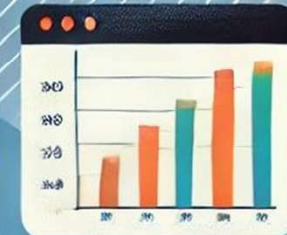


Building software to track EnV impact of EV ownership

SKG Java Meetup



Spring
Shell

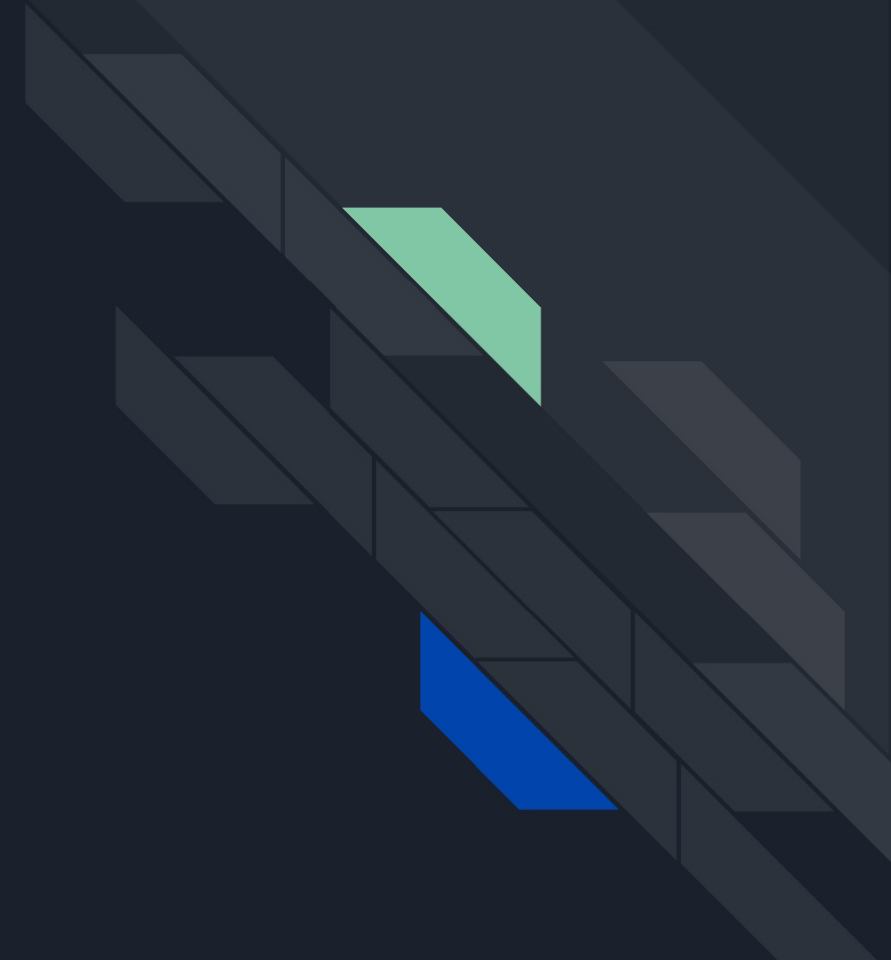
Java



Agenda

- 01 Motivation, history, evolution and goals
- 02 Intro to Spring Shell
- 03 What it measures and how it works
- 04 Live demo one year data
- 05 Q&A Living with a EV

Motivation, history,
evolution and goals





Motivation/History

- 2011-2016
 - Global warming awareness
- 2016
 - Solar water heater project
- 2018
 - LPG conversion to my Seat Leon
- 2020
 - Increased car usage - Reevaluated my impact
 - Peugeot e2008 introduced to the Greek Market
 - Green electricity - Δικαιώματα προέλευσης
 - Ioannis Pregnancy



