CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE

Name and address of submitting body:

Telecom Sector Skill Council

Estel House, 3rd Floor, Plot No: - 126, Sector 44, Gurugram, Haryana 122003

Name and contact details of individual dealing with the submission

Name: Mr. Krishna Nand Jha

Position in the organisation: Assistant General Manager

Address if different from above: Same as above

Tel number(s): 0124-4148029

E-mail address: manager-projects@tsscindia.com

List of documents submitted in support of the Qualifications File

1. Model Curriculum

Model Curriculum to be added which will include the following:
- **Indicative list of tools/equipment to conduct the training**
- **Trainers' qualification**
- **Lesson Plan**
- **Distribution of training duration into theory/practical/OJT component**

1	**Qualification Title:** Machine Learning (ML) Engineer
2	**Qualification Code, if any:** TEL/Q6603
3	**NCO code and occupation:** NCO-2015/7422.6603 Data Handling – Network Managed Services
4	**Nature and purpose of the qualification (Please specify whether a qualification is short term or long term):** **Machine Learning Engineer** Responsible to develop self-running AI software to automate predictive models. This QP is for a short term program, and it is designed based on industrydemand.
5	**Body/bodies which will award the qualification:** Telecom Sector Skill Council
6	**Body which will accredit providers to offer courses leading to the qualification:** Telecom Sector Skill Council
7	**Whether accreditation/affiliation norms are already in place or not, if applicable (if yes, attach a copy):** Yes. SMART norms for accreditation and SSC norms for affiliation are available on the SMART portal.
8	**Occupation(s) to which the qualification gives access:** Data Handling - Network Managed Services
9	**Job description of the occupation**: A Machine Learning (ML) Engineer develops self-running AI software to automate predictive models for recommended searches, virtual assistants, translation apps, etc. The individual designs machine learning systems, generates accurate predictions by applying algorithms, and resolves data set problems.
10	**Licensing requirements:** N/A
11	**Statutory and Regulatory requirement of the relevant sector (documentary evidence to be provided):** N/A
12	**Level of the qualification in the NSQF:** Level 5
13	**Anticipated volume of training/learning required to complete the qualification:** 570 Hours (180 Theory, 270 Practical,120 OJT)
14	**Indicative list of training tools required to deliver this qualification:** Laptop/ Desktop with pre-installed (Java, C++) languages / Software, Laptop / Desktop with pre-installed (Python, R Code writing Software, Google Cloud Auto Machine Learning, Azure Machine Learning studio) languages / Software, Personal Protective Equipment, Hygiene Equipment and Materials like Sanitizer, Soap, Mask, Relevant stationery, First Aid Kit and Equipment used in

	Medical Emergencies.				
15	**Entry requirements and/or recommendations and minimum age:**				
	B.E./B.Tech (Electronics/Telecom/IT and other relevant fields) **OR** Graduate in relevant field with 1 year of relevant experience **OR** Diploma (3 years after Class 12th in Electronics/Telecom/IT and other relevant fields) with 1 year of relevant experience **OR** Class 10th + ITI (2 years in Electronics/Telecom/IT and other relevant fields) with 4 years of relevant experience **OR** Class 12th Pass with 4 years of relevant experience **OR** Certified in NSQF-L4 **AI & ML – Jr. Telecom Data Analyst** with 2 years of relevant experience 21 years				
16	**Progression from the qualification (Please show Professional and academic progression):** Level-6 (Vertical) System Architect - 5G Cloud RAN				
17	**Arrangements for the Recognition of Prior learning (RPL):** RPL will be based on the same approved Qualification Pack and Assessment Criteria mentioned in the Qualification Pack by Telecom Sector Skill Council.				
18	**International comparability where known (research evidence to be provided):** No				
19	**Date of a planned review of the qualification:** 30 June 2025				
20	**The formal structure of the qualification** **Mandatory components**				

(i)	**Title of component andidentification code/NOSs/Learning outcomes**	**Estimated size (learning hours)**			**Level**
		Theory	**Practical**	**OJT**	
1	Bridge Module (Introduction to the Role of aMachine Learning Engineer)	08	04	12	
2	TEL/N6605: Prepare to Develop Machine Learning (ML) Systems	60	110	54	5
3	TEL/N6606: Develop and Assist in the Implementation of	80	108	54	5

