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Updated detailed Assessment of the Member States Implementation Reports on the National Policy Frameworks for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure. Implementation of Art 10 (3) of Directive 2014/94/EU

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4.1.1.1 CNG

Of all the alternative fuel and transport mode combinations, the pair CNG/road is the second best covered. Figure 4.1.1-10 summarises the information for the CNG vehicle estimates and targeted publicly accessible refuelling points as provided in the NIRs for the next decade, as well as the 2016 and 2018 situation.

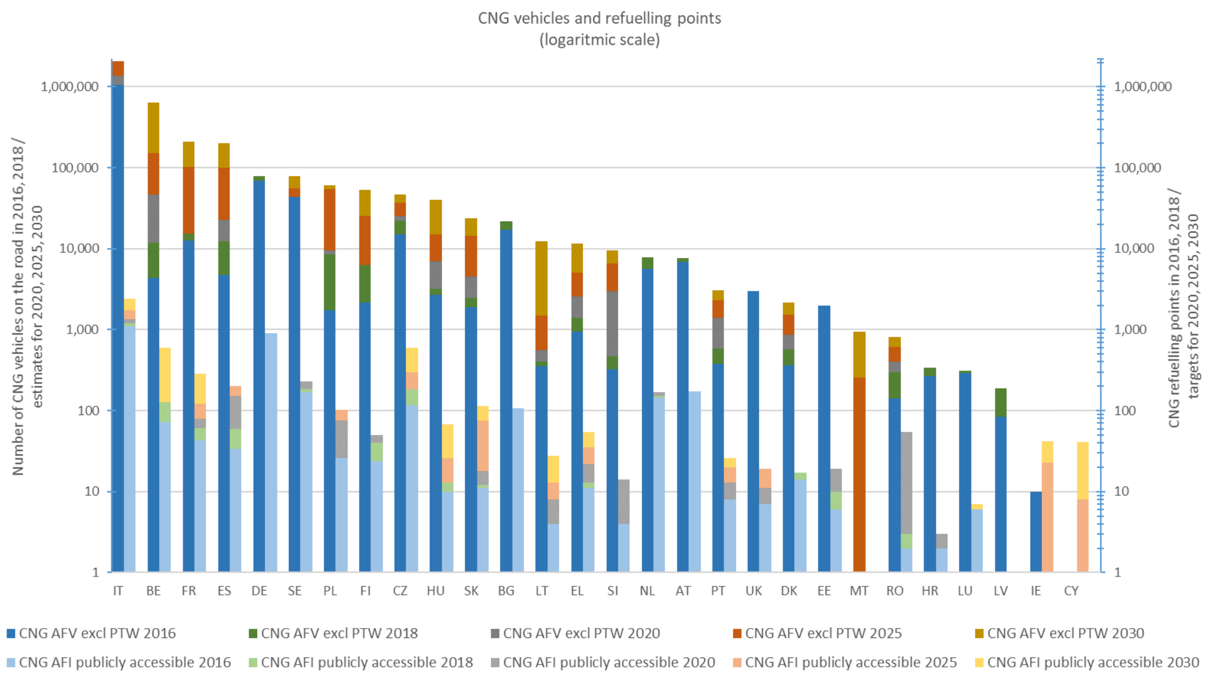

Figure 4.1.1-10 CNG vehicle estimates and refuelling points targets for 2020, 2025 and 2030[1]

CNG vehicles

- **(Coverage)** In the NIRs, 24 MSs have provided at least some historical data (2016-2018) (86%), and 18 MSs have provided at least one estimate for the decade 2020-2030 (64%). In the NPFs, only 14 MSs had provided at least one estimate for this decade.
- **(Change NIR vs NPF)** Considering the 29 cases where a change could be computed (CNG estimates provided both in the NPF and NIR), a decrease of ambition is noticeable in 10 cases (3 in 2020), a similar ambition in 14 cases (7 in 2020) and an increase of ambition in 5 cases (2 in 2020). In other 22 cases, an estimate was provided only in the NIR and the changes could not be computed.
  Regarding the EU-wide perspective the criteria used for representativity did not allow the display of the resulting averages for the next decade (i.e. there were less than 50% of the number of MSs for UWA results and less than 50% of the EU population for the PWA results).

[1] Member States are ordered by their estimated fleet of CNG vehicles (from high to low values).

EU-wide change of CNG vehicle estimates			
Year	2020	2025	2030
Number of MSs	12	10	7
UWA [%]			
EU population [%]	42.19	29.93	8.73
PWA [%]			

- **(Attainment)** The 2018 attainment of the foreseen CNG vehicle estimates ranges significantly across MSs from 15.41% (Slovenia) to more than 100% (France and Sweden) for 2020, from 7.08% (Slovenia) to 78.25% (Sweden) for 2025, and from 1.82% (Belgium) to 55.22% (Sweden) for 2030. One Member State (Luxembourg) foresees a decreasing trend of its CNG vehicle fleet in the future.
  The average situation from an EU-wide perspective is reported in the following table:

EU-wide attainment of CNG vehicles estimates			
Year	2020	2025	2030
Number of MSs	17	18	17
UWA [%]	72.67	42.91	36.19
EU population [%]	60.74	61.82	50.01
PWA [%]	82.09	29.20	15.60

- **(Progress)** Considering the 16 MSs for which progress could be calculated, comparing the 2018 situation with their foreseen CNG vehicle fleet evolution, 7 MSs result to progress slowly, 7 adequately and 2 fast .
- **(Growth rate)** The average annual growth rate characterising the foreseen evolution of CNG vehicles for the next decade ranges from 4% (Sweden) to 41% (Belgium). Out of the 16 computed annual growth rates, 3 are below 10%, 4 are in between 10% and 20%, 7 are in between 20% and 30% while 2 are above 30% (Belgium and Spain).
  The average situation from an EU-wide perspective is reported in the following table:

EU-wide average growth rate of CNG vehicles	
Year	2016 - 2030
Number of MSs	16
UWA [%]	20
EU population [%]	61.70
PWA [%]	21

- **(CNG vehicle share)** The maps in Figure 4.1.1-11 and Figure 4.1.1-12 show the evolution of the shares of CNG vehicles in 2018, 2020, 2025 and in 2030 (according to the estimates provided in the NIRs). The share of CNG vehicles in the total vehicle fleet (excluding PTWs) ranges from 0% (Cyprus and Malta) to 2.42% (Italy) in 2018. This share is also foreseen to vary in the future in the 18 MSs providing CNG vehicle estimates

- from 0% (Malta) to 3.06% (Italy), with 4 MSs above 0.5% share (Belgium, Czechia, Italy and Sweden) in 2020,
- from 0.01% (Romania) to 4.62% (Italy), with 4 MSs above 0.75% share (Belgium, Czechia, Italy and Sweden) in 2025, and
- from 0.01% (Romania) to 8.38% (Belgium), with 3 MSs above 1% share (Belgium, Finland and Sweden) in 2030.

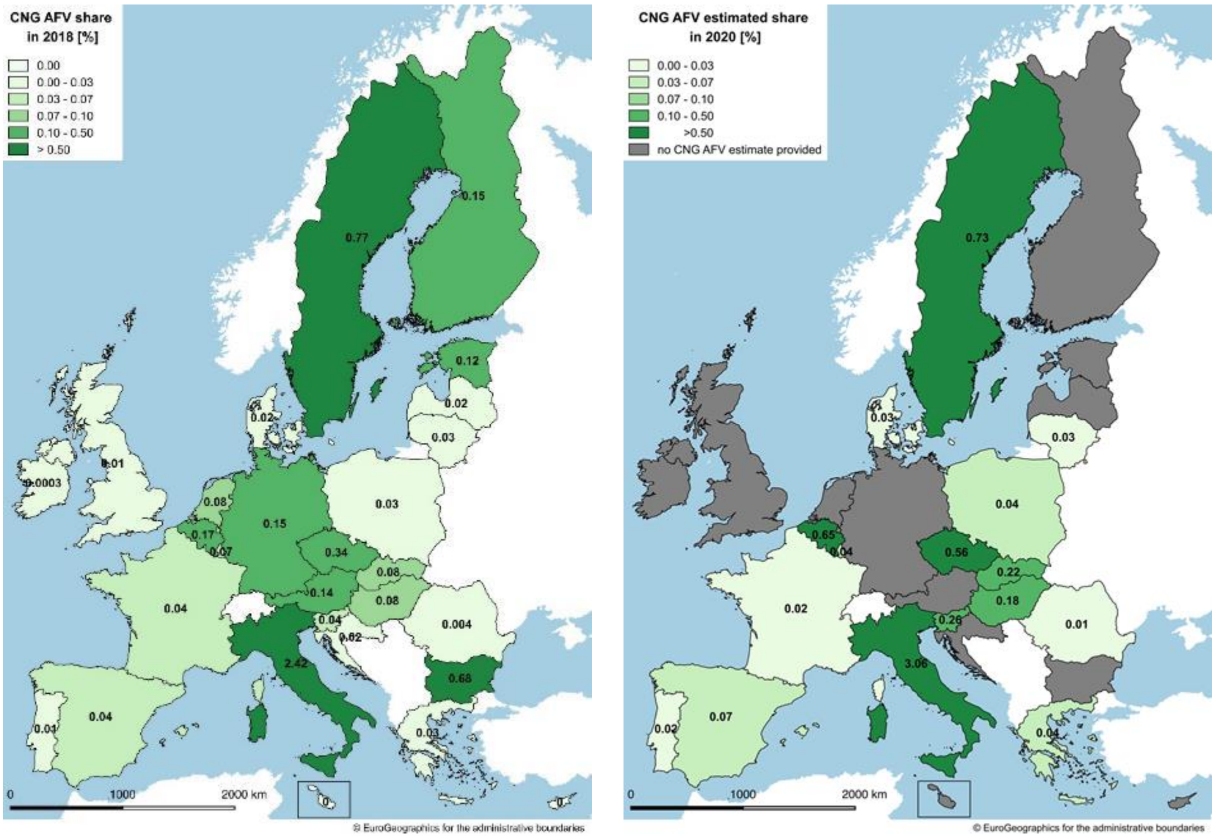

Figure 4.1.1-11 Shares of CNG vehicles in use in 2018 (left map) and estimated in 2020 (from in the NIRs) (right map)

