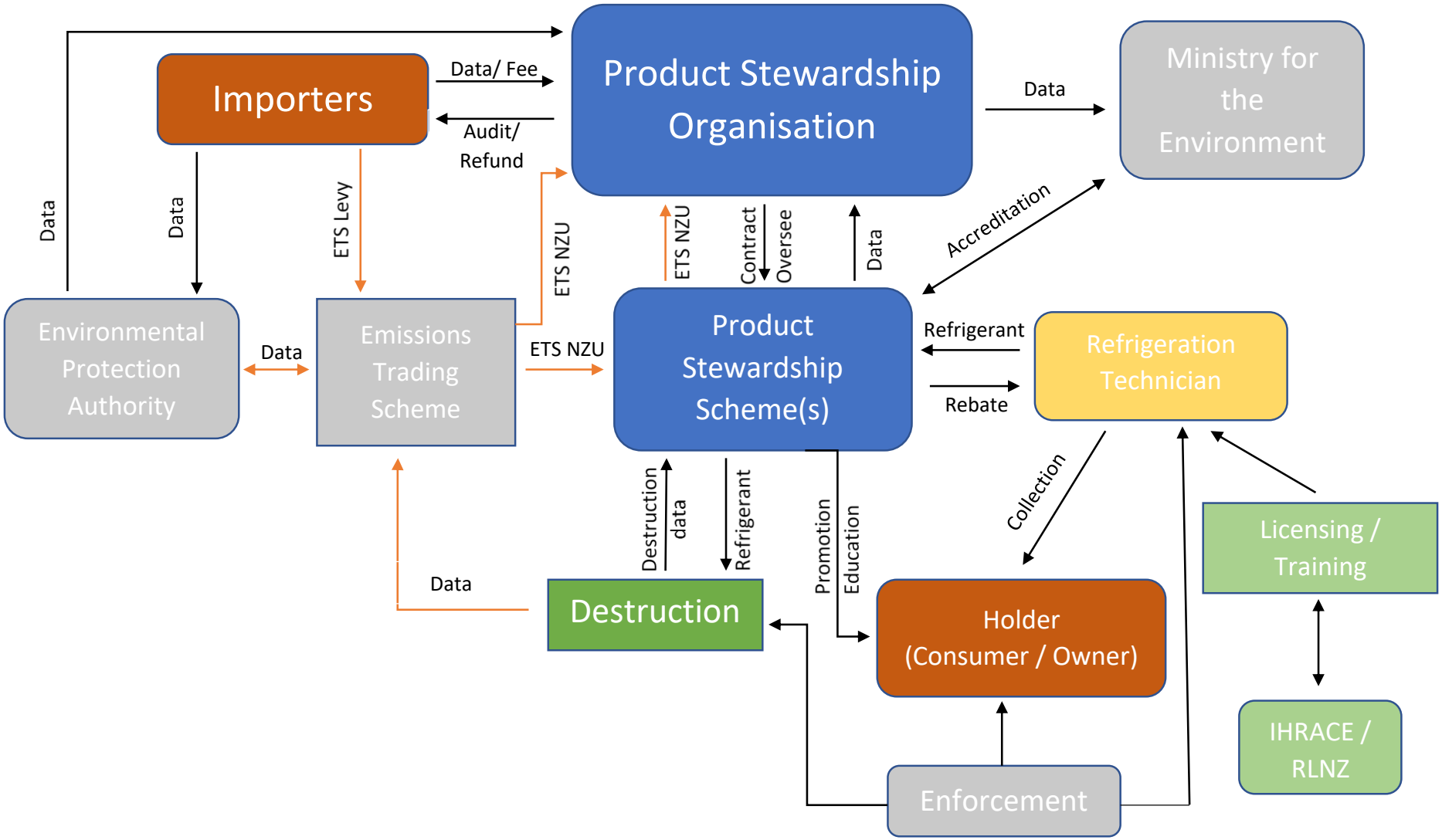
The PSS(s) will be required to:

- be accredited by MfE under the WMA
- receive unwanted SGG refrigerants from holders
- incentivise participation through various methods such as pay a rebate to holders of SGG refrigerants
- only use personnel for the collection and management of SGG refrigerants who are fully trained and qualified.
- promote the scheme to maximise the collection of SGG refrigerants
- report the amount and type of SGG refrigerants destroyed
- pass any ETS units received for the destruction of SGG refrigerants to the PSO
- maintain records of who has deposited SGG refrigerants for destruction, this needs to include at least the individual's name, the business name, contact details, sector, and the amount deposited

4.10. Maintaining records

One of the specific issues with unwanted SGG refrigerants that other priority products do not have is the ability to dispose of the gases unseen and the difficultly enforcement agencies have in proving this intentional release of gases. One way to counter this is to require all parties (excluding householders) to maintain records of the refrigerants they have received and disposed of.

These records can then be requested by enforcement agencies and used to prove that appropriate disposal practices have been used.



Option 3: Regulated Product Stewardship

5. COST BENEFIT ANALYSIS

This section of the report presents a range of assumptions and estimates that underpin a cost benefit analysis (CBA) of options relating to the product stewardship of SGG refrigerants in New Zealand.

The CBA is an economic assessment tool that enables comparison of the status quo "do nothing" scenario with the impacts of two options: a co-regulatory stewardship programme which aims to increase the recovery rate of these gases which have significant global warming potential and an option of no product stewardship at all.

Economic cost and benefits were measured from the perspective of society as a whole, and for comparative purposes, where possible monetised and discounted to convert them to their net present value (NPV). The table below summarizes the key estimates, assumptions, projections and results.

PV ($m) 2020-2030, 2019 base data, 6% discount rate				
Assumptions		Base Case: Voluntary PS	Option 2: No PS	Option 3: Co-Reg PS
General	Base Year data	2019	2019	2019
	Evaluation Period	10 years	10 years	10 years
	Discount Rate	6%	6%	6%
Projections	Tonnes SGG available for AS Fee	6,042	0	11,416
	Tonnes Collected & Destroyed	393	197	1,402
	Recovery Rate	4%	1.7%	4%-14%
Costs	Advance Stewardship Fee (ASF) per Kg	$1.50 - $2.50	0	$1.00
	Total ASF over analysis period ($M)	$12.23	0	$11.42
	Government ($M)	$0	0	$12.97
	Industry ($M)	$2.75	$10.27	$0.50
	Total cost ($M)	$15.0	$10.27	$24.89
	Discounted Cost ($M)	$10.06	$7.00	$17.60
Benefits	Emission Reductions	$39.29	$19.64	$153.26
	Discounted benefit ($M)	$26.06	$13.03	$98.22
Net Benefit $M		$24.31	$9.38	$128.38
Net Present Value (NPV) $M		$16.1	$5.92	$78.1
BCR (Benefit Cost Ratio)		2.59	1.861	5.58
PV ($m) 2020-2030, 2019 base data, 6% discount rate				

Table 1: Summary of assumptions, projections and CBA results

The data used to produce this table and other data in this section can be found in Appendix B

5.1. CBA Analysis Approach

To assess the range of impacts associated with the various product stewardship options a cost benefit analysis framework consistent with the Guide to Social Cost Benefit Analysis[1], published by New Zealand Treasury in July 2015 was used.

The guidance describes how significant decisions should be accompanied by some form of cost benefit analysis, which is essentially about organising available information in a logical and methodical way. A cost benefit analysis measures the impact of a decision on the public at large and even a rough or preliminary CBA is better than no CBA. An overview of the CBA approach is illustrated in Figure 1 and described below.

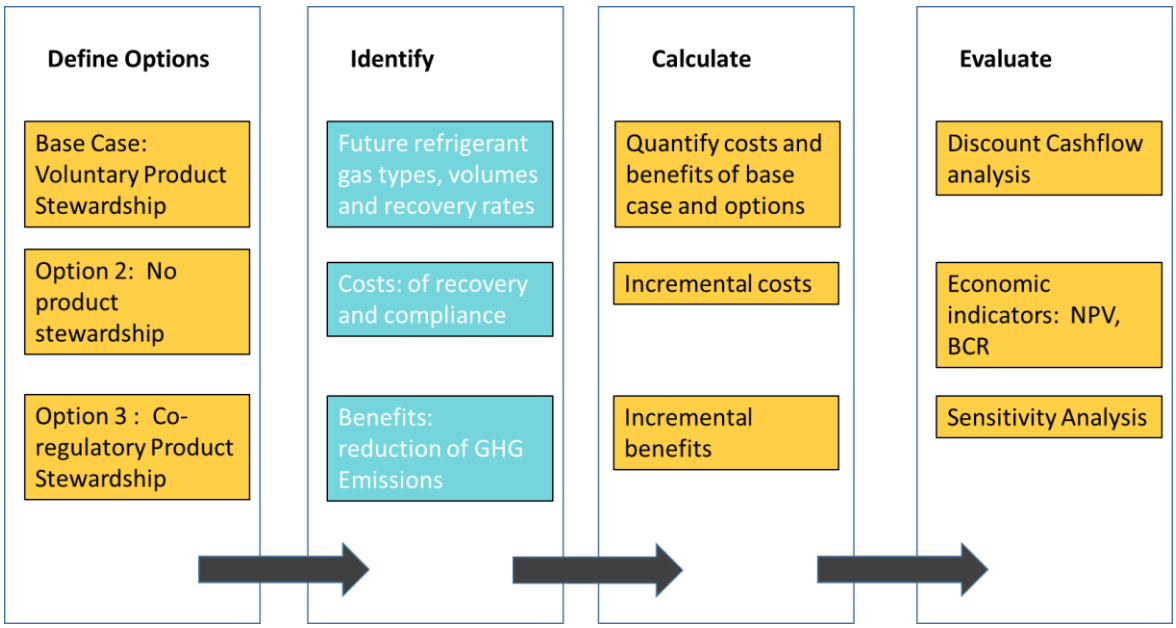


Figure 1: Overview of CBA approach.

The approach to developing the CBA involved the following steps:

1. Define the policy alternatives and the counterfactual (status quo);
2. Identify the people who gain and those who lose;
3. Identify the relevant economic, social and environmental costs and benefits and allocate to time periods;
4. Quantify the benefits and costs within ranges;
5. Qualitative description of costs and benefits that cannot be readily quantified;
6. Discount to a common period, compare benefits with costs;
7. Generation of the economic performance measures (such as net present value (NPV) and benefit cost ratio (BCR))
    - To compare and contrast quantified costs against the benefits over an appropriate timeframe
    - rank the economic returns expected across the proposed options; and
    - undertake a sensitivity analysis to assess the sensitivity of performance measures to changes in key variables.
8. Summarise the analysis and write the report

The performance measures described above are defined as follows:

- **NPV** – the difference between the present value of total benefits and the present value of total costs; and
- **BCR** – ratio of the present value of total benefits to the present value of total costs.

Options that yield a positive NPV indicate that the benefits outweigh the costs over the evaluation period. A BCR greater than one indicates that the option benefits exceed option costs over the evaluation period. A BCR less than one indicates that the option costs exceed the option benefits over the evaluation period.

