AB 32 Cool Cars Proposal

California Air Resources Board

June 25, 2009

Agenda

- Background
- From Cool Paints to Cool Cars
- Cool Cars Rule Development
- Current Proposal
- Identified Issues
- Proposed 15-day Changes
- Recommendations

AB 32 Background

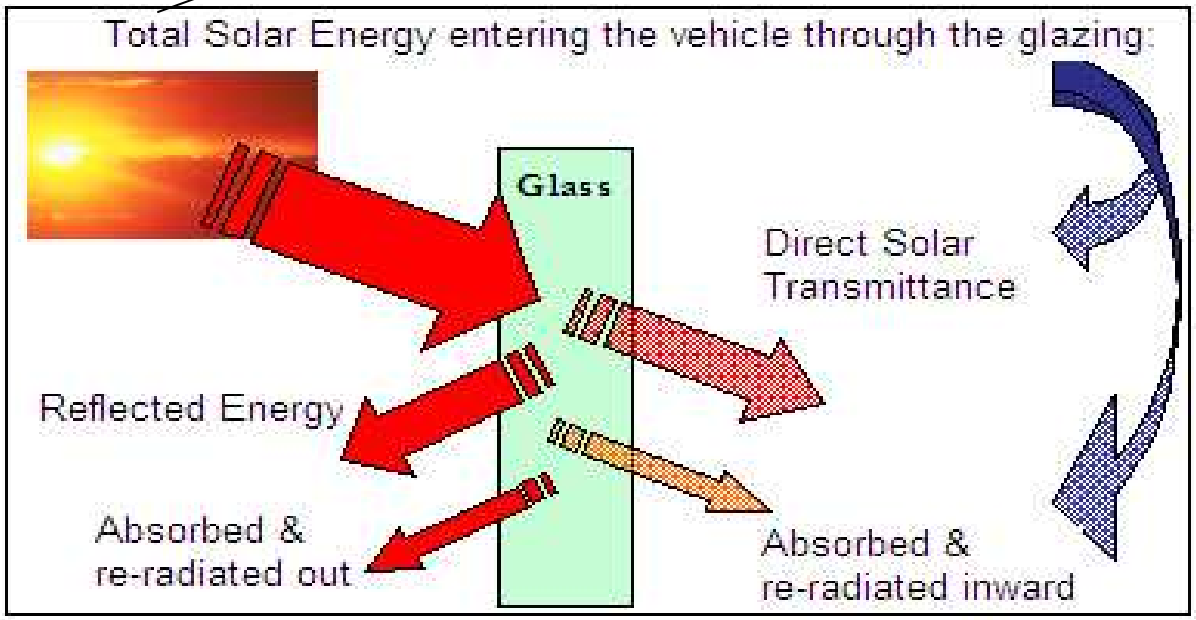
- AB 32 - California's Global Warming Solutions Act of 2006
- Requires CA to reduce GHG emissions to 1990 levels by 2020 (25%)
- Scoping Plan included measure based on use of reflective auto paints
  - "Cool paints"

From Cool Paints to Cool Cars

- Scoping Plan measure based on previous research
- Further assessment by staff found:
  - GHG reductions much less than anticipated
  - Black reflective paint not commercially acceptable
  - Durability concerns re: chipping and scratches
  - Not compatible with emerging paint processes that reduce emissions during paint application
- Staff determined paint technology not ready
- Identified glass technology as another way of reducing vehicle cabin temperature and A/C use

