Agenda Item 4.5

Air Navigation Performance Framework Results from the 2018 data collection exercise

(version 3 reflecting State submissions up to 10 December 2018)

EANPG/60 - RASG-EUR/07

Paris, France

26 – 30 November 2018

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Executive Summary

Highlights on performance results

a) The EUR region is characterised by a wide variety in the size of the airspace as well as of traffic density. The top 4 States included in the report cover two thirds of the continental airspace.

b) The top-5 States account for more than 50% of the flight hours, of the IFR airport movements and of all ATCOs in operations at ACCs.

c) The average IFR flight duration per State (in continental airspace) varies from 0.17 hrs (10 minutes) to 2.03 hrs (122 minutes).

d) The vast majority of States have a single FIR. A smaller number has 2 (often a division between upper and lower), while only 8 States have 3 or more FIRs.

e) The vast majority of States have a single ACC. A smaller number has 2, while only 8 States have 3 or more ACCs. The distribution is similar to the # of FIR distribution.

f) The data shows that between States there are large differences in Just Culture in the EUR Region and that the RAT methodology is well applied to separation minima infringements (23 States at 100%), runway incursions (21 States at 100%) and ATM-specific technical occurrences (24 States at 100%).

g) A few States account for more than 50% of all en-route ATFM delay in the EUR Region, main reasons related to demand/capacity mismatch due to ATC capacity problems. The vast majority of States does not generate any significant delay.

h) 5 airports are causing 50% of all airport ATFM delay in the EUR Region. Weather causes are the biggest contributor; ATC & aerodrome capacity causes together with weather are the biggest contributor to airport ATFM delay.

i) The top-6 States are accountable for 75% of the EUR Region extra-distance and theoretical CO2 emissions from a lack of horizontal flight efficiency.

j) The data suggest that there is a variety of results in the ATCO productivity, a dozen of States perform better than the average while a dozen perform below the average.

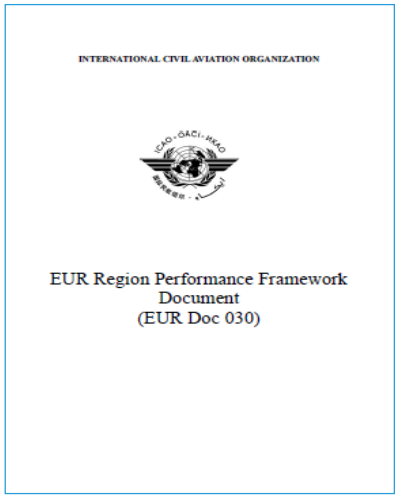
k) The participation of States and Stakeholders to the ICAO activities (e.g. workshops, meetings, reports) varies greatly, with an average (based on the examples examined) of 38%.

Introduction

ICAO Performance Framework Document

ICAO EUR Doc 030 describes the performance Framework (available in English/Russian language)

- Introduction
- Background
- Relationship with ICAO Global developments
- Relationship with the EU Performance Scheme
- Geographical scope
- Roles and responsibilities
- KPAs/KPIs/Metrics
- Monitoring and reporting at regional/national level
- Guidance material

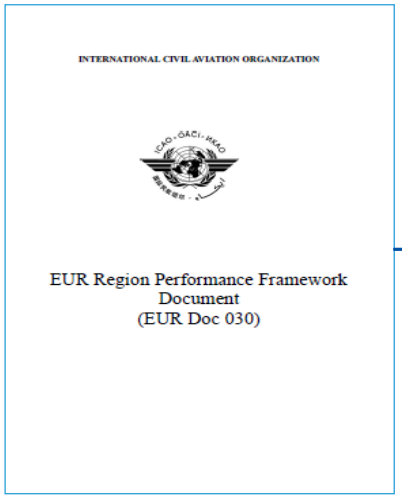

INTERNATIONAL CIVIL AVIATION ORGANIZATION

EUR Region Performance Framework Document
(EUR Doc 030)

EUR Region Performance Framework

KPA	OBJECTIVES	FOCUS AREAS	INDICATORS
SAFETY	Ensure safety continuous improvement through reduction of ATM related safety occurrences and implementation of uniform safety standards		Effectiveness of Safety Management (Safety Maturity Questionnaire)
			Level of State Safety/Just culture (Safety Culture Questionnaire)
			Adoption of an harmonized occurrences severity classification methodology
CAPACITY	Capacity meets demand for en-route and at airports	En-route ATFM Delay	Average en-route ATFM delay generated by airspace volume
		Airport ATFM Delay	Average ATFM delay per flight in the main airports (to be identified by States)
EFFICIENCY	Ensure users may use most efficient routes	Horizontal Flight Efficiency	Average horizontal en route flight efficiency (length of the en route part of the actual trajectory/last flight planned route vs great circle)
ENVIRONMENT	Contribute to the protection of environment (fuel/CO2 emissions reduction)		CO2 emissions related to inefficiencies in route extension
COST EFFECTIVENESS	Contribute to optimization of costs for ANS	ATCO Productivity	IFR Flights (en-route) per ATCO hour duty
			IFR flight hours per ATCO hour on duty
			IFR movements per ATCO hour on duty
PARTICIPATION BY ATM COMMUNITY	Ensure States' participation to Regional planning and implementation activities		Level of participation to meetings
			Level of responses to planning activities
			Level of provision of performance results

ICAO Performance Framework Reporting Tables



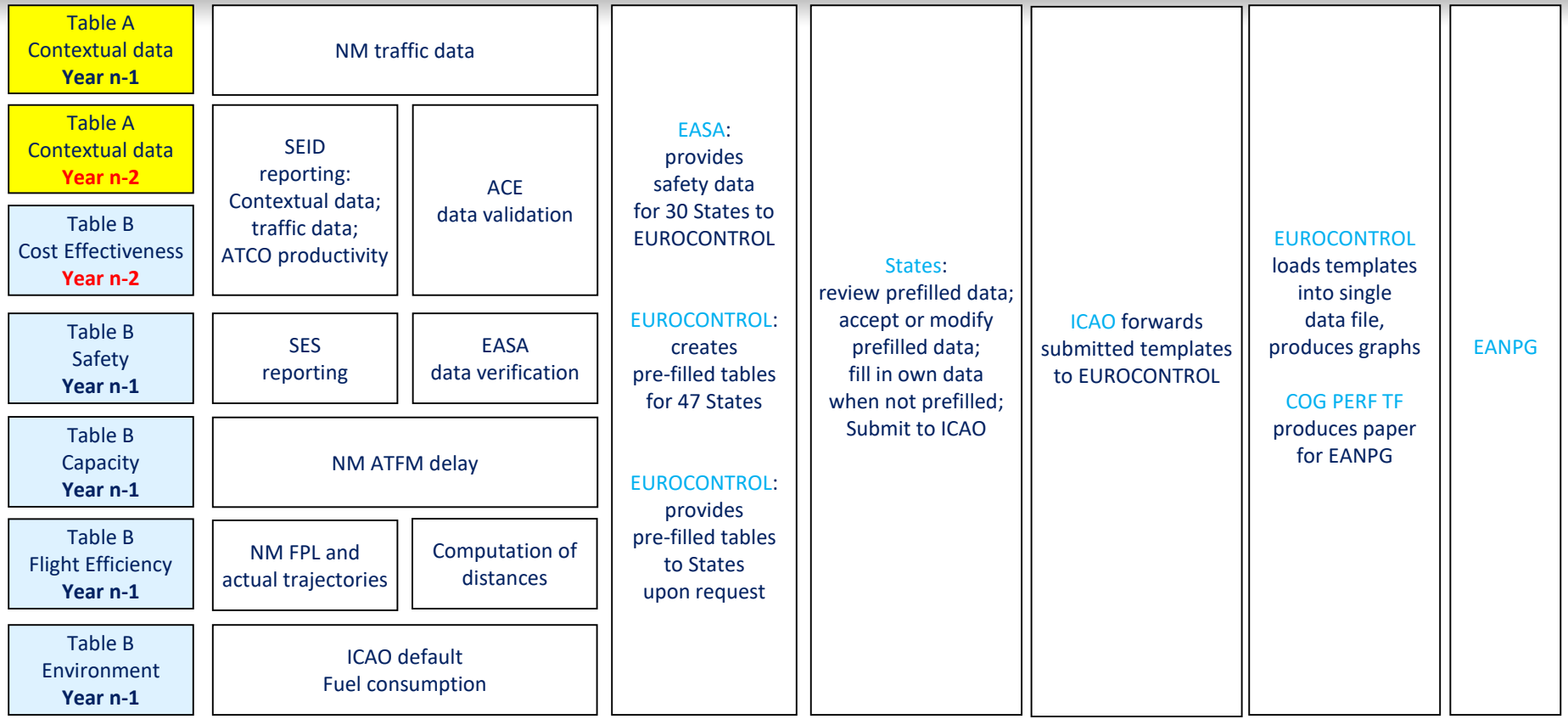
- Table A – Contextual Data
  - Continental Airspace
    - Airspace
    - Traffic
    - ATC Facilities
    - ATCOs in Operations
  - Oceanic Airspace
    - Airspace
    - Traffic
    - ATC Facilities
    - ATCOs in Operations

Contextual data

- Table B – Performance Data
  - Continental Airspace
    - Safety
    - Capacity
    - Flight Efficiency
    - Environment
    - Cost Effectiveness
- Table C – Participation Data
  - EUR Region Activities
    - Level of participation

Performance data

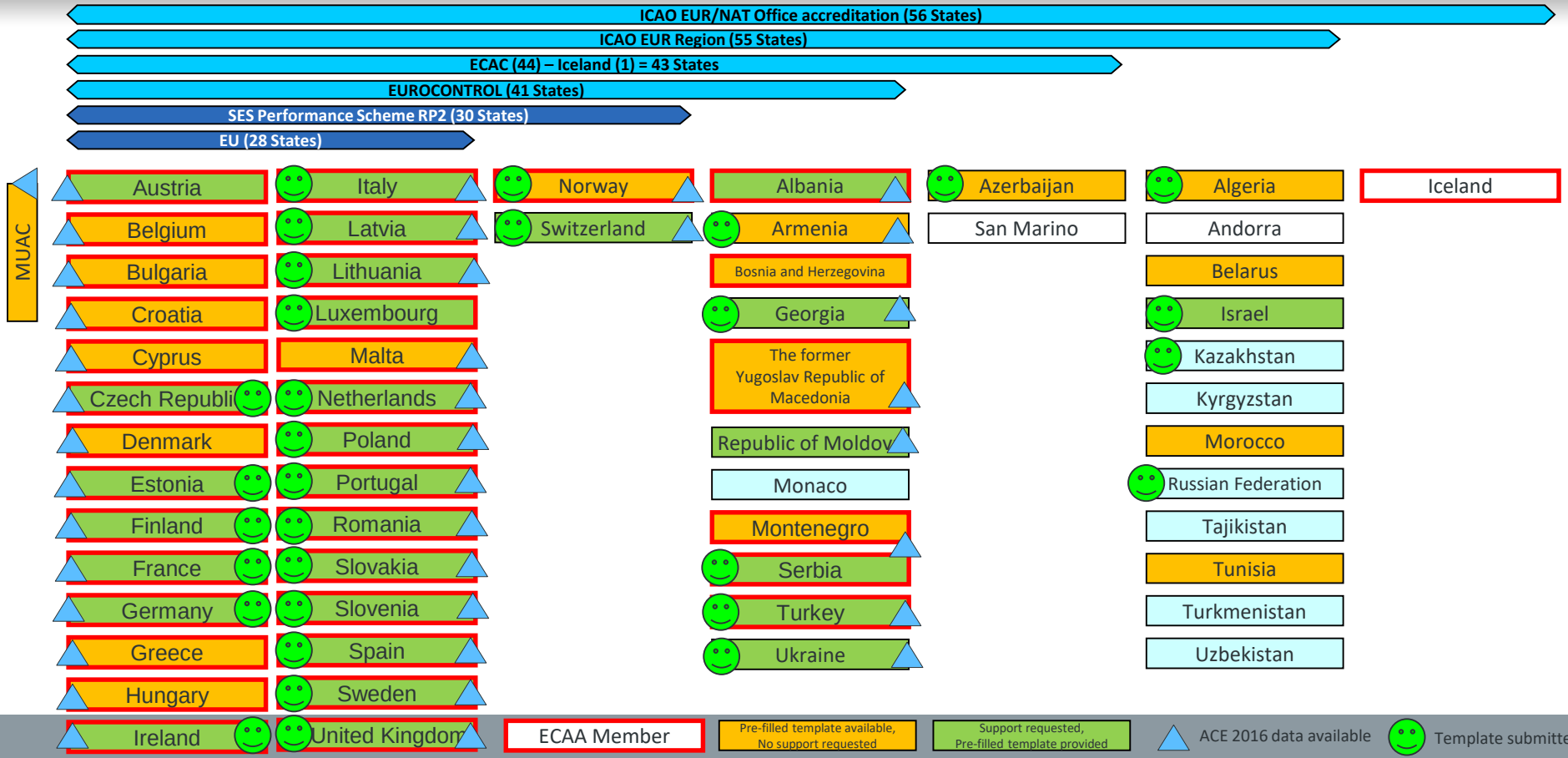
Data flow for Tables A & B



ICAO PARIS UNITING AVIATION

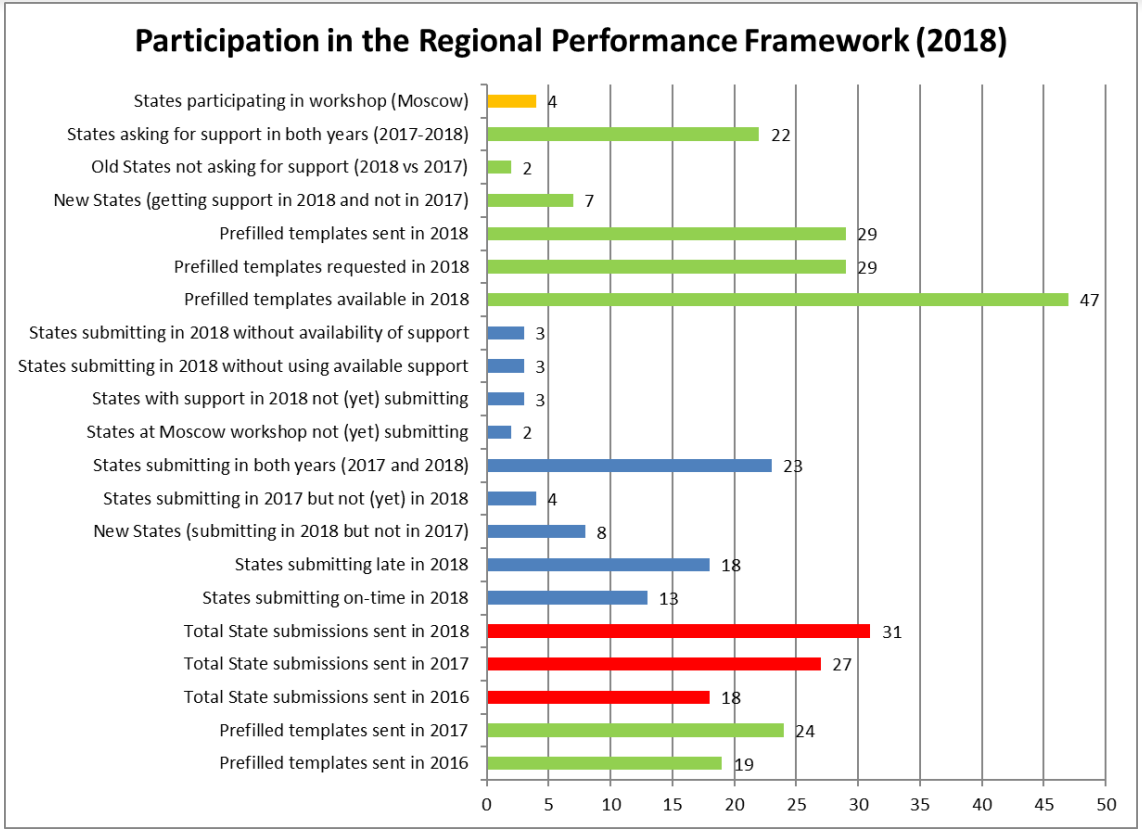
Level of participation in 2018

Status on 10-12-2018



Level of participation in 2018

Status on 10-12-2018

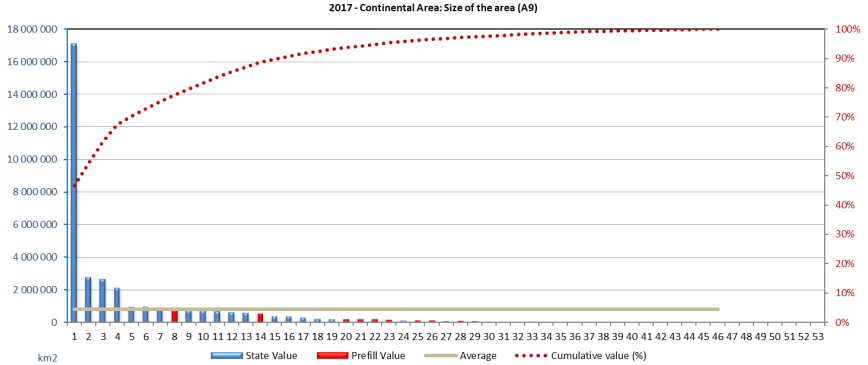


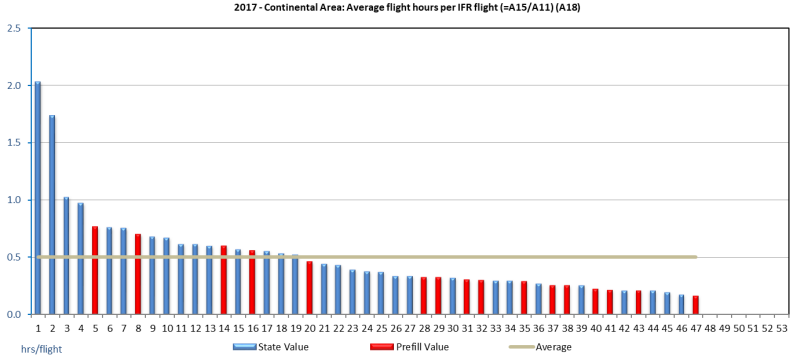
Processing and presentation of results

- Data is collected in one Excel reporting template per State
- Data of individual States is collated into a single data set
  - Basis for graphical representation of results
    - Combination of prefilled and submitted data
      - Blue bars: data as submitted by the State
      - Red bars: prefilled data where available, for States which did not submit a template
      - In some cases the number of States in the graphs is smaller than the number of pre-filled + submitted templates. Reason: for some States the template is only partially filled.
  - Results are anonymised
    - But each State can see where it stands in comparison to all States in the Region
      - Each State knows its own values and can therefore position itself in the graphs

Explanation of graphs

- Title
  - Identifies the data: year, scope (geographical and/or KPA), name of the data item, identifier code in the template
- X-axis
  - The list of anonymised States for the State- and ANSP-based data items (MUAC included as an ANSP), and the list of anonymised airports for the airport-based data items (± 180 airports). Note that the labels are ranking numbers, not State/airport identifiers: in principle the mapping between numbers and States/airports is different for each graph.
- Left y-axis
  - The value of the data item, with the measurement units in the bottom left corner (blank means it is simply a count).
- Brown line
  - The average value (arithmetic mean), based on the number of States/ANSPs for which results are available for this data item (the length of the line indicates for how many States/ANSPs data is available). This value is a proxy for the regional average: it will change as data for more States/ANSPs is available.
- A series of blue and/or red bars
  - The profile of individual State/ANSP/airport values in descending order. This provides a good picture of the differences within the region. The bars do not show the difference between a reported value of zero and the value not being reported, but this can be deduced from the brown line (absence of a bar below the brown line means value zero or a value too small to be visible in the graph).
- A red dotted line
  - For data items which are aggregatable over States/ANSPs/airports: the cumulative profile of the blue bars in percent (see right-hand axis).



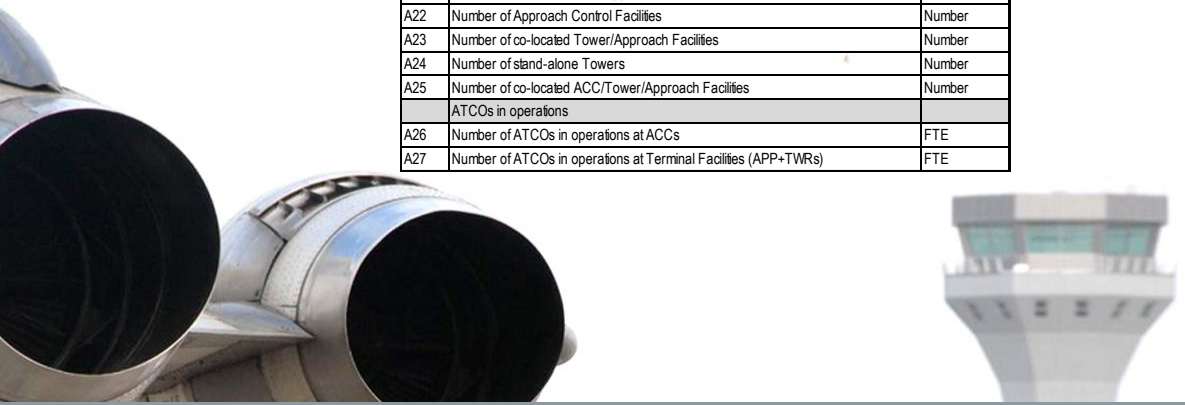


Contextual data (Table A)

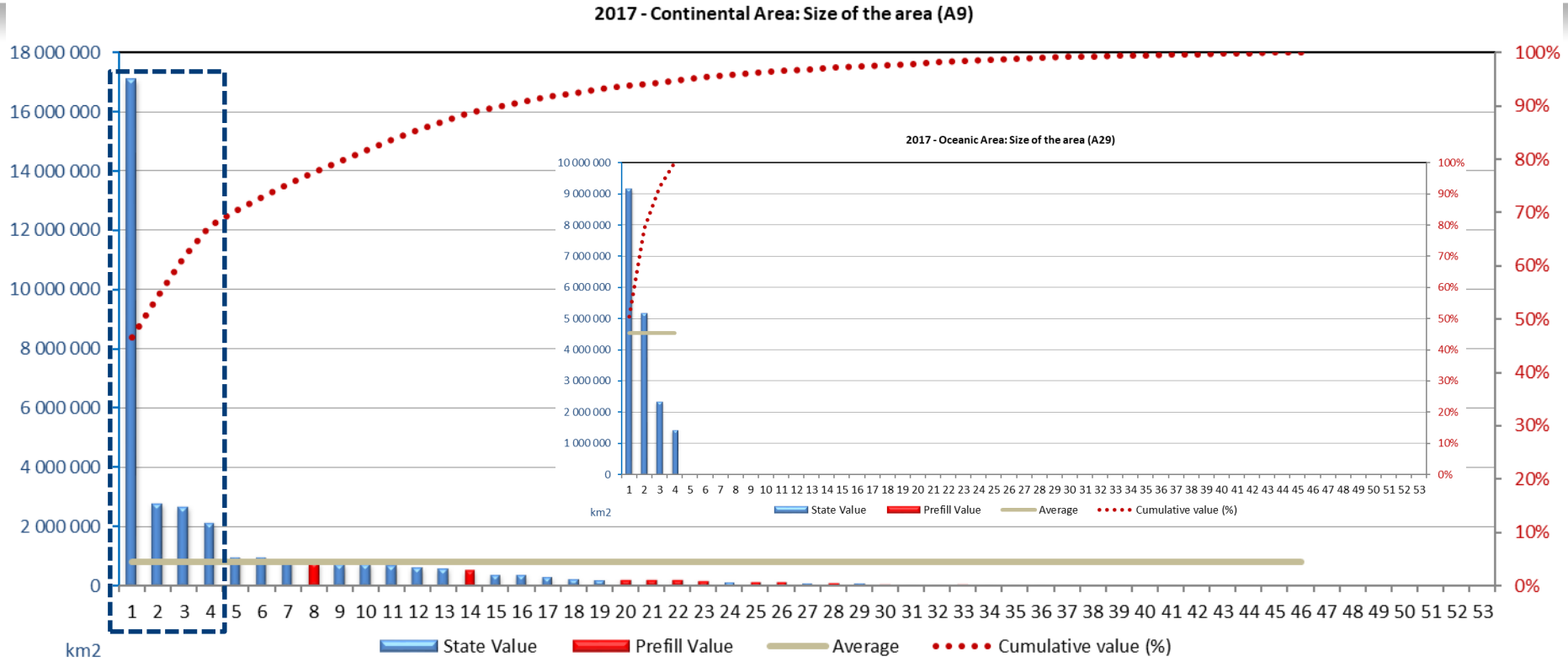
Data items

	Continental Area	
	Airspace	
A8	Number of FIRs	Number
A9	Size of the area	km^2
A10	Radar Surveillance Coverage at FL 290	km^2
	Traffic	
A11	Total number of IFR flights controlled (=A12+A13+A14)	Flights/year
A12	Number of domestic IFR flights controlled	Flights/year
A13	Number of international IFR flights controlled	Flights/year
A14	Number of IFR overflights controlled	Flights/year
A11b	Total number of IFR flights controlled (use only if A12+A13+A14 not available)	Flights/year
A15	Number of IFR flight-hours controlled	hrs/year
A16	Number of IFR airport movements controlled (departures+arrivals)	Mov/year
A17	Number of VFR airport movements controlled (departures+arrivals)	Mov/year
A18	Average flight hours per IFR flight (=A15/A11)	hrs/flight
A19	Average IFR traffic density (=A15/A9)	$hrs/km^2/year$
	ATC facilities	
A20	Number of ACCs	Number
A21	Number of co-located ACC/Approach Facilities	Number
A22	Number of Approach Control Facilities	Number
A23	Number of co-located Tower/Approach Facilities	Number
A24	Number of stand-alone Towers	Number
A25	Number of co-located ACC/Tower/Approach Facilities	Number
	ATCOs in operations	
A26	Number of ATCOs in operations at ACCs	FTE
A27	Number of ATCOs in operations at Terminal Facilities (APP+TWRs)	FTE

	Oceanic Area (for States having an Oceanic Area)	
	Airspace	
A28	Number of FIRs	Number
A29	Size of the area	km^2
A30	Radar Surveillance Coverage at FL 290	km^2
	Traffic	
A31	Number of IFR flights controlled (=A32+A33+A34)	Flights/year
A32	Number of domestic IFR flights controlled	Flights/year
A33	Number of international IFR flights controlled	Flights/year
A34	Number of IFR overflights controlled	Flights/year
A31b	Number of IFR flights controlled (use only if A32+A33+A34 not available)	Flights/year
A35	Number of IFR flight-hours controlled	hrs/year
A36	Average flight hours per IFR flight (=A35/A31)	hrs/flight
A37	Average IFR traffic density (=A35/A29)	$hrs/km^2/year$
	ATC facilities	
A38	Number of OACs	Number
	ATCOs in operations	
A39	Number of ATCOs in operations at OACs	FTE

