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Biofuels in the transport sector in Finland

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- ▶ Head of Environmental Team at the Services for Motorists Area of Expertise
- ▶ Focus: future technologies in transport - alternative transport fuels and energy sources, emissions , vehicle automation
- ▶ Activities: background work for legislation, assessments, steering research projects, strategic planning, workgroups
- ▶ Background: D.Sc. (Tech.), previously university teacher at Aalto University, focus on alternative fuels, combustion and emission reduction technologies in internal combustion engines.



Biofuels in the transport sector, Case Finland

- ▶ Biofuels: a major part of decarbonisation of Finnish transport system

- ▶ Know-how in Finland

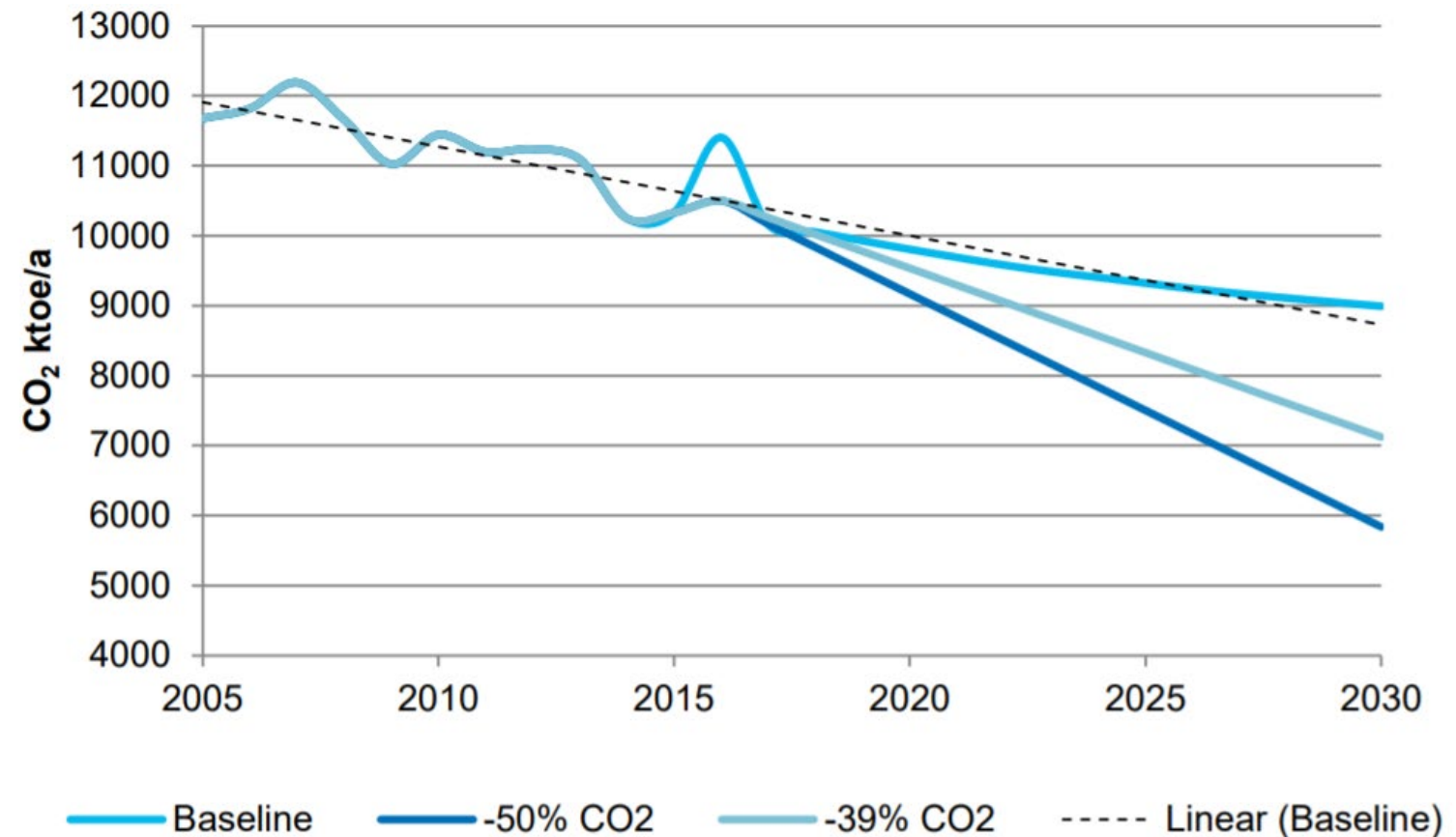
- ⇒ Production and other business possibilities in Finland