Glass Technology Can Affect Solar Heat Gain

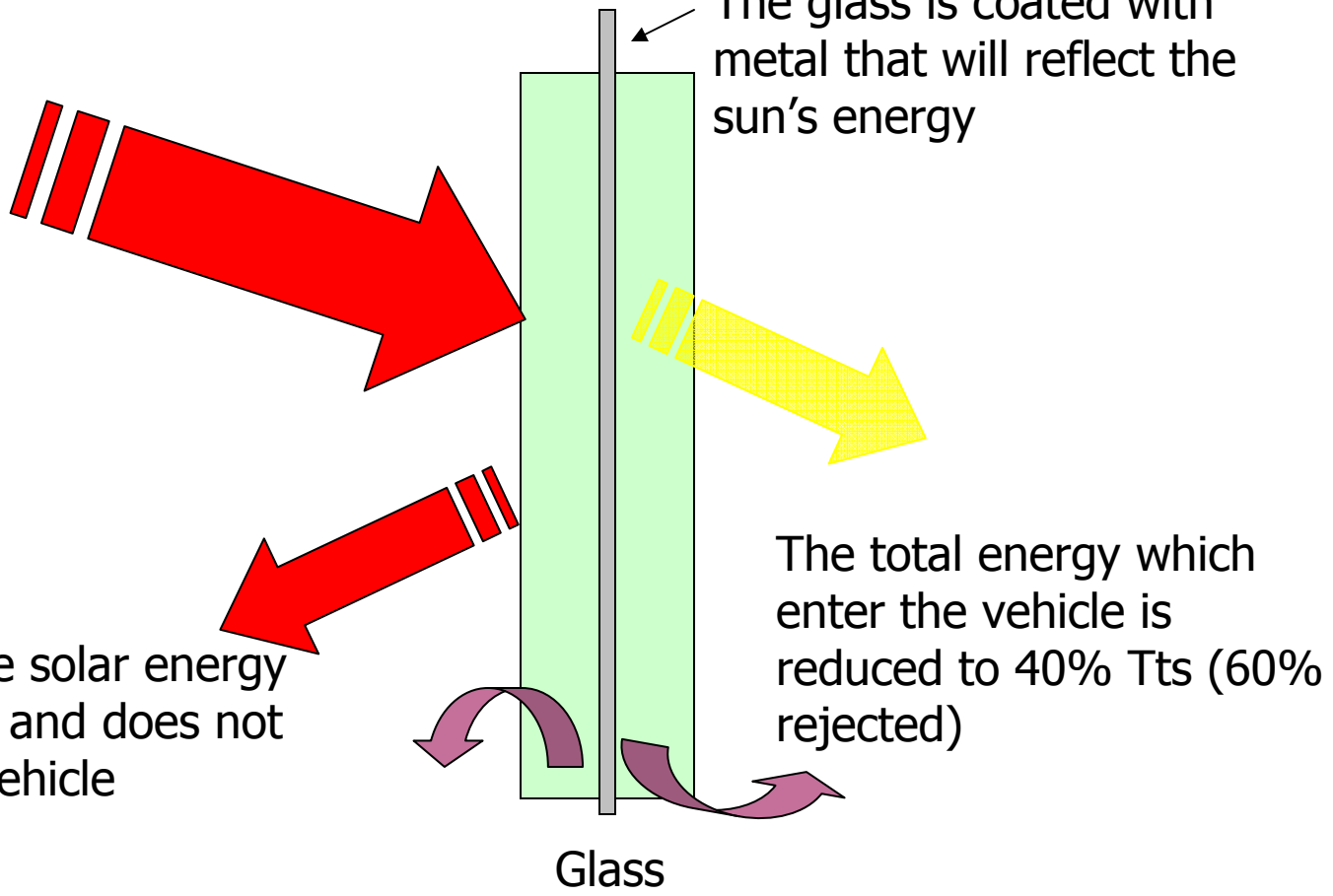
Tts = The percent of the total solar energy entering the vehicle through the glass



Solar Control Glass Technology

- Solar Absorbing Glass
  - Laminated or tempered
  - Addition of iron limits solar energy going into the vehicle
- Infrared Reflective Glass
  - Best for limiting solar energy going into the vehicle
  - Requires window to be laminated
    - Reflective coating "sputtered" between two pieces of glass; or
    - Coated film is placed between the two pieces of glass