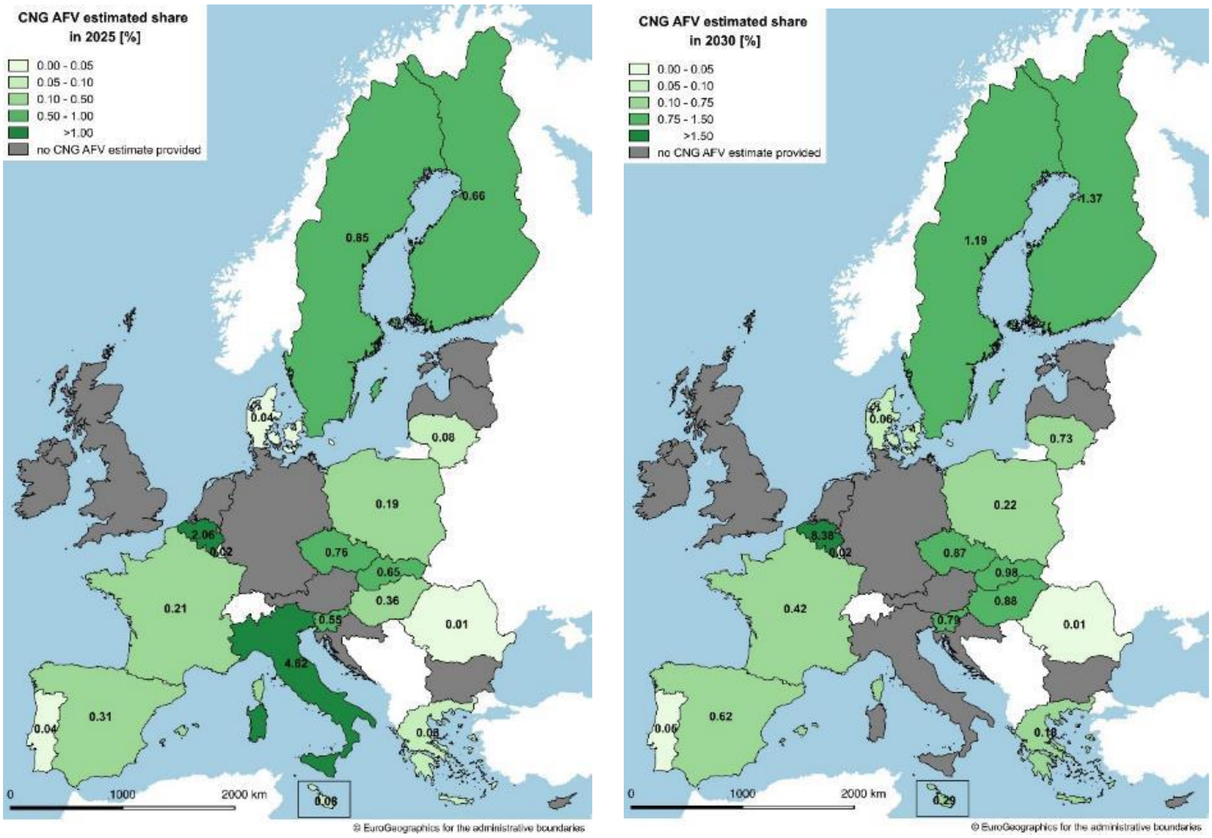

Figure 4.1.1-12 Shares of estimated CNG vehicles (from the NIRs) in 2025 (left map) and in 2030 (right map)

The EU-wide average situation concerning CNG vehicle shares is shown in the following table (it should be noted that the decrease of the PWA in 2030 compared to 2025 is due to the absence of the Italian share in 2030):

EU-wide CNG vehicle shares				
Year	**2018**	**2020**	**2025**	**2030**
	(calculated)	(estimated)		
Number of MSs	28	17	18	17
UWA [%]	0.20	0.35	0.64	1.00
EU population [%]	100.00	60.83	61.91	50.10
PWA [%]	0.37	0.70	1.16	0.82

The maps in Figure 4.1.1-13 and Figure 4.1.1-14 show the evolution of the shares of alternative fuels vehicles normalized by population (that can be named as AFV motorisation) per Member State in 2018, 2020, 2025 and in 2030 (according to the estimates provided in the NIRs) for the pair CNG/road. In 2018, there were 6 MSs having more than 1 CNG vehicle per 1,000 inhabitants. In 2020, there are 4 MSs foreseen to have more than 2 CNG vehicles per 1,000 inhabitants. In 2025, there are 6 MSs foreseen to have values above 3 CNG vehicles per 1,000 inhabitants. In 2030, there are 9 MSs foreseen to exceed the value of 4 CNG vehicles per 1,000 inhabitants. In 2018, 2020 and 2025, Italy presents the highest values of CNG vehicles per 1,000 inhabitants: 17.38 in 2018, 22.32 in 2020 and 33.89 in 2025. In 2030, Belgium presents the highest value of 56.53 CNG vehicles per 1,000 inhabitants.

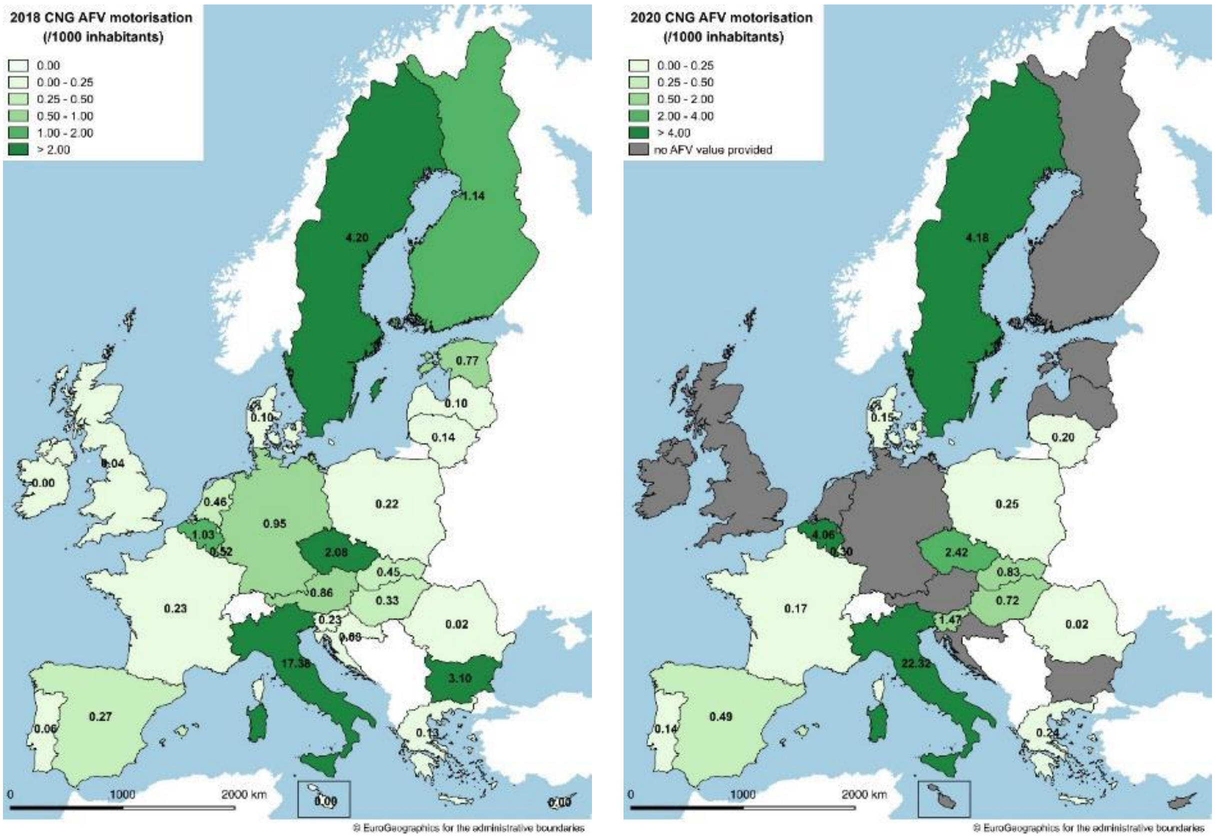

Figure 4.1.1-13 Shares of CNG vehicles normalized by population (CNG vehicle motorisation) in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

