

भारतसरकार GOVERNMENT OF INDIA
रेलमंत्रालय MINISTRY OF RAILWAYS
रेलवेबोर्ड RAILWAY BOARD

No. 2014/M (L)/101/2(BG)pt.D

New Delhi, dt. 30.10.2015


Chief Mechanical Engineers,
All Indian Railways,

ICF/ Chennai.

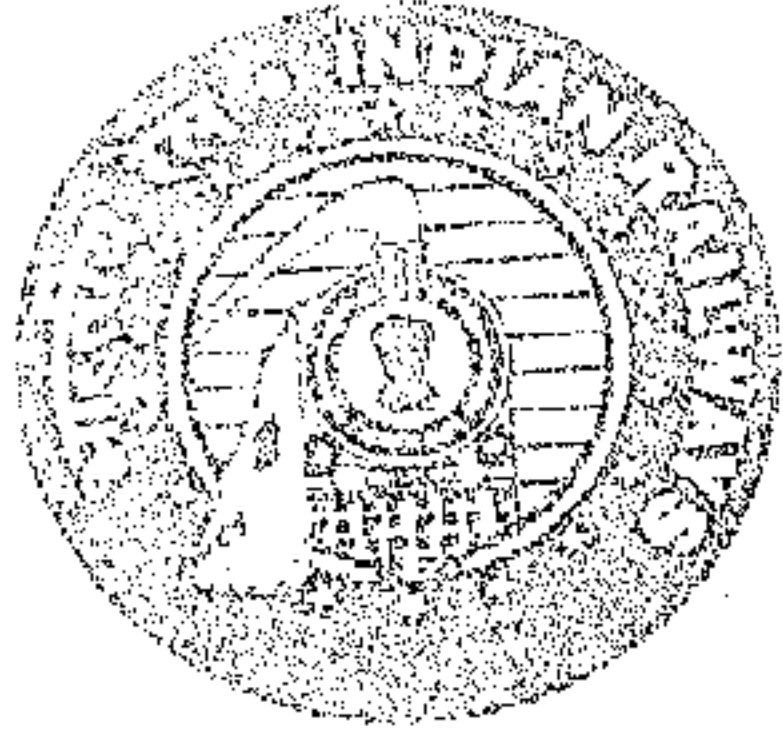
**Sub: Repair and Overhauling of Cummins make High Speed Engines of
IR's DEMU.**

A feasibility report submitted by DMW in consultation with M/s Cummins, on carrying out D & E-checks at DMW of CIL make 700HP (VTA1710L) & 1400HP (Model -KTA 50L) DEMU engines, is enclosed herewith.

Zonal Railways and ICF is advised to furnish their views and suggestions on recommendations submitted by DMW on captioned subject.


(Alok Kumar Misra)
Dir.Mech. Engg. (Tr.)
Railway Board

DA/- As above



भारत सरकार
GOVERNMENT OF INDIA
रेल मंत्रालय
MINISTRY OF RAILWAYS
डीजल रेलइंजन आधुनिकीरण कारखाना
DIESEL LOCO MODERNISATION WORKS

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Dated: 13.10.2015

No. DMW/M/LR/01/Pt-1

Exec. Dir. Mech. Engg.(Tr),
Railway Board,
New Delhi.

Sub: Repair and Overhauling of Cummins make High Speed Engines of IR's DEMU

Ref: 1. Your letter no. 2014/M (L)/101/2BG Pt-D dated 02.02.2015
2. This office letter of even number dated 16.06.2015

On Board's directives vide reference at Sr. No. 1, feasibility of carrying out D and E-checks at DMW of CIL made 1400 hp (Model-KTA 50L) & 700 hp (VTA 1710L) DEMU engines was studied. A detailed feasibility report has already been sent by DMW to Railway Board in June, 2015 vide reference at Sr. No. 2.

