

**Charleroi airport**

**RUNWAY  
PERFORMANCE  
REPORT  
2019**

# EXECUTIVE SUMMARY

2019 has been another record breaking year for Belgian airports, with regards to passenger numbers. As stated on Brussels-Charleroi-airport.com, 8,221,450 passengers were registered at the airport in 2019, which represents a 2% increase compared to 2018. This is reflected in the increasing traffic recorded at the airport over the past four years, with an increase of 2% compared to 2018. Further details are given about the movements of 2019 in the first chapter of this report: the busiest day this year was the 4<sup>th</sup> of July, with 346 movements, while the average was of 225 movements per day. Distribution of air traffic throughout the hours of the day, seasons of the year and per runway can also be found in this chapter. Traffic levels throughout the year have followed similar patterns as observed in the past four years, with more traffic recorded in the summer due to an increased number of VFR flights. When looking at the runway use, 2018 was different to other years, with more movements on runway 06 due to a significant increase that year of north-easterly winds. 2019 shows similarities with 2016 and 2017 as the similar predominant south-westerly winds were registered. An exception to this is the month of April, where easterly winds were very dominant.

Air Traffic Management (ATM) performance is driven by four Key Performance Areas (KPA): safety, capacity, environment and cost-efficiency. This report focuses on skeyes' operations at Charleroi airport (ICAO code EBCI). Its aim is to provide our main stakeholders with traffic figures for 2019 and relevant data on the performance of our operations at EBCI, namely on three of the four KPAs: safety, capacity and environment.

## Safety

Two types of occurrences are analysed in this report, both giving a view on airport safety performance: missed approaches and runway incursions (RI). In 2018, a sharp increase of the missed approaches was prompted by unstable approaches and weather phenomena. The number of missed approaches in 2019 decreased to the same level as the previous years, giving the impression that the number of missed approaches in 2018 was exceptional. Weather conditions and unstable approaches are still the main reasons for missed approaches in 2019, accounting for 71.7% of the missed approaches at Charleroi airport.

As for runway incursions, the rate has dropped significantly since 2018. Note that a high number of RIs occurred in 2018 after the displacement of a holding point, and procedures were put in place to mitigate this, resulting in no more RIs at that holding point. There were no RIs with ATM contribution in 2019 at EBCI. The A-SMGCS, foreseen to become operational in 2021, will allow better awareness of ground movements and thereby help to reduce the number of runway incursions, with and without ATM contribution.

## Capacity and Punctuality

Capacity and delay go hand in hand when it comes to runway performance. As in previous years, the throughput capacity of the airport is analysed by comparing the actual traffic with the declared IFR capacity. Because of the reduction of separation from 5 to 3 NM in the EBCI TMA, the declared capacity of arrivals only has increased in 2018 for both runway thresholds at Charleroi. Even during the busiest month of the year, the declared capacity of each runway was not exceeded (on an average staying 14 movements below), meaning that there is still IFR capacity available. It was reached only once on 29<sup>th</sup> of July, on runway 24.

As opposed to Brussels and Liège, performance targets have not been set by the FABEC on Charleroi arrival delays. These are however monitored for internal monitoring of skeyes' performance. There were no arrival delays due to regulations at the airport itself with causes considered to be with the ANSP's contribution (CRSTMP) in 2019. The ATFM delay "EBCI arrivals" has drastically decreased in the years after 2016, and the trend continues in 2019 where the average arrival delay per flight with ANSP contribution drops to zero. Also, for the first time in years, there were no delays due to weather at the airport.

New to this edition of the RWY performance report are the details of the delays from the airport's point of view. Indeed, from skeyes' point of view, three (3) Air Traffic Flow Management (ATFM) regulations were placed at Charleroi airport in 2019, due to industrial actions, creating a total of 426 minutes of delay. From a passenger or airport perspective however, delays are observed much more frequently than this, as every departure or arrival can be affected by ATFM regulations placed in other parts of the Belgian airspace, or in larger portion, elsewhere in the network. In 2019, departing flights from EBCI experienced a total of 121,168 minutes of ATFM delay, of which 20.9% was attributable to skeyes. The ATFM delay for arrival flights was of 136,057 minutes, 27.7% of which was due to ATFM measures placed by skeyes.

## Environment

A preferential runway system (PRS) is in place at Charleroi airport, and the preferential runway is RWY 24. This runway was more used in 2019 than in 2018 as there were more favourable westerly winds (with an exception during the month of April, as previously mentioned).

One of the factors influencing noise around the airport are the landing procedures. The number of continuous descent operations (CDO), also called green landings, increased at EBCI in 2019. The fluctuation of the CDO rate over the years is however hard to explain, as they are influenced by a multitude of factors. In Charleroi, the arriving traffic flows need to be separated from the Brussels airport traffic, causing more level-offs to be received by aircraft. Even considering this difficulty, the rate of CDOs increased despite the increase of traffic at EBCI. Similarly to what was successfully set up in 2018 in Brussels, skeyes is promoting the implementation of an agreement on 'collaborative environmental management' (CEM) to increase cooperation with airlines and the airport on undertaking joint initiatives that further reduce the environmental impact of airport operations.

Night movements are also part of this section. The number of night movements (i.e. after 23:00 local time) in 2019 considerably decreased, especially between 23:00 and 00:00.



# SYNOPSIS

2019 fut une nouvelle année record pour les aéroports belges en ce qui concerne le nombre de passagers. Comme mentionné sur le site web Brussels-Charleroi-airport.com, 8.221.450 passagers ont voyagé de ou vers l'aéroport de Charleroi en 2019, soit une augmentation de 2% par rapport à 2018. Cela se reflète dans la croissance du trafic enregistré à l'aéroport au cours des quatre dernières années, avec une hausse de 2% par rapport à 2018. Vous trouverez de plus amples détails sur les mouvements en 2019 dans le premier chapitre de ce rapport. Le 4 juillet 2019 fut la journée la plus chargée, avec 346 mouvements, alors que la moyenne de 2019 était de 225 mouvements par jour. La répartition du trafic sur les heures de la journée, les saisons de l'année et par piste se trouve également dans ce chapitre. Les niveaux de trafic tout au long de l'année ont suivi des tendances similaires au cours des quatre dernières années, avec plus de trafic enregistré pendant les mois d'été suite à l'activité accrue des vols VFR. En ce qui concerne l'utilisation des pistes, 2018 fut différente des autres années, avec plus de mouvements sur la piste 06, ceci dû au fait de l'augmentation significative des vents du nord-est cette année-là. L'année 2019 présente des similitudes avec 2016 et 2017, d'un point de vue des composantes des vents venants du sud-ouest. Le mois d'avril constitue une exception ; les vents d'est étaient largement dominants.

Les performances de la gestion du trafic aérien (ATM) reposent sur quatre domaines de performance clés (KPA) : la sécurité, la capacité, l'environnement et l'efficacité économique. Le présent rapport se focalise sur les opérations de skeyes à l'aéroport de Charleroi (code OACI : EBCI). Son objectif est de fournir à nos principaux stakeholders les chiffres du trafic pour 2019 et des données pertinentes sur la performance de nos opérations à EBCI, à savoir pour trois des quatre KPA : la sécurité, la capacité et l'environnement.

## Sécurité

Deux types d'évènements sont analysés dans ce rapport, tous deux donnant un aperçu des performances de la sécurité aux aéroports : les approches interrompues et les incursions de piste (Runway Incursions, RI). L'année 2018 a connu une forte augmentation des approches interrompues dues à des approches instables et à des phénomènes météorologiques. Le nombre d'approches interrompues en 2019 a diminué au même niveau que les années précédentes, donnant ainsi l'impression que le nombre d'approches interrompues en 2018 était exceptionnel. Les conditions météorologiques et les approches instables restent les causes principales des approches interrompues en 2019, représentant 71,7% des approches interrompues à l'aéroport de Charleroi.

Concernant les incursions de piste, le taux a baissé de manière significative depuis 2018. A noter qu'un nombre élevé de RI s'est produit en 2018 après le déplacement d'un point d'attente. Par conséquent, des procédures ont été mises en place pour remédier à cette situation, avec comme résultat une disparition des RI à ce point d'attente. En 2019, il n'y a pas eu de RI imputable à l'ATM à EBCI. L'A-SMGCS, prévu d'entrer en opération en 2021, permettra une meilleure appréciation des mouvements au sol et contribuera ainsi à la réduction du nombre de RI, imputable ou non à l'ATM.

## Capacité et Ponctualité

Sur le plan de la performance des pistes, la capacité et les retards sont indissociables. Comme les années précédentes, la capacité de transport de l'aéroport est analysée en comparant le trafic réel à la capacité IFR déclarée. Avec la réduction de séparation de 5 à 3NM dans la TMA de Charleroi, la capacité IFR déclarée a augmenté en 2018 pour les deux seuils de piste. Même pendant le mois le plus chargé de l'année, la capacité déclarée de chaque piste n'a pas été dépassée (en moyenne, 14 mouvements en dessous), impliquant qu'il reste de la marge de capacité IFR. Elle n'a été atteinte qu'une seule fois le 29 juillet sur la piste 24.

Contrairement à Bruxelles et à Liège, FABEC n'a pas fixé d'objectifs de performance concernant les retards à EBCI. Ceux-ci font toutefois l'objet d'un suivi dans le cadre de la surveillance interne de la performance de skeyes. Il n'y a eu aucun retard à l'arrivée dû à des causes imputables à l'ANSP (CRSTMP) à l'aéroport même de Charleroi en 2019. Le retard ATFM « EBCI arrivals » a énormément diminué après 2016 et la tendance se poursuit en 2019 où le retard à l'arrivée moyen par vol imputable à l'ANSP tombe à zéro. Aussi, pour la première fois depuis des années, il n'y a pas eu de retard causé par la météo à l'aéroport.

Ce qui est neuf dans cette édition du Rapport sur la performance des pistes, ce sont les détails des retards du point de vue de l'aéroport. En effet, aux yeux de skeyes, seules trois régulations ATFM (Air Traffic Flow Management) ont été imposées à l'aéroport de Charleroi en 2019 en raison d'actions collectives, générant un total de 426 minutes de retard. Cependant, du point de vue des passagers ou de l'aéroport, les retards sont constatés beaucoup plus fréquemment que cela, car chaque départ ou arrivée peuvent être impactés par les régulations ATFM imposées dans d'autres parties de l'espace aérien belge ou, en plus grande proportion, par d'autres pays que l'avion doit traverser. En 2019, les vols au départ d'EBCI ont accusé un total de 121.168 minutes de retard ATFM, dont seulement 20,9% étaient imputables à skeyes. Le retard ATFM pour les vols à l'arrivée était de 136.057 minutes, dont seulement 27,7% étaient dus à des mesures ATFM imposées par skeyes.

## Environnement

Un système d'utilisation préférentielle des pistes (Preferential Runway System, PRS) est en place à l'aéroport de Charleroi et la piste préférentielle est la 24. Cette piste a été plus utilisée en 2019 qu'en 2018 car les vents d'ouest étaient plus favorables que l'année précédente (à l'exception du mois d'avril, comme mentionné précédemment).

Un autre facteur qui influence les nuisances sonores à l'aéroport concerne les procédures d'atterrissage. Les Continuous descent operations (CDO), également appelées atterrissages verts, ont augmenté à EBCI en 2019. La fluctuation du pourcentage de CDO au fil des années est cependant difficile à expliquer, car elle dépend d'une multitude de facteurs. A Charleroi, les flux d'arrivées doivent être séparés du trafic pour Bruxelles, ce qui entraîne davantage de mises en palier des avions. Même en tenant compte de cette difficulté, le pourcentage de CDO a augmenté malgré l'augmentation du trafic à Charleroi. Après une expérience positive à Bruxelles depuis 2018, skeyes oeuvre pour la mise en place à Charleroi d'un accord 'collaborative environmental management' (CEM) afin d'améliorer la collaboration avec l'aéroport et les compagnies aériennes pour prendre des mesures communes visant à réduire encore l'impact environnemental des opérations aéroportuaires.

Les mouvements nocturnes sont également examinés dans cette partie. Le nombre de mouvements nocturnes (c.-à-d. après 23h00 heure locale) en 2019 a nettement diminué, en particulier entre 23h00 et 00h00.

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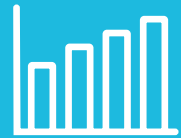


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# ACRONYMS



<b>AIP</b> :	Aeronautical Information Publication	<b>FL</b> :	Flight Level
<b>AMS</b> :	Airport Movement System	<b>FOD</b> :	Foreign Object Debris
<b>ANSP</b> :	Air Navigation Service Provider	<b>ICAO</b> :	International Civil Aviation Organization
<b>ARR</b> :	Arrival	<b>IFR</b> :	Instrument Flight Rules
<b>ATC</b> :	Air Traffic Control	<b>KPA</b> :	Key Performance Area
<b>ATCO</b> :	Air Traffic Control Officer	<b>KPI</b> :	Key Performance Indicator
<b>ATFM</b> :	Air Traffic Flow Management	<b>LVO</b> :	Low Visibility Operations
<b>ATM</b> :	Air Traffic Management	<b>M/A</b> :	Missed Approach
<b>ATS</b> :	Air Traffic Services	<b>MCT</b> :	Maximum Throughput Capacity
<b>CDO</b> :	Continuous Descent Operation	<b>MVT</b> :	Mixed Volume Traffic
<b>CRSTMP</b> :	C-Capacity, R-Routing, S-Staffing, T-Equipment, M- Airspace Management, P- Special Event	<b>NM</b> :	Nautical Mile
<b>CTOT</b> :	Calculated Take-Off Time	<b>NM</b> :	Network Manager (EUROCONTROL)
<b>CTR</b> :	Control Zone of an Airport	<b>NOTAM</b> :	Notice to Airmen
<b>DEP</b> :	Departure	<b>PRS</b> :	Preferential Runway System
<b>EBAW</b> :	Antwerp airport ICAO Code	<b>PRU</b> :	Performance Review Unit
<b>EBBR</b> :	Brussels airport ICAO Code	<b>RAT</b> :	Risk Analysis Tool
<b>EBCI</b> :	Charleroi airport ICAO Code	<b>RI</b> :	Runway Incursion
<b>EBKT</b> :	Kortrijk airport ICAO Code	<b>ROTA</b> :	Runway Occupancy Time for Arrival
<b>EBLG</b> :	Liège airport ICAO Code	<b>RWY</b> :	Runway
<b>EBOS</b> :	Ostend airport ICAO Code	<b>VFR</b> :	Visual Flight Rules
<b>ETOT</b> :	Estimated Take-Off Time		
<b>EU</b> :	European Union		
<b>FABEC</b> :	Functional Airspace Block Europe Central		





# 1. TRAFFIC

In this chapter, the traffic at Charleroi airport is presented, as recorded by the Airport Movement System (AMS) developed by skeyes. The AMS records the movements at an aerodrome and within its Control Zone (CTR), which are defined as an aircraft either crossing the CTR, landing or taking off at the aerodrome.

The figures presented throughout the report consider a movement as a take-off or landing of all traffic (VFR and IFR, helicopters and airplanes, commercial or general aviation). As this report considers runway performance, movements such as crossings of CTRs are not considered. As such<sup>1</sup>:

- one take-off = one movement
- one landing = one movement
- one touch-and-go = two movements.

<sup>1</sup>As per BCAA's aerodrome movement definition



## Increasing traffic

The number of aircraft movements for the last four years are as follows:

- 2016: 75,088 (50,024 IFR; 25,064 VFR)
- 2017: 78,430 (51,285 IFR; 27,145 VFR)
- 2018: 80,508 (53,671 IFR; 26,837 VFR)
- 2019: 82,108 (54,948 IFR; 27,160 VFR).

The amount of movements continues to increase steadily in regard to the previous three years, with some 1,600 additional movements in 2019 in comparison with 2018.

The most traffic in 2019 was observed in July, the busiest month since 2016 with 8,149 movements. See Figure 1-1 and Table 1-1 for the details per month.

