URBAN FAST CHARGING STATIONS

a design of efficient public charging infrastructure for large numbers of electric vehicles in cities

This presentation is part of the graduation project for the MSc in Civil Engineering, which has been graded with a 9.

Interested after this presentation? The research report can be downloaded from http://repository.tudelft.nl/. Feel free to contact me at pieterjan.nijhuis@gmail.com.

TU Delft Delft University of Technology

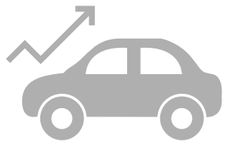
FASTNED

Pieterjan Nijhuis

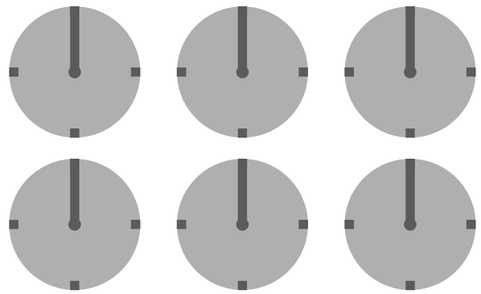
Building engineering
27 - 02 - 2015

ELECTRIC CARS ARE THE FUTURE

ELECTRIC DRIVING AND CHARGING



100 km

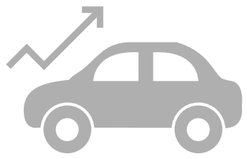


6 hours

> 500 km

2 min.

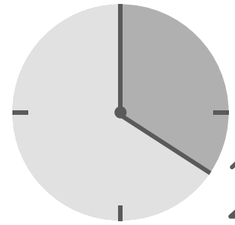
OUTLOOK 2025

	2015	2020	2025
	48.000	200.000	1 mln
	12.000	...	*250.000*

OUTLOOK 2025

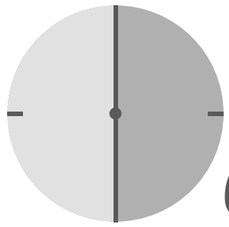
	2015	2020	2025		
	48.000	200.000	1 mln	→	1 mln
	12.000	...	*250.000*	←	2500

FAST CHARGING ALONG HIGHWAYS



20 min.

SLOW CHARGING IN CITIES



6 hours

RESEARCH QUESTION

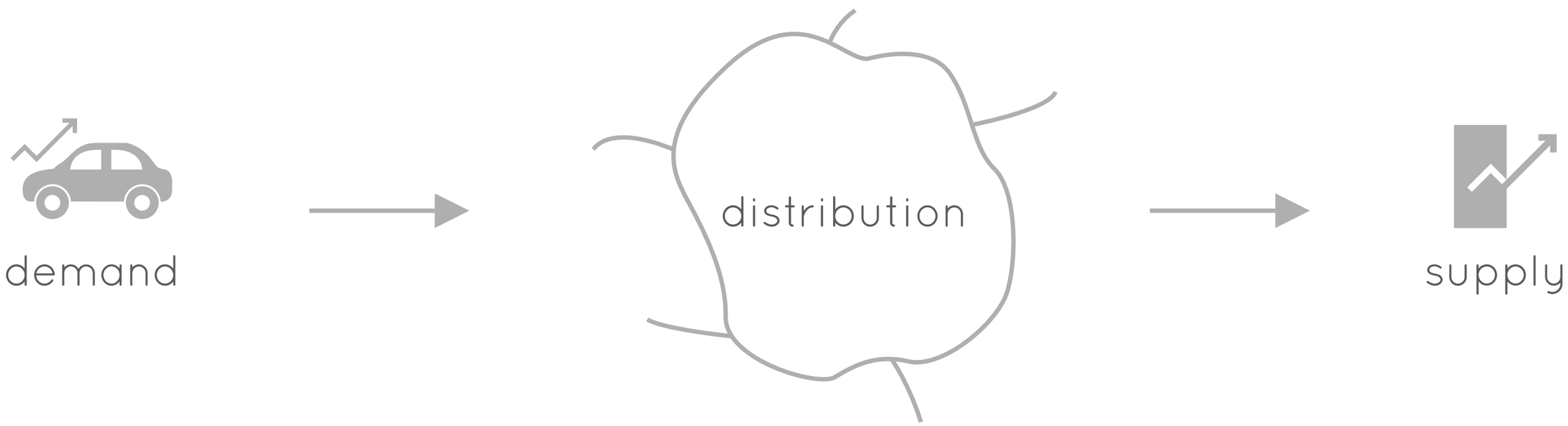
How could **urban areas** provide **public charging** infrastructure for the rapidly increasing number of electric vehicles?

