

**Costs and Benefits
of a
National Greenhouse and Energy Reporting
Framework – Additional Analyses**

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for

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Contents

| | |
|--|-----------|
| <i>Contents</i> | 2 |
| 1. Background | 3 |
| BACKGROUND | 3 |
| THIS STUDY | 3 |
| THRESHOLDS AND TRIGGERS | 5 |
| <i>Triggers in this Analysis</i> | 5 |
| BAU | 5 |
| Scenario A..... | 5 |
| Scenario B | 6 |
| <i>Simplification of Threshold Assumptions</i> | 6 |
| <i>Details to be defined in regulation</i> | 7 |
| ENERGY, SECTORAL AND EMISSIONS COVERAGE..... | 9 |
| Agriculture | 9 |
| Mining..... | 10 |
| Manufacturing | 10 |
| Transport | 10 |
| Commercial and Services | 11 |
| Generation | 12 |
| Construction..... | 12 |
| Water, sewerage and gas | 12 |
| Waste..... | 12 |
| 2. Method of Analysis | 14 |
| METHOD..... | 14 |
| Single Factor Site Analysis | 14 |
| Dual Factor Site Analysis | 15 |
| THE RELATIONSHIP BETWEEN COMPANIES AND SITES | 17 |
| Scenarios..... | 18 |
| 3. Findings | 20 |
| References..... | 26 |

1. Background

Background

A report analysing the costs and benefits associated with adopting a national mandatory requirement for companies and businesses to report greenhouse and energy data was prepared by George Wilkenfeld and Associates and published by the Australian Greenhouse Office in March 2006 (GWA 2006). That document is referred to as the ‘original CBA’.

A consultation paper, *A Streamlined National Reporting Framework for Greenhouse and Energy Data: Reducing the Burden*, which includes information drawn from the cost benefit analysis, was used as the basis for a national consultation process during April 2006.

The Environment Protection and Heritage Council (EPHC) and Ministerial Council on Energy (MCE) Working Groups on Greenhouse and Energy Reporting will provide their final report to the Councils for consideration in June 2006. The EPHC has also initiated a process to consider a variation to the National Pollutant Inventory (NPI), with a decision expected in April 2007.

This study

The present study was commissioned by the AGO to provide additional analysis of the costs and benefits of adopting a national mandatory requirement for companies and businesses to report greenhouse and energy data. It builds on the original CBA in the following ways:

- The thresholds for inclusion in the mandatory obligation are calculated at the ‘business’ level rather than the individual site or facility level as in the original CBA;¹
- The thresholds can be triggered by a range of criteria: greenhouse gases emitted, energy used, energy produced and electricity generation capacity installed. The original CBA focused solely on the criterion of greenhouse gases emitted;
- A slightly wider range of emissions sources is also taken into account. The original CBA considered energy-related emissions: natural gas, coal and petroleum (Scope 1 emissions) and electricity imported from off-site (Scope 2 emissions) as well as fugitive emissions and industrial process emissions. The present study has added emissions from biofuels and emissions from waste, but excludes emissions from the IPCC-defined sectors *Agriculture* and *Land Use, Land Use Change and Forestry*;

¹ The estimates of business numbers in this analysis are taken from ABS (2004). The method of enumeration is explained at length in that publication. The register of Australian Business Numbers (ABNs) is only one of the sources the ABS draws on. The final ABS estimate of businesses is lower than the total number of ABNs. Many ABNs attach to entities which are ‘out of scope’ and not enumerated as operating businesses.

- The original CBA focussed on three main ‘energy consuming’ sectors of the economy: Mining (ANZSIC Division B), Manufacturing (Division C) and Commercial & Services, as well as on the Electricity Generation sector. The present analysis also covers energy-related emissions in the Agriculture, Forestry and Fishing sector (Division A) and Transport.

The original CBA was a detailed stand-alone document that covered a range of issues such as regulatory frameworks and modes and options of public disclosure. The present analysis focuses on the quantifiable monetary costs to business and government. It is intended as a technical input into a wider Regulation Impact Statement and should be read in association with the accompanying spreadsheet. The tables in the present document are cross-referred to named data regions in the spreadsheet (eg <SiteSum>).

Thresholds and Triggers

The original CBA assumed that a business would be required to submit reports of its annual energy use and greenhouse gas emissions only if it owned or controlled at least one facility or site at which total greenhouse gas emissions met or exceeded a given threshold level. A range of declining thresholds was investigated: 125, 25, 10, 5 and 1 kt CO₂-e per annum.

If the threshold were set at 10 kt CO₂-e, for example, a business with one site emitting 30kt would be required to report, another with two sites at 11 kt each would be required to report but a third with 4 sites at 8 kt each would be exempt, even though its aggregate emissions were higher than the other two businesses. Also, where on-site emissions came solely from energy use, as would be the case in the great majority of cases, the quantity of energy use could vary widely – from 40 TJ for a site using only electricity (with a nominal emission factor of 250 t CO₂-e/TJ) to 192 TJ for a site using natural gas (with a nominal emission factor of 52 t CO₂-e/TJ).

Triggers in this Analysis

Four scenarios are compared in the present analysis:

BAU

In the ‘Business as Usual’ (BAU) scenario reporting businesses continue to be subject to a range of mandatory reporting requirements (eg NPI), and/or choose to voluntarily participate in others (eg Greenhouse Challenge Plus (GCP)), and continue to prepare different reports in different formats for each of those programs. The Data Requiring Entities (DREs) continue to independently receive, process and store the data as they do now.

Scenario A

Annual reporting of greenhouse gas emissions and energy use is mandatory for any reporting business which meets **one or more** the following criteria (collectively termed ‘Trigger A’ in this analysis).²

- a. The combined greenhouse gas emissions from all facilities for which the business is responsible are equal to or greater than 50,000 (50 kt) tonnes of CO₂-e per annum, OR
- b. The combined energy consumption of all facilities for which the business is responsible is equal to or greater than 200 TJ per year; OR

² A ‘Trigger A’ site meets the criteria on its own. A ‘Trigger A business’ may have none, one or more Trigger A sites, none, one or more Trigger B sites and none, one or more ‘sub-B’ sites. The category ‘B not A’ applies to businesses or entities which would meet Trigger A but not Trigger B.

- c. The combined energy production of all facilities for which the business is responsible is equal to or greater than 200 TJ per year; OR
- d. The total installed electricity generation capacity at all facilities for which the business is responsible is equal to or greater than 30 MW.

Businesses which currently report but are not caught by Trigger A continue to report.

Scenario B

Annual reporting of greenhouse gas emissions and energy use is mandatory for any RB which meets **one or more** the following criteria (collectively termed ‘Trigger B’ in this analysis).

- a. The combined greenhouse gas emissions from all facilities for which the business is responsible are equal to or greater than 25,000 (25 kt) tonnes of CO₂-e per annum, OR
- b. The combined energy consumption of all facilities for which the business is responsible is equal to or greater than 100 TJ per year; OR
- c. The combined energy production of all facilities for which the business is responsible is equal to or greater than 100 TJ per year; OR
- d. The total installed electricity generation capacity at all facilities for which the business is responsible is equal to or greater than 30 MW.