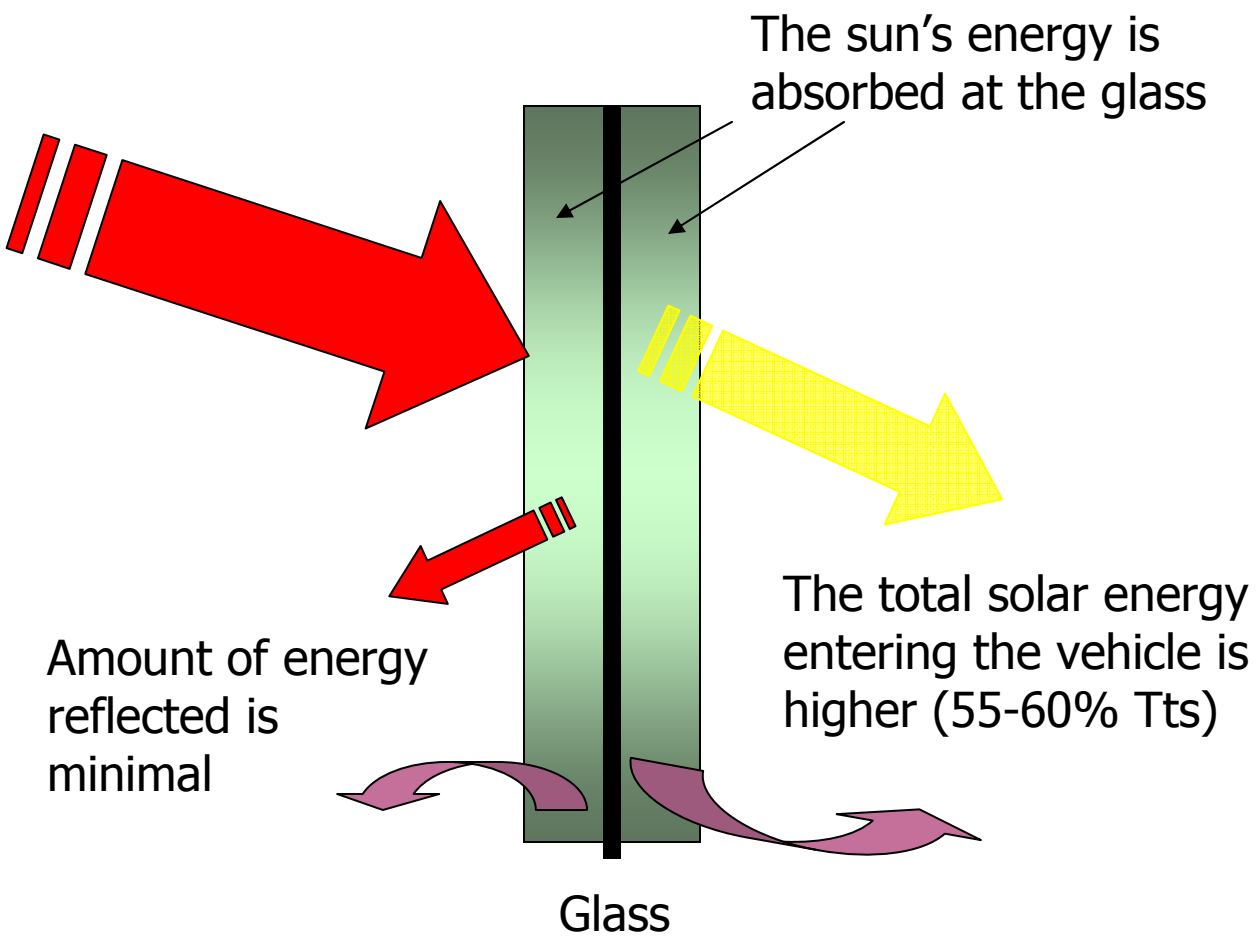
Infrared Reflective Glass



Vehicle Makes w/ Infrared Reflective Glazing Experience

- Audi
- BMW
- Buick
- Cadillac
- Chevrolet
- Ford
- Landrover
- Mercedes
- Oldsmobile
- Pontiac
- Porsche
- Renault
- Volvo
- VW

