Regional Rail for Metra

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1 Introduction

Acknowledgements

We thank the Greenbriar Equity Group for their generous sponsorship is this work through their Fellowship for transportation-related research from Northwestern University undergraduates.

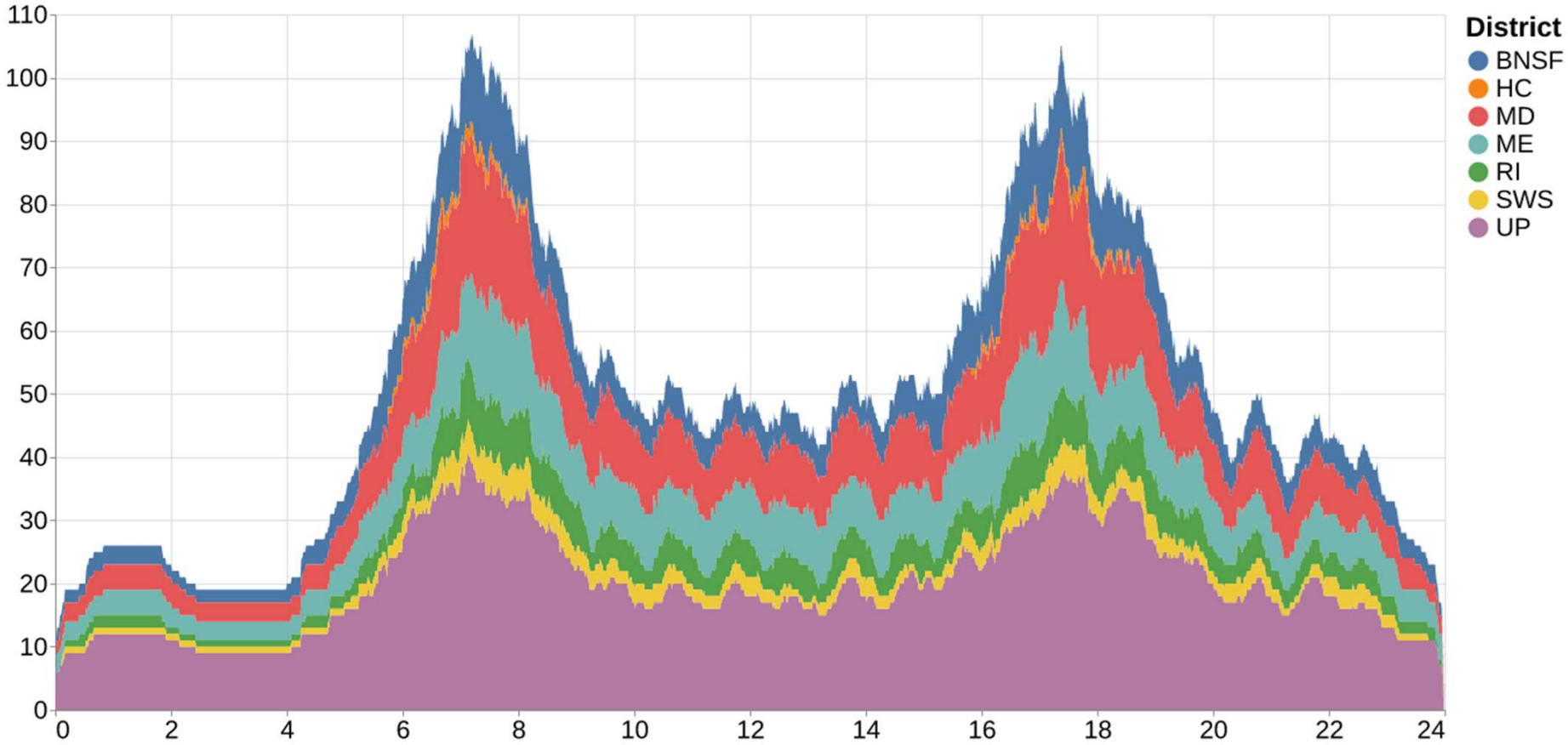
Motivation: Regional Rail

Regional rail is a passenger rail operating model that supports more evenly-distributed service throughout the day.

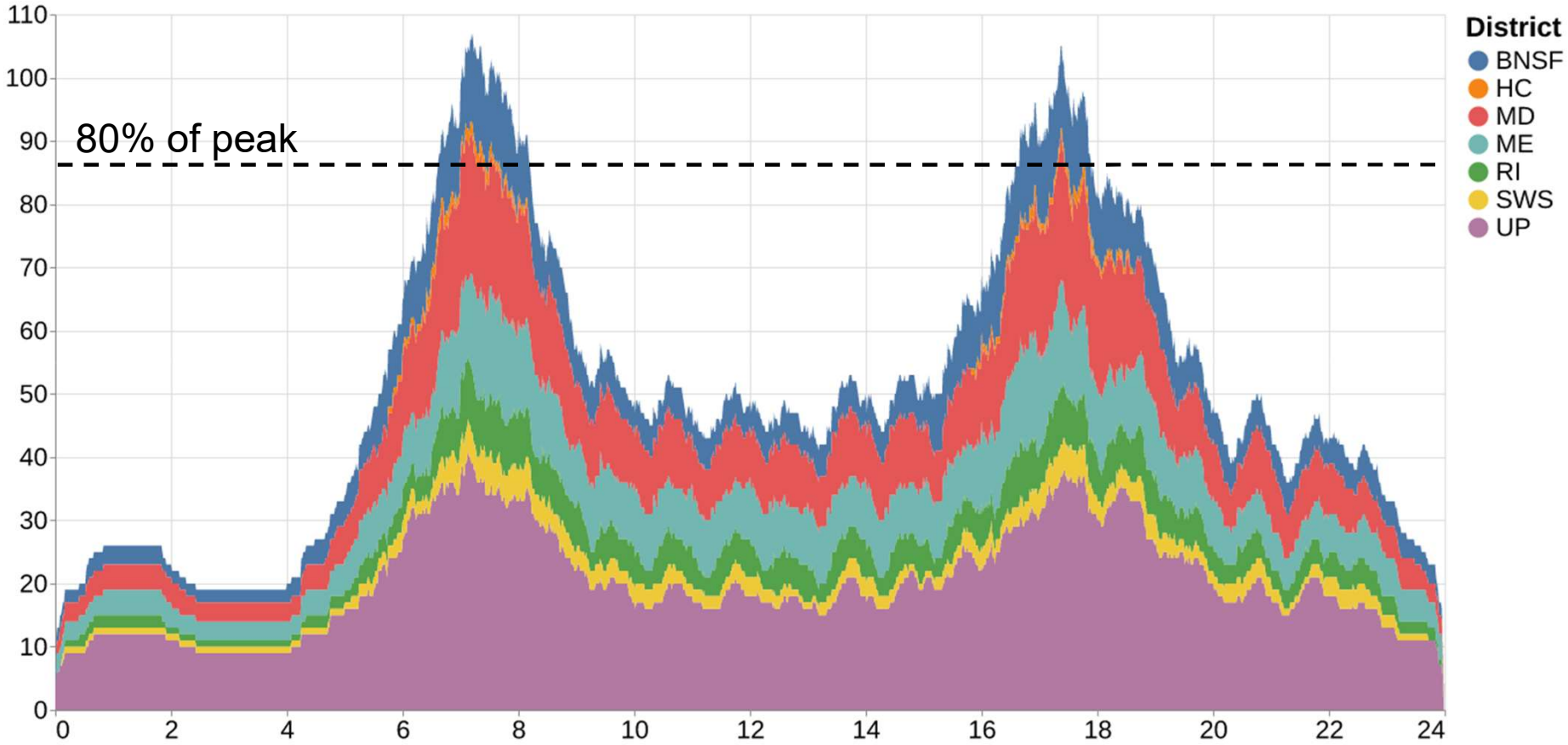
It differs from Metra's traditional **commuter rail** operating model by being less concentrated around peak work commuting times in the morning and evening.