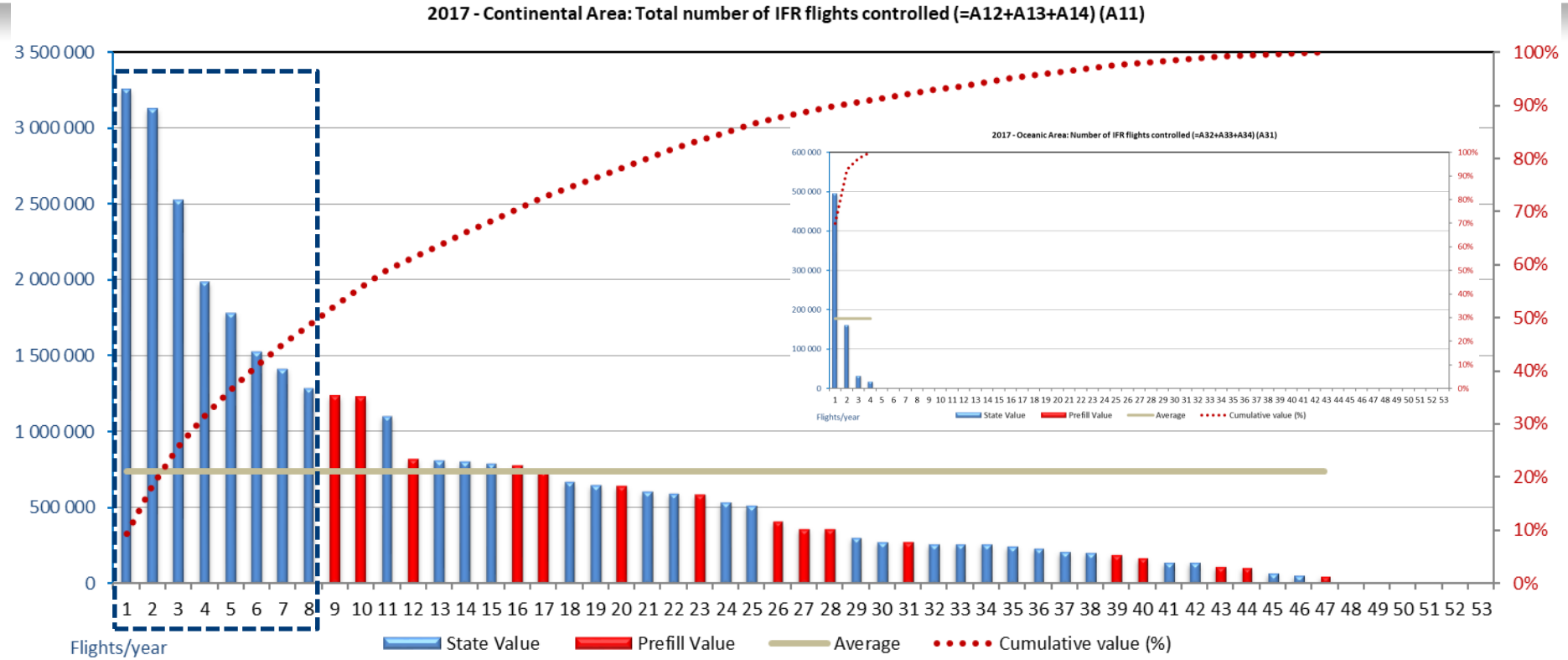


Data items A9 & A29



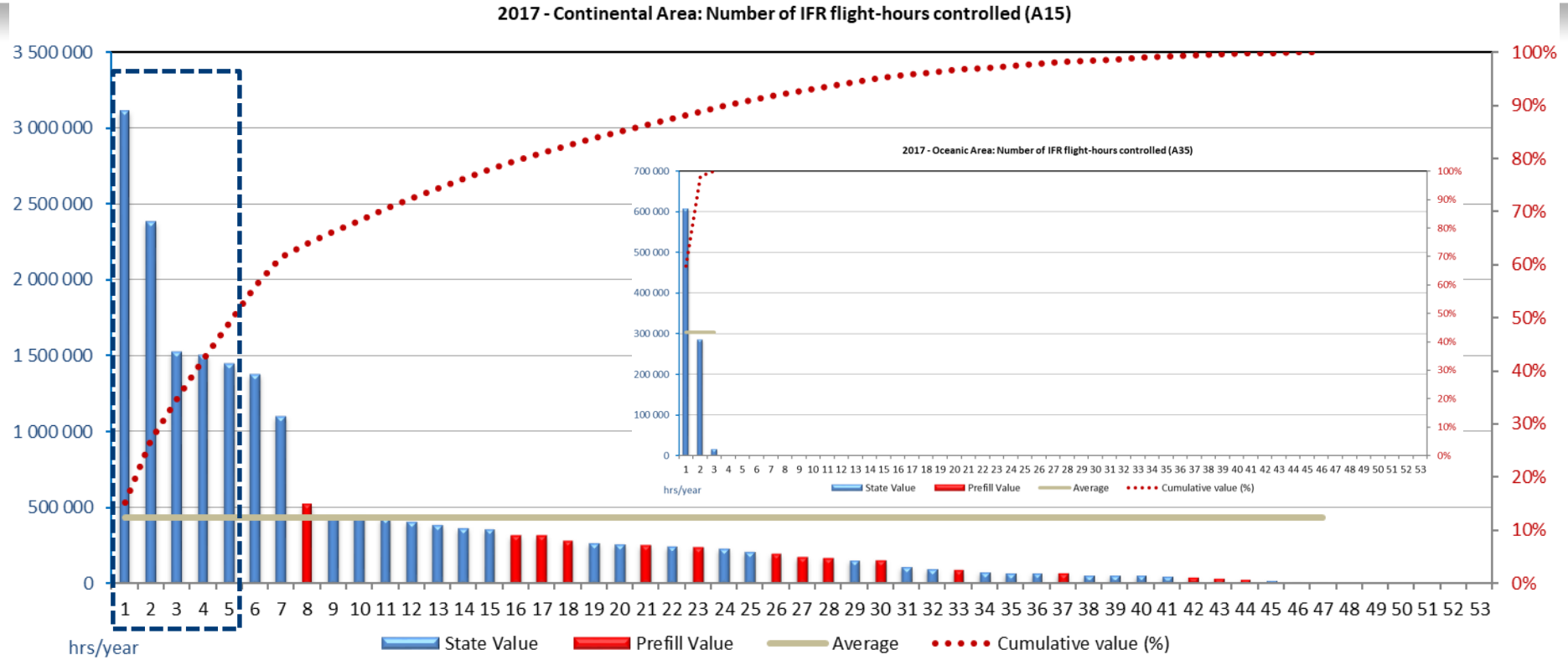
The top 4 States included in the report cover 67% of the continental airspace. There is a big gap in airspace size between the #1 State, the sub-top (3 additional States) and the rest of the States.
With 50% of the States, 95% of the airspace is covered.
So the EUR region is characterised by a wide variety in the size of the airspace.

Data items A11 & A31



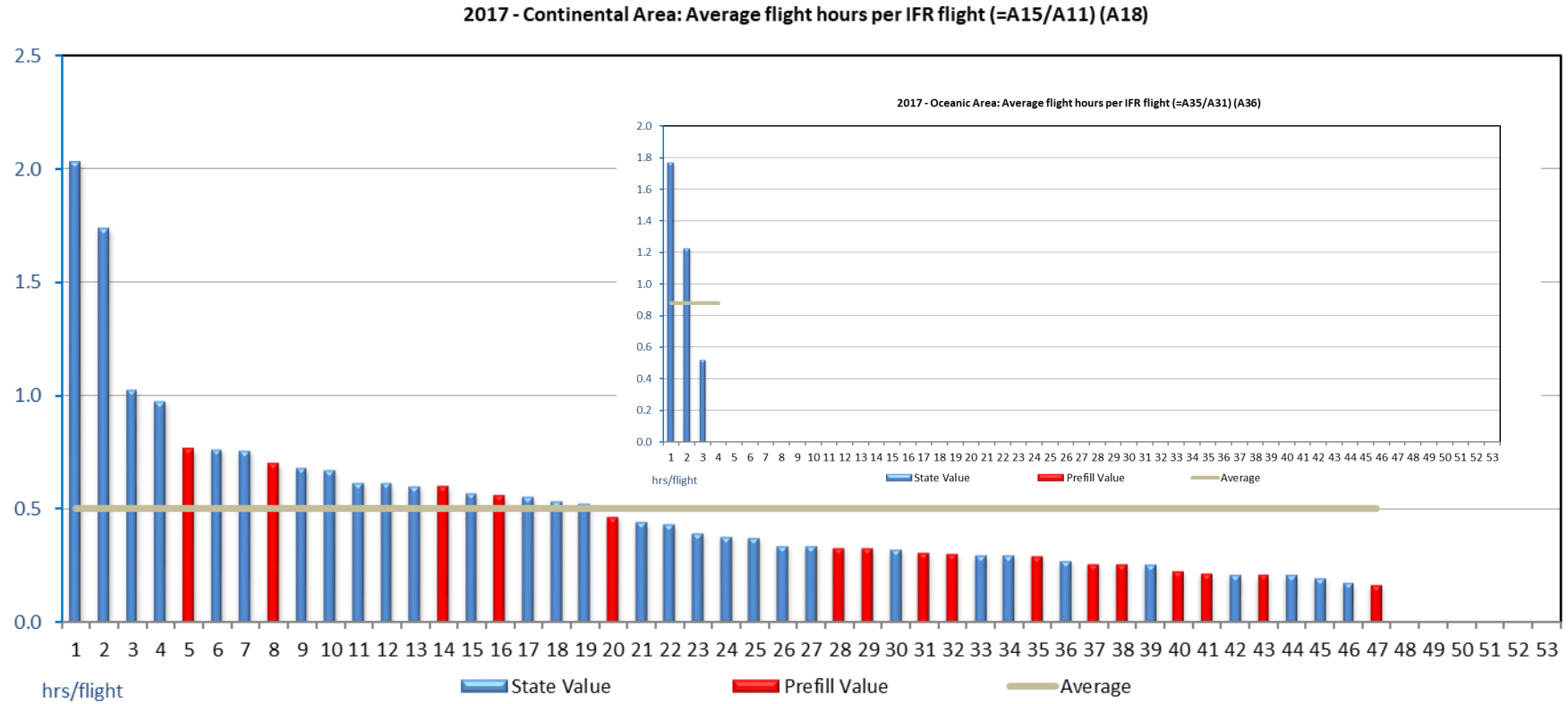
Looking at 8 States is sufficient to address 50% of the IFR flight movements.

Data items A15 & A35



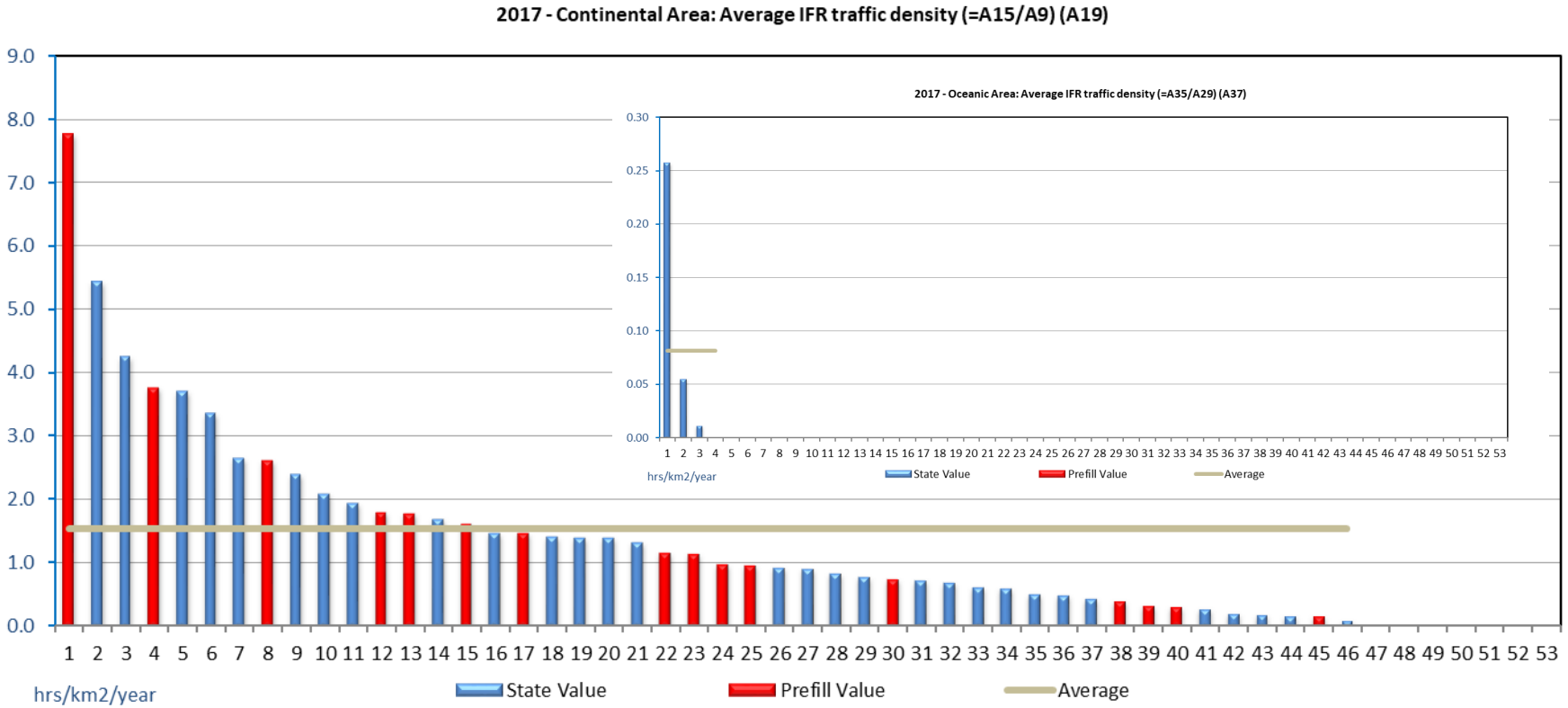
Looking at 5 States is sufficient to address 50% of the IFR flight hours.

Data items A18 & A36



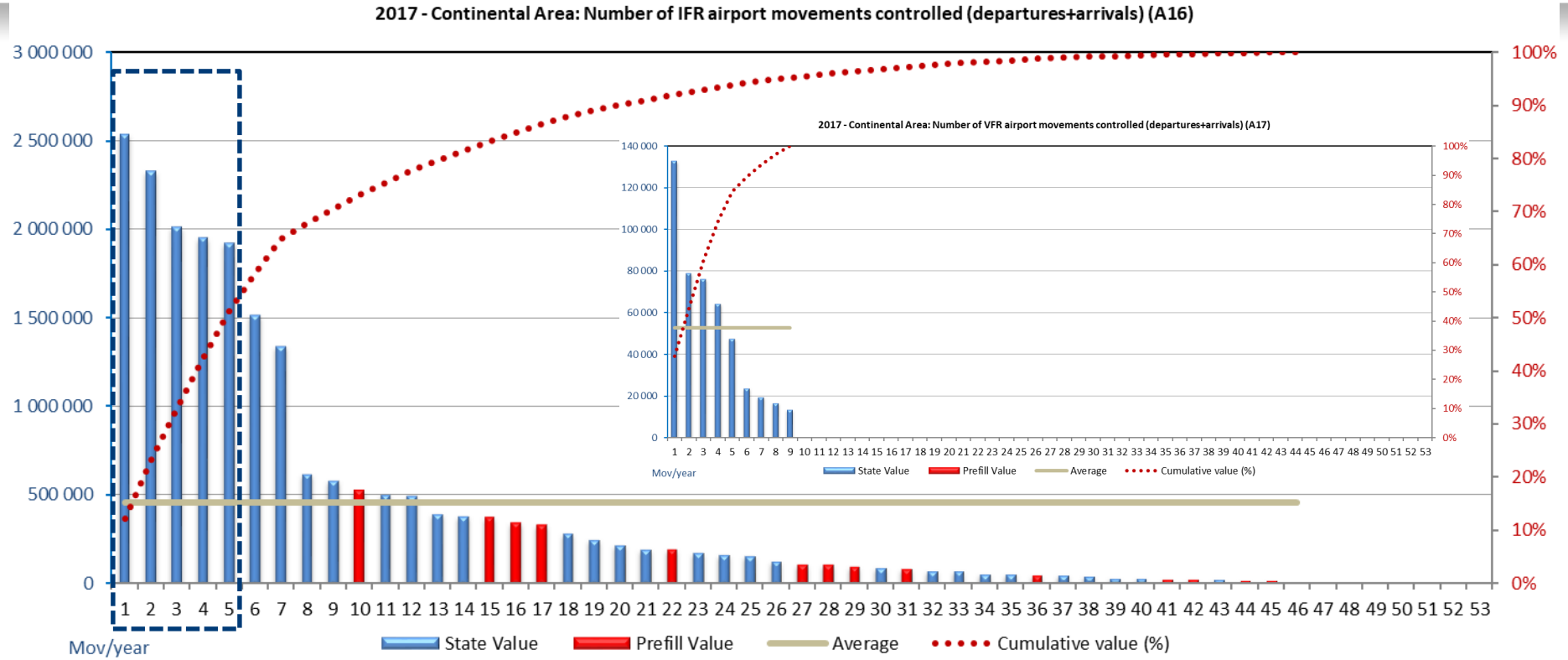
The average IFR flight duration per State (in continental airspace) varies from 0.17 hrs (10 minutes) to 2.03 hrs (122 minutes), a difference of a factor 12.
There is a big gap between the top-2 and the rest.

Data items A19 & A37



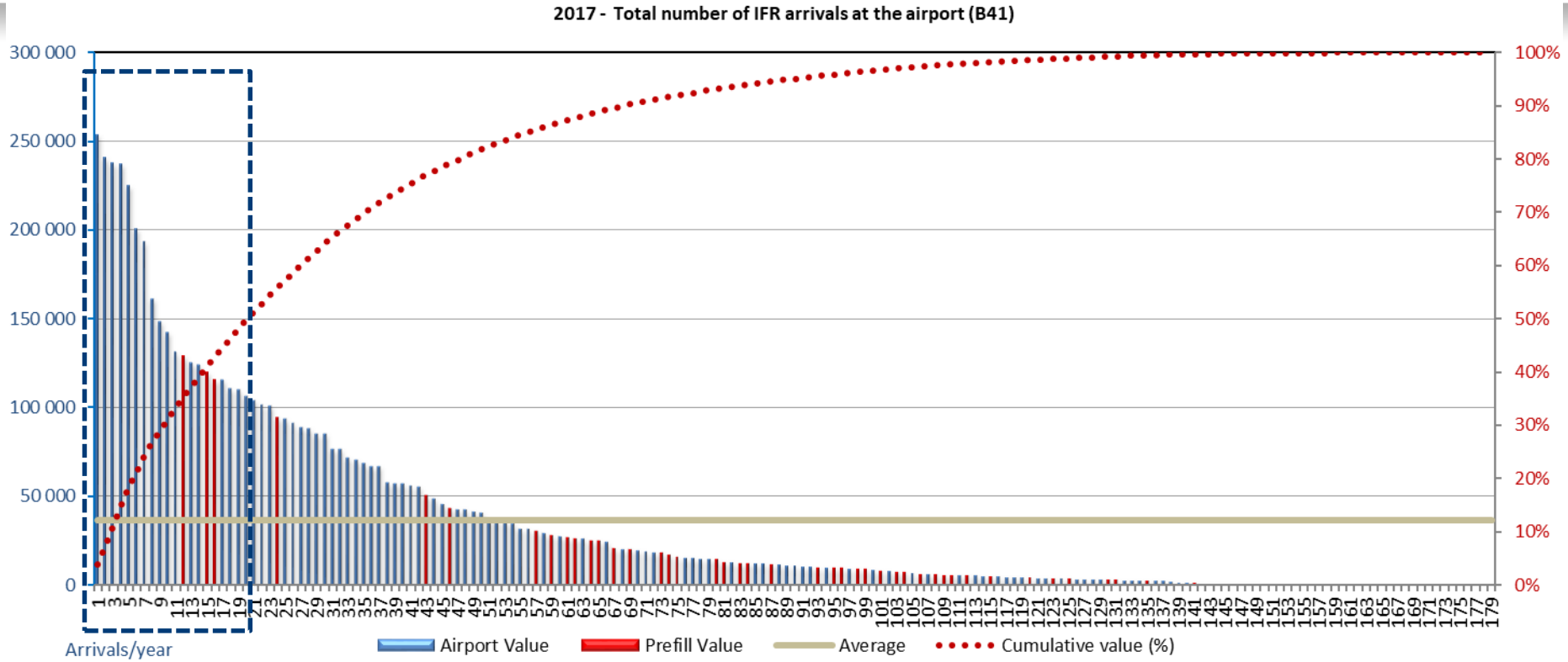
The EUR Region is characterised by significant differences in traffic density.

Data items A16 & A17



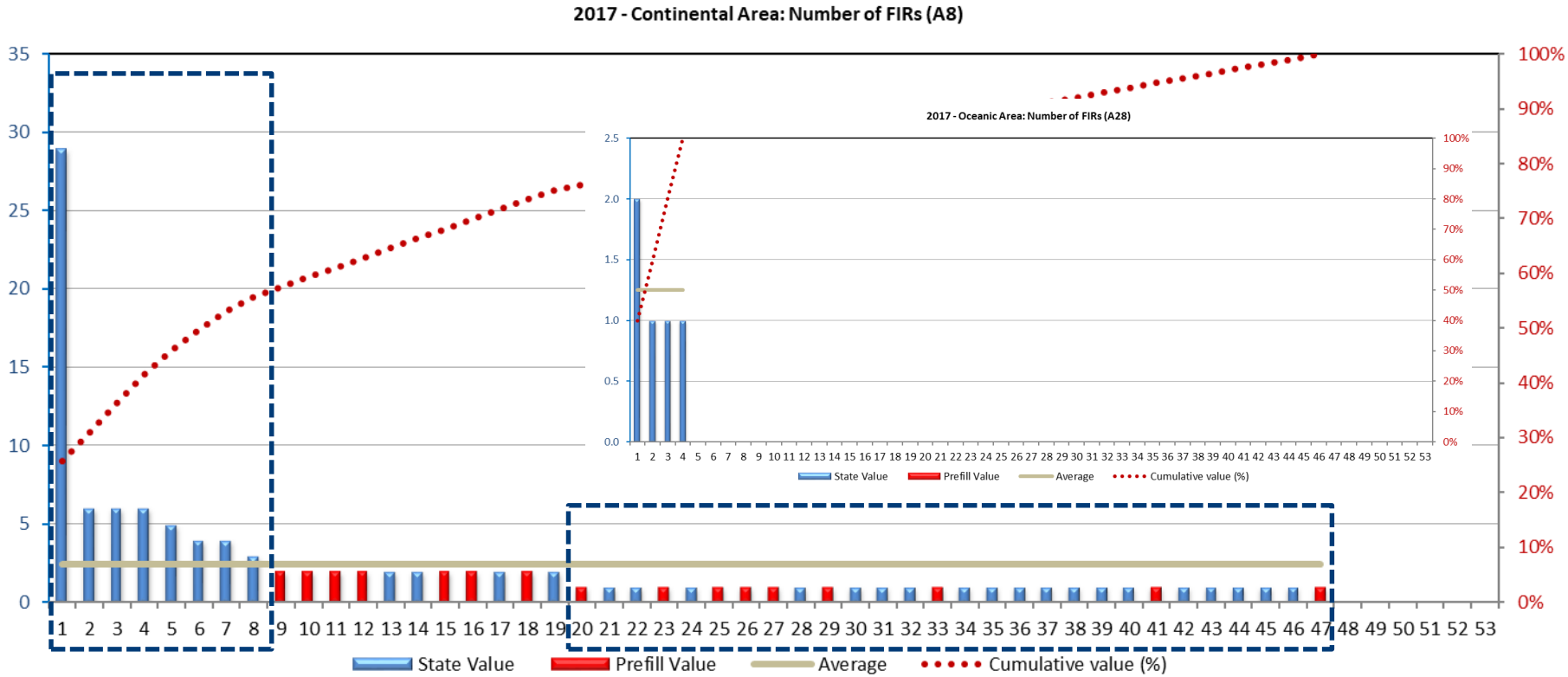
The top-5 States account for more than 50% of the IFR airport movements.
One State reports a significant number of VFR movements at controlled airports (item A17).

Data item B41



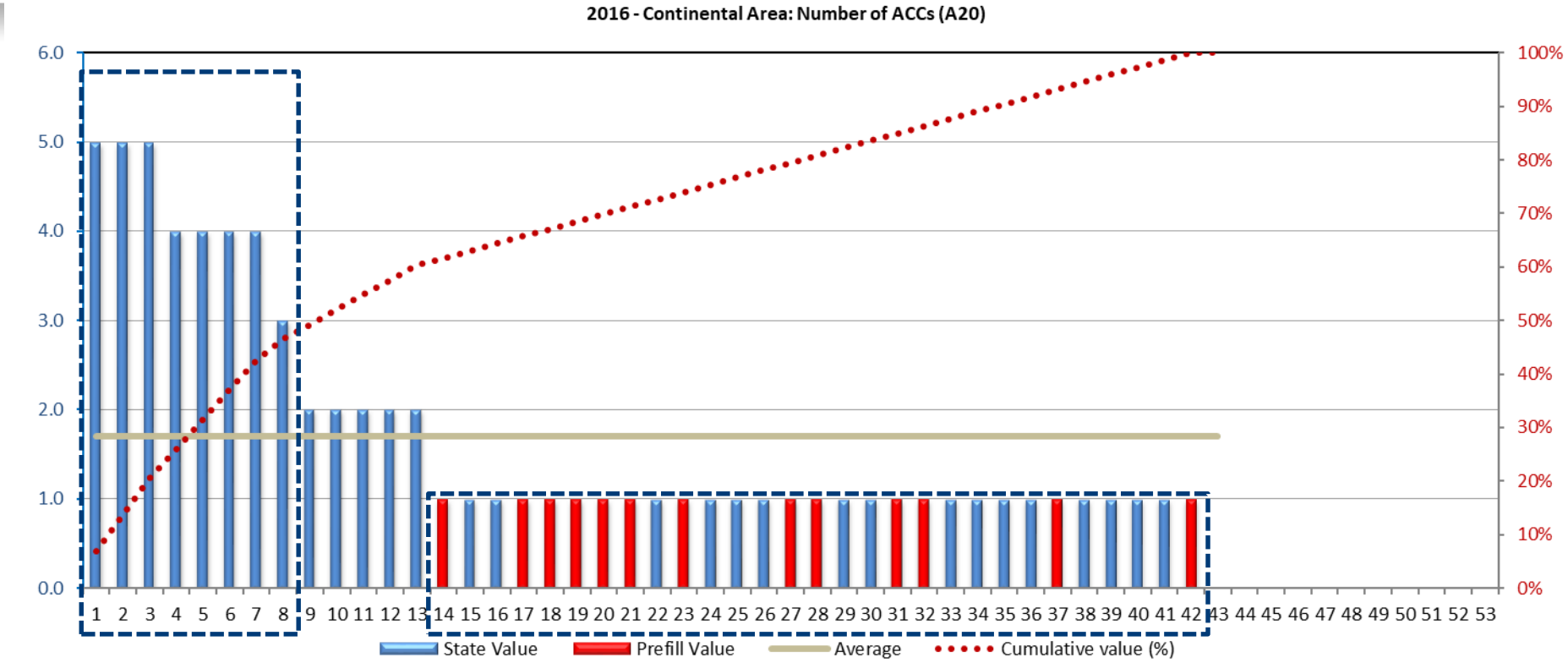
The top-20 airports (out of 179 reported) account for 50% of the IFR arrivals.

Data items A8 & A28



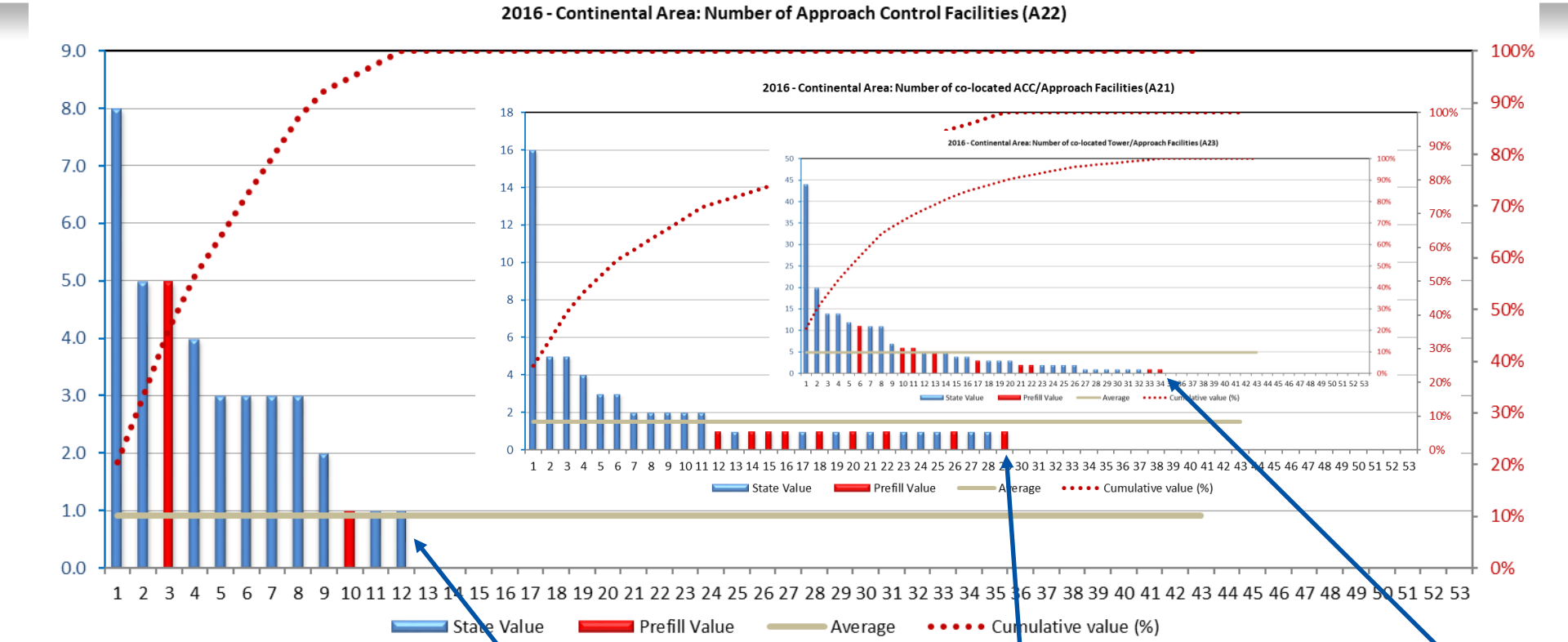
The vast majority of States have a single continental FIR. A smaller number has 2 (often a division between upper and lower), while only 8 reporting States have 3 or more FIRs.
There is a big gap between the #1 State and the rest. The top-6 States account for 50% of all FIRs.

