

Automotive Summit MEETING 2010

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Impact of Cold Storage Evaporator to Fuel economy

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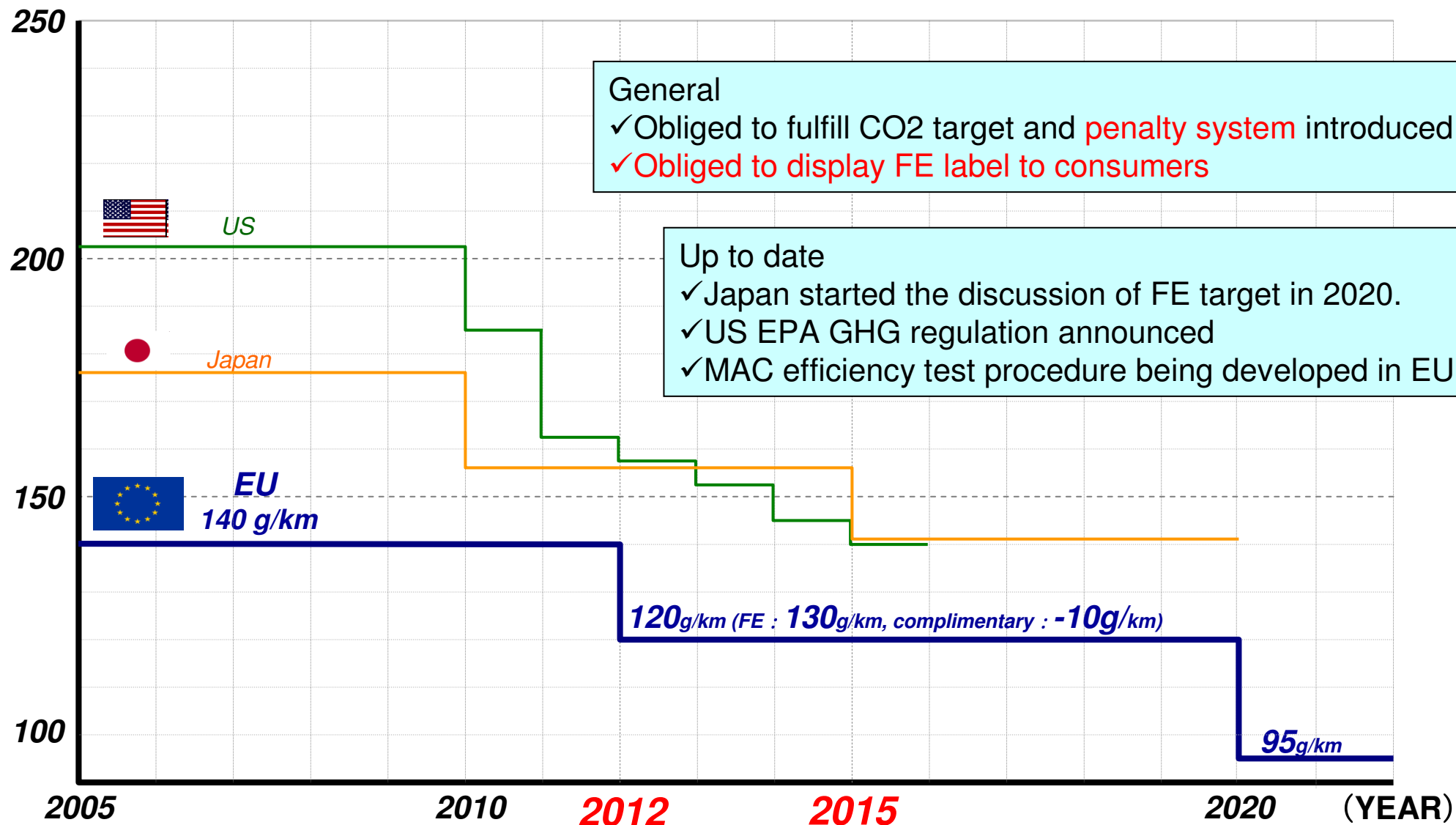
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1. Fuel economy Regulations

CO₂ emission [g/km]