Further to the submission as detailed, meeting was held with M/s Cummins at DMW on 23th September, 2015 to discuss our initial findings and recommendations. Based on the inputs received from Cummins during the meeting and subsequent communications, the original recommendations have been revised as under:

For D-Check:

- Zonal Railways should carry out D-checks in-house for both the engines. ZRs can do D-check during POH of DEMU at POH workshop or homing shed as periodicity for both is same
- ICF may discontinue RC with Cummins for D-check
- Instead ICF should enter into RC with Cummins for centralised procurement of all spares and reconditioned items required for D-check/ lower schedules/ out of course repairs
- Calibration of PT pump & Injectors can also be on ICF's RC with Cummins
- No major infrastructural input needed
- SR & SCR already executing D-checks in-house; therefore knowhow available except calibration of PT pump and injectors

FTS
106951

Quickly finalise
the instructions
EDMB/Tr

29/10

All circulate
to ZRs, and let's
get their
views
to DMW
29/10


50/11

For E-Check:

- **We may continue with RC for E-check with Cummins (done currently at Pune & JP), but with changed contract operating conditions**
- **To reduce cycle time and improve effectiveness, ICF's RC for E-check should be operated by CR (Sr.DME/Dsl/Pune) & NWR (Sr.DME/Dsl/JP) for engines overhauled by Cummins at Pune and JP respectively**
- **ZRs only need to send engines to facility of Cummins. Rest all stages to be taken care of by CR and NWR which include:**
 - **Associating for pre-inspection at Cummins facility**
 - **Receiving estimate from Cummins**
 - **Making proposal on the basis of estimate & placing PO on Cummins**
 - **Witnessing engine testing at Cummins facility and**
 - **Releasing payment to Cummins against invoice**
- **Necessary debits can be raised by CR and NWR on ZRs**
- **This will drastically reduce engine detention and also save manpower**
- **After gaining substantial experience/skill in D-check and ensuring reliable systems for supply of quality spares, we can dispense with Cummins RC for E-check and start doing it in-house**

M/s Cummins agrees with DMW's above recommendations.

Hard copy of a detailed power point presentation containing the background information and DMW's recommendations on the subject is attached herewith for Board's further directive.


(D. L. Kamble)
Chief Mechanical Engineer

Copy for kind information :

✓ **AM/ME, AM/PU/Railway Board/New Delhi.**
ED/Coaching/Rly Board/New Delhi.
CME/ICF/Chennai.

**ROADMAP
FOR OVERHAULING
(D and E CHECKS)
OF DEMU'S
CUMMINS ENGINE**

BACKGROUND

- On Board's directives, feasibility of carrying out D and E-checks at DMW of CIL made 1400 hp (Model-KTA 50L) & 700 hp (VTA 1710L) DEMU engines was studied
- A detailed feasibility report has already been sent by DMW to Railway Board in June, 2015
- A meeting was held by CAO/R, DMW with M/s Cummins on 23th September, 2015 to discuss our initial findings and recommendations
- Based on the inputs received from Cummins during the meeting and subsequent communications, the original recommendations have been revised in this presentation
- Cummins agree with all the recommendations of DMW

BACKGROUND

- Study conducted by CWE/R and Dy.CME/VC
- **Visited:**
 - ICF
 - Loco Works, Perambur
 - Carriage workshop, Lallaguda
 - Diesel Shed, Maula Ali
 - Facility of M/s Cummins India, Jaipur
 - DEMU car shed, JUC
- **Data Collected from:**
 - Above places
 - SSB diesel shed

INTRODUCTION

Cummins (CIL) made diesel engines of capacity 1400 hp (KTA 50L)
& 700 hp (VTA 1710L) are used in DEMU

Type of Schedule	1400 hp Engine**	700 hp Engine**	Remarks
Trip	At the end of each trip		Done in Shed
Monthly	1 month		Done in Shed
Quarterly	3 month		Done in Shed
Half yearly	6 months		Done in Shed
D-Check	18 months or 6000 hours whichever is earlier	18 months	Normally done during POH of DEMU rake in workshops. Engine not removed.
E-Check	54 months or 18000 hours whichever is earlier	18000 hours	Engine is removed & sent by Zonal Railways to the facility of Cummins at Pune or Jaipur

****As per schedule of Standard examination of 1400 hp and 700 hp DEMU issued by RDSO**

DOCUMENTS REFERRED

- Rate contracts for D and E-check of CIL make engine issued by ICF for 700hp & 1400 hp DEMU engines
- Schedule of Standard Examination of 1400 hp DEMU
- Schedule of Standard Examination of 700 hp DEMU
- Maintenance Manual for 1400 HP engine by CAMTECH
- Cummins's Owner Manual of VTA -1710 (700 hp) engine
- Cummins' parts catalogue for KTA 50L /1400 hp
- Workshop instruction for E-check of 700 hp Cummins engine issued by Loco works, Perambur
- DGS&D Rate Contract for spares of Cummins engine

