Chain analysis loading poles

ICT stands for green!

History

Version	Date	Author	Description
0.1	25-08-2015	Frits Wuts	Initial version
0.2	09-09-2016	Léon Huijsdens/Frits Wuts	Addition GreenFlux loading pole information
1.0	10-09-2016	Frits Wuts	Adjustment calculationsBerekeningen aangepast
1.1	14-09-2016	Frits Wuts	Adjustment incorrect emission factor
1.2	24-10-2016	Frits Wuts	Extension with regard to 2017
2.0	30-05-2017	Frits Wuts	Extension with production and recycling car and loading pole.
3.0	10-04-2018	Mark van Eesteren	Update with 2017 CO_2 reduction

References

Ref	Title	Author
1	CO2-Prestatieladder. Generiek Handboek	http://www.skao.nl/
2	Production consumes more energy than use	http://computerworld.nl/algemeen/74646-fabricage-kost-meer-energie-dan-gebruik
3	Installation and assembly loading pole	https://www.laadpaal24.nl/laadpaal-montage
4	TNO-rapport | TNO 2015 R10386 | 7 april 2015	https://www.tno.nl/nl/aandachtsgebieden/mobiliteit-logistiek/roadmaps/mobiliteit/reduceren-van-uitstoot-door-voertuigen/energie-en-milieu-aspecten-van-elektrische-personenvoertuigen/
5	The Correspondent	https://decorrespondent.nl/6601/waarom-de-elektrische-auto-nu-al-groener-rijdt-maar-er-betere-argumenten-zijn-om-over-te-stappen/694075842075-4e3a4cf5

1 Introduction

ICT Group profile

ICT Group N.V. (ICT) is a leading industrial technology solutions and services providers offering high quality technological solutions in the information and communication technology areas within various functional domains, especially within Automotive, Logistics, Machine & Systems, Industrial Automation, Energy and Healthcare. ICT is active within the Netherlands, Belgium, France, Bulgaria and the United States.

The ICT solutions offered to clients involve software development, solutions on project basis, the secondment of experienced and highly educated staff as well as services to maintain IT systems.

Corporate social responsibility

For ICT sustainability is a natural and inevitable part of our daily work. In our day-to-day we pay attention to the sustainable use of energy and materials. We separately collect our waste and products we use are recycled as much as possible. Within ICT mobility is very important. Therefore, ICT has started an initiative to make it possible to drive electric. Also, charging stations are or will be placed at the offices to extend the possibility electric driving and promote this.

Active sustainability policy

Related to corporate social responsibility ICT is executing an active sustainability policy. Part of this is the participation in the 'CO_2 prestatieladder'.

To underline that ICT wants to have an active sustainability role, ICT participates into the CO_2 performance ladder. A part of the CO_2 performance ladder is to take initiative into a development project that facilities the sector in CO_2 reduction. This is recorded in the CO_2 performance ladder manual section 4.A.1. [REF 1]. This document provides an insight in how ICT fills in this chain analysis and fulfil the requirements as recorded in the CO_2 performance ladder.

1.1 Chain analysis subjects

In the order of scope 3 emissions it is concluded that the loading project which is managed by the Energy unit is one of the project for which it is expected that a large CO_2 reduction can be achieved. Furthermore, loading poles has a lot of growth potential in the market. That's why this project is chosen as subject for a chain analysis.

1.2 Aim and research question

The aim of this analysis is to investigate the size of the CO_2 reduction based on ICT's participation in GreenFlux.

Based on chain analysis actions can be determined on which basis emissions can be reduced and/or avoided. This results in action for the coming 4 years which is used by ICT and chain partners. This chain analysis is an additions on the already existing knowledge and views to the subject. It therefore contributes to advancing social insight. The chain analysis report is public, so that improvement possibilities can also applied by other organisations.

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2 Method

This chapter describes the assumptions in this chain analysis and described the used method.

2.1 Chain analysis

This chain analysis is executed conform requirements 4.A.1. of the CO_2 performance ladder manual, The Corporate Value Chain Accounting and Reporting Standard and the Green House Gas Protocol.

2.2 Data collection

For the chain analysis data is collection about the current energy intake for the loading poles managed by GreenFlux. Also data is collection about the growth of the energy intake in the past. This gives an indication about the expected growth of the energy intake for the coming years.