OBJECTIVE

- calculation tool
- efficient solution

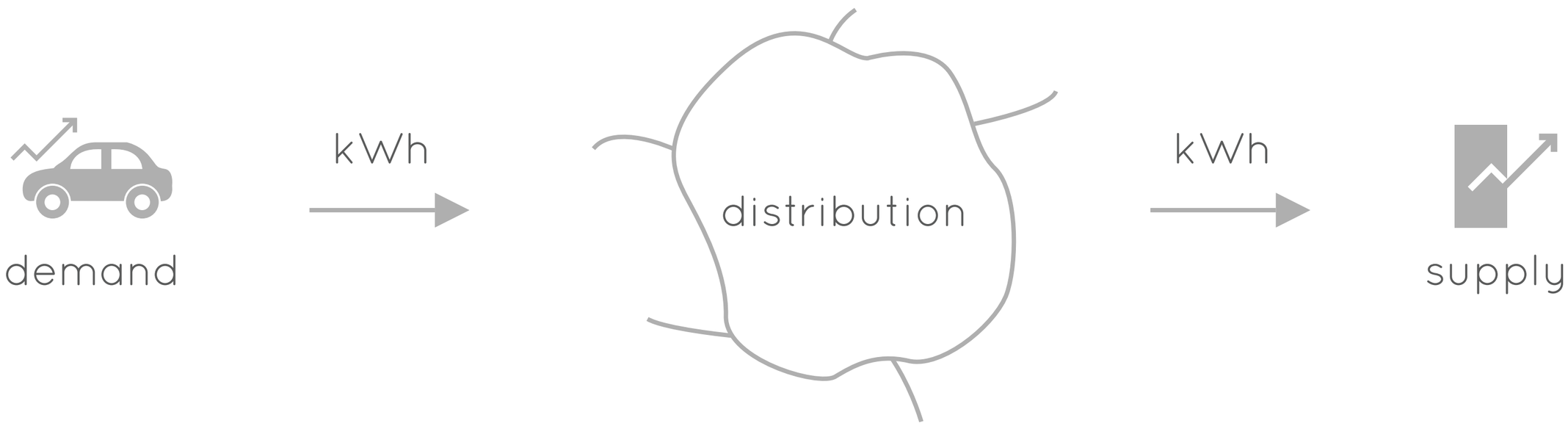
EXPLORATION

SCENARIO MODEL



urban model

THE ENERGY BALANCE



- # electric cars
- distance
- energy usage

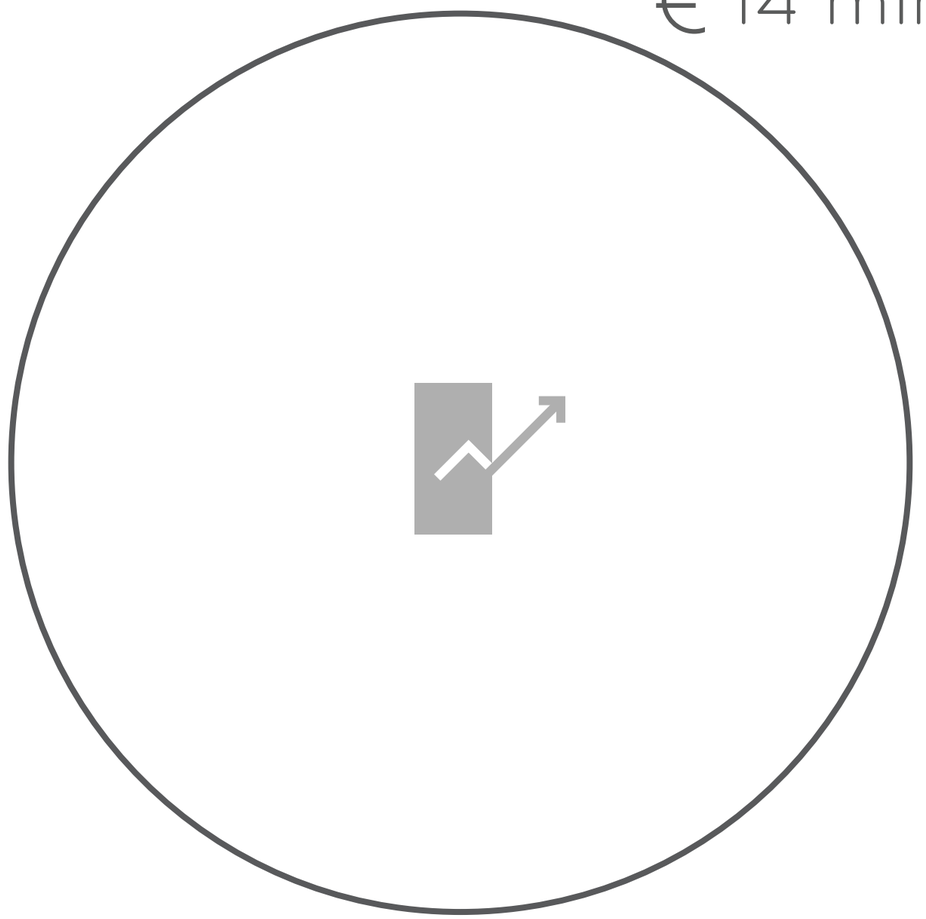
- home
- destination
- public

- # chargers
- charge rate
- utilization

SCENARIO MODEL

