



## **Commercial Harbor Craft Proposed Regulation Workshop**

Sacramento  
April 24, 2007

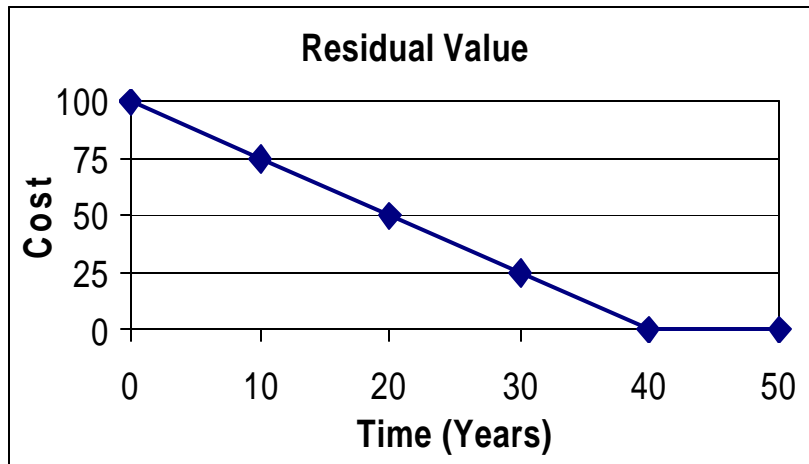


California Environmental Protection Agency

Air Resources Board

## **Commercial Harbor Craft Cost Estimates**

- ◆ Costs for Ferries, Tugs, and Tows
- ◆ Estimate Costs for New Engine Replacement
- ◆ Estimate Costs for Major Rebuilds and Top End Rebuilds



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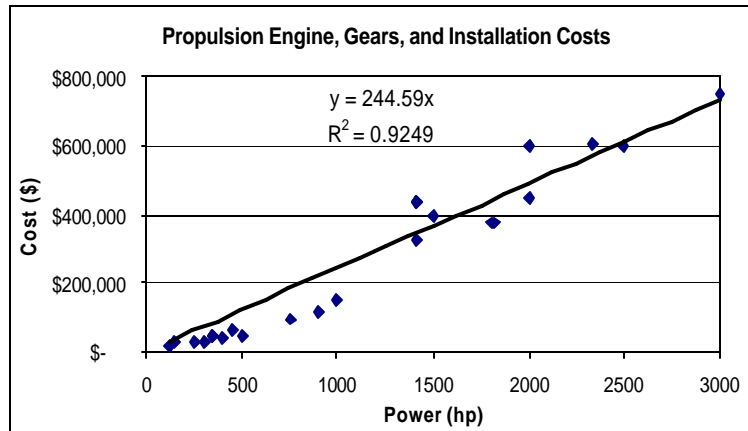
## Non-Fishing Vessel Costs

Replace Engines with Tier II Engines

- ◆ Carl Moyer and POLA AIR Quality Mitigation Program 2005-6 for Propulsion Engines ~ \$245/hp
- ◆ POLA AIR Quality Mitigation Program 2005-6 for Auxiliary Engines ~ \$233/hp

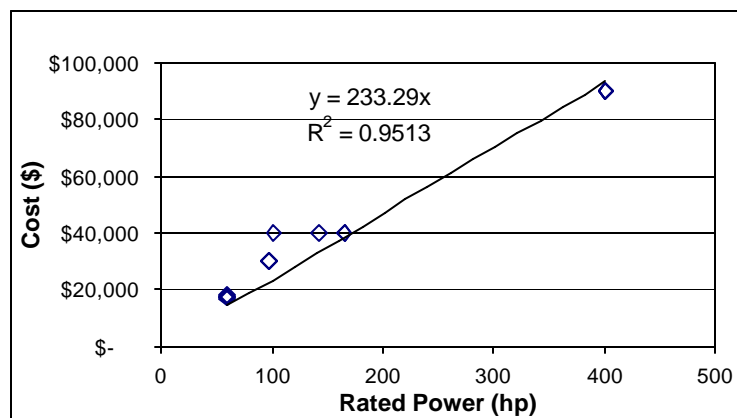
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## Non-Fishing Propulsion Engine Replacement Costs



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## Marine Auxiliary Engine Replacement Costs



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## Marine Engine Life Expectancy

		Estimated Engine Life Expectancy (Years)	
Vessel Type	Engine Type	Useful Life	Total Life
Ferry	Prop	20	40
Ferry	Aux	20	40
Tug	Prop	21	42
Tug	Aux	22.5	45
Tow	Prop	30	60
Tow	Aux	25	50