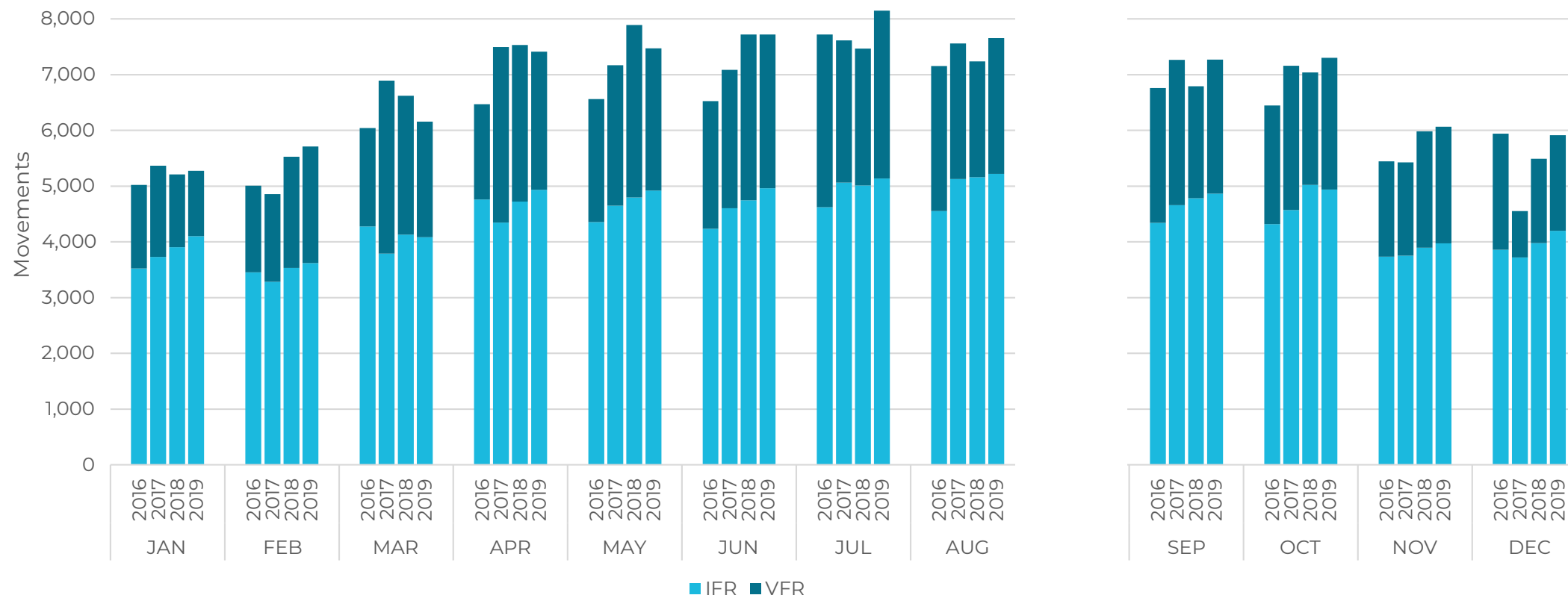


Figure 1-1: Total monthly movements per year

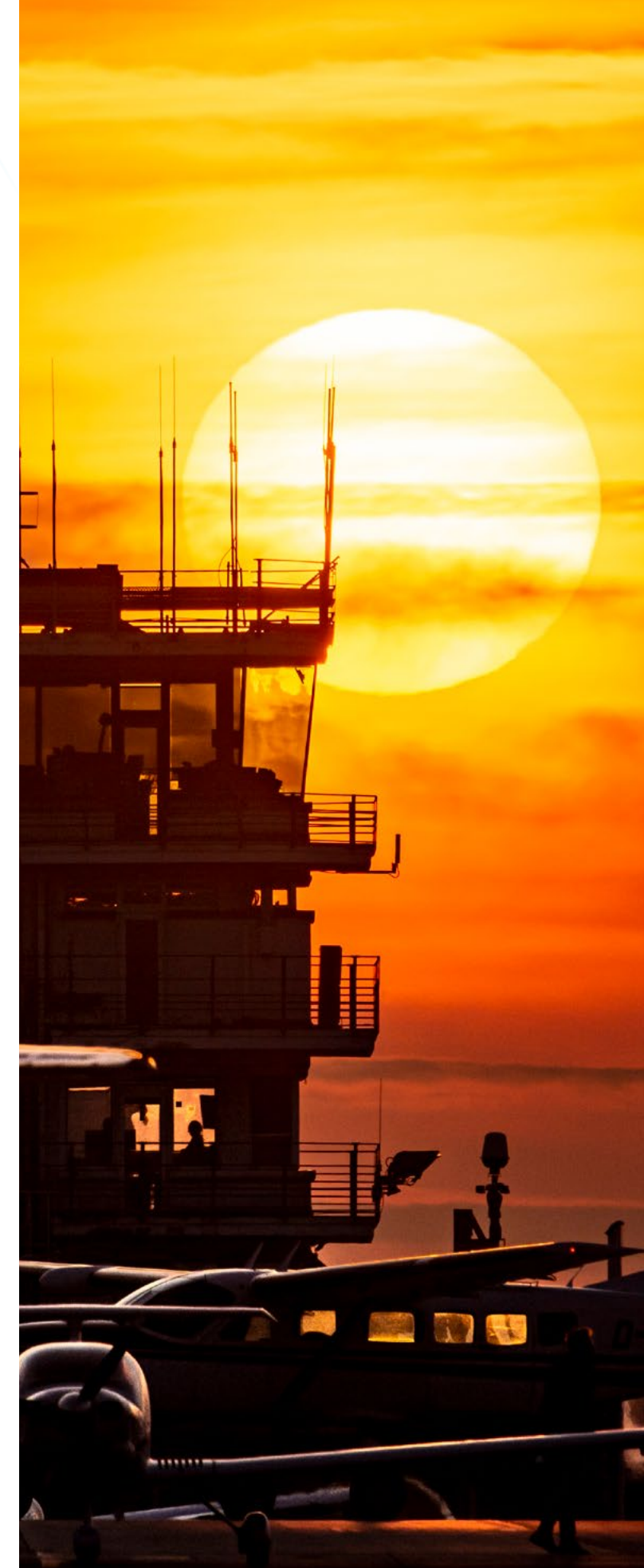


Table 1-1: Total monthly movements per year

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
IFR	2016	3,521	3,453	4,278	4,760	4,354	4,235	4,623	4,550	4,342	4,318	3,734	3,856	50,024
	2017	3,730	3,282	3,788	4,344	4,648	4,601	5,063	5,126	4,658	4,570	3,753	3,722	51,285
	2018	3,903	3,530	4,127	4,722	4,798	4,746	5,013	5,158	4,780	5,022	3,894	3,978	53,671
	2019	4,102	3,618	4,084	4,936	4,918	4,962	5,134	5,219	4,864	4,938	3,973	4,200	54,948
VFR	2016	1,500	1,554	1,764	1,708	2,207	2,292	3,097	2,605	2,416	2,128	1,709	2,084	25,064
	2017	1,634	1,572	3,105	3,151	2,519	2,484	2,550	2,435	2,605	2,590	1,672	828	27,145
	2018	1,306	1,997	2,495	2,808	3,091	2,975	2,456	2,080	2,012	2,017	2,088	1,512	26,837
	2019	1,174	2,094	2,075	2,476	2,554	2,760	3,015	2,437	2,406	2,366	2,090	1,713	27,160
Total	2016	5,021	5,007	6,042	6,468	6,561	6,527	7,720	7,155	6,758	6,446	5,443	5,940	75,088
	2017	5,364	4,854	6,893	7,495	7,167	7,085	7,613	7,561	7,263	7,160	5,425	4,550	78,430
	2018	5,209	5,527	6,622	7,530	7,889	7,721	7,469	7,238	6,792	7,039	5,982	5,490	80,508
	2019	5,276	5,712	6,159	7,412	7,472	7,722	8,149	7,656	7,270	7,304	6,063	5,913	82,108

Another way of describing traffic is to look at the number of arrivals and departures at an airport. Table 1-2 below shows the details for each year. As

the overall traffic in Charleroi airport increased in 2019, so did the arrival and departure rates.

Table 1-2: Monthly arrival and departure movements per year

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ARR	2016	2,513	2,504	3,025	3,232	3,278	3,265	3,855	3,583	3,376	3,225	2,720	2,973	37,549
	2017	2,682	2,424	3,449	3,743	3,584	3,540	3,807	3,784	3,628	3,579	2,714	2,269	39,203
	2018	2,608	2,764	3,310	3,765	3,944	3,860	3,731	3,617	3,396	3,518	2,990	2,748	40,251
	2019	2,638	2,850	3,081	3,707	3,734	3,859	4,075	3,829	3,634	3,653	3,031	2,958	41,049
DEP	2016	2,508	2,503	3,017	3,236	3,283	3,262	3,865	3,572	3,382	3,221	2,723	2,967	37,539
	2017	2,682	2,430	3,444	3,752	3,583	3,545	3,806	3,777	3,635	3,581	2,711	2,281	39,227
	2018	2,601	2,763	3,312	3,765	3,945	3,861	3,738	3,621	3,396	3,521	2,992	2,742	40,257
	2019	2,638	2,862	3,078	3,705	3,738	3,863	4,074	3,827	3,636	3,651	3,032	2,955	41,059

## Busy days

The ten busiest days of 2019 for Charleroi airport are depicted in Figure 1-2 below.

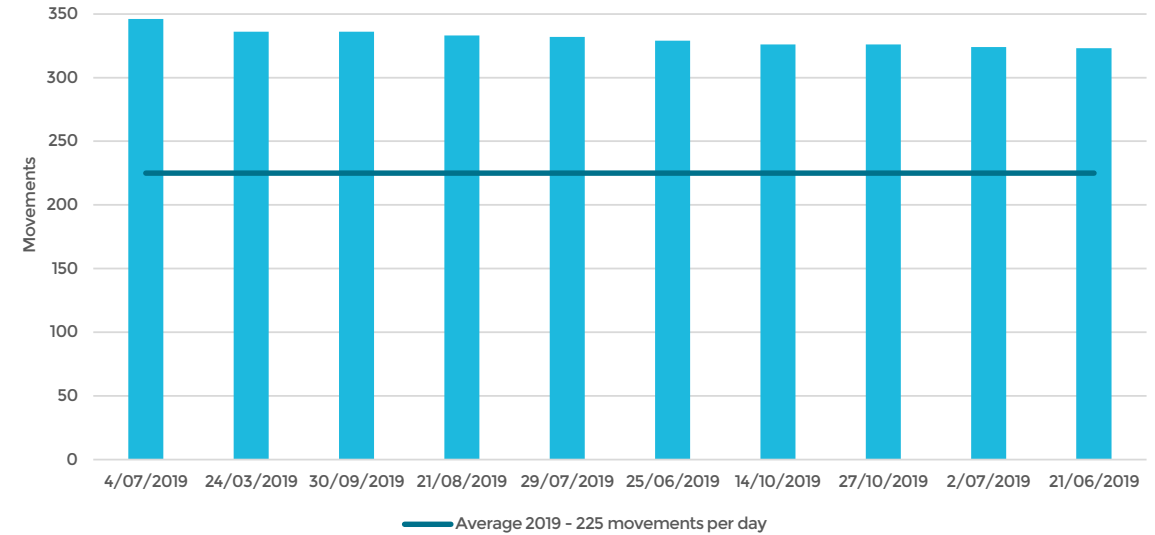


Figure 1-2: Ten days with highest amount of traffic in 2019

The most active days, in terms of number of movements, in 2019 occurred during the summer months. The 4<sup>th</sup> of July was the busiest day with 346 movements, while the average in 2019 was 225 movements per day.

Although the overall traffic number is greater than previous years, only the 4<sup>th</sup> of July makes it to the top ten busiest days of the past four years, as shown in Figure 1-3.

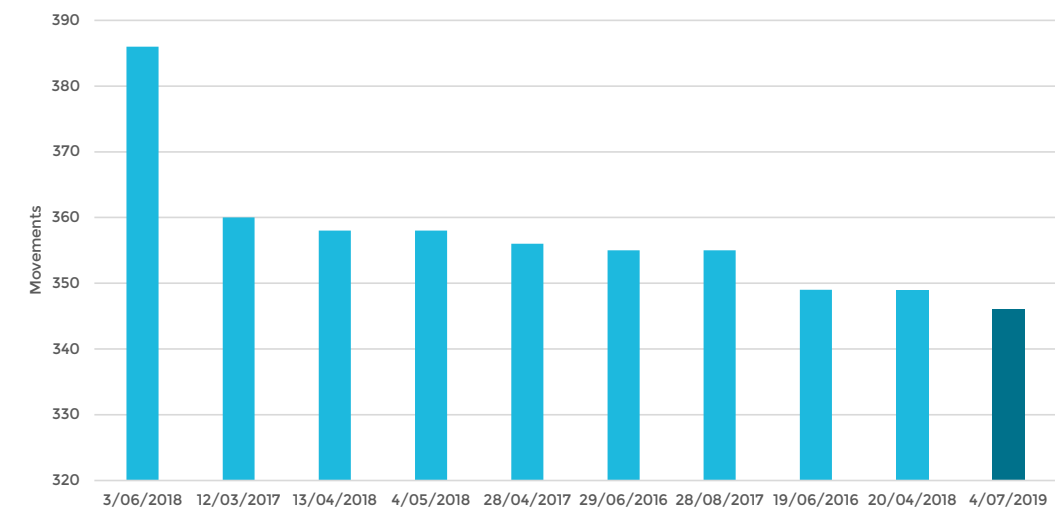


Figure 1-3: Ten days with highest amount of traffic since 2016

## Quiet days

As shown in Figure 1-4 below, the most of low traffic days in 2019 occurred in February and March. The day with least traffic was the 13<sup>th</sup> of February, with seven (7) movements. On that day, air traffic in Belgian airspace was restricted, due to a day

of industrial action at the national level. Air traffic services were halted for two hours on the 13<sup>th</sup> March at Charleroi, also due to industrial actions – although this did not make the 13<sup>th</sup> March appear as a low traffic day.

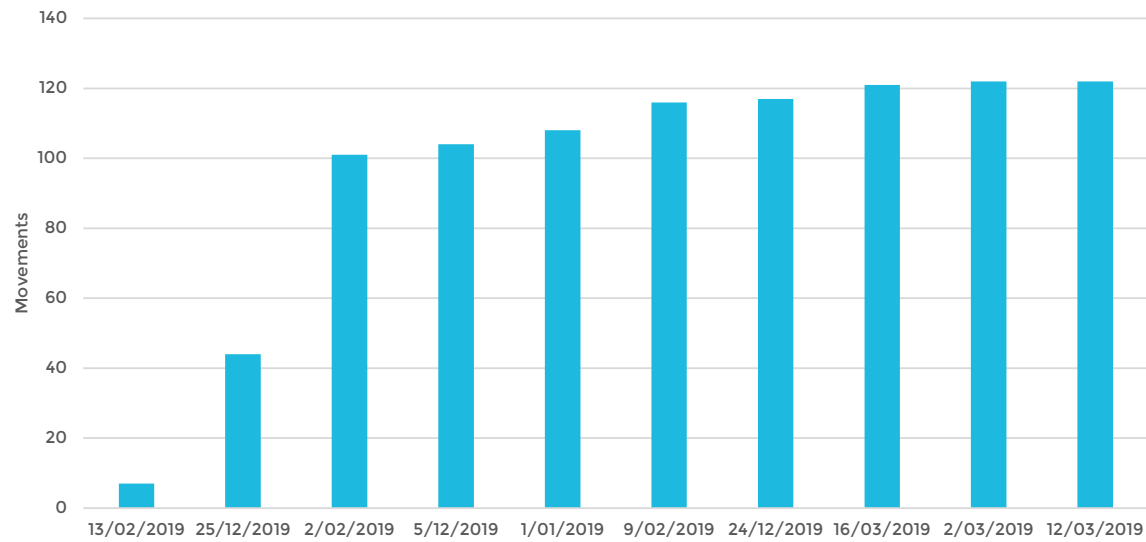
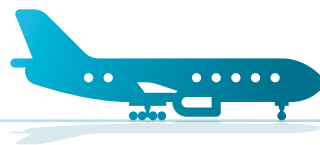


Figure 1-4: Ten days with lowest amount of traffic in 2019



## Traffic patterns

Figure 1-5 shows the average IFR and VFR traffic throughout the hours of the day, in local time, calculated for the period 2016 to 2019. There are two (2) clear peaks for IFR traffic during the day: the first at 07:00 and the second in the evening,

at 22:00. Between these two hours, the number of movements is more or less constant, around nine (9) per hour with a minimum at 19:00. VFR traffic is also roughly constant between 10:00 and 19:00, when there is daylight.

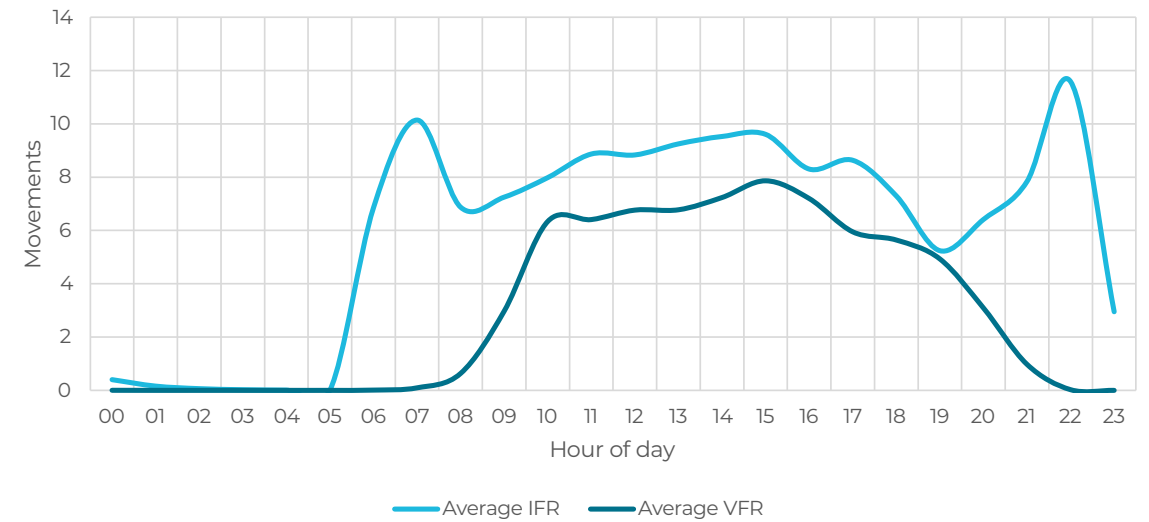


Figure 1-5: Average hourly IFR and VFR movements for the period 2016-2019 (local time)

The same traffic pattern can be identified in winter and summer period in Charleroi airport, with higher numbers in summer, during which VFR flights are more frequent.

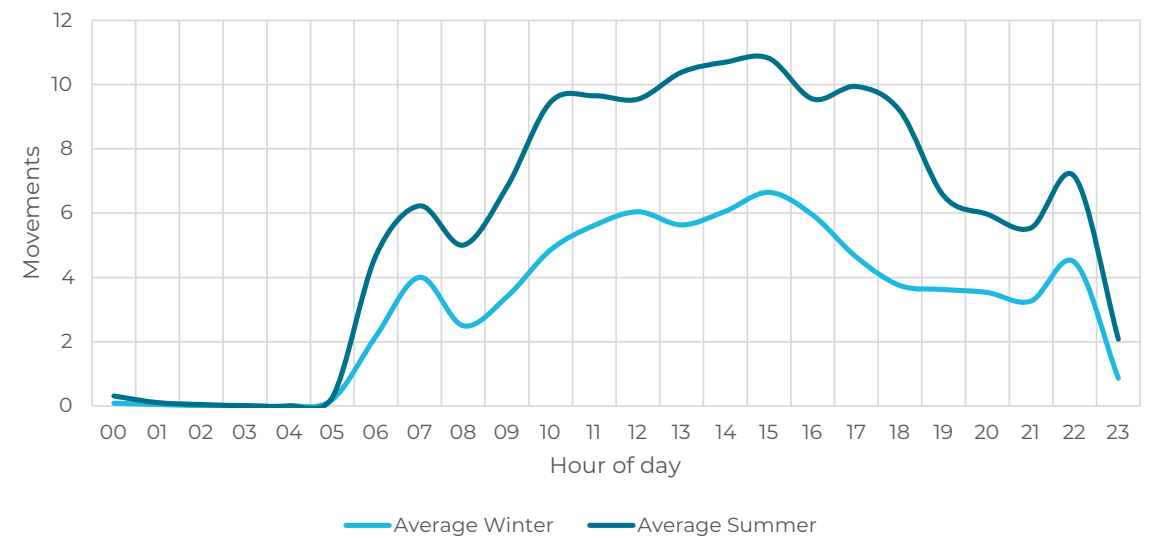


Figure 1-6: Average hourly movements in winter and summer for the period 2016-2019 (local time)

## Runway use

The use of one runway configuration over another depends on several factors that have to be taken into account, such as wind direction and proximity to densely populated areas. Figure 1-7 shows the

runway use in Charleroi since 2016. The trend in 2019 follows those of 2016 and 2017. In 2018, more easterly winds than usual were recorded, which explains the greater use of runway 06 that year.

