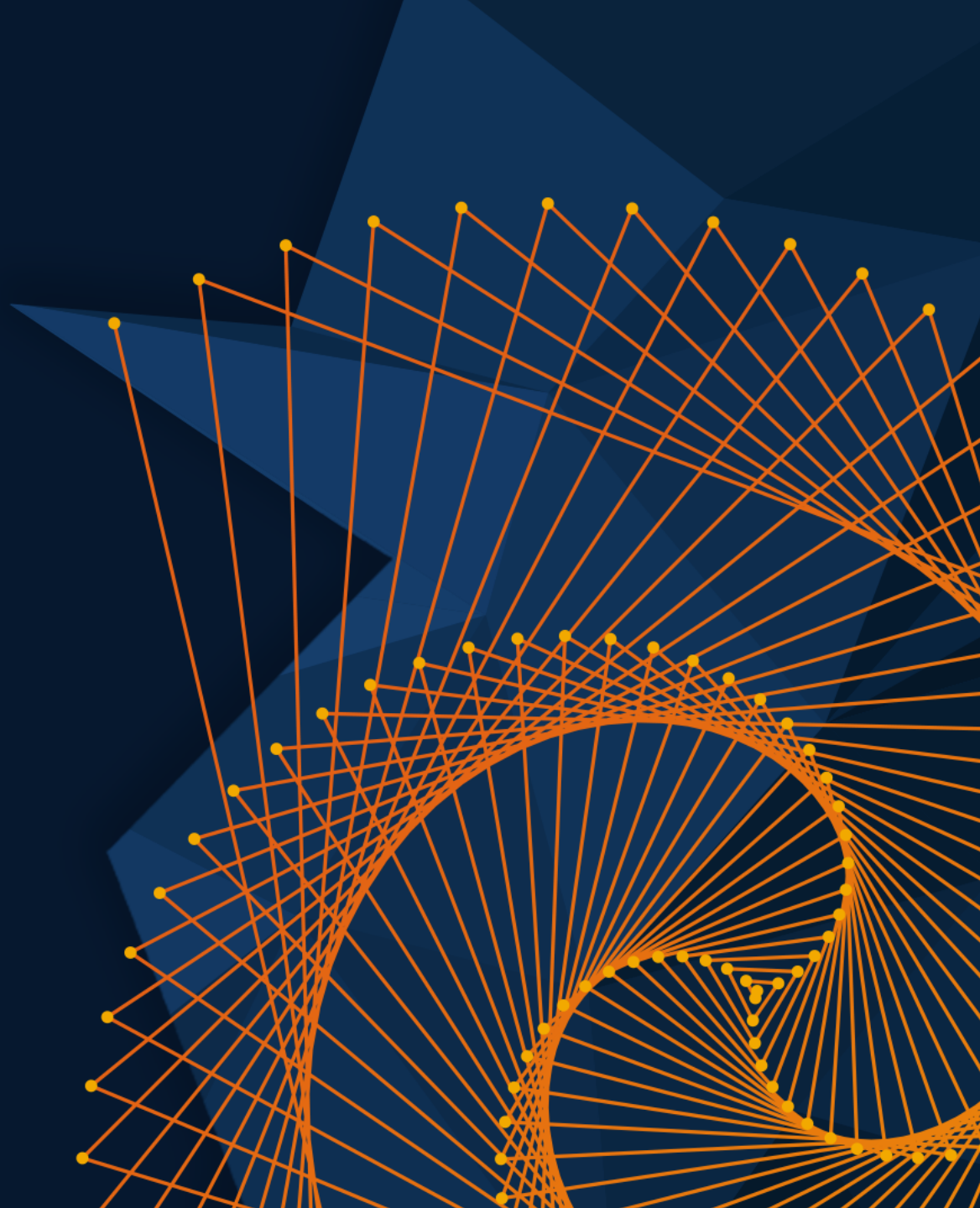


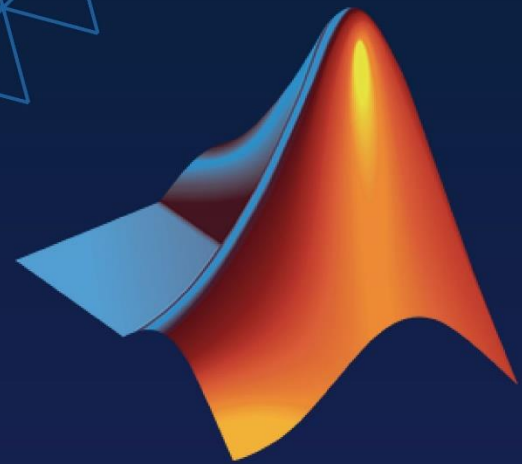
MATLAB EXPO

 UNITED KINGDOM

Delivering Modern Luxury

Simon Message, JLR

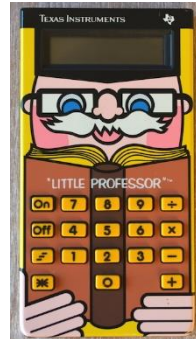




40

MATHWORKS ANNIVERSARY

Simon MESSAGE



```

1 function [dw,parm ]=dw(nomessai,flagi)
2 % Double loi de Wiebe depuis releve pression cylindre
3 % [dw,parm ]=dw(nomessai,flagi)
4 %
5 % Input:
6 % nomessai Nom de fichier dessai
7 % flagi Niveau d'interactivity
8 % Output:
9 % dw(1)=A1; ) Paramètres de Wiebe
10 % dw(2)=Cw1; )
11 % dw(3)=A2; )
12 % dw(4)=Cw2; )
13 % dw(5)=F2; )
14
15 % Version 10
16
17 % Simon MESSAGE, 1998
18 % Ecole Centrale de Nantes, France
19 % University of Bath, UK
20