Motivation/History - Continued

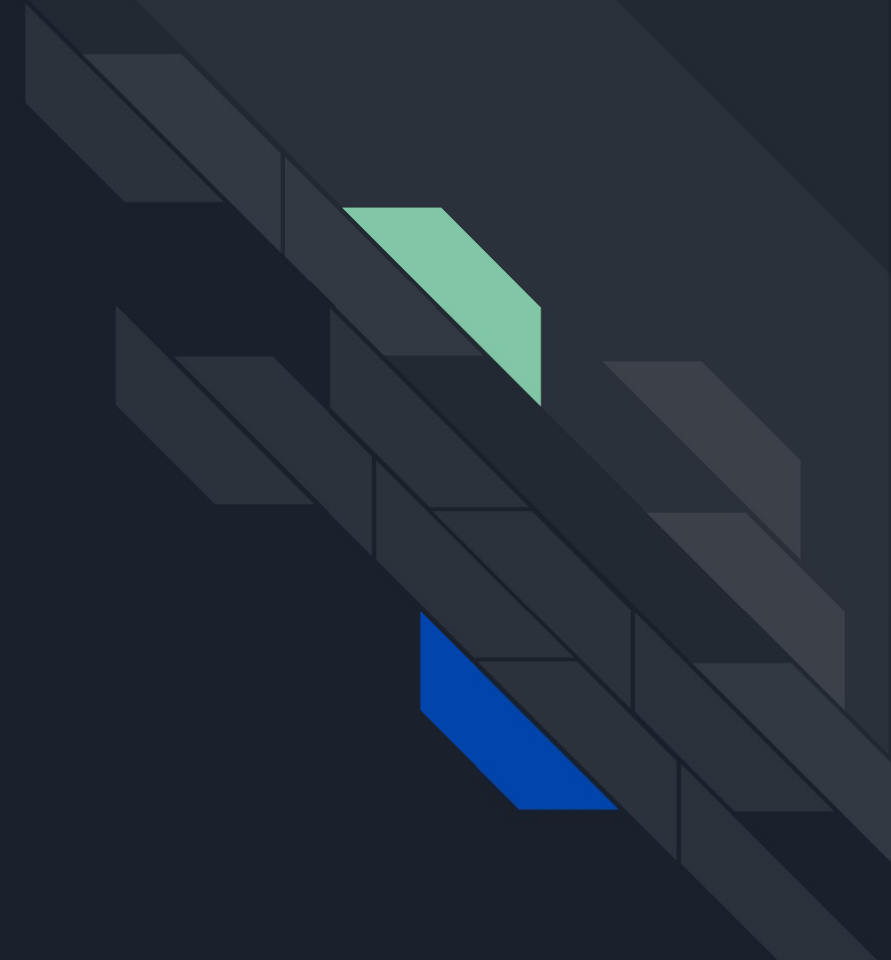
- 2020 - 2023
 - Lack of choice - main hurdle body size :)
- 2021
 - Ipto analytics App introduced
- 2023
 - Introduction of the first chinese brand
 - Ordered MG4
- 2024
 - Received it



Goals

- Have net positive impact on my co2 emissions
 - Have concrete data to evaluate this
- Need for change
- Evaluate my binary decision for environment & ownership
 - Keep Leon LPG or buy an EV