2 Supply Side

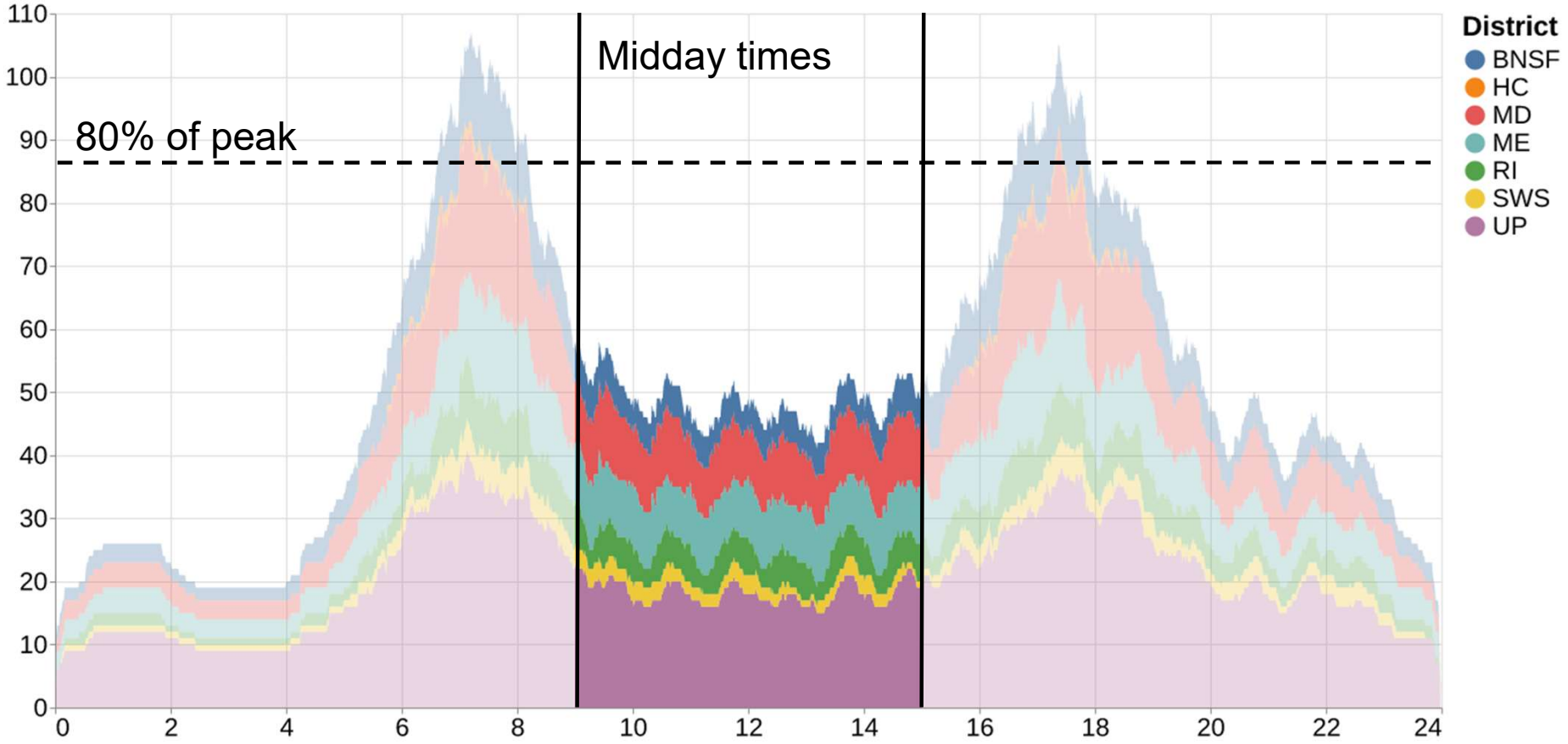
Current Metra Operations



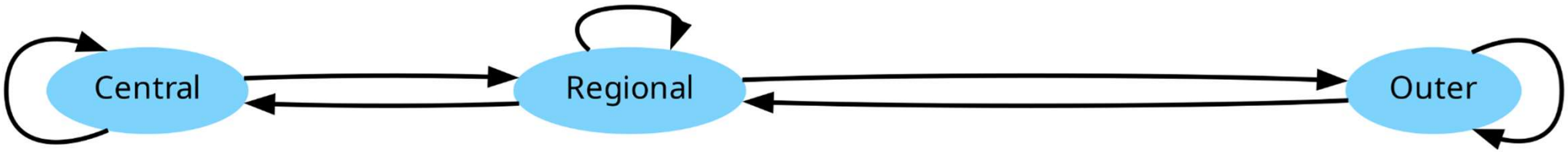
Potential regional operation



Potential regional operation

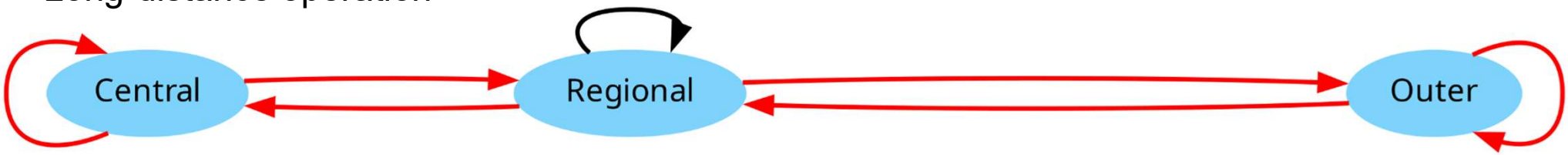


Model Setup



Model Setup: Long-distance operation

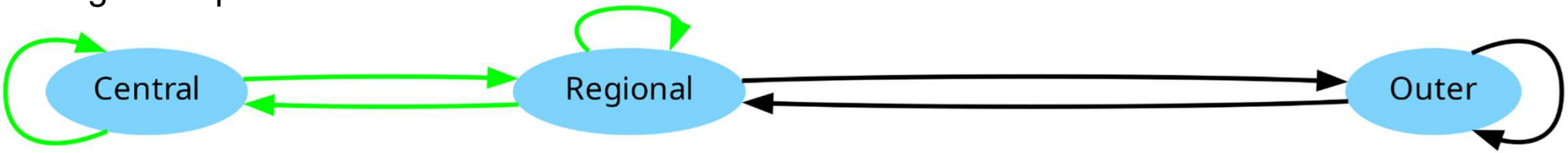
Long-distance operation



Headway: 1 hour

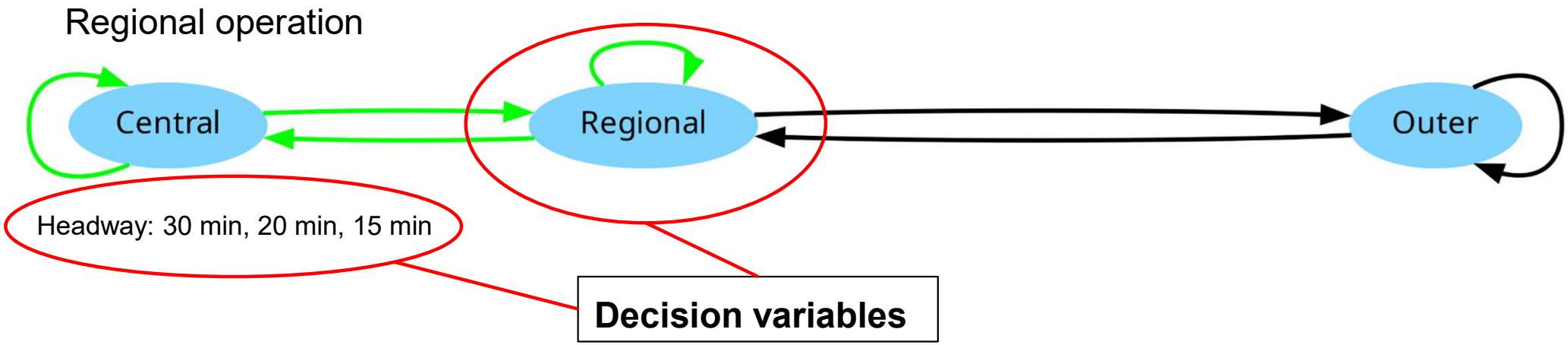
Model Setup: Regional operation

Regional operation



Headway: 30 min, 20 min, 15 min

Model Setup: Decision Variables



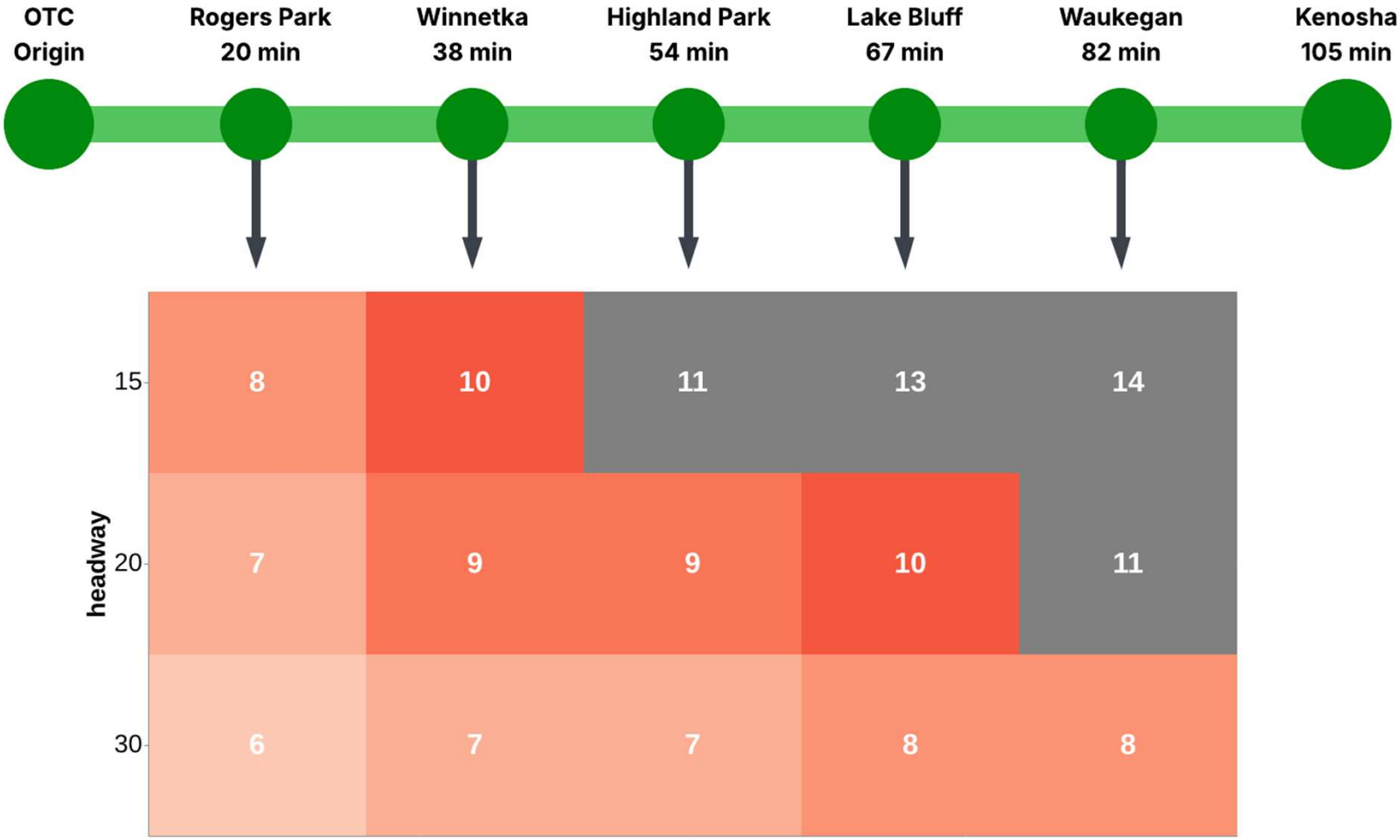
Model time parameters

Point-to-point time

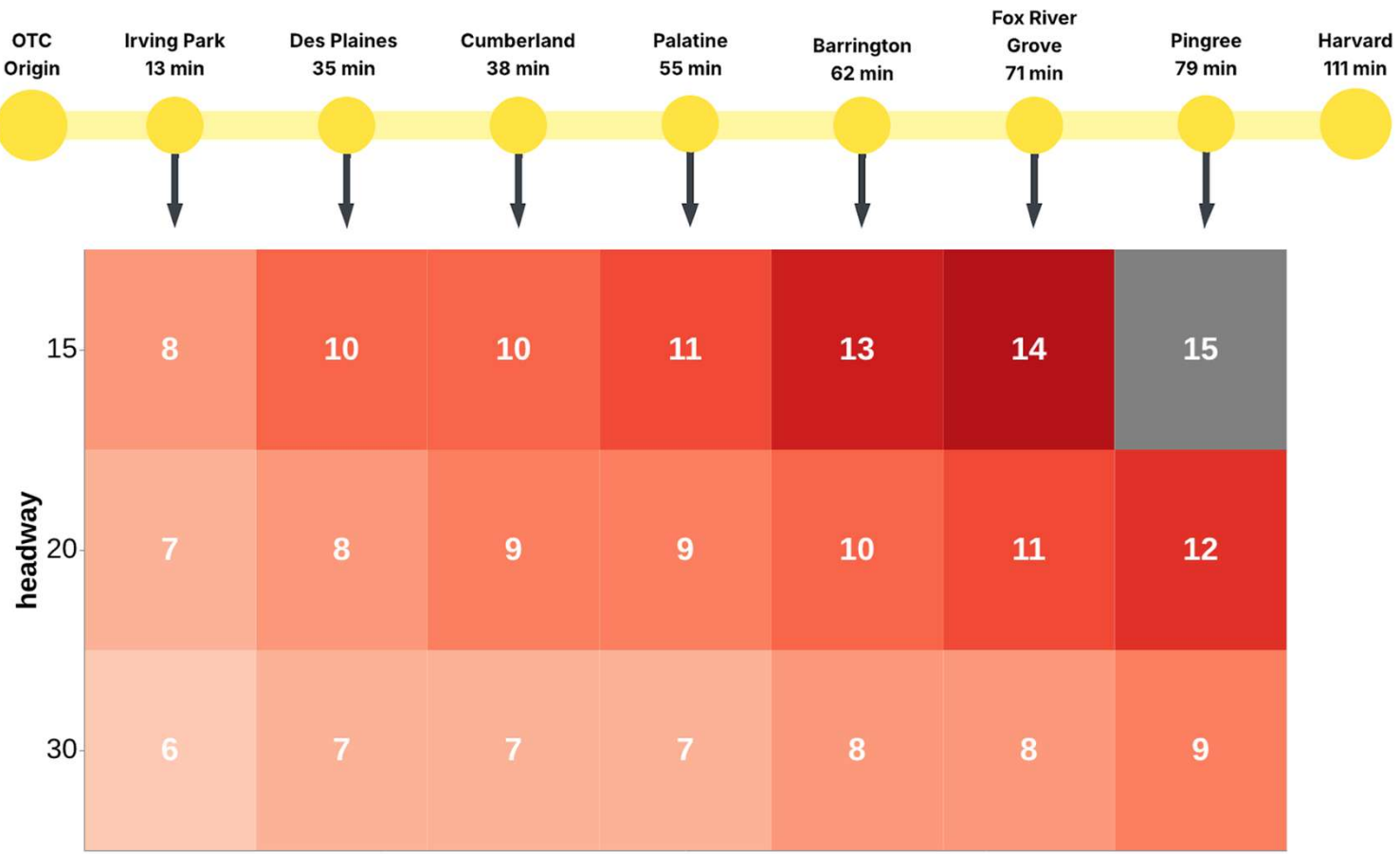
Turnaround time