Standard economic evaluation assumptions adopted for the analysis are outline in Table 2:

Parameter	Value	Rationale
Discount Rate	6%	The discount rate converts costs and benefits that occur in different time periods to the present value (see price year) so they can be compared. Treasury recommends a 6% discount rate as a default for projects that are difficult to categorise including regulatory proposals.
Base Year	2019	The base year is the year in which the value of all costs and benefits will be expressed. All values will be discounted to the price year. Due to factors like inflation and the opportunity cost of investing, a dollar today is worth more than a dollar tomorrow, so future costs and benefits will be converted to an equivalent amount in the price year's dollars by applying the discount rate.
Evaluation Period	2020-2030	The costs and benefits should be estimated over the life of the project. The life of a product stewardship programme for refrigerant gas is likely to 25+ years as these gases have long product life. A 10 year evaluation period (2020 to 2030) was chosen for this preliminary analysis as a relative comparison of options should be apparent within this period

Table 2: CBA evaluation parameters

5.2. Options for Analysis

To assess the impact of declaring SGG refrigerant gases priority products under the Waste Minimisation Act, therefore requiring a regulated product stewardship approach, it is necessary to first define the base case scenario or counter factual for comparative purposes.

The base case scenario (or counterfactual) is the situation that would exist if no decision to declare refrigerant gases a priority product under the Waste Minimisation Act is made and the policy is not implemented. It is sometimes referred to as the "do nothing" option.

The product stewardship options aim to achieve an increase in recovery rates and subsequent safe destruction of SGG refrigerant gases which have significant global warming impact.

In this analysis it is assumed that there will be no additional policy intervention apart from those already implemented (such as Emission Trading Scheme and the Kilgali Amendment HFC phase down) to alter the predicted trend in recovery rates of refrigerant gases under the voluntary stewardship programme.

The base case and options considered in the analysis are outlined in Figure 2. Please refer to Sections 2-4 for full descriptions of the options considered in this analysis.

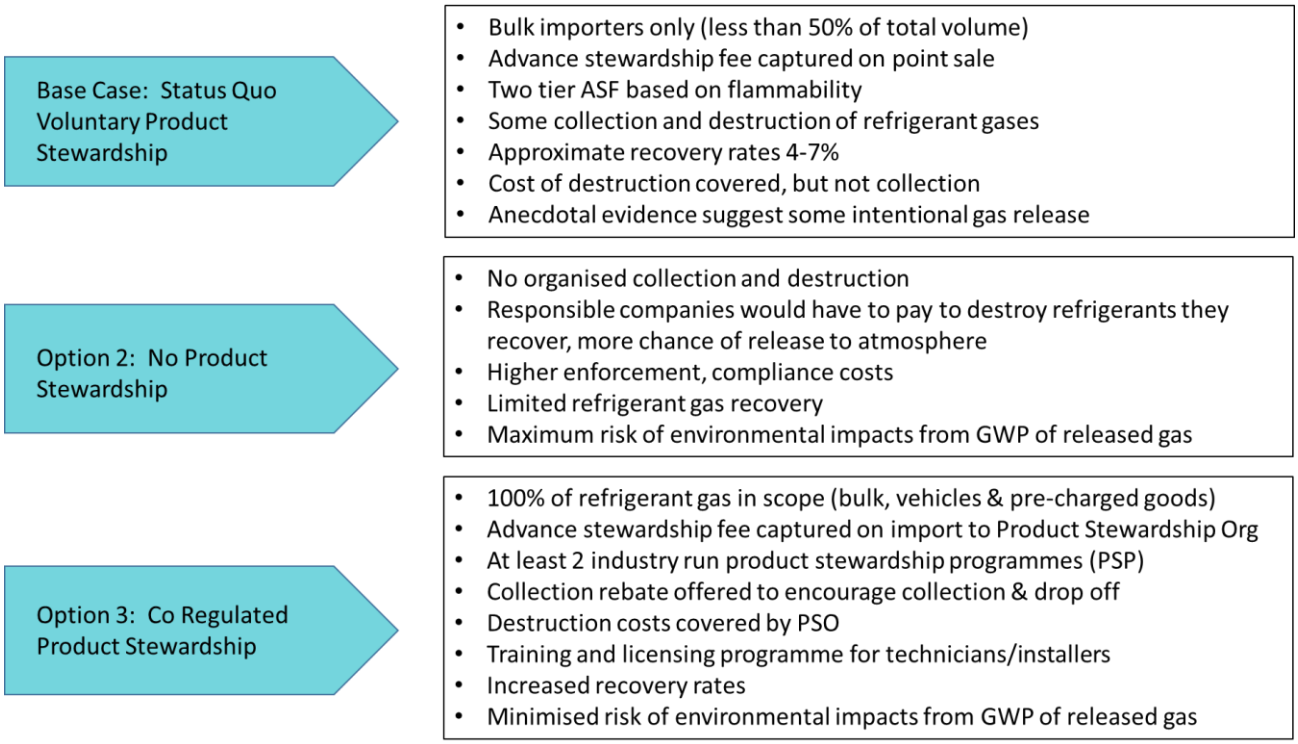


Figure 2: Base case and options considered under the preliminary cost benefit analysis

5.3. Limitations

In undertaking the analysis, 3R Group operated under a number of constraints. It is important to note these constraints and limitations when considering the analysis findings, include:

- Extremely tight time frames for data collection and analysis.
- The feasible product stewardship options are being presented to the working group at the same time as this cost benefit analysis. So they are preliminary in nature and have not been tested in detail as part of this analysis.
- Quantification of a number of the costs and benefits included in the analysis were based on limited data, but the best available given the constraints.
- There are no other co-regulated product stewardship programmes operating in New Zealand. The analysis relied on the working group and 3R Group's knowledge of voluntary product stewardship programmes or international experience in some areas. This may not translate to a co-regulated New Zealand stewardship programme.

Sensitivity analysis was performed to highlight the implications of variations in assumptions.

- There are currently several other pieces of policy intervention or legislation under review or consultation that might impact on the outcomes of this analysis. For example: the amendments to the Emissions Trading Scheme ETS, the proposed Clean Car and Feebate on Electric Vehicle policies and the Zero Carbon Amendment Bill.

5.4. Projections

The RECOVERY programme provided data[2,3,4] from 2013-2019 with the following metrics:

- Kilograms of levied product by category (R22, HFCs, Flammable Blends, Other)
- Fees collected by month
- Quantity and type of gas recovered and sent to Australia for destruction
- Costs of freight, analysis and destruction from ToxFree
- Global warming potential of gases destroyed
- Number and value of emission units credited for the destruction of SGG refrigerant gases
- Financial data from annual reports

From the data provided, total bulk imports of SGG refrigerant gas ranged from 330 to 517 tonnes annually, with an average of 425 tonnes total imported per year. This average value was taken as the 2020 base case value.

SGG Refrigerant	2014-15	2015-16	2016-17	2017-18	2018-19	AVG
R22	96	16	19	15	10	
HFC	420	430	393	394	302	388
Flammable	0	1	3	8	18	
Total	517	447	416	417	330	**425**

Table 3: Forecast bulk import quantities under Base Case Option

An estimated 5% industry growth rate over the next ten years was assumed based on discussion with the working group and the increasing focus on electrification of heating and cooling and increasing trends in quantities of imported pre-charged units and vehicles as detailed in Milestone 2: Report 1[14].

The percentage growth rate was applied to the base case value (425 tonnes in 2020) to forecast annual total refrigerant available for a voluntary advance disposal fee under this option. This ranged from 425 tonnes in 2020 to 693 tonnes in 2030.

The Kigali Amendment policy requires a phase down of the use of HFC gases that have high global warming potential (GWP) and replacement with lower GWP alternatives that are readily available. The phase down time frames are as follows:

- 2021-2022 88% of Total HFC Baseline
- 2023-2024 76% of Total HFC Baseline
- 2025-2026 64% of Total HFC Baseline
- 2027-2028 52% of Total HFC Baseline
- 2029-2030 40% of Total HFC Baseline

These percentage reductions were applied to the forecast tonnes of HFC refrigerant that would be in scope for the voluntary stewardship programme. We assumed that total volume of SGG refrigerant would remain constant, with the volume of flammable HFC blends increasing to compensate for the reducing HFC volumes.

As R22 imports have already been phased out, the forecast shows minimal quantities of existing stocks being sold over the first two years of the analysis period.

Based on these assumptions the projections of SGG refrigerant volumes are outlined below

Tonnes SGG	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
R22	5	2	0								
HFC	388	341	341	295	295	248	248	202	202	155	155
Flammable HFC Blends	32	103	127	197	222	294	322	397	427	505	538
Total	425	447	469	492	517	543	570	598	628	660	693

Table 4: Forecast Tonnes of SGG Refrigerant available for ASF under Base Case option

5.5. Identification and Quantification of Costs and Benefits

Table 5 identifies the costs and benefits used in the analysis. Economic costs and benefits were quantified where market values were available, or estimated based on the best information available. Some other costs and benefits were discussed qualitatively.

Cost/Benefit	Description	Who gains/loses	Quantified	Source of information
COSTS				
Advance stewardship fee	Under the status quo and co-regulatory approach an advanced stewardship fee or levy is charged. Under the base case the levy covers	Industry but more likely passed on to consumer	Yes	Recovery data

	destruction costs, but not collection in NZ.			
Government Costs	Under the co-regulated option there will be a cost associated developing new regulations under the WMA, ensuring the scheme meets requirements, establishment of the PSO and accreditation of one or more Product Stewardship Schemes (PSS), and EPA enforcement costs.	Government & Industry	Yes	MfE
Industry Costs	Under the Status quo, the holder bears the collection costs for SGG refrigerant	Industry/ Consumer	Yes	Working Group estimate
	Option 2 no stewardship, industry will bear the cost of collection, transport and destruction of SGG refrigerants	Industry	Yes	Destruction data from ToxFree.
	Option 3 industry may bear additional costs around licensing and verification on credentials and record keeping	Industry	Yes	IHRACE/Working group estimate
BENEFITS				
Emission Reductions	The benefit of increasing the collection and destruction of SGG refrigerant gases will be a reduction in greenhouse gas emissions, helping NZ meet its national targets and obligations under the Paris Climate agreement, mitigating the impacts of climate change	Environment, Government, Society	Yes	Recovery Data plus Productivity Commission forecasts for price of ETU

Table 5: Identification of costs and benefits, who is impacted

5.6. Costs

Quantification of the costs under each option required development of a series of assumptions, as outlined in the following sections.

5.6.1. Advance Stewardship Fee (ASF)

It is assumed under the Option 1, the status quo voluntary product stewardship model that the advanced stewardship fee remains at the same rate and structure as it is currently under the RECOVERY programme. That is:

- $1.50 per kg fee for HFC refrigerant gases and
- $2.50 per kg fee for flammable HFC blends.

The higher fee is justified as there are increased costs of collection and disposal because of health and safety compliance due to the flammability.

The cost of the advanced stewardship fee is borne by the voluntary industry participants in RECOVERY, but in reality is most likely passed on to the end consumer. The total annual cost of the advanced stewardship fee, and therefore cost to society, was forecast by multiplying the forecast volumes of refrigerant in scope by the corresponding ASF fee per kg.

The total cost per year ranged from $0.70 million in 2020 to $1.68m in 2030, with a total cost of $12.3 million over the 10 year analysis period.

Option 2: with no product stewardship there is no advanced stewardship fee, so no cost to society.

Option 3: with a co-regulated product stewardship approach the advanced stewardship fee is modelled at $1.00 per kilogram over the 10 year period. The ASF value is lower under this option as there is a greater total quantity of SGG refrigerant in scope.

The PSO is likely to review the fee annually taking into account the costs for collection (rebates), transport and destruction, and any credits from the NZ Emission Trading Scheme. Given the significant financial benefit of the ETS credits in offsetting programme costs the ASF fee would in all likelihood reduce over time or even become unnecessary.