Businesses which currently report but are not caught by Trigger B continue to report.

Scenario C

As for Scenario A, plus any businesses with one or more sites meeting Trigger B on their own must report for those sites only. This adds fewer businesses and sites than Scenario B, because:

- Businesses that would be have met Trigger B due to the accumulated emissions or energy use of sub-B sites are excluded; and
- Businesses that *are* caught are only required to report on their B site/s, not on their smaller sites.

Some of the businesses caught under Scenario C already report voluntarily. It is assumed that these companies continue to report voluntarily for their non-B sites as well.

Simplification of Threshold Assumptions

The analysis quantifies the number of sites and businesses in each sector caught by trigger criteria (a) and (b), ie the greenhouse and energy thresholds.

It is not necessary to separately analyse criteria (c) and (d) for the following reasons:

- Nearly all businesses which *produce* more than 100 or 200 TJ of energy per year are likely to consume at least as much energy, and so will be caught by criteria (a) or (b) in any case (eg average emissions **per site** in the electricity generation sector are nearly 300 kt CO₂-e, and average company emissions are much higher);
- For companies where energy is supplied for own use rather than for sale, if 30 MW or more of capacity is used at all, then the fuel consumption (typically natural gas) will trigger the energy threshold at any load factor higher than about 0.05 (ie if the capacity is used for an average of more than one hour per day – see Figure 1). Biofuel generation is less efficient, so the fuel use criterion would be triggered at even lower load factors.

The only class of business for which the ‘energy produced’ criterion is likely to make the difference between participation and non-participation will be smaller renewable energy generators, who consume no fuel and produce less than 100TJ (28 GWh) per year. At a load factor of 25% (typical for wind), companies with more than 12MW of plant would be captured. Larger renewable generators would be covered in any case by the 30 MW criterion.

Since nearly all renewable electricity generators already report to the Office of the Renewable Energy Regulator in order to create Renewable Electricity Certificates (RECs), the cost of submitting the same data to a national reporting framework would be negligible.

Therefore, the ‘30MW’ and ‘energy produced’ criteria will have no significant bearing on the analysis and do not need to be considered further.

It was stated in the terms of reference that ‘companies’ does not include government departments and agencies and the facilities they operate (eg schools, hospitals) – but should include government business enterprises such as power generators. The quality of the data do not allow such distinctions to be made, so in the analysis ‘businesses’ nominally cover publicly as well as privately owned enterprises.

Details to be defined in regulation

A wide range of issues would need to be defined in regulations before any mandatory reporting regime could be operationalised. These include:

- Definition of eligible ‘businesses’ for aggregation purposes – whether companies, local divisions of companies, collectives, public sector corporations etc.
- Definition of what constitutes a business’s ‘responsibility’ for a facility (eg ownership, tenancy, management responsibility or some other criterion) would determine the facilities which a company would need to take into account in assessing its liability. There will be enormous scope for double-counting, especially in the commercial sector – eg would Westfield (with 50 shopping centres in

Australia) be required to report energy use from its 22,500 tenants, when many of those – eg Woolworths, Coles Myer – would be required to report on their own?

- The actual emission factors to be used by businesses to initially screen for their eligibility to participate and, if so, the factors for reporting. The present study uses uniform national average factors, but if state-based factors were used, especially for electricity, the coverage of businesses would be different. In particular, commercial and service businesses with electricity-only sites in Victoria would trigger the CO₂-e criteria at much lower energy use than in other States.
- Rules for enumeration and retention of data at the state level for businesses which operate in more than one state. The original CBA identified this as a minimum requirement before the states would consider abandoning their own data requests.

The analysis assumes that these issues are adequately addressed in the regulation, design and administration of the reporting scheme. It makes no allowance for the possible continuation of multiple reporting or the potentially high costs to government of cleaning and reconciling data and removing double counts and overlaps. However, all such uncertainties are within the overall uncertainty of the analysis.

Energy, Sectoral and Emissions Coverage

The sectors and emissions sources covered in the analysis are summarised in Table 1. The number of business and sites or facilities are summarised in Table 2. The number of sites and companies meeting the trigger criteria is discussed in Section 2.

Table 1 Energy and emissions by Sector

| | PJ | Energy kt CO2-e | Fugitive kt CO2-e | Process kt CO2-e | Total kt CO2-e |
|---------------------------------|--------|--------------------|----------------------|---------------------|-------------------|
| Agriculture, forestry & fishing | 94.4 | 8,250 | | | 8,250 |
| Mining | 327.0 | 30,433 | 24,413 | | 54,847 |
| Manufacturing | 1084.2 | 112,327 | | 25,951 | 138,277 |
| Transport businesses (a) | 582.9 | 44,955 | | | 44,955 |
| Commercial and Services | 234.6 | 45,661 | | | 45,661 |
| Above sectors combined | 2323 | 241,627 | 24,413 | 25,951 | 291,990 |
| Generation | 2233 | 195,205 | | | 195,205 |
| Water, sewerage and gas | 38.5 | 1,578 | | | 1,578 |
| Construction | 27.5 | 1,980 | | | 1,980 |

<SectorSum> (a) Excludes private transport fuel use

Table 2 Business entities by Sector

| | Business Entities(a) | Sites or Facilities(b) | Average kt/site | Number of sites Making up 50kt | AvgNumber of sites Making up 25kt |
|---------------------------------|-------------------------|---------------------------|--------------------|--------------------------------------|---|
| Agriculture, forestry & fishing | 74,111 | 77,065 | 0.1 | 467 | 234 |
| Mining | 2,731 | 3,768 | 8.1 | 6 | 3 |
| Manufacturing | 61,888 | 71,044 | 1.6 | 32 | 16 |
| Transport businesses | 30,281 | 30,281 | 1.5 | 34 | 17 |
| Commercial and Services | 546,949 | 687,238 | 0.1 | 753 | 376 |
| Above sectors combined | 715,960 | 869,396 | 0.3 | 180 | 90 |
| Generation | 66 | 228 | 856 | 0.06 | 0.03 |
| Water, sewerage and gas | NA | NA | NA | NA | NA |
| Construction | 113,426 | 115,666 | 0.02 | 2921 | 1460 |

<Sitesum> (a) Employing entities only, from ABS 8181.0 (b) Author estimate

The number of businesses corresponds to the number of ‘employing businesses’ reported by ABS (2004). There are also nearly 2.2 million ‘non-employing businesses’ (mostly sole traders or very small family businesses). Of these, nearly 1.5 m are based in households, so their energy use is essentially indistinguishable from general residential sector energy use. The other 0.7m are ‘based’ elsewhere – in many cases a vehicle rather than a site. It is assumed that non-employing businesses will play no part in any national greenhouse and energy reporting framework.

Agriculture

Nearly all the energy used in this sector is petroleum. The average emissions per site are very low, so that 234 average sites would be needed to trip Trigger B (Table 2).

