Department of the Environment and Water Resources

Cost analysis of reporting National Pollutant Inventory transfers:

Case studies using the amended NPI NEPM variation

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Environmental Engineering

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1. Project summary

1.1 Case study summary

This report investigates the costs of reporting transfers to the National Pollutant Inventory (NPI). The obligation to report transfers is part of a variation to the current NPI NEPM requirements. Definitions relating to transfers are given in Section 1.2. Eleven case studies were completed to explore the tasks necessary for industry to report transfers. The costs associated with these reporting tasks were estimated. The project methodology is described in Section 1.3.

Transfer reporting methodology

While each case study is unique, there are transfer reporting components that are relevant to most facilities. To properly self-assess the need to report transfers, a facility should:

- review regulatory requirements,
- review the NPI substances for which they exceed the reporting threshold,
- identify the waste streams that may contain these NPI substances,
- review existing data including waste stream analyses, and
- identify any data gaps and if required, obtain additional data.

Where data gaps exist, laboratory analyses may be required. Analytical costs are mostly incurred in the first year and the analytical results developed into transfer factors for subsequent years. Transfer factors will allow simplified calculations. Ongoing analyses are only needed for highly variable waste streams or to modify transfer factors to account for significant process changes.

Estimated costs

A range of industry sectors participated in the case studies and a summary of estimated costs is shown in Table 1.1.

Table 1.1 Case study cost summary

	Total company costs for the first year	Total company costs for each subsequent year	Total costs per facility for the first year	Total costs per facility for each subsequent year
Sewage treatment	$ 5,700	$ 2,200	$ 700	$ 300
Automobile manufacturing	$ 16,000	$3,700	$ 16,000	$3,700
Galvanizing	$ 6,300	$ 2,300	<$ 1,000	<$ 500
Cement manufacturing	$ 990	$ 500	$ 500	$ 250
Electricity generating A	$ 8,500	$ 2,700	$ 8,500	$2,700
Electricity generating B	$ 8,500	$ 2,500	$4,300	$1,200
Petroleum refining	$ 18,000	$5,600	$ 18,000	$5,600
Pig / Poultry farming	$ 100	$ 0	$ 100	$ 0
Sugar milling & refining	$ 990	$ 220	$ 160	$40
Oil & gas extracting	$ 14,000	$6,000	$ 4,800	$ 2,000
Timber product manufacturing	$ 100	$ 0	$ 100	$ 0

(costs rounded to 2 significant digits)

The estimates represent the additional costs of mandatory transfer reporting. In some cases, a facility may determine that they do not need to report transfers, but they nonetheless incur initial costs in learning the transfer requirements and determining the facility's reporting obligations. The estimated ongoing costs beyond the first year are lower as the reporting obligations are known and the need for waste characterisation (including chemical analysis) is reduced or eliminated. Some of the participating companies have more than one reporting facility and therefore comparative costs are provided on a per facility basis.

Typical factors that help reduce the transfer reporting cost per facility include:

- personnel experienced in reporting NPI emissions,
- established systems and spreadsheets for reporting NPI emissions,
- existing analytical programs (e.g. for trade waste, production quality, licensing),
- multiple facilities to share reporting costs.

Extrapolated costs

Table 1.2 presents an extrapolation of the case study cost estimates (Table 1.1) across the participating industry sectors. Case studies are snapshots of a particular situation and the extrapolated average costs are indicative only. The cost per industry sector was weighted according to the number of NPI reporters in the relevant ANZSIC code. For example, there are currently about 190 reporters under the ANZSIC Class *Poultry Farming – Meat* (lower cost) and 10 under *Petroleum Refining* (higher cost). The reporters in these industry sectors represent a broad cross section and about 24% of the total facilities reporting nationally and therefore this subset provides an indicative estimate of the average costs across the wider NPI reporting community.

Table 1.2 Extrapolation of case study costs

	ANZSIC code	Total NPI reporters 2005/06	Total costs per industry sector for the first year	Total costs per industry sector for each subsequent year
Sewerage and drainage services	3702	254	$180,000	$76,000
Motor vehicle manufacturing	2811	10	$160,000	$37,000
Metal coating and finishing	2764	35	<$35,000*	<$18,000
Cement and lime manufacturing	2631	26	$13,000	$6,500
Electricity supply	3610	90**	$580,000	$180,000
Petroleum refining	2510	10	$180,000	$56,000
Farming (pig, poultry-meat, poultry-eggs)	0151, 0141, 0142	322	$32,000	$ 0
Sugar manufacturing	2171	29	$4,600	$1,200
Oil & gas extraction	1200	99	$480,000	$200,000
Wood product manufacturing not elsewhere classified	2329	30	$3,000	$ 0
Total facilities represented		905		
Total NPI reporting facilities		3835		
Weighted average costs for the facilities represented			$1,800	$630
Previous national estimate made prior to variation amendment			$2,800	$1,400

* – For the metal coating and finishing sector, the upper range of the case study cost estimate was used for the extrapolation.

** – 90 electricity supply facilities reported burning more than 2,000 tonnes of fuel or waste per year in 2005/06. For the electricity supply sector, the case studies examined coal fired power stations and many of the 90 electricity supply facilities burn over 2,000 tonnes of either diesel or natural gas. The cost attributed to this sector is probably high as diesel and natural gas fired stations have virtually no residual ash to transfer.

The *Impact Statement for the Variation to the National Environment Protection (National Pollutant Inventory) Measure, June 2006* reported that the estimated average costs for industry were an initial cost increase of $2,800 per facility with on-going costs of $1,400 per annum per facility. These estimates were based on the original variation. Applying the amended variation, Table 1.2 indicates that the estimated additional costs have been reduced for the participating sectors from the costs estimated for the original variation. The average first year costs are extrapolated to be $1,800 for the facilities represented with on-going costs of $630 per annum per facility. The main reason for the cost reduction is that under the amended variation, reporting of transfers for reuse/recycling is no longer mandatory (refer Section 1.2).

1.2 Project background

In July 2005, the National Environment Protection Council commenced a variation process for the National Environment Protection (National Pollutant Inventory) Measure (NPI NEPM). The scope of the variation includes reporting for the transfer of NPI substances. The inclusion of the reporting of transfers would bring the NPI closer in line with international practices and it would broaden the information available to the community and stakeholders. The additional reporting would have associated costs for industry as well as government.

The financial impacts of transfer reporting were investigated earlier in the variation process (EECO, March 2006; NEPC Impact Statement, June 2006). These impacts were assessed based on the original variation requirements, such as the original definitions for *transfer* and *transfer data*. Documents were released for public comment and the consultation for the variation process provided valuable feedback. Modifications to the NPI NEPM variation have been adopted and the amended definitions currently include:

> **"transfer"** means the transport or movement, on-site or off-site, of substances to a mandatory reporting transfer destination or a voluntary reporting transfer destination.
>
> It does not include the transport or movement of substances contained in overburden, waste rock, uncontaminated soil, uncontaminated sediment, rock removed in construction or road building, or soil used for the capping of landfills.
>
> **"mandatory reporting transfer destination"** means:
> (a) a destination for containment including landfill, tailing storage facility, underground injection or other long term purpose built waste storage structure
> (b) a destination for destruction
> (c) a sewerage system
> (d) an off-site treatment facility which leads solely to one or more of the above.
>
> **"voluntary reporting transfer destination"** means a facility for reuse, recycling, reprocessing, purification, partial purification, immobilisation, remediation or energy recovery.
>
> **"mandatory transfer data"** for a substance means an estimate of the amount of the substance transferred, to a mandatory reporting transfer destination, in a reporting period that identifies:
> (a) the transfer destination;
> (b) the type of containment, if applicable;
> (c) whether the transfer is on-site or off-site; and
> (d) the estimation technique used;
>
> **"voluntary transfer data"** for a substance means an estimate of the amount of the substance transferred, to a voluntary reporting transfer destination, in a reporting period that identifies:
> (a) the transfer destination;
> (b) the type of treatment, if applicable;
> (c) whether the transfer is on-site or off-site; and
> (d) the estimation technique used;

These definitions form the basis of this investigation and report, however the variation process is still open for modification.

The variation will apply material usage based thresholds (eg 10 tonnes of a Category 1 NPI substance) to transfer reporting and to include both offsite and onsite transfers. Exceedance of the Category 2a and 2b combustion/electricity based thresholds will not trigger transfer reporting.

To help determine the financial impacts of the amended variation, the Department of the Environment and Water Resources commissioned EECO Pty Ltd to investigate and report on the financial impact associated with transfer reporting under the new requirements.

1.3 Methodology

A literature review was conducted to develop a draft methodology for the reporting of transfers. The methodology was staged using the following four standard tasks that were modified from an internationally accepted basis for reporting to Pollutant Release and Transfer Registers.

Understanding regulatory requirements
Determining reporting obligations
Performing calculations, measurements and estimates
Reporting transfers

The case studies were developed using face-to-face interviews, usually followed by a facility inspection. The facility representative reviewed a draft methodology for transfer reporting based on information on wastes from the industry sector. The interviews focussed on improving the methodology to conform to the specific operations conducted at the facility or group of facilities. The interviews then focussed on the costs involved in completing the reporting tasks. Following the interviews, the case studies were documented with a financial analysis of the reporting activities. The draft case study was sent to the facility representative for review, revision and finalisation.

The State NPI teams took the lead role in developing six case studies and EECO took the lead role in developing five. The technical review roles were the reverse of the lead roles.

Limitations to the case study project should be recognised. The participating facilities have unique aspects and some industry sectors are not directly represented by the eleven case studies. The case studies are not intended to be all-inclusive for the industry sector discussed; rather they are intended to provide a starting point for a comparative assessment that could be conducted by a facility regardless of the industry sector.

2. Case Studies

The following eleven case studies illustrate how facilities will report NPI transfers. In each case, cost estimates are provided for the tasks undertaken.

2.1 Sewage treatment

2.1.1 Background

Eleven sewage treatment facilities are managed by the commercialised business unit of this major Council. The treatment facilities and associated delivery infrastructure represent a range of technologies and processes. Currently, eight of the eleven facilities trigger and report emissions to the NPI.

2.1.2 NPI transfer reporting methodology

Understanding regulatory requirements

The current NPI emission reporting is primarily done by the Environmental Officer with assistance from a Technical Officer. Together with support from the site supervisors, these two will also be the primary people involved with the NPI transfer reporting. Transfer obligations are therefore assessed by people familiar with the NPI structure, calculations and reporting tasks.

Gaining an understanding of regulatory requirements initially involves reviewing an information packet that is sent to all current NPI reporters and other prospective facilities. The packet provides generic and industry-specific information with some worked examples. For sewage treatment facilities, specific examples include biosolids transfers, sewage transfers and treated effluent recycling.

Additional information is gained through discussions with the State NPI team, wastewater colleagues (eg technical professionals from other Councils) and the industry association (AWA).

These activities are most intensive during the first year of transfer reporting and diminish in subsequent years.

Determining reporting obligations

Determining the transfer reporting obligations involves an examination of the activities that may involve transfers of NPI substances. The materials primarily associated with transfers are biosolids, sewage and treated effluent.

