Austrics

Electric Vehicle Functionality

Phase 1 & 2

TABLE OF CONTENTS

Contents

Introduction

Austrics 22.1 includes both phase 1 & 2 of our new Electric Vehicle functionality. It gives users the ability to flag Vehicle Classes as a specific fuel type, create charging activities for vehicles while back in Depot or Garage and generates an EV report of these Vehicle Schedules.

It also includes the updated matcru & ralab optimisation programs which now have the ability to create charging activities automatically. These charging activities are created using a couple of basic vehicle and recharge constraints. We will continue to further develop additional parameters around state of charge and other EV scheduling needs in phase 3a and beyond.

Please find throughout the document further details on how this is controlled.

Phase 1 – Manual creation of charging activities

Creating Electric Vehicle Classes

1. Open Vehicle Class edit window in the Trip Editor under 'Edit – Edit vehicle classes'

2. Select the required 'Vehicle Class'

3. Flag the 'Fuel Type' as 'Electric'

   a. There is now the option to flag the Vehicle class as any of the following:

      i. Any

      ii. Petrol

      iii. Diesel

      iv. Hydrogen

      v. Electric

      vi. Natural Gas

      vii. Hybrid

Creating Charging Activities

The Vehicle Class interface allows the user to flag a refuel time for each Vehicle Class. This in turn allows the user to create charging activities with this default recharge time back at Depot or Garage.

Please find the steps below:

1. Select the required Vehicle Class
2. Add the default recharge time in the 'Refuel minutes' field highlighted below

3. Once the Vehicle Class is flagged as 'Electric' and it has a default 'Refuel minutes' value set the charging activities can be created
4. Open the required Vehicle Schedule in the Trip Editor
5. Open the 'Runs' view
6. Select the required block of work which the Charging activity needs to be created after

7. Right click and select 'Add Refuel Activity to Block'
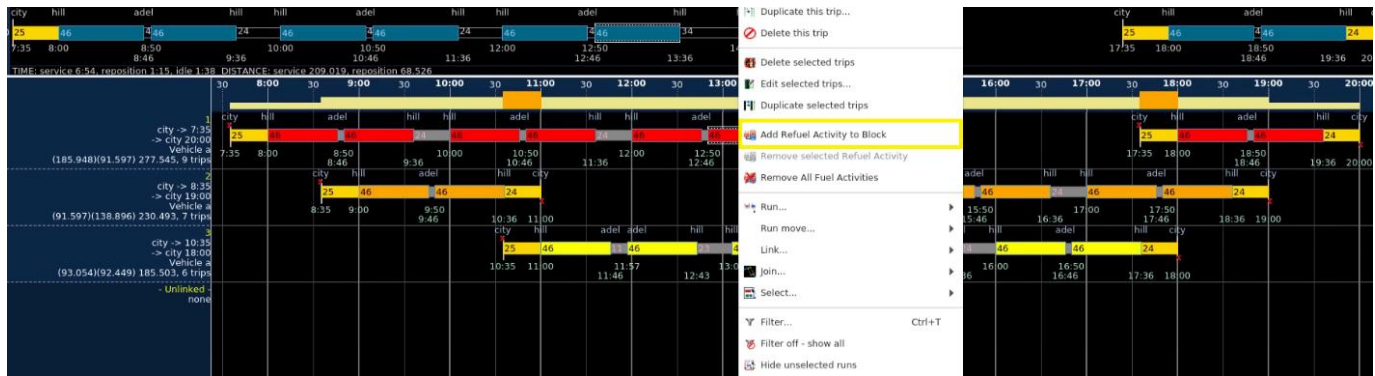
8. The charging activity will then appear after the selected block of work. It will be created for the default number of minutes applied in the Vehicle Class.
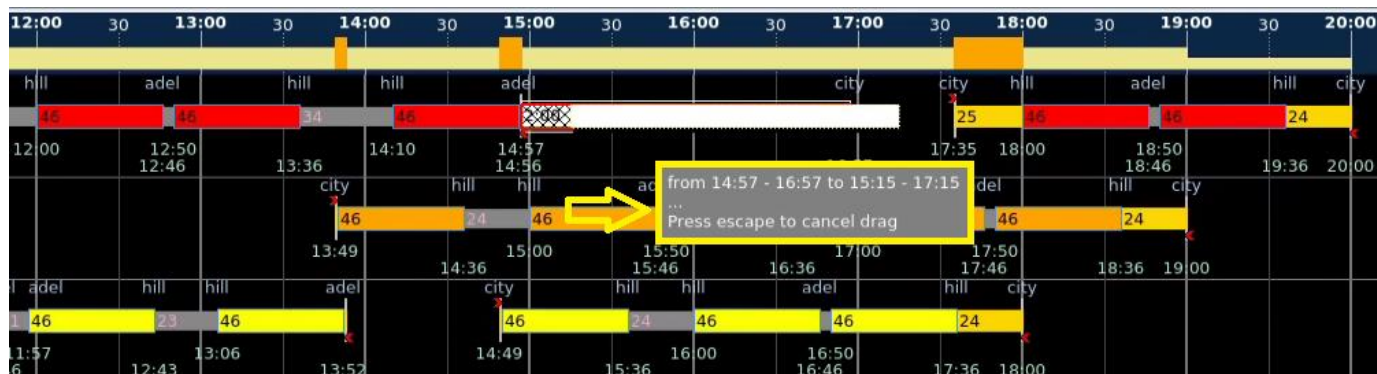
Editing Charging Activity

