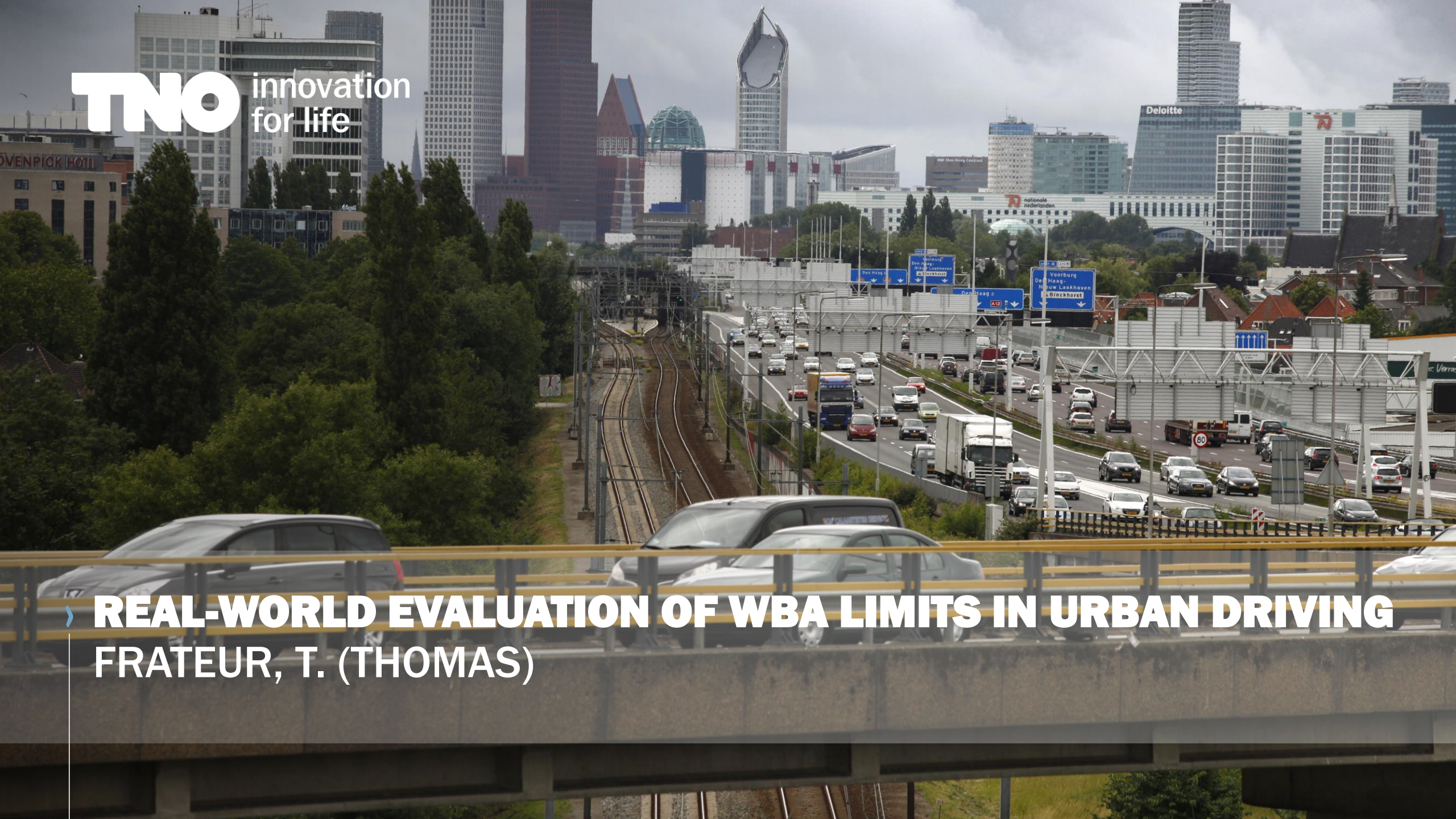


REAL-WORLD EVALUATION OF WBA LIMITS IN URBAN DRIVING

FRATEUR, T. (THOMAS)