- ▶ Availability of feedstocks

- ▶ Self-sufficiency

- ▶ Long distances and very high capacity transportation = electrification more difficult than in e.g. Central Europe

- ▶ CO₂-targets high --→



Alternative fuels in Finland: vehicles

Trend: steep rise of electrified vehicle and methane vehicle sales

► At the end of 2019: alternative fuels, ~ 2% of passenger cars

- Bi-fuel/methane 0,34 %
- EV 0,17 %
- PHEV 1,0 %
- Ethanol (E85) 0,25 %

► Rapid change, numbers small!

⇒ Existing fleet plays a major role in the 1st stage!

► Possibilities recognized

⇒ Vehicle fleet renewal, conversion

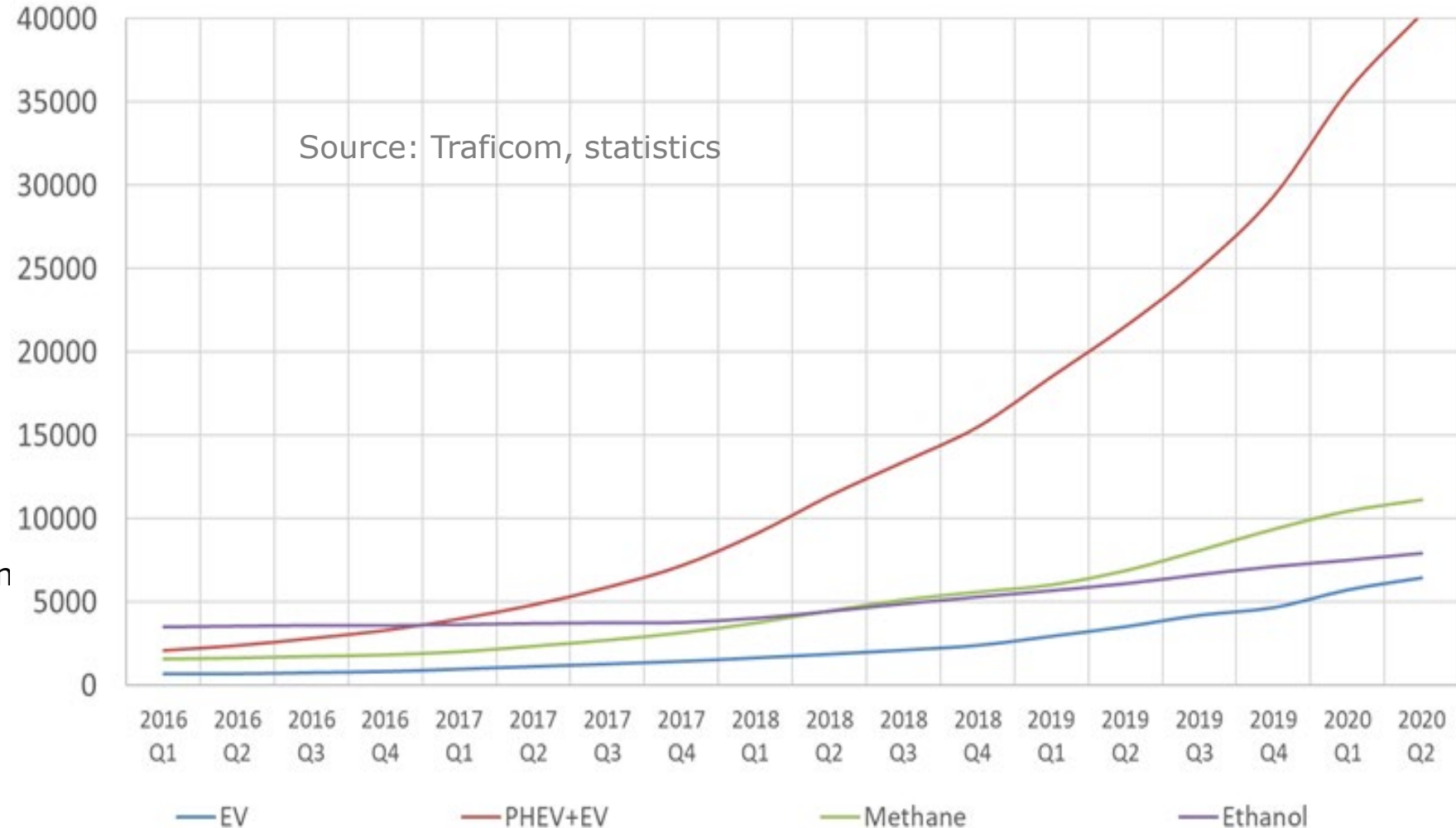
⇒ Instrument: subsidies

⇒ **Renewable drop-in fuels**

⇒ **Instrument: distribution**

mandate for fuel distributors'

