How to fix the PHEV loophole

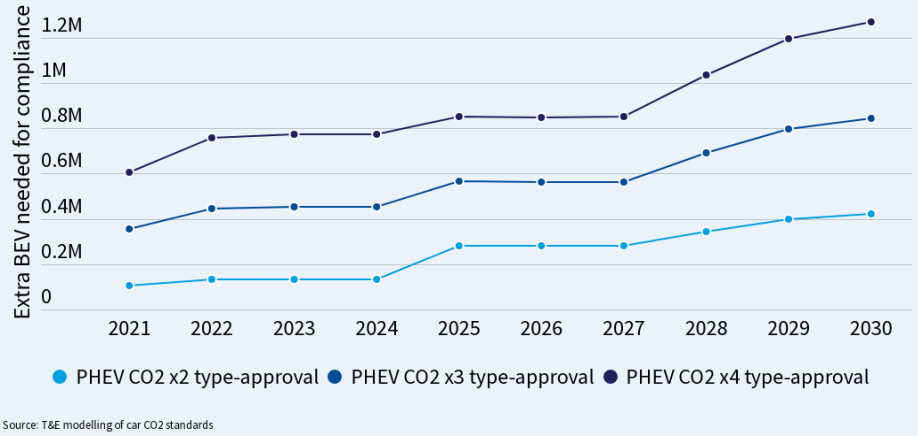
Comments on the European Commission's proposal to update PHEV utility factors

March 2021

Summary

PHEV sales have exploded in recent years with almost 1 million PHEVs sold in the EU in 2021. Carmakers are pushing their sales as their unrealistically low official CO_2 emissions allow them to easily meet their CO_2 targets. Yet PHEVs do not deliver the expected CO_2 savings on the road due to both their poor design and lack of incentives to charge. Real world CO_2 emissions of plug-in hybrids (PHEVs) are on average 2-4 times higher than official values[1]. This undermines the credibility of the car CO2 regulation as well as of Europe's wider climate efforts.

T&E calculates that - depending on how large PHEV CO2 emissions are in real world conditions - between 105,000-606,000 fewer ZEV models were sold last year than if PHEV's official CO2 values reflected real world figures. If this continues, a middle of the road assumption suggests around 5.3 million fewer zero emission cars will be sold between 2022-2030. But unrealistic PHEV CO2 emissions don't just hurt efforts to decarbonise transport, they also hit consumers with much higher fuel bills than expected undermining trust in a technology in which EU carmakers such as BMW are leaders.



Source: T&E modelling of car CO2 standards

Figure 1: Forecast of loss of EU27 BEV sales due to unrealistically low PHEV CO2 emissions. The modeling shows three scenarios where PHEV CO2 emissions are between 2-4 times higher than official figures.

[1] ICCT. (2020) Real-world usage of plug-in hybrid electric vehicles: Fuel consumption, electric driving, and CO2 emission.

At the heart of the problem are so-called utility factors (UFs)- overly optimistic assumptions of the share of kilometers driven electrically. Due to a lack of data at the time, these were not set on real world PHEV use but on conventional internal combustion engine (ICE) cars and are not representative of real world PHEV use resulting in artificially low CO2 emissions.

To tackle the problem the Commission has finally published a draft new methodology for determining utility factors which will be part of the Euro 6e Implementing Act. However, the Commission's proposal lacks the necessary ambition to tackle the problem of PHEVs head on, proposing only small incremental improvements to UFs from the mid 2020's with UFs which fully reflect real world PHEV use not implemented until the late 2020's or even 2030.

Delaying implementation of real world UFs until the late 2020's is not credible as PHEVs are a problem now. Every year that real world UFs are delayed, over a million PHEVs will be sold. By 2030, this will result in almost 11 mln suboptimal PHEVs sold across the EU[2]. These will stay on the road for decades, emitting several times more CO2 than official figures thereby making it harder for Member States and the EU to meet their climate goals. With PHEVs sales expected to peak at around 1.45 million in 2025/2026 it is critical that ambitious action to fix the problem of UFs takes place no later than the middle of this decade.

