**GRADUATE CERTIFICATE: Intelligent Reasoning Systems (IRS)**

**PRACTICE MODULE: Project Proposal**

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| **Date of proposal:**  09 Jan2021 |
| **Project Title:**  ISS Project – Electricity Demand Response Alert System (EDRAS) - AI based solution predicting Electricity Price & Demand. |
| **Sponsor/Client:** *(Name, Address, Telephone No. and Contact Name)*  Institute of Systems Science (ISS) at 25 Heng Mui Keng Terrace, Singapore  NATIONAL UNIVERSITY OF SINGAPORE (NUS)  Contact: Mr. GU ZHAN / Lecturer & Consultant  Telephone No.: 65-6516 8021  Email: [zhan.gu@nus.edu.sg](mailto:zhan.gu@nus.edu.sg) |
| **Background/Aims/Objectives:**   1. **Real-Time Notification of High USEP for Demand Response Participation**   To participate in the programme, licensed load providers will have to submit  demand bids into the NEMS for the periods in which they intend to offer load  curtailments through a process called demand side bidding. The demand bids for a  particular trading period will consist of the following: total load (in MW) for the  registered block, a series of energy curtailment and price quantity tranches and the  linear ramp rates (MW/min) as determined during the registration stage.  Submission of the bids are required to be completed **within 65min** ( “Gate Closure”) of the trading, hence **active real-time notification** will allow the participant to have a **“look-ahead”** plan in order to bid into the system during the periods where the electricity prices are foreseen to be high.   1. **Uniform Singapore Energy Price (USEP) and Demand forecast**   A Demand Response is currently potentially activated if the USEP crosses above 1.5x Balance Vesting Price (\*BVP).  An accurate **forecasted USEP** will enable the market participant to bid in a time slot with a high chance of DR being triggered.   \*BVP = Currently set at S$125/MWh |
| **Requirements Overview:**   * Research ability * Programming ability * System integration ability |
| * Resource Requirements (please list Hardware, Software and any other resources) * Microsoft Power Query:  this component will get the data from EMA website to be shown in the Power BI * Microsoft Power BI: Power BI is used to display the data and show the 5 price points to trigger the alert whenever USEP price has reached certain threshold. The refresh in Power BI will trigger data refresh from the EMA website through Power BI gateway * Microsoft Power Automate: this component will drive the workflow. Any trigger to the price threshold will automatically generate an email. Then the email will trigger a message in Telegram app * Email (Microsoft Outlook): one of the alert format for the user is in the form of email * Telegram: another alert will be in the format of telegram message to ensure that users will get notification in their mobile phone * Python: To scrap the latest EMC data with TagUI (RPA) from the website and append to the training dataset and predict the Demand and USEP with ML model |
| **Number of Learner Interns required: (Please specify their tasks if possible)**  NA |
| **Methods and Standards:**   |  |  |  | | --- | --- | --- | | **Procedures** | **Objective** | **Key Activities** | | | **Requirement Gathering and Analysis** | The team should meet with ISS to scope the details of project and ensure the achievement of business objectives. | 1.        Gather & Analyze Requirements | | 2.        Define internal and External Design | | 3.        Prioritize & Consolidate Requirements | | 4.        Establish Functional Baseline | | **Technical Construction** | ·         To develop the source code in accordance to the design. | 1.        Setup Development Environment | | ·         To perform unit testing to ensure the quality before the components are integrated as a whole project | 2.        Understand the System Context, Design | | 3.        Perform Coding | | 4.        Conduct Unit Testing | | **Integration Testing and acceptance testing** | To ensure interface compatibility and confirm that the integrated system hardware and system software meets requirements and is ready for acceptance testing. | 1.        Prepare System Test Specifications | | 2.        Prepare for Test Execution | | 3.        Conduct System Integration Testing | | 4.        Evaluate Testing | | 5.        Establish Product Baseline | |  | | **Acceptance Testing** | To obtain ISS user acceptance that the system meets the requirements. | 1.        Plan for Acceptance Testing | | 2.        Conduct Training for Acceptance Testing | | 3.        Prepare for Acceptance Test Execution | | 4.        ISS Evaluate Testing | | 5.        Obtain Customer Acceptance Sign-off | |  | | **Delivery** | To deploy the system into production (ISS standalone server) environment. | 1.        Software must be packed by following ISS’s standard | | 2.        Deployment guideline must be provided in ISS production (ISS standalone server) format | | 3.        Production (ISS standalone server) support and troubleshooting process must be defined. | |  | |

**Team Formation & Registration**

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| Team Name:  Group EDRAS |
| Project Title (repeated):  Electricity Demand Response Forecast and Notification |
| System Name (if decided):  Electricity Demand Response Forecast and Notification |
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| Team Member 1 Name:  Chong Keng Han |
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| Team Member 4 Name:  Sivasankaran Balakrishnan |
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| **For ISS Use Only** | | |
| **Programme Name:** | **Project No:** | **Learner Batch:** |
| **Accepted/Rejected/KIV:** | | |
| **Learners Assigned:** | | |
| **Advisor Assigned:**  Contact: Mr. GU ZHAN / Lecturer & Consultant  Telephone No.: 65-6516 8021  Email: [zhan.gu@nus.edu.sg](mailto:zhan.gu@nus.edu.sg) | | |