Consequently, only those few agricultural businesses will be caught that have one or more very large energy-using sites or an unusually large number of smaller sites.

Mining

Because fugitive emissions are of comparable magnitude to energy-related emissions, and a high proportion of energy is electricity, average emissions per site are the highest of the end-use sectors. There is a high probability that a mining business will meet the trigger criteria.

Manufacturing

Although average emissions per site are comparable to transport, there is a very wide range within the sector, from an average of 0.01 kt/site for 'Other Manufacturing' to 5.0 kt/site for 'Metal Products'.

Transport

Each transport business is treated as a single reporting facility irrespective of the number of sites or states of operation.

There are three main categories of transport energy use:

- a. Fuel used in private motor vehicles (this is generally divided by trip purpose: to and from work, in the course of business and private);
- b. Fuel used in vehicles offering a transport service on the open market (generally called 'hire and reward' transport businesses); and
- c. Fuel used in vehicle fleets operated by businesses whose main operations are not transport: eg truck fleets operated by miners or manufacturers, and car and van fleets operated by large service businesses such as banks or telecommunications companies.

The ABARE fuel use data only distinguish fuel use by mode (road, rail etc). The NGGI further divides road vehicle fuel use and emissions by vehicle type. The following assumptions have been used to allocate transport fuel and emissions to businesses:

- All car fuel is allocated to private users, except for the fuel used by taxis (which accounts for just over 1% of car fuel).³
- All light truck fuel is allocated to the 'hire and reward' transport sector, even though a significant share of light trucks are now bought for private use.
- All transport fuel use reported for trucks, railways, aircraft and shipping is allocated to the 'hire and reward' transport sector.

³ Taxi statistics from Australian Taxi Industry Association, www.atia.com.au/statistics.php

- It is assumed that fuel used by ancillary transport is allocated to the sector of the company's principal business. For example, banks would report fleet fuel use in their total energy use (as indeed they do for the Greenhouse Challenge).

There are bound to be overlaps and double counting. For example, many large service and retail companies now contract out their fleet operations to 'hire and reward' operators, who reserve part of their fleet for the exclusive use of that customer. Who should report the energy? Also, many companies cover the costs of cars as part of employee remuneration packages. The cars are essentially used as private vehicles, even though the company pays for and records fuel purchases.

Table 3 shows the average annual fuel use and emissions for various vehicle types. It indicates that a heavy trucking business with more than 52 trucks, each using the national average amount of fuel annually, would trip Trigger B. ACIL (2004) reports 42 businesses in the road freight 'hire and reward' sector with 50-99 trucks, and 30 with more than 100 trucks, which are likely to trip Trigger A.

In fact, the number of large fleets reported for ancillary operators is far higher: about 200 fleets of 50-99 trucks and 60 fleets of more than 100. It is not clear whether ABARE would include the fuel used by these 'ancillary' fleets under transport or under the industry concerned, but in any case it is likely that nearly all of those companies would meet the reporting triggers solely on their stationary fuel use and emissions plus their fugitive or process emissions.

Table 3 Average energy and emissions by type of road vehicle

| | Average TJ/veh | Average kt/veh | Veh/ 200TJ | Veh/ 100TJ |
|------------------------------------|-------------------|-------------------|---------------|---------------|
| Cars - private | 0.06 | 0.004 | 3458 | 1729 |
| Cars - business (taxis, hire cars) | 0.42 | 0.031 | 471 | 235 |
| Light trucks - business | 0.09 | 0.006 | 2325 | 1163 |
| Med trucks - business | 0.25 | 0.017 | 814 | 407 |
| Heavy trucks - business | 1.92 | 0.134 | 104 | 52 |
| Buses - business | 0.31 | 0.021 | 649 | 325 |

<Inputs>

Commercial and Services

The estimates of sites numbers in this sector are largely unchanged from the original CBA. However, as many service sector businesses are multi-site, additional research was undertaken to better understand the relationship between site and company emissions. **Table 4** summarises data for a sample of 10 companies, together accounting for 6.2% of sector emissions and 4.8% of sector energy (excluding their transport fleets).

This analysis indicates that 9 of the 10 businesses would meet both Trigger A and Trigger B because of their large number of sites, even though average fuel use and emissions per site are low (averaging 0.15-0.2 kt CO₂-e per site for financial services businesses). The four Greenhouse Challenge members listed in **Table 4** which report site numbers account for 2,784 sites between them. This conflicts with published

statements that the 780 businesses already participating in the Challenge 'represent over 1000 operating sites of facilities in Australia' (most recently reported in *The Challenge*, May 2005, p4). Consequently, the estimate of the number of sites covered by existing reporting entities in the 'BAU' case has been increased by 3,000.

Generation

The data for this sector are largely unchanged from the original CBA, although there has been some refinement of the estimate of number of businesses. Emissions from electricity generation should not be added to those for the end use sectors, because they are already captured in end use through the use of Scope 2 emission factors.

Construction

Average emissions per facility in the construction sector are an order of magnitude lower than the next lowest (commercial and services). It is likely that the data for the sector are distorted by the large number of small contractors in the industry, and possibly by undercounting of vehicle emissions. The energy use of large construction businesses is dominated by petroleum, and resembles that of large transport businesses, and for the time being is treated within the transport business sector. As total fuel use in the construction sector is less than 5% of transport business fuel use, this assumption is not likely to make any material difference to the analysis.

Water, sewerage and gas

This sector is not separately analysed. As most water and gas utilities already participate in existing greenhouse and energy reporting arrangements, their participation in any national framework is unlikely to add to reporting costs.

Waste

It is assumed that ABARE includes energy use in the Waste sector in Commercial and Services. Much of the landfill emissions captured for generation will be covered by electricity businesses. Only one business is known to report fugitive emissions from its landfills that are *not* captured (**Table 4**).

Table 4 Sample of commercial and service companies participating in Global Reporting Initiative

| | kt CO ₂ -e Stationary | TJ Stationary | kt CO ₂ -e total | TJ Total | Trigger A | Trigger B | Sites | TJ/site | Stationary kt CO ₂ -e/ facility | GHP members May 05 list |
|---|-------------------------------------|------------------|--------------------------------|-------------|-----------|-----------|----------|----------|--|-------------------------------|
| Westpac (Financial services) | 107 | 270 | 125 | 691 | Yes | Yes | 810 | 0.33 | 0.13 | Yes |
| ANZ (Financial services)) | 118 | 478 | 121 | 526 | Yes | Yes | 756 | 0.63 | 0.16 | Yes |
| IAG Insurance (Financial services) | 43 | 173 | 52 | 295 | Yes | Yes | 280 | 0.62 | 0.15 | No |
| NAB (Financial services) | 186 | 746 | 242 | 1491 | Yes | Yes | 1218 | 0.61 | 0.15 | Yes |
| Telstra (Communications) | 1161 | 4668 | 1302 | 6559 | Yes | Yes | NA | NA | NA | Yes |
| Singtel Optus (Communications) | 154 | 620 | 164 | 749 | Yes | Yes | NA | NA | NA | No |
| Transfield Services (excludes generation) | 6 | 22 | 28 | 327 | Yes | Yes | NA | NA | NA | No |
| Vic Super (Financial services) | 0.3 | 1 | 0.3 | 1 | No | No | 3 | 0.41 | 0.10 | No |
| Woolworths (Retail) excludes vehicles | 999 | 3995 | 998.6 | 3995 | Yes | Yes | 1600 | 2.50 | 0.62 | No |
| WSN Environment Solutions (Waste)(a) | 39 | 364 | 377 | 396 | Yes | Yes | NA | NA | NA | No |
| Total of above | 2812 | 11336 | 3411.3 | 15031 | | | 4667 (b) | 2.43 (c) | 0.60 (c) | |