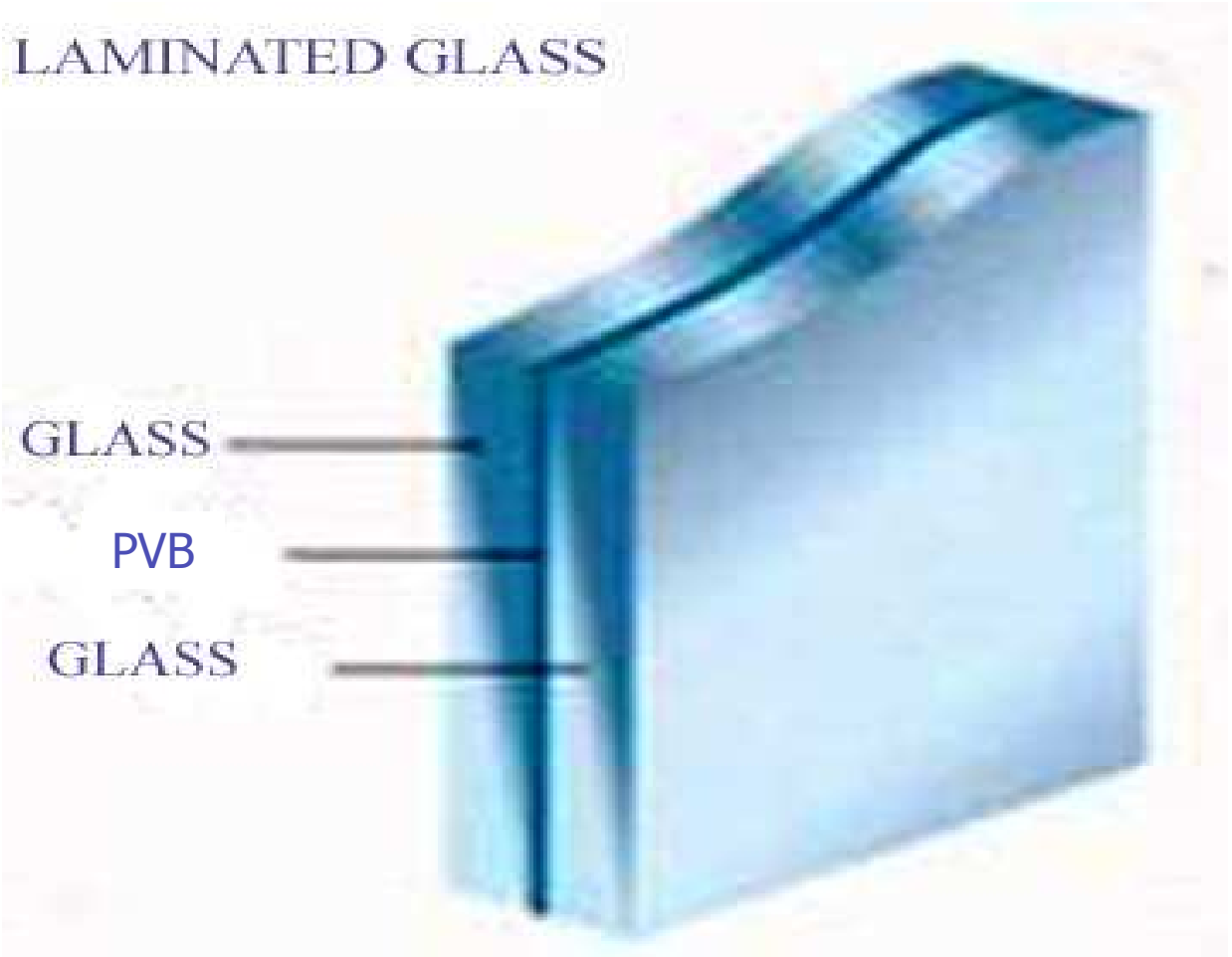
Solar Absorbing Glass



Windshields

- Laminated for safety
  - Two pieces of glass "glued" together by a layer of polyvinyl butyral (PVB)
  - Solar control provided by two basic methods
    - Reflective: directed coating or film
      - Provides best rejection of heat
    - Solar absorbing
      - Glass formulation
      - Solar absorbing PVB interlayer