EURO-7 GUIDING PRINCIPLES

Euro 7 guiding principles and objectives include – among others –

- Guarantee that a vehicle is as clean as possible under all normal driving conditions (excluding biased driving)
- Zero (or near zero) emissions in urban areas

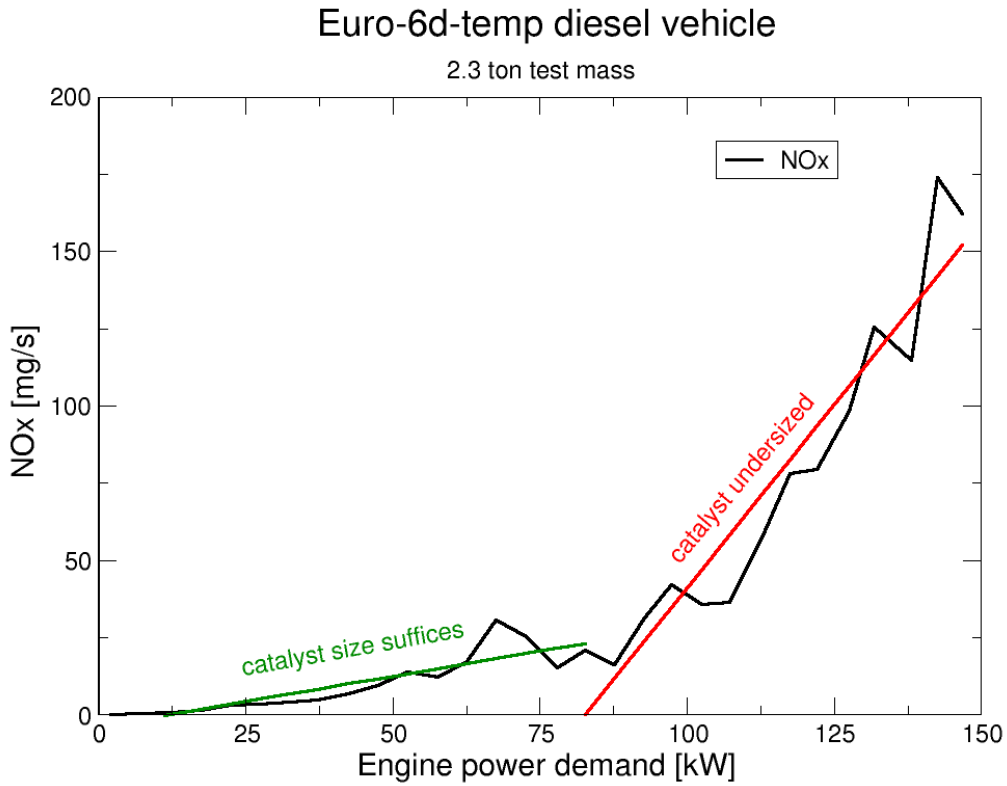
- Real driving emissions (RDE) allows a wide range of traffic conditions and driving styles for testing
- Euro-7 RDE should allow ‘any trip’ to enable testing in all normal driving conditions.
- Discussion remains whether driving behaviour can be deliberately biased.

WBA METHOD
VDA PROPOSAL

- WBA method is proposed to rule out biased driving in RDE.
- WBA imposes a maximum on average work per distance driven.
- Real life occurring driving conditions with many stops per km might be wrongly ruled out from RDE testing based on average work alone.

EMISSION REDUCTION

- High emissions at high engine power (acceleration) from on-road testing.
- Suspected emission control limitations for engine power above 50-70 kW.
- Restricting accelerations tested in type approval effectively ignores this shortcoming in emission aftertreatment systems.

