

**APPENDIX 12B. GOVERNMENT REGULATORY IMPACT MODEL (GRIM)
OVERVIEW**

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APPENDIX 12B. GOVERNMENT REGULATORY IMPACT MODEL (GRIM)

12B.1 INTRODUCTION AND PURPOSE

The purpose of the Government Regulatory Impact Model (GRIM) is to help quantify the impacts of energy conservation standards and other regulations on manufacturers. The basic mode of analysis is to estimate the change in value of the industry or manufacturers(s) following a regulation or a series of regulations. The model structure also allows an analysis of multiple products with regulations taking effect over a period of time, and of multiple regulations on the same products.

Industry net present value is defined, for the purpose of this analysis, as the discounted sum of industry free cash flows plus a discounted terminal value. The model calculates the actual cash flows by year and then determines the present value of those cash flows both without an amended energy conservation standard (*i.e.*, the base case) and under different trial standard levels (TSLs).

Output from the model consists of summary financial metrics, graphs of major variables, and, when appropriate, access to the complete cash flow calculation.

12B.2 MODEL DESCRIPTION

The basic structure of the GRIM is a standard annual cash flow analysis that uses manufacturer selling prices, manufacturing costs, a shipments forecast, and financial parameters as inputs and accepts a set of regulatory conditions as changes in costs and investments. The cash flow analysis is separated into two major blocks: income and cash flow. The income calculation determines net operating profit after taxes. The cash flow calculation converts net operating profit after taxes into an annual cash flow by including investment and non-cash items. Below are definitions of listed items on the printout of the output sheet (see section 12.B.3).

- (1) **Unit Sales:** Total annual shipments for the industry were obtained from the National Impact Analysis Spreadsheet;
- (2) **Revenues:** Annual revenues - computed by multiplying unit prices at each efficiency level by the appropriate manufacturer markup;
- (3) **Labor:** The portion of cost of goods sold (COGS) that includes direct labor, commissions, dismissal pay, bonuses, vacation, sick leave, social security contributions, fringe, and assembly labor up-time;
- (4) **Material:** The portion of COGS that includes materials;
- (5) **Overhead:** The portion of COGS that includes indirect labor, indirect material, energy use, maintenance, depreciation, property taxes, and insurance related to assets. While included in overhead, the depreciation is shown as a separate line item;

- (6) **Depreciation:** Annual depreciation computed as a percentage of **Revenues (2)**. While included in overhead, the depreciation is shown as a separate line item;
- (7) **Stranded Assets:** In the compliance year of the standard, a one-time write-off of net property, plant, and equipment (PPE) assets to account for the book value of these assets that would have enjoyed a longer life if not for the standard;
- (8) **Standard SG&A:** Selling, general, and administrative costs are computed as a percentage of **Revenues (2)**;
- (9) **R&D:** the GRIM separately accounts for ordinary research and development (R&D) as a percentage of **Revenues (2)**;
- (10) **Product Conversion Costs:** Product conversion costs are one-time investments in research, development, testing, marketing, and other costs focused on making equipment designs comply with the new energy conservation standard. The GRIM allocates these costs over the period between the standard's announcement and the effective date;
- (11) **Earnings Before Interest and Taxes (EBIT):** Includes profit before deductions for interest paid and taxes;
- (12) **EBIT as a Percentage of Sales (EBIT/Revenues):** the GRIM calculates EBIT as a percentage of sales to compare with the industry's average reported in financial statements;
- (13) **Taxes:** Taxes on **EBIT (11)** are calculated by multiplying the tax rate contained in Major Assumptions by **EBIT (11)**.
- (14) **Net Operating Profits After Taxes (NOPAT):** Computed by subtracting **Cost of Goods Sold ((3) to (6))**, **SG&A (8)**, **R&D (9)**, **Product Conversion Costs (10)**, and **Taxes (13)** from **Revenues (2)**.
- (15) **NOPAT repeated:** NOPAT is repeated in the Statement of Cash Flows;
- (16) **Depreciation repeated:** Depreciation and Stranded Assets are added back in the Statement of Cash Flows because they are non-cash expenses;
- (17) **Change in Working Capital:** Change in cash tied up in accounts receivable, inventory, and other cash investments necessary to support operations is calculated by multiplying working capital (as a percentage of revenues) by the change in annual revenues.
- (18) **Cash Flow From Operations:** Calculated by taking **NOPAT (15)**, adding back non-cash items such as a **Depreciation (16)**, and subtracting out **Change in Working Capital (17)**;
- (19) **Ordinary Capital Expenditures:** Ordinary investments in property, plant, and equipment to maintain and replace existing production assets, computed as a percentage of **Revenues (2)**;