The biosolids are transferred to a composting facility for the production of soil conditioner. While this is the main fate of biosolids, issues sometime dictate that biosolids are taken to landfill. A key issue that leads to landfilling occurs when a batch of biosolids is analysed and one or more contaminants are found to be above the threshold required by the receiving facility. In total, about 20,000 dry tonnes of biosolids are generated each year, with less than 1% going to landfill. Composting is considered recycling for a beneficial use and reporting is voluntary. Landfilling is a transfer under the NPI definition and reporting is mandatory.

The landfill that accepts the biosolids currently collects methane gas from established cells and plans to continue gas collection from new cells. While this could be construed as an indirect reuse of the material, discussions with the State NPI team determine that it is not recycling/reuse under the transfer definition.

Sewage coming into the treatment facilities may be a reportable transfer for the generators, but not for the treatment facilities. For example, industries with trade waste permits may need to report NPI transfers to sewerage. The receivers do not need to report.

If treated effluent is provided to a third party for their *use*, then this is not a transfer and can be reported voluntarily. However, if Council pumps wastewater for *treatment* to a facility operated by someone else, then this would qualify as a transfer with mandatory reporting obligations.

Determining the transfer reporting obligations involves extracting data from the NPI emission estimation activities. The facilities currently trigger on Category 3 nitrogen and phosphorus and Category 1 substances ammonia, boron, chlorine, chlorophenols, fluoride and hydrogen sulfide. The facilities also report on combustion emissions, but the combustion Categories 2a and 2b are not relevant triggers for transfer reporting.

Some of the combustion emissions (ie carbon monoxide) may approach 10 tonnes, and the use of these substances is reviewed. These substances are found not to be part of any transfer and therefore further consideration of these substances is not required.

Grit and screenings comprise a wastestream that is sent to landfill. This waste is mostly inert material and it is not a homogenous mixture that can be easily sampled and analysed. The NPI substances contained in grits and screenings is believed to be very low and orders of magnitude lower than the key transfers of biosolids and sewage. This potential transfer issue is discussed with the State NPI Team to obtain a policy decision.

Grease is occasionally cleaned and removed from pump stations and sent for treatment prior to landfill. As with the grit and screenings, the NPI substances contained in this clean-out waste is believed to be very low and orders of magnitude lower than the key transfers for the facilities. Therefore, this potential transfer issue is also discussed with the State NPI Team to obtain a policy decision.

Performing calculations, measurements and estimates

Routine analytical tests are already conducted on wastewater and biosolids. An in-house laboratory conducts tests on biosolids mostly to check contaminant levels for the receiving facility – these include chlorinated organics (eg chlorophenols) and several metals. Tests also include the triggered NPI substances boron, nitrogen and phosphorus, but the tests do not currently include ammonia, chlorine or hydrogen sulfide. The levels of these three substances depend on factors including the age of the biosolids prior to transport. Substance volatilisation and degradation is related to the biosolids maturation time.

As this issue is common to many NPI reporters, work is conducted in conjunction with the AWA, the Biosolids Community Engagement Project and other Councils. The facility supplies existing data and also conducts additional tests on two samples for three analytes. The collaborative effort is expected to produce transfer factors for substances in biosolids.

Transport is via truck and weighbridges are used for all loads. Regulated waste tracking certificates are kept for all biosolids transferred offsite. An annual review of the documents provides the mass of biosolids that were disposed to landfill. Moisture content tests are available to assist in calculating the mass of the NPI substances. The mass of grease, grit and screenings is also known, if required.

A spreadsheet system is currently used for NPI emission reporting, and this is modified to calculate the NPI substance content and the end use/fate for transfers. The spreadsheet accounts for all sites and the cost of development could be allocated equally to the reporting facilities. Work procedures are modified and concise training given to instruct on data gathering and spreadsheet data entry.

Reporting transfers

The main reporting functions are conducted annually. The forms (NRT) are downloaded, the regulatory requirements are revisited briefly and data is collected from the sites. The data is entered into the spreadsheet, this is reviewed to check for data gaps and any missing data is obtained. A draft transfer report is completed and distributed to senior management for approval. The transfer report is then submitted to the State and records of the transfer reporting process are filed.

A decision is made to also report on the biosolids that are reprocessed as soil conditioner, since this accounts for more than 99% of the biosolids generated. But as this reporting is voluntary, the associated costs are not included in the estimates below.

2.1.3 NPI transfer reporting costs

Hourly rates are given in the table below for the personnel involved. This rate covers items including the base salary, insurances, leave, building rental and 'company' profit. The rates also cover consumables and proportioned equipment depreciation (eg computers, standard office equipment/photocopiers and telephone charges). Analytical costs include sampling; and these costs are assessed at commercial rates. For this case study, consultants are not used and it is assumed that the policy decisions do not require reporting for grease, grit and screenings. Set-up costs that are incurred only in the first year of transfer reporting are presented separately.

Table 2.1 Sewage treatment cost summary

	Cost components – NPI transfers					
	Staff – Environmental Officer ($110/hr)	Staff – Technical Officer ($80/hr)	Staff – admin. & operational ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting (subtotal)	First year set-up costs for transfer reporting (subtotal)
Understanding regulatory requirements	1st yr setup $440 every year $110	1st yr setup $240 every year $80	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$ 190	$680
Determining reporting obligations	1st yr setup $330 every year $110	1st yr setup $80 every year $80	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$ 190	$410
Performing calculations, measurements & estimates	1st yr setup $550 every year $220	1st yr setup $800 every year $400	1st yr setup $300 every year $250	1st yr setup $360 every year $ 0	$ 870	$2010
Reporting transfers	1st yr setup $220 every year $220	1st yr setup $80 every year $640	1st yr setup $50 every year $100	1st yr setup $ 0 every year $ 0	$ 960	$350
Total	1st yr setup $1540 every year $660	1st yr setup $1200 every year $1200	1st yr setup $350 every year $350	1st yr setup $360 every year $ 0	$ 2210	$ 3450

A major contributor to the first year set-up costs is the modifications to existing spreadsheets. Other additional first year costs include lab analysis and a familiarisation component that is not incurred in the subsequent years. The total cost for transfer reporting in the first year includes the set-up costs plus ongoing costs and is $5,660. The cost of transfer reporting per facility is $707 in the first year.

The cost of transfer reporting in the second year (and thereafter) is $2,210 total or about $275 per facility.

2.2 Automobile manufacturing

2.2.1 Background

Process summary

The major processes performed at this manufacturing facility include: foundry work, engine assembly, panel and unit parts pressing, body and unit parts welding, bumper bars moulding and painting, and vehicle painting and assembly.

The foundry undertakes the casting of aluminium engine components, including engine blocks, crankcases and cylinder heads. Other processes supporting the foundry include: die coating (ie. spraying a protective coating onto the dies) and impregnation (ie. sealing the pores in the casing with sodium silicate). The engine manufacture consists of machining and assembly of engine parts, tin plating, piston anodising and engine testing.

The press shop produces pressed panels and smaller parts, which are later welded in a variety of techniques to produce motor vehicle bodies. The welded car bodies undergo washing and phosphate dipping, electrocoating, applying a sealer and three subsequent coats of paint.

The front and rear bumper bars are moulded from rubber-modified polypropylene and then primed and painted. The car manufacturing procedure finishes in the assembly shop, where engine, transmission, suspension and trims are incorporated, before the car doors are attached and final inspection made.

2.2.2 NPI transfer reporting methodology

Understanding regulatory requirements

Pollutant emissions reporting is currently carried out by the environmental team with support from the production teams. The same team is also in charge of meeting any future transfer reporting requirements, as they are familiar with the NPI structure, calculations and reporting tasks.

Gaining an understanding of regulatory requirements initially involves reviewing information provided on the NPI website and/or sent to the current NPI reporters and other prospective facilities. The information packet contains generic and industry-specific information with some worked examples. Additional information is gained through further discussions with the State NPI Team, professional affiliations and industry associations. These activities are most intensive during the first year of transfer reporting and they diminish in subsequent years.

Determining reporting obligations

The motor vehicle manufacturing facility currently reports to the NPI for emissions of nickel, zinc, hydrochloric and phosphoric acids, ethylene glycol and several volatile organic compounds. The facility also reports on combustion product emissions, but these do not trigger transfer reporting.

Waste generated at this motor vehicle manufacturing facility can be roughly classified as either general or industrial waste. General waste is mainly generated in the assembly shop and staff canteens. Whilst general waste may contain very small amounts of NPI substances, Discussions with the State NPI Team confirm that general waste (eg cardboard, plastic, food scraps) is not to be considered for transfer reporting.

There is a large variety of industrial waste types generated at the motor vehicle manufacturing facility. These waste streams (apart from those sent off site for reuse, recycling or energy recovery) potentially qualify for mandatory transfer reporting.

The major waste types generated at this facility, which potentially contain NPI reportable substances, and the number of waste consignments is shown below in alphabetical order by waste type ID:

- B110 – Spent hydrochloric acid (liquid waste, hydrochloric acid, <10 consignments);
- B120 – Spent nitric acid (liquid waste, nitric acid, <10 consignments);
- C130- Caustic neutralised wastes containing metallic constituents (sludge, potentially contaminated with listed heavy metals, >10 consignments);
- F100-Aqueous-based waste (non-combustible) from the production, formulation and use of paints, lacquers, varnish, etc. (liquid waste, potentially containing listed organic compounds, <100 consignments);
- F120 - Solvent-based wastes (FP>60.5C -combustible) from the production, formulation and use of paints, lacquers, varnish, etc. (sludge and solid waste, potentially containing listed organic compounds, >10 consignments);
- F160 - Solvent-based wastes (FP<60.5C) from the production, formulation and use of paints, lacquers, varnish, etc. (liquid waste, potentially containing listed organic compounds, <100 consignments);
- F170 - Solvent-based wastes (FP<60.5C) from the production, formulation and use of resins, glues and adhesives, etc. (liquid waste, potentially containing listed organic compounds, >10 consignments);
- J100 - Waste oils unfit for original intended use (lubricating, hydraulic) (liquid waste, potentially contaminated with heavy metals, <100 consignments);
- J120 - Waste oils and water mixtures or emulsions and hydrocarbon and water mixtures or emulsions (mainly oil and/or hydrocarbons, ie. >50%) (liquid waste, potentially contaminated with heavy metals, >10 consignments);
- J130 - Waste oils and water mixtures or emulsions and hydrocarbon and water mixtures or emulsions (mainly water, ie. >50%) (liquid waste, potentially contaminated with heavy metals, >100 consignments);
- L150 - Industrial plant washwaters with or without detergents (liquid, potentially containing total phosphorus, <10 consignments);
- N190 – Filter cake (solid waste, potentially contaminated with listed heavy metals, <10 consignments);
- N205 – Residues from industrial wastewater treatment plant (sludge, potentially containing total nitrogen and total phosphorus, >10 consignments);
- N210 - Residues from pollution control operations (sludge and solid waste, >10 consignments);

Some of the above-mentioned wastes are taken off site to be re-used or recycled. For example, a significant amount of solvent-based wastes from the paint shop (F160) and waste and oil mixtures (J120, J130) is currently recycled, while waste cutting oils (J150) are re-used; thus, the reporting of the off-site transfer of these wastes are not mandatory. There are other, less significant waste streams that, while containing reportable substances, are currently recycled and are not included in mandatory transfer reporting, eg. recycled fluoro-tubes containing mercury.