Data item A20



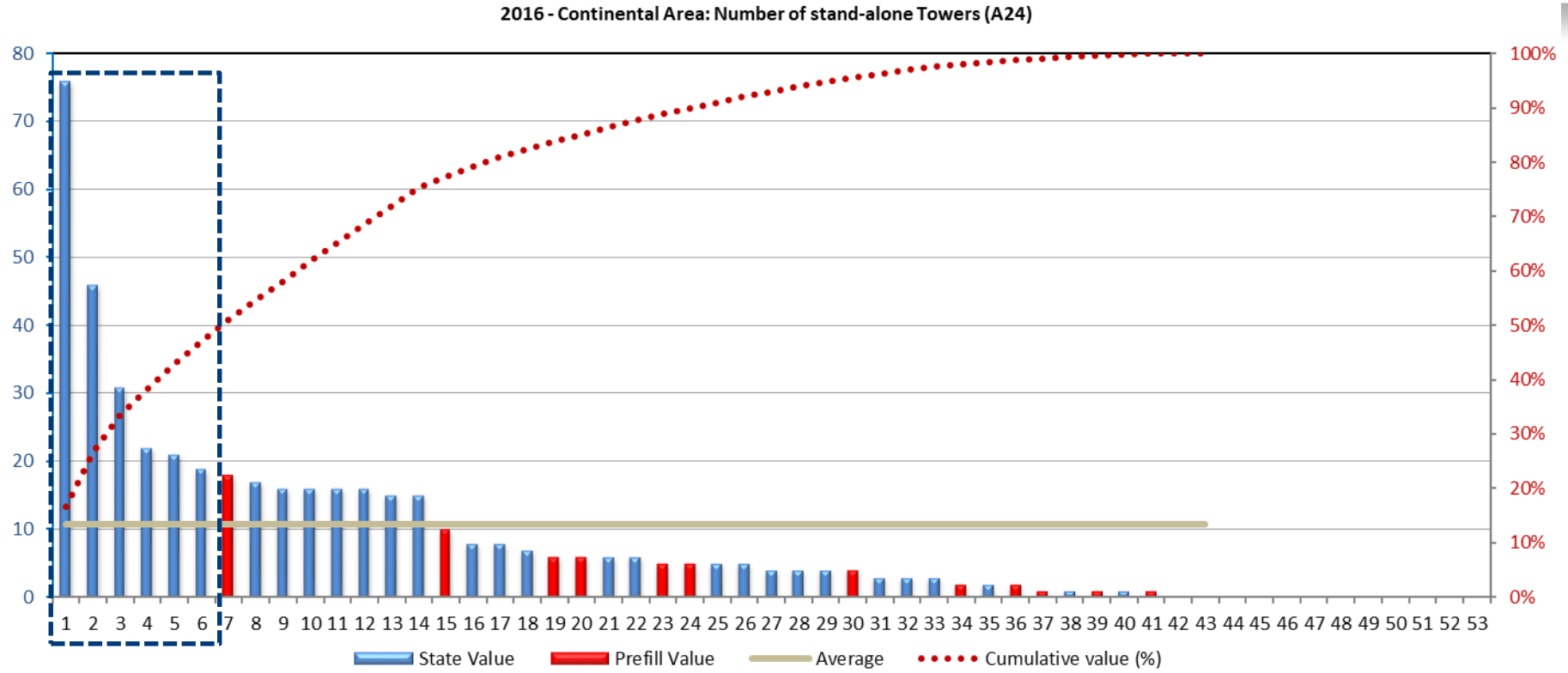
The vast majority of States have a single ACC. A smaller number has 2, while only 8 reporting States have 3 or more ACCs. The distribution is similar to the # of FIR distribution.
Note that the State with the largest number of FIRs did not report its number of ACCs.

Data items A22, A21, A23



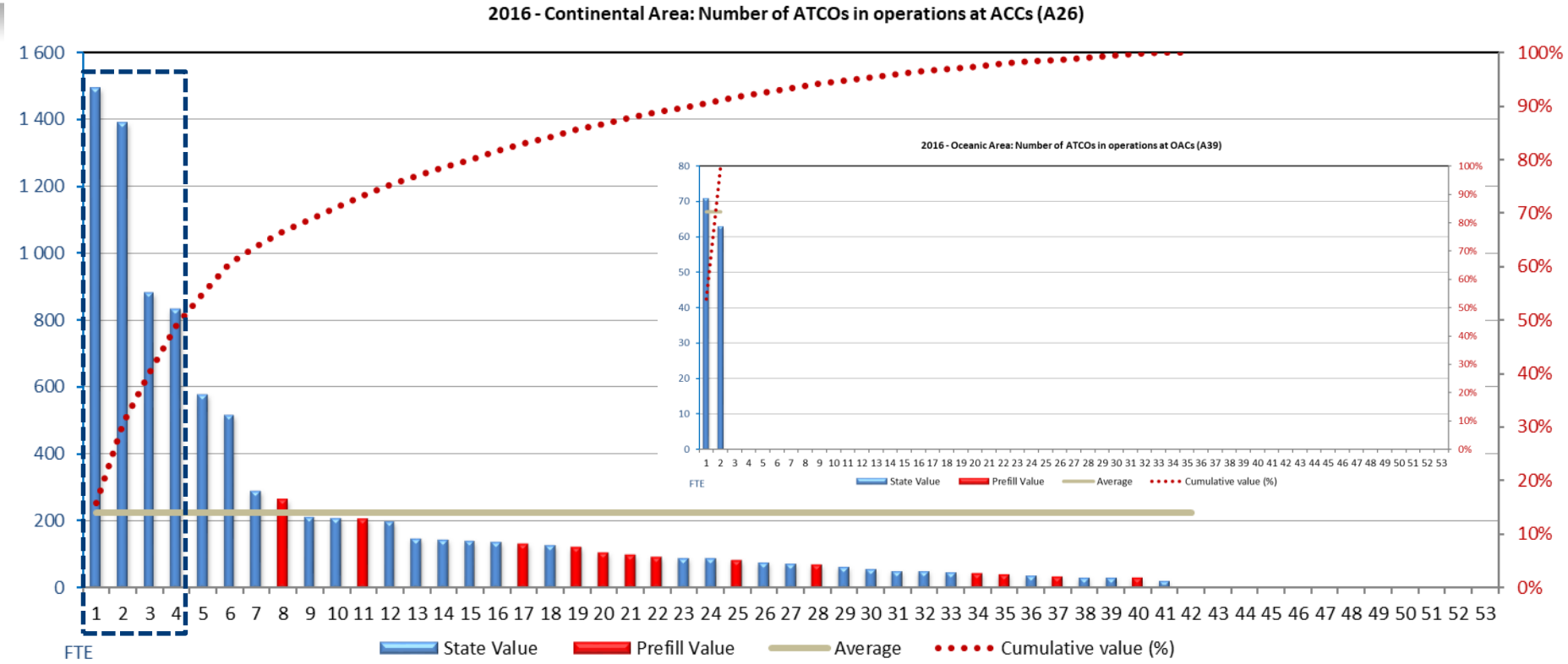
Only a limited number of States have stand-alone APP facilities (item A22). More popular is the practice of co-locating APP units in ACCs (item A21). Most small APP units are co-located in Towers (item A23).

Data item A24



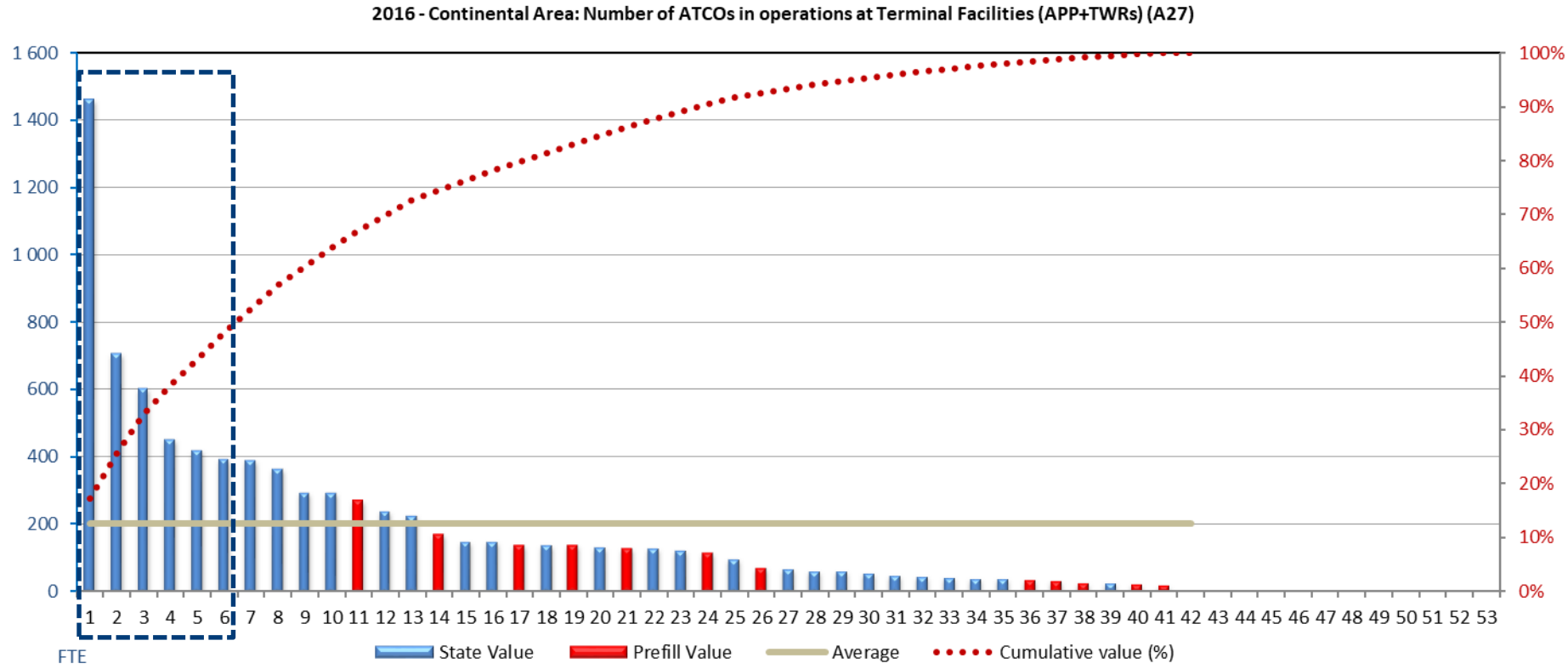
The top-6 States account for 50% of all Towers in the EUR Region. The remaining States have 18 or less towers. The average per State is slightly more than 10.

Data items A26 & A39



The top-4 States account for approximately 50% of all ATCOs in operations at ACCs.

Data item A27



The top-6 States account for 50% of all ATCOs in operations at Terminal Facilities.

Performance data (Table B)

KPA	Safety
Objective	Ensure the continuous improvement of safety through the reduction of ATM related safety occurrences and the implementation of uniform safety standards.
Indicators	- Effectiveness of Safety Management (EoSM) - Level of State Just Culture (JC) - Application of a common methodology (RAT) for classification of occurrences in terms of risk severity

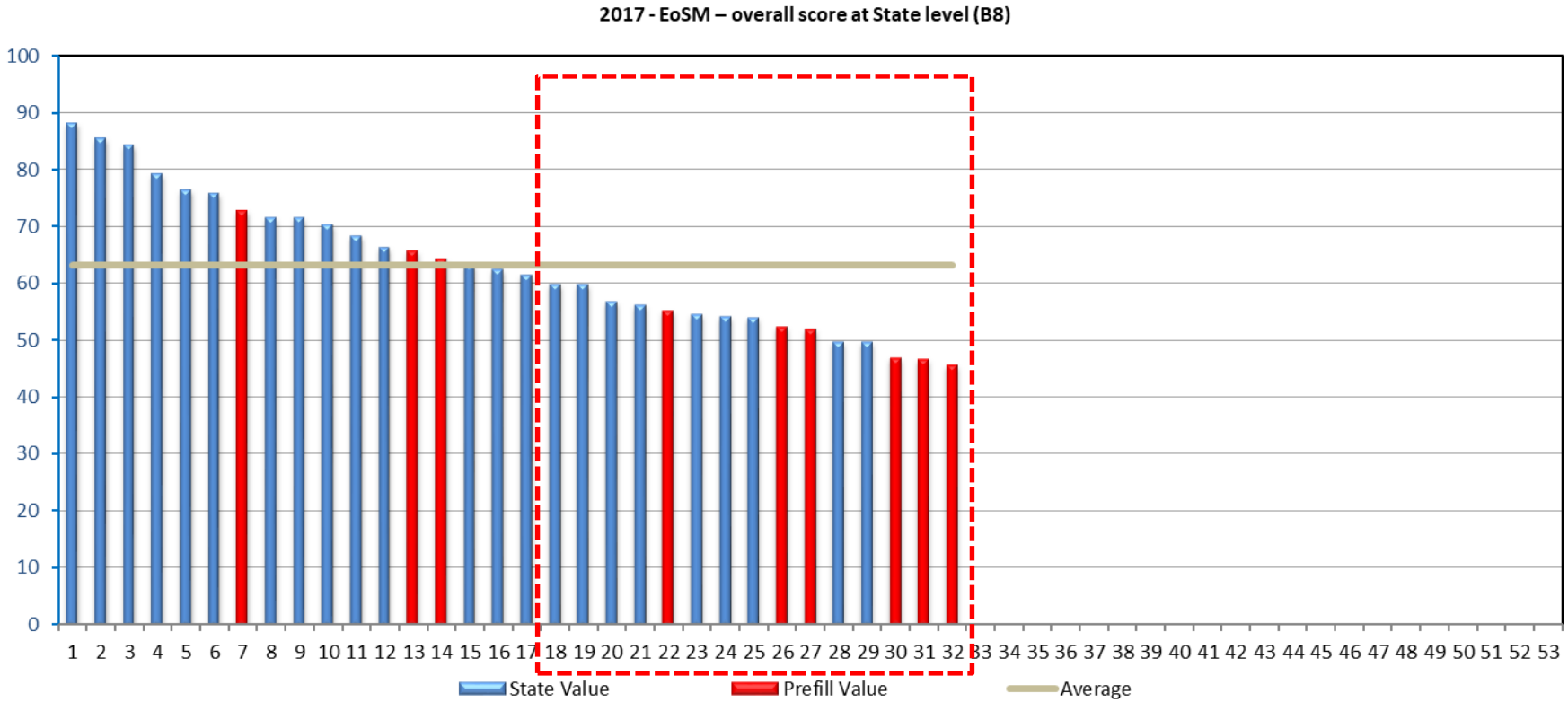
Effectiveness of Safety Management (EoSM)

- Indicator based on the annual completion of two questionnaires
  - A State level questionnaire
  - An ANSP level questionnaire
- Use of the answers
  - Sole purpose of generating recommendations and associated plans for improvement of the safety management
  - Not used to generate findings in the context of standardisation inspections/oversights

Data items

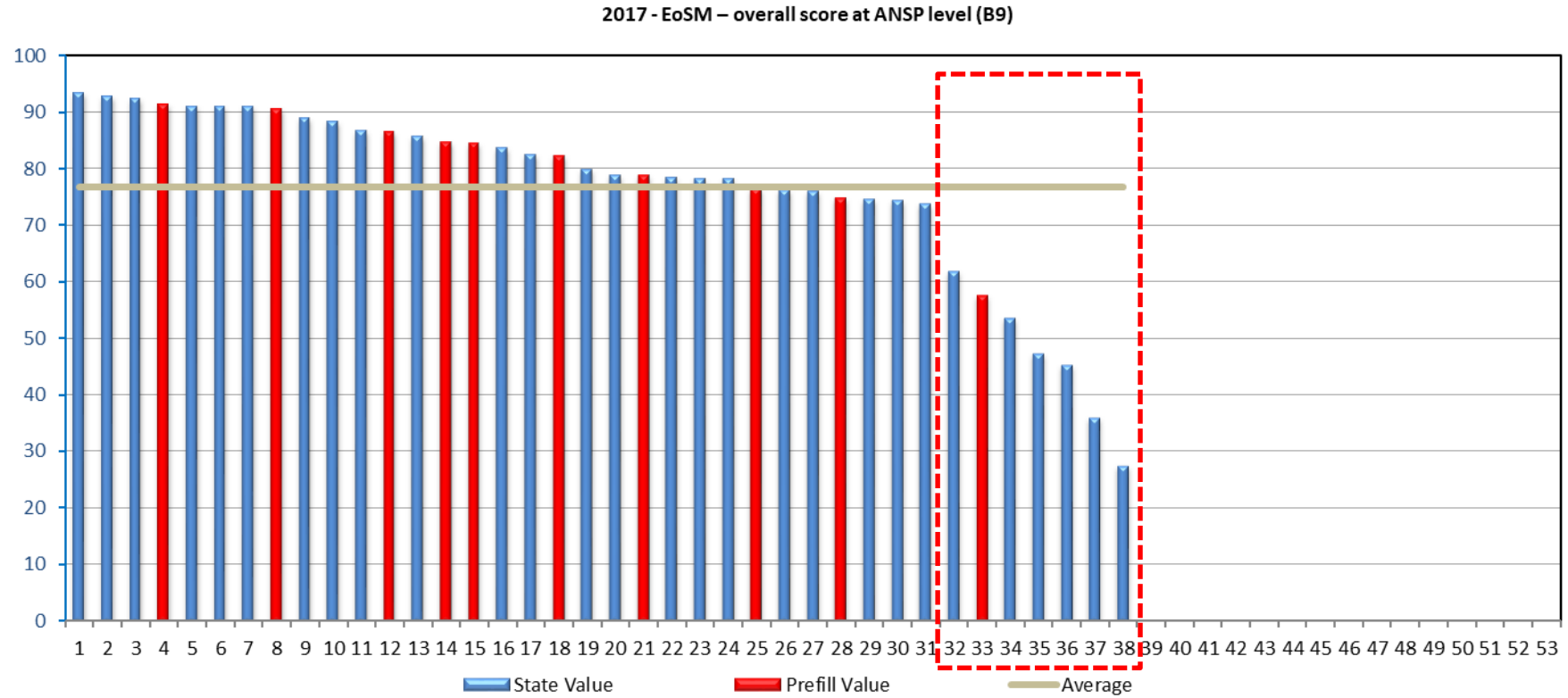
	Safety	
	Effectiveness of Safety Management (EoSM)	
B8	EoSM – overall score at State level	Number
B9	EoSM – overall score at ANSP level	Number

Data item B8



The data suggest that a group of 10-15 States at the tail end of the distribution should consider improving EoSM at State level as a matter of priority.

Data item B9



The data suggest that a group of 7 States at the tail end of the distribution should consider improving EoSM at ANSP level as a matter of priority.

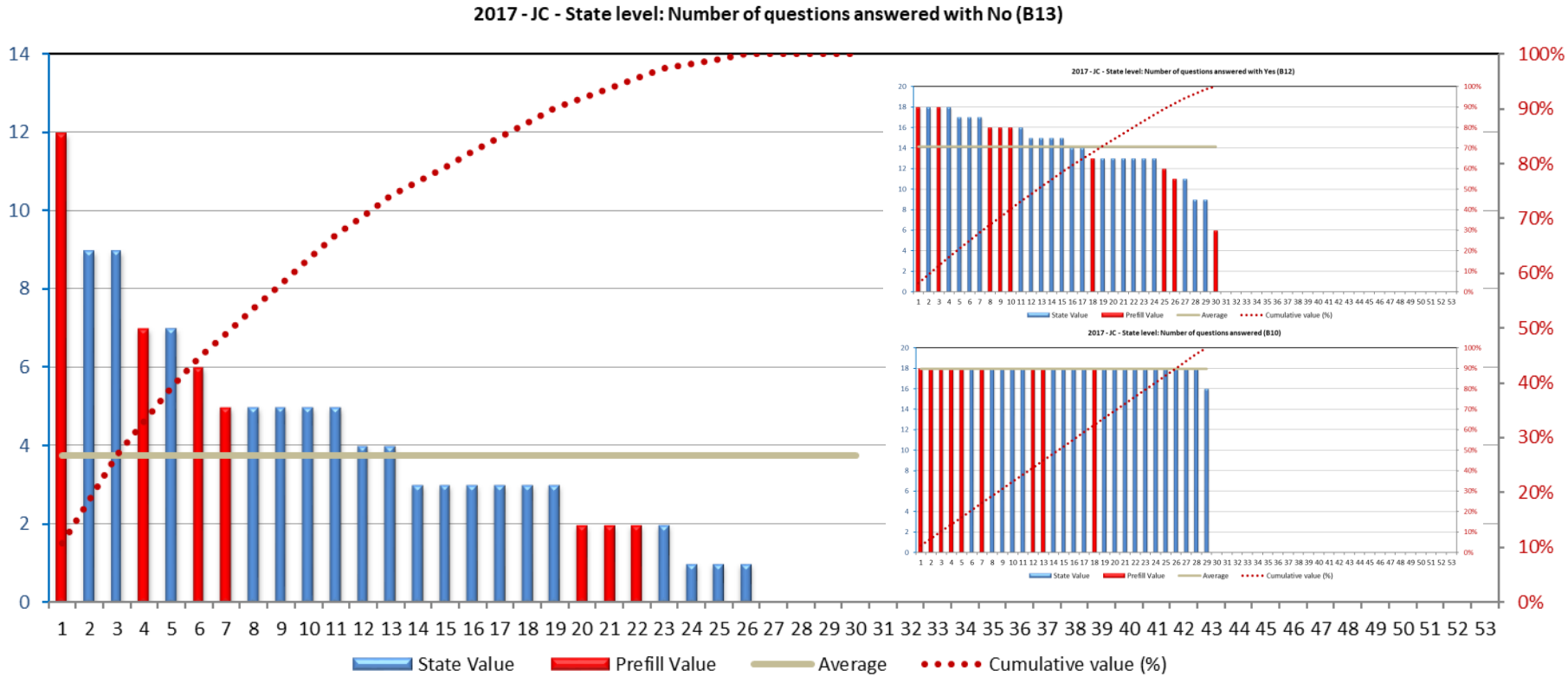
Level of State Just Culture (JC)

- Indicator based on the annual completion of two questionnaires
  - A State level questionnaire
  - An ANSP level questionnaire
- Questions cover the following topics:
  - Policy and its implementation
  - Legal/Judiciary
  - Occurrence reporting and investigation
- Use of the answers
  - Sole intent is to identify possible obstacles and impediments to the application of the just culture
  - Opportunity to give an indication of possible areas of improvement

Data items

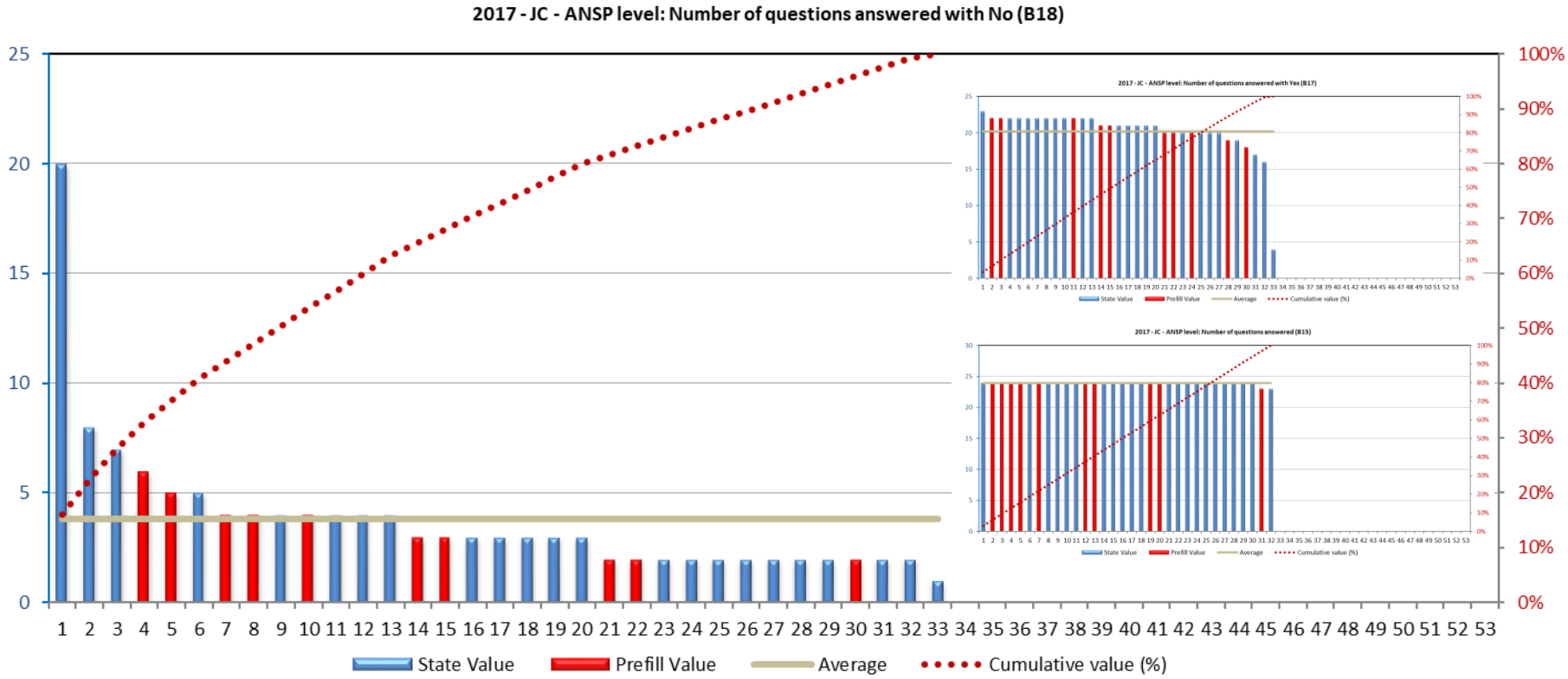
	Level of State Just Culture (JC) – State level	
B10	Number of questions answered	Number
B11	Number of 'Justification and remarks' fields filled in	Number
B12	Number of questions answered with Yes	Number
B13	Number of questions answered with No	Number
B14	Number of areas of improvement identified	Number
	Level of State Just Culture (JC) – ANSP level	
B15	Number of questions answered	Number
B16	Number of 'Justification and remarks' fields filled in	Number
B17	Number of questions answered with Yes	Number
B18	Number of questions answered with No	Number
B19	Number of areas of improvement identified	Number

Data items B13, B12, B10



The data shows that between States there are large differences in Just Culture in the EUR Region.

Data items B18, B17, B15



The data shows that between ANSPs there are large differences in Just Culture in the EUR Region.