Intro to Spring Shell

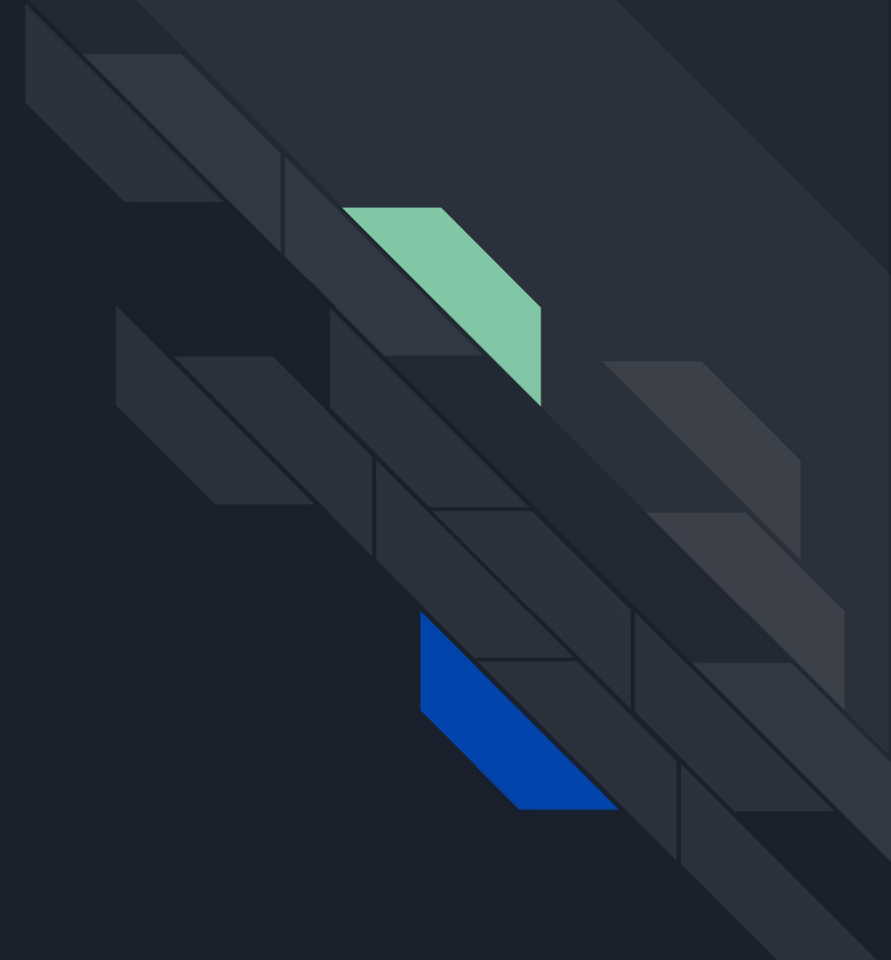




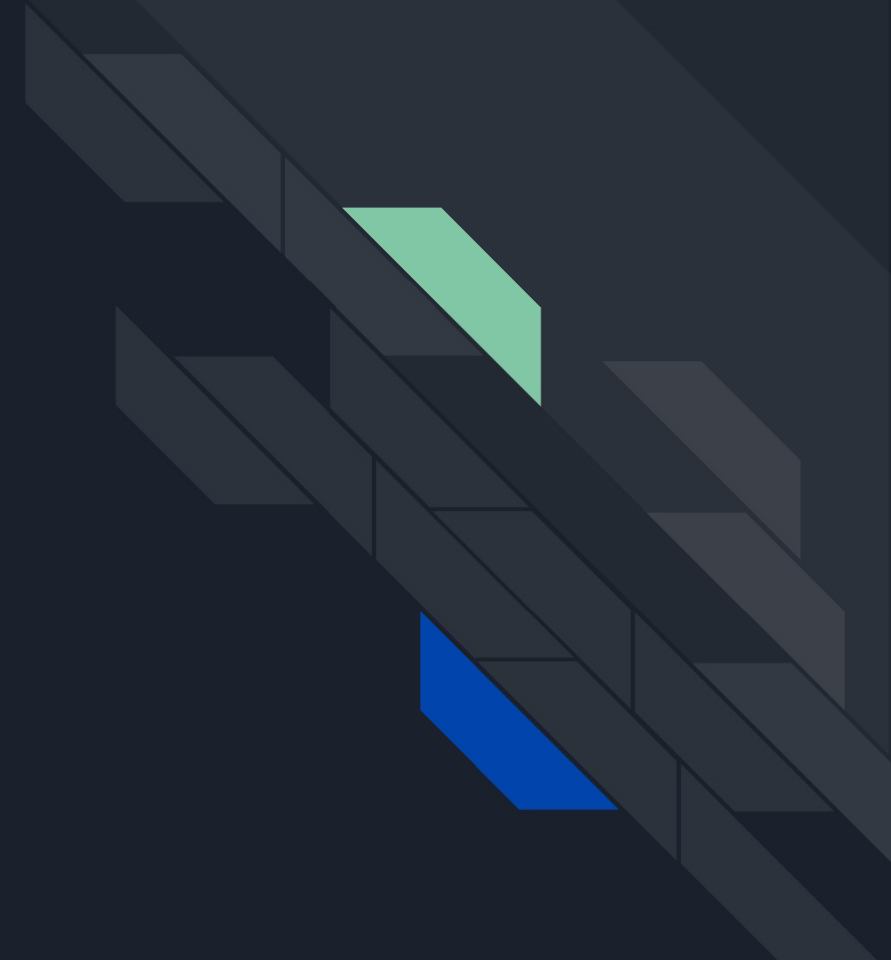
What is Spring Sell?