The slow pace of change is also disappointing given that the data necessary to set real world UFs (from on-bard fuel consumption meters (OBFCM)) will be available to the Commission from April 2022 (with more data coming in 2023, and annually thereafter). Therefore, there is no reason to delay real world UFs until the late 2020's, implementation sooner in 2025 is possible as the datasets can be analysed and ready by early-2023 latest. As T&E has already detailed in a previous briefing (Fixing the PHEV loophole) the Commission will have enough of this data in 2022 to determine real world UFs. If just 3% of EU PHEVs registered in 2021 transmit OBFCM records, 26,730 records will be received by the Commission. This is almost twenty times more data points than the 1,400 internal combustion engine vehicle records[3] used for the development of the current highly flawed WLTP UFs. In case there are any unexpected data issues, the Commission can also use the ICCT/Fraunhofer UF as a backstop in 2025 instead of the late 2020's as planned.

2025 is also a realistic timeline for carmakers as, unlike other car regulations such as new emission standards, changes to UF do not require vehicle engineering changes. An update of UFs simply fixes an erroneous calculation for determining CO2 emissions, it does not change the tests or require vehicle updates. This means that regulatory updates to PHEV UF can happen quickly. As the ongoing semiconductor crisis has shown, carmakers can tweak and ramp up both EV and conventional model

[2] 2022-2029, EU27.
[3] Eder, A., Schütze, N., Rijnders, A., Riemersma, I., Steven, H. (2014) Development of a European utility factor curve for OVC-HEVs for WLTP.

production quickly when needed. Battery electric car sales reached 9.1%[4] this year, much higher than the 6.8% forecast[5] driven by carmakers focusing sales on more profitable models with higher CO2 emissions so more BEV's had to be sold for car makers to comply with CO2 targets.

Therefore T&E calls on the Commission to revise it's proposed update of UF to ensure that:

1. **Real world utility factors based on data collected from on-board fuel consumption meters are used for the calculation of PHEV CO_2 emissions and for compliance with fleet CO_2 standards no later than 2025.**

2. **Utility factors are updated regularly in line with the frequency with which the Commission receives updated OBFCM data from the EU fleet. This will ensure PHEV CO2 emissions continue to reflect real world values and to allow car makers to benefit from improvements to the technology.**

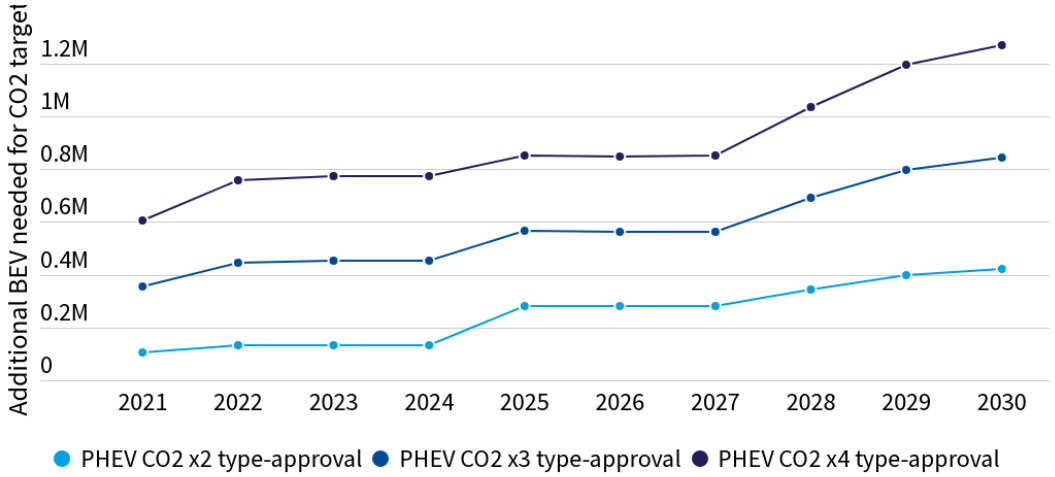
1. Introduction

A reform of how EU plug-in hybrid (PHEV) CO2 emissions are determined is urgently needed. Several independent EU studies have shown that real world PHEV CO2 emissions are several times higher than official figures. Their sale today undermines the effectiveness of the CO2 regulation as car makers benefit twice from their sale. Firstly, through lower CO_2 values, and secondly through super credits until 2023 and Zero and Low Emission Vehicle benchmarks (ZLEV credits) from 2025.