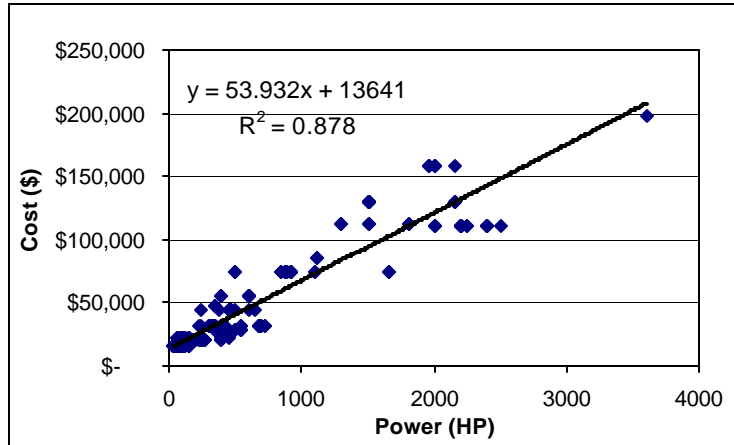
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## Marine Engine Rebuild Frequency

- ◆ **Majority of Engines:**
  - Major Rebuild every 10 years
  - Top End or Minor Rebuild every 5 years
    - In Between Major Rebuilds
- ◆ **EMD Engines:**
  - Major Rebuild every 14 years
  - Minor Rebuild every 7 years
- ◆ **Two Caterpillar Models (D397, D398):**
  - Major Rebuild every 8 years
  - Minor Rebuild every 4 years

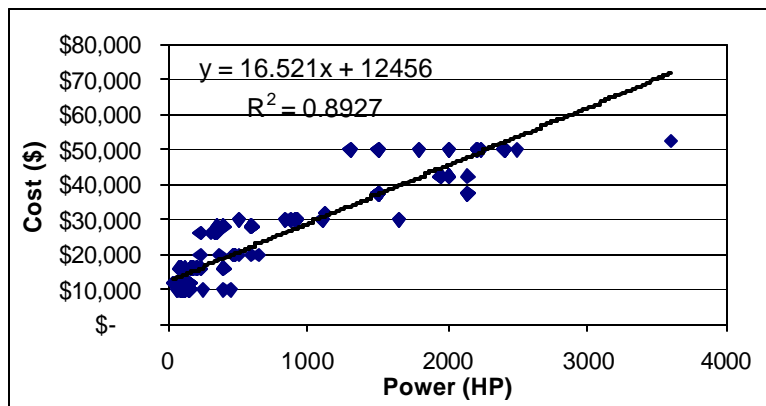
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## Major Rebuild Cost Default Value



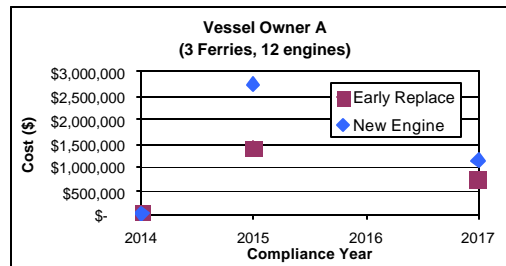
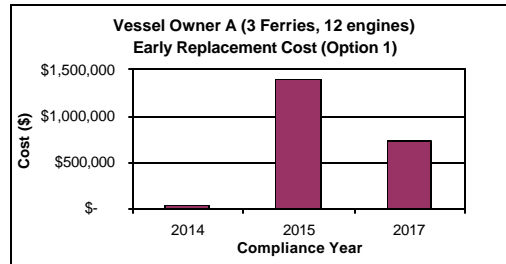
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## Top End Rebuild Cost Default Value



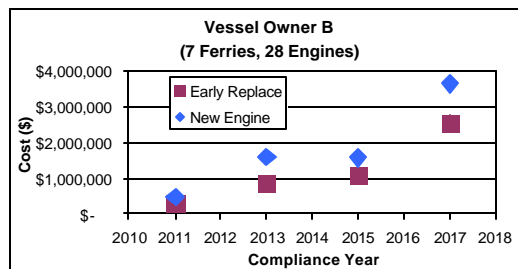
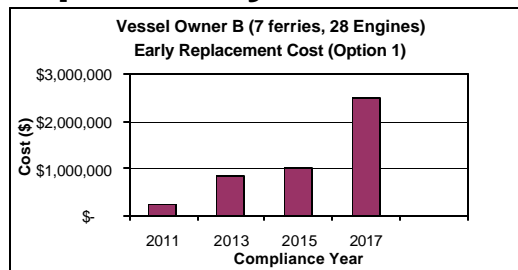
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## Example: Ferry - Small Fleet