Severity Classification (1)

- Objective
  - To motivate States to use a common methodology for the severity assessment of safety occurrences
    - Benefit: harmonise occurrence statistics
- Definition of the indicator
  - The percentage of occurrences for which the common methodology has been applied
    - “RAT methodology” (Risk Assessment Tool)

Severity Classification (2)

- Applied to individual safety occurrence reports:
  - Separation minima infringements
  - Runway incursions
  - ATM-specific technical occurrences
    - Affecting the ability to provide safe ATM services
- Only for severities AA, A, B and C

ESARR 2 Severity	ICAO Doc 4444 AIRPROX Classification	ATM-Specific technical occurrence
Accident	Accident as per ICAO Annex 13	-
Serious Incident (A)	AIRPROX CAT A - Risk Of Collision	AA – total inability A – serious inability
Major Incident (B)	AIRPROX CAT B - Safety Not Assured	B – partial inability
Significant Incident (C)	AIRPROX CAT C - No risk Of Collision	C – safe but degraded ATM services
Not determined (D)	AIRPROX CAT D - Risk Not determined	D – not determined
No safety effect (E)	-	E – no effect on ATM services

Severity Classification (3)

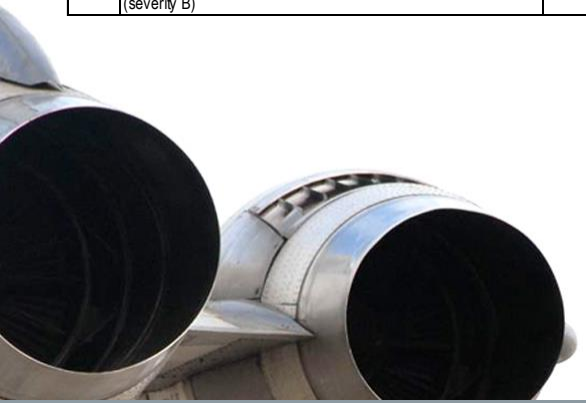
- Two severity scoring perspectives
  - "ATM ground"
    - Can be produced by ANSPs
  - "ATM airborne"
    - Should be used only in cases where ATC is not responsible for providing separation
- Both perspectives combined:
  - "ATM Overall" classification
- Reporting to ICAO:
  - Only "ATM ground" perspective

Data items

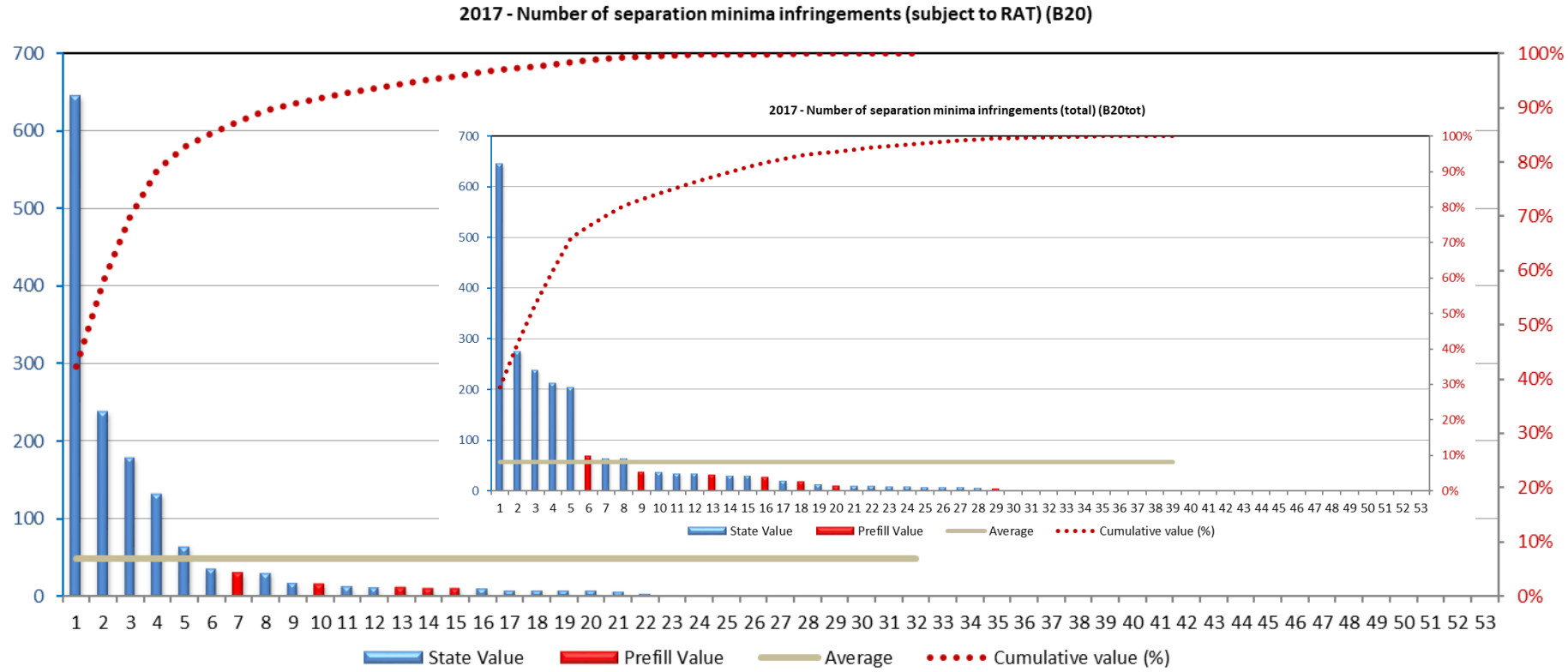
	Adoption of a harmonized occurrence severity classification methodology	
	Separation minima infringements	
B20tot	Number of separation minima infringements (total)	Number
B20	Number of separation minima infringements (subject to RAT)	Number
B21	Number of separation minima infringements for which the severity classification ATM Ground has been determined using the RAT methodology	Number
B22	Percentage of separation minima infringements for which the severity classification ATM Ground has been determined using the RAT methodology (=B21/B20)	%
B23	Number of separation minima infringements for which the severity classification ATM Ground has been determined using the RAT methodology, and which have been classified as Serious Incident (severity A)	Number
B24	Number of separation minima infringements for which the severity classification ATM Ground has been determined using the RAT methodology, and which have been classified as Major Incident (severity B)	Number

	Runway incursions	
B25tot	Number of runway incursions (total)	Number
B25	Number of runway incursions (subject to RAT)	Number
B26	Number of runway incursions for which the severity classification ATM Ground has been determined using the RAT methodology	Number
B27	Percentage of runway incursions for which the severity classification ATM Ground has been determined using the RAT methodology (=B26/B25)	%
B28	Number of runway incursions for which the severity classification ATM Ground has been determined using the RAT methodology, and which have been classified as Serious Incident (severity A)	Number
B29	Number of runway incursions for which the severity classification ATM Ground has been determined using the RAT methodology, and which have been classified as Major Incident (severity B)	Number

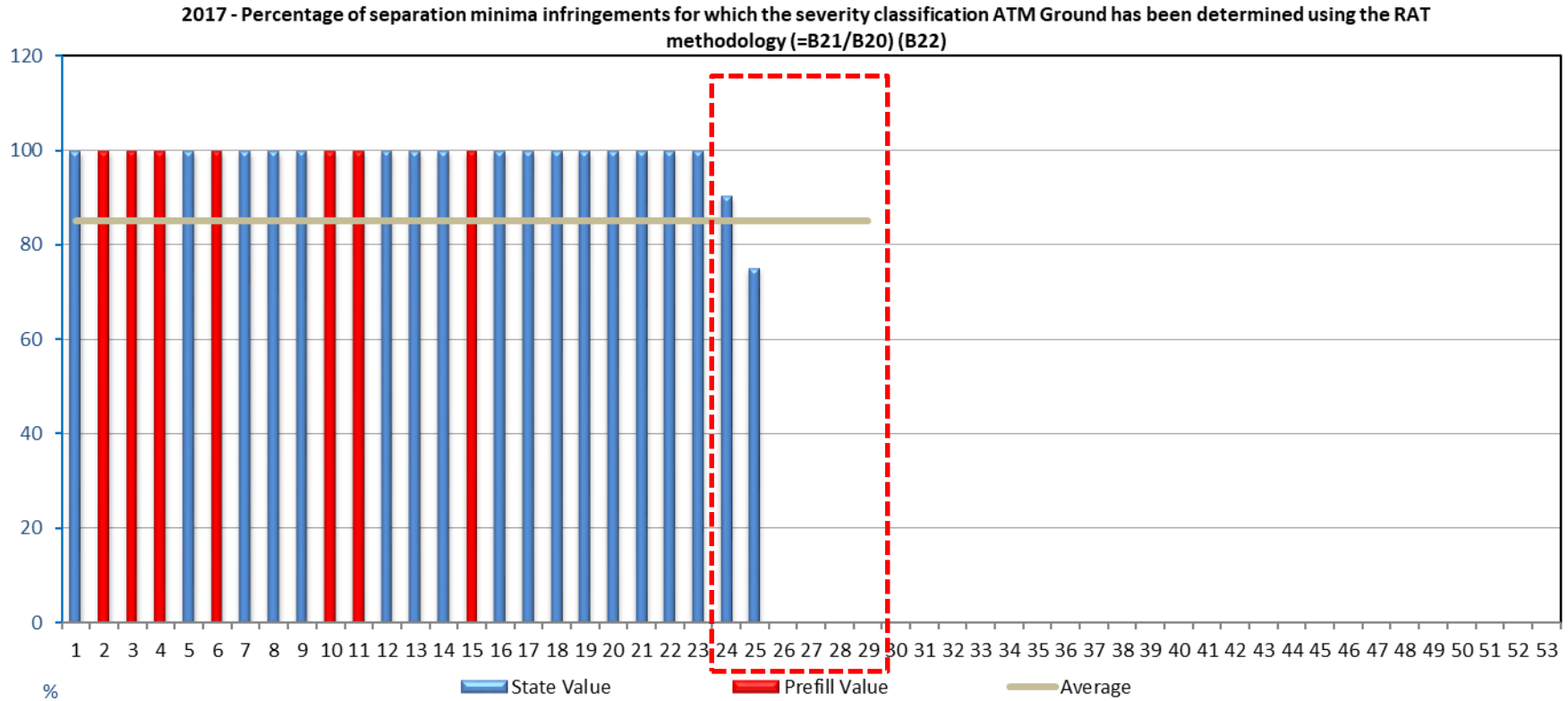
	ATM-specific technical occurrences	
B30tot	Number of occurrences (total)	Number
B30	Number of occurrences (subject to RAT)	Number
B31	Number of occurrences for which the severity classification ATM Ground has been determined using the RAT methodology	Number
B32	Percentage of occurrences for which the severity classification ATM Ground has been determined using the RAT methodology (=B31/B30)	%
B33	Number of occurrences for which the severity classification ATM Ground has been determined using the RAT methodology, and which have been classified as Serious Incident (severity A or AA)	Number
B34	Number of occurrences for which the severity classification ATM Ground has been determined using the RAT methodology, and which have been classified as Major Incident (severity B)	Number



Data items B20 & B20tot

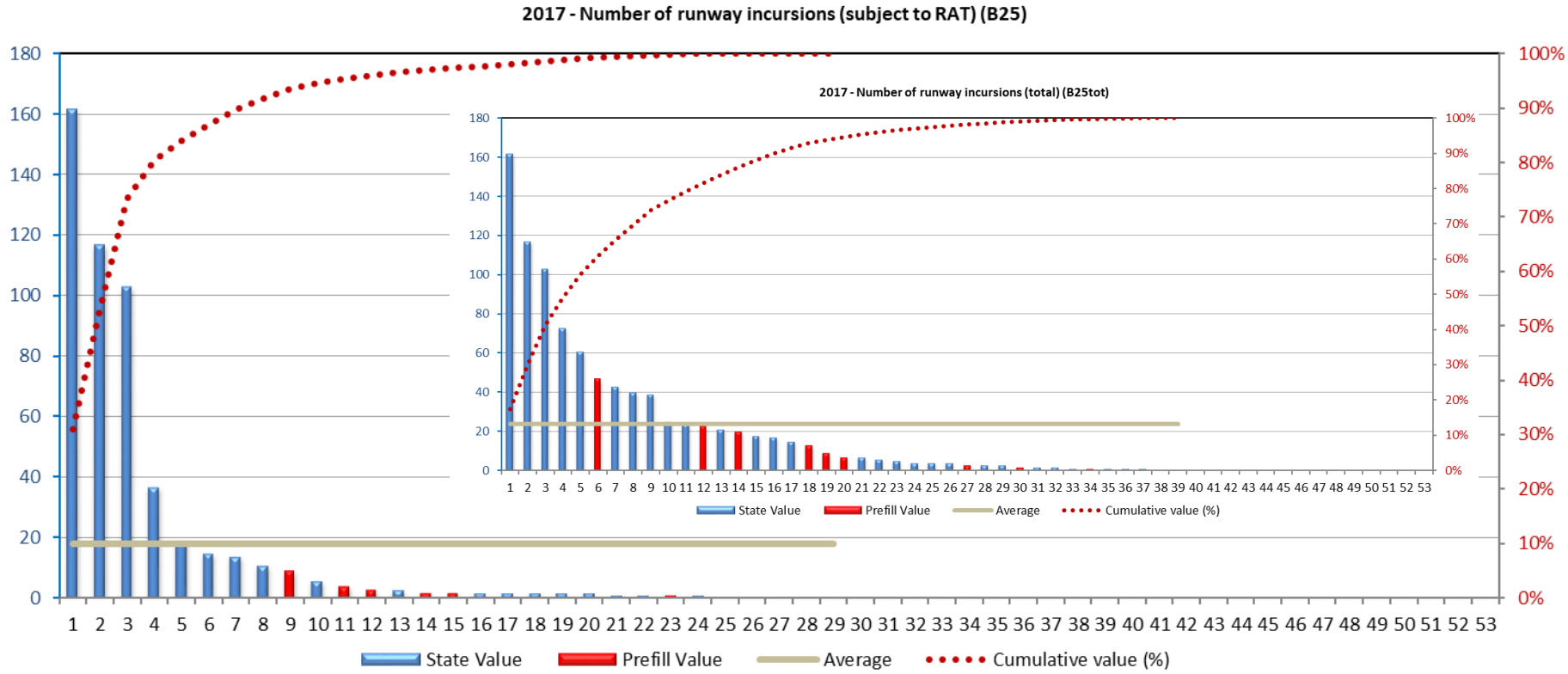


Data item B22

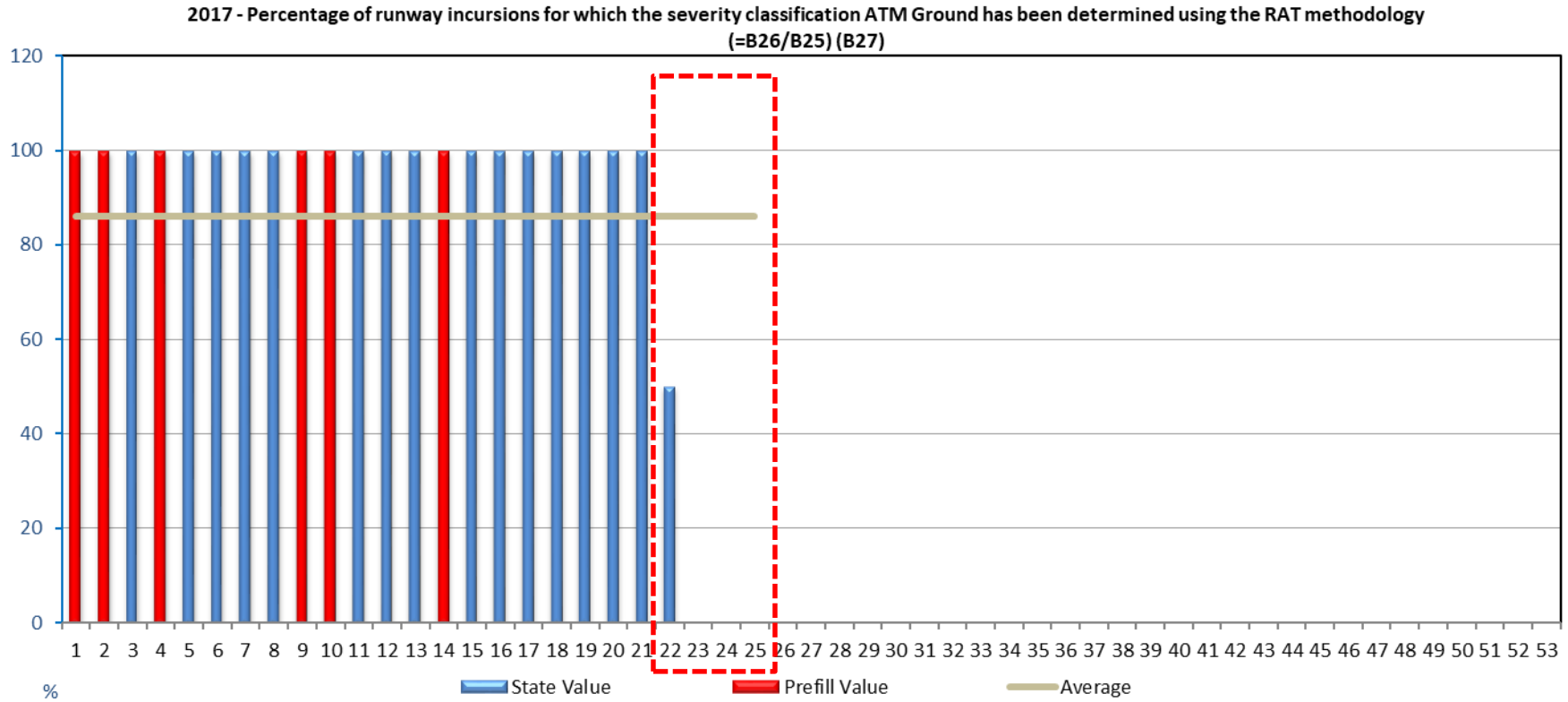


The data shows that the RAT methodology is well applied to separation minima infringements (23 States at 100%). Two States need to make improvements and four States have not yet started using the RAT methodology to harmonise the severity classification.

Data items B25 & B25tot

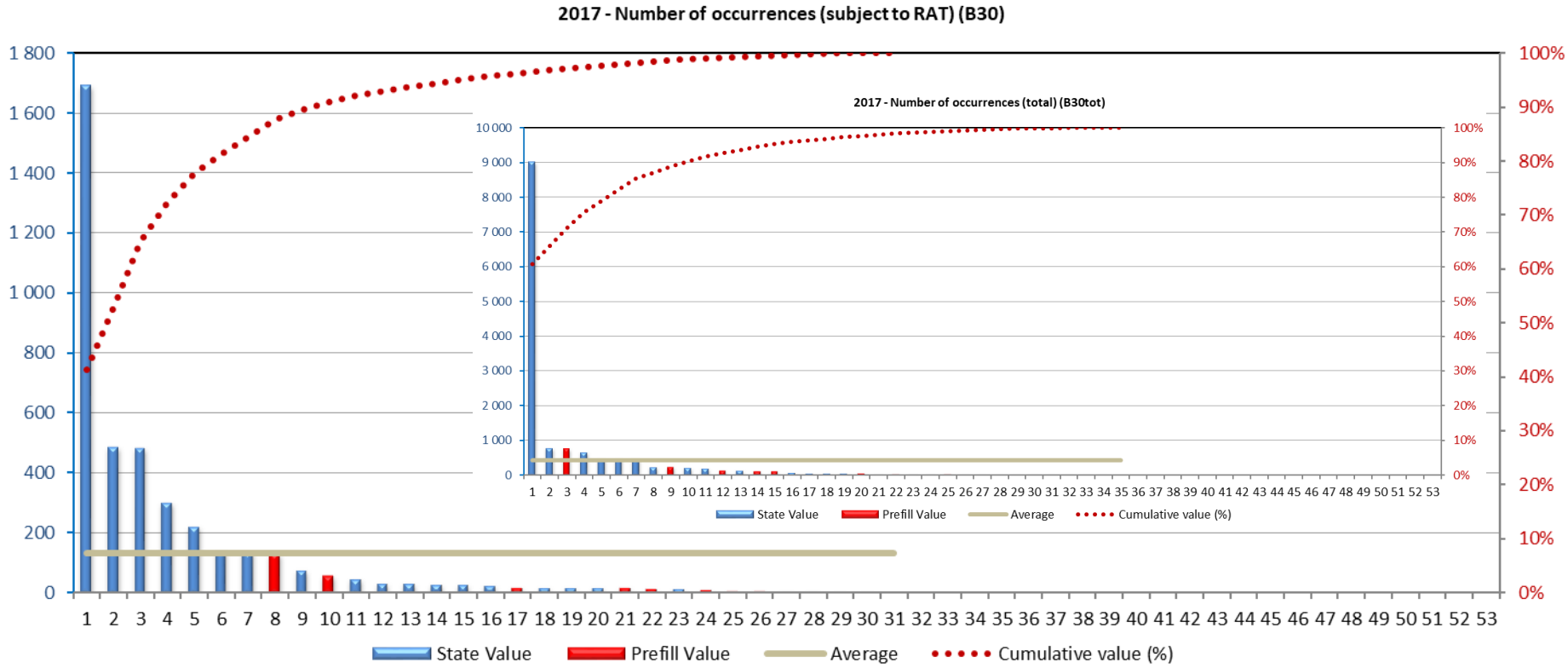


Data item B27



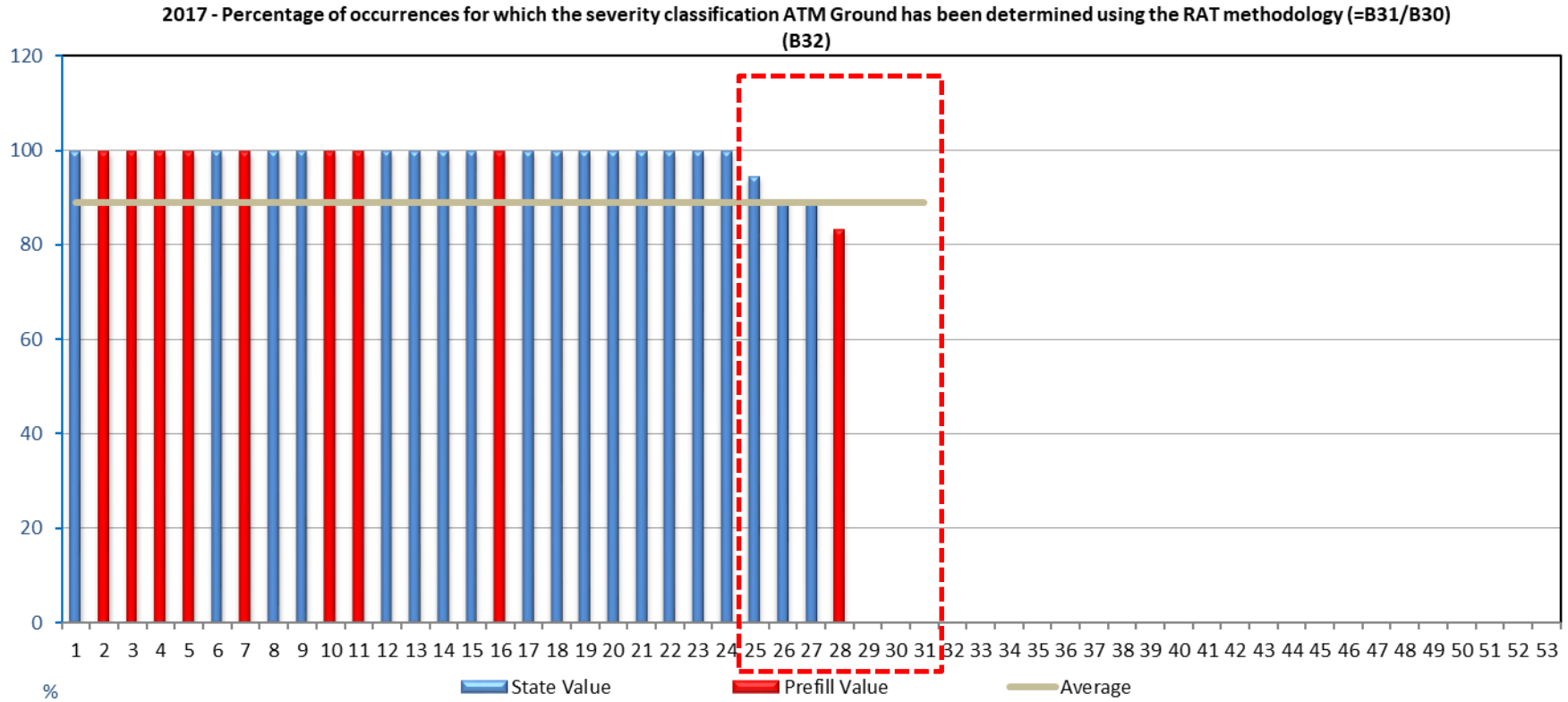
The data shows that the RAT methodology is well applied to runway incursions (21 States at 100%). One State need to make improvements and three States have not yet started using the RAT methodology to harmonise the severity classification.

Data items B30 & B30tot



One State is reporting a vast number of technical occurences.

Data item B32



The data shows that the RAT methodology is well applied to ATM-specific technical occurrences. 24 States are at 100%. Four States need to make improvements and three States have not yet started using the RAT methodology to harmonise the severity classification.

KPA	Capacity
Objective	Ensure that Air Navigation Service capacity meets demand in en-route airspace and at airports
Indicators	- Average ATFM delay per flight generated by the airspace volume (en-route) - Average ATFM delay per flight in the main airports (to be identified by States in advance and based on the regional relevance)

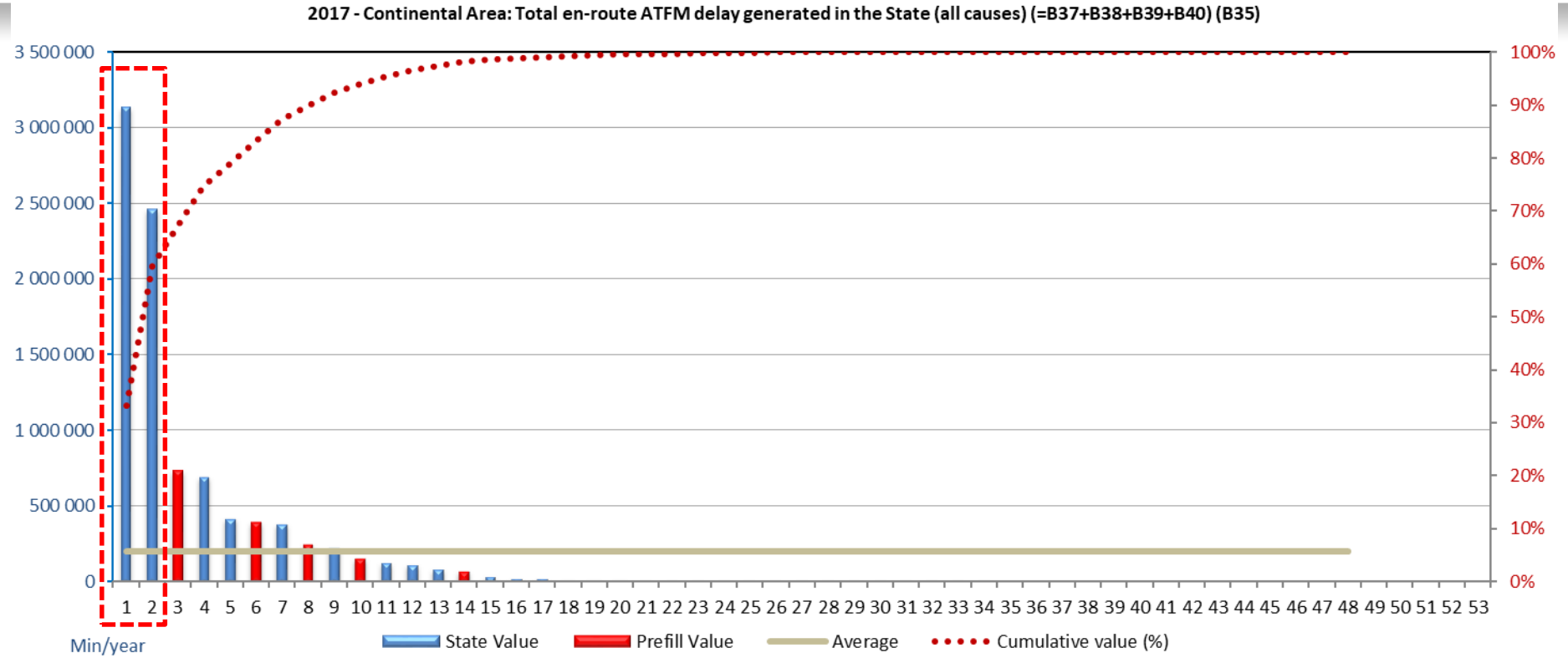
Please note

- Indicators measure
  - The location where the problem (capacity bottleneck) is, not where the delay is taken (departure airport)
  - Performance of airspace volumes and airports, not flights
    - Despite the expression as a value “per flight”
  - Within the Capacity KPA
    - Demand/capacity imbalance
    - Not capacity itself
- Limitations
    - Not designed to measure excess capacity
    - No data if airspace or airport does not participate in a centralised ATFM process

Data items

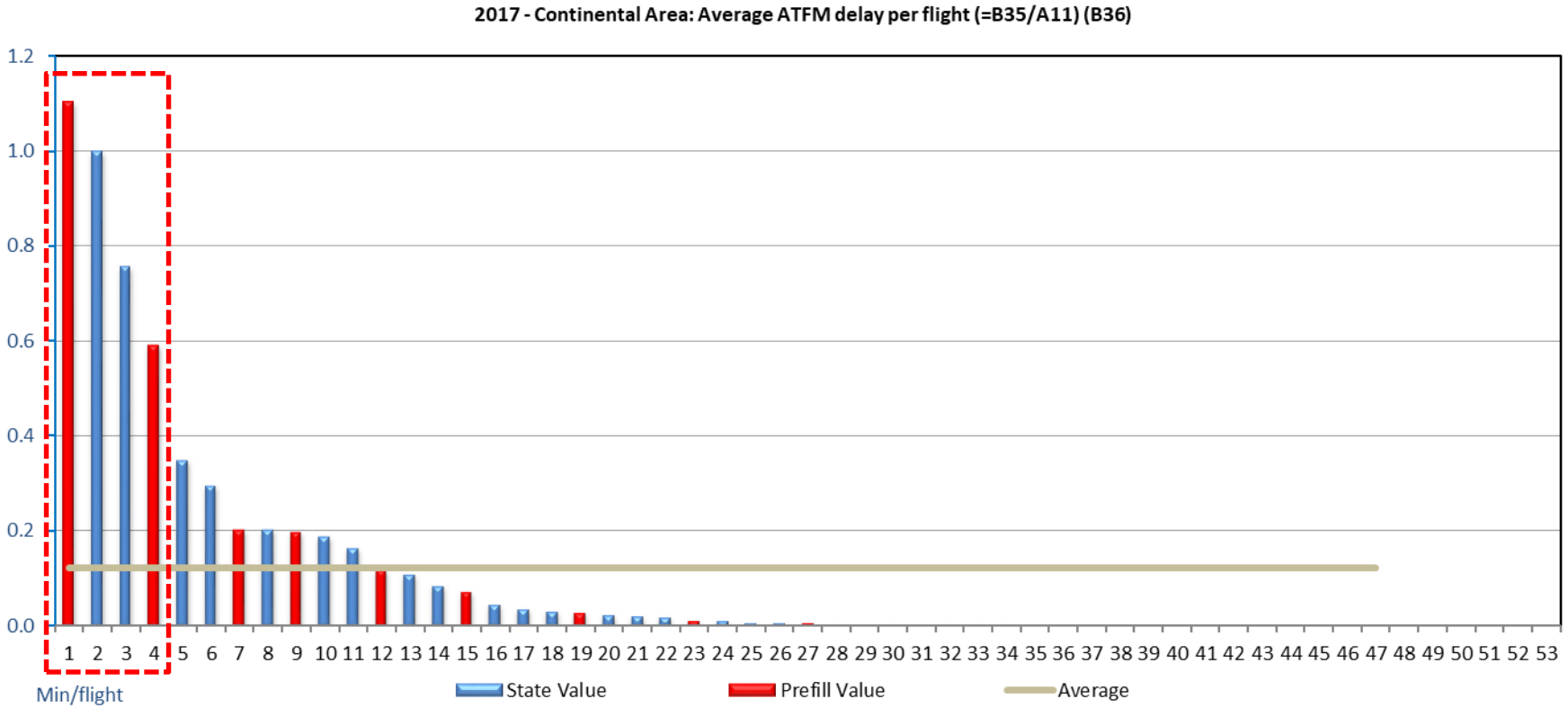
	Capacity	
	En-route ATFM delays (continental airspace)	
B35	Total en-route ATFM delay generated in the State (all causes) (=B37+B38+B39+B40)	Min/year
B36	Average ATFM delay per flight (=B35/A11)	Min/flight
B37	En-route ATFM delay generated in the State (ATC capacity causes)	Min/year
B38	En-route ATFM delay generated in the State (ATC other causes)	Min/year
B39	En-route ATFM delay generated in the State (Weather causes)	Min/year
B40	En-route ATFM delay generated in the State (All other causes)	Min/year
B35b	En-route ATFM delay generated in the State (Cause unknown, use only if B37, B38, B39 & B40 not available)	Min/year
	Airport ATFM delays	
	Airport identifier	ICAO code
B41	Total number of IFR arrivals at the airport	Arrivals/year
B42	Total airport ATFM delay generated by the airport (all causes) (=B44+B45+B46+B47)	Min/year
B43	Average ATFM delay per arrival (=B42/B41)	Min/arrival
B44	Airport ATFM delay generated by the airport (ATC & aerodrome capacity causes)	Min/year
B45	Airport ATFM delay generated by the airport (ATC other causes)	Min/year
B46	Airport ATFM delay generated by the airport (Weather causes)	Min/year
B47	Airport ATFM delay generated by the airport (All other causes)	Min/year
B42b	Airport ATFM delay generated by the airport (Cause unknown, use only if B44, B45, B46 & B47 not available)	Min/year