<Examples> Derived by author from Sustainability Reports posted on <http://www.globalreporting.org/> (a) Excludes 1,598 kt CO₂-e fugitive emissions from landfills that are not captured. (b) Minimum value – does not include NAs (c) Maximum value – addition of NA sites would drive average down

Table 5 Summary of sites meeting Triggers A and B, 5 End Use sectors

| | >50 kt | | | | 25-50 kt | | | | <25 kt | | | | | | |
|-----------------------------------|--------------|----------|---------|--------|----------|--------------|----------|--------|--------|-------|---------------|----------|---------|--------|-------|
| All Sites, this column | 363 | Total kt | 157766 | Avg kt | 434.6 | 515 | Total kt | 20245 | Avg kt | 39.3 | 868517 | Total kt | 113979 | Avg kt | 0.1 |
| | Sites | Total TJ | 1071570 | Avg TJ | 2952.0 | Sites | Total TJ | 199829 | Avg TJ | 388.0 | Sites | Total TJ | 1052009 | Avg TJ | 1.2 |
| >200 TJ | 363 | Total kt | 157766 | Avg kt | 435 | 421 | Total kt | 17352 | Avg kt | 41 | 120 | Total kt | 2500 | Avg kt | 21 |
| | Sites | Total TJ | 1071570 | Avg TJ | 2952 | Sites | Total TJ | 185195 | Avg TJ | 440 | Sites | Total TJ | 29500 | Avg TJ | 246 |
| 100-200 TJ | 0 | Total kt | 0 | Avg kt | 0 | 94 | Total kt | 2893 | Avg kt | 31 | 300 | Total kt | 5693 | Avg kt | 19 |
| | Sites | Total TJ | 0 | Avg TJ | 0 | Sites | Total TJ | 14634 | Avg TJ | 156 | Sites | Total TJ | 41000 | Avg TJ | 137 |
| <100 TJ | 0 | Total kt | 0 | Avg kt | 0 | 0 | Total kt | 0 | Avg kt | 0 | 868097 | Total kt | 105787 | Avg kt | 0.1 |
| | Sites | Total TJ | 0 | Avg TJ | 0 | Sites | Total TJ | 0 | Avg TJ | 0 | Sites | Total TJ | 981509 | Avg TJ | 9107 |
| kt/PJ | 147.2 | Fug+Proc | 44.7 | Energy | 102.6 | 101.3 | Fug+Proc | 12.5 | Energy | 88.8 | 108.3 | Fug+Proc | - | Energy | 108.3 |

<ENDUSEsum>

2. Method of Analysis

Method

Single Factor Site Analysis

The Original CBA described the process by which the energy use and emissions in each sector were allocated to categories of sites, classified by emissions. That analysis was modified in the following way:

- The Agriculture and Transport sectors were added, to make five ‘End Use’ sectors in all (the original CBA covered only Mining, Manufacturing and Commercial & Services); and
- The 25-125 kt category was split into two: 50-125 and 25-50, to better align with Triggers A and B (noting that the triggers apply at the business level rather than the site level).

The analysis of number of sites by emissions alone is summarised in Table 6. The share of the total emissions from the 5 end use sectors is also indicated, by way of comparison with the Original CBA.

The number of end use sites covered has increased from about 700,000 to about 870,000 due to the addition of the Agriculture and Transport sectors, but the share of the emissions of included sectors has fallen from 66.0% to 60.6%, due to the relatively low coverage of Agriculture and Transport businesses by the current greenhouse reporting regimes. Figure 2 illustrates the coverage for each sector, and what the coverage would be if reporting thresholds were determined by the single factor of site emissions. This diagram has been included as a link with the original CBA, and to indicate the level of BAU emissions coverage to which Scenarios A and B must be compared (ie 60.6%). However, the current study does not rely on single factor analysis but on the ‘dual factor’ analysis described below.

Table 6 Estimated number of sites by emissions category, 5 End Use sectors

| Category kt/yr | Number of sites | Average kt/site | Mt this category | Share of emissions covered, this category | Cumulative share covered | Share of emissions covered by sites currently reporting |
|-------------------|--------------------|--------------------|---------------------|--|--------------------------------|---|
| >125 | 106 | 1264 | 134.0 | 45.9% | 45.9% | 40.7% |
| 50-125 | 257 | 92.7 | 23.8 | 8.2% | 54.0% | 6.5% |
| 25-50 | 515 | 39.3 | 20.2 | 6.9% | 61.0% | 5.4% |
| 10-25 | 1102 | 15.2 | 16.7 | 5.7% | 66.7% | 3.4% |
| 5-10 | 2420 | 7.1 | 17.2 | 5.9% | 72.6% | 3.7% |
| 1-5 | 8615 | 2.1 | 17.9 | 6.1% | 78.7% | 0.9% |
| <1 | 856381 | 0.1 | 62.1 | 21.3% | 100.0% | 0.1% |
| Total | 869396(a) | 0.3 | 292.0 | 100.0% | | 60.6% |

<SITEemissions> Horizontal bands correspond to Trigger A and B emission categories (a) Does not match Table 5 total exactly due to rounding error

Dual Factor Site Analysis

Sites can be classified by energy use as well as by emissions. This was done in the following way (for each End Use sector and for Electricity Generation separately):

- Consolidate sites according to the three categories of emissions defined by Triggers A and B: >50 kt, 25-50kt and <25 kt. These are indicated as columns in Table 5.
- Estimate the number of sites in the three categories of energy use defined by Triggers A and B: >200TJ, 100-200 TJ and <100TJ. These are indicated as rows in Table 5.
- Estimate the number of potential sites in each of the 9 cells of the table using the following rules:

Average emissions for the sites in each cell must remain within the emissions constraints (eg the 94 sites in the centre cell average 31 kt/site, which is within the 25-50 kt range);

Average emissions for the sites in each cell must remain within the energy use constraints (eg the 94 sites in the centre cell average 156 TJ/site, which is within the 100-200 range);

Average kt/PJ emission factors must remain within bounds (ie not more than 250 kt/PJ, which would represent an all-electric site, and not less than 52 kt/PJ, which would represent an all-gas site), and preferably close to the weighted average emission factor for that group (indicated in the bottom row of Table 5).