During the literature study also other chain analysis related to the CO_2 performance ladder are studied. For aspects which are not measurable or no data is available estimates are substantiated. ICT has tried to write the chain analysis in association with GreenFlux.

2.3 Calculation and modelling

Based on the above mentioned data calculation a historical insight in the number of loading transaction and the number of kWh per loading transactions is takes by electric vehicles is obtained.

The number of kWh is converted into number of kilometres. The number of kilometres per kWh depends on a number of aspects, like the type and weight of the car. We used a careful and conservative estimate of 5 kilometre per kWh. It is possible that this value increases during the next years.

Next to this the CO_2 emission per electric kilometres is turned off against the CO_2 per fossil fuel kilometre.

Also the CO_2 emissions of the production and recycling in the chain is taken into account.

The calculations executed with use of the collected data and the conversion factor of the website www.CO2emissiefactoren.nl

2.4 Demarcation

Based on the CO_2 performance ladder requirement the focus in the chain analysis is on the indicator Global Warming which is expressed in CO_2 emission. Besides CO_2 reduction loading poles can result in to in cost reduction for GreenFlux clients. The extent of the cost reduction is not investigated in this chain analysis.

3 Collaborating parties

3.1 GreenFlux

The possibility to drive an environment friendly car with renewable energy is attractive for a lot of people. Also, the circumstances to drive an electric vehicle are ideal in this country. The distances to travel are sort and The Netherlands a reliable and extensive power grid. But also in other European countries the market share of electric vehicles is increasing.

As from 2012 Greenflux is active in the market of electric driving. The past years GreenFlux together with ICT has developed a unique platform: GSOP.

GSOP provides the execution of loading transaction, the steering of loading poles from a distance and the managing of the clients, loading passes and invoicing. ICT is in favour of open standards to make it possible there is interoperability between the supplies. GSOP fully uses the international standards OCPP and OSCP. ICT also participates in the introduction of the new standard OCPI on which basis loading pole operators and service providers can exchange information.

3.2 BOM

The BOM is enhancing the economy of Brabant by stimulating collaborating between companies, governments and other entities. This by attracting foreign companies, the development of company location and risk-bearing investment in starting and growing innovative entities. In the Letter of Intent ICT announces that it has the intention to together with the Brabante Ontwikkelings Maatschappij (BOM) to invest in GreenFlux, a loading pole operator and service provider for electric transport. Thanks to this investments GreenFlux enhances their position in the fast growing market for electric driving and is the possibility arises to accelerate the launch of innovative loading services.

Through the collaboration between GreenFlux, ICT and BOM an unique combination of knowledge about electric driving, the energy domain and innovative IT solutions exists.

4 The loading pole

GreenFlux maintains a national network of loading poles. This network is extending the coming years. The loading poles are used by drivers of electric vehicles. The driver executes a loading transaction, and pending on the loading pole costs are associated with the use.

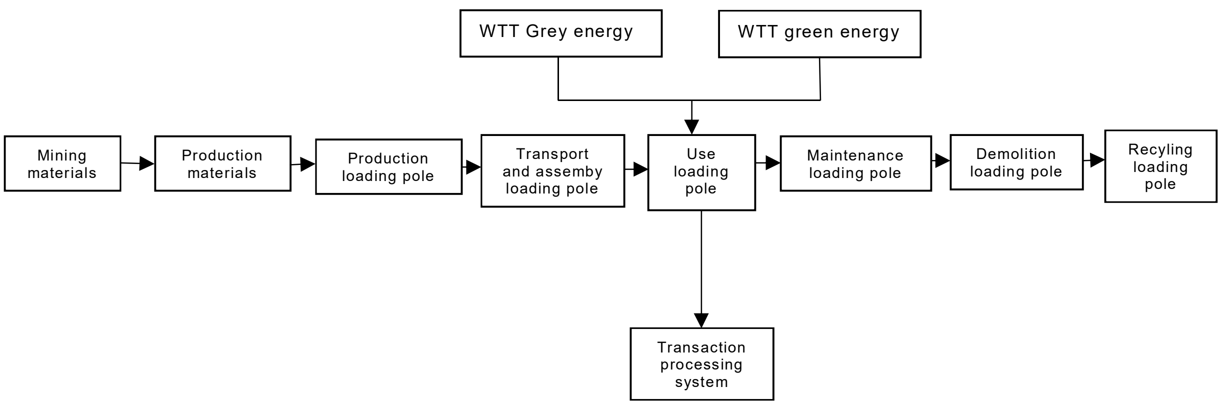
The loading poles are equipped with energy meters which measure the amount of energy delivered per transaction. The transaction and related amount of energy are centrally registered.