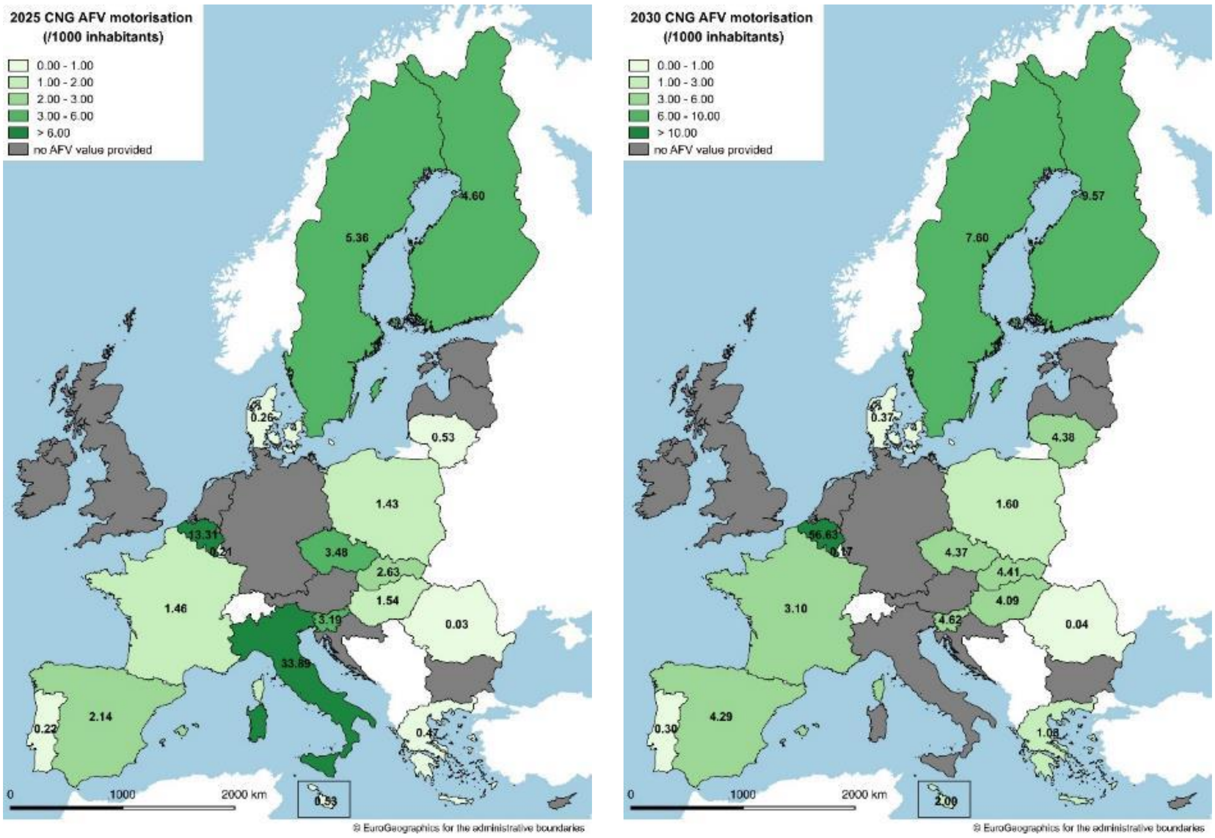

Figure 4.1.1-14 Shares of estimated CNG vehicles (from the NIRs) normalized by population (CNG vehicle motorisation) in 2025 (left map) and in 2030 (right map)

CNG AFI (publicly accessible)

- **(Coverage)** Twenty-three MSs (82%) have provided at least some historical data (2016-2018) and 24 MSs (86%) at least one target for the decade 2020-2030. For the three years of the next decade, the number of provided targets is higher in the NIRs than in the NPFs (60 vs 47).
- **(Change NIR vs NPF)** Considering the 42 situations where a change could be computed (CNG AFI targets provided both in the NPF and NIR), a decrease of ambition is noticeable in 10 cases (6 for 2020), a similar ambition in 23 cases (11 for 2020) and an increase of ambition in 9 cases (5 for 2020). In other 17 cases, a target was provided only in the NIR and the changes could not be computed.

  Looking at these data from an EU-wide point of view, the results shown in the following table are obtained. In this case, only the 2020 and 2025 averages have been displayed as EU-wide representative. It should be kept in mind that the 2025 values are less representative.

EU-wide change of AFI CNG/road targets			
Year	**2020**	**2025**	**2030**
Number of MSs	22	15	5
UWA [%]	-5.28	9.30	
EU population [%]	78.26	59.42	7.42
PWA [%]	8.82	22.06	

- **(Attainment)** The 2018 attainment of the foreseen CNG AFI targets ranges significantly across MSs, from 5.45% (Romania) to 100% or more (Denmark, Ireland, Hungary) for 2020, from 4.35% (Ireland) to 100% (Denmark) for 2025 and from 2.38% (Ireland) to 100% (Denmark) for 2030. One Member State (Luxembourg) foresees a decreasing trend of its CNG refuelling points in the future. Four Member States (Denmark, Estonia, Netherlands and Slovenia) foresee a constant number of refuelling stations in the next decade (2020-2030).

  Looking at these data from an EU-wide point of view, the results shown in the following table are obtained:

EU-wide 2018 attainment of AFI CNG/road targets			
Year	**2020**	**2025**	**2030**
Number of MSs	21 MS	19 MS	16 MS
UWA [%]	67.10	55.31	44.09
EU population [%]	77.88	73.27	55.92
PWA [%]	58.33	43.62	31.36

- **(Progress)** From the 24 MSs that provided at least one target for the 2020-2030 decade in their NIR or NPF, comparing the 2018 situation with their foreseen CNG refuelling infrastructure evolution, 11 MSs result to progress slowly, 7 adequately and 4 fast (for Croatia and Luxembourg the progress could not be computed).

- **(Growth rate)** The average annual growth rate characterising the foreseen evolution of CNG refuelling points for the next decade ranges from 1% (Denmark) to 129% (Romania). Out of the 20 computed annual growth rates, 8 are below 10%, 9 are in between 10% and 20%, 2 are in between 20% and 30% while 1 is above 60% (Romania).

  Looking at these data from an EU-wide point of view, the results shown in the following table are obtained:

EU-wide average growth rate of CNG AFI	
Year	**2016 - 2030**
Number of MSs	20
UWA [%]	17
EU population [%]	79.04
PWA [%]	17

The maps in Figure 4.1.1-15 and Figure 4.1.1-16 show the evolution of the density of publicly accessible CNG refuelling points (number of refuelling points normalized by the total length of roads[2]) per Member State in 2018, 2020, 2025 and in 2030 (according to the estimates provided in the NIRs). In 2018, a group of 7 MSs had a density superior to 0.1 CNG refuelling points per 100 km of road and Belgium had the highest value for this parameter (0.77). Because of the absence of several CNG AFI targets for the decade 2020-2030, the number of MSs foreseen to have a density above 0.1 CNG refuelling points per 100 km of road is 4 for 2020, 7 for 2025 and 7 for 2030.

[2] Including motorways, main/national and secondary/regional roads.

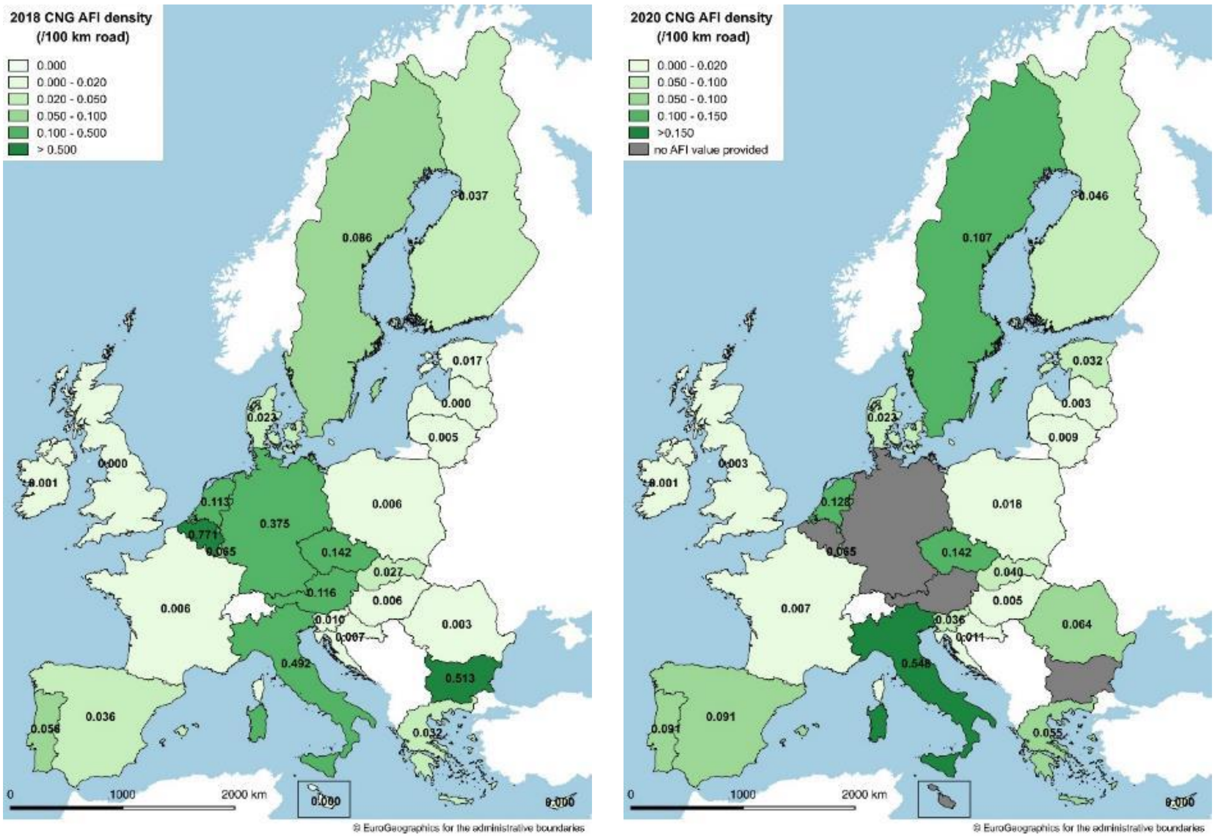

Figure 4.1.1-15 Density of publicly accessible CNG refuelling points in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