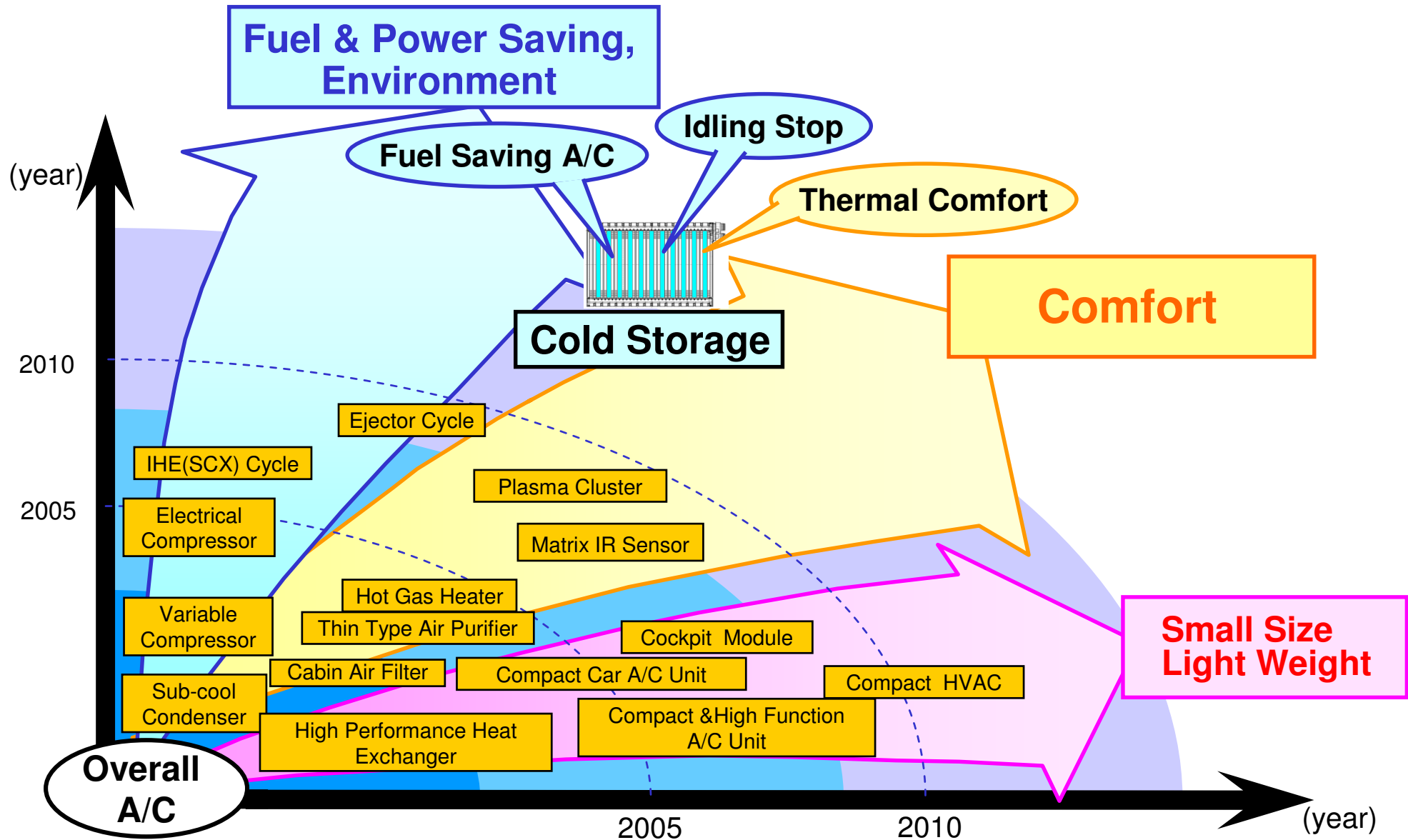


General
 ✓ Obligated to fulfill CO₂ target and **penalty system** introduced
 ✓ Obligated to display FE label to consumers

Up to date
 ✓ Japan started the discussion of FE target in 2020.
 ✓ US EPA GHG regulation announced
 ✓ MAC efficiency test procedure being developed in EU

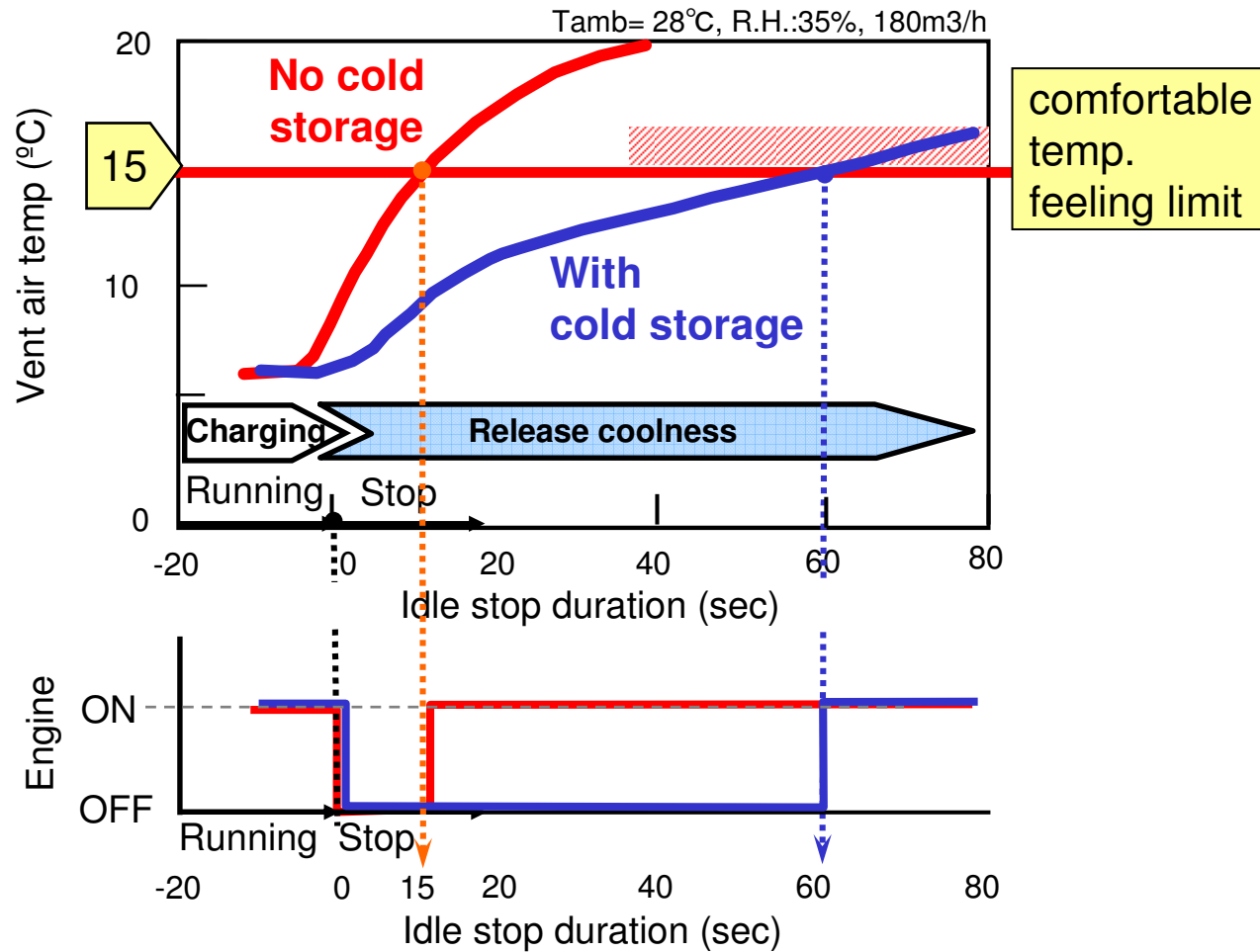
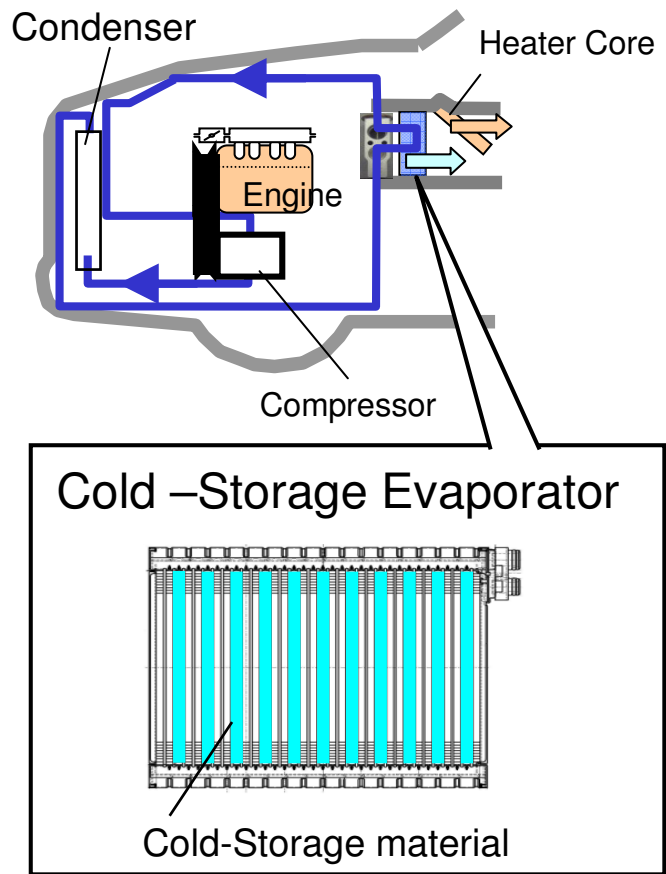


