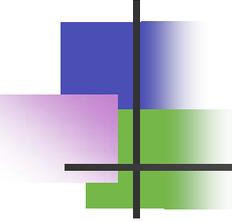


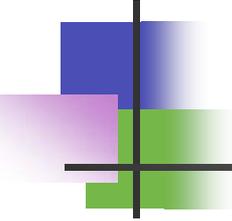
Cool Cars Standards and Test Procedures

California Air Resources Board
Public Workshop
March 12, 2009



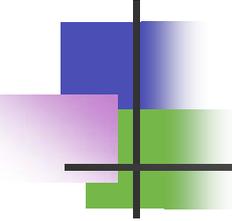
Agenda

- Introductions
- Background
- ARB's Current Proposal
- Costs
- Benefits
- Benefits Methodology
- Upcoming Activities
- Discussion & Public Comment



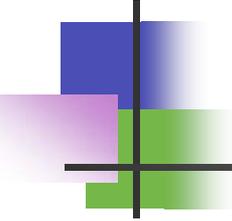
AB 32 Background

- AB 32 is California's Global Warming Solutions Act of 2006
- Requires CA to reduce GHG emissions to 1990 levels by 2020 (25%)
- Cool paints was identified as an early action approach to reduce GHGs from motor vehicle air conditioners use



Cool Cars Measure

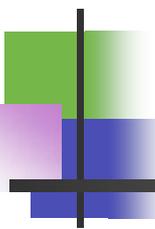
- Proposes to reduce CO₂ emissions by reducing interior temperatures of parked vehicles
- Reduced interior temperatures can reduce a/c capacity and likelihood of a/c use
- Smaller a/c or less operation results in less fuel used
- Less fuel used results in less vehicle CO₂ emissions



