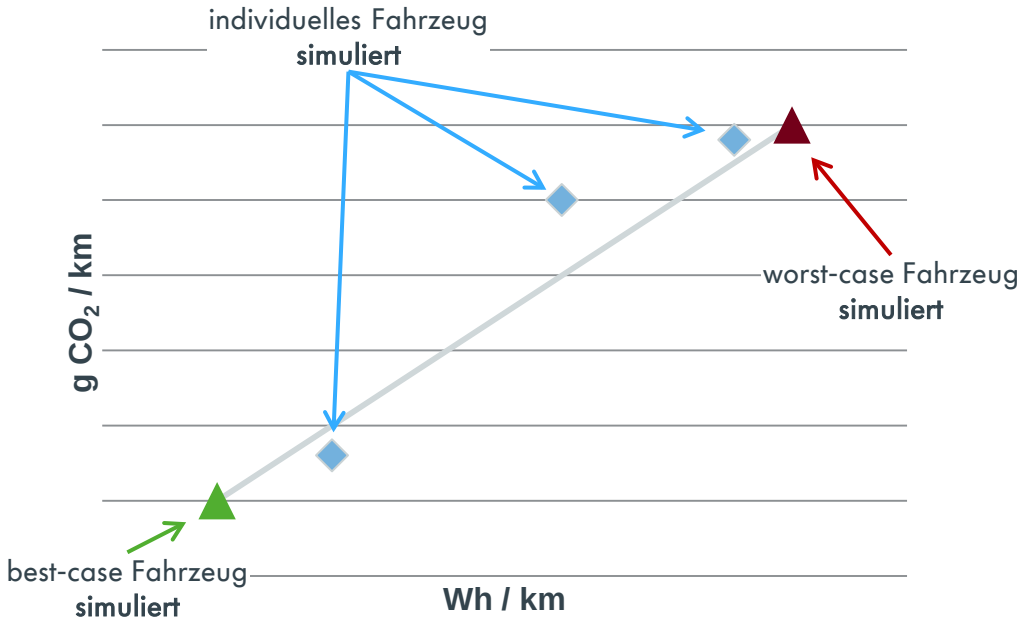
OVC-HEV vehicle family 3

Combined Approach

OVC-HEV: Combined Approach

Evaluation of combined Approach for

Vehicles:
1x best-case vehicle,
1x worst-case vehicle,
3x custom vehicles



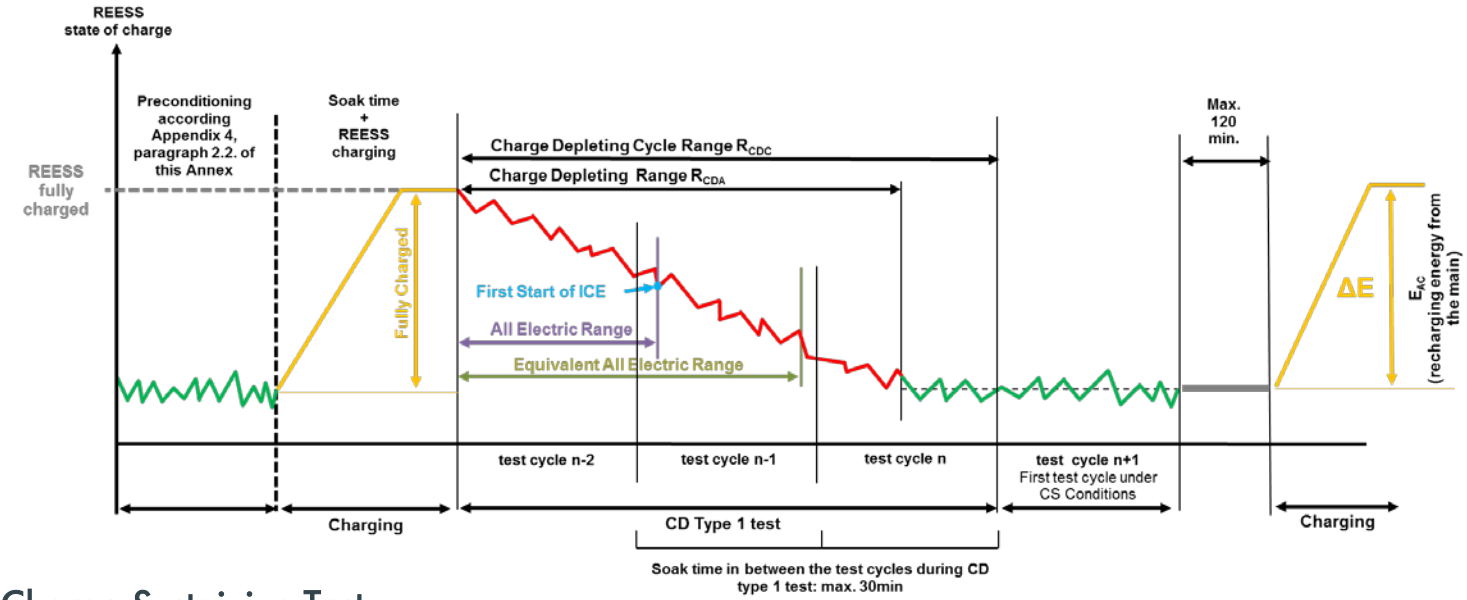
OVC-HEV: Combined Approach

Considered parameters

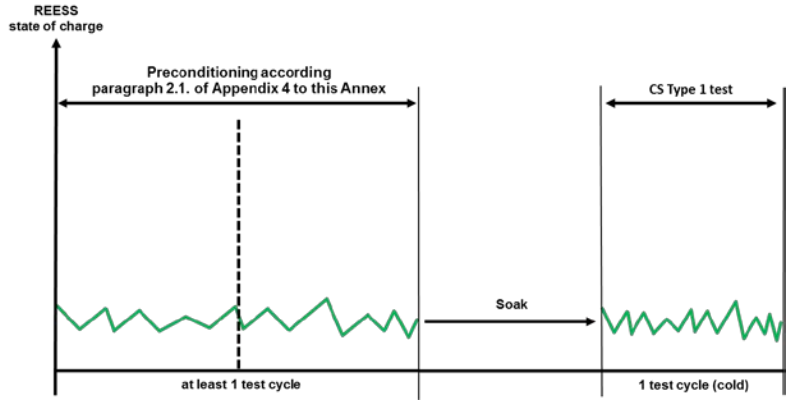