Concerning the energy suppliers for loading poles there are two situations to distinguish:

- GreenFlux has determines the energy supplies.
- GreenFlux has a contract with XXX, the energy supplied is 100% green.
- The loading pole owner has determined the energy supplies. In that case it is not guaranteed that the energy supplied is 100% green.

Therefore, we have used a calculated energy mix.

4.1 Chain overview loading pole



4.2 Production steel and PCB

As GreenFlux currently does not have own loading poles and makes uses of loading poles of another supplies by which the electronics are replaced with hardware with software of ICT we do not have an influence on the CO_2 emission. As GreenFlux is busy with their own loading poles we did calculate the CO_2 emission.

Table 1 Production steel and PCB

Production – each loading pole				
Loading pole steel	50 kg	0,473 kg CO_2/kg steel	23 kg CO_2	Estimate
Electronics	Dedicated Computer	-	230 kg CO_2	Source 2
Total			253 kg CO_2	

4.3 Production loading poles

For the production of the loading poles the same reasoning counts as recorded in paragraph 4.2. GreenFlux does not have an influence in the loading poles production process. Furthermore, this are only hours to produce the loading pole. The CO_2 emission is expected to be minimal.

4.4 Transport and installation

The transport of the hardware cabinet and the software to the location we take an average of 200 kilometres. For 2016 we expect a supply of 400 loadings resulting into a CO_2 emission of 200 km x 220 gr/km x 400 = 17,6 ton CO_2.

4.5 Loading poles maintenance

Based on the remote monitoring we expect 90% less rides for maintenance. The number of faults is 550 on a yearly basis from which 90% is solved with remote monitoring. The 55 maintenance services are locally executed for which an average distance of 200 kilometres is used. This result in the following CO_2 emission 200 km x 220gr/km x 55=2,42 ton CO_2.

If we assume that the remaining 495 faults are solved with remote monitoring this results in a CO_2 reduction of 200 km x 495 x 220 g/km= 21,8 ton CO_2 in 2016. So remote monitoring adds 21,8 – 2,42 = 19,4 ton of CO_2-reduction.

4.6 Demolition and recycling loading poles

How many loading poles will be recycled on a yearly basis and how long the useful of loading pole will be is unknow currently.

4.7 Conclusion CO_2-emission 2016

Summarized the CO_2 emission will be 17,6 + 2,42 = 20 ton for 2016 with respect to the loading poles. If we add the reduction of 21,8 ton for the remote monitoring the CO_2 emission and reduction are almost equal to each other.

5 The passenger car

The below data is collected based on the 2013 TNO rapport (source 4). Because the TNO report is a report written in Dutch the pictures are in Dutch.