2. DENSO's contribution toward fuel economy





3. Outline of the cold storage system

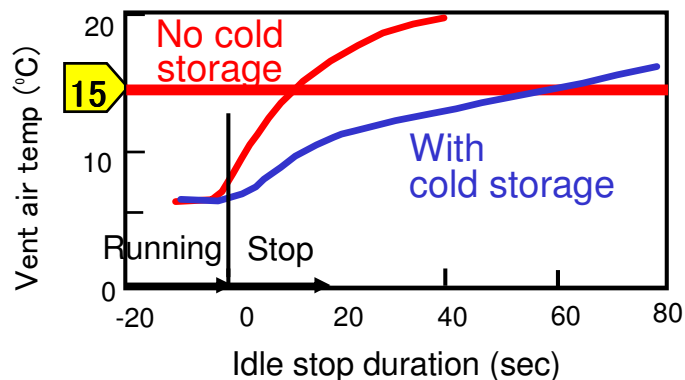


Benefit of the cold storage system:

- improved comfort, improved fuel economy by elongation of stop time
- during idling stop improved (driving) feeling due to engine restart reduction

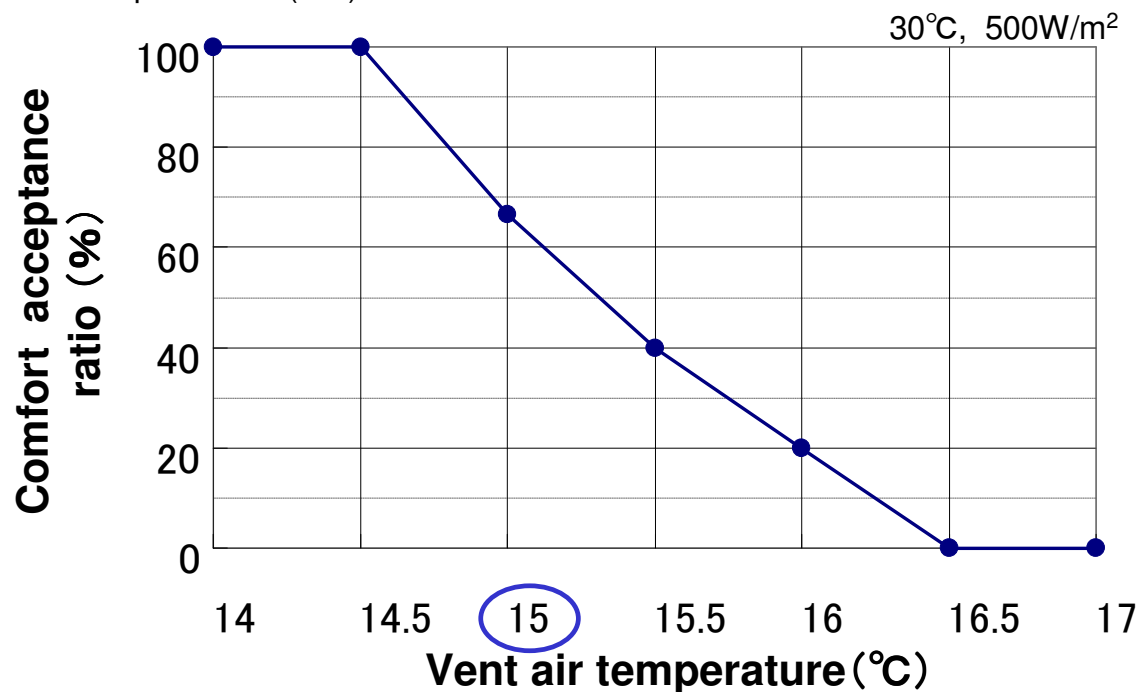


3. Outline of the cold storage system-cont. subjective tests



Subjective tests in DENSO

- position: passenger seat
- comfort evaluation during Idle stop
- feedback, when the temperature became uncomfortable



