

**APPENDIX Y. GOVERNMENT REGULATORY IMPACT MODEL (GRIM)**

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## APPENDIX Y. GOVERNMENT REGULATORY IMPACT MODEL (GRIM)

### Y.1 INTRODUCTION AND PURPOSE

The purpose of the Government Regulatory Impact Model (GRIM) is to help identify the effects of various efficiency regulations and other regulations on manufacturers. The basic mode of analysis is to determine the change in value of the manufacturer(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 product.

Industry value is defined, for the purposes of this analysis as the present value of cash flows for the manufacturer(s) in question. The model calculates the actual cash flows by year and then determines the present value of those cash flows both without regulations, base case, and under different trial standard levels (TSLs).

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

### Y.2 MODEL DESCRIPTION

The basic structure of the GRIM is a standard annual cash flow analysis that uses price and volume information as an input, builds on fundamental base cost information, 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 the profit after taxes but before financial charges. The cash flow calculation converts 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 Y.3)

(1) **Unit Sales:** Total annual shipments for the industry were obtained from the National Energy Savings Spreadsheet. The distribution of shipments by efficiency level was modified based on feedback from manufacturers regarding the ability to sell baseline and premium products depending on the standard level proposed;

(2) **Revenues:** Annual revenues - computed by multiplying equipment unit price at each efficiency level by the appropriate manufacturer markup;

(3) **Labor:** Factory direct labor and fringe benefit costs;

(4) **Material:** Purchased materials and components;

(5) **Overhead:** Factory overhead excluding depreciation;

- (6) **Freight:** Annual shipping costs computed as a percentage of **Revenues (2)**;
- (7) **Depreciation:** Annual depreciation computed as a percentage of **Revenues (2)**;
- (8) **Standard SG&A:** Selling, general and administrative costs are computed as a percentage of **Revenues (2)**;
- (9) **R&D:** GRIM separately accounts for ordinary R&D of 1.3 percent of **Revenues (2)**;
- (10) **Product Conversion:** Conversion expenses are one-time investments in research, development, testing, and marketing focused on making product designs comply with the new efficiency standard. GRIM allocates these costs over the period between the standard's announcement and effective dates;
- (11) **Earnings Before Interest and Taxes (EBIT):** Includes profits before deductions for interest paid and taxes;
- (12) **Stranded Assets:** A one time write-down on stranded assets is computed as the difference between the GRIM two capital expenditures scenarios;
- (13) **EBIT as a Percentage of Sales:** The GRIM calculates EBIT as a percentage of sales as a comparison with the industry's average reported in financial statements;
- (14) **Taxes:** Taxes on **EBIT (11)** are calculated by multiplying the tax rate contained in Major Assumptions by **EBIT (11)**.
- (15) **Net Operating Profits After Taxes (NOPAT):** Profit after taxes and any financing costs; computed by subtracting **Cost of Sales ((3) to (7))**, **SG&A (8)**, **R&D (9)**, and **Product Conversion (10)** from **Revenues (2)**;
- (16) **NOPAT repeated:** NOPAT is repeated in the Statement of Cash Flows;
- (17) **Depreciation repeated:** Depreciation is repeated in the Statement of Cash Flows;
- (18) **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 (2)** by the change in annual revenues.
- (19) **Cash Flow From Operations:** Calculated by taking **NOPAT (16)**, adding back non-cash items such as a **Depreciation (17)**, and subtracting out **Change in Working Capital (18)**;
- (20) **Ordinary Capital Expenditures:** Ordinary investments in property, plant, and equipment to maintain and replace existing production assets computed as a percentage of **Revenues (2)**;

**(21) Conversion Capital Expenditures:** Conversion capital-expenditures 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;

**(22) Capital Investments:** Total investments in property, plant, and equipment is computed by adding *Ordinary Capital Expenditures (19)* and *Conversion Capital Expenditures (20)*;

**(23) Net Cash Flow:** Annual cash flow from operations and investments; computed by subtracting *Cash Used in Investments (21)* from *Cash Flow from Operations (18)*;

**(24) Terminal Value:** Estimate of the continuing value of the industry after 2035 and computed by growing the Free Cash Flow in year 2038 at a constant rate in perpetuity;

**(25) Present Value Factor:** Factor used to calculate an estimate of the present value of an amount to be received in the future;

**(26) Discounted Cash Flow:** *Net Cash Flows (23)* multiplied by the *Present Value Factor (25)*. For 2035 the discounted cash flow includes the discounted *Terminal Value (24)*;

