

IMPACT ASSESSMENT OF EV INTEGRATION IN THE DISTRIBUTION NETWORK

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TÜRKIYE E-MOBILITY TECHNICAL ASSISTANCE PROGRAM

Component 1: E- mobility baseline analysis

Component 2: Support to development of national e-mobility roadmap

- Task 1: International benchmark analysis
- Task 2: Recommendations for EV infrastructure deployment in TR
- Task 3: Feasibility assessment for scale up of EV charging infrastructure
- Task 4: Business models and financial feasibility assessment
- **Task 5: Impact assessment of EV integration in the distribution network**

Component 3: Development of deployment strategy for e-mobility at the municipal level

- Task 1: Benchmark analysis
- Task 2: Identification of target bus routes in Izmir and Gaziantep
- Task 3: Potential business models to electrify target bus routes
- Task 4: Definition of pilot projects in Izmir and Gaziantep
- Task 5: Action plan for processing end-of-life vehicles



Final Report

Deployment of Electric Vehicle Charging Infrastructure and Incentives to Support the Scale-Up of Electromobility Technologies in Türkiye

EMOBILITY DEVELOPMENT IN TÜRKIYE

PROJECT OBJECTIVES

1

conducting an impact assessment of EV integration into the distribution network for different EV deployment strategies on representative urban/semi-urban areas