- Reversing time
- Buffer time (only for Central station)
  - 5 minutes for 95% on-time
  - 10 minutes for 96.75% on-time
  - 15 minutes for 97.75% on-time
- Excess downtime (clock-faced service)

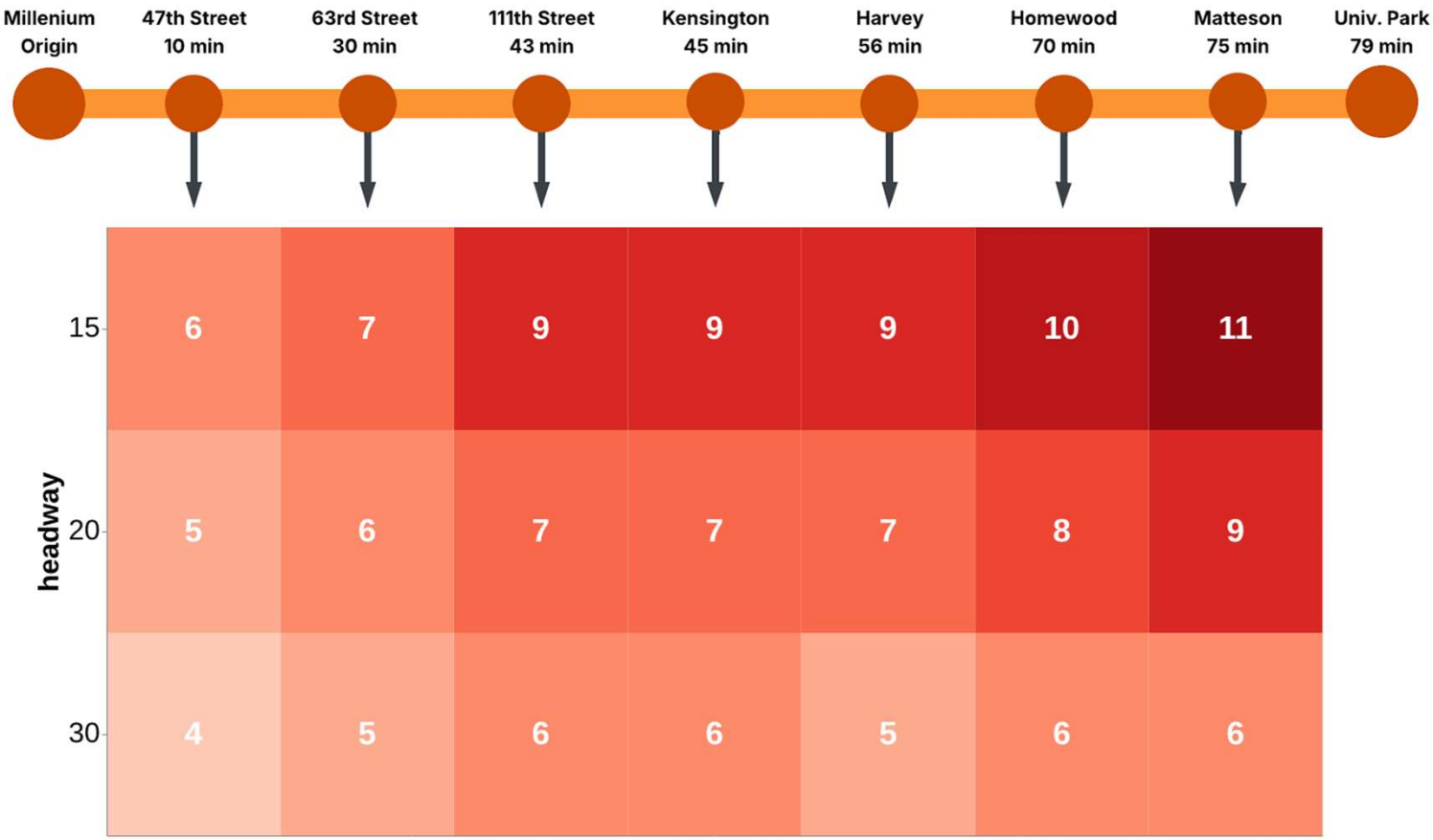
UP-N


OTC
Origin
Rogers Park
20 min
Winnetka
38 min
Highland Park
54 min
Lake Bluff
67 min
Waukegan
82 min
Kenosha
105 min
headway
15
20
30
8
10
11
13
14
7
9
9
10
11
6
7
7
8
8

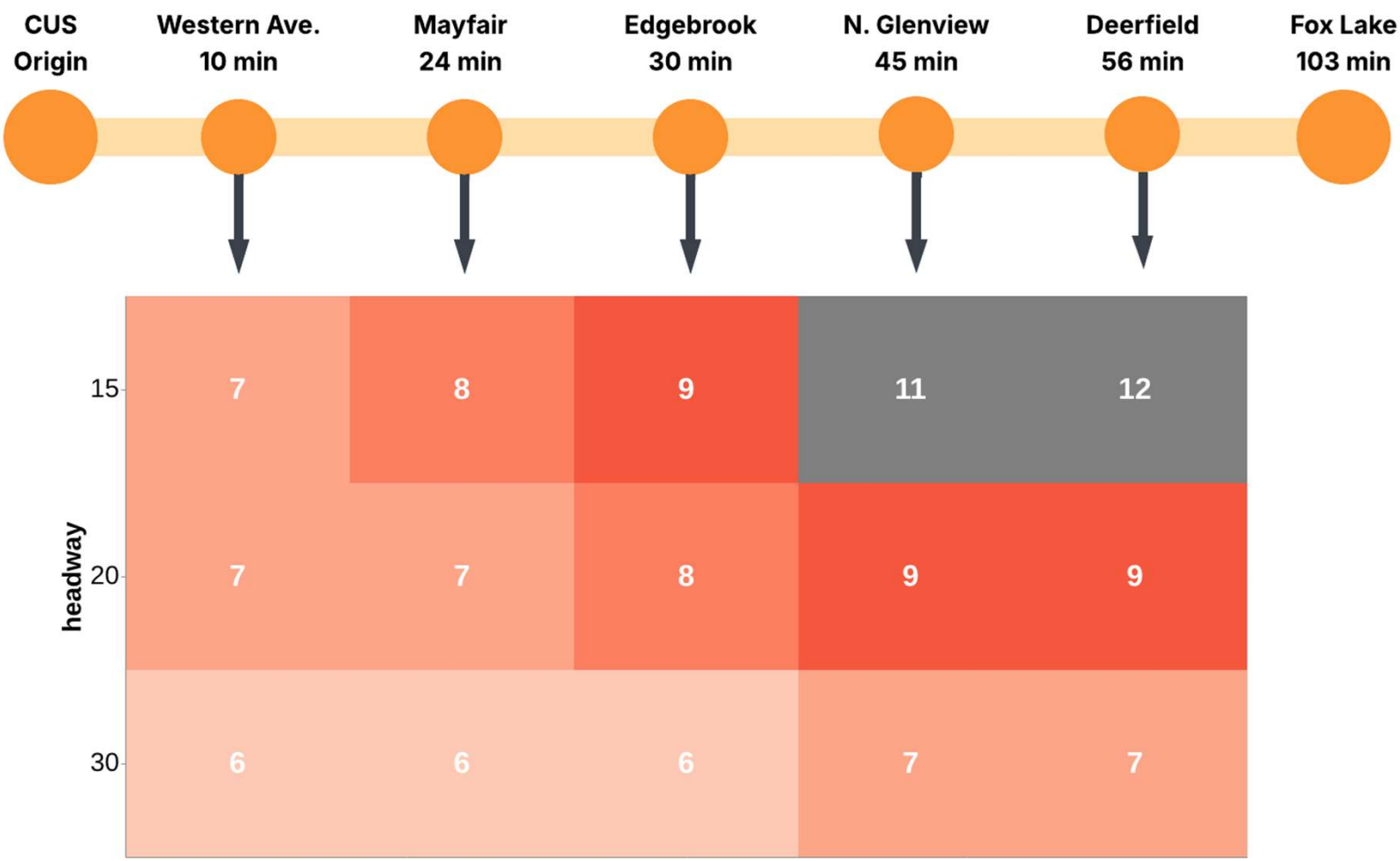
UP-NW


OTC Origin
Irving Park 13 min
Des Plaines 35 min
Cumberland 38 min
Palatine 55 min
Barrington 62 min
Fox River Grove 71 min
Pingree 79 min
Harvard 111 min
headway
15
20
30
8
10
10
11
13
14
15
7
8
9
9
10
11
12
6
7
7
7
8
8
9

