SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING

(An Autonomous Institution)
Kalavakkam – 603 110

SELF STUDY REPORT

3.2.1 Research funding received by the institution and its faculties through Government and non-government sources such as industry, corporate houses, international bodies for research project, endowment research chairs during the last five years

Submitted to

The National Assessment and Accreditation Council

February 2024

FILE NO. IRR/2016/000015

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(a statutory body of the Department of Science & Technology, government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 14-Mar-2018

ORDER

Subject: Financial Sanction of the research project titled **"Design and Development of Energy Efficient Permanent Magnet Assisted Reluctance Motor Drives for Pump Application"** under the guidance of Dr. V Kamaraj, Electrical and Electronics Engineering, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 and by Dr. M Balaji, Associate Professor, Electrical And Electronics Engineering, SSN College Of Engineering and by Mr. Nagarajan VS, Assistant Professor, Electrical And Electronics Engineering, SSN College Of Engineering - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 2118978/- (Rs.** Twenty One Lakh Eighteen Thousand Nine Hundred and Seventy Eight **Only)** with break-up of **Rs. *1236344*/- under Capital (Non-recurring) head** and **Rs.*882634*/- under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 2118978/-** has been approved are given below:
The following budget may be considered for **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam**

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> Simulation Software -> Sensors -> Power Module -> Conventional Prototype -> Optimized Prototype -> Digital Signal Processor	1236344
A'	*Total (Non-Recurring)*	***1236344***
B	**Recurring Items**	
1	Recurring - A : (Manpower) Recurring - B : (Consumables, Travel, Contingencies)	360000 330000
2	Recurring - C : (Overhead Charges)	192634
B'	*Total (Recurring)*	***882634***
C	**Total cost of the project (A' + B')**	**2118978**

2. Once the first installment corresponding to industry share i,e. **(Euro Process Automatik)** is received by PI, the PI will initiate the project work after information to SERB, subsequently the first installment corresponding to SERB share will be released from SERB.
3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**
This release is being made under Industry Relevant R&D. (PAC Electrical Electronics & Computer Engineering)

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on **06 February, 2018** and vide Diary No. **null** dated

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. The date of start of the project will be within one month from the date of issue of this sanction order and the industry contribution received by the institute.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10.The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in- aid General) & Non-Recurring

V E ANNAMALAI

Digitally signed by V E ANNAMALAI
Date: 2024.03.13 11:48:58 +05'30'

(Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

11. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

12.The project File no. IRR/2016/000015 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

13.The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

14.As this is the first grant being released for the project, no previous U/C is required.

15. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

16. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

17. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.

(Dr. Rajwant SERB)
Scientist E
rajwant@serb.gov.in

To,
Under Secretary
SERB, New Delhi
Copy forwarded for information and necessary action to: -
tr>

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	**Dr. V Kamaraj** **Electrical and Electronics Engineering** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: kamarajv@ssn.edu.in** **Mobile: 919841220416** **Dr. M Balaji** **Electrical And Electronics Engineering** **SSN College Of Engineering** **Mr. Nagarajan VS** **Electrical And Electronics Engineering** **SSN College Of Engineering** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)
6.	**Mr.Periyandavar** **Euro Process Automatik** **250C,NP, 10th Street ,Sector 2,SIDCO Industrial Estate,Ambattur,Chennai-600098 Tel:044-42040491,Mobile:9444045277** **Email: sales@epachennai.com** **Mobile: 9003045277**

(Dr. Rajwant SERB)
Scientist E
rajwant@serb.gov.in

Er. Ravinder Gaur,
Scientist & Member Secretary
(State Science & Technology Programme)
TDT Divn., Room No.13, Hall-A,
Tel: 011-2659 0373, Email: rgaur@nic.in

भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
विज्ञान और प्रौद्योगिकी विभाग
टेक्नोलॉजी भवन, नया महरौली मार्ग
नई दिल्ली-110 016

GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENCE AND TECHNOLOGY
TECHNOLOGY BHAVAN, NEW MEHRAULI ROAD
NEW DELHI-110 016

D.O. No. **F. No. DST/SSTP/2018/310**

Dated **05.03.2019**

Subject: Financial support for the project entitled "Development of an Efficient IOT Enabled Plant Disease Pest Detection System" by Dr. S. Radha, Professor & Head, Dept. of ECE, SSN College of Engineering, Old Mahabalipuram Road (OMR), Rajiv Gandhi Salai, Kalavakkam, Chennai, PIN: 603110, Tamilnadu & Dr. R. Selvarajan, Principal Scientist, Department of Plant Pathology, Virology, ICAR-National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Thiruchirapalli-620102- Release of the first instalment regarding

Dear **Dr. Radha,**

I am happy to inform your good self that above mentioned project proposal has been sanctioned by the DST for the implementation which is based on the 'Development of an Efficient IOT Enabled Plant Disease Pest Detection System. Please note that whenever any important activity organized by yourself may kindly to informed this Department so that persons may be nominated for the participation. We have also enclosed the terms and condition of the grants, GFR-2017 (attached along with this letter) please follow them while implementing the project. Please also inform the DST about following as they become applicable:

1. Date of receipt of funds
2. Project commencement date
3. Recruitment of manpower as per DST norms
4. Actual work plan for implementing the project indicating various milestones
5. Quarterly progress report of the project as per the format enclosed
6. Statement of Expenditure (SE) and Utilization Certificate (UC) as per the format attached for General and Capital Grant separately.
7. As per the new instructions of the Ministry, the PI is requested to deposit the whole project grant in an interest earning account and be remitted to the Consolidated Fund of India (through Non-Tax Receipt Portal (NTRP), i.e., www.Bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure/Utilization Certificate for considering subsequent release of grant/closure of project accounts while sending the SE/UC of each financial year for any further release from this Department.
8. The PI is requested to upload the UC in the PFMS website (https://pfms.nic.in/Users/LoginDetails/Login.aspx) and submit the UC number of General and Capital Head.
9. A formal acceptance letter from the competent authority of your institute for agreeing to the terms and conditions of the sanction order (within 15 days of receipt of this letter)

Cont..2

The sanction order contains various annexure which gives the various formats required to be submitted by the PI while implementing the project. We will be happy to provide further any information if needed. You are kindly requested to submit the various documents to this Department through to the undersigned for any further grants from this Department.

Looking forward your soon reply.

Thanking you with kind regards,

Your Sincerely,

(Ravinder Gaur)

Dr. S. Radha
Professor & Head
Dept. of ECE
SSN College of Engineering
Old Mahabalipuram Road (OMR),
Rajiv Gandhi Salai, Kalavakkam,
Chennai, PIN: 603110, Tamilnadu

CC:
Dr. R. Selvarajan, Principal Scientist, Department of Plant Pathology, Virology, ICAR-National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Thiruchirapalli-620102

F. No.: DST/SSTP/2018/310 (G)
Government of India
Ministry of Science and Technology
Department of Science and Technology

Technology Bhavan
New Mehrauli Road
New Delhi- 110 016
Dated: 21/03/2019

ORDER

Subject: **Financial support for the Project entitled "Development of an Efficient IOT Enabled Plant Disease Pest Detection System" by Dr. S. Radha, Professor & Head, Dept. of ECE, SSN College of Engineering, Old Mahabalipuram Road (OMR), Rajiv Gandhi Salai, Kalavakkam, Chennai, PIN: 603110, Tamilnadu& Dr. R. Selvarajan, Principal Scientist, Department of Plant Pathology, Virology, ICAR-National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Thiruchirapalli-620102- Release of the first instalment regarding**

Sanction of the President is hereby accorded for the approval of the above mentioned project at a total cost of **Rs. 62,26,260/-** (Rupees Sixty-Two Lakh Twenty Six Thousand Two Hundred Sixty Only) with bifurcations as **Rs. 34,92,710/-** (Rupees Thirty-Four Lakhs Ninety Two Thousands Seven Hundred Ten Only) to **SSN College of Engineering, Chennai and Rs. 27,33,550/-** (Rupees Twenty-Seven Lakhs Thirty Three Thousands Five Hundred Fifty Only) to **ICAR-National Research Centre for Banana (NRCB), Thiruchirapallifor** a duration of 36 months to the **Principal, SSN College of Engineering, Old Mahabalipuram Road (OMR), Rajiv Gandhi Salai, Kalavakkam, Chennai, PIN: 603110, Tamilnadu and part of grant of NRCB Rs. 27,33,550/- for onward disbursement to The Director, ICAR-National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Thiruchirapalli-620102 as per the budget mentioned below financial year wise**. The detailed breakup of the DST contribution is given below with the following bifurcations:

- General Component: **Rs. 52,50,400/-** (Rupees Fifty-Two Lakhs Fifty Thousands Four Hundred Only)
- Capital Component: **Rs. 9,75,860/-** (Rupees Nine Lakh Seventy-Five Thousand Eight Hundred Sixty Only)

Budget Outlay

Sl. No.	Items	1st year		2nd year		3rd year		Total		
		SSN	NRCB	SSN	NRCB	SSN	NRCB	SSN	NRCB	Grand Total
	Recurring expenses									
1	Salaries	561600	360000	561600	360000	561600	403200	1684800	1123200	2808000
2	Consumables	121229	56241	77451	37479	25000	15000	223680	108720	332400
3	Contingencies	25000	25000	25000	25000	25000	25000	75000	75000	150000
4	Travel	180000	180000	180000	180000	180000	180000	540000	540000	1080000
5	Other cost	80000	80000	80000	80000	80000	80000	240000	240000	480000
6	Overhead expenses	100000	100000	50000	50000	50000	50000	200000	200000	400000
	Subtotal (1)	1067829	801241	974051	732479	921600	753200	2963480	2286920	5250400
	Non-Recurring expenses									
7	Permanent equipment	529230	446630	0	0	0	0	529230	446630	975860
	Grand total	1597059	1247871	974051	732479	921600	753200	3492710	2733550	6226260

* Salary:

SSN College, Chennai:

a) **One Research Associate-I @36,000/- PM fixed + 30% HRA for 3 years** (Candidates should be Ph.D/MD/MS/MDS or equivalent degree or having 3 years of research, teaching and design and development experience after MVSc/M.Pharm/ME/M.Tech with at least one research paper in Science Citation Indexed (SCI) journals.

NRCB, Trichy:

a) **One JRF @25,000/- PM fixed + 20% HRA for 24 months & @28,000/- PM fixed + 20% HRA for 3rd year** (Candidates should be with Pg Degree in Basic Science with NET qualification or graduate degree in Professional course with NET qualification or post graduate degree in

01/03/2019

74302/2019/TDT

Other Costs Head: involves the cost for Agricultural consultancy for getting assistance for Plant health monitoring, plant disease, pest detection and database generation (collecting images of diseased plants at various stages of infection)

2. The sanction of the president is also conveyed for the Initial release of **Rs. 18,69,070/-** (Rupees Eighteen Lakh Sixty-Nine Thousand Seventy Only) under 'General Component' with bifurcations as Rs. **10,67,829/- to SSN College of Engineering, Chennai & Rs. 8,01,241/- to ICAR-National Research Centre for Banana (NRCB), Thiruchirapalli**.

3. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date of progress report at the end of each financial year duly reflecting the interest earned/accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

4. The grantee organization will have to enter and upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

5. If the grant has been released under the capital head through separate sanction order under the same project for purchase of equipment(s), separate SE/UC has to be furnished for the released Capital head grant.

6. The grant –in-aid being released is subject to the condition that:

(a) A transparent procurement procedure in line with the Provision of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of the grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant

(b) While submitting Utilization Certificate/Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

7. The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. For Grants released during F.Y. 2017-18 and onwards, all interests and other earnings, against released Grant shall be remitted to Consolidated Fund of India (through Non-Tax Receipt Portal (NTRP), i.e., www.Bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure/Utilization Certificate for considering subsequent release of grant/closure of project accounts.

8. DST reserves sole rights on the assets created out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.

9. In case the scheme provides for payment of honorarium/remuneration/fellowship/scholarship to the Principal Investigator, a para may be suitably be incorporated in the DSO to the effect that "PI is not drawing any emoluments/salary/fellowship from any other project either supported by DST or by any other funding agency".

10. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C&AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236 (1) of General Financial Rules 2017.

11. Due acknowledgment of technical support/financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications/media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

01/03/2019

13. The expenditure involved is debitableto:-
Demand No. 84, Department of Science & Technology

3425	Other Scientific Research (Major Head)
60	Other (sub-major Head)
60.200	Assistance to other Scientific Bodies (Minor Head)
68	Science & Technology Institutional and Human Capacity Building
68.00.31	Grant –in-aid general for the year 2018-19(Plan Expenditure)
Previous budget head	3425.60.200.27.00.31 (State Science & Technology Programme Grant –in-aid general)

14. The amount of **Rs. 18,69,070/-** (Rupees Eighteen Lakh Sixty-Nine Thousand Seventy Only)will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to the **Principal, SSN College of Engineering, Old Mahabalipuram Road (OMR), Rajiv Gandhi Salai, Kalavakkam, Chennai, PIN: 603110, Tamilnadu out of which Rs. 8,01,241/- he will made onward disbursement to The Director, ICAR-National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Thiruchirapalli-620102 and rest Rs. 10,67,829/- will kept with him for his financial grant as per the budget mentioned above.** The bank details for electronic transfer of funds through RTGS are given below:

Name of the agency	Principal, SSN College of Engineering
Account no.	158100050070022
Bank name	Tamilnadu Mercantile Bank Ltd.
IFSC code	TMBL0000158

15. As per the Rule 234 of GFR 2017, this sanction has been entered at S. No 75 in the register of grants maintained in the Division for the scheme State S&T programme.

16. This issues with the concurrence of IFD vide their Concurrence **Diary No.**5684, **dated** . 01/03/2019

(Er. Ravinder Gaur)
Scientist – D
011-26590373

To
The Pay and Accounts Officer
Department of Science and Technology
New Delhi- 110 016
Copy for information and necessary action to:

1. Cash Section (3 copies) for preparing the bill and remitting the amount to the above grantee.
2. Accounts Section, DST, New Delhi.
3. IFD, Department of Science & Technology, New Delhi.
4. Director of Audit (CW& M-II), AGCR Building, IP Estate, New Delhi.
5. The Principal, SSN College of Engineering, Old Mahabalipuram Road (OMR), Rajiv Gandhi Salai, Kalavakkam, Chennai, PIN: 603110, Tamilnadu.
6. Dr. S. Radha, Professor & Head, Dept. of ECE, SSN College of Engineering, Old Mahabalipuram Road (OMR), Rajiv Gandhi Salai, Kalavakkam, Chennai, PIN: 603110, Tamilnadu. (with a request to intimate the undersigned on receipt of the funds in the bank account)
7. The Director, ICAR-National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Thiruchirapalli-620102.
8. Dr. R. Selvarajan, Principal Scientist, Department of Plant Pathology, Virology, ICAR-National Research Centre for Banana (NRCB), Thogamalai Road, Thayanur Post, Thiruchirapalli-620102. (with a request to intimate the undersigned on receipt of the funds in the bank account)
9. Office Copy
10. Sanction Folder
11. Head (TDT)

01/03/2019
(Er. Ravinder Gaur)
Scientist –D
011-2659037

Er. Ravinder Gaur,
Scientist & Member Secretary
(State Science & Technology Programme)
TDT Divn., Room No.13, Hall-A.
Tel: 011-2659 0373, Email: rgaur@nic.in

भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
विज्ञान और प्रौद्योगिकी विभाग
टेक्नोलॉजी भवन, नया महरौली मार्ग
नई दिल्ली 110 016

GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENCE AND TECHNOLOGY
TECHNOLOGY BHAVAN, NEW MEHRAULI ROAD
NEW DELHI-110 016

D.O. No. **F. No. DST/SSTP/2018-19/10**

Dated **05.03.2019**

Subject: Financial support for the project entitled "Design of game-based communication platform for children with cerebral palsy" by Dr. R. Amutha, Professor, SSN College of Engineering, Rajiv Gandhi Salai, Kalavakkam, Chennai, PIN: 603110, Tamilnadu - Release of the first instalment regarding

Dear **Dr. Amutha**,

I am happy to inform your good self that above mentioned project proposal has been sanctioned by the DST for the implementation which is based on the 'Design of game-based communication platform for children with cerebral palsy. Please note that whenever any important activity organized by yourself may kindly to informed this Department so that persons may be nominated for the participation. We have also enclosed the terms and condition of the grants, GFR-2017 (attached along with this letter) please follow them while implementing the project. Please also inform the DST about following as they become applicable:

1. Date of receipt of funds
2. Project commencement date
3. Recruitment of manpower as per DST norms
4. Actual work plan for implementing the project indicating various milestones
5. Quarterly progress report of the project as per the format enclosed
6. Statement of Expenditure (SE) and Utilization Certificate (UC) as per the format attached for General and Capital Grant separately.
7. As per the new instructions of the Ministry, the PI is requested to deposit the whole project grant in an interest earning account and be remitted to the Consolidated Fund of India (through Non-Tax Receipt Portal (NTRP), i.e., www.Bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure/Utilization Certificate for considering subsequent release of grant/closure of project accounts while sending the SE/UC of each financial year for any further release from this Department.
8. The PI is requested to upload the UC in the PFMS website (https://pfms.nic.in/Users/LoginDetails/Login.aspx) and submit the UC number of General and Capital Head.
9. A formal acceptance letter from the competent authority of your institute for agreeing to the terms and conditions of the sanction order (within 15 days of receipt of this letter)

Cont..2

The sanction order contains various annexure which gives the various formats required to be submitted by the PI while implementing the project. We will be happy to provide further any information if needed. You are kindly requested to submit the various documents to this Department through to the undersigned for any further grants from this Department.

Looking forward your soon reply.

Thanking you with kind regards,

Your Sincerely,

(Ravinder Gaur)

Dr. R. Amutha
Professor
SSN College of Engineering
Rajiv Gandhi Salai, Kalavakkam
Chennai, PIN: 603110

DST/SSTP/2018-19/10(G)
Government of India
Ministry of Science and Technology
Department of Science and Technology

Technology Bhavan
New Mehrauli Road
New Delhi- 110 016
Dated the 26.02.2019

ORDER

Subject: Financial support for the project entitled "Design of game-based communication platform for children with cerebral palsy" by Dr. R Amutha, Professor, SSN College of Engineering, Rajiv Gandhi Salai, Kalavakkam, Chennai, Tamilnadu - Release of the first instalment regarding

Sanction of the President is hereby accorded for the approval of the above mentioned project at a total cost of **Rs. 17,00,959/-** (Rupees Seventeen Lakh Nine Hundred Fifty Nine Only) for a duration of 36 months to the **Principal, SSN College of Engineering, Rajiv Gandhi Salai, Kalavakkam, Chennai, Tamilnadu.**

- **General Component: Rs. 16,15,229/- (Rupees Sixteen Lakh Fifteen Thousand Two Hundred Twenty Nine Only)**
- **Capital Component: Rs. 85,730/- (Rupees Eighty Five Thousand Seven Hundred Thirty only)**

Budget Outlay:

Sl. No.	Items	1st Year	2nd Year	3rd Year	Total
	Recurring expenses				
1	Salaries	390000	390000	436800	1216800
2	Consumables	11510	3010	3010	17530
4	Travel	40000	40000	40000	120000
5	Other Costs	38020	38020	38020	114060
	Sub Total (1)	479530	471030	517830	1468390
6	Overhead expenses	47953	47103	51783	146839
	Total	527483	518133	569613	1615229
7	Non Recurring expenses	85730	0	0	85730
	Grand Total	**613213**	**518133**	**569613**	**1700959**

*** Salary:**
Full time:

a. **One JRF** @ Rs. 25,000/- 30% HRA for first two years (Candidate should be with PG Degree in Basic Science with NET qualification or graduate degree in Professional course with NET qualification or post graduate degree in professional course) and **One SRF** @ Rs. 28,000/- PM fixed + 30% HRA for third year (Candidate should be with PG Degree in Basic Science with NET qualification or graduate degree in Professional course with NET qualification or post graduate degree in professional course with 2 years' experience)

2. The sanction of the president is also conveyed for the Initial release of **Rs. 5,27,483/-** (Rupees Five Lakh Twenty Seven Thousand Four Hundred Eighty Three Only) under 'General Component'.

3. This sanction is subject to the condition that the grantee organization will furnish to the Department of Science & Technology, financial year wise utilization Certificate (UC) in the proforma prescribed as per GFR 2017 and audited statement of expenditure (SE) along with up to date of progress report at the end of each financial year duly reflecting the interest earned/accrued on the grants received under the project. This is also subject to the condition of submission of the final statement of expenditure, utilization certificate and project completion report within one year from the scheduled date of completion of the project.

Cont...2

4. The grantee organization will have to enter and upload the Utilization Certificate in the PFMS portal besides sending it in physical form to this Division. The subsequent/final installment will be released only after confirmation of the acceptance of the UC by the Division and entry of previous Utilization Certificate in the PFMS.

5. If the grant has been released under the capital head through separate sanction order under the same project for purchase of equipment(s), separate SE/UC has to be furnished for the released Capital head grant.

6. The grant –in-aid being released is subject to the condition that:

(a) A transparent procurement procedure in line with the Provision of General Financial Rules 2017 will be followed by the Institute/Organization under the appropriate rules of the grantee organization while procuring capital assets sanctioned for the above mentioned project and a certificate to this effect will be submitted by the Grantee organization immediately on receipt of the grant

(b) While submitting Utilization Certificate/Statement of Expenditure, the organization has to ensure submission of supporting documentary evidences with regard to purchase of equipment/capital assets as per the provisions of GFR 2017. Subsequent release of grants under the project shall be considered only on receipt of the said documents.

7. The grantee organization will maintain separate audited account for the project and the entire amount of grant will be kept in an interest bearing bank account. For grants released during FY 2017-18 and onwards, all interests and other earning against released grant shall be remitted to Consolidated fund of India (trough Non-Tax Receipt Portal, NTRP i.e www.bharatkosh.gov.in), immediately after finalization of accounts, as it shall not be adjusted towards future release of grant. A certificate to this effect shall have to be submitted along with Statement of Expenditure / Utilization Certificate for considering subsequent release of Grant/ Closure of project accounts".

8. DST reserves sole rights on the assets created out of grants. Assets acquired wholly or substantially out of government grants (except those declared as obsolete and unserviceable or condemned in accordance with the procedure laid down in GFR 2017), shall not be disposed of without obtaining the prior approval of DST.

9. In case the scheme provides for payment of honorarium/remuneration/fellowship/scholarship to the Principal Investigator, a para may be suitably be incorporated in the DSO to the effect that "PI is not drawing any emoluments/salary/fellowship from any other project either supported by DST or by any other funding agency".

10. The account of the grantee organization shall be open to inspection by the sanctioning authority and audit (both by C&AG of India and Internal Audit by the Principal Accounts Office of the DST), whenever the organization is called upon to do so, as laid down under Rule 236 (1) of General Financial Rules 2017.

11. Due acknowledgment of technical support/financial assistance resulting from this project grant should mandatorily be highlighted by the grantee organization in bold letters in all publications/media releases as well as in the opening paragraphs of their Annual Reports during and after the completion of the project.

12. Failure to comply with the terms and conditions of the Bond will entail full refund with interest in terms of Rule 231 (2) of GFR 2017.

13. The expenditure involved is debitableto:-
Demand No. **84,** Department of Science & Technology:

Cont...3

3425	Other Scientific Research (Major Head)
60	Other (sub-major Head)
60.200	Assistance to other Scientific Bodies (Minor Head)
68	Science & Technology Institutional and Human Capacity Building
68.00.31	Grant –in-aid general for the year 2018-19 (Plan Expenditure)
Budget head of F. Y 2016-17	3425.60.200.27.00.31 (State Science & Technology Programme Grant in Aid General)

14. The amount of **Rs. 5,27,483/-** (Rupees Five Lakh Twenty Seven Thousand Four Hundred Eighty Three Only) will be drawn by the Drawing and Disbursing Officer, DST and will be disbursed to the Principal, SSN College of Engineering, Rajiv Gandhi Salai, Kalavakkam, Chennai, Tamilnadu. The bank details for electronic transfer of funds through RTGS are given below:

Name of the Agency	**SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING**
Account No.	**151800050070022**
Bank Name	**TAMLINAD MERCANTILE BANK LTD.**
IFSC Code	**TMBL0000158**

15. As per the Rule 234 of GFR 2017, this sanction has been entered at S. No. 69 in the register of grants maintained in the Division for the scheme State S&T programme.

16. This issues with the concurrence of IFD vide their Concurrence **Dy. No. 5046 dated the 02.02.2019.**

17. The PI of the aforementioned project is requested to obtain consumables from Government e-Marketplace (GeM) or from the lowest vendors as per Rule 149 of GFR 2017.

(Er. Ravinder Gaur)
Scientist – D
011-26590373

To
The Pay and Accounts Officer
Department of Science and Technology
New Delhi- 110 016

Copy for information and necessary action to:

1. Cash Section (3 copies) for preparing the bill and remitting the amount to the above grantee.
2. Accounts Section, DST, New Delhi.
3. IFD, Department of Science & Technology, New Delhi.
4. Director of Audit (CW& M-II), AGCR Building, IP Estate, New Delhi.
5. The Principal, SSN College of Engineering, Rajiv Gandhi Salai, Kalavakkam, Chennai, Tamilnadu.
6. Dr. R Amutha, Professor, SSN College of Engineering, Rajiv Gandhi Salai, Kalavakkam, Chennai, Tamilnadu (with a request to intimate the undersigned on receipt of the funds in the bank account)
7. Office Copy
8. Sanction Folder
9. Head (TDT)

(Er. Ravinder Gaur)
Scientist –D
011-26590373

AdhocReports
SchemeWiseContactDetails
Home
CAM Reports
Masters
Users
Agency
Sanctions
PreSanction
Sanction Custom Fields
Printing Templates
Sanction Templates
Employee Info. System
Reports
Masters
My Schemes
Agencies
Scheme Allocation
Register/ Track Issue
Utilisation Certificate
OLD UC

Payee Details

Controller:	037-SCIENCE AND TECHNOLOGY	**Sanction Status:**	**Approved**
Sanction Number:	DST/SSTP/2018-19/10(G)	**Sanction Date:**	26/02/2019
Sanction Type:	Transfer (DDO Bill)	**Sanction Amount:**	527483
IFD Number:	5046	**IFD Date:**	02/02/2019
Scheme:	1817-Science and Technology Institutional and Human Capacity Building	**PAO:**	058296-PAO(DST), New Delhi
DDO:	258297-DEPARTMENT OF SCIENCE & TECHNOLOGY (INCLUDING,NCST)	**Remarks:**	Release of the first installment regarding

Account Details:

Grant	Department (For UT Grants Only)	Function Head	Object Head	Category	Amount	External PAO	Available Budget
084 - Department of Science and Technology		3425602006800 - SCIENCE & TECHNOLOGY INSTITUTIONAL AND HUMAN CAPACITY BUILDING	31 - GRANTS-IN-AID GENERAL	5 - VOTED	527483		538169544

Agency	Bank Account No	Amount	Instrument Type
SSN COLLEGE OF ENGINEERING	158100050070022 - SSN College of En ▼	527,483.00	(•) RTGS

ePayment Details

Accredited Bank : * UNION BANK OF INDIA ▼ **Amount :** 527483 **Not Payable Before :** * Required

Party Name	IFSC Code	Party Account No	Amount	Payee Remarks
SSN COLLEGE O	TMBL0000158	158100050070022	527483	first instalment

Note: If the IFSC Code is not automatically shown it means bank A/C is not validated.If payment process is urgent please key in the IFSC Code and process payment.Please ensure IFSC Code is correct.

Back

Final list of BIG 16 Awardees*

S.No	Proposal Code	Applicant
1	BIRAC/IKP01210/BIG-16/20	30M Genomics Private Limited
2	BIRAC/FITT0777/BIG-16/20	Amandeep Kaur
3	BIRAC/IKP01120/BIG-16/20	AMITKUMAR VERNEKAR
4	BIRAC/NAARM0056/BIG-16/20	AMVICUBE PVT LTD
5	BIRAC/CCAMP01225/BIG-16/20	Anupam Dutta
6	BIRAC/IKP01192/BIG-16/20	Arcapsis Technosolutions Pvt. Ltd.
7	BIRAC/FITT0781/BIG-16/20	Ashutosh Patra
8	BIRAC/CCAMP01238/BIG-16/20	Bauplechain Technologies Private Limited
9	BIRAC/FITT0736/BIG-16/20	Big Bang Boom Solutions Private Limited
10	BIRAC/IKP01125/BIG-16/20	Cellagility Biomed Pvt Ltd
11	BIRAC/SIIC0278/BIG-16/20	Chaitanya Dubey
12	BIRAC/IKP01198/BIG-16/20	CONSYTEL LIFE SCIENCES PVT LTD
13	BIRAC/FITT0779/BIG-16/20	CURIOUZ TECHLAB PRIVATE LIMITED
14	BIRAC/IKP01189/BIG-16/20	Curneu MedTech Innovations
15	BIRAC/CCAMP01165/BIG-16/20	Deval Karia
16	BIRAC/SINE0065/BIG-16/20	Dinoj Joseph
17	BIRAC/CCAMP01148/BIG-16/20	Dr Abrar Rizvi
18	BIRAC/IKP01134/BIG-16/20	Dr. Mrs.V.S.FELIX ENIGO
19	BIRAC/VENTURE0581/BIG-16/20	Dr. Nikhil Mamoria
20	BIRAC/KIIT0938/BIG-16/20	Dr. Shubhankar Kumar Singh
21	BIRAC/IKP01216/BIG-16/20	Dr. Vinod Malshe
22	BIRAC/KIIT0950/BIG-16/20	Elvikon India Pvt Ltd
23	BIRAC/FITT0765/BIG-16/20	GenElek Technologies Pvt. Ltd.
24	BIRAC/SIIC0296/BIG-16/20	Glorios Phyto Labs Private Limited
25	BIRAC/FITT0751/BIG-16/20	HempStreet Medicare Pvt. Ltd.
26	BIRAC/SIIC0363/BIG-16/20	Inhof Technologies

S.No	Proposal Code	Applicant
27	BIRAC/CCAMP01183/BIG-16/20	JESHRON BIOTECH SOLUTION PRIVATE LIMITED
28	BIRAC/SINE0092/BIG-16/20	Kapindra Precision Engineering Ptv. Ltd.
29	BIRAC/IKP01214/BIG-16/20	Kidambi Sneha
30	BIRAC/IKP01199/BIG-16/20	LOOPWORM PRIVATE LIMITED
31	BIRAC/NAARM0071/BIG-16/20	Mallikarjun Sajjan
32	BIRAC/FITT0799/BIG-16/20	NatureDots Private Limited
33	BIRAC/IKP01136/BIG-16/20	Nex Fitzap Private Limited
34	BIRAC/IKP01164/BIG-16/20	Nithyakalyani
35	BIRAC/VENTURE0571/BIG-16/20	PadCare Labs Pvt. Ltd.
36	BIRAC/VENTURE0574/BIG-16/20	Pramod Priya Ranjan
37	BIRAC/SIIC0273/BIG-16/20	Prof. Sourabh Ghosh
38	BIRAC/IKP01130/BIG-16/20	PRUDENTBIO RESEARCH PRIVATE LIMITED
39	BIRAC/CCAMP01241/BIG-16/20	Qzense Labs Private Limited
40	BIRAC/IKP01207/BIG-16/20	Rajasekaran Subramanian
41	BIRAC/IKP01218/BIG-16/20	Rekha Godbole
42	BIRAC/KIIT01029/BIG-16/20	Rigel Bioenviron Solutions Private Limited
43	BIRAC/SINE0060/BIG-16/20	Roshan Udhaorao Sakharkar
44	BIRAC/SINE0096/BIG-16/20	Sal Agrotech Private Limited
45	BIRAC/CCAMP01211/BIG-16/20	Shiva Prakash
46	BIRAC/SIIC0271/BIG-16/20	Siddhant Shrivastava
47	BIRAC/NAARM0032/BIG-16/20	Soniya .H
48	BIRAC/KIIT01036/BIG-16/20	Sumit Healthtech Pvt Ltd
49	BIRAC/IKP01174/BIG-16/20	Tardigrade Private Limited
50	BIRAC/FITT0755/BIG-16/20	Vaishnavi G V S
51	BIRAC/CCAMP01155/BIG-16/20	Wide Mobility Mechatronics Pvt Ltd

* Subject to qualification through further due diligence

From: **Ravindra /IKP/HYD** <ravi@ikpknowledgepark.com>
Date: Tue, Aug 25, 2020 at 10:43 PM
Subject: Congratulations for being selected for BIG 16 award
To: <felixvs@ssn.edu.in>
Cc: Dr. Viswanadham D <viswanadham@ikpknowledgepark.com>, Varma MVP /IKP/HYD <varma@ikpknowledgepark.com>, Bhujanga Rao Kilari <bhujangarao@ikpknowledgepark.com>

Dear Innovator,

Greetings from IKP. We are very glad that you were able to make use of IKP mentorship and your team efforts to win a very prestigious BIG award.

We are pleased to inform you that the committee has recommended your BIG proposal for funding.

Please find the observations from ESC Panel, these need to be attached along with the filled-in due diligence (DD) forms to BIRAC.

The project aims to develop AI based 'Screening Tool' to predict future Osteoporotic Hip Fracture Risk in Post-menopausal women and Elderly population using X-ray Image. Business plan needs strengthening. PI Needs support with IP. Faculty Application. Start up formation to be built in as part of milestones.

Kindly see the below list of documents (company and Individual) to be submitted along with the filled DD forms shortly.
We will be conducting site visit at a date suitable to you at the earliest
It is essential that you prepare the required documents to proceed further. (Please create a dropbox and share where we can update and suggest)

List of documents required for a company:
Link for the templates for the company:
https://www.dropbox.com/sh/9z88792iz5u42hl/AAC-7lteAc6eo15lAxceogxJa?dl=0

1) Completed Due Diligence form
2) Budget Justification for each head with quotations
3) MoU with the Incubator (please kindly let us know if you would like to utilize IKP knowledge Park - or IKP Eden Bangalore)
We will go through the project and suggest the best possible incubator for you)
4) NOC from the employer, if applicable (Technology licensing document etc.)
5) Indian nationality proof of shareholders
6) CA certified 51% shareholding pattern
7) Certificate of incorporation along with MOA and AOA

8) If company is more than 1yr old, then audited financial statements
9) Copy of PAN card of company
10) Responses to ESC recommended documents, if any
11) Individual to Company declaration letter
12) Internal Review report (Financial)

List of documents required for an individual:

Link for the templates for the individual:
https://www.dropbox.com/sh/2p9pahnkorp2ulw/AACwPHMd8QyTpzpk4eMGt6xDa?dl=0

1) Completed Due Diligence form
2) Budget Justification for each head with quotations
3) MoU with the Incubator (please kindly let us know if you would like to utilize IKP knowledge Park - or IKP Eden Bangalore)
We will go through the project and suggest the best possible incubator for you)
4) NOC from the employer, if applicable
5) Indian nationality proof
6) Copy of PAN card
7) ESC recommended documents if any
8) Internal Review report (Financial)

Requesting you to submit the same before 07th of Sept.

We can have a session on zoom about any queries.

Once again congratulations and **our team is looking forward to hearing the feedback** regarding the support received from IKP which helped you succeed. This would help us improve the support process.

Thanks,
Ravindra Y
IKP Knowledge Park

Thenmozhi D <theni_d@ssn.edu.in>

Sanction Order : EEQ/2018/000262

SERB_Administrator@serbonline.in <SERB_Administrator@serbonline.in> Mon, Feb 25, 2019 at 12:31 PM
To: info@serbonline.in

Science and Engineering Research Board

(Statutory Body Established Through an Act of Parliament : SERB Act 2008)
Department of Science and Technology, Government of India

Dear Dr. Thenmozhi Doraiaj,

The below details for **Science & Engineering Research Board (SERB)** Sanction Order (*attached to this mail)*

Sanction Order No	EEQ/2018/000262
Sanction Date	15 February, 2019
PI Name	Dr. Thenmozhi Doraiaj
Institute/University	SSN College Of Engineering , Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (omr), Kalavakkam , Kanchipuram, Tamil Nadu-603110
PI Account Number	158100050070022
Bank & Branch Name	TAMILNAD MERCANTILE BANK LTD., THIRUVANMIYUR BRANCH NO.3, THIRUVALLUVAR SALAI, THIRUVANMIYUR CHENNAI 600 041. TAMILNADU
Amount	INR 1630000/-
In Rupees	Sixteen Lakh Thirty Thousand
UTR No	UBINH19053154261 / SAA432945681
Transaction Date	22 February, 2019

SERB Reference Number:

Bill No: GIA/9992
Diary No / Finance No SERB/F/11199/2018-2019

Confirmation of receipt of funds may be sent by **email** only.

IMPORTANT:

1. **SEPARATE Utilization Certificates (UCs)** for **Recurring and Non Recurring (even if DISBURSED BY SERB THROUGH ONE SANCTION ORDER** for your project) should be **sent directly** to the grant Sanctioning Authority by name (signatory of the sanction order) **within twelve months of the closure of the financial year in which the grants were released irrespecrive of whether the subsequent instalment of grant is due for release or not**.

2. However, if any unspent balance is to be **refunded**, kindly ensure that the unutilized amount may be refunded immediately by way of an **a/c payee cheque/DD** drawn in favour of "**Fund for Science & Engineering Research**", **payable at New Delhi** and **forwarded to the undersigned at the address given below:**

--

Under Secretary

Science & Engineering Research Board (SERB)

(A statutory body under the Government of India's Department of Science & Technology)

5 & 5A, Lower Ground Floor, Vasant Square Mall

Vasant Kunj, New Delhi 110070

INDIA

+91-11-40000328/9

+91-11-40000319/49/52

+91-9818223293

+91-9818223294

Sanction order for EEQ/2018/000262.pdf
1549K

FILE NO. EEQ/2018/000262

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(a statutory body of the Department of Science & Technology, government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 15-Feb-2019

ORDER

Subject: Financial Sanction of the research project titled **"An Automated Tool for Early Detection of Depression from Social Media Text for Mental Health using Deep Learning Approach to Assist Student Counsellors and Psychiatrists of Hospitals in India"** under the guidance of Dr. Thenmozhi Doraiaj, Computer Science and Engineering, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB**) is hereby accorded to the above mentioned project at a total cost of **Rs. 2814000/- (Rs.** Twenty Eight Lakh Fourteen Thousand **Only)** with break-up of **Rs.** ***1000000*****/- under Capital (Non-recurring) head** and **Rs.*1814000*/- under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 2814000/-** has been approved are given below:

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> Workstation	1000000
A'	*Total (Non-Recurring)*	***1000000***
B	**Recurring Items**	
1	Recurring - I : (Manpower) Recurring - II : (Consumables, Travel, Contingencies) Recurring - III : Scientific Social Responsibility	1164000 360000 35000
2	Recurring - IV : (Overhead Charges)	255000
B'	*Total (Recurring)*	***1814000***
C	**Total cost of the project (A' + B')**	**2814000**

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 1000000/-** (Rupees Ten Lakh only) under 'Grants for creation of capital assets' and **Rs. 630000/-** (Rupees Six Lakh Thirty Thousand only) under 'Grants-in-aid General' to **PRINCIPAL, SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**
This release is being made under Empowerment and Equity Opportunities for Excellence in Science. (Task force Committee) (SC)

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on **08 February, 2019** and vide Diary No. **SERB/F/11199/2018-2019** dated **15 February, 2019**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. Budget sanctioned under SSR is meant only for activites enlisted under SSR norms and under no circumstances it can be reappropriated.

9. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

10. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

11. The release amount of **Rs. 1630000/-** (Rupees Sixteen Lakh Thirty Thousand only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	**THE PRINCIPAL, SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING**

Account Number	**158100050070022**
Bank Name & Branch	**TAMILNAD MERCANTILE BANK LTD., THIRUVANMIYUR BRANCHNO.3, THIRUVALLUVAR SALAI, THIRUVANMIYURCHENNAI 600 041. TAMILNADU**
IFSC/RTGS Code	**TMBL0000158**
Email id of A/C Holder	**info@ssn.edu.in**
Email id of PI	**theni_d@ssn.edu.in**

12.The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

13. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

14. The project File no. EEQ/2018/000262 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

15. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

16. As this is the first grant being released for the project, no previous U/C is required.

17. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

18. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

19. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.

(Dr. Pramod Kumar Prasad)
Scientist C
pk.prasad@serb.gov.in

To,
Under Secretary
SERB, New Delhi
Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	**Dr. Thenmozhi Doraiaj** **Computer Science and Engineering** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: theni_d@ssn.edu.in** **Mobile: 919884054239** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**PRINCIPAL,** **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)

(Dr. Pramod Kumar Prasad)
Scientist C
pk.prasad@serb.gov.in

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi and Affiliated to Anna University)

Rajiv Gandhi Salai (OMR), Kalavakkam – 603 110, TN, India.
Tel : +91 44 27469700
Fax : +91 44 27469772
www.ssn.edu.in

Administrative Office: 211/95, V.M. Street, Mylapore, Chennai - 600 004.
Telefax : +91 44 24982656, 24986474

Annexure - A

Project Proposal For

An efficient algorithm for fast processing of Message Quadruples

Submitted to Caterpillar on 03-01-2019

1. **Statement of work:**

The Caterpillar assets such as loaders, dozers, excavators, trucks etc are connected to Caterpillar IoT through an onboard computer called network manager device. These assets may get connected to the devices using either Cellular Radio or Satellite or both or without any one of them. A message quadruple consisting of Asset-Id, Device-Id, CellularRadio-Id and SatelliteRadio-Id indicates the present status of the connectivity between that specific asset and that device. The status indicated by each message has to be updated in the backend database within certain time period (2 seconds) that has been agreed in the Service Level Agreement (SLA).

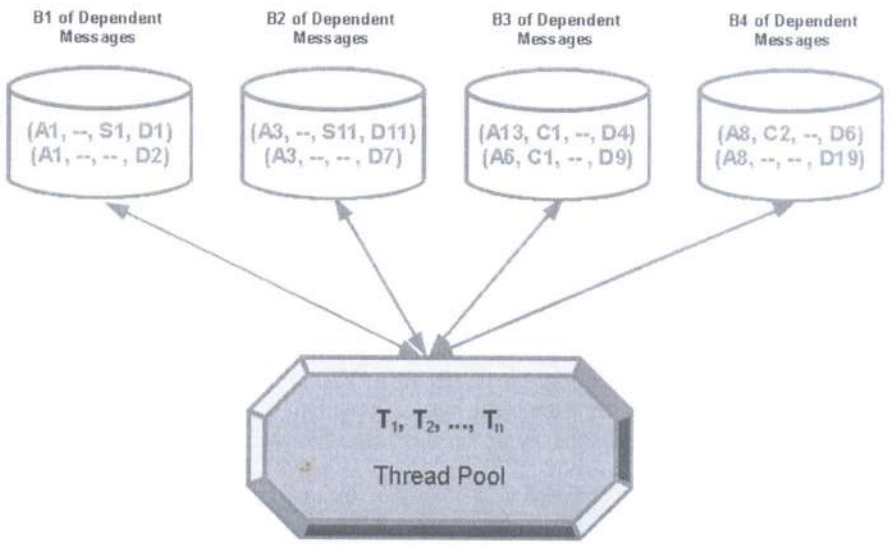

Figure1: Design of SSN-QuadProcess

The message quadruples cannot be processed in parallel whenever one or more of their component values coincide (Asset-Id, Device-Id, CellularRadio-Id or SatelliteRadio). Hence, at present, these messages are entirely sequentially processed and updated by CAT. Hereafter, this methodology is named as **CAT-QuadProcess.** This incurs more time in processing the messages which in turn leads to the violation of SLA. Hence, CAT has suggested coming up with a strategy that will appropriately group the dependent messages in multiple independent bins.

Once this grouping is performed, the different bins can be processed in parallel while the entries within each bin have to be processed sequentially so that the overall processing is efficient and meets the agreed SLA. This algorithm will be named as **SSN-QuadProcess.** This has been illustrated in Figure1.

In order to implement SSN-QuadPorcess, at first the JSON sample data file provided by CAT has to be parsed to retrieve the set of Quadruple messages by using Algorithm 1.

Algorithm 1 JSON Data Parsing

Input: *JSON Data File*

Output: Quadruple messages stored in MySQL table *Quads*

```
1 Parse the JSON file to covert into JSON object
  Convert the JSON object into JSON array
  for i in JSON array do
2   Retrieve Body as JSON object and retrieve the Serial number as Asset-Id
    Retrieve AttachedDevices as JSON object
    Retrieve Devices as JSON array to retrieve Serial Number as Device-Id
    Retrieve AttachedRadio as JSON object
    Retrieve Radio as JSON array to retrieve Radio Serial Number as Radio-Id and Satellite Serial
    Number as Satellite-Id
    Asset-Id, Device-Id, Radio-Id and Satellite-Id are stored in MySQL table Quads
```

Algorithm 2 BUCKETIZATION OF QUADRUPLE MESSAGES

Input: Quadruple messages stored in MySQL table *Quads*

Output: D: Disjoint sets containing dependent Quadruple messages

```
3 Struct Quadruple { string Asset-Id, Device-Id, Cellular Radio-Id, Satellite-Id } Q;
  Struct Record { int To, From } R[10];
  M: Two dimensional integer array to record the status of dependency of Quadruple messages
  K=0
  D ={{1},{2},{3}, ....,{N}} //Initialized with Quadruple numbers as single element sets

4 Retrieve the fields Asset-Id, Device-Id, Cellular Radio-Id and Satellite-Id from Quadsto the re-
  spective fields in structure Q
  for i = 1 to N do
5   for j = i+1 to N do
6     if (Q[i].Asset-Id == Q[j].Asset-Id or Q[i].Device-Id == Q[j].Device-Id or Q[i].Radio-Id
      == Q[j].Radio-Id or Q[i].Satellite-Id == Q[j].Satellite-Id then
7       M[i][j] is set to 1 // To set the connectivity between the Quadruples
        R[k].To is set to i
        R[k].From is set to j
        K++
8   for j = i+1 to N do
9     Find R[i].To in set S1 of D
      Find R[j].From in set S2 of D
      Union (S1, S2)
```

a thread pool will be created to process the messages in buckets. Subsequently, the execution time for processing the messages is recorded by varying the number of threads to find the optimal number of threads.

2. **Principal Investigators:**

1. Dr. Chitra Babu

Professor and Head,

Department of Computer Science and Engineering

Email-id: chitra@ssn.edu.in

Contact no. : 9444046101

2. Dr. B. Prabavathy

Associate Professor

Department of Computer Science and Engineering

Email-id: prabavathyb@ssn.edu.in

Contact no. : 9443884479

3. **Time/Period of Project:** 6 Months

4. **Amount of Research Support:**

MileStone	Deliverables	TimePeriod	Cost (in Rupees)
Implementation of SSN-QuadProcess (CAT-Sample Data)	Code, Test Cases, Detailed Result Analysis	3 Months	1,08,000/-
Implementation of SSN-QuadProcess (Simulation of CAT Data for whole day)	Code, Test Cases, Detailed Result Analysis	3 Months	79,200/-
		Total	**1,87,200/-**

5. **Specified Deliverables:** New efficient algorithm, Code, Report, Presentation
6. **Institute Pre-Existing Intellectual Property and open source works of authorship:** Nil
7. **Caterpillar Equipment Loans or Gifts (if any):** Nil
8. **Proposed Caterpillar visitors (if any), Duration of visit:** Nil
9. **Caterpillar Liason/Contact responsible for the project:** Dinesh, Moorthy and Ramesh

Signature of Principal Investigator

Dr. CHITRA BABU
Head of the Department
Department of Computer Science
and Engineering
SSN College of Engineering
Kalavakkam - 603 110.

CATERPILLAR

Caterpillar India Private Ltd – Engineering Design Centre
RMZ Millenia Business Park, Phase 2, Building 3B,
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Chennai, 600 096, Tamil Nadu, India
Phone : 91-44-33403001, Fax : 91-44-33403003

August 07, 2019

Dear Ms. Snigdha Viswanathan,

Subject: Letter Of Appreciation

We congratulate you, for your active contribution as a Team member for the successful completion of project "An Efficient Algorithm for Fast Processing of Message Quadruples".

This is a significant accomplishment and we personally believe your initiative has helped in the successful implimentation of data logger functionality with improved response time.

We are sure that your creativity, talent and dedication are noticed and recognised.

Thank you for your commitment and wish you all the best.

CAT ENGINEERING DESIGN CENTRE – INDIA
RMZ
CHENNAI

Bhuvaneswaran Anandakrishnan
Director
Electrical, Electronics & Software Technologies
ITDD - Engineering

CATERPILLAR

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Chennai, 600 096, Tamil Nadu, India
Phone : 91-44-33403001, Fax : 91-44-33403003

August 07, 2019

Dear Ms. Sarah Mathew,

Subject: Letter Of Appreciation

We congratulate you, for your active contribution as a Team member for the successful completion of project "An Efficient Algorithm for Fast Processing of Message Quadruples".

This is a significant accomplishment and we personally believe your initiative has helped in the successful implimentation of data logger functionality with improved response time.

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Thank you for your commitment and wish you all the best.

Bhuvaneswaran Anandakrishnan
Director
Electrical, Electronics & Software Technologies
ITDD - Engineering

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Chennai, 600 096, Tamil Nadu, India
Phone : 91-44-33403001, Fax : 91-44-33403003

August 07, 2019

Dear Ms. Samantika Sivakumar,

Subject: Letter Of Appreciation

We congratulate you, for your active contribution as a Team member for the successful completion of project "An Efficient Algorithm for Fast Processing of Message Quadruples".

This is a significant accomplishment and we personally believe your initiative has helped in the successful implimentation of data logger functionality with improved response time.

We are sure that your creativity, talent and dedication are noticed and recognised.

Thank you for your commitment and wish you all the best.

CAT ENGINEERING DESIGN CENTRE RMZ CHENNAI INDIA

Bhuvaneswaran Anandakrishnan
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Chennai, 600 096, Tamil Nadu, India
Phone : 91-44-33403001, Fax : 91-44-33403003

August 07, 2019

Dear Mr. Priya Anna Christall,

Subject: Letter Of Appreciation

We congratulate you, for your active contribution as a Team member for the successful completion of project "An Efficient Algorithm for Fast Processing of Message Quadruples".

This is a significant accomplishment and we personally believe your initiative has helped in the successful implimentation of data logger functionality with improved response time.

We are sure that your creativity, talent and dedication are noticed and recognised.

Thank you for your commitment and wish you all the best.

CATERPILLAR ENGINEERING DESIGN CENTRE RMZ CHENNAI INDIA

Bhuvaneswaran Anandakrishnan
Director
Electrical, Electronics & Software Technologies
ITDD - Engineering

Exhibit 1
PROJECT DESCRIPTION

Upon execution by the Parties below, the Research Project specified herein shall be awarded and performed in accordance with the Master Sponsored Research Agreement ("Agreement"), effective_20th of December, 2018 (which is incorporated herein in its entirety), between SSN College of Engineering (hereinafter, "Institute") and Caterpillar India Private Limited (hereinafter, "Caterpillar").

1. Research Project Title: An Efficient Algorithm for Fast Processing of Message Quadruples
2. Statement of Work: See attached Annexure-A (Proposal # CAT-SSN-2019-005)
3. Principal Investigator: Dr. Chitra Babu, Dr. B. Prabavathy
4. Term/Period of Performance: 6 Months
5. Amount of Research Support (Direct Costs and Indirect Costs), Payment Provisions: 1,87,200/-
6. Specified Deliverable Items (if any): Refer attached Annexure-A
7. Institute Pre-Existing Intellectual Property and open-source works of authorship: None
8. Caterpillar Equipment Loans or Gifts (if any): None
9. Proposed Caterpillar Visitor(s) (if any), Duration of Visit: To be decided later
10. Caterpillar Liaison / Contact Responsible for the Project: Mr. T. Dinesh Vincent

Research Project Authorization:

CATERPILLAR INDIA PRIVATE LIMITED	SSN COLLEGE OF ENGINEERING
_____	_____
Authorized Signature	Authorized Signature
_____	_____
Name & Title	Name & Title
_____	_____
Date	Date

REVIEWED AND ACCEPTED:

_____
Principal Investigator

Exhibit 2

CATERPILLAR'S STANDARD SETTLEMENT SCHEDULE
(As per Proposal# CAT-SSN-2019-005)

Caterpillar will pay SSN the below disclosed amount upon completion of each milestone specified in the table below.

Milestones	Deliverables	Time Period	Cost (Rs)
Implementation of SSN-Quadprocess (Caterpillar sample data)	Code, Test Cases, Detailed Result Analysis	3 months	1,08,000/-
Implementation of SSN-Quadprocess (Simulation of Caterpillar data for whole day)	Code, Test Cases, Detailed Result Analysis	3 months	79,200
		TBD based on M1	-
Total Cost			1,87,200/-

CAT REPORT 12

Project Title: An efficient algorithm for fast processing of Message Quadruples

Faculty involved: Dr. Chitra Babu, Dr. B. Prabavathy

Students involved: Sarah Mathew, Snigdha, Samantika, Priya

Persons from CAT: Dinesh, Moorthy and Ramesh

Date of Meeting: 04.07.2019 @ 11.45 a.m

Venue: In SSNCE, over phone

Caterpillar Electronics Ltd. has provided the test data which consists of around 7000 quadruple messages. Example Quadruple message would be as follows

Asset	Device	Satellite Cellular	Radio Device
99999997	1703070090120000M	18072400H00D003F	

The messages in JSON format were parsed using Algorithm 1. The parsed data is stored in MySQL database. At first, the dependency between each pair of quadruple messages is found and is recorded in an in-memory ***Dependency Table***. If there exists a dependency between the quadruple messages Q1 & Q2, the corresponding cell is set to 1, otherwise, it is set to 0. Since the dependency table cannot be accommodated for the entire 7000 messages in the main memory, they are processed in batches of 300 messages. Once the dependency table is constructed, disjoint set algorithm is used to find disjoint sets of messages and they are placed in separate sets (called as buckets) using Algorithm 2. The algorithms 1 & 2 were implemented using java programs. A thread has been dedicated for processing the incoming messages and placing them in respective buckets. A pool of 5 threads is dedicated to process the messages which are in the buckets. The execution process of SSN-QuadProcess has been illustrated in Figure 1.

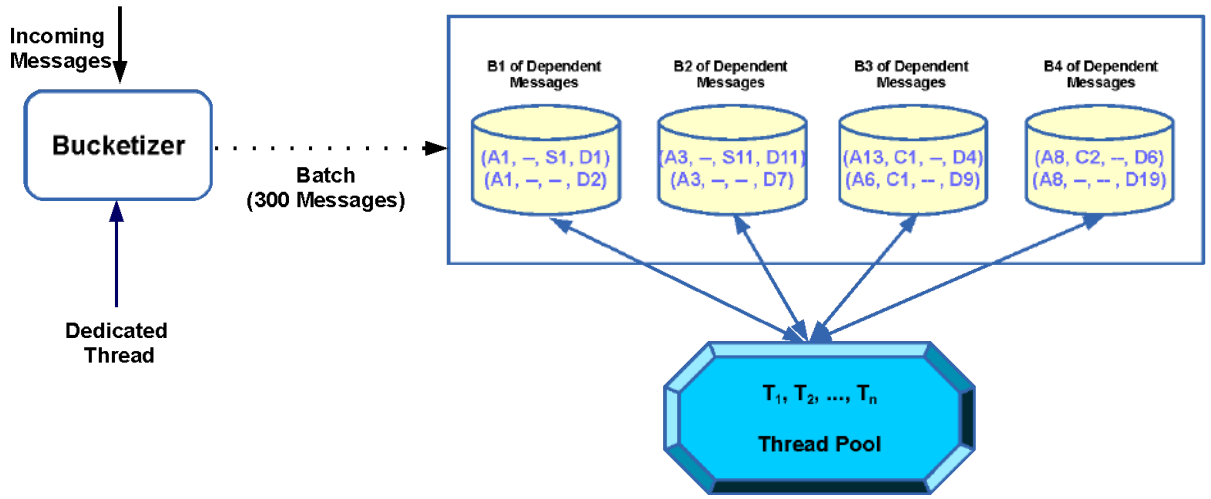


Figure 1: Design of SSN-QuadProcess using Pipelined Fashion

Algorithm 1 JSON Data Parsing

Input: *JSON Data File*

Output: Quadruple messages stored in MySQL table *Quads*

1 Parse the JSON file to convert into JSON object
Convert the JSON object into JSON array
for *i in JSON array* **do**
2 Retrieve Body as JSON object and retrieve the Serial number as Asset-Id
Retrieve AttachedDevices as JSON object
Retrieve Devices as JSON array to retrieve Serial Number as Device-Id
Retrieve AttachedRadio as JSON object
Retrieve Radio as JSON array to retrieve Radio Serial Number as Radio-Id and Satellite Serial Number as Satellite-Id
Asset-Id, Device-Id, Radio-Id and Satellite-Id are stored in MySQL table *Quads*

Algorithm 2 BUCKETIZATION OF QUADRUPLE MESSAGES

Input: Quadruple messages stored in MySQL table *Quads*

Output: D: Disjoint sets containing dependent Quadruple messages

3 struct Quadruple { string Asset-Id, Device-Id, Cellular Radio-Id, Satellite-Id } Q;
struct Record {int From, To } R[10];
k=0
S ={{1},{2},{3}, ...,{N}} //Initialized with Quadruple numbers as single element sets

4 Retrieve the fields Asset-Id, Device-Id, Cellular Radio-Id and Satellite-Id from *Quads* to the respective fields in structure Q
for *i = 1 to N* **do**
5 **for** *j = i+1 to N* **do**
6 **if** *(Q[i].Asset-Id == Q[j].Asset-Id or Q[i].Device-Id == Q[j].Device-Id or Q[i].Radio-Id == Q[j].Radio-Id or Q[i].Satellite-Id == Q[j].Satellite-Id* **then**
7 R[k].From is set to i //To set the connectivity (from) between Quadruples
R[k].To is set to j //To set the connectivity (to) between Quadruples
k++

8 **for** *j =0 to k* **do**
9 s1=Find (R[j].From) // Returns the set number s1 if R[j].From is present
s2=Find (R[j].To) // Returns the set number s2 if R[j].To is present
if *(s1!=s2)* **then**
10 Union(A,B)

Methodology adopted in SSN-QuadProcessV1

In this **SSN-QuadProcessV1**, each Quadruple message is compared with every other message, to see whether the considered pair of quadruple messages is having any common field. If this is the case, the messages are considered to be dependent messages. Any pair of quadruple messages, in which none of the fields are matching, is independent. Considering the following Quadruple messages

Q1 [A1, D1, S1, --]
Q2 [A2, D1, --, --]
Q3 [A3, D4, S2, --]
Q4 [A5, D5, S2, --]
Q5 [A5, D6, S2, --]
Q6 [A6, D7, S3, --]
Q7 [A1, D3, S4, --]

- The messages Q1, Q2 and Q7 are dependent. Q1 & Q2 are dependent because D1 is common, Q1 & Q7 are dependent because A1 is common between them
- The messages Q3, Q4 and Q5 are dependent because S2 is common among them
- The message Q6 is independent of every other message

Whenever the messages are found to be dependent, they are updated in the adjacency matrix as follows:

	From	To
1	1	2
2	1	7
3	3	4
4	3	5
5	4	5

Table 1. Matrix with dependent messages

Disjoint set algorithm is applied with adjacency matrix for bucketization of the messages. The Disjoint algorithm works as follows:

Each Quadruple message is considered to be a singleton set

{Q1} {Q2} {Q3} {Q4} {Q5} {Q6} {Q7}

Once {1,2} is read from the matrix, find(Q1) and find(Q2) are applied and found that both are in different set, hence they are unified using union operator

{Q1,Q2} {Q3} {Q4} {Q5} {Q6} {Q7}

When {1,7} is read from the matrix, find(Q1) and find(Q7) are applied and found that both are in different set, hence they are unified using union operator

{Q1,Q2,Q7} {Q3} {Q4} {Q5} {Q6}

When {3,4} is read from the matrix, find(Q3) and find(Q4) are applied and found that both are in different set, hence they are unified using union operator

{Q1,Q2,Q7} {Q3,Q4} {Q5} {Q6}

When {3,5} is read from the matrix, find(Q3) and find(Q5) are applied and found that both are in different set, hence they are unified using union operator

{Q1,Q2,Q7} {Q3,Q4,Q5} {Q6}

When {4,5} is read from the matrix, find(Q4) and find(Q5) are applied and found that both are in same set, and hence, no change will be made.

{Q1,Q2,Q7} {Q3,Q4,Q5} {Q6}

Once the messages are pushed into different buckets, they are to be processed by the thread pool. The messages from different independent buckets are merged into a single bucket.

Implementation and Results

The above-mentioned SSN-QuadProcess has been implemented using the multithreading concepts of Java. Oracle SQL is used to store the quadruple messages which are retrieved from JSON data. It is incorporated with suitable statements to measure the time for bucketizing a single batch as well as the whole test data. Dependency in the data set has been increased by replicating some of the messages. Around 3000 messages were duplicated thrice to create a dataset which contains 14,336 messages. The time for bucketization depends upon the usage of the matrix and disjoint set algorithm for merging the messages. Hence, the time for bucketization is expected to increase if the number of dependent messages increases.

# of messages	Dataset (7, 336)	Dataset (10, 836)	Dataset (14, 336)
# of dependent messages	4, 495	9, 150	12, 848
Time for bucketization	114 ms	163 ms	202 ms
Time for processing (Processing - Printing)	3261 ms	4090 ms	5113 ms
Time for processing (Processing – Delayed for 200 to 2000 ms)	409, 032 ms	442, 919 ms	460, 421 ms

In order to process the messages, ‘n’ threads would be spawned to process the dependent buckets first. Further, the same ‘n’ threads are used to process the messages available in independent buckets. Buckets are created for the batches of 300 messages. During the bucketization process for first batch, a set of buckets will be created. For further batches, the same set will be reused.

Results

	Original data (7336)							**Synthetic data (14336)**						
Distribution of messages	**Independent**			**Dependent**				**Independent**			**Dependent**			
	2841			4495				1488			12848			
# of buckets	1			671				1			2089			
Time for bucketization	114ms							202ms						
Time for processing	3238ms							5113ms						
# of threads (Thread optimization)	**2**	**3**	**4**	**5**	**6**	**7**	**8**	2	3	4	**5**	6	7	8
Time in ms	4826	4112	4059	**3238**	3261	3369	3419	6663	6291	6007	**5113**	5215	5311	5581

Suggestion by CAT (5th Feb) and the Result of the implementation

- Simulation of streaming of quadruple messages for an entire day to find out how frequently the bucketization algorithm needs to be applied
- Implementation of visualization of messages of every bucket
- Ordering the messages based on timestamp

Simulation of bucketization for single day data

Towards the simulation of streaming of quadruple messages for an entire day, *zookeeper server and kafka broker* have been installed. Kafka producer has been written to read the csv file (Single day data given by CAT) to retrieve the quadruples. In order to mimic real time streaming of messages, messages have to be streamed to the *kafka consumer* in certain random time. In this context, this random time has been kept between ***0 and 800 msec***. This means, after streaming a message, a random number in this range will be generated and the thread is made to sleep for that random time before streaming the next message.

Further, *Linked blocking queue* is used to retrieve the streaming data from the *kafka producer* in order for processing. Hence, a separate producer and consumer part will be present in the blocking queue. The consumer part of the Kafka streaming is now the producer part of the blocking queue that provides the necessary data for bucketization process. The consumer part of the blocking queue will actually performs the bucketization process. Figure 2 shows the *kafka producer* streaming the quadruple messages from the entire day data. Figure 3 shows the number and the actual quadruple messages in each bucket.

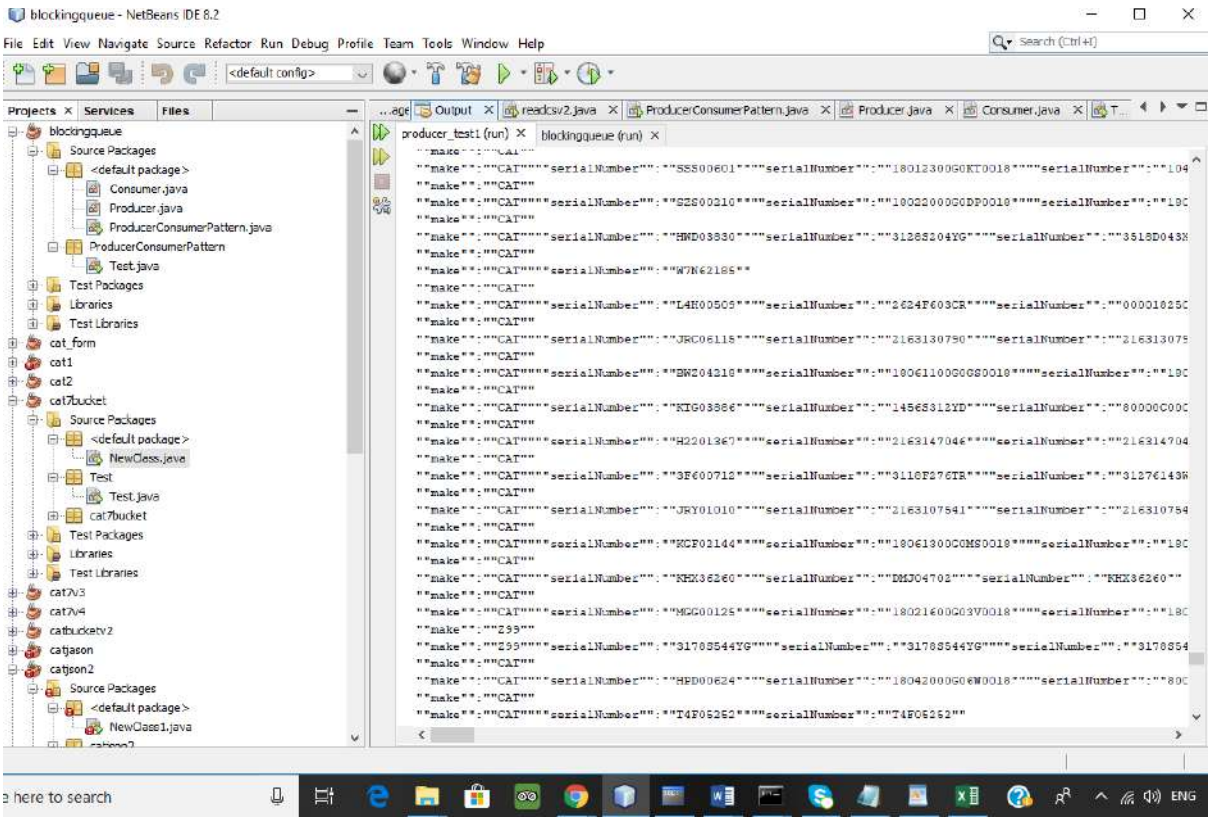


Figure 2: Streaming of entire day data by kafka producer

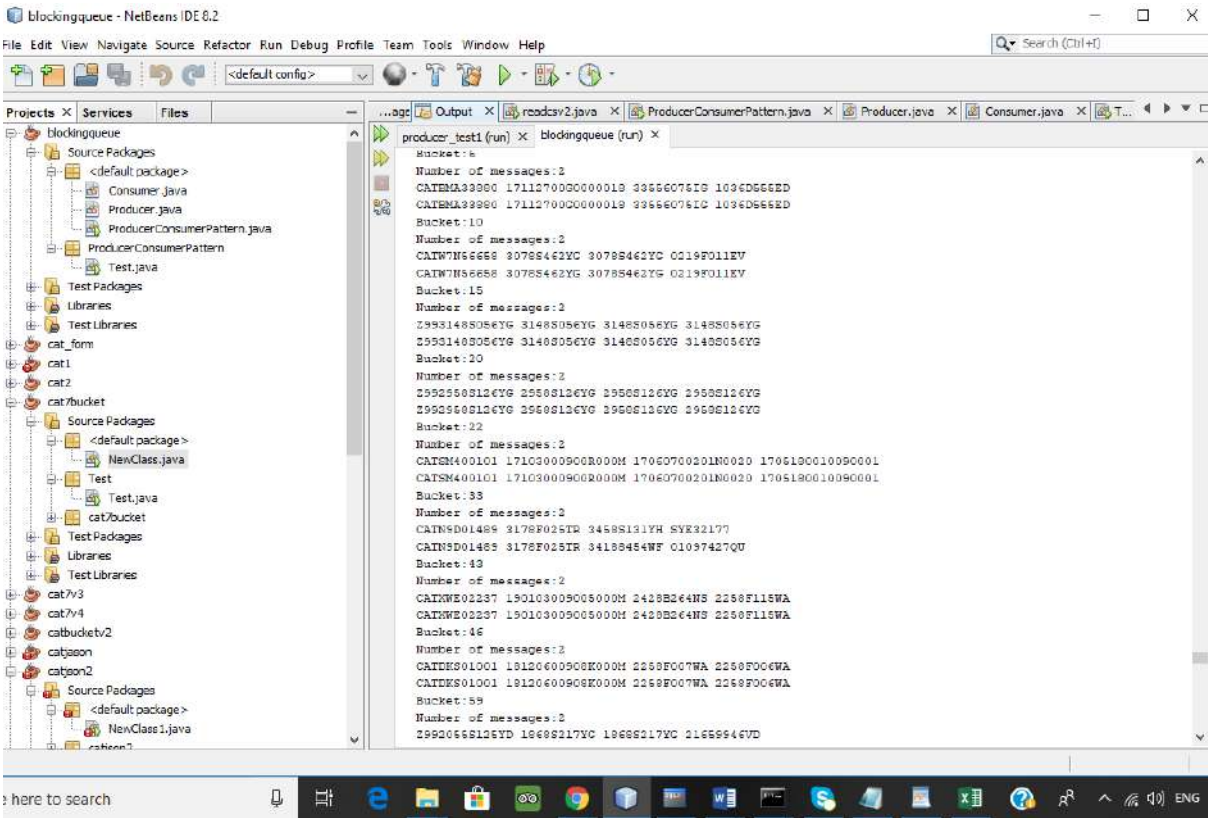


Figure 3: Quadruples messages in buckets

Bucketization process has to be triggered whenever a threshold time has been reached or number of messages becomes 300. Hence, the ***parameters, random streaming time and the threshold time have been tuned*** in order to exercise both the cases. By simulating this way, all the 15,451 quadruple messages were streamed for around 5 hours. In total, for this entire day data, bucketization process has been triggered 95 times. The number of messages when the bucketization was triggered, time for bucketization and the number of dependent buckets were recorded as shown below:

S.No	Number of messages	Time for bucketization (in msec)	Number of dependent buckets
1.	28	0	4
2.	13	0	2
3.	300	5	25
4.	20	0	2
5.	300	6	21
6.	16	0	2
7.	300	5	19
8.	36	0	1
9.	300	12	11
10.	15	0	1
11.	300	11	2
12.	25	0	1
13.	21	0	1
14.	300	10	12
15.	300	7	15
16.	49	0	3
17.	300	6	22
18.	30	0	5
19.	300	5	30

20.	20	0	2
21.	300	6	25
22.	25	0	2
23.	300	5	25
24.	300	6	25
25.	25	0	2
26.	300	5	26
27.	46	1	5
28.	300	5	33
29.	19	0	2
30.	300	8	19
31.	33	0	1
32.	300	9	12
33.	33	0	1
34.	300	9	15
35.	22	0	1
36.	300	8	13
37.	27	0	1
38.	300	6	12
39.	39	0	2
40.	300	5	24
41.	25	0	2
42.	300	5	8
43.	40	0	1
44.	300	9	19
45.	21	0	1
46.	300	6	20
47.	22	0	2
48.	300	9	9
49.	19	0	1
50.	300	5	25
51.	16	0	3
52.	300	5	31
53.	20	0	3
54.	300	5	18
55.	37	0	6
56.	300	5	22
57.	24	0	4
58.	300	9	19
59.	33	0	3
60.	300	7	18
61.	41	0	7
62.	300	5	23
63.	37	0	5
64.	300	6	24
65.	35	0	2
66.	300	4	22
67.	27	0	5
68.	300	11	14
69.	35	0	1
70.	300	8	9
71.	37	0	1
72.	300	5	25
73.	20	0	2

74.	300	8	14
75.	25	0	1
76.	300	10	7
77.	25	0	1
78.	300	11	4
79.	27	0	1
80.	300	10	4
81.	27	0	1
82.	300	9	1
83.	300	9	14
84.	24	0	1
85.	300	10	9
86.	44	0	1
87.	300	5	24
88.	40	0	9
89.	300	6	23
90.	28	0	1
91.	300	5	19
92.	26	0	4
93.	300	7	11
94.	28	0	3
95.	300	6	26

From the above-mentioned table***, it is found that the bucketization time is <12 msec***. The following figures 4 & 5 show the bucketization processes triggered for 300 messages and for reaching the threshold respectively.

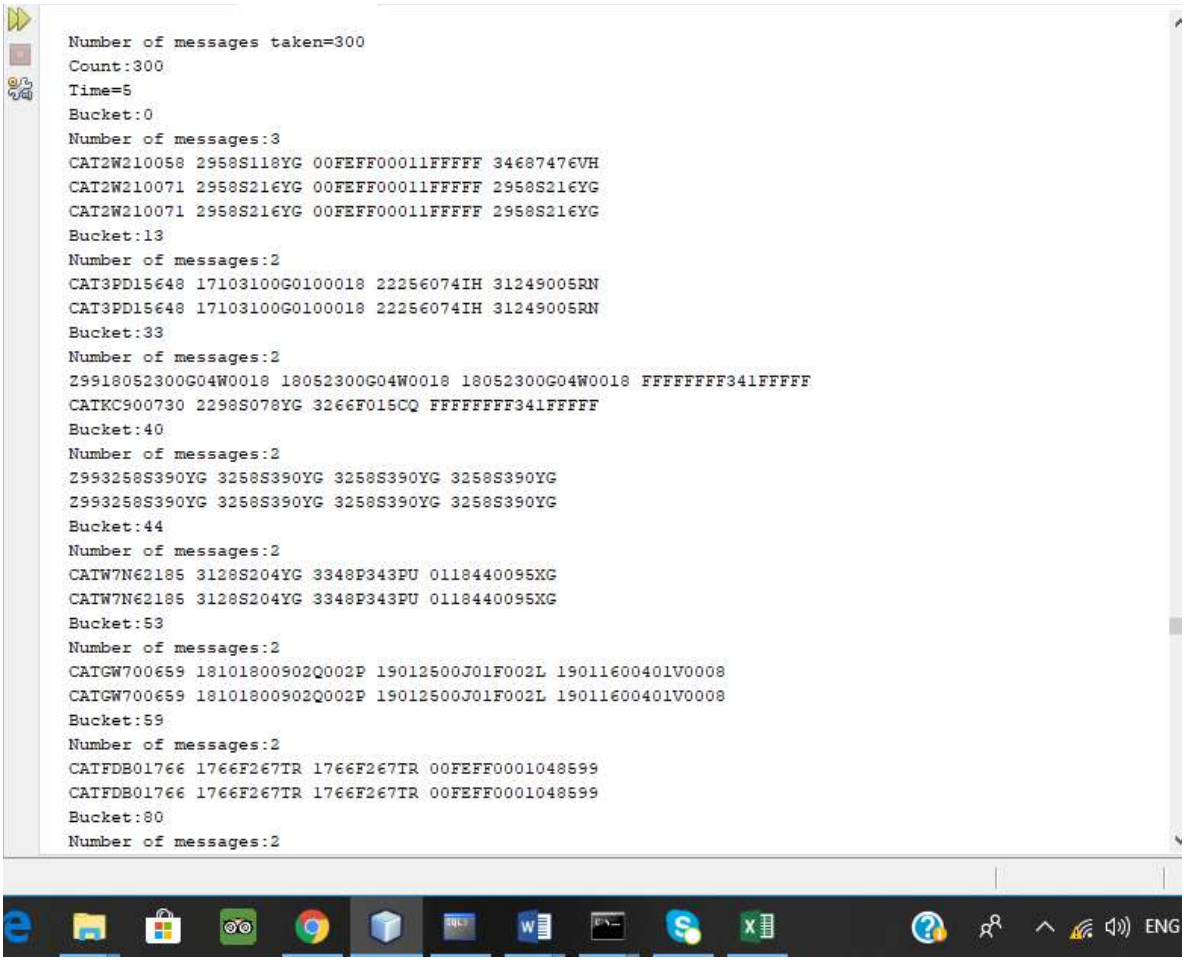


Figure 4: Output of Bucketization process (for 300 messages)

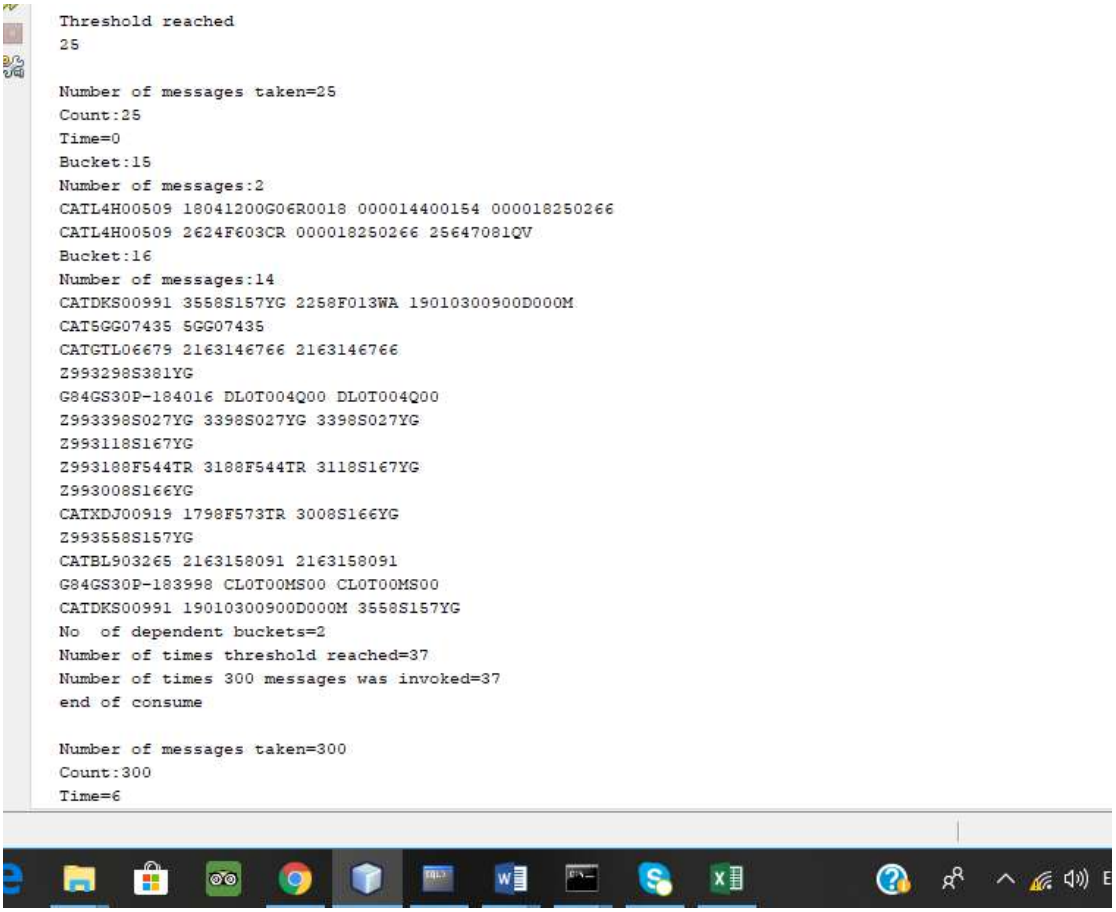


Figure 5: Output of Bucketization process (for threshold reaching condition)

Visualization of messages

At present, an interface has been created as shown in Figure 6, where the ***number of messages and the actual quadruples will be listed*** when the bucket number is given.