	Machine Learning (ML) Systems				
4	TEL/N9103: Implement effective communication and coordination at work	16	24	00	5
5	TEL/N9104: Manage work and resources, and ensure health and safety at work	16	24	00	5
	Sub Total (A)	**180**	**270**	**120**	

SECTION 1
ASSESSMENT

21	**Body/Bodies which will carry out an assessment:** Telecom Sector Skill Council. **Proposed Body/Bodies which will carry out an assessment**: The assessment will be carried out via our affiliated assessment body.
22	**How will RPL assessment be managed and who will carry it out?** The RPL assessment will be managed by TSSC via its affiliate assessment partners.
23	**Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.** The emphasis is on practical demonstration of skills and knowledge based on the performance criteria. The assessment papers are developed by Subject Matter Experts (SME) available with the Assessment Agency as per the performance and assessment criteria mentioned in the Qualification Pack. The assessment papers are also checked for the various outcome-based parameters such as quality, time taken, precision, tools & equipment requirement etc. The assessment results are backed by evidence collected by assessors. 1. The assessor needs to collect a copy of the attendance for the training done under the scheme. The attendance sheets are signed and stamped by the In-charge / Head of the Training Centre. 2. The assessor needs to verify the authenticity of the candidates by checking the photo ID card issued by the institute as well as any one Photo ID card issued by the Central/Government. The same needs to be mentioned in the attendance sheet. In case of suspicion, the assessor should authenticate, and cross verify trainee's credentials in the enrolment form. 3. The assessor needs to punch the trainee's roll number on all the test pieces. 4. The assessor can take a photograph of all the students along with the assessor standing in the middle and with the center name/banner at the back as evidence. 5. The assessor also needs to carry a photo ID card. The assessment agencies are instructed to hire assessors with integrity, reliability and fairness. Each assessor shall sign a document with its assessment agency by which they commit themselves to comply with the rules of confidentiality and conflict of interest, independence from commercial and other interests that would compromise impartiality of the assessments.

Please attach most relevant and recent documents giving further information about assessment and/or RPL.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

ASSESSMENT EVIDENCE

Complete a grid for each component as listed in "Formal structure of the qualification" in the Summary.

NOTE: this grid can be replaced by any part of the qualification documentation which shows the same information – i.e., Learning Outcomes to be assessed, assessment criteria and the means of assessment.

24. Assessment evidences

Title of Component:

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Machine Learning (ML) Engineer

Qualification Pack TEL/Q6603

Sector Skill Council Telecom Sector Skill Council

Guidelines for Assessment

1. Criteria for assessment for each Qualifications Pack will be approved by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions approved by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/ option NOS/Set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for everystudent at each examination/training center based on this criterion.
6. To pass the Qualifications Pack, every trainee should score a minimum of 70% of aggregate marks.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
TEL/N6605: Prepare to Develop Machine Learning (ML) Systems				
Determine the scope of work	13	15	-	4
PC1. co-ordinate with stakeholders to analyse business problems	2	2	-	1
PC2. determine the business objectives, project outcomes, and the scope of resolution required	3	4	-	1
PC3. determine and refine machine learning objectives through consultation with the stakeholders	4	4	-	1

PC4. identify the issues that need to be resolved to make machine programs more effective	4	5	-	1
Plan the development of machine learning systems	**22**	**35**	**-**	**11**
PC5. evaluate the existing Machine Learning (ML) processes	2	3	-	1
PC6. select appropriate datasets and data representation methods	2	2	-	1
PC7. analyse large and complex datasets to extract insights and select the appropriate technique to be used	4	5	-	1
PC8. identify the need of retraining the existing machine programs based on agreed objectives	3	5	-	2
PC9. create the data validation strategies	2	4	-	1
PC10. determine the pre-processing or feature engineering to be carried out on a given dataset	2	5	-	2
PC11. determine the data augmentation pipelines	3	5	-	1
PC12. develop models to achieve the business objectives, along with the relevant metrics to track the progress	4	6	-	2
NOS Total	**35**	**50**	**-**	**15**
TEL/N6606: Develop and Assist in the Implementation of Machine Learning (ML) Systems				
Collect, clean and prepare data	**6**	**12**	**-**	**2**
PC1. collect appropriate data from historical database, open datasets or any other relevant data sources as per the requirement	1	2	-	1
PC2. carry out data cleaning to remove the irrelevant data and ensure its quality and accuracy	2	2	-	-
PC3. manage the data acquisition process, if more data is needed after cleaning of existing data	1	3	-	-
PC4. prepare the data by transforming textual and graphical data into numbers for use in the machine learning system	1	3	-	-
PC5. create data pipeline depending on the machine learning application needs	1	2	-	1
Develop relevant algorithms	**3**	**6**	**-**	**1**

