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Automotive fuels — Assessment of petrol and diesel quality — Fuel quality monitoring system (FQMS)

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Carburants pour automobiles - Evaluation de la qualité de l'essence et du carburant pour moteur diesel (gazole) - Système de suivi de la qualité des carburants (FQMS)

Kraftstoffe für Kraftfahrzeuge - Ermittlung der Qualität von Ottokraftstoff und Dieselmotorkraftstoff - System zum Kraftstoffqualitätsnachweis (FQMS)

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Foreword

This document (EN 14274:2013) has been prepared by Technical Committee CEN/TC 19 “Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14274:2003.

This document had originally been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association. In line with the recent Amendments [3] and [4] to EU Directive 98/70/EC [1], [2], mainly the additional reporting requirement for manganese, the need to update the original document came forward.

This European Standard, which makes use of statistical reasoning, describes a fuel quality monitoring system (FQMS) which may be applied to assess quality of fuels being placed on the market in a European Member State in relation to the European Directive 98/70/EC [1] and its amendments, 2003/17/EC [2], 2009/30/EC [3] and 2011/63/EU [4]. For the purpose of this European Standard, each European Member State is regarded as the smallest unit for which the results of the monitoring system are representative.

Therefore, this European Standard cannot be used without considerable adjustment for the representative monitoring of fuel quality in a specific region nor for a specific distribution chain nor for policing purposes, as the statistical reasoning, which forms the basis for this European Standard, may not be valid for these purposes. The required adjustments for an extension of the monitoring system are rather complex. They are beyond the scope of this European Standard and are therefore not included here. The provisions in this European Standard may, however, in principle be extended to allow for additional purposes.

For several specific parameters, the European fuel specifications in EN 228 and EN 590 request that each country selects limiting values from a given set of values and specifies these country specific limiting values in the corresponding normative annex to EN 228 and EN 590 in order to adjust for geographic and climatic factors. These values may differ from country to country. Therefore, for these specific parameters, also the results obtained in this monitoring system will differ from country to country.

The minimum number of samples that are to be drawn is based on the information and comprehensive statistical analysis available at the time of publication of this European Standard. A statistical explanation on how the different statistical models and minimum samples numbers were achieved will be added as an informative annex to this document at a later stage. As more information becomes available, the number of samples required may change. For this reason this European Standard will be reviewed from time to time.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard describes a fuel quality monitoring system (FQMS) for assessing the quality of petrol and automotive diesel fuel placed on the market in any of the Member States within the European Community.

European Directive 98/70/EC [1] requires that every separate nationally defined fuel grade should comply with one specification as defined in the Directive. Therefore, for each nationally defined fuel grade, there will be a corresponding European parent fuel grade. For instance, unleaded petrol grades placed on the market in Europe can be 91, 95, 98 RON petrol. See also the example discussed in 5.4.2.

Some basic background ideas behind the FQMS are given in Annex A.

Since the specifications for automotive fuels contain climatic related requirements, the FQMS is run twice a year, once during the winter period and once during the summer period. Information about the dates for the summer and winter periods in a specific country are defined in the country's national annex to EN 228 and EN 590. Fuel samples taken during transition periods shall not be included in the FQMS.

For the purposes of this FQMS, grades of petrol that constitute less than 10% of the total amount of petrol placed on the market in any one country, and grades of automotive diesel fuels that constitute less than 10% of the total amount of automotive diesel fuel dispensed in any country may require separate handling as described in Clause 5 of this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 228, *Automotive fuels — Unleaded petrol — Requirements and test methods*

EN 590, *Automotive fuels — Diesel — Requirements and test methods*

EN 14275, *Automotive fuels — Assessment of petrol and diesel fuel quality — Sampling from retail site pumps and commercial site fuel dispensers*

EN ISO 4259, *Petroleum products — Determination and application of precision data in relation to methods of test (ISO 4259)*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

3.1

fuel grade

specific automotive fuel quality of petrol or of diesel fuel for which there exists specifications in:

- a) European Directive 98/70/EC [1] and its subsequent amendments [2], [3] and [4]; or
- b) national implementations of EN 228 and EN 590; or other EN automotive fuel standards, or
- c) other national automotive fuel standards

3.1.1

parent fuel grade

fuel grade that conforms to the requirements of Directive 98/70/EC [1] and its subsequent amendments [2], [3] and [4] or to the appropriate European automotive fuel specifications as laid down in the corresponding EN standards, and to which nationally defined fuel grades shall be referred

3.2

country size

size of a country in relation to the total amount of fuel being placed on the market in that country

3.2.1

small-size country

country in which a total of 15 million tons or less of automotive fuel is being placed on the market per annum

3.2.2

large-size country

country in which a total of more than 15 million tons of automotive fuel is being placed on the market per annum

3.3

fuel dispensing site

site, retail or commercial, where fuel is dispensed into road vehicles for propulsion

3.3.1

retail site

site where the general public can purchase automotive fuel

3.3.2

commercial site

site that is not open to the general public but where automotive fuel is dispensed

3.4

model

design of the FQMS based on a number of different statistical, administrative or logistic criteria

3.5

sample size

minimum number of samples required to be analysed in one country to make the results of the monitoring system representative for that country

Note1 to entry: A country may, at its own discretion, use more than the minimum number of samples, but not less.