5.1 Chain analysis passenger car

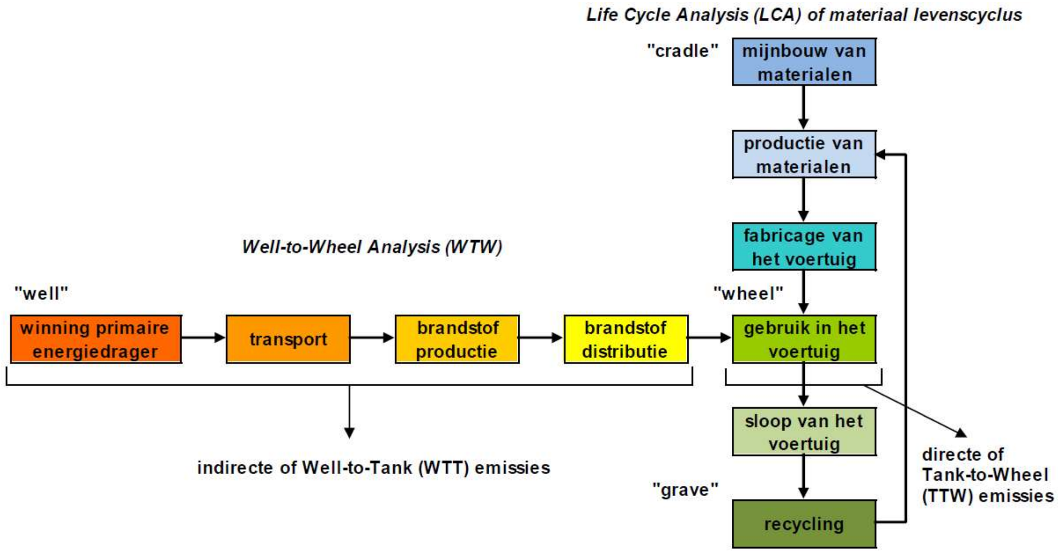


Figure 1 chain analysis passenger car.

This analysis contains the following 3 phases:

- Producing the car (mining materials, producing materials, producing the passenger car, using the car, demolition of the car and recycling the car.
- Producing the fuel (gasoline, grey and green electricity); mining primary energy source, transport energy source, producing the fuel, distributing the fuel, use the fuel in the car.
- Driving the car.

5.2 Producing the passenger car

The CO_2 emission in the production of the vehicle is determined by mining and producing the needed materials, transporting the materials and the assembly.

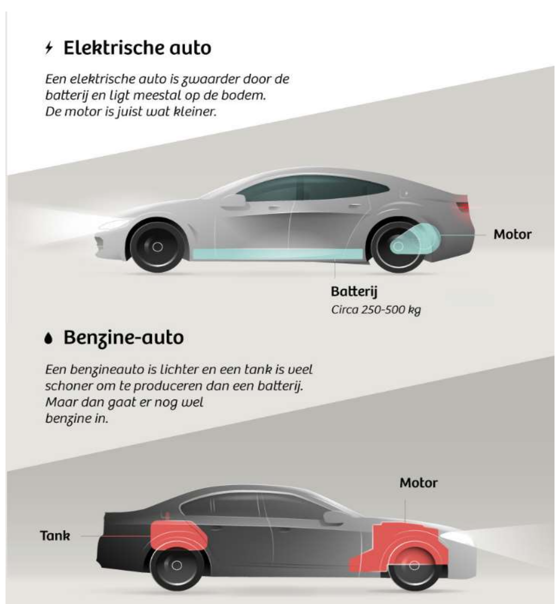


Figure 2 – Producing the car (source 5 'The Correspondent)

The TNO investigators had calculated the average from 5 investigations to different sort car batteries between 2008 and 2013 and concluded that with the production of a battery 150 kg CO_2 emission is released per KwH battery capacity.

If we assume that an electric car must have 60 kWh at least, the production of a battery is causing 9 ton CO_2

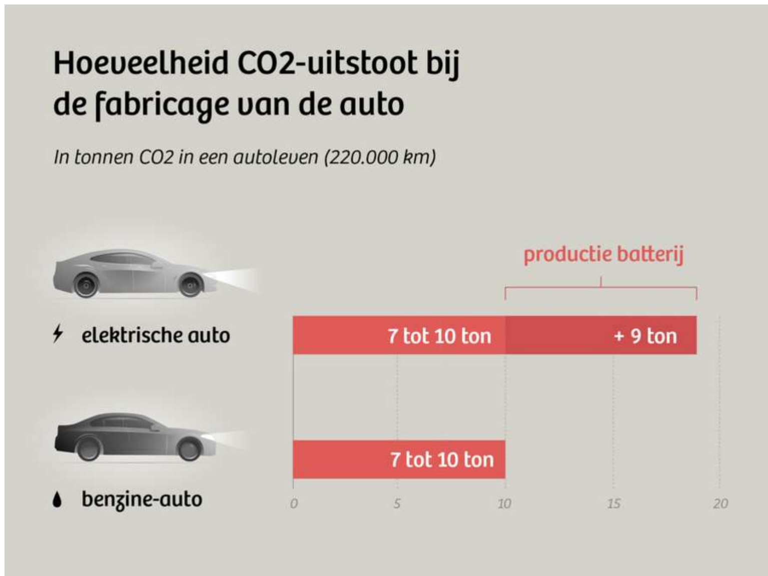


Figure 3 calculated CO_2 emission for the production of a passenger car, maintenance and recycling (demolition). This based on 220.000 kilometres.

