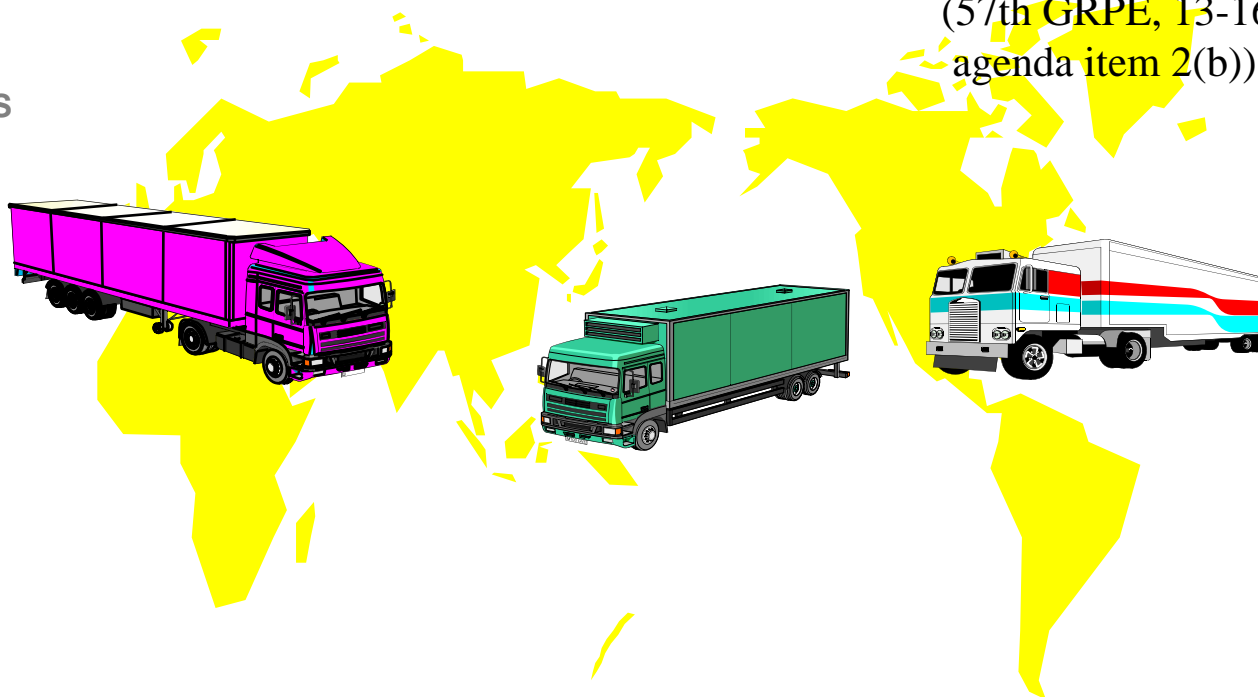




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Informal document No. GRPE-57-32

(57th GRPE, 13-16 January 2009,
agenda item 2(b))



Worldwide Harmonized Heavy Duty Emissions Certification Procedure

57th GRPE, Geneva, 15 January 2009



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Overview Informal Document 57-07

➤ Options

- **Option 1: New structure of § 6.3 (engine power) and new Annex 7**
- **Option 2: Average reference fuel as placeholder, until measurement programs are completed (amended § 6.9 and Annex 2)**
- **Option 5: Deletion of 70 mm filter, allowance of both filter materials, higher filter face velocity (amended § 9.4.2), extended static electricity provisions (amended § 9.4.3)**

➤ Other amendments

- **Clarification on charge air cooling (§ 6.2)**
- **Clarification on intake and exhaust systems (§ 6.4 and 6.5)**
- **Allowance of additive regeneration adjustment factors (§ 6.6.2)**
- **Amendments and new structure for § 7**
- **Amendments on exhaust dilution (§ 8.3.3 and 8.4.3)**
- **New pure gas specifications (§ 9.3.3.1 b)**



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Option 1 – Engine Power/Work