- (20) **Capital Conversion Costs:** Capital conversion costs are one-time investments in property, plant, and equipment to adapt or change existing production facilities so that new product designs can be fabricated and assembled under the new regulation;
- (21) **Capital Investment:** Total investments in property, plant, and equipment are computed by adding **Ordinary Capital Expenditures (19)** and **Capital Conversion Costs(20)**;
- (22) **Free Cash Flow:** Annual cash flow from operations and investments; computed by subtracting **Capital Investment (21)** from **Cash Flow from Operations (18)**
- (23) **Terminal Value:** Estimate of the continuing value of the industry after 2043. Computed by growing the Free Cash Flow in year 2043 at a constant rate in perpetuity;
- (24) **Present Value Factor:** Factor used to calculate an estimate of the present value of an amount to be received in the future;
- (25) **Discounted Cash Flow: Free Cash Flows (22)** multiplied by the **Present Value Factor (24)**. For 2043 the discounted cash flow includes the discounted **Terminal Value (23)**; and
- (26) **Industry Value thru 2043:** The sum of **Discounted Cash Flows (25)**.

12B.3 DETAILED CASH FLOW EXAMPLE

STANDARD CASE SCENARIO		2007	2008	2009	2010	Base Year 2011	2012	2013	Standard Year 2014	2015	2016	2017	2018	2019	2020
Industry Income Statement															
Unit Sales		11,851	11,340	9,626	14,028	14,668	15,060	15,206	15,001	14,794	14,280	13,696	13,501	13,826	14,540
Revenues		\$ 1,820.7	\$ 1,742.2	\$ 1,478.8	\$ 2,155.1	\$ 2,253.5	\$ 2,313.6	\$ 2,336.0	\$ 2,389.6	\$ 2,356.6	\$ 2,274.8	\$ 2,181.7	\$ 2,150.7	\$ 2,202.4	\$ 2,316.2
<i>Cost of Sales</i>															
Labor		\$ 127.6	\$ 122.1	\$ 103.6	\$ 151.0	\$ 157.9	\$ 162.2	\$ 163.7	\$ 167.5	\$ 165.2	\$ 159.4	\$ 152.9	\$ 150.7	\$ 154.4	\$ 162.3
Material		\$ 1,216.1	\$ 1,163.6	\$ 987.7	\$ 1,439.5	\$ 1,505.2	\$ 1,545.3	\$ 1,560.3	\$ 1,596.0	\$ 1,574.0	\$ 1,519.4	\$ 1,457.2	\$ 1,436.5	\$ 1,471.1	\$ 1,547.1
Overhead		\$ 39.4	\$ 37.7	\$ 32.0	\$ 46.7	\$ 48.8	\$ 50.1	\$ 50.6	\$ 51.7	\$ 51.0	\$ 49.2	\$ 47.2	\$ 46.6	\$ 47.7	\$ 50.1
Depreciation		\$ 61.4	\$ 58.8	\$ 49.9	\$ 72.7	\$ 76.0	\$ 78.0	\$ 78.8	\$ 80.6	\$ 79.5	\$ 76.7	\$ 73.6	\$ 72.5	\$ 74.3	\$ 78.1
Stranded Assets		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
<i>Selling, General and Administrative</i>															
