

About OMICS Group

OMICS Group International is an amalgamation of Open Access publications and worldwide international science conferences and events. Established in the year 2007 with the sole aim of making the information on Sciences and technology 'Open Access', OMICS Group publishes 400 online open access scholarly journals in all aspects of Science, Engineering, Management and Technology journals. OMICS Group has been instrumental in taking the knowledge on Science & technology to the doorsteps of ordinary men and women. Research Scholars, Students, Libraries, Educational Institutions, Research centers and the industry are main stakeholders that benefitted greatly from this knowledge dissemination. OMICS Group also organizes 300 International conferences annually across the globe, where knowledge transfer takes place through debates, round table discussions, poster presentations, workshops, symposia and exhibitions.

About OMICS Group Conferences

OMICS Group International is a pioneer and leading science event organizer, which publishes around 400 open access journals and conducts over 300 Medical, Clinical, Engineering, Life Sciences, Pharma scientific conferences all over the globe annually with the support of more than 1000 scientific associations and 30,000 editorial board members and 3.5 million followers to its credit.

OMICS Group has organized 500 conferences, workshops and national symposiums across the major cities including San Francisco, Las Vegas, San Antonio, Omaha, Orlando, Raleigh, Santa Clara, Chicago, Philadelphia, Baltimore, United Kingdom, Valencia, Dubai, Beijing, Hyderabad, Bengaluru and Mumbai.



Development of the Kiira EV SMACK Supervisory Firmware



**International Conference and Exhibition on AUTOMOBILE ENGINEERING
Valencia, Spain
1 -2 September 2015**

Presentation Outline



- Introduction
- Requirements
- Design Process
- Energy Management
- Thermal Management
- Tests