3.6

summer period

period of the year as defined in specifications for fuel grades as per 3.1

3.7

winter period

period of the year as defined in specifications for fuel grades as per 3.1

3.8

macro regions

specific grouping of geographical or political regions within a country formed for efficient design of the FQMS

Note1 to entry: See also 5.5.

3.9

variability factor

factor, not exceeding a value of 10, designed to describe the variability in fuel supply in a specific macro region, which takes account of the number of different fuel sources (petrol or diesel fuel) that distribute fuel in a macro

region, and come from refineries located in it and/or from terminals that receive the fuel from a refinery located outside the macro region

4 Information required to set up the FQMS

The information specified in this clause as a requirement for setting up the FQMS is basically divided into two sets. The first set, described in 4.1, specifies the requirement for a working list which contains all the locations from which samples are to be drawn. The second set, described in entries 4.2 to 4.5, specifies the need for information about how the fuel volumes being placed on the market are dispensed across the country. This information is needed in order to make the results of the FQMS representative for the whole country. The information in entries 4.2 to 4.5 should be applied in a step-wise fashion with decreasing preference in the listed order, depending on the data available in the Member State.

4.1 Requirement for a working list.

A list of retail sites (3.3.1) and commercial sites (3.3.2) where automotive fuels are dispensed. This list shall contain information about the region (see 5.2) in which the site is located. This list shall be updated each year. The retail sites may be further subdivided into main oil company sites, super-/hypermarket sites and independently owned sites, provided that all necessary information detailed elsewhere in this European standard is available.

4.2 Amounts and regional distribution of automotive fuel dispensed.

NOTE Depending on the complexity of the FQMS to be used, the amounts of fuel dispensed on a regional basis could be required.

4.2.1 Total amount of automotive fuel dispensed in the whole country, including regional distribution, if available.

4.2.2 Total amount of each grade of petrol dispensed in the whole country, including regional distribution, if available.

4.2.3 Total amount of diesel fuel dispensed.

4.3 Sources of the fuel and its supply and distribution patterns, if applicable.

4.4 Population size and regional distribution, if applicable.

4.5 Number of vehicles and their regional distribution, if applicable.

4.6 Organisations accredited for sampling and for analytical work.

Organisations conducting sampling, testing and analyses required for monitoring fuel quality in the market, shall demonstrate their competence by complying with the minimum criteria set out in Annex B. For sampling of fuel, or volatile materials, the organisation should be accredited for using EN 14275. A list of accredited laboratories, qualified to carry out the tests required for the FQMS should be compiled and maintained by the national accreditation body of the Member State or its nominated alternate. A list of accredited laboratories or organisations for the sampling should be compiled and maintained as well.

5 Setting up the FQMS

5.1 Country size

Using the criteria of the amount of fuel dispensed, a decision shall be made whether the Member State is a large-size or small-size country (3.2).

5.2 Regions

Each country shall define a set of appropriate regions based on either geographic or administrative criteria, taking into consideration the procedures and criteria described in this European Standard, such as amount of fuel being placed on the market, number of fuel dispensing sites, population distribution, vehicle distribution.

Each region may be further subdivided into sub-regions based on marketing and distribution patterns. In such cases the FQMS would be based on samples drawn from an appropriate grouping of these regions and sub-regions.

5.3 Minimum number of samples for fuel grades with market shares of 10% and above

For fuel grades with market shares of 10% and above, the minimum number of fuel dispensing sites in any country to be sampled and tested is given in Table 1, taking into consideration the provisions given in 5.5.

If a country decides to assess more than this required minimum number of samples, this should be specified in its national annex to this European Standard.

Table 1 — Minimum number of samples per fuel grade in each winter and summer period

Model	A	B	C
Small-size country			
Petrol, per grade	50	100	50
Diesel fuel	50	100	50
Large-size country			
Petrol, per grade	100	200	--
Diesel fuel	100	200	--

5.4 Minimum number of samples for fuel grades with market shares below 10%

5.4.1 For fuel grades with market shares below 10%, the minimum number of fuel dispensing sites in any country to be sampled shall be calculated as follows.

5.4.2 For each fuel grade with a market share of less than 10%, taking petrol and diesel separately, the minimum number of fuel dispensing sites to be sampled shall be calculated proportionally from the number of samples for the corresponding parent grade, using the following formula:

$$N_{\text{Grade X}} = \frac{\text{market share (Grade X)}}{\text{market share (parent grade)}} \times N_{\text{parent grade}} \quad (1)$$

EXAMPLE

	Parent grade Super 95	Parent grade Regular 91	Grade X Super 98
Parent of grade X	yes	no	--
Market share	55 %	38 %	7 %
Sample numbers	100	100	13

5.4.3 When a regional model is used (see 5.5) and the minimum sample number for a specific grade is calculated to be less than 1, at least one sample of that fuel grade shall be drawn from within that region.

NOTE This applies equally if a sub-regional model is used.

5.5 Models for the FQMS

5.5.1 General

For each model, the number of samples per grade per region or macro region (model A) is obtained by setting the number of samples (diesel fuel and petrol separately) to be proportional to the volume sales within each region, macro region, or sub-region (see 5.2).