```



JLR

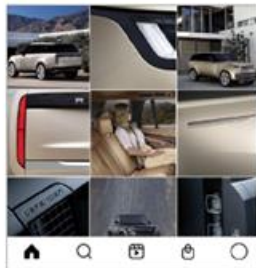
JLR

MODERN LUXURY

SUMMARY

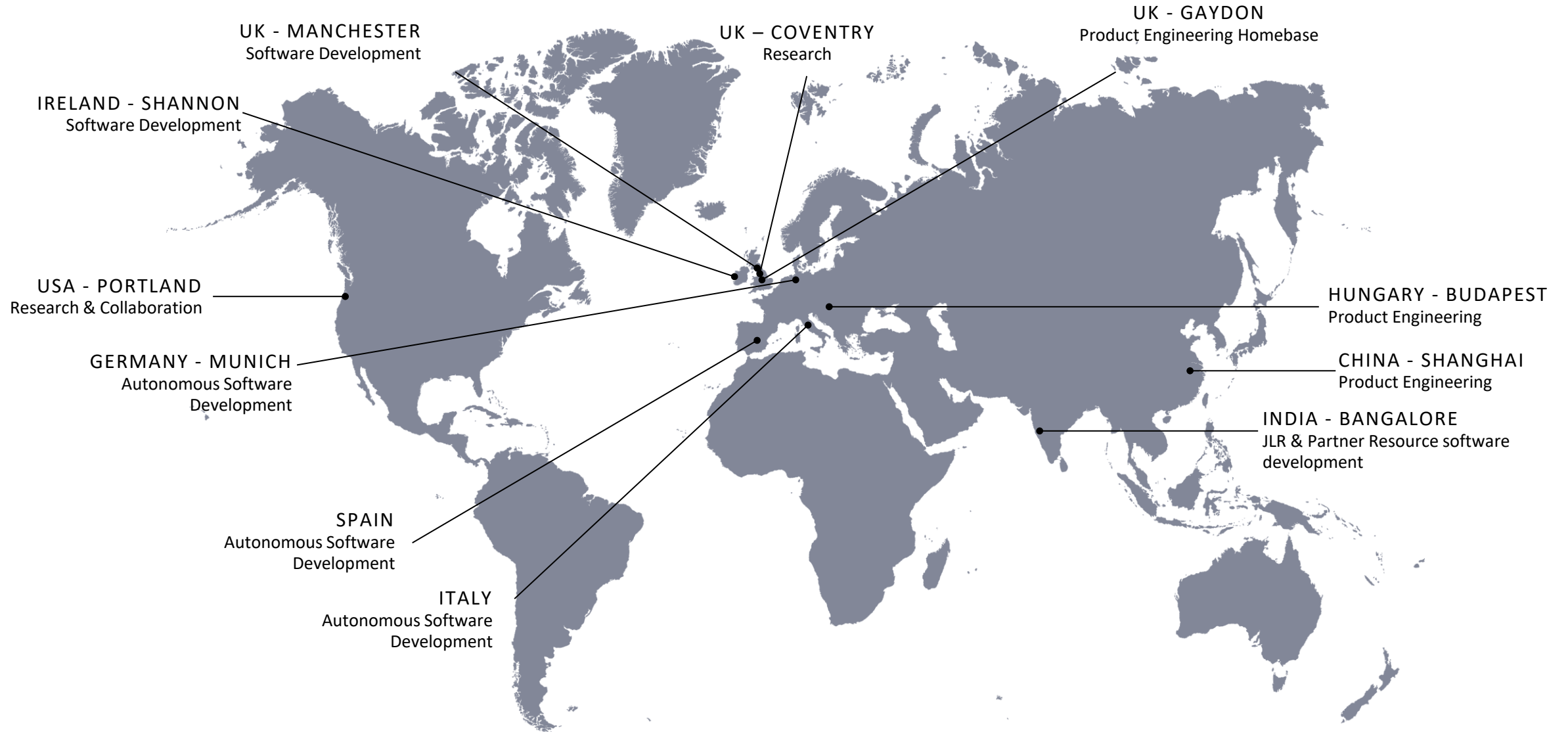
OUR 7 MODERN LUXURY PRINCIPLES

- O1 CURATION
- O2 FUTURE-FACING
- O3 EFFORTLESS
- O4 ENGAGING
- O5 REDUCTIVE
- O6 GLOBAL CITIZENSHIP
- O7 UNIQUE





OUR GLOBAL ENGINEERING FOOTPRINT



11 GLOBAL LOCATIONS WITH A TOTAL OF 10,000+ EMPLOYEES IN PRODUCT ENGINEERING

Mathworks Collaboration

Model Based Design

Model Based Design

```

void adjnvh(void)
{
  Bool rtb_LogicalOperator2;
  Bool rtb_LogicalOperator12;
  TqScal_s16 rtb_Switch_n;
  TqScal_s16 rtb_Switch2;
  UInt16 u0;
  UInt16 u0_0;

  rtb_LogicalOperator2 = ((OprOptmlMode_Zs == ((UntyScal_u8)PRLL_MODE)) &&
    ((Int32)OprEleMachnIncChrg_Tq_Ary[0] < (Int32)ChrgThres_Tq));

  if (EM_SelEleActvFast_B) {
    u0 = SelEleVehNoise_Vkph_Thres_Pt;
    u0_0 = SelEleEngNoise_Wrpm_Thres_Pt;
  } else {
    u0 = VehNoise_Vkph_Thres_Pt;
    u0_0 = EngNoise_Wrpm_Thres_Pt;
  }

  rtb_LogicalOperator12 = (NoiseChrgLim_B_Enbl_Pt && (I
    (IP_Pem_Wrpm < (Int32)u0_0) && rtb_LogicalOperator2

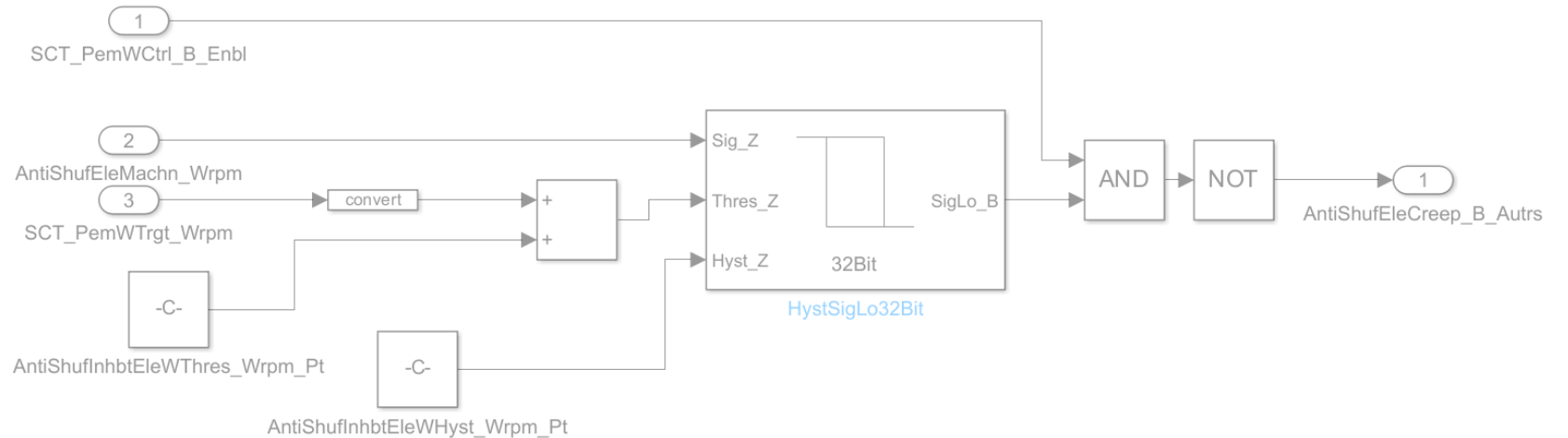
  rtb_LogicalOperator2 = (rtb_LogicalOperator2 && ((Int
    GradEstStats_Zs_Thres_Pt) && (IP_Pem_Wrpm < (Int32)
    UphillChrgLimEngWThres_Wrpm_Pt));

  if (rtb_LogicalOperator12) {
    if (EM_SelEleActvFast_B) {
      rtb_Switch_n = SelEleChrgNoise_Tq_Pt;
    } else {
      rtb_Switch_n = ChrgNoise_Tq_Pt;
    }

    if (((Int32)rtb_Switch_n <= (Int32)OprEleMachnIncChr
      rtb_Switch_n = OprEleMachnIncChrg_Tq_Ary[0];
    }

  } else {
    rtb_Switch_n = OprEleMachnIncChrg_Tq_Ary[0];
  }
}