1. $CO_{2,CD}$
2. $CO_{2,CS}$
3. $CO_{2,weighted}$
4. AER
5. EAER
6. R_{CDa}
7. EC_{CD}
8. $EC_{weighted}$
9. EC

OVC-HEV: Combined Approach

Charge-Depleting Test:



Charge-Sustaining Test:



Mit ***n*** ist der transiente Zyklus benannt

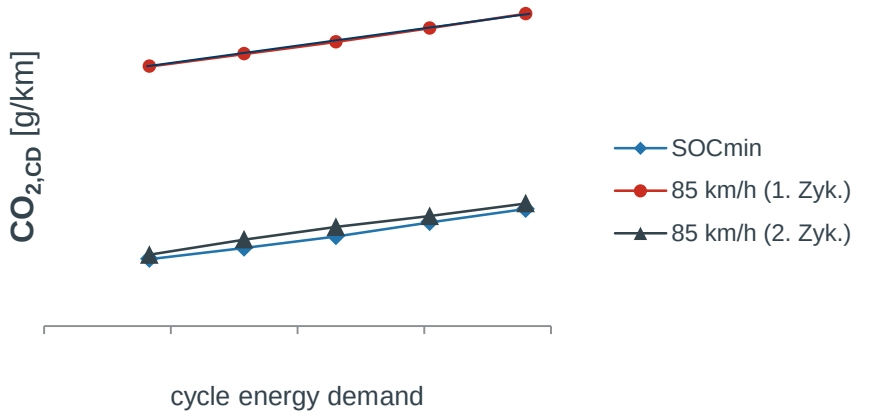
OVC-HEV vehicle family 3: Combined Approach