5.3 Fuel production

Based on the current electricity mix (20% green and 80% grey electricity, from which mainly gas based) TNO has calculated a release of 447 gram CO_2 per kWh[1].

The production of green energy is causing 36 gram CO_2 per kWh on average which is including the production of solar panels and windmills.

These numbers must be compared with the CO_2 emission released in the production of gasoline. This is 57 gram per kWh. This is only the CO_2 related to the mining and refining of the gasoline.

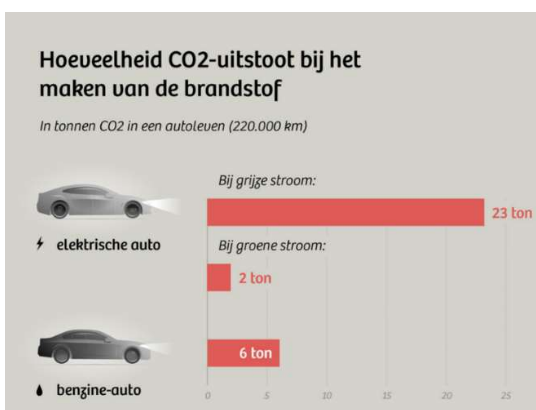


Figure 5 Amount CO_2 by producing fuel

[1] Zie Appendix B

Burning gasoline is causing 170 gram CO_2 per kilometre on average which is a representative number for a modern small middle-class car. If we assume that 220.000 kilometres is driven this causes 37,4 ton CO_2.

An electric car is not causing CO_2 emission, because the CO_2 emission is 0 when driving an electric car.

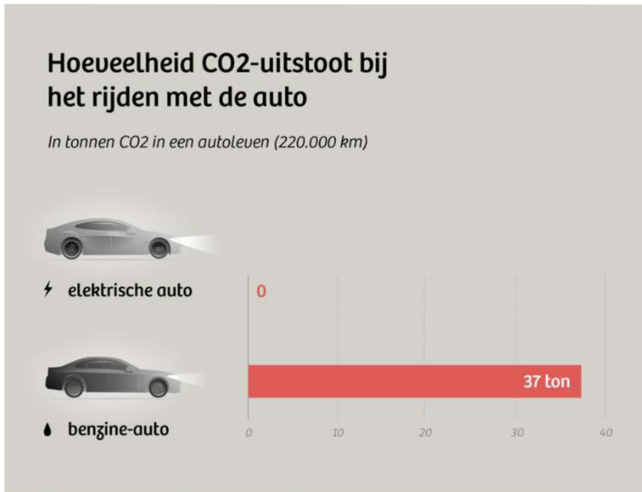


Figure 6. Amount CO_2 emission driving a car.

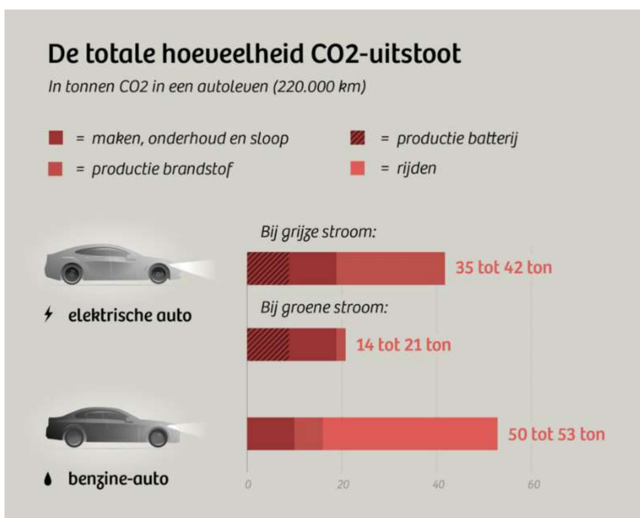


Figure 7 CO_2 emissions conventional and electric cards based on 220.000 kilometres. This is including the production, maintenance, demolition and recycling of the car.

Summarizing: The production of the battery of the electric is causing extra CO_2 emission on a single basis. However if we drive this car based on the current energy mix in the Netherlands the average electric car is releasing less CO_2 than an average gasoline car. As the production of the car and the electricity in the end are responsible for a smaller part of the CO_2 emission than the actual driving.