```





THE NEW RANGE ROVER
EVOQUE

PLUG-IN HYBRID

State-of-the-art PHEV technology is available on the New Range Rover Evoque providing silent running, responsive performance and emission-free city driving – all without any range anxiety.



ABOVE & BEYOND

+ **[1]**
INGENIUM PETROL ENGINE

Lightweight 1.5-litre, 3-cylinder turbocharged engine developing 147kW (200PS) of power and 280Nm of peak torque.

+ **[2]**
BiSG INVERTER

Transforms the current between AC and DC to control the BiSG.

+ **[4]**
ELECTRIC MOTOR

Electric Rear Axle Drive system with integrated gearbox and inverter, producing 80kW (108PS) of power and 260Nm of torque.

+ **[3]**
BELT-INTEGRATED STARTER GENERATOR (BiSG)

Seamlessly starts the engine and supplies power to the high voltage system.

+ **[6]**
INTEGRATED CHARGER

DC/DC converter provides power from the high voltage battery to the 12V system.

+ **[5]**
BATTERY

11.3kWh lithium-ion battery mounted under the floor to maximise range without impacting interior space.

JAGUAR i-PACE

THE AWARD-WINNING JAGUAR I-PACE

Nothing else looks or drives like the I-PACE.



IN FOCUS

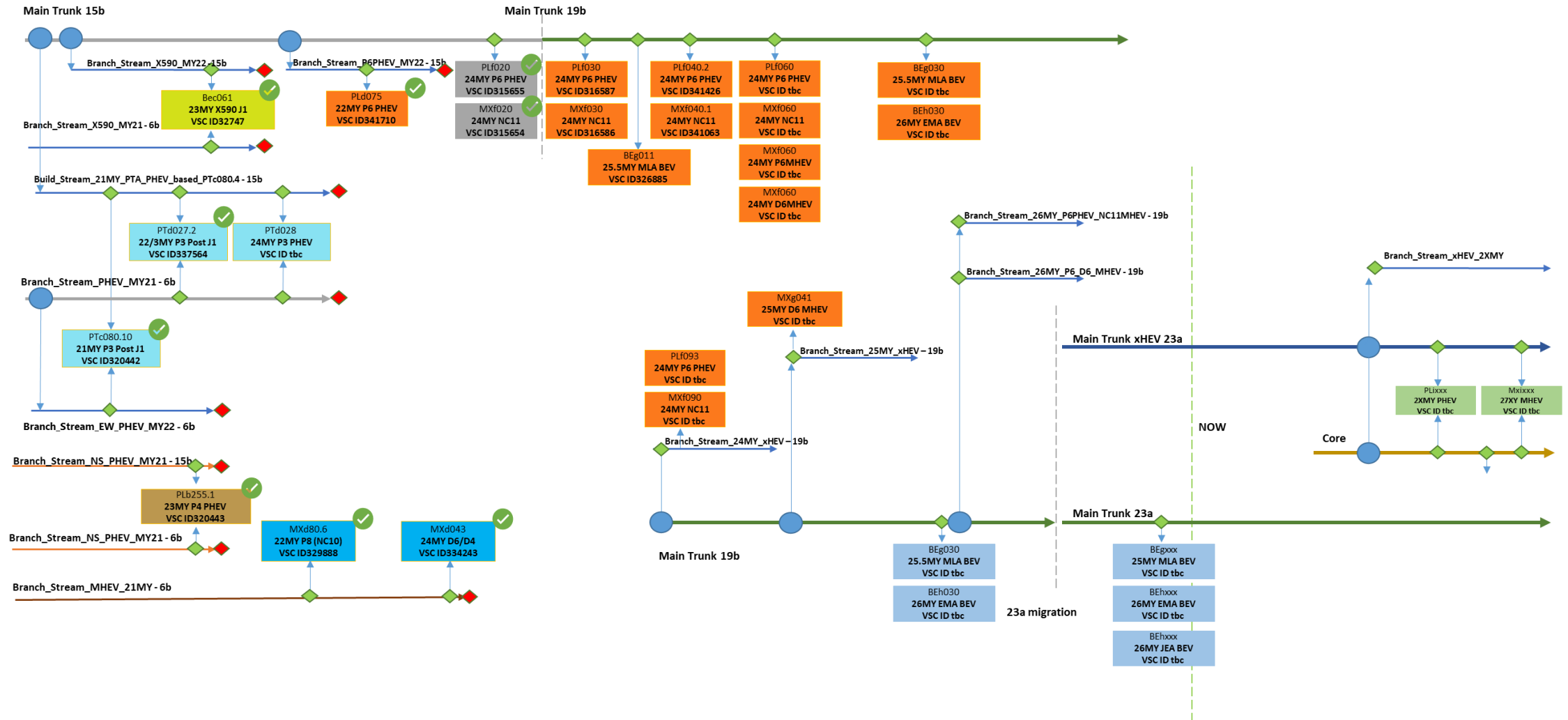
- ① Winner of over 60 awards, including 2019 European and World Car of the Year
- ① World's first truly premium electric SUV
- ① Ground-breaking cab-forward design, engineered from the ground up for electric architecture
- ① Lightweight aluminium body and integrated battery, delivering exceptional stiffness
- ① Leading-edge safety, connectivity and driver assistance features



Range Rover PHEV



MAINLINE SW DEVELOPMENT



System Simulation

1D Simulation

The image displays the CalSim NG 1.5 simulation environment. The main window shows a detailed 1D vehicle model with various components like engines, transmissions, and drivelines connected via a communication bus. The interface includes a menu bar, toolbars, and a central workspace.