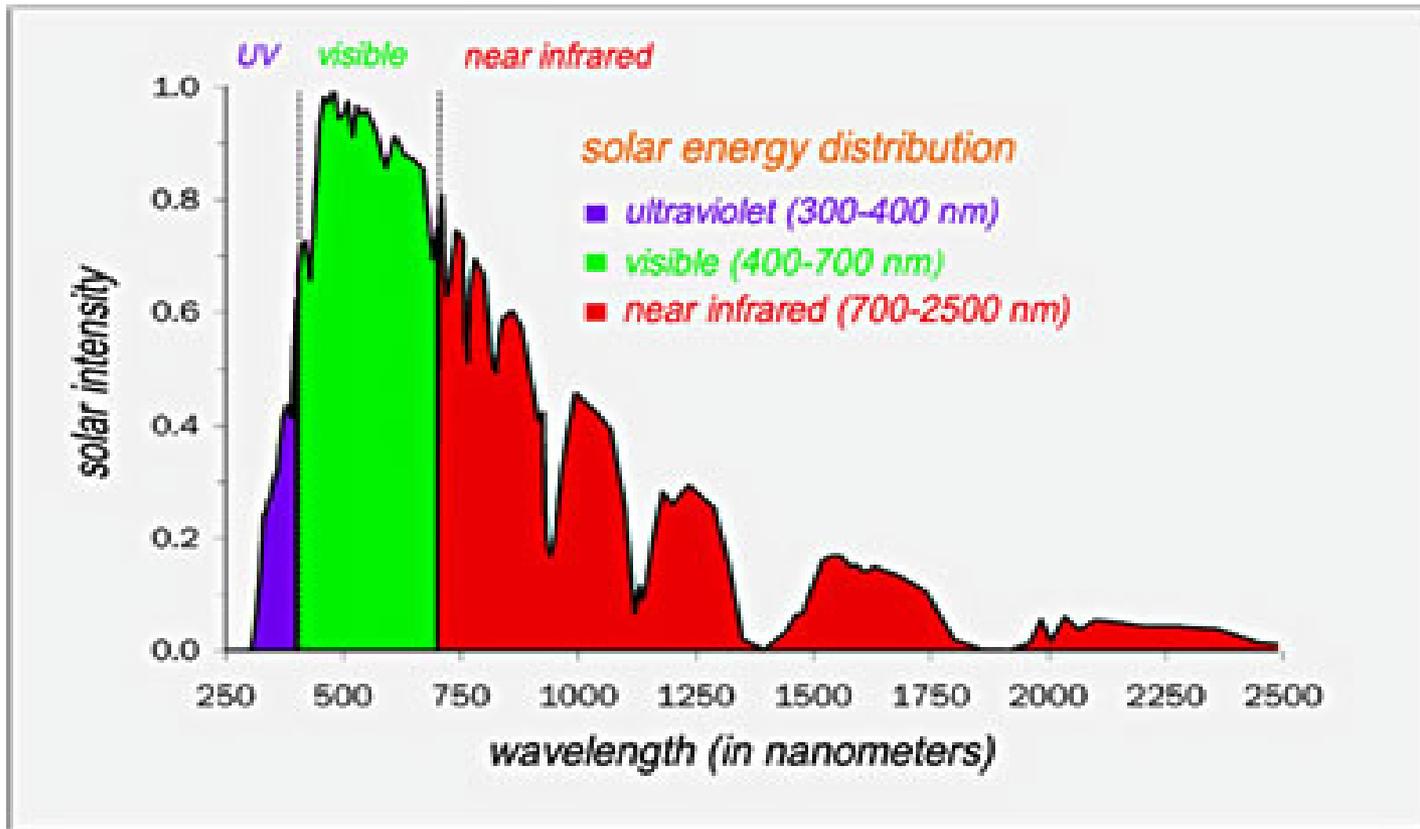
Current Proposal

- Two components:
 - Paint and coating requirements
 - Window glazing requirements
- Population:
 - LDV and MDV \leq 10,000 lbs
 - Beginning with 2012 MY

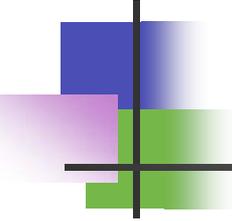
Paint and Coating Requirements



Solar Energy Distribution

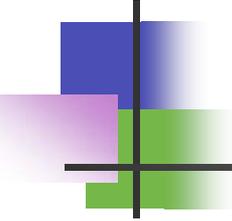


Source: http://www.lbl.gov/Science-Articles/Archive/sb/Aug-2004/3_coolroofs-2.html



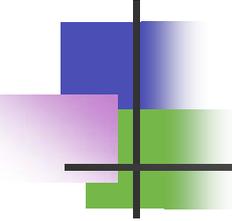
Setting a Paint Standard

- Architectural coatings available in 25-35% reflective range
- Transferability issues of these pigments
- Development data indicates 20-25% more likely achievable range for dark colors for automobiles
- Jet black remains an issue, even at this level



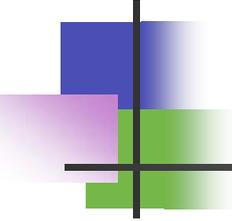
Paints and Coatings

- Paints/coatings on LDV & MDV reflect at least 20% of impinging solar energy
- Includes all opaque materials whether metal, plastic, or cloth
- Requirement begins in 2012 MY
 - Manufacturers must phase-in one third of their color palette.
 - By 2016 MY, all colors must meet the 20% reflectivity requirement,
- Reflectivity determined by ASTM E903



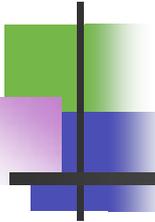
Recoating Operations

- Collision repair must use solar reflective paint for 2016+ MY vehicles
- Automobile manufacturers must include statement in owner's manual that failure to use specified paint may impact occupant's thermal comfort
- Repaint facilities must keep records