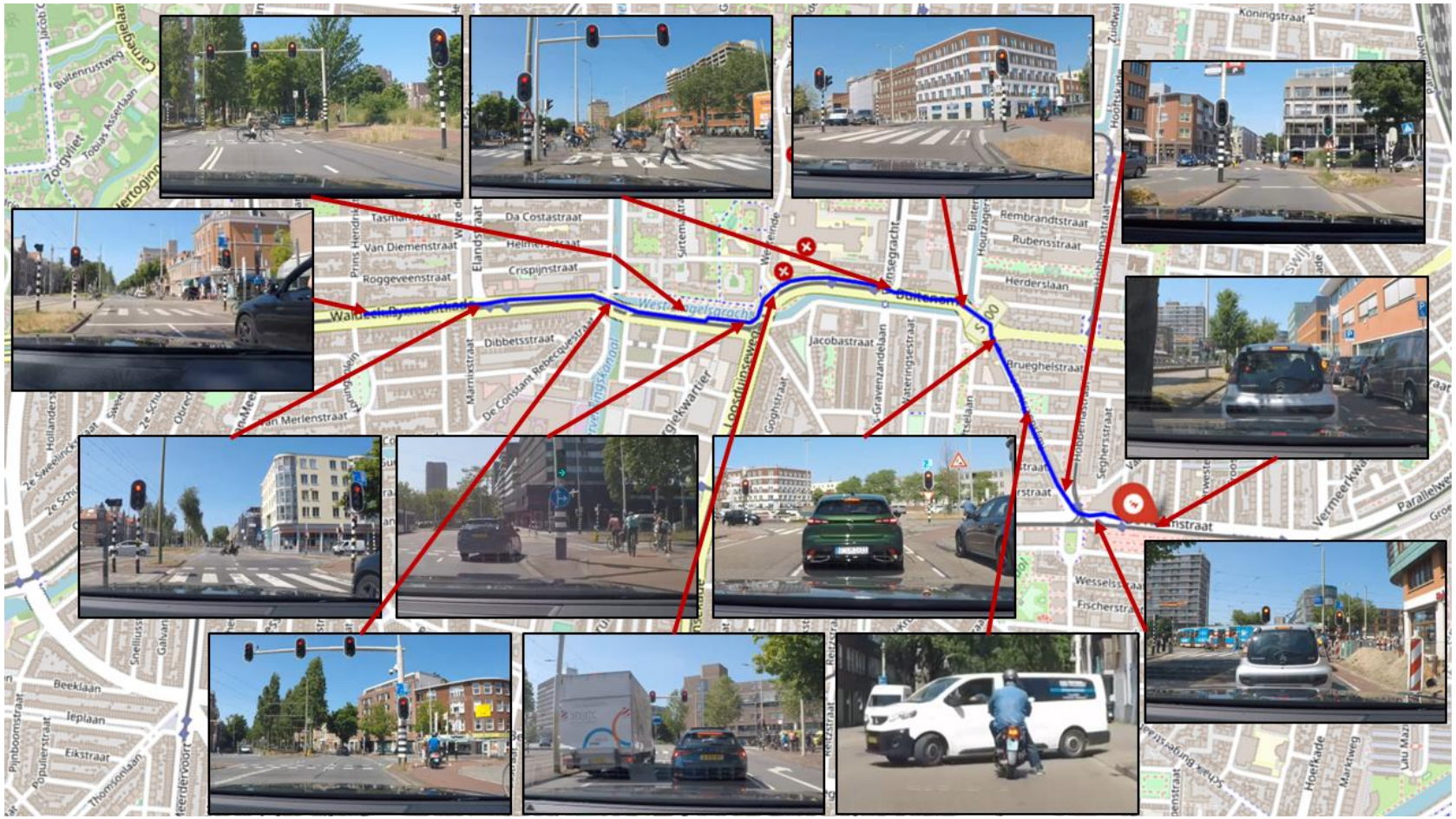


WBA METHOD
REAL WORLD EVALUATION

- Real world evaluation of the WBA method performed in Urban environment
  - 3 Dutch city routes
  - Upper-middle segment passenger vehicle
  - Following regular traffic
  - WBA calculation based on vehicle speed