On the right side, there are two panels: "1 - Vehicle and TestCase" and "2 - Simulation and Results".

1 - Vehicle and TestCase

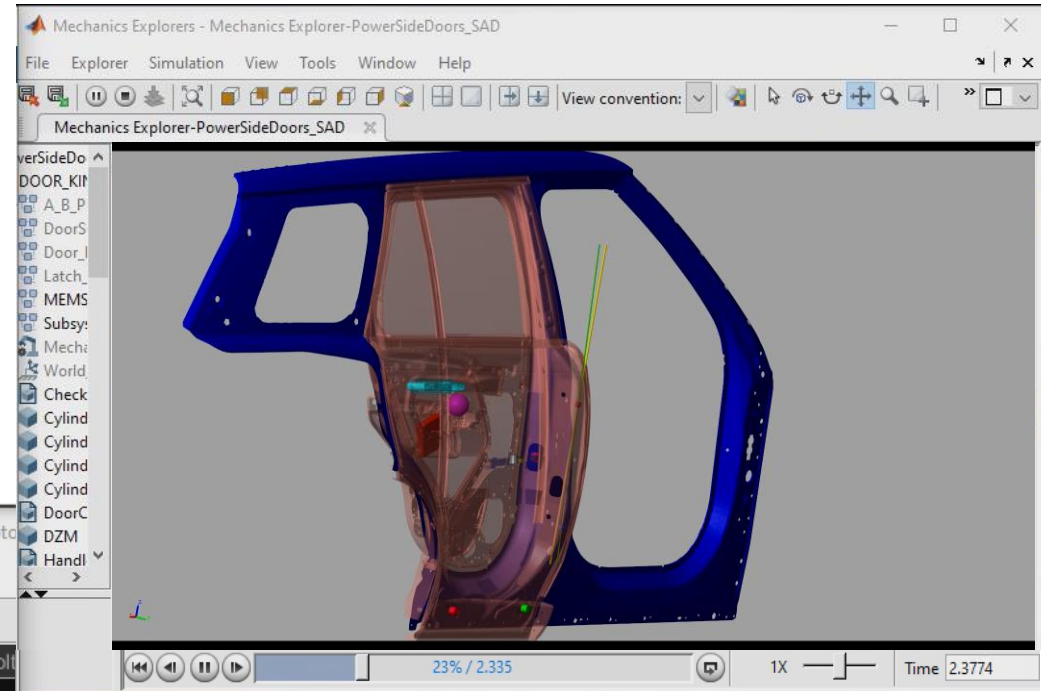
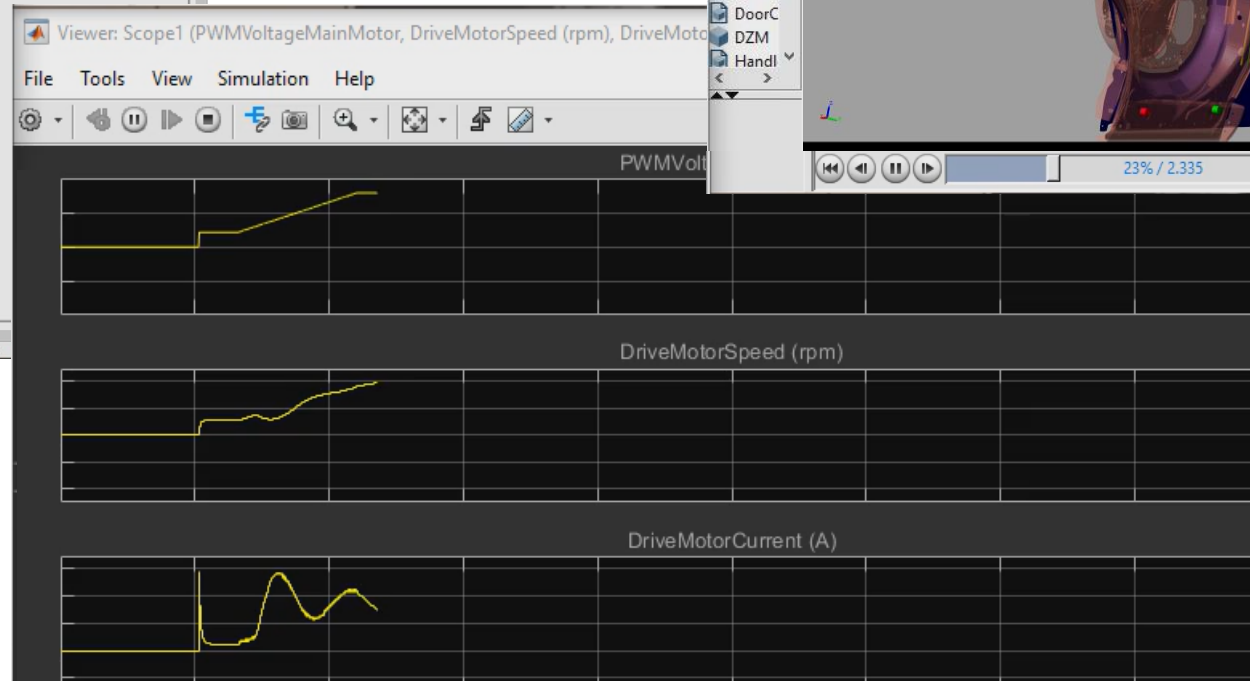
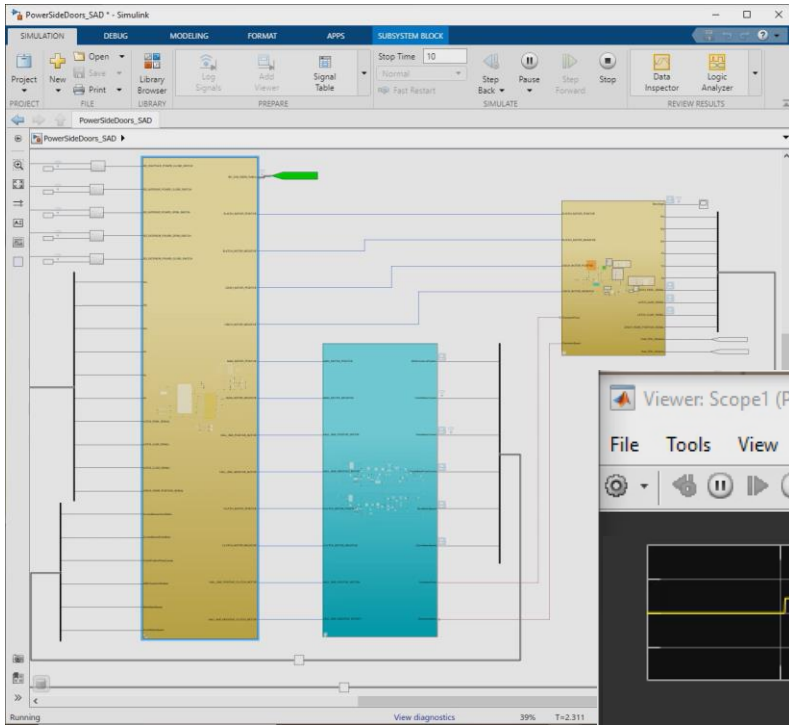
- Simulation info:**
 - Model: CSV1p5
 - TestCase: FTP
 - Sim date: 05-Oct-2023 23:51:46
 - Run time: 28.0378 s
- Diagnostics info:**
 - PreRun:
 - [BrokenLinks] ✓
 - [InitSOC] ✓
 - [RoadLoad] ✓
 - [SvnRevCheck] ✓
 - [TestMass] ✓
 - PostRun:
 - [CycleViolations] ✓
- Headline figures:**