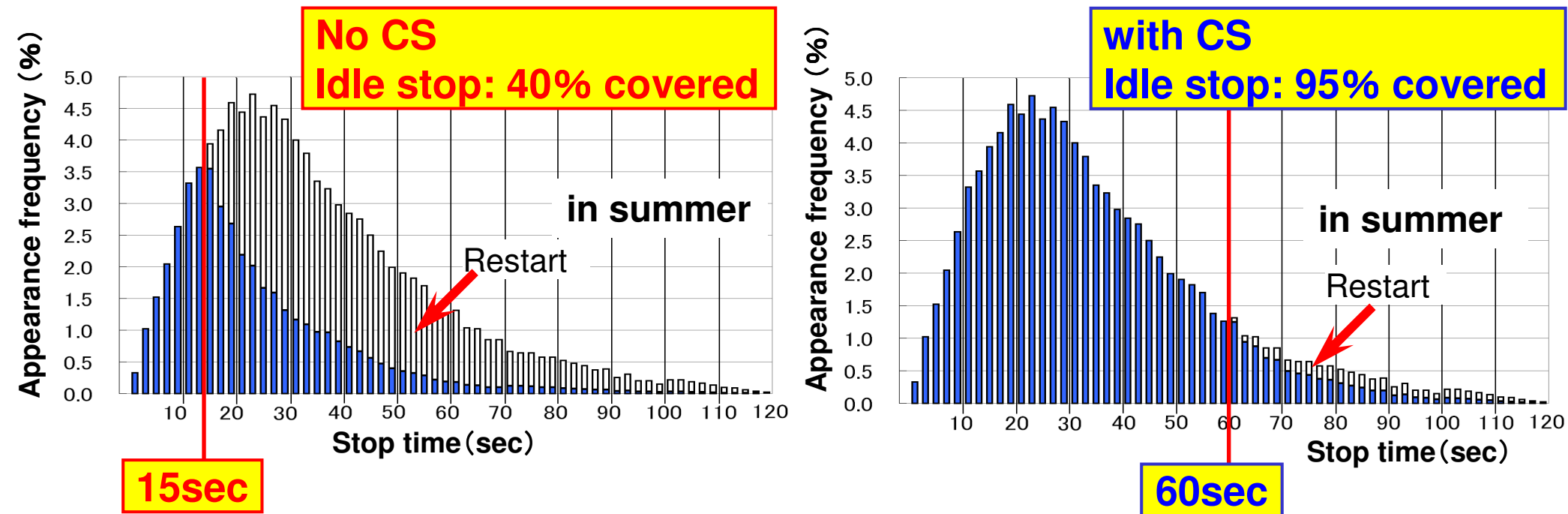
Based on the feedbacks during subjective evaluation, 15°C was set as limit temp. for comfort



3. Outline of the cold storage system-cont. idling time duration appearance frequency in Japan

- Urban and rural area in Japan, different cities and country sides
- 60 vehicles