POPULATION AND ANNUAL ARISING

Periodicity: 54 months for E-check
18 months for D-check

Type of Engine	Population of Engines (As on 01 July, 2015)	Schedule	Theoretical Average Annual Arising (based on periodicity) (As on 01 July, 2015)
1400 hp	271 (193 on 01 Jan, 2014 & 116 on 01 Jan, 2011)	D-Check	103
		E-Check	26
700 hp	100 (100 on 01 Jan, 2014 as well as on 01 Jan, 2011)	D-Check	45
		E-Check	22
TOTAL	371	D-Check	148
		E-Check	48

EXISTING SYSTEM OF MAINTENANCE

- 4 rate contracts of ICF with Cummins covering D and E-check for 1400 hp & 700 hp engines
- Zonal Railways execute contract by issuing P.O.
- Contract stipulates total number of engines to be overhauled in a year by a ZR
- Most ZRs get D-check done through RC;
SCR and SR execute D-checks in-house
SR is about to start D-check through RC
- For E check, rate contract is used by ZRs invariably

DIFFICULTIES BEING FACED BY ZONAL RAILWAYS IN MAINTENANCE

**Poor Availability of spares for schedules conducted in-house
(Trip, Monthly, Quarterly and sometimes D-check)**

- Spares normally procured from Cummins on PAC or through DGS&D Rate Contract (for a few items)
- Frequent / abnormal delay in supply of spares and in submission of budgetary quotes by Cummins
- Sometimes spares are also procured through open tenders; quality inconsistent
- For a few non-critical items, SR and SCR developed non-OEM sources; quality & reliability not yet established

**SUMMARY OF ACTUAL AVERAGE COST OF
E-CHECK CARRIED OUT UNDER ICF's RC**

COST ELEMENT	1400 HP	700 HP
Cost of Mandatory Items (Change+Recon)	26,09,641	10,86,110
Cost of Condition Based items	4,23,830	7,37,331
Engineer deputation/ Labour cost	2,23,710	1,50,000
Transportation and insurance	70,704	51,317
VAT and Service Tax	3,99,418	2,35,278
Total Average Cost of one E-Check (in INR)	37,27,303	22,60,036

**** Figures provided by Cummins for FY- 2014-15**

Correctness of figures confirmed from JUC / SSB sheds and PER workshop

**SUMMARY OF ACTUAL AVERAGE COST OF
D-CHECK CARRIED OUT UNDER ICF's RC**

COST ELEMENT	1400 HP	700 HP
Cost of Must Change/Recon Items	5,38,171	1,90,735
Cost of Condition Based Change/Recon Items	10,08,661	2,48,524
Engineer deputation/ Labour cost	58,276	37,453
Other Charges (transportation, conveyance)	1,350	375
Total Average Cost of one D-Check (in INR)	16,06,458	4,77,088

**** Figures based on data collected from SSB, JUC sheds & PER workshop**

All cost elements include taxes

**FINANCIAL IMPLICATIONS OF SWITCHING OVER
FROM CUMMINS RCs TO IN-HOUSE MAINTENANCE**
(D and E check for both engines)

Labour Cost

LABOUR COST (In INR)	1400 HP		700 HP	
	D-Check	E-Check	D-Check	E-Check
Cost charged by Cummins ^^	58,276	2,23,710	37,453	1,50,000
DMW's in-house estimated cost**	2,80,059	4,41,636	2,54,025	3,68,030

^^ Actual average cost based on data collected from SSB, JUC sheds & PER workshop

** Based on man-hours provided by Perambur Workshop

*In-house Labour Cost is 5-7 times for D-check and
about 2 times for E-check*

**FINANCIAL IMPLICATIONS OF SWITCHING OVER
FROM CUMMINS RCs TO IN-HOUSE MAINTENANCE**
(D and E check for both engines)

- **Cost of *Must Change* Items**
 - Will not get immediately reduced as bulk of the parts will have to be sourced from Cummins
 - May gradually come down with development of alternative sources
- **Cost of *Condition based Change* Items**
 - Not going to fall much initially since in-house practices shall be guided by Cummins
 - With experience, considerable reduction expected in replacement of spares on condition basis; reducing cost
 - Development of non-OEM sources may also reduce cost

FINANCIAL IMPLICATIONS OF SWITCHING OVER FROM CUMMINS RCs TO IN-HOUSE MAINTENANCE

(D and E check for both engines)