URBAN DRIVING CONDITIONS
THE HAGUE EXAMPLE

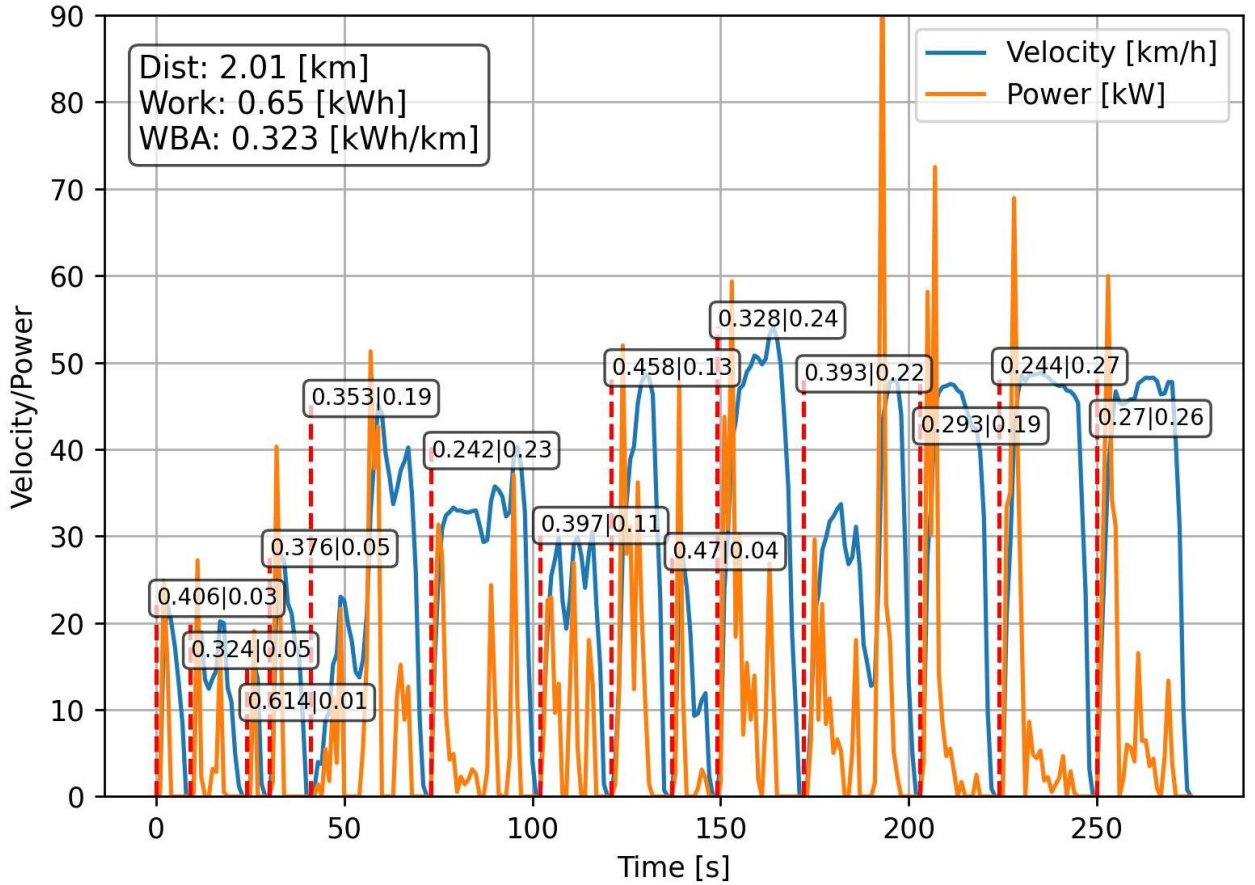
- Trip section of 2 km
- Average distance between stops: 155m
- Stops all related to either infrastructure or other traffic.



https://www.youtube.com/watch?v=88ak_vQIoC0

URBAN DRIVING CONDITIONS
THE HAGUE EXAMPLE

- High engine power is often used in urban regions during normal driving conditions.
- Average work well above 0.25 kWh/km
  - Without context, this section would be excluded from RDE based on the WBA limit.