Furthermore, used drums and containers containing industrial waste residues (waste types N110 and N100, respectively) are currently taken off site to be washed and re-used. Recycling of these drums and containers are considered as voluntary reporting destinations and do not require mandatory transfer reporting. At the same time, the content of these drums and containers (ie. sludges containing listed organic compounds) are reportable, according to the proposed transfer definition.

Some other prescribed industrial wastes generated, such as alkaline cleaners (C100) are unlikely to contain any NPI listed substances, and therefore are not included in the mandatory transfer

reporting. Similarly, mandatory transfer reporting of foundry sands (T160), containing phenolic resin and small quantities of other NPI listed organics, is not required because the usage is significantly below the Category 1 threshold of 10 tonnes. There is no untreated trade waste discharge to sewer at this facility. The industrial wastewater is treated on site and then taken off site for further treatment and disposal.

Performing calculations, measurements and estimates

This motor vehicle manufacturing company already has a significant amount of the information required to compile their mandatory transfer reports. Similar to other industrial waste generators, this company is required to know the type and amount of waste sent off site for treatment and/or disposal. A transport certificate specifying the amount of waste, its category and potential contaminants currently accompanies each consignment of prescribed industrial waste. Furthermore, the waste category and its mass is checked and reported by the company receiving and treating this waste.

As this motor vehicle manufacturing company uses the electronic waste transport certificate system, the data on the amount and characteristics of each waste type sent off site is readily available either as an in-house kept tally (register) or as a downloadable file from the environmental agency website (Excel spreadsheet). Notwithstanding the above, some information gaps are expected in relation to the wastes' speciation. This is of particular relevance to the prescribed industrial waste (such as oil contaminated articles) collected in the hundreds of on site waste bins.

Companies that receive and treat the major waste streams generated at this motor vehicle company routinely analyze these wastes. This analytical information, however, is not adequate for transfer reporting of some waste categories. For example, while the calorific value of the solvent-based wastes is routinely determined, their precise composition might not be investigated because the xylene or toluene content of waste is of no importance. This issue is further complicated due to the variability of the composition of solvent-based wastes because of the paints used.

The remaining information gaps are filled in either through analytical work or mass balance calculations. (It is expected that the changes to waste classifications to be introduced in Victoria in July 2007 will lead to more information on waste composition becoming available.)

Site personnel (with assistance from an external analytical laboratory) compile the required data for transfer reporting.

Reporting transfers

The transfer reporting functions will be conducted annually. The regulatory requirements are revisited briefly, and the transfer reports are generated using either the Excel spreadsheet or the on-line reporting application developed by the Australian government Department of the Environment and Water Resources. The draft transfer report is checked and approved by senior management. The company also decides whether to report on wastes being re-used or recycled. The approved report is then be submitted to the relevant environmental agency.

2.2.3 NPI transfers reporting costs

Hourly rates are given in the table below for the personnel involved. This rate covers items including the base salary, insurances, leave, building rental and 'company' profit. The rates also cover consumables and proportioned equipment depreciation (eg. computers, standard office equipment/photocopiers and telephone chargers). Analytical costs include sampling; and these costs are assessed at commercial rates.

Table 2.2 First year set-up costs for transfer reporting

	Staff - Environmental Officer ($110/hr)	Staff - Technical officer ($80/hr)	Staff - administrative ($50/hr)	Service providers - analytical laboratory	First year costs for transfer reporting
Understanding regulatory requirements	$550	$320	$0	$0	$870
Determining reporting obligations	$880	$320	$0	$0	$1,200
Performing calculations, measurements & estimates	$2,200	$1,200	$550	$5,000	$8,950
Reporting transfers	$440	$720	$150	$0	$1,310
Total	$4,070	$2,560	$700	$5,000	$12,330

Table 2.3 Ongoing costs for transfer reporting

	Staff - Environmental Officer ($110/hr)	Staff - Technical officer ($80/hr)	Staff - admin & operational ($50/hr)	Service providers - analytical laboratory	Ongoing costs for transfer reporting
Understanding regulatory requirements	$110	$80	$0	$0	$190
Determining reporting obligations	$110	$80	$0	$0	$190
Performing calculations, measurements & estimates	$550	$600	$250	$1,000	$2,400
Reporting transfers	$220	$640	$100	$0	$960
Total	$990	$1,400	$350	$1,000	$3,740

The transfer reporting costs shown above are estimates and the first years' reporting costs are greatly influenced by the quantity of waste analysis costs.

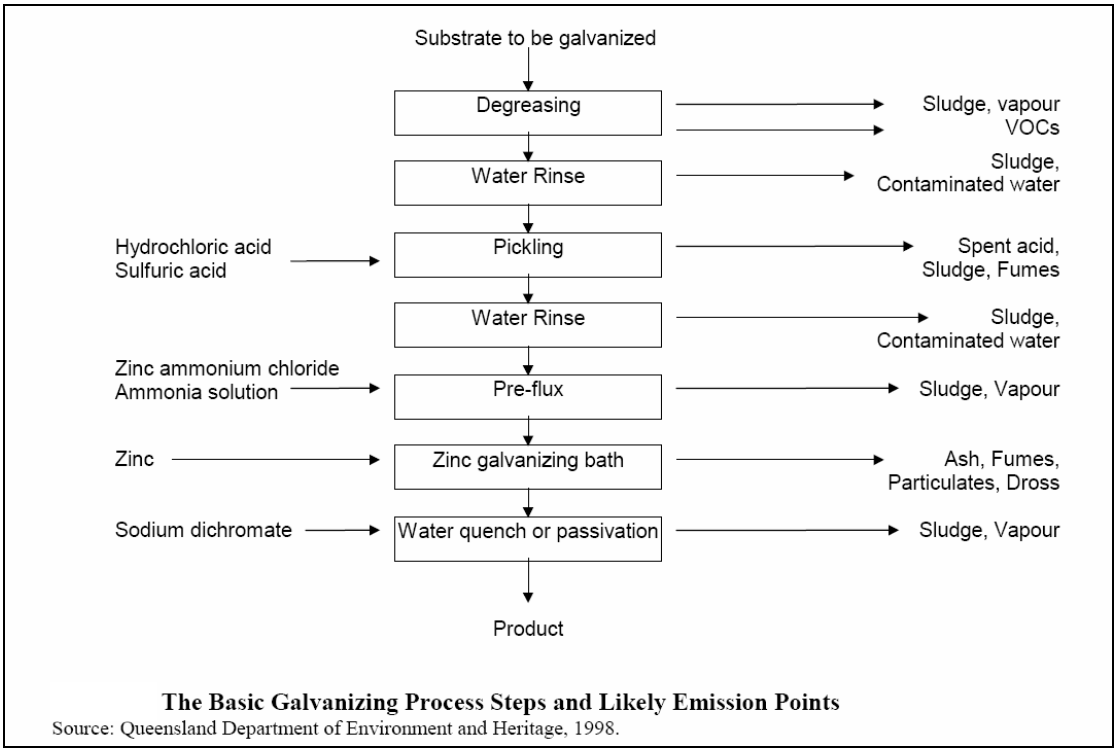
2.3 Galvanizing

2.3.1 Background

Process summary

Galvanized coatings are used to protect steel from corrosion. The galvanizing process involves a series of steps as shown in Figure 2.1.

Figure 2.1 Typical galvanizing process steps



The Basic Galvanizing Process Steps and Likely Emission Points

Source: Queensland Department of Environment and Heritage, 1998.

The steel objects to be galvanized require pre-treatment to remove paint, grease, rust and other impurities. This involves hot caustic degreasing, hydrochloric acid pickling and prefluxing in zinc ammonium chloride solution. Pre-treatment is critical because the object must be completely clean for successful galvanizing. Hot dip galvanizing occurs in the molten zinc bath at 450 °C and this is followed by chromate quench/passivation.

Facility information

The galvanising company has a number of facilities in Australia, all of which trigger NPI emission reporting for the use of 10 tonnes or more of the substance zinc. The galvanizing process is similar for each of the facilities, though the specific infrastructure and production capacity varies.

The following methodology and cost estimate illustrate how transfer reporting requirements are addressed.

2.3.2 NPI transfer reporting methodology

Understanding regulatory requirements

The company's Environmental Officer conducts the current NPI emission reporting for all sites. She also obtains and learns the transfer requirements. Transfer obligations are therefore assessed by a person familiar with the NPI structure, calculations and reporting tasks.

Gaining an understanding of regulatory requirements initially involves reviewing an information packet that is sent to all current NPI reporters and other prospective facilities. The packet provides generic and metal industry-specific information with some worked examples. A web-based (www.npi.gov.au) tutorial is reviewed and completed; this explains the regulatory requirements and provides the information in an interactive format. Discussions are held with the State NPI teams to clarify facility-specific issues. These 'regulatory understanding' activities are most intensive during the first year of transfer reporting and diminish in subsequent years.

Determining reporting obligations

The facilities currently report to the NPI for zinc emissions. The facility also reports on combustion emissions, but these are not relevant triggers for transfer reporting. Use may be made of ten tonnes or more of ammonia and hydrochloric acid, however, the NPI handbook does not require reporting as there is no approved emission estimation method.

Zinc ash, dust and dross are transported to a recycling facility. The zinc is refined into zinc ingots and alloys for reuse in galvanising where possible; the remainder is converted into agricultural and other products. This transfer is a recycling activity and therefore transfer reporting is voluntary.

Zinc is also found in a dissolved form in the waste process liquids and sludges. These waste liquids and sludges are treated for disposal and therefore the transfer reporting is mandatory. The chemical composition of the acid, alkali, pre-flux and quench solutions are routinely monitored for production purposes. The main liquid waste stream generated is spent hydrochloric acid; however, sludges are periodically removed from the degreasing, rinsing, prefluxing and quenching tanks. These sludges also contain entrapped process solutions. The quench solution may also require periodic disposal if it becomes too contaminated with other process residues. When required, these waste streams are collected by a waste contractor and transferred to a treatment facility for disposal. Although the waste contractor may utilise the wastes in a neutralisation process, discussion with the State NPI Team determine that this does not qualify as 'recycling' for transfer reporting purposes.

The waste streams of potential interest to transfer reporting are summarised below for an individual facility. The approximate number of transfers per year is given together with the NPI substance(s).

- Spent hydrochloric acid, approximately 15 loads per year, containing dissolved zinc and low-level hydrochloric acid;
- Waste caustic sludge and solution, up to 2 loads per year, some dissolved zinc;
- Pre-flux solution and sludge waste, approximately 2 loads per year, some dissolved zinc and ammonia;
- Mixed sump waste, variable waste stream, containing dissolved zinc, ammonia and hydrochloric acid; and
- Chromate quench solution waste, up to 2 loads per year, containing some dissolved zinc.
- Chromate quench sludge waste, up to 2 loads per year, containing zinc.

Facilities in Western Australia are required to neutralise acid wastes prior to transport. This impacts on the transferred mass of hydrochloric acid but does not alter the need to report. The chromate wastes containing hexavalent chromium must be reduced to the trivalent state prior to transport in WA. The 10 tonne use threshold for chromium is not triggered at any site. The preflux solution contains dissolved zinc and ammonia. Ammonia is triggered at about half of the sites.