Alternative fuel and electric vehicles in Finland 2016-2020:



Distribution mandate for fuel distributor's: legislation in Finland

- ▶ Mandates liquid biofuel distribution for road traffic
- ▶ Distribution mandate, law 446/2007, in force 2008
 - ▶ Target: (liquid) biofuels replacing gasoline and diesel in road transport

Year	2008	2009	2010
Energy content target	2 %	4 %	5,75%*
* did not come into force			

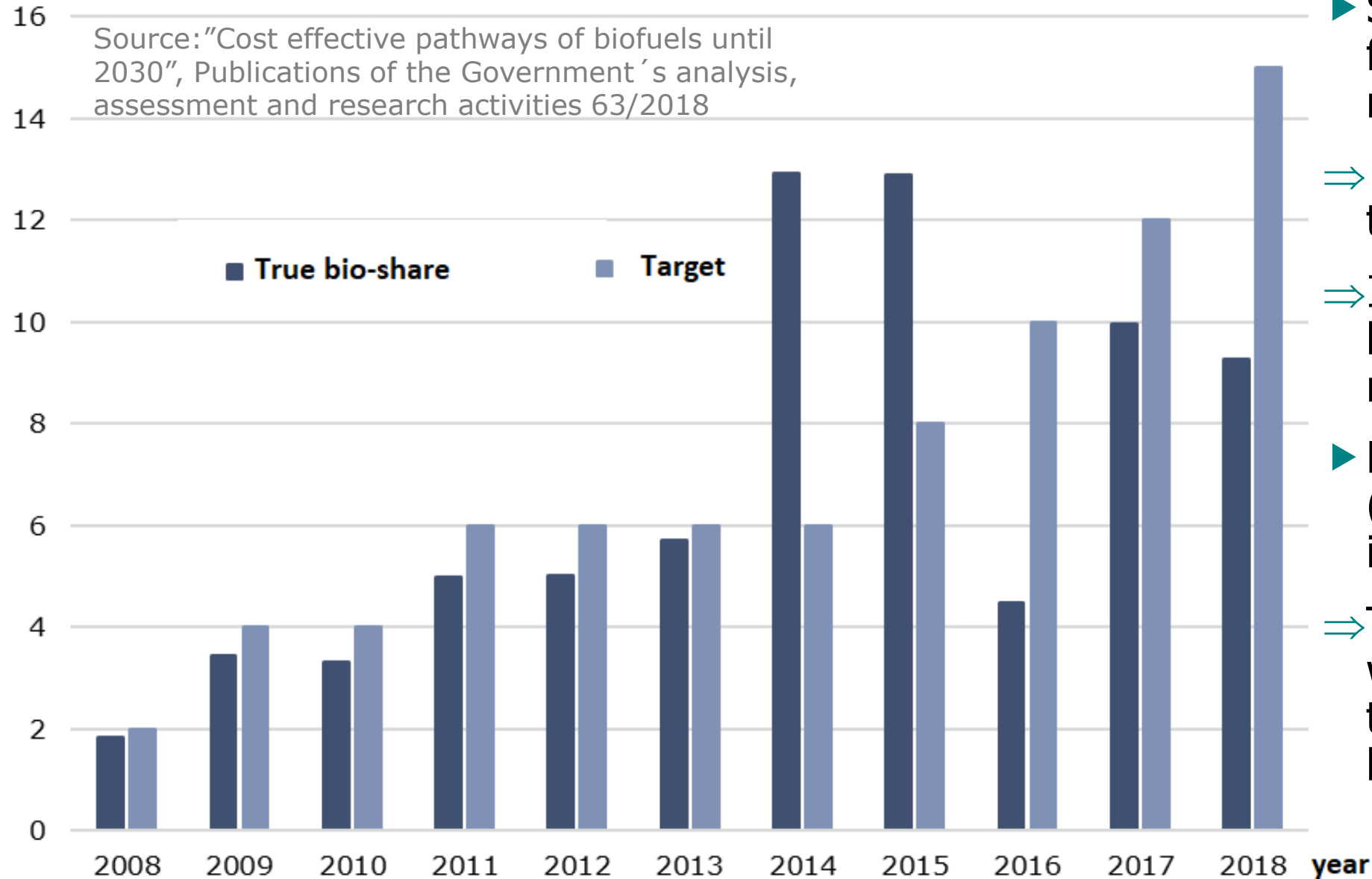
- ▶ Update (e.g. due to RED) 2010: law 1420/2010
 - ▶ Background RED 10% and national 20% target 2020