2

identify the EV charging load impact to the demand curve of the urban regions

3

assessing the power distribution investment needs for the deployment of EV

4

identify the benefits of smart charging solutions

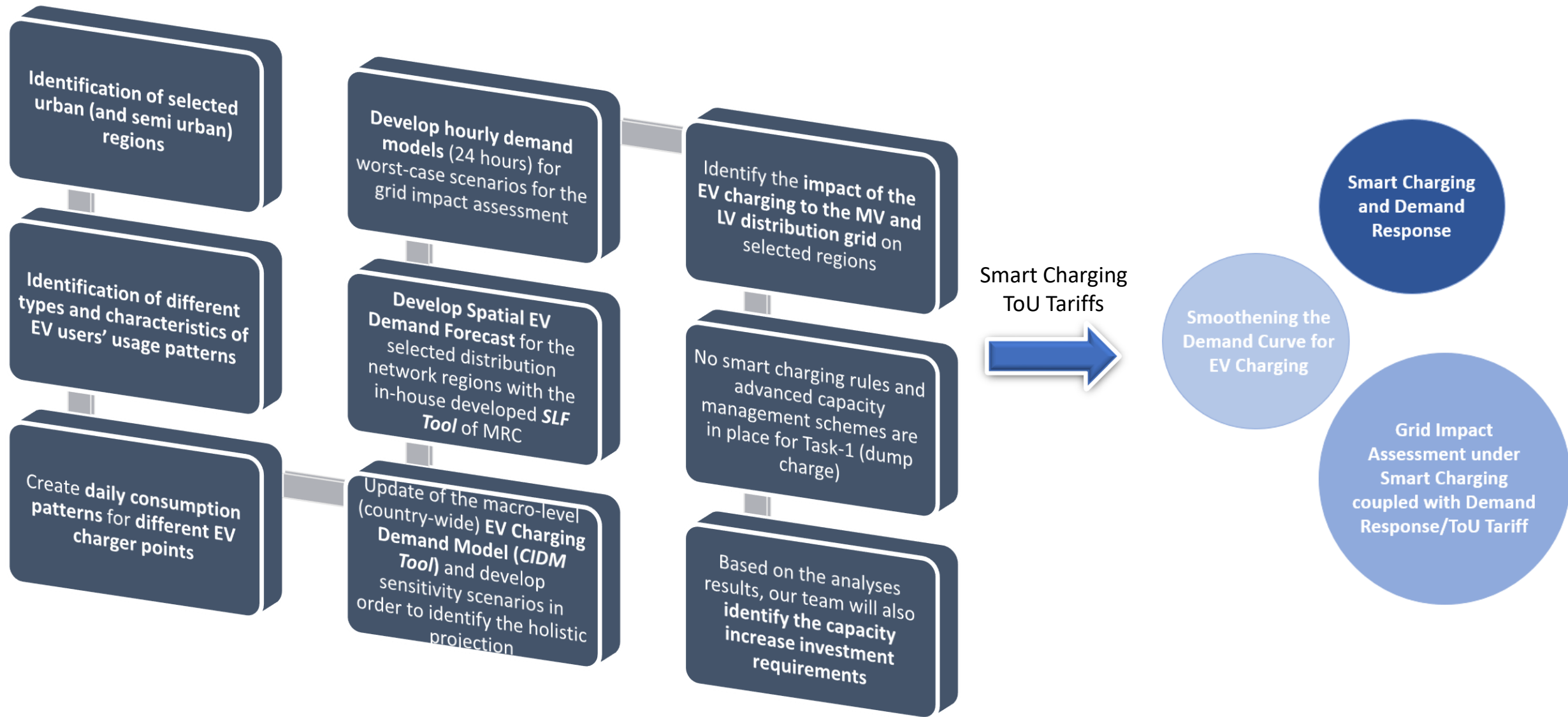
5

assess the demand-side management (direct via active network management or indirect via tariffs) benefits for mitigating the issues that could be caused especially due to the fast-charging stations

6

exploring the opportunities of deferring investment needs through a coordinated deployment rooftop PV and EV infrastructure

METHODOLOGY

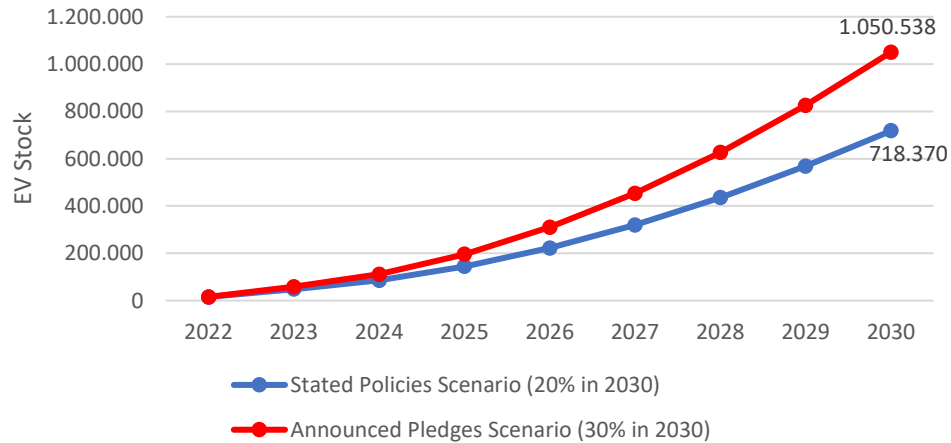


EV AND CHARGING POINT PROJECTIONS

EV Sales Forecast - Benchmarking

- Ministry of Industry and Technology (MoIT) forecasts that the number of EVs in 2030 will reach to;
 - High Scenario : 2.5 million
 - Medium Scenario : 1.6 million
 - Low Scenario : 0.88 million