The facility's dust extraction system utilises a filter baghouse. The extracted dust is recycled as described above, however the baghouse filter bags require replacement about every 2 – 3 years. The

filters contain minor quantities of zinc residues. Floor sweepings can also contain minor quantities of zinc. Both the filters and the floor sweepings are segregated from the general waste stream.

There are no trade waste discharges directed to sewerage.

The transfer reporting requirements are not triggered by the Category 2a or 2b emission thresholds for fuel combustion/electricity use. Some of the combustion emissions may approach 10 tonnes, and the use of these substances is reviewed. However, these substances are found not to be part of any transfer and therefore further consideration of these substances is not required.

Performing calculations, measurements and estimates

Analytical tests are conducted on process solutions regularly to satisfy production requirements. Hydrochloric acid process solutions are tested weekly and the results of this testing forms the basis for the disposal of spent acid solutions. The volumes of transported acid wastes are known and the composition of the acid solution (including hydrochloric acid and zinc) is analysed as part of the in-house analytical program.

There is very limited data available on the composition of any of the sludge wastes or mixed sump wastes. Sludges and mixed sump wastes can be of variable composition. A new schedule of sampling and analysis is developed to meet transfer reporting requirements. In the first year, the following analyses are conducted to characterise the waste streams

- Waste caustic sludge and solution (mixed), 2 zinc analyses;
- Pre-flux sludge and solution waste (mixed), 2 zinc and 2 ammonia analyses;
- Mixed sump waste, 1 analysis for zinc, ammonia and hydrochloric acid; and
- Chromate quench solution waste, 2 zinc analyses.
- Chromate quench sludge waste, 2 zinc analyses;

An in-house laboratory is able to conduct the analytical testing. While some variability is expected, the results should be sufficient to characterise the waste stream concentrations. The transfer factors can be applied to the measured waste volumes to obtain the transfer estimates. The exception to this is the sump waste, which consists of spillage and drag out from various sources. This waste stream has a unique composition each time it is collected and a sample is analysed on an ongoing (once per year) basis.

The additional activities and costs to characterise waste streams help to build an information base for all of the company's facilities. Each facility monitors its waste volumes and hydrochloric acid as per existing procedures. Transfer factors are applied to estimate zinc and ammonia transfers. The company uses an existing spreadsheet for NPI emission reporting and this is modified to assist with the transfer calculations.

Waste tracking certificates are kept for process wastes transferred offsite. Site personnel compile the required data for transfer reporting and this should require only minor modifications to existing procedures. Minor transfer components such as the zinc content of the floor sweepings and zinc residue on filter bags are estimated.

Waste oil, stormwater interceptor trap sludge and other non-process specific waste are reviewed. Discussions with the State NPI Team determine that these other wastes do not need to be included in the NPI transfer report for these facilities.

Reporting transfers

The main reporting functions are conducted annually. The regulatory requirements are revisited briefly, the National Reporting Tool forms are downloaded and any remaining issues are discussed

with the State NPI team. A draft transfer report is completed and distributed to senior management for approval. The transfer report is then submitted and records of the transfer reporting process are filed. The choice may be made to report on the zinc and other wastes that are reprocessed, but as this is voluntary, the costs are not included in the estimates below.

NPI transfer reporting costs

Hourly rates are given in the table below for the personnel involved. This rate covers items including the base salary, insurances, leave, building rental and company profit. The rates also cover consumables and proportioned equipment depreciation (eg computers, standard office equipment/photocopiers and telephone charges). Analytical costs include sampling; and these costs are assessed at commercial rates. Set-up costs that are incurred only in the first year of transfer reporting are presented separately.

Table 2.5 Galvanizing cost summary

	Cost components – NPI transfers					
	Staff – Environmental Officer ($100/hr)	Staff – operational ($80/hr)	Staff – admin. ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting (subtotal)	First year set-up costs for transfer reporting (subtotal)
Understanding regulatory requirements	1st yr setup $500 every year $50	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$ 50	$500
Determining reporting obligations	1st yr setup $400 every year $100	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$ 100	$400
Performing calculations, measurements & estimates	1st yr setup $1,000 every year $1,000	1st yr setup $400 every year $320	1st yr setup $100 every year $50	1st yr setup $1,100 every year $ 200	$ 1,570	$2600
Reporting transfers	1st yr setup $400 every year $500	1st yr setup $0 every year $0	1st yr setup $100 every year $50	1st yr setup $ 0 every year $ 0	$ 550	$500
Total	1st yr setup $2,300 every year $1,650	1st yr setup $400 every year $320	1st yr setup $200 every year $100	1st yr setup $1,100 every year $ 200	$ 2,270	$ 4,000

The total cost for transfer reporting in the first year is $6,270 and includes the set-up costs plus ongoing costs. The approximate cost of transfer reporting per facility is less than $1,000 in the first year.

The total cost of transfer reporting in the second year (and thereafter) is $2,270. The approximate cost of ongoing transfer reporting per facility is less than $500.

2.4 Cement manufacturing

A cement manufacturing plant and lime kiln, and an associated limestone mine, report their emissions to the NPI. The environmental officer responsible for the NPI emissions report will also undertake the transfer reporting duties.

Step 1 – Identifying possible substances for reporting transfers
The cement and lime kiln currently report the following substances to the NPI:

Ammonia (total)
Antimony & compounds
Arsenic & compounds
Benzene
Beryllium & compounds
Boron & compounds
Cadmium & compounds
Carbon monoxide
Chlorine
Chromium (III) compounds
Chromium (VI) compounds
Cobalt & compounds
Copper & compounds
Fluoride compounds
Hydrochloric acid
Lead & compounds
Magnesium oxide fume
Manganese & compounds
Mercury & compounds
Nickel & compounds
Nickel carbonyl
Nickel subsulfide
Oxides of Nitrogen
Particulate matter 10.0 um
Polychlorinated dioxins and furans
Polycyclic aromatic hydrocarbons
Selenium & compounds
Sulfur dioxide
Total Volatile Organic Compounds
Zinc and compounds

The substances in *italics* are triggered by the Category 2b reporting threshold but may also trigger the Category 1 or 1a thresholds.

The mine site currently reports the following substances to the NPI:

Arsenic & compounds
Carbon monoxide
Chromium (III) compounds
Cobalt & compounds
Copper & compounds
Fluoride compounds
Hydrochloric acid

Lead & compounds
Manganese & compounds
Nickel & compounds
Oxides of Nitrogen
Particulate matter 10.0 um
Polycyclic aromatic hydrocarbons
Selenium & compounds
Sulfur dioxide
Total Volatile Organic Compounds
Zinc and compounds

The substances in *italics* are triggered by the Category 2b reporting threshold but may also trigger the Category 1 or 1a thresholds.

Step 2 – Consideration of the waste streams
The cement and lime kiln waste streams and the mine site waste streams were analysed as part of a company waste management plan and ISO 14000 accreditation.

No significant waste stream was to a mandatory transfer reporting destination. Most waste material is reused in the kiln or, in the case of the mine, is waste rock or overburden.

Summary
No mandatory reporting transfers occur. Additional costs due to transfers are restricted to understanding requirements. This is estimated below based on a cost of $110 per hour for an environmental officer.

Table 2.6 Cement production cost summary

	Cost components – NPI transfers					
	Staff – Environmental Officer ($110/hr)	Staff – Technical Officer ($80/hr)	Staff – admin. & operational ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting (subtotal)	First year set-up costs for transfer reporting (subtotal)
Understanding regulatory requirements	1st yr setup $440 every year $110	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$110	$440
Determining reporting obligations	1st yr setup $330 every year $110	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$110	$330
Performing calculations, measurements & estimates	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $0 every year $ 0	$0	$0
Reporting transfers	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	$0	$0
Total	1st yr setup $770 every year $220	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $0 every year $ 0	$220	$770
Cost per facility					$110	$385

2.5 Electricity generating A

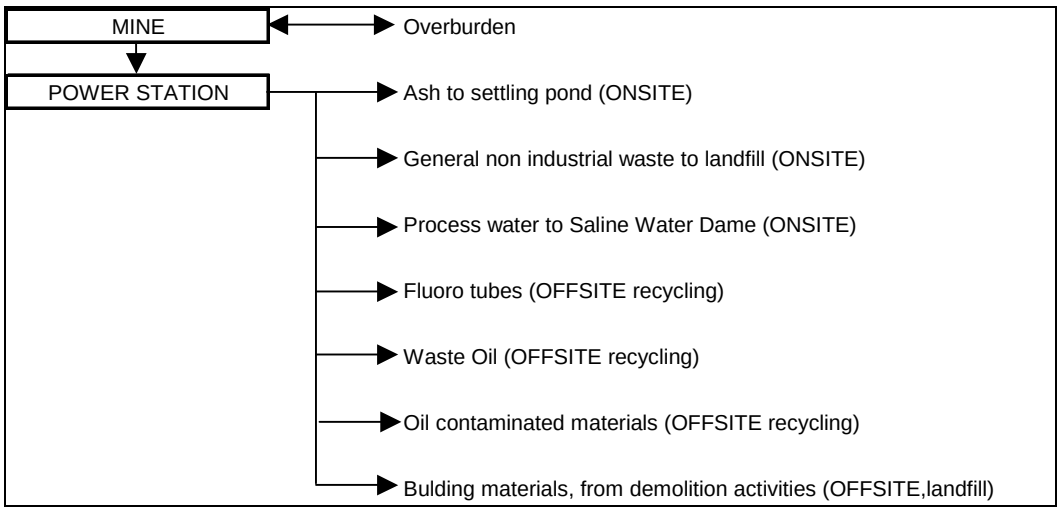
2.5.1 Background

Brown coal fired base load stations located in the Latrobe Valley region of Victoria generate a majority of Victoria's electricity. In general brown coal fired power stations report close to 30 substances to NPI to air, land and water.

Process Description

Brown coal is excavated from the mine, which is then transferred to the power station. At the power station, the coal is crushed and pulverised before it is burnt in the boilers. The boilers generate steam, which is used to drive turbines to produce electricity. The combustion of coal generates ash residue which is captured in the boiler ash hopper, and also generates some emissions of particulates to air, with over 99% captured by the electrostatic precipitators. The captured ash residue is carried by a wet system to a settling pond. In some cases once the ash material has dried, it is transferred to an on-site storage facility with the intention of future use.

Figure 2.2 General Process Waste Material Flowchart



The main waste streams from the power station are:

- Ash material from the combustion process, which is sluiced to the settling pond using a wet system,
- General non industrial waste, which is sent to an onsite landfill,
- Process water which is sent to a saline water dam where the overflow is piped to a secondary and tertiary facility (Other power stations in the Latrobe Valley) before being sent directly to a licensed treatment facility for discharge to the ocean,
- Fluorescence tubes which are sent off site for recycling,
- Waste oils which are sent off site for recycling,
- Other industrial wastes and building materials from demolition (which may potentially contain NPI substances), which are sent offsite for disposal in landfills.

