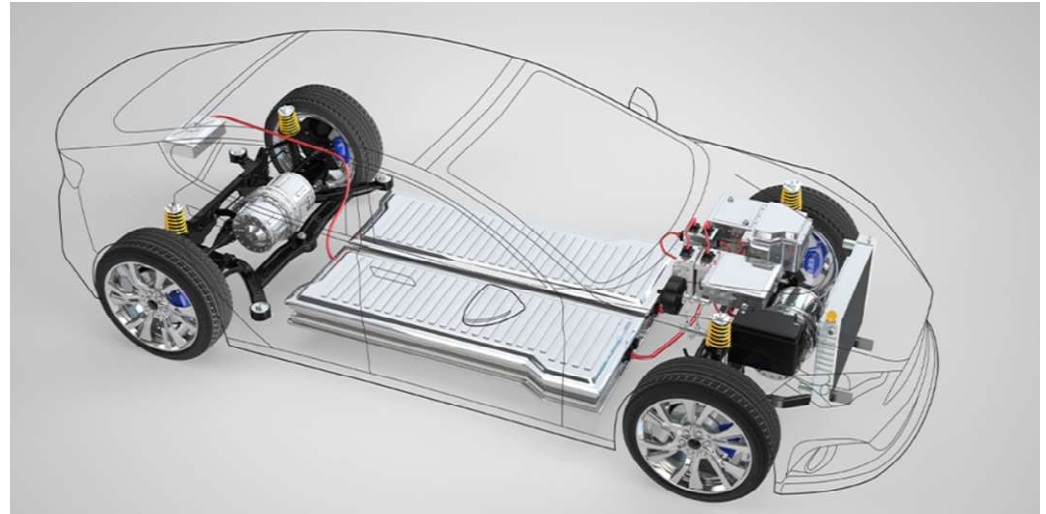


# EV Electronics and Control

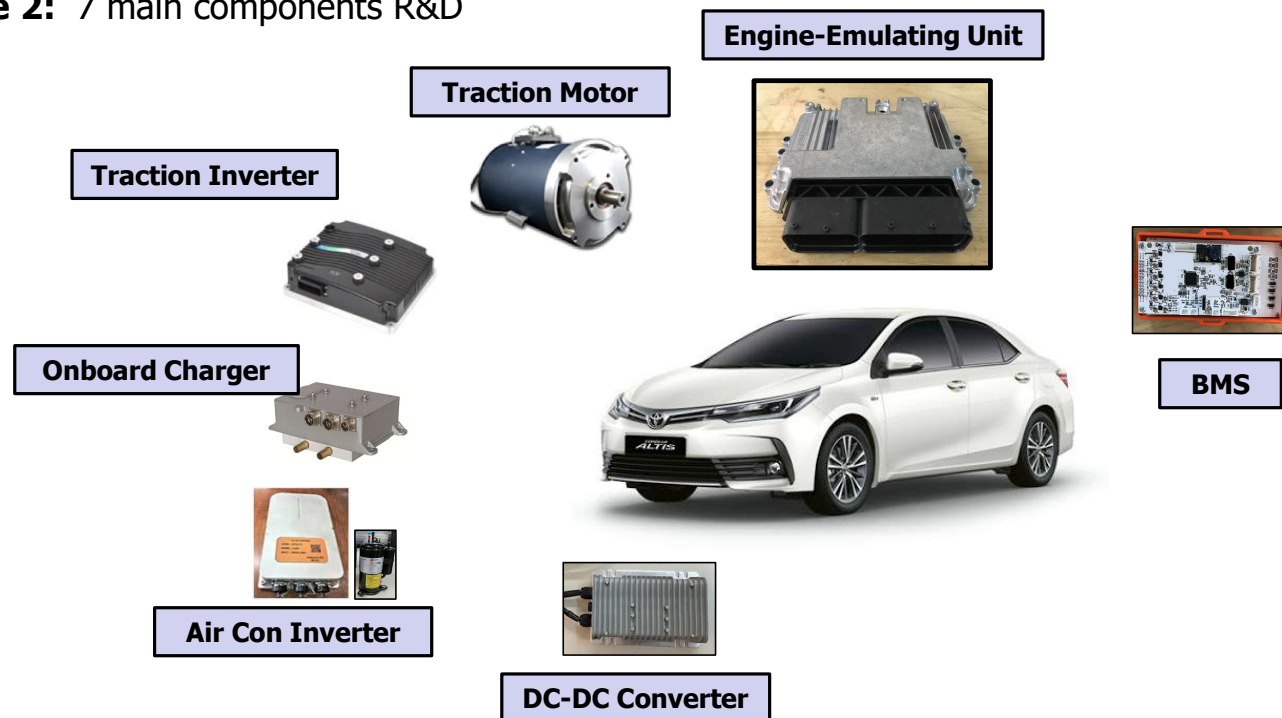


ดวิษ กิระชัยวนิช  
ทีมวิจัยผลิตภัณฑ์อุตสาหกรรมและอิเล็กทรอนิกส์กำลัง

# Recent EV Projects

## EV Kit & Blueprint Project (2017-2023)

- Introducing **e-Engine** conversion technique
- **Phase 1:** Developing e-Engine conversion kit, blueprints, and instruction manual for converting ICE vehicle to BEV
- **Phase 2:** 7 main components R&D



# Project Outcomes

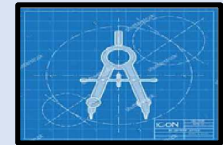