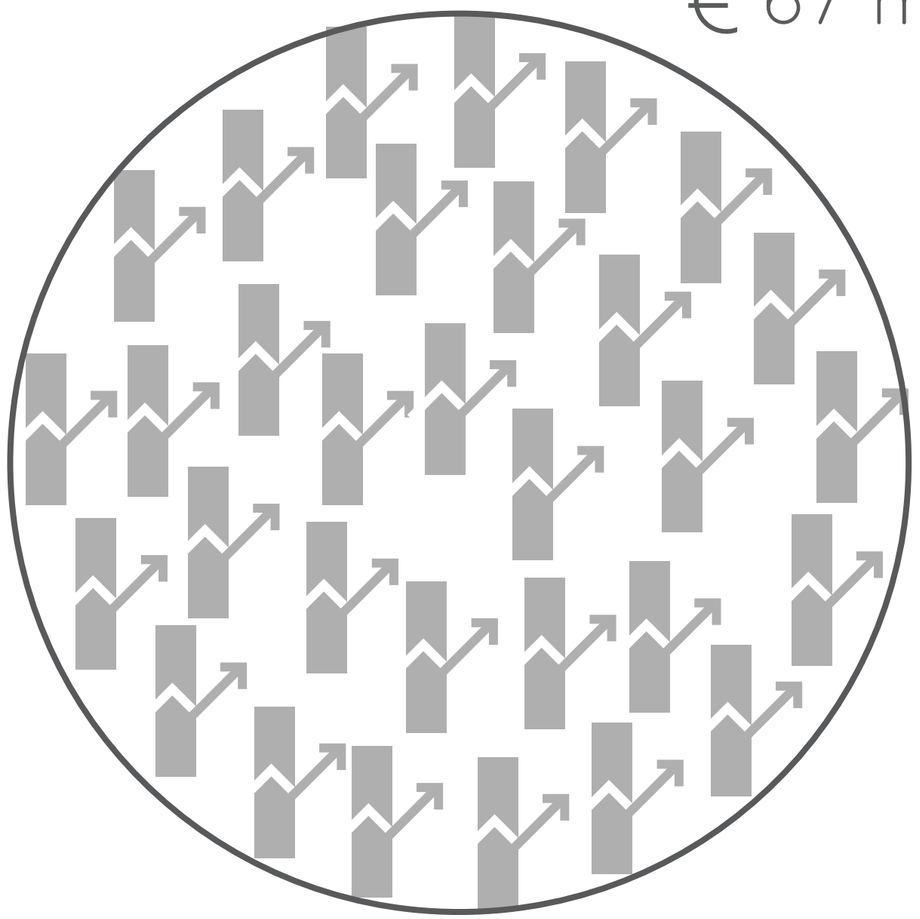
EFFICIENT SOLUTION: FAST CHARGERS

€ 14 mln



280 fast chargers

€ 67 mln



8500 slow chargers

DESIGN

STARTING PRINCIPLES

large network

city locations

sustainability

I

industrial

F

flexible

D

demountable

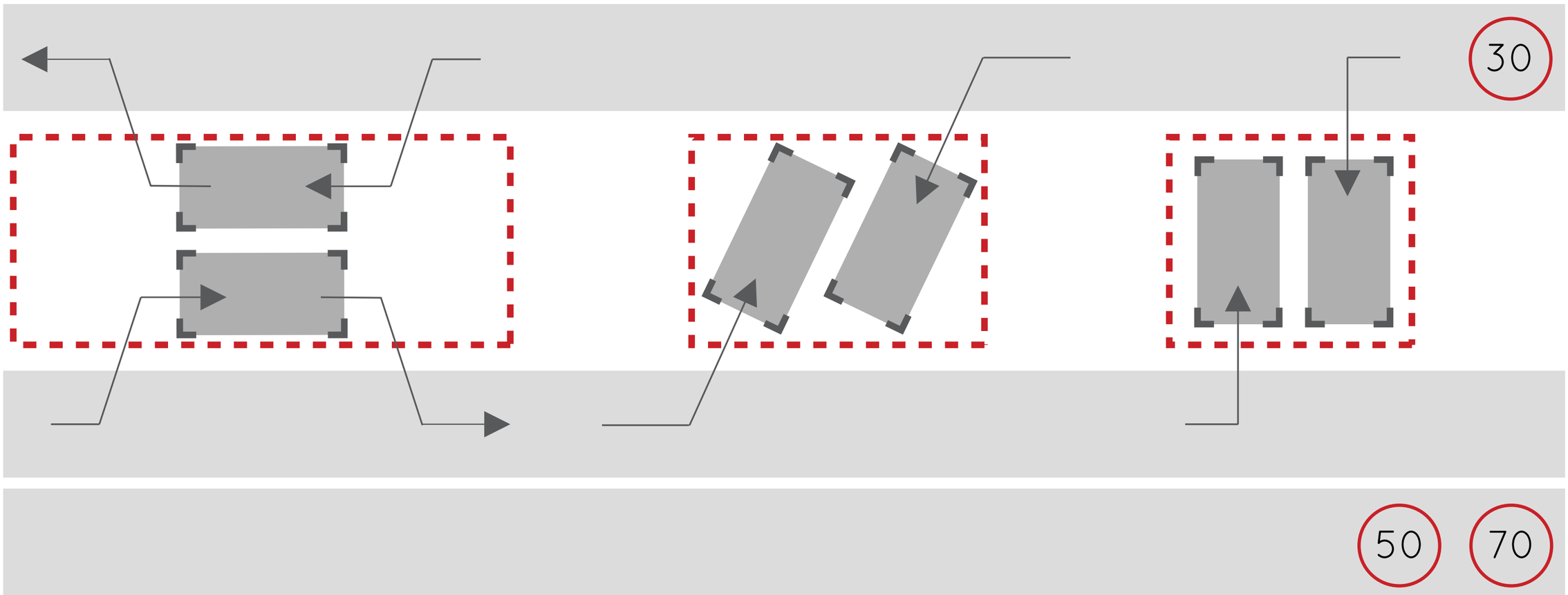
[Habraken, 2003; Crone, 2007]