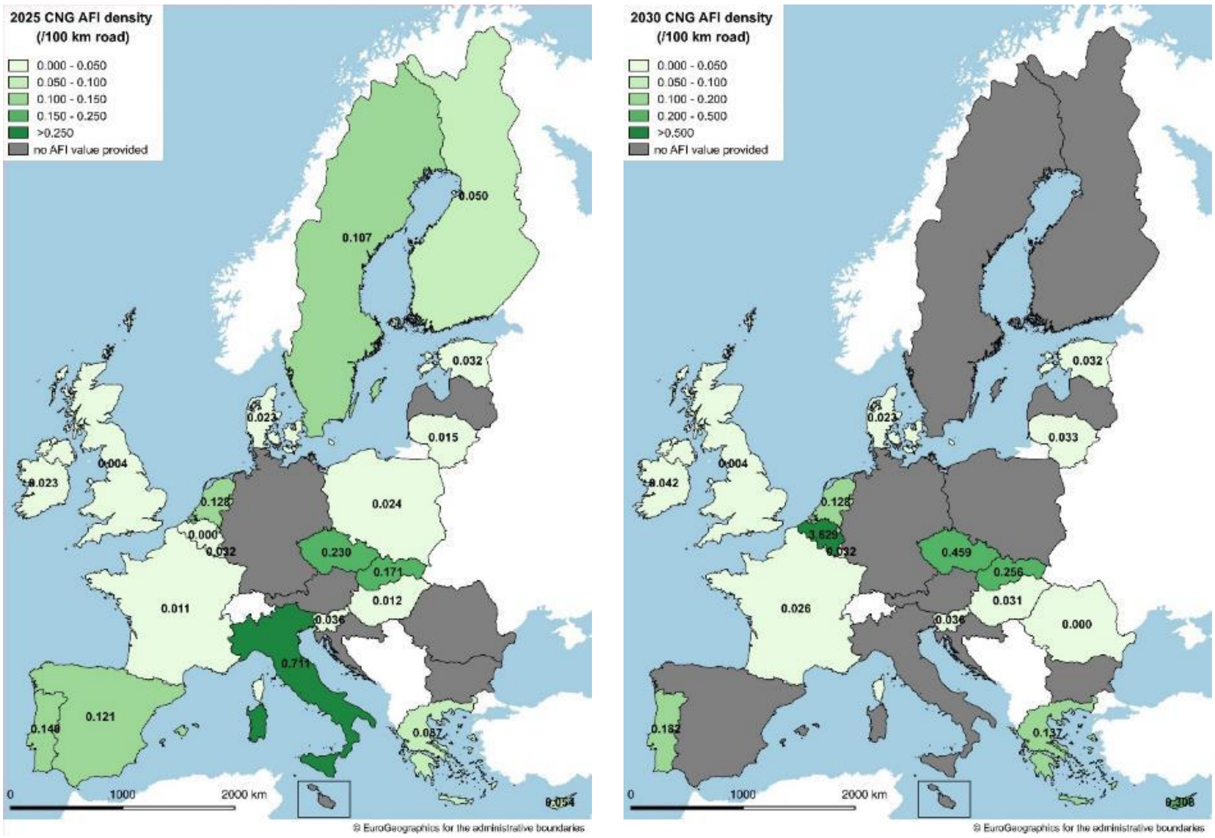

Figure 4.1.1-16 Estimated density of publicly accessible CNG refuelling points (from the NIRs) in 2025 (left map) and in 2030 (right map)

Sufficiency Index (Ratio AFV/AFI)

From NIR data, it is possible to compute the ratio of CNG vehicles and publicly accessible CNG refuelling points for 15 MSs for the 2020-2030 decade, overall in 37 cases compared with the NPF that allowed 30 cases. For 2020, the ratio can be computed for 13 MSs and ranges from 50.71 (Denmark) to 1,000.00 (Italy), with 11 MSs situated below 400, 1 MS in between 400 and 800 and 1 MS above 800. For 2025, the ratio can be computed for 14 MSs and ranges from 89.53 (Denmark) to 1,171.43 (Italy), with 8 MSs situated below 400, 5 MSs in between 400 and 800 and 1 MS above 800. For 2030, the 10 computable ratios range from 77.23 (Czechia) to 1,086.67 (Belgium), with 6 MSs situated below 400, 3 MSs in between 400 and 800, and 1 MS above 800.

The maps in Figure 4.1.1-17 and Figure 4.1.1-18 show the evolution of the sufficiency index for CNG/road in 2018, 2020, 2025 and in 2030 (according to the estimates and targets provided in the NIRs).

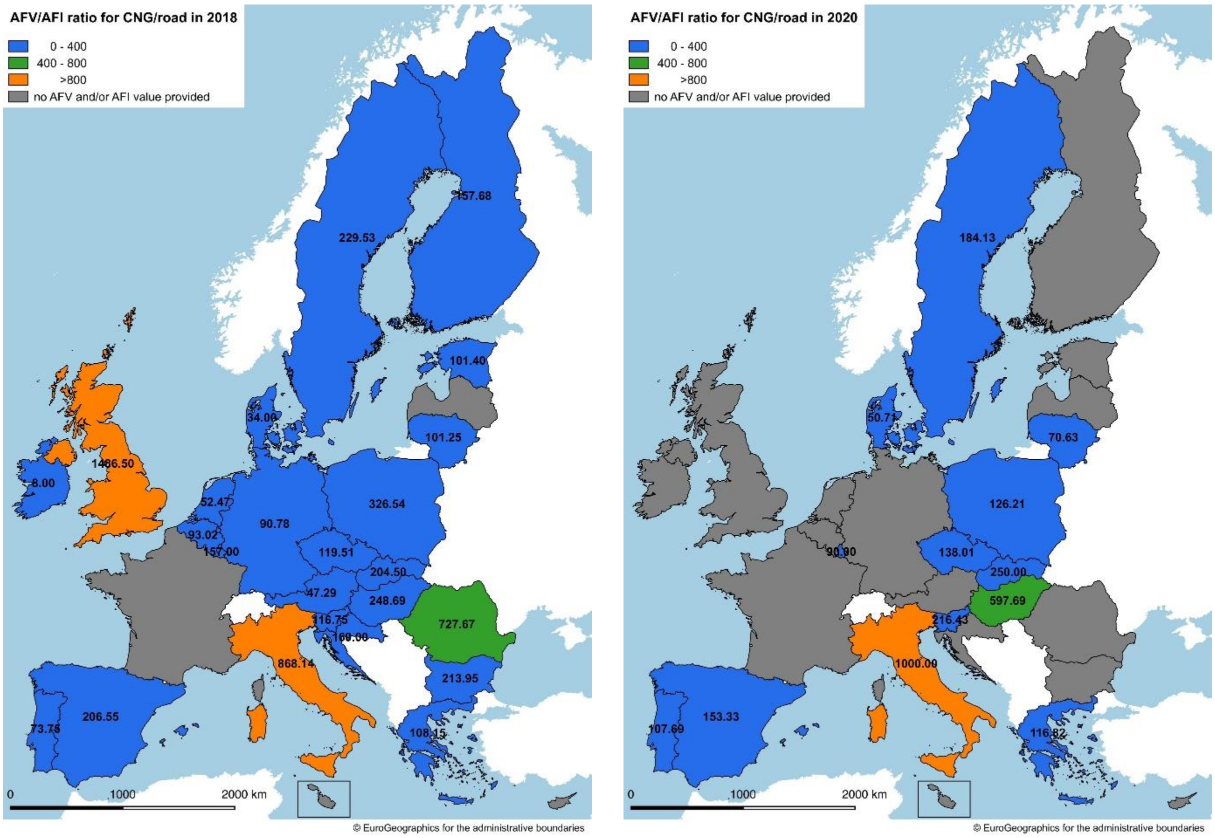

Figure 4.1.1-17 Ratio AFV/AFI (sufficiency index) for CNG/road in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