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Energy content target	6 %	6 %	6 %	6 %	8 %	10 %	12 %	15 %	18 %	20 %

- ▶ ILUC-directive => update regarding mostly calculation and definitions, law 387/2017

Distribution mandate and realised bio-share

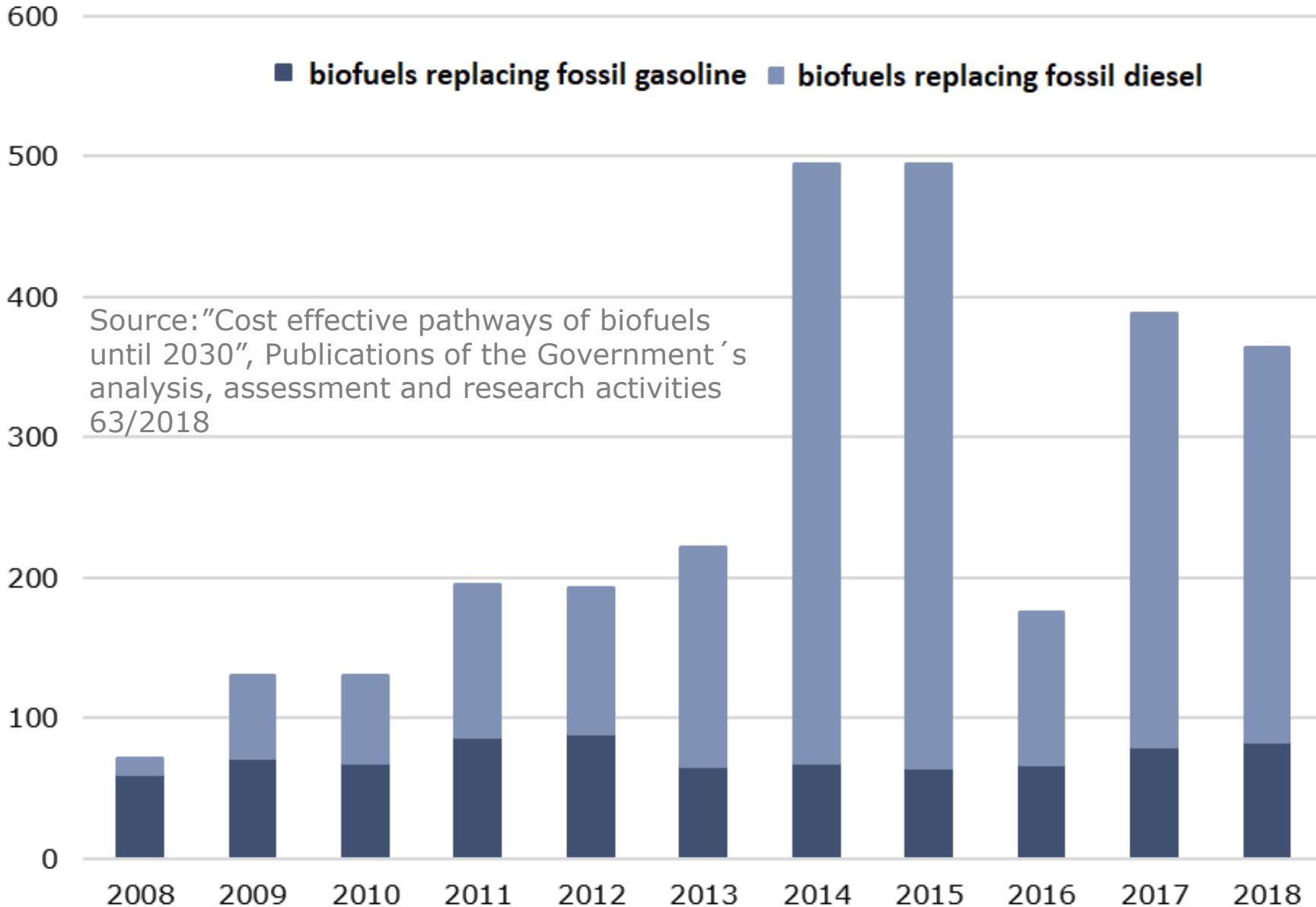
% of energy content



- ▶ Surplus amount can fulfill the next years' mandate
- ⇒ Flexibility, possibility to optimize, but...
- ⇒ In the long run, the bioshare is not maximized
- ▶ Double counting (waste, residues, inedible feedstocks)
- ⇒ The actual bioshare will not be 20% even though the target has been met