The result is that PHEV sales significantly reduce BEV sales because if official PHEV CO2 emissions were in line with real world emissions carmakers would have to sell more BEVs to meet their CO2 targets. This is becoming more of a problem as the share of PHEV sales grow. PHEV sales have increased from just 1.1% of the EU market in 2019[6] to 8.9% in 2021,[7] with close to a million PHEVs sold last year. T&E calculates (figure 1) that depending on how large PHEV CO2 emission are in reality- data suggests it is between 2-4 times higher than official values[8]- between 105,000 - 606,000 less BEVs were sold last year than if PHEV's official CO2 values reflected real world figures. If this continues, a middle of the road assumption suggests

[4] ACEA. (2022, 02, 02) Fuel types of new cars.
[5] T&E. (2020) Mission (almost) accomplished.
[6] T&E. (2021) CO_2 targets propel Europe to 1st place in emobility race.
[7] ACEA. (2022, 02, 02) Fuel types of new cars.
[8] ICCT. (2020) Real-world usage of plug-in hybrid electric vehicles: Fuel consumption, electric driving, and CO2 emission.

that around 5.3 million less BEVs will be sold between 2022 to 2030[9]. This would both hinder the EU's transition to electromobility and make it harder to achieve climate goals.



Source: T&E modelling of car CO2 standards

Figure 1: Forecast of loss of EU27 BEV sales due to unrealistically low PHEV CO2 emissions. The modeling shows three scenarios where PHEV CO2 emissions are between 2-4 times higher than official figures.

At the heart of the problem are overly optimistic assumptions on the share of electric km driven by PHEVs -known as utility factors (UFs)- compared to the actual share of electric kilometers driven. Official UFs are not based on real world PHEV use, due to a lack of data when the UFs were first developed, but on outdated data on conventional internal combustion engine (ICE) cars. These unrealistic UFs are not representative of real world PHEV use, resulting in unrealistically low CO_2 emissions.

To tackle the problem the Commission has finally published a draft new methodology for determining utility factors which will be part of the Euro 6e Implementing Act. However, the Commission's proposal lacks the necessary ambition to tackle the problem of PHEVS head on, allowing car makers to continue to benefit from artificially low emitting PHEVs and undermining Car CO2 targets into the late 2020's. This briefing provides an analysis of the Commission's proposal and shows why it is inadequate for restoring the integrity of the car CO2 standards.

[9] Methodology: each year, the minimum number of BEV required to meet the CO2 regulation (-15% emission reduction in 2025 and the -55% emission reduction in 2030 proposed the European Commission) was calculated in two scenarios: one with the official CO2 emissions from PHEVs, one where the real world emissions are assumed to be 2-4 times higher than official values. The share of PHEV is assumed to be the same in both scenarios. Therefore, the difference in the BEV number between the two scenarios shows the number of BEV missing due to the wrong accounting of PHEV emissions. Middle of the road assumption is based on PHEV emissions which are 3 times higher than official values.

2. The Commission needs to introduce utility factors based on real world data in 2025 at the latest

The European Commission is planning a two step approach to updating UFs:

1. **20YY:** From a as yet to be determined date in the future the Commission plans to use utility factors which are fully based on real world data from on-board fuel consumption meters. While the Commission has not yet published the expected start date, from previous Commission communications T&E expects this to be in the late 2020's or 2030. As the first OBFCM data will be available to the Commission from later this year, provisionally the UF will be based on ICCT/ Fraunhofer[10] study on PHEV utility factors.