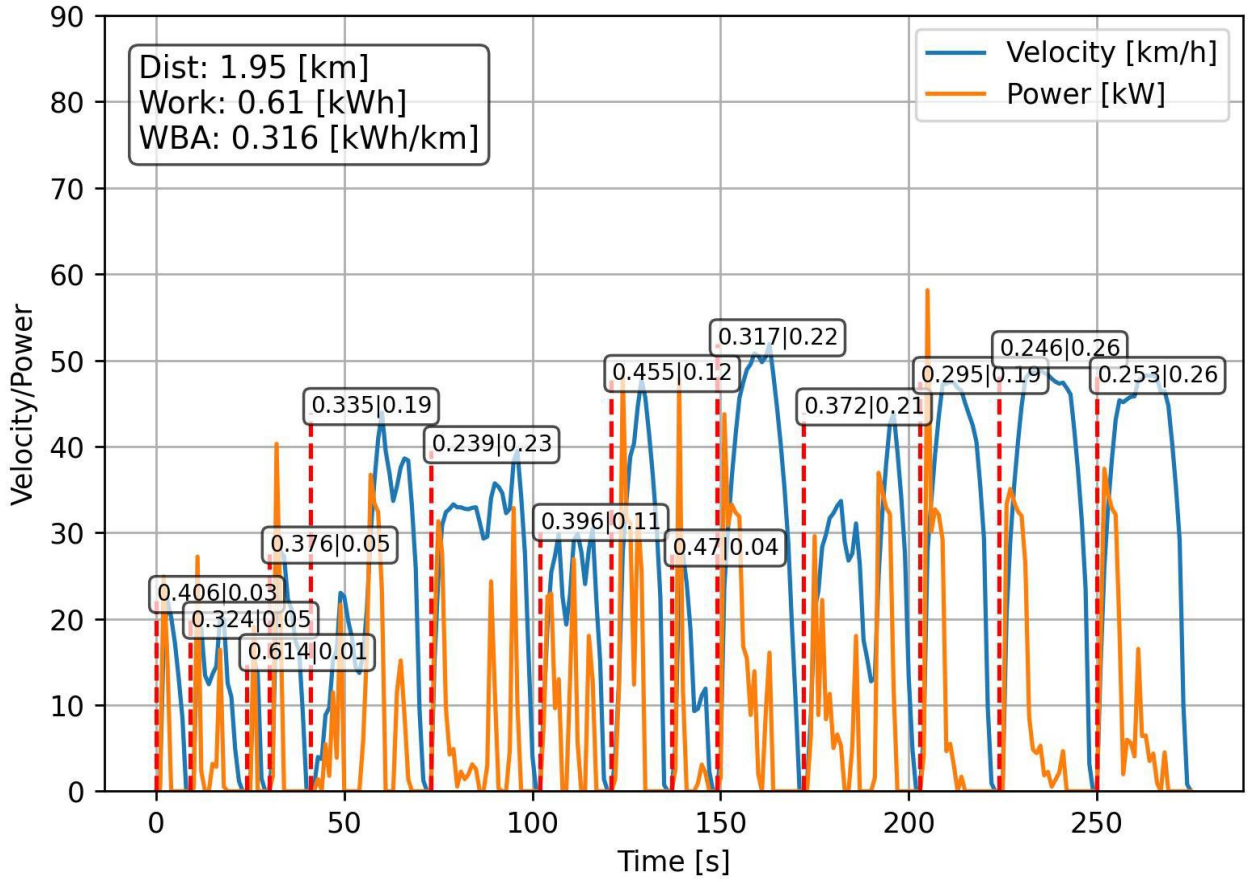


* Intermediate results as (WBA [kWh/km] | distance [km]).

https://www.youtube.com/watch?v=88ak_vQIoC0

URBAN DRIVING CONDITIONS
SENSITIVITY

- Reduced engine power using ‘full throttle’ method to 30 kW/ton (low powered vehicle).
- Only slight decrease in average work with severely limited power.
- Large sensitivity to infrastructure and traffic conditions.



* Intermediate results as (WBA [kWh/km] | distance [km]).

CONCLUSION

- High engine power is often used in urban driving conditions.
- The average work of a trip is largely determined by infrastructure and traffic conditions.
- A low WBA limit forces averaging of high-power conditions with low-power conditions.
- High power conditions can therefore not be tested separately in RDE
  - local (high) emissions are present where exposure is highest, e.g. city centres.
- WBA limit on RDE does not guarantee application of best available technology for all normal (urban) driving conditions.

- Report: Real-world evaluation of WBA limits in urban driving | TNO Publications
- Video: https://www.youtube.com/watch?v=88ak_vQIoC0


THANK YOU FOR
YOUR TIME
TNO innovation for life