If the user needs to edit a charging activity there are the below options:
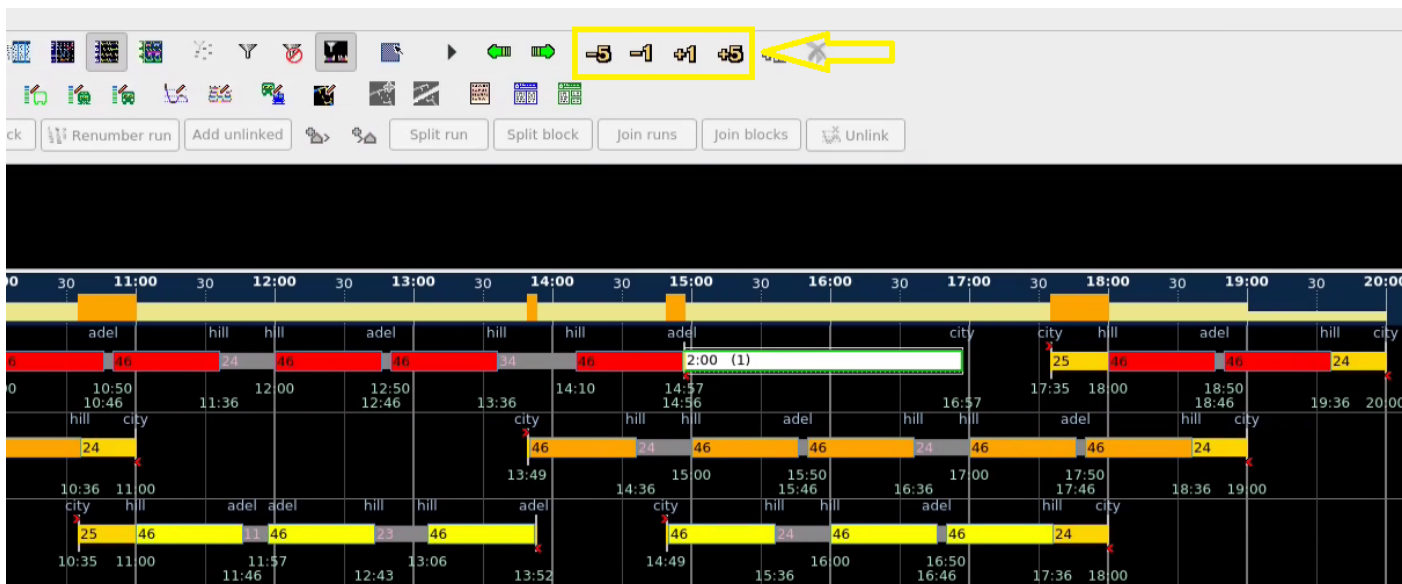
Drag and drop activity to the required time