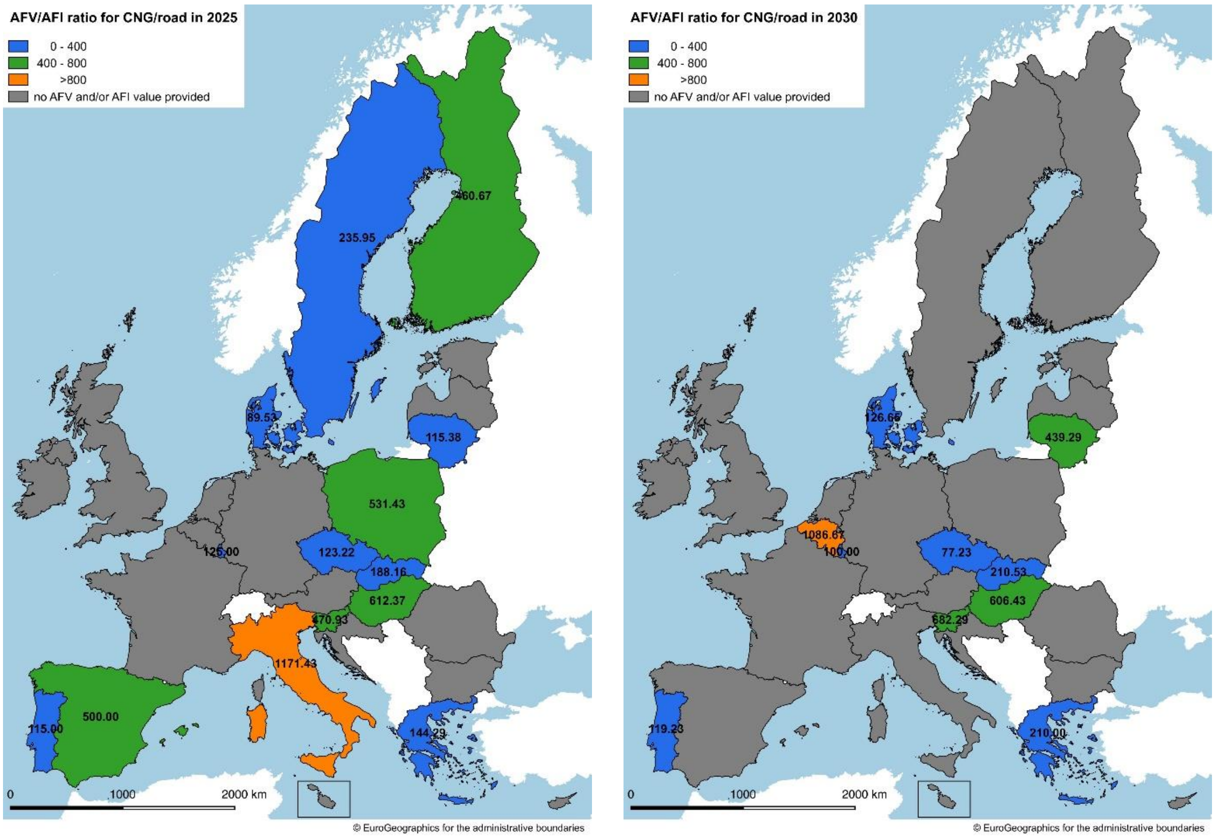

Figure 4.1.1-18 Estimated ratio AFV/AFI (sufficiency index) for CNG/road (from the NIRs) for 2025 (left map) and for 2030 (right map)

Looking at these data from an EU-wide point of view, the criteria used for representativity did not allow the presentation of results for the next decade and only the 2018 averages are reported in the following table.

EU-wide sufficiency index for CNG/road				
Year	**2018**	**2020**	**2025**	**2030**
Number of MSs	24	13	14	10
UWA	247.59			
EU population [%]	84.92	41.64	42.72	13.57
PWA	479.81			

Measures

The pair CNG/road is the second most covered in terms of dedicated measures by the majority of MSs. Compared to the electricity/road pair, for which a full commitment and positive outlook are shown by almost all MSs (although with important differences in absolute terms), the pair CNG/road presents a more articulated and MS-differentiated scenario:

- The **legal measures**' level of ambition in the NIR vs. NPF has increased for 14 MSs out of the 23 assessable NIR measure sets.
- Concerning the **policy and deployment & manufacturing support measures**, 26 MSs have reported assessable clusters of measures. Of these, only 4 clusters have obtained a high overall score, 15 clusters have obtained a medium score, 2 clusters a low/medium score, 4 a low score and 1 a not assessable score. Eleven clusters are comprehensive,

while the others are not comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, only 2 clusters are assessed as having a high level impact (Finland and Ireland), 9 a medium level and 14 a low impact. Regarding the ambition in the NIR vs. NPF, an increased level has been found in 18 cases.

- In nineteen cases, the ambition of **RTD&D measures** targeting CNG/road in the NIRs could be determined, and among these 11 measure sets show an increased ambition compared to the NPF situation.

4.1.1.2 LNG

Figure 4.1.1-19 summarises the information for the estimated LNG vehicles and targeted publicly accessible refuelling points as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

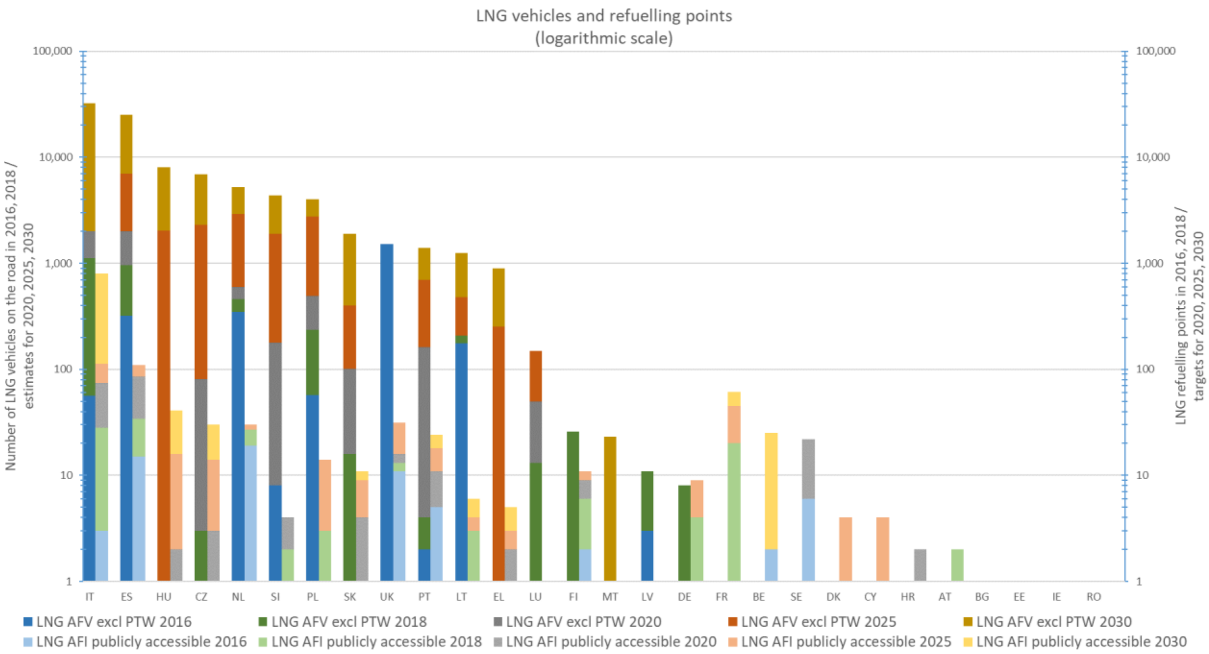

Figure 4.1.1-19 LNG vehicle estimates and refuelling points targets for 2020, 2025 and 2030[3]

With LNG, the level of coverage by the MSs starts to decrease and does not allow to provide averages at EU-wide level.

LNG vehicles

- **(Coverage)** In the NIRs, 14 MSs have provided at least some historical data (2016-2018) (50%). Among these, three MSs have declared zero LNG vehicles up to 2018. Thirteen MSs have declared at least one target for the decade 2020-2030 (46%).

[3] Member States are ordered by their estimated fleet of LNG vehicles (from high to low values) and afterwards, for the MSs without informations on vehicles, by their targeted LNG refuelling points (from high to low values).

- **(Change)** In the NPFs, there were only 9 MSs having at least one target. Comparing with NIR data, it results that the change is computable for 9 MSs and only 16 changes can be determined. Out of these 16 computable changes, 3 indicate less ambitious LNG vehicle estimates in the NIR compared to the NPF (1 MS in 2020), 8 changes indicate the same ambition as NPF (2 MSs in 2020) and 5 changes show increased ambition (2 MSs in 2020). In other 18 cases, an estimate was provided only in the NIR and the changes could not be computed.
- **(Attainment)** The 2018 attainment of the foreseen LNG vehicle estimates is computable for 10 MSs, with 29 attainment values as result. They range significantly across MSs from 2.45% (Portugal) to 100% (Lithuania) for 2020, from 0.09% (Czechia) to 42.95% (Lithuania) for 2025, and from 0.03% (Czechia) to 16.53% (Lithuania) for 2030.
- **(Progress)** Comparing the 2016-2018 LNG vehicle fleet evolution with their 2016-2030 foreseen evolution, the progress was computed for 10 MSs and it ranges from 0.00% (Slovenia) to 8.05% (Luxembourg).

LNG refuelling points

- **(Coverage)** In the NIRs, 17 MSs have provided at least some historical data (2016-2018) (61%). Among these, seven MSs have declared zero LNG infrastructure in 2018. Twenty-three MSs have declared at least one target for the decade 2020-2030 (82%).
- **(Change)** The NIR and NPF data allows computing 31 changes corresponding to 2020-2030 period, for 16 MSs. There are 3 decreasing changes (1 in 2020), 17 situations with the same ambition (5 in 2020) and 11 with increased ambition (4 in 2020). In other 13 cases, a target was provided only in the NIR and the changes could not be computed.
- **(Attainment)** The 2018 attainment of the foreseen LNG AFI targets is computed for 14 MSs and 29 determined attainment values result. They range across MSs from 27.27% (Sweden) to 81.25% (United Kingdom) for 2020, from 7.14% (Czechia) to 100% (Austria) for 2025, and from 3.33% (Czechia) to 48.78% (France) for 2030.
- **(Progress)** Comparing the 2016-2018 LNG AFI evolution with their 2016-2030 foreseen evolution, seven progress values are determined. They range from 0.00% (Portugal) to 47.50% (France).

Measures

- The level of NIR's ambition vs NPF for legal and RTD&D measures is assessed for 23 and 18 MSs respectively, and for the majority of them the level is increased (15 and 9 respectively).
- From the 20 NIRs offering assessable data regarding policy and deployment measures, only 2 have a high score and none of them displays a high impact. The ambition level is predominantly increased (13 MSs).