2.5.2 NPI Transfer methodology

Understanding regulatory requirements

Pollutant emissions reporting under NPI is currently carried out by the Environmental team with support from the production teams. This same team would likely be in charge of meeting any transfer obligations, as they are familiar with the NPI structure, calculations and reporting tasks.

Gaining an understanding of regulatory requirements initially involves reviewing an information packet that is sent to all current NPI reporters and other prospective facilities. The packet provides generic and industry-specific information with some worked examples. For electricity generating facilities, specific examples include coal/ash mass balances, ash transfers including ash recycling.

Additional information is gained through discussions with the State NPI team, professional affiliations and industry associations. These activities are most intensive during the first year of transfer reporting and the activities diminish in subsequent years.

Determining reporting obligations

Determining the transfer reporting obligations involves an examination of the activities that may involve transfer of NPI substances. The materials primarily associated with transfers in this case are the transport of waste oil, ash material to the settling dam and saline water. Overburden is returned unprocessed to the mine, and while it does fit the description of a transfer it is specifically excluded from the requirements for transfer reporting.

The categories 2a and 2b do not trigger transfer reporting, however some of these combustion substances (eg PAHs, copper) may exceed 10 tonnes and trigger transfer reporting under Category 1. Given the large amount of brown coal burnt in a reporting period, it is expected that several substances will trigger the 10 tonne threshold for transfers reporting.

A significant amount of literature is available which would enable Victorian brown coal fired power stations to estimate which substances would be required to be reported to transfers. It is not expected that additional sampling and testing will be required.

Main transfer streams

The focus of the transfers should be on the ash handling. Whilst it is likely that there is small amounts of NPI substances in the waste oil, which is sent offsite for recycling, it is expected that it will only make up a negligible contribution when compared with the material present in the ash sent to the settling dam. In addition, as the waste oil and fluoro lamps are to be recycled, reporting under transfers is voluntary.

For the saline water dam, the material there is sent to another power station, which is then sent on for disposal via ocean outfall. So it is not classed as the final destination, so this site would be exempt from reporting to transfers for this waste stream.

2.5.3 Transfers costs assessment

Hourly rates are given in the table below for the personnel involved. This rate covers items including the base salary, insurances, leave, building rental and 'company' profit. The rates also cover consumables and proportioned equipment depreciation (eg computers, standard office equipment/photocopiers and telephone chargers). Analytical costs include sampling; and these costs are assessed at commercial rates. For this case study, consultants are not used and it is assumed that the policy decisions do not require reporting for waste oils for recycling and the saline water dam.

Table 2.7 First costs for Transfer Reporting

First Year costs for Transfer Reporting					
	Staff - Environmental Officer ($110/hr)	Staff - Technical officer ($80/hr)	Staff - admin & operational ($50/hr)	Service providers - analytical laboratory	First year set-up costs for transfer reporting
Understanding regulatory requirements	$550	$320	$0	$0	$870
Determining reporting obligations	$440	$160	$0	$0	$600
Performing calculations, measurements & estimates	$770	$1,200	$550	$500	$3,020
Reporting transfers	$440	$720	$150	$0	$1,310
Total	$2,200	$2,400	$700	$500	$5,800

Table 2.8 Ongoing transfer-reporting costs

Ongoing transfer reporting costs					
	Staff - Environmental Officer ($110/hr)	Staff - Technical officer ($80/hr)	Staff - admin & operational ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting
Understanding regulatory requirements	$110	$80	$0	$0	$190
Determining reporting obligations	$110	$80	$0	$0	$190
Performing calculations, measurements & estimates	$220	$400	$250	$500	$1,370
Reporting transfers	$220	$640	$100	$0	$960
Total	$660	$1,200	$350	$500	$2,710

A major contributor to the first year costs is the modifications to existing spreadsheets. Additional on going costs, which may be dropped in future years depending on data stability, include the analysis costs. The total cost for transfer reporting in the first year includes the set-up costs plus ongoing costs and is $5,800.00. The cost of transfer reporting in the second year (and thereafter) is $2,710.00.

Only minor analysis costs were included in this case study as this is what will be required of industry to meet their reporting requirements. It is likely that Victorian brown coal fired power stations will undertake additional sampling and analysis to fully understand their waste streams, thus incurring additional costs that are not directly required for transfer reporting and are therefore not compiled above. This additional analysis could easily double the cost of transfer reporting.

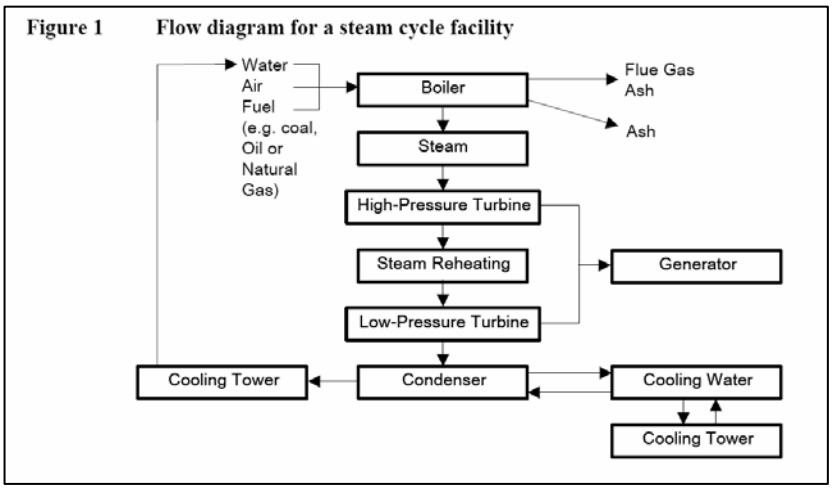
2.6 Electricity generating B

2.6.1 Background

Process summary

A flow diagram for a typical power station is provided in Figure 2.3 (*NPI Emission Estimation Technique Manual for Fossil Fuel Electric Power Generation, version 2.4*).

Figure 2.3 General electricity generating waste material flowchart



For this case study, coal is the fuel used and it is pulverised prior to combustion. Fly ash and particulate matter are created during the combustion process and they are captured from the exhaust by electrostatic precipitators or fabric filters (also called baghouses). Some of the fly ash is provided to others for use as a component of cement. Bottom ash is also extracted from the boiler. The ash is transported as a slurry to a thickening plant and then to an ash dam. A large amount of ash is generated and a large disposal area is required. The thickening plant reduces the amount of water in the ash placed in the ash dam, producing a more stable landform. The water from the thickening plant is recycled back to create the ash slurry.

Facility information

The company operates a coal fired power station. An environmental management team operates from the power station and emission reporting has been conducted annually since the inception of the NPI. The company participates in a joint venture that operates a second adjoining power station. Under the service level agreement, the environmental management team also works for the second power station (including NPI reporting).

The following methodology and cost estimate illustrate how transfer reporting requirements are addressed.

2.6.2 NPI transfer reporting methodology

Understanding regulatory requirements

The company's Environmental Advisor – Operations conducts the current NPI emission reporting for the two power stations. He is assisted by operational personnel with responsibilities for the fuel/chemical inventory and the coal laboratory. The Environmental Advisor obtains a copy of the transfer requirements and learns about how they may affect the power stations. Although the

transfer obligations are new, the Environmental Advisor is familiar with the NPI structure, calculations and reporting tasks.

Gaining an understanding of regulatory requirements initially involves reviewing an information packet that is sent to all current NPI reporters and other prospective facilities. The packet provides generic and power station-specific information with some worked examples. The Environmental Advisor takes the opportunity to travel to and attend a ½ day workshop on NPI transfer requirements. Discussions are held with the industry association (National Generators Forum) for industry-specific guidance. These 'regulatory understanding' activities are most intensive during the first year of transfer reporting and will diminish in subsequent years.

Determining reporting obligations

The facilities currently report to the NPI for emissions, primarily due to the combustion of coal. Although the combustion thresholds (Category 2a and 2b) are not relevant triggers for transfer reporting, several substances are triggered by the Category 1 (10 tonne) use thresholds. Substances that are known to be above the Category 1 threshold include hydrochloric acid, sulfuric acid and chlorine. Total volatile organic compounds are known to trigger the 25 tonne Category 1a threshold.

The coal contains trace amounts of naturally occurring substances. Although these substances occur in very small concentrations, there is a very large amount of coal used each year. Coal analysis, together with the mass of coal combusted per year, provides the mass of NPI substances including the reportable substances that occur in an amount of 10 tonnes/yr or more. The coal analysis program is very comprehensive and all of the compounds listed below are included in the existing 6-monthly tests. The amount of coal used is accurately known and concentrations of the following substances are reviewed to determine the mass used per year.

Table 2.9 NPI substances for coal-fired electricity generating emission reporting

antimony and compounds	arsenic and compounds
beryllium and compounds	boron and compounds
cadmium and compounds	chromium (III) and compounds
chromium (VI) and compounds	cobalt and compounds
copper and compounds	fluoride compounds
lead and compounds	manganese and compounds
mercury and compounds	nickel and compounds
selenium and compounds	zinc and compounds

Note that under the variation to the NPI NEPM, the threshold for selected substances may change, such as mercury's annual threshold from 10 tonnes to 5 kilograms.

Water is reclaimed from the ash dam and reused in the ash slurrying process. The wet ashing system does not use fresh water. While the material placed in the ash dam is predominantly coal ash, other waste streams are also present. The placement of the ash slurry in the ash dam is a transfer for the triggered substances. The waste streams of potential interest to transfer reporting are summarised below.

- Fly ash,
- Bottom ash,
- Coal rejects,
- Contaminated stormwater from chemical storage & process areas, and
- Water treatment plant (reverse osmosis, demineralisation) effluent.

There are no trade waste discharges directed to sewer.

Performing calculations, measurements and estimates

Analytical tests are regularly conducted on the coal and the in-house analytical capabilities will be used to assist with transfer reporting.

A study was completed in 1999 to correlate the composition of the coal, air emissions and the ash. The study analysed samples from the coal feed, bottom ash, flyash, stack gas and stack particulates. The fate of the NPI substances in the coal feed was determined. For example, the copper content of the coal equals the sum of the copper content in each of the four streams (flyash, bottom ash, stack gas and stack particulates). As the overall process and combustion conditions are virtually unchanged since the study, the mass balance is still valid.

Transfer factors are developed based on the mass balance that is derived from the existing detailed study. This is used to calculate the NPI transfer masses based on the coal analyses that correspond to the current reporting year.

A portion of the ash is provided to a cement manufacturer. The mass of ash is accurately known. This transfer is recycling and therefore the reporting is voluntary.

The coal rejects can be assumed to have the same composition as the incoming coal. (Coal rejects are chunks that are not pulverised and are therefore 'rejected' prior to combustion.) To account for the transfer of substances, a procedure is developed and implemented to estimate the mass of the coal rejects.

The power station uses an existing spreadsheet and database for NPI emission reporting. The spreadsheets are modified and the relevant data is entered into the spreadsheet to calculate transfer estimates. There are minor modifications to existing procedures, checklists and record-keeping activities.

Waste tracking certificates provide total volume/mass for waste oil loads. The oil is collected for recycling so NPI transfer reporting is voluntary.