1. Hold left click and use the mouse to drag and drop the activity
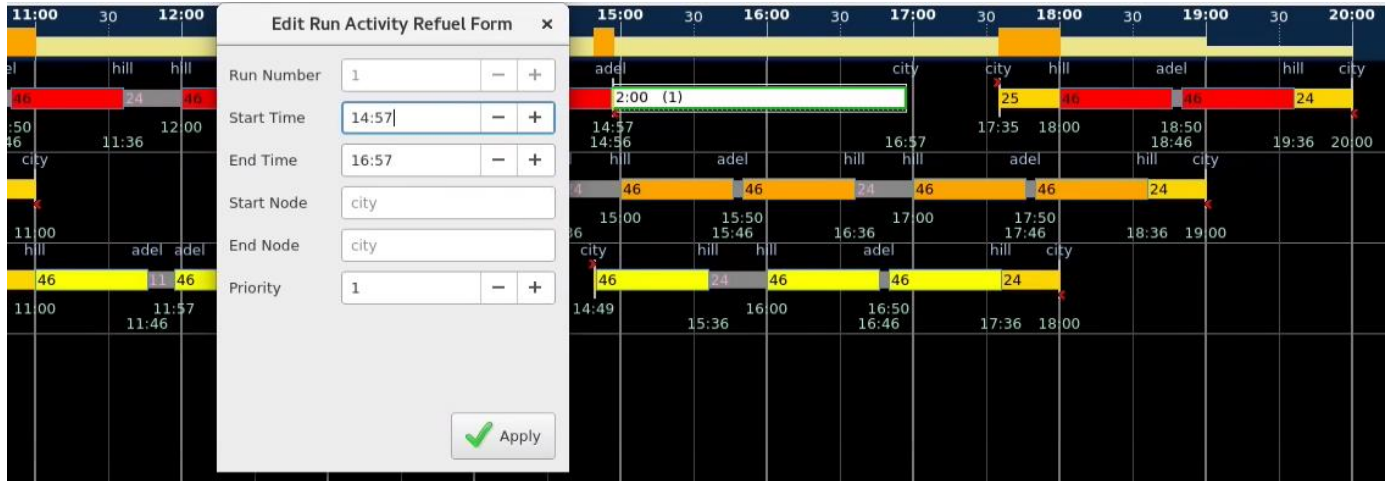

Plus and minus

1. Plus and minus the activity by 1 or 5 minutes using the Trip Editor interface

Edit interface

1. Double click on the required activity and it will open the edit window
   a. User then has the ability to adjust the start and end time
   b. User can also add a priority value to the activity for Depot/Garage staff
      i. Default value is 1

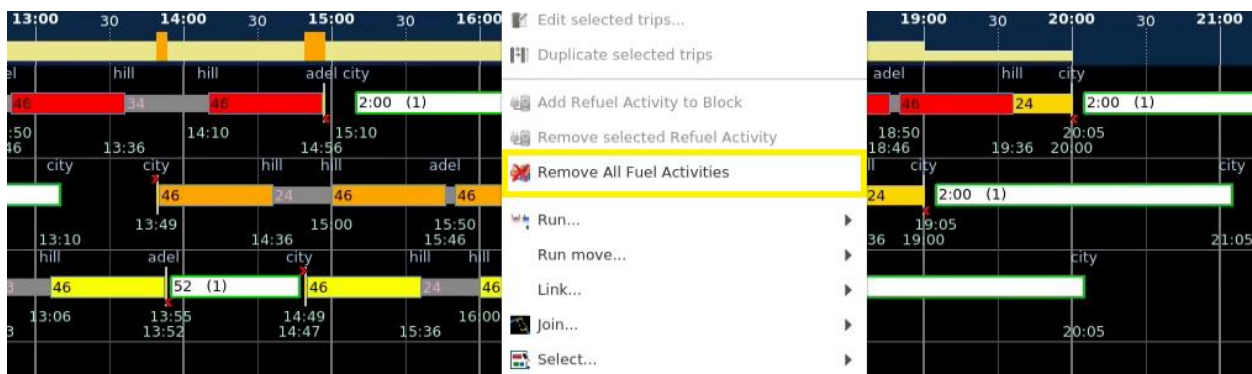# Removing Charging Activities

Remove individual charging activity:

1. Select the required charging activity
2. Right click – 'Remove selected Refuel Activity'
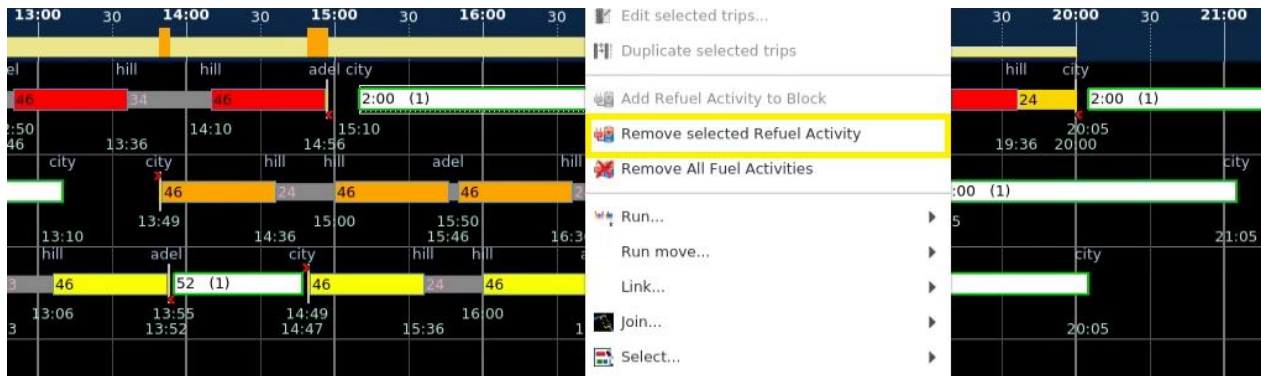
Remove all charging activities:

1. Right click in the Runs view of the Trip Editor
2. Select 'Remove All Fuel Activities'
   a. This will remove all Refuel Activities from the open Vehicle Schedule
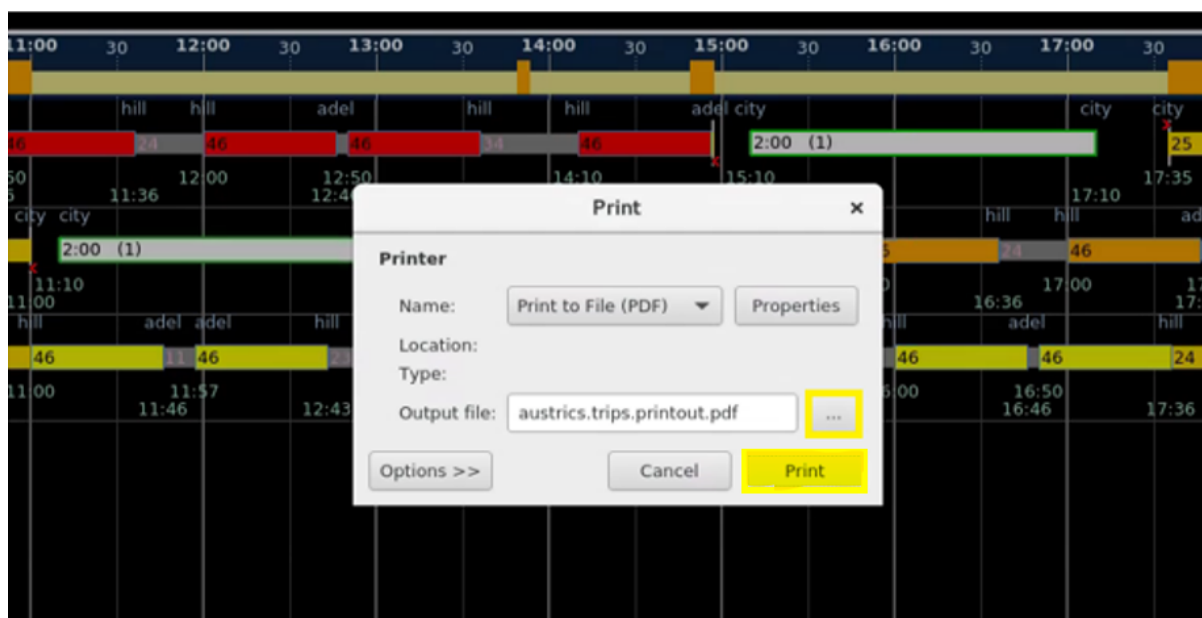
Reporting – EV Charge Report