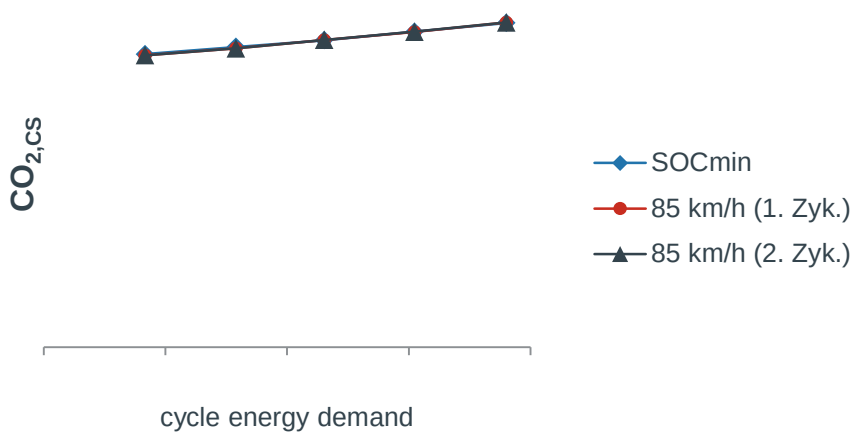
Results

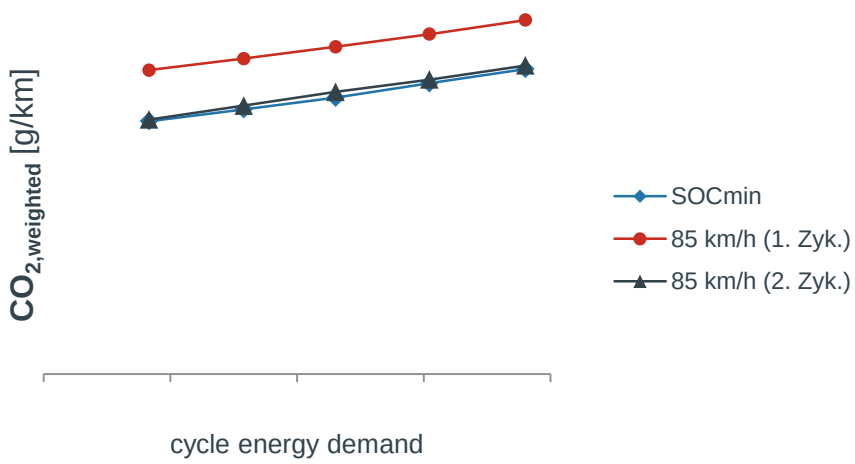
Combined Approach versus Simulation

OVC-HEV vehicle family 3: simulation results

R_{CDC}: identical ($n_{TMH} = n_{TML}$)