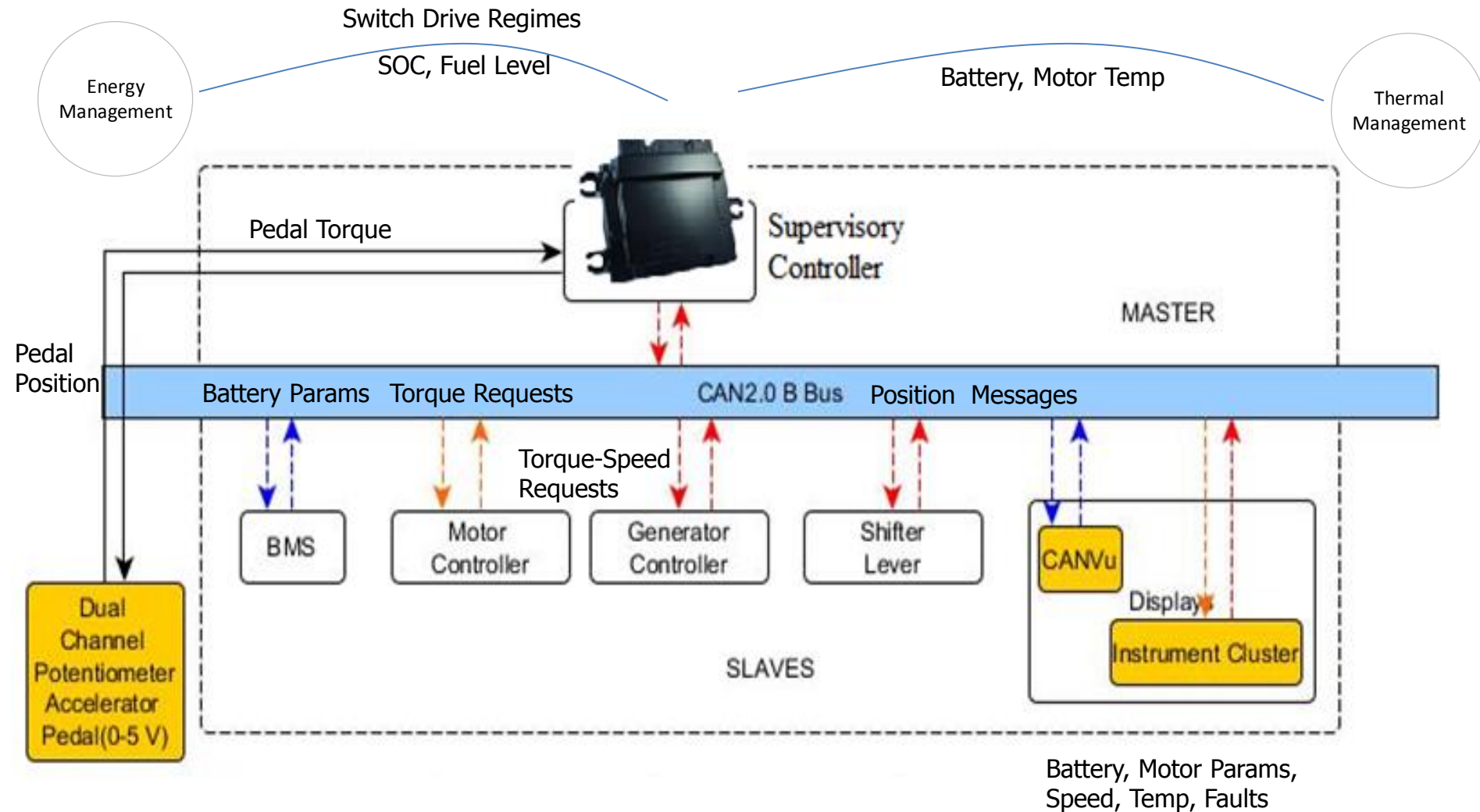
Kiira Motors - Uganda



- Kiira Motors Project - Championing Automotive Development in Uganda
- Products
 - Kiira EV
 - Kiira EV SMACK
- Kiira SMACK Production 2018