Once the charging activities are created there is a Departure and Arrivals report which displays the details of the blocks of work along with the charging activities. This can then be used to validate the runs as well as passed along to Depot or Garage staff to use on Day of Operation.

Please find below the steps on creating the output:

1. Open the required Vehicle Schedule in the Trip Editor
2. Select 'Reports – EV Charge Report' on the menu
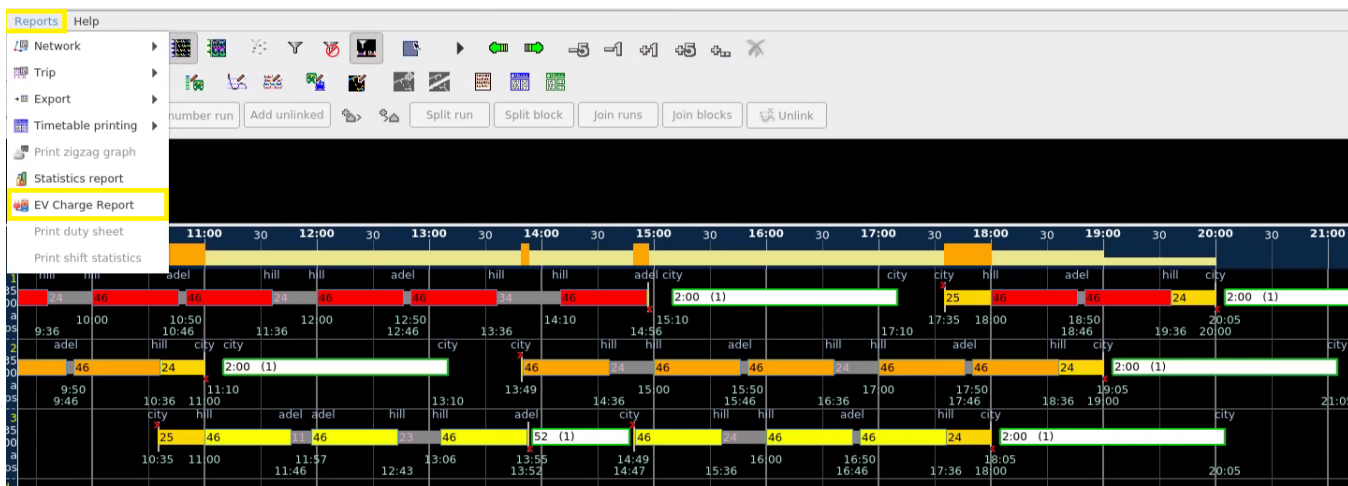
3. The below interface will then appear. Please select '…' as this will allow you to select the folder you want the output to be saved to.