Figure 6: Query Interface

Further, code has been written to display the buckets indicating the number of messages using pie chart, for any given range of buckets (i.e from 5 to 25) as shown in Figures 7 & 8. This enables to view any range of buckets to see the number of messages. Further, when the mouse is kept over a partition of pie chart, the number of independent and dependent messages has been displayed.

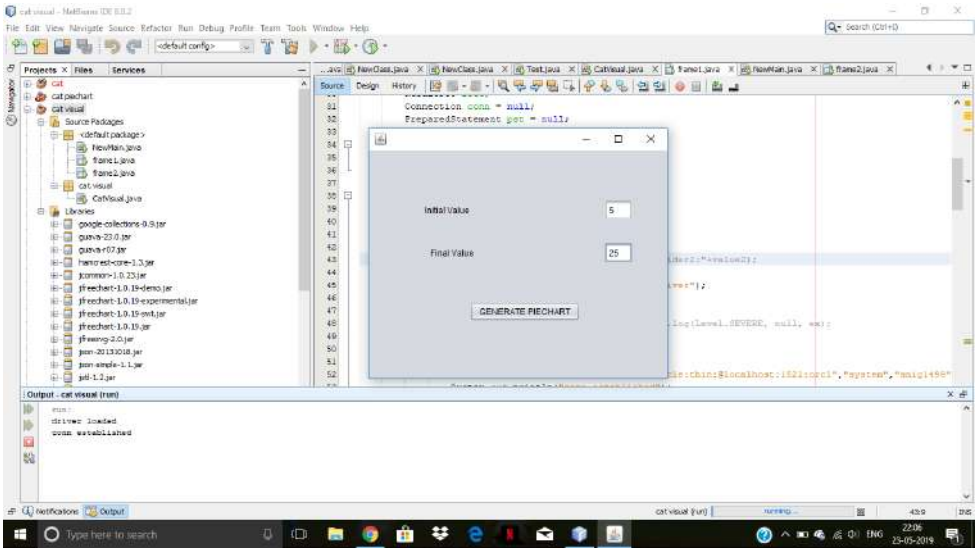


Figure 7: Input for Pie chart

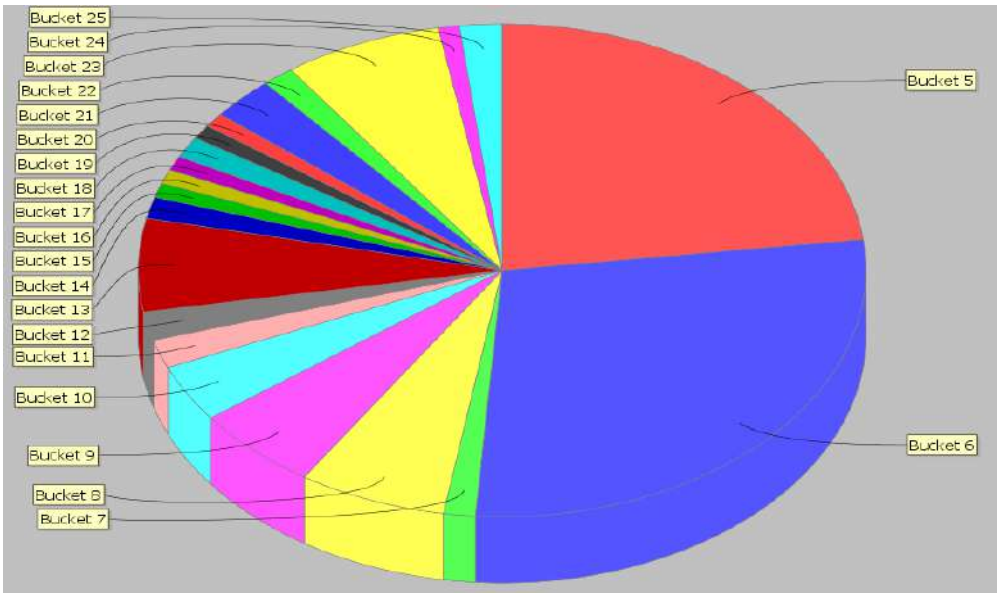


Figure 8: Pie chart visualization for range of buckets

Order the messages based on timestamp

Timestamp of the messages have also been included in the bucket along with the quadruple messages. These messages are placed in an Array List. The ***Compare method*** of the Array List was overloaded to sort the messages based on the timestamp. The code snippet of the ***Compare method*** and the resulting ordering of messages are shown in figures 9 & 10.

```
class compare_time implements Comparator<Integer>
{
  public int compare(Integer i,Integer j)
  {
        if(NewClass.timestamps.get(i).before(NewClass.timestamps.get(j)))  return -1;
        else return 1;
     }
}
```

Figure 9: Code snippet of Compare method

Unordered messages in Sample Bucket 0

```
SQL> select * from buckets where bucket_no=0;

 BUCKET_NO MAKE                                 DEVICE_NO                                RADIO_NO
---------- ---------------------------------------- ---------------------------------------- ----------------------------
-------------
SATELLITE_NO                           TIMESTAMP
---------------------------------------- ---------------------------------------------------------------
         0 CAT-99999997                           170307009012000M                         18072400H00D003F
                                        2018-8-3.11.38. 27. 227934000

         0 CAT-99999997                           170307009012000M                         18072400H00D003F
                                        2018-8-3.10.8. 3. 491493000

         0 CAT-99999997                           170307009012000M                         18072400H00D003F
                                        2018-8-3.10.23. 31. 461115000
```

Ordered messages in Sample Bucket 0

```
SQL> select * from buckets where bucket_no=0;

 BUCKET_NO MAKE                                 DEVICE_NO                                RADIO_NO
---------- ---------------------------------------- ---------------------------------------- ----------------------------
-------------
SATELLITE_NO                           TIMESTAMP
---------------------------------------- ---------------------------------------------------------------
         0 CAT-99999997                           170307009012000M                         18072400H00D003F
                                        2018-8-3.10.8. 3. 491493000

         0 CAT-99999997                           170307009012000M                         18072400H00D003F
                                        2018-8-3.10.23. 31. 461115000

         0 CAT-99999997                           170307009012000M                         18072400H00D003F
                                        2018-8-3.11.38. 27. 227934000

SQL> s_
```

Figure 10: Ordering of messages

Conclusion

In the proposal, it has been mentioned to complete *SSN-QuadProcess for CAT sample data* and *simulation of SSN-QuadProcess for CAT single day data*. SSN-QuadProcess utilizes the proposed bucketization algorithm and consumes *114msec* for bucketizing the batch data of 7,336 quadruple messages. Further, CAT single day data of 15,451 messages has been streamed for 5 hours with random time interval between 0 to 800msec using Apache kafka broker. Bucketization process has been invoked whenever the threshold time (2 min) or 300 messages are reached. It is found that bucketization process has been invoked 75 times for the single day data, with the above-mentioned tuned parameters, namely streaming and threshold time. However, the average bucketization time is around *12msec* only for the stream data. Hence, it is observed that both the specified milestones in the proposal have been completed.

PURCHASE ORDER

Correspondence Address	**PO NO: 8001001840**
ESK India Commerce and Trade Private Limted	**PO Date: 02-09-2019**
Near Gate 3, Caterpillar,	
Melnallathur,Thiruvallur - 602004,Tamil Nadu.	**Payment Terms: 15 Working Days**
GSTIN REG NO: 33AACCE2411Q1ZR	**Delivery Terms : As per Terms**
Supplier Name & Address	**Shipping Address**
SSN COLLEGE OF ENGINEERING	Caterpillar India Private Limited
RAJIV GANDHI SALAI (OMR)	Power Systems Division
KALAVAKKAM, Chennai - 603110	Mathagondapalli, Hosur - 635114.
Supplier Contact : 4600570258	**Port of Destination :**

Part Number	Description	QTY	Unit	Unit Price in INR	Value
	Message Quadruples project SSN	1	AU	187200.00	INR 187,200.00
	SAC Code:998399				
	Total				INR 187,200.00
	CGST	9%			INR 16,848.00
	SGST	9%			INR 16,848.00
					INR 220,896.00
				Rounding off	
				Grand total	INR 220,896.00

Prepared By: Ganapat **Approved By: Anil Sharma**

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING
(Approved by AICTE, New Delhi and Affiliated to Anna University)
Rajiv Gandhi Salai (OMR), Kalavakkam – 603 110, TN, India.
Tel : +91 44 27469700
Fax : +91 44 27469772
www.ssn.edu.in
Administrative Office: 211/95, V.M. Street, Mylapore, Chennai - 600 004.
Telefax : +91 44 24982656, 24986474

Annexure – A

Project Proposal For

Dynamic Reporting Framework

Submitted to Caterpillar on 03-01-2019

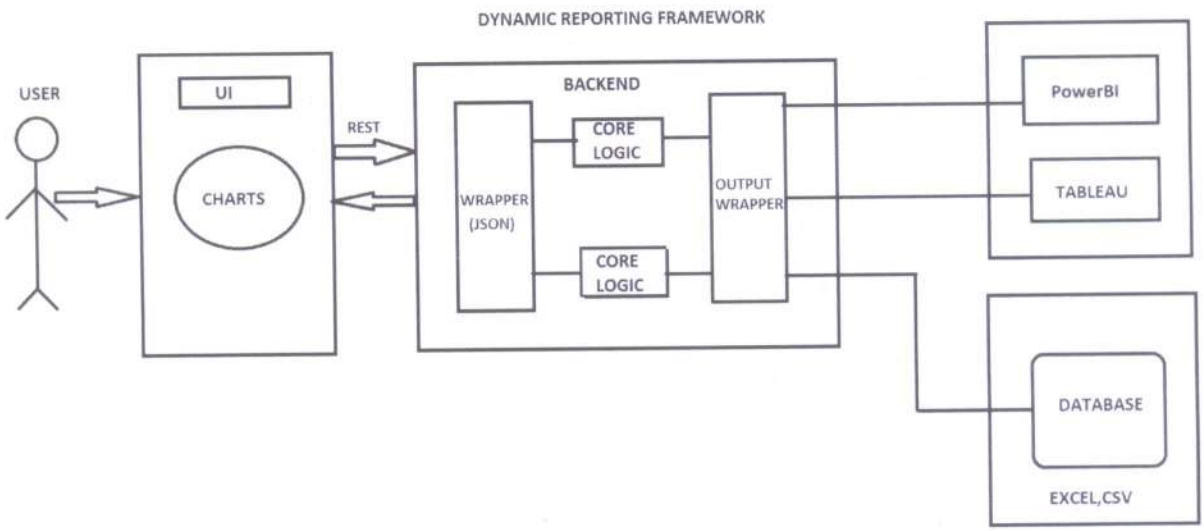
1. Statement of Work:

Caterpillar monitors the assets of its customers such as trucks, excavators, wheel loaders which are equipped with telemetry capable of communicating the parameters monitored by the sensors attached to the assets. This information is sent to the remote database servers of caterpillar where it is stored for future reference and further investigation. Various analyses of the data are performed to track the performance of the assets and it is provided to the customer through reports and visual charts. Hence reporting plays a vital role in providing services to caterpillar customers.

Reporting in web application is a data analysis process and serves to present data in a visual and interactive way for further data discovery or data analysis. The levels of interactivity vary from report to report and from platform to platform. Common types of interactions web reporting tools provide are the ability to sort and filter data, drill through different semantic layers of data and export data to other systems for further analysis. All of the interactive options culminate in providing users with the ability to dig deeper into data.

The objective of this project is to embed different reporting models in AngularJS Web Application. The mandatory reporting tool to be embedded is PowerBI and Tableau. The reports should have drill-down options to display data dynamically. Also, the web application should adapt gracefully among different reporting models without the user knowledge.

2. Framework:



3. Steps to be taken:

i. Study and select the appropriate tech stack that can satisfy all the needs of the project.
ii. Start with designing a basic wrapper framework.
iii. Use the necessary tools to develop an API Server for our requests.
iv. Develop an input wrapper that returns some pre-existing data as JSON.
v. Make an API request to the server and retrieve the pre-existing data and display it in the console log.
vi. Develop an output wrapper that connects to and retrieves values from a Database.
vii. Use the chosen tech stack to connect to front end and display the retrieved values.
viii. Design charts based on the data retrieved and display that in the front end.
ix. Accommodate the ability for the output wrapper to read from an Excel file and connect to front end to display retrieved values.
x. Get familiarized with the PowerBI environment and then integrate it with our application framework.
xi. Work on creating and displaying reports using Tableau and integrate that functionality with our framework.

xii. Write core logic such that change in core logic is sufficient to switch between PowerBI reports and Tableau reports without the user intervention.

4. Proposed Milestones:

- **Milestone1:**
  - Tech stack selection
  - Proof of concept
  - Basic wrapper framework.
- **Milestone2:**
  - Basic UI
  - Backend (Wrapper, Core Logic, API) – DB
- **Milestone3:**
  - Connect with external tools (PowerBI,Tableau)
  - Connect with Dynamic UI.

5. Principal Investigator:

Dr. V.S. Felix Enigo,
Associate Professor,
Dept. of Computer Science & Engineering,
SSN College of Engineering.
Email ID : felixvs@ssn.edu.in
Mobile No.: 9444662464

6. Term / Period of Project: 6 Months

7. Amount of Research Support:

Milestones	Process	Estimated Man-hours	Deliverables	Amount (INR)
M1	Selection of tech stack	10	Proof of Concept for Tech Selection and Design of Basic Wrapper Framework	45 x 350 = 15,750
	Design of basic wrapper framework	20		
	Simulating an API Server	15		
Total for M1		45		15,750
	Development of input wrapper	40		
	Retrieving data from	25		

M2	the API Server and displaying in front end.		A common Input Wrapper and Output Wrappers for DB and Excel to retrieve data from API Server to front-end	185 x 350 = 64,750
	Development of output wrapper for relational Database.	60		
	Development of output wrapper for Excel.	60		
Total for M2		185		64,750
M3	Study of PowerBI and development of an output wrapper.	45	Output Wrappers for PowerBI and Tableau and a Core logic that dynamically selects PowerBI or/and Tableau using minimal configuration to generate reports	150 x 350 = 52,500
	Study of Tableau and development of an output wrapper.	45		
	Implementation of core logic.	60		
Total for M3		150		52,500
Grand Total		380		1,33,000

8. Specified Deliverables: A Generalized Wrapper Framework that generates reports using various Reporting Models.

10. Institute Pre-Existing Intellectual Property and Open-Source works of authorship: -

11. Caterpillar Equipment Loans or Gifts (if any): -

12. Proposed Caterpillar Visitors(s)(if any), Duration of Visit:

13. Caterpillar Liason / Contact responsible for the project:
Mr. Sudhakar S. and Mr. Dinesh T.

V. S. Felix Enigo

Dr. V.S. FELIX ENIGO
ASSOCIATE PROFESSOR
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SSN COLLEGE OF ENGINEERING
KALAVAKKAM-603 110.

18-19

Exhibit 1
PROJECT DESCRIPTION

Upon execution by the Parties below, the Research Project specified herein shall be awarded and performed in accordance with the Master Sponsored Research Agreement ("Agreement"), effective 20th of December, 2018 (which is incorporated herein in its entirety), between SSN College of Engineering (hereinafter, "Institute") and Caterpillar India Private Limited (hereinafter, "Caterpillar").

1. Research Project Title: Dynamic Reporting Framework (CAT-SSN-2019-002)
2. Statement of Work: See attached Annexure-A
3. Principal Investigator: Dr. V.S. Felix Enigo
4. Term/Period of Performance: 6 Months
5. Amount of Research Support (Direct Costs and Indirect Costs), Payment Provisions: 1,33,000/-
6. Specified Deliverable Items (if any): A generalized wrapper framework that generates reports using various reporting models. (Refer Annexure-A for details)
7. Institute Pre-Existing Intellectual Property and open-source works of authorship: None
8. Caterpillar Equipment Loans or Gifts (if any): None
9. Proposed Caterpillar Visitor(s) (if any), Duration of Visit: To be decided later
10. Caterpillar Liaison / Contact Responsible for the Project: Mr. Sudhakar S. , Mr. Dinesh T.

Research Project Authorization:

CATERPILLAR INDIA PRIVATE LIMITED

Authorized Signature

Bansidhar Phansalkar, Managing Director – ITDD India

Name & Title

12-6-2019

Date

SSN COLLEGE OF ENGINEERING

Authorized Signature

Mrs. Kala Vijayakumar, President

Name & Title

(KALA VIJAYAKUMAR)
President
Sri Sivasubramaniya Nadar
College of Engineering
Chennai - 600020

Date

REVIEWED AND ACCEPTED:

V. S. Felix Enigo

Principal Investigator

CAT ENGINEERING DESIGN CENTRE - INDIA * TARAMANI CHENNAI 600 113

Exhibit 3

RESEARCHER'S AGREEMENT

The SSN College of Engineering has entered into a Master Sponsored Research Agreement ("Agreement") with Caterpillar India Private Limited (Company) dated 20th of December, 2018, to collaborate or research projects of mutual interest.

Company is funding a Research Project (Proposal No.: CAT-SSN 2019-012) under the Agreement, to be performed under the direction of Dr. V.S. Felix Enigo (who will serve as Principal Investigator) for the project entitled "Dynamic Reporting Framework".

The Agreement contains certain obligations regarding protection of Company's Confidential Information which must be undertaken by each Researcher with a "need to know" who is participating in the collaborative Research Project, and additional obligations which are the personal responsibility of Institute Employees performing the work. As a Institute Researcher, your signature on this document ("Researcher's Agreement") indicates your understanding and acceptance of the terms described below.

1. During the term of the Research Project funded under the Agreement, Company and Researcher may determine and agree that the work of the Research Project requires access to certain proprietary or confidential information of Company which is related to the Project. The terms of this Researcher's Agreement shall apply solely to such Project-related information disclosed by Company to Researcher.

2. "Confidential Information" is defined as any device, graphics, written information or information in other tangible forms that is disclosed, for evaluation and/or research purposes, to Researcher by Company that is marked at the time of disclosure as being "Confidential". Information disclosed orally or visually and identified at that time as confidential shall be considered as Confidential Information only if it is summarized in tangible form, marked "Confidential", and transmitted to Researcher within thirty (30) days after the oral or visual disclosure.

3. Unless otherwise expressly authorized by Company, Researcher agrees to retain the Confidential Information in confidence for the "Confidential Period" defined below, during which Period Researcher shall not disclose the Confidential Information to any third party, and shall not use the Confidential Information for any purpose other than the aforesaid evaluation and consulting purposes.

4. The "Confidential Period" shall mean five (5) years from the end date set forth in the applicable Project Description under the Agreement or until such time as the information no longer qualifies as Confidential Information pursuant to Paragraph 5 below.

5. Company acknowledges Researcher shall not have any obligation of confidentiality with respect to information that:

   (a) was already in Researcher's possession on a non-confidential basis prior to receipt from Company; and/or

   (b) is in the public domain by public use, general knowledge of the like, or after disclosure hereunder, becomes general or public knowledge through no fault of Researcher; and/or

SAMPLE ONLY DO NOT FILL THE BLANKS

(c) is properly obtained by Researcher from a third party not under a confidentiality obligation to company; and/or

(d) is explicitly approved for release by written authorization of Company.

6. Researcher agrees to return to Company, upon request, the devices, graphics, writings and information in other tangible forms containing any of the Confidential Information referred to in Paragraph 2 above, and any copies of such Confidential Information (or alternatively, at Company's direction, to destroy such Confidential Information and verify its destruction in writing).

7. No license, express or implied, in the Confidential Information is granted to Researcher other than to use the information in the manner and to the extent authorized by this Researcher's Agreement and the Agreement.

Pre-Publication Review

Researcher agrees to submit all publications to Company for pre-publication review in accordance with Article 10 of the Agreement. Further, Researcher agrees to waive and hereby waives all moral rights in Company material.

Inventions and Patents

In accordance with Article 11 of the Agreement, Researcher agrees to promptly and fully disclose all potentially patentable inventions to Institute. Researcher hereby assigns all right, title and interest in the Institute-Caterpillar Project Intellectual Property to Company.

If Researcher has any questions regarding the terms of the Agreement or this Researcher's Agreement, Researcher should contact the Office of the Vice Chancellor for Research of the Institute for assistance.

By your signature below, you acknowledge that you have read and understand the terms of the Agreement and this Researcher's Agreement, and agree to abide by them.

RESEARCHER

By: V. S. Felix Enigo

Name: Dr. V. S. FELIX ENIGO

Title: ASSOCIATE PROFESSOR

Date: _____

18-19

Exhibit 1
PROJECT DESCRIPTION

Upon execution by the Parties below, the Research Project specified herein shall be awarded and performed in accordance with the Master Sponsored Research Agreement ("Agreement"), effective_20th of December, 2018 (which is incorporated herein in its entirety), between SSN College of Engineering (hereinafter, "Institute") and Caterpillar India Private Limited (hereinafter, "Caterpillar").

1. Research Project Title: An Efficient Algorithm for Fast Processing of Message Quadruples
2. Statement of Work: See attached Annexure-A (Proposal # CAT-SSN-2019-005)
3. Principal Investigator: Dr. Chitra Babu, Dr. B. Prabavathy
4. Term/Period of Performance: 6 Months
5. Amount of Research Support (Direct Costs and Indirect Costs), Payment Provisions: 1,87,200/-
6. Specified Deliverable Items (if any): Refer attached Annexure-A
7. Institute Pre-Existing Intellectual Property and open-source works of authorship: None
8. Caterpillar Equipment Loans or Gifts (if any): None
9. Proposed Caterpillar Visitor(s) (if any), Duration of Visit: To be decided later
10. Caterpillar Liaison / Contact Responsible for the Project: Mr. T. Dinesh Vincent

Research Project Authorization:

CATERPILLAR INDIA PRIVATE LIMITED

Authorized Signature

Bansidhar Phansalkar, Managing Director – ITDD India

Name & Title

12-6-2019

Date

CAT ENGINEERING DESIGN CENTRE - INDIA
TARAMANI
CHENNAI
600 113

SSN COLLEGE OF ENGINEERING

Authorized Signature

Mrs. Kala Vijayakumar, President

Name & Title

(KALA VIJAYAKUMAR)
President
Sri Sivasubramaniya Nadar
College of Engineering
Chennai - 600020

Date

REVIEWED AND ACCEPTED:

Principal Investigator

Exhibit 3

RESEARCHER'S AGREEMENT

The SSN College of Engineering has entered into a Master Sponsored Research Agreement ("Agreement") with Caterpillar India Private Limited (Company) dated 20th of December, 2018, to collaborate or research projects of mutual interest.

Company is funding a Research Project (Proposal No.: CAT-SSN 2019-005) under the Agreement, to be performed under the direction of Dr. Chitra Babu (who will serve as Principal Investigator) for the project entitled "An efficient algorithm for fast processing of Message Quadruples".

The Agreement contains certain obligations regarding protection of Company's Confidential Information which must be undertaken by each Researcher with a "need to know" who is participating in the collaborative Research Project, and additional obligations which are the personal responsibility of Institute Employees performing the work. As a Institute Researcher, your signature on this document ("Researcher's Agreement") indicates your understanding and acceptance of the terms described below.

1. During the term of the Research Project funded under the Agreement, Company and Researcher may determine and agree that the work of the Research Project requires access to certain proprietary or confidential information of Company which is related to the Project. The terms of this Researcher's Agreement shall apply solely to such Project-related information disclosed by Company to Researcher.

2. "Confidential Information" is defined as any device, graphics, written information or information in other tangible forms that is disclosed, for evaluation and/or research purposes, to Researcher by Company that is marked at the time of disclosure as being "Confidential". Information disclosed orally or visually and identified at that time as confidential shall be considered as Confidential Information only if it is summarized in tangible form, marked "Confidential", and transmitted to Researcher within thirty (30) days after the oral or visual disclosure.

3. Unless otherwise expressly authorized by Company, Researcher agrees to retain the Confidential Information in confidence for the "Confidential Period" defined below, during which Period Researcher shall not disclose the Confidential Information to any third party, and shall not use the Confidential Information for any purpose other than the aforesaid evaluation and consulting purposes.

4. The "Confidential Period" shall mean five (5) years from the end date set forth in the applicable Project Description under the Agreement or until such time as the information no longer qualifies as Confidential Information pursuant to Paragraph 5 below.

5. Company acknowledges Researcher shall not have any obligation of confidentiality with respect to information that:

   (a) was already in Researcher's possession on a non-confidential basis prior to receipt from Company; and/or

   (b) is in the public domain by public use, general knowledge of the like, or after disclosure hereunder, becomes general or public knowledge through no fault of Researcher; and/or

Original for Recipient

INVOICE SSN/TL/1920/017

Date November 11, 2019

SSN TRUST

SSN COLLEGE OF ENGINEERING
NO.211/95, V.M. STREET,
MYLAPORE,
Chennai*, Tamil Nadu (TN - 33),
PIN Code 600004, India
044-24416474/24412676
trust.finance@ssn.edu.in
www.ssn.edu.in
GSTIN: 33AAATS2240Q1ZD
PAN: AAATS2240Q

Bill to:

SONEPAR INDIA PRIVATE LTD.,
(Formerly ESK India Commerce & Trade Pvt. Ltd.)
Near Gate - 3, Caterpillar,
Melnallathur,
Thiruvallur, Tamil Nadu (TN - 33),
PIN Code 602004, India
(91-044) 27641121| Mobile: +91 7358070035
Place of Supply: TN (33)
PAN no AACCE2411Q, GSTIN: 33AACCE2411Q1ZR

Ship to:

SONEPAR INDIA PRIVATE LTD.,
(Formerly ESK India Commerce & Trade Pvt. Ltd.)
Near Gate - 3, Caterpillar,
Melnallathur,
Thiruvallur, Tamil Nadu (TN - 33),
PIN Code 602004, India
(91-044) 27641121| Mobile: +91 7358070035
Ganapathi C - Assistant Manager – Purchase

NO	PRODUCT / SERVICE NAME	HSN/SAC	QTY	UNIT PRICE	CGST	SGST	AMOUNT
1	**CONSULTANCY CHARGES** Towards Dynamic reporting frame work by SSN	998399	1.00	1,33,000.00	11,970.00 9.00%	11,970.00 9.00%	1,56,940.00
	TOTAL		1.00	133000.00	11970.00	11970.00	156940.00

Total: ₹ One Lakh Fifty Six Thousand Nine Hundred Forty Only

AUTHORIZED SIGNATORY

TOTAL BEFORE TAX	₹ 1,33,000.00
TOTAL TAX AMOUNT	23,940.00
ROUNDED OFF	0.00
TOTAL AMOUNT	₹ 1,56,940

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING
KALAVAKKAM
603 110.

Note:
Subject to Chennai Jurisdiction only

PURCHASE ORDER

Correspondence Address	**PO NO: 8001001902**
Sonepar India Pvt. Ltd.	**PO Date: 10-11-2019**
Near Gate 3, Caterpillar,	
Melnallathur,Thiruvallur - 602004,Tamil Nadu.	**Payment Terms: 15 Working Days**
GSTIN REG NO: 33AACCE2411Q1ZR	**Delivery Terms : As per Terms**
Supplier Name & Address	**Shipping Address**
SSN COLLEGE OF ENGINEERING	Sonepar India Pvt. Ltd.
RAJIV GANDHI SALAI (OMR)	Near Gate 3, Caterpillar,
KALAVAKKAM, Chennai - 603110	Melnallathur,Thiruvallur - 602004,Tamil Nadu.
Supplier Contact : 4600582708	**Port of Destination :**

Part Number	Description	QTY	Unit	Unit Price in INR	Value
	Dynamic Reporting Framework - SSN	1	AU	133000.00	INR 133,000.00
	SAC Code:998399				
	Total				INR 133,000.00
	CGST	9%			INR 11,970.00
	SGST	9%			INR 11,970.00
					INR 156,940.00

Rounding off

Grand total INR 156,940.00

Prepared By: Ganapat **Approved By: Anil Sharma**

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING
(Approved by AICTE, New Delhi and Affiliated to Anna University)
Rajiv Gandhi Salai (OMR), Kalavakkam – 603 110, TN, India.
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www.ssn.edu.in

Administrative Office: 211/95, V.M. Street, Mylapore, Chennai - 600 004.
Telefax : +91 44 24982656, 24986474

Annexure - A

Project Proposal For

Generating Machine Productivity using Video Analytics

Submitted to Caterpillar on 03-01-2019

1. Statement of Work

1.1 Introduction:

Today's machines are equipped with onboard electronics to sense data. Mechanical devices from earlier days do not have this facility. There are a significant number of these older machines still in deployment, and the option of replacing all these machines for newer models capable of sensing operational data would incur high costs. This considered, there exists a need to analyse the video to extract the status of the machines including its operations such as state of operation, duration, Timestamps, GPS coordinate of said machines, which could be done by capturing the machine's operations in a video.

1.2 Technology Employed:

Phase 1:

We propose a deep model that uses Convolutional Neural Networks (CNN) and Faster R-CNN to classify and detect the state of the bucket of the machine. Deeper layers of the Convolutional Networks extract highly abstract and complex shapes and patterns, while the first few layers extract simple features like edges and colors. These features are used by the dense layers of CNN for classification of the state of the bucket. Faster R-CNN is used to detect the bucket from the whole machine. The detected bucket will be fed to CNN for classification of states (empty, filled and half-filled).

Phase 2:

We propose a deep model that combines two successful architectures, namely Convolutional Neural Networks and Recurrent Neural Network to learn joint dependencies of a sequence of frames and the corresponding sequence of words. A sequence of frames are fed into a Convolutional Neural Network that extracts patterns from them hierarchically. Deeper layers of the Convolutional Networks extract highly abstract and complex shapes and patterns, while the first few layers extract simple features like edges and colors. Deep abstract features learned by this Convolutional Network are given to a deep Recurrent Neural Network that models dependencies between frames that occur at different times. This consolidated feature vector is then given to a second Recurrent Neural Network that conditions the words it generates over previous context and the learned video features.

Milestone	Deliverable
Module 1 : Capturing images of the different states of the bucket(full,empty,half-filled) and model-building and evaluation for the same.	
1. Data collection of state of bucket	Dataset of the states of the bucket
2. Model-building and evaluation	CNN model
Module 2 : Capturing images of the full machine and detection of bucket.	
1. Data collection of whole machine	Dataset of the whole machine
2. Bucket-detection from the machine	Faster R-CNN model
3. Applying deliverable of Module 1 to identify the state of the bucket	CNN model

2. Principal Investigator:

Dr. T. T. Mirnalinee,
Professor
Department of CSE
SSN College of Engineering
mirnalineett@ssn.edu.in

Dr. J. Bhuvana
Associate Professor
Department of CSE
SSN College of Engineering
bhuvanaj@ssn.edu.in

3. Term/Period of Performance:

Phase 1: Image Analysis – 12 weeks
Phase 2: Video Analytics - This phase will be executed after completing phase 1 with consent from Caterpillar Team

4. Amount of Research Support (Direct Costs and Indirect Costs), Payment Provisions: Specify Payment Breakup with Milestones e.g Parameter standardization can have two milestones.

Work flow for Phase 1

Milestone	Deliverable	Man-Hours	Cost in Rupees
Module 1 : Capturing images of the different states of the bucket(full,empty,half-filled) and model-building and evaluation for the same.			
1. Data collection of state of bucket	Dataset of the states of the bucket	1 week	8750
2. Model-building and evaluation	CNN model	4 weeks	35000
Module 2 : Capturing images of the full machine and detection of bucket			
1. Data collection of whole machine	Dataset of the whole machine	1 week	8750
2. Bucket-detection from the machine	Faster R-CNN model	4 weeks	35000
3. Applying deliverable of Module 1 to identify the state of the bucket	CNN model	2 weeks	17500
Total man-hours:		**12 weeks**	**1, 05,000**

No of hours Per week : 5 hours per Member
Members involved : 5
Total effort per week in man hours: 25 hours
Cost per hour : Rs.350
Cost per week : 8,750
Total man hours : 300 hrs

Total cost of Project: **Rs. 1,05,000**

5. Specified Deliverable Items (if any):
   - Dataset of bucket and whole machine
   - CNN model capable of identifying bucket from whole machine

6. Institute Pre-Existing Intellectual Property and open-source works of authorship: Not applicable

7. Caterpillar Equipment Loans or Gifts (if any): Not applicable

8. Proposed Caterpillar Visitor(s) (if any), Duration of Visit:

9. Caterpillar Liason/Contact responsible for the project: Mr. Vishnu and Mr. Merlin

Dr.T.T.MIRNALINEE M.E., Ph.D.,
Professor
Department of Computer Science and Engineering
S.S.N. College of Engineering
Old Mahabalipuram Road
SSN Nagar - 603 110

19-20

Exhibit 1
PROJECT DESCRIPTION

Upon execution by the Parties below, the Research Project specified herein shall be awarded and performed in accordance with the Master Sponsored Research Agreement ("Agreement"), effective 20th of December, 2018 (which is incorporated herein in its entirety), between SSN College of Engineering (hereinafter, "Institute") and Caterpillar India Private Limited (hereinafter, "Caterpillar").

1. Research Project Title: Generating Machine Productivity using Video Analytics
2. Statement of Work: See attached Annexure-A (Proposal No: CAT-SSN-2019-004)
3. Principal Investigator: Dr. T.T. Mirnalinee, Dr. J. Bhuvana
4. Term/Period of Performance: 12 Weeks
5. Amount of Research Support (Direct Costs and Indirect Costs), Payment Provisions: 1,05,000/-
6. Specified Deliverable Items (if any): as per Annexure-A (Proposal No: CAT-SSN-2019-004)
7. Institute Pre-Existing Intellectual Property and open-source works of authorship: None
8. Caterpillar Equipment Loans or Gifts (if any): None
9. Proposed Caterpillar Visitor(s) (if any), Duration of Visit: To be decided later
10. Caterpillar Liaison / Contact Responsible for the Project: Merlin Singh, Vishnu Selvaraj

Research Project Authorization:

CATERPILLAR INDIA PRIVATE LIMITED

Authorized Signature

Bansidhar Phansalkar, Managing Director – ITDD India

Name & Title

12-6-2019

Date

SSN COLLEGE OF ENGINEERING

Authorized Signature

Mrs Kala Vijayakumar, Preside

Name & Title

(KALA VIJAYAKUMAR)
President
Sri Sivasubramaniya Nad
College of Engineering
Chennai - 600020

Date

CAT ENGINEERING DESIGN CENTRE INDIA TARAMANI CHENNAI 600 113

REVIEWED AND ACCEPTED:

Principal Investigator

Original for Recipient

INVOICE SSN/TL/1920/031

Date March 17, 2020
P.O. Number I000387989
P.O. Date March 17, 2020

SSN COLLEGE OF ENGINEERING

SSN COLLEGE OF ENGINEERING
NO.211/95, V.M. STREET,
MYLAPORE,
Chennai*, Tamil Nadu (TN - 33),
PIN Code 600004, India
044-24416474/24412676
trust.finance@ssn.edu.in
www.ssn.edu.in
GSTIN: 33AAATS2240Q1ZD
PAN: AAATS2240Q

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(91-044) 27641121| Mobile: +91 7358070035
Place of Supply: TN (33)
PAN no AACCE2411Q, GSTIN: 33AACCE2411Q1ZR

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Thiruvallur, Tamil Nadu (TN - 33),
PIN Code 602004, India
(91-044) 27641121| Mobile: +91 7358070035
Ganapathi C - Assistant Manager – Purchase

NO	PRODUCT / SERVICE NAME	HSN/SAC	QTY	UNIT PRICE	CGST	SGST	AMOUNT
1	**CONSULTANCY CHARGES** Towards Generating Machine Productivity using Video Analytics Project by SSN	**998399**	**1.00**	**1,05,000.00**	**9,450.00** 9.00%	**9,450.00** 9.00%	**1,23,900.00**
	TOTAL		1.00	105000.00	9450.00	9450.00	123900.00

Total: ₹ One Lakh Twenty Three Thousand Nine Hundred Only

TOTAL BEFORE TAX	₹ 1,05,000.00
TOTAL TAX AMOUNT	₹ 18,900.00
ROUNDED OFF	0.00
TOTAL AMOUNT	₹ 1,23,900

AUTHORIZED SIGNATORY

S. Ramesh

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING ★ KALAVAKKAM 603 110.