VARIOUS CITY LOCATIONS

ring location

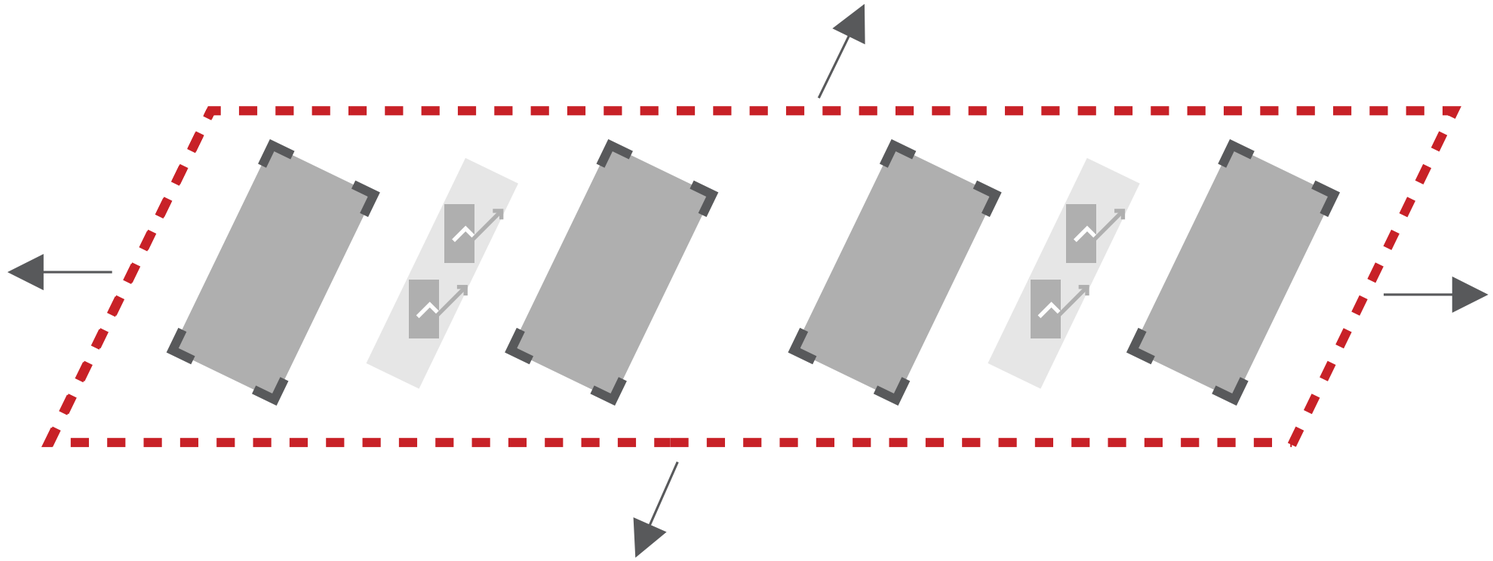
city location

LIMITED SPACE IN THE CITY



three parking configurations

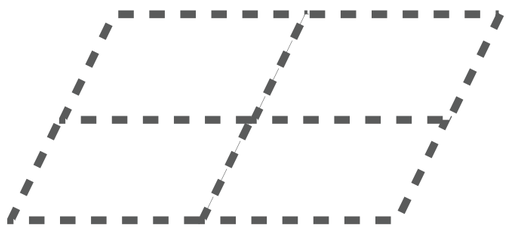
FLEXIBLE MODULES



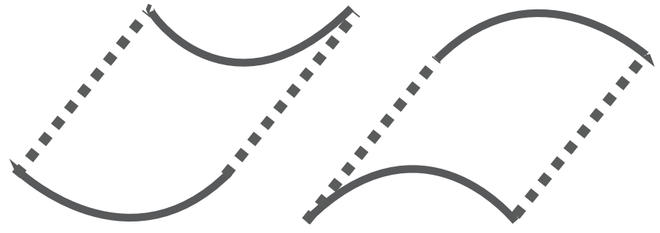
one basic station that can be expanded

A FLEXIBLE LOCATION DESIGN

A MODULAR STATION