The contribution of contaminated stormwater and water treatment plant effluent to the ash slurry is reviewed. It is determined that the contribution of substances from these sources is insignificant (ie much less than 1%) in comparison to the coal ash contribution. No further consideration is given to these wastewater streams with respect to NPI transfer reporting.

Reporting transfers

The main NPI reporting functions are conducted annually, although some of the key data is compiled on a six-monthly basis. The Environmental Advisor briefly reviews the regulatory requirements. The National Reporting Tool forms are downloaded and any remaining issues are discussed with the State NPI team. A draft transfer report is completed, checked and distributed to select operational personnel for checking and to senior management for approval. A brief explanatory presentation to senior management is made in the first year. The transfer report is then submitted to the State and records of the transfer reporting process are filed. The choice may be made to report on the wastes that are recycled, but as this is voluntary, the costs are not included in the estimates below.

2.6.3 NPI transfer reporting costs

Hourly rates are given in the table below for the personnel involved. This rate covers items including the base salary, insurances, leave, building rental and company profit. The rates also cover consumables and proportioned equipment depreciation (eg computers, standard office

equipment/photocopiers and telephone charges). Analytical services are not required for these facilities due to the ongoing coal analyses and the existing results from the environmental mass balance report. Set-up costs that are incurred only in the first year of transfer reporting are presented separately.

Table 2.10 Coal-fired power generation

	Cost components – NPI transfers					
	Staff – Environmental Advisor ($140/hr)	Staff – Operational Technician ($100/hr)	Staff – admin. ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting (subtotal)	First year set-up costs for transfer reporting (subtotal)
Understanding regulatory requirements	1st yr setup $1,120 every year $140	1st yr setup $ 0 every year $ 100	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$ 240	$1,120
Determining reporting obligations	1st yr setup $420 every year $140	1st yr setup $300 every year $100	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$ 240	$720
Performing calculations, measurements & estimates	1st yr setup $2,800 every year $420	1st yr setup $500 every year $400	1st yr setup $50 every year $50	1st yr setup $ 0 every year $ 0	$ 870	$3,350
Reporting transfers	1st yr setup $700 every year $840	1st yr setup $100 every year $200	1st yr setup $50 every year $100	1st yr setup $ 0 every year $ 0	$ 1,140	$850
Total	1st yr setup $5,040 every year $1,540	1st yr setup $900 every year $800	1st yr setup $100 every year $150	1st yr setup $ 0 every year $ 0	$ 2,490	$ 6,040

The total company cost for transfer reporting in the first year is $8,530 and includes the set-up costs plus ongoing costs. The first year cost per facility is $4,265.

The cost of transfer reporting in the second year (and thereafter) is $2,490. The ongoing cost per facility is $1,245.

2.7 Petroleum refining

2.7.1 Background

Process summary

In general, the petroleum refining process can be described as:

- crude oil receipt and storage,
- crude distillation,
- reforming,
- cracking,
- polymerisation,
- alkylation,
- solvent distillation,
- isomerisation, and
- hydrotreating.

Control systems are integrated into each of the above processes to ensure product quality, regulated parameters typically include flows, temperatures, pressures and liquid levels. An onsite laboratory serves to test process streams and products for quality control purposes. The products consist of various grades of petroleum (~50%), diesel (~30%) and other hydrocarbon fuels (~20%).

Facility information

The company has numerous Australian facilities. An Environment Protection Group operates from the refinery and emission reporting has been conducted annually since the inception of the NPI.

The following methodology and cost estimate illustrate how transfer reporting requirements are addressed.

2.7.2 NPI transfer reporting methodology

Understanding regulatory requirements

The company's Environmental Engineer conducts the current NPI emission reporting for the refinery and Environmental Superintendent reviews and authorises the report. An Environmental Consultant is also engaged to calculate emissions using established programs. These employees also learn the transfer requirements. Although the transfer obligations are new, they are assessed by a team familiar with the NPI structure, calculations and reporting tasks.

Gaining an understanding of regulatory requirements initially involves reviewing an information packet that is sent to all current NPI reporters and other prospective facilities. The packet provides generic and petroleum industry-specific information with some worked examples. The Environmental Superintendent and Environment Engineer take the opportunity to attend a ½ day workshop on NPI transfer requirements. Discussions are held with the industry association (Australian Petroleum Production & Exploration Association) for industry-specific guidance. These 'regulatory understanding' activities are most intensive during the first year of transfer reporting and they diminish in subsequent years.

Determining NPI transfer reporting obligations

The facility currently reports to the NPI for emissions, including the substances listed in Table 1. The facility also reports on combustion emissions, but these are not relevant triggers for transfer reporting.

Table 2.11 NPI substances for refinery emission reporting

acetaldehyde	acetone
ammonia	benzene
biphenyl (1,1 biphenyl)	1,3 butadiene (vinyl ethylene)
chlorine	cumene (1-methylethylbenzene)
cyclohexane	1,2 dibromoethane
ethylbenzene	fluoride compounds
formaldehyde (methyl aldehyde)	n-hexane
phenol	polycyclic aromatic hydrocarbons
styrene (ethenylbenzene)	toluene (methylbenzene)
total volatile organic compounds	xylenes

The full years' data on wastes is reviewed. This includes internal documentation, consultant's reports and the waste contractor's data. The waste streams generated by the refinery processes that need to be considered for transfer reporting include tank sludges, contaminated soil, spent catalysts, spent adsorbents, waste caustic and acids, laboratory wastes and wastewater treatment plant sludges. Tank sludges are residual hydrocarbon sludges that settle in storage tanks. This material is dissolved with solvent and returned to the distillation process. This is a recycling activity and transfer reporting is voluntary. Some portion of the tank sludge is not amenable to this process and they are collected by the waste contractor for offsite disposal.

Contaminated soil is not a process waste per se, but it is common within the petroleum industry. Contaminated soil is excavated and taken offsite for bioremediation. When the contaminant levels are reduced to an acceptable level, the soil is taken to an approved disposal site. The most common analysis for the soil is total petroleum hydrocarbons (TPH) and while this can determine whether the soil is suitable for disposal, TPH does not establish the amounts of NPI substances such as those listed in Table 1.

The waste streams of potential interest to transfer reporting are summarised below together with the approximate number of transfers per year.

- Contaminated soil, 1 load per year,
- Waste caustic sludge and solution , 2 loads per year,
- Mixed sump waste, 4 loads per year,
- Fluoride waste, 2 loads per year, and
- Catalyst dust waste, 10 loads per year.

There are no trade waste discharges directed to sewer.

The transfer reporting requirements are not triggered by the Category 2a or 2b emission thresholds for fuel combustion/electricity use. Some of the combustion emissions may approach the Category 1 threshold of 10 tonnes, and the use of these substances is reviewed. However, these substances are found not to be part of any transfer and therefore no further consideration of these substances is required.

Performing calculations, measurements and estimates

Analytical tests are regularly conducted on process streams and products to satisfy production requirements. The in-house analytical capabilities are used to assist with transfer reporting.

There is very limited data available on the composition of the wastes. The analyses required for disposal are not sufficient to determine NPI substances. Sludges and mixed sump wastes can be of variable composition. A new schedule of sampling and analysis is developed to meet transfer reporting requirements. In the first year, the following materials are sampled and analysed to help characterise the waste streams:

- Contaminated soil, 6 samples,
- Waste caustic sludge and solution, 2 samples,
- Mixed sump waste, 1 sample,
- Fluoride waste, 2 samples, and
- Baghouse dust waste, 2 samples.

The waste stream characteristics are reviewed to develop a practical analytical program for the above samples. Some of the light solvents easily volatilise or biodegrade and the amount transferred are negligible. Other substances, such as polycyclic aromatic hydrocarbons, are not highly volatile or biodegradable and therefore they are included in the analytical program. A combination of commercial and in-house laboratory expertise is used to conduct these tests. The contaminated soil volumes vary from year to year. Approximately 10 samples per year are collected based on at least one sample for each remediation project and at least one sample per every 50 cubic metres of soil to satisfy contaminated land obligations. For transfer reporting, costs are limited to the extra analyses for NPI substances and 6 analyses should be sufficient for transfer estimates.

For the process wastes that are consistently generated, the results should be sufficient to characterise the NPI substance concentrations. While some variability is expected, transfer factors are applied to the measured waste volumes to obtain the transfer estimates. The contaminated soils and sump wastes are highly variable and ongoing analyses beyond the first year will be required.

The refinery uses an existing spreadsheet for NPI emission reporting and this is modified to assist with the transfer calculations.

Waste tracking certificates provide total volume/mass for the process wastes and contaminated soils transferred offsite. The required data is compiled for transfer reporting and this requires only minor modifications to existing procedures and record-keeping activities.

Stormwater interceptor trap sludge, grease trap waste and other non-process specific wastes are reviewed. Discussions with the State NPI Team determine that these other wastes do not need to be included in the NPI transfer report.

The data is entered into the spreadsheet to calculate transfer estimates.

Reporting transfers

The main NPI reporting functions are conducted annually, although some of the key data is compiled on a six-monthly basis. The Environmental Protection Group briefly reviews the regulatory requirements. The National Reporting Tool forms are downloaded and any remaining issues are discussed with the State NPI team. A draft transfer report is completed, checked and distributed to senior management for approval. The transfer report is then submitted to the State and records of the transfer reporting process are filed. The choice may be made to report on the wastes that are reprocessed, but as this is voluntary, the costs are not included in the estimates below.

2.7.3 NPI transfer reporting costs

Hourly rates are given in the table below for the personnel involved. This rate covers items including the base salary, insurances, leave, building rental and company profit. The rates also cover consumables and proportioned equipment depreciation (eg computers, standard office equipment/photocopiers and telephone charges). Analytical costs include sampling; and these costs are assessed at commercial rates. Set-up costs that are incurred only in the first year of transfer reporting are presented separately.

Table 2.12 Petroleum refining cost summary

	Cost components – NPI transfers						
	Staff – Environmental Superintendent ($150/hr)	Staff – Environmental Engineer ($110/hr)	External Consultant ($110/hr)	Staff – admin. ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting (subtotal)	1st year set-up costs for transfer reporting (subtotal)
Understanding regulatory requirements	1st yr setup $300 every year $150	1st yr setup $660 every year $110	1st yr setup $660 every year $110	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$ 370	$1,620
Determining reporting obligations	1st yr setup $300 every year $150	1st yr setup $1,540 every year $220	1st yr setup $1,540 every year $220	1st yr setup $ 0 every year $ 50	1st yr setup $ 0 every year $ 0	$ 640	$3,380
Performing calculations, measurements & estimates	1st yr setup $300 every year $150	1st yr setup $1,320 every year $330	1st yr setup $3,300 every year $2,200	1st yr setup $50 every year $50	1st yr setup $2,600 every year $ 1,400	$ 4,130	$7,570
Reporting transfers	1st yr setup $150 every year $150	1st yr setup $220 every year $220	1st yr setup $ 0 every year $ 0	1st yr setup $0 every year $50	1st yr setup $ 0 every year $ 0	$ 420	$370
Total	1st yr setup $1,050 every year $600	1st yr setup $3,740 every year $880	1st yr setup $5,500 every year $2,530	1st yr setup $50 every year $150	1st yr setup $2,600 every year $1,400	$ 5,560	$ 12,940

The total cost for transfer reporting in the first year is $18,500 and includes the set-up costs plus ongoing costs. The cost of transfer reporting in the second year (and thereafter) is $5,560.