4.1.1.3 Hydrogen

Figure 4.1.1-20 summarises the information for the estimated hydrogen vehicles and targeted publicly accessible refuelling points as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

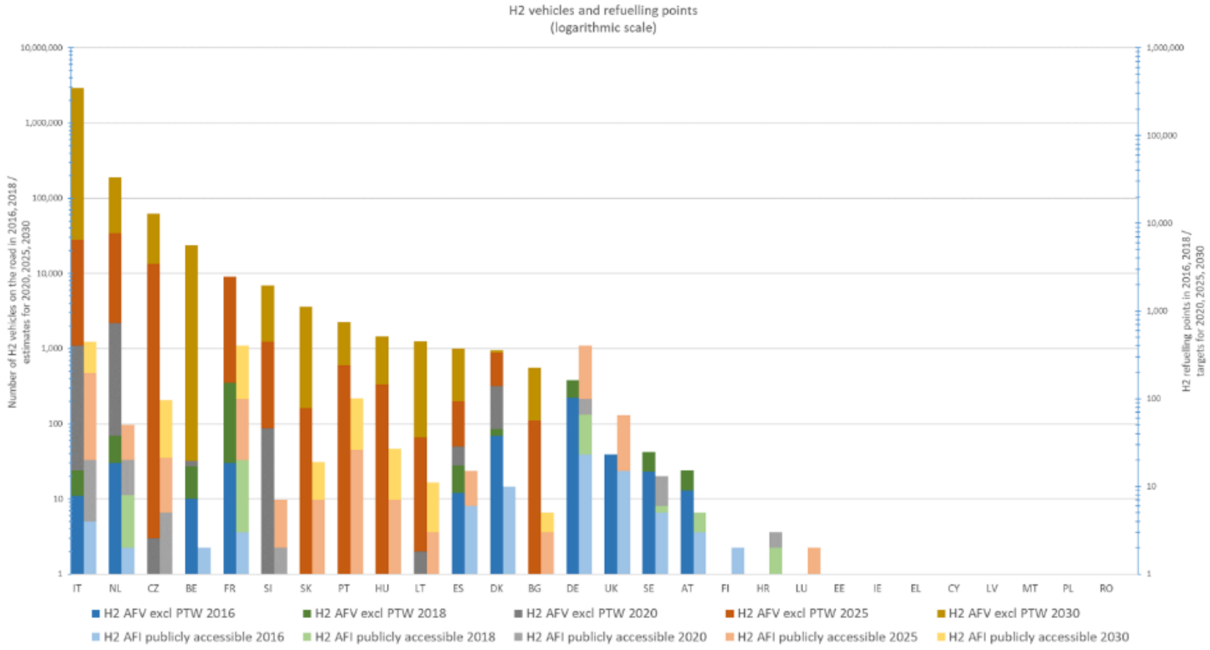

Figure 4.1.1-20 Hydrogen vehicle estimates and refuelling points targets for 2020, 2025 and 2030[4]

Hydrogen vehicles

- **(Coverage)** Twelve[5] MSs present positive values for hydrogen vehicles in 2018 (43%). Fourteen MSs have declared at least one positive estimate for the decade 2020-2030 (50%).
- **(Change)** The NPF and NIR data allow change computing for only 7 MSs. Two MSs have provided less ambitious AFI estimates in their NIR compared to the NPF (Bulgaria and Spain). Other four MSs have practically confirmed their initial NPF plans, while Hungary increased its ambition for 2025 and 2030. In other 22 cases, an estimate was provided only in the NIR and the changes could not be computed.
- **Attainment** The 2018 attainment of the foreseen hydrogen vehicle estimates are computed for 7 MSs and 19 attainment values result. For 2020, they range significantly across MSs, from 2.18% (Italy) to more than 100% (France), from 0.01% (Czechia) to 14% (Spain) for 2025 and from less than 0.01% (Czechia and Italy) to 8.91% (Denmark) for 2030. For one Member State (Sweden), the attainment was not computed since all the future estimates are below the 2018 value.
- **Progress** Comparing the 2016-2018 hydrogen vehicles evolution with the 2016-2030 foreseen evolution, six progress values are determined. They range from 0.00%

[4] Member States are ordered by their estimated fleet of hydrogen vehicles (from high to low values)

[5] According to the NIRs and EAFO

(Czechia) to 1.81% (Denmark). For one Member State (Sweden), the progress was not computed since the 2030 estimated value is below the 2018 existing one.

Hydrogen refuelling points

- **(Coverage)** Twenty MSs have provided at least some historical data (2016-2018) in their NIRs (71%). Twelve[6] MSs present hydrogen infrastructure by 2018 (43%). Twenty MSs have declared at least one target for the decade 2020-2030, but two of them have declared only targets of zero. Eighteen MSs out have set hydrogen infrastructure targets above zero by 2030 (64%).
- **(Change)** Twelve MSs allow the change computing. Two MSs have decreased their targets (Bulgaria and Spain). Six of them preserve the NPF target values and therefore the change values are zero. The remaining four have shown an increase of their ambition, significant in three cases: Netherlands (in 2020) and Czechia (in 2025), both with 400% change values, and France with 233% in 2025. In other 19 cases, a target was provided only in the NIR and the changes could not be computed.
- **(Attainment)** The 2018 attainment of the foreseen hydrogen refuelling points are computed for 10 MSs and 20 attainment values result. They range across MSs, from 15.00% (Italy) to 100% (Austria) for 2020, from 1.53% (Italy) to 46.15% (Sweden) for 2025 and from 0.67% (Italy) to 14.29% (Slovenia) for 2030. One Member State (Denmark) foresees a decreasing trend of its hydrogen refuelling points in the future.
- **(Progress)** Comparing the 2016-2018 hydrogen AFI evolution with the 2016-2030 foreseen evolution, four progress values are determined. They range from -14.00% (United Kingdom)[7] to 2.31% (France).

Measures

The pair hydrogen/road shows an increased interest from the MSs.

- The level of NIR's ambition vs NPF for legal and RTD&D measures is assessed for 16 MSs and 15 respectively, and for the majority of them the level is increased (12 in both cases).
- For this pair, 24 NIRs contain data regarding policy, and deployment and manufacturing support measures. Three measure sets are assessed with high score (Czechia, Germany and Croatia), 11 are comprehensive but only one receives a high level impact (Germany). An indicator of the increased interest is the fact that 19 NIRs out of the 24 have an increased ambition level in the comparison with the NPF.

[6] According to the NIRs and EAFO

[7] The negative value of progress for the United Kingdom means that a lower number of hydrogen refueling points was recorded in 2018 in comparison with 2016, however an increase of hydrogen infrastructure above the value recorded in 2016 is targeted for the next decade.

4.1.1.4 LPG

Figure 4.1.1-21 summarises the information for the LPG vehicle estimates and targeted publicly accessible refuelling points as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

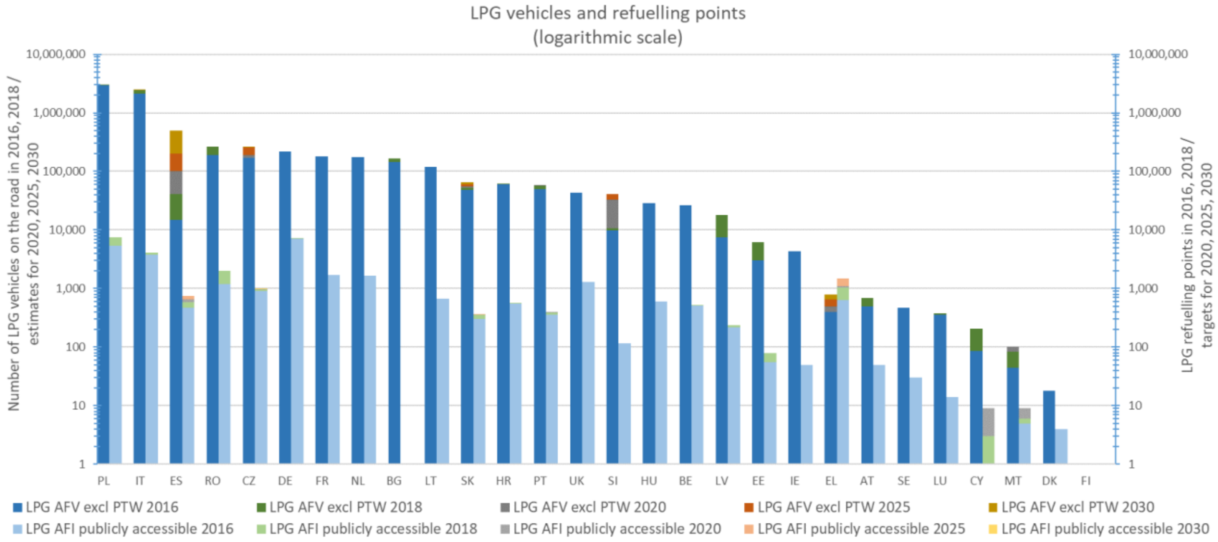

Figure 4.1.1-21 LPG vehicle estimates and refuelling points targets for 2020, 2025 and 2030[8]

LPG vehicles

- **(Coverage)** Twenty MSs (71%) have provided at least some historical data (2016-2018) in their NIRs. Eleven MSs (39%) have declared at least one vehicle estimate for the decade 2020-2030.
- **(Change)** Because only five MSs had estimates for the future in the NPF, only these MSs allow change computing. Italy and Slovenia preserve their estimates while Greece and Spain are decreasing their ambition. Hungary presents an increased ambition for 2020 and decreased ambition for 2025 and 2030. In other 19 cases, an estimate was provided only in the NIR and the changes could not be computed.
- **(Attainment)** The 2018 attainment of the foreseen LPG vehicle estimates is computed for 8 MSs, resulting in 21 attainment values. They range across EU from 32.05% (Slovenia) to 97.49% (Portugal) for 2020, from 20.54% (Spain) to more than 100% (Italy) for 2025, and from 8.22% (Spain) to 96.59% (Italy) for 2030. Two Member States (Denmark and France) foresee lower LPG vehicle fleets from 2020 onwards and Portugal from 2025 onwards.
- **(Progress)** Comparing the 2016-2018 LPG vehicles evolution with the 2016-2030 foreseen evolution, seven progress values are determined. They range from -14.33% (Greece)[9] to 76.53% (Italy). For three Member States (Denmark, France and Portugal),

[8] Member States are ordered by their estimated fleet of LPG vehicles (from high to low values).
[9] The negative value of progress for Greece means that a lower number of LPG vehicles was recorded in 2018 in comparison with 2016, however an increase of LPG vehicles above the value recorded in 2016 is estimated for the next decade.

the progress was not computed since they foresee a decreasing trend of their LPG vehicle fleets in the future.