Evaluation of Energy Conservation Center, Japan



The Cold Storage system can cover 95% of Idle Stop conditions

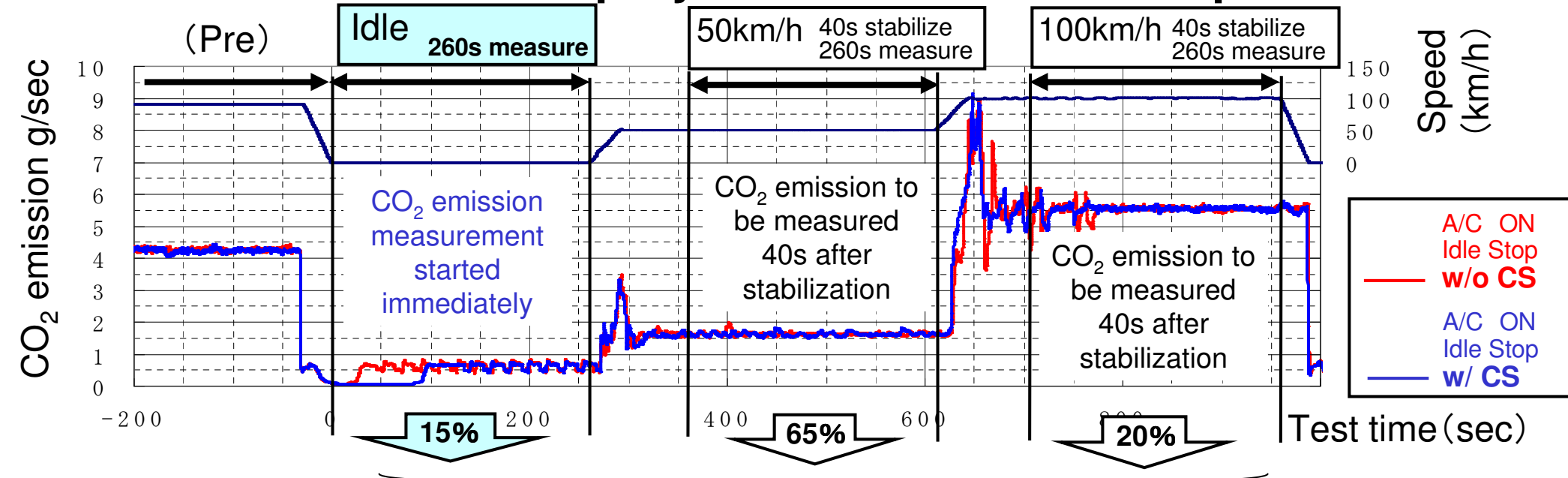


4. Test conditions of Idle Stop System under MAC test procedure

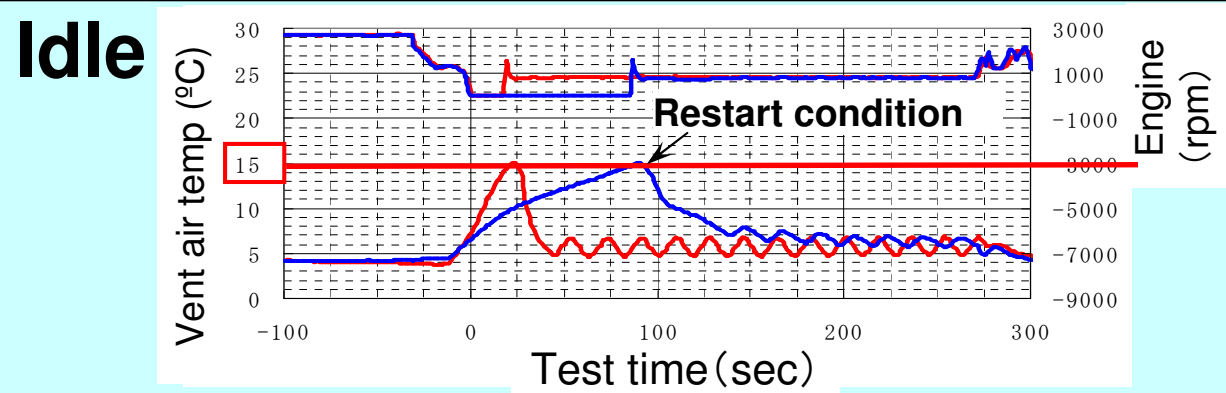
		Conditions
Climate condition		25° C / 50% / 0 W/m²
Vehicle speed and weighting		Idle (15%) 50km/h (65%) 100km/h (20%)
Vehicle		B segment, Gasoline 1000cc
A/C	Mode	Manual
	Set temp.	MAX COOL
	Vent air temp.	15°C
	Vent position	FACE
	Cabin temp.	21°C
	REC/FRE	Outside air
	Air flow rate	140kg/h



5. Test results of Idle Stop System under MAC test procedure



Accumulated CO₂ emission during the Test / distance in Test time = CO₂ g/km (weighted)



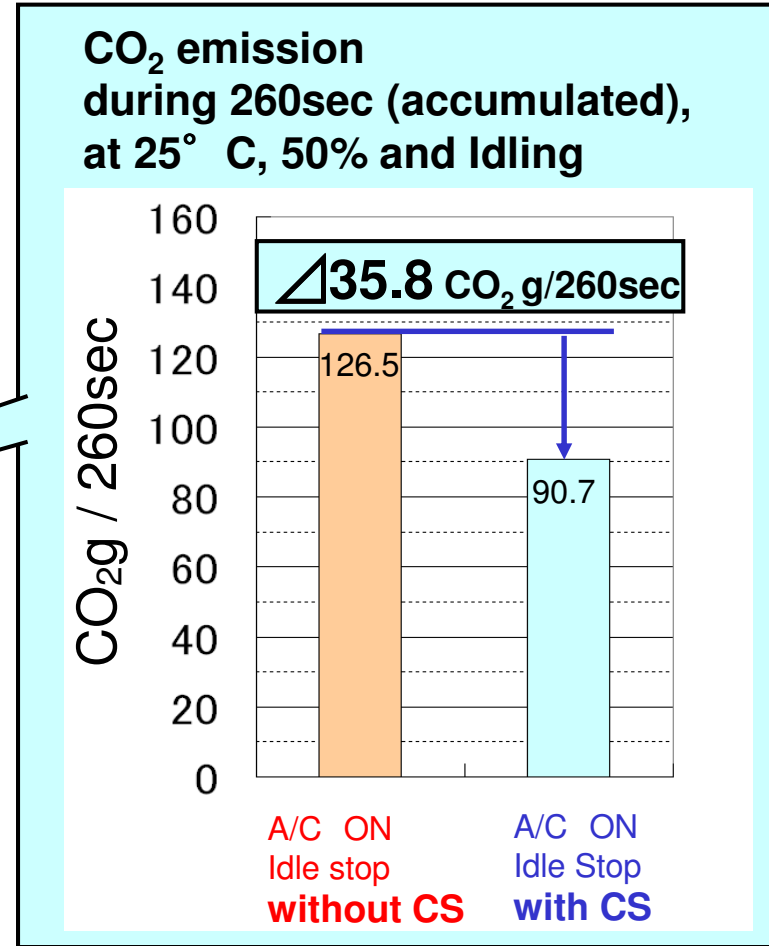
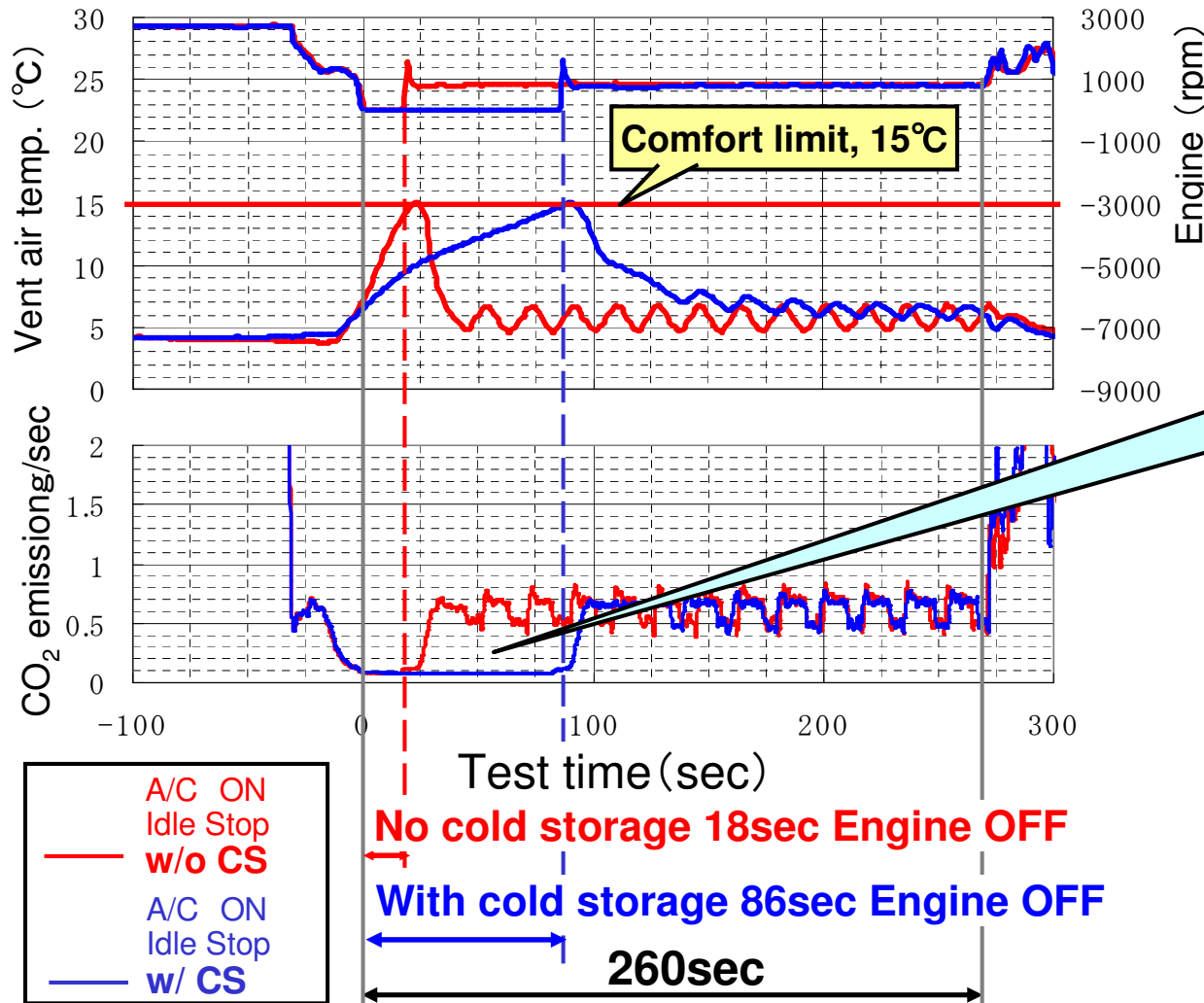
decided restart condition: if $T > 15^{\circ} \text{C}$
(15°C is the comfort temp. limit)