These constraints make it impossible to have a site emitting more than 50kt with energy use of less than 200 TJ, and limit the maximum number of 25-50 kt/100-200 kt sites to 94 (note that these totals exclude Electricity Generation, which was analysed separately).

In the <25kt category, which is dominated by Commercial and Services, Transport and Agriculture Sites, the number of >200TJ sites is limited to large fuel-dominated facilities (the emissions from electric-intensive sites exceeding 200 TJ would exceed 25 kt and so violate the constraint). The number of 100-200TJ sites in this emission category is estimated at 300, but could potentially be much higher. If this estimate were increased, the residual average consumption of the remaining 868,097 sites shown at the bottom right cell of Table 5 would have to fall.

Once this table is solved, the number of sites meeting Trigger A and B can be read off. The 904 sites in the red cells meet either the energy or the emissions criterion for Trigger A – the sites in the ‘intersection cell’ (top left) meet both. The 394 sites in the orange cells meet the criteria for Trigger B but not A. The 868,097 cells in the green cell do not meet the criteria for either trigger. Figure 3 illustrates the estimated number of sites meeting Trigger A and B in each sector.

There are $(904+394) = 1298$ end use sites meeting Trigger B, since all sites meeting Trigger A automatically meet Trigger B as well. About 42% of Trigger A and 66% of Trigger B sites meet *both* emission and energy criteria factors. Of the sites which meet one criterion only, more meet the energy than the emissions criterion (Table 7).

Table 7 Sites meeting energy and emissions criteria

| | Sites meeting trigger by TJ | | | Sites meeting trigger by kt | | |
|-----------------|-----------------------------|------------|--------|-----------------------------|----------|-------|
| | >200 TJ | 100-200 TJ | >100TJ | >50kt | 25-50 kt | >25kt |
| Agriculture | 1 | 54 | 55 | 0 | 5 | 5 |
| Mining | 370 | 50 | 420 | 160 | 200 | 360 |
| Manufacturing | 316 | 90 | 406 | 136 | 150 | 286 |
| Transport | 107 | 30 | 137 | 37 | 60 | 97 |
| Comm & Services | 110 | 170 | 280 | 30 | 100 | 130 |
| End Use Sectors | 904 | 394 | 1298 | 363 | 515 | 878 |
| Generation | 67 | 50 | 117 | 67 | 27 | 94 |
| Total sites | 971 | 444 | 1415 | 430 | 542 | 972 |

<ABsum>

It is possible to get some external verification of these estimates. ABARE reports that for the businesses covered by the FES (mainly Agriculture, Mining, Manufacturing, Transport and Generation, but not Commercial and Services) there are 777 sites with energy use exceeding 100 TJ per annum.⁴ Table 7 indicates 1415 sites exceeding 100 TJ. This would imply that there are about 640 sites or facilities with >100TJ energy use not presently covered by reporting to the FES, and up to 280 of these are in the Commercial and Services sector alone.

⁴ From ABARE FES, conveyed to author by PWG. Apparently 705 of these sites also exceed 250 TJ.

The Relationship between Companies and Sites

For single-site businesses there is a direct relationship between the number of sites meeting a given trigger and the number of businesses: if 75 sites meet Trigger A then so do 75 businesses. For any group of businesses having two or more sites, however, and where the sites differ in their energy and emission characteristics, three different outcomes are possible:

- The number of businesses meeting a given trigger could be *lower* than the number of sites meeting the same trigger. This would occur if some businesses had more than one above-trigger site;
- The number of businesses meeting a given trigger could be *higher* than the number of sites meeting the same trigger. This is possible because a business could have enough sub-trigger sites to add to the trigger; or
- The number of businesses meeting a given trigger could be *equal* to the number of sites meeting the same trigger. This is the least probable outcome.

Therefore, there is no necessary relationship between the number of sites meeting each trigger and the number of businesses. The best guidance would be a survey and analysis of a statistically significant number of firms in each end use sector. In the absence of such information, the number of businesses meeting each threshold can be estimated within the known constraints of total businesses, total sites meeting each trigger and total energy and emissions. This is the approach taken in this study.⁵ All end use businesses are combined for this part of the analysis, because there is no real data basis to differentiate sectors, and many large companies will have sites across sectors.

In the solution illustrated in Table 8, 71% of businesses have one site, 15% have two and 14% have more than two (the average for this group is 3.0). In the end use sectors, the overall average of sites per business is 1.2 (in Electricity Generation it is 3.6). Sites not meeting trigger B ('sub-B') were split into Larger and Smaller, such that two Larger sub-B sites would be enough for a business to trip Trigger B. Of course, many sub-B sites are owned by businesses that also have A or B sites, and so do not change the compliance status of the business, and many B sites are owned by businesses that also have A sites. Many businesses, especially in the Commercial sector, will meet Trigger A trigger solely through having many Smaller sub-B sites (eg 5 of the 10 businesses in **Table 4**).

⁵ Even within these constraints, there is an infinite number of solutions, and if high confidence were required a Monte Carlo type probability program would need to be set up to identify the region where the solutions converge. However, given the uncertainty surrounding reporting costs and other values critical to the cost-benefit analysis, and the relatively modest cost of the reporting regime as a whole, this does not seem necessary for the present.

Table 8 indicates that 504 businesses in Australia are estimated to meet Trigger A and a further 382 businesses would meet Trigger B.⁶ The number of businesses and sites caught by Trigger C lies between the totals for Trigger A and Trigger B.

Table 8 Estimated number of businesses meeting proposed trigger criteria

| Category of business in relation to trigger criteria | Number of businesses | Sites meeting Trigger A (a) | Sites only meeting Trigger B (a) | Larger sub-B sites (a) | Smaller sub-B sites (a) | Total reportable sites (a) | Average reportable sites per business |
|--|----------------------|-----------------------------|----------------------------------|------------------------|-------------------------|----------------------------|---------------------------------------|
| Businesses meeting Trigger A | 504 | 1018 | 250 | 1185 | 2560 | 5013 | 9.9 |
| Additional businesses meeting Trigger B | 382 | 0 | 194 | 583 | 1177 | 1954 | 5.1 |
| Total businesses meeting Trigger B | 886 | 1018 | 444 | 1768 | 3737 | 6967 | 7.9 |
| Additional businesses meeting Trigger C | 194 | 0 | 194 | 0 | 0 | 194 | 1.1 |
| Total businesses meeting Trigger C (b) | 698 | 1018 | 444 | 1185 | 2560 | 5207 | 7.6 |
| Businesses not meeting any Trigger | 722233 | 0 | 0 | 2006 | 861223 | 863229 | 1.2 |
| Total all businesses | 723119 | 1018 | 444 | 3774 | 864960 | 870196(a) | 1.2 |

<ABcombined> Includes Electricity Generation businesses (a) Number of sites which need to be covered in reporting. (b) In Scenario C, reporting on sub-B sites is only required for Trigger A companies. Only. (c) Does not match Table 5 total exactly due to rounding error.