2 - Simulation and Results

This panel contains five time-series plots over a 3000-second duration:

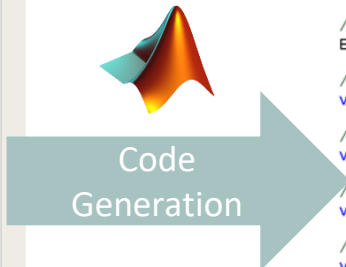
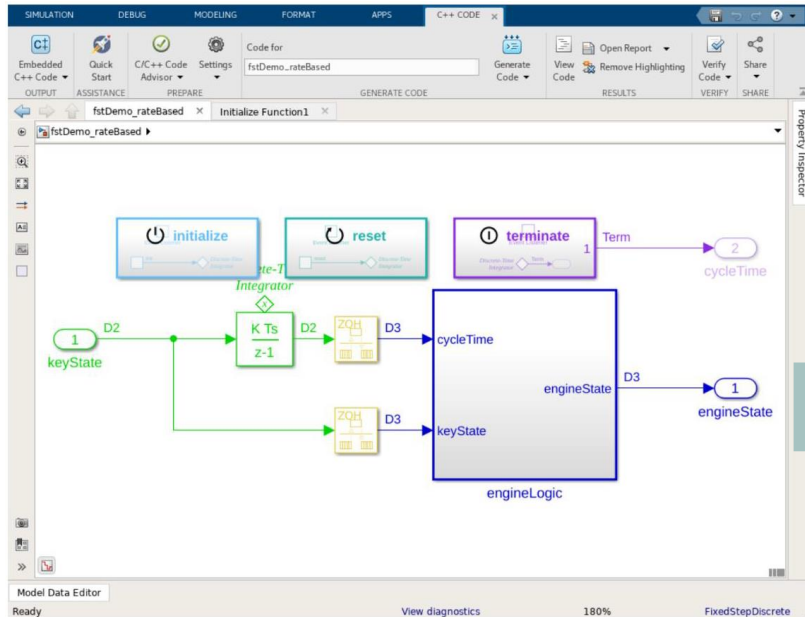
- Vehicle speed:** Shows Actual speed (blue) and Target speed (orange) in kph. The target speed fluctuates between approximately 20 and 100 kph.
- Electric machine speed(s):** Shows Front EM speed (blue) and Rear EM speed (orange) in rpm. Both speeds track the vehicle speed, with the front EM speed reaching up to 3000 rpm.
- Electric machine torque(s):** Shows Front EM torque (blue) and Rear EM torque (orange) in Nm. The torque values fluctuate significantly, reaching up to 100 Nm.
- Battery SOC:** Shows Battery State of Charge (SOC) in percentage. The SOC starts at 100% and gradually decreases to approximately 80% over the 3000-second period.

MULTIBODY Simulation



Software Pipeline

Models to code



```

namespace pcg
{
class fstDemoModelClass {
// public data and function members
public:
// External inputs
ExtU_fstDemo_rateBased_T fstDemo_rateBased_U;

// External outputs
ExtY_fstDemo_rateBased_T fstDemo_rateBased_Y;

// model initialize function
void initialize();

// model step function
void step0();

// model step function
void step1();

// model step function
void step2();

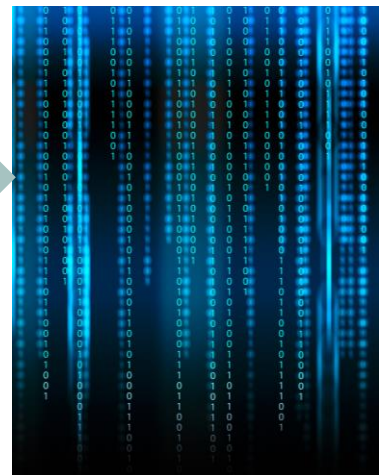
// model event function
void fstDemo_rateBased_reset();

// model terminate function
void terminate();

// private data and function members
private:
// Tunable parameters
static P_fstDemo_rateBased_T fstDemo_rateBased_P;

// Block signals
B_fstDemo_rateBased_T fstDemo_rateBased_B;

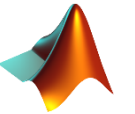
// Block states
DW_fstDemo_rateBased_T fstDemo_rateBased_DW;
};
}
    
```



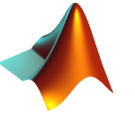
Software Robustness

Model Simulation

- Error checking of models to ensure basic functionality.
- Acquisition of Model Metrics (e.g. Complexity)

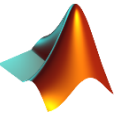
Model Advisor
Compliance

- Model syntax checking (aka Linting)
- Ensures Models meet software development standards.



Model-in-Loop Testing

- Functional/Unit testing of models to ensure desired behaviour.



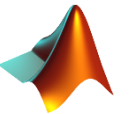
Software-in-Loop Testing

- Equivalence/back-to-back testing to ensure code behaviour matches models.