Requirements and Architecture



Design Process



Model Definition

Engine-Gen
Module

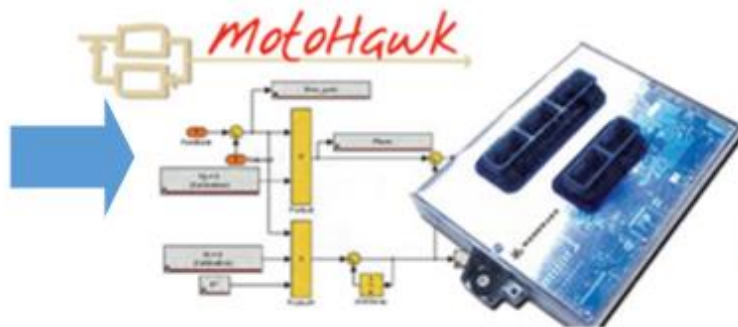
Motor Control
Module

Drive Inputs/
Outputs

Thermal Mgt
Module

Energy Mgt
Module

Battery Mgt
Module



Code
Generation

Testing

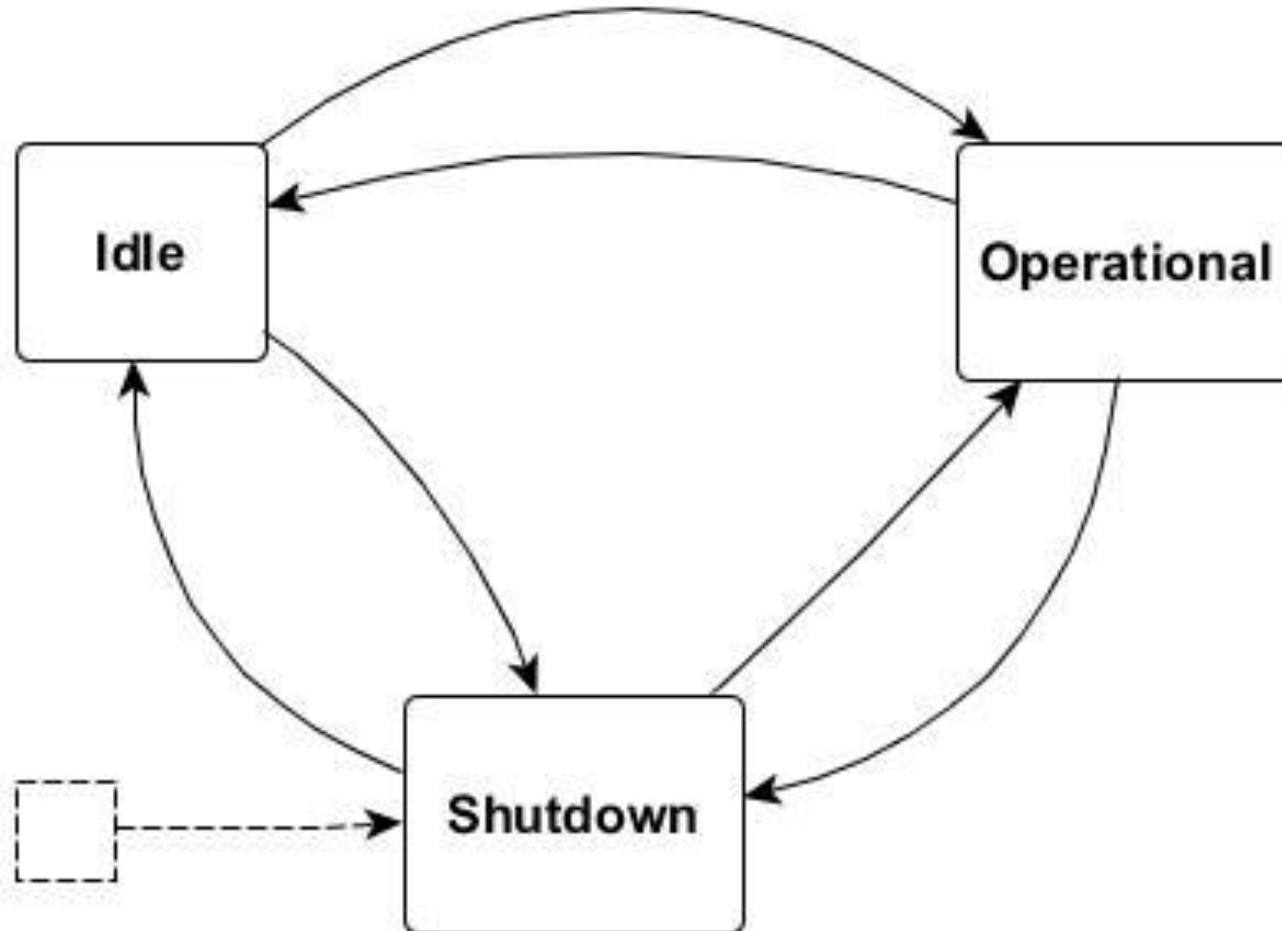


Flashing

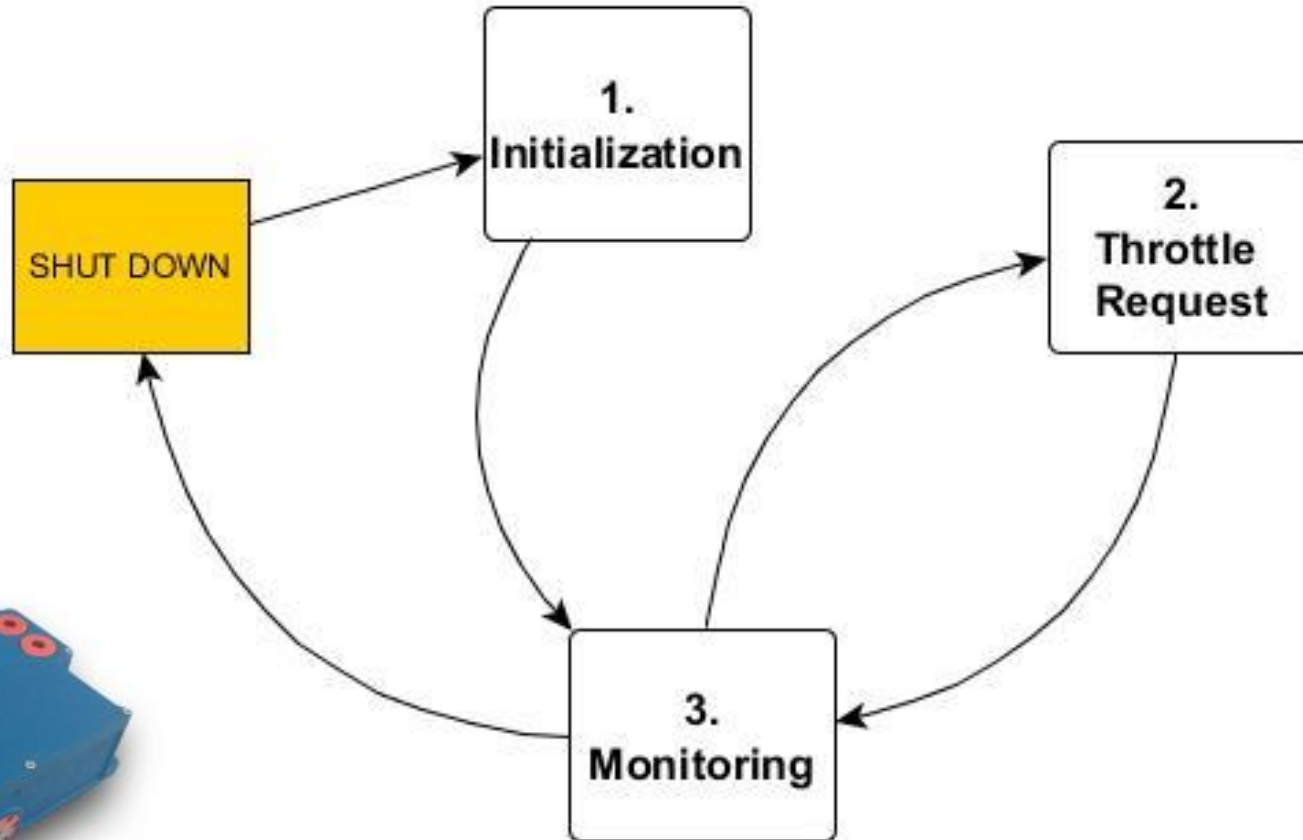


Mototune