Distribution mandate: fuels

ktoe/A



Source: "Cost effective pathways of biofuels until 2030", Publications of the Government's analysis, assessment and research activities 63/2018

- ▶ Initially mainly ethanol
- ▶ Limited ethanol content in gasoline and very few flex-fuel vehicles
- ⇒ after 2010 mandate mainly fulfilled with bio-based diesel fuels

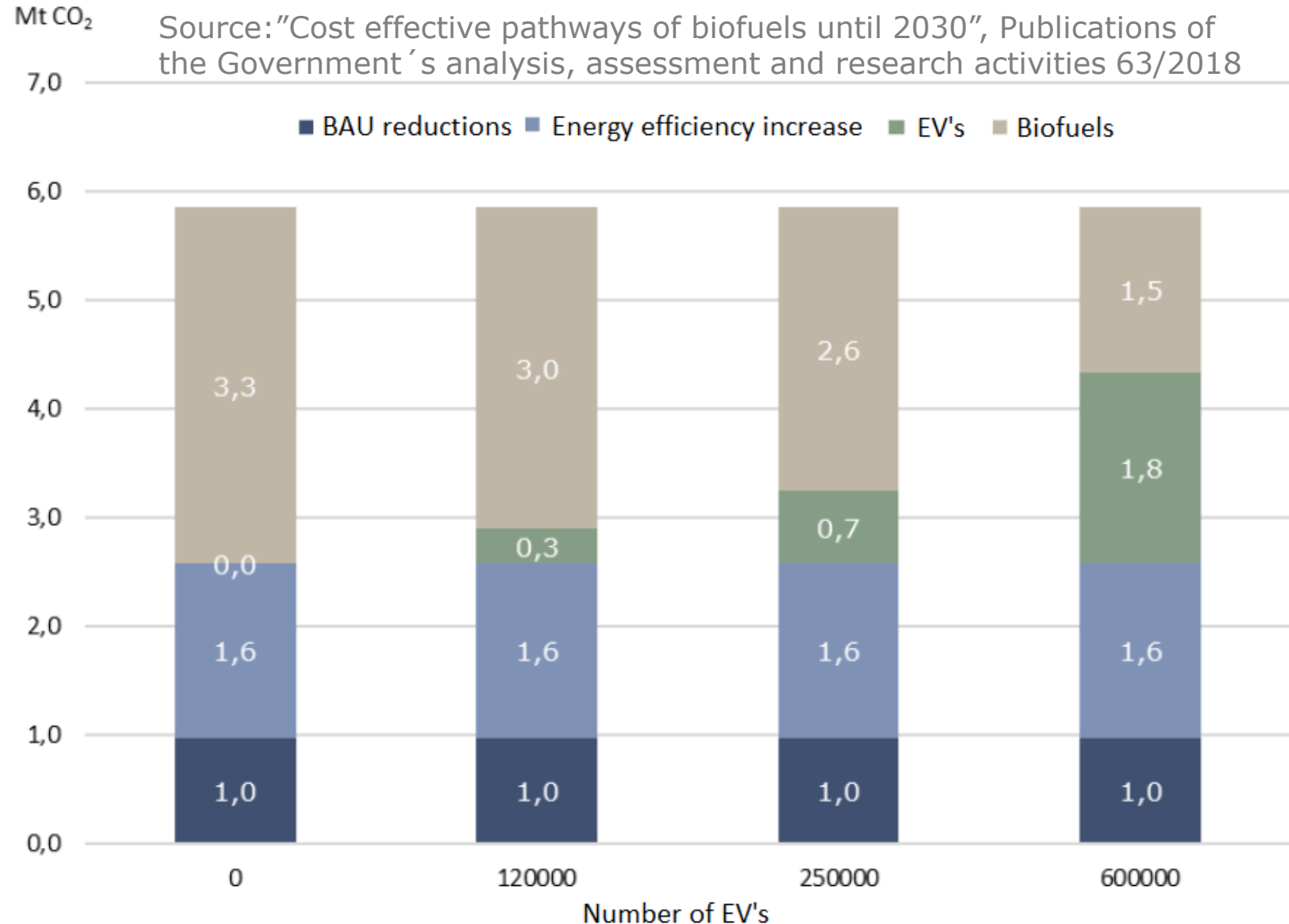
Distribution mandate: current activities, future mandates