4. Once the user has selected the folder for the output to be saved to, select 'Print' to build the output.

5. Output will then be created as seen below in a PDF format.

EV Charge Report - Days (-m-----)

Run	Depot	Depart Time	Arrive Time	In Traffic (Mins)	In Traffic (Distance)	Charging Activity	Charging Time (Mins)	Charging Priority
1	City Depot	7:35	14:57	442	185.948	15:10-17:10	120	1
	City Depot	17:35	20:00	145	91.597	20:05-22:05	120	1
Run total	-		-	**587**	**277.545**	-	**240**	-
2	City Depot	8:35	11:00	145	91.597	11:10-13:10	120	1
	City Depot	13:49	19:00	311	138.896	19:05-21:05	120	1
Run total	-	-	-	**456**	**230.493**	-	**240**	-
3	City Depot	10:35	13:53	198	93.054	13:55-14:47	52	1
	City Depot	14:49	18:00	191	92.449	18:05-20:05	120	1
Run total	-	-	-	**389**	**185.503**	-	**172**	-
Combined total	-	-	-	**1432**	**693.541**	-	**652**	-

Phase 2 - Automatic creation of charging activities

As discussed in the introduction, this release includes the updated matcru & ralab optimisation programs which can now create and allocate charging activities. These charging activities are built of some basic constraints and will be further advanced in the upcoming Phase 3a release.

These constraints are the below:

- Maximum running distance
  - In turn creates blocks of work which respect the maximum distance constraint.
- Recharge minutes (Full recharge time)
  - This time value is fixed and all charging activities created at home depot/garage in the Vehicle Schedule will be a full charge.
  - Phase 3a will improve on this and allow flexible driving and charging times respecting state of charge. In turn creating more efficient planning and scheduling results.

Please find below the steps to set up and automatically create an EV result:

1. Set the required vehicle classes as 'electric' as seen above in phase 1
   a. Add the default full recharge time in the 'Refuel minutes' field

2. Create the vehicle class max distance constraint in the matcon file
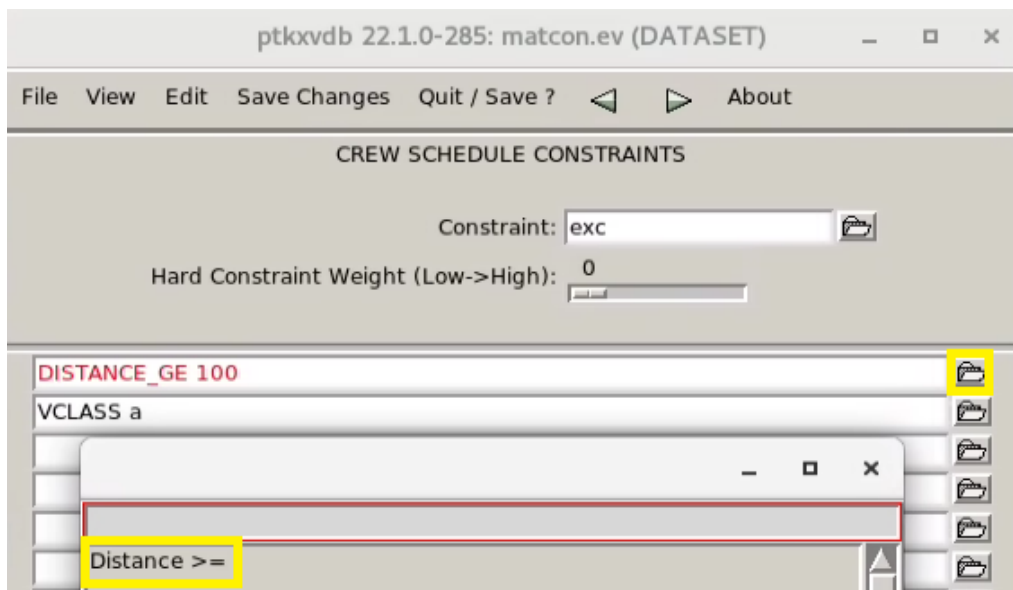   a. Format is the below:

       exc
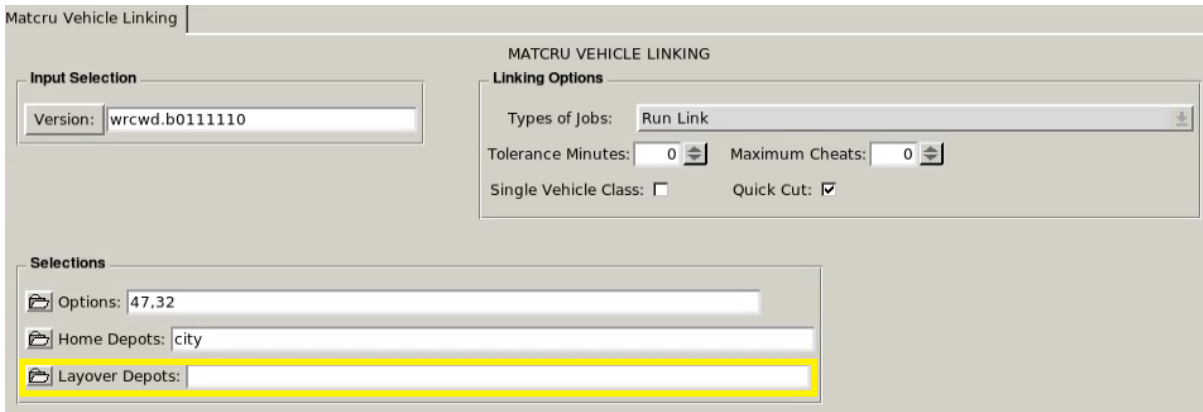   DISTANCE_GE x
       VCLASS x

    b. The below example would be 'max distance of 100KM per block for a vehicle class a'. Block is defined in phase 2 as home-depot-to-same-home-depot.
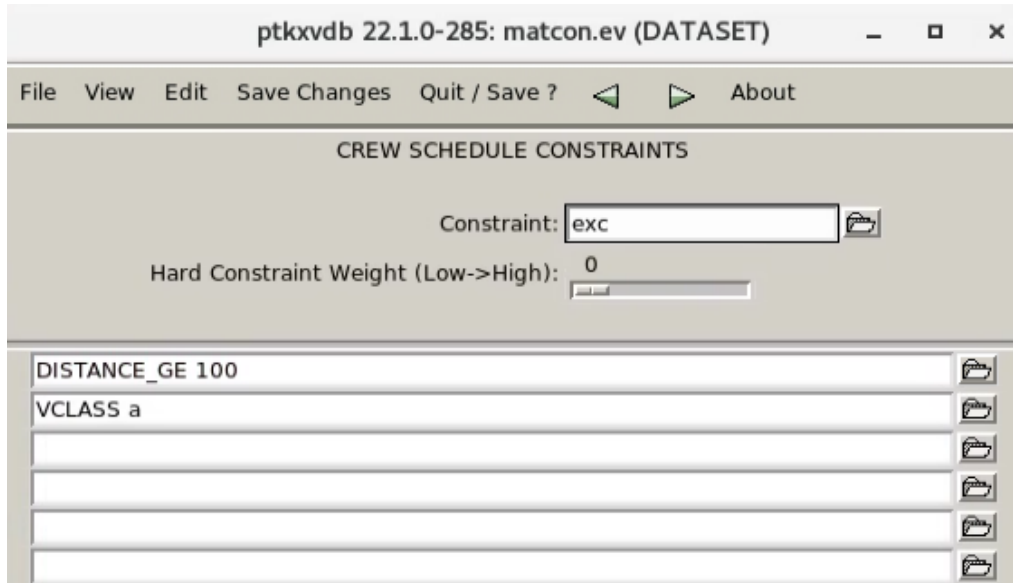
    c. This new distance constraint can be found under 'Distance >=' in the drop down menu

3. Run the fleet optimisation as per usual under 'Fleet – Fleet optimisation'
    a. You will notice there is now new 'Layover' depot functionality in this interface. This is due to the Ralab optimisation program being reintroduced as part of the Fleet optimisation. Ralab does not replace matcru, it works in tandem with matcru to assist with the layover depot optimisation.
    b. These layover depots can be used by EV vehicle blocks, however charging activities will only be assigned at Home Depots in Phase 2. All blocks for EV charging allocation are currently classified as home-depot-to-same-home-depot.
    c. Layover Depots do not have to be used and can be left blank if this is not an option.

    d. Once the fleet optimisation is ran, any vehicle classes which have the below minimum details will include charging activities in the runs:
        i. Vehicle class set as electric in the vclass file
        ii. Max distance constraint set in the matcon file