6 Emission fuel electric car (only consumption)

6.1 Emission electric driving 2015

What is the contribution of ICT related to the energy reduction following the participation in GreenFlux. In the month November 2015 110.794 kWh is used related to the loading poles of GreenFlux. Based on the TTW the calculations are as following:

Table 2 emission based on the kWh amount

CO_2 emission Electric driving 2015				
Situation November 2015	kWh	Emission factor	Total emission	Kilometres*)
	110.794	477 gr CO_2/kWh[2]	52,8 ton CO_2	553.970

*) 5 km/kWh

If we use the same kilometres for the fuel car the CO_2 emission calculations are as following:

Table 3 emission based a fossil fuel with the same number of kilometres:

CO_2 emission Fossil fuel driving 2015			
Situation November 2015	Kilometres	CO_2 g/km	Total emission
	553.970	220	121,8 ton CO_2

6.2 Emission reduction 2015

Based on the above calculation we can conclude that replacing fossil fuel kilometres has resulted in a CO_2 reduction of 69,0 ton (121,8 – 52,8) over the month November 2015.

On 17 November 2015 ICT started to participate in GreenFlux for 24,49%. Proportionally a CO_2 reduction of 69,0 * 0,2449 * 1,5 = 25,3 ton has been achieved over 2015.

6.3 Prognose emission reduction 2016-2020

We expect, based the historical data, a growth of 50% on a yearly basis (based on the expectation of GreenFlux) in the amount of delivered kWh, and also in CO_2 reduction. For 2016 this results in CO_2 reduction of 828,0 CO_2 ton (69,0*12)

Table 1 Reduction 2016-2020

CO_2 emission and reduction in tons (prognose)				
Year	2016	2017	2018	2019
CO_2 emission	1.462	2.193	3.290	4.935
Reduction	828	1.242	1.863	2.794

6.4 Emission 2016 electric driving

For 2016 the following data is obtained from GreenFlux.

Table 2 Emission related to numer of kWh

CO_2 emission electric driving 2016				
2016	kWh	Emission factor	Total emission	Kilometres
	1.068.952	477 CO_2 g/kWh	509,9 ton CO_2	5.344.760

Also the number km/kWh will increase the coming years. If we assume the number of kilometres is the same for a fossil fuel car the following CO_2 emission is calculated

Table 6 CO_2-emission fossil fuel car based on the same number of kilometres

CO_2 emission Fossil fuel driving 2016			
2016	Kilometres	CO_2 g/km	Total emission
	5.344.760	220	1.175,8 ton CO_2

[2] 20% green and 80% grey electricity

6.5 Conclusion CO_2-emission 2016

Based on previous page we can conclude that the replacement of fossil kilometres in electric kilometres in 2016 has resulted in a reduction of 665,9 ton CO_2 (1.175,8 – 509,9).

Based on the participation of ICT in GreenFlux of 24,49% the CO_2 reduction related to ICT is 665,9 x 0,2449 = 163,1 ton.

The above results in the conclusion that the actual CO_2 reduction of 665,9 ton is behind the forecasted CO_2 emission reduction of 828 ton.

ICT only has an indirect influence on this CO_2 reduction as the effects take place by GreenFlux and their chain partners. To come up with innovative solutions we can contribute to CO_2 emission reduction.

ICT will report on the progress of the CO_2 reductions on a semi-annual basis.

6.6 Emission 2017 electric driving

For 2017 the following data is obtained from GreenFlux.

Table 7 Emission related to numer of kWh

CO_2 emission electric driving 2017				
2017	kWh	Emission factor	Total emission	Kilometres
	3.197.883	477 CO_2 g/kWh	1.525,4 ton CO_2	15.989.415

Also the number km/kWh will increase the coming years. If we assume the number of kilometres is the same for a fossil fuel car the following CO_2 emission is calculated

Table 8 CO_2-emission fossil fuel car based on the same number of kilometres

CO_2 emission Fossil fuel driving 2017			
2017	Kilometres	CO_2 g/km	Total emission
	15.989.415	220	3.517,7 ton CO_2

6.7 Conclusion CO_2-emission 2017

Based on the above calculation we can conclude that the replacement of fossil kilometres in electric kilometres in 2017 has resulted in a reduction of 1.992,3 ton CO_2 (3517,7 – 1.525,4).