- Spring framework component/library for command line applications
- It allowed me to very quickly be able to interact with my application
- Has been a great find that I have been using also at work

Spring Shell - Live Coding



What it measures and
how it works





Domain

- EVs “refuel” through charging, consuming electricity from the Hellenic Transmission System(grid)
- The grid provides this consumed electricity through production
 - This production causes co2 emissions
- This production is documented both annually & hourly eg

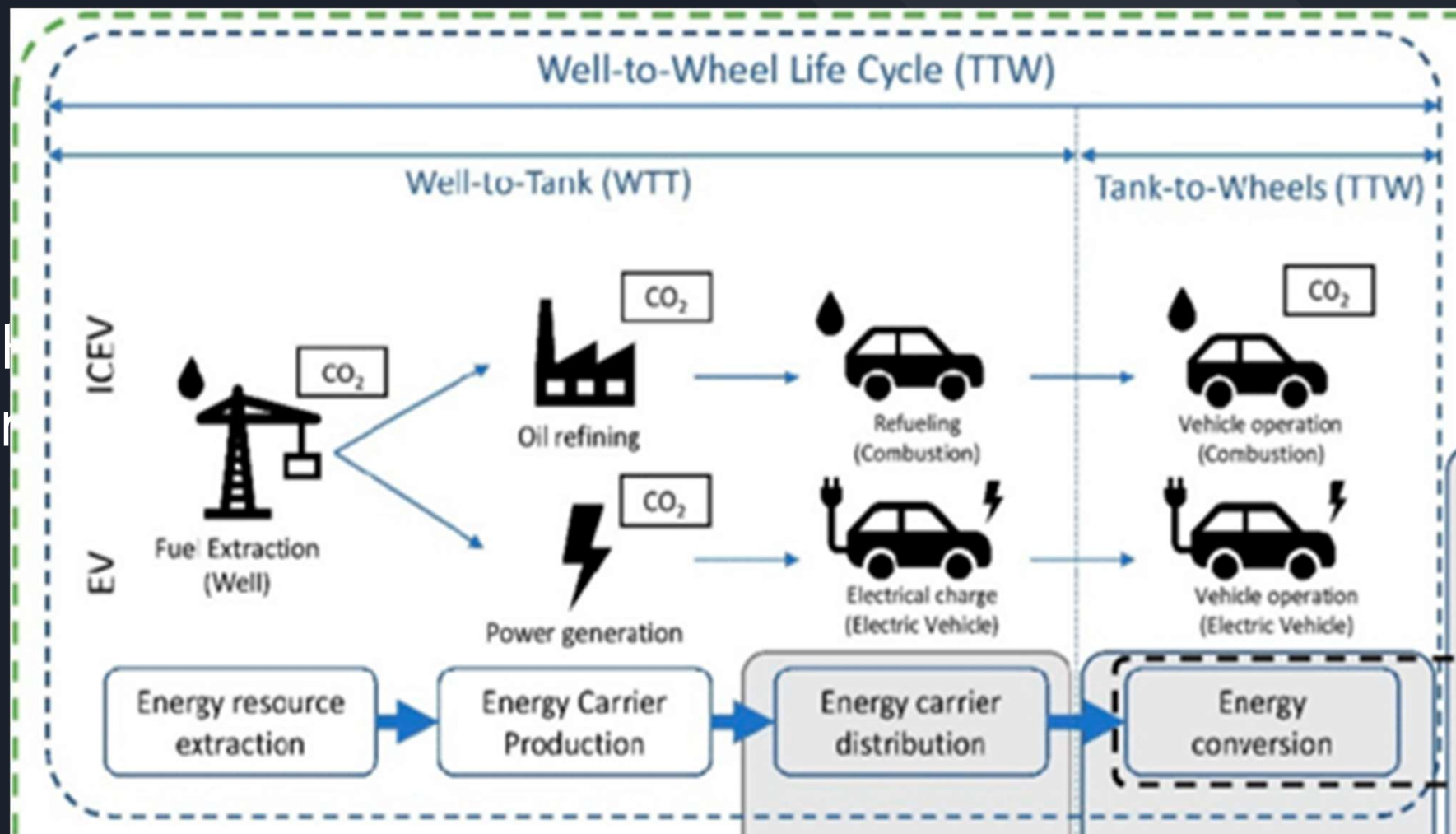



Image source: https://www.researchgate.net/figure/illustration-of-a-vehicle-life-cycle-adapted-from-5-6_fig1_345766650

- 
- Capture what are the co2 emission for each hour - co2-gatherer
 - Capture which hours charge - power-per-hour

co2-gatherer operation video

The image displays the co2-gatherer application in two states: a mobile app interface and its underlying Kotlin code in an IDE.