Condition:
 ■ above $T=15^{\circ} \text{C}$, Engine restarted

Comparison test according to new MAC test procedure



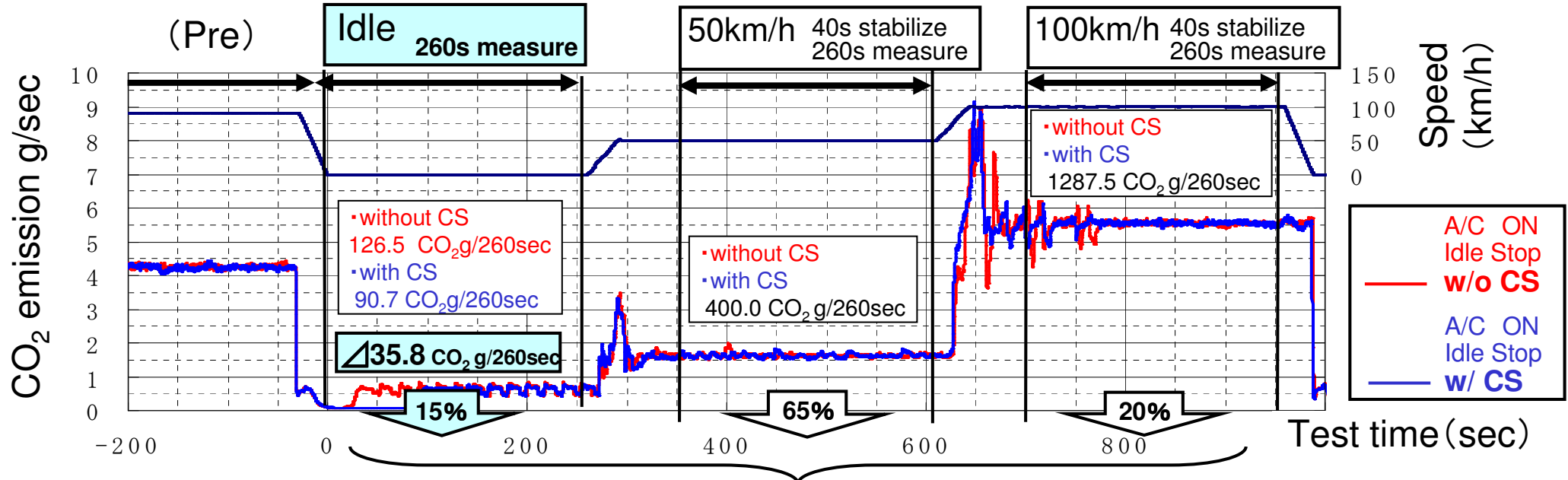
5. Fuel economy effect of cold storage Eva, based on MAC test (1)