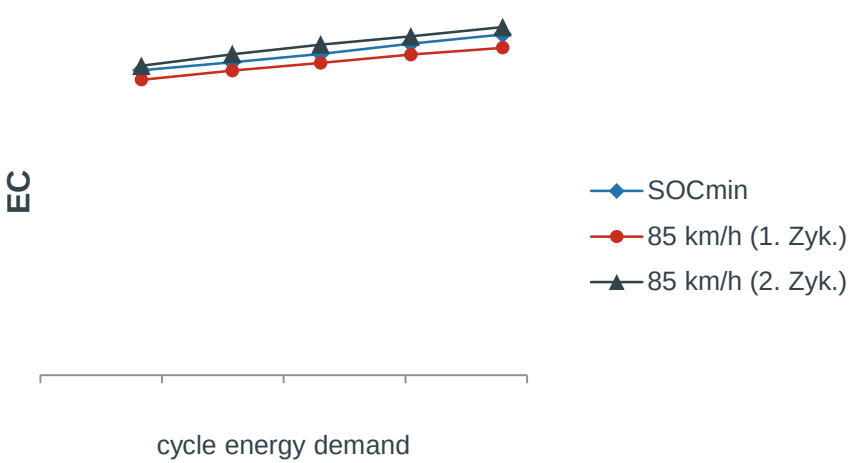


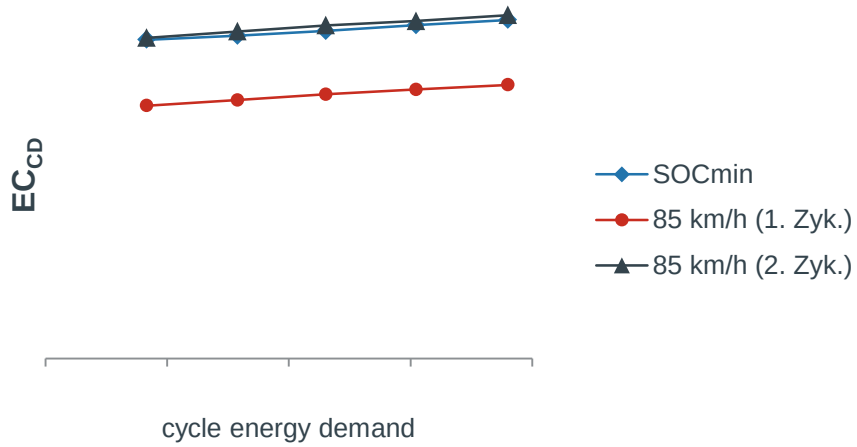


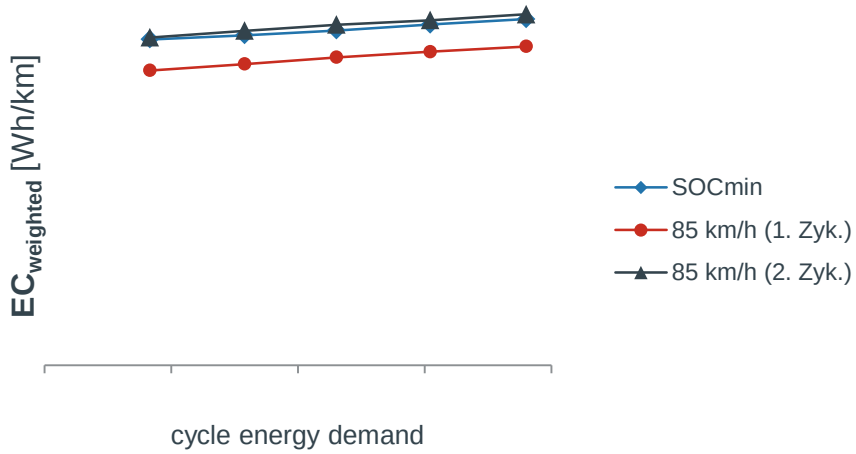


OVC-HEV vehicle family 3: simulation results

R_{CDC}: identical ($n_{TMH} = n_{TML}$)