Calibration

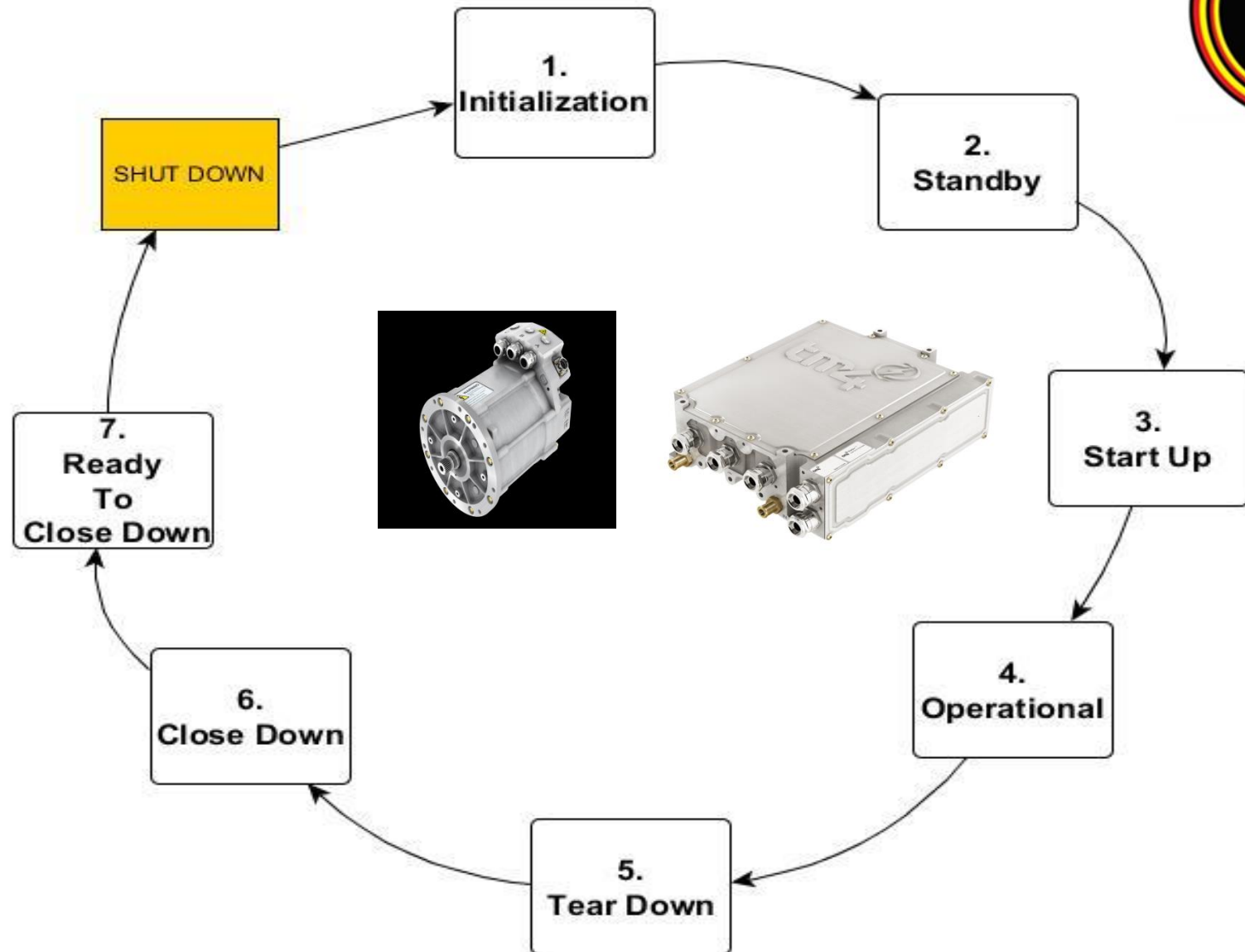
Design: Vehicle States



Design: Generator Control Unit

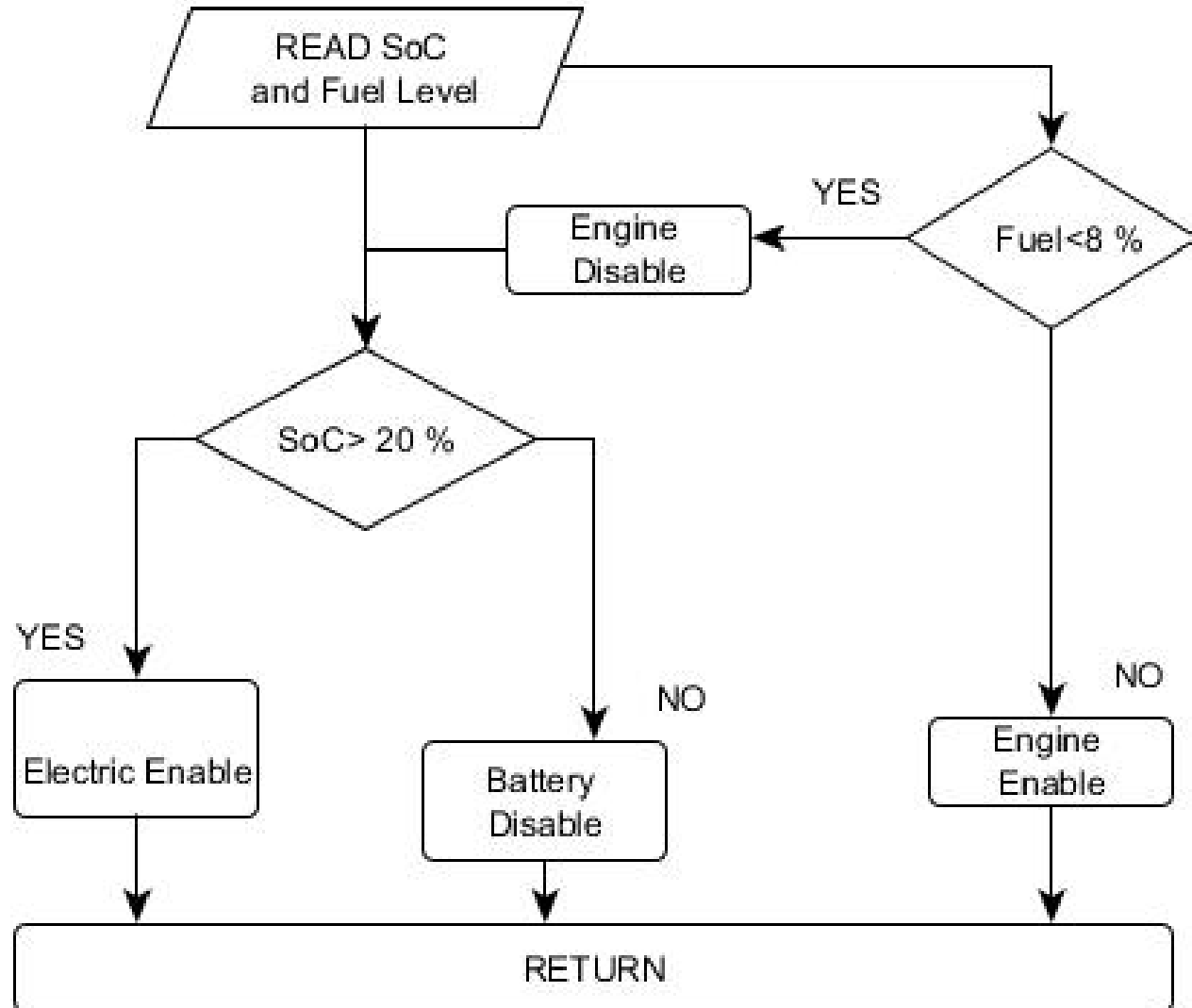


Design: Motor Controller

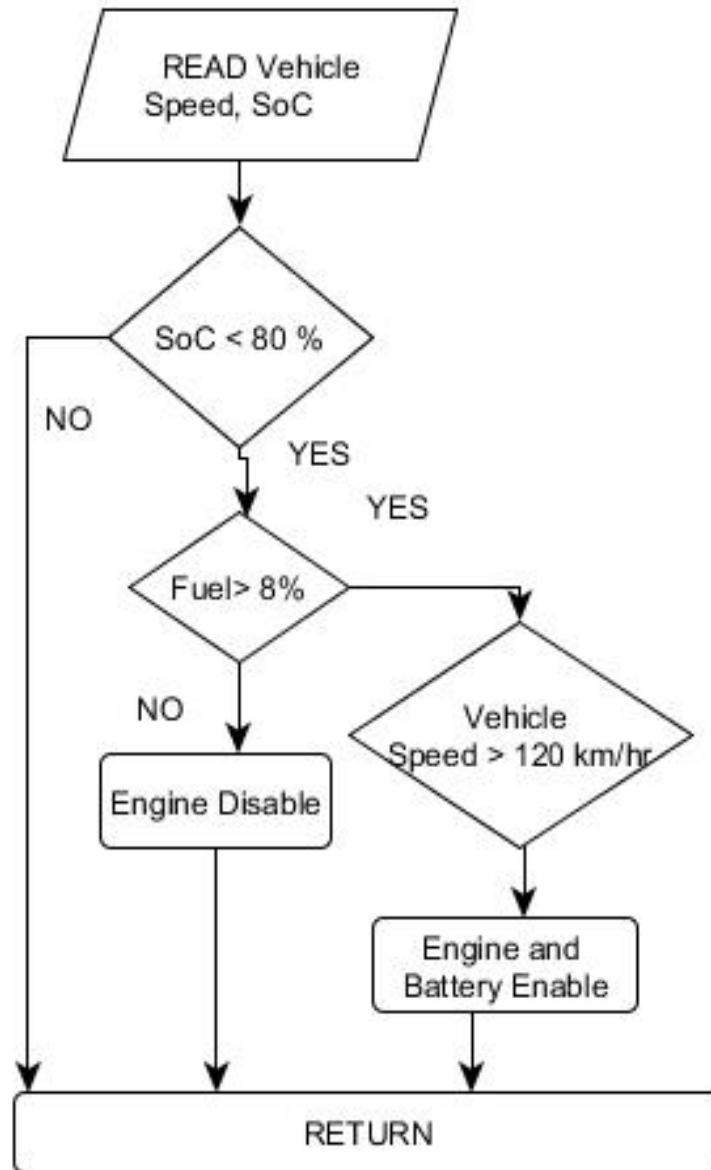


Energy Management Strategy

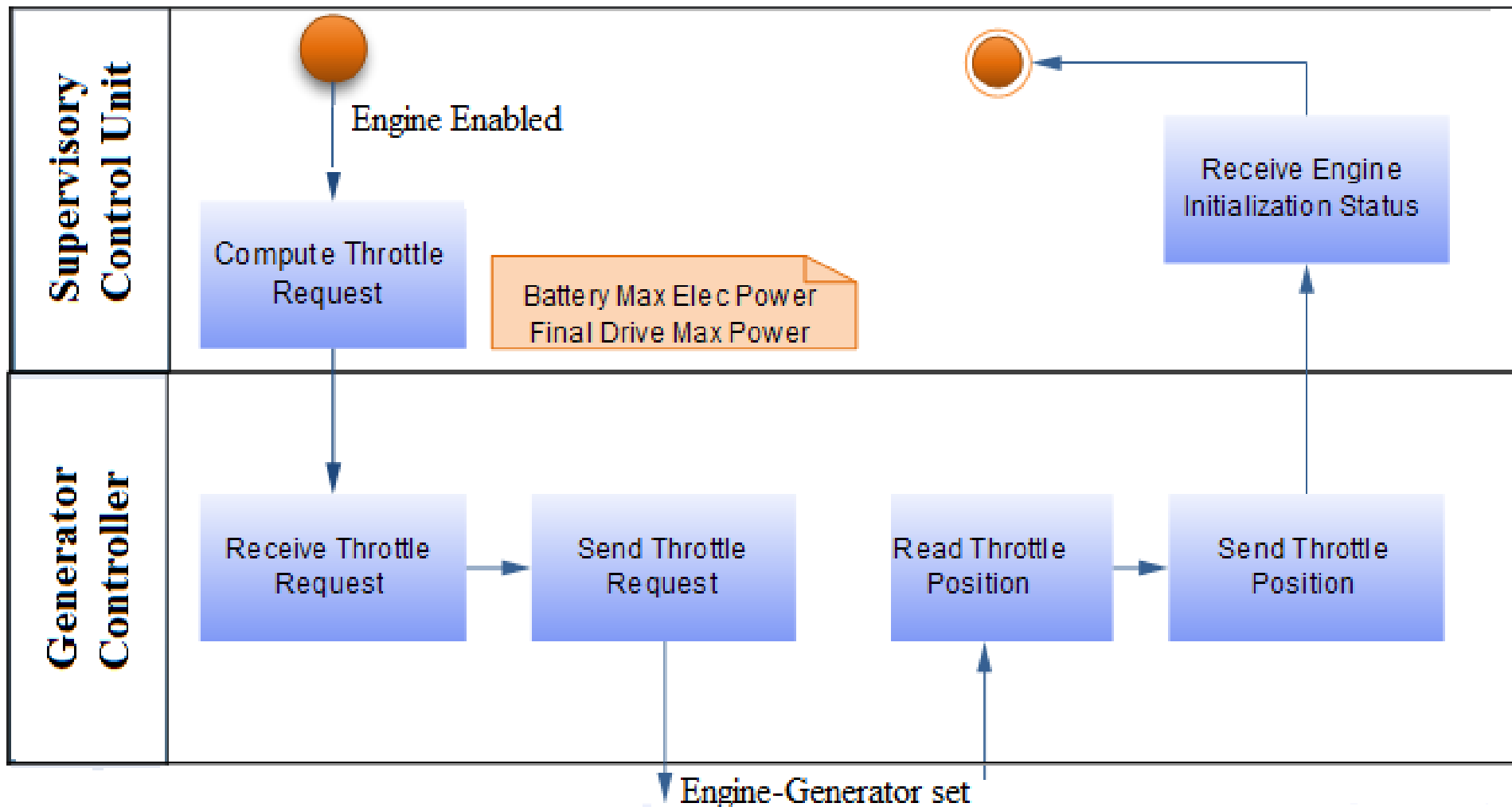
Purely Electric Mode



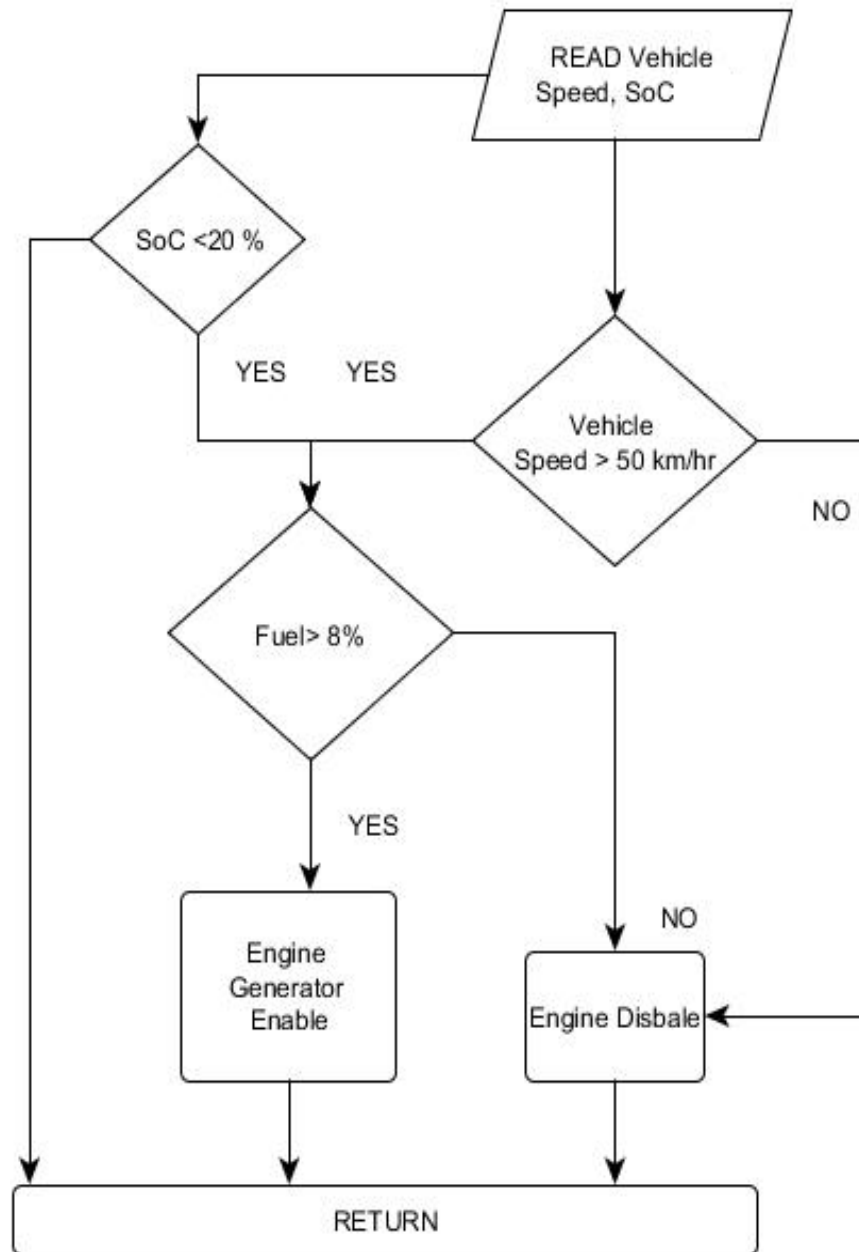
Engine Mode