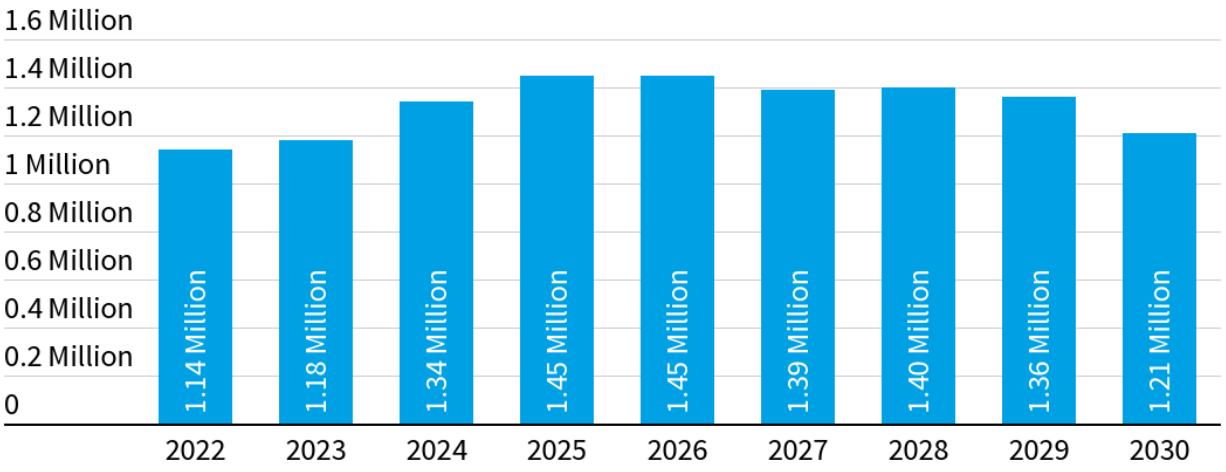
2. **2025 to 20YY-1:** Before real world UF are implemented in 20YY the Commission will set progressively decreasing UF starting at the current WLTP UF's and decreasing towards the 20YY UF.

2.1 2025 should be the latest date of application of RW UFs

The problem with the Commission's current approach is that it does not move fast enough to update UFs based on real world use, proposing only small incremental improvements to the overly optimistic PHEV UF from the mid 2020's. This will continue to allow a large gap between real world and type-approval figures meaning that carmakers will continue to unfairly benefit from tax benefits and low CO2 values, the stringency of the car CO2 standards will continue to be undermined (meaning higher CO2 in the real world) and consumers will continue paying a lot more for fuel than promised.

Yet the problem with PHEV CO_2 emissions is current and therefore action to fix the problem cannot be delayed until the end of the decade. Over 1 million PHEVs are expected to be registered in the EU each year in the 2020s with sales peaking in 2025/2026 at around 1.45 million PHEVs per year. From the late 2020s onwards their sales are expected to decrease to just over a million in the early 2030's. Waiting until the late 2020's to fully implement real world utility factors will mean that millions of PHEVs are sold in the EU with artificially low CO2 emissions. Every year that real world UF are delayed over a million PHEVs will be sold, between 2025 and 2029 that equates to 7 million PHEVs. These cars will stay on the road for decades, emitting several times more than official figures, thereby making it harder for the EU and Member States to meet their climate goals. Bringing forward the date which real world UF apply to 2025 is critical to ensuring that PHEVs do not continue undermining car CO2 targets in the mid 2020's.

[10] ICCT. (2020) Real-world usage of plug-in hybrid electric vehicles: Fuel consumption, electric driving, and CO2 emission.



Source: T&E modelling of EU PHEV car sales based on IHSM production data

Figure 3: EU27 PHEV sales forecast 2022-2030.

2.2 Why real-world OBFCM data should be used

To ensure official PHEV CO2 emission figures reflect real world CO2 emissions, UFs needs to be based on real world data collected annually by the Commission from on-board fuel consumption meters (OBFCM) fitted to all PHEVs from 2021. Yet the Commission's proposal will not use OBFCM data for UFs until the late 2020's/2030. The Commission is concerned about the amount of OBFCM records that will be collected starting in 2022 and the representativeness of the data. However, as T&E has already detailed in a previous briefing (Fixing the PHEV loophole) the Commission will have enough real world data in 2022 from on-board fuel consumption meters fitted to PHEVs to set realistic real world UFs starting in 2025.

The first set of OBFCM data from PHEVs registered in 2021 will be available to the Commission in April 2022. T&E calculates that there should be sufficient PHEV OBFCM records collected in 2022 to develop real world UFs. If just 3% of EU PHEVs registered in 2021 transmit OBFCM records, 26,730 records will be received by the Commission in 2022. This is almost twenty times more data points than the 1,400 internal combustion engine vehicle records[11] used for the development of the current WLTP UFs. The PHEV OBFCM data obtained should also be more representative of PHEV operation since it will be based on the operation of PHEVs not conventional internal combustion engine vehicles. As a backstop already known UF from the ICCT/Fraunhoffer study- can be set as temporary 2025 UF instead of 20YY -while 2021 OBFCM data is analysed by the Commission this year. The ICCT/Fraunhoffer UF can also be used as UF is 2025 in the case that there are any issues with the OBFCM data received by the Commission in 2022. However if this is the case OBFCM UF must be implemented in 2026 since more OBFCM data will be received by the Commission in April 2023.