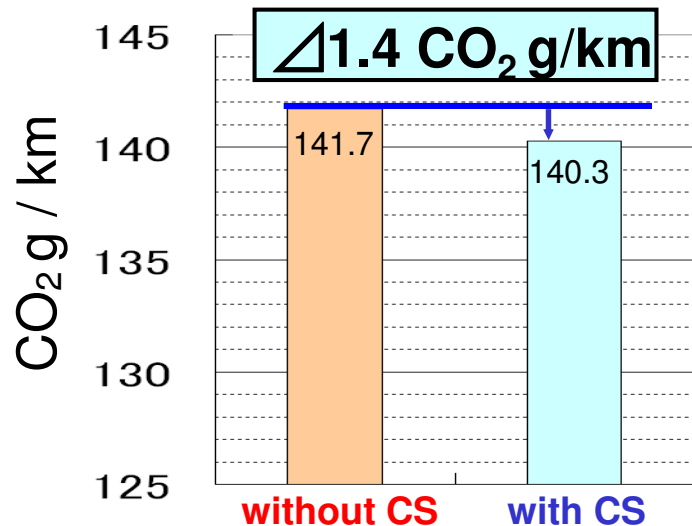
- Cold storage elongates engine stop duration (18sec⇒86sec)
- CO₂ reduction by Δ35.8 CO₂ g/260sec



5. Fuel economy effect of cold storage Eva, based on MAC test (1)



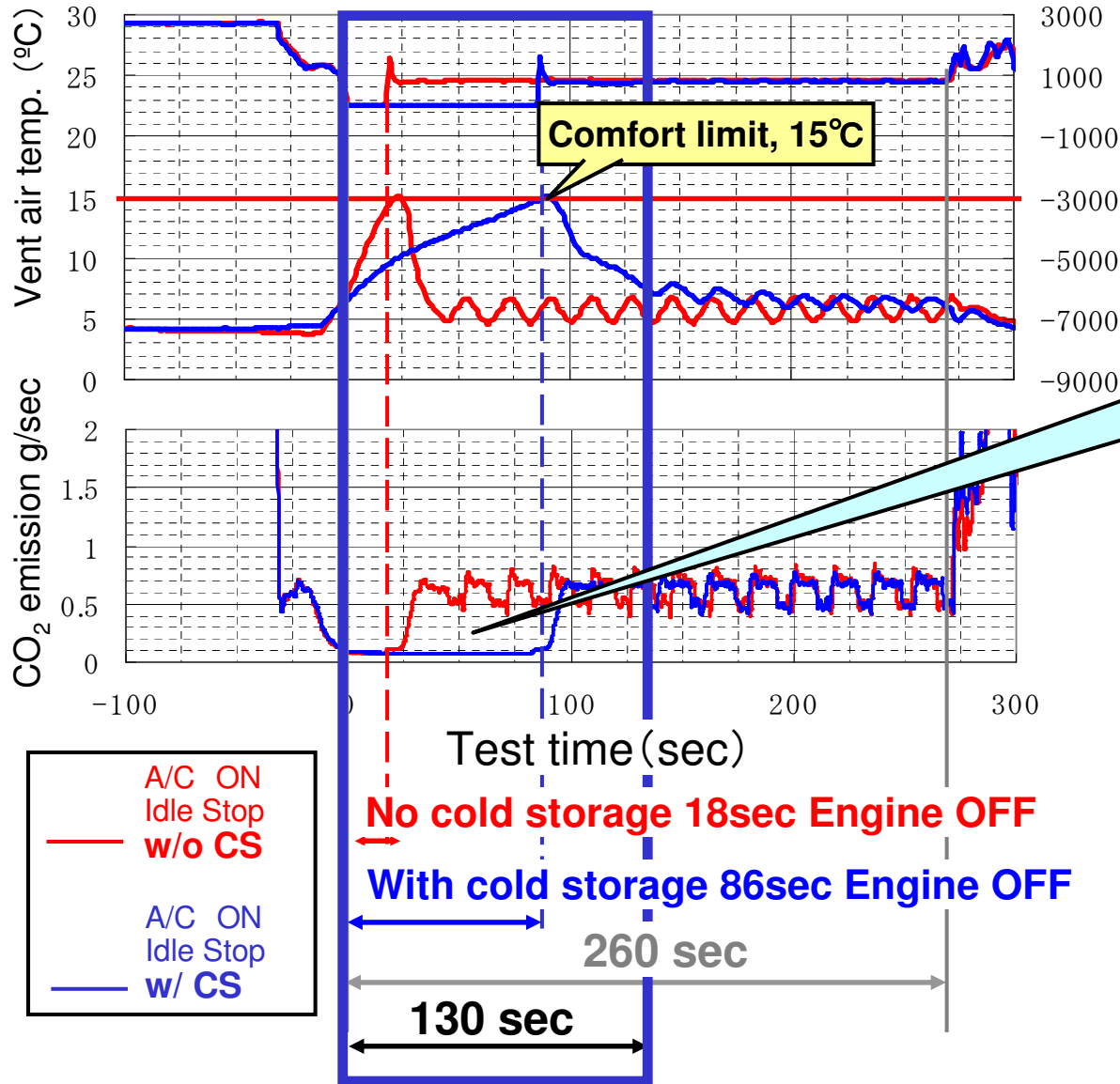
Accumulated CO₂ emission during the Test / distance in Test time = CO₂ g/km (weighted)