A full financial model for the preferred option will be developed in the next project Milestone, which will include modelling on the advanced stewardship fee and programme costs. Based on these assumptions the advanced stewardship fee under each option is outlined below.

	Option 1: Voluntary PS	Option 2: No PS	Option 3: Co-regulated PS
Advanced Stewardship Fee	$1.50 - $2.50	No fee	$1.00
Annual ASF	$0.70M - $1.68M	$0	$0.80M - $1.31M
Total ASF Cost	$12.3M	$0	$11.42M
Benefit from ETS – available to offset ASF (as per Table 11	$26.06M	$13.03	$98.2M

Table 6: Advanced stewardship fee projections

5.6.2. Cost to Government

Data was requested from the Ministry for the Environment to include in this analysis but was not available at the time of writing the report.

Estimates of costs to government from the Tyrewise Cost Benefit Analysis[12] in 2013 were used as a starting point, adjusted for inflation and increased by 15% to compensate for historic optimism and under-estimation of monitoring and compliance costs. The Working Group also recommended increased resourcing for enforcement activities, estimated at $1 million annually for this analysis.

Government costs were expected to include

- design of new priority product regulations proposed under the Waste Minimisation Act
- public consultation
- establishment of PSO
- accreditation of the Product Stewardship Scheme(s) along with annual reviews
- regulation changes over the 10 years
- Monitoring, enforcement and compliance costs.

Based on these assumptions the costs to government under each option is outlined below.

	Option 1: Voluntary PS	Option 2: No PS	Option 3: Co-regulated PS
Government Costs per annum	$0	$0	$2.18M - $1M
Total	$	$0	$13.0M

Table 7: Costs to government

5.6.3. Cost to Industry

Under Option 3: co-regulated product stewardship, all who install, service, decommission, reuse, recycle or manage SGG refrigerants or SGG refrigerant containing equipment are required to be suitably trained and qualified as described in Section 4.8.

Data was requested from IHRACE but at the time of writing the draft report this was not available. A PC sum of $500K over 10 years was included to test the CBA model and prepare this draft report. This will be updated once the industry data is available

Additionally under this option there will be record keeping requirements as outlined in Section 4.10. For this analysis it was included in the $500K PC sum above, and will be updated once industry estimates are available.

Under Option 2: no product stewardship, the costs of collection, transport, analysis and destruction of any refrigerant gas are borne by holders of the SGG refrigerant as the only option for disposal, other than releasing to the atmosphere. However, with no co-ordinated stewardship approach or funding available it is likely the recovery rates would be significantly lower.

For this option it was estimated 50% of the SGG destroyed under the status quo option would be captured, ranging from 15 tonnes in 2020 to 22 tonnes in 2030.

The costs for collection and destruction were based on actual cost data provided by Recovery and Tox Free[4,] at $14.00 per kilogram for freight, analysis and destruction in Australia. An estimate of $7.00 per kilogram was used for the collection costs borne by the holder in New Zealand.

Under Option 2, the collection and destruction costs were expected to be at least 50% higher than the actual cost data provided by RECOVERY and Tox Free[4]. This is because RECOVERY is able to negotiate a more attractive per kilo rate due to the volume they send to Australia. Individual companies would likely be charged a higher rate. The costs were estimated at $21.00 per kilogram for freight, analysis and destruction in Australia and $10.50 per kilogram for collection in New Zealand. An estimate was also included for increased investment in infrastructure such as equipment to recover SGG, cylinders, scales and staff training. Each individual company would also need a licence to export SGGs, at $12,000 per year.

Based on these assumptions the costs to industry under each option are outlined below.

	Option 1: Voluntary PS	Option 2: No PS	Option 3: Co-regulated PS
Additional Industry Training/Licencing Costs	Industry funded	$0	PC Sum $0.5M To be provided by IHRACE / Working Group
Maintaining records	$0	$0	Included in PC sum above To be provided by IHRACE / Working Group
Collection & Destruction Costs	Destruction covered by ASF Collection costs paid by Holder of SGG refrigerant $204K - $302K annually @ $7/kg $2.7M Total	$830K - $1M / year $10.3 M Total	Covered by ASF

Table 8: Costs to industry

5.7. Benefits

The benefits in all options result from reduction in greenhouse gas (GHG) emissions by collecting and destroying SGG refrigerant gases.

Quantifying the benefit of reduced environmental emissions is based on the following:

- assumptions regarding the type and amount of refrigerant gases that will be destroyed over the period of analysis;
- application of the appropriate global warming potential measure; and
- application of a value of the GHG emissions to the atmosphere, or value of emission reductions units under the New Zealand Emission Trading Scheme.

The GWP values are calculated using the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) GWP values which New Zealand currently uses to report its United Nations Framework Convention on Climate Change (UNFCCC) commitments

Global warming caused by substances such as SGG refrigerants has a number of global environmental consequences, including:

- sea-level rise;
- ocean acidification;
- change in rainfall patterns;
- increased risk of natural disaster (including storms and droughts)
- biodiversity loss
- impacts on human health caused by extreme weather and disease
- failure of crops and agriculture due to weather, causing famine and migration
- increased risk, business and economic impact

In New Zealand, potential consequences of climate change include:

- higher temperatures: Greater increases in the North Island than the South, with the greatest warming in the northeast.
- sea-level rise; increasing the risk of erosion, coastal flooding and saltwater intrusion, increasing the need for coastal protection.
- more frequent extreme weather events
- droughts (especially in the east of New Zealand)
- floods
- changing rainfall patterns with increased summer rainfall in the north and east of the North Island and increased winter rainfall in many parts of the South Island.

The Ministry for the Environment's 2018 report, *The co-benefits of emissions reduction: An analysis*[6], did not identify any other co-benefits from reducing Industrial Processes and Product Use (IPPU) emissions, which is the classification of SGG refrigerants. In line with this, we did not quantify any other co-benefits in this analysis.

5.8. Recovery Rates

Data[2] from RECOVERY showed that actual collection and destruction quantities ranged from 15 to 38 tonnes per annum over the past five years, with an average of 29 tonnes. As there was no linear trend observed, the average value of 29 tonnes was assumed for our base case scenario in 2020. This is a recovery rate of approximately 4% of the total SGG refrigerant gas (bulk + pre-charged + vehicles) coming into New Zealand in the same year.

Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Average
Refrigerant Destroyed (tonnes)	34	34	17	37	38	15	29
Total SGG Refrigerant (bulk + precharged + vehicle)	478	780	754	829	961	694	804
Recovery rate %	7%	4%	2%	4%	4%	2%	4%

Table 9: Forecast recovery rates

We recognise that some level of leaked gas is inevitable, and the total actually available for recovery will be much less than the total imported or in the refrigerant bank. There is no accurate way of knowing how much this leakage or loss really is, but we expect recovery rates would be unlikely to reach 50% of the total imported.

To account for these losses, some international refrigerant stewardship programmes make an adjustment for this loss before calculating the recovery rate. This results in a much higher as a percentage recovery rate. This is also an option for this project, but we would need advice from the Working Group on how to estimate this leakage/loss.

Under Option 1 it was assumed that the recovery rate will stay consistent at 4% of the total SGG refrigerant imported to New Zealand.

Under Option 2: no product stewardship, the recovery rate would reduce to 1.7% of the total imported, or 50% of the tonnes collected under the base case.

Under Option 3 co-regulated stewardship, the recovery rate would increase from 4% to 19% over the 10 year period.

Based on these assumptions the recovery rates and tonnes of SGG refrigerant destroyed under each option are outlined below.

	Option 1: Voluntary PS	Option 2: No PS	Option 3: Co-regulated PS
Tonnes of SGG collected and destroyed per year	29-43	15-22	33-249
Recovery Rates	4%	1.8-1.65%	4-19%

Table 10: Forecast tonnes of SGG recovered for destruction

5.8.1. Global Warming Potential (GWP)

Data[2] from Recovery showed the global warming potential (GWP) of the various gases sent for destruction, ranging from 124 for HFC R152A to 14,800 for HFC R23 refrigerant.

Refrigerant	R125	R134A	R152A	R32	R23	R143A
Type	HFC	HFC	HFC	HFC	HFC	HFC
GWP	3,500	1,430	124	675	14,800	4,470
Tonnes CO2e per kg of refrigerant	3.5	1.43	0.124	0.675	14.8	4.47

Table 11: Global warming potential (GWP) for SGG refrigerants

Analysis of the refrigerant sent for destruction showed that HCFs accounted for between 82% and 91% of the gases destroyed and this has increased over time. The other 10-20% of gases are made up of CFCs and HCFCs and small amounts of other hydrocarbons. CFC and HCFCs were phased out in 1993 but are still being recovered more than 25 years later, although at a decreasing rate.

Destruction data[2] since 2013 showed that the average CO_2e factor for one kilogram of HFC was 2.493, compared to a lower CO_2e factor of 2.091 across all gases destroyed. This is because HFCs have much higher global warming potential than CFC and HCFCs.

For all options in the cost benefit analysis we estimated the refrigerant gas collected during the 2020-2030 period would primarily be HFCs, with an average CO_2e factor of 2.493. This was based on the assumption that the majority of SGG refrigerant available will be HFCs due the implementation of the Kigali Amendment. This means every kilogram of SGG refrigerant sent for destruction is the equivalent of 2.493 tonnes of carbon dioxide, (on average). A lower CO2e factor was tested during sensitivity analysis.

Based on these assumptions and factors the tonnes of SGG refrigerant and equivalent tonnes of CO_2e under each option is outlined below.

	Option 1: Voluntary PS	Option 2: No PS	Option 3: Co-regulated PS
Tonnes of SGG per year	29-43	15-22	33-249
Tonnes of CO_2e per year	70,750 – 104,727	35,375 - 52,364	78,985 – 604,900

Table 12 Tonnes of SGG refrigerant recovered and equivalent tonnes of CO2e

5.8.2. Value of Emission Reductions

The economic benefit of carbon emission reductions depend on the social cost of carbon that is used to convert the tones to dollar values. In this analysis, carbon price or the value of a New Zealand Emission Trading Unit, equivalent to one tonne of CO_2e has been used as a proxy.

From Recovery's annual reports[5] the historic value of New Zealand's emission units was established, rising from $6.57 in 2014 to $25.09 in March 2019.

Forecasting the future increase in emissions pricing is much more difficult, especially as the New Zealand ETS is currently under review and a number of significant changes have been proposed. The Productivity Commission's 2018 report on Transitioning to a Low Emissions Economy[7] provides various scenarios with forecast emission unit pricing out to 2050, enabling New Zealand to meet a target of zero carbon by 2050.

Two of the Productivity Commission scenarios, Disruptive and Stabilising have the same forecast emission unit pricing for the period 2020-2030, rising from $25 in 2020 to $55 in 2030. These forecast carbon prices were used in this analysis.

Based on these carbon prices, the benefit to society in reducing emissions by destroying SGG refrigerant gases under each option is outlined below.

