Emission Benefit Calculations for OTC 2006 Control Measures

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VOC Source Categories

- Categories identified at June 2006 OTC meeting
- Memorandum of Understanding
  - Adhesives and Sealants Application
  - Consumer Products
  - Portable Fuel Containers
- Resolution 06-02
  - Emulsified and Cutback Asphalt Paving
  - Regional Fuels

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VOC Analysis Methods

- Emission Benefit Analysis Method:
  - Starting Point: 2002 MANEVU Inventory
  - 2009 MANEVU Inventory
    - *growth*
    - *on-the-books controls (OTC 2001 model rules, Federal rules, others)*
  - Determined incremental percent reduction from OTC 2006 measure
  - Applied percent reduction to 2009 emission projections
- Benefits Calculated in Two Ways:
  - Assume all States will adopt rule by 2009
    - *documented in the OTC TSD to show potential reductions*
  - Assumes rules adopted according to “matrix” developed by States
    - *documented in the MANEVU BOTW Modeling Inventory TSD*

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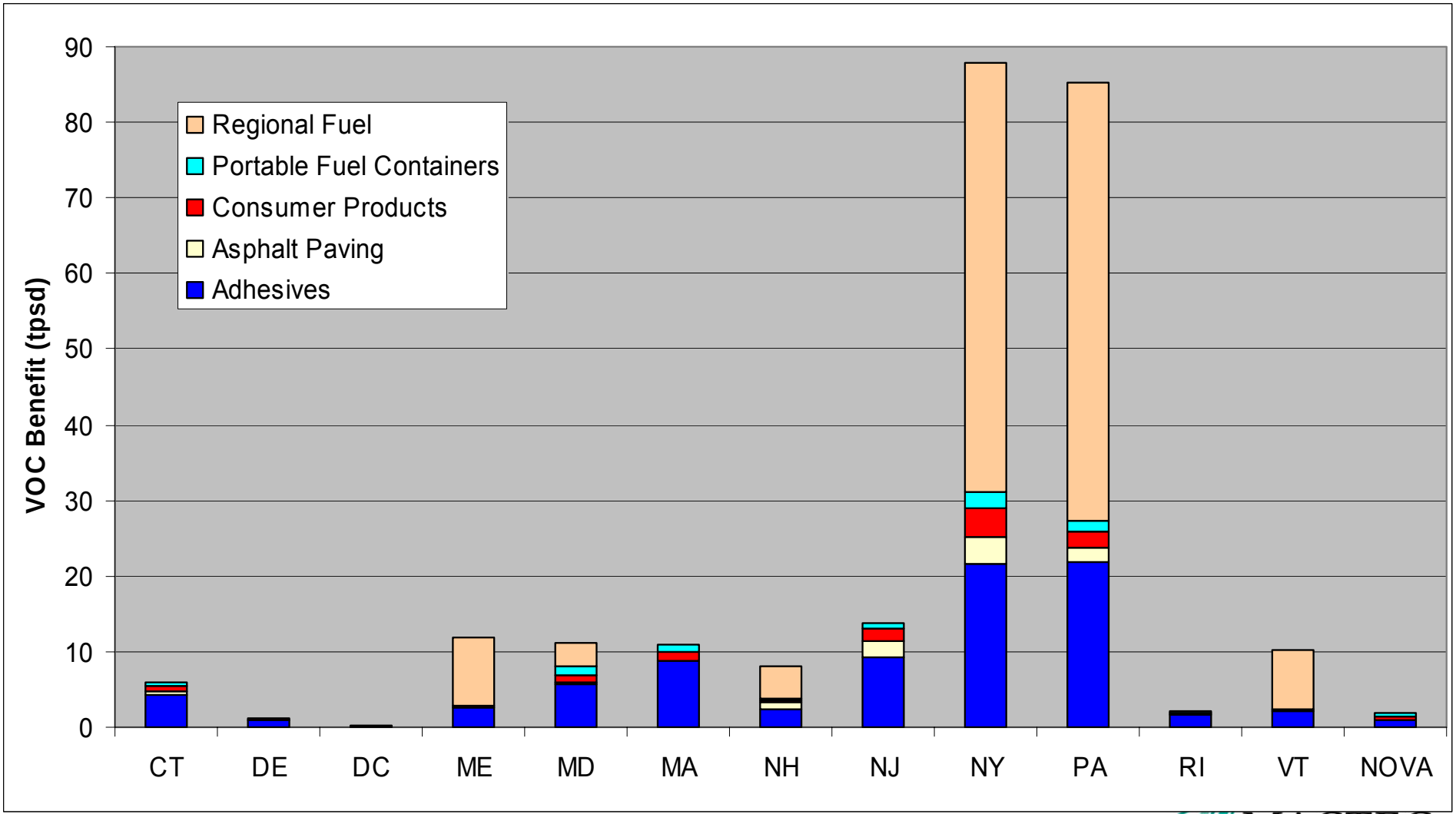
VOC Emission Benefits for 2009