Standard SG&A		\$ 227.2	\$ 217.4	\$ 184.6	\$ 269.0	\$ 281.2	\$ 288.7	\$ 291.5	\$ 298.2	\$ 294.1	\$ 283.9	\$ 272.3	\$ 268.4	\$ 274.9	\$ 289.1
R&D		\$ 40.2	\$ 38.5	\$ 32.7	\$ 47.6	\$ 49.8	\$ 51.1	\$ 51.6	\$ 52.8	\$ 52.0	\$ 50.2	\$ 48.2	\$ 47.5	\$ 48.6	\$ 51.1
Product Conversion Costs		\$ -	\$ -	\$ -	\$ -	\$ 42.6	\$ 59.7	\$ 68.2	\$ 3.5	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Earnings Before Interest and Taxes (EBIT)		\$ 108.8	\$ 104.1	\$ 88.3	\$ 128.8	\$ 92.0	\$ 78.5	\$ 71.3	\$ 139.3	\$ 140.8	\$ 135.9	\$ 130.3	\$ 128.5	\$ 131.6	\$ 138.4
EBIT/Revenues		6.0%	6.0%	6.0%	6.0%	4.1%	3.4%	3.1%	5.8%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Taxes		\$ 36.9	\$ 35.3	\$ 30.0	\$ 43.7	\$ 31.2	\$ 26.7	\$ 24.2	\$ 47.3	\$ 47.8	\$ 46.1	\$ 44.2	\$ 43.6	\$ 44.7	\$ 47.0
Net Operating Profit after Taxes (NOPAT)		\$ 71.9	\$ 68.8	\$ 58.4	\$ 85.1	\$ 60.8	\$ 51.9	\$ 47.1	\$ 92.0	\$ 93.0	\$ 89.8	\$ 86.1	\$ 84.9	\$ 86.9	\$ 91.4
Cash Flow Statement															
NOPAT		\$ 71.9	\$ 68.8	\$ 58.4	\$ 85.1	\$ 60.8	\$ 51.9	\$ 47.1	\$ 92.0	\$ 93.0	\$ 89.8	\$ 86.1	\$ 84.9	\$ 86.9	\$ 91.4
Depreciation		\$ 61.4	\$ 58.8	\$ 49.9	\$ 72.7	\$ 76.0	\$ 78.0	\$ 78.8	\$ 80.6	\$ 79.5	\$ 76.7	\$ 73.6	\$ 72.5	\$ 74.3	\$ 78.1
Change in Working Capital		\$ -	\$ 2.3	\$ 7.7	\$ (19.9)	\$ (2.9)	\$ (1.8)	\$ (0.7)	\$ (1.6)	\$ 1.0	\$ 2.4	\$ 2.7	\$ 0.9	\$ (1.5)	\$ (3.3)
Cash Flows from Operations		\$ 133.3	\$ 129.8	\$ 116.0	\$ 137.8	\$ 133.9	\$ 128.1	\$ 125.3	\$ 171.0	\$ 173.5	\$ 168.9	\$ 162.4	\$ 158.3	\$ 159.7	\$ 166.2
Ordinary Capital Expenditures		\$ (64.4)	\$ (61.6)	\$ (52.3)	\$ (76.2)	\$ (79.7)	\$ (81.8)	\$ (82.6)	\$ (84.5)	\$ (83.3)	\$ (80.4)	\$ (77.2)	\$ (76.1)	\$ (77.9)	\$ (81.9)
Capital Conversion Costs		\$ -	\$ -	\$ -	\$ -	\$ (2.0)	\$ (2.8)	\$ (3.2)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Capital Investments		\$ (64.4)	\$ (61.6)	\$ (52.3)	\$ (76.2)	\$ (81.7)	\$ (84.6)	\$ (85.8)	\$ (84.5)	\$ (83.3)	\$ (80.4)	\$ (77.2)	\$ (76.1)	\$ (77.9)	\$ (81.9)
Free Cash Flow		\$ 68.9	\$ 68.2	\$ 63.7	\$ 61.6	\$ 52.2	\$ 43.5	\$ 39.5	\$ 86.5	\$ 90.1	\$ 88.5	\$ 85.3	\$ 82.3	\$ 81.8	\$ 84.3
Terminal Value		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Present Value Factor		0.000	0.000	0.000	0.000	1.000	0.933	0.871	0.813	0.758	0.708	0.660	0.616	0.575	0.537
Discounted Cash Flow		\$ -	\$ -	\$ -	\$ -	\$ 52.21	\$ 40.64	\$ 34.38	\$ 70.31	\$ 68.34	\$ 62.60	\$ 56.32	\$ 50.70	\$ 47.04	\$ 45.23
Industry Value thru 2043				\$ 1,283.53											