5.5.2 Model A – macro regions

The regions within a country are grouped (preserving some geographical identity) into macro regions so that they have similar total sales volumes relative to each other and also about the same number of different supply sources (measured by the variability factor, see 3.9). This approach is recommended for all countries as it is designed to capture fuel variation efficiently and hence requires a smaller total number of samples, as reflected in Table 1.

If geographical, administrative or other circumstances do not allow fulfilment of the requirements for the design of this preferred model, model B shall be considered the next best model.

In defining the macro regions, a country shall first list all the principal supply points of petrol and diesel fuel (i.e. refineries, in-land terminals and coastal terminals) within each proposed macro region.

The variability factor for a macro region takes account of the number of different fuel types, which are distributed within the region, as well as the number of refineries (R) and supply terminals (T) in that region.

EXAMPLE If, in a certain region of this country, there is only one refinery (R) which supplies two terminals (T1 and T2), and if those three are the only supply points in that region, then the variability factor is 1, because the "fuel type" served in that region comes only from one production site. If, on the other hand, one of the two terminals (T2) is supplied by another refinery (located outside the region), then the variability factor is 2.

Therefore, the variability factor is not simply the sum of all refineries and terminals present in a certain region, but the number of different supply points that are supplying fuel from different sources.

Once these variability factors have been defined for each geographical or political region in the country, the regions shall be grouped into macro regions with approximately the same total variability factor and same total volumes in each macro region, thereby ensuring that the sampling proportional to fuel volumes also captures fuel variability.

An explicit example is given in Annex C. If appropriate, the macro regions may be further split into sub regions by sales channel and the sampling carried out in proportion to the volumes in these sub regions. The minimum overall number of samples per grade and per season is 50 per small-size country and 100 per large-size country.

5.5.3 Model B – Non-macro region

If the construction of macro regions (based on fuel supply patterns) is not possible within a country, then the country shall be divided into regions using only geographic and administrative criteria. To ensure that fuel variability is reliably captured, a larger minimum number of samples per grade are required: 100 for small-size countries and 200 for large-size countries. An example is given in Annex C.

5.5.4 Model C – Non region model

If the country is small-sized (see 3.2.1) and when it can be demonstrated that a division into macro regions (5.5.1) or non-macro-regions (5.5.2) is not possible, having considered the procedures and provisions given in this European Standard, then the country shall be considered as one region for sampling purposes.

5.6 Number of fuel dispensing sites to be sampled

Based on the total volume of fuel dispensed (4.2) or the population size (4.4) and the model chosen (5.5), the minimum number of samples to be taken during the summer and the winter periods shall be calculated for each region, macro region and/or sub region. If, for any region or sub region, and for any one fuel grade, the minimum

number of samples is calculated to be less than one, at least one sample of that fuel grade shall be drawn from within that region or sub region.

In order to make the FQMS as robust and representative as possible, all available information shall be used to calculate the minimum number of samples to be used. The general procedure to be followed is given in Annex D in form of a flow chart. Extension of this system is possible, provided that no other provisions in this European Standard are violated.

5.7 Identification of fuel dispensing sites

Each site that is to be monitored shall be given a unique and unmistakable identification number. This number shall appear on all samples drawn from the site and in the analytical reports.

5.8 Appointment of organisations

A qualified organisation, organisations or laboratories shall be appointed to draw samples. Laboratories shall be appointed to carry out the tests; see 4.6. An organisation shall be appointed to collect and compile the summary report see 6.6, containing all necessary information and data to allow the construction of a final report, see Clause 7.

6 Procedure

6.1 From the list of sites to be sampled for each region, macro region and/or sub-region, randomly select the required number of sites to be sampled. Randomly select an additional 10% of sites to be used if any of the previously selected sites have been shut down or are not currently in operation.

6.2 Provide the organisation(s) that will draw the samples with a list of sites to be sampled. The information given shall be sufficient to allow the site to be located and uniquely identified.

6.3 Obtain samples for each grade to be sampled from the selected sites in accordance with EN 14275.

This sampling procedure may be repeated as many times as necessary in order to obtain replicate samples which may be required for compliance with any additional national requirements.

6.4 Submit the samples to an accredited laboratory (4.6) for analysis and testing. Samples shall be analysed and tested for the characteristics given in the European Directive 98/70/EC [1]. Only those methods specified in EN 228 and EN 590 shall be used for testing the samples.

The parameters to be analysed are the emission relevant parameters currently listed in European Directive 98/70/EC or in updates thereof. Additional fuel quality characteristics as specified in EN 228, EN 590 or other automotive fuel standards may also be checked (see 3.1).

6.5 The analytical report prepared by the laboratory shall only contain the following information:

- laboratory identifier;
- sample identification code;
- site identification code;
- sample collection date;
- type of fuel and fuel grade (see 3.1);
- date of test;
- complete results of the tests (as defined in Annex E).

For reasons of data protection, confidential information about the samples shall be made anonymous in the report and be kept on file only in the laboratory executing the analysis according to the acceptance criteria for laboratories; see Annex B. All data relating to samples taken shall be made available to the government authorities of the Member State upon request.