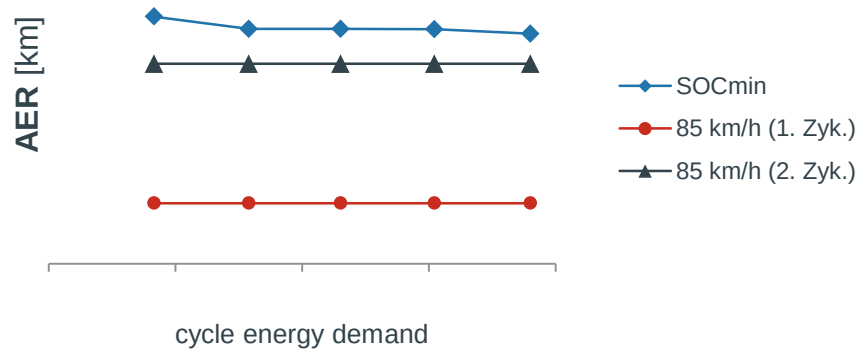


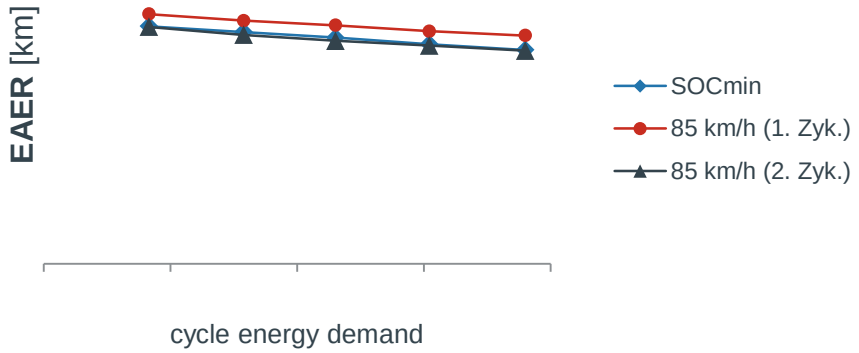


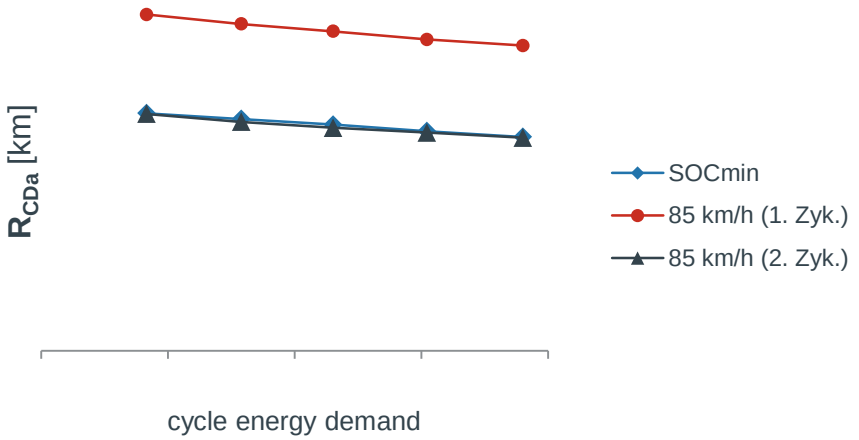


OVC-HEV vehicle family 3: simulation results

Comparison of different hybrid strategies







OVC-HEV vehicle family 3: simulation results

Results

AER_{City}: Simulation vs. Calculation

OVC-HEV vehicle family 3: simulation results

AER City: „Simulation“ vs „Calculation (averaged/weighted)“

$E_{DC,p,c}$ – Used energy of each individual phase, Wh;

$K_{p,c}$ – Weighting factor for each individual phase, - ;
$EC_{DC,p,c}$ – Electric consumption of each individual phase, Wh/km;
n_p – Phase specific number of available phases, -;
$EC_{DC,p}$ – Phase specific electric consumption, Wh/km;
p – Index for each phase of the test cycle (low, mid,...)
c – Index for the number of the considered cycle

UBE – Usable battery energy – Used battery energy during type 1 test, Wh;

The usable battery energy is determined from the beginning of type 1 test until the EoT is reached (last incomplete driven phase is included).

Weighting factors

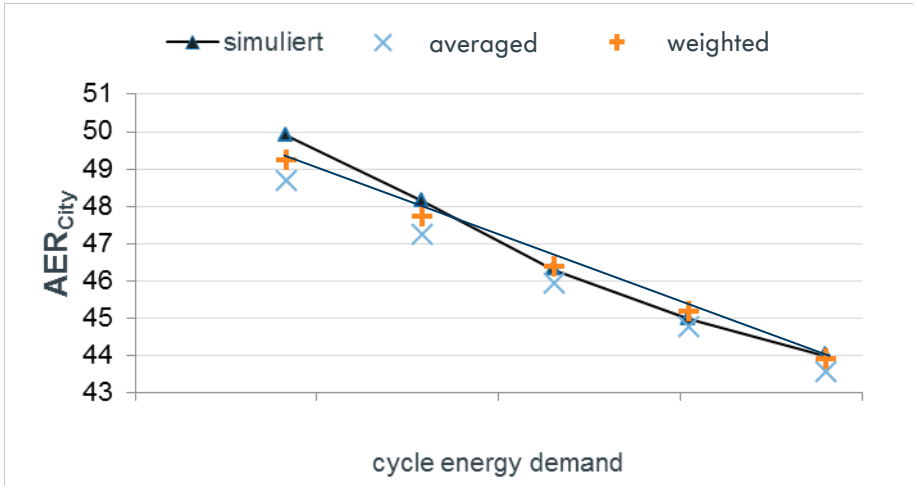
$$K_{p,1} = \frac{E_{DC,p,1}}{UBE} \qquad K_{p,i} = \frac{1 - K_{p,1}}{n_p - 1} \text{ for } i = 2 \ldots n_p$$