Scenarios

To compare Scenarios A, B and C with the existing reporting requirements it is necessary to convert estimates of numbers of sites captured under the current regime (which in the Original CBA were based on emissions alone) to the dual factor classification used in Scenarios A and B. The conversion, illustrated in Table 9, suggests that about sixty per cent (300/504) of the businesses that would be caught by Trigger A (Table 8) are covered by existing reporting arrangements, and about fifty five per cent (490/886) of the sites that would be caught by Trigger B are already covered.

It is estimated that about 85% of the companies currently participating in greenhouse and energy reporting (some voluntarily, and some by obligation) would fall below Trigger B.

In Scenario C, all 504 of the businesses meeting Trigger A would have to report. However, only those of the 370 companies in the 'A to B' group which have one B site would need to report. It is estimated that there are 194 businesses in this category, with 194 B sites between them.⁷ It is estimated that about half these businesses would already participate in existing reporting arrangements, so Scenario C would only bring in about 97 businesses and 97 B sites beyond Scenario A. (It is assumed that the businesses in this category which already report voluntarily report on all their sites and continue to do so, but businesses reporting mandatorily, report only on their B sites and not any other sites).

⁶ Although the estimates are subject to some uncertainty the values are presented as they are produced by the spreadsheet rather than rounded to the nearest 10 or 100, which would be a more accurate reflection of their degree of approximation.

⁷ Logically, a business in this category can only have one B site, because if it had more than one it would meet Trigger A.

Table 9 Estimated number of currently reporting businesses meeting proposed trigger criteria

| Business Category | businesses reporting now | Eligible businesses | % eligible companies | Sites Meeting Trigger A | Sites Meeting B not A | Below Trigger B Larger | Below Trigger B Smaller | Total sites | Sites per business |
|--------------------|--------------------------|---------------------|----------------------|-------------------------|-----------------------|------------------------|-------------------------|-------------|--------------------|
| A only | 300 | 504 | 60% | 605 | 200 | 100 | 300 | 1205 | 4.0 |
| A to B | 190 | 382 | 50% | 0 | 80 | 150 | 500 | 730 | 3.8 |
| Below B | 2776 | 722233 | 0.4% | 0 | 0 | 350 | 6424 | 6774 | 2.4 |
| Total reporting | 3266 | 723119 | 0.5% | 605 | 280 | 600 | 7224 | 8709 | 2.7 |
| Total sites | | | | 1018 | 444 | 3774 | 864960 | 870196 | |
| % of sites covered | | | | 59% | 61% | 16% | 0.8% | | |

<SITEtoCO>

3. Findings

Once the numbers of companies and sites is estimated, it is relatively straightforward to calculate annual costs of the reporting framework, based on the cost assumptions in Table 10. The cost categories follow those used in the Original CBA:

- Annual ‘entity costs’ represent the fixed cost to the business of participating in the reporting regime (whether mandatory or voluntary), and of collecting and submitting data, irrespective of the number of sites. The costs are estimated at \$10,000 per annum for businesses meeting Trigger A, \$5,000 for businesses meeting Trigger B but not A and report on all their sites, \$4,000 for businesses that meet Trigger B but not A and report only on their B sites (for Scenario C), and \$1,000 for those businesses which only have sub-B sites but report voluntarily.
- Sites costs: these represent record keeping costs per site, and the estimate ranges from \$2,000 for a site which meets Trigger A on its own to \$ 200 for a small sub-B site (eg a branch owned by a national bank, a shop owned by a national retailer). In the BAU scenario, site costs are increased by the estimated multiple reporting factor (1.25).
- Administrative costs borne by the Data Requiring Agencies. The annual processing costs are estimated at \$500 per report from each Trigger A business, \$400 per report from each business meeting Trigger B but not A and \$300 per report for residual sub-B reporter. In the BAU scenario, processing costs are increased by the estimated multiple reporting factor (1.25).
- The recurrent fixed administrative costs of running the national greenhouse and reporting framework database are estimated at \$1 m per year.

As in the Original CBA, it is assumed that if a mandatory framework is established, those currently reporting businesses which fall below the threshold will continue to report, but gain some cost savings from reporting once only rather than making multiple reports as at present. These continuing sub-threshold businesses are termed ‘residual reporters’. As thresholds are lowered, the number of residuals falls, since some will become mandatory reporters. The elimination of multiple reporting also lowers the administrative costs to Data Requiring Agencies, since fewer reports need to be processed.

The principal cost findings are summarised in Table 11. The main points are:

- The cost of the existing reporting regime is about \$M 13.2 annually; about 83% of this is business costs, and the rest administrative costs.
- The annual cost would increase to \$M 16.1 under Scenario A (the 50kt/200TJ trigger, applied at the business level) and \$M 17.6 under Scenario B (the 25kt/100TJ trigger).
- The current reporting regime covers 60.6% of the total emissions from the 5 main end use sectors (ie excluding Electricity Generation, which must be analysed

separately to avoid double counting). The coverage increases to 69.6% for Scenario A , 74.2% for Scenario B and 71.2% for Scenario C.

- The annual cost for Scenario C would be \$M 16.7. This represents a \$M 0.9 per year saving compared with Scenario B, but also a 3.0 percentage point reduction in end use emissions coverage.
- The cost per percentage point of sector emissions covered (the measure of effectiveness used in the Original CBA) is about \$M 1.48 per annum for the existing regime, and in the narrow range \$M 1.58-1.62 for Scenarios A, B and C. (The emissions coverage for the Electricity Generation sector is already over 98% under the current regime and would approach 100% under Trigger A, so the potential for increased coverage is negligible. However, 'single-report' mandatory reporting would result in a major reduction in the multiple reporting burden, which is highest in the Generation sector.
- The value to government, the public and to business users themselves of the significant increases in data quality, reliability and timeliness that a mandatory regime would bring about have not been estimated. If the value of these quality improvements were greater than \$M 4.8 per year – as is highly likely - even the most costly scenario (Scenario B) would be cost-effective.
- The Net Present Value of the costs of the reporting regime (at 10% discount rate over a 12 year reporting period) would be about 22% higher than BAU for Scenario A, 34% higher for Scenario B and 27% higher for Scenario C.
- Costs per participating business are \$3,323 per annum under BAU, \$4,016 per annum under Scenario A, \$4,201 per annum under Scenario B and \$4,054 per annum under Scenario C.