Polyspace Static Analysis

- Check code for errors & vulnerabilities
- Coding rule compliance (MISRA / AUTOSAR)

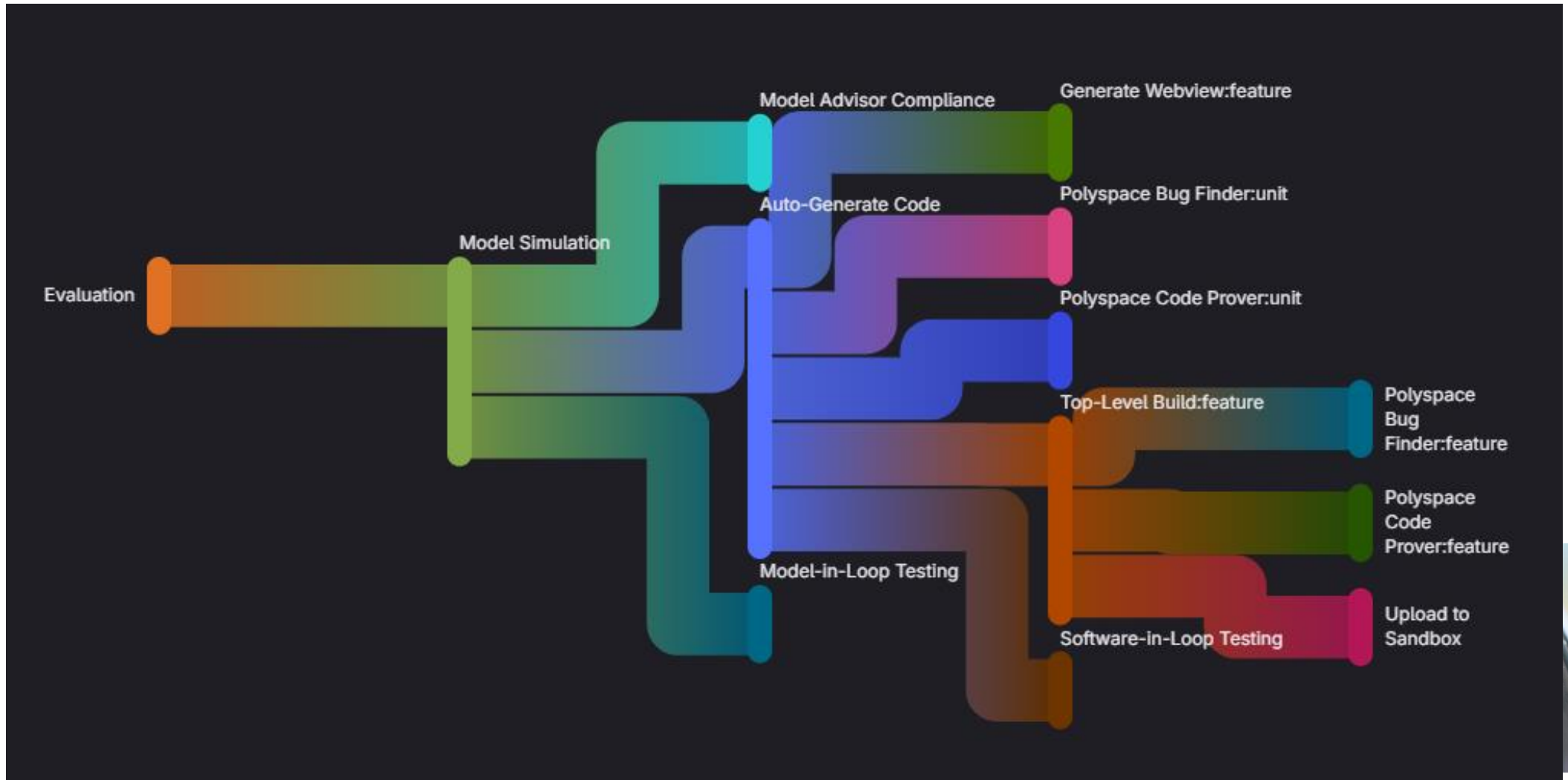




Continuous Integration Pipeline



Process efficiency



PEOPLE

OUR CREATORS' CODE



CUSTOMER
LOVE

WE LOVE OUR
CUSTOMERS

UNITY

WE WORK
AS ONE

INTEGRITY

WE SPEAK
THE TRUTH

GROWTH

WE PROGRESS
TOGETHER

IMPACT

WE ARE PURPOSE
ORIENTED



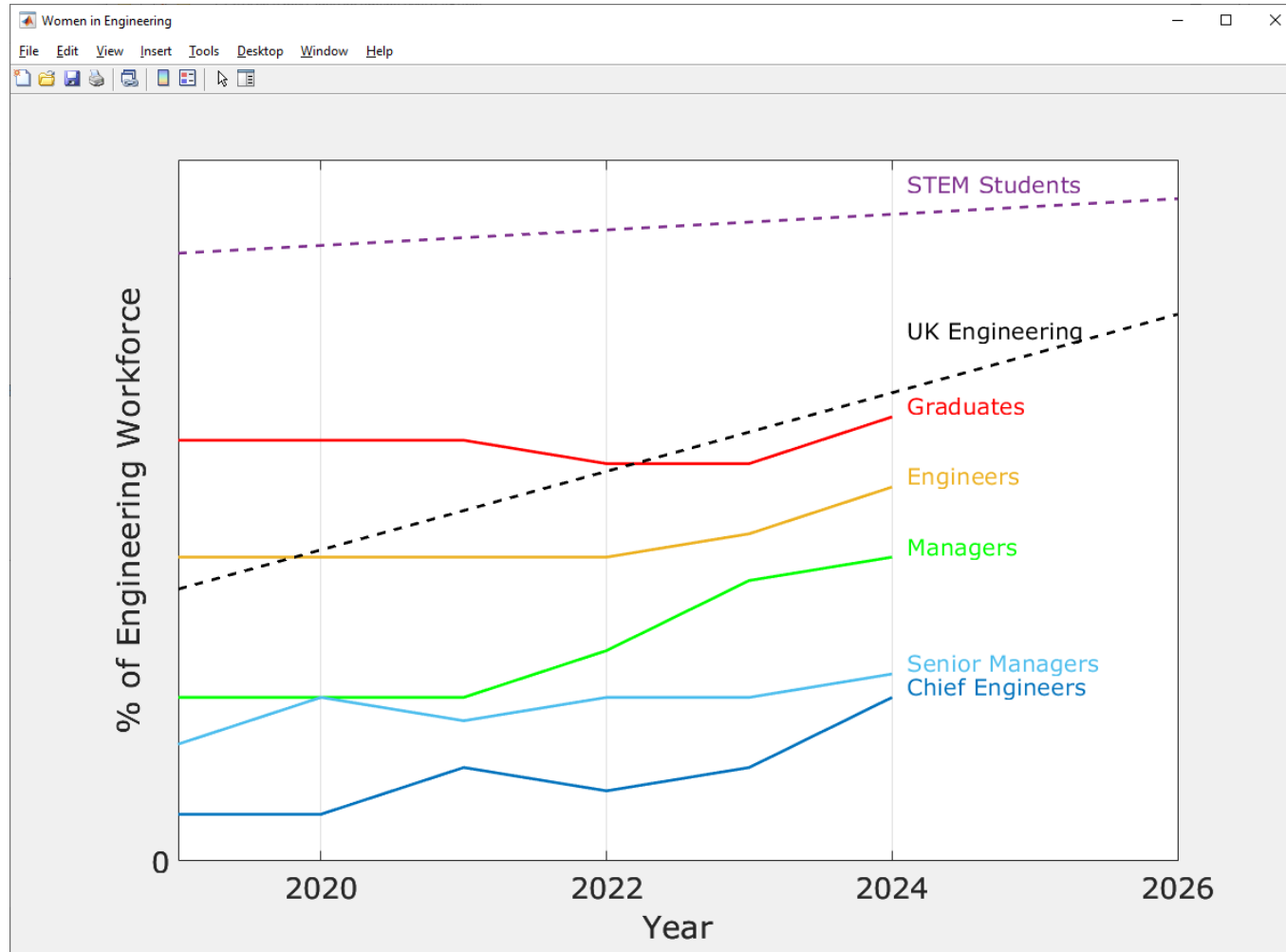
DRIVING EQUITY AND BELONGING
AT JAGUAR LAND ROVER



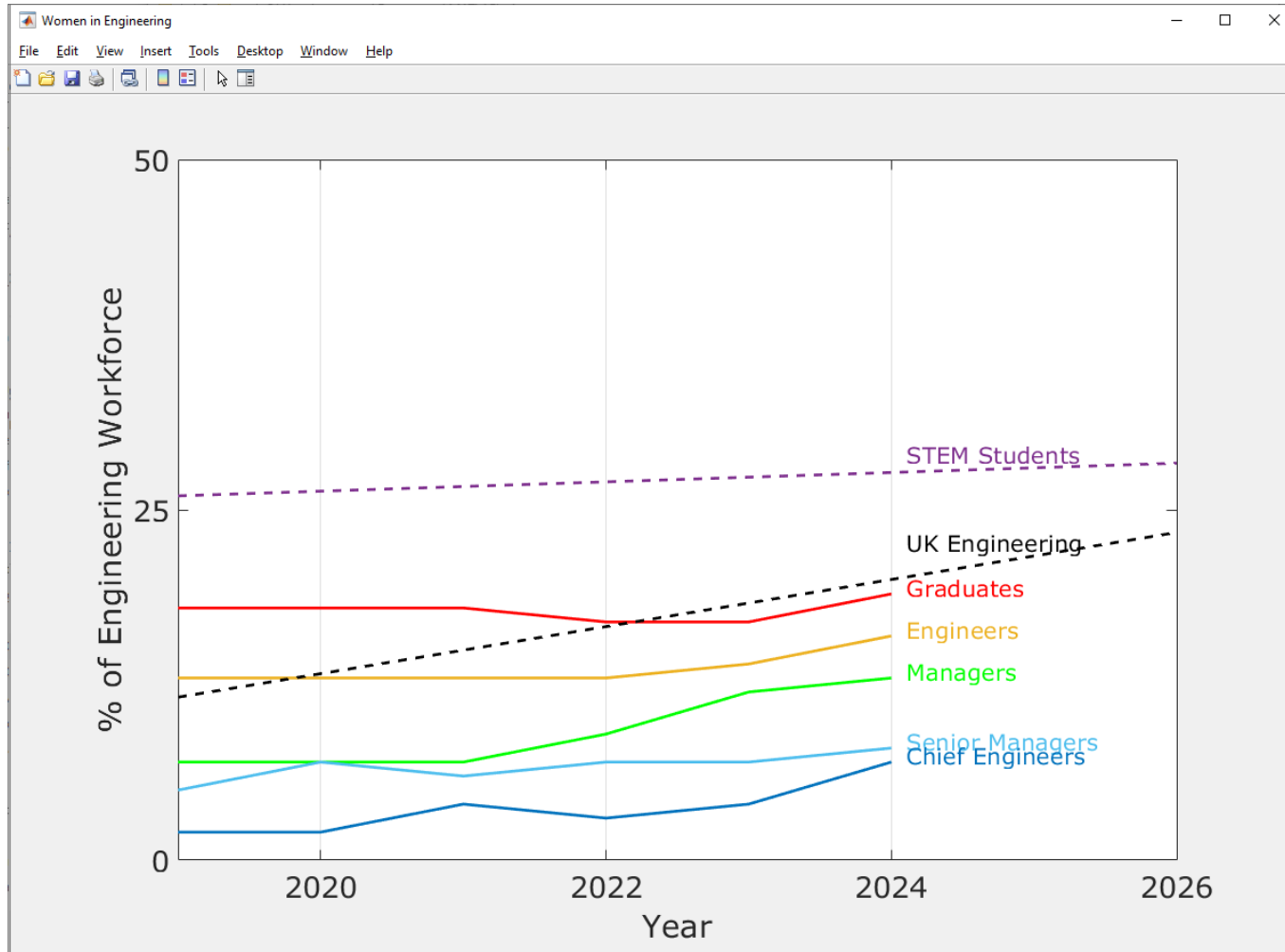
OUR 14 GLOBAL NETWORK GROUPS HAVE OVER 10,000 EMPLOYEE MEMBERS