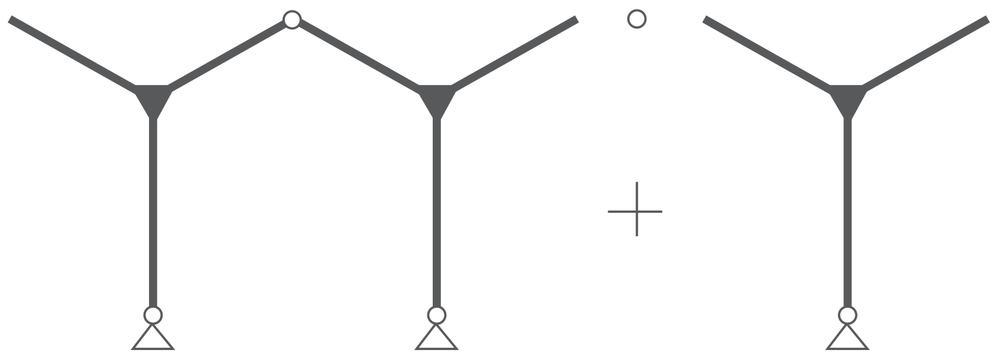


top roof shape



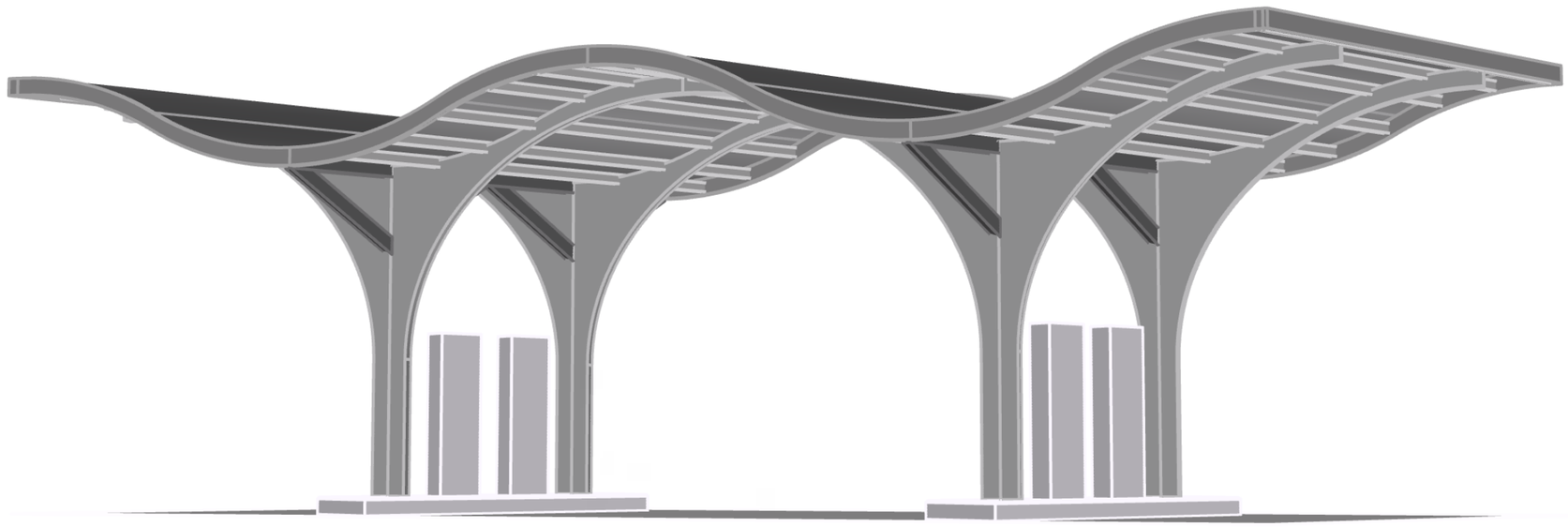
curved roof shapes

repeating shape



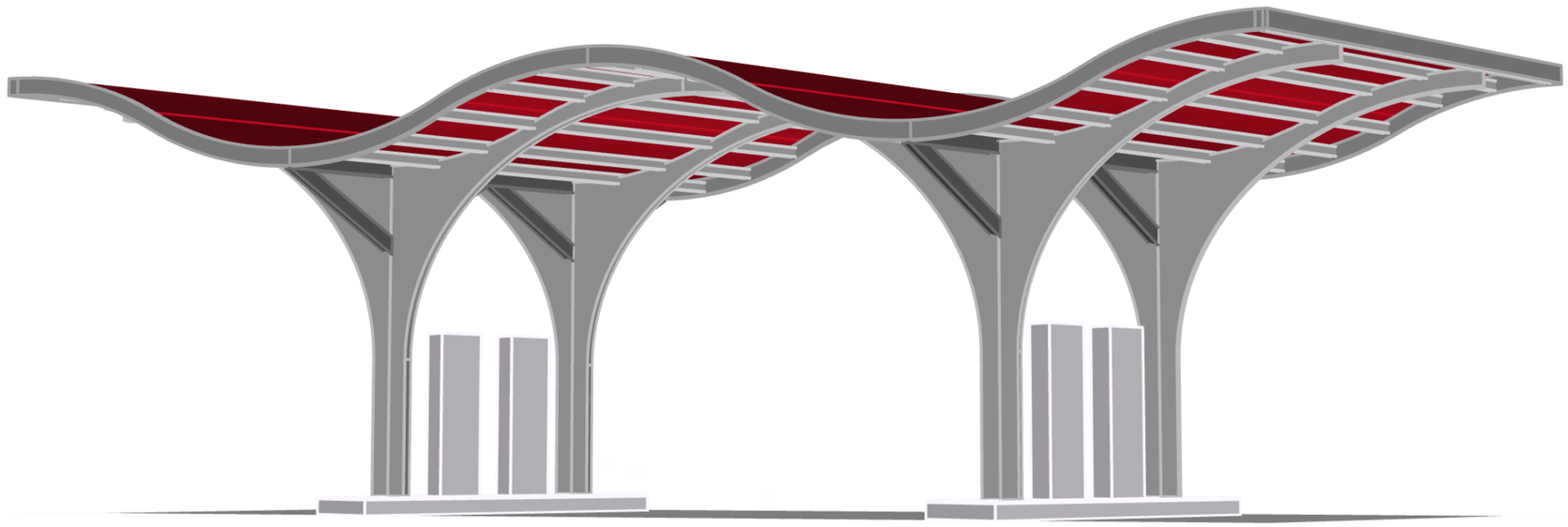
interconnected columns

A MODULAR STATION



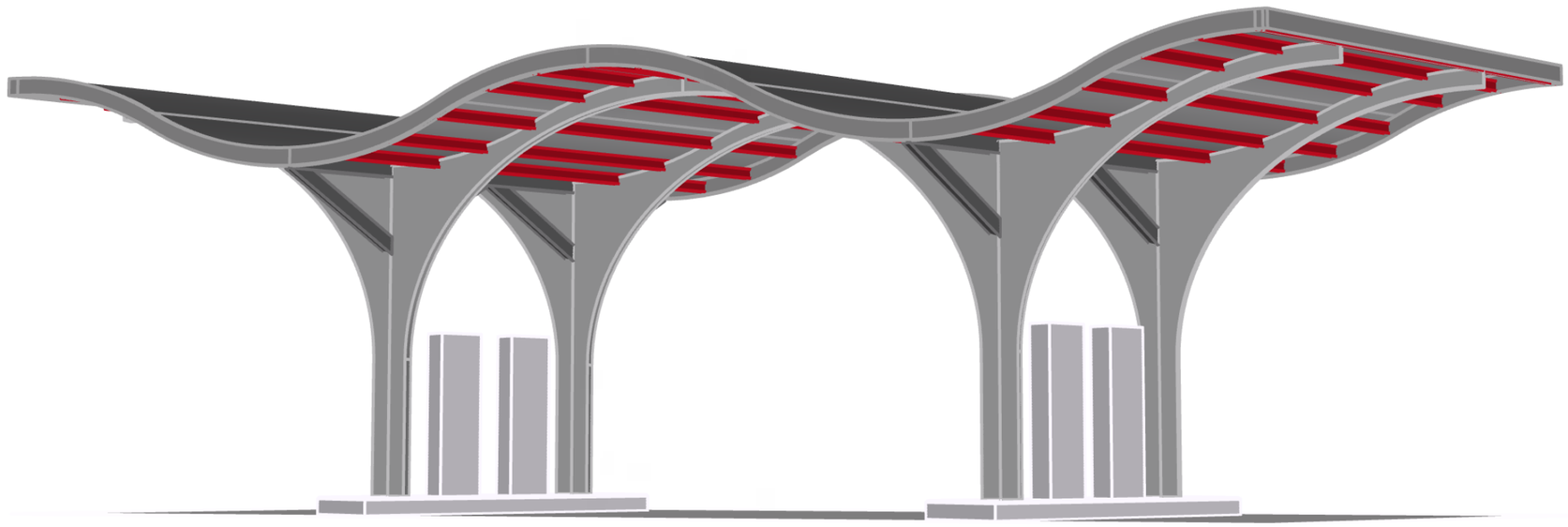
minimized number of different elements

A MODULAR STATION