Note:
Subject to Chennai Jurisdiction only

PURCHASE ORDER

BILLING Address	**PO NO: I000387989**
Sonepar India Private Limited (Formerly known as ESK India Commerce and Trade Pvt. Ltd.)	**PO Date: 17.03.2020**
Near Gate 3, Caterpillar India Pvt Ltd, Melnallathur,Thiruvallur	
Chennai 602004 Tamil Nadu India	**Payment Terms: 15DAYS**
GST No -33AACCE2411Q1ZR	**Delivery Terms :DDP**
Supplier Name & Address	**Shipping Address**
SSN COLLEGE OF ENGINEERING	Sonepar India Private Limited (Formerly known as E
RAJIV GANDHI SALAI (OMR)	Near Gate 3, Caterpillar India Pvt Ltd, Melnallathur,Thiruvallur
KALAVAKKAM, Chennai - 603110	Chennai 602004 Tamil Nadu India
	GST No -33AACCE2411Q1ZR
Supplier Contact :	**Port of Destination :**

PART NO	Description	SAC	QTY	Unit	Unit Price in INR	Value
	Generating Machine Productivity using Video Analytics	998399	**1**	**AU**	105000	**105000**
	Total					INR 1,05,000.0
				CGST	9.00%	INR 9,450.00
				SGST	9.00%	INR 9,450.00
					Rounding off	**INR 1,23,900.00**
					Grand total	INR 1,23,900.00

Prepared By **Approved By**

Minutes of 22nd PERC (Project Evaluation & Review Committee) meeting held under the Chairmanship of Shri Upendra C. Joshi, Joint Secretary, Ministry of Mines during 03rd – 05th Aug 2022 through VC. The list of participants is enclosed in Annexure-A.

1. The project proposals under the Science & Technology Programme Scheme of Ministry of Mines were invited online on SATYABHAMA portal (research.mines.gov.in). The last date of receipt of proposals was 13th May 2022.

2. A total number of 319 project proposals were received online on the portal. A two-stage review process was adopted to evaluate the proposals for recommendation to Standing Scientific Advisory Group (SSAG). The first stage comprised of preliminary screening of the proposals done by a team of experts constituted by Ministry of Mines. Based on the guidelines as adopted in 14thPERC, the experts conducted pre-screening of the proposals. After screening, 82 proposals covering five areas, namely (i) Geosciences and Exploration (ii) Mining(iii) Mineral Processing & recovery from waste (iv) Metal Extraction (Metallurgical processes) and (v) Alloys, specialty materials and product; were short listed for further review in the second stage. Three virtual meeting rooms were arranged by JNARDDC, Nagpur for (a) Mining–*(i& ii)* (b) Mineral Processing *(iii)* and (c) Metallurgy*(iv & v)*. All the members and PIs attended the meeting through Video Conferencing mode. In addition to the new proposals the committee re-considered 9 proposals which were recommended for resubmission by the last PERC / SSAG with certain changes. Thus (82+9) = 91 project proposals were presented by the respective Principal Investigators (PIs) and evaluated by the committee during the VC meeting held on 03-05 Aug 2022. Furthermore, 4 completed and 35 ongoing projects were also reviewed by the committee. As per the terms of reference of PERC, the concerned members recused themselves, to avoid conflict of interest, from the proceedings from that part of the meeting when project(s) related to their institute(s) was/were under consideration.

3. The following criteria were given to all the experts for detailed evaluation.

(i) Is the problem well defined?

(ii) Does the proposal adequately cover prior work both in the institution and elsewhere\ Is it similar to any earlier work already sanctioned; has the PI done prior work to prove proof of concept before submitting the project or is the project in the early stage itself ?

(iii) Does it address a critical gap in our country's needs and requirements?

(iv) Is the methodology of work well laid out and doable?

(v) Are the deliverables well defined?

(vi) Is there a translational potential for application / user interface; Can it move to higher TRL?

(vii) Does the PI and institution have adequate competence to do the proposed research?
(viii) Is there collaboration with another Lab or institution or industry to enhance the quality and quantum and application potential?
(ix) Budget: Is the budget correctly done; Is there deficiency or excess?
(x) Time duration:
(xi) Any other comments.

The 3 panels met together at the end and selected the projects for recommendation to the next level SSAG, or asked the PIs to revise and attempt a resubmission to the next PERC or not recommended at all. The details are given in the succeeding paragraphs.

Final recommendation

(i) Recommended with or without changes to SSAG: **29 Project Proposals**
(ii) To be revised and resubmitted in next PERC: **5 project Proposals**
(iii) NOT recommended: **57 Project Proposals**
(iv) Review of report of completed **(4)** and ongoing projects **(35)**

4. Based on the detailed review and evaluation, the following new project proposals are being recommended to SSAG. ***The details of recommended projectsand specific recommendations are given hereunder:***

RECOMMENDED- 29 nos.

1	
Project No.	SNTMOM/684/2022
Project Title	Potentiometric low-cost sensing of rare earth and other heavy metals with high specificity in prospecting for minerals
Institution	Indian Institute of Technology Delhi
Principal Investigator	Madhusudan Singh (7503608075, msingh@ee.iitd.ac.in)
Project Cost & Duration	Rs. 67,80,450.00 3years
Objectives of the project	A. Develop non-specific rare earth atom / heavy metal sensing devices, based on our existing work on Cu and Cd sensing ISEs and ISFETs, for rapid in-field testing of minerals. B. Develop a library of metal-organic framework (MOF) based functionalized with a range of chelating ligands for highly specific coordination of rare earth ions, and integration of these layers into one-time use sensors. C. Develop artificial intelligence (AI) / machine learning (ML) based models to use sensor data from non-specific sensors (a) to predict presence of specific rare earth ions in presence of confounding data. Training of models will employ sensors (b) along with currently standard analytical methods like ICP-MS/XPS/EDX, etc.

REMARKS/SUGGESTION:
RECOMMENDED WITH MODIFICATIONS

1. Project idea is good
2. Seed money of Rs. 10 Lakhs is recommended for a period of one year to establish validity for at least 4 rare earth elements.
3. PI should contact NFTDC to get the mixed RE solutions

2	
Project No.	SNTMOM/700/2022
Project Title	Estimation and Fingerprinting of Chromite, Ni, PGE Resources in Selected Geological tracts of Singhbhum (Sukinda) and Western Dharwar Craton (Nuggihalli chromite belt). Geosciences and Exploration
Institution	CSIR National Geophysical Research Institute
Principal Investigator	P V SUNDER RAJU (9490748152, pvsraju@ngri.res.in)
Project Cost & Duration	Rs. 15,12,000.00 1yrs
Objectives of the project	To collate the published Reports from GSI etc.., available in public domain Integrated Geological, Geochemical and Geophysical studies for the delineation of Chromitite extensions in Nuggihalli Schist Belt and implications for Ni-Cu+-PGE mineralization. 2. Develop a database 3. Controls on platinum group element variation in mafic-ultramafic-magmatic systems 4. Prospectivity indicators for magmatic Ni-Cu sulfides. 5. Apply the Fingerprinting for chromite in virgin potential geological tracts

REMARKS/SUGGESTION:

RECOMMENDED

1. The project idea is good and presently targeting Chromium, Nickel and PGE of different chromite mines.
2. The process of estimation would be useful to evaluate the elements
3. Approach is innovative and would help the industries

3	
Project No.	SNTMOM/718/2022
Project Title	Development of supercapacitor devices for grid-level energy storage application based on natural mineral Chalcopyrite and bauxite residue. Mining (includes rock mechanics, design, equipments, energy, environment, safety)
Institution	Indian Institute of Technology Bhubaneswar
Principal	Saroj Kumar Nayak

Investigator	(9438290179, nayaks@iitbbs.ac.in)
Project Cost & Duration	Rs. 31,42,600.00 3yrs
Objectives of the project	We present a research proposal explaining the significant role of nanostructured CuFeS2 along with the waste, bauxite residue (red mud), in playing a major role towards electrochemical charge storage. ? The proposal highlights the importance, current progress and futuristic prospects of supercapacitor based on nanostructured materials based CuFeS2 and red mud. ? One of the core objectives of this proposal is to develop CuFeS2 and red mud-based supercapacitors which can provide long term and cost-effective solution in the field of electric energy storage. The surge in energy demand is inevitable considering the fact that the electronic industry and transportation sector are expanding rapidly to meet the public demand. ? The purpose of taking red mud is to introduce the novel concept of "waste to energy". As the red mud contains maximum amount of Fe2O3, so after purification of red mud, Fe2O3 can be used as electrode material of supercapacitor. ? Apart from the experimental development, first principles based theoretical investigations will be carried out for the understanding the atomic/electronic level mechanism of CuFeS2 based supercapacitor devices ? Synthesis, characterization, and performance evaluation of the supercapacitor devices.

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. Project idea is good and has novelty.
2. The PI should establish the proof of concept with the developed material.
3. Seed money of Rs. 20 lakh is recommended for a period of 1½ years.
4. Based on these findings the next phase of the project may be decided in developing prototype validation etc.

4	
Project No.	SNTMOM/723/2022
Project Title	Synthesis of precipitated silica from waste beach sand tailings and its value addition in glass making industries Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	SOCIETY RAMAN EDUCATION
Principal Investigator	SUNITA ROUTRAY (7327847963, sroutray1@cvrce.edu.in)
Project Cost	Rs. 26,90,700.00

& Duration	2yrs
Objectives of the project	1. Value addition of waste beach sand tailings 2. To generate wealth from waste 3. To produce precipitated silica 4. Utilization of precipitated silica for industrial applications especially in glass making industries.

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. The project idea is good.
2. PI should focus on achieving purity of silica (+99%) for its utilization in glass and other industries.
3. As beach sand tailing is associated and under the control of IREL, PI needs to submit a letter form IREL for providing samples for the research work.
4. Project is recommended with a revised budget of 15 Lakhs for a duration of 1½ year.

5	
Project No.	SNTMOM/726/2022
Project Title	Development of low-cost heterogeneous catalyst using Red mud for Biodiesel Production. Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	PRACHIPRAVA PRADHAN (9438760367, prachi@jnarddc.gov.in)
Project Cost & Duration	Rs. 29,35,800.00 2yrs
Objectives of the project	(i) Conversion of red mud as low-cost heterogeneous catalyst for biodiesel synthesis from waste cooking oil in Oscillatory Baffle Reactor. (ii) To assess engine performance of biodiesel produced from transesterification of waste cooking oil using red mud as a catalyst and its blends with petro diesel.

REMARKS/SUGGESTION:

RECOMMENDED

1. Project proposal is good with application potential.
2. Project targets to develop low-cost catalyst in biodiesel production
3. The value of catalyst could be attractive based on the quantum of uses
4. Based on outcome the scale up avenues could also be worked out

6	
Project No.	SNTMOM/744/2022
Project Title	Dissolution of chalcopyrite and other sulphide ores using extractive deep eutectic solvents
Institution	K.C college, HSNC University, Mumbai (Hyderabad Sind National Collegiate Board)
Principal Investigator	Hemlata K. Bagla (9821420698, hemlata.bagla @kccollege.edu. in)
Project Cost & Duration	Rs. 50,00,000.00 3 years
Objectives of the project	1. Very limited water consumption 2. Reduced energy consumption 3. Process intensification 4. Reduced consumption of acids 5. Higher selectivity for leaching 6. Suitable for the treatment of low-grade ores, mine tailings, and industrial process residues 7. Useful for the treatment of urban waste 8. New separation processes with low generation of toxic gases and waste
REMARKS/SUGGESTION: **RECOMMENDED WITH MODIFICATIONS** 1. Idea is novel and aims for zero waste. 2. PI should approach NFTDC for facility utilization and project guidance specific to removal of copper from solutions obtained from recycled LiB. 3. Emphasis on cost-effective solvents. 4. Recommended for seed money of Rs. 10 Lakhs for 1 Year to perform prefeasibility studies with emphasis on Cu recovery from Li-Fe batteries and establish POC.	

7	
Project No.	SNTMOM/745/2022
Project Title	Techno Economic survey of copper recycling industry in India Metal Extraction (Metallurgical processes)
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	KOLA IMMANUEL RAJU (9980574024, immanuelkola@jnarddc.gov.in)
Project Cost & Duration	Rs. 57,33,000.00 1 year
Objectives of the project	1. To establish techno-economic scenario of copper scrap recycling industry in the country. 2. To corroborate facilities, current and best practices for collection, processing and value addition in entire copper scrap recycling.
REMARKS/SUGGESTION: **RECOMMENDED** 1. Panel noted that JNARDDC has been nominated as MRA for undertaking the	

functions stipulated in National Non-Ferrous Metal Scrap Recycling Framework, 2020. 2. The proposed work of data collection of copper is crucial. 3. PI should collaborate with International bodies like ICA, ICSZG.

8	
Project No.	SNTMOM/747/2022
Project Title	Recovery of Li, Ni, Mn and Co from spent Li-ion Battery using facile and ecofriendly recovery process Metal Extraction (Metallurgical processes)
Institution	Banaras Hindu University
Principal Investigator	Rajendra Kumar Singh (9451000681, rajendrasingh.bhu@gmail.com)
Project Cost & Duration	Rs. 28,46,655.00 3 Yrs
Objectives of the project	Electric vehicle (EV) battery market of India has targeted to achieve $300 billion by 2030. The National Electric Mobility Mission (NEMM) Project 2020 of India has aimed to bring ~7 million EVs with clean energy aim of 175 GW by 2022. Owing to high cost associated with batteries (40–50 % of EV cost), the spent batteries without recycling can be turned into severe environmental hazard. Rapid expansion of LIB market has resulted significant battery waste. The recycling rate is only at sporadic level worldwide, while no significant project has started yet in our country. Most of these spent LIBs are ending up in landfills. Present project is aimed at developing spent LIB derived precious Li, Ni, Co and Mn metals for fabricating Li nickel manganese cobalt oxide (NMC) cathodes for LIBs for EVs and HEVs. Specific objectives are: To dismantle and discharge spent lithium ion batteries (LIBs) to recover Li and other costly metals Ni, Co and Mn using hydrometallurgical and leaching processes. To recover about 95% of Li, and about 90% of Ni, Co, Mn from spent LIBs using ecofriendly and energy efficient routes using ionic liquid (IL). To reuse the recovered metals Li, Ni, Co and Mn from spent LIBs for fabricating LIBs and test the performance of LIBs fabricated.
REMARKS/SUGGESTION: **RECOMMENDED WITH MODIFICATIONS** 1. Project idea is novel. 2. Recommended with seed money of Rs. 10 lakhs for one year to do POC for demonstrating the selective binding of Li/Ni/Co/Mn in ionic liquids. 3. PI should contact NFTDC for getting the solutions from recycled LiB from its pilot plant	

9	
Project No.	SNTMOM/749/2022
Project Title	Processing of Bauxite Residue Dressing, Mineral Processing & Recovery from waste by Innovative Pyro-Hydrometallurgical Process for Exploring Value Added Bulk Waste Utilization Beneficiation, Ore

Institution	CSIR Institute of Minerals and Materials Technology)
Principal Investigator	Chinmaya Kumar Sarangi (8895198482, cksarangi@immt.res.in)
Project Cost & Duration	Rs. 91,31,390.00 2yrs
Objectives of the project	(1) Establishment of the process for extraction of alumina, iron and titania from Bauxite residue through an innovative process of gaseous reduction followed by hydrometallurgical routes. (2) Utilization of final residue generated after recovery of metal and material values from Bauxite residue. (3) Process parameters optimization for each unit operation involved in the extraction of metal and material values from Bauxite residue. (4) Scale-up testing of the flowsheet at 5-10 kg Bauxite residue processing scale for its validation. (5) Material balance and cost economics of the process. (6) Feasibility, way forward (pilot plant scope) and project report preparation.

REMARKS/SUGGESTION:

RECOMMENDED

1. Project is good and process for recovery of iron, alumina and titania along with use of final residue from red mud presented and is well appreciated by all members
2. The process is innovative and different from various other processes targeted.
3. The recovery and efficiencies presented based on lab work is quite significant with likely viability.
4. PI should assess rare earth elements mix while working out on metals recoveries

10	
Project No.	SNTMOM/752/2022
Project Title	Studies on ilmenite mineral using synthesis gas generated from gasification of carbonaceous materials Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	CSIR Institute of Minerals and Materials Technology)
Principal Investigator	Rakesh Saini (09680842254, rakeshsaini@immt.res.in) CSIR Institute of Minerals and Materials Technology
Project Cost & Duration	Rs. 48,57,000.00 3yrs
Objectives of the project	Recovery of titanium and iron metal from ilmenite ore fines using synthesis (syn) gas, Hydrogen, and natural gas is gaining popularity due to the simultaneous availability of heat and reductant sources with

	the utilization of biomass or coal. This novel process majorly utilizes ilmenite ore fines of less than 100-micron size. It applies reducing gases such as Hydrogen, syngas, methane etc., at high temperatures to recover valuable metals such as Ti and Fe from ilmenite ore fines. Compared to the conventional technologies, which are highly energy and resource-intensive, the ilmenite ore-reduction process using the reducing gas has environmental benefits and is considered a sustainable approach. In this process, biomass, coal, lignite, or petcoke supply high-temperature reducing gas by applying the gasification process. This process can eliminate the energy-intensive and complex steps and thus improves the overall energy consumption in a sustainable way. As per the literature, Ti and Fe metal production from ilmenite ore fines could be improved by 35% to 40% in terms of overall energy consumption if a technology independent of complex processes is developed. The reduction process will be carried out in a fluidized bed gasification reactor with a limited residence time of a few seconds. Here, the fluidized bed gasification reactor design and syn-gas composition are critical to the process performance; therefore, a software-based optimization and scale-up study will be carried out along with the lab-scale experimental work. The major objectives of the proposed project could be categorized as – (a)Studies on ilmenite to recover valuable titanium and titanium-based compounds for industrial applications using synthesis gas generated from gasification.(b)Development of a fluidized gasification reactor based ilmenite conversion process from the cost-effective carbonaceous materials.(c)Energy optimization of the aforementioned process by applying and developing the model.

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. Project idea is good but needs focussed objectives with differentiation from other similar work
2. Project recommended with a seed money of Rs. 15 Lakhs for 2 years to establish the proof of concept. PI may get the balance fund from his parent organization.
3. Association of industry (IREL) is essential in such type of work to access its potential. PI should submit consent letter of IREL.

11	
Project No.	SNTMOM/755/2022
Project Title	Graphitic Ore Derived Fluorographenes for Energy Storage Applications
Institution	University of Calicut
Principal Investigator	Renuka N. K. (9447647790, nkrenu@gmail.com)
Project Cost & Duration	Rs. 86,97,700.00 3 years

Objectives of the project	The specific objectives of the proposed project are: a) Value addition of graphene derived from locally mined graphite ore by converting it to fluorographene having multifaceted applications. b) Synthesis of fluorographene from the graphene-organic dye dispersion via displacing the noncovalently bound dyes on graphene with fluorine, using suitable alkali fluorides and optimization of fluorine and oxygen contents in fluorographenes by altering the reaction parameters like the reaction time, the concentration of fluorine source, etc. c) To prepare fluorographene-based aerogel, hydrogel, and mixed metal-oxide nanocomposites and evaluation of electrochemical characteristics in terms of voltage limit, specific capacitance, energy density, power density and lifetime using cyclic voltammetry (CV), galvanostatic charging/discharging (GCD), and electrochemical impedance spectra (EIS). d) Fabrication and testing of efficient, low-cost, easy-to-process fluorographene based supercapacitor devices.

REMARKS/SUGGESTION:
RECOMMENDED WITH MODIFICATIONS

1. Project idea is novel.
2. The testing charges may be included in PI's institutional budget.
3. Total Budget revised to Rs. 40 lakhs for 2 years.
4. The emphasis should be on super capacitor device development using Fluorographenes materials developed in the project.

12	
Project No.	SNTMOM/760/2022
Project Title	Process for Recovering Zinc from Secondary Resources (Zinc Tailing and Jarosite) and Utilization of Process Wastes into Lightweight Building Materials Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	ANAS N S (7382105254, anas@jnarddc.gov.in)
Project Cost & Duration	Rs. 48,86,216.00 2yrs
Objectives of the project	The objectives of the proposal are as below: • Develop a sustainable process for utilizing secondary zinc resources. • Achieve selective recovery of available zinc (Zn) for mineral augmentation • Attain resource efficiency (to fulfil zero-waste concept) by utilizing leftover rejects as lightweight building materials

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. Project idea is good
2. PI should first target on recovery efficiency of zinc mineral value based on characteristics of mineral phases in jarosite and zinc mine tailings

3. Seed money of Rs. 20 lakh is recommended for a period of 1½ year. 4. Based on these findings, the next phase of the project may be decided

13	
Project No.	SNTMOM/764/2022
Project Title	Designing lightweight and highly formable Mg-Li-Zn-Ca-RE based alloys using the CALPHAD method
Institution	Indian Institute of Technology Jodhpur
Principal Investigator	Jaiveer Singh (9022080900, jaiveer@iitj.ac.in)
Project Cost & Duration	Rs. 46,88,200.00 3 years
Objectives of the project	The major objectives of the proposed work are as follows: 1. Design of binary (Mg-Li/Zn/RE) and complex (Mg-Zn-Ca, Mg-Zn-RE, Mg-Zn-Ca-RE, Mg-Li-Zn-RE) Mg alloy systems by thermodynamic modeling based on the CALPHAD approach for getting optimized compositions. 2. Successful fabrication of the newly designed alloys using the induction melting furnace by controlling the cooling rates and the casting atmosphere. 3. Optimization of thermo-mechanical processing parameters for obtaining the weaker basal texture using the Gleeble thermo-mechanical simulator. 4. Detailed microstructural characterization (OM, SEM, EBSD, t-EBSD (TKD), and X-ray diffraction) and evaluation of room temperature mechanical properties to establish the microstructure-property relationships for the developed Mg alloys. 5. Experimental investigation of crystallographic texture and change in c/a ratio of h.c.p. unit cell in the developed Mg alloys will be performed to understand the active deformation mechanisms at room temperature. 6. Detail investigation of corrosion behavior for selected processing conditions of optimized alloys in various corrosive media will be carried out and a microstructure-corrosivity relationship will be established.
REMARKS/SUGGESTION: **RECOMMENDED WITH MODIFICATIONS** 1. Project idea is good. 2. Revised cost of Rs. 25 lakhs for 2 years is recommended. 3. PI should engage with NFTDC for assistance in melting and rolling facilities.	

14	
Project No.	SNTMOM/783/2022
Project Title	Enhancement of Mechanical and Electrical properties of Iron (Fe) by incorporation of Graphene (Gr) for advance applications Alloys, Rare Earths, Specialty materials and product
Institution	Balaram Panda Trust
Principal Investigator	Priyambada Nayak (7873008101, dr.priyambada@gift.edu.in)

Project Cost & Duration	Rs. 24,41,800.00 3yrs
Objectives of the project	The present proposal is the enhancement of composites by following specially developed process. (i) The aimed to develop Iron based special composites with the incorporation of graphene, and workout the cost effectiveness vis-à-vis advanced properties for engineering applications. (ii) To improve the mechanical and electrical properties of the develop Iron-graphene metal matrix composite with improved properties. (iii) To work out the cost economics compared with the existing composites for different applications. (iv)Explore development of prototype and validation of the newly prepared composites in association with industry partner.
REMARKS/SUGGESTION: **RECOMMENDED WITH MODIFICATIONS** 1. The project idea is good. 2. PI should use normal iron instead of low-grade iron to develop the target material for its validation in phase-1 3. Prototype preparation could be taken up in next phase. 4. A seed money of Rs. 15 Lakh for a period of two years is recommended.	

15	
Project No.	SNTMOM/795/2022
Project Title	Agglomeration of spent garnet for possible reuse as abrasives in water jet applications Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste (Duration: 2 Yrs, 0 Mth) Submitted
Institution	SSN TRUST
Principal Investigator	V.E.Annamalai (9840359093, annamalaive@ssn.edu.in)
Project Cost & Duration	Rs. 27,47,000.00 2yrs
Objectives of the project	i) The background: Garnet is an environmental friendly material with specific applications. Large quantities are used in waterjet application as abrasives. The usable size is around grit 80. After use, the material gets too fine and becomes unusable. At this stage it is a waste that needs to be handled only by landfilling. Objectives: The objective is to reconstruct the spent garnet into required bigger / usable size by material processing techniques. From larger agglomerates of spent garnet, required usable size can be generated by size reduction methods. This may enable reusing the material again, in waterjet applications.
REMARKS/SUGGESTION:	

RECOMMENDED WITH MODIFICATIONS

1. Project idea is good
2. The PI needs to establish the agglomeration process for its abrasive application in phase-1
3. A seed money of Rs 15 lakh for 1½ years is recommended for taking up the work and establishing commercial avenues for possible MSME.

16	
Project No.	SNTMOM/796/2022
Project Title	Techno-economic Survey of Lead recycling Industry Metal Extraction (Metallurgical processes)
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	V N S U VISWANATH AMMU (7798546794, viswanatha@jnarddc.gov.in)
Project Cost & Duration	Rs. 58,38,000.00 1 year
Objectives of the project	To establish a techno-economic scenario of lead scrap recycling industry in the country • To provide support in promoting sustainable recycling of lead and circular economy for lead recycling

REMARKS/SUGGESTION:
RECOMMENDED

1. Panel noted that JNARDDC has been nominated as MRA for undertaking the functions stipulated in National Non-Ferrous Metal Scrap Recycling Framework, 2020.
2. The proposed work of data collection of lead is crucial.
3. PI should collaborate with International bodies.

17	
Project No.	SNTMOM/814/2022
Project Title	Setting up of pilot cum demonstration plant for recovery of alumina and value-added products from fly ash Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	KALI SANJAY (9338291970, ksanjay@immt.res.in)
Project Cost & Duration	Rs. 3,92,16,000.00 3yrs
Objectives of the project	• Validation of Proof of Concept, Generation of engineering data and preparation of Basic Engineering Package (BEP) for setting up of pilot plant (50 kg/day fly ash) at NALCO • Preparation of Detailed

	Engineering data sheet for bought out equipment and installation of pilot cum demonstration plant (50 kg/day fly ash) and commissioning at NALCO • Pilot plant campaigns including fine-tuning of process parameters for generating data and products • Product evaluation/testing/developing sub-processes for utilizing by-products including recovery of REEs in lab-scale • Technical Feasibility report with viability for processing of fly ash to extract alumina and other valuables.

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. The project proposal is very good with elaborate proof of concept with global importance.
2. PI informed that two stages of work already carried out earlier on this project with NALCO support. PI has also submitted the 3rd stage of scale-up proposal to NALCO which is under review. Confirmation from NALCO is awaited. Parallelly, they have submitted the current proposal for pilot plant to PERC with partial industry support.
3. The pilot plant will be set up in NALCO.
4. In view of its national significance, the proposal is recommended with 50% support by MoM and 50% funding by NALCO.
5. PI should intimate about the decision of NALCO before the SSAG meeting to avoid duplicate funding.

18	
Project No.	SNTMOM/832/2022
Project Title	Development of a sustainable material using chromite mine overburden and other industrial wastes for stowing or backfilling of underground mines in Sukinda Valley, Odisha Mining (includes rock mechanics, design, equipments, energy, environment, safety)
Institution	National Institute of Technology Rourkela)
Principal Investigator	Himanshu Bhushan Sahu (9437245625, hbsahu@nitrkl.ac.in)
Project Cost & Duration	Rs. 38,88,600.00 3yrs
Objectives of the project	The main objective of the research work is to develop a sustainable material using chromite mine overburden and other industrial wastes for stowing/backfilling of underground mines in Sukinda Valley, Odisha. Keeping the aforementioned problem in mind, the work has been planned with the following objectives: 1. Characterization of OB material collected from Sukinda valley 2. Determination of strength and water drainage characteristics for different size fractions of OB 3. Determination of strength and water drainage characteristics for

	different size fractions of OB-fly ash and/or tailing mixture 4. Study of leachates using chemical analysis 5. Numerical simulation for stability and material flow modeling. 6. Development of a suitable material based on the laboratory investigation and simulation results.

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. The project is innovative.
2. Committee recommends a seed money of Rs.15 lakh for a period of 1½ year to undertake characterization of over burden from Sukinda chromite mines for the proposed work and exclude the simulation and modelling part at present in phase-1
3. Industry support from OMC and TATA were shown by PI with regards to providing required samples.

19	
Project No.	SNTMOM/834/2022
Project Title	SiAlON based Novel Composites for Rock Drilling-A plausible Alternative of Hard WC-Co composite
Institution	CSIR Central Glass and Ceramic Research Institute
Principal Investigator	Soupitak Pal (8777541388, soupitak@cgcri.res.in)
Project Cost & Duration	Rs. 48,04,674.00 3 Yrs
Objectives of the project	The broad objective of the proposed research is to design and develop potential candidate material for the replacement of the WC as a drilling tool material used in mining industries. However, in the milieu of the present proposal, the specific objectives are given below: 1) Processing of SiAlON and SiAlON-Co composite (less than 5 wt.% of Co)with microstructure tailoring to produce a tougher (KIC ˜ 10 MPavm) and hard (hardness ˜20 GPa) ceramics-metal composite. 2) Qualify the as-fabricated composite in terms of strength, hardness, and toughness as a replacement for WC-Co composite. 3) Characterization of tribological behavior of the as-fabricated composite at room temperature and development of wear mechanism map against EN31 tool steel. 4) Near net shape components fabrication of simple geometries and evaluation of cutting performance of the as-processed composite for mild steel and Ni-base superalloy machining.

REMARKS/SUGGESTION:
RECOMMENDED WITH MODIFICATIONS

1. Product Manufacturing and Benchmarking should be done.
2. Industry collaboration with tool / ceramic industry is necessary
3. Budget to be revised to Rs 18 Lakhs for 1½ years subject to the condition that PI should submit letter of financial support of at least Five Lakhs of Co-funding from relevant industry /CSIR.

20	
Project No.	SNTMOM/845/2022
Project Title	Development and scale up -TRL 5 – of cost effective Copper Graphene materials using in-situ synthesis and coating in Fluidized Bed Process systems
Institution	CSIR Advanced Materials and Processes Research Institute AMPRI
Principal Investigator	TILAK (7906445435, tilak@ampri.res.in)
Project Cost & Duration	Rs. 91,71,500.00 2 Yrs
Objectives of the project	(This is resubmission of SNTMOM/503/2021. Since NFTDC was added as another collaborator after last PERC so freshly submitted again) o Design and development of fluidized bed apparatus for in-situ synthesis of Cu-graphene composite powders and synthesis. o Synthesis of Cu-graphene composite powders using fluid-bed coating o Themo-mechanical processing of Cu-Gr composites from above routes to obtain PM compacts and mill forms. o Characterization of Cu-graphene composites developed using powders obtained through above routes

REMARKS/SUGGESTION:
RECOMMENDED WITH MODIFICATIONS

1. Project idea is novel
2. It addresses the emerging copper / carbon materials for high strength and conductivity.
3. The research is of contemporary international calibre in this category of materials.
4. Recommended with revised budget of Rs. 60 Lakhs for 2 years.

21	
Project No.	SNTMOM/847/2022
Project Title	Techno-economic Survey of Zinc recycling Industry in India Metal Extraction (Metallurgical processes)
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	RAMAVAJJALA ANIL KUMAR (9491318525, anilkumar@jnarddc.gov.in)
Project Cost & Duration	Rs. 54,09,600.00 1 year
Objectives of the project	To establish techno-economic scenario of zinc scrap recycling in the country

REMARKS/SUGGESTION:
RECOMMENDED

1. Panel noted that JNARDDC has been nominated as MRA for undertaking the functions stipulated in National Non-Ferrous Metal Scrap Recycling

Framework, 2020.
2. The proposed work of data collection of zinc is crucial.
3. PI should collaborate with International bodies.

22	
Project No.	SNTMOM/863/2022
Project Title	Process for the preparation of iron oxide nanoparticles and zeolite nanoparticles from iron and bauxite mine rejects and evaluation of products for the environmental applications Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	SUJANA M G (9438399955, sujana@immt.res.in)
Project Cost & Duration	Rs. 57,46,244.00 3yrs
Objectives of the project	Sampling and complete physical and mineralogical characterization of the selected iron and bauxite mine rejects for phase and elemental analysis through XRD, XRF, SEM EDS, TG/DTA and wet chemical analysis, using ICP-OES. Analysis of minor elements such as rare earth elements by ICP-MS. ? To investigate the optimization of the technical parameters for effective recovery of metal oxides by hydro/biometallurgical reaction processes using mine rejects as starting materials. ? Separation, and Preparation of iron oxide nanoparticles /zeolite materials ? Mapping of minor elements distribution in the flow sheet for identification of possible points at which the sub-processes can be made in future. Sink-float studies will be carried out using heavy organic liquids such as bromoform (CHBr3; specific gravity, 2.89), as a medium for separation of heavier fractions from the lighter one. Methylene iodide (di-iodo methane, 3.3 specific gravity) heavy medium will be used to determine the very heavy minerals and light heavy minerals from the total heavy minerals (sinks) obtained by using the bromoform as heavy medium. ? Characterization of the developed materials by systematic structure characterizations with X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), transmittance electron microscope (TEM), X-ray fluorescence spectroscopy (XRF), X-ray photoelectron spectroscopy (XPS) and DRS UV visible spectra and particle size analysis,BET Surface area and RAMAN spectroscopy. ? To explore the possible utilization of developed materials through modification or as such for the environmental applications by conducting feasibility studies on contaminants (As(III)/(V), Selenium/dye degradation).

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. The project idea is good
2. Panel recommends a seed money of 15 lakhs for a period of 1½ years for

undertaking the preliminary studies.
3. The work should focus on PLK.

23	
Project No.	SNTMOM/865/2022
Project Title	Design and development of an instrument for unmanned noise mapping of mines using a drone-mounted acoustic camera Mining (includes rock mechanics, design, equipments, energy, environment, safety)
Institution	National Institute of Technology Rourkela
Principal Investigator	Dibya Prakash Jena 9938084602, jenad@nitrkl.ac.in
Project Cost & Duration	Duration: 2 Yrs, 0 Mth Cost:1,32,65,500.00
Objectives of the project	The acoustic camera is an advanced instrument that is used for noise source localization and at the National level the competencies don't exist. The said acoustic camera is a general instrument that has been used by researchers for traffic noise localization in complex environments like ports, however, never been attempted for mines. The additional complexity of the mine is geospatial discontinuities. Currently, the noise map of a mine is generated with a sound level meter where the measurements of a few set points is used to estimate the noise map which in principle is not much accurate. So, the present research aims at design and development of an instrument for unmanned noise mapping of mines using a drone-mounted acoustic camera.

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. Project idea is good and is a move towards digitalization in mining
2. PI submitted consent letter of NALCO for 25% funding.
3. Panel noted that similar work on noise mapping carried out by NIMH in the past was limited to manual data collection followed by modelling in lab for validation.
4. The present proposal aims to develop a drone based mine mapping system which can be handed over to NALCO followed by training to NALCO personnel.
5. The total budget should be pruned down by reducing the number of microphones and data acquisition system accordingly.
6. The panel recommended for a revised budget of Rs. 110 Lakhs with 40% funding by MoM (Rs. 44 Lakhs) and balance 60% by NALCO (Rs. 66 Lakhs)
7. PI advised to submit revised funding letter from NALCO.

24	
Project No.	SNTMOM/885/2022
Project Title	Development of Nanostructure Chalcopyrite Materials as Sustainable Thermoelectric and Supercapacitor Applications
Institution	Hindustan Institute of Technology and Science
Principal Investigator	Indrajit Shown (7596917050, shownindrajit@gmail.com)
Project Cost & Duration	Rs. 50,27,700.00 3 Yrs
Objectives of the project	1. To evaluate the thermoelectric (TE) and supercapacitor (SC) behavior of hierarchically nanostructured chalcopyrite doped heavily by p-type silver. 2. To explore the feasibility of producing a novel thermoelectric and supercapacitor material by using Cd or Se as a ternary addition to form nanostructured chalcopyrite. Attractive TE properties of Zn added chalcopyrite make it appear that the study may discover a high ZT stable thermoelectric material. 3. To develop optimized synthesis techniques by microwave assisted hydrothermal means so as to produce nanostructures (nanowires or nanoplates) by bottom up approaches. Moreover, suitable thermomechanical treatment will be evolved for creating nonuniformity in distribution of nanoprecipitates/ doping elements within nanostructured matrix that helps in modulation doping. Both Mechanical alloying and liquid metallurgy and routes will be tried. 4. To study the effect of fullerene C70 addition on the stability and thermoelectric behavior of TE and SC behavior of chalcopyrite-C70 nanocomposites with or without silver doping. 5. To explore the feasibility of He ion implantation followed by annealing to create homogeneously distributed pores and to study its effect on thermoelectric and supercapacitor properties. Abstract Herein we propose to develop nanostructure chalcopyrite with dopant as universal materials that can be used to generate electrical energy from thermal energy as a thermoelectric generator and store the energy as a structural supercapacitor. It is expected that this material can be used in the structural body of electric vehicles or heat generators with ion-exchanging rechargeable supercapacitors and form a hybrid energy storage system. The use of thermoelectric material to harvest waste heat energy is not new, but if the same material can store that energy, it will be a gamechanger in the field of sustainable energy application.

REMARKS/SUGGESTION:
RECOMMENDED WITH MODIFICATIONS

1. Project idea is good.
2. Panel recommends a seed money of Rs 10 Lakhs for one year to work on Supercapacitors to establish PoC and compare the performance with competitive materials in Phase-1
3. No funding for capital equipment.

4. Target should cross 40 Wh/kg for energy density

25	
Project No.	SNTMOM/886/2022
Project Title	Recovery of Molybdenum, Nickel and Alumina values from spent hydrotreating catalyst of HPCL and Demonstration at Pilot plant (TRL-7) and techno-economic feasibility studies Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Non Ferrous Materials Technology Development Centre
Principal Investigator	D Lokeswara Rao (9849604852, lokesh@nftdc.res.in)
Project Cost & Duration	Rs. 99,77,000.00 1 yrs 6 Mth
Objectives of the project	Approximately 220 Tons (110 Tons – CoMo/Al2O3, 110 Ton-NiMo/Al2O3)/ year from HPCL Mumbai refinery and 230 tons (110tons- CoMo/Al2O3, 120 tons – NiMo/Al2O3) /year spent hydro treating catalyst wastes are generated. The typical Mo and Ni content of the spent hydro treating catalyst after usein the refining by HPCL contains 5-15% Mo and 1-5% Nion Al2O3 substrate. This spent catalyst was taken for prior work. 1. Development of process flow sheet for recovery of Molybdenum, Nickel/ Cobalt and pure alumina from the spent HDS catalyst. 2. Process intensification techniques of Microwave and sonication to be incorporated in the leaching circuit. 3. Development of a closed loop, zero discharge process without effluent. 4. Achievement of 90% leaching efficiencies with an overall 80% material recovery. 5. Pilot plant at 25 kg level (TRL-7) for demonstration up to 1-ton operations. (Six months) 6. Techno-economic study at DPR for 400 TPY spent catalyst plant (yielding approx. 40 TPY Mo values and 10 TPY of Ni values and 300 TPY of alumina values at HPCL-NFTDC site.