- **The new structure for § 6.3 has been agreed by WHDC group**
 - **6.3 Engine power**
 - **6.3.1 General engine installation**
 - **6.3.2 Auxiliaries to be fitted for the emissions test**
 - **6.3.3 Auxiliaries to be removed for the emissions test**
 - **6.3.4 Determination of auxiliary power**
 - **6.3.5 Reference power**
 - **Annex 7: Installation of the auxiliaries for the emissions test**



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Option 1 – Principles

➤ **General engine installation**

Engine to be tested only with the auxiliaries needed for operating the engine. Other auxiliaries should be removed.

➤ **Auxiliaries to be fitted for the emissions test**

If required auxiliaries are not fitted, their power shall be subtracted from engine power

➤ **Auxiliaries to be removed for the emissions test**

If non-required auxiliaries are fitted, their power may be added to engine power



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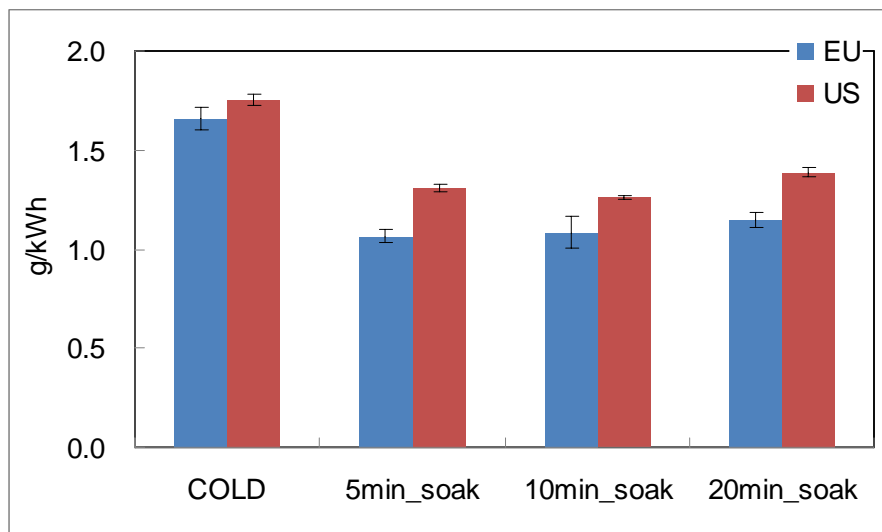
Option 2 - Reference Fuel

- **Introduction of average reference fuel that covers national reference fuel specifications is generally supported**
 - **5% biofuel content accepted by WHDC group**
- **DG-JRC test program started in October 2008**
 - **2 engines (US07 with DPF, Euro V with SCR)**
 - **preliminary results from Euro V engine were presented by JRC**
- **Japanese test program with JP05 engine (NSR + DPF) finished; results were presented by NTSEL**
- **Preliminary test results from both programs suggest acceptance of average reference fuel**
- **EMA test program with US07 engine not yet finished; results will be presented at next WHDC meeting**

