

# Knockout Qualifying Stage:

The Gateway to the Grand Prize

*Michigan International Speedway*

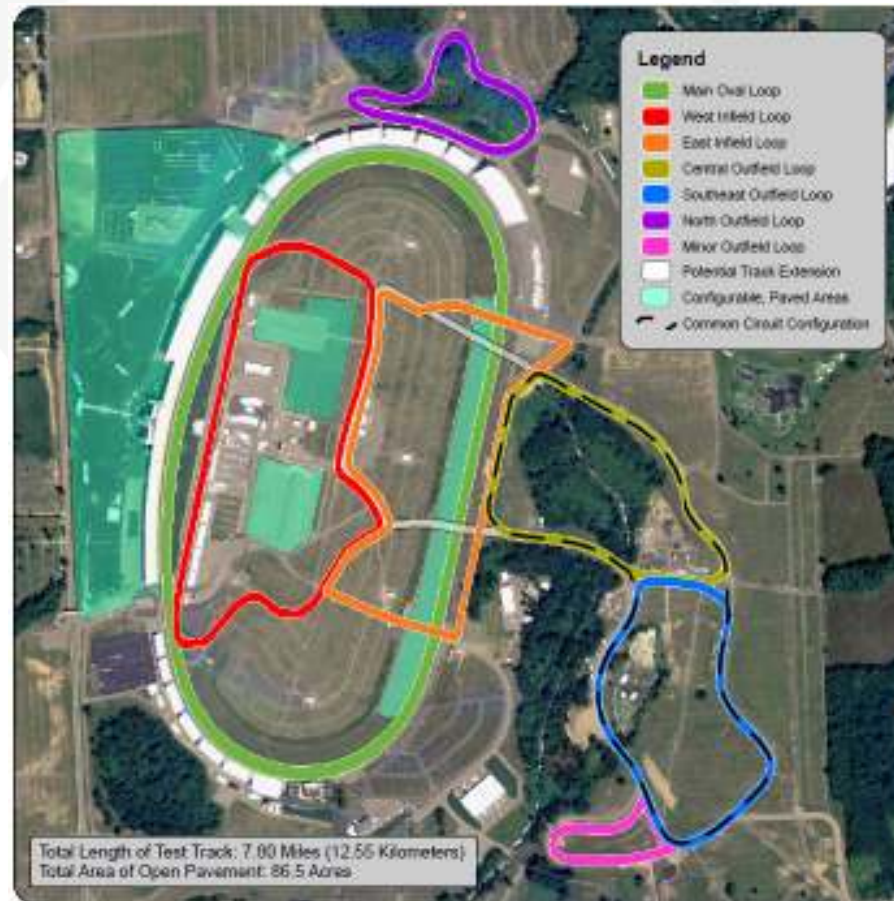
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## Knockout Qualifying Stage is Pivotal

- Timeframe: June 15 to 30, 2010
- Duration: 10 to 14 days depending on vehicles, weather
- Number of vehicles
  - Must have attended Shakedown
  - No phasing – everyone at once
- The most crowded situation
- Will need to work together to make this a success
- Multiple events going on simultaneously
- Likely to have separate events for Mainstream, Alternative Class vehicles

## MIS Facilities and Logistics

- Same as Shakedown



## All Vehicles Must Pass Tech Inspection

- Mechanical
- Electrical
- DAS – installed and functioning
- Fueling/Charging before Dynamic Safety Testing
- No hardware changes from here to end of competition
  - With the exception of repairs

## Pre-Event Dynamic Safety Testing

Must meet minimum requirements for these on-track tests (same as Shakedown):

- Braking test: stop from 60 MPH in less than 170' without knocking over cones in 12 foot lane
- Low-speed stability testing – 30 MPH slalom
- CU double lane change maneuver at 50 MPH
- 0 – 60 MPH: 15 s max Mainstream class; 18 s max Alternative class
- 40 – 65 MPH: maximum 9 s
- Skid pad – 0.7 g on 300' circle

## Vehicle Noise Test

- Based on ISO 5130:2007 (74 dB maximum total vehicle noise test)
- Drive-by test measure all sources of vehicle noise
  - WOT acceleration past meter at 50'
  - Repeated going other direction
- Weather and wind dependent
- Likely to be held on back straight apron

## On-Road Emissions Test

- Using Semtech DS mobile emissions instrumentation
- Vehicles unable to carry Semtech DS will have to tow a trailer with emission equipment in it



## On-Road Emissions Test

- Tailpipe will need to support dilution system
- Will drive a UDDS-type cycle to measure emissions
- PHEVs will have to be in charge-sustaining operation and use engine-on switch
- Must achieve Tier II Bin 10 emissions from a hot start
- Likely to be done after Range Test – no charging allowed for PHEVs
  - Ensures operation in charge-sustaining mode
  - Refueling prior to emissions test allowed if needed

## On-Track Grade Test

- Designed to provide assurance of minimum consumer acceptability
- Will use towing dynamometer set for 4% grade for your vehicle weight
- Test will use MIS oval in the bottom lane
- Pass/Fail event
  - Mainstream vehicles run 30 minutes at 60 MPH
  - Alternative vehicles run 15 minutes at 60 MPH

## Range Test

- Done on MIS oval after refueling and recharging
- 200 miles for Mainstream; 100 miles for Alternative
- 60 MPH average speed with 1 stop every 10-15 miles
- Maximum time based on minimum average speeds of 55 MPH
- Must meet minimum acceleration requirements during test
- Pass/Fail



## Efficiency Tests

- City test: 15 miles with 4 stops/mile; average speed 20 MPH – held on infield road course
- Suburban test: 30 miles long; 2 stops/mile; average speed 40 MPH – held on infield road course and oval track
- Highway test: 100 miles long; 1 stop/10 miles; average speed 60 MPH – held on oval track



## Efficiency Tests

- Based on National Household Transportation Survey (NHTS) data
  - Distribution of miles driven by US households
  - Average speed history of US households
  - Details can change to ensure proper weighting of miles and speeds across histogram
    - Will further develop with control vehicle and share data
- Anticipate at least two tests/day
  - No refueling expected between lower mile tests
  - Charging to “full” will be allowed

## The “Knockout”

- Vehicles unable to achieve minimum performance targets will be eliminated from the competition at this stage
  - Must pass all Dynamic Safety requirements
  - 67 MPGe minimum
  - 100 mile range for Alternative/200 mile range for Mainstream
  - Tier 2 Bin 10 emissions (at a minimum)
- Vehicles passing these criteria will be invited to proceed to Finals