REMARKS/SUGGESTION:

RECOMMENDED

1. The project idea is good and will validate the product quality.
2. Prior work is well done on actual materials from HPCL.
3. The deliverables include pilot plant for demonstration up to 1-ton operations for Recovery of Molybdenum, Nickel and Alumina values.
4. HPCL (Industry partner) and NFTDC shall cover 67% of the budget (HPCL – Rs 49 lakhs and NFTDC – Rs. 17.6 lakhs) and PI has sought the balance 33% budget from MoM (Rs. 33.165 Lakhs).
5. HPCL and NFTDC will further scale up to 400 TPY input catalyst plant on successful completion of the pilot plant on this project.

26	
Project No.	SNTMOM/900/2022
Project Title	Development of Eco-friendly molten salt extraction process for Nd and Pr and Establishment of 25- 50 TPY Nd and Pr Metal Extraction Demonstration Plant (TRL7-8) for Rare Earth Magnet Production
Institution	Non Ferrous Materials Technology Development Centre
Principal Investigator	Nirmal Panda (9985509736, nirmalpanda@nftdc.res.in) (Non Ferrous Materials Technology Development Centre)
Project Cost & Duration	Rs. 19,52,87,000 2 Yrs
Objectives of the project	WP-1: Design and fabrication of 25-50TPY demonstration Nd/Pr Extraction Plant of 8KA Molten Salt Electrolytic Cell WP-2: Innovative process development in terms of eco-friendliness using coated carbon or non-carbon electrodes. WP-3: Nd/(Nd-Pr) FeB alloy powder using rapid solidification process and process equipment development WP-4: Establishment of demonstration plant: 25-50 TPY entry level plants (TRL 7/8) and demonstration up to 6 tons of metal production.

REMARKS/SUGGESTION:
RECOMMENDED

1. Project Idea is novel and is at higher TRL-7/8 level
2. Industry support is appreciated by panel members
3. PI is seeking only around 15% of total budget from MoM (Rs. 295.35 Lakhs). Balance budget is funded by Midwest Rare Earth – Rs. 13.0284 crores and NFTDC – Rs. 3.5468 crores.
4. The PI informed that an entire team of around 10 members of multi-disciplinary scientists and engineers will execute the pilot plant in 18 months followed by 6 months of operation for validation.
5. The proposal is of national importance.

27	
Project No.	SNTMOM/923/2022
Project Title	Pre-feasibility Studies on Biological Extraction of RE (Nd, Pr, Sm, Dy, Gd) ions from leached solutions
Institution	CSIR Institute of Microbial Technology
Principal Investigator	Srinivasan Krishnamurthi (7837306552, kmurthi@imtech.res.in)
Project Cost & Duration	Rs. 20,39,730.00 1 year

Objectives of the project	1)Screening for siderophore producing bacteria from wealth of marine bacterial cultures available with PI research group. Concurrent selection and screening of bacterial cultures in NFTDC suitable for REE biosorption. 2)Establishment of enrichment cultures and/or assays for determining mobilization of REE from mineral ores/wastes. 3)Deposition of selected biomass on Silica spheres to created sorption columns and desorption of immobolized REEs (NFTDC)

REMARKS/SUGGESTION:
RECOMMENDED WITH MODIFICATIONS

1. Project idea for biological extraction of RE is good.
2. The findings will help in determining mobilization of REE from mineral ores/wastes.
3. Recommended with a revised budget of Rs. 15 Lakhs for 1 year

28	
Project No.	SNTMOM/557/2021
Project Title	Conversion of natural mineral based tetrahedrite compounds into high performance thermoelectric devices used in the conversion of waste heat into electricity
Institution	Indian Institute of Technology Bhubaneswar
Principal Investigator	SIVAIAHBATHULA (9958923766, sivaiahb@iitbbs.ac.in)
Project Cost & Duration	Rs.42,06,750.00 3 Yrs
Objectives of the project	• To develop novel material designing strategies for making the naturally available tetrahedrite minerals as potential thermoelectric materials in clean energy generation applications. • To tune the thermoelectric transport properties (band structure engineering and nanostructuring) of naturally available tetrahedrite (Cu12Sb4S13) as well as synthetic tetrahedrite minerals. • To perform systematic microstructural, and thermoelectric characterization to optimize the base composition of tetrahedrite. • To scale up the indigenously developed tetrahedrite materials into the thermo-element devices (dimensions, 8 x 8 mm) with ohmic contact engineering (low specific contact resistance). • To fabricate uni-couple thermoelectric devices using natural metal tetrahedrite based un-couple TE device (p-type tetrahedrite with matchable n-type) and to demonstrate reasonable power density (~0.5 W/cm2) with improved mechanical properties (Fracture toughness, thermal shock resistance).

REMARKS/SUGGESTION:

RECOMMENDED

1. The PI complied with suggestion of previous PERC
2. PI should start Synthetic compound along with natural ones.

29	
Project No.	SNTMOM/607/2021
Project Title	Nano Ion-Chromatograph in Action - Sustainable and Scalable Quantum Dots Paves a Facile Route for Rare-Earth Ions Separation Through Advanced Hydrometallurgy.
Institution	Banaras Hindu University
Principal Investigator	SomenathGarai (8400098731, sgarai@bhu.ac.in)
Project Cost & Duration	Rs.1,61,58,500.00 3 Yrs
Objectives of the project	• The tunable nature of the concave surface of the Keplerate is truly unique and provides a powerful tool in the design and development of novel nanocontainer molecules. Therefore, the specific objectives to be achieved by this project include: • The use of the Nano-Keplerates as highly efficient rare-earth metal absorber under confinement. • Facile separation of the rare earth metals selectively from the other naturally occurring trivalent cations in the corresponding ores through Nano-Ion Chromatograph behavior of the voltage gated {Mo9O9}-pores of the Quantum Containers. • The evaluation of corresponding Dissociation Constants KD(s) of rare earth metals as compared to the different cations to enable Nano-engineering of the Quantum Containers towards optimization. • The high throughput recyclability of the Novel Quantum Containers will be tested for the bulk real-life Nanotechnology application to finally, set-up of a pilot hydrometallurgical demo unit for upscaling of a minimum of 100 L/Day of raw digested ore solution.

REMARKS/SUGGESTION:

RECOMMENDED WITH MODIFICATIONS

1. PI complied with the recommendations of previous PERC
2. Recommended for a revised cost of Rs. 65 Lakhs for 2 years.
3. No capital equipment except for one essential item.
4. For support, NFTDC may be approached for scale up facilities and concurrent engineering

5. The following projects were recommended for resubmission to next PERC.

RESUBMISSION TO NEXT PERC – 5 nos.

1	
Project No.	SNTMOM/634/2022
Project Title	Czochralski growth of Silicon single crystals to produce up to 3-inch wafers with potential for import substitution
Institution	CSIR Institute of Minerals and Materials Technology, IMMT
Principal Investigator	NIRMAL KUMAR VELU (9600973603, nirmalvelu@immt.res.in)
Project Cost & Duration	Rs. 2,25,64,752.00 2yrs
	Czochralski growth process of Silicon single crystals along (111) and (100) planes to produce wafers up to 3-inch size and economic feasibility study for import substitution. The scope of this work are; • Growth Si single crystals along (111) and (100) planes by Czochralski method • Varying crystal diameter from 25 to 80 mm by controlling growth parameters • Process to produce wafers of sizes 1", 2" and 3" by cutting and polishing of Si single crystals • Production of Si wafers with global standards • Economic feasibility study: calculating the production cost/wafer and comparison with commercial products
REMARKS/SUGGESTION: **RESUBMISSION TO NEXT PERC** **1.** The project idea is good **2.** PI should include strategy for development of equipment **3.** Proposal should be resubmitted with co-funding of beneficiary industry partner	

2	
Project No.	SNTMOM/693/2022
Project Title	Development of a V2X-based low-cost fleet management system for opencast mines Mining (includes rock mechanics, design, equipments, energy, environment, safety
Institution	CSIR Central Institute of Mining and Fuel Research
Principal Investigator	Swadeskumarchaulya 0947119138, chaulyask@gmail.com

Project Cost & Duration	1,15,27,600.00 Duration: 3 Yrs, 0 Mth
Objectives of the project	The objectives of the proposed project: i) Development of an integrated V2X and GPS device; ii) Development of an application software for HEMM tracking, navigation, proximity warning, production monitoring, and fleet management; iii) Field trial of the developed system in an opencast mine; and iv) Patent and copyright filing of the developed system and software

REMARKS/SUGGESTION:

RESUBMISSION TO NEXT PERC

1. The project idea is good.
2. Members observed that more than 40% budget is being expended for the outsourced work viz computer engineer etc.
3. Proposal should be resubmitted with co-funding of beneficiary industry partner.

3	
Project No.	SNTMOM/705/2022
Project Title	COLLABORATIVE AUTONOMOUS MULTI ROBOT SYSTEM BASED GEOSPATIAL DATA COLLECTION, MAPPING AND INSPECTION FOR MINING OPERATIONS
Institution	Indian Institute of Science Bengaluru
Principal Investigator	ABHRA ROY CHOWDHURY (7376469472, ABHRA@IISC.AC.IN)
Project Cost & Duration	Rs. 37,70,800.00 3yrs
Objectives of the project	Design of an Human Collaborative Multi Autonomous (AMS) Team of Land based and Drone robots for Mapping, Navigation and Exploration in Mining Operations (Surface and Underground)

REMARKS/SUGGESTION:

RESUBMISSION TO NEXT PERC

1. Project idea is good and is aimed towards digitalization in mining.
2. However, similar robotic work is being done by CSIR-CMERI Durgapur, IIT Kanpur, IIT(ISM) Dhanbad and other organizations, which PI should take into consideration.
3. Panel suggested PI to visit similar mining projects to know the mining

environment and constraints 4. Proposal should be resubmitted with co-funding of beneficiary industry partner.

4	
Project No.	SNTMOM/830/2022
Project Title	Investigation of structurally bound invisible gold incorporation process into sulfide minerals and its extraction potential through hydrothermal experimental studies and reactive transport modeling Geosciences and Exploration (Duration: 3 Yrs, 0 Mth) Submitted
Institution	Indian Institute of Technology ISM Dhanbad
Principal Investigator	ALIK SUNDAR MAJUMDAR (7045800260, asmajumdar@iitism.ac.in)
Project Cost & Duration	Rs. 69,19,752.00 3yrs
Objectives of the project	iThe major objectives of the proposed project are as follows: 1) To carry out a series of hydrothermal experiments between natural sulfides (pyrite, arsenian pyrite, arsenopyrite, and löllingite) and Gold chloride solution with variable AuCl: AuCl3 ratios, temperature, pressure, solution pH to understand the control of gold valence state (Au+1 vs Au+3) on the pattern and mechanism of Au substitution into major gold-bearing sulfide minerals. 2) To compare experimental results with natural samples to interpret the valence state and site preference of gold during incorporation into pyrite, arsenian pyrite, arsenopyrite, and löllingite crystal structures.
REMARKS/SUGGESTION: **RESUBMISSION TO NEXT PERC** 1. Project idea is good. 2. PI was suggested to involve mineral beneficiation and metallurgy expert to execute project with revised budget. 3. Project should be recast with reduced capital budget.	

5	
Project No.	SNTMOM/554/2021
Project Title	Micron to Nano Scale Investigation of Platinum group of Minerals in Chromitite of the Indo-Burma-Andaman Ophiolite
Institution	Indian Institute of Science Bengaluru Pondicherry University
Principal	SAJEEV KRISHNAN

Investigator	9448427463, E-mail: sajeev@iisc.ac.in PM Mohan
Project Cost & Duration	Rs. 8909108.00 3 Yrs
Objectives of the project	• To explore and locate platinum group of elements (PGEs) texturally in Chromititeand associated ultramafic rocks from Indo-Burma-Andaman ophiolite belt. • To investigate the presence of PGEs and their forms using atomic resolution advanced techniques such as transmission electron microscopy and atom probe tomography. • To investigate the atomic-scale chemistry and structure of the PGEs and their form. • To rationalize the genesis of PGEs in the chromitite sample based on the location and time.
REMARKS/SUGGESTION: **RESUBMISSION TO NEXT PERC** PI could not present the project due to unforeseen emergency.	

6. The list of new projects NOT RECOMMENDED is as below:-

These proposals were not recommended as the (i) objectives are very sketchy and methodology not clear or doable; (ii) proposals not directly in the thrust areas, (iii) outcomes are not relevant or impactful, (iv) there is no visible translational potential; (v) similar projects have already been funded, (vi) it could be directly done as a consultancy project with the industry; (vii) preliminary proof of concept is not done; (viii) the proposed work can be done by PI within the facilities available with them and it does not really need a project proposal;(ix) in a few cases PI has not adequate domain knowledge in mining or minerals or lacking a partner with domain knowledge, (x) casual approach to problem definition and a loose connection made between mining, minerals and waste.

NOT RECOMMENDED –57 nos.

1	
Project No.	SNTMOM/253/2020
Project Title	Development of India specific scientific framework to promote the beneficial reuse, rehabilitation or remediation of landscape affected by abandoned mines or flyash ponds or slags
Institution	Indian Institute of Technology BHU Varanasi and other institutes

	Industry Partner - MOIL, Hindalco and Triveni Earth Movers
Principal Investigator	Amit Verma 0778101240 amitvermaism@gmail.com
Project Cost & Duration	Rs. 49,98,000.00 2 Years
Objectives of the project	1. To develop a framework to facilitate a successful transition to mine closure 2. To delineate potential uses of abandoned/inactive mines/fly ash ponds across India 3. To study the impact of rehabilitation on alleviating social, economic and environmental wellbeing of communities living in and around major mining centers in various parts of India.
Remarks **NOT RECOMMENDED** 1. The objectives are very generic 2. Lacks innovation and novelty	

2	
Project No.	SNTMOM/483/2021
Project Title	Development Of An Integrated Bioprocess For The Enrichment And Separation Of Precious Rare Earths From Phosphogypsum Industrial Wastes
Institution	CSIR National Institute for Interdisciplinary Science and Technology
Principal Investigator	PRATHISH K P 9447798707, prathishkp@niist.res.in
Project Cost & Duration	Rs. 74,73,000.00 3 yrs
Objectives of the project	Rare earth elements (REEs) are of growing interest and their applications cover many fields such as permanent magnets, wind turbines, hybrid cars and mobile phone speakers. The recovery of REEs from both bulk PG waste, as well as leachate is targeted through two entirely different approaches in this project. 1. Bench scale bioprocess development for producing organic acid cocktail for extracting (bio-leaching) REEs from waste phosphogypsum. 2. Exploring the application of a sulphidogenic microbial system for recovering REE from leachates. 3. Biomimetic polymeric resins for the selective separation of REEs from the reaction mixtures 4. Development of Process Flow sheet with material balance and techno-economic feasibility evaluation
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. The proposal is not economically feasible based on the preliminary studies presented by PI. 2. The RE content is very low and hence not viable.	

3	
Project No.	SNTMOM/507/2021
Project Title	A Real-time Ground Vibration Monitoring and Alert System Integrated with Mobile App for Mining Area
Institution	Bannari Amman Institute of Technology
Principal Investigator	SANJOY DEB E Mail- sanjoydeb@bitsathy.ac.in
Project Cost & Duration	Duration: 2 Yrs, 0 Mth Rs.1617600.00
Objectives of the project	• The fundamental objective of the proposed project is to design, develop and field trial of real-time 'Ground Vibration Monitoring and Alert System (GVMAS)' prototype for predicting hazards in mining area. The real-time GVMAS will be a highly advanced system which will be technologically derived from basic 'Ground Vibration Detection and Processing Technology (GVDPT)'

	available with us. Under this fundamental objective the sub-objectives are; • To design the system hardware, an algorithm for GVMAS prototype * To test the prototype performance at the original 'Field-site'* • Design modifications for performance optimization based on test results • To develop a user-friendly dedicated 'Software User Interface' (or App) for creating 'Real-time Vibration Map (RVM)' along with data table on system server (or on mobile) (Our part) * To scale-up the GVMAS prototype by 5 units Implement those for a short phase of field trial

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. The objective is not reaching blast vibration monitoring system measurement
2. The measurement does not fit into the required standard range of blast induced ground vibration frequency encountered at mines

4	
Project No.	SNTMOM/595/2021
Project Title	Rare-Earth Element potentiality of carbonatite breccia or agglomerate from Ambadungar-Saidivasan alkaline-carbonatite complex, India-Phase Two
Institution	Banaras Hindu University
Principal Investigator	Amiya Kumar Samal 09580270209 E-mail: amiyasamal007@gmail.com)
Project Cost & Duration	Rs. 5173308.00 3 Yrs
Objectives of the project	• Recommendations of the 19th Meeting of Project Evaluation and Review Committee (PERC): "to carry out the first phase with seed money of Rs.15 Lakhs for one year for desk studies, collection of field samples, identifying mineral phases and chemical analysis. • If encouraging results are obtained, the 2nd phase project may be considered based on review." Based on the highly encouraging results (finding of several REE phases) from the first phase of the project (results attached in document file), the following objectives are proposed for the second phase. • Characterization of different rock units of the Ambadungar-Saidivasan alkaline carbonatite complex (ASACC) by detailed petrography and mineral chemistry. • Identification of different

	phases (by XRD, SEM and EPMA) to assess the presence of REE, Nb-Ta and U-Th bearing phases. Further, the REE phases will be characterized through LA-ICPMS to evaluate the LREE/HREE ratio and genesis. • To establish a genetic relationship between the different rock units of the complexes, whether they are derived from similar mantle melts or has different genetic histories. This would be done with the help of whole-rock major, trace and rare-earth element compositions of selected samples from different litho-units

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. PI has not followed the recommendation of last PERC for 1st phase work.
2. There was no clarity in the presentation.
3. Chemical analysis/ characterization is not done systematically
4. Quantitative analysis and corresponding information are missing
5. PI needs to complete the phase-1 work as suggested by Committee

5	
Project No.	SNTMOM/599/2021
Project Title	Overburden, sand and industrial waste as mine fills and their impact on soil morpho-dynamicity and sustainable developments
Institution	Kalinga Institute of Industrial Technology **(**KIIT) University, Bhubaneshwar
Principal Investigator	BiswabanditaKar Mail-drbbkar@gmail.com
Project Cost & Duration	Rs. 9,61,54,500.00 Duration: 3 Yrs, 0 Mth
Objectives of the project	• Physical, Chemical, Mechanical and Engineering property estimation of the soil and soil impregnated by overburden, sand and other industrial waste. • Process simulation and optimization. • Estimation of soil morpho-dynamicity before and after mixing of overburden, sand and other industrial waste. • Remedial measures to cease the impact of overburden, sand and other industrial waste on soil property changes. • Establishment of soil properties in the landfill sites. • Addition of industrial waste as a landfill material.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project lacks Novelty
2. Similar work already done
3. Panel noted that Industrial Partner agreed to contribute 20% of the project cost
4. The cost of the project is not justified.

6	
Project No.	SNTMOM/615/2021
Project Title	Assessment of the impact of mining on the accumulation of potentially toxic and economically important elements in coastal marine sediments
Institution	CSIR National Institute of Oceanography CSIR Central Institute of Mining and Fuel Research
Principal Investigator	KrushnaVudamala 8806640609 E-mail: krushna@nio.org Vikram Singh
Project Cost & Duration	Rs. 3,07,69,532.00 3 Yrs
Objectives of the project	• To assess the dispersion of potentially toxic and economically important elements from different mining sites towards the eastern coast of India. • To explore economically important elements (potassium, lithium, strontium zircon, RREs, etc) and potentially toxic elements (lead, mercury, cadmium, etc) in the coastal marine sediments near mining sites of the east coast of India. • Source identification of economically important and potentially toxic elements in the coastal ecosystems near mining sites using geochemical and Isotopic (Stable – C, N, O, Hg, Pb, Radiogenic - Sr, Nd& Radioactive – 210Pb, 226Ra) studies.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. The work is more of mineral exploration rather than contamination detection
2. PI has not done proper background work.
3. Budget is not justified.

7	
Project No.	SNTMOM/626/2022
Project Title	Development of a self-healing, electromagnetic interference (EMI) shielding concrete composite utilizing iron tailing and manganese ore

	tailing Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	National Institute of Technology Calicut
Principal Investigator	BlessenSkariah Thomas 9946857587, blessen@nitc.ac.in
Project Cost & Duration	Rs. 4908300.00 3 Yrs
Objectives of the project	This research aims to develop a novel self-healing concrete (ordinary, standard and high strength as per IS 456:2019) solid building block utilizing iron tailing, manganese ore tailing and discarded tire rubber ash (carbon black), which can provide an electromagnetic (EM) shielding of minimum 30 decibels (dB) over a frequency range of 0.1 to 10 gigahertz (GHz). To achieve this aim, the research is outlined into the following objectives: 1) Develop mix designs for the M20 (ordinary concrete), M40 (standard concrete) and M60 (high strength concrete) as per IS 456:2019. Manganese ore tailing (2.5% to 10% of the cement/binder by mass), iron tailings (10-50% of fine aggregate by mass), and discarded tire rubber ash (1% to 5% of the binder/as filler material) will be incorporated to these concretes, and the best combination to be selected by trial mixes. 2) Develop a single or a combination of bacillus (CaCO3 precipitating) bacteria selected from the mining yards, cement plants, marine and acidic atmosphere to provide self-healing mechanism to the concrete. Investigate the influence of self-healing mechanism on the normal and high strength sustainable concrete blocks. This phase consists of various trial mixes with different bacterial combinations and selecting the best performers. 3) Investigate the properties of the concrete for strength, durability and microstructure. The following properties will be studied: Mechanical properties, Durability properties, Microstructural studies. 4) The shielding potency against electromagnetic frequencies will be tested with an intention to provide an electromagnetic (EM) shielding of minimum 30 decibels (dB) over a frequency range of 0.1 to 10 gigahertz (GHz). The concrete composite exhibiting the higher effectiveness against EM frequencies will be recommended towards IPR and product development.

REMARKS/SUGGESTIONS:

NOT RECOMMENDED

1. Project lacks preliminary work data.
2. There is no focused application and processing cost of wastes although not worked out, but would be high to compete.

8	
Project No.	SNTMOM/630/2022
Project Title	Newly developed P rich Organo-Mineral Fertilizer from phosphatic rock for sustainable agricultural application, Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste 2 Yrs
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	NABIN KUMAR DHAL (7978253276, dhalnk@yahoo.com)
Project Cost & Duration	Rs. 4161744.00 2 Yrs
Objectives of the project	Development of P-rich Organo mineral fertilizer an alternative for conventional phosphate fertilizer through use of organic Rock Phosphate amended fertilizer in a sustainable agricultural production system.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Analysis of source material and its mineral composition not done
2. Preliminary work not carried out.
3. Phosphate resources are mainly limited to the state of Rajasthan and to be judiciously used.

9	
Project No.	SNTMOM/648/2022
Project Title	USE OF RED MUD AS SORBENT MATERIALS FOR REMOVING ACIDIC GREEN HOUSE GASES Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Indian Institute of Technology Kharagpur
Principal Investigator	Tapas Kumar Bandyopadhyay (9475658924, tapas@rgsoipl.iitkgp.ernet.in)
Project Cost & Duration	Rs. 8105600.00 3yrs
Objectives of the project	The aim of this research will be to develop methodologies for abating the acid/greenhouse gases, that are effective, inexpensive, indigenous, easy to manufacture and deploy, do not produce any hazardous or toxic byproducts and easy to sustain. Hence, the objective may be listed as follows; • To design and develop optimum method to use red mud for

	removal of acid gases • To regenerate the oxide from by-product

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Chemical composition of red mud presented by PI is not proper.
2. The project does not focus on alkaline content of red mud and its impact
3. Red mud contains +25% alkaline water, the processing cost would be high for such limited application.
4. Cost of transportation involved would be very high due to which process will not be viable.

10	
Project No.	SNTMOM/651/2022
Project Title	Development of an economically viable process the remediation of Cu mining waste, Recovery of heavy metals and low concentration high value metals Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	NATIONAL EDUCATION FOUNDATION
Principal Investigator	Remya P Narayanan (9902083537, remyapn@gat.ac.in)
Project Cost & Duration	Rs. 4482200.00 3Yrs
Objectives of the project	The main objective of the project is to develop and demonstrate an economically viable process for the recovery of heavy metals from Cu mining waste. To achieve this goal the following methodologies will be followed: ? Collection of mining waste from various plants in India ? Analysis of the collected sample ? Environmental risk analysis of the waste ? A survey of literature on the available processes ? Economic analysis of these processes to evaluate the economic feasibility ? Detailed analysis of current disposal methods in India: the environmental and economic aspects ? Based on the cost calculations design the most promising feasible process to recover heavy metals ? Lab scale optimization of proposed process ? Feasibility of Large scale application

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. The PI has based his proposal with copper tailing from outside India.
2. The study must focus on raw materials of Indian origin.
3. Preliminary studies need to be carried out to understand the gap area.

11	
Project No.	SNTMOM/653/2022
Project Title	Sustainable Biotransformation of Industrial byproduct Phosphogypsum to industrially Important calcium carbonate Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Goa University
Principal Investigator	Meghanath Shambhu Prabhu (8007390016, mprabhu@unigoa.ac.in)
Project Cost & Duration	Rs. 4884035.37 3yrs
Objectives of the project	Collection and characterization of phosphogypsum waste and characterization of bacterial strain Lysinibacillussphaericus involved in biotransformation of phosphogypsum. 2. Characterization of phophogypsum biotransformation products (calcite and ammonium sulphate). 3. Process optimization and study of mechanisms of phosphogypsum biotransformation of phosphogypsum biotransformation using the potential isolate. 4. Lab-scale pilot studies for phosphogypsum biotransformation using Lysinibacillussphaericus

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. There is no clarity about the process.
2. Phospho-gypsum which has certain utility as a fertilizer is converted to Calcium carbonate for use in cement industry.
3. Cement industry uses natural Calcium carbonate material available at reasonable price
4. Processing cost to make synthetic Calcium carbonate would not be a viable option.

12	
Project No.	SNTMOM/670/2022
Project Title	Development of a low-cost process for removal of Cr(VI) from waste water of chromite mines-Lab scale study Mining (includes rock mechanics, design, equipment's, energy, environment, safety)
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	Dr. PravatManjari Mishra pravatmanjari@immt.res.in, 9861544056
Project Cost & Duration	Cost 4837200 Duration: 2 Yrs

Objectives of the project	i. Studies on efficacy of bio-based nanomaterials towards removal of Cr (VI) from wastewater generated in chromite mines. ii. ii. Process development for the treatment chromite mines wastewater.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. The project lacks novelty
2. The objectives of the project are not clear
3. The existing method and proposed method are not defined properly.

13	
Project No.	SNTMOM/676/2022
Project Title	Development of Cu-Based ternary alloy for fin-tube resistance welding electrode
Institution	All India Shri Shivaji Memorial Society)
Principal Investigator	BhanudasDattatrayaBachchhav (0985017262, bdbachchhav@aissmscoe.com)
Project Cost & Duration	48.2 Lakhs 3 years
Objectives of the project	a) Development of a novel Cu-based ternary alloy for fin-tube resistance welding electrode by casting process followed by suitable forming operation with improved grain flow to increase life of an electode. b) Evaluation of Mechanical and Tribological Properties of newly developed alloy. c) Comparative analysis with other welding electrode materials for its longevity. d) Performance evaluation and life expectancy on Profile welding machine (In collaboration with Thermax Ltd., Pune) e) Evaluation of cost benefit to industry

REMARKS/SUGGESTION:
NOT RECOMMENDED

1. Project lacks novelty
2. No prior work done to establish proof of concept
3. The composition is not identified and process flow sheet may not be feasible
4. PI may contact NFTDC for getting familiarized with similar work.

14	
Project No.	SNTMOM/677/2022
Project Title	A novel approach for precious metal recovery from low-grade ores using a combination of Bioleaching-Enhanced Electrokinetic Remediation (BEER) Technology Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Thiruvalluvar University

Principal Investigator	Rajasekar Aruliah (7639186598, rajasekargood@gmail.com)
Project Cost & Duration	Rs. 4489700.00 3yrs
Objectives of the project	The main objectives of the proposed project are to develop an effective bioleaching-enhanced electrokinetic remediation (BEER) technology and to demonstrate its technical advantages by achieving the following targets in a laboratory setting: 1. The Isolation and identification of acidophilic bacteria and cyanogenic bacteria from low- grade ores using molecular technique viz 16S rDNA gene analysis. 2. Evaluation of both oxidative and reductive mineral bioprocessing options for extracting metals from waste materials, using defined consortia of acidophilic bacteria and archaea; 3 To evaluate the optimization of bio-oxidation and bioleaching of low-grate ores using microorganism. 4. Development of bioleaching-enhanced electrokinetic remediation (BEER) technology for metal recovery from low-grade ores.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. The PI could not define which raw material is to be used and its composition. 2. Proof of concept needs to be established before any such work. 3. There was no clarity on which mine and which low grade to be focused.	

15	
Project No.	SNTMOM/683/2022
Project Title	Characterization of Jointed Rock Mass using 3D-Printing Technology and Its Application to Stability Analysis of Mines Mining (includes rock mechanics, design, equipment's, energy, environment, safety)
Institution	Indian Institute of Technology Delhi
Principal Investigator	R. Ayothiraman 9868182877, araman@civil.iitd.ac.in
Project Cost & Duration	17925599.510.00 3 Years
Objectives of the project	The following are the objectives of the proposed research project: 1. Simulation of complex joint conditions of rock mass using 3D printing technology. 2. Characterization of 3D printed rock mass with complex joint

	conditions using element testing and large-scale testing. 3. Development of criterion describing strength behavior of jointed rock mass. 4. Analysis of failure of Goaf edge area in Bord and pillar mining in jointed rock roof/pillar conditions. 5. Development of guidelines for safety in the golf edge area.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. The objectives and deliverables are not well defined 2. Similar studies already in process. 3. Project lacks validation of parameters	

16	
Project No.	SNTMOM/685/2022
Project Title	GENERATION OF DESTRUCTIVE WAVE INTERFERENCE TO CONTROL STRUCTURAL DAMAGES DUE TO ROCK BLASTING Mining (includes rock mechanics, design, equipment's, energy, environment, safety)
Institution	Indian Institute of Technology ISM Dhanbad
Principal Investigator	Bhanwar Singh Choudhary 9471191374, bhanwarschoudhary@iitism.ac.in
Project Cost & Duration	5816600.00 Duration: 2 Yrs,
Objectives of the project	1. Investigations into the directional effect of blast induced wave propagation in rock mass. 2. Development of Destructive wave Interference techniques for controlling ground vibration for safety of the structures. 3. Numerically simulate the shock wave propagation in rock medium 4. Optimization of blast design to maximize useful energy and overcome the seismic energy
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. The objectives and deliverables are not well defined 2. Similar studies already in process and work is generic in nature.	

17	
Project No.	SNTMOM/687/2022
Project Title	AlxCoCrFeNi based high entropy alloys and studying their high temperature dynamic mechanical behavior.
Institution	CSIR Central Glass and Ceramic Research Institute
Principal Investigator	Saikat Deb Acharya (9433580935, saikat@cgcri.res.in)
Project Cost & Duration	66.1 Lakhs 3 years
Objectives of the project	Objectives: 1. Synthesis of single and dual phase AlxCoCrFeNi high entropy alloys. 2. Study of dynamic behaviour of the alloy under high temperature and strain rate conditions. 3. Optimization of processing parameters through microstructural property correlations. Scope of work: (1) Synthesis of specimens (induction melting) and Records of SHPB tests for optimizing the process parameter. (2) Synthesis of specimens (milling and hot pressed) and Records of SHPB tests for optimizing the process parameter. (3) AlxCoCrFeNi based HEA system with optimized processing parameters based on experimental data from SHPB.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Project lacks clarity and problem definition is vague. 2. Applications of the project are not identified. 3. It's more of academic nature	

18	
Project No.	SNTMOM/690/2022
Project Title	Application of flakes from mine tailings for carbon capture Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	CSIR National Institute of Oceanography pas Kumar Bandyopadhyay
Principal Investigator	Ta SIBY KURIAN (9423889319, siby@nio.org)
Project Cost & Duration	Rs. 7669264.00 3yrs
Objectives of the project	The major objective of the project is to prepare buoyant flakes for oceanographic application, especially for carbon capture. The specific objectives are listed below: • Analysis of the composition of mine tailings before preparation of flakes • Preparation of flakes under different coating and baking conditions to study the rate of release of micro- and macro-nutrients • Phytoplankton response to flakes' addition based on incubation experiments
REMARKS/SUGGESTION:	

NOT RECOMMENDED

1. Even through project concept is good, the process would not be effective
2. The objectives are qualitative and does not focus on a target mine waste of particular composition.
3. PI needs to carry out laboratory work internally to find its prospects for a proposal with focus objectives and benefits.

19	
Project No.	SNTMOM /692/2022
Project Title	Development of components for mining applications using powder injection moulding (PIM) or powder metallurgy process
Institution	CSIR Central Mechanical Engineering Research Institute
Principal Investigator	SHRIKANT MADHUKAR DESHMUKH (8147184478, sm.deshmukh@cmeri.res.in)
Project Cost & Duration	82.46 Lakhs 3years
Objectives of the project	a) Development of bimetallic two-colour powder injection moulding process for manufacturing of button bits for usage in mining applications. b) Optimization of Tungsten Carbide (WC-Co) alloy composition for button bits using Powder Metallurgy process and bimetallic powder injection moulding process for mining applications. Brief Outline of the Project with specific technology fall-outs 1. Development of bimetallic two-colour powder injection moulding process which can be used for making button bits. 2. Data generation with respect to the composition of button bits raw material used for mining usages. 3. An alternative process (i.e 2 colour powder metal injection moulding process) along with the existing Powder Metallurgy process to develop bimetallic button bits 4. Skill development and awareness of manufacturing button bits in India by Powder Metallurgy process and bimetallic powder injection moulding process.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Feasibility of the product is not established. 2. PI should have attempted for advanced technologies. 3. No proof of concept.	

20	
Project No.	SNTMOM/694/2022
Project Title	Engineering Intermetallic phase fraction and spatial location for producing utilization enhanced degradation resistance alloy coatings
Institution	Indian Institute of Science Bengaluru
Principal Investigator	Chandan Srivastava (9900626327, csrivastava@iisc.ac.in)

Project Cost & Duration	25.43 Lakhs 2 years
Objectives of the project	To significantly enhance the corrosion resistance of Zn based electrodeposited alloy coatings (Zn-Ni and Zn-Cr) by engineering volume fraction and spatial distribution of the intermetallic phases (in the matrix phase) in the coating microstructure.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Proposal is more of fundamental in nature. 2. Applied work and evaluation on components is lacking.	

21	
Project No.	SNTMOM/697/2022
Project Title	Enhancing the Erosion-Corrosion resistance of Mining Pump Components using High-Velocity Oxy-Fuel(HVOF) Sprayed Nickel Chromium-Yttrium Oxide Coating Mining (includes rock mechanics, design, equipment's, energy, environment, safety)
Institution	Annamalai University
Principal Investigator	P. Sivaraj 9865032026, cemajorsiva@gmail.com
Project Cost & Duration	Duration: 2 Yrs, 0 Mth Cost 3385000rs
Objectives of the project	(i) To Develop high-velocity oxy-fuel sprayed Ni-20Cr2O3/Y2O3 coatings (with appropriate stoichiometric ratio) on mining pump components to enhance erosion-corrosion resistance. (ii) To Develop processing windows to identify feasible working limits of HVOF spray process parameters to attain high-quality coatings. (iii) To Optimize HVOF spray process parameters to attain maximum bonding strength and hardness on the coatings
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. The work is generic in nature and lacks proof of concept 2. Similar technology is already available in market 3. There is no clarity on the beneficiary of project	

22	
Project No.	SNTMOM/703/2022
Project Title	Fabrication of closure caps by recycling of waste 8011 Al alloy chips using powder metallurgy

Institution	NIT Rourkela
Principal Investigator	DebasisChaira (9438370956, chaira.debasis@gmail.com)
Project Cost & Duration	26.12 Lakhs 3 years
Objectives of the project	Solid state recycling of 8011 Al alloy saw chips using powder metallurgy. • Reduction in green house gas emission and machining cost by producing near net shape closure cap, more energy conservation and higher yield. • Synthesis of powder by planetary milling of 8011 saw chips. • Preparation of powder metallurgy compact and conversion into thin sheet. • Direct conversion of waste 8011 Al saw chips into value added product like closure caps.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Scaling up of project is not possible. 2. High energy process w.r.t other processes making it not viable	

23	
Project No.	SNTMOM/712/2022
Project Title	Studies on the Pozzolanic properties ceramic oxy hydroxides modified Ca rich Fullers earth deposits of Telangana state for low carbon cement applications Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	CSIR National Institute for Interdisciplinary Sciecne and Technology
Principal Investigator	S. ANANTHAKUMAR (9497271547, ananthakumars@niist.res.in)
Project Cost & Duration	Rs. 2761508.08 2yrs
Objectives of the project	1. A concerted study of a rare class of "Fuller's earth" (calcium bentonite) deposits in the Vikarabad, Tandur and Sangareddy districts of Telangana state involving determination of the physical and compositional (bulk chemistry and mineralogy) characteristics of samples at key mine sites. 2. Chemical modifications of the Calcite rich Fuller's earth mineral deposits by providing mixed hydroxy-hydrate phases, mainly using Boehmite (AlOOH)/MgO-OH and produce reactive, cementitious products. 3. Thermal activation of chemically modified Fuller's earth mineral deposits at <350oC to obtain hydrated clays and formulate low-carbon cement by blending into hemi hydrated gypsum 4. Study the material for curing, mechanical strength, water absorption, wet-strength and density properties and validate for eco-friendly green cement and concrete technology applications 5. Amine activation of Fuller's Earth deposits to utilize as Industrial sorbents for CO2 adsorption and demonstrate Honeycomb CO2 sorbents module.
REMARKS/SUGGESTION:	

NOT RECOMMENDED

3. Project lacks novelty.
4. Not clarity about raw material

24	
Project No.	SNTMOM/713/2022
Project Title	Extraction of metals from bauxite waste economically and utilization of the material after extraction Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Vidya Bharati Educational Trust
Principal Investigator	Manoj Kumar Sahu (9439843878, manojsahu.pdm@gmail.com)
Project Cost & Duration	Rs. 3446950.00 3yrs
Objectives of the project	Extraction of iron and titanium by a cost effective method ? Characterization of extracted iron and titanium and the waste residue ? To evaluate the mechanism of the process ? To develop an engineering prototype incorporating the results of the experiment ? Utilization of waste for value added product left after extraction of metals

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. The objective is not focused.
2. Raw material has not been properly studied with regard to its composition
3. Addressing of alkali could not be clarified as no preliminary work done.