[11] Eder, A., Schütze, N., Rijnders, A., Riemersma, I., Steven, H. (2014) Development of a European utility factor curve for OVC-HEVs for WLTP.

2.3 Why lead time for carmakers is not appropriate in this case

By delaying the use of real world UFs until the late 2020's or even 2030 the proposal provides carmakers with an excessive amount of time to adjust to real world UFs instead of addressing the climate problems caused by soaring PHEV sales. Unlike other car regulations such as new emission standards, changes to UF do not require car makers to make vehicle engineering changes which need a certain amount of lead time to complete. An update of UFs simply fixes an erroneous calculation for determining PHEV CO2 emissions, it does not change the tests themselves or require vehicle updates.

As such, updates to PHEV UF can happen quickly and do not need several years of lead time to implement. The recent semiconductor crisis has shown that carmakers can quickly ramp up EV production when required. This year BEV sales increased from 5.4% of the EU market in 2020 to 9.1%[12], higher than the 6.8% forecast[13] driven by carmakers using the limited amount of chips available in more profitable models which also have higher CO2 emissions. Higher EV sales are therefore needed to compensate for more sales of higher emitting models in order to ensure compliance with CO2 targets. In any case real world UF based on OBFCM data starting in 2025 would give car makers at least two years lead time (a realistic timetable given that the Commission will receive 2021 OBFCM data in April of this year) to comply. This is sufficient time for car makers to ensure that they meet their 2025 CO2 targets for the year, especially if real world data shows that PHEVs are driven electrically as much as car makers claim[14].

Therefore, T&E calls on the Commission to tighten the proposal for updating WLTP PHEV UF to ensure that they adequately tackle the problem of high real world PHEV CO2 emissions. This means that data from OBFCM should be used to set utility factors no later than 2025, with ICCT/Fraunhofer UF used as a backstop while real world data is analysed by the Commission in 2022.

3. ACEA's proposal will not reduce the real world gap

The European Automobile Manufacturers Association (ACEA) has countered Commission proposals with an even weaker approach which will do little to close the real world gap in PHEV CO2 emissions. ACEA proposes to:

1. **2025:** As a first step ACEA proposes for the WLTP UF will be adjusted to assume that PHEVs are charged every 3 out of 4 days instead of the currently assumed everyday charging.

2. **2028-2030:** As a second step ACEA proposes for the UF to be based on OBFCM data.

ACEA's proposal for 2025 is overly optimistic as it assumes a much higher rate of charging frequency than takes place in reality. T&E assumes that ACEA's proposal is based on the findings of the ICCT/Fraunhofer

[12] ACEA. (2022, 02, 02) Fuel types of new cars.
[13] T&E. (2020) Mission (almost) accomplished.
[14] Fleetnews (2021, 08, 05) Ford Kuga PHEV drivers cover half their total mileage on electricity.

PHEV study[15] which found that German privately owned PHEVs were charged on average every three out of four days. However, by basing UF on this assumption ACEA fails to take into account findings from the same study which found that company owned PHEVs were charged much less, only about every second day. Even this may be overly optimistic as data from a Belgian leasing company shows that more than half of their PHEVs are charged less than once a week[16].

Considering that in 2021 in the EU's seven biggest car markets the majority of PHEV sales were company cars (71%), even reaching as much as 90% in Belgium[17], failing to take company cars into account when setting UF is not a credible approach and would yet again result in overly optimistic utility factors and unrealistically low PHEV CO2 values .As can bee seen in figure 3 ACEA's proposed UF for 2025 differ little from current WLTP UF used today and fall far short of the UF determined by ICCT/Fraunhofer (EC 20YY).