	Option 1: Voluntary PS	Option 2: No PS	Option 3: Co-regulated PS
ETU $25-$55			
Annual Benefit	$1.77M - $5.76M	$0.88M - $2.88M	$1.97M - $33.3M
Total Benefit	$39.29M	$19.64M	$153.2M
Discounted Benefit	$26.06M	$13.03	$98.2M

Table 13 Economic benefit of emission reductions under each option

Various other carbon price scenarios were tested in the sensitivity analysis including:

- Productivity Commission "policy driven" scenario with prices from $40 to $80.
- A more conservative price from $19.57 to $25.00 in 2030 as used in the Ministry of Transports Clean Car Standard Cost Benefit Analysis[8], and sourced from New Zealand's Seventh National Communication to the UNFCCC[9]

5.8.3. Contribution to New Zealand's GHG Reduction Targets

The removal and safe destruction of SGG refrigerants will help New Zealand meet its emission reduction targets and international obligations under the Paris Climate Agreement. As discussed in Project Drawdown[13], investing in refrigerant management has the most potential above all other potential solutions, to reduce global temperature rise and limit the impact of climate change.

Meeting our domestic and international targets avoids unnecessary cost and burden on other sectors and the public, which is expected to benefit all New Zealanders over time.

5.8.4. Net Benefits

Two options, co-regulated product stewardship and no stewardship of SGG refrigerant gases were compared with the base case of voluntary stewardship using a discounted cash flow technique with a real discount rate of 6 per cent.

The net present value (NPV) provides an indication of the option that provides the greatest net benefit for the whole of society. The BCR is a useful measure when faced with budget constraints as it provides an indication of efficiency of expenditure.

The results of the analysis are presented in Table 14 .

	PV ($m) 2020-2030, 2019 base data, 6% discount rate		
	Option 1: Voluntary PS	Option 2: No PS	Option 3: Co Regulated PS
Costs	$15.0	$10.27	$24.89
Discounted Costs	$10.06	$7.00	$17.60
Benefits	$39.29	$19.64	$153.26
Discounted Benefits	$26.06	$13.03	$98.22
NPV	$16.1	$5.92	$78.1
BCR	2.59	1.86	5.58

Table 14 Economic benefit of emission reductions under each option

All three of the options have a net benefit to society. Option 3: the co-regulated product stewardship approach has the highest Net Present Value of $78.1 million over the 10 year analysis period and is therefore considered the most beneficial to society.

The benefits of this option are primarily derived from the credits received from the ETS, for the removal and destruction of greenhouse gases with high global warming potential. The

benefits are compounded by three variables that are forecast to increase over the analysis period

- value of ETS units,
- increasing recovery rates of SGG refrigerant and
- increasing GWP of the gases that are collected due to the HFC phase down in comparison to the present.

There comes a point when the value of the ETS credits means that the PSO could potentially remove the Advanced Stewardship Fee altogether, funding the product stewardship of SGG refrigerants from the ETS credits. This scenario will be modelled in more detail in the next project milestone.

The next most beneficial option is the Status Quo – voluntary stewardship option with a NPV of $16.1 million.

Option 2 with no product stewardship is the least beneficial of all options, with a NPV of $5.9m.

5.9. Sensitivity analysis

A sensitivity analysis was carried out to account for the uncertainties in key parameters and to identify those ones that have a significant impact on the economic viability of this intervention. A sensitivity analysis also establishes the robustness of the results subject to alternative parameter values and scenarios.

Table 13 lists the key parameters that have been tested.

Parameters tested in Sensitivity Analysis and Ranking	Rank in terms of impact to NPV
Recovery Rate	1
Value of NZ Emission Unit	2
Growth Rate of Industry - Import Volumes SGG to NZ	3
CO_2e per kg of refrigerant destroyed	4
Discount Factor	5
Advanced stewardship fee	6
Government Costs	7
Industry Compliance costs - training/licensing programme	8

Table 13 Variables tested for sensitivity, and relative ranking

The most sensitive variable in the cost benefit analysis is the Recovery Rate of the SGG refrigerants, which determines the tonnes of gas sent for destruction. In the analysis we modelled a modest 2% annual increase in recovery rate over the 10-year period. A higher recovery rate, will increase the benefits and a lower recovery rate would reduce the benefits.

The second ranked variable was the forecast value of emission trading unit or price on carbon. Similarly, a steeper rise in the value of emission units will increase the benefits of the model, and a more conservative price increase will reduce the benefits. Optimistic forecasts for these variables could result in over estimation of the benefits.

However, a scenario with conservative values for both Recovery Rate (1% annual increase) and NZ Emission Unit prices ($19.57 in 2020, rising to $25.00 in 2030) still shows a positive NPV of $28.8 million. This is a higher NPV than either the Status Quo at $16.6 million or Option 2 no product stewardship at $10.6 million. This demonstrates that even though there is uncertainty around the value of these variables, the overall ranking of which option is most beneficial does not change.

5.10. CBA summary

Analysis of costs and benefits relating to stewardship options of SGG refrigerants found that:

- Under all options the costs are borne by industry and government and benefits flow to the environment, community and society as a whole.
- The benefits exceed the costs under each option.
- Option 3, a co-regulatory approach had the largest net present value of the three options analysed.
- The benefits are largely driven by increased SGG refrigerant collection rates and the value of the credits from the Emission Trading Scheme.
- The options are potentially largely sensitive to the value placed on the recovery of these gases and associated avoided emissions

This cost benefit analysis forms part of a process of investigating options for increasing the recovery and destruction of SGG refrigerants which have high global warming potential.

The purpose of the CBA is to measure the economic, environmental and social costs and benefits of the product stewardship options developed by the Working Group and the Ministry for the Environment, and to compare the relative net benefits to society of the three options.

The analysis will be used to inform advice from the project Working Group to the Government on the feasibility of a co regulated product stewardship approach, as part of the SGG Refrigerant Stewardship Project.

6. REGULATORY REQUIREMENTS

Under the Waste Minimisation Act 2008 (WMA) the Minister has the ability to declare a product as a priority product, providing, they can show that the product either poses a significant threat to the environment, or that there are significant benefits from reduction, recycling, recovery or treatment of the product, and it can be manged under a product stewardship scheme.

The WMA encourages a reduction in the amount of waste we generate and dispose of in New Zealand and aims to lessen the environmental harm of waste.

This Act also aims to benefit our economy by encouraging better use of materials throughout the product life cycle, promoting onshore reprocessing of recovered materials and providing more employment.

To encourage waste minimisation, protect the environment and provide wider social, economic and cultural benefits, the Act:

- requires product stewardship schemes to be developed for certain 'priority products' where there is a high risk of environmental harm from the waste or significant benefits from recovering the product
- allows for regulations to be made to control the disposal of products, materials or waste, require take-back services, deposit fees or labelling of products

Specific Section of the Act that applies to product controls:

Section 23: Regulations in relation to products (whether or not priority products), materials, and waste

(1) The Governor-General may, by Order in Council made on the recommendation of the Minister, make regulations for 1 or more of the following purposes:

Control or prohibition on disposal, sale, etc

(a) controlling or prohibiting the disposal, or anything done for the purpose of disposing, of products or waste:

(b) controlling or prohibiting the manufacture or sale of products that contain specified materials:

Take-back services, fees, and refundable deposits

(c) requiring specified classes of person to provide a take-back service for products, and prescribing requirements for—

(i) the take-back service; and

(ii) the reuse, recycling, recovery, treatment, or disposal of products taken back:

(d) setting fees payable for the management of a product and specifying—

(i) the class or classes of person who must pay the fee; and

(ii) the stages in the life of the product where the fee must be paid; and

(iii) the purposes to which the fee must be applied:

(e) requiring specified classes of person to charge a deposit on the sale of a product, requiring the deposits to be refunded in specified circumstances, and prescribing requirements for the application of any deposits not refunded:

Labelling of products

(f) prescribing requirements for the labelling of a product:

Quality standards

(g) for any product or material that has become waste, prescribing standards to be met when reusing, recycling, or recovering the product or material:

(h) requiring specified persons or specified classes of person to ensure that the standards prescribed under paragraph (g) are met:

Information to be collected and provided

(i) requiring specified persons or specified classes of person to collect, and provide to the Secretary, information about any requirements imposed in regulations made under paragraph (a), (b), (c), (d), or (e):

Miscellaneous

(j) providing for any other matter contemplated by this Part.

(2) The Minister must not recommend the making of regulations—

(a) under subsection (1) (a), unless he or she is satisfied that there is adequate infrastructure and facilities in place to provide a reasonably practicable alternative to disposal or, if not, that a reasonable time is provided before the regulations come into force for adequate infrastructure and facilities to be put in place:

(b) under subsection (1) (b), unless a reasonably practicable alternative to the specified materials is available.

(3) Before recommending the making of regulations under subsection (1), the Minister must—

(a) obtain and consider the advice of the Waste Advisory Board; and

(b) be satisfied that—

(i) there has been adequate consultation with persons or organisations who may be significantly affected by the regulations; and

(ii) the benefits expected from implementing the regulations exceed the costs expected from implementing the regulations; and

(iii) the regulations are consistent with New Zealand's international obligations.

It is likely that SGG refrigerants will be declared priority product(s) and will be required to be part of a regulated product stewardship scheme that would seek accreditation by the Minister for the Environment.

The act of declaring a product "priority" doesn't in itself require business and organisations to participate in product stewardship, the regulations in relationship to the products imported and distributed do. (refer extract of the WMA 2008 Section 23 above).

Therefore, it is important the Working Group identifies what regulatory controls would be required to ensure the success of any future regulated product stewardship scheme(s).

The Working Group's first report[2] identified Acts and Regulations that currently control or influence the management of SGG refrigerants within New Zealand.

Within this report above, the Working Group has outlined a preferred option (Option 3) that would require regulation to ensure its success. This next section details these controls.

6.1. Requirements for effective stewardship

The current stewardship regime (Option 1) is voluntary relying on producers to pay a fee to cover the cost of the disposal of SGG refrigerants. Due to its voluntary nature not all producers contribute to the current product stewardship scheme which creates an unlevel playing field as all can access the free disposal.

It is considered that the following requirements would be essential to ensure that any regulated PSS(s) for SGG refrigerants are safely stewarded through their lifecycle from importation through use to their final safe disposal at end of useful life.

a) **Product Stewardship Organisation -** Given the commercial sensitivity around the data that is required for setting and receiving stewardship fees it is considered this is done by an independent non-profit stewardship organisation. The preferred option (Option 3) requires this to be established to collect data, set the advanced stewardship fee and oversee the delivery of the product stewardship schemes.
b) **Data management** - A requirement for those who import, export, manufacture, sell, collect and/or dispose of SGG refrigerants to collect, maintain and provide on request data relating to their SGG refrigerants.
c) **Advanced Stewardship Fee** - A requirement to pay an advanced disposal fee that is set at a level that can cover the cost of final collection and safe disposal. It should also cover promotional and administration costs involved with the scheme.
d) **Training and Qualifications** - A requirement that all who handle, install, service/maintain, remove and/or dispose of SGG refrigerants are suitably trained and qualified.

Synthetic Refrigerant Stewardship Milestone 2: Report 1– Critique existing system(s) including product regulations [2]

e) **Equipment standards** - That all equipment used during the lifecycle of SGG refrigerants is of a suitable standard and is regularly maintained to ensure that SGG refrigerants are not lost to the environment.
f) **Recycling controls** - That any recycling of SGG refrigerants is carried out in a manner that ensures that SGG are not released to the environment. Is carried out by suitably qualified persons using appropriate equipment.
g) **Prohibition of intentional discharges** -That the intentional release of SGG refrigerants is prohibited and that there are legal consequences for such releases.
h) **Collection locations/services –** In order to be successful any product stewardship scheme needs a good distribution of collection locations and/or services where collections for larger volumes can be carried out on site.
i) **Storage controls** - That SGG refrigerants held in storage for either recycling or disposal are done so in containment systems that meet current suitable standards.
j) **Safe destruction** - That collected unwanted SGG refrigerants are safely destroyed and records of this destruction are maintained.