## 4 Prototype Converted BEVs



## EV Kit Components



## Blueprint & Instruction Manual



## Knowledge Sharing

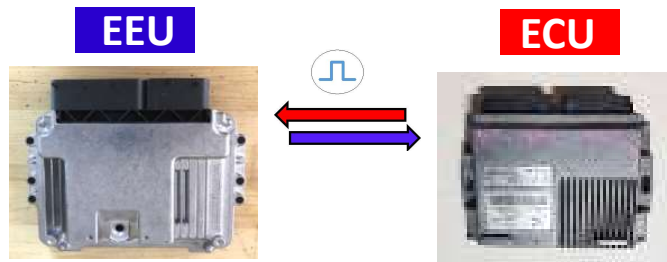
Public Seminar



Private Workshop



# e-Engine Technique



- Auto Transmission
- ABS
- Air bag
- Dashbaord
- Electronics Power Steering
- Immobilizer

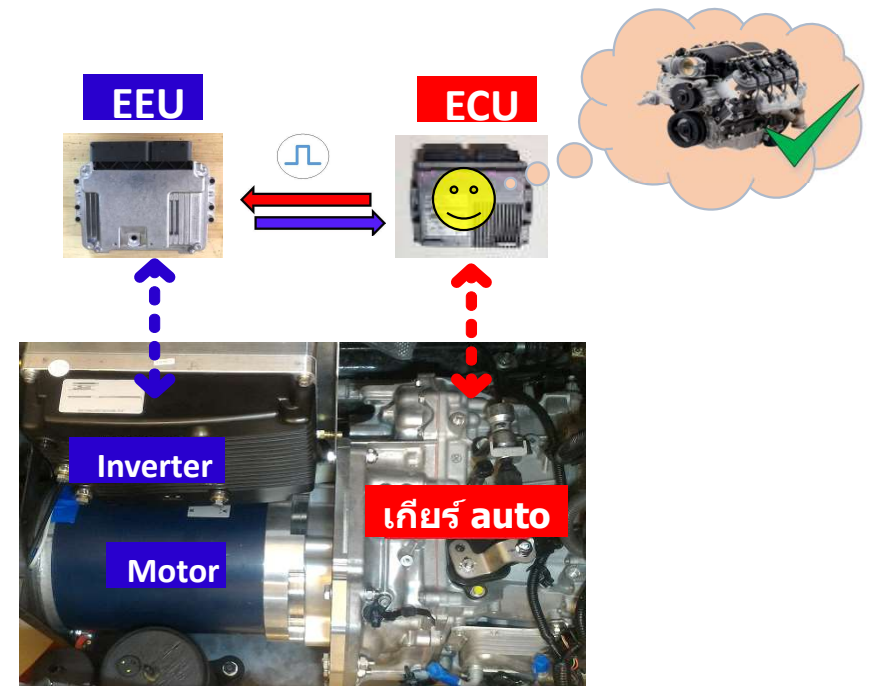


1. Low cost (keep original parts)
2. Short conversion time
3. Applicable to all transmissions (MT & AT)
4. Preserved original safety function