(assuming all States adopt all measures)



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	VOC Emission Benefits in 2009 (tpsd)					
	Adhesive Sealants	Asphalt Paving	Consumer Products	PFCs	Fuels	Total
CT	4.2	0.6	0.7	0.3	0.0	5.9
DE	1.0	0.0	0.1	0.1	0.0	1.3
DC	0.1	0.0	0.1	0.1	0.0	0.3
ME	2.5	0.0	0.2	0.1	9.1	12.0
MD	5.8	0.0	1.0	1.2	3.2	11.2
MA	8.9	0.0	1.1	0.9	0.0	10.9
NH	2.3	1.0	0.3	0.2	4.3	8.0
NJ	9.2	2.3	1.4	0.9	0.0	13.9
NY	21.5	3.7	3.7	2.2	56.9	87.9
PA	21.9	1.9	2.1	1.4	58.0	85.2
RI	1.5	0.2	0.2	0.1	0.0	2.1
VT	2.2	0.0	0.1	0.1	7.9	10.3
No. VA	1.0	<0.1	0.5	0.3	0.0	1.8
OTR	**82.4**	**9.6**	**11.4**	**8.0**	**139.4**	**250.8**

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Adhesives and Sealants

- OTC 2006 MR based on CARB RACT/BARCT
  - VOC content limits, or
  - 85% control if add-on controls used
- CARB Emission Benefits Analysis:
  - Baseline emissions 45 tpd
  - Reductions from 29-35 tpd (64.4 to 77.8% reduction)
- OTC Emission Benefits Analysis:
  - Used lower end of CARB estimates (i.e., 64.4%)

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Cutback and Emulsified Asphalt

- Cutback asphalt
  - OTC 2006 MR: ozone season ban
  - State already ban (with exemptions)
  - Still allow exemptions as in current rules?
- Emulsified asphalt
  - OTC 2006 MR: 2% VOC content limit
  - Current limits vary by state and grade of asphalt
  - Many states used 2.5% in 2002 emission calculations
    - *Roughly 20% reduction*
  - Percent reduction = (1 – (2% VOC/State VOC Limit))

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Consumer Products

- OTC 2006 MR based on CARB July 2005 Amendments
  - 18 categories of consumer products
    - *New categories*
    - *More restrictive limit*
    - *Additional requirements*
- CARB Emission Benefits:
  - 6.05 tpd emission reduction (0.122 lbs/person)
- OTC Emission Benefit:

Current OTC Emission Factor	=	6.06 lbs/capita
Benefit from CARB 2005 amendments	=	0.122 lbs/capita
Percent Reduction	=	100%*(1 - (6.06 – 0.122)/6.06)
	=	2.0%