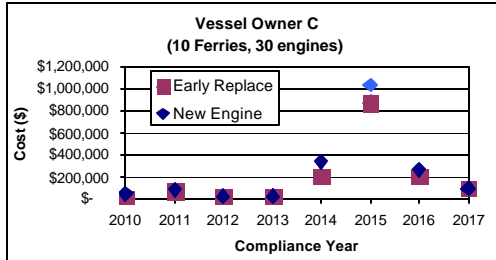
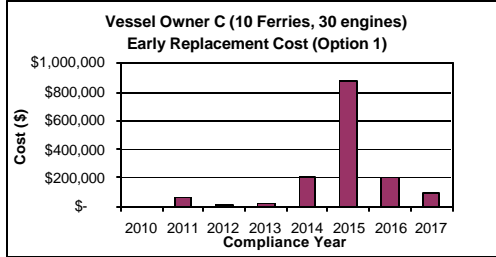
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## Example: Ferry - Midsize Fleet



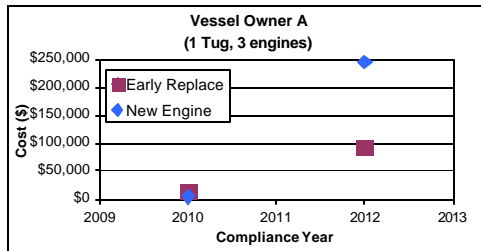
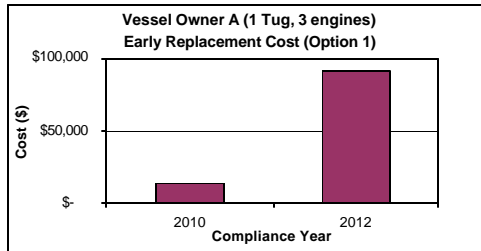
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# Example: Ferry - Larger Fleet



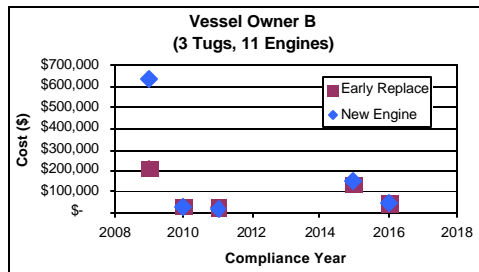
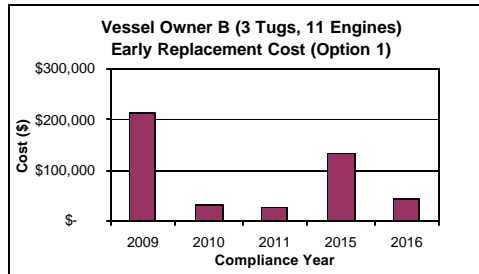
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# Example: Tug - Small Fleet



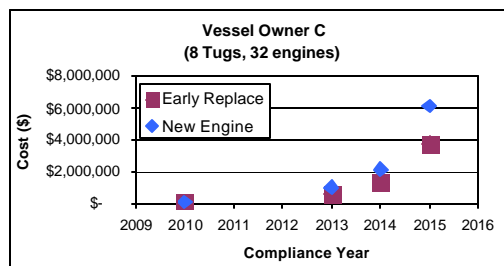
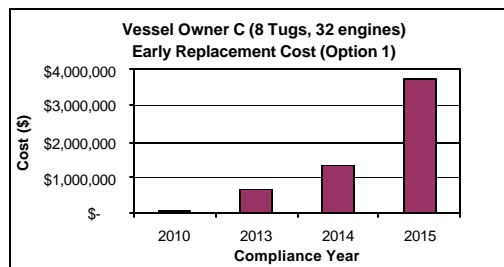
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## Example: Tug - Midsize Fleet



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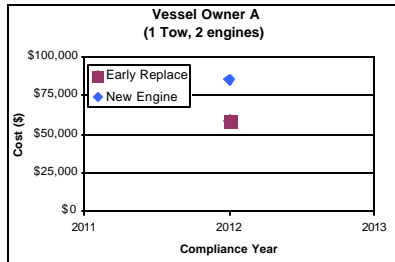
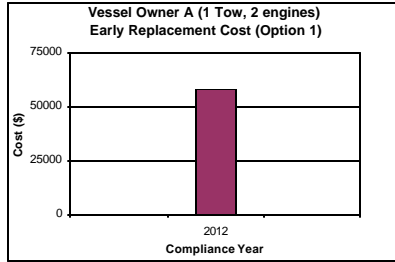
## Example: Tug - Larger Fleet