PC6. analyses the machine learning algorithms that could be used to solve a given problem and rank them by their success probability	1	2	-	1
PC7. develop machine learning algorithms, such as Linear Regression, Logistic Regression, and Naive Bayes, based on statistical modelling procedures	1	2	-	-
PC8. ensure the algorithms can analyses large volume of historical data to make predictions and generate accurate user recommendations	1	2	-	-
Perform data analysis	**6**	**12**	**-**	**2**
PC9. explore and visualize data to gain an understanding of it	1	2	-	1
PC10. identify differences in data distribution that could affect performance when deploying the model in the real world	1	2	-	-
PC11. perform statistical analysis to resolve data set problems	1	2	-	-
PC12. solve complex problems with multi-layered data sets	1	2	-	-
PC13. use data modelling and evaluation strategy to find patterns and predict unseen instances	1	2	-	1
PC14. evaluate and transform data science prototypes	1	2	-	-
Perform machine learning tests	**5**	**10**	**-**	**2**
PC15. design machine learning systems/applications and self-running Artificial Intelligence (AI) software to automate predictive models	1	2	-	1
PC16. carry out machine learning tests, interpret the test results and make appropriate adjustments based on test results	1	2	-	-
PC17. carry out research and implement best practices to improve the existing machine learning infrastructure	1	2	-	-
PC18. optimize existing machine learning libraries and frameworks based on testing	1	2	-	11

PC19. create useful information from unstructured data by auto-tagging images and text-to-speech conversions	1	2	-	-
Train and retrain models	**5**	**10**	**-**	**2**
PC20. train models and optimize their hyper- parameters	1	2	-	1
PC21. analyses the errors of the model and develop appropriate strategies to rectify them	1	2	-	-
PC22. retrain the existing systems based on new machine learning model	1	2	-	-
PC23. document the machine learning processes as per the organizational policy	1	2	-	1
PC24. follow the latest machine learning developments and technologies	1	2	-	-
Assist in the implementation of machine learning systems	**5**	**10**	**-**	**1**
PC25. coordinate with data engineers to build data and model pipelines	1	2	-	-
PC26. manage the infrastructure and data pipelines needed to implement code in production	1	2	-	-
PC27. set up and maintain scalable machine learning solutions in the production	1	2	-	1
PC28. assist in deploying the models for production	1	2	-	-
PC29. assist in monitoring production to ensure production is carried out based on the developed machine learning system	1	2	-	-
NOS Total	**30**	**60**	**-**	**10**
TEL/N9103: Implement effective communication and coordination at work				
Interact effectively with superiors	**2**	**9**	**-**	**1**
PC1. interpret work requirements from the superior and customers	1	2	-	-
PC2. report any unforeseen disruptions or delays to superiors and/or concerned person	1	2	-	1
PC3. achieve productivity and quality of work as per the company procedure	-	5	-	-
Interact effectively with colleagues and customers	**13**	**27**	**-**	**5**

PC4. explain the work requirements and the scope of work to the team	2	3	-	-
PC5. communicate information using different techniques such as face-to-face, telephonic and written means	2	4	-	1
PC6. co-ordinate with team to integrate work as per requirements	-	4	-	1
PC7. respect colleagues and customers and communicate taking care of their personal spaces	-	3	-	-
PC8. find solutions to work related difficulties with mutual agreement with colleagues and customers	3	3	-	-
PC9. resolve conflicts within the team at work to achieve smooth workflow	-	4	-	1
PC10. motivate team members to put organizational goals over individual goals	3	4	-	1
PC11. encourage the team to provide feedback on any issues facing them	3	2	-	1
Respect differences of gender and ability	**15**	**24**	**-**	**4**
PC12. ensure personal behaviour of self and team is conducted taking gender and disability of the person into consideration	2	4	-	-
PC13. demonstrate sensitivity towards gender and person with disability while communicating	2	3	-	1
PC14. list the different types of disabilities with their respective issues	2	3	-	1
PC15. provide help to PwD team members in overcoming any challenges faced in work	2	3	-	-
PC16. use inclusive language irrespective of the disability and the gender of the person	2	3	-	1
PC17. treat all colleagues and co-workers equally	2	3	-	-
PC18. respect personal space of colleagues and co-workers	3	5	-	1
NOS Total	**30**	**60**	**-**	**10**
TEL/N9104: Manage work and resources, and ensure health and safety at work				
Manage learning and self-direction	**4**	**5**	**-**	**-**