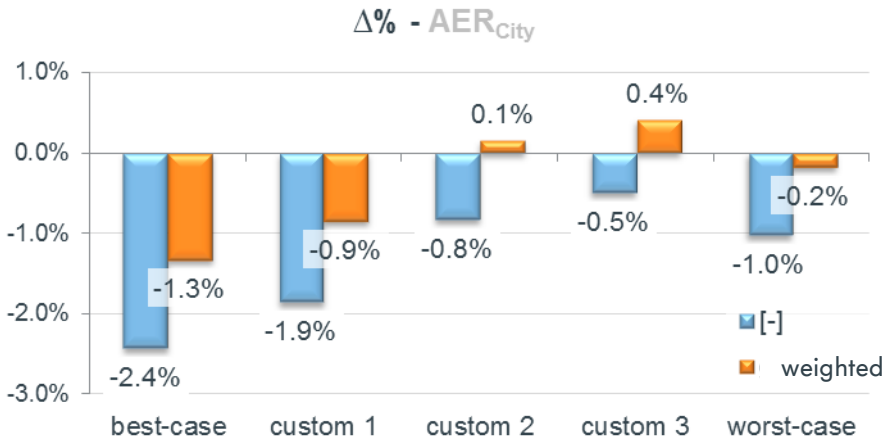
Phase specific electric consumption

$$EC_{DC,p} = \sum_{c=1}^{n_p} EC_{DC,p,c} \times K_{p,c}$$

Phase specific all electric range

$$AER_p = \frac{UBE}{EC_{DC,p}}$$





OVC-HEV vehicle family 3

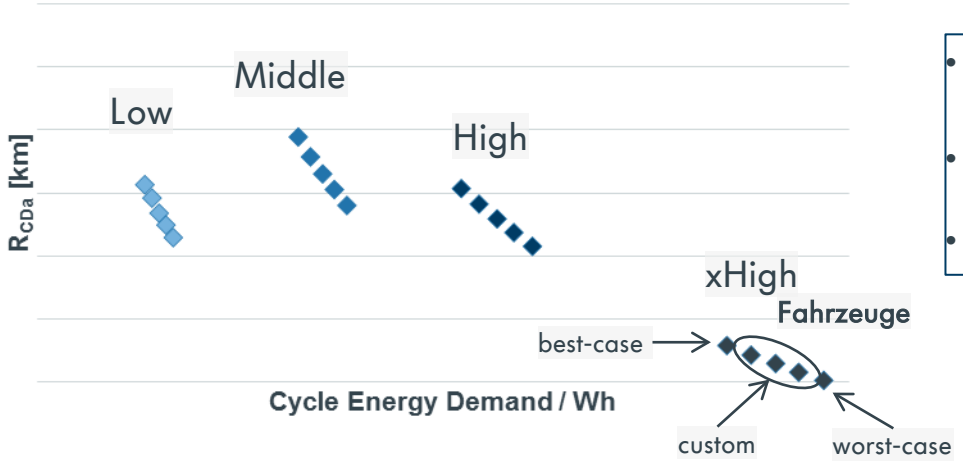
Results

Simulation: phase specific values
(excluding transition cycle)

Engine start at SOC_{min} , same R_{CDC}

OVC-HEV vehicle family 3: phase specific values

Results: Engine start at SOC_{min} , same R_{CDC}



- $R_{CDA,m} = \frac{UBE}{EC_{CD,m}}$
- $EAER_m = \left(\frac{CO_{2,CS,m} - CO_{2,CD,avg,m}}{CO_{2,CS,m}}\right) * R_{CDA,m}$
- $EC_m = \frac{E_{AC}}{EAER_m}$