6.6 Collect and collate the analytical reports from the laboratories, prepare a summary report and submit it to the government of the Member State for preparation of the final report.

7 Final report

7.1 General

The report shall contain two main sections, which contain all information and data of interest, collated for the whole country and divided into one separate section for each grade and for each season.

7.2 Report section about the executed system

The general section shall contain all information about the executed system and about the procedures followed, which could be of interest for quality assurance. More detailed information is given in Annex E, Clause E.2.

7.3 Report section about the results

This section shall contain, separately for each analysed fuel grade, a separate table displaying for each analysed parameter all data and information, which are necessary to make a reliable judgement on the fuel quality in that country. In order to have uniform reporting, the report format given in Annex E shall be used.

If results have been obtained for fuel grades with a market share of less than 10%, then these results, apart from being reported separately, shall be pooled with the results obtained from the corresponding parent grade (see 3.1) and be included in the reporting for that parent grade. (Thus in the example in 5.4.2, the report for "Super 95" shall contain 113 samples.)

Annex A (informative)

Establishing the number of samples to be taken

A.1 Basic criteria

Several basic criteria were considered as a basis of the recommendations on the models used to design the system and the sample size:

- the mean of each key parameter should be estimated with adequate precision,
- the system should be designed to collect samples which give a representative "picture" of fuel variability within the country,
- the data on which a specific model will rely on need to be available in the necessary degree of detail.

A.2 Precision

The precision of the mean may be measured by the 95% confidence interval for the true mean, where the 95% confidence level is commonly used in many industries.

For a simple random sample from a population, if the sample size is N and the observed mean for a fuel parameter is m with a standard deviation S ; the 95% confidence level for the true mean is given by:

$$m \pm \Delta$$

where

$$\Delta = t(5\%)_{N-1} \times \frac{S}{\sqrt{N}} \tag{A.1}$$

and $t(5\%)_{N-1}$ is the 5% value (two sided) from the t distribution with $N - 1$ degrees of freedom; this provides for $N > 50$ a value of $t(5\%)_{N-1} = 2$, i.e. one may be 95% confident that the true mean value of the parameter (the average result that would be obtained if the whole population were surveyed) is in the range $m \pm \Delta$.

Using data from existing within country fuel surveys estimates of the sample-to-sample standard deviation are made for key fuel parameters. From these the value of Δ is estimated for any sample size (N).

EXAMPLE Super 95 % Aromatics Content: From an earlier survey with 100 samples the following summary results were obtained: Mean=37.7%, Standard Deviation $S=4.7\%$ For a sample size $N=100$

$$\Delta = 2 \times \frac{4,7}{\sqrt{100}} = 0,94 \tag{A.2}$$

If a sample size of 100 is used, the precision of the mean aromatics (%) will be of the order +/- 0,9% as measured by the 95% confidence interval. Applying formula (A.1) to typical survey data from EU countries it was found that 50 samples gave an adequate level of precision of estimation of the mean for all stable (non transition) fuel parameters.

However the sample size required to estimate the mean with adequate precision was not considered large enough to ensure that representative data was obtained within a country (particularly a larger country).

Annex B (normative)

Acceptance criteria for laboratories to be used in the FQMS

B.1 Assessment of the laboratory

The laboratory shall hold a valid accreditation in accordance with EN ISO/IEC 17025 for all the test methods required for the monitoring system, or shall have been appointed by the national government.

B.2 Member of an inter-laboratory correlation scheme

The laboratory shall regularly take part in one or more national, European or international inter-laboratory correlation scheme(s). The scheme(s) shall include all the tests to be carried out by the laboratory for the FQMS.

Due to the small number of test engines within Europe, laboratories determining octane number and cetane number should join a scheme with sufficient members so as to ensure that their results are part of a statistically valid data set.

The laboratory shall show by reports that it is able to produce test results that are within the statistically acceptable limits of the mean of the valid results produced by all the laboratories in the correlation scheme.

B.3 Review of inter-laboratory correlation scheme test results

Any laboratory that fails to produce results that are within the statistically acceptable limits of the mean will be required to carry out a check in accordance with EN ISO/IEC 17025 and show that corrective action has been taken in accordance with EN ISO/IEC 17025. If any laboratory consistently produces results that are outside the acceptance limits and cannot demonstrate that they have rectified the problem, the laboratory shall be removed from the list of acceptable laboratories.

Annex C (informative)

FQMS Design - Using models A, B, C

C.1 Model A (Example Italy)

Italy is classed as a large country for the purposes of FQMS and since it uses the macro-region model a minimum of 100 samples per grade are required

The administrative regions in Italy are grouped into 5 geographically coherent macro-regions (North-West, North-East, Centre, South, Islands) such that the number of fuel sources (refineries, terminals, depots) in each macro-region is about the same and the fuel volumes dispensed are of the same order of magnitude.