Women in Engineering



Women in Engineering



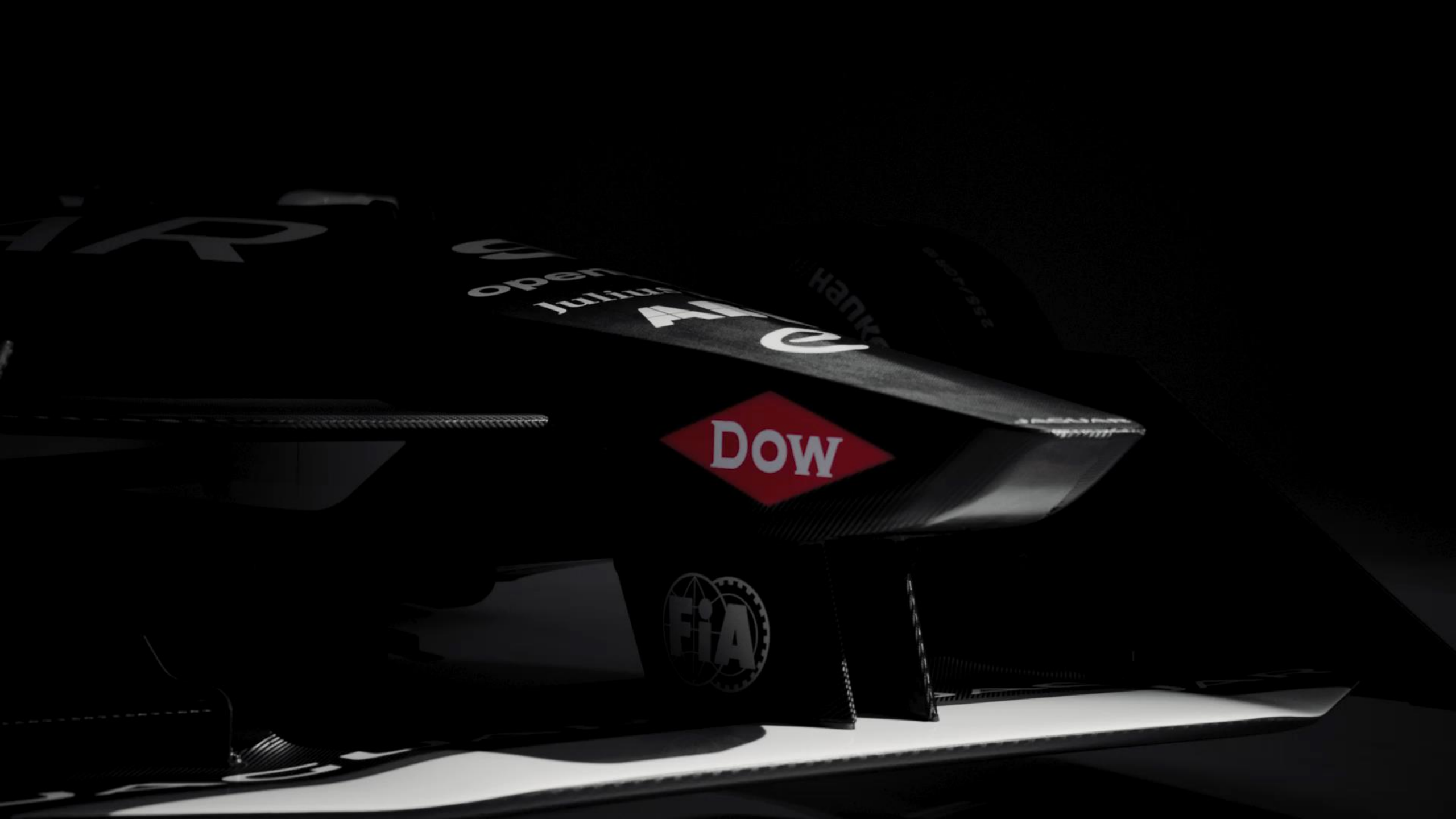
The following video contains
flashing images

JAGUAR



RACING





DOW

FIA

open
Julius

Hank

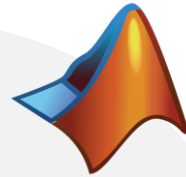
Pirelli

Jaguar TCS Racing

Control System Development



Analysis, Modelling and Visualisation



Optimisation



Report Generator



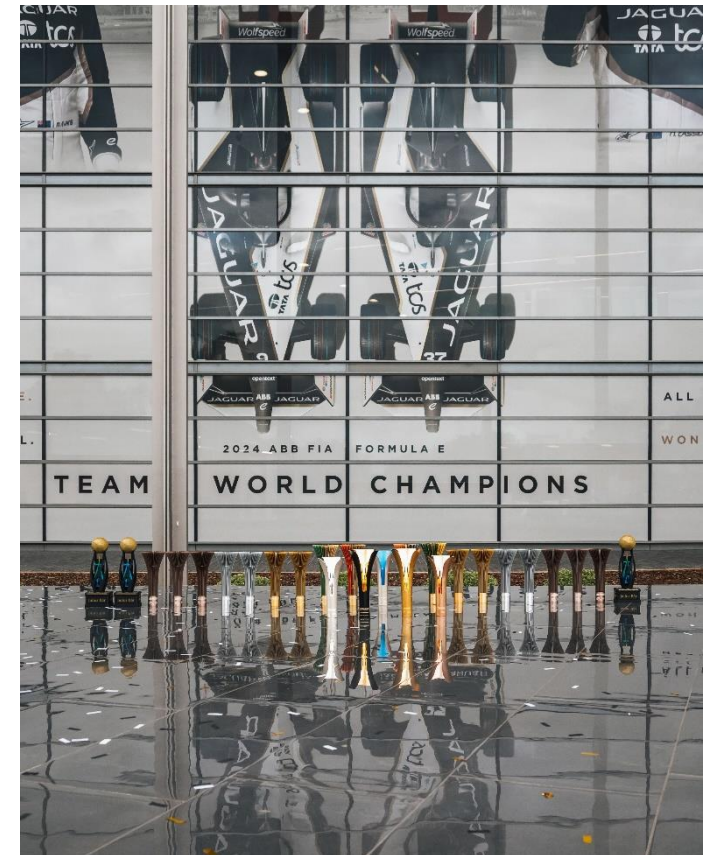
App Designer w/ Mathworks UI Element



JAGUAR



RACING



An aerial photograph of a vast, snow-covered landscape. In the foreground, a dense forest of evergreen trees is scattered across a wide, flat expanse of snow. A winding path or road, marked with tracks, leads through the trees. In the background, a range of mountains is visible, with the most prominent one having a snow-capped peak. The sky is filled with soft, white clouds, and the overall lighting suggests a bright, clear day. The text "RANGE ROVER TEST FACILITY: SOMEWHERE NEAR THE ARCTIC CIRCLE" is overlaid in white, bold, sans-serif font across the center of the image.

**RANGE ROVER TEST FACILITY:
SOMEWHERE NEAR THE ARCTIC CIRCLE**

Q&A