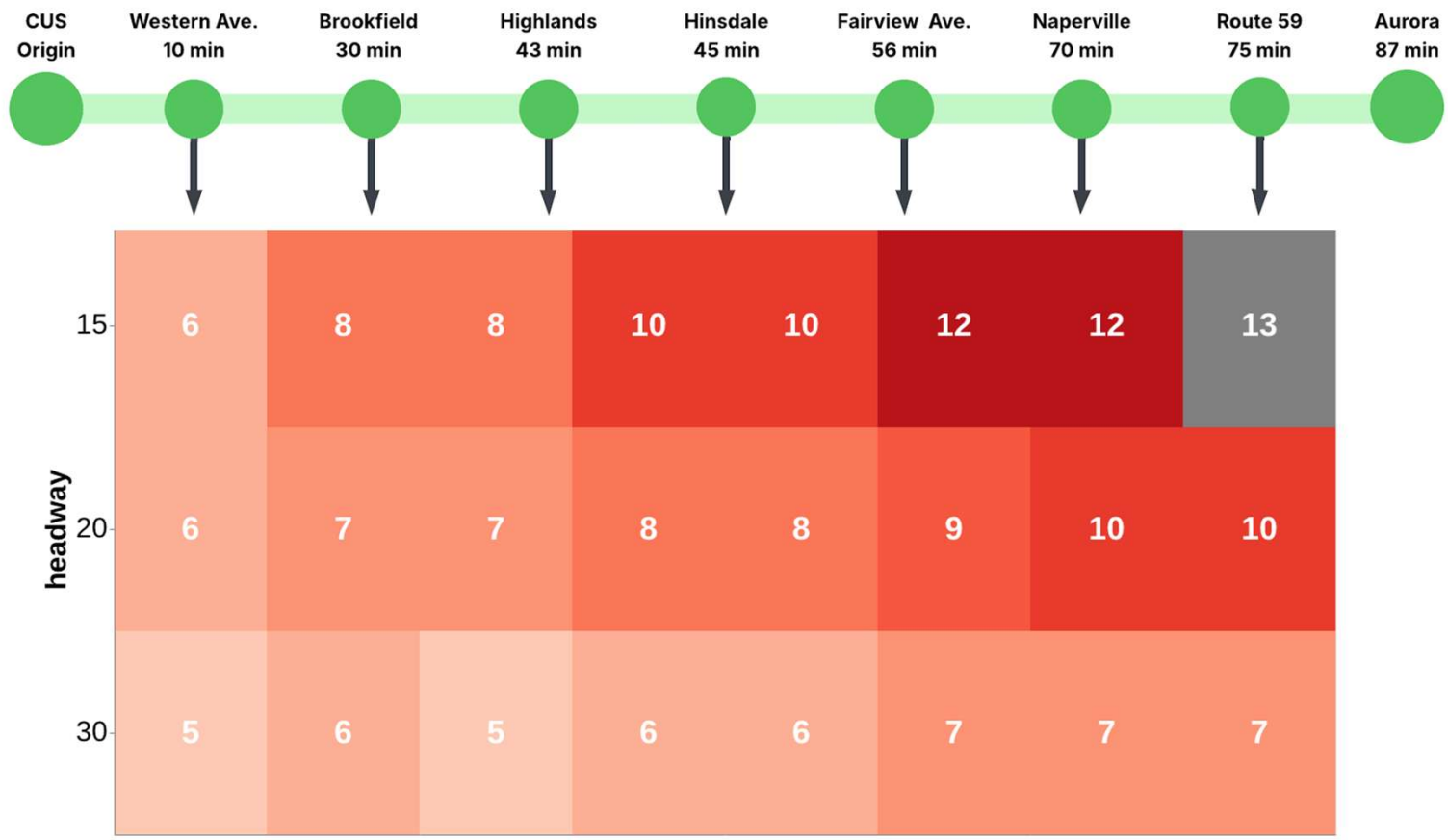
ME (Main branch)



MD-N


CUS
Origin
Western Ave.
10 min
Mayfair
24 min
Edgebrook
30 min
N. Glenview
45 min
Deerfield
56 min
Fox Lake
103 min
headway
15
20
30
7
8
9
11
12
7
7
8
9
9
6
6
6
7
7

BNSF


CUS Origin
Western Ave. 10 min
Brookfield 30 min
Highlands 43 min
Hinsdale 45 min
Fairview Ave. 56 min
Naperville 70 min
Route 59 75 min
Aurora 87 min
headway
15
20
30
6 8 8 10 10 12 12 13
6 7 7 8 8 9 10 10
5 6 5 6 6 7 7 7

Infeasible Lines

Certain lines, which have low amounts of service to begin with, have most of their regional rail operating scenarios as infeasible.

These lines are:

- The Southwest Service
- The Heritage Corridor
- The North Central Service

Pooling Model Formulation

The pooling formulation seeks to reduce overall excess downtime and trains required by **interworking** trains between lines in a **district** that share tracks at a central station.

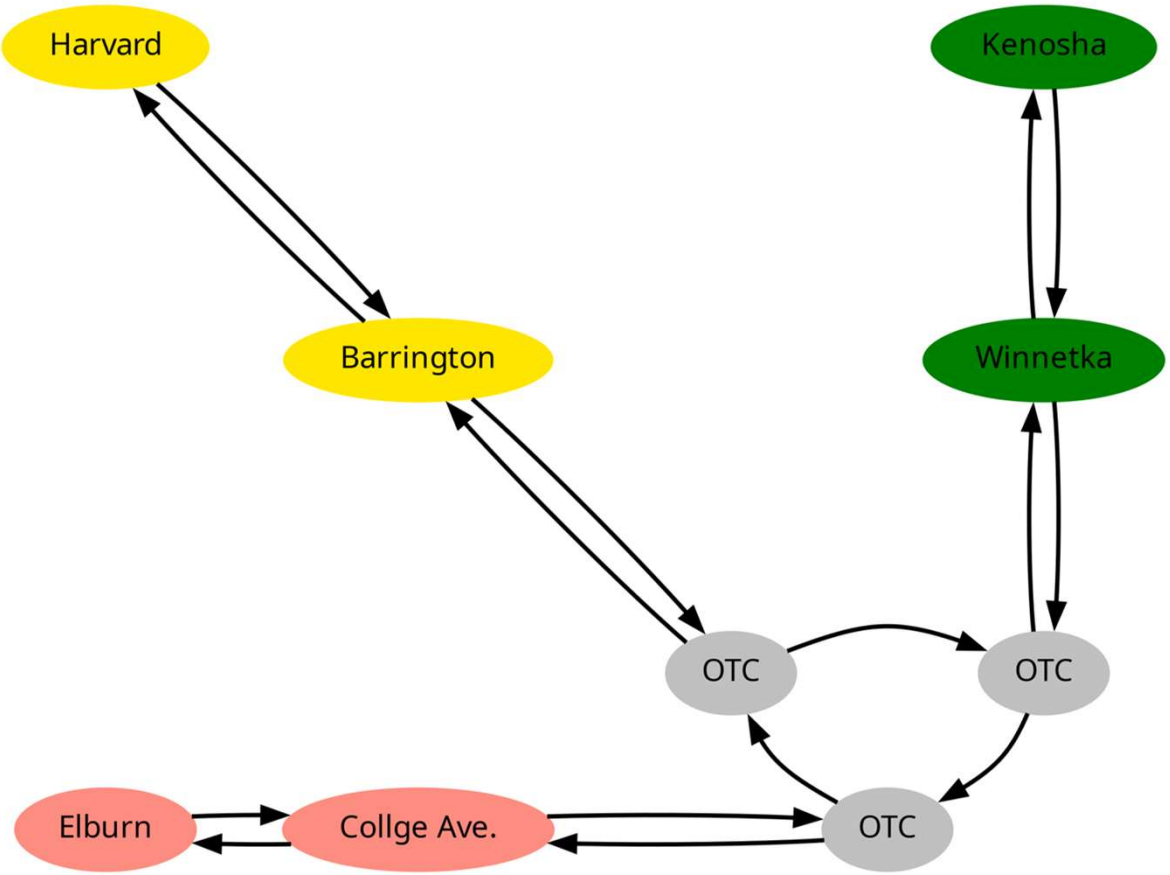
In the pooling model, once a train from one line in a district returns to the central station, it can depart on any other line in the district. For example, a train returning to Union Station on the MD-W line can depart from the MD-N line.