PC1. develop technical and personal skills to be updated with new technologies prevalent in the industry	2	1	-	-
PC2. train the team such that they are able to adapt latest products/services in their working environment	1	2	-	-
PC3. identify opportunities for team building workshops and motivational trainings	1	2	-	-
Develop critical thinking and problem solving	**4**	**7**	**-**	**-**
PC4. guide the team to be accountable for timely completion of tasks	2	3	-	-
PC5. analyse problems accurately to be able to correctly suggest suitable solutions to the concerned persons	1	2	-	-
PC6. train the team to estimate the cause of the problem and validate	1	2	-	-
Perform work as per quality standards	**5**	**9**	**-**	**4**
PC7. implement ways to keep immediate as well as team's work area clean and tidy	1	2	-	-
PC8. maintain efficiency and productivity while performing role/responsibility	1	2	-	2
PC9. supervise the team to ensure that the work is done as per the assigned and agreed requirements	1	2	-	1
PC10. create schedules and rosters for the team to ensure they understand individual work requirements	2	3	-	1
Maintain safe and secure working environment	**12**	**13**	**-**	**2**
PC11. identify organisation's health, safety, security policies and procedures	3	3	-	-
PC12. instruct team to report any identified breaches in health, safety, and security policies and procedures to the designated person	3	3	-	-
PC13. manage hazards such as illness, accidents, fires or any other natural calamity safely, as per organisation's emergency procedures, within the limits of individual's authority	3	4	-	1

PC14. report any hazard outside the individual's authority to the relevant person in line with organisational procedures and warn others who may be affected	3	3	-	1
Material / energy / electricity conservation practices	**15**	**16**	**-**	**4**
PC15. implement ways to optimize usage of material including water in various tasks/activities/processes	1	2	-	1
PC16. supervise the team to ensure responsible use of resources	2	2	-	1
PC17. motivate the team to carry out routine cleaning of tools, machine and equipment	2	2	-	1
PC18. guide the team to optimize use of electricity/energy in various tasks/activities/processes	3	4	-	-
PC19. implement periodic checks of the functioning of the equipment/machine and rectify wherever required	2	2	-	1
PC20. guide the team to report malfunctioning and lapses in maintenance of equipment	3	2	-	-
PC21. implement ways to use electrical equipment and appliances properly	2	2	-	-
NOS Total	**40**	**50**	**-**	**10**

Outcomes to be assessed/NOSs to beassessed	Assessment criteria for the outcome
Provided in the above section	

Means of assessment 1
1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportionalto its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on the knowledge bank of questionscreated by the SSC.
3. Individual assessment agencies will create unique question papers for the theory partfor each candidate at each examination/training centre (as per assessment criteria below.)
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on these criteria.

Means of assessment 2
Add boxes as required.

Pass/Fail
1. To pass the Qualification Pack, every trainee should score a minimum of 70% inevery NOS.
2. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

SECTION 2
25. EVIDENCE OF LEVEL

Title/Name of qualification/component: Machine Learning Engineer Level: 5			
NSQF Domain	**Outcomes of the Qualification/Component**	**How the outcomes relates to the NSQF level descriptors**	**NSQF Level**
Process	**Develops self-running AI software to automate predictive models for recommended searches, virtual assistants, translation apps, etc.** • determine the business objectives, project outcomes • Plan the development of a machine learning system • create algorithms based on statistical modelling procedures	The individual designs machine learning systems to generate accurate predictions by applying algorithms and resolving data set problems. Hence, this is level 5	5
Professional knowledge	**Knowledge of developing the Machine Learning System.** • Technical specifications of products and processes • Importance and process of the existing Machine Learning (ML) processes • Maintenance standards/guidelines	The individual should have a good understanding of strong analytical and problem-solving skills, knowledge about managing concern/issues, and standards/guidelines of Machine Learning. Hence, this is level 5.	5