Mobile App Interface (Left):

- Header:** ipto ANALYTICS
- Date/Time:** 22.12.2024 05:00
- CO2 Emissions:** 1h 05:00 24h
- CO2 Gauge:** A semi-circular gauge with a needle pointing to 367 gCO2/kWh. The gauge is divided into three segments: Low (green), Medium (yellow), and High (orange).
- Footer:** ipto

IDE Code (Right):

```
class GatherService {
    fun getAndStoreCo2() {
        logger.trace("Get and store has been started")
        try {
            var day = LocalDate.now()

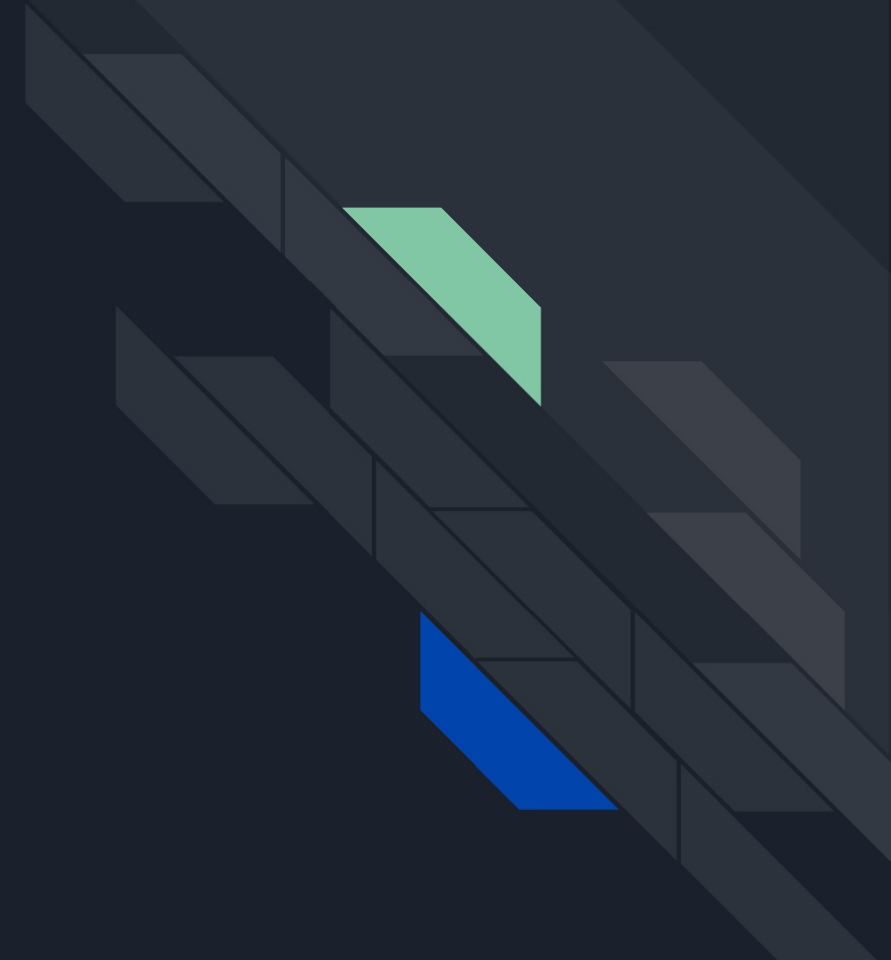
            val checkDays: Long = 4
            var moveBackDays = haveAllHoursForPastDays(checkDays)
            if (moveBackDays < 0) {
                logger.info("We already have all hours for past {} days.", checkDays)
                return
            }

            while (true) {
                if (moveBackDays < 0) {
                    break
                }
                for (hour in 1..23) {
                    val iteratedHour = LocalDateTime.of(day, LocalTime.of(hour, minute: 0, second: 0))
                    if (iteratedHour.isBefore(Instant.now().atZone(greekTimezone))) {
                        checkAndUpdate(iteratedHour)
                    }
                }
            }
        }
    }
}
```

IDE Log (Bottom):

```
environment
date=2024-12-22, hour=3, gatheredTime=2024-12-22T10:31:02.763313402Z, gatheredTimeString=12:31:02
[ main] c.g.co2gatherer.ip.to.GatherService : Upserting into database co2 = Co2(id=6767ef160aff8e26e1eaf01f, co2=331,
date=2024-12-22, hour=4, gatheredTime=2024-12-22T10:51:02.783313482Z, gatheredTimeString=12:51:02)
[ main] c.g.co2gatherer.ip.to.GatherService : Upserting into database co2 = Co2(id=6767ef230aff8e26e1eaf020, co2=350,
date=2024-12-22, hour=4, gatheredTime=2024-12-22T10:51:15.879055398Z, gatheredTimeString=12:51:15)
[ main] c.g.co2gatherer.ip.to.GatherService : Upserting into database co2 = Co2(id=6767ef2c0aff8e26e1eaf021, co2=367,
date=2024-12-22, hour=5, gatheredTime=2024-12-22T10:51:24.298528893Z, gatheredTimeString=12:51:24)
2024-12-22T12:51:24.308+02:00 INFO 5820 [ main] c.g.co2gatherer.ip.to.GatherService : Upserting into database co2 = Co2(id=6767ef2c0aff8e26e1eaf021, co2=367,
date=2024-12-22, hour=5, gatheredTime=2024-12-22T10:51:24.298528893Z, gatheredTimeString=12:51:24)
```