Data item B35



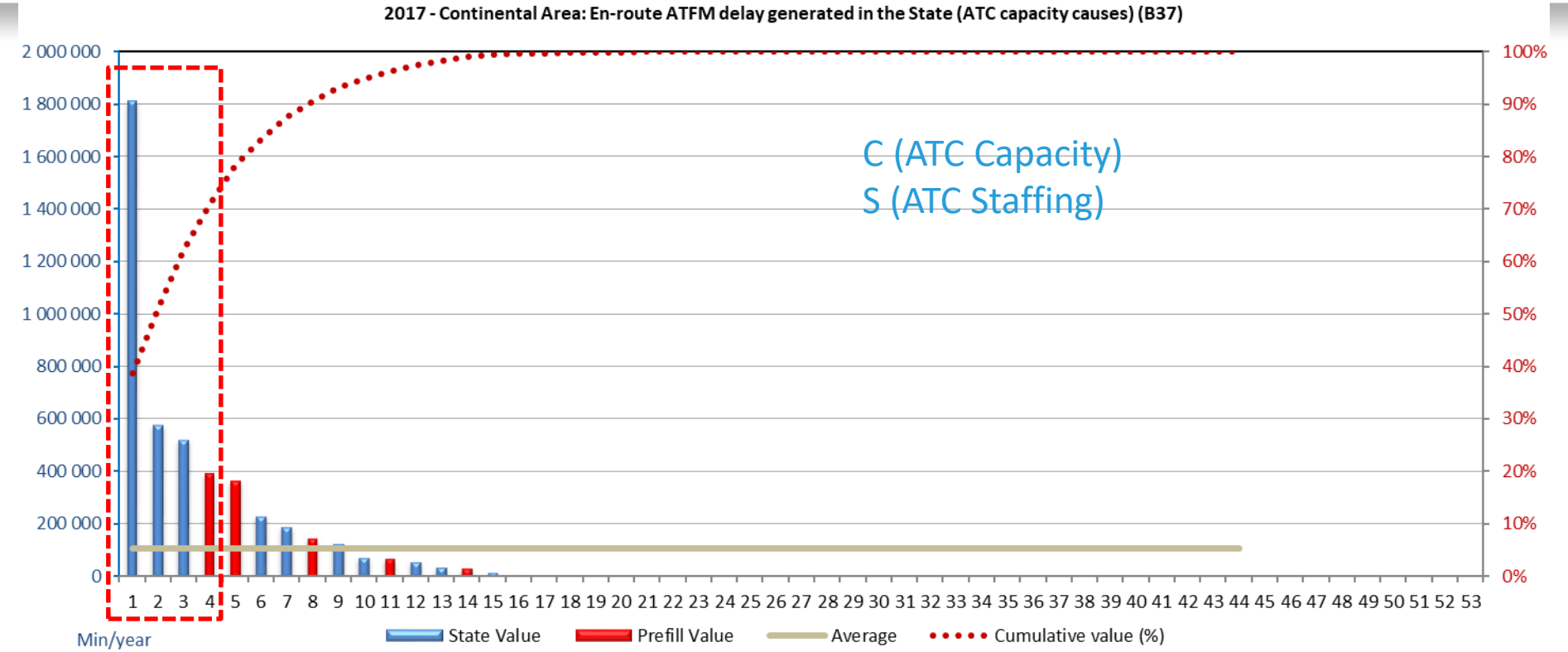
2 States account for more than 50% of all en-route ATFM delay in the EUR Region. The vast majority of States does not generate any significant delay.

Data item B36



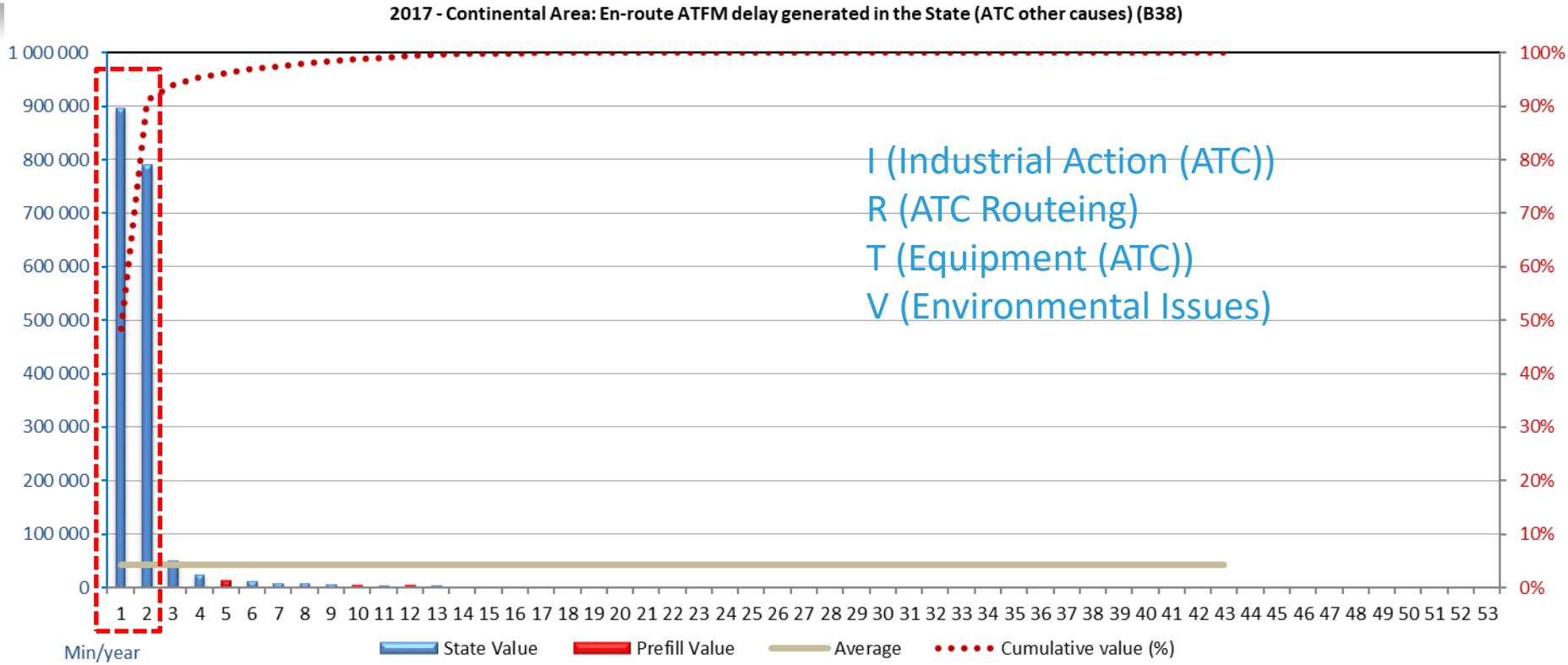
Looking at the indicator, improvements should primarily focus on the 4 States with the highest value. However for prioritisation of improvements the total amount of delay (item B35) should be considered as well.

Data item B37



Demand/capacity mismatch in en-route airspace due to ATC capacity problems occurred in a limited number of States. 1 State causes nearly 40% of all such delay, and 4 States cause 70% of all such delay.

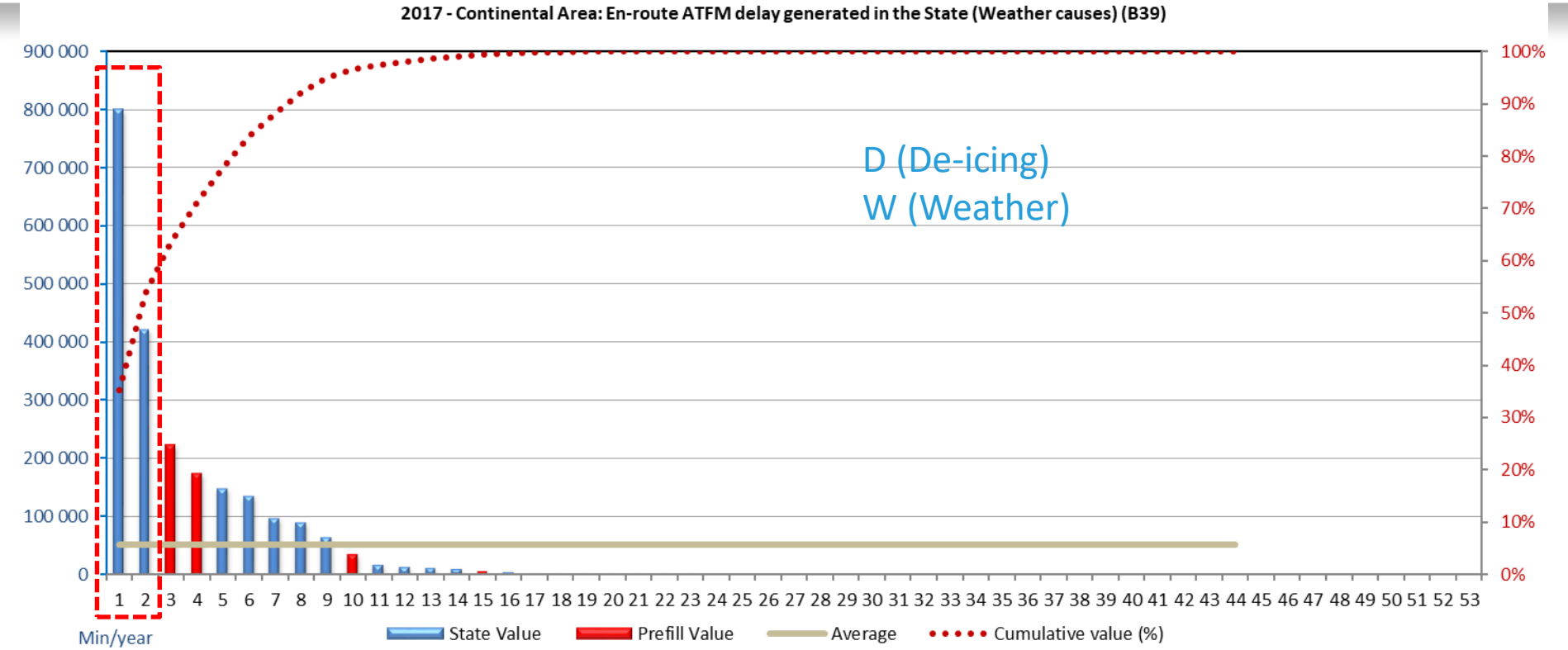
Data item B38



I (Industrial Action (ATC))
R (ATC Routeing)
T (Equipment (ATC))
V (Environmental Issues)

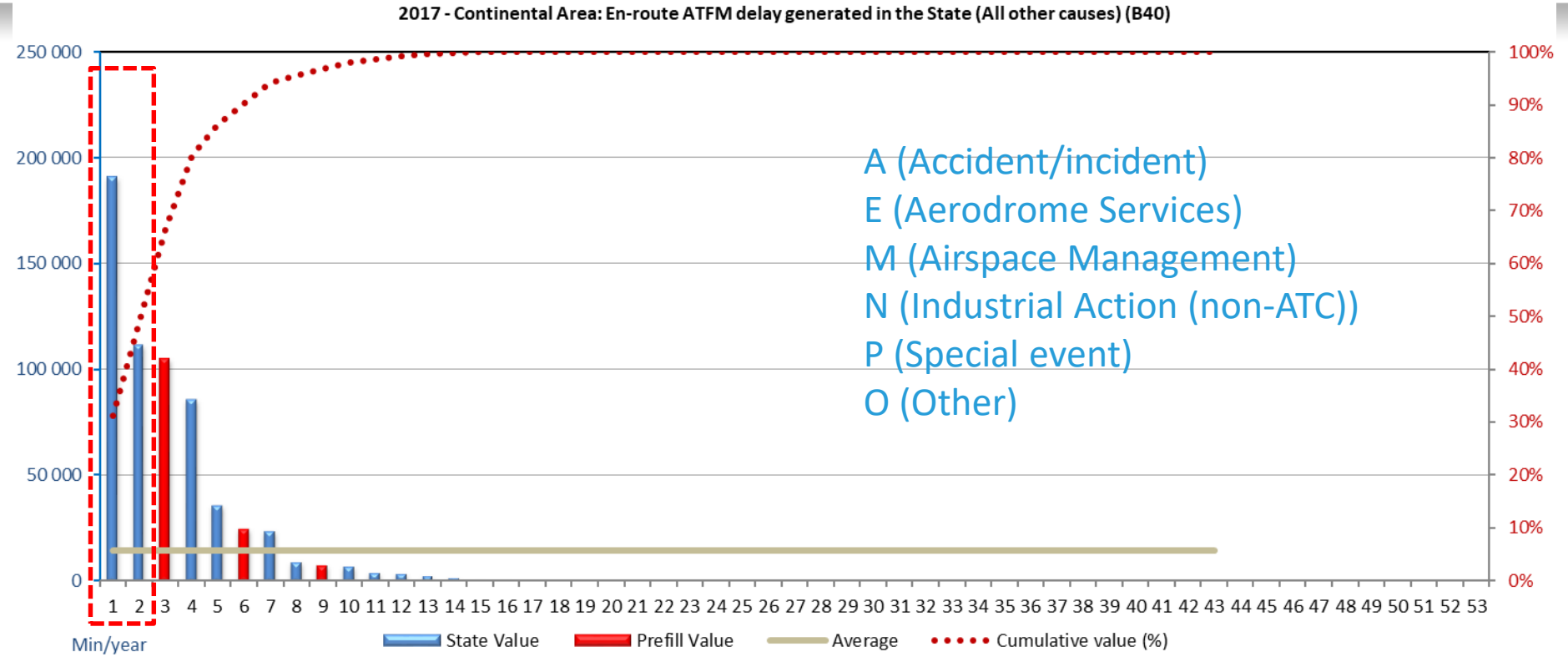
Demand/capacity mismatch in en-route airspace due to “ATC other causes” is a phenomenon taking place in only 2 States.

Data item B39



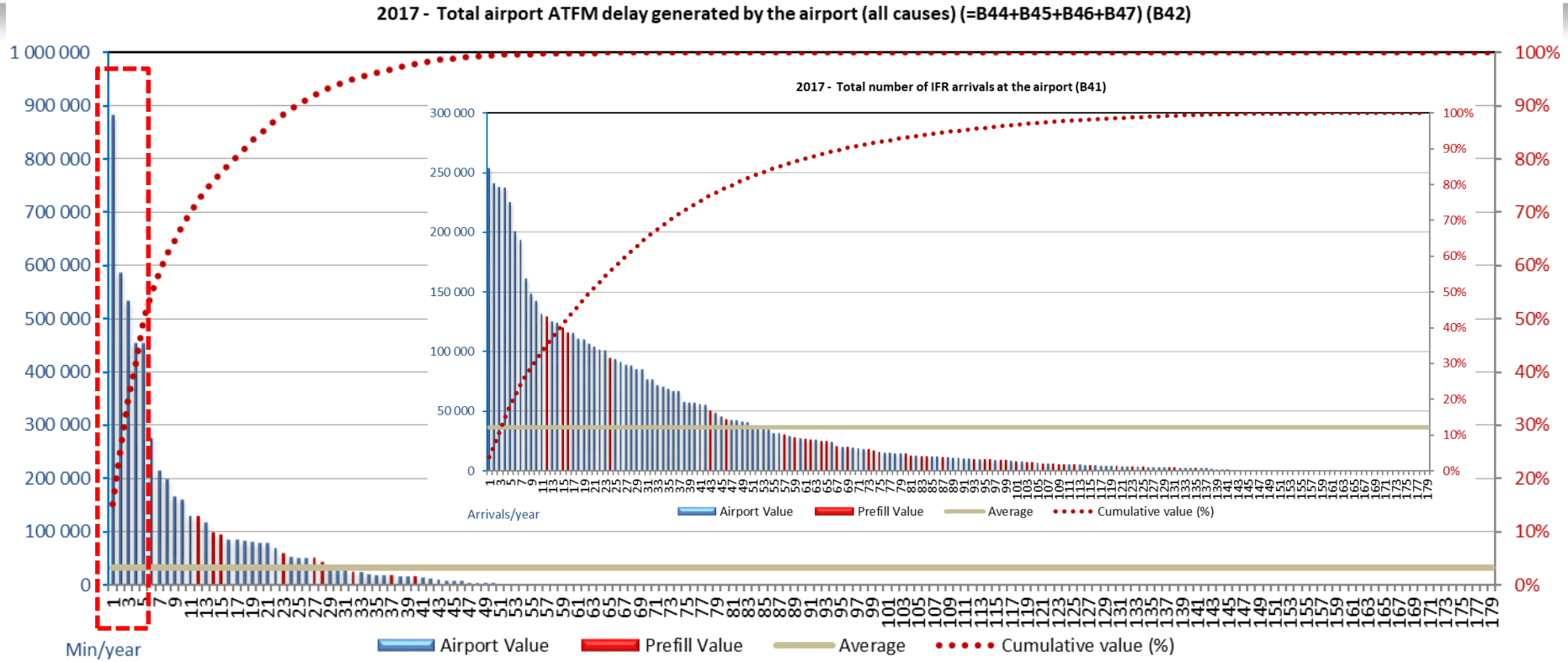
Demand/capacity mismatch in en-route airspace due to weather causes is somewhat more widespread, but not a factor in most of the States.

Data item B40



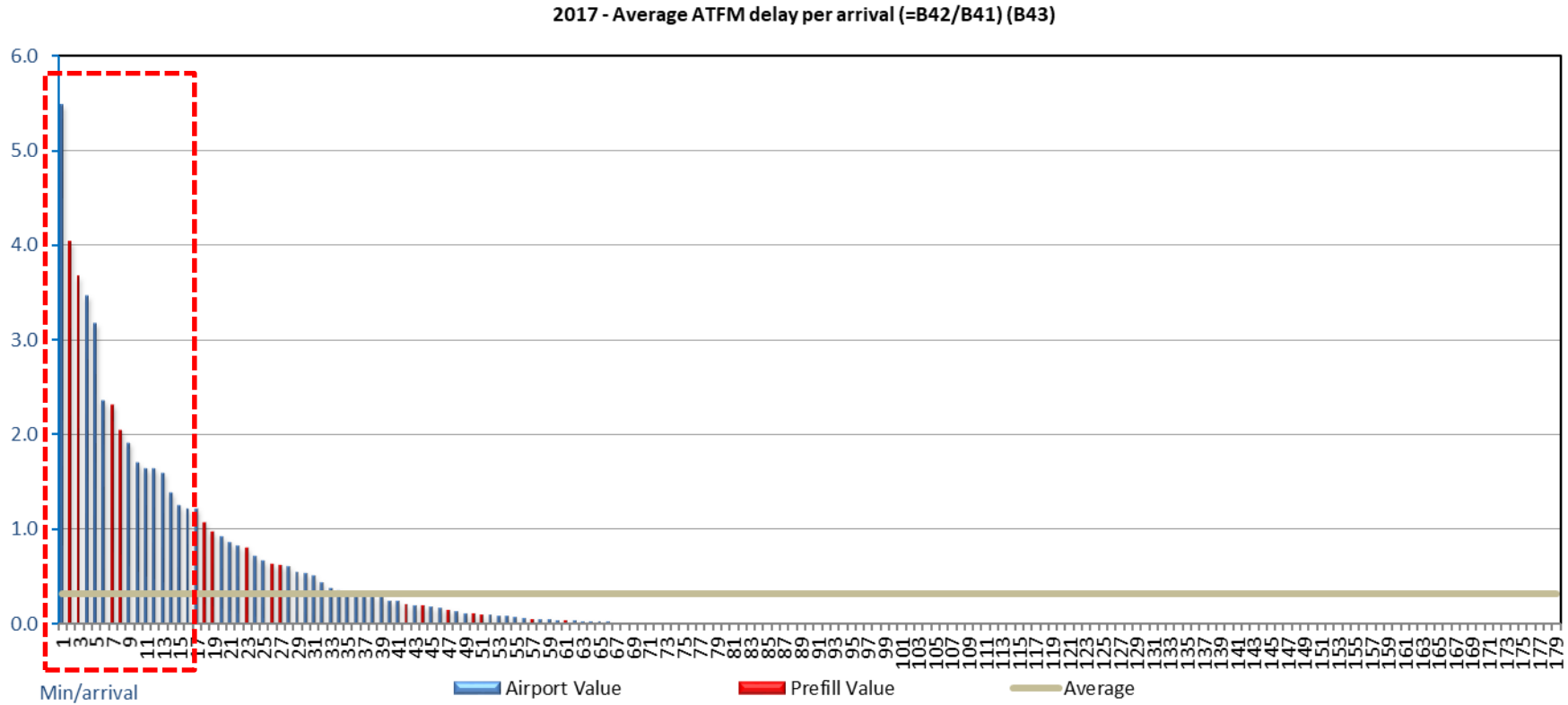
50% of all en-route ATFM delay for “all other causes” in the EUR Region is generated by 2 States. 4 States generate 80% of all such delay. In the vast majority of States this is not a factor.

Data items B42 & B41



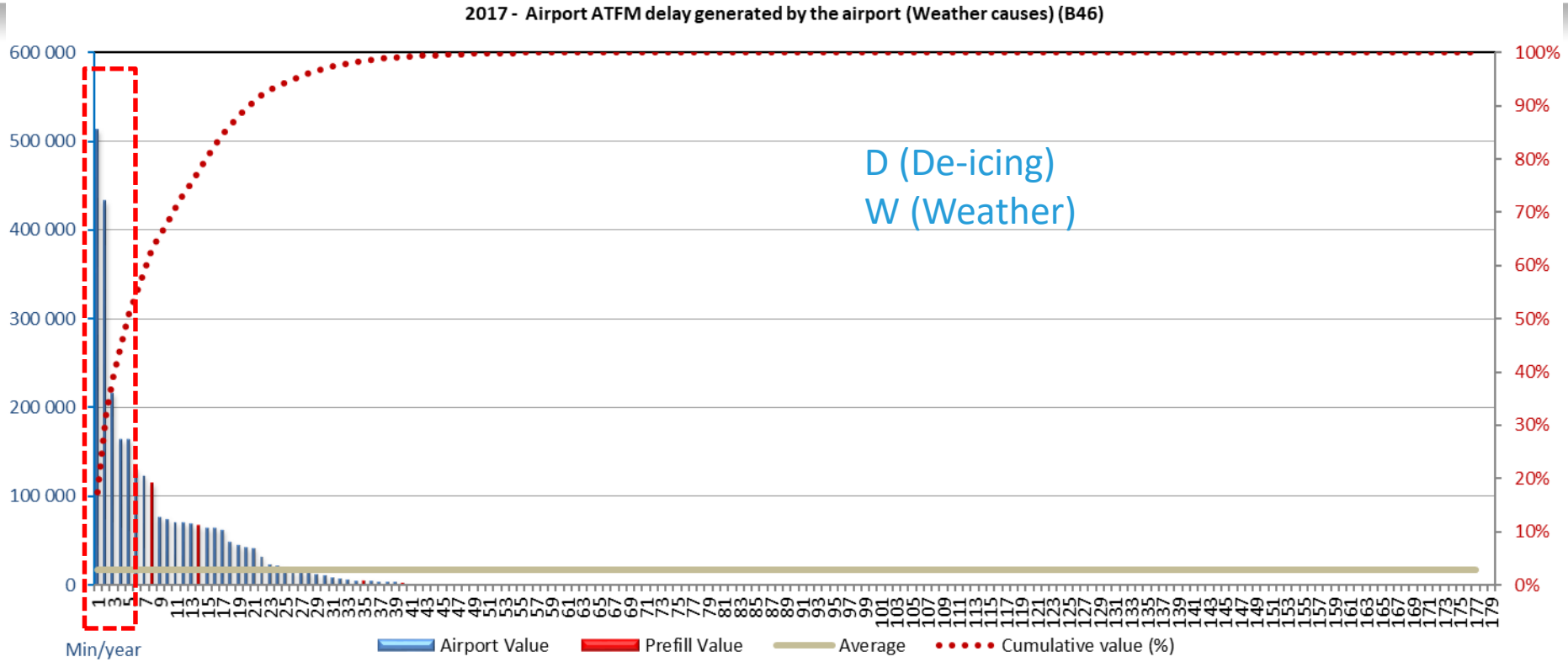
5 airports are causing 50% of all airport ATFM delay in the EUR Region.

Data item B43



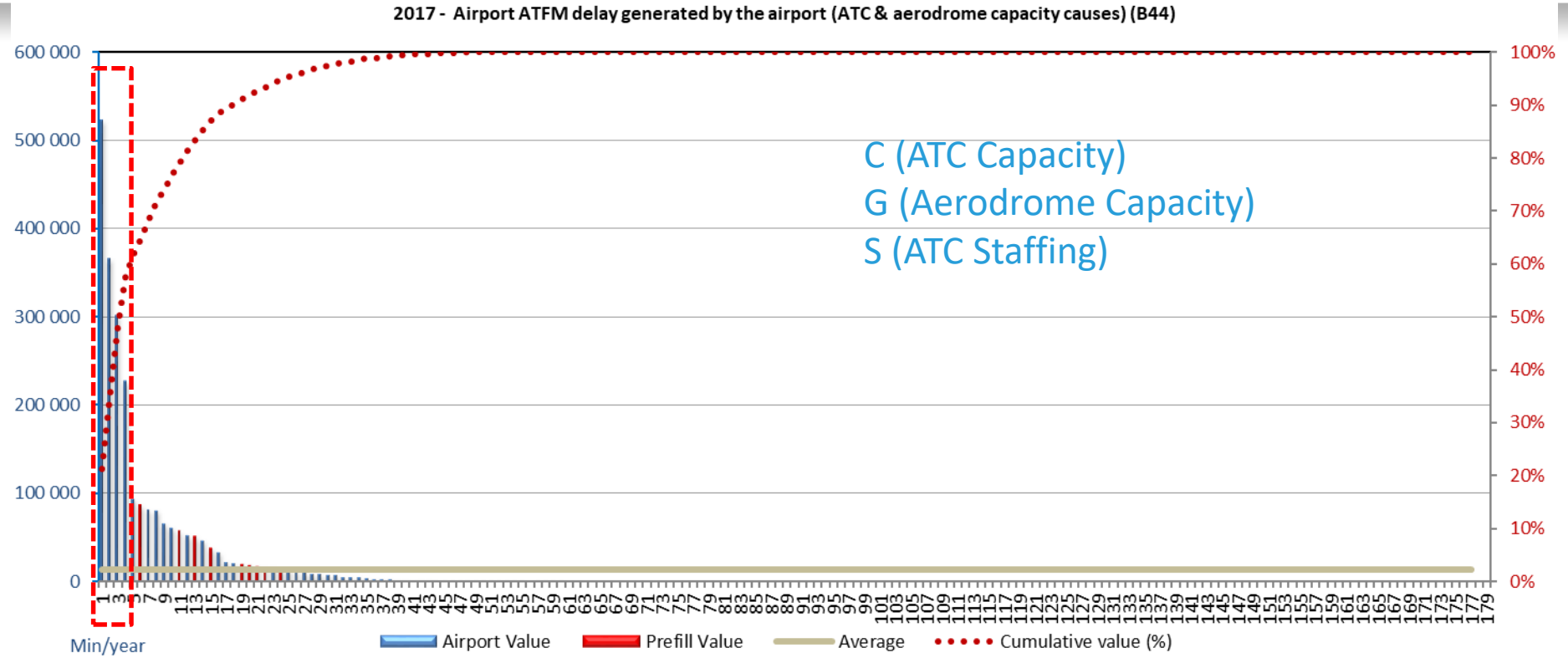
Looking at the indicator, improvements should primarily focus on the 5-15 airports with the highest value. However for prioritisation of improvements the total amount of delay (item B42) should be considered as well.