**(27) Industry Net Present Value:** The sum of *Discounted Cash Flows (26)*;

STANDARD CASE SCENARIO		Annoucem ent Year												
		2003	Base Year 2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
<b>Income Statement (mln)</b>														
(1)	Unit Sales	0.127	0.119	0.113	0.107	0.104	0.102	0.101	0.100	0.098	0.095	0.092	0.090	
(2)	Revenues	\$ 105	\$ 99	\$ 94	\$ 89	\$ 86	\$ 85	\$ 84	\$ 83	\$ 81	\$ 78	\$ 76	\$ 74	
<i>Cost of Sales</i>														
(3)	Labor	15.9%	\$ 17	\$ 16	\$ 15	\$ 14	\$ 14	\$ 13	\$ 13	\$ 13	\$ 13	\$ 12	\$ 12	
(4)	Material	46.3%	\$ 49	\$ 46	\$ 43	\$ 41	\$ 40	\$ 39	\$ 39	\$ 38	\$ 38	\$ 36	\$ 34	
(5)	Overhead	5.0%	\$ 5	\$ 5	\$ 5	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	
(6)	Freight	4.5%	\$ 5	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 3	\$ 3	
(7)	Depreciation	2.00%	\$ 2.10	\$ 1.98	\$ 1.87	\$ 1.77	\$ 1.73	\$ 1.69	\$ 1.68	\$ 1.65	\$ 1.62	\$ 1.57	\$ 1.52	\$ 1.48
<i>Selling, General and Administrative</i>														
(8)	Standard SG&A	21.0%	\$ 22	\$ 21	\$ 20	\$ 19	\$ 18	\$ 18	\$ 18	\$ 17	\$ 17	\$ 16	\$ 16	\$ 16
(9)	R&D	1.2%	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	
(10)	Product Conversion Expense		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 0.2	\$ 1.4	\$ 3.0	\$ 3.7	
(11)	EBIT	3.7%	\$ 4.29	\$ 4.03	\$ 3.82	\$ 3.62	\$ 3.52	\$ 3.45	\$ 3.42	\$ 3.37	\$ 3.14	\$ 1.78	\$ 0.10	\$ (0.72)
(12)	One-time writeoff on stranded assets												\$ 3	
(13)	EBT as % of Revenues	4.08%	4.08%	4.08%	4.08%	4.08%	4.08%	4.08%	4.08%	4.08%	3.87%	2.27%	0.13%	-0.98%
(14)	Taxes	42.5%	\$ 2	\$ 2	\$ 2	\$ 2	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 1	\$ 0	\$ -
(15)	NOPAT		\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 1	\$ 0	\$ (1)
			2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.35%	2.23%	1.31%	0.08%	-0.98%
<b>Cash Flow Statement</b>														
(16)	NOPAT	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 1	\$ 0	\$ (1)
(17)	Depreciation	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 2	\$ 1
(18)	Change in Working Capital	\$ -	\$ 0.83	\$ 0.69	\$ 0.64	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
(19)	Cash Flows from Operations	\$ 5	\$ 5.13	\$ 4.76	\$ 4.49	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 4	\$ 3	\$ 2	\$ 1
(20)	Ordinary Capital Expenditures	\$ (1.79)	\$ (1.68)	\$ (1.59)	\$ (1.51)	\$ (1.47)	\$ (1.44)	\$ (1.42)	\$ (1.40)	\$ (1.38)	\$ (1.33)	\$ (1.29)	\$ (1.26)	
(21)	Conversion Capital Expenditures	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ (0.1)	\$ (1.2)	\$ (2.5)	\$ (3.2)	
(22)	Cash Used In Investment	\$ (2)	\$ (2)	\$ (2)	\$ (1.51)	\$ (1)	\$ (1)	\$ (1)	\$ (1)	\$ (2)	\$ (3)	\$ (4)	\$ (4)	
(23)	Net Cash Flow	\$ 3	\$ 3	\$ 3	\$ 2.99	\$ 3	\$ 2	\$ 2	\$ 2	\$ 2	\$ 0	\$ (2)	\$ (3)	
(24)	Terminal Value	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
(25)	Present Value Factor	1.00	0.94	0.89	0.84	0.79	0.74	0.70	0.66	0.62	0.59	0.55	0.52	
(26)	Discounted Cash Flow	\$ 3	\$ 3	\$ 3	\$ 2.50	\$ 2	\$ 2	\$ 2	\$ 2	\$ 1	\$ 0	\$ (1)	\$ (2)	
(27)	Industry Value thru 2038	<b>\$ 29.28</b>												