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Portable Fuel Containers

- OTC 2006 MR based on CARB 2006 Amendments
  - Include kerosene containers and utility jugs
  - Permeability standard
  - Other changes
- CARB Emission Benefits:
  - 58% reduction from 2002 levels at full implementation
- OTC Emission Benefit:
  - Assumes 10-yr turnover instead of 5 years assumed by CARB
  - 10% of the full 58% reduction will be achieved in Year 1
  - 20% of the full 58% reduction will be achieved in Year 2
  - Assume July 2008 effective date (when new PFCs available)
  - 5.8% additional reduction in 2009

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Regional Fuels

State	Current RFG Fraction
CT	100%
DC	100%
DE	100%
MA	100%
MD	86%
ME	0%
NH	64%
NJ	100%
NY	54%
PA	24%
RI	100%
NOVA	100%
VT	0%
OTR	**67%**

NOx Source Categories

- Categories identified at June 2006 OTC meeting
- Memorandum of Understanding
  - Diesel Engine Chip Reflash
- Resolution 06-02
  - Asphalt Production Plants
  - Cement Kilns
  - **Glass Furnaces**
  - **Industrial/Commercial/Institutional Boilers**
  - Regional Fuels
- Statement Concerning Multi-Pollutant Control of EGUs
  - **EGUs**
  - **High Energy Demand Day Units**

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NOx Analysis Methods

- Reviewed Existing Federal and State Rules
- Reviewed OTC 2006 Model Rule or Measure
- Emission Benefit Analysis Method:
  - Starting Point: 2002 MANEVU Inventory
  - 2009 MANEVU Inventory has growth and on-the-books controls
  - Determined incremental percent reduction from OTC 2006 measure
  - Applied percent reduction to 2009 emission projections
- Benefits Calculated in Two Ways:
  - Assume all States will adopt rule by 2009
    - *documented in the OTC TSD to show potential reductions*
  - Assumes rules adopted according to “matrix” developed by States
    - *documented in the MANEVU Modeling Inventory TSD*

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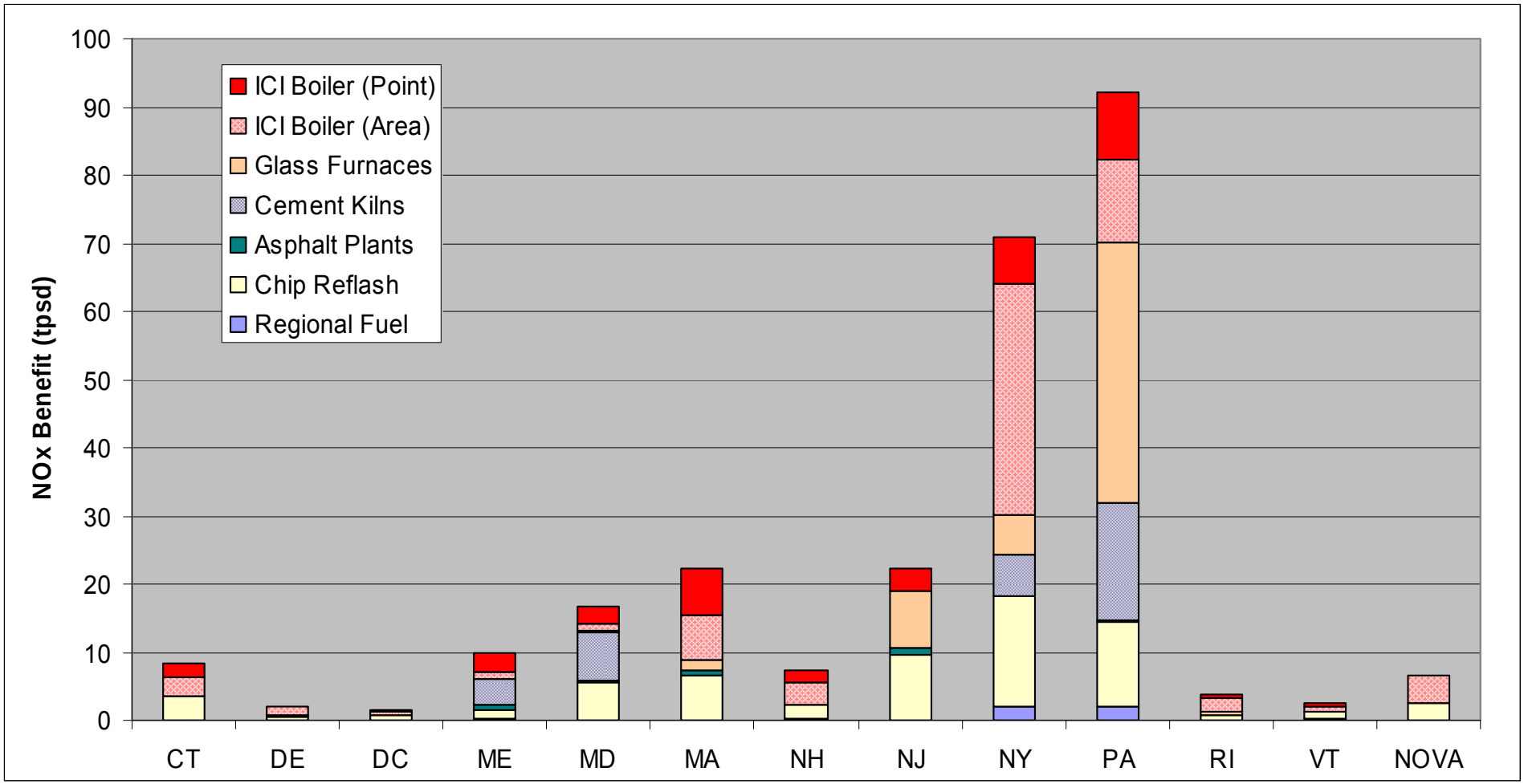
NOx Emission Benefits for 2009