Table C.1 — Petrol Italy Macro-regions

Italy Macro-regions	Fuel consumption (million tons)	Variability Factor	Proportion of total samples	Minimum number of samples per grade
North-West	5,0	6 - 8	0,29	29
North-East	3,8	7 - 9	0,22	22
Centre	4,0	7 - 8	0,23	23
South	2,8	6 - 8	0,16	16
Islands	1,7	6 - 7	0,10	10
Total	17,3		1,00	100

Table C.2 — Diesel Italy Macro-regions (retail sites only)

Italy Macro-regions	Fuel consumption (million tons)	Variability Factor	Proportion of total samples	Minimum number of samples per grade
North-West	2,4	6 – 8	0,26	26
North-East	2,1	7 - 9	0,22	22
Centre	2,2	7 - 8	0,23	23
South	1,8	6 - 8	0,19	19
Islands	0,9	6 - 7	0,10	10
Total	9,4		1,00	100

The proportion of total samples per grade for petrol/diesel in macro-region j (p_j) is calculated using formula C.1

$$p_j = \frac{v_j}{V} \quad (C.1)$$

where

v_j = total petrol/diesel fuel volume sold per year in macro region j

V = total petrol/diesel fuel volume sold per year in country

The number of samples per macro-region n_j is calculated using formula C.2

$$n_j = p_j \times N \quad (C.2)$$

where

N = Total number of samples required within country

If it is decided to collect more than the minimum number of samples then the proportionality of samples to volumes within each macro-region should be maintained.

C.2 Model B (Example Germany)

Germany is divided into 16 Political regions without consideration of supply patterns. Since Germany is classed as a large country for the purpose of FQMS, a minimum of 200 samples per grade is required. The proportion of samples per region and the number of samples per region are calculated using formulae (C.1) and (C.2).

Table C.3 — Petrol Germany Non Macro-regions

Germany Non Macro-regions	Fuel Consumption (Petrol all grades) (million tons)	Proportion of total sample	Minimum number of samples per grade
Baden-Württemberg	4,1	0,13	27
Bayern	5,2	0,17	34
Berlin	0,8	0,03	5
Brandenburg	0,9	0,03	6
Bremen	0,2	0,01	1
Hamburg	0,5	0,02	3
Hessen	2,7	0,09	17
Mecklenburg-Vorpommern	0,6	0,02	4
Niedersachsen	3,1	0,10	20
Nordhein-Westfalen	6,5	0,21	43
Rheinland Pfalz	1,7	0,06	11
Saarland	0,4	0,01	3
Sachsen	1,3	0,04	9
Sachsen Anhalt	0,8	0,03	5
Schleswig Holstein	1,0	0,03	7
Thüringen	0,7	0,02	5
Total	30,4	1,00	200

Table C.4 — Diesel Germany Non Macro-regions

Germany Non Macro-regions	Fuel Consumption (Diesel all grades) (million tons)	Proportion of total sample	Minimum number of samples per grade
Baden-Württemberg	3,4	0,13	25
Bayern	4,7	0,17	35
Berlin	0,6	0,02	4
Brandenburg	1,0	0,04	7
Bremen	0,2	0,01	1
Hamburg	0,6	0,02	4
Hessen	2,1	0,08	15
Mecklenburg-Vorpommern	0,7	0,03	5
Niedersachsen	3,0	0,11	22
Nordhein-Westfalen	5,3	0,19	39
Rheinland Pfalz	1,4	0,05	10
Saarland	0,3	0,01	2
Sachsen	1,1	0,04	8
Sachsen Anhalt	0,8	0,03	6
Schleswig Holstein	1,1	0,04	8
Thüringen	0,8	0,03	6
Total	27,1	1,00	200