2.8 Poultry / Pig farming

This case study examines two closely related industry sectors.

2.8.1 Poultry Farming Industry

The industry is largely comprised of chicken meat (broiler) producers and chicken egg producers.

Types of effluent from the poultry farming industry

The broiler sector and barn style egg laying operations produce poultry litter. Poultry litter is the bedding material, manure (100% bird droppings) and feathers that result from intensive poultry production. The broiler sector produces the vast majority of litter. Caged egg laying operations largely produce manure.

Waste disposal methods

Litter is generally applied directly onto land, and acts as a fertiliser and soil conditioner. Most growers receive small profits from its sale, or trade the litter for sheds to be cleaned and the litter taken away.

Litter has significant energy value. Overseas power plants have been developed using litter as fuel and a plant has been researched and planned for Western Australia, though approval is still pending.

Raw poultry manure is a low cost source of a wide range of plant nutrients, especially nitrogen, and can be applied directly to land. Manure can also be conditioned, composted and pelletised prior to land application.

Conclusion - Transfer reporting

Under normal operations facilities will not be subject to mandatory transfers reporting. Facilities can, however, report transfers voluntarily. There is only a minor upfront cost ($100) in the first year to assess the regulatory obligations.

Discussions with the State NPI Team confirm that the disposal of carcasses by burial or other means is not to be considered in transfer reporting; and burning for energy recovery is regarded as beneficial use.

2.8.2 Pig Farming Industry

There are two types of pig housing structures predominant in the industry – conventional housing sheds with slatted floors and wastes flushed to a central system, and deep litter sheds (with a straw type bedding).

Types of waste from the pig farming industry

Piggery effluent typically contains large amounts of nitrogen and phosphorus compounds derived from urine and faeces, together with salts, volatile organics and suspended solids. The flushing of wastes in conventional housing operations results in large volumes of effluent. Following screening for solids, the wastewater is directed to one or more ponds for further treatment. For some small ventures it may be possible to apply untreated effluent directly onto the land.

Deep litter operations produce spent bedding. The bedding comprises material such as straw, rice hulls or saw dust which has absorbed manure wastes and spilt drinking water.

Waste disposal methods

Screened solids (manure etc.) may be composted on site and applied to land. Effluent in the final ponds may be left to evaporate and the accumulated sludge removed, or applied to utilisation areas for beneficial reuse. Most piggeries apply their waste water to their own irrigation areas where crops are grown or livestock graze.

Spent bedding litter from deep litter sheds is stored and composted on site, then applied to the piggeries' own land or transported off site for beneficial reuse. Uses can include commercial horticulture and domestic gardens.

Conclusion - Transfer reporting

Under normal operations facilities will not be subject to mandatory transfers reporting. Facilities can, however, report transfers voluntarily. There is only a minor upfront cost ($100) in the first year to assess the regulatory obligations.

Discussions with the State NPI Team confirm that:

- the transport of effluent to an on-site stabilisation pond is not regarded as a transfer; and
- the disposal of carcasses by burial or other means is not to be considered in transfer reporting. Most piggeries bury or compost carcasses on site.

2.9 Sugar milling and refining

Sugar milling and sugar refining are processes that are often undertaken by associated facilities. The figures below outline the typical process steps. This case study involves five mills and a refinery.

Figure 2.5 Typical sugar milling process

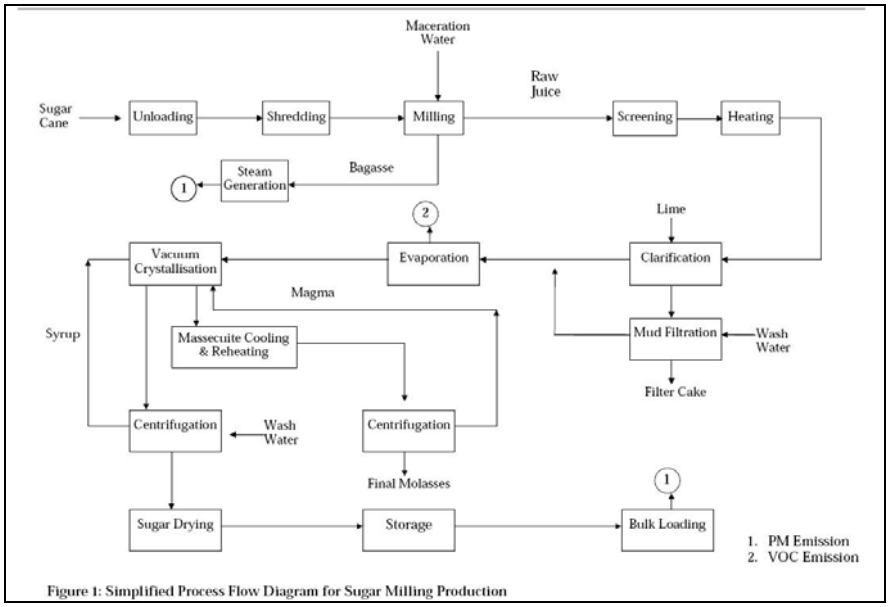
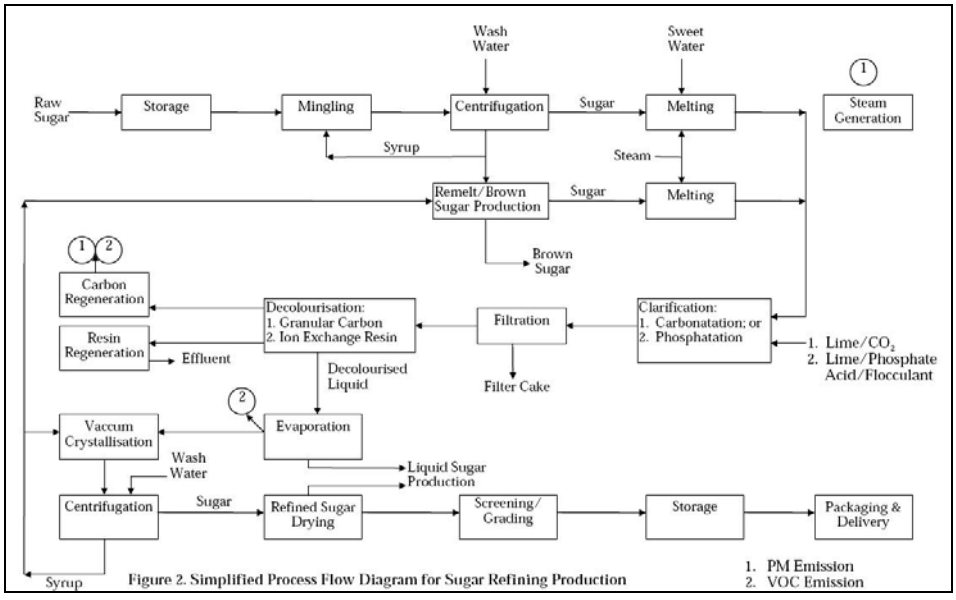


Figure 2.6 Typical sugar refining process



Step 1 – Identifying possible substances for reporting transfers

The mills and refinery currently report the following substances to the NPI:

Arsenic & compounds
Beryllium & compounds
Cadmium & compounds

Carbon monoxide
Chromium (III) compounds
Chromium (VI) compounds
Copper & compounds
Fluoride compounds
Hydrochloric acid
Lead & compounds
Mercury & compounds
Nickel & compounds
Oxides of Nitrogen
Particulate matter 10.0 um
Polychlorinated dioxins and furans
Polycyclic aromatic hydrocarbons
Sulfur dioxide
Total Volatile Organic Compounds

All of these substances are triggered by the Category 2b reporting threshold.

Sulfur dioxide and possibly hydrochloric acid may also exceed the Category 1 threshold. Additionally, total nitrogen and total phosphorus are present in waste streams and need to be further examined.

Step 2 – Consideration of the waste streams
The sugar milling and refining process was examined using the process flow diagrams above and it was determined:

- Sulfur dioxide was only present in the direct emission to air
- Hydrochloric acid is neutralised before it enters a waste stream or prior to the waste stream reaching its destination
- Total nitrogen and total phosphorus may be present in the filter cake from both milling and refining and, possibly, in the ash from burning bagasse for steam generation.
- The filter cake is collected and is placed in hoppers from which trucks are loaded and the filter cake transported to farms where it is used as a soil conditioner.
- The ash is collected and placed in an ash dam that is emptied at the end of the crushing season. The ash from the dams is transported to farms and used as a soil conditioner.
- Water is used at various parts of the process. Excess water, which may contain some NPI substances is piped to a farm and used for irrigation. In some sugar mills excess water is disposed-of through evaporation in the cooling towers or through an artificial wetland.

Summary
No mandatory reporting transfers occur. Additional costs due to transfers would be restricted to understanding requirements. Similar circumstances exist for each mill and no additional costs apply. The costs are estimated below based on a cost of $110 per hour for an environmental officer.

Table 2.13 Sugar Milling cost summary

	Cost components – NPI transfers					
	Staff – Environmental Officer ($110/hr)	Staff – Technical Officer ($80/hr)	Staff – admin. & operational ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting (subtotal)	First year set-up costs for transfer reporting (subtotal)
Understanding regulatory requirements	1st yr setup $440 every year $110	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$110	$440
Determining reporting obligations	1st yr setup $330 every year $110	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	1st yr setup $ 0 every year $ 0	$110	$330
Performing calculations, measurements & estimates	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $0 every year $ 0	$0	$0
Reporting transfers	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $ 0 every year $ 0	$0	$0
Total	1st yr setup $770 every year $220	1st yr setup $0 every year $0	1st yr setup $0 every year $0	1st yr setup $00 every year $ 0	$220	$770
Cost per facility					$37	$128

2.10 Oil & gas extracting and producing

2.10.1 Background

The processes undertaken by a typical oil & gas extraction and production facility (*based on NPI Emission Estimation Technique Manual for Oil & Gas Exploration and Production, version 1.1*) include:

- seismic (note that *emissions* from this activity are not reportable under the NPI),
- exploration and appraisal drilling,
- production testing,
- development drilling
- separation and processing,
- water management,
- oil storage, and
- product delivery.

The three facilities are based in inland Australia and the parent company operates several other facilities. Activities carried out at these facilities include oil and gas exploration, extraction and production.

2.10.2 NPI transfer reporting methodology

Understanding regulatory requirements

Primary responsibility for the current NPI reporting rests with the Environmental Engineer who is assisted by field staff. The Environmental Engineer is also responsible for any additional NPI transfer reporting and he therefore gathers and learns the transfer reporting requirements. The NPI reports are also reviewed by the Health Safety & Environment (HSE) Manager prior to submission to the State NPI Team.

As the Environmental Engineer's responsibility includes three of the company's facilities in the immediate locality, the costs of transfer reporting are shared between these facilities.