Data item B46



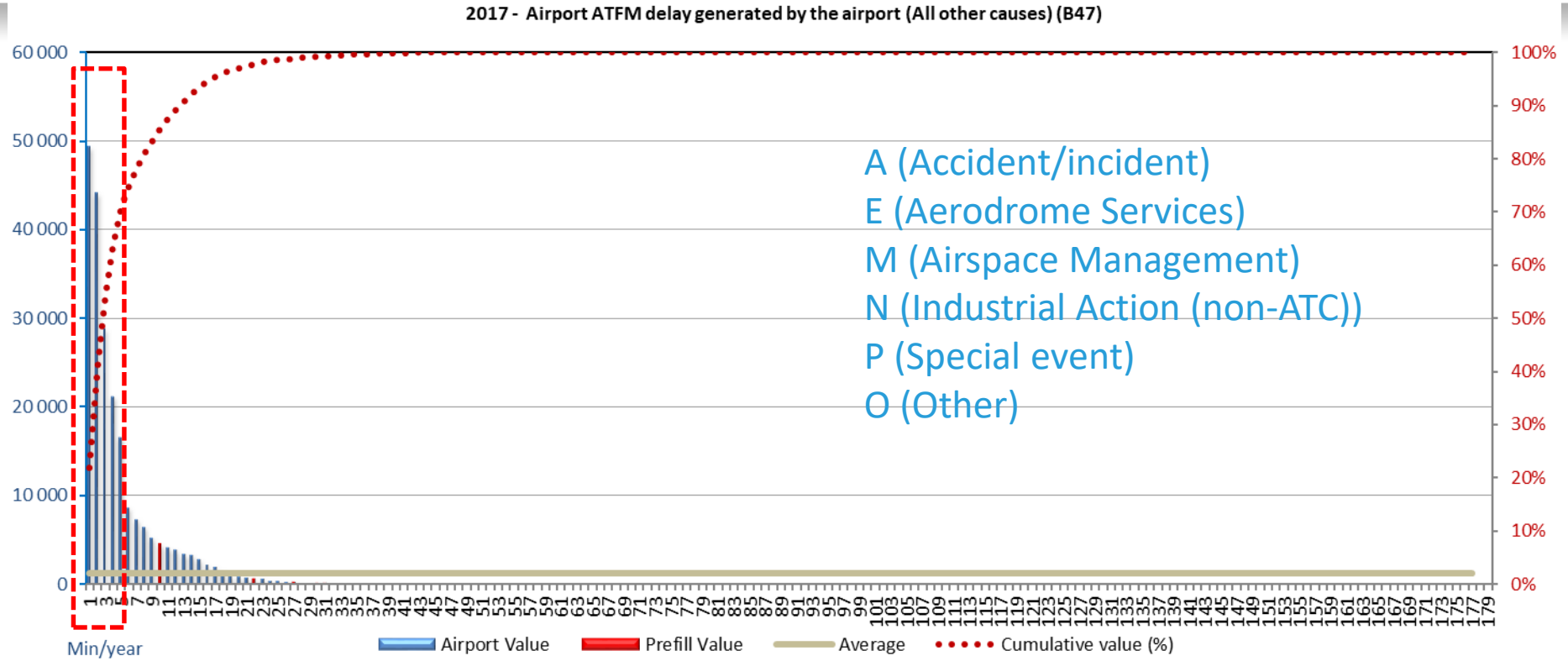
Weather causes are the biggest contributor to airport ATFM delay. To address 50% of this delay, it is sufficient to look at 5 airports.

Data item B44



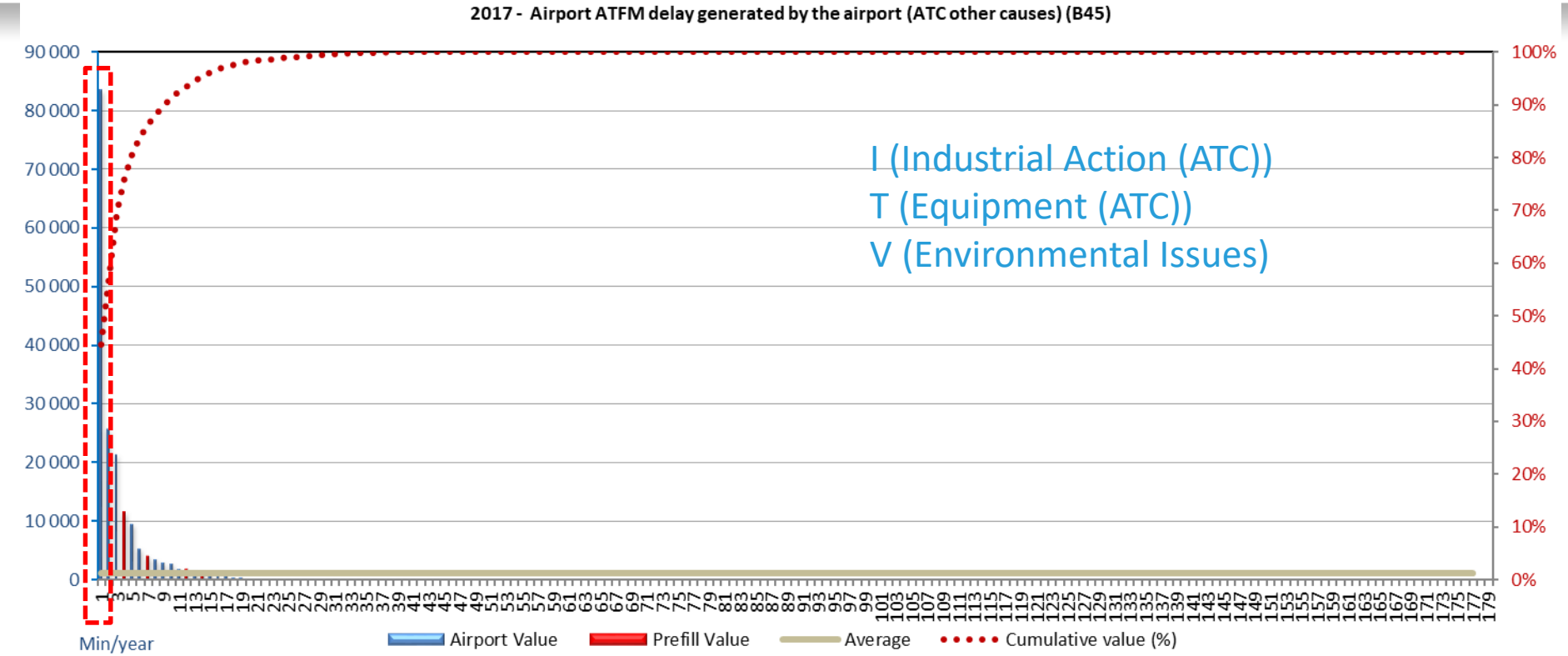
ATC & aerodrome capacity causes are the second biggest contributor to airport ATFM delay. 4 airports need to be looked at as a matter of priority.

Data item B47



'All other causes' is a relatively small factor. This can be addressed by looking at 5 airports.

Data item B45

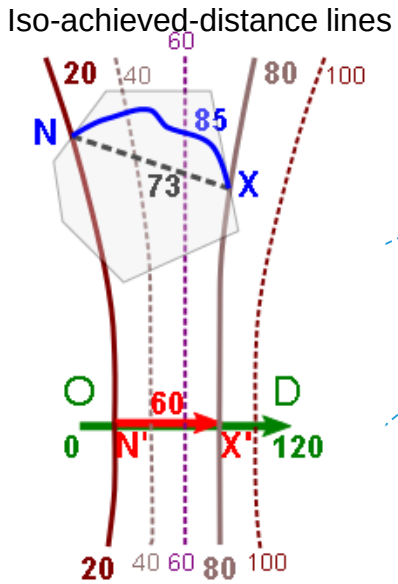


On average, ATC other causes is the smallest contributor to airport ATFM delay. However at one airport it was a severe problem in 2017.

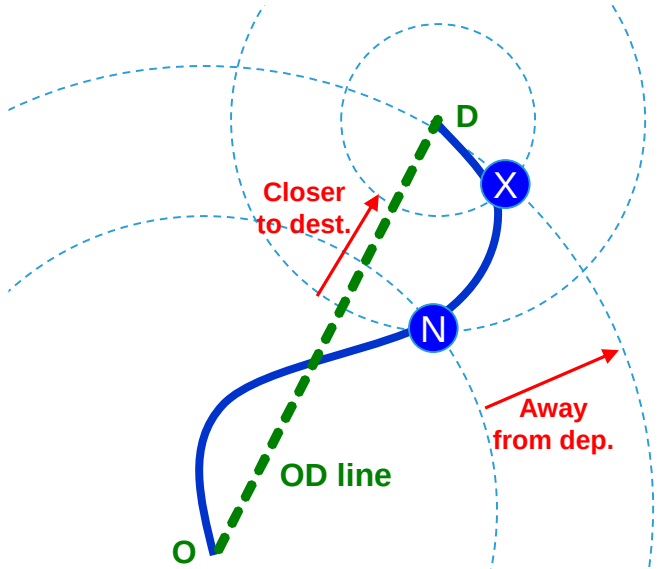
KPA	Efficiency
Objective	Ensure that users [can?] use the most efficient routes – focussing on the horizontal flight-efficiency
Indicator	Average horizontal en route flight efficiency, defined as the difference between the length of the en route part of the actual trajectory (where available) or last flight planned route and the great circle.

Notion of "Achieved Distance"

- O, D, N, X: **O**rigin, **D**estination, e**N**try, e**X**it
- "Corresponding portion of the great circle distance OD" = achieved distance N'X' (needed to calculate the indicator at State level)
- Calculation of achieved distance N'X' for flight segment NX: (distance-closer-to-destination + distance-away-from-departure)/2
- Important properties
  - Sum of achieved distances of flight segments is always equal to total direct (great circle) distance from O to D
  - Actual, achieved and excess distances for flight segments are aggregatable (bottom-up from State level to regional level)

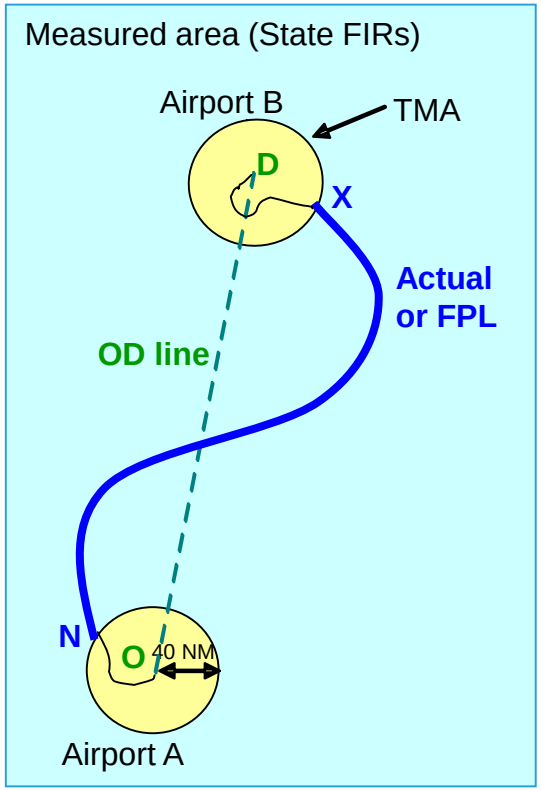


In the example to the left:
Extra distance: 85 – 60 = 25
Inefficiency = 25 / 60 = 0.42 = 42%

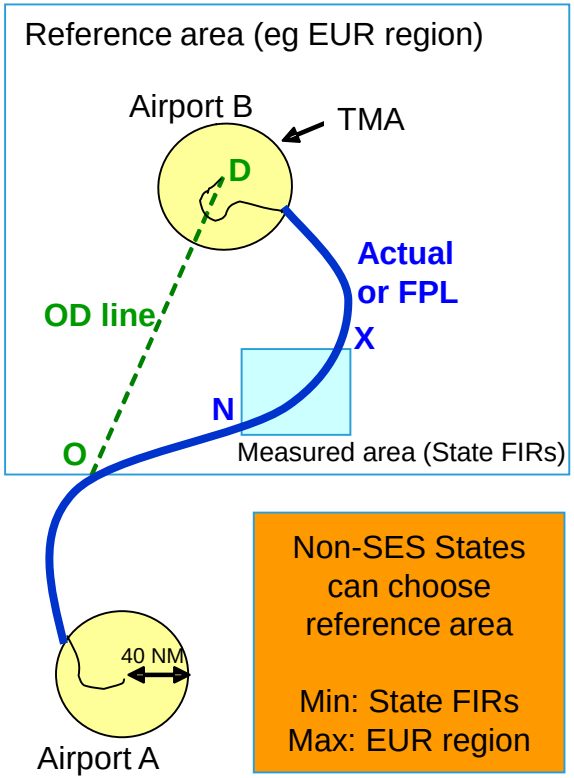


Processing of domestic flights and overflights

Domestic flight

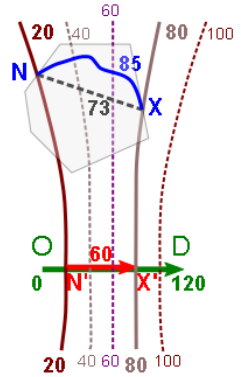


Overflight



Non-SES States can choose reference area

Min: State FIRs
Max: EUR region

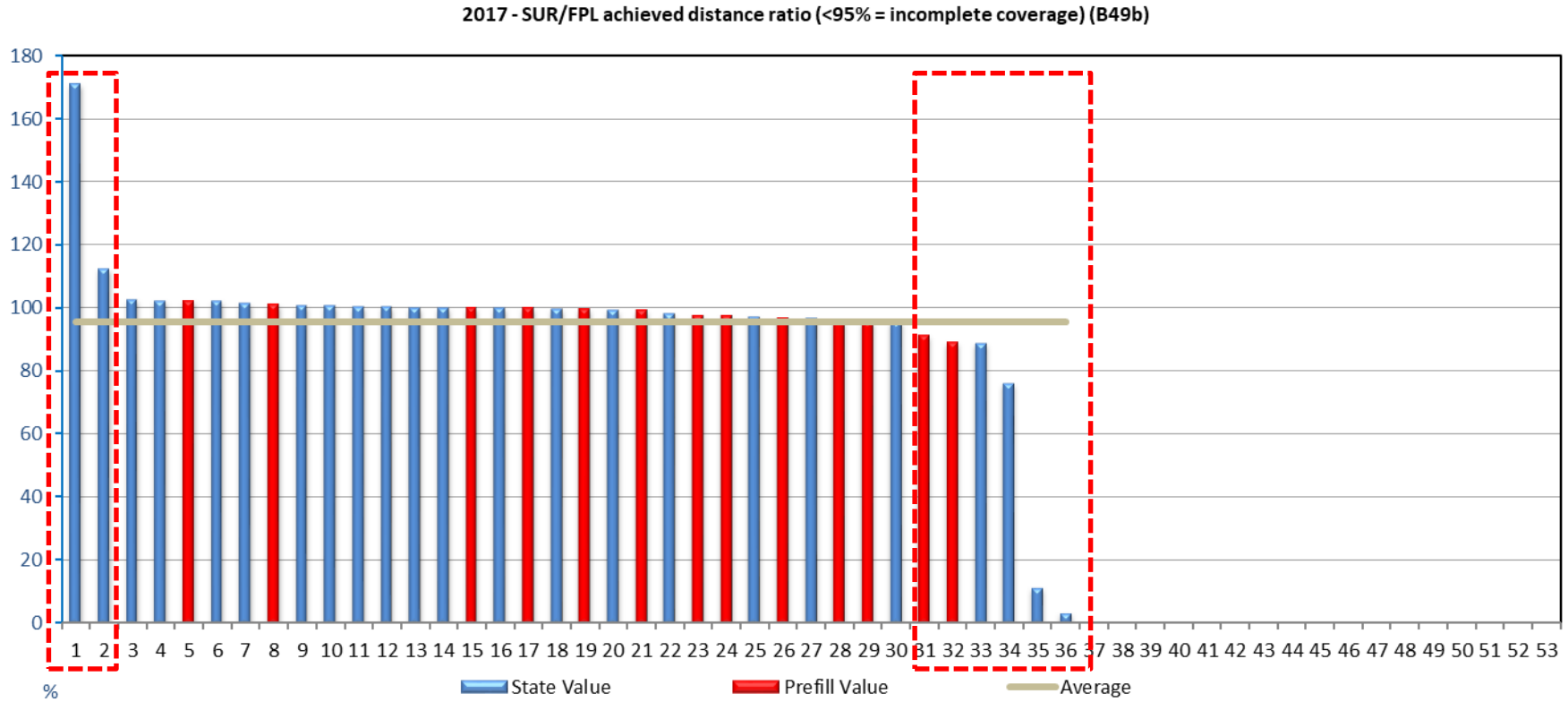


- Required inputs: Trajectory and the coordinates of points O, D, N, X
  (**O**rigin, **D**estination, e**N**try, e**X**it)
- Computed: Trajectory distance (NX), achieved distance (N'X')
- For the NX parts of all trajectories of IFR flights domestic, departing, arriving, or overflying IFR flights

Data items

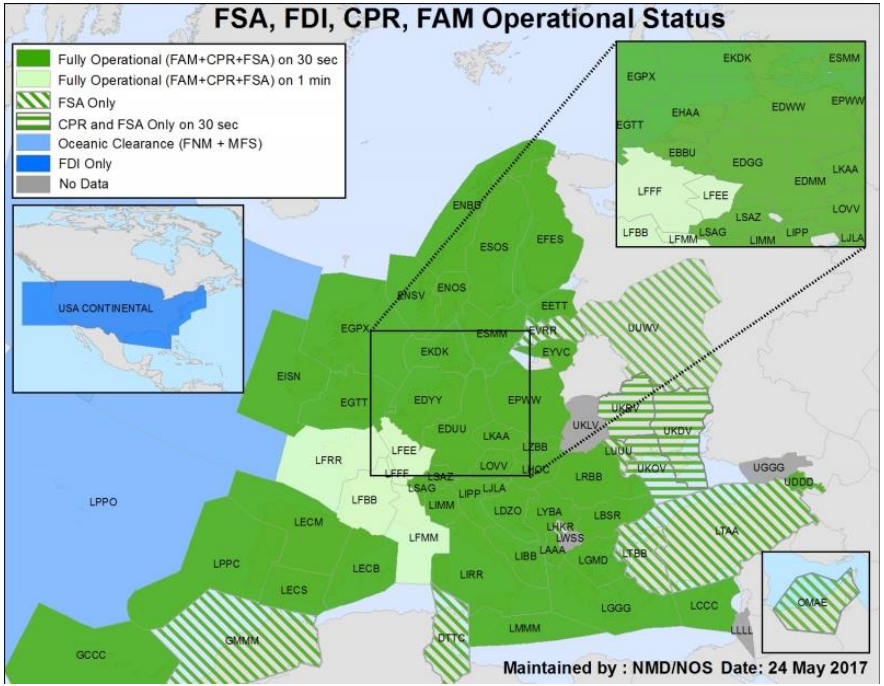
	Flight Efficiency	
	Horizontal en-route flight efficiency	
B48	Name of selected reference area (provide list of FIRs in annex)	Text
B50fpl	Total planned IFR distance (flight plan)	km/year
B51fpl	Total achieved IFR distance (flight plan)	km/year
B50sur	Total actual IFR distance (surveillance data)	km/year
B51sur	Total achieved IFR distance (surveillance data)	km/year
B49	Data source for B50 - B53 (surveillance data or flight plan)	SUR or FPL
B49b	SUR/FPL achieved distance ratio (<95% = incomplete coverage)	%
B50	Total flown IFR distance	km/year
B51	Total achieved IFR distance	km/year
B52	Total extra IFR distance (=B50 – B51)	km/year
B53	Horizontal en-route flight efficiency (=B52/B51)	%

Data item B49b

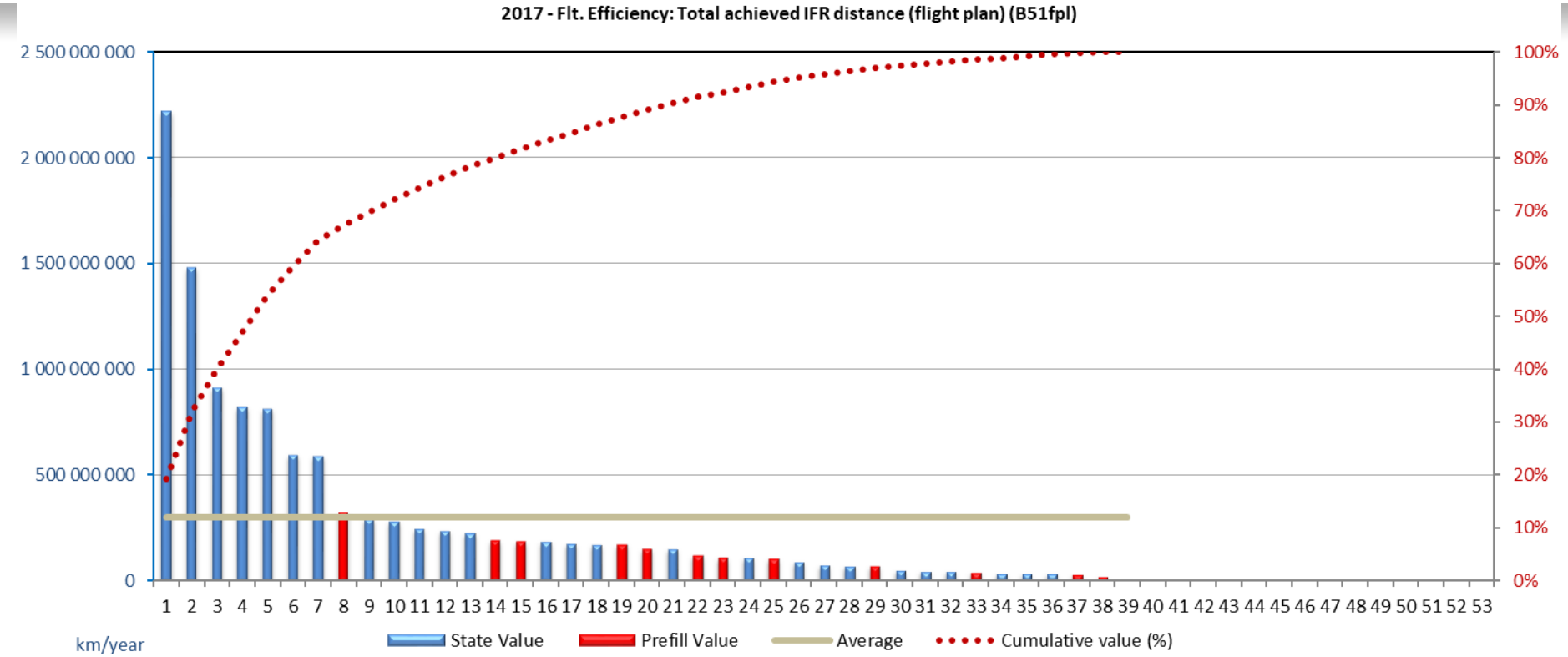


On the left side of the graph: for 2 States a number of FPL trajectories have been discarded for data quality reasons. This causes the SUR/FPL ratio to be > 100%, which is not an issue for performance measurement.
On the right side of the graph: for 6 States the SUR/FPL ratio is significantly < 100%, which is an indication of insufficient surveillance data coverage.

Surveillance data (CPR) coverage

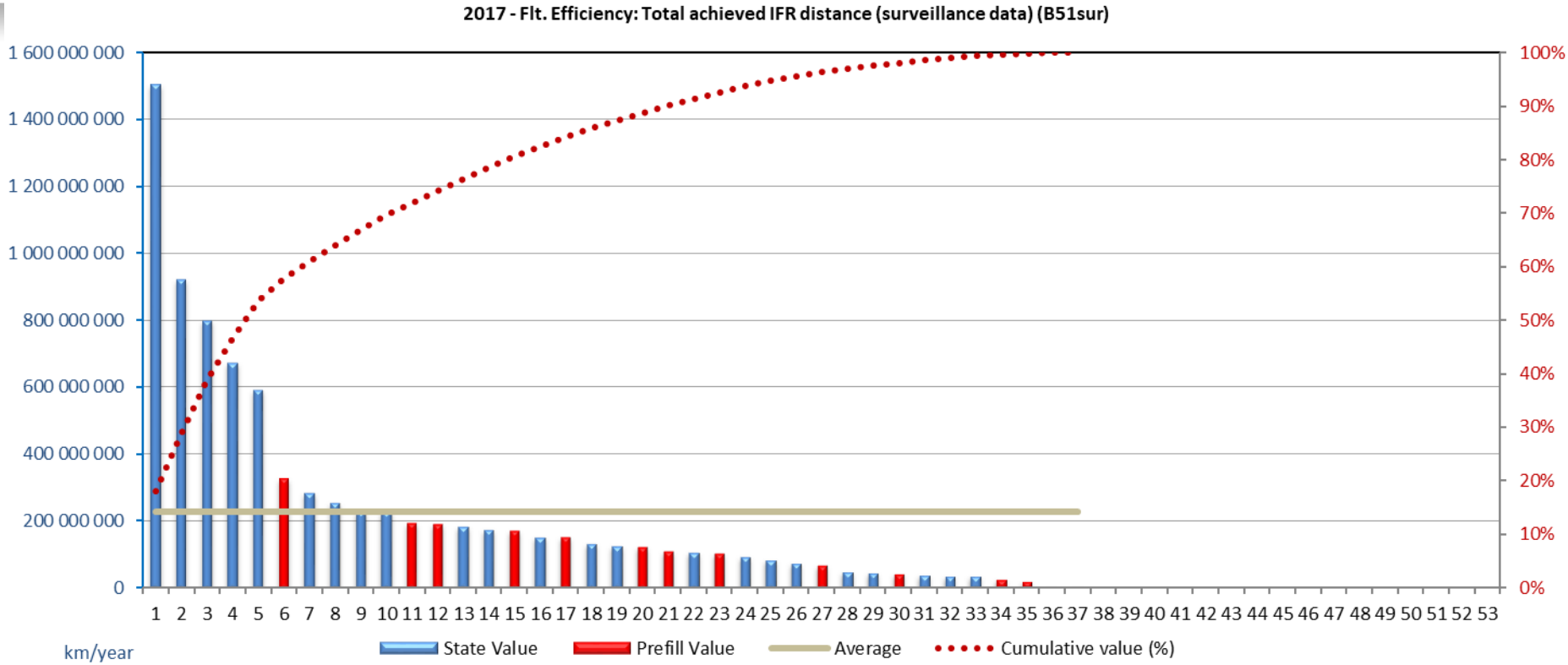


Data item B51fpl



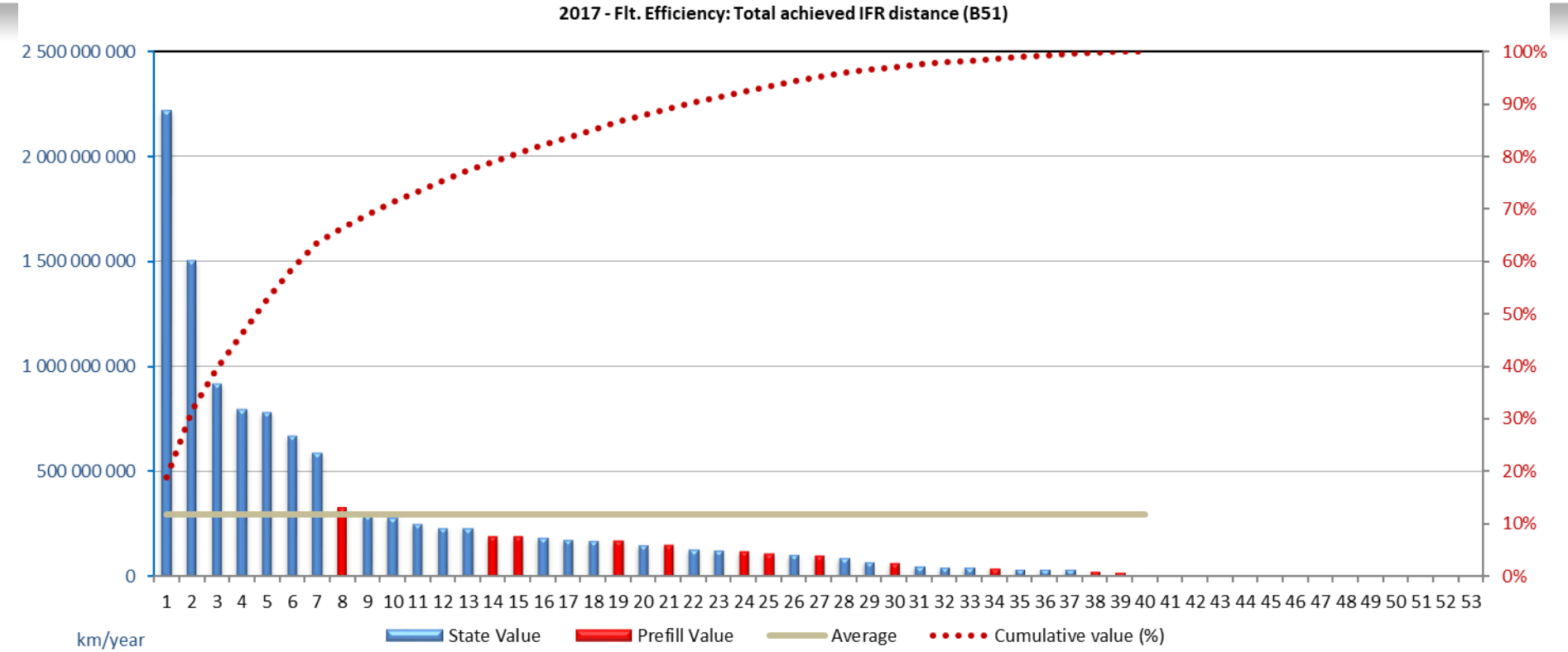
Total achieved IFR distance (in other words: contribution to the great circle distance of the flights) according to FPL trajectories.