Table 16 below is a representation of where the current legislation has controls that are the same or similar to those that are consider essential for a successful product stewardship scheme.

	Import	Export	Manufacture	Sale	Installation/ Use	Recycling/ Reuse	Storage	Disposal
Data management	**CCRA** s48, s50 (2), s139, s140, s248, s253, s259, s260, s268 **WMA** s23, s24	**CCRA** s48, s50 (2), s139, s140 CCORAR pt2 WMA s23	**CCRA** s48, s50 (2) **WMA** s23	**CCRA** s48, s50 (2), s139, s140 **WMA** s23	**CCRA** s48, s50 (2), s139, s140	**WMA** s23		CCORAR pt2 **WMA** s23
Stewardship Fee	WMA s23	**WMA** s23	**WMA** s23	**WMA** s23	**WMA** s23	**WMA** s23	**WMA** s23	**WMA** s23
Training and Qualifications			HSWHSR pt4 s15.66		**HSWHSR** pt4 s15.66	**HSWHSR** pt4, s15.66	**HSWHSR** pt4, s15.66	**HSWHSR** pt4, s15.66
Equipment standards	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15
Prohibition of intentional discharges	**RMA** s15, s17	**RMA** s15, s17	**RMA** s15, s17	**RMA** s15, s17	CCRA s264 **RMA** s15, s17	CCRA s264 **RMA** s15, s17	**RMA** s15, s17	CCRA s264 **RMA** s15, s17
Recycling controls				**WMA** s23		**WMA** s23		**WMA** s23
Collection locations/services				WMA s23		WMA s23		WMA s23
Storage controls	**HSWHSR** pt2, pt15	**HSWHSR** pt2 pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15	**HSWHSR** pt2, pt15
Safe destruction								HSDN s7

Table 16: Outline of the current controls that potentially overlap with the requirements for a successful product stewardship scheme.

6.2. Assessment of current controls

6.2.1. Data Management

6.2.1.1. Current controls

Currently the Climate Change Response Act 2002 (CCRA) s 48, s 50 (2) and s 246 enables Regulations to be made that require persons to maintain records who *"imports, exports, manufacture, sales, and the nature of the use of products that contain hydrofluorocarbons…"*. These regulations are the Climate Change (Other Removal Activities) Regulations 2009 (CCORA) and the Climate Change (Synthetic Greenhouse Gas Levies) Regulations 2013 (CCSGGLR).

The CCORA (pt2) addresses the removal (export or destruction) of SGGs from NZ and its implications for the Emissions Trading Scheme.

The CCSGGLR details the levies that are required to be paid on importation of SGG, who should pay (the importer – not including motor vehicles which is the registrant) and when it should be paid (on import – except motor vehicles which is on registration).

The CCRA also outlines that it is a requirement for importers to collect and keep records (s259) and that the EPA can require these records(s253) and must maintain and publish specific data annually (s250).

Finally, the Waste Minimisation Act requires that information be collected and provided (s23 (i)) for specific wastes or products. It also requires the NZ Customs Service to provide (s24) any information it has on imports (but not exports) of priority products.

6.2.1.2. Recommended controls

Currently there is a requirement for multiple parties to collect, maintain and provide information on SGG refrigerants under their management but this requirement does not cover the whole lifecycle and relates to the collection of ETS levy money.

For a successful product stewardship scheme there should be a requirement for all to maintain records and ensure they only use suitably qualified and competent persons for the management, handling and disposal of SGG refrigerants. However, it is not considered practicable for this to apply to householders , but it would apply to those within the industry that provide services to this sector. Any scheme should promote the safe installation and removal of refrigerant containing goods.

6.2.2. Advanced Stewardship Fee

6.2.2.1. Current controls

The Waste Minimisation Act provides for the application of fees to cover the cost of managing a product and specifying, who can apply, when it can be applied, and for what it can be used.

6.2.2.2. Recommended controls

There is currently no requirement to charge an advanced stewardship fee on SGG refrigerants. This would be essential for any scheme and should be set at a rate that ensures the collection, storage, management and promotion of the scheme and the safe destruction of the collected refrigerants.

6.2.3. Training and Qualifications

6.2.3.1. Current controls

The Health and Safety at Work (Hazardous Substances) Regulations 2017 (s 15.66) outlines the requirements for approved fillers and the compliance certificate they must obtain. It also outlines the (pt 4) training, supervision and certification for those that handle SGGs refrigerants that are hazardous substances under HSNO.

6.2.3.2. Recommended controls

There are requirements for persons in control of a business or undertaking to ensure that persons undertaking work with refrigerants are suitably trained and qualified. However, this does not appear to extend to installations undertaken outside of a place of work such as a home owner installing their own heat pump.

Given the risks to the environment that unintentional releases of SGG refrigerants can have, it is considered that SGG refrigerant containing equipment should only be installed, serviced and decommissioned by qualified technicians regardless of where they are located.

6.2.4. Equipment standards

6.2.4.1. Current controls

The Health and Safety at Work (Hazardous Substances) Regulations 2017 (pt2), details the labelling, signage and packaging for hazardous substances. It also (pt15) details the requirements for cylinders, fittings and the records that Worksafe must keep for cylinder designs.

6.2.4.2. Recommended controls

As with training and qualifications above, there are requirements on equipment used for gases under pressure that apply in a place of work. This does not extend to other locations.

6.2.5. Prohibition of intentional discharges

6.2.5.1. Current controls

Climate Change Response Act 2002 (s 264) and the Ozone Layer Protection Act 1996 (s13) state that it is an offence to knowingly and without justification release SGGs (or controlled substance) whilst “installing, operating, servicing, modifying, dismantling, or disposing of any electrical switchgear, refrigeration or air-conditioning equipment, or other heat-transfer medium” and the potential fines that would result.

The Resource Management Act (s 15) prohibits the discharge of a contaminant into air unless it is allowed by regulation, resource consent or a rule in a regional plan, it also outlines (s 17) that it is

every person's responsibility to avoid, remedy or mitigate any adverse effect on the environment from an activity. This would be enforced by a regional council. However, the Resource Management (Energy and Climate Change) Amendment Act 2004 requires local authorities to not consider the "the effects on climate change of discharges into air of greenhouse gases". This amendment makes it unlikely that a regional council could prevent or prosecute a person who intentionally released an SGG refrigerant.

During the consultation for the Working Group's first report we were approached by Carl Johnson Senior Advisor Hazardous Substance Compliance at the Environmental Protection Authority (EPA). He outlined a number of incidents that he was investigating where SGG refrigerant containing equipment were being scrapped and the SGG refrigerants were not being captured and are released to the atmosphere.

One vehicle recycler who processes around 10 vehicles per day is reported to always release the refrigerant at the rear of the property.

Businesses who charge to degas fridges and freezers have reported that potential customers are unwilling to pay for the cost of degassing and choose to "get rid of them some other way".

6.2.5.2. Recommended controls

There are controls that prohibit the intentional release of SGG refrigerants in specific situations. However, it does not cover the whole lifecycle of the gases and provides potential loopholes that could enable intentional discharges in some situations.

For example, an SGG refrigerant gas is extracted from a refrigeration system into a cylinder by a technician who then transfers it to a third party for disposal. This third party could then release the gas and would not be subject to the prohibition. It is also possible that the legislation would not apply if the technician released the SGG refrigerant from the cylinder at a later date from when it was extracted.

Other potential loopholes are when refrigerant containing equipment are scrapped. The legislation specifies that the gases cannot be released through dismantling and it has been suggested that crushing refrigerant containing equipment is not dismantling and therefore is permitted under the legislation. The information from the EPA would suggest that, for some in this sector, releasing the refrigerant to the atmosphere is standard practice.

These loopholes need to be addressed in order to ensure that SGG refrigerants are not intentionally released into the atmosphere. However, care needs to be taken when drafting any regulations as there are SGG refrigerants used as carry gases in aerosols for medical and other applications.

In particular HFC-134a is used in medical treatments for asthma and chronic obstructive pulmonary disease, and as a cryogen cooling spray during laser hair and skin treatments.

Also, these Acts do not address the disposal via export of SGG refrigerants. There is the potential that SGG refrigerants collected through a PSS could be exported overseas to countries that do not restrict their release into the atmosphere. The exporter could then claim the ETS NZUs because the gasses were removed from NZ.

6.2.6. Recycling controls

6.2.6.1. Current controls

The Waste Minimisation Act (s23) can require certain persons to reuse, recycle, recover, treat or dispose of products that have been required to be taken back.

6.2.6.2. Recommended controls

There are no specific controls on recycling or reuse.

Currently, whilst there is a market to reuse refrigerants, given the requirement to phase out CFCs and HCFC and phase down HFCs, reuse/recycling would appear to potentially impede those goals. However, there may still be the need to use HFCs for a number of years to come and a desire to reuse and recycle lower global warming potential SGG refrigerants.

Therefore, controls should be developed to ensure that the recycling and reuse of SGG refrigerants is undertaken in a manner that minimises the risks to the environment whilst not impeding the requirement to phase out and phase down those SGG refrigerants that are ozone depleting and have a high GWP.

6.2.7. Collection locations/services

6.2.7.1. Current controls

The Waste Minimisation Act (s23) can require take back services for products and prescribe the requirements of that service.

6.2.7.2. Recommended controls

It is not considered practicable or effective to have any regulation that specifically identifies where collection services should operate. It would be more effective for these to be left to individual schemes to decide the most effective locations and services provided. However, it is important that access to collection points and services are available in locations that enable participation in the scheme. The PSO should ensure that rural areas are provided with suitable options to safely deposit their SGG refrigerants and that individual schemes do not focus on urban areas due to the lower overheads in providing services to a compact area and ignore remoter locations.

6.2.8. Storage controls

6.2.8.1. Current controls

The Health and Safety at Work (Hazardous Substances) Regulations 2017 (pt2) details the storage requirements for hazardous substances and (pt15) for gasses under pressure.

6.2.8.2. Recommended controls

It is considered that there are sufficient controls on the storage of SGG refrigerants. Whilst these controls relate just within places of work, it is considered unlikely that significant quantities of SGG refrigerants would be stored in other locations.

6.2.9. Safe destruction

6.2.9.1. Current controls

The Hazardous Substances Disposal Notice 2017 (s7) requires that a person disposing of a class 2 substance must dispose of it by treating it in a manner that changes its characteristics or composition so that it is no longer hazardous.

6.2.9.2. Recommended controls

There is a requirement for SGG refrigerants that are hazardous substances to be treated so that it is no longer hazardous. This does not mean that the SGG refrigerant is required to be safely destroyed. Given that these refrigerants are classified as a hazardous substance due to their flammability this treatment could take the form of dilution with a non-flammable gas. It is unlikely that this will significantly reduce its global warming potential.

It is therefore considered that there should be a requirement to ensure that all unwanted SGG refrigerants collected by the PSS(s) are safely destroyed in a manner that eliminates or significantly reduces their global warming potential.

This should be reassessed by the PSO no more than 10 years after the declaration of SGG refrigerants as priority products to see what the proportion of refrigerants collected are CFC, HCFC and HFC. If the proportion of these gases is significantly lower than other lower GWP SGG refrigerants, then consideration should be given to encourage recycling and reuse over disposal.