Based on the participation of ICT in GreenFlux of 24,49% the CO_2 reduction related to ICT is 1.992,3 x 0,2449 = 487,9 ton.

The above results in the conclusion that the actual CO_2 reduction of 1.992,3 ton is above the forecasted CO_2 emission reduction of 1.242 ton.

ICT only has an indirect influence on this CO_2 reduction as the effects take place by GreenFlux and their chain partners. To come up with innovative solutions we can contribute to CO_2 emission reduction.

ICT will report on the progress of the CO_2 reductions on a semi-annual basis.

7 Emission reduction based on the TNO report (production + recycling)

Based on figure 6 of the 2013 TNO report the CO_2 emission of electric cars is at least 30% less than the CO_2 emission of a conventional fuel car. This percentage will increase the coming years as we will be able to make more use of green electricity. This is further elaborated in the below table.

The CO_2 emission following a comparable use of fossil fuel 1.175,8 ton, refer table 6.
Based on an increasing percentage of at least 30% less CO_2 emission in 2016 if an electric car is used we have calculated the following prognose.

Table 9 Prognose reduction 2016-2019 including car production

CO_2 reduction in tons – prognose based on 2015 base year				
Year	2016	2017	2018	2019
Estimated CO_2-emission fossil fuel	1.462	2.193	3.290	4.935
Percentage relative to fossil fuel (including production and recycling)	30%	35%	40%	45%
CO_2 emission (including production and recycling)	1.023	1.425	1.974	2.715
Reduction	438	767	1.316	2.221

De daadwerkelijke reductie, zie onderstaande tabel.

Tabel 3 Actual reduction 2016-2019 including car production

CO_2 reductie in ton volgens afname aan kWh				
Year	2016	2017	2018	2019
Estimated CO_2-emission fossil fuel	1.175,8	3.517,7		
Percentage relative to fossil fuel (including production and recycling)	30%	35%	40%	45%
CO_2 emission (including production and recycling)	823,1	2.286,5		
Reduction	352,7	1.231,2		

7.1 Conclusion CO_2-emission reduction 2016

If we also take into the production and recycling of car in the determination of the CO_2 emission reduction, and we use 220.000 kilometres as driven kilometres during the lifetime of the car. The actual CO_2 emission reduction is not 665,9 ton, but 352,7 ton for the year 2016.

7.2 Conclusion CO_2-emission reduction 2017

If we also take into the production and recycling of car in the determination of the CO_2 emission reduction, and we use 220.000 kilometres as driven kilometres during the lifetime of the car. The actual CO_2 emission reduction is not 1.992,3 ton, but 1.231,2 ton for the year 2017.

8 Planning 2017 (increase enthusiasm)

Reduction possibilities in energy and CO_2 emission:

- Promote driving electric vehicles.
- Temporary use of electric vehicles by colleagues.
- Increase possibilities to lease an electric vehicle.
- Monitoring use and driven kilometres.
- Social charging (app on phone, which give a signal when the electric vehicle is fully loaded).
- Show calculations of costs of an electric vehicle compared to a fossil fuel car.

8.1 Reduction measures

The reduction is mainly realised through the forecast grow in the use of GreenFlux loading poles. The measure ICT has to take is to maintain the GreenFlux loading pole network. ICT is responsible for the technical systems of GreenFlux.

There are two measures described:

- Collect further information with respect to the use of the loading poles.
- Remote management of the loading poles.

8.1.1 Measure: Collect information about the use of loading poles

In chapter 7 a forecast is recorded with respect to the CO_2 reduction by drivers of electric vehicles who are using GreenFlux loading poles. From time to time the collected transaction data is discussed with GreenFlux to verify if the forecasted growth and CO_2 reduction is in line with the realised CO_2 reduction.

8.1.2 Measure: remote management loading poles

With this chain analysis the ICT advisors has a clear story about the sustainable participation in the energy sector. Only the remote management on the loading poles must be optimized. This can be realised by reducing the visits to the loading poles what result in a positive effect on CO_2 reduction.