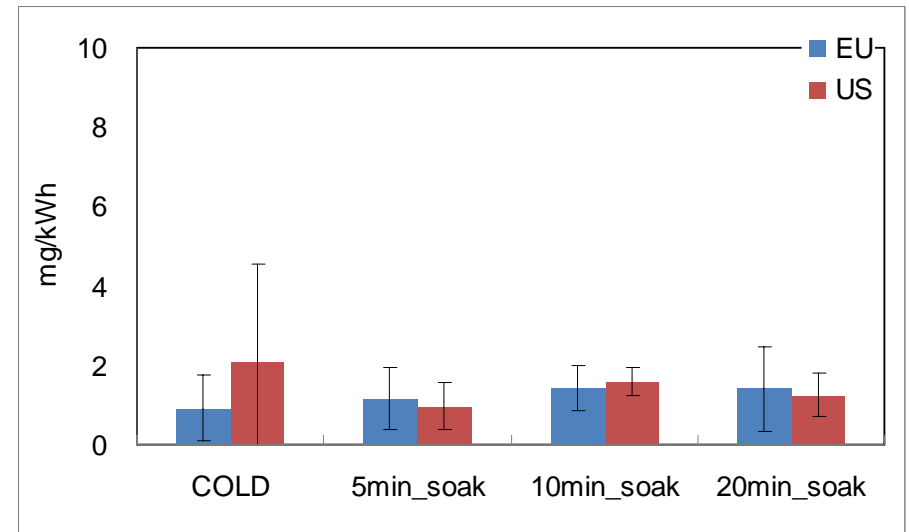


Option 2 – Japanese Results

NOx



PM



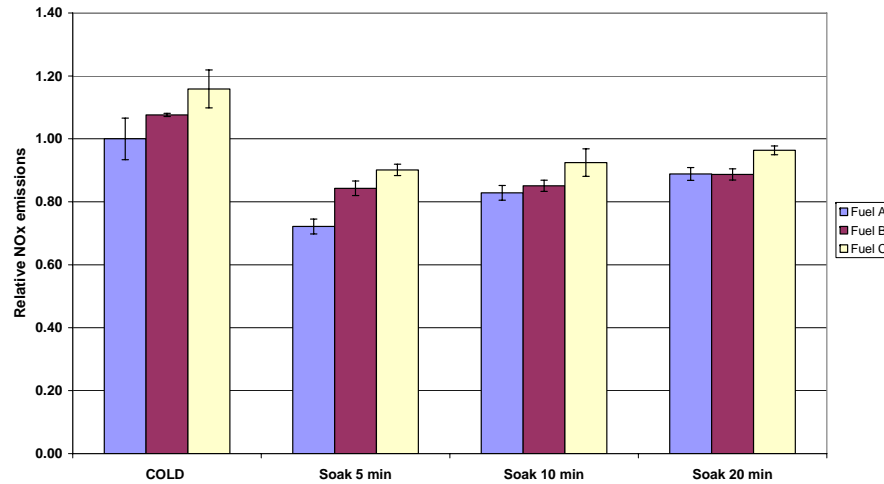
- Emissions with US reference fuel slightly higher for NOx, no clear trend with PM
- No significant influence of soaktime



Option 2 – JRC Results

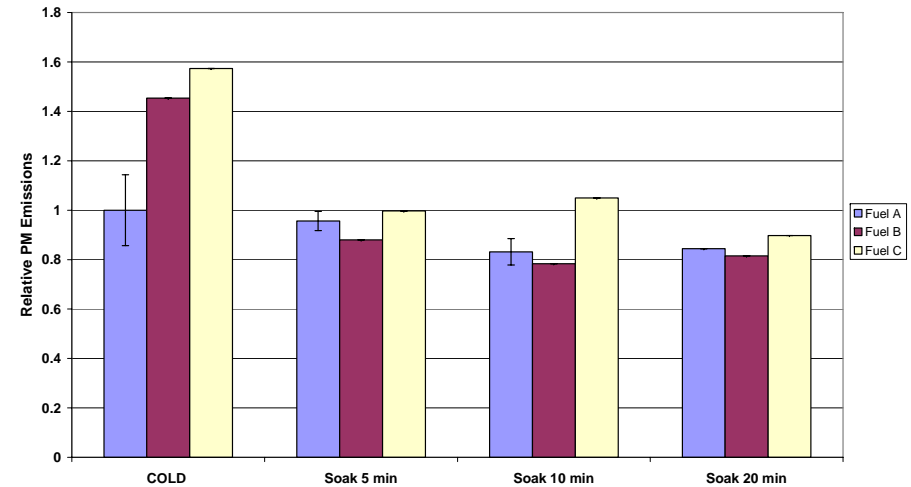
NOx

WHTC Cycle - Effect of different soak times and fuels



PM

WHTC Cycle - Effect of different soak times and fuels



- Emissions with US reference fuel slightly higher for NOx and PM
- No significant influence of soaktime
- Test results in relative terms, since validation still under work