Data item B51sur



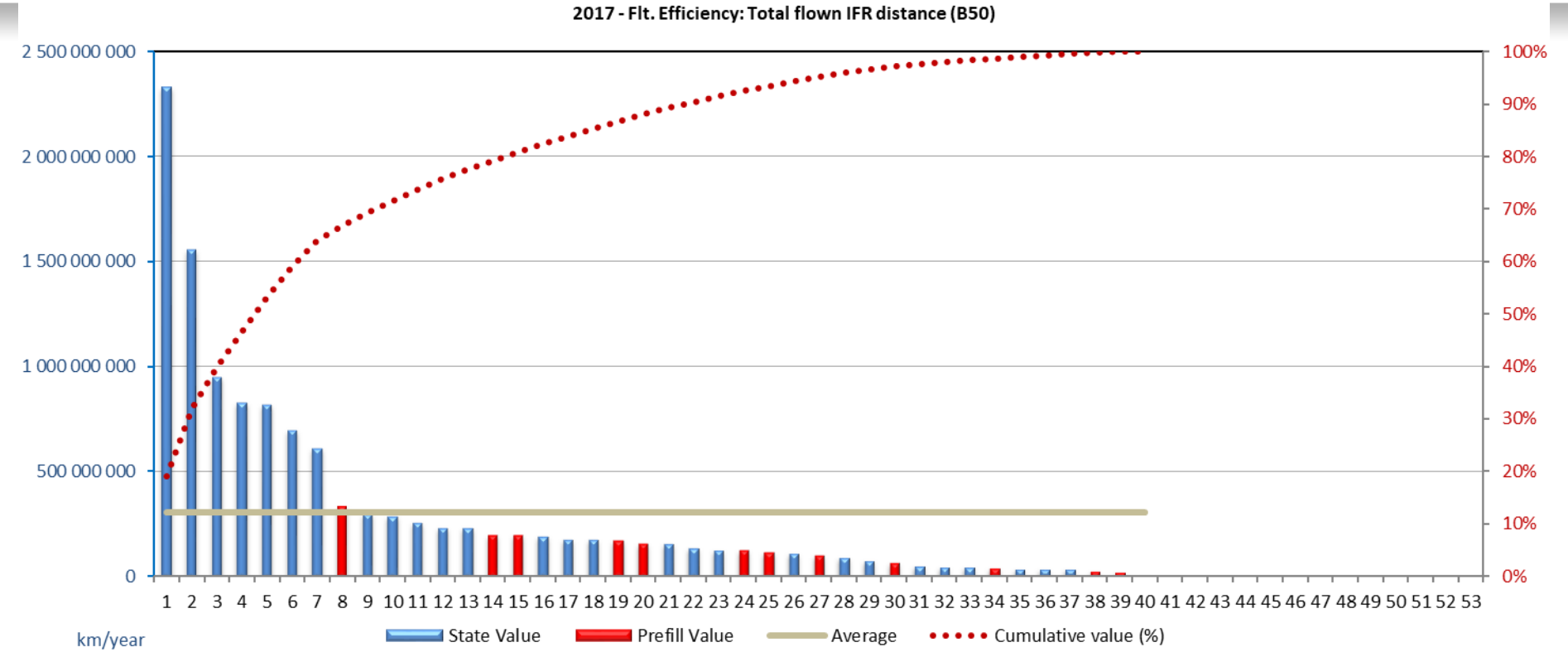
Total achieved IFR distance (in other words: contribution to the great circle distance of the flights) according to surveillance data trajectories.

Data item B51



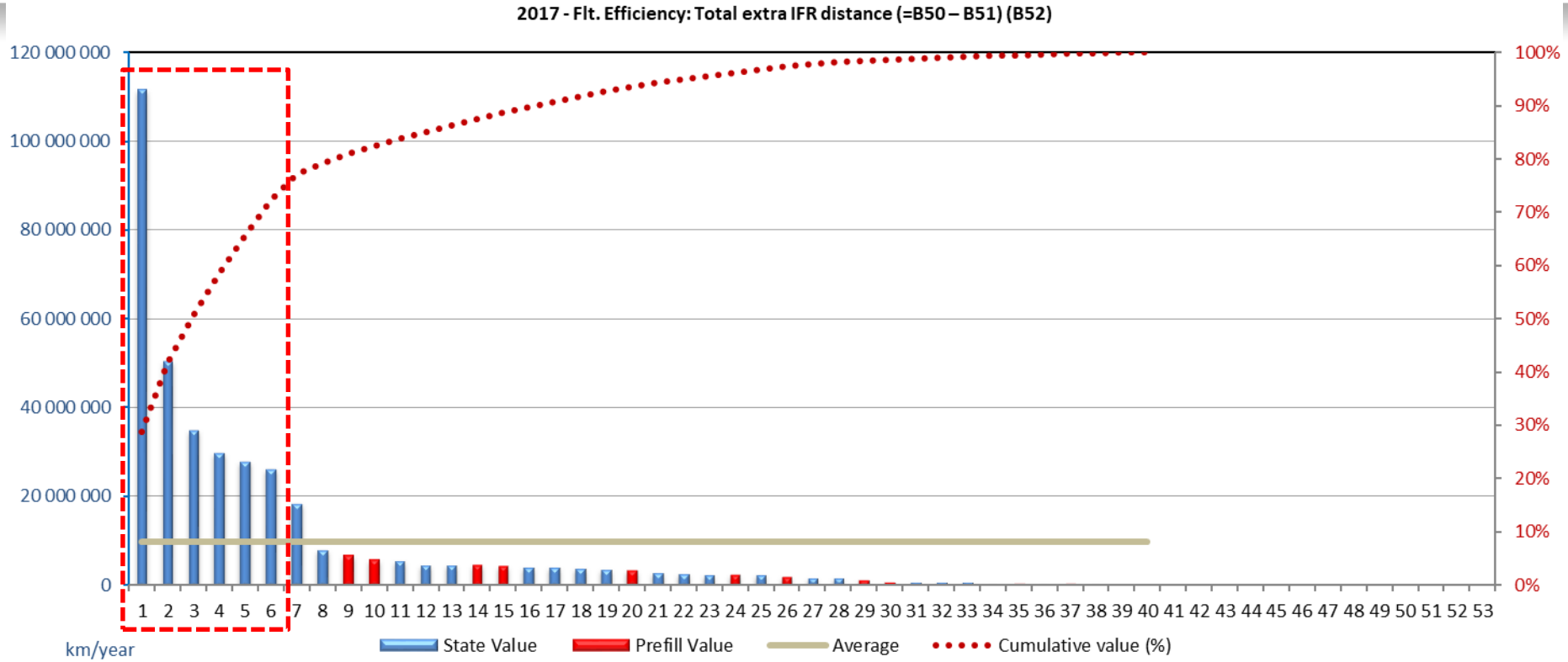
Total achieved IFR distance (in other words: contribution to the great circle distance of the flights) adjusted to compensate for insufficient surveillance data coverage.

Data item B50



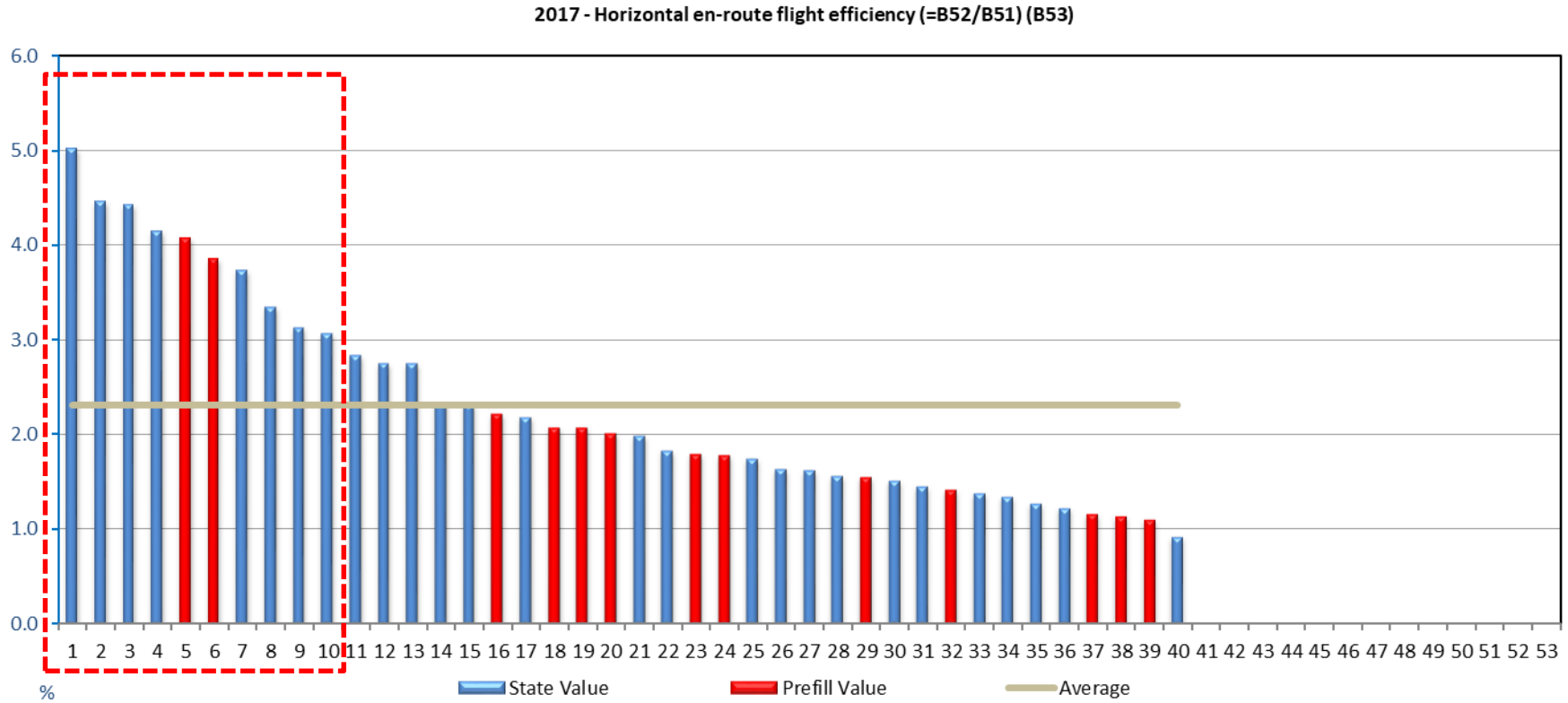
Total flown IFR distance (=actual distance) fused from SUR and FPL data sources and adjusted to compensate for insufficient surveillance data coverage.

Data item B52



Total extra IFR distance (=excess distance flown) based on fused SUR and FPL data sources and adjusted to compensate for insufficient surveillance data coverage.
The top-3 States are accountable for 50% of all extra distance, the top-6 for 75%.

Data item B53



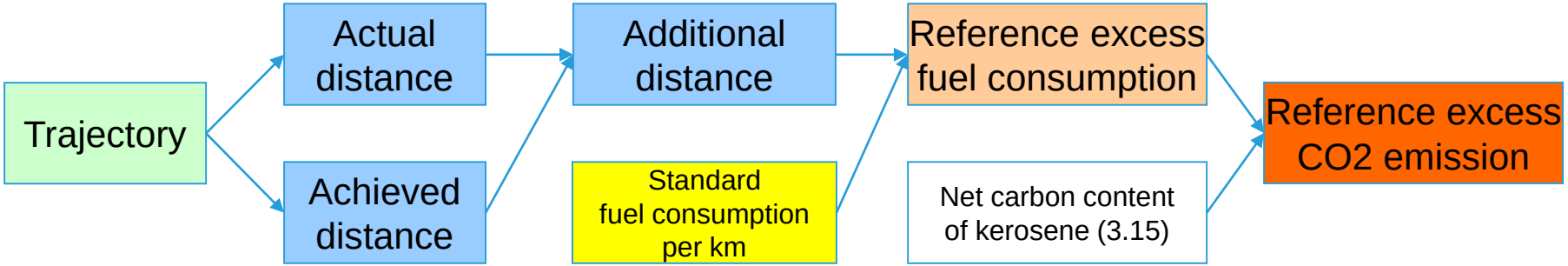
Looking at the indicator, improvements should primarily focus on the 10 States with the highest value. However for prioritisation of improvements the total amount of extra IFR distance (item B52) should be considered as well.

KPA	Environment
Objective	Contribute to the protection of the environment – focussing on fuel savings and CO2 emission reductions
Indicator	CO2 emissions deriving from inefficiencies in flight efficiency (conversion of additional distance into CO2 emissions based on standard values formula)

Definition of indicator

- Reference excess fuel consumption:
  Total additional distance flown in the airspace volume (i.e. State) multiplied by a standard fuel consumption factor (value chosen by each State)

- Reference excess CO2 emission:
  Reference excess fuel consumption multiplied by 3.15 (net carbon content of kerosene)



Remarks

- Indicator
  - Has low data requirements and is therefore easy to implement
    - Because mostly based on “additional distance” already computed
  - Publishes an approximation of excess CO2 emission, resulting from horizontal flight inefficiency
    - The optimum indicator value is not equal to zero
    - Value is influenced by many different factors (including traffic volume, fleet characteristics etc.)
    - Indicator does not cover everything (missing: vertical flight efficiency, TMA inefficiencies, surface movement inefficiencies)
    - Hence the absolute value of the indicator should not be interpreted as representing the CO2 emissions caused by ANS.
    - Indicator to be used for “general purpose” and trend analysis only

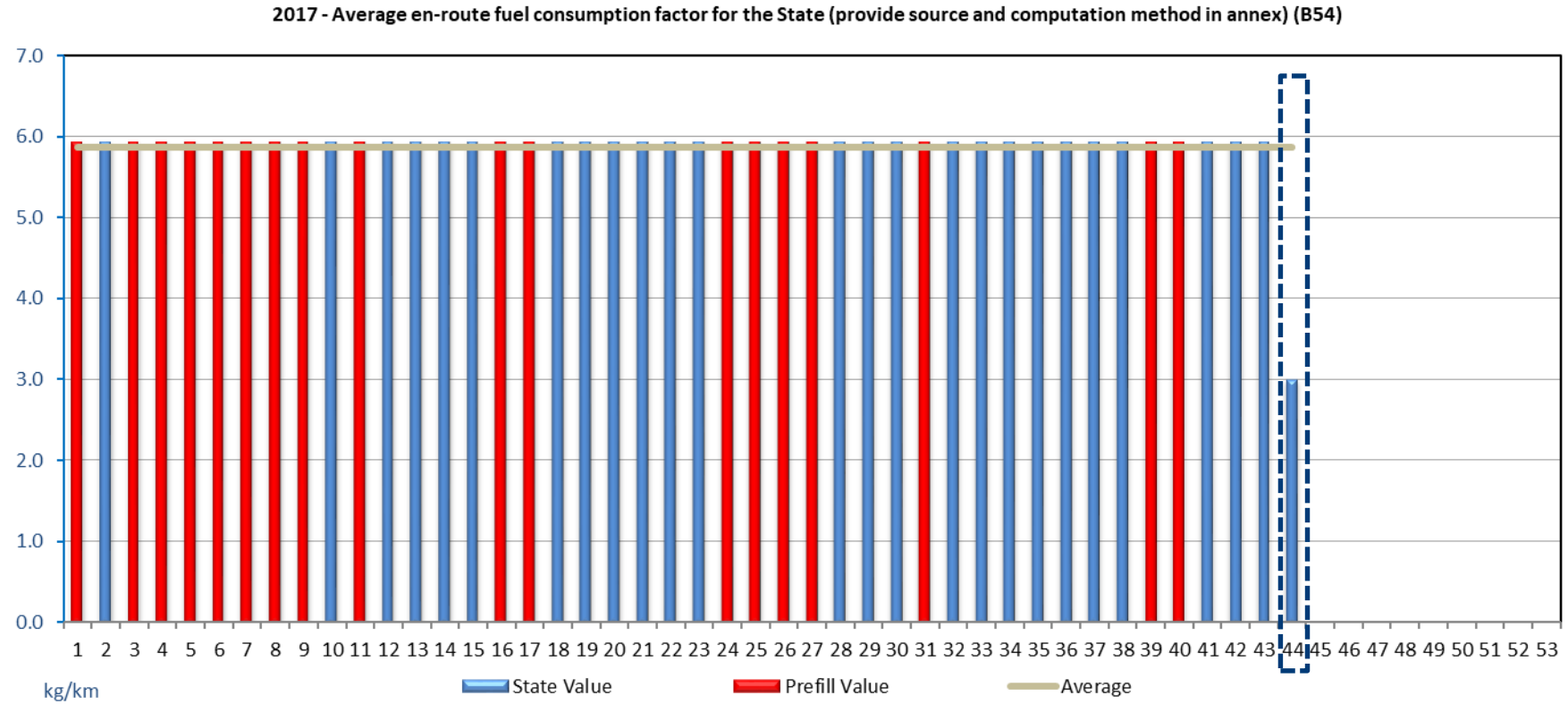
Data items

	Environment	
	CO2 emissions deriving from inefficiencies in flight efficiency	
B54	Average en-route fuel consumption factor for the State (provide source and computation method in annex)	kg/km
B55	Average en-route CO_2 emission factor for the State (=B54 * 3.15)	kg/km
B56	Theoretical CO_2 emissions deriving from inefficiencies in horizontal en-route flight efficiency (=B52 * B55 / 1000)	Tonnes/year

B54 – Average en-route fuel consumption factor

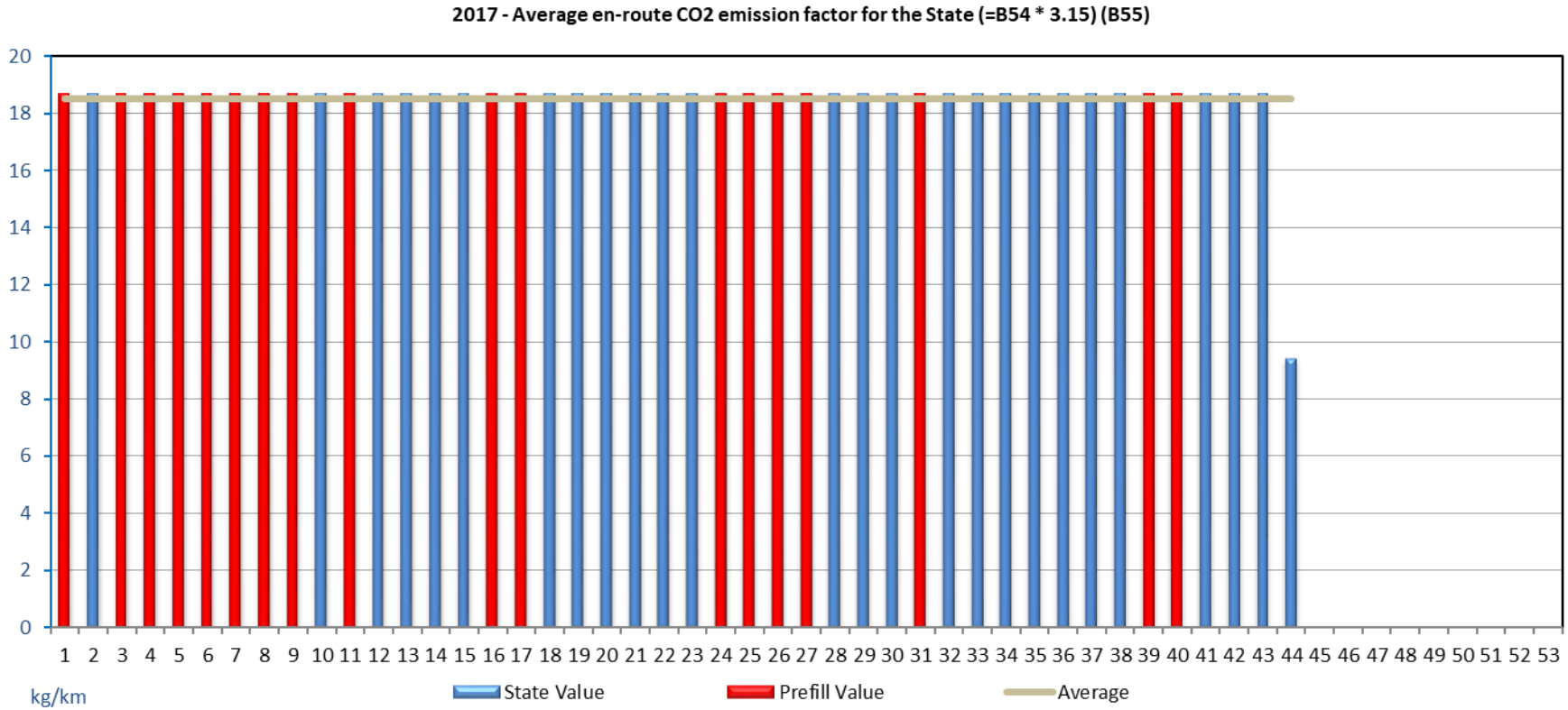
- State can choose method/value
  - Global standard value from ICAO
    - Average fuel burn per nautical mile (NM) of flight = 11 kg/NM = 5.9 kg/km
      - Source: Doc 9750 3rd ed. page App H-8
    - Used for the prefilling of the template
  - State-specific standard value: the standard kerosene consumption per kilometer of a typical jet aircraft type
    - States can select their own “typical aircraft type”, reflecting the composition of traffic in their airspace
  - State-specific measured value: a calibrated average fuel consumption per kilometre flown,
    - computed from the State’s average annual traffic composition in terms of aircraft types, vertical traffic distribution and distance flown
      - using the ICAO Fuel Savings Estimation Tool (IFSET)
      - or any other modeling tool, if available
    - recalibration needed every couple of years to take into account changes in traffic composition

Data item B54



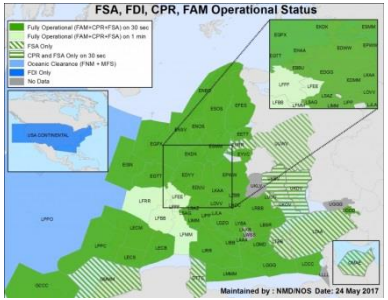
1 State has submitted its own computation of the average en-route fuel consumption. All others use the default ICAO value provided in the prefilled tables (5.87 kg/km).
Note that since mid-2018 we know (as a result of detailed modelling) that the average gate-to-gate (not en-route) fuel consumption factor for the ECAC area is 20% less: 4.72 kg/km.

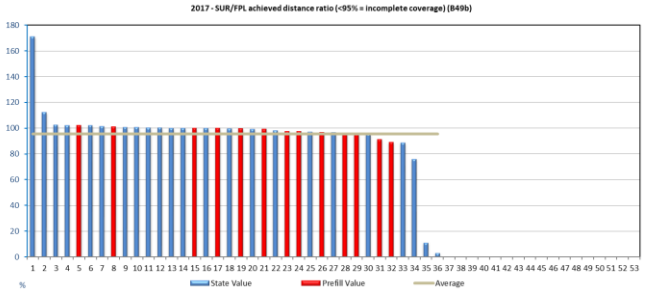
Data item B55



This is the States' CO2 emission factor assuming that all used fuel is Jet fuel.

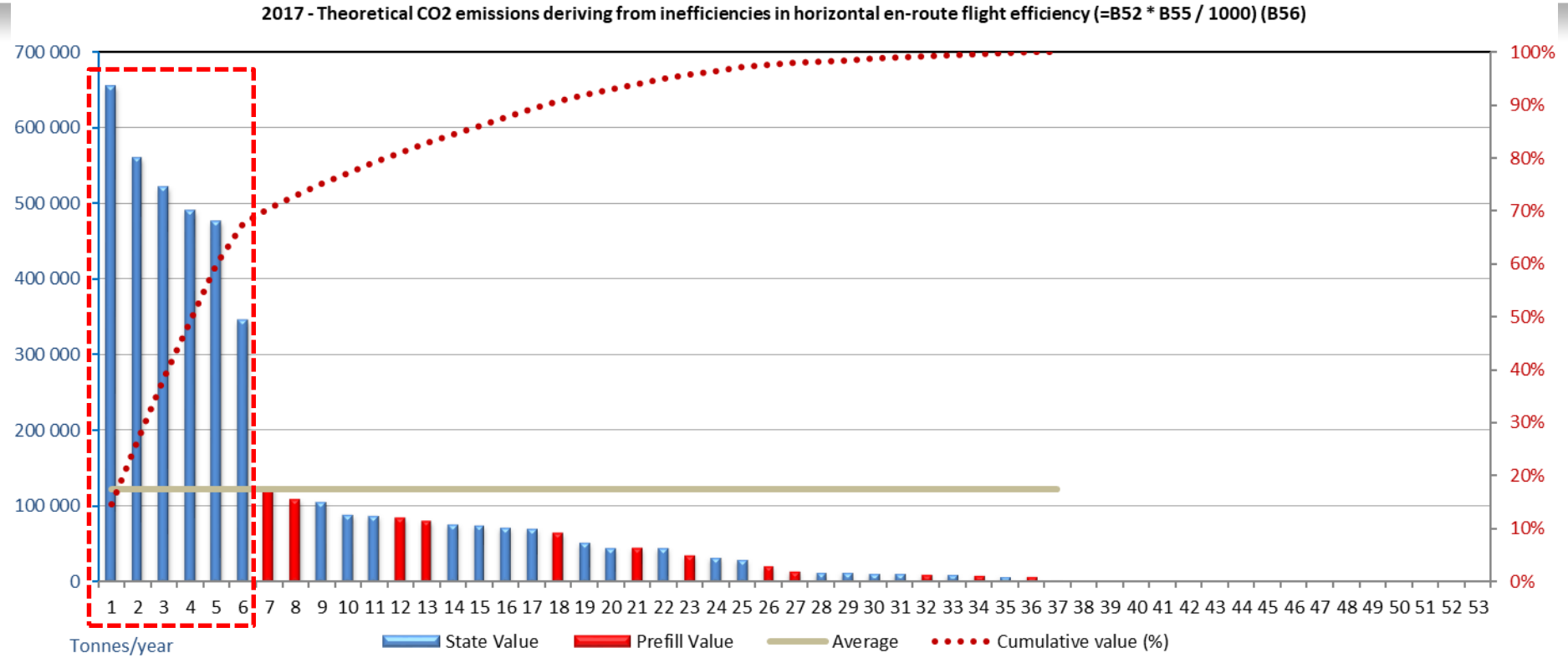
Addressing coverage issues





- Indicator is an absolute value
  - Susceptible to coverage issues
    - Geographical, time, flight category filtering
- Coverage checks & corrections
  - SUR data available
    - Sufficient match with FPL data (achieved distance comparison >95%)
      - Use additional distance from SUR data as is
    - Insufficient match with FPL data
      - Upscale additional distance from SUR data to 95% of additional distance from FPL data
  - SUR data not available
    - Use additional distance from FPL data

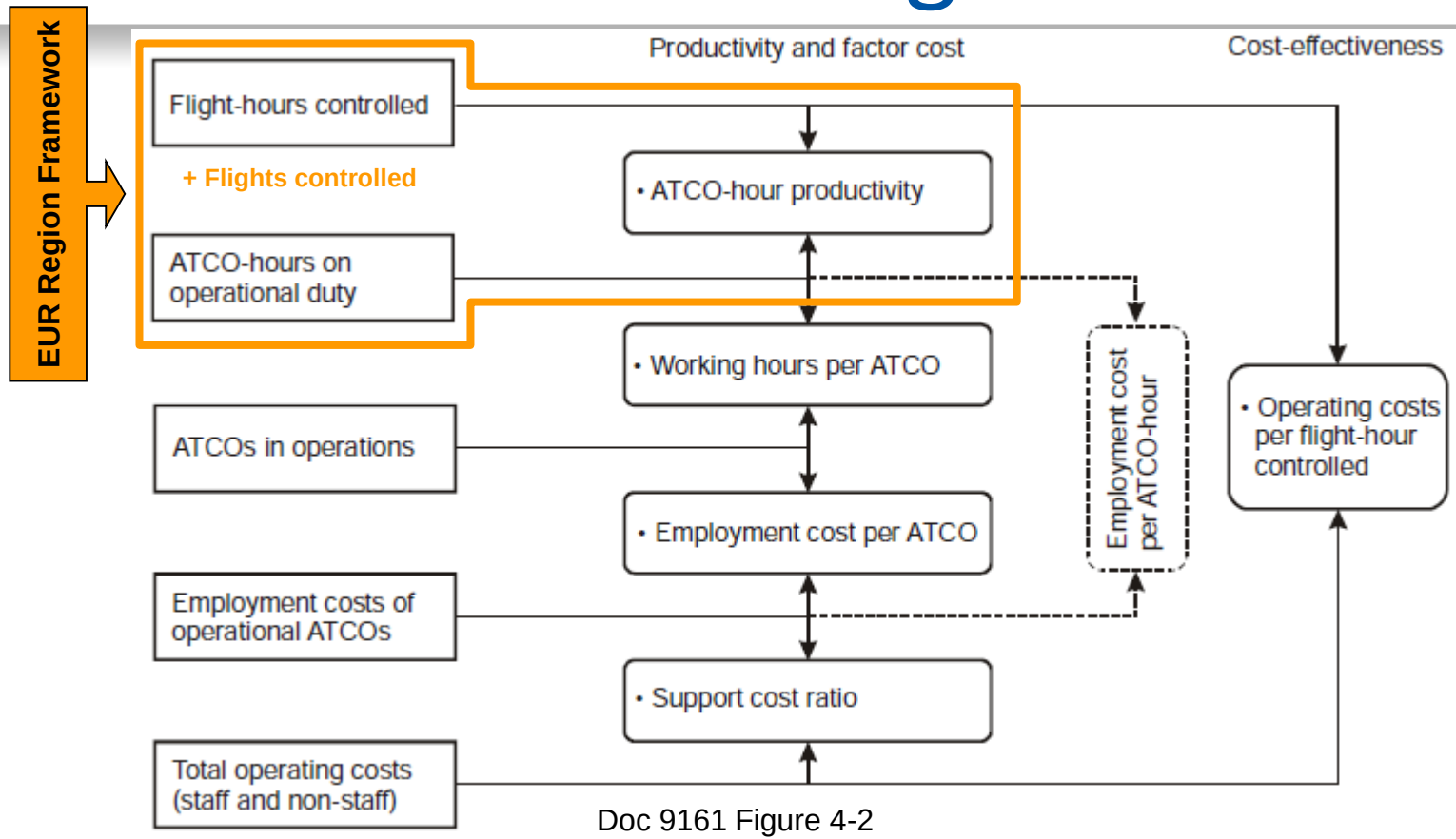
Data item B56



The top-6 States are accountable for 70% of the EUR Region theoretical CO2 emissions originating from a lack of horizontal flight efficiency. When prioritising improvements, the focus should be on these States.