25	
Project No.	SNTMOM/715/2022
Project Title	Developing an integrative approach of geophysical exploration with simultaneous application of polarization sensitive hyper spectral imaging and HVSR method assisted by machine learning Geosciences and Exploration
Institution	Tezpur University
Principal Investigator	Rajib Biswas (9954313970, rajib@tezu.ernet.in)

Project Cost & Duration	Rs. 6705250.00 3yrs
Objectives of the project	a) Development of an automated prototype assisting polarization sensitive hyperspectral imaging device to capture a large field of view b) Exploring the mineral content or deposits in test field through the developed system c) Ambient noise recordings with analysis via horizontal to vertical spectral ratio technique on sites determined by hyperspectral imaging and its subsequent correlation using machine learning based analysis

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Objectives and deliverables are not well defined
2. Similar technology is available in market
3. The project is more of theoretical research rather than of practical use
4. PI is not aware about end user

26	
Project No.	SNTMOM/728/2022
Project Title	Development of Eco-friendly Delivery system for utilizing Gold Ore Tailings of KGF as Micronutrients Source in Agriculture
Institution	Hindustan Institute of Technology and Science
Principal Investigator	Prakash S S
Project Cost & Duration	78.1 Lakhs 3 years
Objectives of the project	Gold ore tailings (GOT-crushed rock with water) are the wastes generated after gold ore mining, mineral processing and extraction activities. During the process of gold nearly 99 per cent of the extracted ore go as waste to the environment and is stored near the mining area. These tailings are rich source of plant micronutrients viz., zinc, iron, manganese, copper, cobalt, nickel that plays essential and beneficial role in plant metabolism. However, they are also loaded with heavy metals viz., arsenic, cadmium, lead, mercury and cyanide that pave the way for their release to the ecosystem leading to widespread contamination of water, soil and atmosphere, if not treated scientifically. The abandoned site of Kolar Gold Mine, which has around 33 million tons of tailings, is posing threat to the environment. Hence, the present project is proposed to develop scientific protocol for utilizing this solid waste as micronutrients source by detoxifying or inactivating heavy metals. The physical, chemical and biological processes either individually or in combinations will be used for developing eco-friendly GOT products for delivering it as micronutrients source to agriculture. The objectives intended to achieve are 1. Characterization of GOT for their distribution and quantification of micronutrients and heavy metals for understanding their bioavailability 2. Development of techniques for

	granulation and bio-encapsulation using organic molecules for controlled availability of micronutrients from GOT 3. To develop protocol for stabilization of heavy metals using in GOT 3a. Chemical modification of heavy metals in GOT to less soluble form 3b. Heavy metal sequestration using effective microbial strains 4. Validation of GOT products under field condition, bio-encapsulated and physico-chemically stabilized GOT granules with effective microbial consortia, for its eco-friendly delivery to soil and crop system as micronutrients source

REMARKS/SUGGESTION:
NOT RECOMMENDED

1. No clear POC.
2. PI may approach NFTDC to study micronutrients in tailings solution to establish POC.
3. PI should undertake extensive prior work.

27	
Project No.	SNTMOM/731/2022
Project Title	DEVELOPMENT OF MULTIFUNCTIONAL ARTIFICAL COARSE AGGREGATE BY UTILIZING ZINC AND ALUMINIUM WASTE MATERIALS. Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste (Duration: 3 Yrs, 0 Mth) Submitted
Institution	VELLORE INSTITUTE OF TECHNOLOGY
Principal Investigator	S.ELAVENIL (9840237492, elavenil.s@vit.ac.in)
Project Cost & Duration	Rs. 2261700.00 3yrs
Objectives of the project	1. By the process of cast moulding and pelletization the aluminum and zinc industry mine waste by-products initially in powder form will be transformed to the size of the coarse aggregate. Further by conducting various curing processes, the artificial aggregate will gain strength and durability properties. 2. Though the coarse aggregate state is achieved by the above process, in an attempt to further develop its physical and chemical properties, The artificial aggregate in the amorphous state will be transformed into crystalline nature. 3. The main purpose of a conventional coarse aggregate is to provide strength and durability to concrete, but with these artificial aggregates additional properties like thermal resistance and electrical resistivity will be incorporated with the help of various additional minerals present in the selected mine waste materials, various treatment will be conducted to improve these additional parameters in the artificial aggregate making it a multi-functional aggregate. 4. The developed aggregate will undergo extensive

	microstructural analysis using a Scanning electron microscope, and X-ray diffraction. by which the bonding strength and pattern of the minerals in the developed artificial aggregate will be studied. 5. As the aggregate has electrical and thermal properties the aggregate incorporated concrete will be tested for the high voltage withstanding capability and thermal behavior so that the aggregate limitation can be exploited. 6. The artificial aggregate incorporated concrete will undergo various laboratory experiments such as rapid chloride penetration, freeze and thawing cycles, chloride ion infusion, compressive and tensile strength tests to identify the strength and durability limit of the artificial aggregate incorporated concrete.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project lacks novelty
2. Similar studies are already reported
3. Jarosite is already used for building material.

28	
Project No.	SNTMOM/734/2022
Project Title	Green extraction of iron – multiscale analysis of Hydrogen based direct reduction (HyDR) of hematite and wustite Metal Extraction (Metallurgical processes)
Institution	Indian Institute of Technology Delhi
Principal Investigator	Prateek Gupta (9289188977, prgupta@am.iitd.ac.in)
Project Cost & Duration	100.36 Lakhs 3 years
Objectives of the project	1. Develop a framework for diffusion and phase-transformation and use it to implement molecular simulations to study the adsorption of hydrogen on the surface of iron-ore pellets, diffusion of hydrogen and oxygen radicals into the iron-ore, and phase-transformation of hematite to w ¨ustite to a-Fe. 2. Upscale the information obtained from molecular simulations into pellet-scale phase field simulations of redox kinetics. 3. Predict the ideal operating conditions in terms of ore size, temperature, and hydrogen gas pressure under which the process is most efficient.

REMARKS/SUGGESTION:
NOT RECOMMENDED

1. Proposal is more of fundamental in nature.
2. PI may explore funding agencies such as DST / Ministry of Steel.

29	
Project No.	SNTMOM/737/2022
Project Title	Exploitation of Mine Wastes from Tamil Nadu Magnesite Limited in Connection with Biorecovery of Mg, Fe and Mn as Growth Promoting

	Plant Minerals through Redox and Adsorption Process Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Periyar University
Principal Investigator	P.M. AYYASAMY (9486327103, pmayyasamy@gmail.com)
Project Cost & Duration	Rs. 4123150.00 3yrs
Objectives of the project	Determine available minerals Mg, Fe and Mn in the mine wastes from the Tamilnadu Magnesite Limited, Salem District by appropriate Methods. To find out Microbial consortium developed earlier in the Bioremediation Laboratory, Periyar University capable of Mg, Fe and Mn mineralization using Mineral Salts Medium enriched with respective elements To study a batch process on the mineralization of Mg, Fe and Mn from synthetic mineral oxide with suitable carbon source, nitrogen source, temperature and pH. To study biomineralization and the extraction of Mg, Fe and Mn from synthetic mineral oxide and magnesite mine wastes through a fixed bed column and field approach. To confirm biomineralization of Mg, Fe and Mn by the microbes with SEM, EDX and FTIR analysis To study the application of Mg, Fe and Mn as growth endorsing minerals for the plant growth and their root molecules..
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Project lacks novelty 2. Chemical composition of raw material is not clear and lacks economic assessment. 3. PI is not clear about the process steps and operation	

30	
Project No.	SNTMOM/753/2022
Project Title	Bioleaching of manganese from a low-grade ore. Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Birla Institute of Technology and Science Pilani
Principal Investigator	Srikanth Mutnuri (9421243443, srikanth@goa.bits-pilani.ac.in)
Project Cost & Duration	Rs. 4847744.12 2yrs
Objectives of the project	Physical survey for site selection and chemical analysis of ore from selected site. 2) Isolation of chemolithotrophic microorganisms 3) Lab scale bioleaching experiments: batch and column and analyzing manganese before and after bioleaching process 4) Scale up and Pilot Scale demonstration
REMARKS/SUGGESTION: **NOT RECOMMENDED**	

1. Project lacks novelty
2. The process is not established in India and it requires large space for operation
3. Industry partner for such proposal is essential for consideration.

31	
Project No.	SNTMOM/765/2022
Project Title	Development of New Functional Cement Composites using Graphene synthesized from used Graphites for Special Applications
Institution	CSIR National Institute for Interdisciplinary Sciecne and Technology
Principal Investigator	JAYASANKAR K (9778060563, jayasankar@niist.res.in)
Project Cost & Duration	57.16 Lakhs 2 years
Objectives of the project	The broad objective of this project is to develop an effective and scale up process for the mass production of graphene kg/batch from used graphites (battery and crucibles) and its application for making graphene based low cost conductive concrete and acid resistance of construction materials. The characteristics of used graphite's will be evaluated which would enable to adopt suitable physico-chemical separation technique to reduce the silica and iron and other impurities as an enrichment step, prior to the subsequent exfoliation processes. Based on the lab scale exfoliation process developed by NIIST, the next level of scale up of the process in kg/batch will be developed in this project and optimize the parameters for the used graphites for graphene production. Development of graphene incorporated cementitious composite and assessment of electrical , mechanical properties and • Investigation of efficiency of graphene incorporated cementitious composite for special functions like electrical conductivity and chemical resistance. . The proof of concept of the proposed work is attached as Annexure. (Pg No: 8-11)

REMARKS/SUGGESTION:
NOT RECOMMENDED

1. Projects of similar nature have been adequately funded earlier to the same institute
2. No Scalability has been done with earlier projects funded by MoM.

32	
Project No.	SNTMOM/767/2022
Project Title	Synthesis of new collectors for the beneficiation of oxide and sulfide ores of base metals Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste (Duration: 3 Yrs, 0 Mth)

	Submitted
Institution	SARANATHAN ACADEMY OF HIGHER EDUCATION
Principal Investigator	NATARAJAN, R. (9790912713, natarajan-rd@saranathan.ac.in)
Project Cost & Duration	Rs. 5129200.00 3yrs
Objectives of the project	• Synthesis of a new series of chelating collectors namely, aminothiols that float both oxide and sulphide ores of base metals. • The new collector has more selectivity for valuable minerals than gangue minerals such as pyrite, clay, silica etc. • The new collector floats zinc without activation using copper sulphate. In case of zinc supressed during flotation of lead in the case of Pb-Zn ores, floats zinc with reduced copper sulphate. • Copper sulphate being corrosive and expensive its elimination or reduced usage will increase the environmental compliance of the process and reduce corrosion of machinery. • Recovery of low amount of silver present in some of the Pb-Zn ore will also be tested. • A scientific method of selection and synthesis of flotation collectors will be developed to avoid any trial-and-error method.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Project lacks novelty with no preliminary work. 2. Proof of concept is not established.	

33	
Project No.	SNTMOM/774/2022
Project Title	Development of novel sacrificial electrode based on Al-Mg alloys for the application of Aluminum Air Batteries
Institution	Indian Institute of Technology BHU Varanasi
Principal Investigator	Nikhil Kumar (8433149991, nikhil.mst@iitbhu.ac.in)
Project Cost & Duration	25.95 Lakhs 2 years
Objectives of the project	(1) The electrode (better discharge efficiency and negligible self-corrosion rate) based on Al-Mg based alloys will be developed for the Al-air batteries for the electric vehicles application. (2) The new production process route will be identified for further improving the discharge performance of the Al-Mg based alloy electrode. (3) The effect of metallurgical factors (such as grain size, dislocations, etc) on the discharge performance of the Al alloy anode will be investigated. (4) The optimized thermo-mechanical process will be identified for further improving the discharge performance of the Al alloy-anode. (5) The improvement in the discharge efficiency and hinder in the self-corrosion rate of the anode will be obtained through introducing the nano-scale precipitates. The optimized size and volume fraction of the

	precipitates required for improving the anode discharge efficiency will be identified through experimentally and theoretically. (6) The relationship between the corrosion product and texture, and influence of the discharge product and texture on the discharge performance of anode will be investigated. (7) The green corrosion inhibitors for the brine and alkaline electrolytes will be investigated for suppressing the self-corrosion of the aluminum anode. (8) Understanding of the active sites on the surface of the Al alloy anode during application will be investigated through the detail microstructural investigation.

REMARKS/SUGGESTION:
NOT RECOMMENDED

1. Objectives are vague
2. No Clarity in terms of final product.
3. No proof of concept.

34	
Project No.	SNTMOM/780/2022
Project Title	Operative utilization of Granite powder generated from mines and mining industries Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	B M SREENIVASIAH EDUCATIONAL TRUST
Principal Investigator	P Velumani (9842760260, vels.velumani@gmail.com)
Project Cost & Duration	Rs. 3141491.00 3yrs
Objectives of the project	Well-prepared granite waste can be used as coarse aggregate and fine aggregate and as a constituent in building materials. ? The morphological parameters of the aggregates were determined. ? Economic analysis of the disposal of granite waste was carried out. ? The type of the aggregate had an influence on the properties of the concrete. ? The new SCM induces no changes in C-S-H gel product morphology. ? Low concentrations of the waste can be regarded as feasible new SCM.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project lacks novelty
2. Granite powder is targeted to use with fly ash for construction material.
3. Fly ash is already used as a potential construction material
4. Preliminary work needed to find product application potential.

35	
Project No.	SNTMOM/782/2022

Project Title	Development of Anti-Corrosion Aluminium Alloy Based Metal Matrix Composite Reinforced With Industrial Waste Material for Naval Application Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Vidya Bharati Educational Trust
Principal Investigator	AJIT KUMAR SENAPATI (9437783220, ajits@giet.edu)
Project Cost & Duration	Rs. 6067000.00 3yrs
Objectives of the project	1. Production of Aluminium alloy based MMC reinforced with ferrochrome slag by stir casting method. 2. Evaluation of the properties such as physical, mechanical, tribological and corrosion of developed MMC. 3. Prototype development of naval components by using indigenously developed MMCs 4. Comparative analyses of the properties of the newly developed prototype with the existing naval components.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. PI will be using red mud with aluminium to make composite whereas aluminium has a good market 2. No preliminary work established or validated 3. Industry support both financially and technically required to consider such project.	

36	
Project No.	SNTMOM/785/2022
Project Title	Smart Mineral Exploration to Locate and Exploit New Mineral Resources Geosciences and Exploration
Institution	Anna University
Principal Investigator	Roselin (9488515751, roselin.js@auttvl.ac.in)
Project Cost & Duration	Rs. 5232000 3 yrs
Objectives of the project	India has a high geological potential for minerals. Most of the minerals on or just below the surface have been located and there is a need to look deeper for concealed mineral deposits. This means conducting mineral exploration on a continuous basis through the latest technologies. Thus a clear need was seen in the mineral exploration to introduce three dimensional (3D) imaging of the sub-surface, which meant developing methods of both acquiring data and visualizing it.
REMARKS/SUGGESTION:	

NOT RECOMMENDED

1) Objectives and deliverables are not clear
2) The procedure is not aligned with the objectives.
3) No proof of concept and work methodology was not well defined

37	
Project No.	SNTMOM/791/2022
Project Title	Remediation of chromite mine overburden and wastewater of Sukinda Valley, Odisha using nanoparticle assisted biochar obtained from thermo-chemical conversion of agro-industrial wastes
Institution	Tezpur University
Principal Investigator	RUPAM KATAKI 9435380921, rupam@tezu.ernet.in
Project Cost & Duration	6245520.00 Duration: 3 Yrs, 0 Mth
Objectives of the project	1. To produce biochar utilizing low-value biowastes arising from agri-food Industries followed by chemical activation of the produced biochar and their detailed characterization: Morpho-physiological properties of both the pristine and activated biochar will be studied by FTIR spectroscopy, XRD analysis, BET (Brunauer–Emmett–Teller) surface area analysis, SEM analysis etc. 2. To evaluate the adsorption potential of hexavalent chromium [Cr(VI)] by the biochar and its reusability: The Cr(VI) adsorption potential of the biochar at different parameters like biochar dose, initial Cr(VI) concentration, initial pH, particle size of biochar, temperature, and contact time will be tested. The biochar will be reused for multiple cycles to check the adsorption potential. 3. To analyseCr(VI) adsorption potential of biochar from the chromite mine overburden and wastewater of Sukinda Valley, Odisha. According to the Indian Bureau of Mines, 96% of total chromite ore in the country is present in Sukinda in Jajpur district of Odisha..

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project lacks novelty and deliverables are not convincing
2. Similar work already done
3. Project proposed was of fundamental material science research rather than translational R&D

38	
Project No.	SNTMOM/788/2022
Project Title	PROCESS INTENSIFICATION OF BENEFICIATION OF FINE METAL OXIDES BY REDUCING BACKMIXING IN A MICROSTRUCTURED

	FLOTATION COLUMN Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	Indian Institute of Technology Guwahati
Principal Investigator	Subrata Kumar Majumder (9954864735, skmaju@iitg.ac.in)
Project Cost & Duration	Rs. 2126350.00 3yrs
Objectives of the project	i) Development of plant prototype for fine particle separation, (ii) Stability of bubble and its size distribution in microstructured flotation column (iii) Studies on particle–particle interactions with different collectors and at pH by measuring the zeta potential changes, (iv) Degree of reduction of backmixing and its effect of particle-bubble interaction to find out the degree of separation of fine particle (v) Study the performance of microstructured flotation column for the separation of a selective binary fine metal (Ni, Cu (II), Zn and Al (III)) oxide (vi) Study the kinetics of fine particle flotation in microstructured flotation column.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. The proposal is design of a flotation column 2. PI should undertake preliminary work to establish proof of concept using some target mineral 3. PI may approach DST for such design concept project	

39	
Project No.	SNTMOM/794/2022
Project Title	Design, Development and Simulation of Material Feeding System for transportation of large particles through pipeline Mining (includes rock mechanics, design, equipment's, energy, environment, safety)
Institution	Kalinga institute of industrial technology
Principal Investigator	AKSHAYA KUMAR ROUT 09437756207, akroutfme@kiit.ac.in
Project Cost & Duration	Duration: 3 Yrs, 0 Mth 4980000.00
Objectives of the project	Comprehensive scientific study and modelling of material feeding system for the transportation of large particles through pipelines (a)To design and develop material feeding systems based upon their mechanical integrity and stress pattern through modelling & simulations and by proctographic, micrograph and metallographic study to assess their life in service with a view to increasing its life

	span. (b) To minimize the capital investment in the procurement of mine material feeding system attachments and in the rework (c)To avoid unexpected component failure and premature replacement of components prior to the end of their useful life (d)To make the Bharat AATMANIRBHAR

Remarks
NOT RECOMMENDED

1. Project work is of academic interest
2. No novelty and research innovation
3. Objectives and deliverables not clear

40	
Project No.	SNTMOM/806/2022
Project Title	Studies on transportation of mineral-ore particles (up to 20 mm) from open cast mines through slurry pipeline Mining (includes rock mechanics, design, equipment's, energy, environment, safety)
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	JAYANTA KUMAR POTHAL
Project Cost & Duration	Duration: 2 Yrs, 0 Mth 6430000.00
Objectives of the project	Design and installation of an appropriate hydraulic transport system for transportation of minerals/ore particles (up to 20 mm) through slurry pipeline. - CFD modelling to simulate flow conditions in the pipeline with pressure drop modeling & empirical modeling of the system. - Analysis of degradation rate of ore/mineral samples influenced by flow velocity, interfacial slip

Remarks
NOT RECOMMENDED

1. Project aims at generic studies and lacks novelty
2. PI should have visited open cast mines while drafting the proposal
3. PI is not aware of materials which is to be transported

41	
Project No.	SNTMOM/815/2022
Project Title	Design and Development of an unmanned electric shovel system for excavation trajectory planning in open pit mines Mining (includes rock mechanics, design, equipment's, energy, environment, safety)
Institution	National Institute of Technology Rourkela

Principal Investigator	J SRINIVAS 9556713217, SRINIVASJ@NITRKL.AC.IN
Project Cost & Duration	Duration: 3 Yrs, 0 Mth 2506700.00
Objectives of the project	1. Dynamic modeling of electric shovel with respect to ore location 2. Optimization studies of trajectory to minimize the time and power requirements 3. Fabrication and testing of scaled model and real time implementation in open and underground mining)

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. It is a fundamental research proposal
2. Objectives and deliverables are not clear
3. This is not a translational work.

42	
Project No.	SNTMOM/827/2022
Project Title	Development of an automated mineral detection system using underwater hyperspectral imaging for deep-sea mining Geosciences and Exploration
Institution	Indian Maritime University Navi Mumbai Campus
Principal Investigator	G. VEERA SENTHIL KUMAR (9789554775, veerasenthilkumar@imu.ac.in)
Project Cost & Duration	Rs. 2436965.69 2yrs
Objectives of the project	To develop the Underwater Hyper spectral Unfixing algorithm and design a prototype for mineral detection. To pre-process the images using a suitable Dimensionality Reduction technique for subsequent analysis To extract the end members' signatures and estimate the abundance fraction using deep convolutional neural networks. To validate the results obtained using the proposed method with ground truth data. To implement the developed algorithm in FPGA-based reconfigurable computing.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Objectives and deliverables are not clear
2. No proof of concept
3. Lack of novelty and its more of a conceptual work
4. There is no clarity about adopted methodology and deliverables
5. NIOT Chennai has already done similar work.

43	
Project No.	SNTMOM/838/2022
Project Title	Development of Extraction process for Neodymium andNeodymiumIron alloy by molten salt electrolysis of oxides.
Institution	International Advanced Research Centre for powder Metallurgy and New Materials
Principal Investigator	B. V. Sarada (9963978039, sarada@arci.res.in)
Project Cost & Duration	49.6 Lakhs 3 Yrs
Objectives of the project	A rapidly expanding market for Nd-Fe-B permanent magnets has created intense interest in development of an efficient process for producing Nd metal and NdFe alloy. However, presently, Nd metal is not being produced in India. The present proposal involves development of Neodymium and Neodymium-Iron alloy by an efficient and environmental friendly molten salt electrolysis of oxide. Although there are many processes, oxide molten salt electrolysis is more suitable for the economic mass production of metals of higher quality, with lower oxygen content and fewer impurities The main objectives are as follows: 1. Development of Neodymium (Nd) from its oxides using fluoride/chloride electrolytic bath by a sustainable molten salt electrolysis (MSE) process. 2. Design and development of the electrolytic cell for the molten salt electrolysis of Nd and NdFe with high efficiencies. 3. Investigation of the electroreduction processes taking place at the cathode and to elucidate the reduction mechanism of neodymium. 4. Use a reactive Iron anode in order to eliminate the evolution of Carbon monoxide (CO), carbon dioxide (CO2) and PFCs (polyfluorocarbons) during the electrolysis thus reduce the greenhouse gases and simultaneously form NdFe alloy. 5. Optimization of process parameters, temperature of the molten salt and the composition of electrolytes (fluoride/chloride) and electrolyte additives during the MSE process. 6. Study of microstructural, morphological and chemical properties of the alloy formed. 7. Evaluation of the alloy and conversion to NdFeB master alloy by vacuum induction melting process..
REMARKS/SUGGESTION: 1. The proposed methodology with Fe as Anode will not work and it has been abandoned at industrial scale. 2. Nd, Pr extraction by molten salt electrolysis already being done by other research groups at high TRL levels.	

44	
Project No.	SNTMOM/851/2022
Project Title	Direct upcycling of iron ore tailing slurry for reducing the disposal into tailing ponds, through a novel geopolymeric material Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste

Institution	Indian Institute of Technology Indore
Principal Investigator	Sandeep Chaudhary (9549654195, schaudhary@iiti.ac.in)
Project Cost & Duration	Rs. 2984100.00 3yrs
Objectives of the project	The project aims to directly upcycle the iron ore tailing slurry and reduce its disposal into tailing ponds. The slurry will be upcycled into a novel Fe-rich geopolymer, which will utilize all major components of iron ore tailings, i.e., iron-rich minerals, alumino-silicates and water. Through wholistic utilization of iron ore tailing slurry and slurry-based transport, the project aims to develop a commercially beneficial industrial process, as an alternative to tailing ponds. The overall aim of the project can be broken down as the following objectives: 1. Complete physical, chemical, mineralogical and rheological characterization of iron ore tailing slurry from different iron mining sites. 2. Development of a novel Fe-based geopolymer, using iron ore tailings slurry. 3. Evaluation of iron ore tailing slurry based geopolymer for rheological, hardening, strength, and durability properties as per relevant standards. 4. Optimization of iron ore tailing slurry based geopolymer to produce a ready to use construction material (inspired from ready mix concrete and self-compacting concrete) 5. Identification of an economically viable slurry transportation mechanism, for direct upcycling of iron ore tailing waste before its disposal into tailing ponds 6. Simulation-based sustainability assessment of proposed slurry management as compared to the ongoing practice of tailing ponds, to demonstrate the economic and environmental advantages 7. Development of an industry-oriented guideline for setting up new economic ventures based on the direct upcycling of iron ore tailings The target mine for the study will be selected from Agariya Iron Ore Mine (Jabalpur), Dubiyara Iron Ore Mine (Jabalpur) or Pindrai Iron Ore mine (Katni), due to its proximity to the investigating institute.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. No novelty as similar work being done.
2. Comparative study of various tailings not done, so no proof of concept.
3. PI was informed to interact with NMDC / TATA / other Mining companies for preliminary work.

45	
Project No.	SNTMOM/859/2022
Project Title	PARADIGM SHIFT IN DESIGN OF LEACHING IN MINERAL PROCESSING- AN IMMENSE SOURCE OF ELECTRICAL ENERGY Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	National Institute of Technology Trichy

Principal Investigator	Sarat Chandra Babu Jakka (9486771039, sarat@nitt.edu)
Project Cost & Duration	Rs. 3961802.00 3yrs
Objectives of the project	1) Evaluation of primary parameters using electrochemical impedance spectrometry studies on electrical energy production in a laboratory cell. 2) Screening of suitable electrode material with acceptable performance characteristics Preparation of electrode materials sourcing from low cost biomass, available locally and evaluation of physical and functional characteristics 3) Design of flow cell membrane electrode assembly (MEA) with instrumentation to monitor and regulate the process parameters 4) Evaluate the sensitivity of process parameters on leaching efficiency and electrical energy generation 5) Optimize the process conditions for maximizing the leaching efficiency and electrical energy to acceptable levels. 6) Evaluate the sensitivity and safety parameters and scaling parameters fulfilling the criteria of Lab-to-Business concept. 7) Design a demonstration unit of suitable capacity in consultation with any agency showing interest for testing the performance at plant level.

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project lacks novelty.
2. There is no schematic diagram to understand the process, it has no clarity
3. At present maximum copper is recovered from ore by HCL and if such leaching process proposed to be taken up, then PI needs to get associated with an industry partner

46	
Project No.	SNTMOM/862/2022
Project Title	Development of process for making high pure silicon from low grade quartz Metal Extraction (Metallurgical processes)
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	ALOK TRIPATHY (9437066723, atripathy@immt.res.in)
Project Cost & Duration	47.7 Lakhs 2 Yrs
Objectives of the project	The following is the objective of the study proposed ? Preparation of high pure silicon from low grade quartz

REMARKS/SUGGESTION:
NOT RECOMMENDED

1. Project lacks clarity and detailing of process steps for silica to silicon
2. Silica to silicon process flow sheet is very well established at commercial production scales and hence basic R&D is not required.

47	
Project No.	SNTMOM/868/2022
Project Title	Development of cost-effective 3D high-resolution ambient seismic noise imaging technique using fiber-optic interrogator for mineral exploration Geosciences and Exploration (Duration: 3 Yrs, 0 Mth)
Institution	Indian Institute of Technology Bombay
Principal Investigator	Satish Maurya (9372011131, smaurya@iitb.ac.in)
Project Cost & Duration	Rs. 17920547.92 3yrs
Objectives of the project	1. Development 3D high-resolution ambient noise tomography tool which includes following steps: Measurement of Green Function's and dispersions curves for all receivers pair; Development of regionalization technique for exploration scale and preparation of tomographic maps at different frequencies; Obtained the shear wave velocity model using Bayesian trans-dimensional approach. 2. Make a realistic 3D synthetic test modelling for validation 3. Delineation of mineralized zone from 3D shear wave velocity model and k-mean cluster analysis approach.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. There is no innovation in this project 2. PI has not identified the targeted exploration area 3. Overall budget of project is very high, as equipment itself cost around 1.45 crores; some of the required instruments might be available in the institute	

48	
Project No.	SNTMOM/888/2022
Project Title	Dry beneficiation process using tribo-electrostatic method for removal of unwanted silica from low grade limestone, design and development of tribo-electrostatic separator. Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste (Duration: 3 Yrs, 0 Mth) Submitted
Institution	Indian Institute of Technology Jodhpur
Principal Investigator	Vikky Anand (7409935252, vikky@iitj.ac.in)
Project Cost & Duration	Rs. 11334106.40 3yrs
Objectives of	Removal of silica (SiO2) from the limestone or raw mix to the maximum

the project	extent possible, so that consumption of high grade limestone is eliminated/reduced to the possible extent. I. Developing a fundamental knowledge about the course to understand the dependence of the individual parameters on tribo-electrostatic separator. II. Optimization of both operating and separator design parameters. III. Design of lab scale separator: the different design configurations will be tested such as horizontal setups, vertical, or any possible integrated model. IV. Design and development of semi-pilot scale plant. V. Reporting the data of the experimental separation efficiency of the lab scale setup. VI. Training undergraduate, and postgraduate students in the area of electrostatic application of solid-solid separation process

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project objectives are not focused and lacks proof of concept.
2. PI has not undertaken the work of analysis and liberation of characteristics of limestone.
3. PI should initially try in similar system available in NML /IMMT before investing on the equipment and to get familiar with the R&D / equipment available.

49	
Project No.	SNTMOM/890/2022
Project Title	Utilization of Khetri Copper Mine Tailings for Fabrication of Sulfide Functionalized Fe3O4 Nanocomposites and its application for Selective Recovery of Copper from Low-Grade Ore Tailings Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste (Duration: 3 Yrs, 0 Mth) Submitted
Institution	Central University of Rajsthan
Principal Investigator	Ritu Singh (9602127352, ritu_ens@curaj.ac.in)
Project Cost & Duration	Rs. 6963530.00 3yrs
Objectives of the project	i) Pre-concentration of ferric ions from copper mine tailing ponds. ii) Synthesis of Fe3O4 nanoparticles and functionalization with sulfide polymers for selective adsorption of Cu2+ ions iii) Fabrication of a fixed bed reactor grafted with functionalized nanocomposites for efficient recovery of Cu2+ from low-grade ore tailings

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project lacks novelty and concept is not clear.
2. No preliminary work has been carried out
3. Such type of project should carry industry support including part finance by them.

50	
Project No.	SNTMOM/892/2022
Project Title	Mineral industry waste processing for development of efficient adsorbents and extraction of residual metals Metal Extraction (Metallurgical processes)
Institution	Malaviya National Institute of Technology Jaipur
Principal Investigator	Madhu Agarwal (9549654166, magarwal.chem@mnit.ac.in)
Project Cost & Duration	57.0 Lakhs 3 Yrs
Objectives of the project	Development of efficient adsorbent for the removal of dye waste and emerging pollutants • Recovery of valuable metals from the waste of the mineral industry using novel solvent. • Immobilization of hazardous waste for better disposal.
REMARKS/SUGGESTION: **NOT RECOMMENDED** **1.** Proposal is very generic. **2.** Industry partnership and co-funding is required. **3.** POC should be first established at the level of 100g-1kg	

51	
Project No.	SNTMOM/894/2022
Project Title	Recovery of Rhenium from Copper Concentration Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	LN INDTECH SERVICES PVT LTD
Principal Investigator	Subash Chandra Mallick (9922498715, lnindtech@gmail.com)
Project Cost & Duration	Rs. 3804200.00 2 yrs
Objectives of the project	The objective of the proposed project is to recycling of wastes of copper industries to produce some valuable materials which have wide applications and uses.To recover Rhenium material from copper Concentration . i. To recover purified Rhenium material from the copper concentrate . ii. To produce purified Molybdenum during the process iii. To optimize the process parameters for commercially viable extraction process technology
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Project lacks proof of concept and no flowsheet of proposed process could be explained 2. The raw material is copper concentrate for smelting, containing minute	

percentage of Rhenium 3. Rhenium recovery from wet copper concentrate is difficult 4. PI may get the support of an industry for such project.

52	
Project No.	SNTMOM/902/2022
Project Title	Extraction of Lithium Oxide from Partially LaterisedKhondalite Rocks - a bauxite mining waste and its application in Lithium battery Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	SOCIETY RAMAN EDUCATION
Principal Investigator	Ranjita Swain (9556779520, ranjitaswain@cvrce.edu.in)
Project Cost & Duration	Rs. 5287660.00 3yrs
Objectives of the project	? PLK- a bauxite mining waste can be a potential resource for the production of valuable minerals. ? Extraction of Lithium oxide (LiO2) using different acids/alkalis. ?Optimisation of leaching reaction and its process parameters. ? Kinetic study on leaching reaction. ? Simulation using MATLAB/DOE. ? Lithium Oxide extracted in liquor. ? The residue part can be utilised after a suitable treatment. ? This is a zero waste technology. ? Waste to wealth.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. PI has not presented proper analysis of raw material. 2. After preliminary studies, PI may approach NALCO for support and raw material 3. PI can co-ordinate with MECL / JNARDDC w.r.t detail characterization of PLK rocks already done by them. 4. It is essential to get the analysis verified with number of samples collected in a scientific manner to conclude presence of Li.	

53	
Project No.	SNTMOM/910/2022
Project Title	DEVELOPMENT OF A NOVEL LOW-COST AMBIENT RECONNAISSANCE TECHNIQUE FOR THE EXPLORATION OF MINERAL DEPOSITS Geosciences and Exploration
Institution	Indian Institute of Technology Madras
Principal Investigator	TarunNaskar (8861541569, tarunnaskar@civil.iitm.ac.in)
Project Cost	Rs. 4975200.00

& Duration	3yrs
Objectives of the project	The main objective of this proposed study is: 1) To develop a new passive low-frequency surface wave field test methodology. 2) To develop a new wave field transformation technique to generate high resolution images of the subsurface from a passive surface wave test. 3) To develop a fast and accurate numerical algorithm to model the subsurface earth. 4) To develop an analytical Jacobian based Inverse model 5) To develop a convolutional neural network-based algorithm to predict mineral deposit

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project is of theoretical nature rather than of practical use
2. Methodology of using sensors is not clear
3. Objectives are not clear and the proposed work is not suitable for mineral exploration.

54	
Project No.	SNTMOM/915/2022
Project Title	Integrated hairy root phytoremediation with biochar application for the in-situ transformation of mine tailings from Sukinda Valley Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste
Institution	National Institute of Technology Rourkela
Principal Investigator	Balasubramanian P (8280282807, biobala@nitrkl.ac.in)
Project Cost & Duration	Rs. 3744600.00 3yrs
Objectives of the project	The proposed research work has been planned with the following specific objectives: 1. Production of hairy roots by infecting the selected plant species with A. rhizogenes through transformation. 2. Phytoremediation of chromite overburden by using hairy root cultures and biochar. 3. Application of paper-based electrochemical Biosensor for assessment of heavy metals in soil. 4. To elucidate the mechanism by hairy root cultures with biochar on abandoned overburden sites. 5. Demonstration of the developed treatment techniques with real-time reclamation of Sukinda Chromite valley (Odisha, India)

REMARKS/SUGGESTION:

NOT RECOMMENDED

1. Project does not have clarity as to what would happen to Cr+6 ultimately
2. No preliminary studies done
3. If there is rain the hexavalent chromium concertation at roots will spread

thereby causing damage to living beings
4. Phytoremediation is done by others and yet to be proved for application in Cr+6

55	
Project No.	SNTMOM/928/2022
Project Title	Exploring the Rare Earth Elements from mines of Kachchh Gujarat Developing a prospective technology for REE extraction through Microbial Mobilization for industrial applications
Institution	GUJARAT INSTITUTE OF DESERT ECOLOGY
Principal Investigator	K KARTHIKEYAN (8141276926, karthikmicrobio@gmail.com)
Project Cost & Duration	24 Lakhs 3 years
Objectives of the project	The intended work-plan consists of a methodical investigation comprising the following: • Reconnaissance survey in the mines of Kachchh and conduct sampling at different types of mines and mine tailings (GUIDE and KSKVKU). • Characterizing the samples for mineralogical characteristics and quantification of REE's from the samples using ICP-AES, XRF and SEM (KSKVKU and Shree Ram Minerals). • To further study the microbial community structure via metagenome of mine soil and mine tailings (CSIR-NEERI). • To isolate Organic acid producing microbial strains (fungi) from the samples and their application in the extraction of REE's (GUIDE). • To evaluate the bioleaching and biosorption potential of the strains for REE's under varying bioprocess variables (GSFCU). • Further to develop Novel application of REE's for o In-vitro studies on Mammalian Cell culture for potential use of REEs in healthcare and diagnostic sector (GSFCU). o Photocatalytic treatment of wastewater employing REE's doped with Metal oxides (GUIDE and M/s Shree Ram Minerals). • To create a database on potential mines for exploration of rare earth elements from Kachchh (GUIDE and KSKVKU). • To understand the economic evaluation of the technology in bioleaching and its applications (All the participating Institutes).

REMARKS/SUGGESTION:
NOT RECOMMENDED

1. Proposal is Techno-economically not feasible.
2. No possibility for scalability.
3. Should perform prefeasibility studies in gpl or mgpl level REE solutions and establish the POC.

56	
Project No.	SNTMOM/930/2022
Project Title	Graphene based conducting ink for energy storage and microwave application

Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	mamatamohapatra (9437260688, mamata@immt.res.in)
Project Cost & Duration	57.45 Lakhs 2 Yrs
Objectives of the project	Synthesis of hybrid graphene conductive inks with use of metal particles and polymer materials • Investigation on different polymer host matrix assisted creation of graphene inks • Optimizing the liquid media assisted synthesize route to generate graphene inks with variable solvents • To develop a scalable, cost-effective and facile method for the preparation of flexible graphene ink substrates • Study of electrochemical properties of developed ink • Evaluation of Microwave properties of as-prepared graphene inks with various experimental conditions • Scale up the generation of graphene inks to bench scale • Testing of graphene ink based screen type radar absorbing material for Microwave anechoic Chamber or Testing of Graphene ink based resistive sheet design for wideband flat, thin absorbing screen towards microwave absorption • Cost analysis with process flow sheet development
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. Proposal is not relevant to the purview of MOM. 2. PI may approach DRDO / MEITY	

57	
Project No.	SNTMOM/946/2022
Project Title	Reclamation of abandoned mining sites using cattle dung derived biochar Mining (includes rock mechanics, design, equipments, energy, environment,safety)
Institution	Indian Institute of Technology Roorkee
Principal Investigator	Sonal K. Thengane 7977507193, sonalt@hre.iitr.ac.in
Project Cost & Duration	Duration: 3 Yrs, 0 Mth Cost 7190000
Objectives of the project	The objective of this study is to find out the potential of biochar in the reclamation of abandoned mining sites in India. The main objectives of this integrated experimental and theoretical research are as follows: • To produce biochar using slow pyrolysis of cattle dung using an auger reactor. • To evaluate the impact of biochar on soil samples collected from different abandoned mining sites in India and find the optimum

	percentage for mixing • To evaluate the effect of soil amended with cattle dung biochar on plant growth parameters and the yield • To evaluate the environmental and economic performance of the proposed intervention for selected abandoned mining sites as case studies.
REMARKS/SUGGESTION: **NOT RECOMMENDED** 1. The objective of the project is not aligning with the MoM goals and thrust areas 2. PI may explore other funding agency	

7. REVIEW OF COMPLETED / ONGOING PROJECTS

The following projects were reviewed by the PERC and recommendations are as below:-

COMPLETED – 4 nos.