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Option 3 – Hot Soak Period

- **Original USA EPA proposal for validation program not feasible within WHDC time line**
- **WP.29/AC.3 therefore agreed to exclude soak time from the current mandate**
- **Industry does not like gtr with options**
 - **10 minutes (EU-COM proposal) could still be compromise solution**
- **EMA/ACEA/JAMA met with EPA senior management on 25 November to find possible solution**
- **EPA recognized the tight Euro VI timing, and agreed to separate soaktime evaluation from general stringency evaluation**
- **Industry agreed to deliver test data within few months**
- **Possible solution must be ready for June 2009 GRPE**



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Option 4 – Cold Start Weighting

- **General problem**
 - only limited field data with cold start statistics available
 - USA EPA proposal for validation program not feasible within WHDC time line
- **WP.29/AC.3 therefore agreed to exclude cold start weighting from the current mandate**
- **Basically, no compromise solution feasible due to lack of statistical data**
- **OICA indicated acceptance of the 14% weighting factor in case of a compromise solution on option 3 (soaktime)**
 - could be taken into account for Euro VI via WHTC/ETC correlation study



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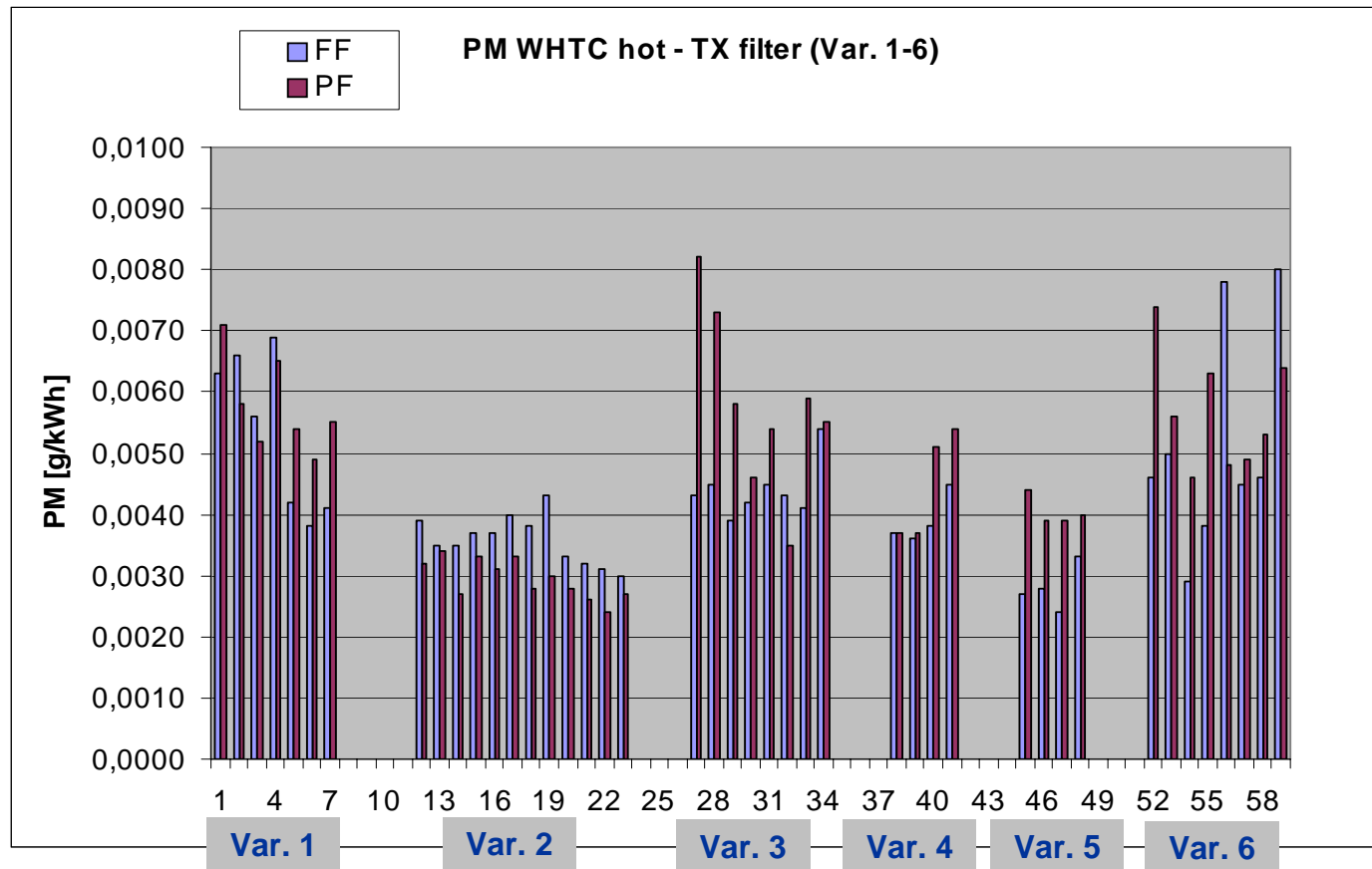
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Option 5 – PM Measurement