Engine Control Unit – Throttle Request



Hybrid Mode



Design: Thermal Management



- **Battery** - Air cooled system using a blower fan controlled by the SC
- Single speed fans
- Fan Enable signal on BMS
- ON/Off Strategy at 60 degrees Celsius
- Control Strategy Prospects
 - PWM Support for different fan speeds at different pack temperatures
 - Battery cooling and heating for diverse operating conditions
- **Engine and Motors**

Component Specifications



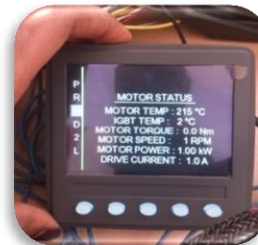
Supervisory Controller: Woodward:
ECM-5554-112-0904-C00-M:112
Pin Platform,
Operating DC Voltage: 12 V
Calibratable Memory: 512K
CAN 2.0B Channels: 3



Accelerator Pedal
Operating DC Voltage: 12 V
Sensor: Programmable Hall
Effect SensorType: Dual
Potentiometer



Motor Controller: TM4 MΦTIVE:
Series C060
Operating DC Voltage: 220-400 V
Minimum Operating DC Voltage:
180 V



Communication: CAN 2.0
Active fault alarms



Shift Lever
Operating DC
Voltage: 12 V
Communication: CAN



Generator Control Unit: Rhinehart Motion
Systems RMS-PM150DZ
Peak Power: 100 kW
Continuous Power: 70 kW Continuous
Output Current: 300 A
Peak Output Current: 500 A



Battery
Management
System: Orion
BMS L4275D05



System Tests

- Off board system and On board tests
 - Energy Management performance
 - Switching – auto and manual
 - Vehicle Performance



Pauline Korukundo

BSc. Telecommunications Engineering (MAK)

MSC. Electrical and Electronics Engineering (Nottingham)

For God and My Country