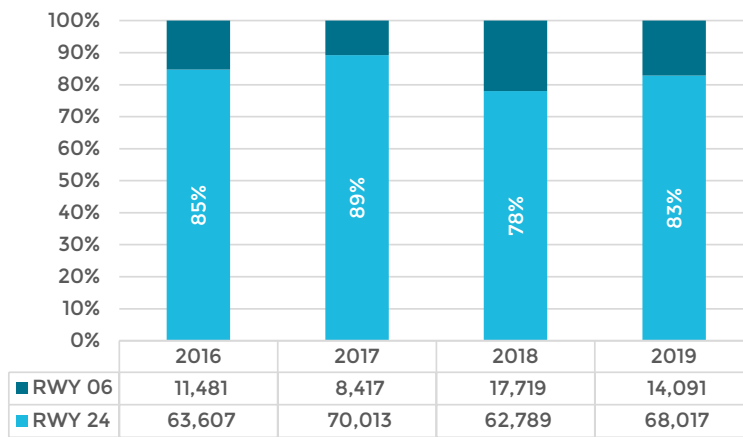


Figure 1-7: Runway use per year at EBCI

Figure 1-8 below shows the runway use per month of 2019. Runway 24 is overall the most used runway. In April 2019, strong north-easterly winds were recorded, in Charleroi as at all other Belgian airports,

which explains the increased usage of runway 06. More details about winds can be found in Figure 4-10 and Figure 4-11 in the Environment chapter.

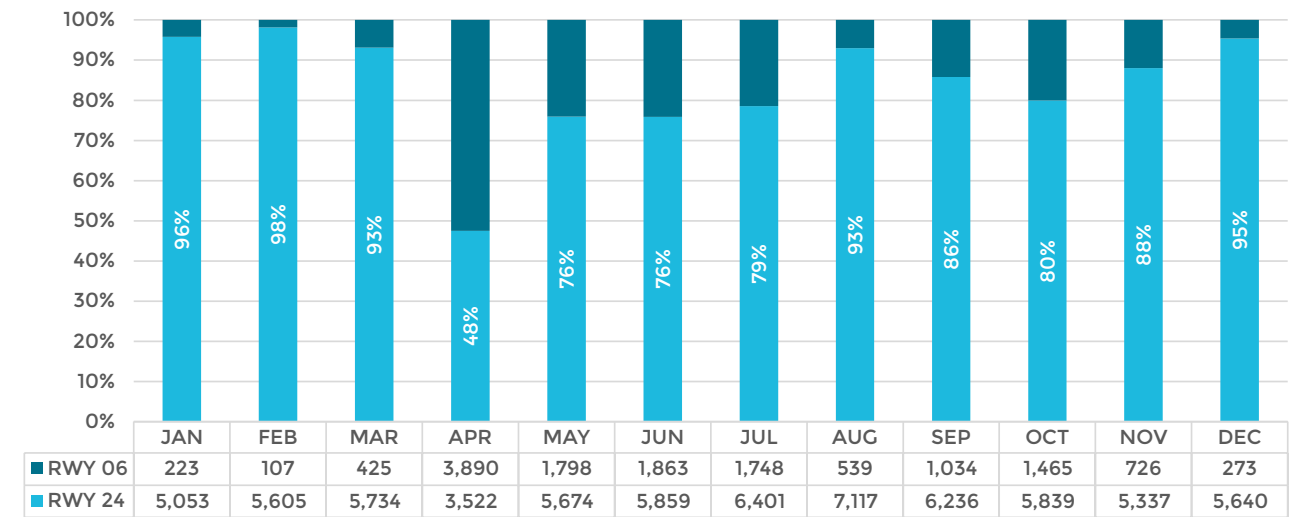


Figure 1-8: Runway use per month in 2019





## 2. SAFETY

*This section highlights two topics: runway incursions and missed approaches. The runway incursions is a lagging runway safety indicator and is mandatory to be reported. Missed approaches are not mandatory to be reported, and are reported on a voluntary basis. As such the quality and accuracy of the available information is commensurate with the level of reporting.*

*Missed approaches do not represent safety incidents. They are an operational solution allowing to maintain safety margins when the approach cannot be continued for a safe landing. At the same time, particularly during peak hours at busy airports, they also increase the traffic complexity and the residual safety risk. One could argue that missed approaches are a hybrid leading indicator, and that by analysing the reasons leading to this type of procedure, we can examine if there are any systemic deficiencies in a technical equipment, in a procedure or in manner in which Air Traffic Control Officers (ATCOs) and/or pilots apply these procedures.*





## Missed Approaches

Missed approaches are performed according to published procedures, under the instructions of the air traffic controller or they are initiated by the pilot when the approach cannot be continued for a safe landing. Besides the discomfort for passengers and crew, the missed approaches increase the air traffic management complexity. The number of missed approaches and particularly their cause can therefore indicate which measures are to be taken to improve the safety of air navigation service provision. All missed approaches are recorded by cause of event, and the reporting is done by the ATCOs.

The missed approaches are monitored at skeyes on a weekly basis. This report gives a yearly overview and a comparison over four years for each runway in Charleroi. In 2019 there were 60 missed approaches. Figure 2-1 shows the number of missed approaches per cause. It is clear that weather conditions and unstable approaches are the main reasons accounting for 71.7% of the missed approaches at Charleroi airport.

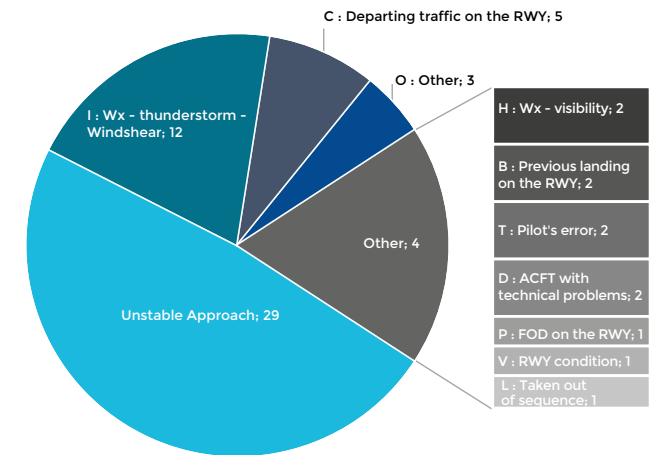


Figure 2-1: Missed approaches 2019 per cause

In 2018, a sharp increase of the missed approaches occurred prompted by unstable approaches and weather phenomena (Figure 2-2). The number of missed approaches in 2019 decreased to the same level as the years before, giving the impression that the number of missed approaches in 2018 was an exception rather than a trend.

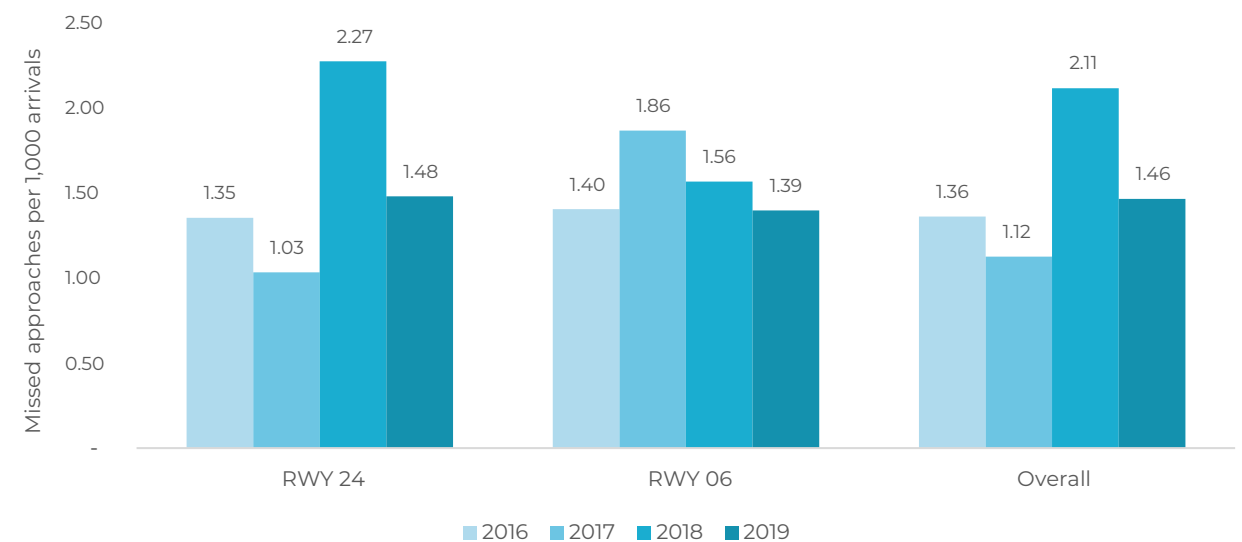


Figure 2-2: Rate of missed approaches per 1000 arrivals, per year

## Runway 24

The number of missed approaches reported on runway 24 in 2019 is 50. This is a decrease compared to 2018 which shows a large number of missed approaches caused by unstable approaches. Table 2-1 shows the top five causes of missed approaches in 2019. The table also shows the number of missed approaches with these reasons in the years 2016 until 2018 and the percentage of the total missed

approaches attributable to these causes. E.g. 72% of all the missed approaches in 2018 had as cause one (1) of the top five causes listed in the table.

The main reason for the missed approaches is the unstable approach, accounting for half of the missed approaches. Because the runway is equipped for CAT III landings, only one missed approach was caused by a lack of visibility.

	2016	2017	2018	2019
<b>Total missed approaches</b>	<b>43</b>	<b>36</b>	<b>71</b>	<b>50</b>
<b>Unstable Approach</b>	18	12	38	25
<b>I : Wx - thunderstorm - Windshear</b>	5	5	9	12
<b>C : Departing traffic on the RWY</b>	3	4	1	3
<b>O : Other</b>	2	3	2	2
<b>B : Previous landing on the RWY</b>	2	3	1	2
<b>part top 5 causes of 2019</b>	<b>70%</b>	<b>75%</b>	<b>72%</b>	<b>88%</b>

*Table 2-1:  
Causes of missed approaches on runway 24, per year, top five causes in 2019*

## Runway 06

Ten missed approaches were reported on runway 06, a large difference with runway 24 in absolute numbers. However, when comparing the rate (Figure 2-2) the difference is rather smaller.

Therefore, this difference can be attributed to the use of runway 24, which is the preferential runway, compared to runway 06.

	2016	2017	2018	2019
<b>Total missed approaches</b>	<b>8</b>	<b>8</b>	<b>14</b>	<b>10</b>
<b>Unstable Approach</b>		2	2	4
<b>C : Departing traffic on the RWY</b>			1	2
<b>H : Wx - visibility</b>	3	2	9	1
<b>O : Other</b>	4			1
<b>T : Pilot's error</b>				1
<b>part top five causes of 2019</b>	<b>88%</b>	<b>50%</b>	<b>86%</b>	<b>90%</b>

*Table 2-2:  
Causes of missed approaches on runway 06, per year, top five causes in 2019*

## Runway incursions

According to ICAO Doc 4444 – PANS-ATM, a Runway Incursion (RI) is defined as “Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft”.

It should be noted that this ‘incorrect presence’ may be a consequence of a failure of a pilot or vehicle driver to comply with a valid ATC clearance or their compliance with an inappropriate ATC clearance.

Runway incursions are mandatory to be reported as per EU 2015/1018. Moreover, in accordance with EU 2019/317, all RIs need to be reported using the severity classification based on the Risk Analysis Tool (RAT).

According to this scheme, RIs are classified based on their severity in the following categories:

- A – Serious Incident, a collision was narrowly avoided
- B – Major Incident, separation decreases and there is a significant potential for collision, which may result in a time critical corrective or evasive response.
- C – Significant Incident, an incident characterized by ample time and/or distance to avoid a collision.
- D – Not Determined, an incident that meets the definition of runway incursion such as incorrect presence of a single vehicle/person/aircraft on the protected area of a surface designated for the landing and take-off of aircraft but with no immediate safety consequences.
- E – No Safety Effect
- N – No ATM contribution (i.e. no system, procedure or person involved in the provision of ATC services initiated or contributed to the incident).



This indicator includes:

- The overall number of runway incursions;
- The overall number of runway incursions where skyes had an ATM Ground contribution, classified according to the incident’s severity from A to E as described above;
- The overall number of movements in the corresponding period. The number of movements for this KPI is provided by the AMS under the BCAA’s aerodrome movement definition.

## No skeyes contribution in the runway incursion incidents

A monthly overview of the runway incursions in 2019 can be seen in Figure 2-3. Four (4) runway incursions occurred in 2019, none of which had an ATM contribution.

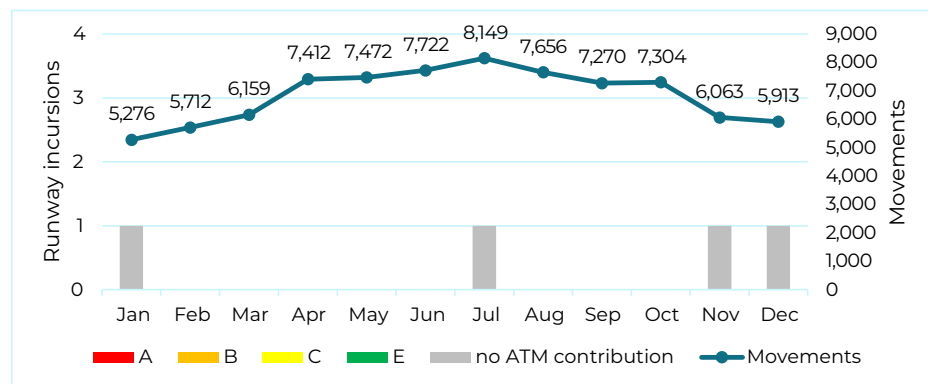


Figure 2-3: Runway incursions 2019, per month, per category

One of the runway incursions was a landing without clearance, another was an aircraft that lined up out of sequence but the ATCO reacted appropriately and the aircraft vacated the runway. The other runway incursions were due to crossing of holding points, one of which caused a missed approach.

Figure 2-4 gives a yearly overview of the runway incursions from 2016 until 2019. A large decrease is seen in runway incursions compared to 2018, four compared to fourteen incursions without skeyes contribution and none compared to two (2) with skeyes contribution. The reason for the large number of runway incursions last year is that

ten (10) of the runway incursions occurred as a result of the displacement of the N holding point (CAT I, II, III) renamed in November 2018 as A. No runway incursions occurred at this holding point in 2019, potentially as a result of NOTAM A1116/18, offering further clarifications with respect to the new position of the holding point and an internal note to operations which was issued to recommend ATCOs to indicate “new” holding point in their taxi clearance: “Taxi to new holding point runway 06...”. If the word “new” is not read-back, it was suggested to add a position information: “Holding point N is now situated at a distance of 150m West of N3”.

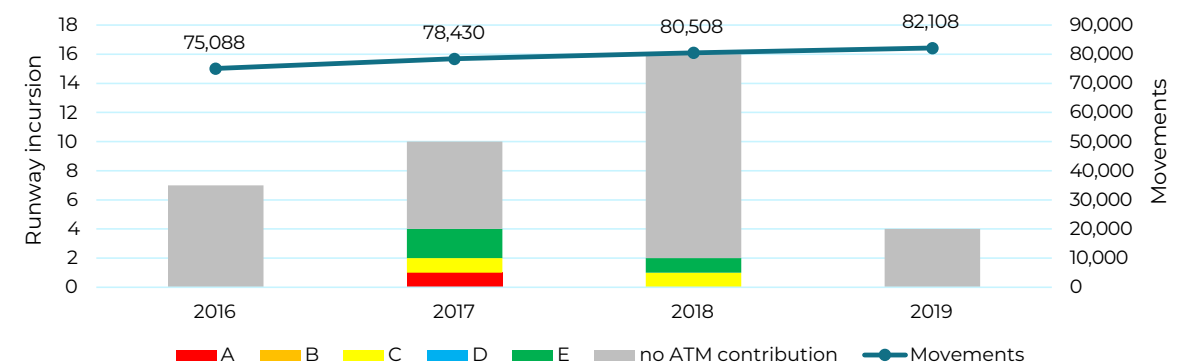


Figure 2-4: Runway incursions 2016-2019, per year, per category

Figure 2-5 shows the rate per 100,000 movements for Charleroi airport for the period from 2016 until 2019. The same trend is seen as in the graph showing the absolute figures (Figure 2-4). In 2019 EBCI had the lowest rate of RIs with ATM

contribution while the rate of RIs with no ATM contribution remained similar to EBLG and EBOS but still higher than in EBBR (which is equipped with a ground radar).