Live demo one year data



Co2 Web UI

Odometer

Trigger

Sum

Cost

Months

LPG

Public Charge

Hours

Ipto Hours

Graphs

≡

Sum

Log out user

Total kwh	3,863
kwh/100km	20.45
Total kg of co2	
* Leon 1.6 LPG	3,778.0
* MG4 Ipto	821.9
* MG4 Green	525.0
Co2 kg saved	
* Ipto	2,956.1
* Green	3,253.0
Comparative reference	
* Aygo 1.0 AT	3,259
* Gasoline car 5l/100km	2,172
* Greece per capita co2	7,000
Battery kg co2 deficit [1]	
* Ipto	3,956 of 6,912 (57%)
* Green	3,659 of 6,912 (53%)
Odo for bat co2 breakeven	
* Ipto	44,169.26
* Green	40,137.06
Car kg co2 deficit [1]	
* Ipto	14,324 of 17,280 (83%)
* Green	14,027 of 17,280 (81%)
Odo for car co2 breakeven	
* Ipto	110,423.16
* Green	100,342.66
Average grams of co2 per kwh	
* Ipto	212.81
Co2 Grams/km	
* Leon 1.6	201.0
* Aygo 1.0 AT	172.5
* Ipto	43.5
* Green	27.8
Grams Saved per km	
* Ipto	156.49
* Green	172.81

An abstract geometric graphic on the right side of the interface. It consists of several dark grey and black rectangular blocks of varying sizes, arranged in a layered, isometric fashion. Two colored triangles are integrated into the design: a light green triangle pointing downwards and a blue triangle pointing upwards. The overall aesthetic is modern and architectural.

Co2 Web UI

- Odometer
- Trigger
- Sum
- Cost
- Months
- LPG
- Public Charge
- Hours
- Ipto Hours
- Graphs

Cost [Log out user](#)