- ▶ Update 2019, law 419/2019: Biofuel distribution mandate 30% (2029 ->)
 - ▶ (...of which) advanced biofuel mandate 10% (vs. RED II minimum 3,5%)
 - ▶ double counting removed
 - ▶ mandate for fuel oil biocomponents: 10% by 2030 (law 418/2018)
 - ▶ Background:
 - ▶ Regulation (EU) 2018/842, ESR mandate for Finland -39% (ref. 2005) of GHG by 2030
 - ⇒ For transport, -50% (as stated already in Finnish Energy and Climate Strategy, 2016)
 - ▶ Other effort sharing sector emission reductions considered more challenging
 - ▶ RED II (e.g. feedstock restrictions) and the analysis made in Finland: "Cost effective pathways of biofuels until 2030"

How to reach targeted road transportation GHG savings by 2030?

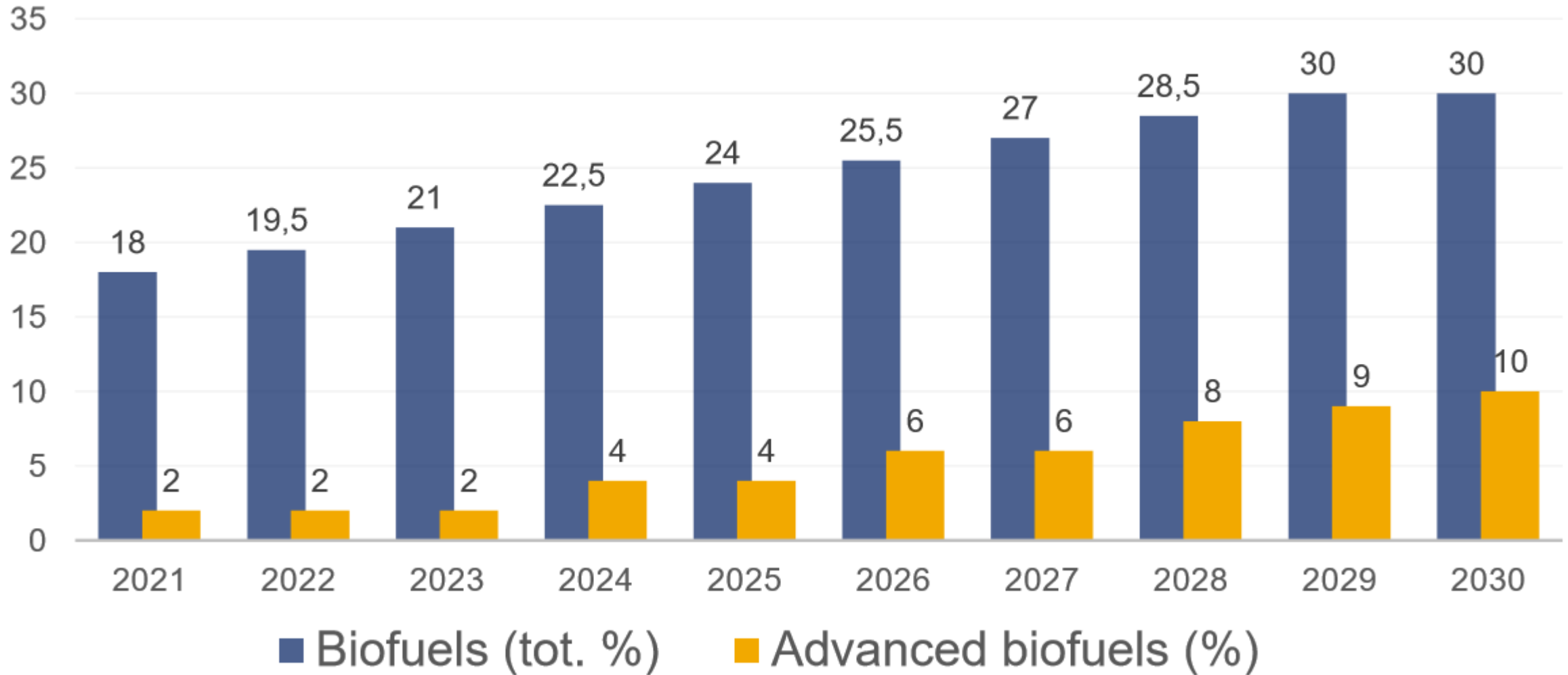
Basis for distribution mandate: "Cost effective pathways of biofuels until 2030": 50% target can be met with