NSQF QUALIFICATION FILE

Title/Name of qualification/component: Machine Learning Engineer Level: 5			
NSQF Domain	**Outcomes of the Qualification/Component**	**How the outcomes relates to the NSQF level descriptors**	**NSQF Level**
Professional skill	**A range of cognitive and practical skills is required to generate solutions to specific problems in a field of work or study.** • Selection and Analysing the datasets. • Creating the data validation strategies. • Knowledge of service virtualization concept and process.	The individual is required to have a range of technical skills, to be competitive in this job role, such as strong analytical and problem-solving skills, verbal and written communication skills. Comply with standards related to Machine Learning. Hence, this is level 5	5
Core skill	**Core Domain Skill:** • Operate self-running software to use data. • Use Python, Java, R code writing software, etc. • Creating algorithms based on statistical modelling procedures	The individual is required to create algorithms based on statistical modelling procedures, carry out machine learning tests and carries out documentation activities. Hence, this is level 5.	5

NSQF QUALIFICATION FILE

Title/Name of qualification/component: Machine Learning Engineer Level: 5			
NSQF Domain	**Outcomes of the Qualification/Component**	**How the outcomes relates to the NSQF level descriptors**	**NSQF Level**
Responsibility	**Responsibility of completing the work assignedand reporting the same as per standards.** • Understand the job role and follow the organisational policy • Record and report about the work status • Follow safety regulations at workplace • Work along with colleagues and supervisors	The individual is responsible for making the appropriate preparations for developing machine learning systems. Also, responsible for applying various techniques and processes to develop machine learning systems as per the business objectives, and assisting in their implementation Hence Level 5	5

SECTION 3
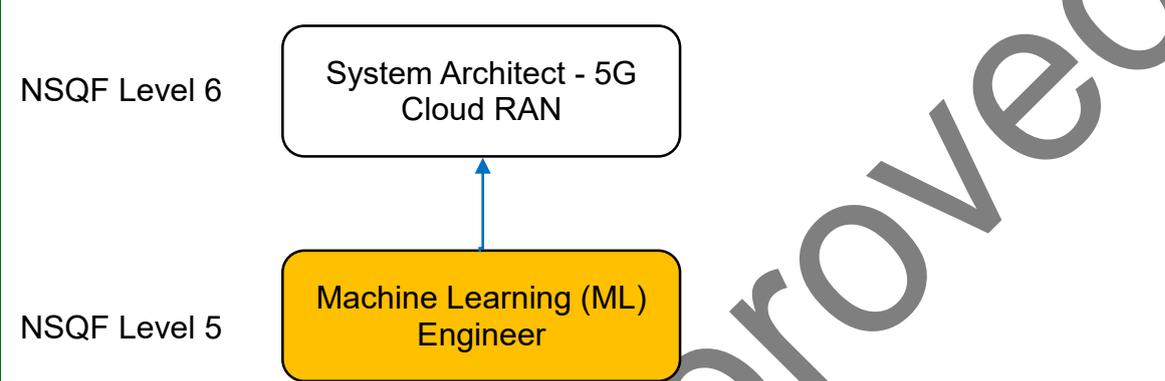**EVIDENCE OF NEED**

26	**What evidence is there that the qualification is needed? What is the estimated uptake of this qualification and what is the basis of this estimate?**
	  1. Feedback from industry was collected with respect to roles for which qualification pack development was to be prioritized.
	  2. Skills Gap analysis reports for industry demand
	  Training duration w.r.t current and potential capacity envisaged for potential supply

27	**Recommendation from the concerned Line Ministry of the Government/Regulatory Body. To be supported by documentary evidences** We have received the approval from the Line Ministry department.
28	**What steps were taken to ensure that the qualification(s) does (do) not duplicate already existing or planned qualifications in the NSQF?Give justification for presenting a duplicate qualification** NSDC list of Approved and Under-Development QPs was checked prior to commencement the work.

29	**What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated? Specify the review process here**
	  • Agencies have been appointed by the SSC to interact with training providers to gather feedback in implementation
	  • Monitoring of results of assessments
	  • Employer feedback will be sought post-placement
	  • A formal review is scheduled by 2025

Please attach most relevant and recent documents giving further information about any of the topics above.
Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

SECTION 4
EVIDENCE OF PROGRESSION

30	**What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?**
	1. Endorsed and accepted by the industry players
	2. Formal recognition from the industry players
	3. Horizontal and vertical mobility options are available

Annexure 1: Career Map of Machine Learning Engineer

NSQF Level 6 — System Architect - 5G Cloud RAN

NSQF Level 5 — Machine Learning (ML) Engineer