6.3. Specific regulatory controls for successful stewardship

Under the Waste Minimisation Act the Minister can recommend regulations in relation to products, materials and waste. This section details the specific regulatory requirements the Working Group considers are necessary for the successful stewardship of SGG refrigerants.

The regulation should require the Refrigerant Product Stewardship Organisation (RPSO) as a specified person to:

- to set an advanced stewardship fee (based on a dollar per kilogram amount) to be paid by the importers (producers) of SGG refrigerants or SGG refrigerant containing equipment or vehicles. WMA s23 (1)(d)
- collect data from the importers (producers) about the net amount of SGG refrigerants they have imported, (the data format and timeframes will be consistent with that provided to the EPA for the ETS) WMA s23 (1)(i)
- collect the required stewardship fee from the importers. WMA s23 (1)(e)
- validate the importers declarations with the data held by the EPA. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- contract third parties to deliver effective and efficient product stewardship scheme(s) (PSS) for SGG refrigerants within NZ. WMA s23 (1)(c)
- ensure that any contracted PSS has and maintains accreditation issued by the MfE under the WMA. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)set performance targets for the recovery of SGG refrigerants by the PSS(s). This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)receive the ETS units from the PSS(s) that they received for the destruction of SGG refrigerants and use these to fund the stewardship of SGG refrigerants. WMA s23 (1)(j)

- report progress of the PSS(s) in disposing of SGG refrigerants to the MfE. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)

The regulation should require the Product Stewardship Scheme(s) to:

- attain and maintain accreditation issued by the MfE under the WMA. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- receive unwanted SGG refrigerants from holders. WMA s23 (1)(c)
- incentivise participation through various methods such as paying a rebate, determined by the PSO, to holders of SGG refrigerants who deposit SGG refrigerants with the PSS for destruction. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- only use personnel for the collection and management of SGG refrigerants who are fully trained and qualified. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- only accept SGG refrigerants from third parties who are fully trained and qualified. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- promote the scheme to maximise the collection of SGG refrigerants. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- report the amount of SGG refrigerants destroyed. WMA s23 (1)(i)
- pass any ETS units received for the destruction of SGG refrigerants to the RPSO. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- maintain records of who has deposited SGG refrigerants for destruction, this must include, individual's name, the business name and contact details, their credentials ID number and the time, date and amount deposited. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- destroy all SGG refrigerants collected until such time as they can show that the refrigerants being collected consist of primarily of low global warming SGG refrigerants and recycling and reuse is a better option than destruction. WMA s23 (1)(a)

The regulation should require the importers (producers) to:

- pay the advanced stewardship fee set by the PSO. WMA s23 (1)(d)(i)
- provide data on the type and quantity of SGG refrigerants they have imported and exported (the data format and timeframes will be consistent with that provided to the EPA for the ETS levy) to the PSO quarterly and MfE (on request). WMA s23 (1)(i) and would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)
- maintain records of SGG refrigerants imported and who these were transferred to. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)

The regulation should require holders of refrigerants and refrigerant containing equipment to:

- maintain and service equipment to minimise the risk of leaks and containment failures. WMA s23 (1)(j)
- only use suitably qualified technicians for the installation, servicing and decommissioning of SGG refrigerant containing equipment. WMA s23 (1)(j)

- maintain records of SGG refrigerants received and transferred for all refrigerant containing equipment excluding householders WMA s23 (1)(j)

The regulation should require all persons who are handling, installing, servicing and decommissioning SGG refrigerant containing equipment or containers refrigeration technicians to

- be fully trained and qualified. WMA s23 (1)(j)
- maintain records of SGG refrigerants they have used, removed and sent for destruction. WMA s23 (1)(j)

The regulation should require that all persons, who are recovering equipment or materials that contain, or have contained SGG refrigerants:

- ensure that the SGG refrigerants are safely removed by a suitably trained and qualified person and the collected SGG refrigerant is sent for destruction through an accredited PSS. WMA s23 (1)(a)
- maintain records for the disposal of the SGG refrigerants, this must include, who they transferred the gases to, the individual's name, the business name contact details, their credentials ID number and the time, date and amount transferred. This would be a requirement included in the accreditation issued by the MfE under WMA s22 (1)

The regulation should prohibit the release to the atmosphere of SGG refrigerants that have been collected for storage, destruction, recycling or reuse. WMA s23 (1)(a)

The Working Group consider it is vital to the success of any scheme that requirements to properly steward SGG refrigerants from the moment of import to final destruction are fully enforced by the relevant enforcement agencies. Failure to do this will undermine the integrity of any scheme and potentially cause significant damage to the environment.

7. APPENDIX A

Synthetic Greenhouse Gas Refrigerant Working Group Members

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8. APPENDIX B

Cost Benefit Analysis Excel Model over 10 years

	Millions										
Base Case: voluntary PS	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Costs - Advance Stewardship Fee	$ 0.85	$ 0.92	$ 0.98	$ 1.05	$ 1.23	$ 1.30	$ 1.38	$ 1.46	$ 1.54	$ 1.74	$ 1.83
Discounted Cost	$ 0.85	$ 0.86	$ 0.09	$ 0.88	$ 0.97	$ 0.98	$ 0.96	$ 0.97	$ 0.97	$ 1.03	$ 1.03
Benefits - Emission Reductions	$ 1.77	$ 2.06	$ 2.37	$ 2.71	$ 3.06	$ 3.44	$ 3.85	$ 4.28	$ 4.74	$ 5.24	$ 5.76
Discounted Benefit	$ 1.77	$ 1.94	$ 0.21	$ 2.27	$ 2.42	$ 2.58	$ 2.69	$ 2.87	$ 2.99	$ 3.09	$ 3.23
NPV	$16.58										
BCR	2.72										

	Millions										
Option 2: No PS	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Costs	$ 0.27	$ 0.28	$ 0.29	$ 0.30	$ 0.32	$ 0.33	$ 0.34	$ 0.36	$ 0.37	$ 0.38	$ 0.40
Discounted Cost	$ 0.27	$ 0.26	$ 0.03	$ 0.25	$ 0.25	$ 0.25	$ 0.24	$ 0.24	$ 0.23	$ 0.23	$ 0.22
Benefits - Emission Reductions	$ 0.88	$ 1.03	$ 1.19	$ 1.35	$ 1.53	$ 1.72	$ 1.92	$ 2.14	$ 2.37	$ 2.62	$ 2.88
Discounted Benefit	$ 0.88	$ 0.97	$ 0.11	$ 1.14	$ 1.21	$ 1.29	$ 1.35	$ 1.43	$ 1.49	$ 1.54	$ 1.61
NPV	$10.63										
BCR	5.28										

	Millions										
Option 3: Co regulated PS	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Costs - Advance Stewardship Fee	$ 3.23	$ 1.19	$ 1.23	$ 1.27	$ 1.32	$ 1.06	$ 1.11	$ 1.17	$ 1.22	$ 1.28	$ 1.34
Discounted Cost	$ 1.97	$ 3.26	$ 0.48	$ 6.48	$ 8.35	$ 10.49	$ 12.62	$ 15.26	$ 17.83	$ 20.46	$ 23.52
Benefits - Emission Reductions	$ 1.97	$ 3.47	$ 5.36	$ 7.71	$10.57	$ 13.98	$ 18.03	$ 22.78	$ 28.30	$ 34.67	$ 42.00
Discounted Benefit	$ 1.97	$ 3.26	$ 0.48	$ 6.48	$ 8.35	$ 10.49	$ 12.62	$ 15.26	$ 17.83	$ 20.46	$ 23.52
NPV	$106.33										
BCR	10.77										

Option 1: Status Quo - Voluntary Product Stewardship, bulk importer only, ASF on sales

COST ANALYSIS	AVG	FORECAST 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
From SR1 - Tonnes SGG from bulk importers part of RECOVERY												
Tonnes of R22 bulk imported and sold in NZ, part of RECOVERY												
Tonnes of HFCs, Bulk imported & sold in NZ	388											
Tonnes of Flammable refrigerants bulk imported and sold in NZ - HFC Blends + Other												
Total Tonnes Bulk imports	425											
Total tonnes - all SGG into NZ (Bulk + Pre charged + Vehicles) - from SR1	804											
Estimated overall industry growth rate, based on industry discussions? - do we want flat rate or model each year?	5%											
Forecast total tonnes SGG from bulk importers part of RECOVERY: Average over last 5 years as 2020 value, increase by X% annually		425	447	469	492	517	543	570	598	628	660	693
Phase down HFCs from implementation of Kigali amendment		90%	90%	90%	90%	60%	60%	60%	60%	60%	30%	30%
Forecast tonnes R22 bulk imports - already imports phased out, sales of product already in stock	R22	5	2	0								
Forecast tonnes HFCs bulk imports - phased down from 2020 by 90% to 2023, 60% 2024	HFC	349	349	349	349	233	233	233	233	233	116	116
Forecast Tonnes Flammable HFC Blends and others bulk imported - assume increases to compensate for reducing HFC	Flammable	71	95	120	143	284	310	337	366	396	543	576
Reccovery Advance Stewardship fee - HFC, R22, Other - per KG	$ 1.5											
Recovery Advance Stewardship Fee - flammable - per KG	$ 2.5											
Total Levy collected												
Forecast Advance stewardship fee	HFC, R22	$ 531,006	$ 527,410	$ 523,815	$ 523,815	$ 349,210	$ 349,210	$ 349,210	$ 349,210	$ 349,210	$ 174,605	$ 174,605
	Flammable	$ 178,154	$ 237,304	$ 299,113	$ 357,720	$ 710,265	$ 774,879	$ 842,724	$ 913,961	$ 988,760	$ 1,358,307	$ 1,440,773
Total Forecast ASF		**$ 709,159**	**$ 764,715**	**$ 822,928**	**$ 881,534**	**$ 1,059,475**	**$ 1,124,089**	**$ 1,191,934**	**$ 1,263,171**	**$ 1,337,970**	**$ 1,532,912**	**$ 1,615,377**
Industry cost of collection												
Estimated cost of collection in NZ per kg	$ 5.00	$ 145,833	$ 151,667	$ 157,733	$ 164,043	$ 170,604	$ 177,429	$ 184,526	$ 191,907	$ 199,583	$ 207,566	$ 215,869
TOTAL COST (ASF + Collection Cost borne by Holder)		**$ 854,993**	**$ 916,381**	**$ 980,661**	**$ 1,045,577**	**$ 1,230,079**	**$ 1,301,517**	**$ 1,376,459**	**$ 1,455,077**	**$ 1,537,553**	**$ 1,740,478**	**$ 1,831,246**