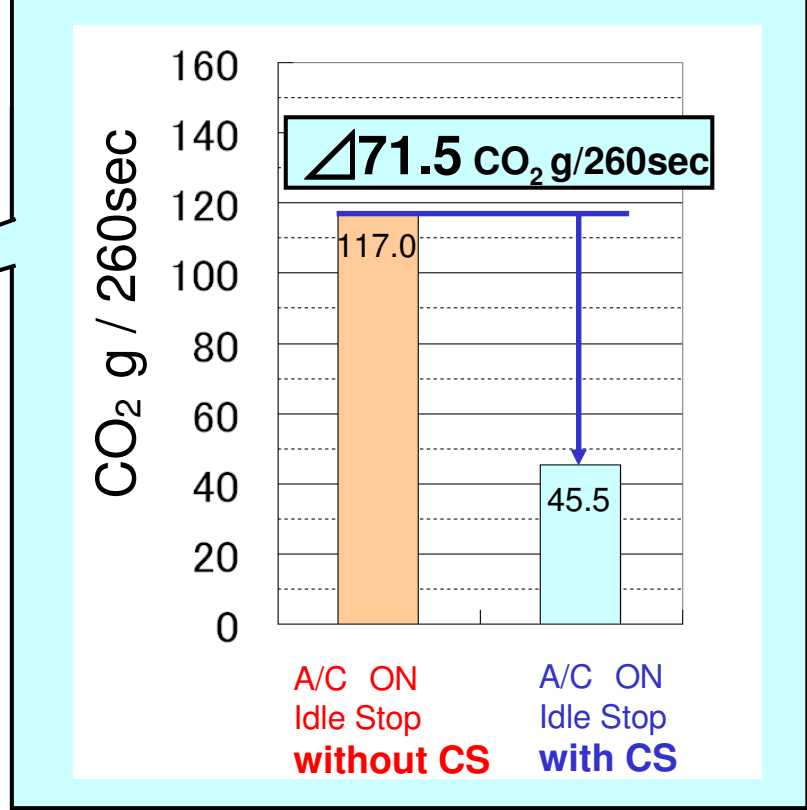
CO₂ reduction, as the whole effect on vehicle, incl. Weighting (MAC test procedure)



5. Fuel economy effect of cold storage Eva, based on MAC test (2)

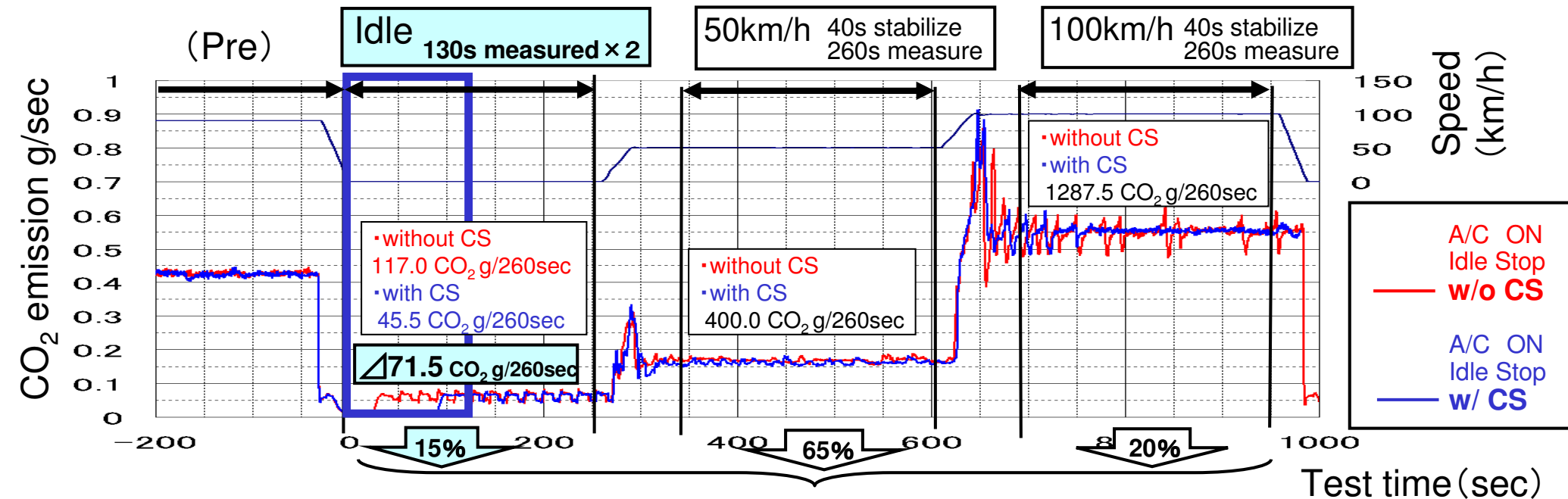


[Idea]
simulation of the driving condition,
with short Idle stop time

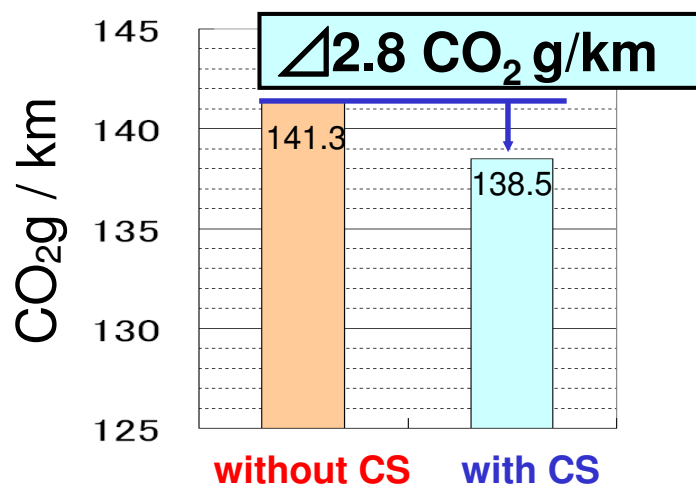




5. Fuel economy effect of cold storage Eva, based on MAC test (2)



Accumulated CO₂ emission during the Test / distance in Test time = CO₂ g/km (weighted)





6. Summary

- **DENSO contributes to Fuel economy improvement by technical development**

- **For Idling Stop vehicles the Cold Storage Evaporator will improve the fuel economy and comfort at same time**
 - CS Eva improves the comfort and extending the idling stop duration, reducing the actual fuel consumption
 - the number of Engine restart is decreased and the driving feeling is improved

- **According to MAC test the cold storage evaporator reduces the CO₂ emission by 1.4 g CO₂/km**

Eco innovation: max 7g CO₂ /km



Thank You for Your attention!