- **Cost of Reconditioning of items**
 - This cost element is there for D-checks only (not for E-check) in the ICF's rate contracts
 - With Experience, Railways and DMW can identify items for reconditioning instead of replacing during E-check, leading to cost reduction
- **Infrastructure and M&P cost**
 - Cost of setting up the infrastructure/M&P/testing equipment
 - Recurring maintenance cost of these assets
- **Transportation charges**
 - Applicable for E-check and will not be affected much

ADDITIONAL ISSUES

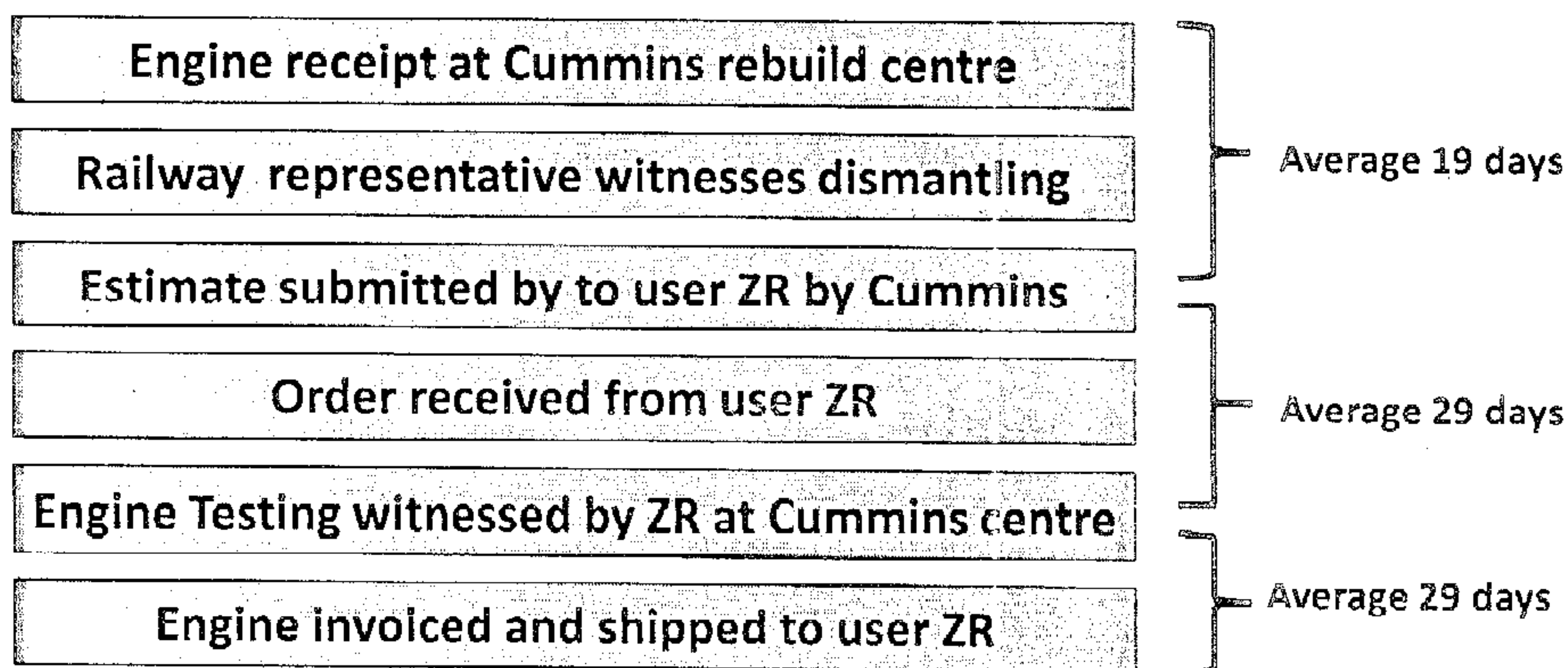
- Theoretical annual arising of E and D-check for both engines is 48 and 148
- Annual Quantity as per ICF contract for E and D-check for both engines is 54 and 59
- Actual checks done under ICF rate contract is around 50% of allocated quantity for E and D checks for both the engines, that also despite persistent chasing with ZRs by Cummins for getting the checks done under RC
- It clearly indicates under-maintenance of DEMU engines
- This results in higher costs of D-check and E-checks (due to heavier damages found during checks)