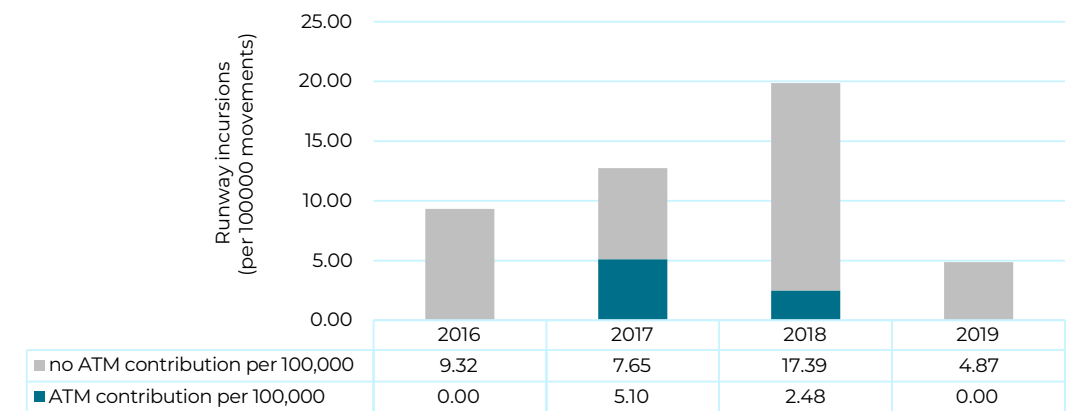


Figure 2-5: Rate of runway incursions per 100,000 movements 2016-2019, per year

## Improvements and recommendations

Clarifications regarding the position of holding point N have helped to reduce the RI linked to this holding point. Further, skeyes is working on the implementation of the A-SMGCS system together with the airport. The A-SMGCS (Advanced-Surface Movement Guidance and Control System) is a radar monitoring tool which, in poor visibility on the airfield, provides air traffic controllers the means to control and guide aircraft and ground vehicles. In conditions of reduced visibility, this technology will make it

possible to optimize the capacities while guaranteeing an optimal level of safety. This is expected to have a positive impact also on the probability to have runway incursions, as it represents a safety net, increasing the controllers’ situational awareness regarding every target on the movement surface. The A-SMGCS has been installed and is awaiting Site Acceptance and operational validation by the provider. It is expected to become operational at the end of 2021.

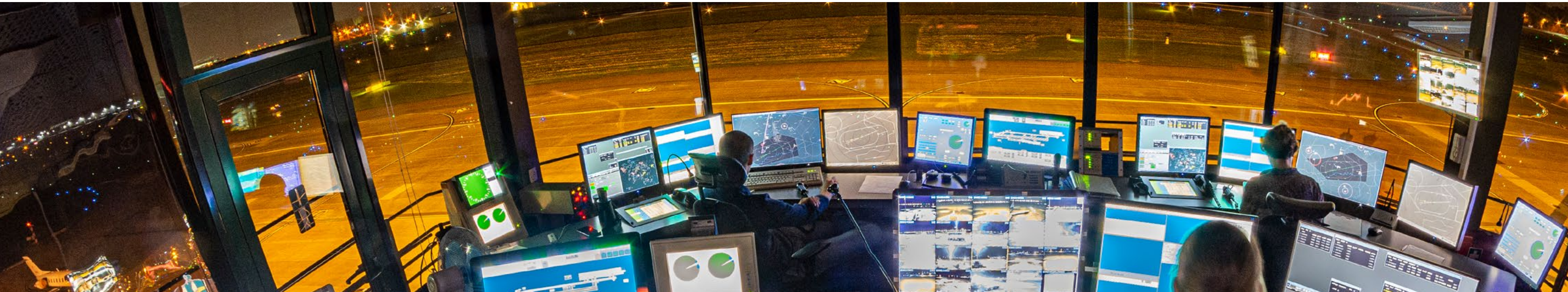


## 3. CAPACITY & PUNCTUALITY

*This chapter is divided into two sections. In the first part, the airport capacity is addressed. The declared capacities for runways 06 and 24 are given and analysed, taking as reference the number of movements during peak hours in the busiest month.*

*In the second section, the punctuality (arrival delay) at EBCI is studied. An overview of the targets and assumptions are given, and arrival delays are analysed. The delay is also analysed from the airport's point of view, i.e. considering the impact caused by regulations not only at EBCI, but also in the Belgian en-route airspace and by other ANSPs.*





## Airport Capacity

A performance indicator for airports is the throughput capacity and its utilisation. The throughput capacity of an airport is influenced by several factors, e.g. airport layout, weather, fleet mix, ATC procedures, etc.

To better understand the following section, some definitions are given first:

### Capacity

Aerodrome capacity is the estimated number of total operations that a given aerodrome configuration can handle in a given period of time and under a given set of assumptions, which are fleet mix, separation minima rules, weather conditions and technological aids.

### Maximum Capacity Throughput (or Saturation)

Maximum Capacity Throughput (MCT) is the fundamental measure of the runway system's capacity. MCT defines the average number of movements (arrivals and/or departures) that can be performed on the runway system in one hour. The following assumptions are made:

- there is a continuous supply of arrivals and/or departures.
- Air Traffic Control rule - no Simultaneous Runway Occupancy (SRO).
- Air Traffic Control rule - safe Wake Vortex Separation Distances between two flights.
- Static fleet mix (i.e. types of aircraft do not change).
- Approach and departure procedures do not change.

As a consequence, MCT is a theoretic measure of runway capacity and is represented as an average capacity for the runway system.

### Declared Capacity

Declared capacity is the capacity per hour used to determine the number of slots available for schedule coordination purposes.

For the declared capacity of 2019, the figures of 2018 were taken, as the assumptions and conditions did not change. Note that because of the reduction of separation from 5 to 3NM in the EBCI TMA, the declared capacity of arrivals has increased in 2018 for both runway thresholds at Charleroi.

For Charleroi airport, the declared capacities for each runway threshold have been calculated as being 90% of the theoretical MCT. For the calculations of the MCT, on top of the above-mentioned assumptions, the following was considered:

- The fleet mix of the busiest month in 2018 is taken as reference.
- A nominal radar separation of 3NM is taken into account.
- A loss factor of 15% is considered for inter arrival times.
- The average runway occupancy time for arrival (ROTA) is based on measurements.
- The average approach speed is 136 knots (based on an analysis of the characteristics of the aircraft operating into EBCI during the busiest month).
- The average headwind differs per runway.
- The inter departure time is a function of the between T/O-clearance delivery and the aircraft reaching a given altitude.



Table 3-1 shows the declared capacities depending on the runway configuration at Charleroi airport. As only IFR traffic has been considered in the

calculations, the declared capacity will therefore be referred to “declared IFR capacity”.

Table 3-1: Declared IFR capacity

Runway configuration	Runway		Declared Capacity		
	DEP	ARR	DEP	ARR	MVT
<b>RW24</b>	24	24	29	33	42
<b>RW06</b>	06	06	27	30	42

Details for the month of July, the busiest month of the year, are presented below. In fact, Figure 3-1 shows the number of arrivals and departures, along with the runway configuration and the resulting declared IFR capacity for the peak hour of each day

of the month. A peak hour is determined on a 15 minutes floating basis.

The overview of the year can be found monthly in Annex 1.

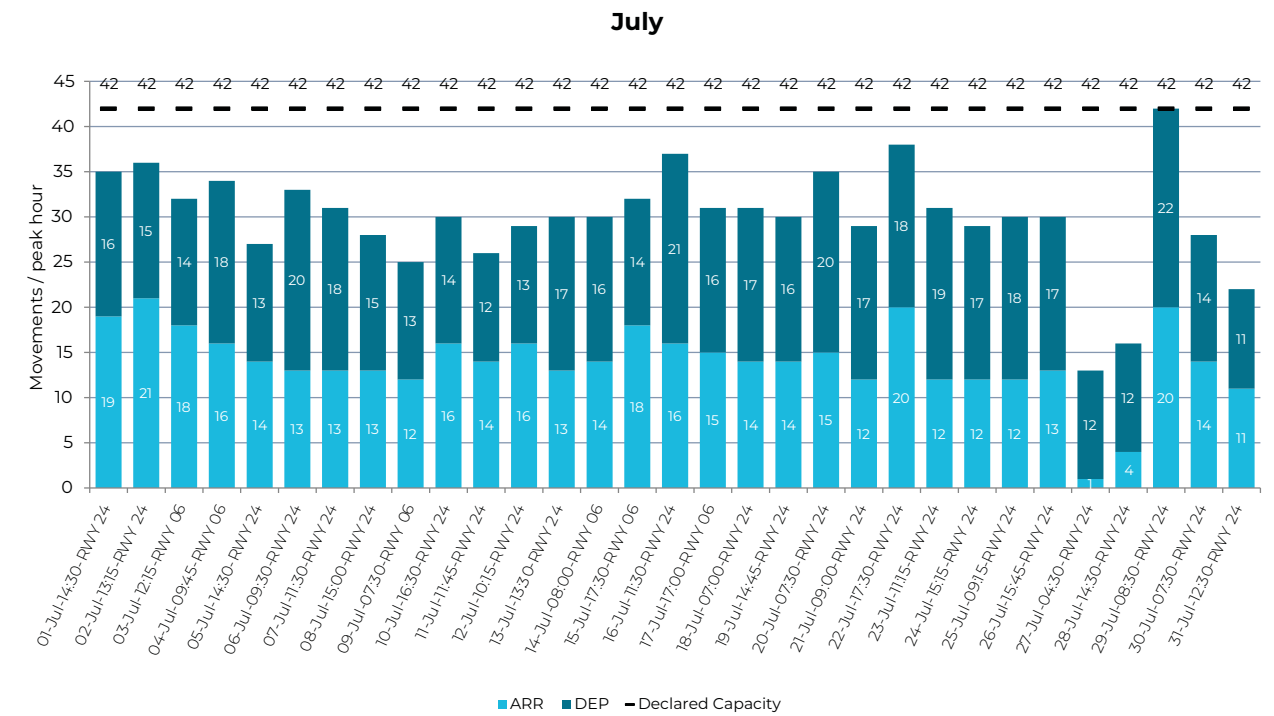


Figure 3-1: Arrivals, departures and declared capacities during peak hours in July 2019

The declared IFR capacity was reached only once in July, on the 29<sup>th</sup>.

The highest traffic per peak hour occurred on the 30<sup>th</sup> of September, with 44 movements. On two (2) more days, the 24<sup>th</sup> of May and 24<sup>th</sup> of June, the declared IFR capacity was exceeded by one (1) movement.

On these three (3) occurrences, 74% of the movements were due to VFR traffic, which impacts on the capacity of the airport. It can be concluded that the declared IFR capacity was, in fact, not exceeded.

On average in 2019, the traffic at peak hours was 14.3 movements below the declared IFR capacity.

## Punctuality

Punctuality can be seen as a service quality indicator from a passenger perspective. This section observes one of the factors that influences the punctuality: ATFM (Air Traffic Flow Management) delay. ATFM delay is defined as the time difference between estimated take-off time (ETOT) and calculated take-off time (CTOT) of the NM (Network Manager, EUROCONTROL) and is due to ATFM measures that are classified according to the respective causes listed below:

- A - Accident
- C – ATC Capacity
- D - De-icing
- E - Equipment (non-ATC)
- G – Aerodrome Capacity
- I - Industrial Action (ATC)
- M - Airspace Management
- N - Industrial Action (non-ATC)
- O - Other
- P - Special Event
- R – ATC Routeing
- S – ATC Staffing
- T - Equipment (ATC)
- V – Environmental Issues
- W - Weather
- NA - Not Specified.

### Airport arrival ATFM delay per flight

As of January 1st 2015, skeyes is subject to an annual target with regard to ATFM arrival delay. ATFM arrival delay is the delay of a flight due to a regulation from the destination airport. The target is defined as an average arrival delay per flight, as defined in the FABEC Performance Plan, §3.1. (C). (ii), which is in accordance with the European Performance Regulation (EU) No 390/2013, Annex 1, Part 2, §3.1 (b).

Targets are set on a national level and on an airport level. On an airport level, only Brussels airport and Liège airport have targets for the arrival ATFM delay. However, as part of a continuous monitoring

According to the FABEC Performance Plan the causes with ANSP contribution are (in the order as listed in the Performance Plan):

- C – ATC Capacity
- R – ATC Routeing
- S – ATC Staffing
- T - Equipment (ATC)
- M - Airspace Management
- P - Special Event.

Hence, in the remainder of the report all causes with ANSP contribution are referred to as “CRSTMP” while “Other Categories” aggregates all categories but CRSTMP and W (weather).

The discussion in this subchapter starts with the key performance indicator: arrival delay, the delay of a flight due to a regulation placed by the airport of arrival. In addition, this section gives an overview of the influence of ATFM measures on departing traffic followed by an overview of the influence of ATFM measures on arriving traffic.

of the ANSP's performance, skeyes registers the arrival ATFM delays for Charleroi airport, as an internal performance indicator. The national target is the aggregation of the airport targets and is 0.10 minutes/flight for the period from 2016 until 2019.

The average arrival delay per flight is calculated by dividing the sum of arrival delay with ANSP contribution by the number of total flights. Note the number of arrivals in this chapter and the arrival delay for each flight is calculated by the NM and has been provided by the Performance Review Unit (PRU / EUROCONTROL)<sup>2</sup>.

Table 3-2 gives the amount of arrival delay in Charleroi airport and the total number of NM arrivals per year.

Table 3-2: Number of arrivals and arrival delay at Charleroi airport for 2016-2019, per year, per cause

Year	# Arrivals	Arrival delay (minutes)			Total
		CRSTMP	Weather	Other categories	
2016	24,859	10,028	1,049	501	11,578
2017	25,508	1,203	1,693	19	2,915
2018	26,695	484	1,538	0	2,022
2019	27,364	0	0	426	426

There was no delay due to CRSTMP causes (i.e. causes with ANSP contribution) in 2019, nor any weather delay. Delay in 2019 was recorded due to regulations under other categories: (i) one zero rate regulation was put in place on March 21st 2019 with reason ‘I-Industrial Action (ATC)’ this caused a delay of 22 minutes on one flight. (ii) on March 27<sup>th</sup> 2019 one zero-rate regulation with reason ‘I-Industrial Action (ATC)’ was active, which caused 293 minutes of delay, 288 minutes of delay on arrivals and 27 minutes on departures. (iii) This regulation was followed by one regulation with

reason ‘G-Aerodrome Capacity’. The regulation for aerodrome capacity was put in place to avoid bunching after the industrial action, which was done in close coordination with the NM. The regulation added another 138 minutes of delay on arrivals.

As mentioned before, the key performance indicator (KPI) is the average arrival delay per arrival at the airport. Figure 3-2 gives the data for Charleroi airport for the years 2016 until 2019.

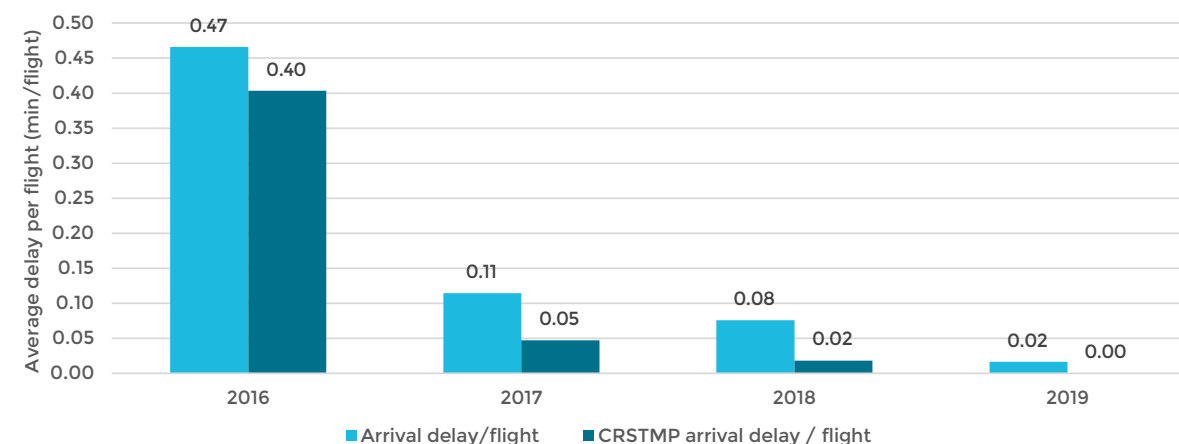


Figure 3-2: Arrival delay KPI at Charleroi airport for 2016-2019, per year

The graph shows clearly that the delay has drastically decreased in the years after 2016 and the trend continues in 2019, where the CRSTMP average arrival delay drops to zero.

<sup>2</sup> Hence the difference with figures in chapter 1, where movements are counted using the AMS and the BCAA criteria. NM only account for flights with a registered flight plan.



## Measures taken by skeyes to reduce delay

Regarding delay due to weather conditions, the regulations put in place since 2016 were all due to low visibility. In some cases, Low Visibility Operations (LVO) are initiated at the airport. LVO are put in place when the visual range at the airport falls below 550 meters or if the cloud base drops below 200 ft, in order to ensure safe operations. In 2019, no weather regulations were set up, and from 2016 to 2018, LVO was respectively in place in 63 %, 70 % and 91 % of the regulations' duration.

Improvements in the low visibility procedures made in 2018 have increased capacity during low visibility

conditions and have helped to reduce delay due to weather. The planned installation of an A-SMGCS system will allow further optimisation of procedures during low visibility conditions as it will provide an aid to ATCOs to handle a greater amount of movements in low visibility. This will have a positive impact on capacity and thereby reduce delay. The A-SMGCS is planned to become operational in 2021.

In Figure 3-3 below, it can be seen that most LVO happen during winter, where weather conditions are usually challenging than in summer.