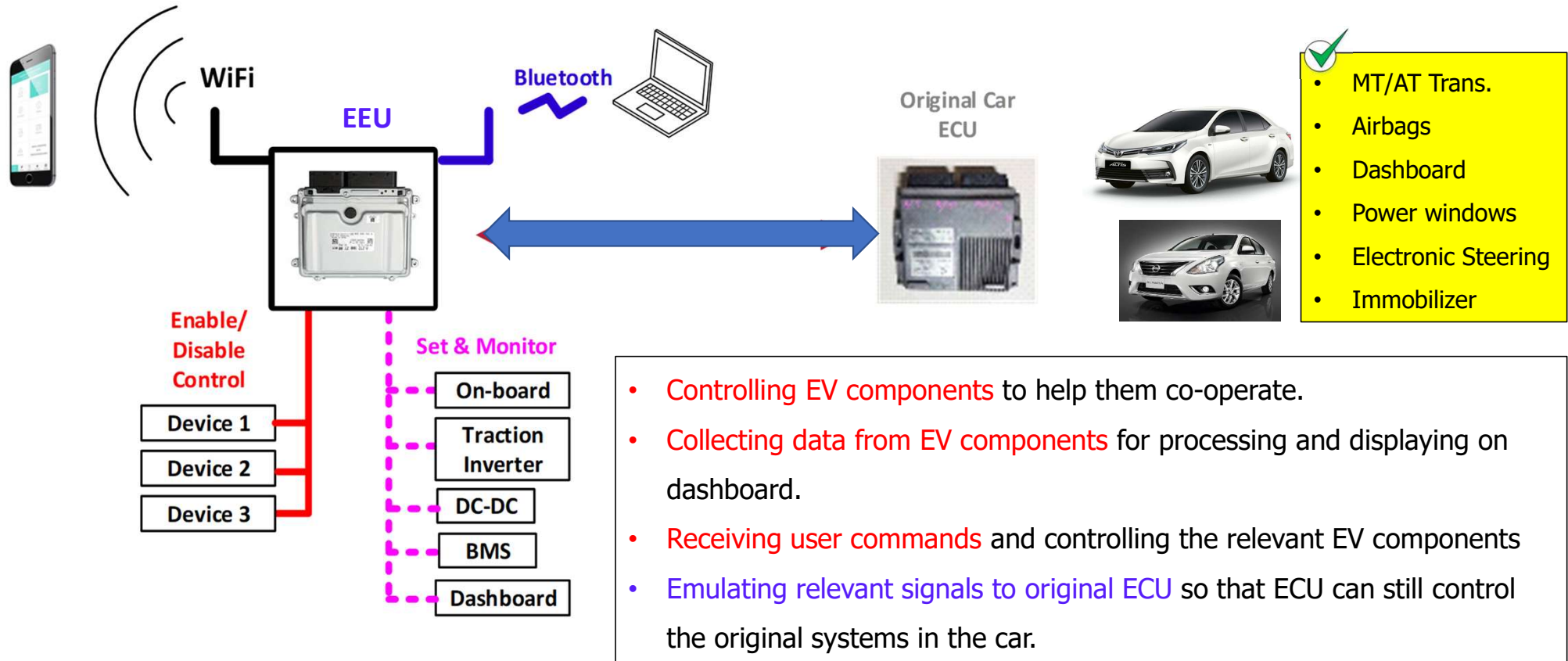


# Engine Emulating Unit (EEU)

- EEU is the central vehicle controller, 100% in-house developed at NSTDA.
- It functions in similar fashion as **Vehicle Control Unit (VCU)** in general EV.
- With extra feature embedded for supporting e-Engine conversion technique, EEU standouts from other VCU.
- EEU is a perfect platform for both EV conversion and EV central controls.