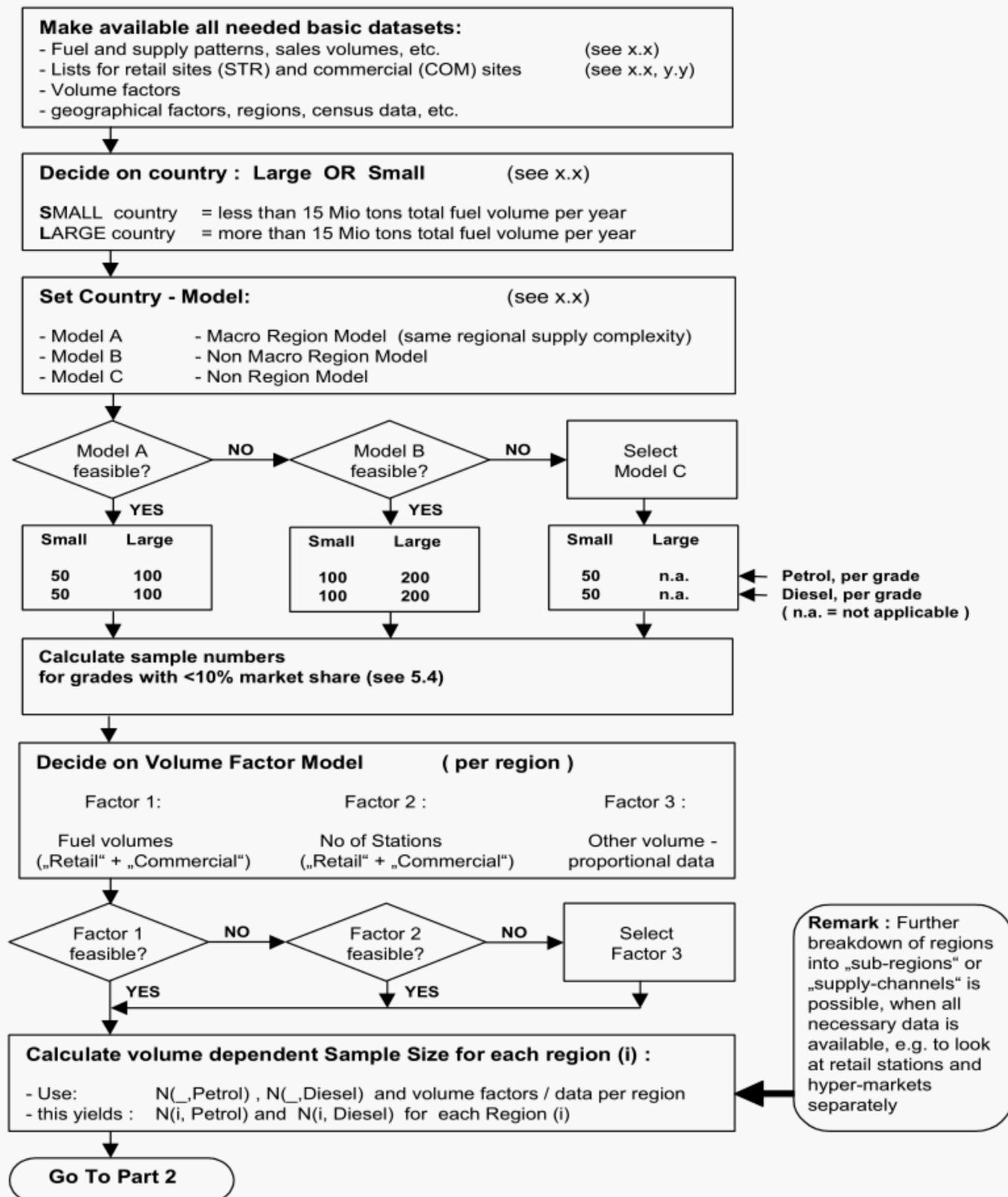
C.3 Model C (Example Luxembourg)

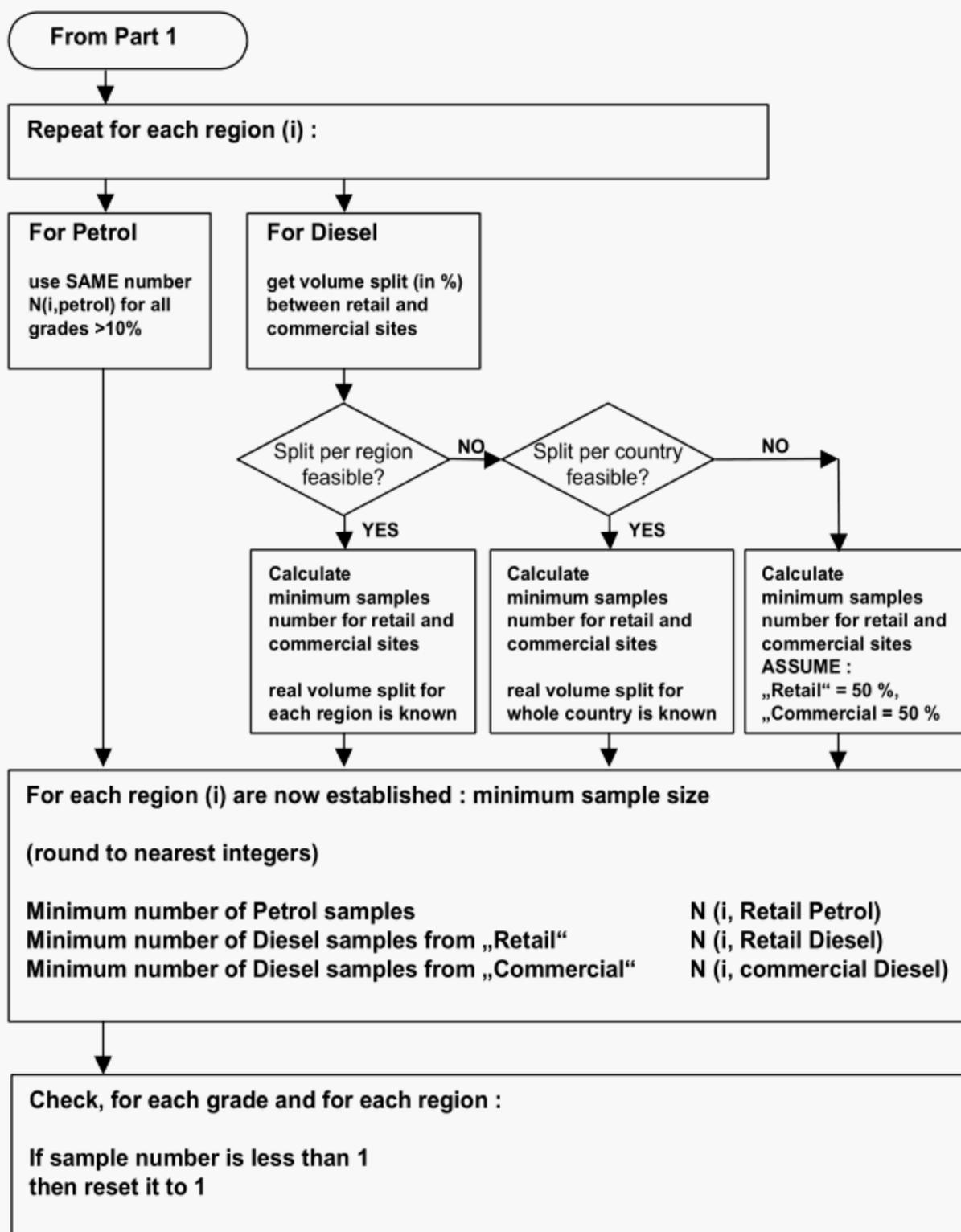
For the purposes of FQMS, Luxembourg may be considered as a small country made up of one region. A minimum of 50 samples per grade will be required from the whole country.