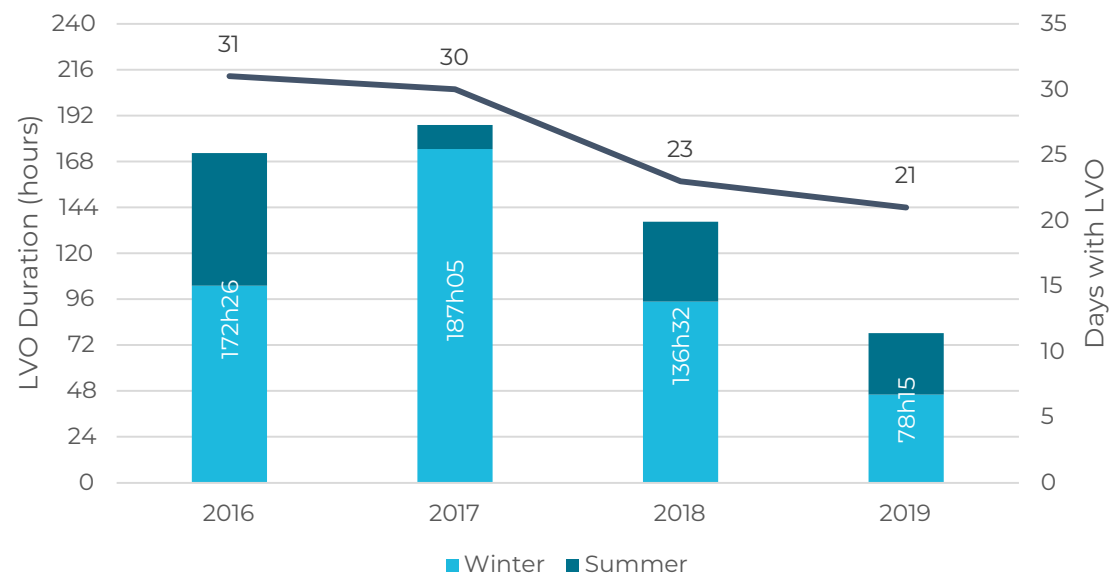
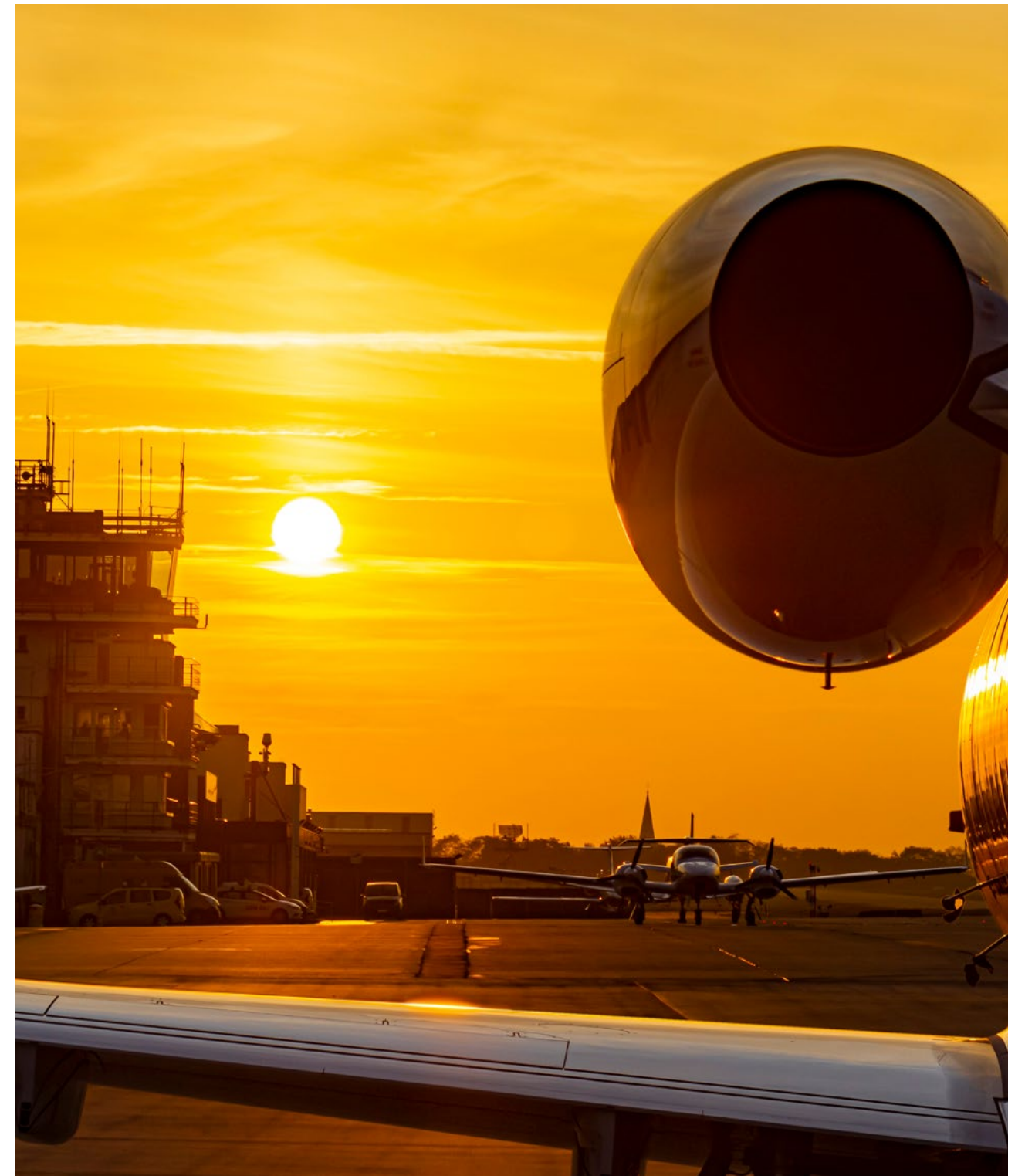


Figure 3-3: Low visibility operations per year



### All ATFM delay affecting departures

Flights departing from an airport can be delayed by ATFM measures in any of the sectors they cross on their route. In 2019, 6,989 departing flights from Charleroi airport were delayed resulting in a total of 121,168 minutes of delay. 20.9% (25,377 minutes)

of that delay is attributable to skeyes while 79.1% (95,791 minutes) is attributable to other ANSPs. Figure 3-3 shows the ATFM delay attributable to skeyes and other ANSPs.

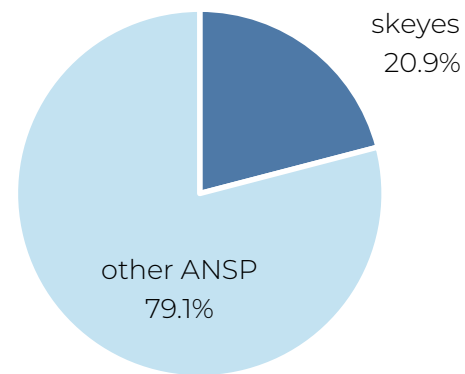


Figure 3-4: ATFM delay for departing flights attributable to skeyes and other ANSPs

To give a view of the severity of the impact, the delayed flights can be categorised based on the length of the delay (Figure 3-5). There are four categories:

- Between 1 and 15 minutes
- Between 16 and 30 minutes
- Between 31 and 60 minutes
- More than 60 minutes.

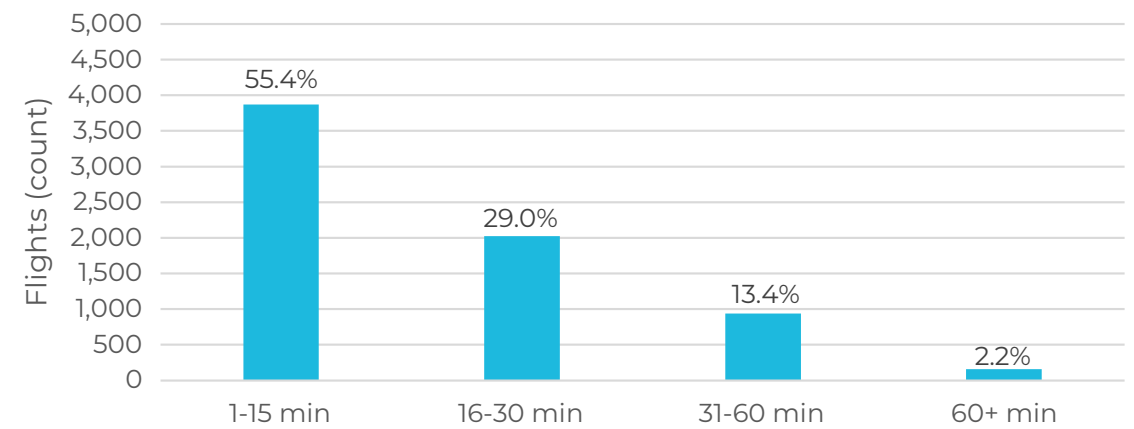


Figure 3-5: Delayed departing flights per category

The graph in Figure 3-5 shows that 55.4% of the delayed flights were not delayed more than 15 minutes, 84.4% of the delayed flights had a

maximum of 30 minutes of delay and 97.8% of the delayed flights did not have a delay that exceeded one hour.



### All ATFM delay affecting arrivals

Flights arriving to an airport can be, just like departing flights, delayed by ATFM measures in ATC sectors on the flight plan (en-route delays) and

arrival delays which are caused by ATFM measures at the airport of arrival. This section observes the delay of arriving traffic at Charleroi airport.

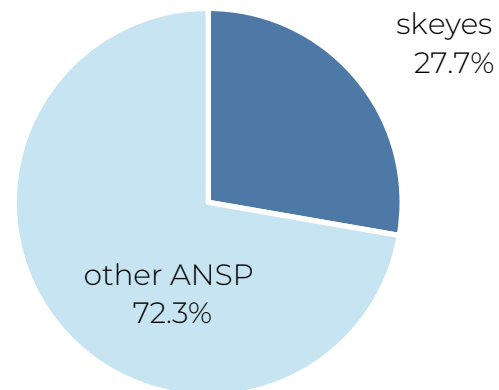


Figure 3-6: ATFM delay for arriving flights attributable to skeyes and other ANSPs

In 2019, 7,804 flights with destination Charleroi airport were delayed and experienced a total of 136,057 minutes of delay. 27.7% (37,731 minutes) of that delay is attributable to skeyes while 72.3% (98,326 minutes) is attributable to ATFM measures by other ANSPs.

As for departures, delayed arrival flights can be categorised based on the length of the delay, see Figure 3-7.

- Between 1 and 15 minutes
- Between 16 and 30 minutes
- Between 31 and 60 minutes
- More than 60 minutes.

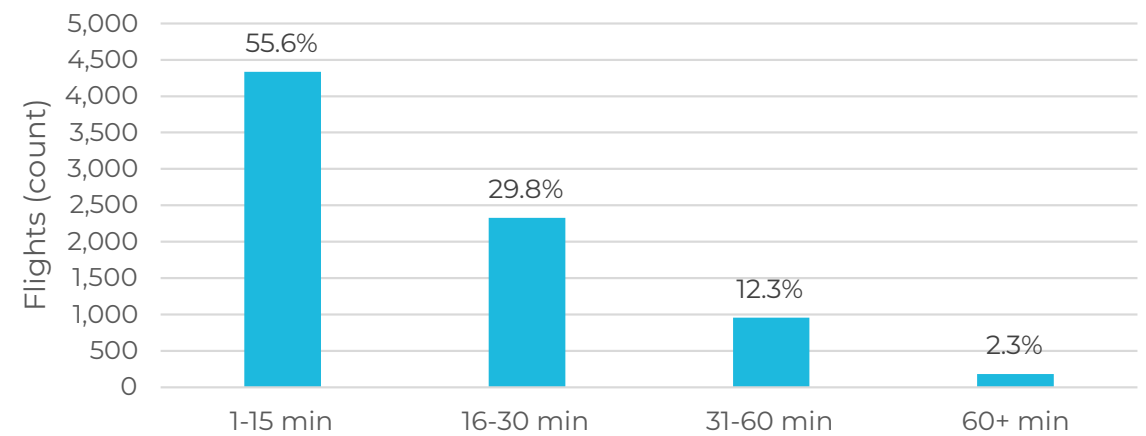


Figure 3-7: Delayed arriving flights per category

The graph in Figure 3-7 shows that the majority of the delayed flights have a maximum delay of 15 minutes, 85.4% are delayed maximum half an hour and 97.7% have a delay that did not exceed one hour.



## 4. ENVIRONMENT

*Because of its geographical location, which is usually in the vicinity of densely populated areas, it is important to consider noise distribution around the airport. There is as such a preferential runway system in place at EBCI which is monitored in this chapter. Night movements are also observed, as the airport does not operate H24.*

*Green landings, or Continuous Descent Operations (CDO) have also been in place at EBCI as an effort to minimize the noise impact of traffic. CDO figures are provided in this chapter.*

*Lastly, an overview of predominant winds is provided, as wind is a leading factor in the choice of runway use.*

## Preferential Runway System (PRS)

According to the AIP (AD 2.20, Ch 4.1), runway 24 should be used over runway 06 for take-offs and landings in case it is dry and tailwind does not exceed ten (10) and eight (8) knots, respectively. When the runway is wet, the maximum tailwind threshold is five (5) knots. In order to see how the amount of movements evolved per runway,

Figure 1-7 and Figure 1-8 of the first chapter compare the runway usage per month in 2019 and in comparison with previous years. RWY 24 was used for 83% of all movements in 2019, an increase of 5% points from 2018, where winds were more favourable to the use of RWY 06 (Figure 4-1).

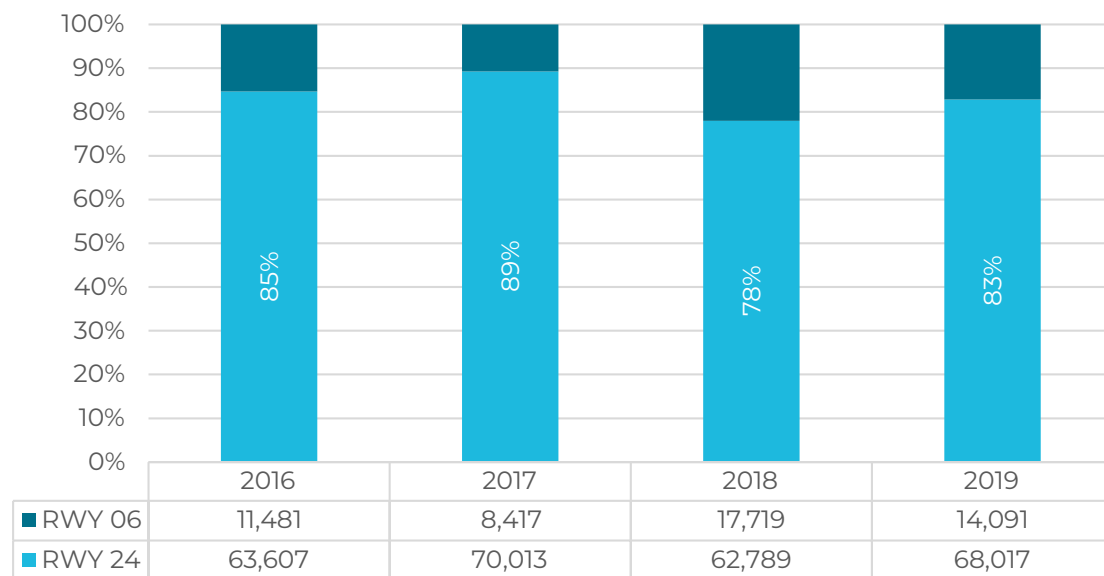


Figure 4-1: PRS: Runway use per year

## Continuous Descent Operations (CDO)

A CDO is an aircraft operating technique in which an arriving aircraft descends from an optimal position with minimum thrust and avoids level flight to the extent permitted by the safe operation of the aircraft and in compliance with published procedures and ATC instructions. By doing so, the aircraft will consume less fuel and produce less noise. Based on the recommendations made by EUROCONTROL, two CDO performance indicators were developed in 2016:

- CDO Fuel: binary indicator (yes/no) indicating if a CDO was flown from FL100 to 3000ft.
- CDO Noise: binary indicator (yes/no) indicating if a CDO was flown from FL60 to 3000ft.

A descent is considered as a CDO if no level off lasting more than 30 seconds is detected. A level off is considered as a segment during which the aircraft has a rate of descent of less than 300 feet/minute.

## CDOs increasing

Figure 4-2 and Figure 4-3 show the monthly evolution of CDO fuel and noise, respectively, at Charleroi airport.