Label	Value
Odometer	18,890 km
LPG cost €/l	0.889 €

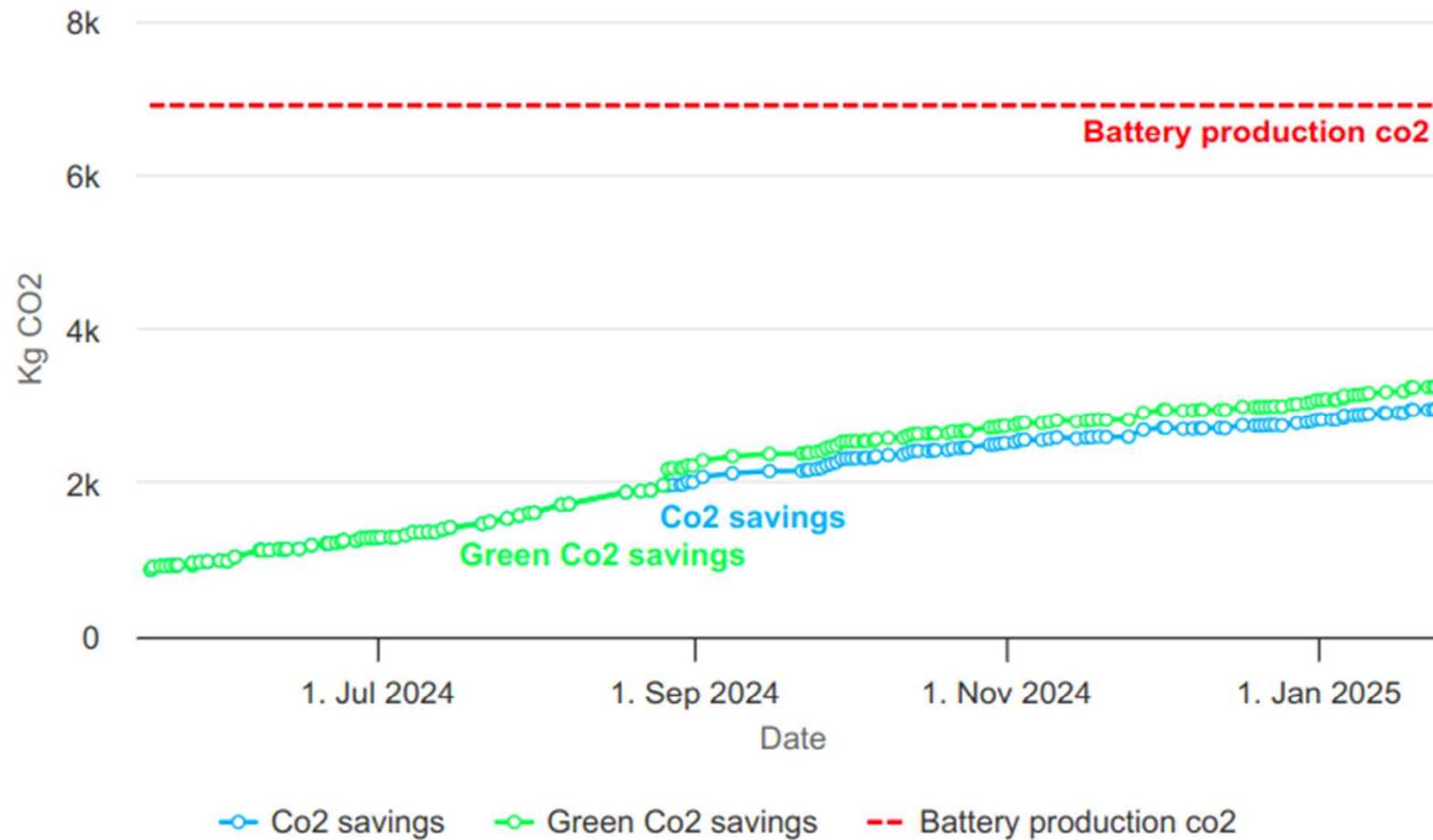
Total Cost	
* Actual	607.29 €
* Estimated with free charging done at home	968.25 €
* Leon LPG	1,847.05 €
Free kwh	1,719
Estimated savings due to free	360.96 €

Total e/100km	
* Actual	3.21 €
* Estimated with free charging done at home	5.13 €
* Leon	9.78 €
Savings	
* Actual	1,239.76 €
* Estimated with free charging done at home	878.80 €

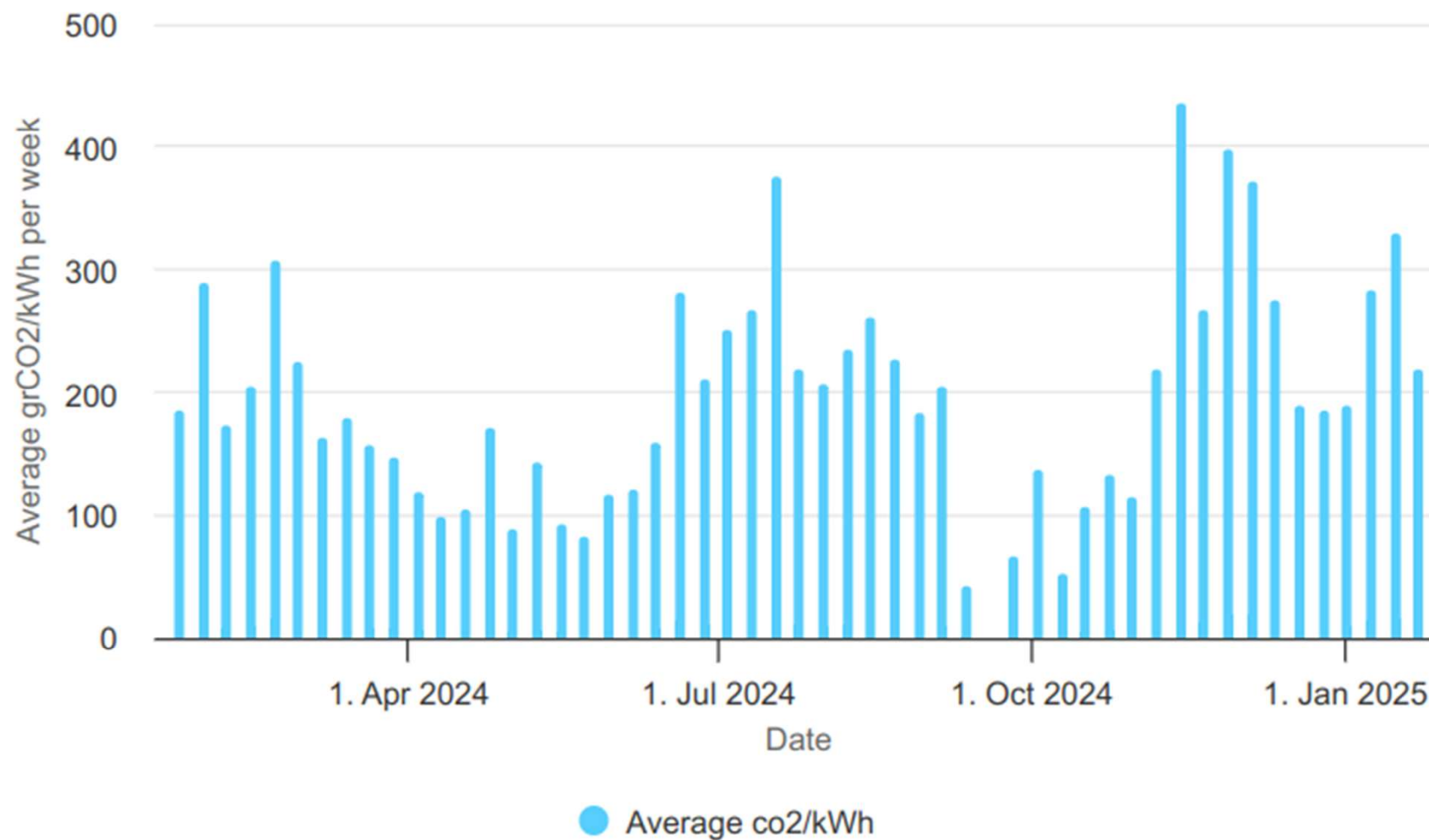
Cleared cost	534.59 €
Cleared kwh	2,830 kwh
Projected # of kwh	242 kwh
Projected cost e/kwh	0.30 €
Projected cost	72.70 €