- **PM test program at TÜV Nord has just been finished**
- **Current status on option 5 (decision at 25th WHDC meeting)**
 - **Since filter size did not show significant influence, it was agreed to delete 70 mm filter**
 - **Since both filter materials showed good low PM measurement accuracy, it was agreed to permit both materials at the choice of the manufacturer**
- **Test results were presented by TÜV Nord**
- **Decisions on filter size and material have been confirmed**
- **Additional investigations within the program not yet finished**
 - **determination of NO_x measurement accuracy at very low levels**
 - **measurement of particle number according to PMP protocol**



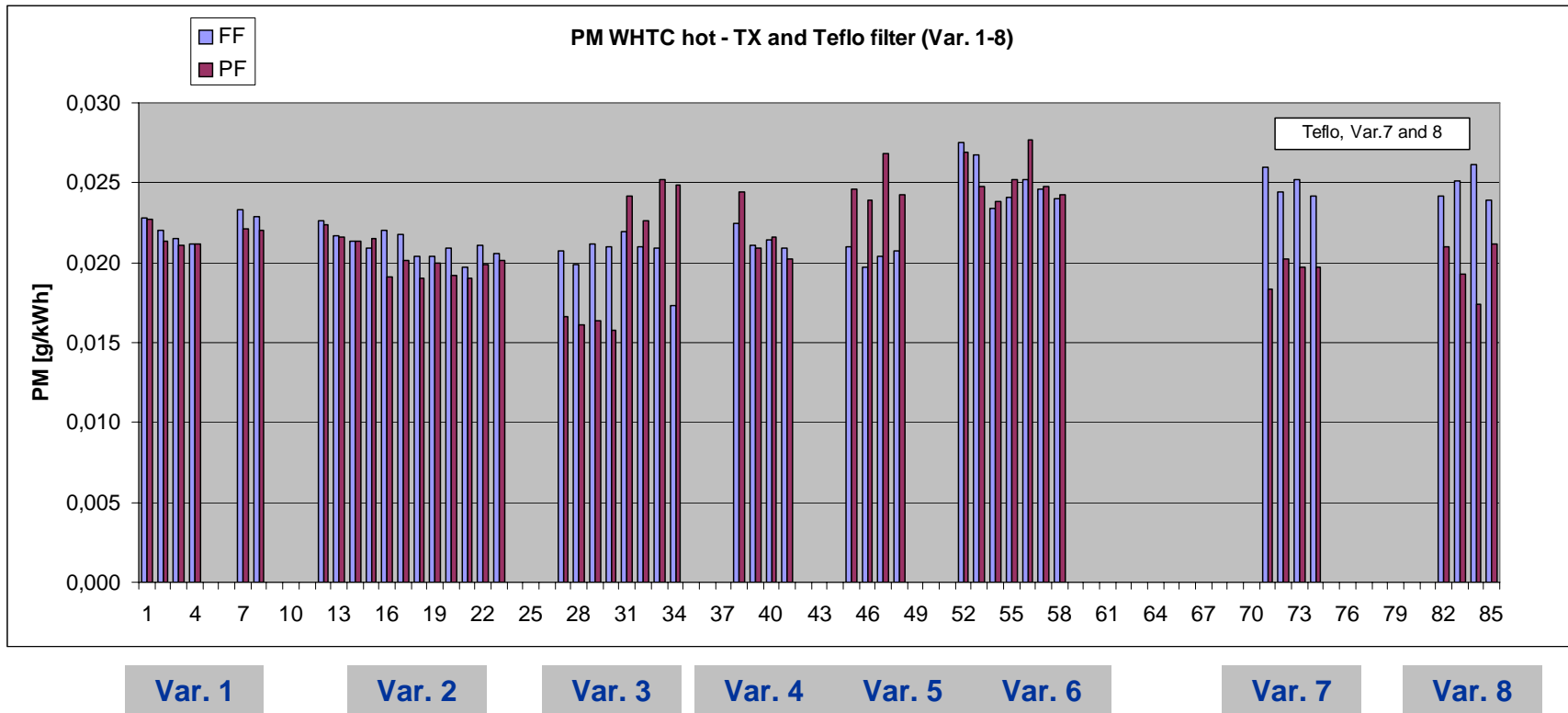
Option 5 – PM Results of Engine 1



- Lowest variability with variant 2 (low dilution, high filter face velocity)
- No significant influence of filter size (variant 6 compared to variant 3)



Option 5 – PM Results of Engine 2



- Lowest variability with variant 2 (low dilution, high filter face velocity)
- No significant influence of filter size (variant 6 compared to variant 3)
- No significant difference between TX 40 and Teflo filters



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Gasoline Engines

- **China and Japan presented test results showing that**
 - **current WHDC procedure is not fully applicable to gasoline engines**
 - **major modifications would be needed to extend the scope**
- **WHDC group agreed to drop the issue from this gtr**
- **Regional regulations are acceptable for the major stakeholders (Japan, China, USA, EU)**



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Alignment with Nonroad gtr

- **WHDC and NRMM secretaries will put together differences between NRMM and WHDC gtr's**