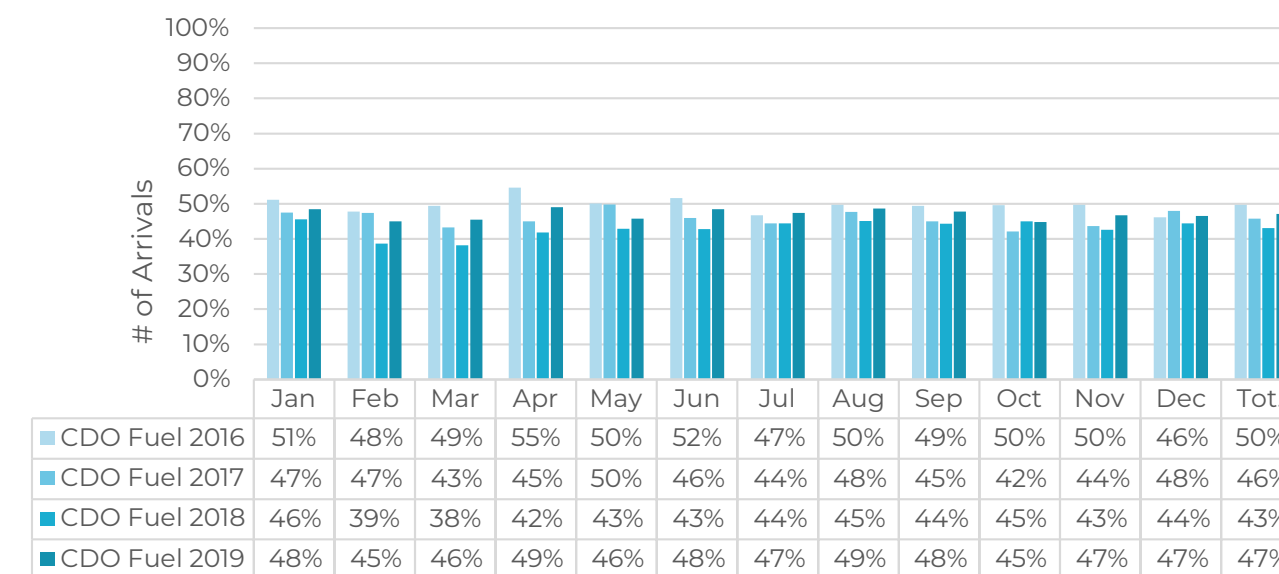


Figure 4-2: CDO Fuel usage



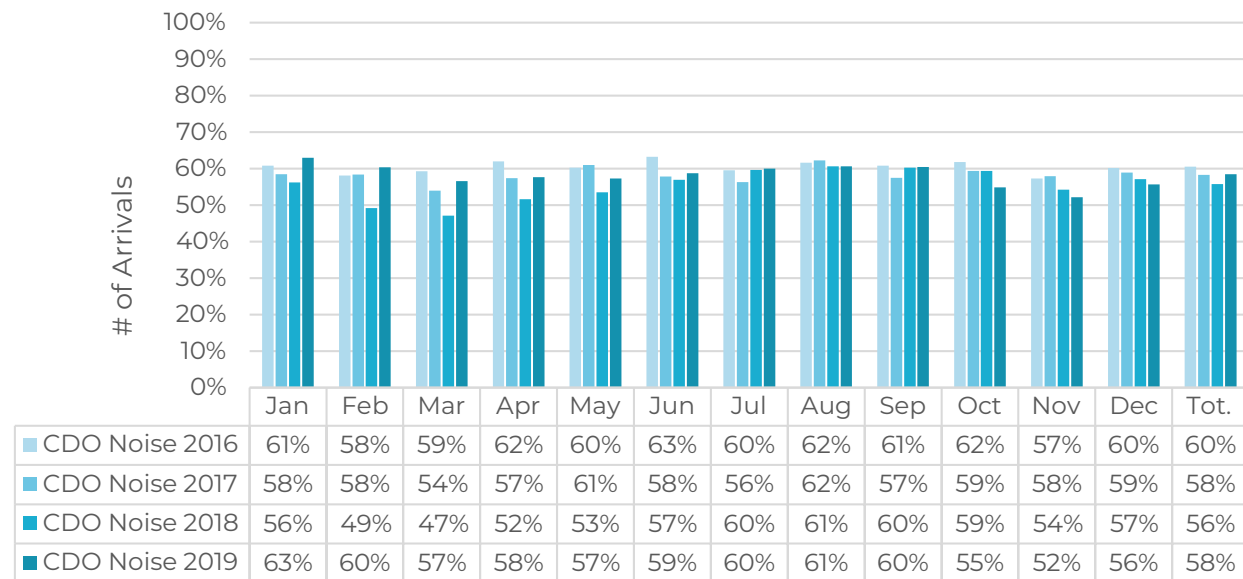


Figure 4-3: CDO Noise usage

The percentage of CDOs increased in comparison with 2018, showing very similar values as 2017. The most significant increases occurred in the first months of the year. The total of CDOs per year can be observed in Figure 4-4, along with the arrivals

considered in the analysis. Note that helicopters and Touch and Go flights are not counted in the arrivals for the calculation of the CDO indicator<sup>3</sup>. Missed approaches are also excluded.

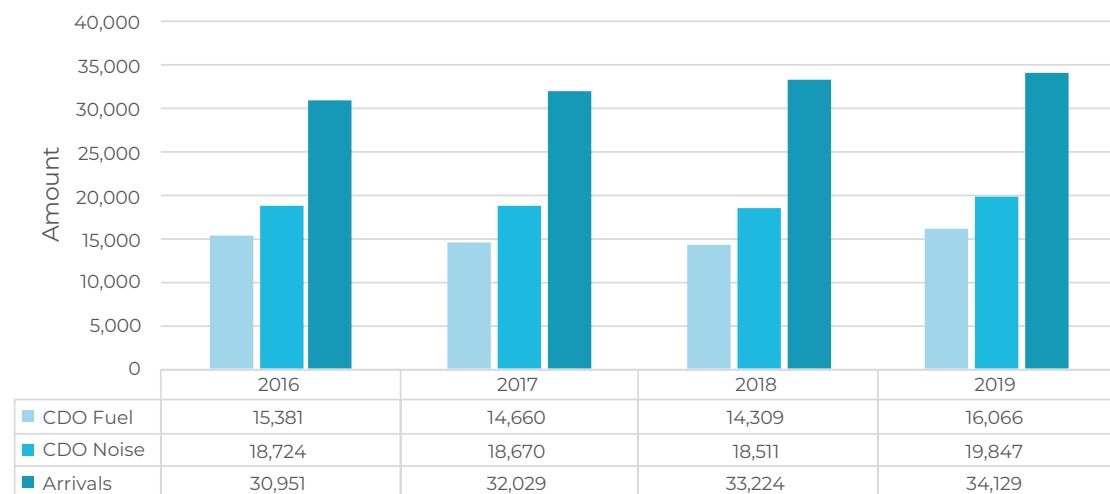


Figure 4-4: Total CDO Fuel and Noise per year

<sup>3</sup> Hence the difference with figures in chapter 1, where touch and go's and helicopter arrivals are counted using the AMS and the BCAA criteria. For CDO analysis those are excluded.

However, the frequency of continuous descents varies significantly according to the runway in use for landing. Figure 4-5 shows the evolution of the CDOs per runway over the past years.

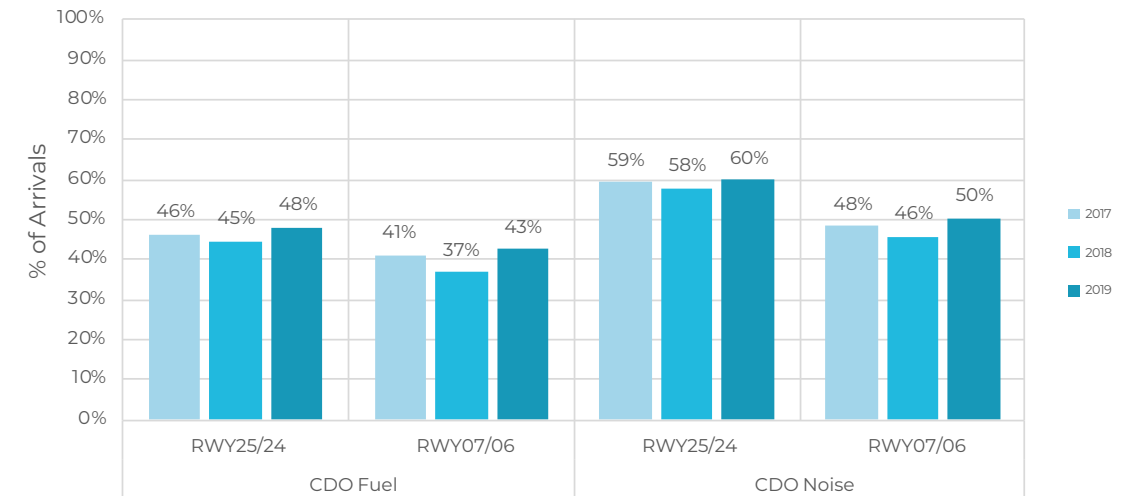


Figure 4-5: CDO Fuel and Noise per RWY

It can be seen that the runway 24 shows in general better results. That can be explained due to the fact that this runway is equipped with an ILS, making the approaches more predictable when compared to runway 06.

CDO rate has increased in line with an increase in traffic at EBCI.

CDO statistics are inherently variable, because they are influenced by such a multitude of external factors, such as:

### Improvement measures and activities

To promote and facilitate the number of CDOs flown to EBCI, different measures are investigated or already implemented:

- Pilot CDO flying experience
- Pilot experience with specific airport
- ATC experience
- Runway usage (equipment)
- Aircraft type/equipment
- Mil airspace open/closed
- Traffic flows
- "Impact" of other traffic streams on arriving traffic.

- skeyes is in contact with airlines presenting CDO statistics and communicating the phraseology;
- skeyes is increasing awareness amongst ATCOs through courses, and by informing them of the current statistics and performance;
- Setting up a working group (ATCOs and pilots) to identify, analyse and implement operational improvements is planned for 2020.
- Similarly to what was successfully set up in 2018 in Brussels, skeyes is promoting the implementation of an agreement on 'collaborative environmental management' (CEM) to increase cooperation with airlines and the airport on undertaking joint initiatives that further reduce the environmental impact of airport operations.

As a result, it is difficult to detect a direct source for an increase or decrease from one year to the next. Important to note for EBCI is that despite the complexity of the airspace (arrival flows have to be separated from Brussels traffic, increasing the number of level-offs that flights need to make), the

## Less night movements in 2019

The normal operational hours of Charleroi airport are from 06:30 to 23:00 local time. Figure 4-6 shows the night movements (between 23:00 and 06:30) since 2016. It can clearly be seen that the amount

of night movements in 2019 puts an end to the increasing trend seen in the previous years, showing a considerable overall decrease, especially between 23:00 and 00:00.

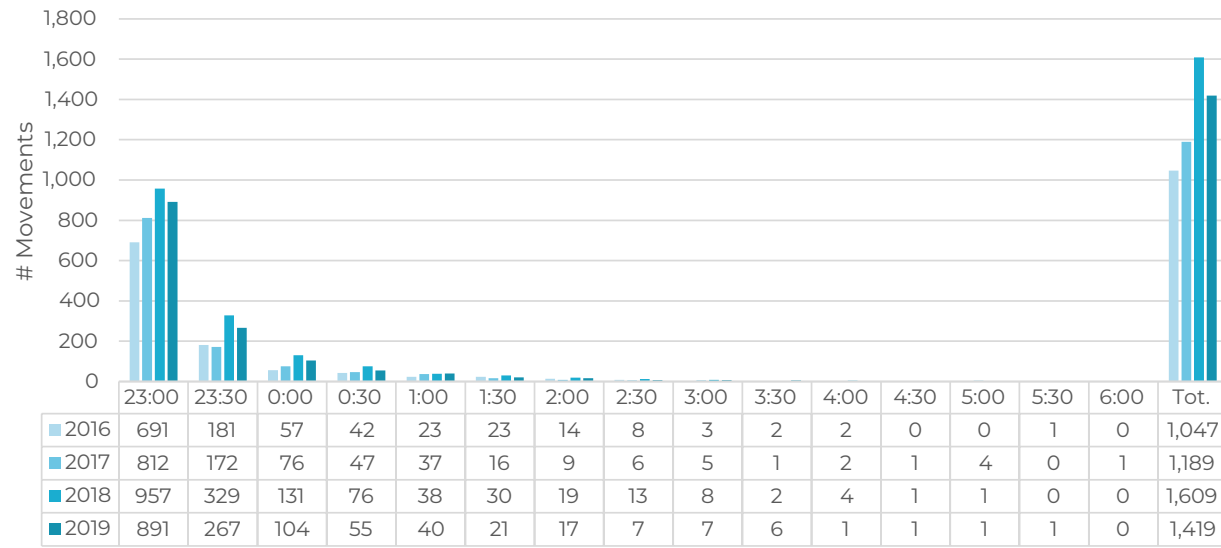


Figure 4-6: Night movements at EBCI from 2016 until 2019 (hours indicate start time of 30 minutes period)

To allow these late flights to land, ATS operational hours are extended until the last flight has landed.

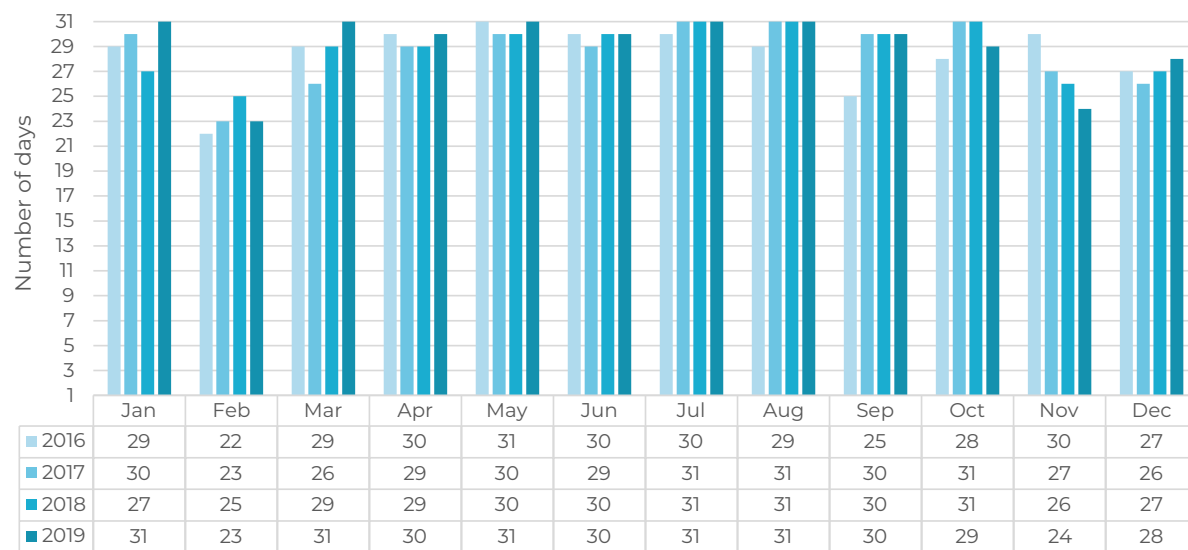


Figure 4-7: Days of ATS Operational Hours of extension at EBCI from 2016 until 2019

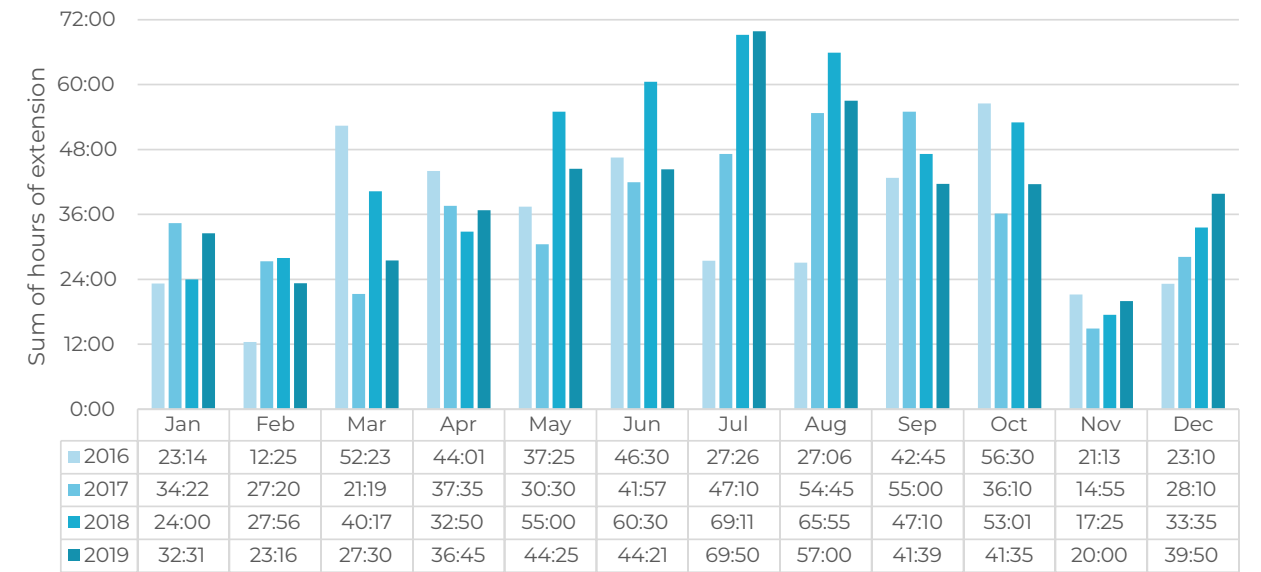


Figure 4-8: Hours of ATS Operational Hours of extension at EBCI from 2016 until 2019

The number of extension days in 2019 remains consistent with 2018 and 2017 (Figure 4-7). Almost every day, the airport has to extend its opening time. Looking at the number of hours, these have decreased by 9% compared to 2018. The peak month has been July 2019, with almost 70 hours

of extension (Figure 4-8). There has been a slight decrease of the number of extensions lasting less than 30 minutes, but the amount of extensions between 30 minutes and two hours increased. Extensions lasting more than two hours were less frequent than in 2018 (Figure 4-9).

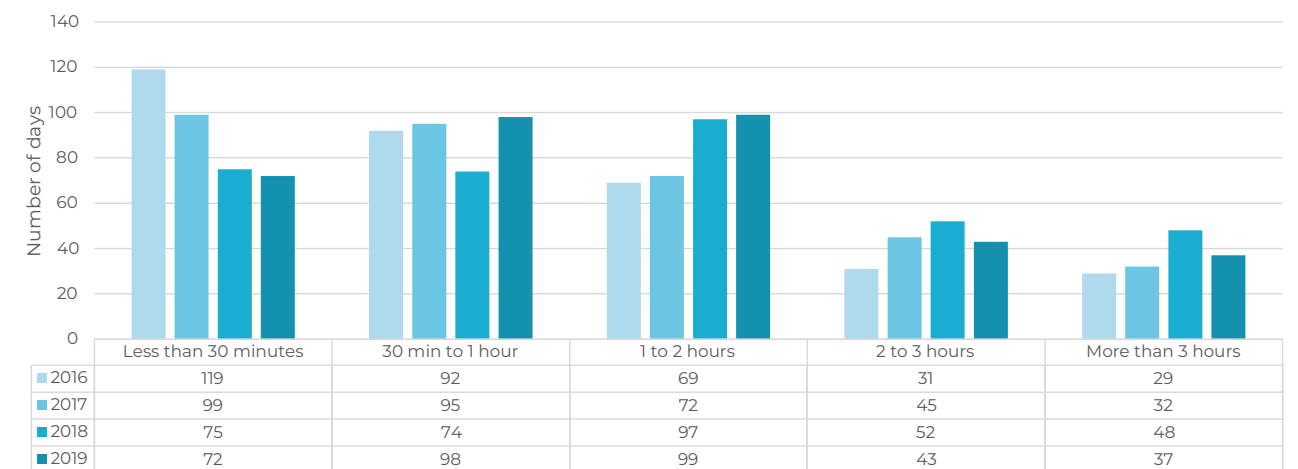


Figure 4-9: Duration of ATS Operational Hours of extension at EBCI from 2016 until 2019



## Again more south westerly winds in 2019

The wind pattern in 2019 shows very similar patterns as 2016 and 2017, as can be seen in Figure 4-10 below. The predominance of south westerly winds increased again in comparison to 2018, whereas

north easterly winds were on the whole less frequent. That was one of the contributing factors for the increase in the movements on RWY 24.