Please find below a mock electric Vehicle Schedule result produced from the phase 2 optimisation:
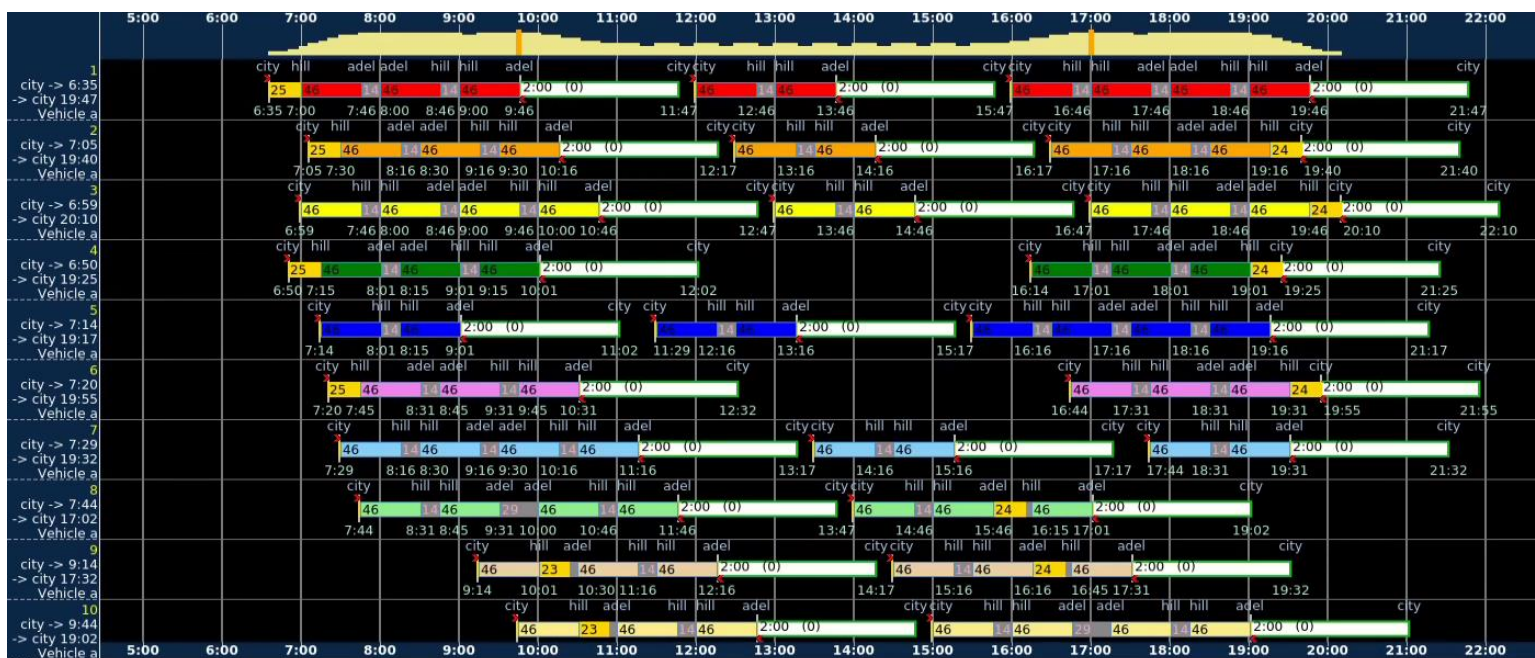
4. Shift Optimisation – Schedule Data Creation
    a. There is now a new 'Relinking' option in the Schedule Data Creation for EV.
        i. USE NON-Electric Vehicles ONLY For Relinking (Runs & Trips)
    b. This allows the 'Electric' vehicle classes to remain fixed as a runs job during the shift optimisation. The other non-electric vehicle classes in the Vehicle Schedule will be treated as a trips job.

5. Shift Optimisation
    a. Once the above Schedule Data Creation has been ran the shift optimisation can be completed as per usual under 'Crew - Shift Optimisation'