Example pooling: UP District

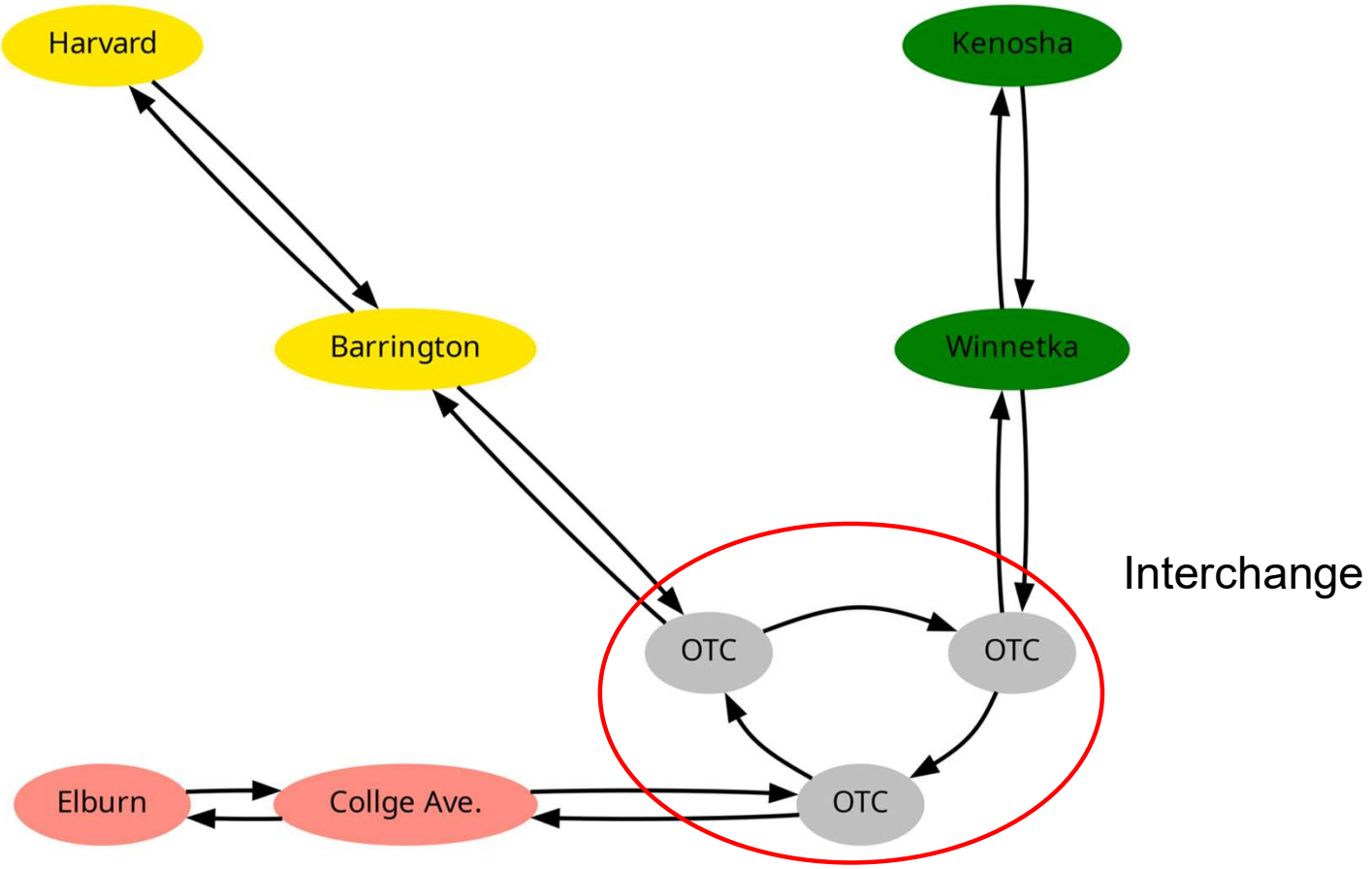
In the example pooling scenario, the regional stations are:

- Winnetka on UP-N
- Barrington on UP-NW
- College Ave. on UP-W

Example pooling: UP District



Example pooling: UP District



Example Pooling: Impact

Headway	**15 min**	**20 min**	**30 min**
Base trains	34	28	22

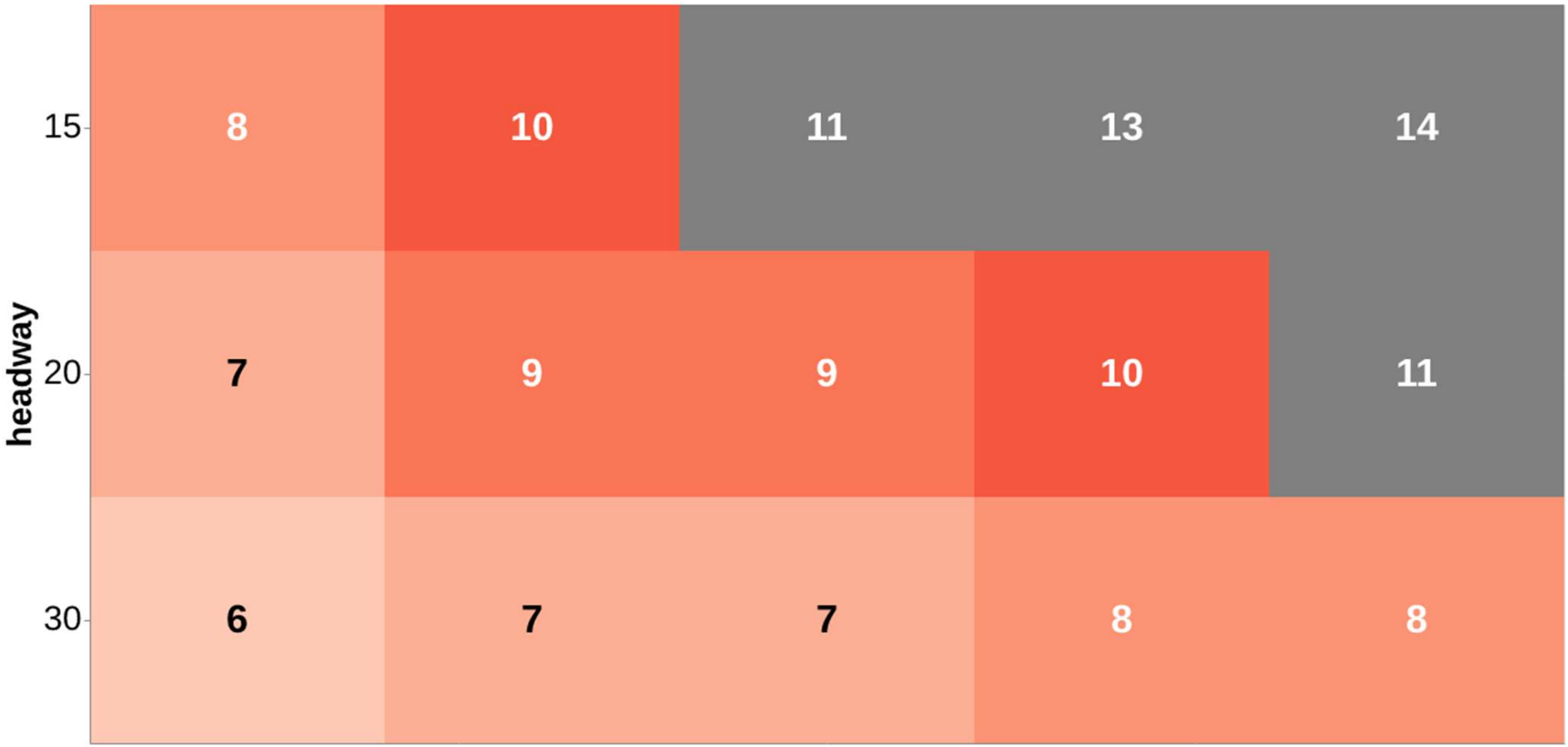
Impact of pooling for Example

Headway	**15 min**	**20 min**	**30 min**
Base trains	34	28	22
Pooling trains	33	27	20

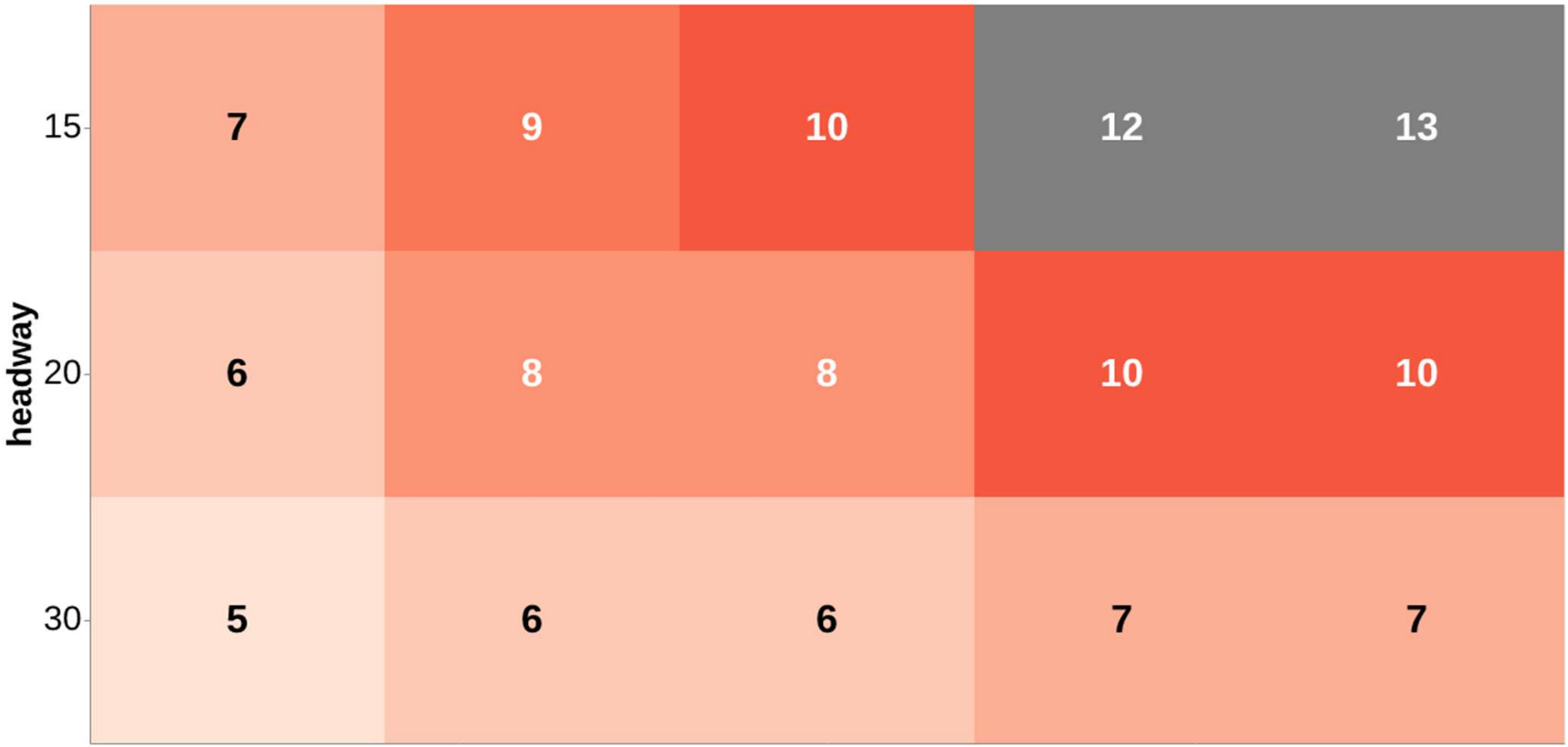
Modified Scenarios

Scenario	Point-to-point reduction	Turnaround reduction
Base	None	None
Scenario 1	10%	20%
Scenario 2	20%	40%