Table 10 Cost Assumptions

| | \$/year |
|--|-----------|
| Gentility cost per reporter (Trigger A) | \$ 10,000 |
| Gentility cost per reporter (Trigger B not A) | \$ 5,000 |
| Gentility cost per B site reporter (Trigger C) | \$ 4,000 |
| Entity cost per smaller voluntary reporter | \$ 1,000 |
| Site cost per A site | \$ 2,000 |
| Site cost per B not A site | \$ 1,200 |
| Site cost per Larger sub-B site | \$ 500 |
| Site cost per Smaller sub-B site | \$ 200 |
| Administration costs A entity | \$ 500 |
| Administration costs per B not A entity | \$ 400 |
| Administration costs per sub-B entity | \$ 300 |
| Weighted average all sites, BAU | \$ 324 |

<OutputSUM>

Table 11 Summary of Findings

| | Number of reporting businesses (b) | Number of sites covered | M/yr \$entity costs | \$M/yr site costs | \$M/yr business costs | Average \$/yr per entity | \$M/yr admin costs | \$M/yr total costs | \$M NPV total Costs(a) | % of end use kt CO ₂ -e | \$M NPV per % of CO ₂ -e |
|-------------------------------|------------------------------------|-------------------------|---------------------|-------------------|-----------------------|--------------------------|--------------------|--------------------|------------------------|------------------------------------|-------------------------------------|
| BAU (Existing) | 3266 | 8709 | 6.7 | 4.1 | 10.9 | 3,323 | 2.3 | 13.2 | 89.8 | 60.6% | 1.48 |
| Scenario A: Meeting Trigger A | 3470 | 12517 | 8.8 | 5.2 | 13.9 | 4,016 | 2.2 | 16.1 | 109.7 | 69.6% | 1.58 |
| Scenario B: Meeting Trigger B | 3662 | 13741 | 9.7 | 5.7 | 15.4 | 4,201 | 2.2 | 17.6 | 120.1 | 74.2% | 1.62 |
| Scenario C | 3584 | 12631 | 9.2 | 5.3 | 14.5 | 4,054 | 2.2 | 16.7 | 114.0 | 71.2% | 1.60 |

<Results> (a) Net Present Value at 10% discount rate of annual business and administrative costs over a 12 year period (b) Note that the estimates embody assumptions about the behaviour of existing reporters under changes in regime. This accounts for apparent differences between tables.

Table 12 Comparisons with BAU (a)

| | Number of reporting businesses (total) | Number of reporting businesses beyond BAU | Number of sites (total) | Number of sites beyond BAU | Total costs \$M/yr | Total business costs \$M/yr | Total \$M/yr costs, averaged over reporting businesses | Total \$M/yr costs, averaged over covered sites |
|---|--|---|-------------------------|----------------------------|--------------------|-----------------------------|--|---|
| BAU (Existing) | 3266 | NA | 8709 | NA | 13.2 | 10.9 | 4035 | 1513 |
| Scenario A: All businesses meeting Trigger A | 3470 | 204 | 12517 | 3808 | 16.1 | 13.9 | 4639 | 1286 |
| Scenario B: All businesses meeting Trigger B | 3662 | 396 | 13741 | 5032 | 17.6 | 15.4 | 4812 | 1283 |
| Scenario C: As for A, plus businesses with a B site | 3584 | 318 | 12631 | 3922 | 16.7 | 14.5 | 4667 | 1324 |

<Results> (a) Note that the estimates embody assumptions about the behaviour of existing reporters under changes in regime. This accounts for apparent differences between tables.

Figure 1 Relationship between 30MW generation capacity and Natural Gas use

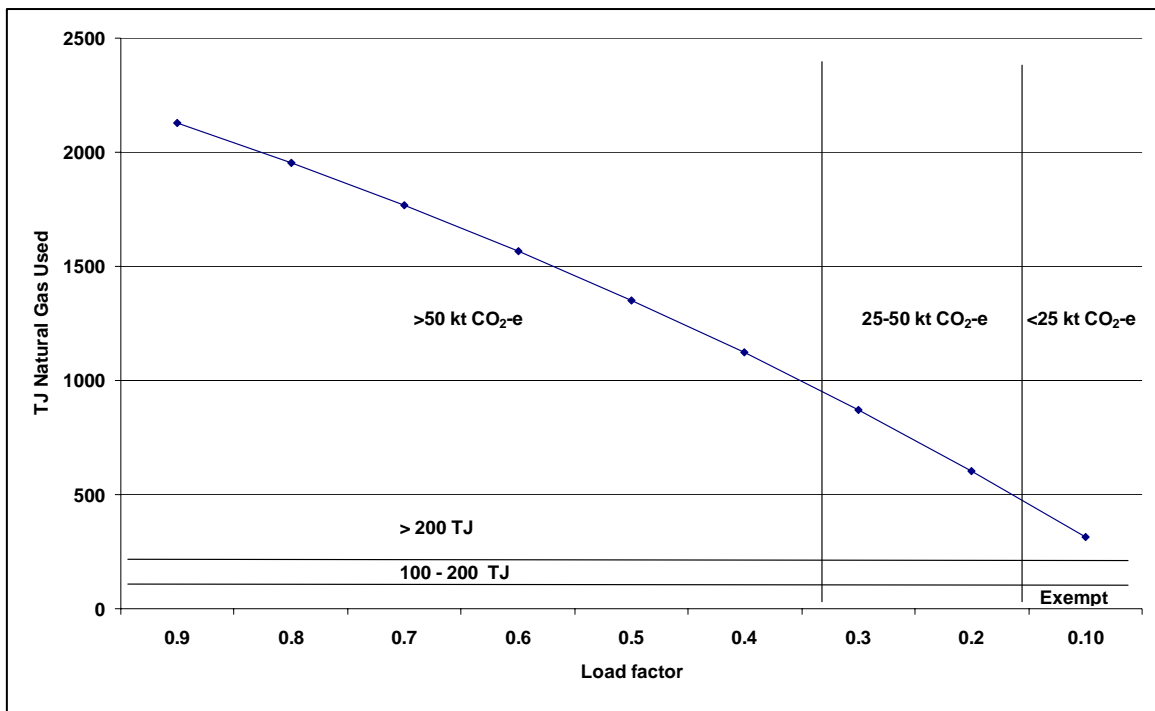


Figure 2 Estimated coverage of sector emissions by facility (NOT business) emission thresholds