1	
Project No.	14/12/2017-Metal-IV
Project Title	Critical Mineral (non-fuel) Resources Index of India-for effective policy decisions on mineral and manufacturing sector of India
Institution	Council of Energy Environment and Water (CEEW), Thapar House, Janpath, New Delhi
Principal Investigator	Vaibhav Gupta vaibhav.gupta@ceew.in
Project Cost & Duration	Duration: 3 years Rs.36.29115 lakh
Remarks **COMPLETED** 1) The PI has left the organization. 2) The final findings presented by the Co-PI were reviewed and accepted. 3) PI was advised to include the latest available data in the updated/final report. 4) PI was advised to submit the utilization certificates and statement of expenditure 5) Based on the final findings the PERC recommended for acceptance of the final report and closure by SSAG.	

2	
Project No.	14/26/2018-Met4
Project Title	Improving fracture resistance of rocks through adhesive bonding for underground mining application
Institution	India Institute of Technology (ISM) Dhanbad
Principal Investigator	Dr.Rashmi Ranjan Das : 08895556016
Project Cost & Duration	Rs. 14.73467 lakh

Remarks

COMPLETED

1. PI informed that project has been completed and report is already submitted
2. The final findings were reviewed and report was accepted.
3. Based on request of the PI, the project is recommended for time extension upto July 2022
4. A one page write up on the outcome of this project along with the potential scope for commercialization should be submitted to Ministry of Mines
5. Recommended to release balance funds subject to submission of utilization certificates and statement of expenditure.
6. PERC recommended for acceptance of the final report and closure by SSAG.

3	
Project No.	F.No. 14/14/2019-Metal-IV
Project Title	Identification and Investigation of efficacy of potential biochemical molecules for extraction of gold and other noble metals from tailings and waste sources.
Institution	Indian Institute of Technology Madras
Principal Investigator	Prof. T. Pradeep pradeep@iitm.ac.in : 09445560767
Project Cost & Duration	Rs. 34.64 Lakh Duration : 2 Years

Remarks

COMPLETED

1. The final report has been submitted by the PI
2. The findings presented by the PI were reviewed and accepted.
3. The work was highly appreciated.
4. A one page write up on the outcome of this project should be submitted to Ministry of Mines
5. Recommended to release balance funds subject to submission of utilization certificates and statement of expenditure.

6. PERC recommended for acceptance of the final report and closure by SSAG

4	
Project No.	14/9/2019-Metal-IV
Project Title	Utilization of aluminium dross to achieve zero waste – A bench scale study
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre, Wadi, Nagpur and CSIR-National Environmental Engineering Research Institute, Nagpur,
Principal Investigator	Upendra Singh Principal Scientist, Bauxite Division E-mail:Upendra1970@gmail.com
Project Cost & Duration	Rs.74.34 Lakh Duration: 2 Years

PERC REMARKS/SUGGESTION:
COMPLETED

1. The final findings were reviewed and final report was accepted.
2. A one-page write-up on the outcome of this project should be submitted to Ministry of Mines highlighting the process economics of the technology for possible commercialization.
3. Recommended to release balance funds subject to submission of utilization certificates and statement of expenditure.
4. PERC recommended for acceptance of the final report and closure by SSAG.

ONGOING – 35 nos.

1	
Project No.	Met4-14/9/2021
Project Title	Studying, modelling and evolving a new blasting technique for open cast mine excavations near the proximity of structures (beyond 50 m) using the structural response analysis and dynamic FEM
Institution	CSIR Central Institute of Mining and Fuel Research
Principal Investigator	ADITIYA RANA adityarana.nitjaipur@gmail.com9694641232
Project Cost & Duration	Rs. 38.19 lakhs 3 years

Remarks
ONGOING

1. The progress was satisfactory
2. PI was advised to conduct more blasts at the earliest for validation
3. Recommended to release balance fund /next installment subject to submission of utilization certificate and statement of expenditure

2	
Project No.	Met4-14/1/2021
Project Title	Recovery of copper from water bodies nearby copper mines using microbial electrochemical systems
Institution	Indian Institute of Technology ISM Dhanbad **Industry Partner** Hindustan Copper Limited
Principal Investigator	VIPIN KUMAR E-mail:- vipinmicro1@iitism.ac.in 9471191352
Project Cost & Duration	Rs. 25 Lakhs 18 month

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was slow and recovery of copper % is not appreciated by members
2) Sampling for copper recovery need to be done more systematically.
3) The project is recommended for time extension upto Dec 2022 as per request of PI for completing the pending work.

3	
Project No.	Met4-14/24/2021
Project Title	Corrosion and wear resistant advanced coatings based on high entropy alloys for mining equipments
Institution	Indian Institute of Technology Delhi
Principal Investigator	JAYANT JAIN E-mail:- jayantj@iitd.ac.in 9582513867
Project Cost & Duration	24 Lakhs 2 Years

REMARKS/SUGGESTIONS:

ONGOING

1) Progress of work is satisfactory
2) PI has done one preliminary coating trails
3) Recommended to release balance fund /next installment subject to submission of utilization certificate and statement of expenditure

4	
Project No.	Met4-14/17/2021
Project Title	Design, analysis and development of Rheo gravity die cast Al-15Mg2Si-4.5Si composite based light weight Bucket links for Mining Excavators
Institution	CSIR Central Mechanical Engineering Research Institute
Principal Investigator	PROSENJIT DAS E-mail:-prosenjit@cmeri.res.in, 9531590074
Project Cost & Duration	Rs. 55 Lakhs 2 Years

REMARKS/SUGGESTION:

ONGOING

1) Progress of work till now was reviewed
2) Since there is a change of Institute of the PI, the project is recommended for time extension by one year
3) Director CMRI should release the equipment and consumables to the PIs current location
4) Recommended to release balance fund /next installment subject to submission of utilization certificate and statement of expenditure

5	
Project No.	Met4-14/2/2021
Project Title	Development of Empirical Methodology for Design of Crown Pillar during transition from opencast to underground mining for Indian Mines
Institution	CSIR Central Institute of Mining and Fuel Research
Principal Investigator	CHANDRANI PRASAD E-mail:-chandrani@cimfr.nic.in 9422477144
Project Cost & Duration	Duration 3 years Rs. 37.89850 lakhs

Remarks
ONGOING

1) Progress was satisfactory.
2) Panel suggested PI to carry out field visit and complete the project work.
3) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

6	
Project No.	Met4-14/18/2021
Project Title	Determination of optimum safe distance of toe of dump from crest of open pit for stability of pit slope under different geo-mining conditions
Institution	CSIR Central Institute of Mining and Fuel Research **Industry Partner** Hindustan Zinc Limited, Tata Steel and SAIL
Principal Investigator	SANJAY KUMAR ROY E-mail:-sanjaykroy.cmri@gmail.com 9471192140
Project Cost & Duration	Rs. 52 Lakhs **2 years**

Remarks
ONGOING

1) Progress was satisfactory.
2) Work done was appreciated.
3) PI was advised to procure the equipment at the earliest and validate data with case studies
4) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

7	
Project No.	Met4-14/3/2021
Project Title	Development of Ready-To-Use assorted sand for construction activities from Zinc Refining Wastes and Marbel Powder.(Phase 2
Institution	Manipal University Jaipur
Principal Investigator	Bhavna Tripathi bhavna.tripathi@jaipur.manipal.edu, 9460383678
Project Cost & Duration	Rs. 30 lakh

Remarks
ONGOING

1. Progress was satisfactory
2. Proposed objectives are being duly met.
3. PI should work on cost calculations
4. Recommended to release next instalment/balance funds subject to submission of utilization certificates and statement of expenditure.

8	
Project No.	Met4-14/26/2021
Project Title	Preparation of synthetic zircon from zircon minerals of beach sand, its characterization and value addition as thermal and electrical insulator
Institution	C.V. Raman Global University, Bhubaneswar (NGO - Society Raman Education)
Principal Investigator	SUNITA ROUTRAY E-mail:- sroutray1@cvrce.edu.in 7327847963
Project Cost & Duration	Rs. 10 Lakhs (seed money) Duration: 1 years

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress is satisfactory
2) Work is appreciated by the committee and scope of large-scale studies in collaboration with IREL is identified
3) Material balance showing in-flow and out-flow of material and recovery of zirconium should be incorporated in final findings.

9	
Project No.	Met4-14/19/2021
Project Title	Design, Synthesis and Fabrication of Donor-Acceptor Based Fluorescent Sensing Organic-Nanomaterials and Devices for Detection and Quantification of Rare Earth Elements in Minerals
Institution	University of Calcutta
Principal Investigator	DILIP KUMAR MAITI E-mail:- maitidk@yahoo.com 0798061767
Project Cost & Duration	Rs. 54.935 Lakhs 2 Yrs

REMARKS/SUGGESTION:

ONGOING

1) Demonstration of the sensing is to be done in 6 months
2) PI has to speed up the procurement of equipment.
3) The progress is behind schedule.

10	
Project No.	Met4-14/8/2021
Project Title	Extraction and isolation of Al, K, Li, Rb and Cs from Mica
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	BARSA DAS E-mail:- barsha.dash@gmail.com 9439018460
Project Cost & Duration	Rs. 9.975Lakhs 1 Year

REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) PI has complied to the suggestions
3) Need to increase the GPL to get quantity of material at least 100 kg
4) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

11	
Project No.	Met4-14/7/2021
Project Title	Development of Process for Making High Pure Quartz or Silica and Metallic Silicon from Low Grade Naturally Occurring Quartz
Institution	CSIR Institute of Minerals and Materials Technology

Principal Investigator	ALOK TRIPATHY E-mail:- atripathy@immt.res.in 9437066723
Project Cost & Duration	Rs 15 lakh (seed money) 1yr

PERC REMARKS/SUGGESTION:

ONGOING

1) Purity of silica achieved is 99.9% and Silicon recovery achieved close to 95%.
2) Silicon could be prepared using the technology developed
3) The findings on silica and iron content based on floatation were presented.
4) PI was advised to close the project and submit his findings.

12	
Project No.	Met4-14/4/2021
Project Title	Employing metallurgical silicon to develop new class of silicon composites for structural applications
Institution	Indian Institute of Technology Bhubaneswar
Principal Investigator	SRIKANT GOLLAPUDI E-mail:- srikantg@iitbbs.ac.in 9566288703
Project Cost & Duration	Rs 37.997 Lakhs 2 years

REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

13	
Project No.	Met4-14/16/2021
Project Title	Bioleaching of Lithium from minerals and low grade ores of Indian origin
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	NILOTPALA PRADHAN

	E-mail:- npradhan@immt.res.in 0943754083
Project Cost & Duration	Rs. 12.936 Lakhs (seed money) 1yr

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory till date
2) Proposed objectives are being duly met.
3) Work done was appreciated and the project is recommended for time extension up to March 2023.

14	
Project No.	Met4-14/15/2021
Project Title	Production of high pure manganese metal organic frameworks (Mn-MOFs) and their derivatives from low grade manganese ores for supercapacitor applications
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	BANKIM CHANDRA TRIPATHY E-mail:- bankim@immt.res.in 7978521730
Project Cost & Duration	Rs. 10 lakhs (seed money) 1ys

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) PI should undertake mass balance and characterization work
3) The final report should be submitted by PI with above suggestions to close the project.

15	
Project No.	Met4-14/27/2021
Project Title	Development of Alternative flux Material from Red Mud for Steel

	Dephosphorization
Institution	CSIR Central Electrochemical Research Institute
Principal Investigator	ANAND BABU G E-mail:- anandbabu@cecri.res.in 9486339240
Project Cost & Duration	Rs. 10 lakhs (seed money) 1yr

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) PI should undertake physical separation with hematite
3) PI should get characterization data from Aluminium Industry/JNARDDC on red mud.

16	
Project No.	Met4-14/5/2021
Project Title	Sustainable ion exchange resin-based technology for rare earth extraction
Institution	Indian Institute of Technology Madras
Principal Investigator	THALAPPIL PRADEEP E-mail:- pradeep@iitm.ac.in 9445560767
Project Cost & Duration	Rs. 52.51 lakhs 2 Yrs

REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Work done was appreciated by members
3) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

17	
Project No.	Met4-14/28/2021
Project Title	Bio-electrochemical reclamation of titanium and other rare earth metals

	from red mud waste using a modified microbial fuel cell approach
Institution	PSG Institute of Advanced Studies (NGO - PSG and Sons Charities)
Principal Investigator	R.SELVAKUMAR E-mail:- rsk@psgias.ac.in 9944920032
Project Cost &Duration	Rs. 9.99 lakhs (seed money) **1yr**

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) PI should come up with process flow sheet and mass balance along with percentage of yield with time and economics of the process.
3) Focus should be on recovery of titanium & other elements

18	
Project No.	Met4-14/29/2021
Project Title	Exploring the Practicability of Extracting Platinum and Palladium from the Mineral Beds of Sittampudi Village in Salem District of Tamil Nadu An Experimental and Molecular Dynamics Approach
Institution	National Institute of Technology Trichy
Principal Investigator	KARTHIK.V E-mail:- kartik@cimfr.nic.in 9589442278
Project Cost & Duration	Rs. 15 lakhs (seed money) 1 Year

REMARKS/SUGGESTION:

ONGOING

1) PI yet to start hydro metallurgical operations
2) Progress is behind schedule

19	
Project No.	Met4-14/20/2021
Project Title	Development of perovskite based materials using inexpensive RE mixed oxides precursors derived from Indian beach sands for room temperature magnetic refrigeration applications

Institution	CSIR- Indian Institute of Chemical Technology
Principal Investigator	Vasundhara Mutta E-mail:-mvas@iict.res.in 9496445333
Project Cost & Duration	Rs. 51 lakh (MoM-31 lakh, CSIR- 20 lakh) 1 year

REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Based on request of PI, the project is recommended for time extension upto March 2023
3) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

20	
Project S No.	Met4-14/30/2021
Project Title	Recovery of galena, sphalerite from lead zinc tailings by integrated energy efficient ultrafine comminution and novel shear floc-flotation and its impact on downstream Paste fill
Institution	Indian Institute of Technology Hyderabad and CSIR Institute of Minerals and Materials Technology **Industry Partner** Hindustan Zinc Limited
Principal Investigator	NARSIMA MANGADODDY E-mail:- narasimha@che.iith.ac.in 9505754134
Project Cost & Duration	Rs. 25 lakhs (Rs. 10 Lakh (seed money)(MoM) + Rs. 15 lakhs (HZL)) **1 year**

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory but recoveries are less as of now which needs to improve.
2) Proposed objectives were duly met.
3) PI was advised to prepare process flow sheet and mass balance chart and focus on unit operations involved.

21	
Project No.	Met4-14/31/2021

Project Title	Innovative approach to recover chromite value from low-grade chromite ore, fines and slimes by dry and wet beneficiation technique
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	PRASANTA KUMAR BASKEY E-mail:- pkbaskey@immt.res.in 9470393508
Project Cost & Duration	Rs. 10 Lakh (seed money) 1yr
PERC REMARKS/SUGGESTION: **ONGOING** **PI was absent due to COVID.**	

22	
Project No.	Met4-14/32/2021
Project Title	Process development for the recovery of tungsten values from lean grade Indian resources
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	SHIV KUMAR ANGADI E-mail:- shivakumar@immt.res.in 8763866142
Project Cost & Duration	Rs. 10 Lakh (seed money) 1yr
PERC REMARKS/SUGGESTION: **ONGOING** 1) Progress was satisfactory. 2) Work done was in line with the proposal. 3) The project is recommended for time extension up to march 2023 as per request of PI 4) PI should come up with flow chart of the process	

23	

Project No.	F No. 14/3/2017-Metal IV
Project Title	Development of a novel underground mining method for exploitation of Chromite deposits from friable ore body and host rocks of Sukinda Valley, Odisha,
Institution	Department of Mining Engineering, IIT, Kharagpur
Principal Investigator	akverma@mining.iitkgp.ac.in : 09547859609
Project Cost & Duration	Duration: 3 years, Rs. 68.46 lakh

Remarks

ONGOING

1) Project is delayed.
2) PI was suggested to develop the mining method which is the main activity of project
3) The project is recommended for time extension upto March 2023 as requested by the PI

24	
Project No.	14/8/2018-Met4
Project Title	Use of Overburden Clay as alternate for aggregate
Institution	Indian Institute of Technology Madras Chennai-600 036, India &Neyveli Lignite Corporation Ltd. (NLC Ltd)
Principal Investigator	Dr. K. Ramamurthy, E-mail:-vivek@iitm.ac.in: 09445391265
Project Cost & Duration	Rs. 173 Lakhs (MoM's contribution-Rs. 70 lakhs &NLC's contribution - Rs.103 lakh) 3 years

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Work done was satisfactory and in line with the objectives.
3) The project is recommended for time extension up to Dec 2022 as per PI request
4) Recommended to release next instalment / balance funds subject to submission of utilization certificates and statement of expenditure

25	

Project No.	14/18/2018-Met4
Project Title	Investigation of the dynamics & mechanism of flocculation by polymers and biopolymers for separation of solid particles of high rate thickeners in mineral processing industries.
Institution	CSIR-National Institute for Interdisciplinary Science and Technology (NIIST) Industrial Estate P.O, Thiruvananthapuram - 695 019
Principal Investigator	Dr. Lakshmi Rakesh Kumar Yasarla E-mail:yasarla.rakesh@gmail.com : 09032450550
Project Cost & Duration	Rs. 42.61 lakhs 2 years

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Work done was appreciated.
3) the project is recommended for time extension up to Dec 2022 as per PI request
4) Recommended to release next instalment / balance funds subject to submission of utilization certificates and statement of expenditure

26	
Project No.	14/23/2018-Met4
Project Title	Bench scale study on extraction of pure Silica and smelter grade Aluminium Fluride from Coal Fly Ash (CFA)
Institution	JNARDDC, Nagpur
Principal Investigator	Shri Manoj T. Nimje E-mail:mantukni@gmail.com
Project Cost & Duration	Rs.63.026 lakh 18 Month
Objectives of the project	Based on in-house laboratory scale (10 g CFA) studies, it is confirmed that extraction of pure silica and aluminium fluoride from coal fly ash is technically possible. Major objective of the project is to study process on bench scale (0.5-1 kg CFA) and to understand various parameters of process, such as Pressure, Temperature

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Work done was appreciated.
3) The project is recommended for time extension up to Dec 2022 as per PI request

for submission of final report
4) Recommended to release next instalment / balance funds subject to submission of utilization certificates and statement of expenditure

27	
Project No.	14/27/2018-Met4
Project Title	Integrated Geological, Geochemical and Geophysical studies for the delineation of Chromitite extensions in Nuggihalli Schist Belt and implications for Ni-Cu+-PGE mineralization.
Institution	CSIR-NATIONAL GEOPHYSICAL RESEARCH INSTITUTE and Indian Institute of Science, Bangalore
Principal Investigator	Dr P.V. Sunder Raju; Principal Scientist Email: perumala.raju@gmail.com; : 09490748152 Dr Sajeev Krishnan Associate Professor Centre for Earth Sciences (CEaS), Indian Institute of Science, Bangalore 560 012, India E-mail: sajeev@iisc.ac.inkrishnansajeev@gmail.com09448427463/8281309847
Project Cost &Duration	Rs. 60.00 lakh (NGRI- Rs.30 lakh, IISc-Rs. 30 lakh, 2 years

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) A summary table of all elements present with weight percentage range along with minerals associated to be provided for better understanding.
3) The project is recommended for time extension up to Oct 2022 for submission of final project report.
4) Recommended to release next instalment / balance funds subject to submission of utilization certificates and statement of expenditure

28	
Project No.	14/28/2018-Met4
Project Title	Development of graphene based membranes from graphite ore for desalination.
Institution	CSIR -National Institute for Interdisciplinary Science and Technology
Principal Investigator	Dr SreejaKumari S.S. E-mail:-sreejakumari@niist.res.in**:** 09442217259
Project Cost & Duration	Rs 60 Lakhs 2 Yrs,

REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

29	
Project No.	14/30/2018-Met4
Project Title	Treatment of Acid Mine Drainage for Heavy Metal Removal,
Institution	Indian Institute of Technology Mandi, Kamand Campus, VPO Kamand,
Principal Investigator	Dr.SumitSinha Ray \ E-mail:-sumitsinha@iitmandi.ac.in : 09748159620
Project Cost & Duration	Rs. 19.8397 Lakh 1 years

PERC REMARKS/SUGGESTION:

ONGOING

1) PI and Co-PI both have left the institute.
2) No person was authorized to present the status of the project.
3) Ministry is requested to take up the matter with Director, IIT Mandi to get the final report

30	
Project No.	14/31/2018-Met4
Project Title	Recovery of scandium metal from acid leach liquor from titanium mineral industries.
Institution	CSIR-National Institute for Interdisciplinary Science and Technology (NIIST) Industrial Estate P.O, Thiruvananthapuram -695
Principal Investigator	Dr. M. Sundararajan E-mail:rajanmsundar77@yahoo.com : 08129075511
Project Cost & Duration	Rs. 32.92 lakh 2 years

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory and well presented.
2) The project is recommended for time extension up to March 2023

3) Recommended to release next instalment / balance funds subject to submission of utilization certificates and statement of expenditure

31	
Project No.	14/6/2019-Metal-IV
Project Title	Processing of spent and natural graphite for energy and aerospace application.
Institution	CSIR-Institute of Minerals & Materials Technology (Formerly Regional Research Laboratory), Bhubaneswar PIN: 751013
Principal Investigator	Mamata Mohapatra (Sr. Scientist) CSIR-IMMT, Mail- mamata@immt.res.in: 09437260688
Project Cost & Duration	Rs. 23.10 Lakh Duration:2 Years

PERC REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) Work done was as per the objectives.
3) The project is recommended for time extension up to April 2023
4) PI should present the performance of battery and after validation give a comparison with other similar device with regard to cost and performance.
5) Recommended to release next instalment / balance funds subject to submission of utilization certificates and statement of expenditure

32	
Project No.	14/7/2019-Metal-IV
Project Title	Production and certification of certified reference materials (CRMs) for the analysis of aluminium alloy.
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	R. N. Chouhan, Principal Scientist Emailid: rnchouhan@jnarddc.gov.in**:** 09422124941
Project Cost & Duration	Rs 76.40 Lakhs 2 Yrs,

REMARKS/SUGGESTION:

ONGOING

1) Progress was satisfactory.
2) PI presented the status of CRMs developed by the Lab

3) Recommended to release next installment / balance funds subject to submission of utilization certificates and statement of expenditure

33	
Project No.	14/12/2019-Metal-IV
Project Title	Development of Novel Nano porous hollow Fiber membrane basedunit for the effective treatment of Mine wastewater
Institution	National Institute of Technology Karnataka, Surathkal
Principal Investigator	Prof. ArunM.Isloor Membrane Technology Laboratory, Prof & Head of Department, Department of Chemistry, NationalInstituteofTechnology Karnataka, Surathkal, Mangalore E-mail:isloor@yahoo.com**:** 09448523990
Project Cost & Duration	Rs 5 lakh(seed money), 18 months
REMARKS/SUGGESTION: **ONGOING** 1) Progress of work carried out with seed money is satisfactory 2) After submission of the final report of this initial work, the PI should rework the original proposal 3) PI should concentrate on filtration and absorption and interact with NFDTC for reclaiming process waste water	

34	
Project No.	14/13/2019-Metal-IV
Project Title	Direct production of Fe-Cr- Ni-Mn stainless alloy from mine waste by thermal plasma process
Institution	CSIR-InstituteofMinerals&Materials TechnologyBhubaneswar
Principal Investigator	Dr.A.K.Chaubey Principal Scientist E-mail: akchaubey@immt.res.in 094380890232 anil.immt@gmail.com
Project Cost & Duration	Rs 38.31 Lakhs 2 Yrs,
REMARKS/SUGGESTION: **ONGOING** 1) Progress is behind the schedule 2) PI needs to accelerate the work to complete before Dec 2022	

35	
Project S No.	14/11/2019-Metal-IV
Project Title	Mineral chemistry, isotope geochemistry, geochronology, and metallogeny of rare and rare-earth metals present in the alkaline-carbonatite complexes associated to the Narmada-Son rift zone, western India
Institution	Banaras Hindu University, Varanasi
Principal Investigator	Dr.Amiya Kumar Samal; Department of Geology, Institute of Science E-mail: amiyasamal007@gmail.com: 9580270209
Project Cost & Duration	Rs. 14.99 Lakh Duration: 9 months (1st Phase)

PERC REMARKS/SUGGESTION:

ONGOING

1) PI should undertake characterization, quantitative analysis & chemical analysis and present the data in table form.
2) Associated minerals may also be summarized for different elements in the final report.
3) The project is recommended for time extension up to March 2023

8) The members suggested to hold a brainstorming session of PERC with a view to review the existing guidelines, thrust areas for making the S&T (Mines) scheme more effective.

9) PERC suggested that the Ministry should pay suitable honorarium to non-official members for the meeting.

The PERC meeting concluded with thanks to the chair, members and the experts.

ANNEXURE-A

LIST OF PARTICIPANTS OF 22nd PERC MEETING HELD THROUGH VC

DURING 03-05 August 2022

Sr no	Name	Portfolio
1.	Shri U C Joshi Joint Secretary (Mines), Delhi	Chairman
2.	Dr. Pradeep Singh Director Technical (Mines), Delhi	Member
3.	Shri A. R. Sengupta Dy Secretary, IFD (Mines), Delhi	Member
4.	Shri Dheeraj Kumar Dy Secretary (Mines), Delhi	Member
5.	Prof. T.C. Rao Ex. Director, RRL Bhopal	Member
6.	Prof S.P. Mehrotra IIT, Gandhinagar	Member
7.	Shri B.K. Satpathy Ex E.D, NALCO, Bhubaneshwar	Member
8.	Dr. K. Balasubramanian Director, NFTDC Hyderabad	Member
9.	Dr. A. Agnihotri Director, JNARDDC	Member
10.	Prof. Suddhasawa Basu, Director, CSIR-IMMT	Member
11.	Dr. H.S. Venkatesh Director, NIRM, Bangalore	Member
12.	Shri Subrata Kar GM (R&D), NALCO, Bhubaneswar	Representative Member
13.	Prof. A K Mishra Head, Department of Mining Engineering, IIT (ISM), Dhanbad	Representative Member
14.	Dr P K Mandal, Chief Scientist & Head, Mining Methods & Geomechanics Group, CIMFR, Dhanbad	Representative Member
15.	Shri Sanjay Panjiyar Director (Operations) HCL, Kolkata	Member
16.	Shri Pradeep Kulkarni, Dy General Manager (Exploration), MECL, Nagpur	Representative Member
17.	Dr P C Jha Head (Engineering Geophysics) NIRM Bangalore	Representative Member
18.	Shri Sarang Dhatrak Scientist-D, NIOH, Ahmedabad	Representative Member

Leave of absence granted to other members.

FILE NO. CRG/2018/001006

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(A statutory body of the Department of Science & Technology, Government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 20-Mar-2019

ORDER

Subject: Financial Sanction of the research project titled **"Hybrid casting approach for manufacturing magnesium nanocomposites"** under the guidance of Dr. Lakshmanan Poovazhagan, Mechanical Engineering, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 and by Dr. K Rajkumar, Associate Professor, Mechanical Engineering, SSN College Of Engineering - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 2494166/-** (Rs. Twenty Four Lakh Ninety Four Thousand One Hundred and Sixty Six **Only)** with break-up of **Rs.** ***633424/-*** **under Capital (Non-recurring) head** and **Rs.*1860742/-* under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 2494166/-** has been approved are given below:

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> INDFURR MAGNESIUM MELTING FURNACE -> Ultrasonic Liquid Processor	633424
A'	*Total (Non-Recurring)*	***633424***
B	**Recurring Items**	
1	Recurring - I : (Manpower) Recurring - II : (Consumables, Travel, Contingencies) Recurring - III : Scientific Social Responsibility	1164000 400000 70000
2	Recurring - IV : (Overhead Charges)	226742
B'	*Total (Recurring)*	***1860742***
C	**Total cost of the project (A' + B')**	**2494166**

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 633424/-** (Rupees Six Lakh Thirty Three Thousand Four Hundred and Twenty Four only) under 'Grants for creation of capital assets' and **Rs. 666913/-** (Rupees Six Lakh Sixty Six Thousand Nine Hundred and Thirteen only) under 'Grants-in-aid General' to **Principal, SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**

This release is being made under Core Research Grant. (PAC Civil and Mechanical Engineering)

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on **20 March, 2019** and vide Diary No. **SERB/F/12573/2018-2019** dated **20 March, 2019**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10. The release amount of **Rs. 1300337/-** (Rupees Thirteen Lakh Three Hundred and Thirty Seven only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	**The Principal, SSN College of Engineering**
Account Number	**158100050070022**
Bank Name & Branch	**Tamilnad Mercantile Bank LTD No: 3, Thiruvalluvar salai, Thiruvanmiyur, Chennai-600041**
IFSC/RTGS Code	**TMBL0000158**
Email id of A/C Holder	**trust.fm@ssn.edu.in**
Email id of PI	**poo7876@gmail.com**

20.03.19

11.The institute will furnish to the SERB, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

12. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

13. The project File no. CRG/2018/001006 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

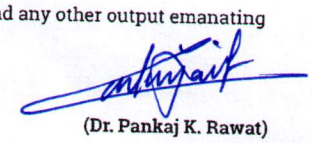
14. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

15. As this is the first grant being released for the project, no previous U/C is required.

16. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

17. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

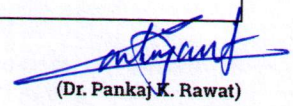
18. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board.



(Dr. Pankaj K. Rawat)
Scientist C
ms_cmer@serbonline.in

To,
Under Secretary
SERB, New Delhi
Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	**Dr. Lakshmanan Poovazhagan** **Mechanical Engineering** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: poo7876@gmail.com** **Mobile: 919962521304** **Dr. K Rajkumar** **Mechanical Engineering** **SSN College Of Engineering** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**Principal,** **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)



(Dr. Pankaj K. Rawat)
Scientist C
ms_cmer@serbonline.in

FILE NO. CRG/2018/000382

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(A statutory body of the Department of Science & Technology, Government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 18-Mar-2019

ORDER

Subject: Financial Sanction of the research project titled **"Development of Bismuth-based complex perovskites piezoelectric single crystals for strategic applications"** under the guidance of Dr. Anandhababu Govindan, Physics, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 2878700/- (Rs.** Twenty Eight Lakh Seventy Eight Thousand Seven Hundred **Only)** with break-up of **Rs.** ***1272000/-*** **under Capital (Non-recurring) head** and **Rs.*1606700/-* under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 2878700/-** has been approved are given below:

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> UPS -> Top seeded solution growth System -> MoSi2 heating Module	1272000
A'	*Total (Non-Recurring)*	***1272000***
B	**Recurring Items**	
1	Recurring - I : (Manpower) Recurring - II : (Consumables, Travel, Contingencies) Recurring - III : Scientific Social Responsibility	585000 700000 60000
2	Recurring - IV : (Overhead Charges)	261700
B'	*Total (Recurring)*	***1606700***
C	**Total cost of the project (A' + B')**	**2878700**

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 1272000/-** (Rupees Twelve Lakh Seventy Two Thousand only) under 'Grants for creation of capital assets' and **Rs. 575500/-** (Rupees Five Lakh Seventy Five Thousand Five Hundred only) under 'Grants-in-aid General' to **Principal, SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER) This release is being made under Core Research Grant. (PAC Condensed Matter Physics and Material Sciences)**

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on **14 March, 2019** and vide Diary No. **SERB/F/12325/2018-2019** dated **14 March, 2019**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10. The release amount of **Rs. 1847500/-** (Rupees Eighteen Lakh Forty Seven Thousand Five Hundred only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	**The Principal, SSN College of Engineering**
Account Number	**158100050070022**
Bank Name & Branch	**Tamilnad Mercantile Bank Limited 3, Thiruvalluvar Nagar,Thiruvanmiyur, Chennai, Tamil Nadu600041**
IFSC/RTGS Code	**TMBL0000158**
Email id of A/C Holder	**info@ssn.edu.in**
Email id of PI	**anandcgc@gmail.com**

11.The institute will furnish to the SERB, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

12. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

13. The project File no. CRG/2018/000382 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

14. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

15. As this is the first grant being released for the project, no previous U/C is required.

16. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

17. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

18. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board.

Nilotpal Ghosh

(Dr. Nilotpal Ghosh)
MS
nilotpal@serb.gov.in

To,
Under Secretary
SERB, New Delhi
Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy

4.	**Dr. Anandhababu Govindan** **Physics** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: anandcgc@gmail.com** **Mobile: 919791137823** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**Principal,** **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)

(Dr. Nilotpal Ghosh)
MS
nilotpal@serb.gov.in

FILE NO. EEQ/2018/000745

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(a statutory body of the Department of Science & Technology, government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 26-Feb-2019

ORDER

Subject: Financial Sanction of the research project titled "**Device quality and bulk size high performance thermoelectric silver bismuth sulfide ($AgBiS_2$) and silver bismuth selenide ($AgBiSe_2$) single crystals for thermoelectric (TE) applications**" under the guidance of Dr. SenthilPandian M, SSN Research Centre and Department of Physics, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 4059000/-** (**Rs.** Forty Lakh Fifty Nine Thousand **Only)** with break-up of **Rs. *1500000*/- under Capital (Non-recurring) head** and **Rs.*2559000*/- under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 4059000/-** has been approved are given below:

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> Crystal Cutting Machine -> Crystal Growth Setup	1500000
A'	*Total (Non-Recurring)*	***1500000***
B	**Recurring Items**	
1	Recurring - I : (Manpower) Recurring - II : (Consumables, Travel, Contingencies) Recurring - III : Scientific Social Responsibility	1164000 1000000 35000
2	Recurring - IV : (Overhead Charges)	360000
B'	*Total (Recurring)*	***2559000***
C	**Total cost of the project (A' + B')**	**4059000**

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 1500000/-** (Rupees Fifteen Lakh only) under 'Grants for creation of capital assets' and **Rs. 875000/-** (Rupees Eight Lakh Seventy Five Thousand only) under 'Grants-in-aid General' to **The Principal, SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**
This release is being made under Empowerment and Equity Opportunities for Excellence in Science. (Task force Committee) (SC)

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on **25 February, 2019** and vide Diary No. **SERB/F/11556/2018-2019** dated **25 February, 2019**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. Budget sanctioned under SSR is meant only for activites enlisted under SSR norms and under no circumstances it can be reappropriated.

9. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

10. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

11. The release amount of **Rs. 2375000/-** (Rupees Twenty Three Lakh Seventy Five Thousand only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	THE PRINCIPAL, SSN COLLEGE OF ENGINEERING
Account Number	158100050070022
Bank Name & Branch	TAMILNAD MERCANTILE BANK LTD Thiruvanmiyur Brach, No.3, Thiruvalluvar Salai, Thiruvanmiyur, Chennai-600041, Tamilnadu
IFSC/RTGS Code	TMBL0000158
Email id of A/C Holder	info@ssn.edu.in
Email id of PI	msenthil.cgc@gmail.com

12.The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

13. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

14. The project File no. EEQ/2018/000745 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

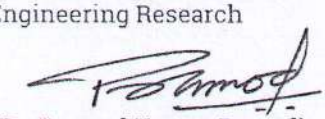
15. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

16. As this is the first grant being released for the project, no previous U/C is required.

17. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

18. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

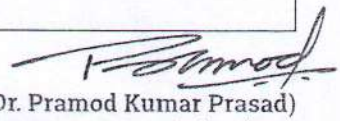
19. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.



(Dr. Pramod Kumar Prasad)
Scientist C
pk.prasad@serb.gov.in

To,
Under Secretary
SERB, New Delhi
Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	**Dr. SenthilPandian M** **SSN Research Centre and Department of Physics** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: msenthil.cgc@gmail.com** **Mobile: 919944294169** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**The Principal,** **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)



(Dr. Pramod Kumar Prasad)
Scientist C
pk.prasad@serb.gov.in

Jayashri Ravishankar

From: GMO Operations
Sent: Wednesday, 20 June 2018 4:09 PM
To: Jayashri Ravishankar
Cc: Julie Ward; Eliathamby Ambikairajah
Subject: UNSW-India Seed Grant Outcome Notification
Attachments: RG181558_AOG_Acceptance of Grant form.pdf

20-Jun-18
Our Ref: RG181558

Dr Ravishankar, Jayashri
Faculty of Engineering

Dear Dr Ravishankar,

Re: UNSW-India Collaborative Research Seed Fund
A Robustly Optimal Energy Management System for High PV-Penetrated Smart Cities with A Case Study: Implementation of PVs for Smart Street Light Poles

I am very pleased to advise that you have been awarded a UNSW-India Collaborative Research seed grant.

Your grant has been awarded $10,000.

The Conditions of Award of the grant are below. If you wish to accept the grant, please sign the attached acceptance form, including the signature of the Head of School/Centre/Institute and return it to UNSW Research Grants and Contracts (mygrants.gmo@unsw.edu.au) as soon as possible.

Please direct any enquiries to the Grants Officer responsible for your Faculty, or email mygrants.gmo@unsw.edu.au for assistance.

Congratulations on your success.

Yours sincerely

Debbie Docherty
Director
UNSW Research Grants and Contracts

Conditions for Award of Grant

1. Eligible items for funding: international travel costs for researchers and/or research students associated with the project for the purposes of exchange *(note: domestic travel costs may be eligible but must relate **directly** to the seed grant project);* living and hosting costs of visiting researchers from UNSW and the partner research institution; workshop or meeting costs; Minor research costs associated with the project (**not to exceed 25% of**

the grant) *(Note: Research Assistant personnel salary costs are eligible to be included within the 25% minor research costs, however salaries for CIs or other salaried academics are not eligible items for funding.)*

2. Salaries (for professional or academic staff) and scholarship/top-ups are not eligible funding items.
3. The seed grants are provided for a period of 12 months. A final report is to be submitted at the close-out of the grant providing information regarding outcomes to date.
4. All funds must be expended by **01 July 2019**.