Deficit	28,538 e
Running costs compared to leon	-212 e
Recupp kms	434,821 km

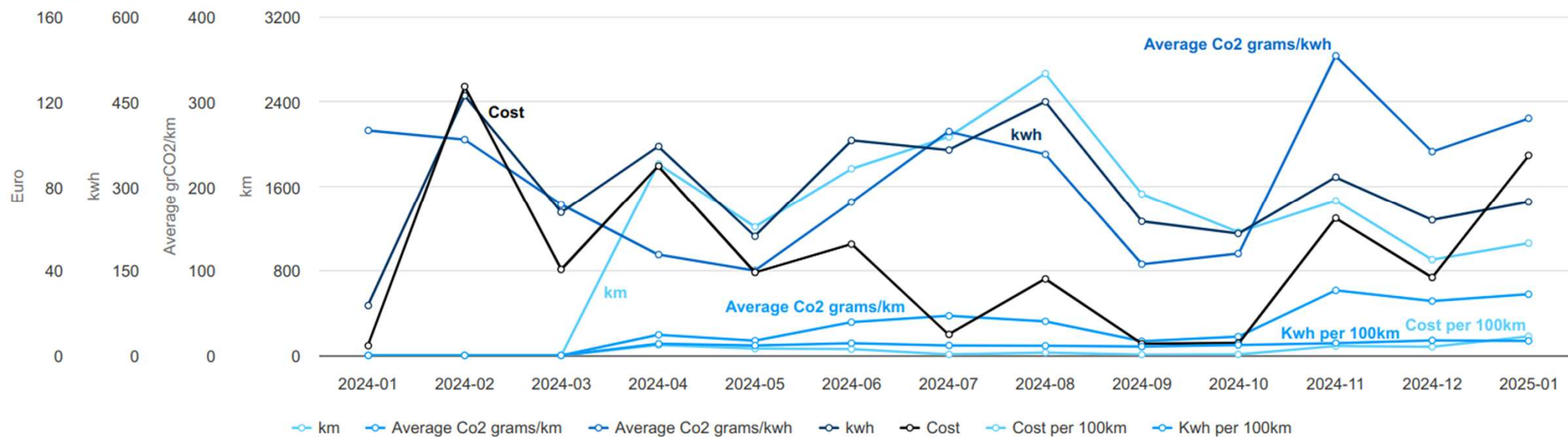
Kg Co2 Saved over time



Average grCO₂/kWh per week



Montly data



Q&A Living with a EV