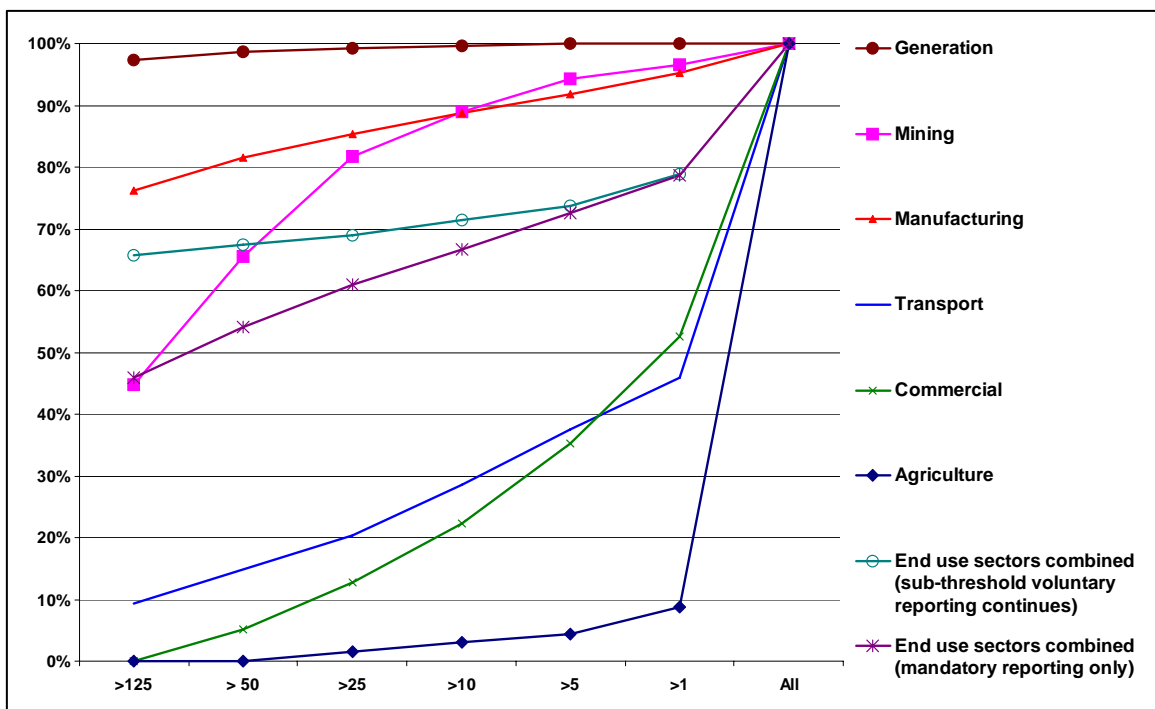


Figure 3 Number of sites meeting Triggers A and B by sector

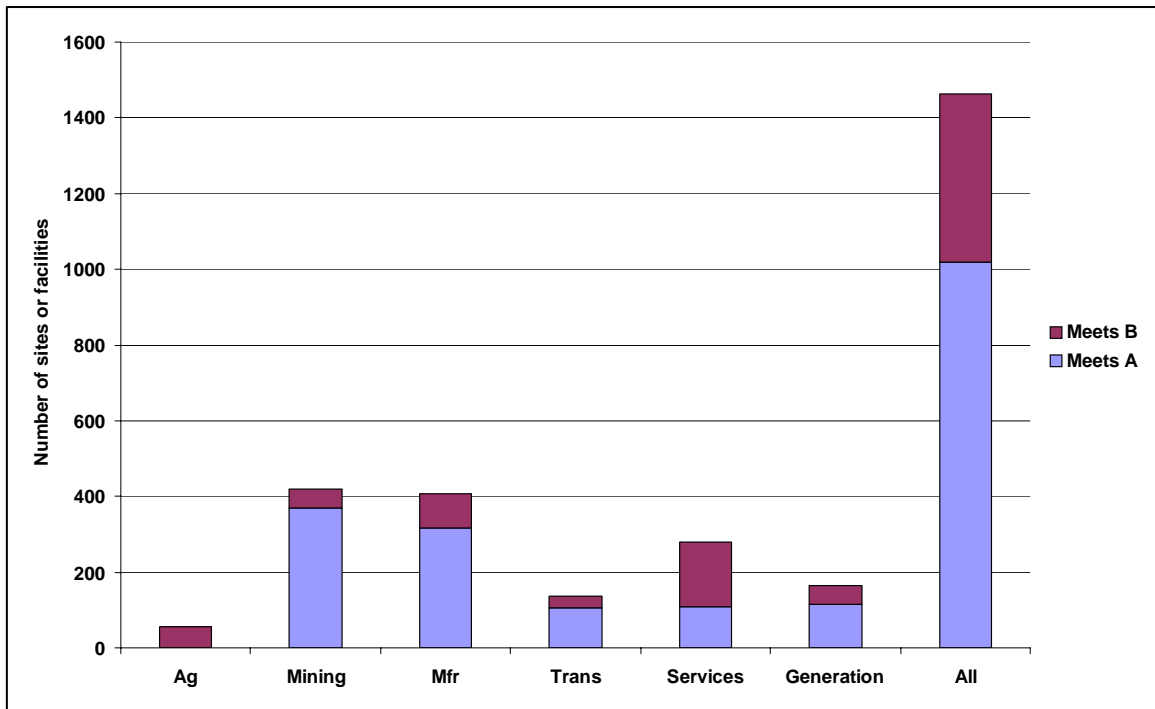
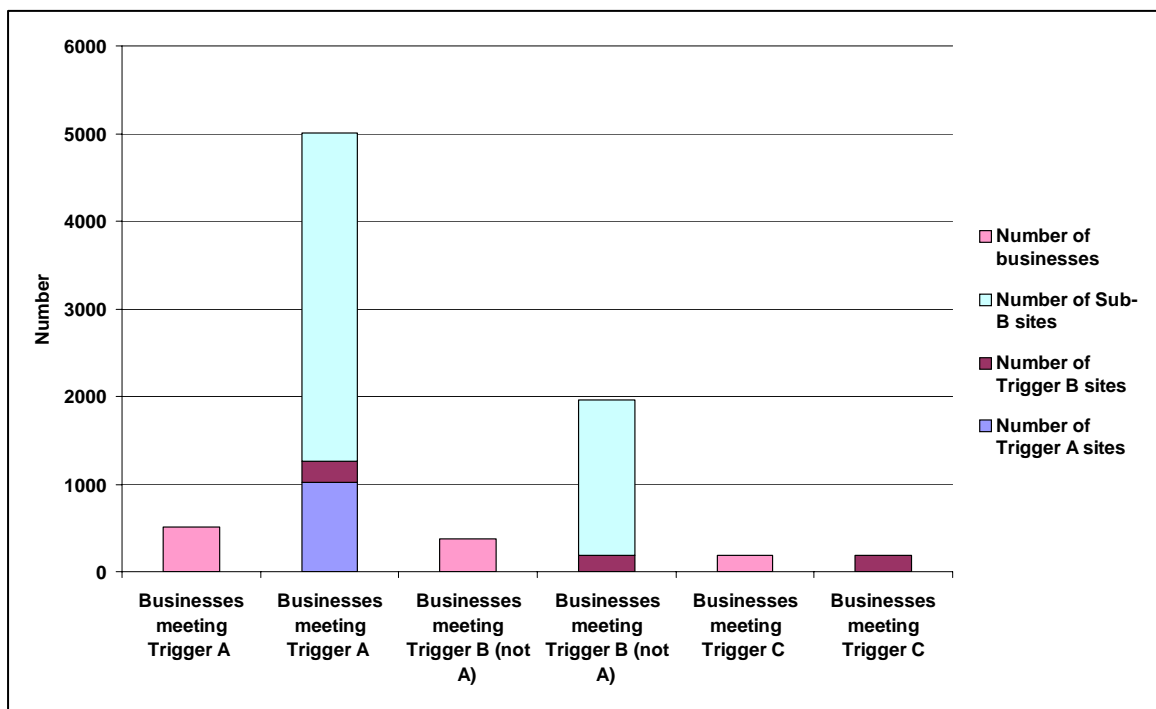


Figure 4 Number of business meeting Triggers A, B and C and sites covered



References

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