FILE NO. EEQ/2017/000457

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(a statutory body of the Department of Science & Technology, government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 16-Mar-2018

ORDER

Subject: Financial Sanction of the research project titled **"Design & Development of Axial Flux Switched Reluctance Motor based battery operated vehicle"** under the guidance of Dr. Saravanan Palani, EEE, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 3626000/- (Rs.** Thirty Six Lakh Twenty Six Thousand **Only)** with break-up of **Rs. *2000000/-* under Capital (Non-recurring) head** and **Rs.*1626000/-* under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 3626000/-** has been approved are given below:
The following budget may be considered for **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam**

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> Battery -> Vehicle set-up -> Desk top computer -> Processor and its accessories -> Axial Flux Switched Reluctance Motor -> Power Converter	2000000
A'	*Total (Non-Recurring)*	***2000000***
B	**Recurring Items**	
1	Recurring - I : (Manpower) Recurring - II : (Consumables, Travel, Contingencies)	936000 360000
2	Recurring - III : (Overhead Charges)	330000
B'	*Total (Recurring)*	***1626000***
C	**Total cost of the project (A' + B')**	**3626000**

2. Sanction of the **SERB** is also accorded to the payment of

- **Rs. 2000000/-** (Rupees Twenty Lakh only) under 'Grants for creation of capital assets' and **Rs. 545000/-** (Rupees Five Lakh Forty Five Thousand only) under 'Grants-in-aid General' to **Principal, SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam**

being the first installment of the grant for the year 2017-2018 for implementation of the said research project.
3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**
This release is being made under Empowerment and Equity Opportunities for Excellence in Science. (Task force Committee) (SC)

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on **15 March, 2018** and vide Diary No. **SERB/F/10692/2017-2018** dated **16 March, 2018**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10. The release amount of **Rs. 2545000/-** (Rupees Twenty Five Lakh Forty Five Thousand only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	**SSN College of Engineering**
Account Number	**158100050070022**
Bank Name & Branch	**Tamilnad Mercantile Bank N0.3, Thirulalluvar salai,Thiruvanmiyur Chennai- 600041**
IFSC/RTGS Code	**TMBL0000158**
Email id of A/C Holder	**salivahanans@ssn.edu.in**
Email id of PI	**saravananp@ssn.edu.in**

11.The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

12. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

13. The project File no. EEQ/2017/000457 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

14. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

15. As this is the first grant being released for the project, no previous U/C is required.

16. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

17. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

18. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.

(Dr. Pramod Kumar Prasad)
Scientist C
pk.prasad@serb.gov.in

To,
Under Secretary
SERB, New Delhi
Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	**Dr. Saravanan Palani** **EEE** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: saravananp@ssn.edu.in** **Mobile: 919962034516** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**Principal,** **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)

(Dr. Pramod Kumar Prasad)
Scientist C
pk.prasad@serb.gov.in

FILE NO. EMR/2017/001521

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(a statutory body of the Department of Science & Technology, government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 16-Jul-2018

ORDER

Subject: Financial Sanction of the research project titled **"THEORETICAL AND EXPERIMENTAL ANALYSIS ON THE DESIGN OF COMPOUND RECONFIGURABLE REFLECTARRAY ANTENNA WITH AN INTEGRATED ELECTRONIC CONTROL SYSTEM"** under the guidance of Dr. Gulam Nabi Alsath, Electronics and Communication Engineering, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 and by Ms. Kirubaveni Savarimuthu, Associate Professor, Electronics And Communication Engineering, SSN College Of Engineering and by Dr. Ramprabhu Sivasamy, ASSOCIATE PROFESSOR, ELECTRONICS AND COMMUNICATION ENGINEERING, SSN College Of Engineering - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 3673602/- (Rs.** Thirty Six Lakh Seventy Three Thousand Six Hundred and Two **Only)** with break-up of **Rs. *1515102/-* under Capital (Non-recurring) head** and **Rs.*2158500/-* under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 3673602/-** has been approved are given below:

The following budget may be considered for **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam**

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> Dell Precision Tower Workstation -> RF Shielded Anechoic Chamber	1515102
A'	*Total (Non-Recurring)*	***1515102***
B	**Recurring Items**	
1	Recurring - I : (Manpower) Recurring - II : (Consumables, Travel, Contingencies, Other Cost)	1029600 795000
2	Recurring - III : (Overhead Charges)	333900
B'	*Total (Recurring)*	***2158500***
C	**Total cost of the project (A' + B')**	**3673602**

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 1515102/-** (Rupees Fifteen Lakh Fifteen Thousand One Hundred and Two only) under 'Grants for creation of capital assets' and **Rs. 695000/-** (Rupees Six Lakh Ninety Five Thousand only) under 'Grants-in-aid General' to **Principal, SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**
This release is being made under Core Research Grant. (PAC Electrical Electronics & Computer Engineering)

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on **09 July, 2018** and vide Diary No. **SERB/F/4227/2018-2019** dated **14 July, 2018**

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10. The release amount of **Rs. 2210102/-** (Rupees Twenty Two Lakh Ten Thousand One Hundred and Two only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	**The Principal, SSN College of Engineering**
Account Number	**158100050070022**
Bank Name & Branch	**Tamilnad Mercantile Bank Thiruvanmiyur BrachNo. 3, Thiruvalluvar Salai, Thiruvanmiyur, Chennai 600041**

IFSC/RTGS Code	**TMBL0000158**
Email id of A/C Holder	**salivahanans@ssn.edu.in**
Email id of PI	**alsath@live.com**

11.The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

12. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

13. The project File no. EMR/2017/001521 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

14. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

15. As this is the first grant being released for the project, no previous U/C is required.

16. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

17. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

18. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.

(Dr. Rajwant SERB)
Scientist E
rajwant@serb.gov.in

To,
Under Secretary
SERB, New Delhi
Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	**Dr. Gulam Nabi Alsath** **Electronics and Communication Engineering** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: alsath@live.com** **Mobile: 919551145246** **Ms. Kirubaveni Savarimuthu** **Electronics And Communication Engineering** **SSN College Of Engineering** **Dr. Ramprabhu Sivasamy** **ELECTRONICS AND COMMUNICATION ENGINEERING** **SSN College Of Engineering** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**Principal,** **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)

(Dr. Rajwant SERB)
Scientist E
rajwant@serb.gov.in

Biotechnology Industry Research Assistance Council

(A Government of India Enterprise)

Ref: BT/IDIA0158/04/17 **Dated: 22nd November 2018**

Sanction Order

Subject: Sanction of support for project entitled "Nagarik Rog Pratirakshak: Unified Smart Immunization Coverage Monitoring And Analysis Unisicma " to be implemented by Indian Institute of Information Technology, Una (IIIT Una) New Delhi under Grand Challenges India (GCI) – "Immunization Data: Innovating for Action (IDIA)"

Sanction of the Competent Authority of BIRAC is hereby accorded for the implementation of project entitled "Nagarik Rog Pratirakshak: Unified Smart Immunization Coverage Monitoring And Analysis Unisicma" at the estimated cost of **Rs. 106.00 Lakhs (Rupees One Crore Six Lakhs Only inclusive of all applicable taxes)** under Grand Challenges India.

Cost Recipient:
The following are the Cost Recipient:
Indian Institute of Information Technology, Una (IIIT Una)
NIT Campus,
Hamirpur-177005

Collaborator:
Dr. R. Kanchana
Associate Professor
Dept. of CSE
SSN College of Engineering
Rajiv Gandhi Road,
Kalavakkam, Chennai - 603 110

Designated Principal Investigator from the Organization: Dr. S.Selvakumar, Director, Indian Institute of Information Technology, Una

Collaborator: Dr, R. Kanchana, Associate Professor, Dept. of CSE, SSN College of Engineering

1. Aims and Objectives:-

The following aims and the objectives that are to be executed by the aforesaid entity for the Project are as per the detailed Project document, submitted by them including revisions / modifications incorporated therein:

1. *Data warehouse construction from data sources*
2. *Development of mobile app for tracking migrant immunization data and integration of data streams into validated data warehouse*
3. *Module testing and development of analytics platform*

2. Duration of the Project: **18 Months**

3. Project Implementation Site: **Indian Institute of Information Technology, Una (IIIT Una)**

4. Total Cost sanctioned for the project: **Rs. 106.00 Lakhs (Rupees One Crore Six Lakhs Only) inclusive of applicable taxes**

5. Periodic Payment Arrangements of the Project Cost Based On Milestone
Organization: Indian Institute of Information Technology, Una (IIIT Una)

Milestone Name	Month of End of Activity	Activities and deliverables		Outcomes	Amount (INR in Lakhs)
		IIIT, Una	SSNCE, Chennai		
Signing of Agreement (35.0% Release of funds)	0	Execution of contract by all the parties and fulfillment of pre-release conditions		Release of funds	37.10
Technical Milestone 1 (15.0% Release of funds) *Data warehouse construction from data sources*	6	→ Setting up IIIT-Una-UniSIMCA net → Setting up private cloud → Database schema collection, preprocessing and standardization of columns for first data source → Warehouse construction from first data source	→ Setting up SSN-UniSIMCA net → Setting up private cloud → Database schema collection, preprocessing and standardization of columns for second data source → Warehouse construction from second data source	1. Warehouse construction completed and ready for validation 2. Signed MOU with relevant stakeholder	15.9
		Database schema collection, preprocessing and standardization of columns Final warehouse constructed Signing MoUs with the relevant stakeholders (NIC/ UNDP/ Logistimo / State Govt etc.) for			

		necessary data and code sharing Submission of Utilization certificate (UC) and statement of Invoice (SOI) and technical report on the specific milestone		
Technical Milestone 2 (20.0% Release of funds) *Development of mobile app for tracking migrant immunization data and integration of data streams into validated data warehouse*	12	→ Validation of data warehouse → Development of App with natural language interfaces → Tracking immunization data of migrant population	→ Validation of data warehouse → Integration of private sector data into the warehouse → Warehouse integrated with new streams of data → Online querying of data warehouse	1. Warehouse validation complete 2. Warehouse integrated with new streams of data 3. App developed with natural language interfaces 21.2
		→ Validation of data warehouse → Integration of new streams of data from private sector and migrants into the warehouse → Development of app for tracking immunization data of migrant population → Submission of Utilization certificate (UC) and statement of Invoice (SOI) and technical report on the specific milestone		
Technical milestone 3 (20.0% Release of funds) *Module testing and development of analytics platform*	18	1. Testing module of app and web server → Dynamic visualization of data in different contexts and format	2. Statistical report generation 3. Data analytics 4. Deploying web services for analytics	1. Statistical report 2. Analytics and Visualizations 3. Validated app and warehouse developed 21.2

		→ Testing module of app and web server → Statistical reports and analytics service deployed as a web server → Dynamic visualization of data in different contexts and format → Submission of Utilization certificate (UC) and statement of Invoice (SOI) and technical report on the specific milestone		
Reporting (10.0% Release of funds)	18	Submission of technical project completion report and other related manuscripts and consolidated utilization certificate	Submission of Report	10.6
		Total		106.00

6. Breakup of sanctioned cost:

Sl.No.	Details	Overall Budget Split Up		
		IIITU (Cost recipient)	**SSNCE (Collaborating Institute)**	**Total**
1	Equipment	8,75,000.00	8,10,000.00	16,85,000.00
2	Accessories	2,50,000.00	2,65,000.00	5,15,000.00
	Non-Recurring Total (A)	**11,25,000.00**	**10,75,000.00**	**22,00,000.00**
3	Manpower	28,74,000.00	24,26,000.00	53,00,000.00
4	Contingency Consumables	6,00,000.00	5,00,000.00	11,00,000.00
5	Travel	4,00,000.00	4,00,000.00	8,00,000.00
6	Research Contingency Overhead	6,00,000.00	6,00,000.00	12,00,000.00
	Recurring Total (B)	44,74,000.00	39,26,000.00	84,00,000.00
	Total A+B)	**55,99,000.00**	**50,01,000.00**	**1,06,00,000.00***

***The entire sanctioned cost of the project will be disbursed to the Cost-recipient – IIIT, Una. The cost associated with the collaborator, SSNCE will be disbursed by IIIT, Una.**

Stage and Head wise Budget Split Up among Institutions

Stage	Details	IIITU (Cost recipient)	SSNCE (Collaborator)	Total
1	Equipment/Accessories	7,75,000.00	7,10,000.00	14,85,000.00
	Manpower	9,43,200.00	8,03,400.00	17,46,600.00
35%	Contingency	1,89,200.00	1,50,000.00	3,39,200.00
	Travel	89,200.00	50,000.00	1,39,200.00
	Total	**19,96,600.00**	**17,13,400.00**	**37,10,000.00**
2	Equipment/Accessories	1,00,000.00	1,15,000.00	2,15,000.00
	Manpower	6,59,000.00	6,57,600.00	13,16,600.00
15%	Travel	31,000.00	27,400.00	58,400.00
	Total	**7,90,000.00**	**8,00,000.00**	**15,90,000.00**
3	Equipment/Accessories	1,00,000.00	1,00,000.00	2,00,000.00
	Manpower	9,43,200.00	8,03,400.00	17,46,600.00
20%	Contingency	50,000.00	50,000.00	1,00,000.00
	Travel	37,400.00	36,000.00	73,400.00
	Total	**11,30,600.00**	**9,89,400.00**	**21,20,000.00**
4	Equipment (UPS)	1,50,000.00	1,50,000.00	3,00,000.00
	Manpower	3,28,600.00	1,61,600.00	4,90,200.00
20%	Contingency	3,60,800.00	3,00,000.00	6,60,800.00
	Travel	2,42,400.00	2,86,600.00	5,29,000.00
	Institution Overhead	1,40,000.00	0.00	1,40,000.00
	Total	**12,21,800.00**	**8,98,200.00**	**21,20,000.00**
5 **10%**	Institution Overhead	**4,60,000.00**	**6,00,000.00**	**10,60,000.00**
	Total	**55,99,000.00**	**50,01,000.00**	**1,06,00,000.00**

7. First installment will be released on signing of the Contract by all the parties. Release of further installments to the Cost Recipients will be subject to the review of the progress in the project AND acceptance of invoices raised separately by the Project Cost Recipients. Separate release order(s) will be issued in this regard.

8. The Cost Recipients (For Profit Entity) in India will maintain separate no-lien account for the project. The Cost Recipients (Not for Profit Entity) in India will house the cost in an interest bearing account for the project. Interest if any, earned should be reported to

Project by the Cost Recipients for each projected milestone shall be determined based on the specific cases and the contractual arrangement.

10. Cost towards the collaborators shall be released through the corresponding Cost Recipients against whom the specific activity is projected will be subject to applicable tax. It shall be the responsibility of such Cost Recipients to meet the relevant Cost and report the performance thereunder.

11. The Cost Recipient under the Project will submit consolidated Utilization Certificate (UC) and Statement of Invoice (SOI) duly audited and/or certified for the expenditure incurred towards the Project for every half year period, ending 30th September and 31st March, to BIRAC, within a month of closure of the accounts for the respective half year, in the format provided by BIRAC; It is also clarified that the financial year begins from 1st April and ends on coming 31st March.

12. Carry forward of unspent funds or re-appropriation of BIRAC funds from one budget head to another shall not be affected without the specific written approval of BIRAC. Fund release will be consider on due recipient of activities based invoice.

13. The present order confirming the sanction of support to the project is not legally binding on BIRAC or the Cost Recipients in any way unless the relevant contracts / agreement is duly executed by the Parties and the terms and conditions stated therein shall be legally binding on the Parties.

14. The Indian Cost Recipients shall enter into a Collaborative Research MOU (Memorandum of Understanding) with the Non- Indian Cost Recipients/Collaborators if applicable on the Project activities.

15. The relevant template of the Cost Plus Fixed Term Contract that should be entered into between BIRAC and the Indian Cost Recipients are appended herein as Annexure I. The undertaking with regard to attainment of Project Milestones by the Cost Recipients/Collaborators if applicable will be executed on case to case basis.

16. The Expenditure is debitable to "GCI" scheme under BIRAC, PMU - Head of Accounts (**C.03.05.002**) for the financial year 2018-19.

17. This issue with the approval of competent authority vides BFD No. AO/C03:05:002/055/18-19 dated 28/11/2018

18. The Sanction order has been noted at Serial No. 1.on.Pg.40 in the Register of Grant/Cost.

26/11/18

Dr. Shirshendu Mukherjee
Mission Director, PMU-BIRAC

To,
Dr. S. Selvakumar
Director
Indian Institute of Information Technology, Una (HP)
NIT Campus,
Hamirpur-177005

Copy for information to:
1. BIRAC Finance folder
2. Sanction Folder (GCI)

26/11/13

Dr. Shirshendu Mukherjee
Mission Director, PMU-BIRAC

जैव विज्ञान अनुसंधान बोर्ड
रक्षा अनुसंधान एवं विकास संगठन मुख्यालय
तृतीय तल, डी आर डी ओ भवन
कमरा न 399/04 नई दिल्ली 110011
टेली फैक्स - 011-23012652
टेलीफोन 011-23007894
Email : lsrb@hqr.drdo.in

Life Sciences Research Board
Defence Res. & Dev. Organisation HQ
3rd Floor, DRDO Bhawan
Room No. 399/04, New Delhi – 110011
Tele Fax : 011-23012652
Tele : 011-23007894
Email : lsrb@hqr.drdo.in

No. O/o DG (TM)/81/48222/LSRB-331/LS&BD/2018 **Date: 11.09.2018**

To,

The Principal
Department of Biomedical Engineering
SSN College of Engineering
Kalavakkam - 603110

Sub : **GRANTS IN AID SCHEME OF LIFE SCIENCES RESEARCH BOARD**

In exercise of powers vested in the Life Sciences Research Board vide Govt. of India, Ministry of Defence letters No. DBAS/48222/RD-81/784/D(R&D) dt 06 Mar 1998, as amended from time to time in terms of SL No 3.1, and GoI, MoD letter No DRDO/DFMM/PL/83226/M/01/1174/D (R&D) dt 28.06.2018. I hereby convey the sanction of the Board for the following project at the cost of **Rs 23,70,206/- (Rupees Twenty three lakh seventy thousand two hundred and six only)**

Project Title and No:

Title : **"DESIGN AND DEVELOPMENT OF BIOSIGNAL CONTROLLED HAND EXOSKELETON"**

No : **LSRB-331/LS&BD/2018**

PI : **Dr A Kavitha**
Professor & Head
Department of Biomedical Engineering
SSN College of Engineering
Rajiv Gandhi Salai (OMR)
Kalavakkam - 603110
Mob: 09677057669, Ph: 044-27469700
Email: kavithaa@ssn.edu.in

Co-PI 1: **Dr S Bagyaraj**
Associate Professor
Department of Biomedical Engineering
SSN College of Engineering
Rajiv Gandhi Salai (OMR)
Kalavakkam - 603110
Mob: 09841982250, Ph: 044-27469700
Email: bagyarajs@ssn.edu.in

Co-PI 2 : **Ms R Nithya**
Assistant Professor
Department of Biomedical Engineering
SSN College of Engineering
Rajiv Gandhi Salai (OMR)
Kalavakkam - 603110
Mob: 09443635470
Email: nithyar@ssn.edu.in

PDC : **02 Years**

Cost : **Rs 23,70,206/- (Rupees Twenty three lakh seventy thousand two hundred and six only)**

Break-up of the cost:

Grants	1st Yr IC	2nd Yr IC	Line total
(a). Research Staff (JRF- 01)	3,72,000	3,72,000	7,44,000
(b).Non-expandable equipment and stores (i) Schematic design and development for hardware prototype (ii) Digital modeling and fabrication – 5 prototype (iii) Procurement of electro and mechanical components (iv) Development of embedded firmware for atmel SAM3X8E ARM cotem – M3 – DEV BOARD for current control and impedance measurements (v) Development of system software for user interface and embedded device control from Intel Edison processor based control unit. (vi) Design and fabrication of power amplifier hardware for deriving the control signals from biosignals (vii) Acquiring the bio signals for analysis (viii) To acquire and analysis EEG and EMG signals	6,60,000	2,55,000	9,15,000
(c) Expendable stores, Chemicals etc (i) Structure and fabrication composite materials, liquid photopolymer cured with UV light 3 layers per 1mm (ii) Electrodes & Accessories .	1,65,000	1,40,000	3,05,000
(d). Contingencies	40,000	23,460	63,460
(e). TA/DA (including TA/DA of specialist/ monitors for the project)	50,000	50,000	1,00,000
(f). Overhead charges	1,47,200	95,546	2,42,746
Total	14,34,200	9,36,006	23,70,206

Grant Total = Rs 23,70,206/- (Rupees Twenty three lakh seventy thousand two hundred and six only)

2. The research staff is only for the duration of the project. DRDO holds no responsibility for further employment/absorption of the staff. The staff will be recruited as per rules & procedure of the grantee institution.

3. Statements of account duly certified by the executive financial authority of the institution are also required to be submitted along with the annual reports. **Excess expenditure, beyond the yearly sanction, unless authorised by LSRB in writing, shall be the responsibility of the grantee institution.**

4. The annual statement of Expenditure & utilization certificate should be in accordance with the **General Financial Rule-19 (GFR-19).**

5. The duration of the project is **02 Years.** The date of issue of this letter would be reckoned as the commencement date of the project.

6. PI to ensure that the laboratory guidelines for genetic engineering, animal experimentation and medical ethics issued by DBT, Animal Welfare Division (CPCSEA) and Ministry of Health & Family Welfare, Govt. of India, respectively and any other statutory issues related to the experiments are adhered to.

7. A separate saving bank account for the grant would be maintained and interest earned thereon would be accrued in the project account by the Institute. **Interest earned to be refunded to LSRB in the form of DD / Cheque addressed to PCDA (R&D) New Delhi** along with contingent bill for the release of next year grant. On completion of the project, the grantee institute should send the unspent money to Member Secretary, LSRB through DD / Cheque in favour of PCDA (R&D), New Delhi.

8. A list of inventory of equipment purchased out of LSRB grant shall be intimated along with annual report/closure report, giving item-wise cost, date of purchase and source of procurement to LSRB Sectt. The equipment should be stamped LSRB Project number and each item should be serially numbered. The photocopy of the stock registers maintained by the institute/university for the non-expendable and expendable stores may be submitted duly audited with a **certificate** from the audit authorities that **"the necessary check has been made and the inventory is found to be in order".** For further details, kindly refer the website of DRDO/LSRB i.e. http://www.drdo.gov.in/drdo/English/indexCorpDir.jsp?pg=home.jsp&dir=LSRB

9. **On completion of the project, the grantee institution would forward the consolidated audited list of equipments and expendable items, if any, with request for retention of equipment for another project or in house R&D, with due recommendations of their executive authority.**

10. **Shri K Mohanavelu, Sc 'E', DEBEL, Bangalore,** will be the facilitator. He will be visiting the Institute for periodical monitoring of the project.

11. Following **policy on the Intellectual Properties** generated under the scheme will be taken care of:-

i) All Foreground Information and Foreground Intellectual Property, created during the performance of the Project, whether or not legally protected, shall be owned jointly by DRDO and Grantee Institution. DRDO and Grantee Institution shall be deemed to have a royalty-free license to use such joint Foreground Information and Foreground Intellectual Property Rights for their own R&D purposes.

j) Grantee Institution shall not publish any research paper covering Foreground Information generated during the performance of the Project before seeking written consent from DRDO to assure that no proprietary information is released and no legal rights covering Foreground Information are jeopardized. Normally, such decision for publication shall be provided by DRDO within 30 days of receipt of such request from Grantee Institution.

k) Grantee Institute shall promptly report to DRDO about any Intellectual Property generated during the performance of the Project. DRDO and Grantee Institution shall confer and consult each other regarding preparation, filing, prosecution, maintenance of Intellectual Property Rights applications including patent applications covering Foreground Information, generated during the performance of the project. DRDO shall be responsible for filing, prosecution, grant and maintenance of such Intellectual Property Applications including patent applications and Grantee Institute shall render all possible help to DRDO regarding the same. DRDO shall also bear all expenses related to filing, prosecution, grant and maintenance of such Intellectual Property Applications including patent applications.

l) Grantee Institution may commercially exploit any Foreground Information and Foreground Intellectual Property Rights, generated during the performance of the Project, whether or not legally protected, for purposes other than Government Applications upon conclusion of the separate agreements to be negotiated between Grantee Institution and DRDO. Grantee Institution shall maintain an account of its incomes arising out of such commercial use and any royalty income shall be shared equally between DRDO and Grantee Institution.

m) Notwithstanding any provisions mentioned above or any future licensing agreements, DRDO shall be deemed to have all rights including a nonexclusive, irrevocable, royalty-free, world-wide perpetual license for the unlimited commercial development, series production, continuing engineering support, product improvement, or have developed, any Foreground Information and Foreground Intellectual Property, generated during the performance of the Project, whether or not legally protected, for the purposes of Government Applications including armed forces and paramilitary forces.

n) Whenever DRDO informs Grantee Institution that the interest of national security requires Grantee Institution to refrain from commercially supplying product/process based upon any Foreground Information and Foreground Intellectual Property, generated during the performance of project, whether
or not legally protected, to any particular third parties, or stipulate conditions in such commercial sale, Grantee Institution shall abide by DRDO requirements.

o) DRDO shall not be responsible and shall not accept any liability for infringement, innocent or otherwise, by PI or the Grantee Institute of the Intellectual Property Rights of third parties.

p) The term of the above provisions shall survive the term of the Project.

12. If there is any legal issue/dispute, it shall be redressed within the jurisdiction of Delhi.

13. PCDA (R&D), DRDO Cell, West Block-V, RK Puram, New Delhi-110066 will make disbursement of money as sanctioned. Payment shall be released through e-payment system and physical cheques will not be issued. A mandate form is enclosed for filling up the required information and forwarding alongwith a blank cancelled cheque bearing account number.

14. In case of premature termination/closure of the project, the grantee institute is liable to refund the entire budget released to them alongwith interest.

15. **Closure report** – On completion / closure / termination of the project, three copies of the consolidated closure report (soft & hard copy) as per **ANNEXURE III** (refer website) should be submitted alongwith a certificate that objectives of the project have been achieved. The Executive Summary & unspent amount if any will also be submitted through DD/ Cheque in favour of PCDA (R&D) by PI within **3 months** of completion of the project.

16. Ensure about providing of reservation for Scheduled Castes and Scheduled Tribes or OBC in posts and services.

17. The expenditure will be debited to Major Head - 2080 (Defence Services) R&D Minor Head-004 Research & Development, Code Head 852/05 of the Defence Services Estimates.

18. Contingent bill (in triplicate) for the release of grant for first year i.e. **Rs. 14,34,200/- (Rupees Fourteen lakh thirty four thousand and two hundred only)** duly completed and signed on revenue stamp with official seal by the competent financial authority of the institute alongwith ECS mandate form may please be forwarded to us immediately for onward submission to PCDA for payment.

19. This issues with the concurrence of IFA (R&D), New Delhi vide their UO No 1940/0682 dt 07.09.2018

20. The sanction code is DG TM/TM/LSRB/GIA/18-19/0177 dt 11.09.2018

21. Kindly acknowledge receipt.

Yours faithfully

(Dr. Rajio Singh)
Member Secretary
Life Science Research Board
O/o DG (TM)

Ink Signed Copy :

(i) PCDA (R&D), DRDO Cell, West Block-V, R K Puram, New Delhi-110066
(ii) IFA (R&D), DRDO Bhawan, New Delhi-110011
(iii) DGADS, 'L-1' Block, Church Road, New Delhi-110011
(iv) OS & DG (TM), DRDO Bhawan, New Delhi-110011
(v) DS & DG (LS), DRDO Bhawan, New Delhi-110011
(vi) **Dr A Kavitha**
Professor and Head
Department of Biomedical Engineering
SSN College of Engineering
Rajiv Gandhi Salai (OMR)
Kalavakkam - 603110

Copy to:

(vii) Chairman Spl Panel LS&BD & OS and Director, DEBEL, Bangalore - 560093
(viii) Member Secretary, ARMREB, DRDO Bhawan, New Delhi-110011
(ix) Member Secretary, AR&DB, DRDO Bhawan, New Delhi-110011
(x) Member Secretary, NRB, DRDO Bhawan, New Delhi-110011
(xi) DER&IPR, DRDO Bhawan, New Delhi-110011

Tel : 2300 7307
Fax: 2379 4562

ARMREB/MAA/2018/200
Defence R&D Organization (HQ)
Armament Research Board
DRDO Bhawan, Rajaji Marg,
New Delhi – 110 011
01 May 2018

To

The Principal
SSN College of Engineering
Rajiv Gandhi Salai (OMR)
Kalavakkam, Chennai - 603110

SANCTION OF PROJCET UNDER GRANT-IN-AID SCHEME OF ARMREB

Under the power vested in the ARMREB vide Government of India, Ministry of Defence letter No. ARM (RD-17)/2035/1008/D (R&D) dated 18/21 Mar 1997 & in terms of power delegated vide Sl. No. 3.1 of DRDO DBFA/FA/83226/M/01/2031/D(R&D) dated 30 July 2010, I am directed to convey the sanction of the CFA i.e. OS & DG (TM) for the following project:-

Project Number	:	**ARMREB/MAA/2018/200**
Title of the Project	:	Optimizing the Ballistic Performance of AA7075 Thick Plate Friction Stir Welds
Name of the PI	:	Dr. S.R. Koteswara Rao, Professor, SSN College of Engg, Chennai
Name of the Co-PI	:	Dr. R. Damodaram, Assoc Prof, SSN College of Engg, Chennai
Name of the Co-ordinating DRDO Scientist	:	Dr. G Madhusudan Reddy, Sc 'H', DMRL, Hyderabad

2. **COST:** - The total cost of the project is **Rs. 18.78604 lakhs**. However, the same is subject to revision based on performance of review committee/panel. Break-up of the project cost is given under: (Rs in Lakhs)

Heads	1st Year	2nd Year	3rd Year	Total
(a) Research Staff (01 Project Associate/ Project Technician)	1.8	1.8	1.8	5.4
(b) Special Equipment • Box Furnace	2.478	-	-	2.478
(c) Consumable stores, chemicals etc.,	2.0	1.0	1.0	4.0
(d) TA/DA	0.50	0.50	0.50	1.5
(e) Contingencies	0.20334	0.099	0.099	0.40134
(f) Special Testing Charges	1.0	1.0	1.0	3.0
(g) Institute Overheads	1.01670	0.495	0.495	2.00670
Grand Total	**8.99804**	**4.89400**	**4.89400**	**18.78604**

REGISTERED

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

EXTRAMURAL RESEARCH DIVISION

CSIR COMPLEX, PUSA, NEW DELHI - 110 012

No. 03(1445)/18/EMR-II Dated : 05/06/2018

From : Head, Human Resources Development Group

To

DR G ANANDHA BABU
DEPT OF PHYSICS
SSN COLLEGE OF ENGG
KALAVAKKAM 603110 T N

Subject : Grants-in-aid for your scheme entitled :DEVELOPMENT OF HIGH-PERFORMANCE TERNARY PIEZOELECTRIC CERAMICS FOR TRANSDUCER APPLICATIONS

Sir,

I am directed to refer to your proposal for sanction of CSIR Scheme titled above and to convey the approval of DG CSIR as per the details given below.

I	Duration of the Scheme (from the date of Commencement)	**36 Months**		
II	Staff	1-RA / SRF / JRF		
III	Contingency (per annum in ₹)	1st Year : 1,50,000	2nd Year : 1,50,000	3rd Year :1,50,000
IV	Equipment (lumpsum in ₹)	5,00,000 (LS)		

2. The above sanction is subject to review of periodical progress of the project by expert committee.

3. DG CSIR has also approved the release of the following grants for the period 01/05/2018 to 31/03/2019

No	Grants	Amount (in ₹)
I	Staff	3,96,000
II	Contingency	1,37,500
III	Equipment	5,00,000
	Total :	**10,33,500**

4. Sanction of grants is subject to strict compliance of the terms and conditions enclosed or as may be modified from time to time. Please go through the instructions carefully with regard to subsequent release of grants and your obligations under this sanction. **The grant for the Ist installment will be sent through EFT (Electronic Funds Transfer), to the concerned authority of your institution on receipt of undertaking (form-A), non-funding certificate and EFT Transaction Request Form.**

The expenditure is debitable to budget head P81102.

Yours faithfully,

SECTION OFFICER (EMR-II)

Encl : As above

Copy to :-

1. Registrar/Principal/Director _____. The utilisation of grant is subject to compliance of para-1 of the terms and conditions stated overleaf.
2. Sr F&AO(EMR) alongwith FVC for first year's grant.

FILE NO. ECR/2017/000447

SCIENCE & ENGINEERING RESEARCH BOARD(SERB)

(a statutory body of the Department of Science & Technology, government of India)

5 & 5A, Lower Ground Floor
Vasant Square Mall
Plot No. A, Community Centre
Sector-B, Pocket-5, Vasant Kunj
New Delhi-110070

Dated: 05-Jun-2018

ORDER

Subject: Financial Sanction of the research project titled **"Understanding the Structure Function Relationship of the Natural Anticoagulant ZPI, a Member of Serpin Superfamily"** under the guidance of Dr. Tanusree Sengupta, Chemistry, SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110 - Release of 1st grant.

Sanction of **Science and Engineering Research Board (SERB)** is hereby accorded to the above mentioned project at a total cost of **Rs. 3462800/-** (**Rs.** Thirty Four Lakh Sixty Two Thousand Eight Hundred **Only)** with break-up of Rs. *1000000/-* **under Capital (Non-recurring) head** and **Rs.*2462800/-* under General (Recurring) head** for a duration of 36 months. The items of expenditure for which the total allocation of **Rs. 3462800/-** has been approved are given below.

The following budget may be considered for **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam**

S. No	Head	Total (in Rs.)
A	**Non-recurring**	
1	Equipment -> Vortex mixer -> Four degree cabinet -> Laminar flow hood -> -80 degree freezer -> Table top centrifuge -> Shaker incubator -> Plate reader	1000000
A'	*Total (Non-Recurring)*	***1000000***
B	**Recurring Items**	
1	Recurring - I : (Manpower) Recurring - II : (Consumables, Travel, Contingencies)	648000 1500000
2	Recurring - III : (Overhead Charges)	314800
B'	*Total (Recurring)*	***2462800***
C	**Total cost of the project (A' + B')**	**3462800**

2. Sanction of the **SERB** is also accorded to the payment of **Rs. 1000000/-** (Rupees Ten Lakh only) under 'Grants for creation of capital assets' and **Rs. 820900/-** (Rupees Eight Lakh Twenty Thousand Nine Hundred only) under 'Grants-in-aid General' to **Principal, SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** being the first installment of the grant for the year 2018-2019 for implementation of the said research project.

3. The expenditure involved is debitable to **Fund for Science & Engineering Research (FSER)**
This release is being made under Early Career Research Award. (EC Life Sciences)

4. The Sanction has been issued to SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam with the approval of the competent authority under delegated powers on 18 May, 2018 and vide Diary No. SERB/F/1748/2018-2019 dated 04 June, 2018

5. Sanction of the grant is subject to the conditions as detailed in Terms & Conditions available at website (www.serb.gov.in).

6. Overhead expenses are meant for the host Institute towards the cost for providing infrastructural facilities and general administrative support etc. including benefits to the staff employed in the project.

7. While providing operational flexibility among various subheads under head Recurring-II, it should be ensured that not more than Rs. 1.5 lakh each should be spent for travel and contingency.

8. As per rule 211 of GFR, the accounts of project shall be open to inspection by sanctioning authority/audit whenever the institute is called upon to do so.

9. The sanctioned equipment would be procured as per GFR and its disposal of the same would be done with prior approval of SERB.

10. The release amount of **Rs. 1820900/-** (Rupees Eighteen Lakh Twenty Thousand Nine Hundred only) will be drawn by the Under Secretary of the SERB and will be disbursed by means of RTGS transaction as per their Bank details given below:

Account Name	**THE PRINCIPAL SSN COLLEGE OF ENGINEERING**
Account Number	**158100050070022**
Bank Name & Branch	**Tamilnad Mercantile Bank Ltd ThiruvanmiyurNo 3, Thiruvalluvar Salai. Chennai 600041**
IFSC/RTGS Code	**TMBL0000158**
Email id of A/C Holder	**trust.finance@ssn.edu.in**
Email id of PI	**tanusrees@ssn.edu.in**

11.The institute will furnish to the SERB, New Delhi, separate Utilization certificate(UCs) financial year wise to the SERB for Recurring (Grants-in-aid General) & Non-Recurring (Grants for creation of capital assets) and an audited statement of accounts pertaining to the grant immediately after the end of each financial year.

12. The institute will maintain separate audited accounts for the project. A part or whole of the grant must be kept in an interest earning bank account which is to be reported to SERB. The interest thus earned will be treated as credit to the institute to be adjusted towards further installment of the grant.

13. The project File no. ECR/2017/000447 may also be mentioned in all research communications arising from the above project with due acknowledgement of SERB.

14. The manpower sanctioned in the project, if any is co-terminus with the duration of the project and SERB will have no liability to meet the fellowship and salary of supporting staff if any. beyond the duration of the project

15. As this is the first grant being released for the project, no previous U/C is required.

16. The institute may refund any unspent balance to SERB by means of a Demand Draft favoring "FUND FOR SCIENCE AND ENGINEERING RESEARCH" payable at New Delhi.

17. The organization/institute/university should ensure that the technical support/financial assistance provided to them by the Science & Engineering Research Board, a statutory body of the Department of Science & Technology (DST), Government of India should invariably be highlighted/ acknowledged in their media releases as well as in bold letters in the opening paragraphs of their Annual Report.

18. In addition, the investigator/host institute must also acknowledge the support provided to them in all publications, patents and any other output emanating out of the project/program funded by the Science & Engineering Research Board, a statutory body of Department of Science & Technology (DST), Government of India.

(Dr. Thangaradjou T)
Scientist E
msls@serb.gov.in

To,
Under Secretary
SERB, New Delhi

Copy forwarded for information and necessary action to: -

1.	The Principal Director of Audit, A.G.C.R.Building, IIIrd Floor I.P. Estate, Delhi-110002
2.	Sanction Folder, SERB , New Delhi.
3.	File Copy
4.	**Dr. Tanusree Sengupta** **Chemistry** **SSN College of Engineering , Sri sivasubramaniya nadar college of engineering rajiv gandhi salai (omr), kalavakkam , Kanchipuram, Tamil nadu-603110** **Email: tanusrees@ssn.edu.in** **Mobile: 919940401250** (Start date of the project may be intimated by name to the undersigned. For guidance, terms & Conditions etc. Please visit www.serb.gov.in.)
5.	**Principal,** **SSN College Of Engineering, Sri Sivasubramaniya Nadar College Of Engineering Rajiv Gandhi Salai (OMR), Kalavakkam** (Receipt of Grant may be intimated by name to the undersigned)

V E ANNAMALAI

Digitally signed by V E ANNAMALAI
Date: 2024.03.13 11:49:18 +05'30'

(Dr. Thangaradjou T)
Scientist E