- ▶ sustainable biofuel 30% share of total transport energy(800 ktoe)
- ▶ 250 000 electric vehicles
- ▶ 50 000 gas vehicles
- ▶ meeting the energy efficiency targets set
- ▶ 7% increase in fuel price (compared to BAU)



Finnish distribution mandate 2021-2030

% of energy in fuels



Source: Ministry of Economic Affairs and Employment of Finland

Distribution mandate: lessons learned

- ▶ A working scheme
 - ▶ Economically viable way ensures achieving the targets set
 - ▶ ...if realistic and formulated correctly ("you get what you measure")
- ▶ However...
 - ▶ Does not maximize alternative fuel use
 - ▶ Balancing between years: see years 2014-2015 vs. 2017
 - ▶ Target setting VERY important, has to be well defined and justified
 - ▶ Does not maximize the fuel sustainability or CO2-reductions
 - ▶ Simple, understandable, usable system vs. system taking into account a wide range of products and sustainability levels
 - ▶ Lack of sustainable economically viable resources and drop-in gasoline alternatives
 - ⇒ Major part of the renewable diesel in the world used in Nordic countries
 - ⇒ The role of R&D, production, and their support mechanisms!

Distribution mandate: areas of development

- ▶ Role of consumer small + lack of incentive to go beyond targets
 - ▶ “Why help corporation x to reach targets, that have to be reached anyway, and won't be exceeded?”
 - ⇒ Give room for consumer choice effects, how?
 - ▶ Possibility of partial counting of pure/high bioshare fuels, possibly together with incentives for exceeding targets??
 - ⇒ Give consumer possibility to make informed choices: price and information
 - ▶ E.g. information on how a certain vehicle + fuel affects emissions and costs
<https://www.ilmastopaneeli.fi/autokalkulaattori/>
- ▶ Mandate does not recognize all sustainable products + are all included products really sustainable?
 - ▶ Developing the criteria important (EU-level, and national)

Ongoing activities and plans

In the government programme one of the focal points is the path towards CO2-neutrality

- ▶ Roadmap for fossil free transport
 - ▶ Goal: to identify and introduce the means to halve domestic transport GHG emissions by 2030 and to reach zero emission transport system by 2045
 - ▶ Has been under discussion and development since January 2020, to be made public very soon
- ▶ Workgroup examining taxation reform of transport
 - ▶ Goal: to clarify the needs for transport taxation reform from the point of view of climate change and national economy
- ▶ Workgroup preparing the national biogas program
 - ▶ End report given 1/2020, input for e.g. the roadmap towards fossil free transport: <http://julkaisut.valtioneuvosto.fi/handle/10024/162032>

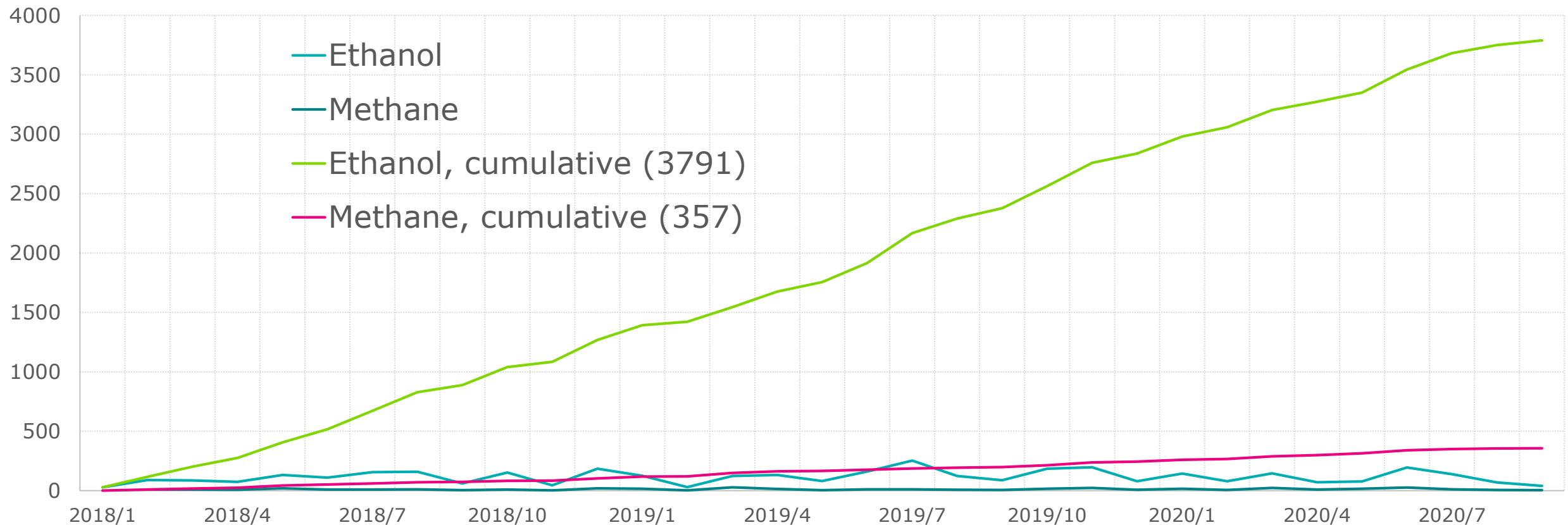
Possible future strategies and development