Annex D (normative)

Process flowchart

Process flowchart part 1





Annex E (Informative)

Recommended reporting formats for the final report

E.1 Introduction

The final report for any one country can contain two or more sections, in which all necessary information and data is given to allow a reliable judgement on the fuel quality in that country. The complete report shall consist of two parts, one for each season (summer and winter, see 3.6 and 3.7).

E.2 General section

The general section of the final report shall adequately describe the necessary general information about the executed FQMS system. Since layout and administrative details about execution of the FQMS system may differ from country to country, no specific format for this part of the final report is defined for the general section. The final report shall, however, contain information about:

- The European Member State having executed the FQMS;
- Season of the year (summer, winter) and specific time periods in which the FQMS has been executed;
- A complete list of the fuel grades (see 3.1) in its territory;
- Statistical model (model A, B, C), including any additional provisions made;
- Information and identification of the defined regions;
- Volume information per country and per fuel grade, and their breakdown into regional sample numbers;
- Number of samples taken per fuel grade per region;
- Any other information deemed necessary to give a reliable description about the executed FQMS, like the organisation(s) responsible for compiling the report, etc.

E.3 Analytical section

This section of the final report shall contain, separately for each fuel grade (see 3.2), a detailed list of analytical results for each parameter which has been analysed, including information necessary for unambiguous identification of the fuel grades as well as information about the time periods in which the samples have been taken and analysed.

The data shall be reported using the appropriate format(s) defined in Tables E.1, E.2 and E.3

Country :
Fuel grade : Unleaded petrol

Table E.1 — Analytical report form – FQMS according to EN 14274
Market Fuels used in Vehicles with Spark Ignition Engines - EN 228

Parent grade:
National Specification :
Period - Year :

Parameter	Unit	Analytical and statistical results					Limiting value ¹⁾				Test method ²⁾	
							National Specification, if any		According to 98/70/EC Annex I			
		No of samples	Min.	Max.	Mean	Standard deviation	Min.	Max.	Min.	Max.	Method	Date
Research Octane number	--											
Motor Octane number	--											
Vapour pressure, DVPE	kPa											
Distillation : - evaporated at 100 °C - evaporated at 150 °C	%(V/V) %(V/V)											
Hydrocarbon Analysis : - olefins - aromatics - benzene	%(V/V) %(V/V) %(V/V)											
Oxygen content	%(m/m)											
Oxygenates : - Methanol - Ethanol - Iso-propyl alcohol - Tert-butyl alcohol - Iso-butyl alcohol - Ethers containing 5 or more carbon atoms per molecule - other oxygenates	%(V/V) %(V/V) %(V/V) %(V/V) %(V/V) %(V/V) %(V/V)											
Sulfur content	mg/kg											
Lead content	g/l											
Manganese content	mg/l											

Sample Numbers in Month						Total :
January	April	July	October			
February	May	August	November			
March	June	September	December			

1) The limiting values are "true values" according to EN ISO 4259. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259.

2) Methods and dates are those listed in the latest edition of EN 228.

Country :
Fuel grade : Diesel Fuel

Parent grade: National
Specification :Period -
Year :

Table E.2 — Analytical report form – FQMS according to EN 14274
Market Fuels used in Vehicles with Compression Ignition Engines – EN 590

Parameter	Unit	Analytical and statistical results					Limiting value ¹⁾				Test method ²⁾	
							National Specifications if any		According to Specification 98/70/EC Annex II			
		No of samples	Min.	Max.	Mean	Standard deviation	Min.	Max	Min.	Max.	Method	Date
Cetane number	--											
Density at 15 °C	kg/m ³											
Distillation – 95% Point	° C											
Polycyclic aromatic hydrocarbons	%(m/m)											
Sulfur content	mg/kg											
FAME content	% (V/V)											

Sample Numbers in Month			
January		July	
February		August	
March		September	
April		October	
May		November	
June		December	
		Total :	

- 1) The limiting values are "true values" according to EN ISO 4259. The results of individual measurements shall be interpreted following the criteria described in EN ISO 4259.
- 2) Methods and dates are those listed in the latest edition of EN 590.

E.4 Macro Region Approach

The simplest way to sample from a country is to split the country into regions and randomly select sampling points within each region (the number selected per region weighted proportionally to the fuel volumes sold within each region). However this will not necessarily be the most efficient approach as two regions of the same size may show very different fuel variations due to the supply situations within the regions.