- **WHDC secretary will present a proposal for solution at the March 2009 WHDC meeting**
- **Status:**
 - **US Part 1065 amendments have been published, which now allows to complete the nonroad gtr**
 - **the nonroad gtr includes many minor details that are not covered within WHDC gtr**
 - **it will be possible to align the broad technical requirements to a high degree**



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Proposal for New Structure of Section 7

- **7.1 Principles**
- **7.2 Test cycles**
- **7.3 Engine mapping**
- **7.4 Reference cycle**
- **7.5 Pre-test procedures**
- **7.6 WHTC cycle run**
- **7.7 WHSC cycle run**
- **7.8 General test sequence**
- **7.9 Post-test procedures**



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Next Meetings

- **27th meeting: 10 to 12 March 2009, Budapest, Hungary**
- **28th meeting: 09(?) June 2009, Geneva (to prepare final GRPE approval)**



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Summary

- **Options 1 and 5 basically solved**
- **Option 2 test programs at JRC and EMA behind schedule; test results will be finally discussed at March 2009 meeting; preliminary results suggest acceptance of average reference fuel**
- **Option 3 test results from engine manufacturers will be available by March 2009, but on a reduced scale compared to the original EPA proposal**
- **Extension of scope to gasoline engines will be dropped**
- **Editorial and technical comments to gtr n°4 by GRPE members to be submitted to secretary by February 2009**
- **gtr time line is confirmed and WP.29 adoption in November 2009 not in jeopardy**
- **Solution of options 3 and 4 might still be feasible by June 2009**