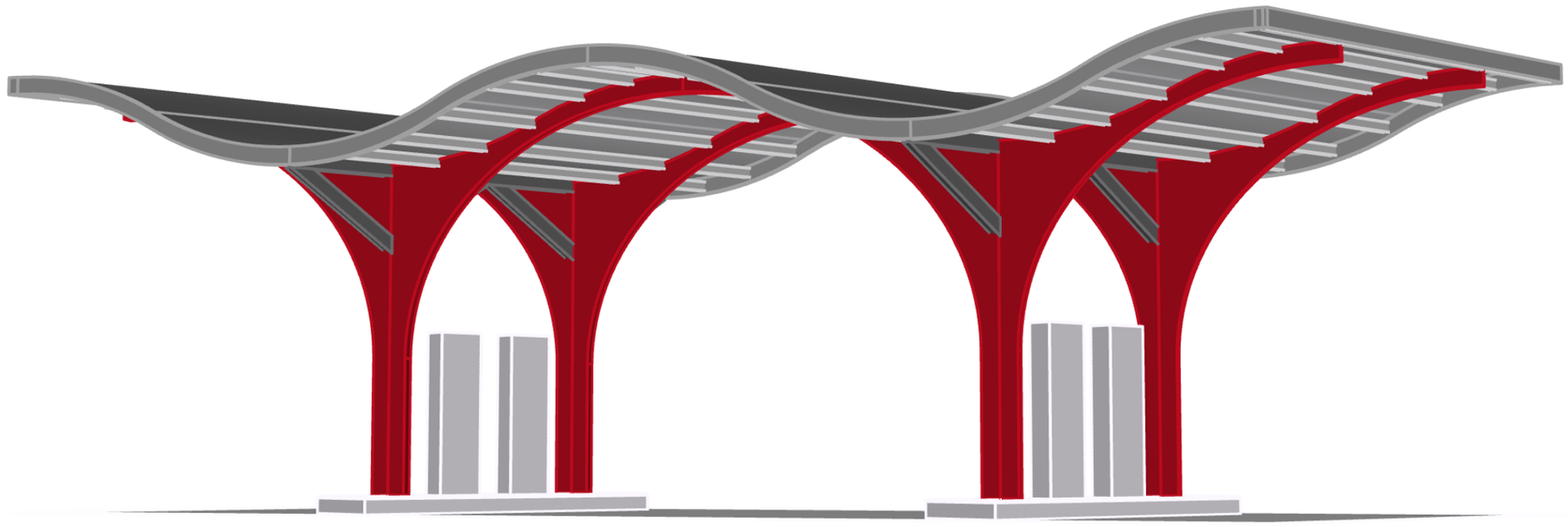
identical solar glass panels

A MODULAR STATION



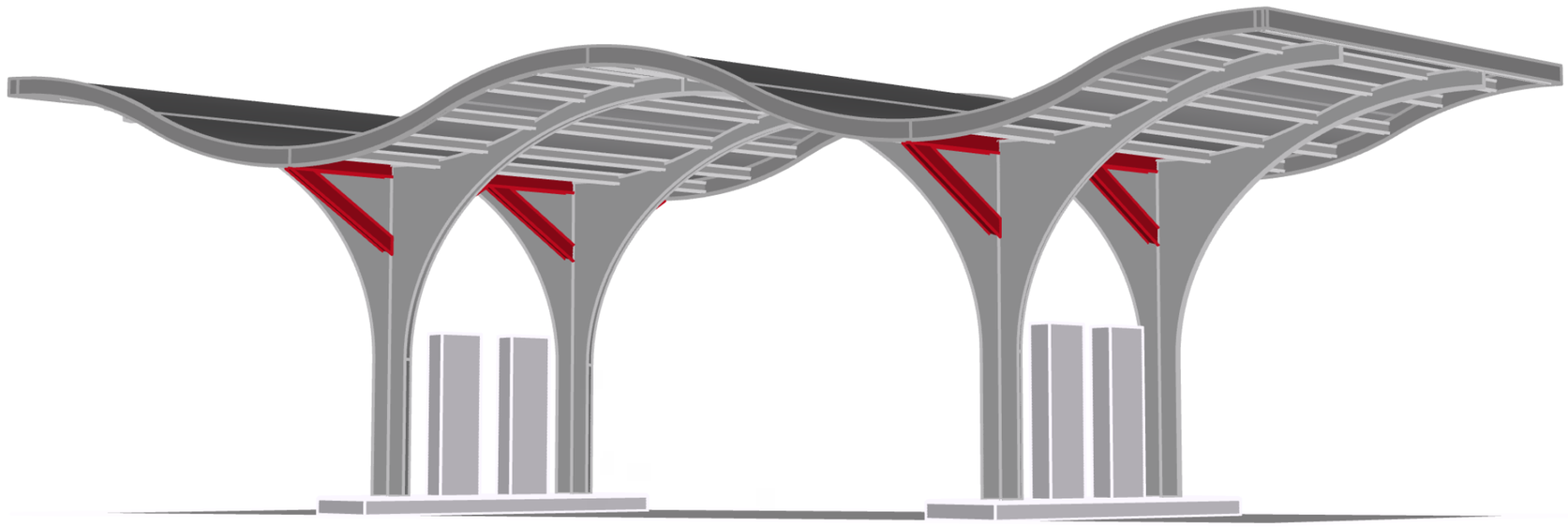
timber iroko purlins

A MODULAR STATION



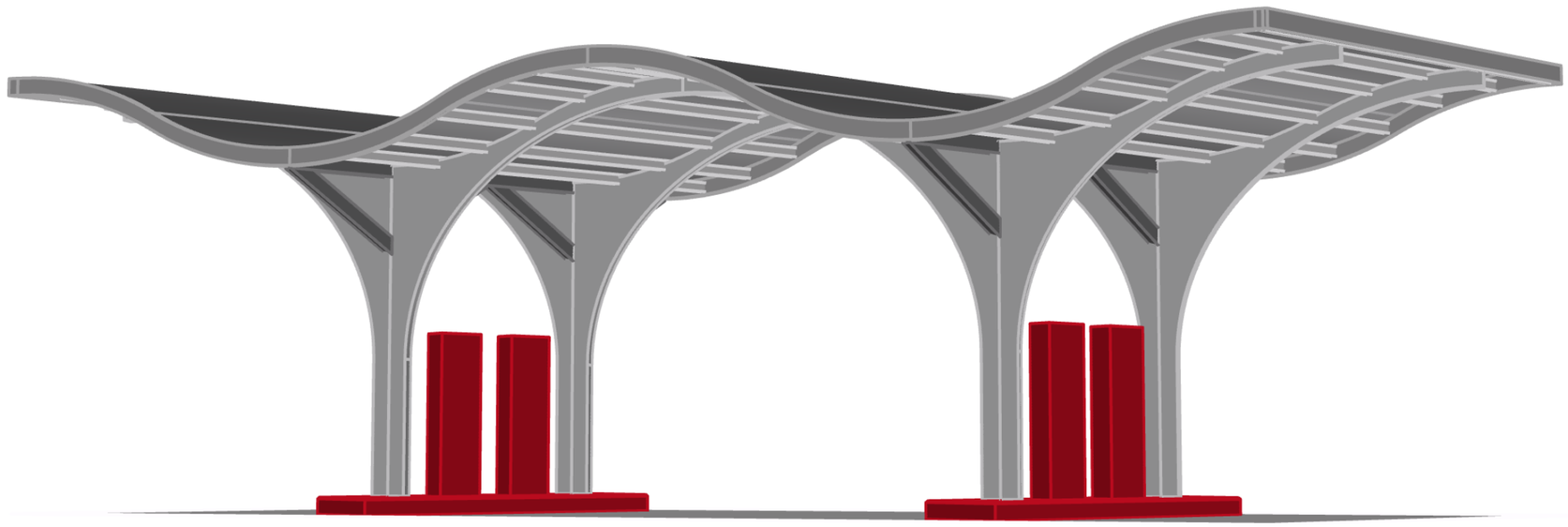
8 timber iroko trusses

A MODULAR STATION



timber bracings for stability

A MODULAR STATION