LPG refuelling points

- **(Coverage)** Nineteen MSs (68%) have provided at least some historical data (2016-2018) in their NIRs. Ten MSs (36%) have declared at least one target for the decade 2020-2030.
- **(Change)** Because only five MSs had provided targets for the future in the NPF, only these MSs allow change computing. Greece and Portugal preserved in their NIRs the NPF targets, while Spain, Cyprus and Hungary have decreased their targets. In other 15 cases, targets were provided only in the NIR and the changes could not be computed.
- (**Attainment)** The 2018 attainment of the foreseen LPG refuelling points targets is computed for 7 MSs, resulting 13 attainment values. They range across EU from 25.00% (Cyprus) to 100% (Slovakia) for 2020, from 70.00% (Greece) to 99.18% (Slovakia) for 2025, and from 94.53% (Czechia) to 99.18% (Slovakia) for 2030. Three Member States (Denmark, Lithuania and Hungary) foresee a decrease of LPG refuelling points from 2020 onwards and Portugal from 2025 onwards.
- **(Progress)** Only two progress values are calculated (Czechia 42.7% and Slovakia 95.4%).

Measures

- The level of NIR's ambition vs NPF for legal measures is assessed for six MSs, and for three of them the level is increased.
- From the eight NIRs containing assessable policy and deployment & manufacturing support measures for this cluster, only Spain and Portugal had a medium score and only Spain a medium level of impact, the rest had low level impact. The level of ambition is similar to the one in the NPF for four NIRs.
- The level of NIR's ambition vs NPF for RTD&D measures is assessed for four MSs, and for three of them the level is considered increased.

4.1.2 *Rail transport*

4.1.2.1 Electricity

AFV

Six MSs[10] have provided in their NIRs the existing numbers of locomotives in the period 2016-2018 and at least one estimate for the next decade.
Six MSs[11] have provided only the existing numbers of locomotives.

4.1.2.2 Hydrogen

AFV

Germany has reported the existence of two hydrogen locomotives in 2018, while France, the Netherlands and Slovakia have announced plans for 15, 1 and 10 hydrogen locomotives, respectively within the next decade.

4.1.3 *Waterborne transport (maritime and inland)*

4.1.3.1 Electricity

AFI

Around 48% of the MSs that should have reported about the shore-side electricity supply infrastructure for their maritime ships have provided at least some historical data (2016-2018) while around 39% have declared at least one target for the decade 2020-2030. In the case of waterborne inland transport, these percentages become 42% of the MSs providing at least some historical data (2016-2018) and 32% declaring at least one target for the decade 2020-2030.

Figure 4.1.3-1 summarises the information for the shore-side electricity supply for waterborne transport (maritime and inland) as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

[10] Belgium, Czechia, Denmark, Lithuania, Hungary and Romania
[11] Germany, Greece, Austria, Portugal, Sweden and United Kingdom

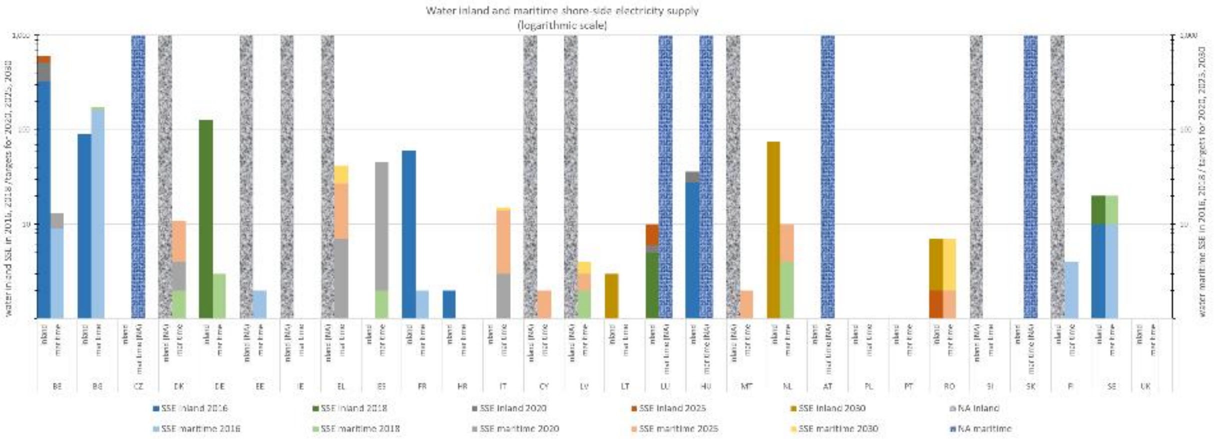

Figure 4.1.3-1 Shore-side electricity supply targets for 2020, 2025 and 2030 (maritime and inland waterborne transport)

4.1.3.2 LNG

AFI

Around 52% of the MSs that should have reported about the LNG supply infrastructure for their maritime ships have provided at least some historical data (2016-2018) while around 62% have declared at least one target for the decade 2020-2030. For the waterborne inland transport these percentages become 53% of the MSs both for providing at least some historical data (2016-2018) and declaring at least one target for the decade 2020-2030.

Figure 4.1.3-2 summarises the information for the LNG refuelling supply for waterborne transport (maritime and inland) as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

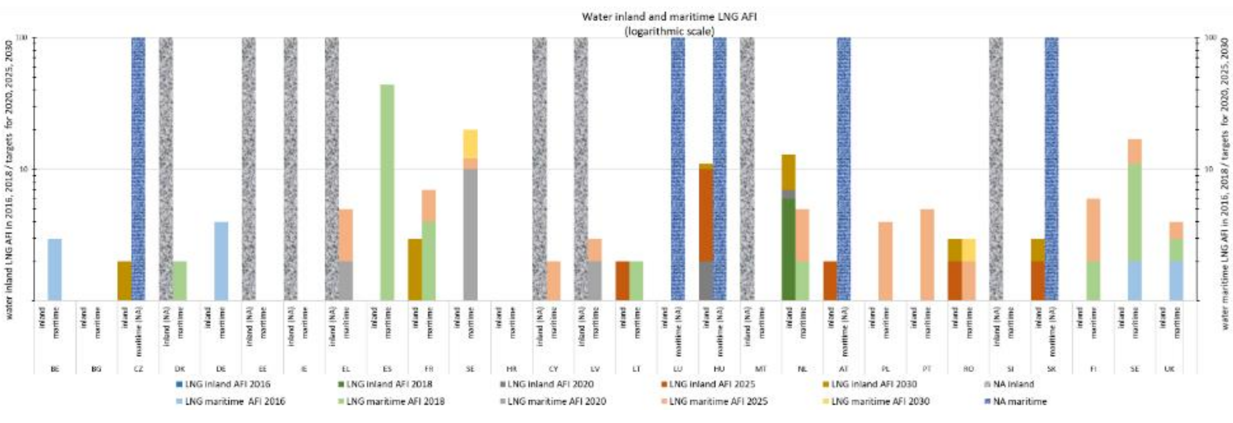

Figure 4.1.3-2 LNG refuelling supply targets for 2020, 2025 and 2030 (maritime and inland waterborne transport)

4.1.4 ***Air transport***

4.1.4.1 Electricity

AFI (electricity supply for stationary airplanes)

Eight MSs[12] have provided in their NIRs the existing numbers of electricity supply for stationary airplanes in the period 2016-2018 and at least one estimate for the next decade. Two MSs[13] have provided only the existing numbers of electricity supply for stationary airplanes.
Changes could be computed for only three MSs: Luxembourg has increased its targets while Netherlands and Austria have similar targets as in the NPF.

4.2 Strengthening EU competitiveness and jobs

4.2.1 *Method to assess the strengthening of the EU's competitiveness and jobs*

A computational model was developed for calculating the value creation and employment effects resulting from AFI build-up as described in the NPFs and revised in the NIRs. It outputs Member States' domestic as well as the EU-wide effects resulting from infrastructure production and installation. Types of infrastructure covered by the model include electricity recharging points and CNG, LNG and hydrogen refuelling points for road transport.

4.2.1.1 Calculating the Gross Value Added (GVA) through AFI build-up

Figure 4.2.1-1 shows a model flowchart for the calculation of the domestic economic effects of recharging point build-up in a Member State. The calculations are intended to cover the period 2019-2030 by considering three sub-periods dictated by the years for which targets were requested by the Directive (i.e. 2019-2020, 2021-2025 and 2026-2030) and they are adapted to the AFI targets provided by the Member States. For each infrastructure type, Member State and sub-period, AFI build-up targets are derived in a first step, calculated as the target number of recharging or refuelling points for each requested year (2020, 2025 and 2030) minus the previously built or targeted number as given in the NIR[14] (e.g. 2020-2018, or 2025-2020, or 2030-2025). Summed over Member States, the number of total planned AFI of each type in the EU is obtained. AFI build-up is assumed to be linear for each sub-period in the model.