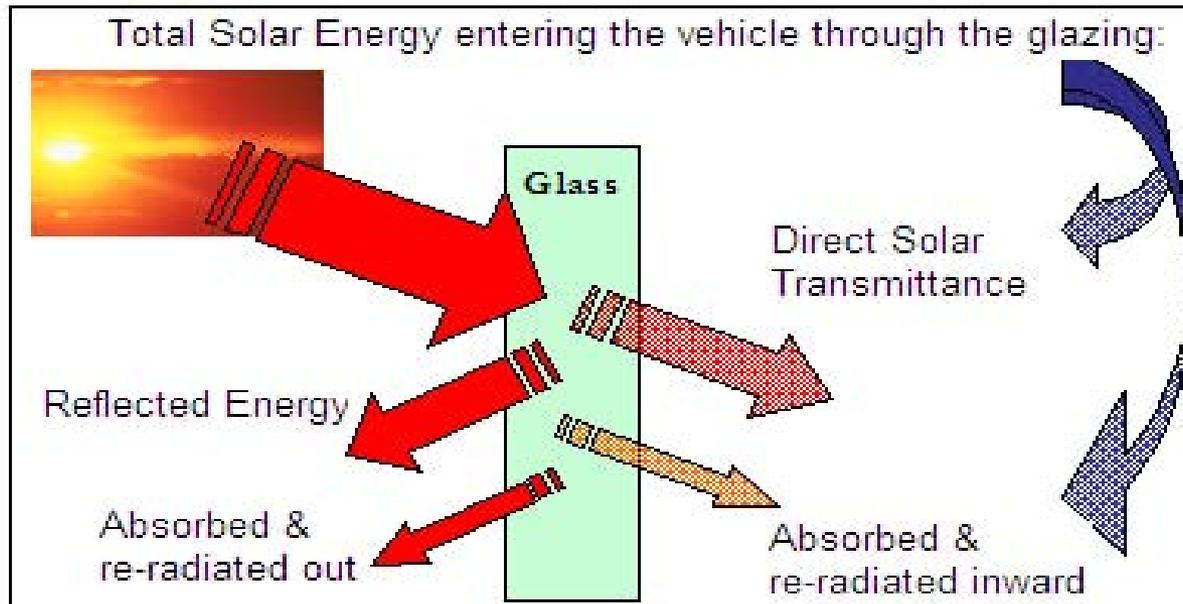
2016 MY Compliance Options

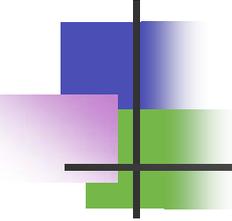
- Paint requirements can be reduced by better glazing:
 - 40% Rds windshield reduces paint to 15%
 - 42% Rds windshield reduces paint to 10%
 - 44% Rds windshield eliminates paint requirements
- Other compliance options are under investigation
- Maintaining a paint requirements spurs innovation and research for reflective paint



Window Glazing Requirements

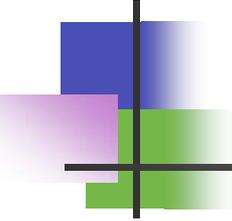
Solar Energy Penetration





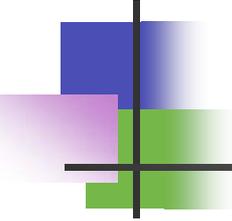
Windshield Requirement

- Starting 2012 MY all new vehicle windshields must reflect at least 30% of the total solar spectrum
- Must maintain 70% visible transmittance requirements
- Reflectivity determined by ISO 13837



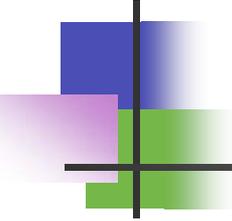
Side/Back/Rooflite Glazing

- Starting 2013 MY sidelites and backlite cannot transmit more than 55% total solar transmittance (Tts)
- Must maintain 70% visible transmittance requirements where applicable
- Rooflites to transmit no more than 20% of the total solar spectrum
- Test methodology - ISO 13837