(assuming all States adopt all measures)



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NOx Emission Benefit in 2009 (tpsd)

	Regional Fuels	Chip Reflash	Asph. Plants	Cement Kilns	Glass Furnace	ICI Area	ICI Point	Total
CT	0.0	3.5	0.0	0.0	0.0	2.8	2.1	8.4
DE	0.0	0.6	0.2	0.0	0.0	1.2	0.1	2.1
DC	0.0	0.8	0.0	0.0	0.0	0.4	0.4	1.6
ME	0.2	1.4	0.7	3.8	0.0	1.1	2.8	9.9
MD	0.0	5.6	0.1	7.1	0.3	1.2	2.4	16.7
MA	0.0	6.7	0.6	0.0	1.5	6.6	6.8	22.2
NH	0.2	2.0	0.0	0.0	0.0	3.4	1.9	7.5
NJ	0.0	9.7	1.0	0.0	8.2	0.0	3.4	22.3
NY	2.1	16.1	0.0	6.1	5.8	33.8	7.0	70.9
PA	2.0	12.4	0.2	17.3	38.1	12.2	9.8	92.0
RI	0.0	0.8	0.0	0.0	0.5	2.1	0.5	3.9
VT	0.3	0.9	0.0	0.0	0.0	0.9	0.4	2.5
NOVA	0.0	2.5	0.1	0.0	0.0	3.9	0.1	6.6
OTR	**4.8**	**63.0**	**3.0**	**34.3**	**54.4**	**69.5**	**37.7**	**266.7**

ICI Boilers

- Options by Size Range and Fuel Types
  - 5-25, 25-100, 100-250, >250 mmBtu/hr
  - Natural gas, #2 oil, #4/#6 oil, coal
- Control Options
  - lbs/mmBtu limits
  - % reduction from uncontrolled
  - purchase current year NOx allowances
  - install control technology