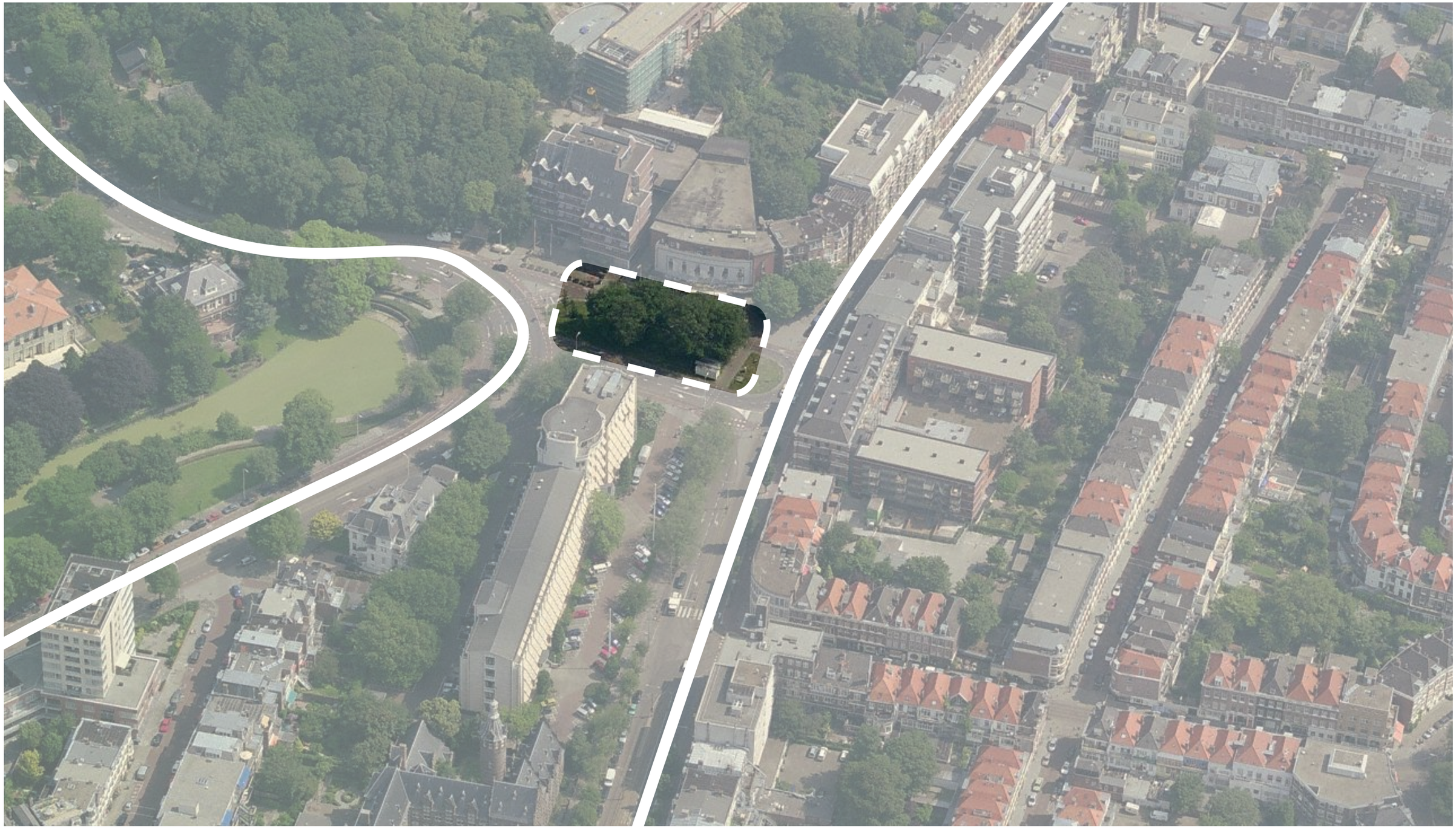


a prefabricated charger island

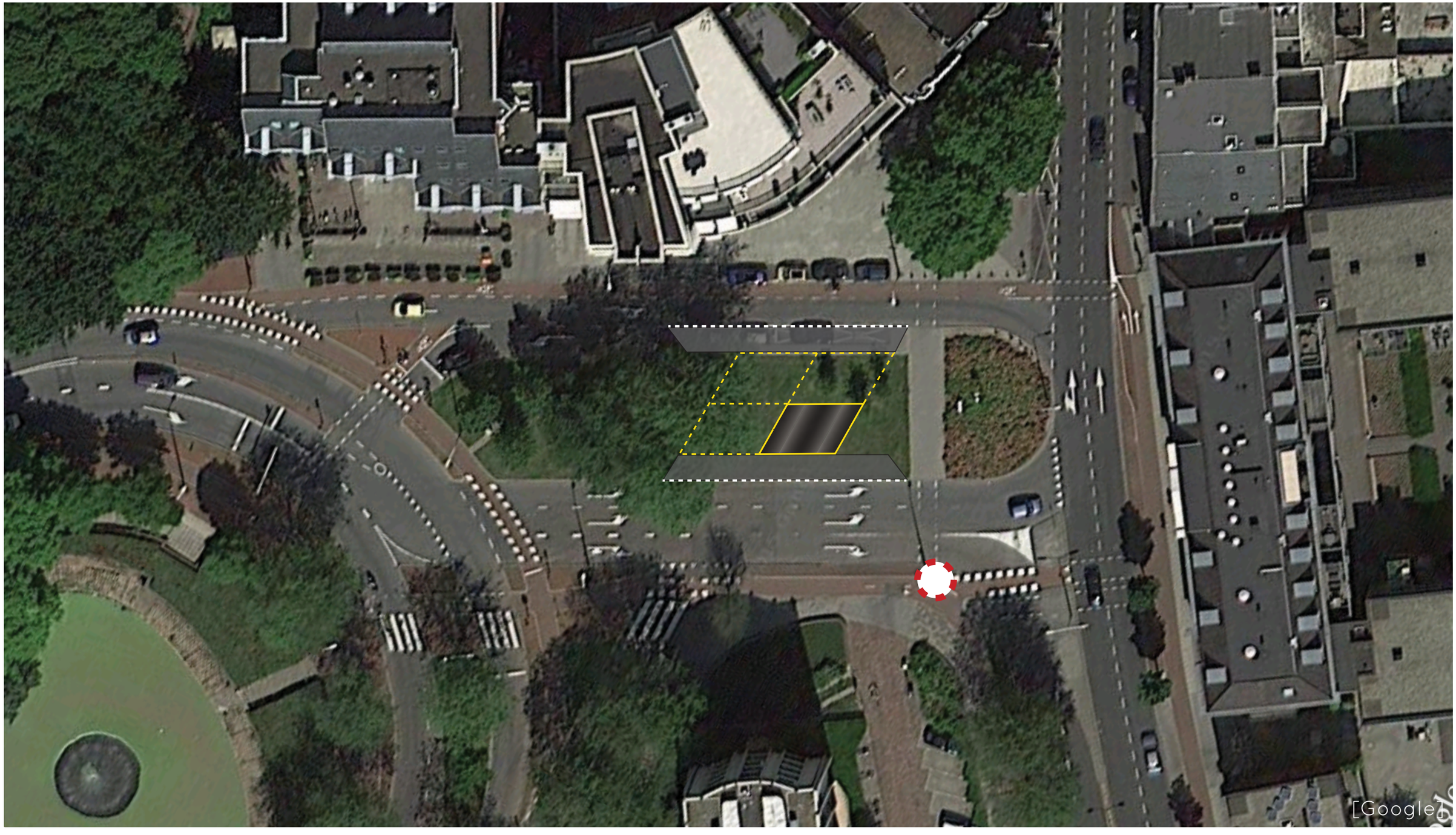
POTENTIAL LOCATION

[Bing]

POTENTIAL LOCATION



POTENTIAL LOCATION



BASIS STATION

TWO STATION MODULES

TWO STATION MODULES

CONCLUSIONS

How could urban areas provide public charging infrastructure for the rapidly increasing number of electric vehicles?

- slow chargers are not efficient

- fast chargers on strategic locations

- modular, flexible, and demountable stations

RECOMMENDATIONS

scenario model:

- other cities and rural areas
- combine with traffic models
- smart network

station:

- develop this design concept
- additional facilities

QUESTIONS