Determining reporting obligations

The facilities currently trigger on Category 1, 1a and 2b. Category 1 and 1a substances that are currently included in NPI reports and are likely to be in transfer streams include:

Table 2.14 NPI substances for oil & gas emission reporting

benzene	n-hexane
cyclohexane	toluene
ethyl benzene	total volatile organic compounds
ethylene glycol	xylenes

The facilities also report on Category 2b combustion emissions, but these are not relevant triggers for transfer reporting. Some of the combustion emissions may approach the Category 1 threshold of 10 tonnes and therefore these substances are reviewed. Some of these substances, such as carbon monoxide, are likely to be entrained in the product stream (natural gas) in trace amounts. Discussions with the State NPI Team confirm that no reporting is required for a transfer of a product.

The transferred wastes streams that are likely to include NPI substances are:

- Waste oils / oily water mixtures.
- Waste hydrocarbons / sludges (tank cleaning, line pigging and pond skimming).
- Used filters and adsorbents.

- Spent glycol.
- Produced water.
- Contaminated soils.

Some of the transported wastes are collected on a routine basis (e.g. spent glycol), others are collected on an as needs basis (e.g. waste hydrocarbons from tank clean outs). Typically the facilities each generate approximately 10 loads of transported waste in a year; some of these loads are of mixed types (i.e. wastes transported in drums). The Environmental Engineer determines that the NPI substances currently reported may be present in each of the listed waste streams.

Performing calculations, measurements and estimates

The Environmental Engineer reviews the available data. The status of available transfer data is:

- The composition of the transported wastes, particularly those collected on an as needs basis, is variable and needs to be assessed on a case by case basis until compositions are established. The testing required to meet waste tracking requirements does not cover the NPI Category 1 and 1a substances triggered. Waste characterisation analysis is required and the costs are incurred in the first year. Transfer factors will be established for subsequent years. Contaminated soil transfer is very infrequent and light hydrocarbons are bioremediated onsite. The hydrocarbon sludges are a highly variable waste stream and ongoing analyses beyond the first year will be required.
- A significant proportion of the transported waste quantities are estimated rather than measured directly and estimated as volumes rather than as mass. To report NPI substance quantities accurately, these issues are addressed with changes to the relevant checklists and spreadsheets.
- The composition and flow of produced water is measured on a routine basis and this provides adequate data for transfer reporting, if required.
- The existing monitoring of spent glycol is adequate for transfer reporting.

The Environmental Engineer seeks advice from the industry group (Australian Petroleum Production and Exploration Association) regarding transfer factors developed from several member companies and from many chemical analyses. This information is used in the calculations where applicable.

The facilities have existing NPI reporting systems that are included in the company's overall environmental reporting systems. To align reporting requirements and ensure that data is prepared on schedule, the main environmental reporting functions are conducted and reviewed internally on a quarterly basis. NPI transfer reporting is included in this process. This requires development, implementation and ongoing 'system' tasks as detailed below:

Development

- Update the process waste analytical program.
- Update the field data collection sheets for environmental reporting.
- Update the existing NPI monitoring and reporting procedure and spreadsheets (to match new national reporting tool).
- Update the relevant job descriptions.
- Prepare a management brief on the new requirements
- Update the project impact statement system to ensure that any future effects on waste transfers are considered and captured in future projects.
- Attend external training and inform/train relevant field staff.

Implementation

- Use newly developed procedures and enter data into spreadsheets.
- Check veracity of data collection systems and calculations via an internal review.

- Report to management on development and implementation.

Ongoing system tasks

- Maintain and update the system (facility changes, process changes, new estimation factors / techniques) as required.
- Compare with previous years' data (to confirm data generated).
- Identify and investigate any irregularities.
- Conduct audits (as part of the environmental management system).

Reporting transfers

The facilities currently report emissions using the national reporting tool. The new forms that include transfers are downloaded and reviewed. Data is uploaded from the newly developed spreadsheets into the transfer forms. This process needs internal review in the first year. Consultation with the State NPI team also occurs in the first year.

The draft transfer reports are reviewed and approved by the HSE Manager. The transfer reports are then submitted and records of the transfer reporting process are filed. When the data is published on the NPI website, the transfer data is checked by the Environmental Engineer.

2.10.3 NPI transfer reporting costs

The expected costs of NPI transfer reporting are based on the tasks described above and the expected time and resource requirements for these tasks. Hourly rates are given in the table below for the personnel involved. This rate covers items including the base salary, insurances, leave, building rental and company profit. The rates also cover consumables and proportioned equipment depreciation (eg computers, standard office equipment, photocopiers and telephone charges). All analyses are outsourced. Set-up costs that are incurred only in the first year of transfer reporting are presented separately. Consultants are not used.

Table 2.15 Oil & gas extraction

	Cost components – NPI transfers						
	Staff – HSE Manager ($180/hr)	Staff – Environmental Engineer ($130/hr)	Staff – Field Engineer s ($90/hr)	Staff – Admin. ($50/hr)	Service providers - analytical laboratory	Ongoing transfer reporting (subtotal)	First year set-up costs for transfer reporting (subtotal)
Understanding	1st yr setup $180	1st yr setup $520	1st yr setup $360	1st yr setup $ 0	1st yr setup	$ 440	$1,060

regulatory requirements	every year $ 0	every year $260	every year $180	every year $ 0	$ 0 every year $ 0		
Determining reporting obligations	1st yr setup $ 0 every year $ 0	1st yr setup $1,950 every year $780	1st yr setup $90 every year $90	1st yr setup $ 0 every year $ 50	1st yr setup $ 0 every year $ 0	$ 920	$2,040
Performing calculations, measurements & estimates	1st yr setup $ 0 every year $ 0	1st yr setup $2,600 every year $2,080	1st yr setup $810 every year $720	1st yr setup $50 every year $50	1st yr setup $800 every year $ 200	$ 3,050	$4,260
Reporting transfers	1st yr setup $360 every year $360	1st yr setup $520 every year $650	1st yr setup $ 0 every year $270	1st yr setup $50 every year $100	1st yr setup $ 0 every year $ 0	$ 1,380	$930
Total	1st yr setup $540 every year $360	1st yr setup $5,590 every year $3,770	1st yr setup $1,260 every year $1,260	1st yr setup $100 every year $200	1st yr setup $800 every year $ 200	$ 5,990	$ 8,290

For the three facilities, the total cost for transfer reporting in the first year is $14,280 and includes the set-up costs plus ongoing costs. The cost of transfer reporting in the second year (and thereafter) is $5,990.

The cost per facility for transfer reporting in the first year is $4,760 and the cost per facility in the second year (and thereafter) is $2,000.

2.11 Timber product manufacturing

2.11.1 Background

Process summary

This facility is dedicated to the manufacture of timber products of various lengths and thicknesses and includes both laminated and unlaminated coating. There are two production lines; however the older line has been mothballed for two years and is unlikely to be re-commissioned.

Wood waste, used as the basis of the reconstructed timber product, is collected from three sources:

- wood waste from an adjacent sawmilling facility (which also reports to the NPI). This is the primary constituent of the particle board.
- wood waste collected from other sources; typically other sawmills in the region.
- board waste from the site (typically product that has failed quality inspection), and MDF board waste from a sister plant.

Wood waste is chipped to ensure consistent grade (finer particles are redirected to be used as fuel for the boiler) and dried in a rotary drier.

Dried chip is combined with resins and formed and pressed into a board 48 feet by 6 feet. The board is cooled and transported to the cutting room. The board is cut into sizes specific to customer orders.

Board is warehoused for delivery, or forwarded to the laminating line for covering specific to the requirements of the customer.

Emissions relevant to the NPI occur from the chipper, boiler, press, former, cooler, saws and laminating process, as well as forklifts used within the warehouse. In addition to the substances emitted from combustion, emissions of formaldehyde are noted.

2.11.2 NPI transfer reporting methodology

Understanding regulatory requirements

NPI reporting is undertaken by the facility Project Engineer, who has been employed at the site for more than a decade. NPI reporting is part of standard operating processes, and the requirements are well understood.

It is expected that any change to the reporting requirements could be articulated via the NPI web site, through information pack, or attendance at a seminar.

Determining reporting obligations

As noted, the facility reports primarily on formaldehyde and the products of combustion.

Waste generated at the facility can be roughly classified as either general or industrial.

General waste typically comprises that generated by the staff canteen and administrative areas. It is doubtful that the waste would contain NPI substances in sufficient quantities to warrant reporting.

Industrial waste primarily comprises formaldehyde as well as other resins and dyes as a result of the production process. This waste is pumped from the particle board process to one of two concrete lined settling pits. The pits are alternated as required.

Prior management practice of disposing of industrial waste in unlined pits resulted in contamination of the aquifer (this occurred under a previous owner). Following successful prosecution by the local EPA the facility has been pumping the aquifer in an attempt to remove the pollutant (predominantly formaldehyde). Waste is directed to the concrete lined pits. It is expected that this extraction will continue for several years, although it is noted that the concentration of pollutant is significantly reduced from the commencement of the pumping programme.

Over time, the waste solidifies and is removed by excavator for disposal and a local landfill.

There is no waste discharge to sewer at this facility.

Performing calculations, measurements and estimates
Approximately 25 tonnes of solid waste is removed from the pits each month, of which 97% of the composition is known to be formaldehyde. The facility is charged on a per weight basis for disposal and therefore exact costs are known (although have not been revealed for the purposes of this case study).

On this basis, there is little effort and cost over and above standard operating practice in complying with reporting transfers to the NPI from this facility.

Reporting transfers
The transfer reporting functions will be conducted annually. The regulatory requirements are revisited briefly, and the transfer reports are generated using either the Excel spreadsheet or the on-line reporting application developed by the Australian Government Department of the Environment and Water Resources. A draft transfer report is checked and approved by the facility manager. The facility may choose to voluntarily report reuse and recycling. The approved report is then submitted to the relevant environmental agency.

2.11.3 NPI transfer reporting costs

There is only a minor upfront cost ($100) to assess the regulatory obligations. There is virtually no additional ongoing cost to this industry as the facility already conducts the required calculations. This industry currently disposes of their waste via landfill. The facility pay the landfill operator per tonne of waste, therefore these tasks are already undertaken at this facility.

2.12 Case study summary

While each case study is unique, there are transfer reporting components that are relevant to most facilities. To properly self-assess the need to report transfers, a facility should:

- review regulatory requirements,
- review the NPI substances for which they exceed the reporting threshold,
- identify the waste streams that may contain these NPI substances,
- review existing data including waste stream analyses, and
- identify any data gaps and if required, obtain additional data.

Where data gaps exist, laboratory analyses may be required. Analytical costs are mostly incurred in the first year and the analytical results developed into transfer factors for subsequent years. Transfer factors will allow simplified calculations. Ongoing analyses are only needed for highly variable waste streams or to modify transfer factors to account for significant process changes.

An analysis of the case study cost estimates is given in Section 1.1. Typical factors that help reduce the transfer reporting cost per facility include:

- personnel experienced in reporting NPI emissions,
- established systems and spreadsheets for reporting NPI emissions,
- existing analytical programs (e.g. for trade waste, production quality, licensing),
- multiple facilities to share reporting costs.

Case studies have inherent limitations. The participating facilities have unique aspects and some industry sectors are not directly represented by the eleven case studies. The case studies are not intended to be all-inclusive for the industry sector discussed; rather they are intended to provide a starting point for a comparative assessment that could be conducted by a facility regardless of the industry sector.