As mentioned in Chapter 1, the exception was the month of April, when RWY 06 was the most used (see Figure 1-8). That is explained due to the change

in wind direction, which came exceptionally from the north-east in that month.

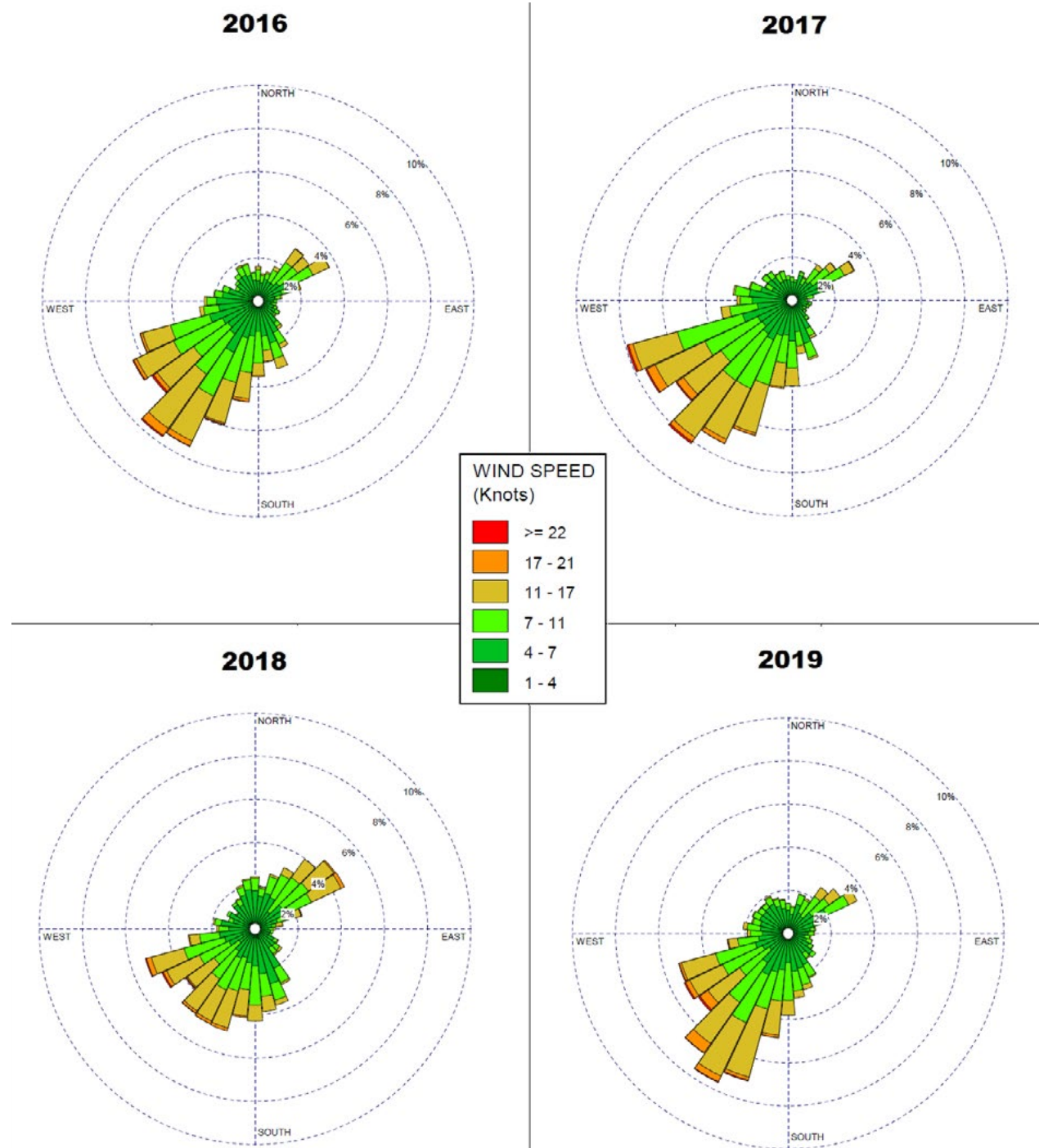


Figure 4-10: Wind roses EBCI 2016 – 2019

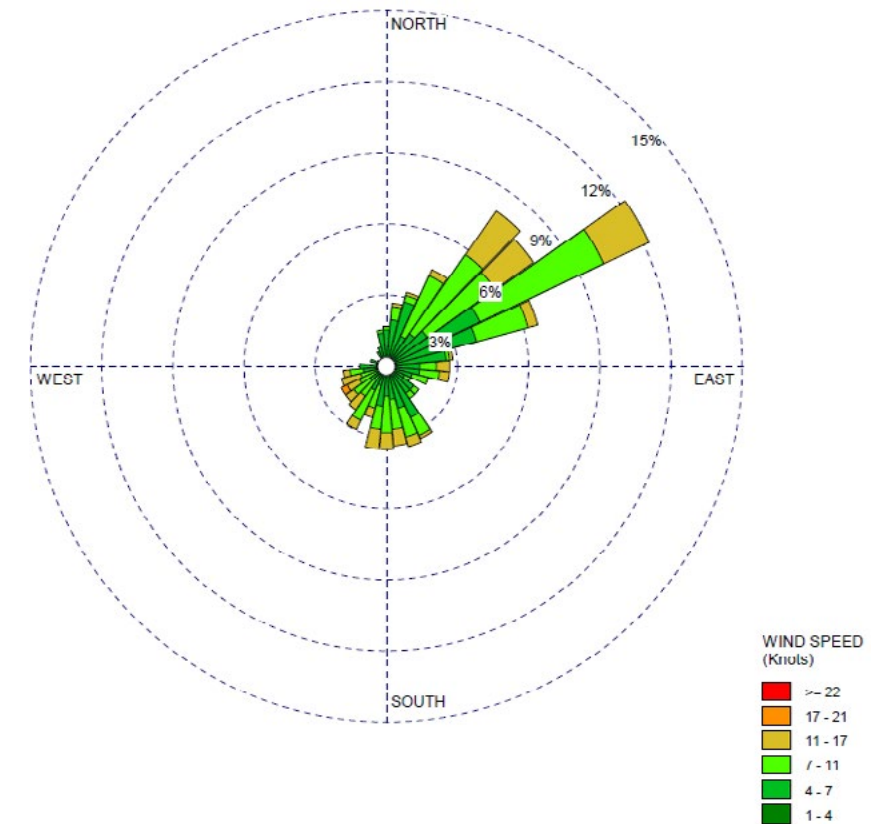


Figure 4-11: Wind rose EBCI April 2019

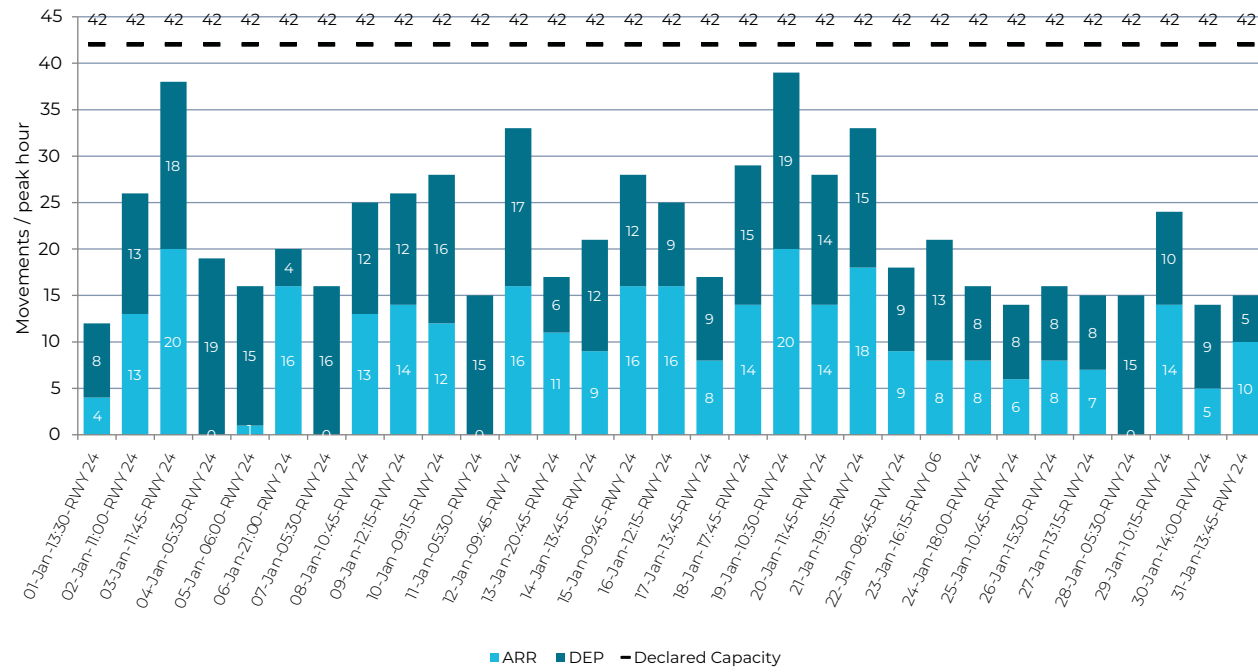


**ANNEX**

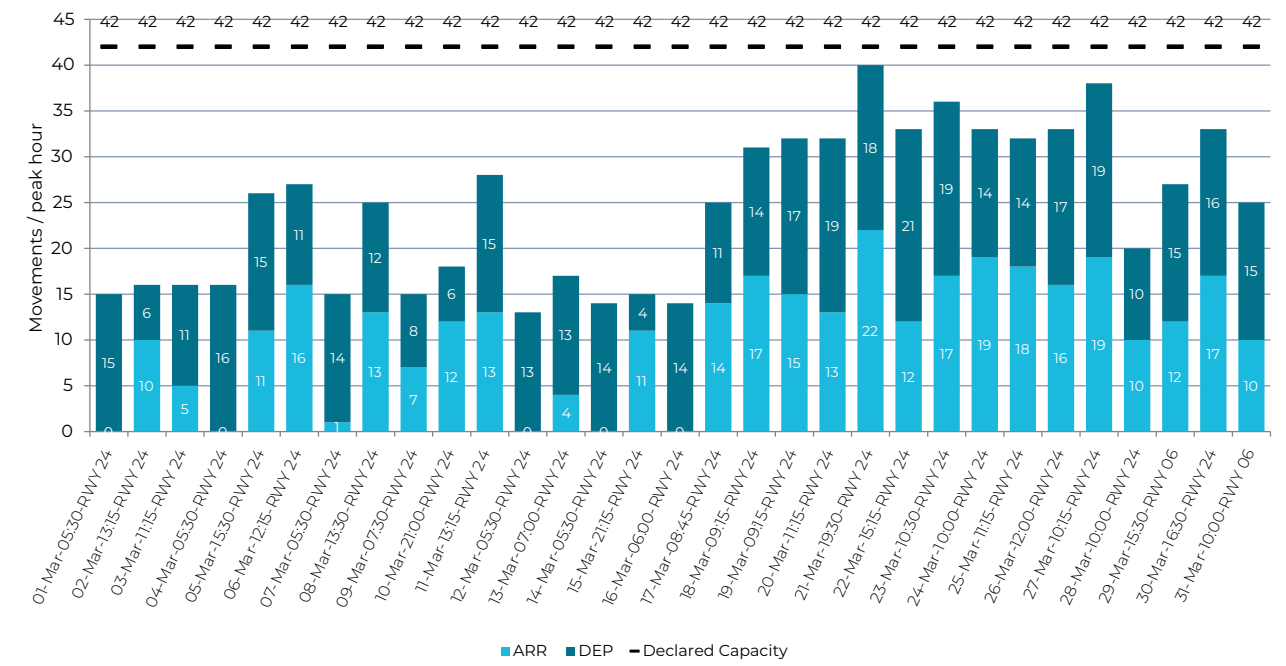