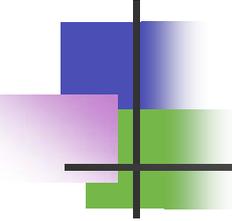
Window Replacement

- All windows replaced on affected MY 2012+ vehicles must comply with the standards, including any option exercised
- Manufacturers must include a statement in owner's manual that failure to use specified solar control glazing may impact occupant's thermal comfort
- Window replacement companies must keep records



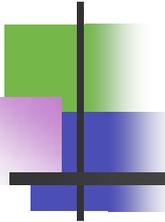
Estimated Costs

- Average additional costs for specified technology:
 - Reflective paint: \$8-70 per vehicle
 - Solar reflective windshield: \$25 per vehicle
 - Side/backlites: \$6-25 per vehicle
 - Rooflite: information needed
- Total cost per vehicle is estimated at \$39-128

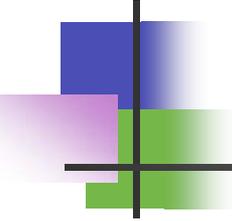


Emission Benefit (MMTCO₂/yr)

2020	Reduced compressor load	~ 0.6 MMT
	Reduced use (shoulder)	~ 0.2 MMT
2040	Reduced compressor load	~ 0.8 MMT
	Reduced use (shoulder)	~ 0.3 MMT
	Nationwide (side/backlites)	~ 1.9 MMT

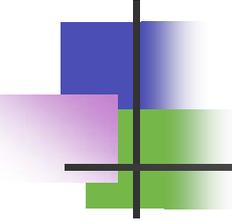


Emissions Benefit Methodology



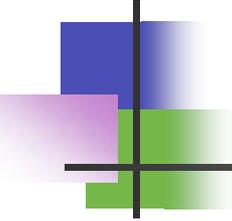
Simplifications & Assumptions

- 50% of solar heat gain through the glazing passes through the windshield
- 20% passes through the backlite
- 30% passes through the sidelites
- Rooflites increase solar heat gain 50% or more
- Current glazing is tinted glass, without specific solar management goals



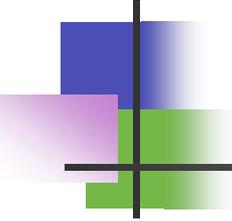
Simplifications & Assumptions

- A windshield with a Rds of 30% will reduce soak temps by 4°C
- Solar management glazing for balance of vehicle will reduce soak temps by 3°C
- No benefit for glazing rear of B-pillar in LDT and MDV – still refining
- SR paint reduces interior soak temps by 1°C on a fleet average basis



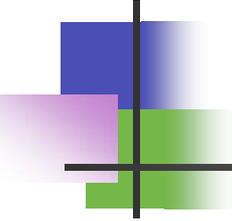
Model Inputs

- 2040 vehicle fleet - EMFAC
- 2040 vehicle miles travelled (VMT) – EMFAC
- Increased fuel use due to air conditioner operation – literature, ARB testing
- Average California a/c usage 26% - NREL