ADDITIONAL ISSUES

- As some ZRs are doing D-checks themselves also, **under-maintenance in terms of D-check may not be that grave**
- Data clearly indicates that **delay in E-checks (as none of ZRs does it in-house) is rampant**
- In fact, based on the population and E-checks done in year 2014 (27 in total), the **actual average periodicity at which E-checks are actually being done works out to be 8 years instead of recommended 4.5 years, which is alarming**
- Such under-maintenance may lead to poor reliability of the engine, E-check being the most comprehensive schedule
- **This issue needs to be studied further and addressed suitably**

ADDITIONAL ISSUES

Logistics involved in E-check are:



- **Total time consumed in getting one E-check is 77 days which is too high**
- **Reasons need to be studied and issue to be addressed suitably to bring downtime of engine down on account of E-check**

DMW'S RECOMMENDATIONS for D-Check

Zonal Railways to carry out D-checks in-house for both the engines as:

- **D check by DMW's flying gang involves 5 to 7 times manpower cost** as compared to Cummins' RC cost; besides wastage of man hours due to mismatch of flying gang & engine availability
- **Material cost may come down gradually** due to reduction in material cost as discussed
- **SR & SCR executing the D-checks; knowhow available**
- **No major infrastructural input needed**
- **ICF to discontinue RC for D-check**


DMW'S RECOMMENDATIONS for D-Check

- **ZRs can do D-check during POH of DEMU at POH workshop or homing shed** as periodicity for both is same
- **ICF to enter into RC for centralised procurement of all spares and reconditioned items required for D-check/ lower schedules/ out of course repairs**
- **Lower rates available for a few items in DGS&D RCs; Cummins to be impressed upon to offer same rates against ICF's RCs**
- **In due course, ICF to develop and recommend quality alternate sources** for more and more items to bring down cost. ICF may consider non-OEM sources developed/ suggested by SR, SCR & other Railways

DMW'S RECOMMENDATIONS for D-Check

- Calibration of PT pump & injectors can also be on ICF's RC with Cummins; ICF can include it in RC for spares and recon items
- Compliance will improve in recommended system
- Manpower requirement for carrying out D-check of one Engine will be around 350 hours (As per data provided by PER workshop)

DMW'S RECOMMENDATION for E-Check

- Centralised work at DMW will not be cost effective immediately due to substantial infrastructural and manpower needs; also spares cost not going to reduce 
- Total value of the work is quite low
- DMW may concentrate on developing skills and facilities for HHP's 18-yearly schedule and other major sub-assemblies
- Railways will be in a better position to take up E-check once experience in D-check is gained and regular & cheaper supply of spares streamlined
- Till then we may continue with RC for E-check with Cummins

DMW'S RECOMMENDATIONS for E-Check

- E-check is done by Cummins at 2 centralised locations viz Pune and Jaipur
- **A lot of delay/detention to each engine occurs mainly at 3 stages i.e.**
 - Joint pre-inspection by user railway with Cummins
 - Release of PO by user Railway and
 - Witnessing of final testing by user Railway at Cummins facility
- **To minimise this, the ICF's RC for E-check is to be operated by CR (Sr.DME/Dsl/Pune) & NWR (Sr.DME/Dsl/JP) for engines overhauled by Cummins at Pune and JP respectively (*Proposed for future RC*)**

DMW'S RECOMMENDATIONS for E-Check

- ZRs only need to send engines to facility of Cummins
- **Rest all stages to be taken care of by CR and NWR which include:**
 - Associating for pre-inspection at Cummins facility
 - Receiving estimate from Cummins
 - Making proposal on the basis of estimate & placing PO on Cummins
 - Witnessing engine testing at Cummins facility
 - Releasing payment to Cummins against invoice
- Necessary debits can be raised by CR and NWR on ZRs
- **This will drastically reduce engine detention and also save manpower which is deputed by ZRs repeatedly for each engine**

DMW'S RECOMMENDATIONS for E-Check

After gaining substantial experience/skill in D-check and ensuring reliable systems for supply of quality spares, we can dispense with Cummins RC for E-check and start doing it in-house as per following model:

- In-house work in workshops or depots/sheds
- Centralised procurement of spares through RC
- In-house PT pump overhauling & calibration at one or two centralised places
- Alternatively, it can be got done from Cummins through RC by ICF

THANKS