BENEFIT ANALYSIS	AVG	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Actual tonnes of SGG collected and destroyed via RECOVERY	29											
Recovery Rate - as % of Total tonnes SGG into NZ (Bulk, Precharged, Vehicle)	4%											
Emission reductions of SGG destroyed via RECOVERY												
CO2e per kg of SGG destroyed	2.019166515											
CO2e per kg of HFC destroyed	2.42570902											
Key assumption: Forecast tonnes collected and destroyed - assume recovery % is consistent, but actual tonnes with increase in line with overall growth	4%	29	30	32	33	34	35	37	38	40	42	43
Assume HFCs will make up bulk of recovered SGG, due to Kilgali phase down, and based on historic data between 82-92%												
Forecast Value of NZ ETS Emission Unit - from Productivity Commission Stabilising and Disruptive scenarios, 2020-2030		$ 25.00	$ 28.00	$ 31.00	$ 34.00	$ 37.00	$ 40.00	$ 43.00	$ 46.00	$ 49.00	$ 52.00	$ 55.00
Estimated Tonne CO2e per kg of SGG Destroyed - based on avg value for ALL Gases destroyed last 5 years, from Toxfree d	2.42570902											
Forecast equivlant tonnes of CO2e		70750	73580	76523	79584	82767	86078	89521	93102	96826	100699	104727
Forecast value of Emission reductions		$ 1,768,746	$ 2,060,236	$ 2,372,214	$ 2,705,854	$ 3,062,391	$ 3,443,120	$ 3,849,408	$ 4,282,691	$ 4,744,476	$ 5,236,353	$ 5,759,988
TOTAL COST (ASF + Collection)		$ 854,993	$ 916,381	$ 980,661	$ 1,045,577	$ 1,230,079	$ 1,301,517	$ 1,376,459	$ 1,455,077	$ 1,537,553	$ 1,740,478	$ 1,831,246
Total Cost of Analysis period		$ 14,270,022										
Discounted Cost		$ 854,993	$ 861,398	$ 87,279	$ 878,285	$ 971,763	$ 976,138	$ 963,522	$ 974,902	$ 968,658	$ 1,026,882	$ 1,025,498
Total discounted Cost		$ 9,589,317										
TOTAL BENEFITS (Emission Reduction)		$ 1,768,746	$ 2,060,236	$ 2,372,214	$ 2,705,854	$ 3,062,391	$ 3,443,120	$ 3,849,408	$ 4,282,691	$ 4,744,476	$ 5,236,353	$ 5,759,988
Total Benefit of Analysis period		$ 39,285,477										
Discounted Benefit		$ 1,768,746	$ 1,936,621	$ 211,127	$ 2,272,918	$ 2,419,289	$ 2,582,340	$ 2,694,586	$ 2,869,403	$ 2,989,020	$ 3,089,448	$ 3,225,593
Total discounted Benefit		$ 26,059,091										
NET BENEFITS		$ 913,753	$ 1,143,854	$ 1,391,553	$ 1,660,277	$ 1,832,311	$ 2,141,603	$ 2,472,949	$ 2,827,613	$ 3,206,924	$ 3,495,875	$ 3,928,742
Discount Factor	6%	1	0.94	0.089	0.84	0.79	0.75	0.7	0.67	0.63	0.59	0.56
Net Present Value		**$16,581,079**										
Benefit Cost Ratio		**2.718**										

Option 2: No Product Stewardship

			FORECAST										
COST ANALYSIS			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Forecast tonnes into NZ as from Option 3 Co regulated			804	844	886	930	977	1026	1077	1131	1187	1247	1309
No Stewardship Fee			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Some companies will collect and send refrigerant for destruction themselves													
More likely to see increased incidence of refrigerant released to atmosphere													
Increased compliance cost for each company to deal with ToxFree and send smaller quantities compared to Status Quo													
Costs on Industry													
Estimated Tonnes sent for destruction annually as % of RECOVERY, Status Quo	50%		15	15	16	16	17	18	18	19	20	21	22
Estimated cost of collection in NZ per kg	$ 5.00		$ 72,917	$ 75,833	$ 78,867	$ 82,021	$ 85,302	$ 88,714	$ 92,263	$ 95,953	$ 99,791	$ 103,783	$ 107,934
Estimated cost of destruction in Australia per kg including freight, analysis, destruction	$ 13.50		$ 196,875	$ 204,750	$ 212,940	$ 221,458	$ 230,316	$ 239,529	$ 249,110	$ 259,074	$ 269,437	$ 280,215	$ 291,423
Additional costs for more cylinders, de gassing equip, trained staff etc													
TOTAL COST (Collection & Destruction)			$ 269,792	$ 280,583	$ 291,807	$ 303,479	$ 315,618	$ 328,243	$ 341,373	$ 355,027	$ 369,229	$ 383,998	$ 399,358
BENEFIT ANALYSIS													
Recovery Rate - as % of Total tonnes SGG into NZ (Bulk, Precharged, Vehicle)			1.81%	1.80%	1.78%	1.76%	1.75%	1.73%	1.71%	1.70%	1.68%	1.67%	1.65%
CO2e per kg of SGG Destroyed - based on avg value for HFCs destroyed last 5 years, from Toxfree d	2.425709												
Forecast tonnes of CO2e recovered and destroyed			35,375	36,790	38,262	39,792	41,384	43,039	44,761	46,551	48,413	50,350	52,364
Forecast Value of NZ ETS Emission Unit - from Productivity Commission Stabilising and Disruptive scenarios			$ 25.00	$ 28.00	$ 31.00	$ 34.00	$ 37.00	$ 40.00	$ 43.00	$ 46.00	$ 49.00	$ 52.00	$ 55.00
Forecast value of Emission reductions			$ 884,373	$1,030,118	$1,186,107	$1,352,927	$1,531,195	$1,721,560	$1,924,704	$2,141,345	$2,372,238	$2,618,176	$2,879,994
TOTAL COST			$ 269,792	$ 280,583	$ 291,807	$ 303,479	$ 315,618	$ 328,243	$ 341,373	$ 355,027	$ 369,229	$ 383,998	$ 399,358
Total Cost of Analysis period			$ 3,638,505										
Discounted Cost			$ 269,792	$ 263,748	$ 25,971	$ 254,922	$ 249,338	$ 246,182	$ 238,961	$ 237,868	$ 232,614	$ 226,559	$ 223,640
Total discounted Cost			$ 2,469,595										
TOTAL BENEFITS			$ 884,373	$1,030,118	$1,186,107	$1,352,927	$1,531,195	$1,721,560	$1,924,704	$2,141,345	$2,372,238	$2,618,176	$2,879,994
Total Benefit of Analysis period			$19,642,739										
Discounted Benefit			$ 884,373	$ 968,311	$ 105,564	$1,136,459	$1,209,644	$1,291,170	$1,347,293	$1,434,701	$1,494,510	$1,544,724	$1,612,797
Total discounted Benefit			$13,029,546										
NET BENEFITS			$ 614,581	$ 749,534	$ 894,300	$1,049,448	$1,215,577	$1,393,317	$1,583,332	$1,786,318	$2,003,010	$2,234,179	$2,480,636
Discount Factor	6%		1	0.94	0.089	0.84	0.79	0.75	0.7	0.67	0.63	0.59	0.56
Net Present Value			**$10,633,258**										
Benefit Cost Ratio			**5.276**										

Option 3: Co-Regulatory Product Stewardship

COST ANALYSIS	AVG 5Yrs	FORECAST 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
From SR1 - Total Tonnes SGG Imported to NZ												
Bulk net imports (tonnes) Customs Data	373											
Pre charged SGG refrigerant (tonnes) - EPA data	246											
Refrigerant in Motor vehicles (tonnes) - EPA Data	185											
Total tonnes - all SGG into NZ (Bulk + Pre charged + Vehicles) - from SR1	804											
Estimated overall industry annual growth rate	5%											
Forecast total tonnes SGG into NZ: Average over last 5 years as 2020 value, increase by X% annually		804	844	886	930	977	1026	1077	1131	1187	1247	1309
Forecast Net Bulk imports (tonnes)	Bulk	373	391	411	431	453	476	499	524	551	578	607
Forecast Precharged good (tonnes)	Pre Charged	246	258	271	285	299	314	330	346	364	382	401
Forecast Refrigerant in vehicles (tonnes)	Vehicles	185	194	204	214	225	236	248	260	273	287	301
	Total	804	844	886	930	977	1026	1077	1131	1187	1247	1309
ASFee must be set to cover destruction costs + collection rebate + programme manager	1	1	1	1	1	1	1	1	1	1	1	1
Advance Stewardship fee - flat fee per kg.		$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0
Total Forecast ASF		$ 803,534	$ 843,710	$ 885,896	$ 930,191	$ 976,700	$ 1,025,535	$ 1,076,812	$ 1,130,653	$ 1,187,185	$ 1,246,545	$ 1,308,872
Government Compliance Costs - develop new regulations under WMA - as from Tyrewise - Dana to provide update												
New regulations under Waste Minimisation Act, includes public discussion document, advisory group for development of the regulation.		$ 1,850,925	0	0	0	0	0	0	0	0	0	$ -
Annual regulations updates such as fee changes		0	$ 3,887	$ 3,887	$ 3,887	$ 3,887	$ 3,887	$ 3,887	$ 3,887	$ 3,887	$ 3,887	$ 3,887
Scheme accreditation audits		$ 18,509	$ 6,170	$ 6,170	$ 6,170	$ 6,170	$ 6,170	$ 6,170	$ 6,170	$ 6,170	$ 6,170	$ 6,171
Enforcement costs		$ 308,488	$ 308,488	$ 308,488	$ 308,488	$ 308,488	$ -	$ -	$ -	$ -	$ -	$ -
Industry Compliance Costs -changes for industry training and licensing programme, admin/compliance	PC SUM	$ 250,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
TOTAL COST		$ 3,231,456	$ 1,187,255	$ 1,229,440	$ 1,273,735	$ 1,320,245	$ 1,060,592	$ 1,111,869	$ 1,165,709	$ 1,222,242	$ 1,281,601	$ 1,343,930

BENEFIT ANALYSIS	AVG	FORECAST 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Assume recovery increases over time as collection rebate encourages recovery, along with licensing and increased promotion and education												
Average forecast recovery rate	4%	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%
2020 forecast recovery rate	4%											
Annual increase in recovery rate	2.00%											
Forecast tonnes of refrigerant recovered		33	51	71	94	118	144	173	204	238	275	315
Estimated cost of Destruction per kg based on actuals from RECOVERY, includes freight, analysis and destruction	$ 13.5	439,582	689,363	963,023	1,262,326	1,589,151	1,945,503	2,333,518	2,755,470	3,213,783	3,711,039	4,249,987
Rebate for collection $ per kg	$ 2.5	81,404	127,660	178,338	233,764	294,287	360,278	432,133	510,272	595,145	687,230	787,035
Tonnes CO2e per kg of SGG destroyed	2.019166515											
Tonnes CO2e per kg of HFC destroyed	2.42570902											
Assume HFCs will make up bulk of recovered SGG over next 10 years, due to Kilgali phase down, and based on historic data, so use higher CO2e figure												
Forecast Tonnes CO2e per kg of SGG Destroyed - based on avg value for HFC destroyed	2.43											
Forecast Tonnes of CO2e recovered and destroyed		78,985	123,866	173,038	226,817	285,542	349,572	419,291	495,109	577,459	666,808	763,647
Forecast Value of NZ ETS Emission Unit - from Productivity Commission Stabilising and Disruptive scenari		$ 25.00	$ 28.00	$ 31.00	$ 34.00	$ 37.00	$ 40.00	$ 43.00	$ 46.00	$ 49.00	$ 52.00	$ 55.00
Forecast value of Emission reductions		**$ 1,974,626**	**$ 3,468,254**	**$ 5,364,179**	**$ 7,711,791**	**$ 10,565,057**	**$ 13,982,887**	**$ 18,029,532**	**$ 22,775,001**	**$ 28,295,514**	**$ 34,673,992**	**$ 42,000,572**
TOTAL COST		$ 3,231,456	$ 1,187,255	$ 1,229,440	$ 1,273,735	$ 1,320,245	$ 1,060,592	$ 1,111,869	$ 1,165,709	$ 1,222,242	$ 1,281,601	$ 1,343,930
Total Cost of Analysis period		$ 15,428,074										
Discounted Cost		$ 3,231,456	$ 1,116,019.40	$ 109,420	$ 1,069,937	$ 1,042,993	$ 795,444	$ 778,308	$ 781,025	$ 770,013	$ 756,145	$ 752,601
Total discounted Cost		$ 11,203,361										
TOTAL BENEFITS		$ 1,974,626	$ 3,468,254	$ 5,364,179	$ 7,711,791	$ 10,565,057	$ 13,982,887	$ 18,029,532	$ 22,775,001	$ 28,295,514	$ 34,673,992	$ 42,000,572
Total Benefit of Analysis period		$ 188,841,405										
Discounted Benefit		$ 1,974,626	$ 3,260,159	$ 477,412	$ 6,477,904	$ 8,346,395	$ 10,487,165	$ 12,620,673	$ 15,259,251	$ 17,826,174	$ 20,457,655	$ 23,520,320
Total discounted Benefit		$ 120,707,734										
NET BENEFITS	**Net Benefit**	-$ 1,256,830	$ 2,280,999	$ 4,134,739	$ 6,438,056	$ 9,244,812	$ 12,922,295	$ 16,917,663	$ 21,609,291	$ 27,073,272	$ 33,392,391	$ 40,656,642
Discount Factor	**6%**	1	0.94	0.089	0.84	0.79	0.75	0.7	0.67	0.63	0.59	0.56
Net Present Value		**$106,330,838**										
Benefit Cost Ratio		**10.77**										

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10. GLOSSARY OF TERMS

Advanced disposal fee (ADF): a fee payed in advance that covers the costs of collection and safe disposal/destruction of an item or product.