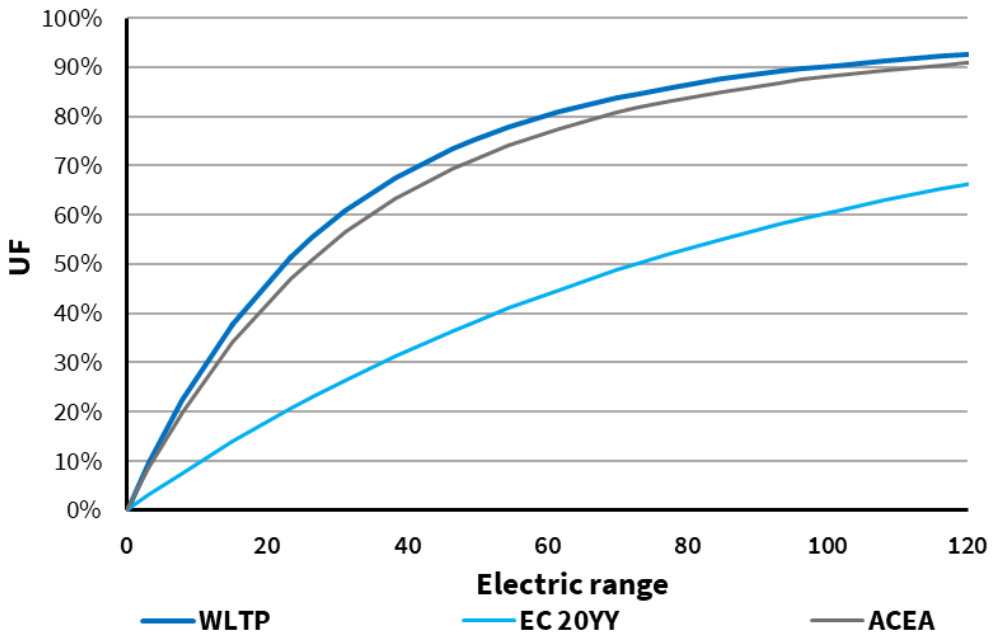


Figure 3: WLTP and proposed UF curves. EC 20YY is based on dj=2600 and ACEA is based on dj=914.

In addition, focusing only on charging frequency fails to take into account other important factors which have a large impact on PHEV UF and therefore CO2 emissions. This includes driving distance and driving mode which can have a large bearing on PHEV CO2 emissions. Testing by T&E found that charging the battery using the internal combustion engine while driving can result in emissions up to twelve times higher than official values[18]. Frequently driving longer trips with a PHEV also reduces the share of electric driving due to the small electric range of PHEVs. In contrast, OBFCM data takes this into account as it

[15] ICCT. (2020) Real-world usage of plug-in hybrid electric vehicles: Fuel consumption, electric driving, and CO2 emission.
[16] Stroohm. Bart Massim. (2020,10,29) To plug or not to plug-in (hybrid).
[17] Datforce 2021 EU sales data for Belgium, France, Germany, Italy, the Netherlands, Poland and Spain.
[18] T&E. (2020) Is Europe heading for a new dieselgate?

covers all vehicle operation and driving styles from a wide range of PHEVs registered across EU Member States and is therefore more reliable for setting UFs.

3. Summary

The European Commission's proposal to update PHEV utility factors falls far short of the ambition necessary to tackle the problem of fake electric sales in the EU. As PHEV sales are mostly growing in the early-mid 2020s, using real-world CO2 values by the late 2020's or even 2030 is too late to solve the problem. The current proposal will do little to close the huge gap between official and real world CO2 emissions until the late 2020's/2030 thus allowing PHEV sales to continue undermining Europe's climate ambition and misleading consumers and national tax authorities. This is despite real world fuel consumption data from the EU PHEV fleet being available to the Commission from April this year.

Continuing to allow carmakers to benefit from artificially low PHEV CO2 values is unacceptable. It will only delay the EU's transition to zero emissions mobility and make it harder for the EU and Member States to reach climate goals. As such, T&E calls on the Commission to amend the proposal to:

1. **Introduce real world utility factors based on OBFCM data for the calculation of PHEV CO_2 emissions and for compliance with fleet CO_2 standards no later than 2025. ICCT/Fraunhofer UF should be used as a placeholder until OBFCM based UF are determined by the Commission this year.**

2. **Update utility factors on a regular basis in line with the frequency with which the Commission received OBFCM data from the EU fleet.**

It is now in the hands of the Commission to fix the obsolete system of PHEV type-approval and ensure that carmakers benefit fairly from the sale of these cars. Without improvements to the current proposals suboptimal PHEVs will continue undermining car CO2 standards and polluting the planet for almost a decade.

Further information

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