# Engine Emulating Unit (EEU)

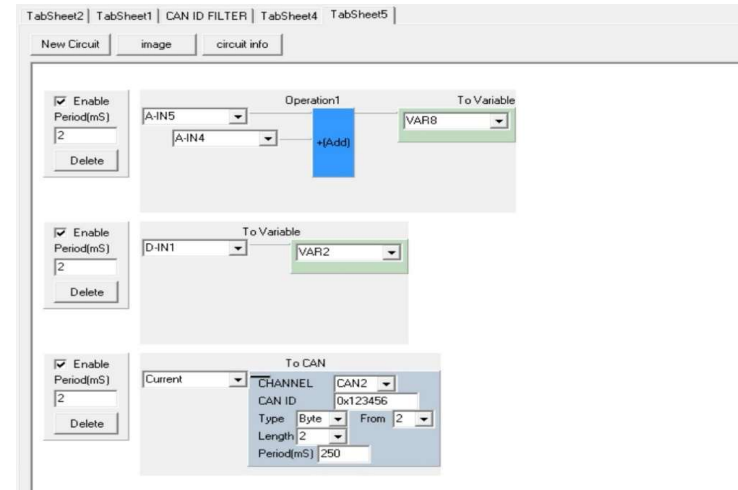


# General VCU Platforms for EV & EV conv.

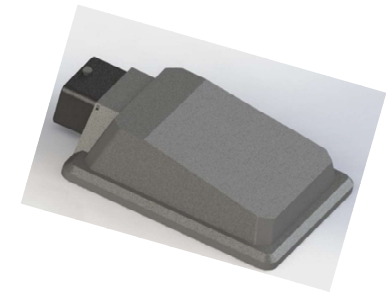
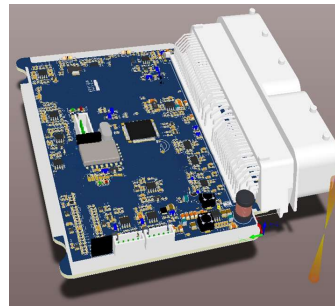


## FEATURES

- Multiple analog & digital ports for sensor inputs
- Multiple high power output port (upto 6A) for device ON/OFF control
- Easy-to-use block-based programming for configuration
- Vehicle data logging (black box)
- Vehicle data uploading to cloud (with 4G module)
- Communications: CAN bus, bluetooth, WiFi, 4G
- EV conversion support:
  - Engine signal emulating outputs
  - Auto transmission shifting control



Upcoming: Safety integrated design



# Traction Inverter Design



## Power Board

- For EV induction motor (60kWpk) drive
- 144Vbus, 500Apk
- 3-Phase IGBT H-bridge
- Water Cooled