Model Results

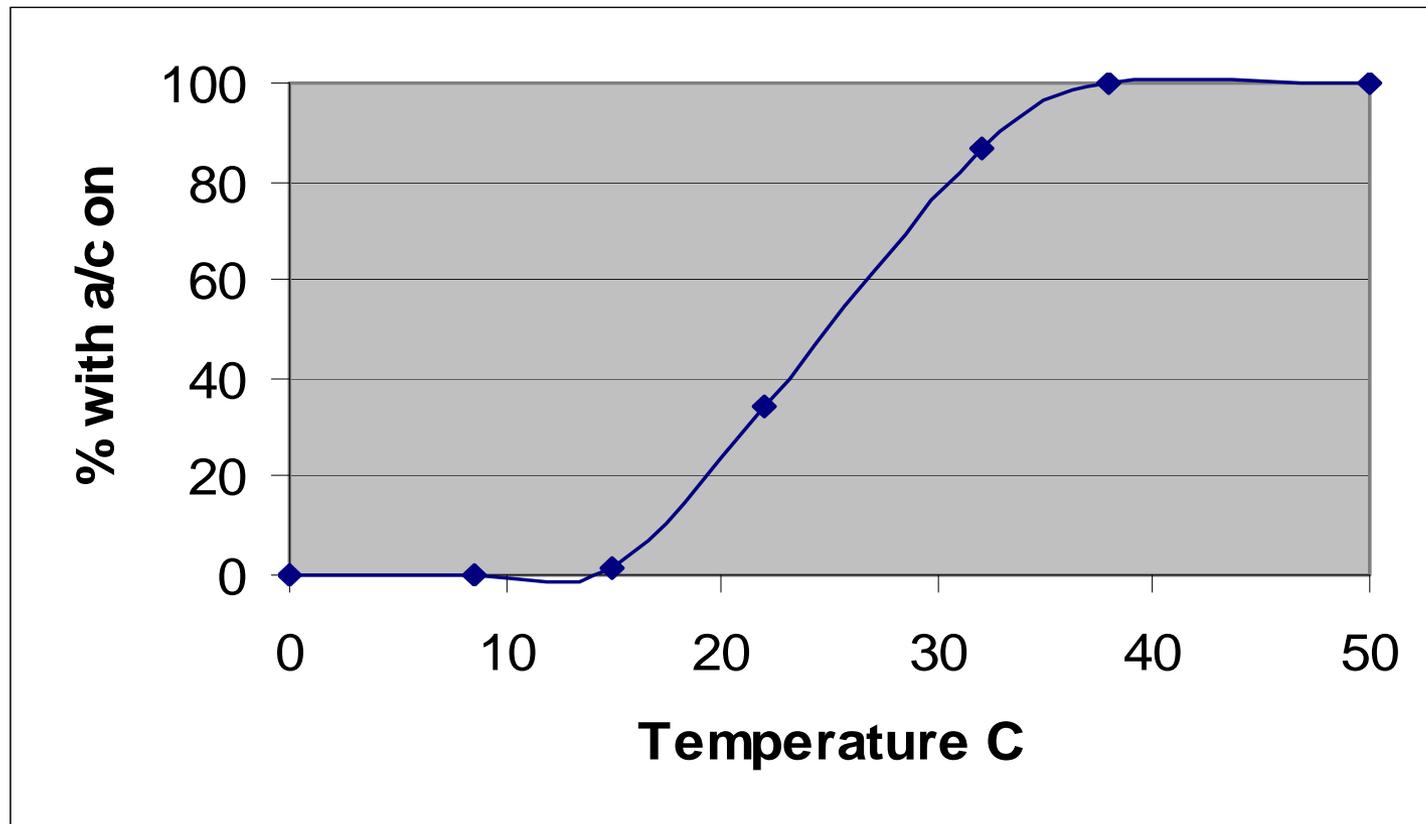
- Calculate a/c contribution to fuel use
- Apply NREL figure of 1.2% reduction in a/c fuel use per °F reduction in soak temperature
- Convert to CO₂ reductions
- Reduce result by 20% for uncertainties

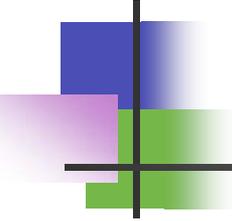


Shoulder Month Benefits

- Benefit derived when cooler interior temperatures lead to the air conditioner not being activated

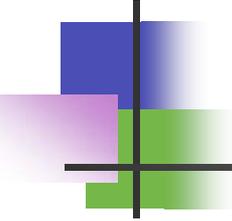
Ambient Temp & MVAC Use





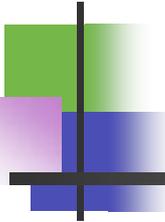
Selecting Shoulder Months

- Monthly temp data by time of day - EMFAC
- Selected 5 pm, evening commute
- Temperatures between 62 °F and 77 °F
- 4 months met this criteria statewide

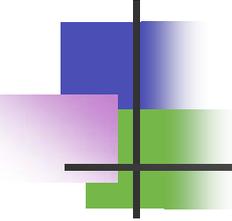


Benefits from Shoulders

- 4/12 * annual benefit
- Around 0.3 MMT CO₂ reduced in 2040.