To overcome this problem regions are grouped into Macro Regions so that within each Macro region the number of supply points is the same or nearly the same (see also Figure E.1). Thus ensuring that variation in fuel quality due to supply is captured most efficiently.

It was recognised that the Macro Region approach would not be applicable in all countries and in these countries a larger sample would be required to compensate.

From statistical experience (see also the Foreword) it was felt that for countries where the Macro region approach could be implemented 100 samples for large countries and 50 samples for small countries was an acceptable *minimum* sample size (model A). For countries where Macro regions could not be formed 200 and 100 samples were the recommended *minimum* sample size (model B) with an exceptional case of 50 samples per country for very small countries with no regional breakdown.

Process flowchart part 1

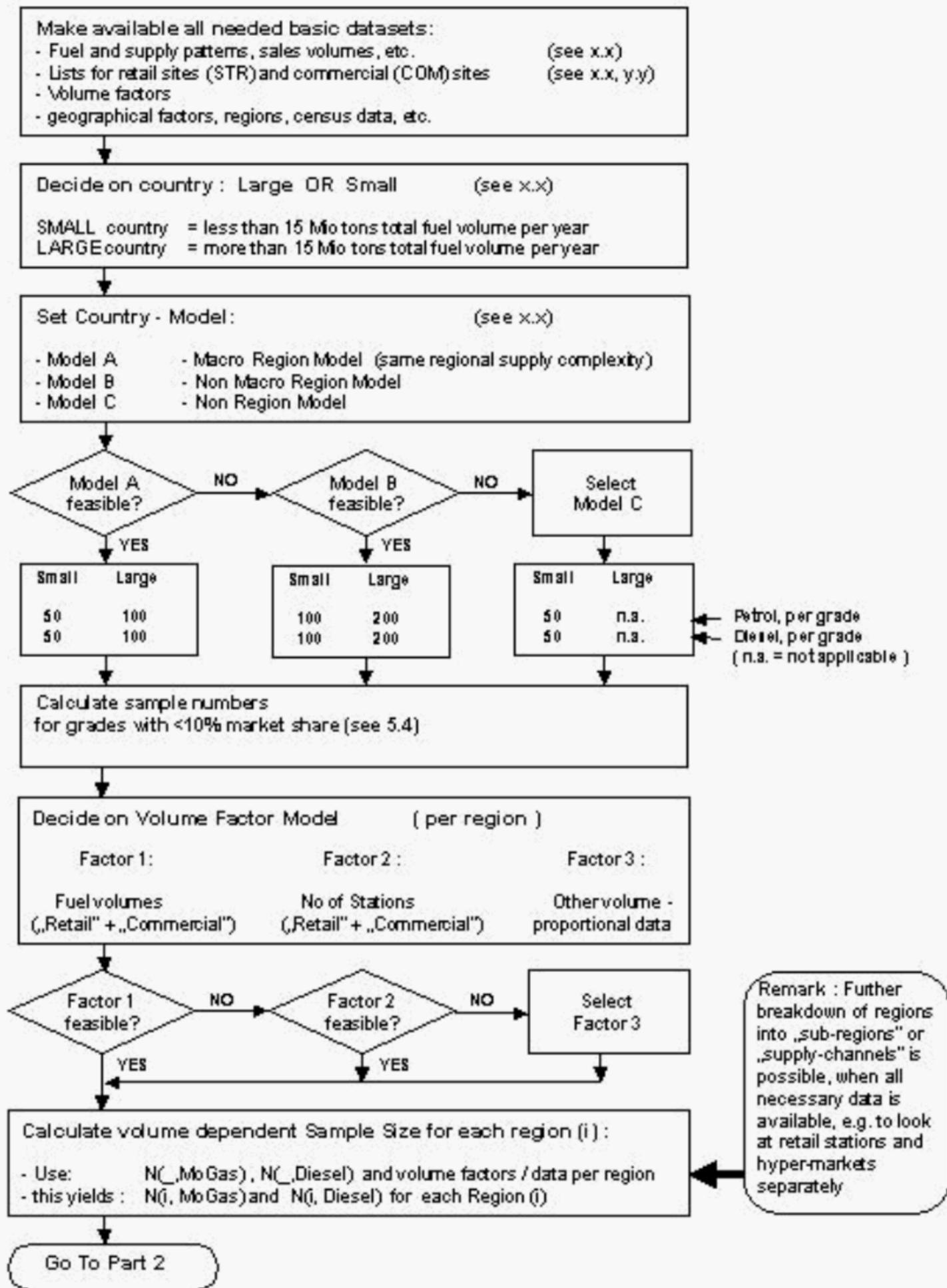


Figure E.1 — Explanation of the Macro Region Approach

Bibliography

- [1] Directive 98/70/EC of the European Parliament and of the Council of 13 October 1998 relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC
- [2] Directive 2003/17/EC of the European Parliament and of the Council of 3 March 2003 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC
- [3] Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC amending Directive 98/70/EC as regards the specification of petrol, diesel and gas oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC
- [4] Directive 2011/63/EU of the European Parliament and of the Council of 1 June 2011 amending, for the purpose of its adaptation to technical progress, Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels.

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