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ICI Boilers – June 2006 MOU

Size	Fuel	lbs NOx/mmBtu	% Reduction In 2009 in OTC
<25 mmBtu/hr	All	*	10
25-50 mmBtu/hr	Nat. Gas	0.05	50
	#2 Oil	0.08	50
	#4 or #6 Oil	0.20	50
	Coal	*	*
50-100 mmBtu/hr	Nat. Gas	0.05	10
	#2 Oil	0.08	10
	#4 or #6 Oil	0.20	10
	Coal	*	*
100-250 mmBtu/hr	Nat. Gas	0.10	75
	#2 Oil	0.20	40
	#4 or #6 Oil	0.20	25
	Coal	*	*
>250 mmBtu/hr	All	Same as EGUs of similar size	

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ICI Boilers – Current Proposal

Size	Fuel	lbs NOx/mmBtu	% Reduction In 2009 in OTC
<25 mmBtu/hr	All	*	10
25-50 mmBtu/hr	Nat. Gas	0.05	50
	#2 Oil	0.08	50
	#4 or #6 Oil	0.20	50
	Coal	0.30	50
50-100 mmBtu/hr	Nat. Gas	0.05	10
	#2 Oil	0.08	10
	#4 or #6 Oil	0.20	10
	Coal	0.30	10
100-250 mmBtu/hr	Nat. Gas	0.10	75
	#2 Oil	0.20	40
	#4 or #6 Oil	0.20	25
	Coal	0.08, 0.12, 0.14, 0.22	25
>250 mmBtu/hr	All	0.12 → 0.08	20 → 30

ICI Boilers – State by State Analysis

- Determined current limits in each state
  - By fuel, size range, and boiler type
  - Made simplifying assumptions
  - Matched fuels, size ranges to SCCs in inventory
- Compared state emission limit to OTC proposal
- Calculated percent reduction
  - (1 – (OTC Limit (lbs/mmBtu) / Current Limit (lbs/mmBtu))
- If state did not have a limit for a given size range, used the general percent reduction from uncontrolled

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ICI Boilers – Area Sources

- ICI boilers not at a major source
- In many states, ICI boilers at non-major sources are not subject to RACT limits
- Used the general % reduction from uncontrolled from OTC proposal
  - < 25 mmBtu/hr: 10% reduction
  - 25-100 mmBtu/hr: 50% reduction
- Made assumptions about area source boiler size distribution based on:
  - Boiler capacity by size: Table ES-1, Characterization of the U.S. Industrial/Commercial Boiler Population, May 2005. Oak Ridge National Laboratory

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Glass Furnaces

- OTC Resolution 06-02
  - 85% reduction based on oxy-firing
- Updated based on-going discussions with stakeholders
  - San Joaquin Valley Limits (Block 24-hr, rolling 30 day)
  - 4.0 lbs/ton Container
  - 4.0 lbs/ton Fiberglass
  - 9.2 lbs/ton Flat

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Cement Kilns

- OTC Resolution 06-02
  - 60% reduction from uncontrolled
  - 3.88 lbs/ton for wet kilns
  - 3.44 lbs/ton for long dry kilns
  - 2.36 lbs/ton for preheater
  - 1.52 lbs/ton for precalciner
- Currently assuming 60% reduction from uncontrolled for all kilns

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Asphalt Production Plants

- OTC Resolution 06-02
  - 35% reduction for major sources
  - Low NOx burner technology for minor sources
- Current OTC Control Measure Summary Sheet
  - 35% reduction for major sources
    - *lbs/ton limits vary depending on plant/fuel type*
  - LNB or BMP which result in a 20% reduction in fuel consumption or 20% reduction in NOx emissions

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Heavy-Duty Truck Diesel Engine Chip Reflash

- OTC MR based on California mandatory program
- CARB estimated 35 tpd reduction
  - Roughly 1 tpd for each 1 million people
- OTC reduction expected to be similar
  - Assume 1 tpd for each 1 million people
  - 63 tpd across the OTR
- Note: actual reductions are embedded in the MOBILE6/SMOKE emission modeling files and are difficult to isolate specific reduction attributable to chip reflash

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