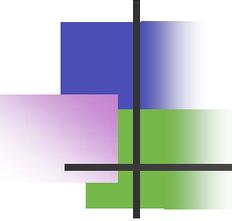


Issues Raised



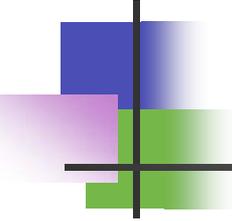
Issues Raised - Paint

- What is the effect of paint regs on potential move to compact processes?
- What about exempting vehicles painted using compact processes?
- Is eggplant approach required? Will it work satisfactorily? Why eggplant over white versus over moderately reflective primer? Why not use the patented opaque black pigment? Why not increase reflectivity with additives such as metal flakes or mirror flakes?



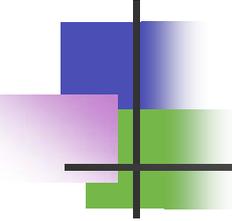
Issues Raised – Paint (cont)

- What about powder coatings?
- Will potential increased film build increase vehicle weight?
- How frequently are vehicle roofs repainted?
- What are process-line costs versus paint costs? What is the certainty of the estimate?
- What about toxicity of SR pigments?



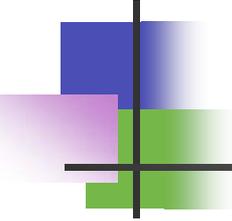
Issues Raised - Glazing

- Rds requirement for windshield should be higher to avoid loss of significant benefit.
- SR backlite should be required and/or be a compliance option to reduce paint requirement.
- SR front door sidelites should be required and/or be a compliance option to reduce paint requirement.
- Requirements should be phased in with model changes rather than specific model years.



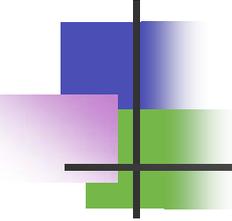
Issues Raised – Glazing (cont)

- 55% Tts cannot be met without laminated glazing. What is the performance of the best solar management glazing for tempered glass that each mfg offers?
- Since a move to laminated glass for sidelites and backlites is not required, the implementation should be pulled forward from 2013 to 2012.
- There should be a separate, more stringent Tts requirement for privacy glazing.
- Thinner glass should meet a lower Tts standard than thicker glass
- Proposal will limit the move to thinner lightweight glass needed for fuel economy



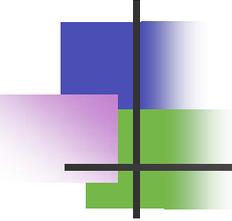
Data Needs – Rooflites

- What is the average/best performance currently available for tempered rooflites?
- How much more does better solar performance cost for rooflites?
- What is the typical surface area of a rooflite per vehicle?
- What percent of vehicles sold in CA currently contain rooflites? – OEM options data



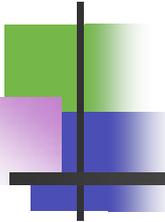
Upcoming Activities

- Today's Public Workshop
- Investigating issues raised at today's workshop and other public/private meetings
- Individual meetings
- 45-day comment period starts May 11th
 - Draft final regulations released
 - Initial Statement of Reasons – detailed description of regulation, technology, costs and benefits
- June 25th 2009 Board Hearing
 - Staff can propose "15-day" reg changes
 - Board can direct staff to make reg changes
 - Board can adopt regulation as proposed



Contacts

- Marijke Bekken, Lead Staff
 - mbekken@arb.ca.gov
 - (626) 575-6684 or (775) 762-1771
- Sharon Lemieux, Manager
 - sclemieu@arb.ca.gov
 - (626) 575-7067
- <http://www.arb.ca.gov/cc/cool-paints/cool-paints.htm>
- Please sign up for the listserv at <http://www.arb.ca.gov/listserv/listserv.php>



Open Discussion