Advanced stewardship fee (ASF): a fee payed in advance that covers the costs of the stewardship of an item or product through either all or part of its life.

Alternative refrigerant: A refrigerant other than that for which a system was designed.

BCR Benefit Cost Ratio (BCR) is the ratio of the present value of total benefits tothe present value of total costs.

Bulk: Refers to SGG refrigerants that are imported in containers that are not goods or motor vehicles that are subject to the SGG levy. These containers can be any size and in some situations are small, containing a few 100ml

Blend: A combination of two or more refrigerants in a defined ratio that forms a refrigerant with specified thermodynamic properties.

CBA Cost Benefit Analysis (CBA) is a method for organising information to aid decision making. CBA as two main features:

- costs and benefits are expressed in monetary terms and hence are directly comparable; and
- costs and benefits are valued in terms of the claims they make on and gains they provide to the community as a whole.

Charge: To load or fill a compressed gas container with a gas or combination of gases.

Compliance Certifier: A person approved by Worksafe New Zealand to issue compliance certificates as outlined in regulation 6.22 of the Health and Safety at Work (Hazardous Substances) Regulations 2017.

Compressed gas: Gases and mixtures of gases stored under pressure.

Compressed gas container: Meaning as detailed in the Health and Safety at Work (Hazardous Substances) Regulations 2017.

Contaminated refrigerant: A refrigerant containing oil, acid, non-condensable substances and/or moisture and/or other foreign substances. This could include mixed refrigerants (cocktails) that are not manufactured products.

Cylinder : Has the meaning given to it in the Health and Safety at Work (Hazardous Substances) Regulations 2017. These are used to store or transport compressed, liquefied or dissolved gases, but do not include an aerosol or a cartridge. They have a water capacity of 120mls or greater if the content is a liquefied flammable gas, a water capacity of 500mls or greater if the content is other than a liquefied flammable gas, and a water capacity not exceeding 500L**.**

Decommissioning: The process whereby a system is deliberately rendered inoperable.

Destruction: A process whereby a refrigerant is permanently transformed or decomposed into other substances.

Disposal: To dispose of or to convey a product usually for scrapping or destruction.

Disposable container, disposable refrigerant container: A non-refillable cylinder.

Emissions Trading Scheme (ETS): The NZ government's main tool for reducing greenhouse gas emissions by putting a price on emissions of gases that have a global warming potential. It requires all sectors of New Zealand's economy to report on their emissions and, with the exception of biological emissions from agriculture, to purchase and surrender emissions units to the Government for those emissions.

EPA: Environmental Protection Authority is the New Zealand authority responsible for implementing the HSNO Act.

Fluorocarbon (SGG): A hydrocarbon in which some or all of the hydrogen atoms have been replaced by fluorine.

Fluorocarbon refrigerant: A refrigerant consisting of or containing fluorocarbon.

Gas Substance that:

- Is completely gaseous as 20°C and at 101.3kPa absolute pressure; or
- Has a vapour pressure of more than 300kPa absolute pressure at 50°C.

Global warming potential (GWP): The atmospheric warming impact of a gas compared with an equal mass of carbon dioxide over a specified period of time (usually 100 years).

Householder: the person who owns or rents a particular property for the purpose of living in it.

HSW (HS) Act 2017: Health and Safety at Work (Hazardous Substances) Act 2017.

HSNO Act 1996: Hazardous Substances and New Organisms Act 1996.

Levy: A tax or fee *typically* imposed by government for a specific activity where normally the monies raised are hypothecated for a specific purpose.

Liquefied gas: A gas that has a critical temperature greater than -50°C and a boiling point not exceeding 20°C at 101.3 kPa absolute.

Low pressure liquefied gas: A liquefied gas with a critical temperature exceeding 65°C.

Maximum charge: Maximum amount of refrigerant that can be put in a cylinder, calculated by multiplying the water capacity of the cylinder by the refrigerant's fill ratio.

Maximum fill weight: This is calculated by adding the empty weight of the cylinder to the maximum charge.

Net Present Value (NPV): is the difference between the present value of total benefits and the present value of total costs.

Ozone Depletion Potential (ODP): The ODP of a chemical compound is the relative amount of degradation to the ozone layer it can cause

PCBU (Person Conducting a Business or Undertaking): In relation to a place that has a gas cylinder located in it, means:

- The person who is the owner, lessee, sub-lessee, occupier, or person in possession of the place or any part of it, or

- Any other person who, at the relevant time, is in effective control or possession of the relevant part of the place.

Permanent gas: A gas with a critical temperature not exceeding -50°C.

Plant: A combination of one or more refrigerating systems at a single site.

Pre-charged consumer products: Consumer products that are imported containing refrigerants.

Priority Product: A product whose waste will or may cause significant environmental harm; or there are significant benefits from the waste minimisation or treatment of the product. The Minister for the Environment must also:

- be satisfied that the product can be effectively managed under a product stewardship scheme
- consider the effectiveness of any relevant voluntary product stewardship scheme.

Producer: a person who —

- manufactures a product and sells it in New Zealand under the person's own brand; or
- is the owner or licence holder of a trademark under which a product is sold in New Zealand; or
- imports a product for sale in New Zealand; or
- manufactures or imports a product for use in trade by the person or the person's agent

Present Value (PV): is the discounted value of the cost or benefit

Product Stewardship Organisation (PSO): An organisation that is non profit and responsible for providing oversight of its Product Stewardship Schemes, award contracts for service delivery, stetting targets, strategic goals and advanced stewardship fees for PSS.

Product Stewardship Scheme (PSS): A scheme responsible for meeting targets set by the PSO which can include waste prevention, reuse, recycling, recovery and or disposal.

Reclaiming: To reprocess used refrigerant to new product specification by means which may include distillation.

Recovery: To remove refrigerant in any condition from a system and store it in an external cylinder, without necessarily testing or processing it in any way. It may be that the refrigerant is removed to enable the system to be repaired or de-commissioned.

Recycle: A process that uses a recycle unit in conjunction with a recovery unit, to process the refrigerant where it is going to be used again. The recycle unit removes the oil and solid gross contaminants only.

RECOVERY Trust NZ: The name of the Voluntary Stewardship Scheme which is held by The Trust for the Destruction of Synthetic. Collects SGG refrigerants and sends for them for destruction overseas.

Refrigerant: The medium used for heat transfer in a refrigerating system, which absorbs heat on evaporating at a low temperature and a low pressure and rejects heat on condensing at a higher temperature and higher pressure. Unless specified otherwise, 'refrigerant' in this guide refers to fluorocarbon refrigerant only. Note: The term 'gas' should be avoided when referring to refrigerants.

Refrigerated liquefied gas: A gas that, when packaged, is partially liquid because of its low temperature.

Refrigerating system: An assembly of piping, vessels, and other components in a closed circuit in which a refrigerant is circulated for the purpose of transferring heat.

Retrofit: To replace the original refrigerant (and components, lubricant, etc. as required) in a system with an alternative.

Returned refrigerant: Refrigerant recovered from a system and returned to the supplier (or equivalent) for reclaim or destruction.

Reuse: Use (charge) of recovered refrigerant without any processing to remove impurities.

RSWG: The Synthetic Greenhouse Gas Refrigerant Stewardship Working Group.

Synthetic greenhouse gas (SGG): artificial chemicals commonly used in refrigeration and air conditioning that have a high global warming potential because they can remain in the atmosphere for long periods of time and contribute to climate change.

Transport refrigeration: Any mobile refrigeration system other than air conditioning systems for passenger vehicles.

Volume of gas: The volume of a gas at 101.3 kPa absolute pressure and 15oC.

Waste Minimisation Act 2008 (WMA): Legislation that aims to encourages a reduction in the amount of waste generated and disposed of in New Zealand. The aim is to reduce the environmental harm of waste and provide economic, social and cultural benefits for New Zealand. It details the requirements that need to be met for a product to be a priority and the requirements for any mandatory product stewardship schemes.

Waste Minimisation Fund (WMF): A contestable fund manged by the Ministry for the Environment using monies collected from the Waste Disposal Levy, that aims to minimise waste.

Worksafe: WorkSafe is New Zealand's primary workplace health and safety regulator and enforcer.

I have reviewed the documents entitled Synthetic Refrigerant Stewardship Milestone 3 Report 2: Identify options for mandatory product stewardship and Milestone 3 Report 3 - IHRACE Product Stewardship Scheme Training Overview

Signature: 

Name: Carl Eath

Organisation: Temperzone

Date: 11/9/19

Once all participants in the Working Group have signed off the report it will be made available to all stakeholders via the Synthetic Refrigerant Stewardship website.

Please scan and email this page to darren@3R.co.nz

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Signature: 

Name: CHRISTINE JOHNSON

Organisation: IHRACE.

Date: 12.9.19.

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Signature: 

Name: Dave Nicholls

Organisation: Rex Cold

Date: 12/09/19

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Signature: H Dodson

Name: Harry Dodson

Organisation: AIA. Automotive Aftermarket Industry Association

Date: 12/9/2019

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Signature: _____

Name: JOHN BOWON

Organisation: REFRIGERANT RECOVERY

Date: 11 - 09 - 19

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Signature: _____

Name: Leo S Mortimer

Organisation: Motor Industry Association.

Date: 12 September 2019.

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Signature: 

Name: MALCOLM YARSTON

Organisation: IMPORTED MOTOR VEHICLE INDUSTRY ASSN (VIA)

Date: 11/08/2019

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Signature: 

Name: PETER HUTSON

Organisation: H.P.S.A

Date: 11/9/2019

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Signature: _____

Name: Morgan. _____

Organisation: ECCANZ _____

Date: 12/9/19. _____

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Signature: _____

Name: Roger Wyatt

Organisation: Refrigerant Licencing NZ (RLNZ)

Date: 12.9.19

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