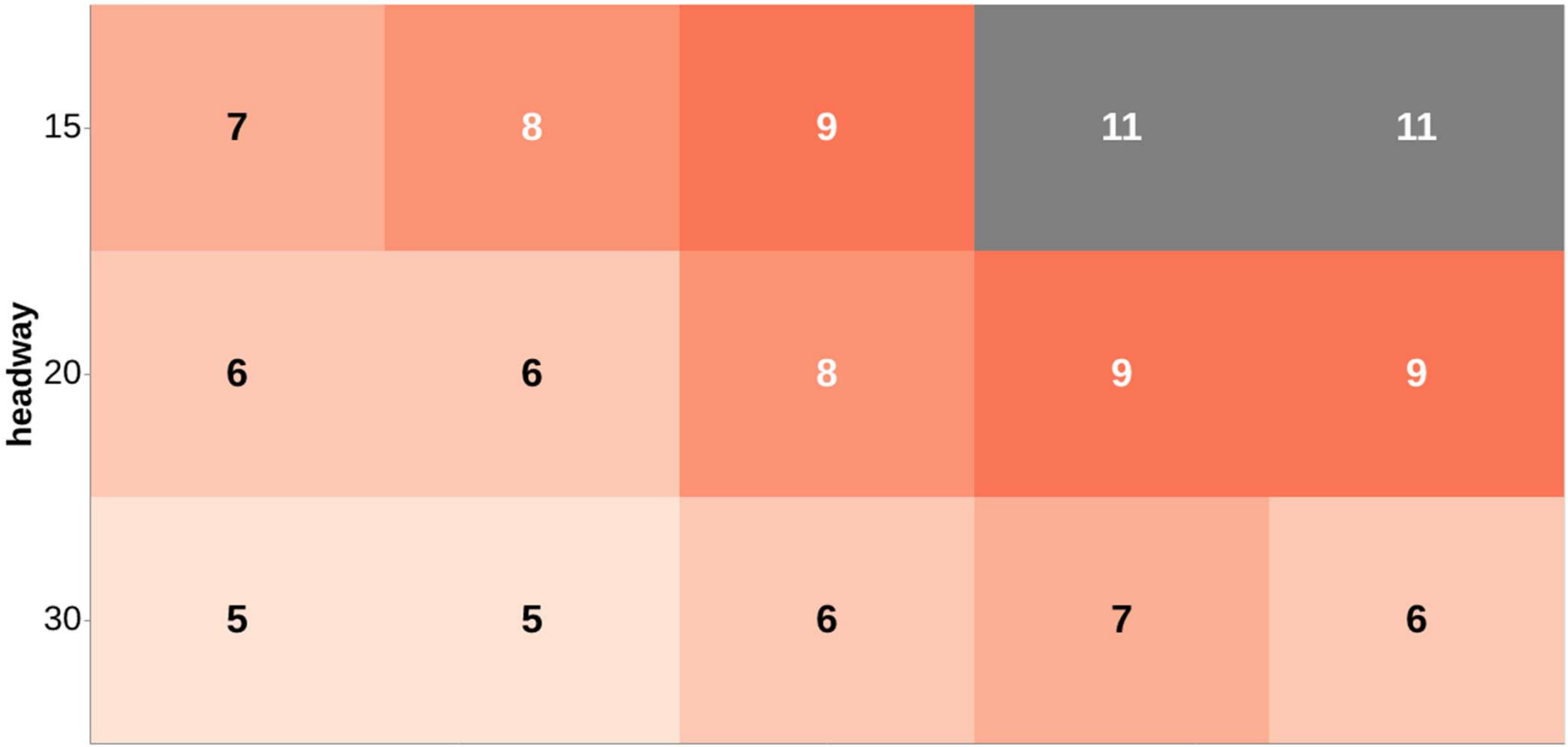
UP-N: Base



UP-N: Scenario 1



UP-N: Scenario 2



3 Demand Side

Regional Rail Score

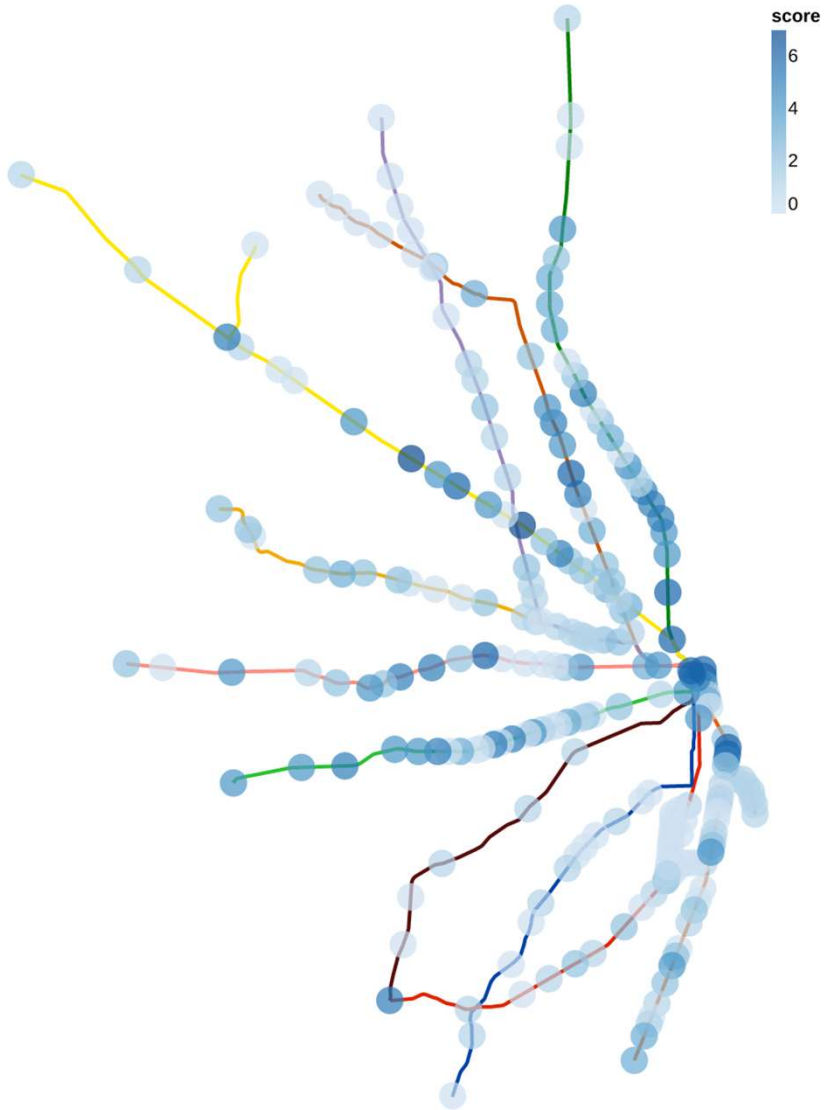
Regional rail indicators for the score:

- Total ridership
- Proportional growth in ridership
- Ratio of off-peak to peak ridership
- AM peak outbound boardings
- AM peak alightings
- Mid-day boardings and alightings
- PM peak boardings