[12] Bulgaria, Greece, Spain, Lithuania, Luxembourg, Netherlands, Austria and Romania
[13] Ireland and Hungary
[14] Or in the NPF or EAFO, if absent in the NIR

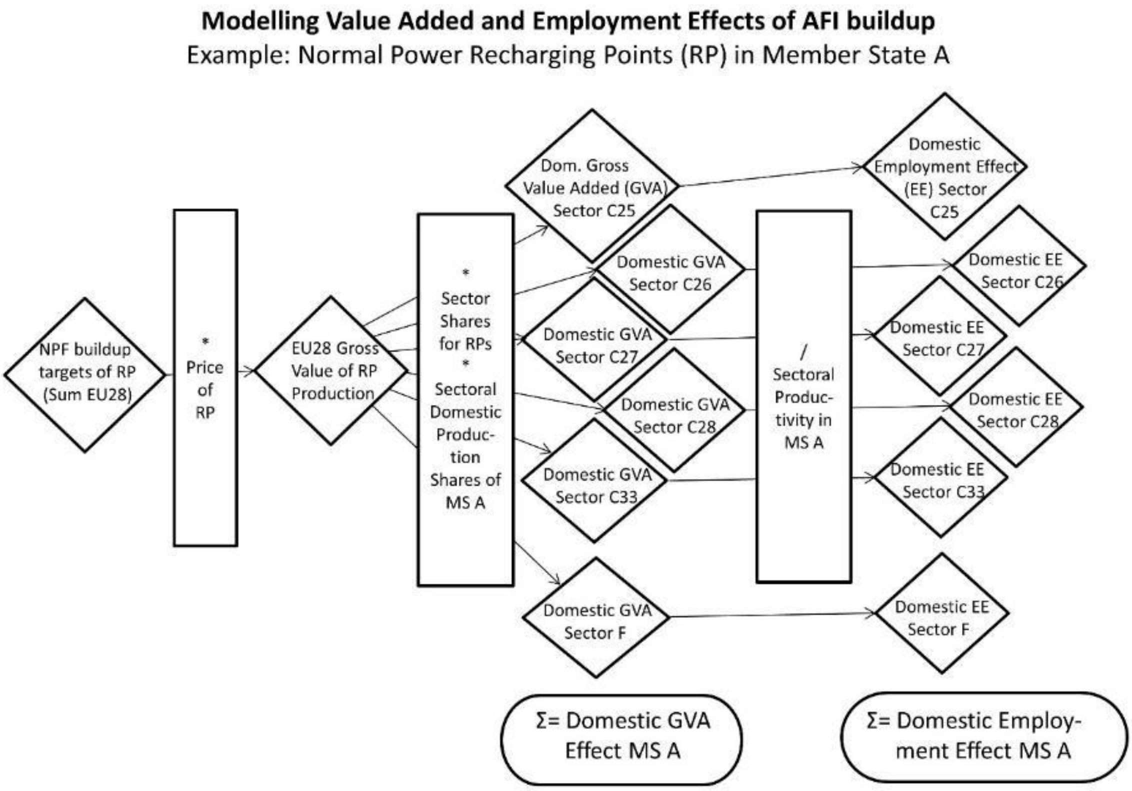

Figure 4.2.1-1 Flowchart of Added Value and Employment Calculation

Annual numbers of new AFI installed are multiplied by their net market prices to derive the Gross Value of Production (GVP). As the market price of a technology includes all value added along the value chain, it is a reasonable proxy for the calculation of gross value of production added.

In a next step, the share of each Member State in the production and installation of AFI needs to be determined, and imports from outside the EU need to be deducted. As the share of imported preliminary products differs among economic sectors, the GVP is sub-split. This is done by assigning the different technological components of an AFI installation (and thus their costs) to different economic sectors, on the basis of data on the composition and prices of the different AFI types. Price information was taken from studies and industry sources (Steer Davies Gleave, 2016), (Ludwig-Bölkow-Systemtechnik, 2016), (Nationale Plattform Elektromobilität (NPE), 2015), (European Commission, 2020). AFI GVP is assigned to the following sectors (in line with Eurostat NACE Rev. 2):

Table 4.2.1-1 Economic Sectors Considered

Sector	Fabricated metal products, except machinery and equipment	Computer, electronic and optical products	Electrical equipment	Machinery and equipment n.e.c.	Repair and installation services of machinery and equipment	Constructions and construction works
Eurostat Sector Number	C25	C26	C27	C28	C33	F

For each of these sectors, the sectoral GVP is multiplied by the sectoral domestic production share, yielding the sectoral domestic GVA for each of the six sectors for the AFI type and Member State under consideration. By default, the sectoral domestic share in AFI production in each Member State is assumed to be equal to the Member State's present sectoral share of production value within the EU, which is derived from Eurostat data[15]. The model allows reallocating domestic production shares as well as import shares from outside the EU for scenario analysis.

The national GVA effect resulting in the sectors C25, C26, C27 and C28 from the production is allocated completely (adjusted by preliminary imports) to the producing country. The costs of installing a recharging or refuelling point, occurring in sectors C33 and F, is divided into a GVA effect in the producing country and the country that installs the infrastructure.

Summing over the sectors, the Member States' domestic GVA effect from the particular infrastructure type results. For each Member State, total sectoral GVA effect includes the domestic effect of own AFI installation and the Member States exports of preliminary products for AFI installation to other EU countries. The sum over all AFI types per Member State is the total national GVA effect from the EU-wide implementation of AFI targets as envisaged in the NPFs and revised in the NIRs, and the sum over all Member States yields the EU-wide effect. AFI maintenance costs are included via a multiplier representing annual costs as percentage of total investment per facility.

4.2.1.2 Calculating the employment effect of AFI build-up

As shown in Figure 4.2.1-1, the employment effect of building a given type of infrastructure in each Member State is derived from domestic GVA per sector, dividing it by productivity. This yields the amount of person-years required to build the AFI envisaged in the NPF and revised in the NIR, which is assumed to translate into employment.

As labour productivity varies for each Member State and sector, this calculation is done on sectoral level. Data on the number of persons employed in the production of AFI is not available, thus productivities in the sectors contributing to AFI build-up (see Table 4.2.1-1) were used. These were derived by dividing each Member State's sectoral gross value added by the number of employed persons, both taken from Eurostat[16].

The domestic employment effect is derived by aggregating over all sectors, and the EU-wide effect by then aggregating over all Member States.

4.2.1.3 Sensitivities and scenario analysis

The model allows for running scenarios on a wide number of parameters. These include, for example:

- The allocation of AFI production and installation, intra-EU and international,
- Technology costs and sectoral shares,

[15] Total imports and EU-internal imports for each Member State are available from Eurostat at http://appsso.eurostat.ec.europa.eu/nui/show.do?wai=true&dataset=nama_10_exi, input-output tables for all member states based on http://ec.europa.eu/eurostat/de/web/esa-supply-use-input-tables/data/workbooks.

[16] Annual enterprise statistics for special aggregates, http://ec.europa.eu/eurostat/data/database.

- Technology types, e.g. normal power (≤22kW) vs. high power (>22kW) recharging points, number of points per recharging or refuelling station, etc.,
- The time frame of AFI build-up, and
- Labour productivity.

4.2.2 *Assessment of the strengthening of the EU's competitiveness and jobs*

The effects of AFI infrastructure build-up were calculated using the model described above (subsection 4.2.1). The model was run using AFI build-up targets for the different road transport AFI types (recharging points, CNG, LNG and hydrogen refuelling points) for the periods 2019-2020, 2021-2025 and 2026-2030. Table 4.2.2-1 shows the EU-wide value added and additional labour demand that can be achieved by fulfilling the targets for publicly accessible recharging points and CNG, LNG and hydrogen refuelling points for the next decade provided by the Member States in their NPF and revised in the NIR. The total value-added until 2030 sums up to more than 26 billion € with annual effects ranging from roughly 580 to 4,300 million €. The economic effect is strongest for the period 2026-2030, as the Member States foresee a significant increase of the number of AFI towards the end of the decade. The annual effects for the 2021-2025 period are smaller since several MSs did not provide targets for the year 2025 (in this case, if a target is provided for 2030, the model considers that all infrastructure build-up and the associated economic benefits related to the 2030 target take place in the period 2026-2030).

Table 4.2.2-1 Gross Value Added (GVA) and Employment Effects of Implementing the AFI targets for each year between 2019 and 2030

Years	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	**Total**
GVA (million EUR)	576	594	884	910	936	962	988	3,930	4,028	4,126	4,223	4,321	**26,477**
Employment (person-years)	8,691	9,067	13,018	13,477	13,928	14,385	14,838	57,841	59,561	61,281	63,001	64,720	**393,808**

The total effect on labour demand amounts to roughly 394,000 person-years until 2030, again with higher effects of around 60,000 persons per year during the last period 2026-2030. Additional employment effects could be triggered by the substantial deployment of private recharging points that several MSs refer to in their NPF/NIR, but are not considered in this analysis. In conclusion, a consistent EU-wide build-up of alternative fuels infrastructure could trigger a sustained positive employment effect, and could contribute to translating the temporary extra labour demand resulting from NPFs and NIRs into permanent jobs. Moreover, the respective qualification of workforce, which is more likely to occur in the presence of longer-term targets, can support the maintenance or increase of domestic shares in AFI production and installation. This again can have a positive impact on the EU sector's competitiveness.