Laminated Glass



Side and Rear Windows

- Side, back and many roof windows are "tempered" glass
  - One piece of heat treated glass
- Use of solar absorbing control technology best choice
- Use of more effective solar reflecting technology would require change to laminated glass
  - Too expensive for incremental benefit

Proposed Performance Standards

- Require glazing that limits the total transmission of solar energy (Tts) into the vehicle
- Results in average 13^{o}F temperature reduction
  - PC - 14^{o}F reduction
  - SUVs – 12^{o}F reduction
- Windshield - accounts for 50% of the heat gain from the sun
  - 2012 MY – 50 % Tts
  - 2014 MY – 40% Tts
- Side and back windows
  - 2012 MY – 60% Tts
- Rooflites
  - 2012 MY – 30% Tts

Solar Control Technology Comparisons

Tts %	Solar Control Reflective Film	Reflective Directly Coated Glass	Solar Absorbing
60%	X	X	X
50%	X	X	
40%		X	
Costs	Medium	Medium-High	Low

Costs

- $111 per vehicle, includes
  - Initial cost of glazing
  - Replacement cost from breakage

Benefits

GHG reductions in CA

- 0.7 MMT CO_2 in 2020
- 1.2 MMT CO_2 at full implementation

- $16 fuel savings per year per vehicle
  - Payback capital cost in 7 years

Main Issues

- Implementation is too fast
  - Tier 1 windshield (50% Tts)
  - Tier 2 windshield (40% Tts)
- Electromagnetic attenuation
- Alternative approaches

Implementation Rate

- Tier 1 (50% Tts)
  - Staff proposes 2 years (75%, 100%, starting 2012)
  - Some stakeholders say more time needed to revise hundreds of windshield models, and shift to reflective coatings, suggest 3-5 years
  - Some glass manufacturers say ready and able to meet need demand

Implementation Rate

- Tier 2 windshield (40% Tts)
  - Staff proposes full compliance in 2014
  - Two glass manufacturers suggest demand can be met
  - Others say need more time to develop 40% coating technology for glass or film, suggest 2016 or later

Electromagnetic Attenuation

- Cars are commonly equipped with devices that rely on radio waves to function properly
  - Global Positioning Systems, garage door openers, cellphones, etc.
  - Reflective coating can affect operation of these devices
- Some auto makers claim it will take many years to assure devices work OK, and some question using reflective technology at all
  - Not a technical issue. Some European cars currently use reflective glass all-around, not just on windshield.
  - Deletion area in glass allowed for garage door openers and speed pass. Glass manufacturers can provide this.
  - Roof antennas an alternative already abundantly used

Alternative Approaches

- Auto makers want to be able to suggest alternative approaches to reduce cabin temperature
- The staff proposal does not allow alternative compliance approaches
  - Standardized procedures lacking
  - Potential for gaming, resulting in manufacturers not ever switching to the best technology

Proposed 15-Day Changes

- Labels for enforcement and consumer awareness

Proposed 15-Day Changes (cont.)

- "Referenced to 4 mm" language
- Secondary manufacturers
- Additional Tts percent equating glazing with deletion windows to those not needing deletion windows

Conclusions and Recommendation

- Proposal is:
  - Feasible
  - Cost effective
  - Consistent with Scoping Plan
  - Reduces GHG by ~ 1 MMT/year
- Staff recommends adoption, with 15 day changes