9 Authorisation

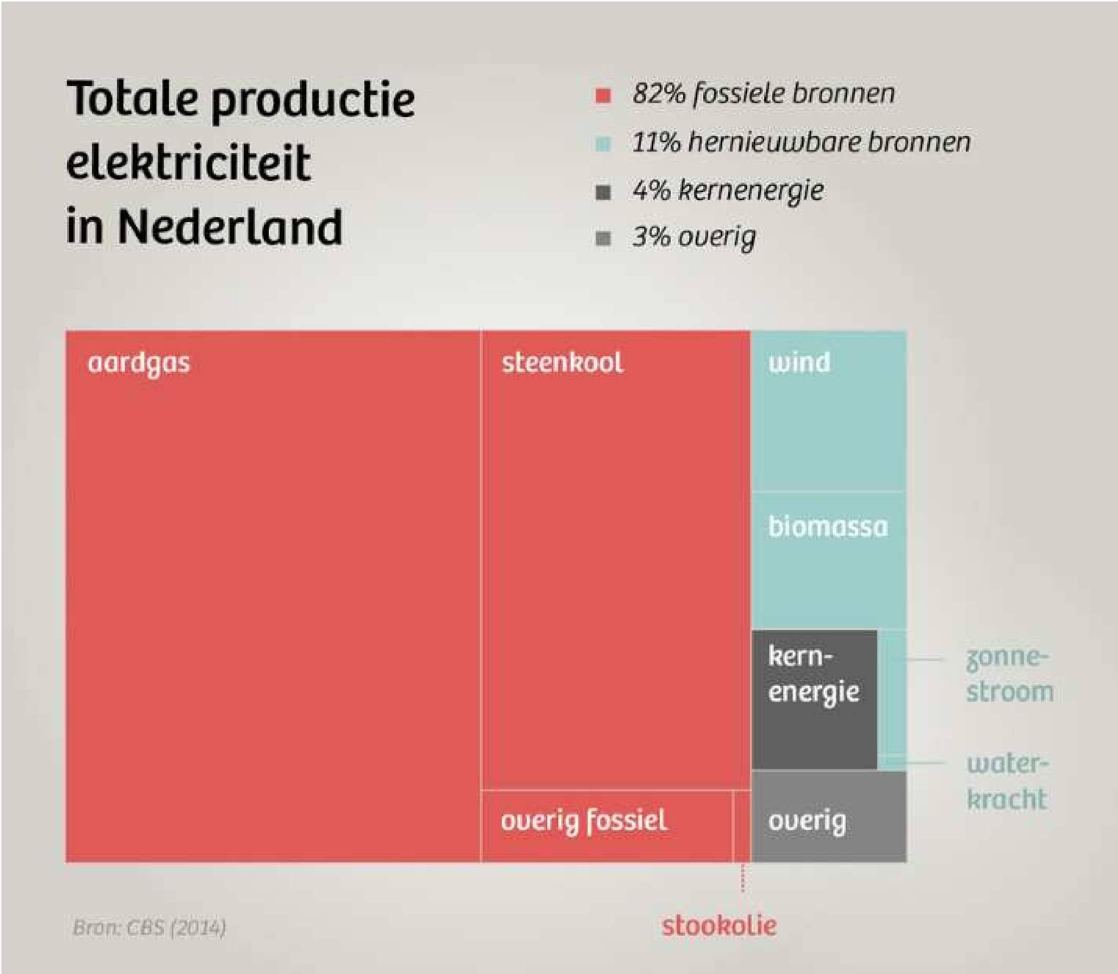
	Initials	Date
Mark van Eesteren – Financial Controller & Sustainability Officer ICT Group N.V.		10-04-2018
Jan-Willem Wienbelt – Chief Financial Officer ICT Group N.V.		10-04-2018

Appendix A Chain overview

Based on the TNO 2015 R 10386 report the below chain in the production of electric vehicles and fossil fule cars is presented together with the chain of the loading poles.

Figure 8 – Chain overview.

Appendix B Total electricity production in the Netherlands



Wat betekent dit voor de CO_2-uitstoot?

TNO komt voor de huidige leveringsmix (één vijfde groen en vier vijfde grijs, waarvan het meeste gas) uit op 447 gram CO_2 per kWh. Goed om te weten is dat de CO_2-uitstoot van kolencentrales circa twee keer zo hoog ligt als bij gascentrales.