Regional Rail Score

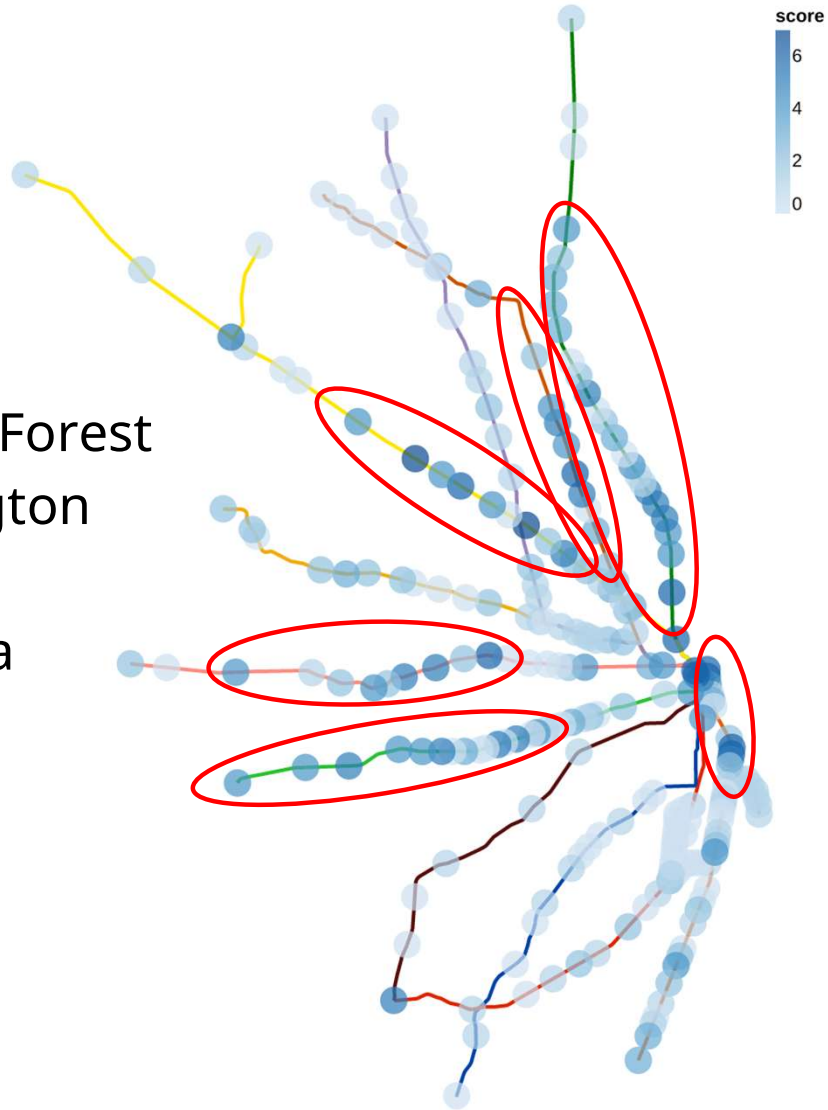
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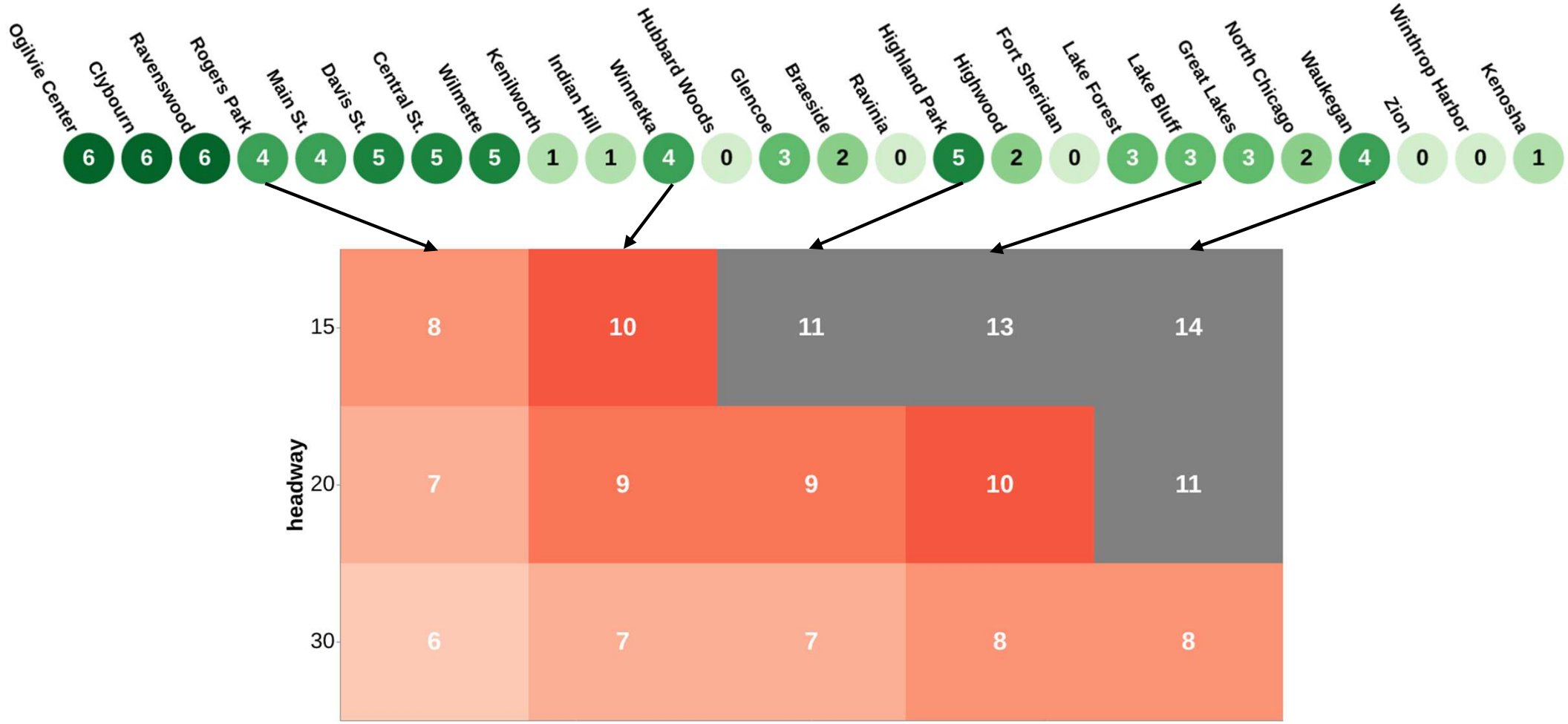


Strong regional corridors

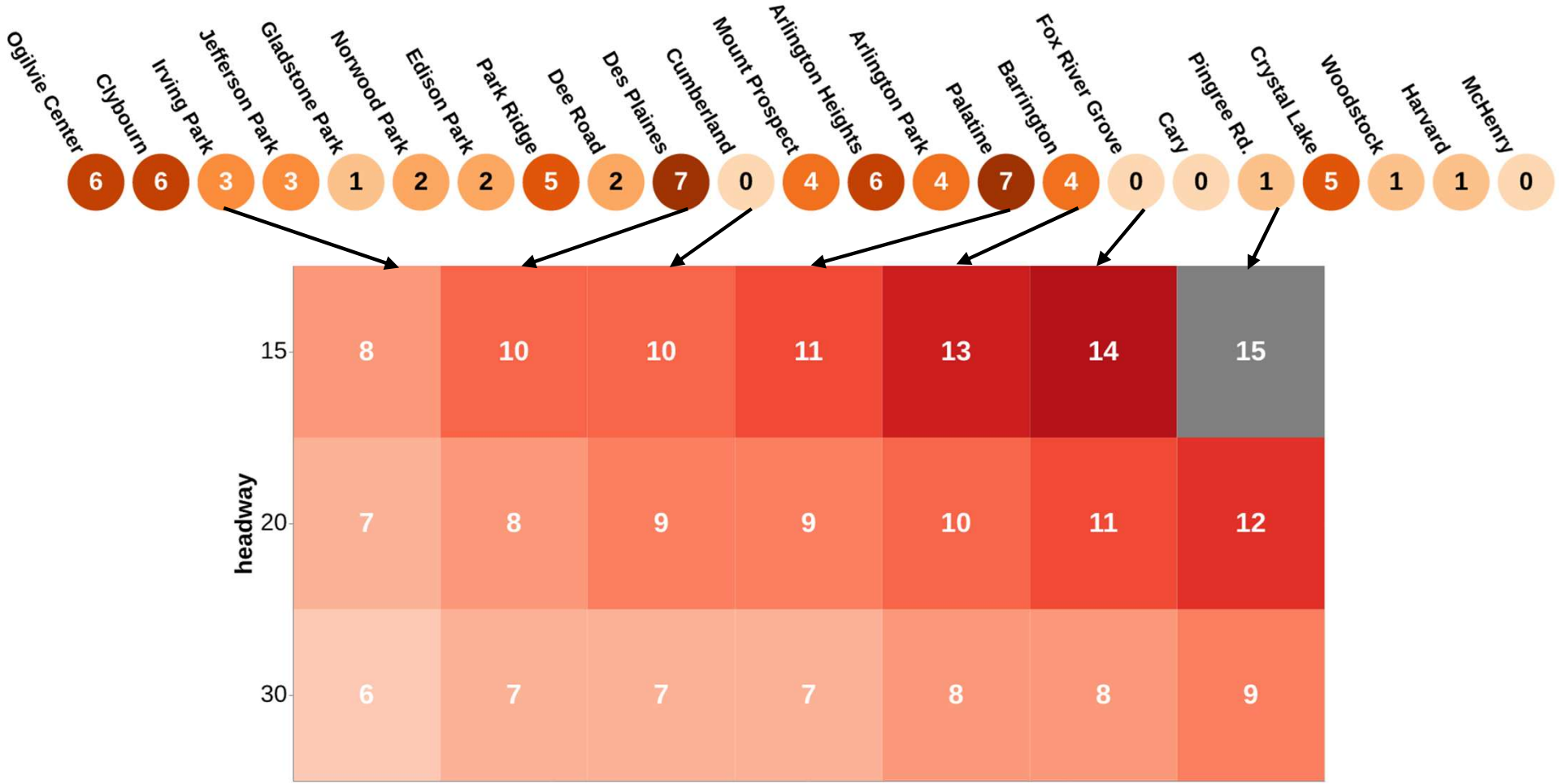
- Most of downtown
- Most of UP-N
- MD-N from Morton Grove to Lake Forest
- UP-NW from Park Ridge to Barrington
- UP-W from Elmhurst to Geneva
- BNSF from LaGrange Rd. to Aurora
- ME from Millenium to 59th St.