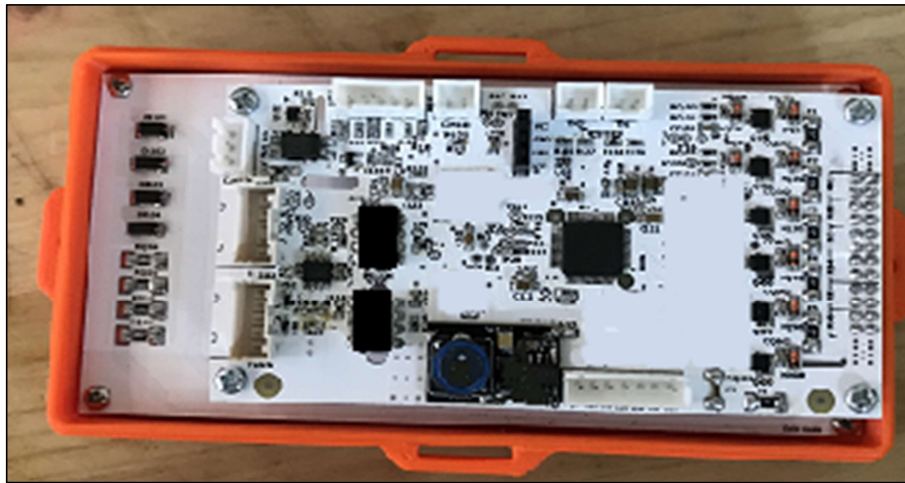


## Controller

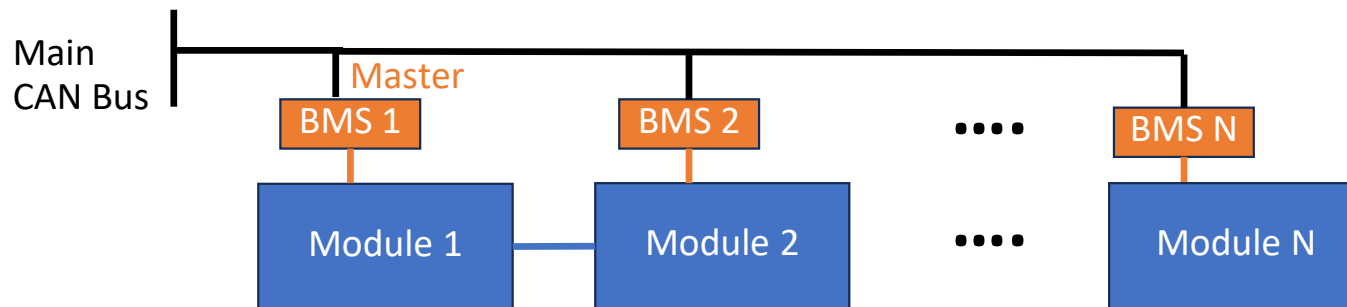
- FOC algorithm + SVPWM
- CAN communication with other components



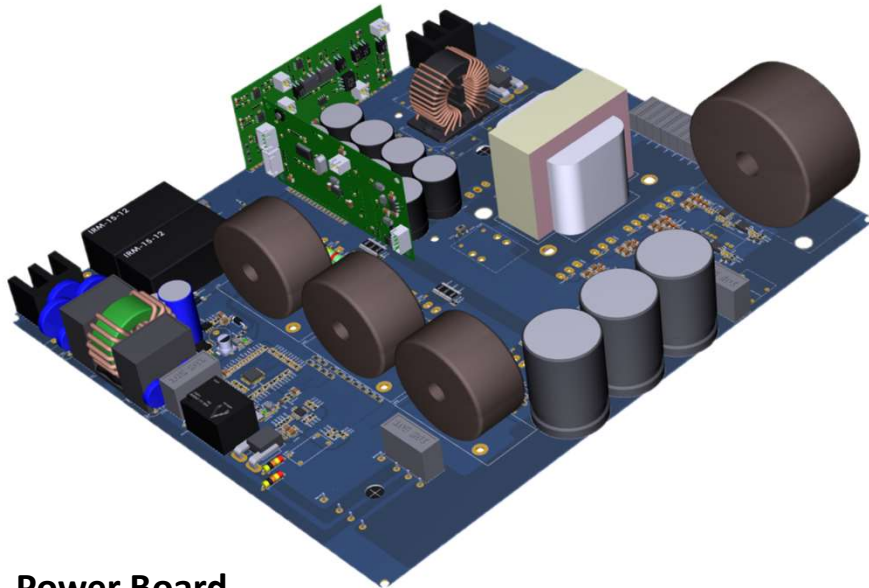
# Battery Management System (BMS) Design



- Battery module voltage & temperature monitoring
- Pack current monitoring
- Passive module-voltage balancing
- OV, UV, OT fault message through CAN
- Control ON/OFF protection contact
- Control ON/OFF cooling system
- Programmable mode (master/slave)

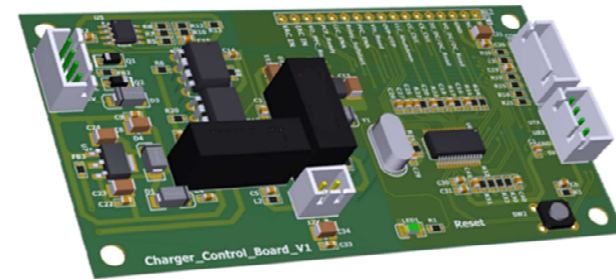


# AC-DC Onboard Charger Design



## Power Board

- AC in : 220V 1-ph input
- DC out: 144V, 45A, 6.6kWmax
- PFC + LLC converter
- SW freq:
- Water cooled
- HV-LV isolation



## Charger Controller

- CAN communication for communication with other system in the vehicle
- ISO 15118 protocol for communication with AC charging station

# DC-DC Converter Design



## DC-DC Converter

- DC in : 144 Vnom, 170Vmax
- DC out: 13.8V, 80A, 1100W
- Fullbridge LLC converter
- Enable port for ON/OFF control
- HV-LV Isolation
- Air cooled

A close-up photograph of a white electric vehicle's charging port. A white charging cable is plugged into the port. The background is a blurred view of the car's front end, showing the headlight and grille. The overall color palette is light blue and white.

# EV จุดเปลี่ยน

อุตสาหกรรมรถยนต์

**ขอบคุณครับ**