# Annex 1: Monthly overview of arrivals and departures at peak hours

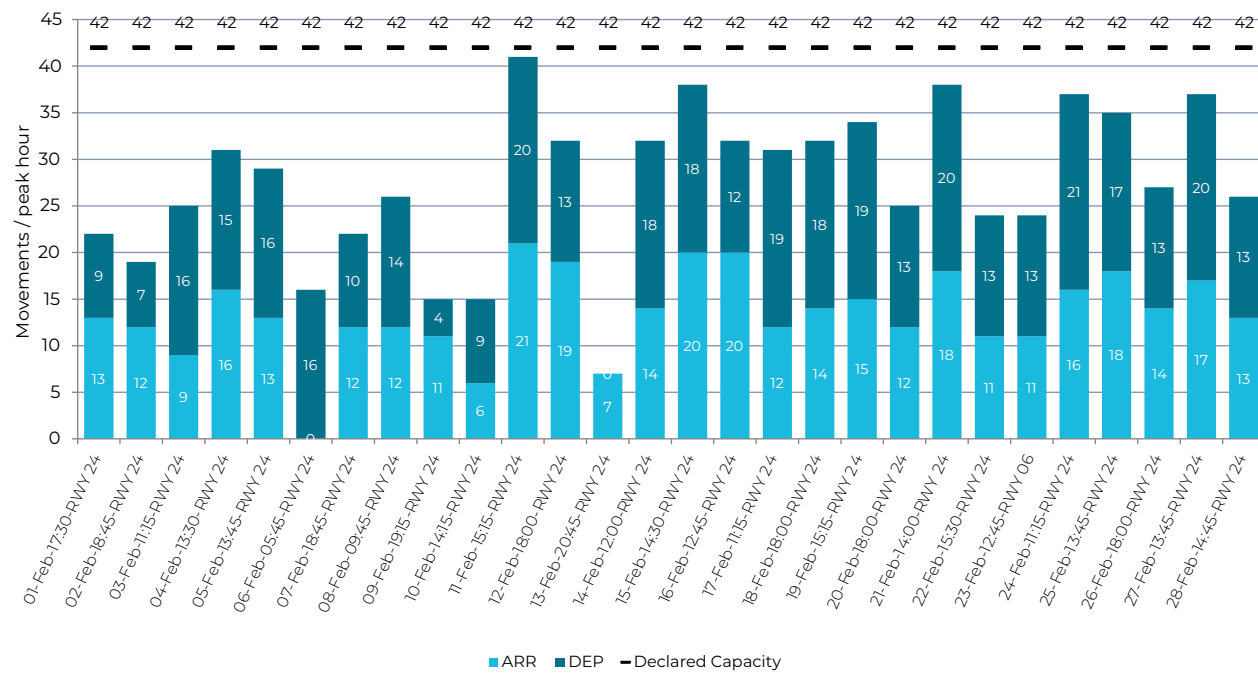
January



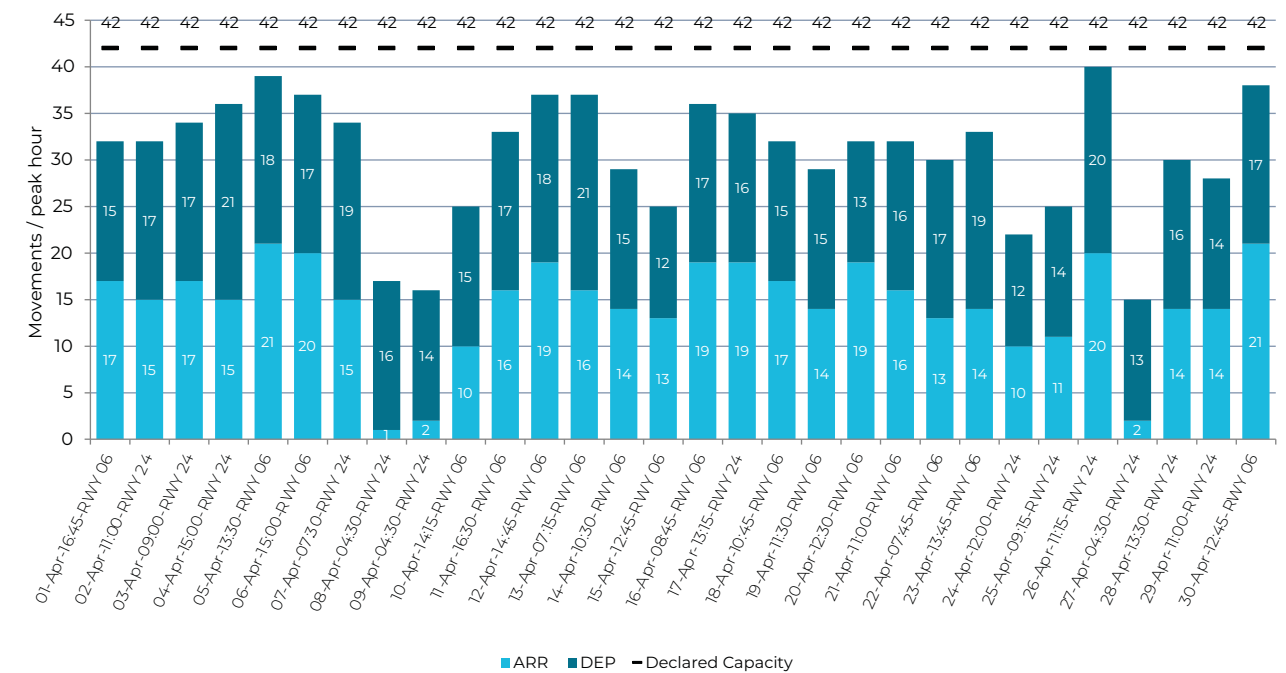
March



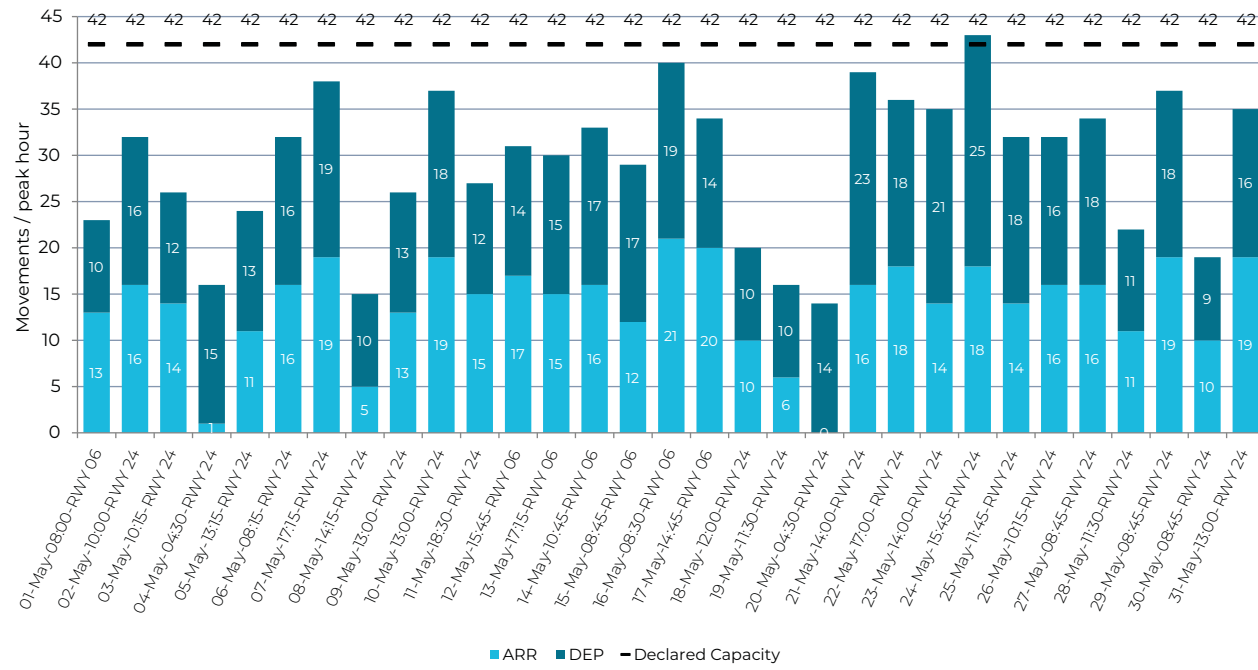
February



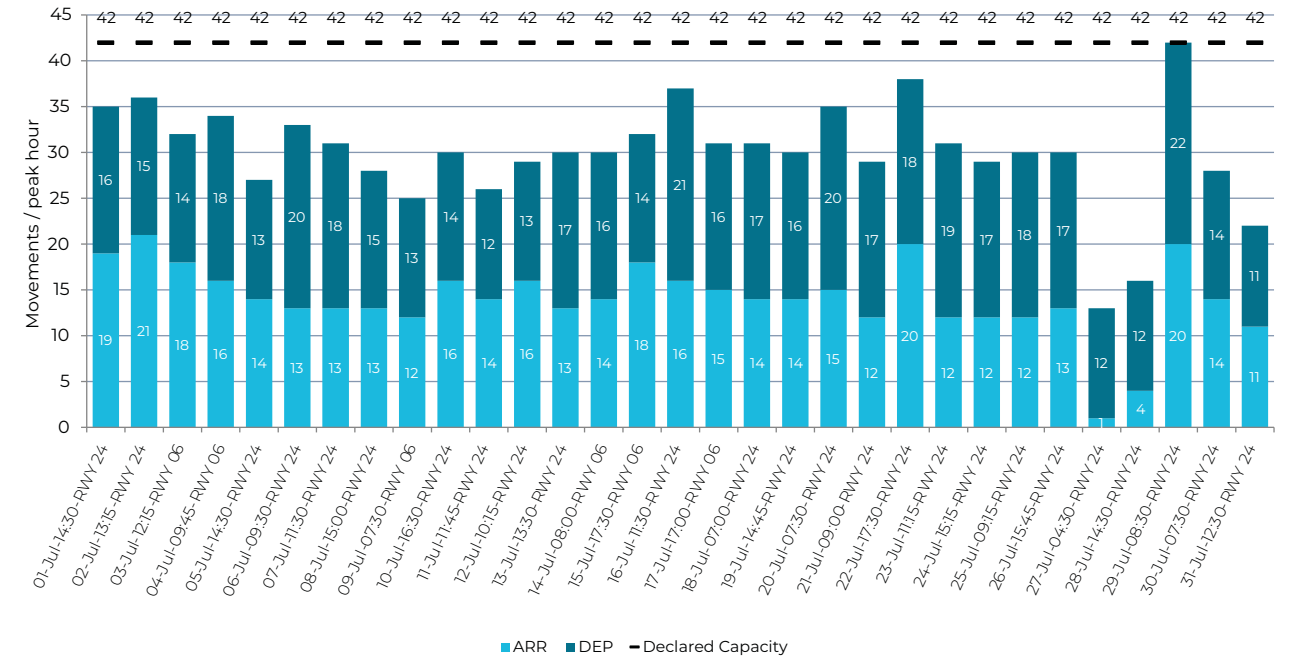
April



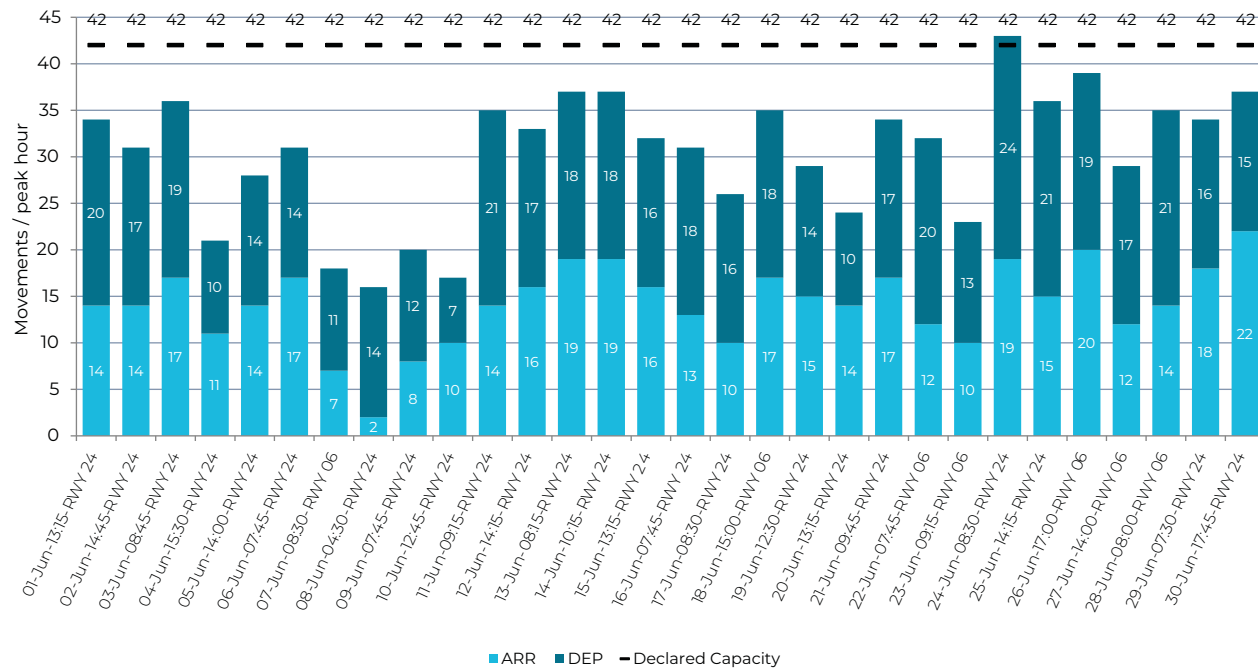
### May



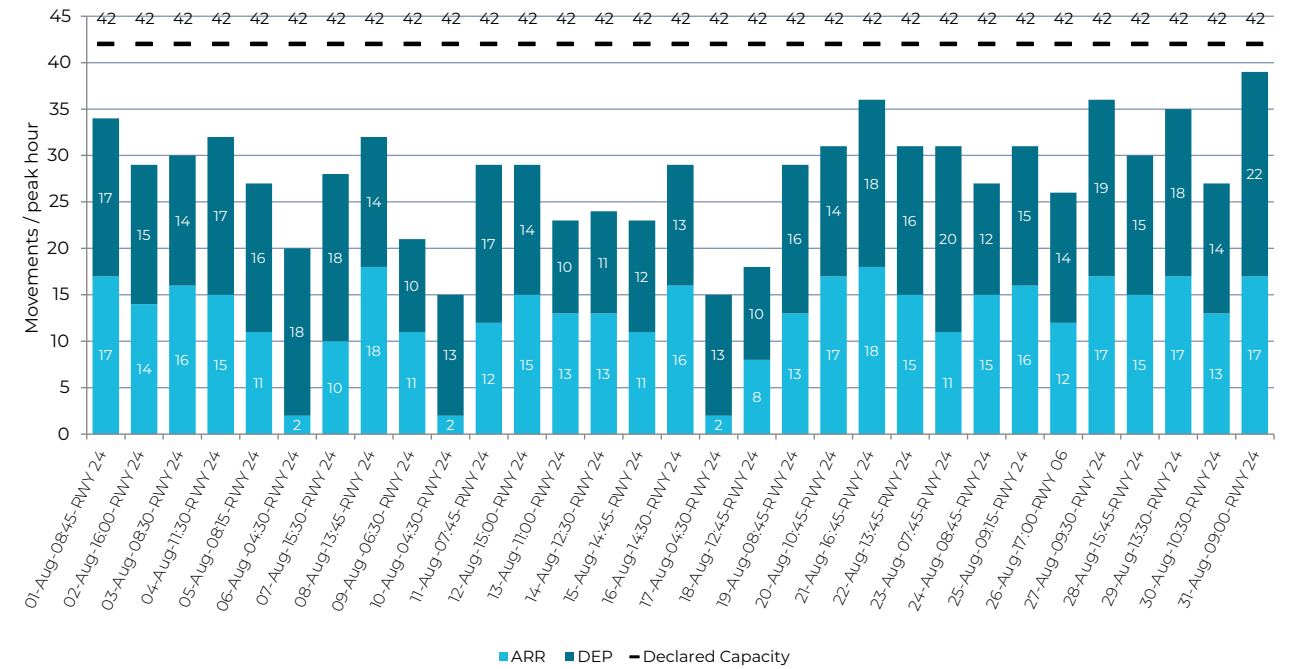
### July



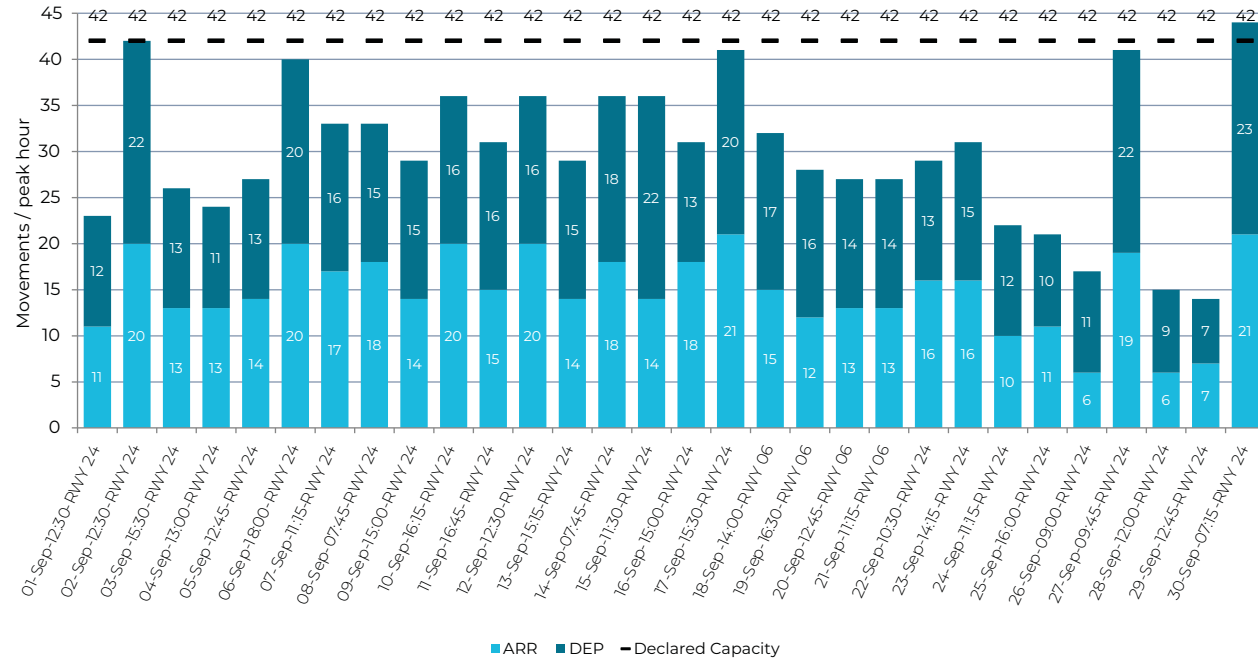
### June



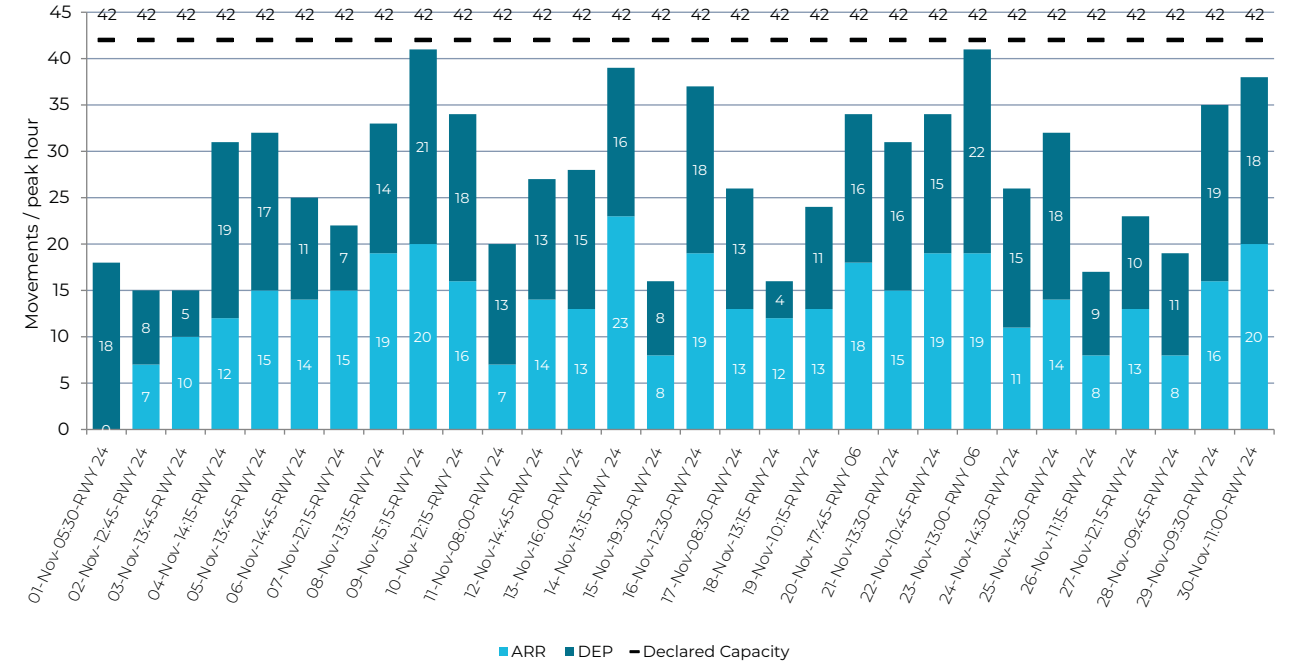
### August



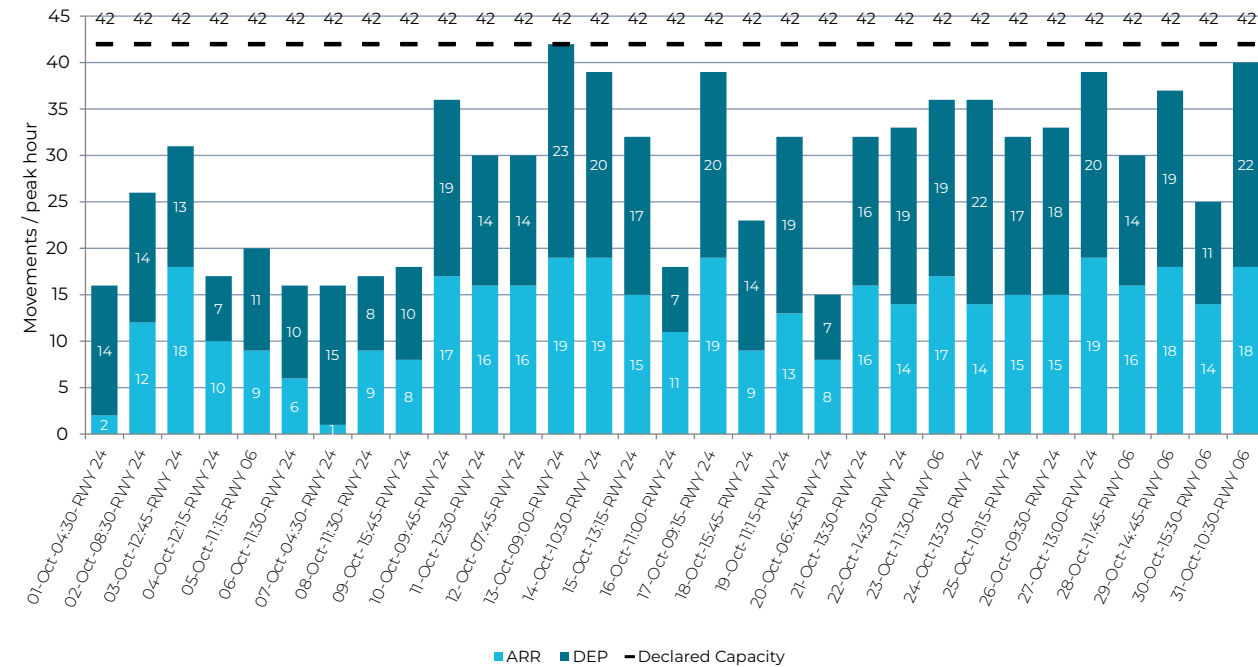
### September



### November



### October



### December