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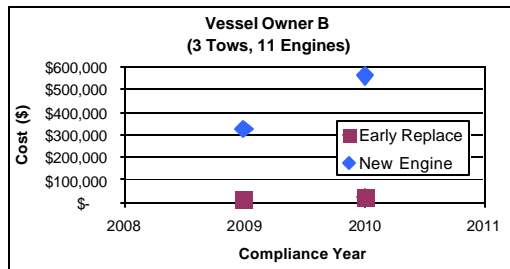
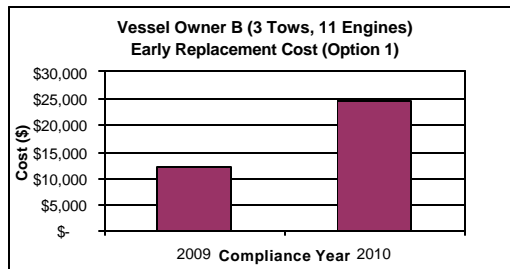


## Example: Tow - Small Fleet



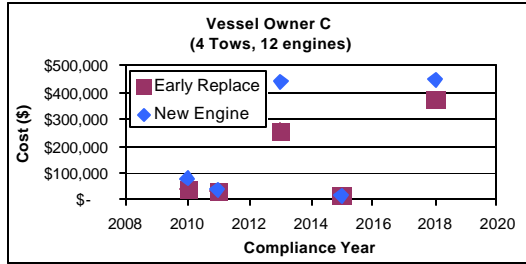
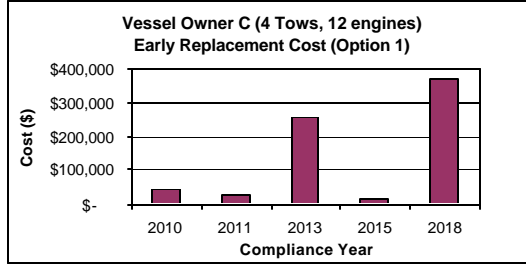
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## Example: Tow - Midsize Fleet



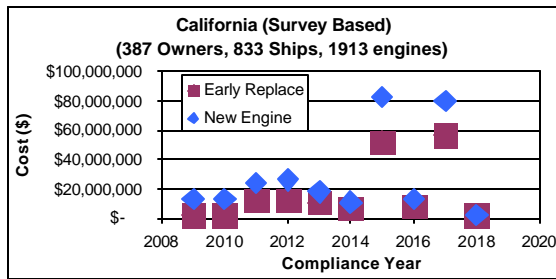
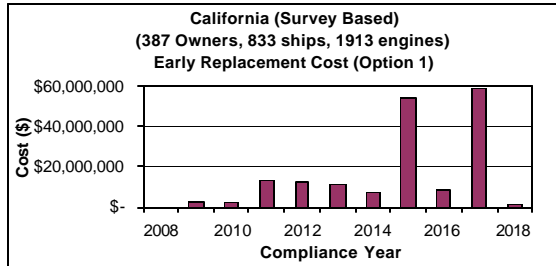
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# Example: Tow - Larger Fleet



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# California Costs



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## California Costs

		Early Replacement Costs (Option 1)	New Engine Cost
<b>Ferry</b>	Aux	\$10,820,000	\$12,230,000
	Prop	\$104,260,000	\$176,280,000
	<b>Sum</b>	<b>\$115,080,000</b>	<b>\$188,510,000</b>
<b>Tug</b>	Aux	\$3,970,000	\$4,450,000
	Prop	\$41,410,000	\$79,780,000
	<b>Sum</b>	<b>\$45,380,000</b>	<b>\$84,230,000</b>
<b>Tow</b>	Aux	\$700,000	\$790,000
	Prop	\$4,810,000	\$9,240,000
	<b>Sum</b>	<b>\$5,510,000</b>	<b>\$10,030,000</b>
<b>Total</b>	<b>Aux</b>	<b>\$15,500,000</b>	<b>\$17,460,000</b>
	<b>Prop</b>	<b>\$150,470,000</b>	<b>\$265,300,000</b>
	<b>Sum</b>	<b>\$165,970,000</b>	<b>\$282,760,000</b>

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## Cost Effectiveness

	Emissions Reduced		Cost Effectiveness	
	Total NOx (Tons)	Total PM (lbs.)	1/2 Early Replacement \$/Ton NOx	1/2 Early Replacement \$/lb. PM
<b>Sum to 2018</b>	<b>30,370</b>	<b>3,490,000</b>	<b>\$ 2,732</b>	<b>\$ 24</b>
<b>Sum to 2025</b>	<b>62,290</b>	<b>8,187,000</b>	<b>\$ 1,332</b>	<b>\$ 10</b>

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