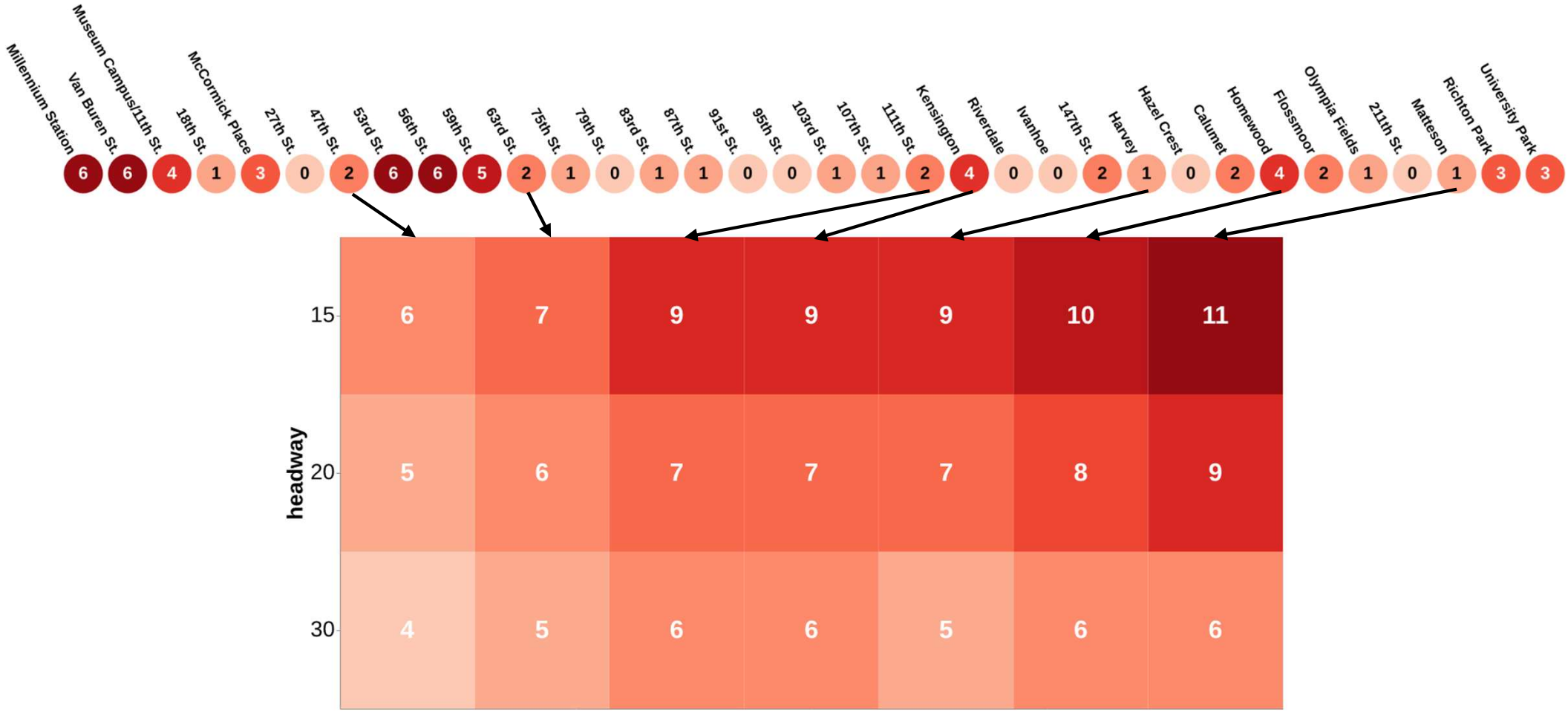
UP-N revisited



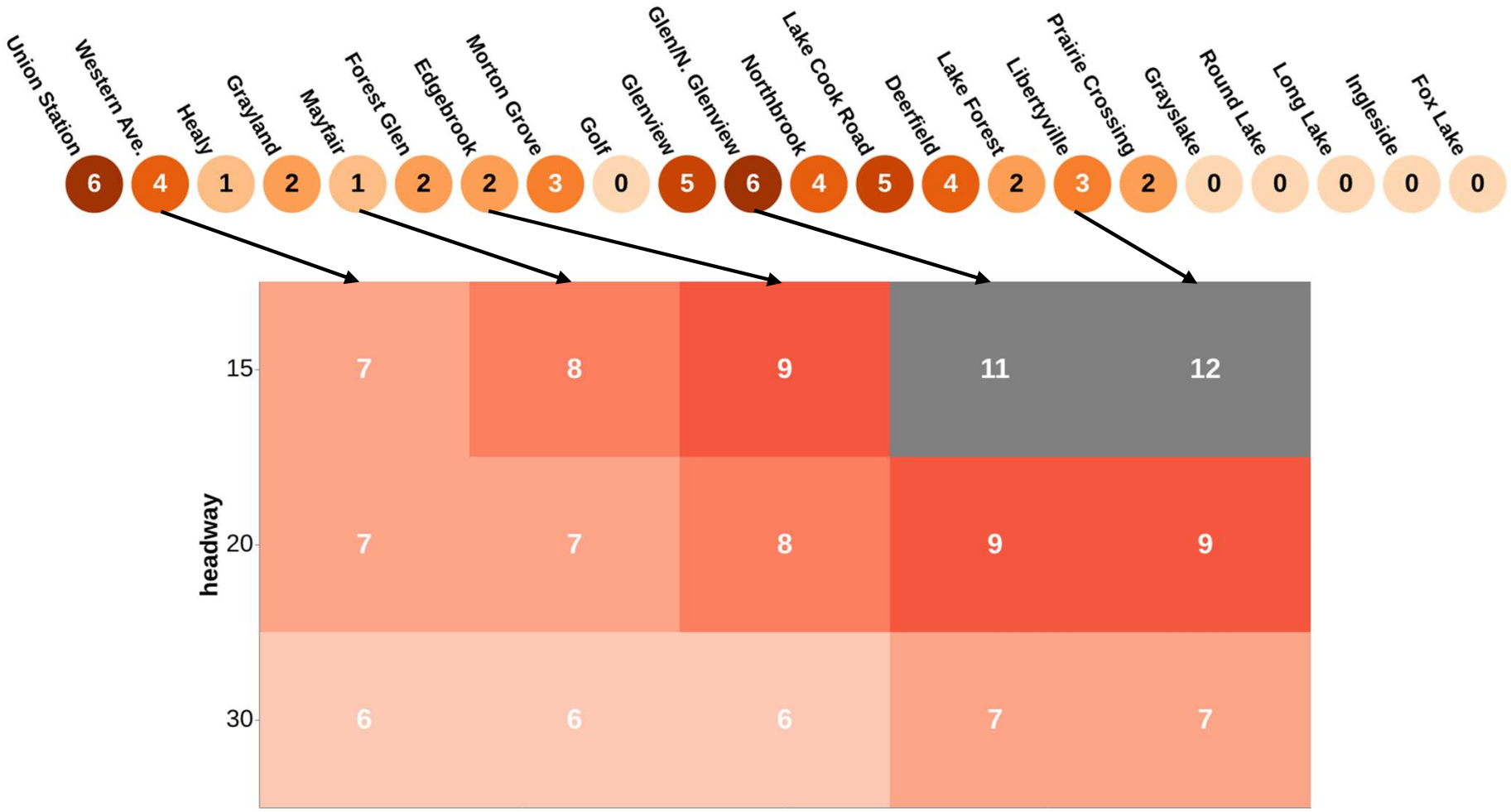
UP-NW revisited



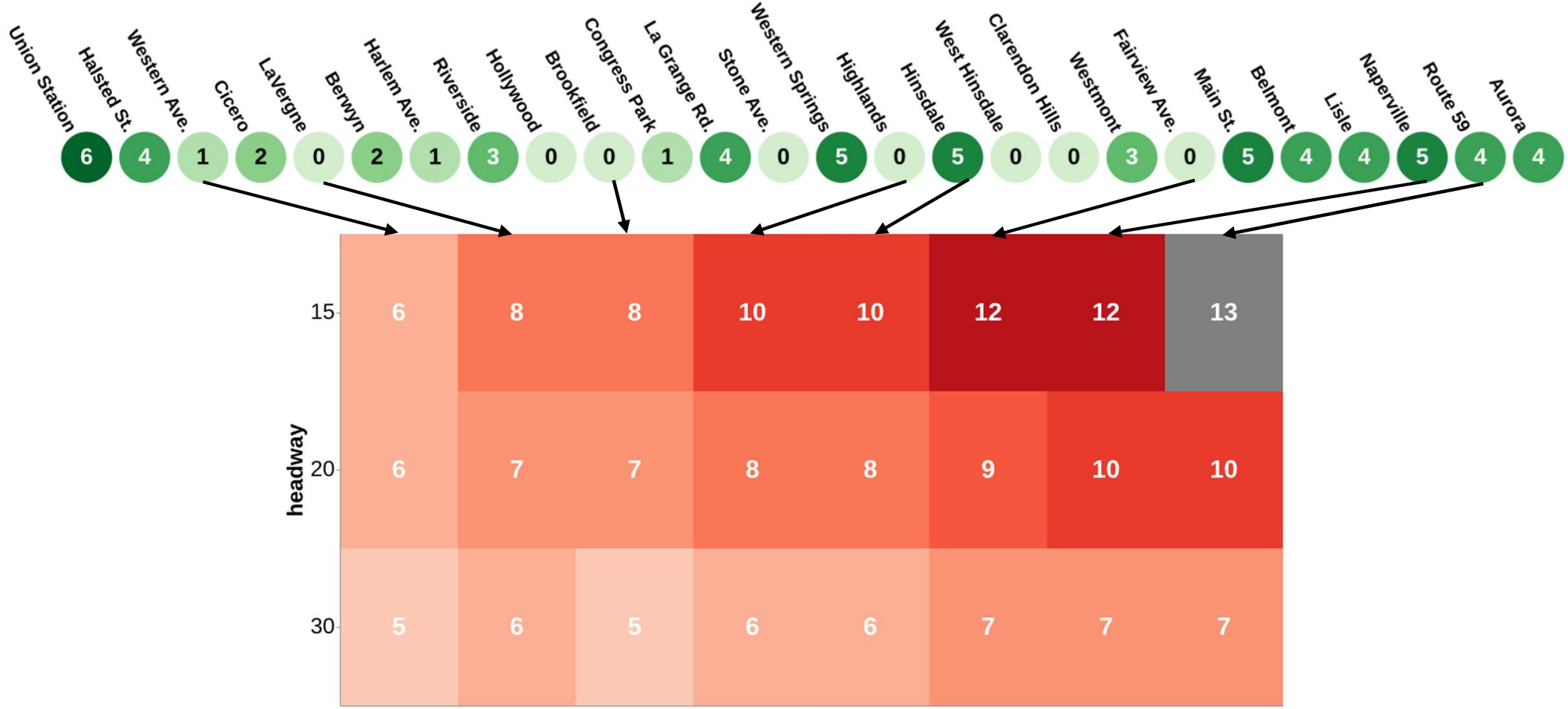
ME (Main branch) revisited



MD-N revisited



BNSF revisited



Key Takeaways

Supply side

- Assuming mid-day train availability is 80% of peak availability, most Metra lines have many feasible scenarios

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- The main advantage of pooling is reducing excess downtime, and pooling has the greatest impact for 30-minute headway regional service

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- Assuming mid-day train availability is 80% of peak availability, most Metra lines have many feasible scenarios
- Certain stations along the lines serve as supply-side boundaries for regional operation at all possible headways
- The main advantage of pooling is reducing excess downtime, and pooling has the greatest impact for 30-minute headway regional service
- Modified scenarios show potential for cost reduction and regional service expansion with trainset or infrastructure improvements

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Demand side

- Certain corridors of high-scoring stations seem to have strongest potential for regional rail
- As with supply side, HC, NCS, and SWS are overall the weakest routes

Questions