KPA	Cost effectiveness
Objective	Contribute to optimize the cost for air navigation services
Indicators	- IFR flights (en-route) per ATCO hour on duty - IFR flight hours (en-route) per ATCO hour on duty - IFR movements (airport) per ATCO hour on duty

Origin of indicators



Doc 9161 Figure 4-2

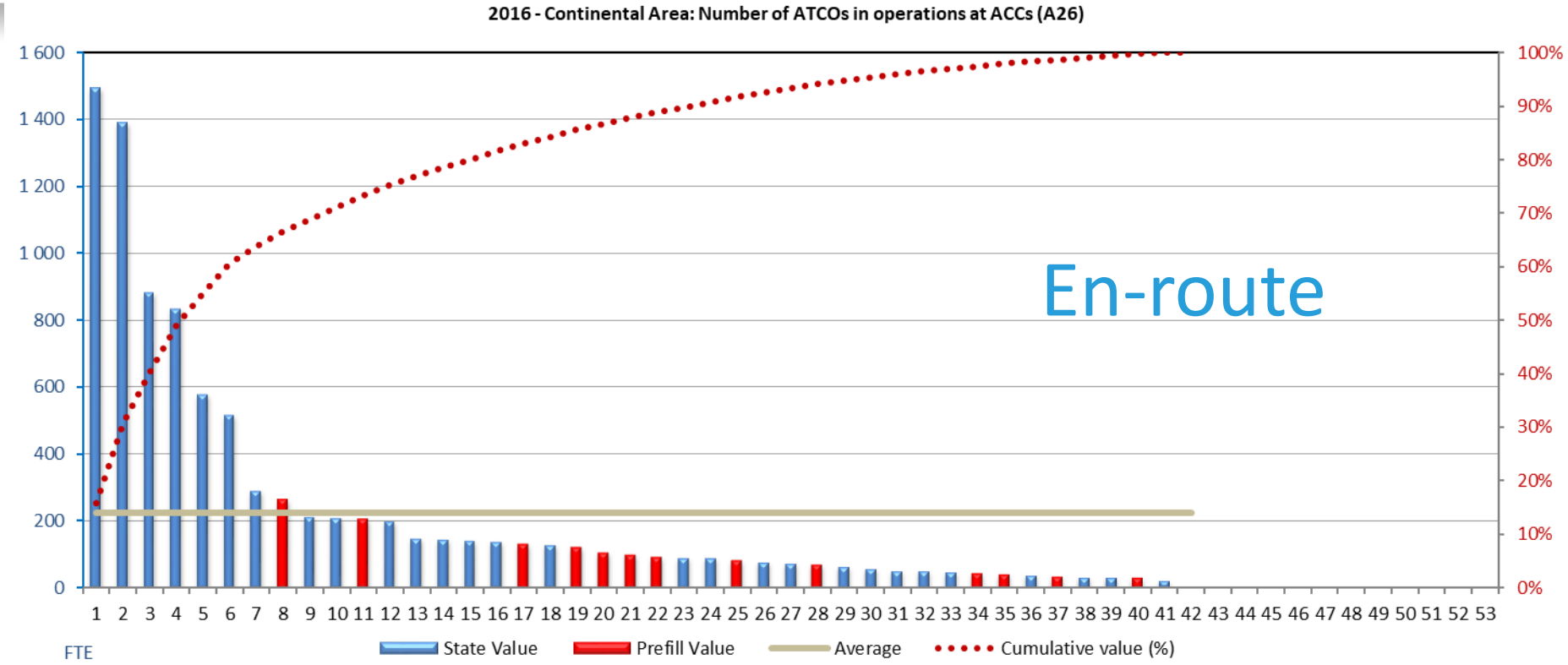
Remarks

- Indicators
  - Focus on an important component of ANSP costs
    - However with the limitation that working hours per ATCO, employment cost per ATCO, and support cost are not covered
  - Reuse data reporting already in place for many States
    - Also reuse existing data definitions and terminology
      - EUROCONTROL Specification for Economic Information Disclosure (SEID)
  - Have relatively simple reporting requirements
    - Only traffic volume and ATCO hours on duty
  - Avoid entering into financial information disclosure issues for the initial implementation of the framework

Data items

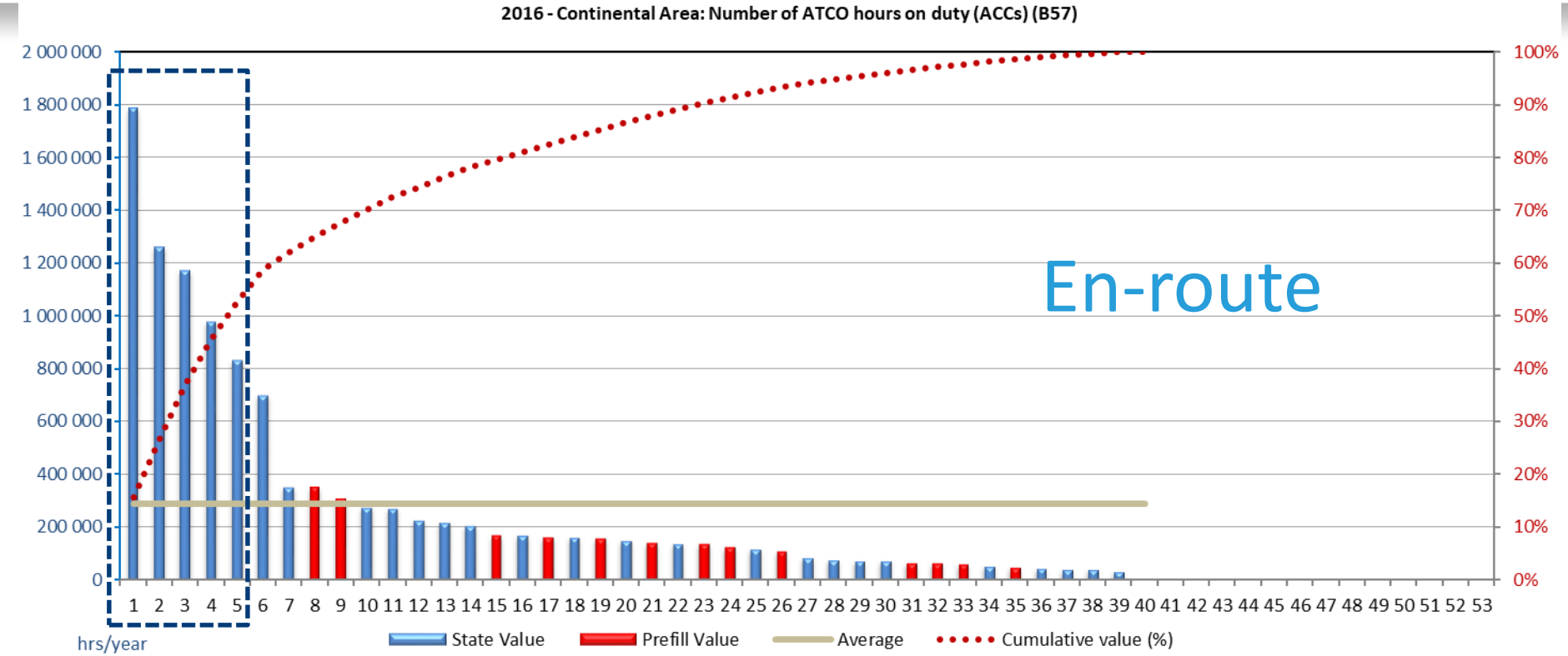
	Cost effectiveness	
	ATCO productivity (Continental Area)	
B57	Number of ATCO hours on duty (ACCs)	hrs/year
B58	Number of ATCO hours on duty (APP+TWRs)	hrs/year
B59	IFR flights (en-route) per ATCO hour on duty (ACCs) (=A11/B57)	Flights/hr
B60	IFR flight hours per ATCO hour on duty (ACCs) (=A15/B57)	hrs/hr
B61	IFR movements (airport) per ATCO hour on duty (APP+TWRs) (=A16/B58)	Mov/hr

Data item A26



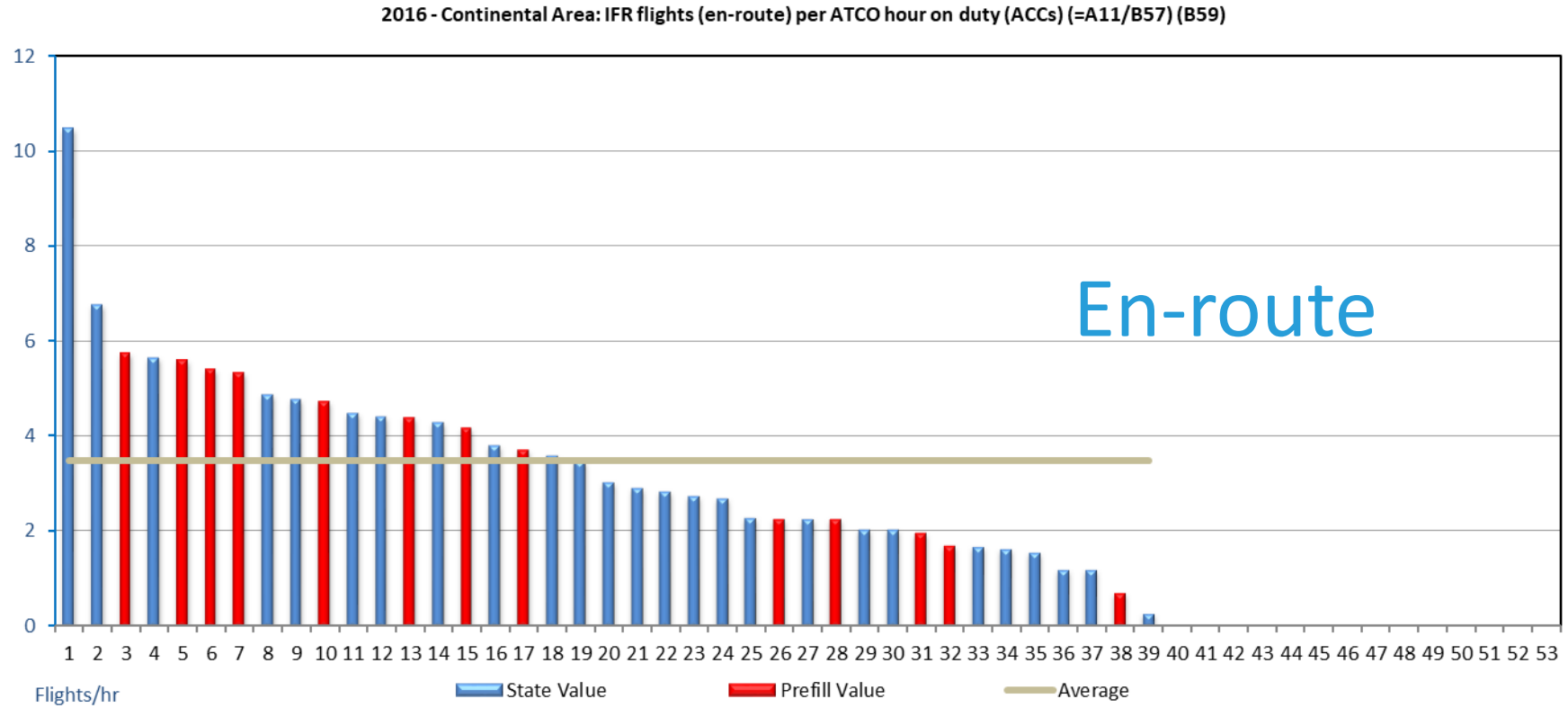
This graph is repeated here for ease of reference and comparison with the next graph (ATCO hours on duty).

Data item B57



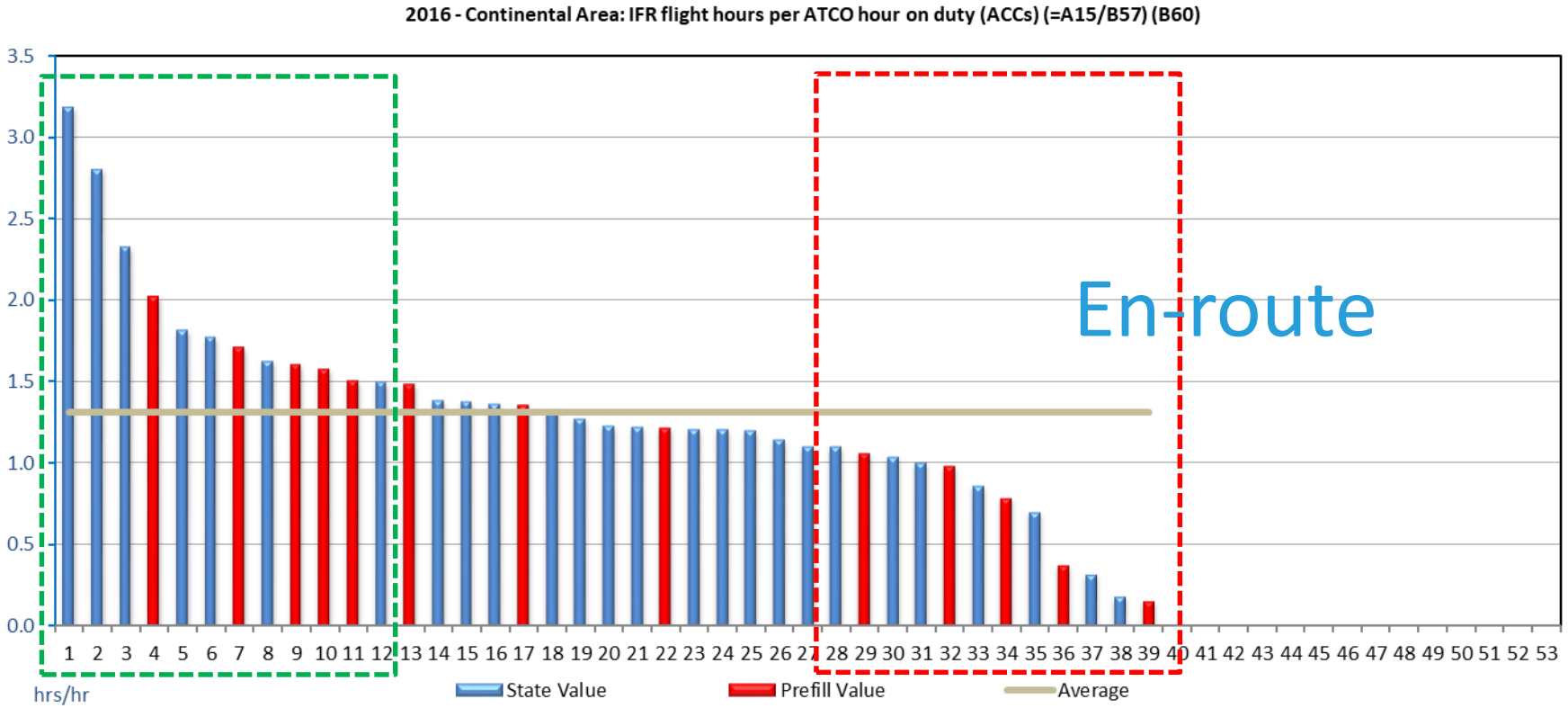
5 States are accountable for 50% of all en-route ATCO hours on duty in the EUR Region.

Data item B59



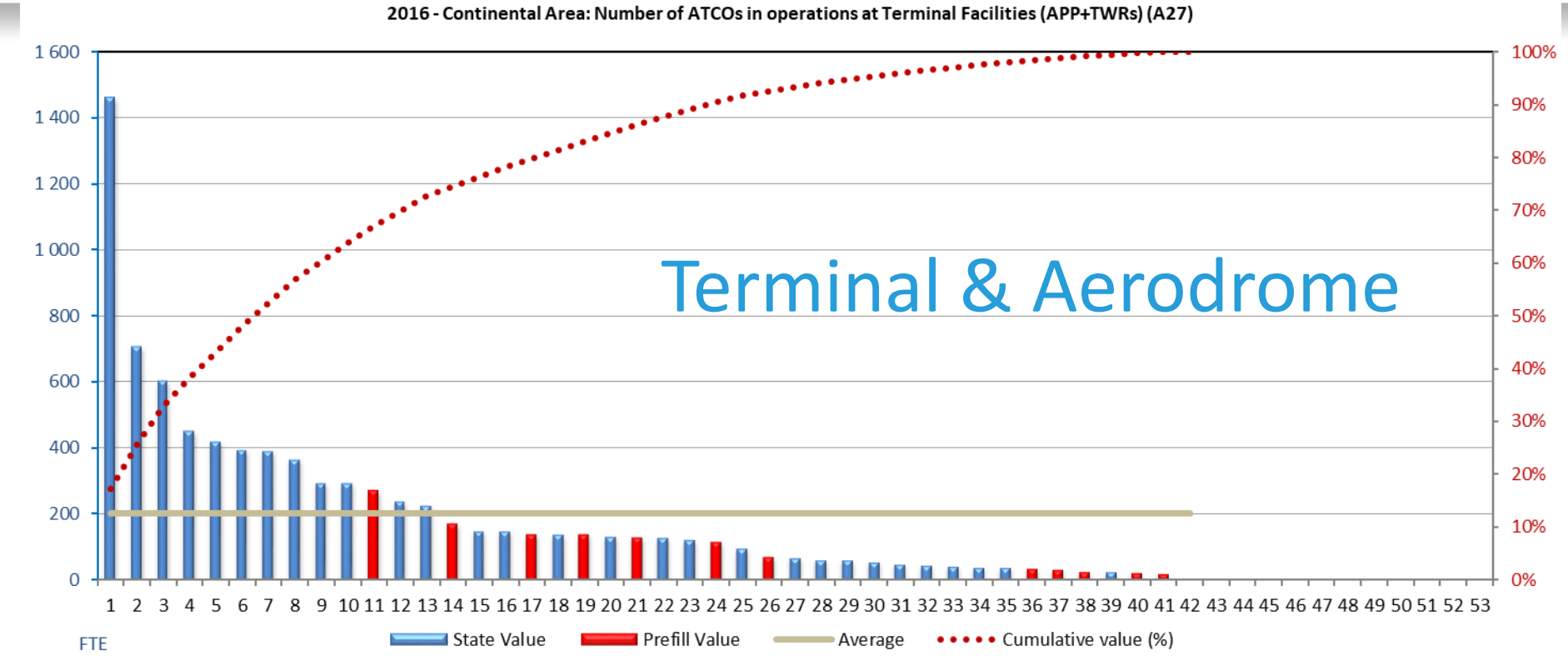
In terms of number of movements handled per en-route ATCO hour on duty, there is a large variation but this does not take into account the average flight duration in the State.

Data item B60



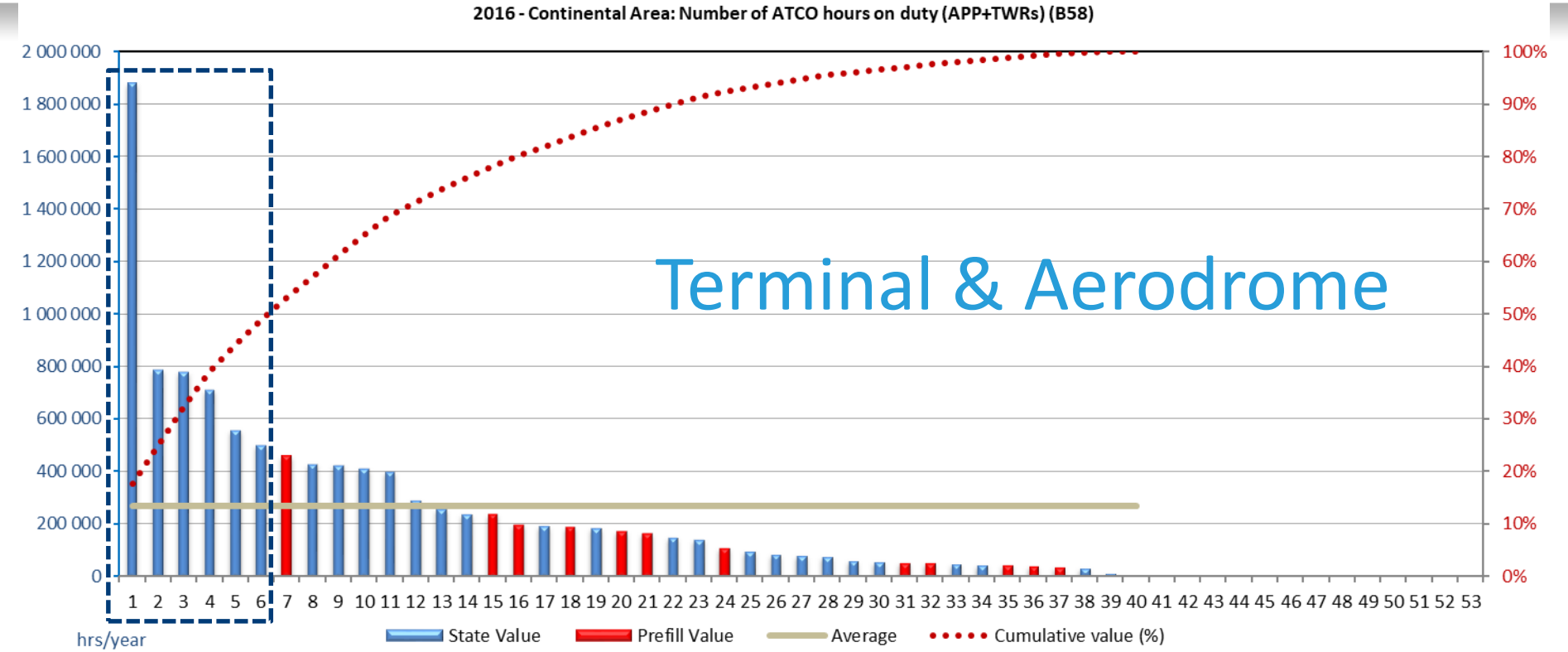
Item B60 is a better indicator for en-route ATCO productivity than item B59. The data suggest that about a dozen States at the tail end of the distribution need to work on improving their ATCO productivity. Lessons can be learned from the dozen States on the left side of the graph which perform better than average.

Data item A27



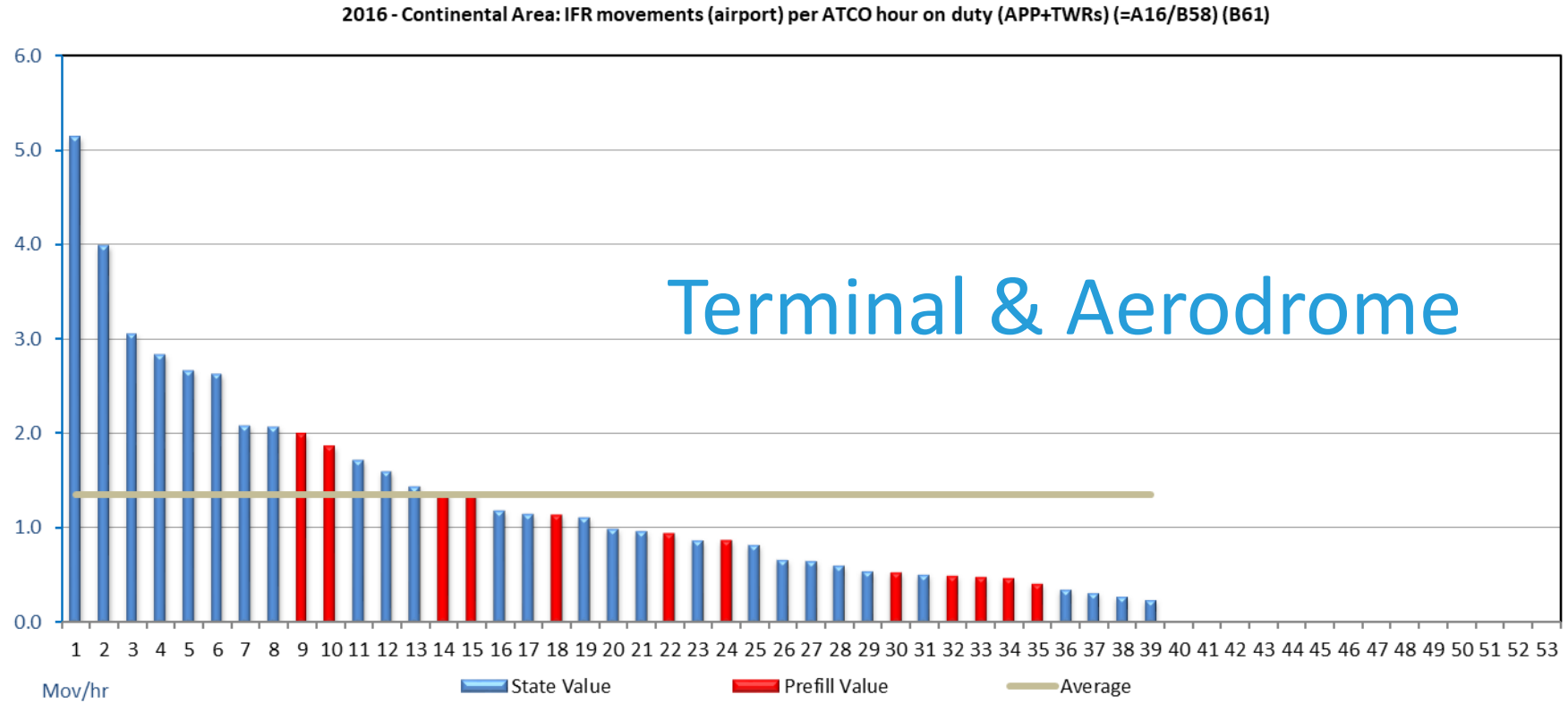
This graph is repeated here for ease of reference and comparison with the next graph (ATCO hours on duty).

Data item B58



6 States are accountable for 50% of all terminal & aerodrome ATCO hours on duty in the EUR Region.

Data item B61



This indicator is considered less than ideal because it only relates the terminal & aerodrome ATCO hours on duty to the number of IFR airport movements. However certain States report a significant number of VFR airport movements (item A17), and obviously these ATCOs control the total number of airport movements. When aggregating to State level, this includes airports with a mix of IFR and VFR traffic, as well as airports predominantly used by VFR or IFR traffic. In particular the ATCO hours on duty include those at smaller (regional or local) controlled airports with a high proportion of VFR traffic.

Participation KPA

Examples of Participation in 2017

Subject	# of invited States	# of States participating	Participation
AWOG/23 20 June 2017	53	11	21%
REG PERF Framework data provision 2017	53	27	51%
REG PERF Framework workshop 2017	53	9	17%
PBN Plans EUR Region	53	20	38%
EURNAT DGCA Meeting 31 January 2017	56	41	73%
ATMGE/23 13 January 2017	31	10	32%
ASBU Implementation State report 2017	24	11	35%

Examples of Participation in 2018

Subject	# of invited States	# of States participating	Participation
AWOG/24 15-16 October 2018	53	10	15%
REG PERF Framework data provision 2018	53	29	55%
REG PERF Framework workshop 2018	53	4	8%
PBN Plans EUR Region	50	29	58%
METG/28 18-21 September 2018	55	43	73%
ATMGE/25 25-27 April 2018	31	8	26%
ASBU Implementation State report 2018	54	20	37%

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Asia and Pacific (APAC) Sub-office Beijing
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THANK YOU