- ▶ Aim: in the long run biofuel allocation to where options are limited
 - ▶ Electrification: focus on light vehicles, urban areas
 - ▶ Biofuels: focus on heavy duty long haul, marine and aviation
- ▶ Possibilities:
 - ▶ Biogas as a part of distribution mandate?
 - ▶ Distribution mandate development towards "national transportation fuel emission trade scheme"?
- ▶ Challenges that have to be tackled:
 - ▶ Regional and social effects and equality
 - ▶ Competitiveness
- ▶ Increasing the biofuel share is not viable if the share of electrified vehicles isn't simultaneously rapidly increased

Other activities to increase the use of biofuels

- ▶ Conversion subsidy (2018-2021) to convert a vehicle to use ethanol or methane
 - ▶ **1000 €** for gas conversion, **200 €** for ethanol conversion
- ▶ With purchase subsidy for EV's (2000 EUR), 28% of reserved 24 M EUR used by 9/2020

Subsidized converted vehicles



Other activities to increase the use of biofuels

Infrastructure aid (2019: 3 M EUR)

- ▶ Subsidizes part of the investment
- ▶ One category gas filling stations (others charging systems and stations)

Energy aid

- ▶ Subsidizes part of the investment
- ▶ Investment projects and studies that promote...
 - ▶ a) the production or use of renewable energy b) energy savings or increase the efficiency of energy generation or use c) the transition towards a low-carbon energy system.

Other subsidies

- ▶ Investment aid schemes related to rural and agricultural development

Taxation

- ▶ Lower CO₂-tax, which is **halved** for sustainable biocomponents and fuels; **zero**, if the biocomponent source is waste or residues, or inedible feedstocks
- ▶ Biogas: no (energy content or CO₂-) tax

Taxation

► CO2-taxes

- **halved** for sustainable biocomponents and fuels;
- **zero**, if the biocomponent source is waste or residues, or inedible feedstocks

(For comparison, gasoline price at the pump is ~1,50 EUR)

- Biogas: no excise tax

Table →

Finnish tax rates on certain liquid fuels 1.8.2020 -

Product	Energy content tax	Carbon dioxide tax	Strategic stock fee	Total
Motor gasoline c/l	53,79	21,49	0,68	75,96
Bioethanol c/l	35,3	14,1	0,68	50,08
Bioethanol R c/l	35,3	7,05	0,68	43,03
Bioethanol T c/l	35,3	0,00	0,68	35,98
Biogasoline c/l	53,79	21,49	0,68	75,96
Biogasoline R c/l	53,79	10,74	0,68	65,21
Biogasoline T c/l	53,79	0	0,68	54,47
Diesel oil c/l	34,57	24,56	0,35	59,48
Diesel oil para c/l	27,65	23,2	0,35	51,2
Biodiesel oil c/l	31,69	22,51	0,35	54,55
Biodiesel oil R c/l	31,69	11,26	0,35	43,3
Biodiesel oil T c/l	31,69	0	0,35	32,04
Biodiesel oil P c/l	27,65	23,2	0,35	51,2
Biodiesel oil P R c/l	27,65	11,6	0,35	39,6
Biodiesel oil P T c/l	27,65	0,00	0,35	28

Thank you!

Questions?