EV Stock Projection until 2030 based on IEA Global Forecasts



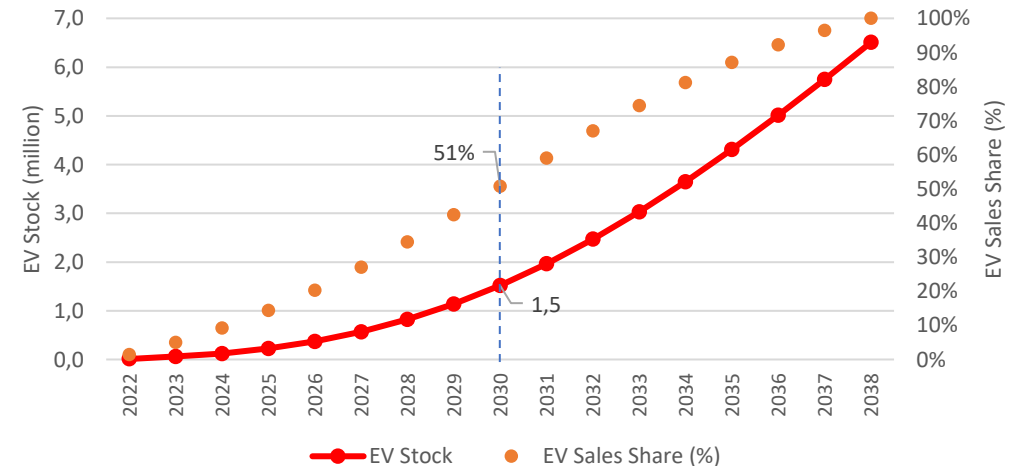
STEPS EV : **718,370**

- BEV : 807,993
- PHEV : 242,544

APS EV : **1,050,538**

- BEV : 555,059
- PHEV : 163,311

EV Stock Projection based on the EU Target (100% in 2035)



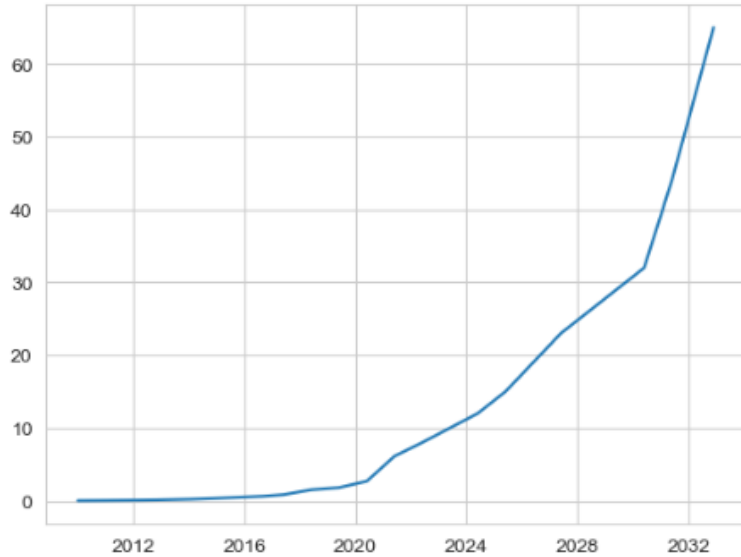
- BEV : 1,151,846
- PHEV : 367,854

EV AND CHARGING POINT PROJECTIONS

EV Sales Forecast – Statistical Model

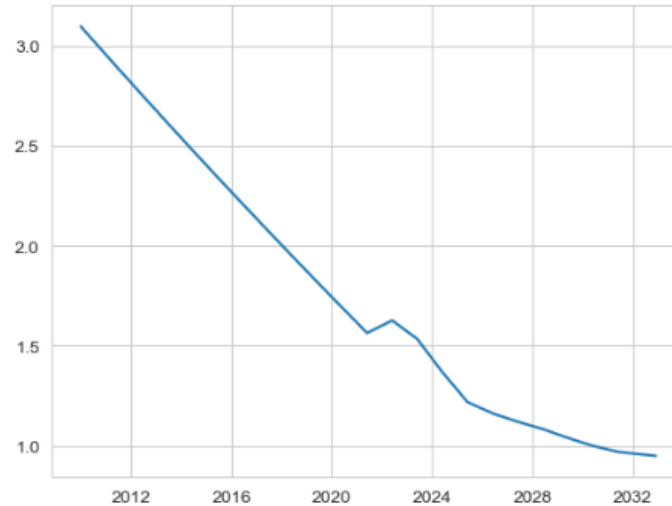
Projections for the Worldwide Adoption

Projection of Sale Share of BHEVs in the World

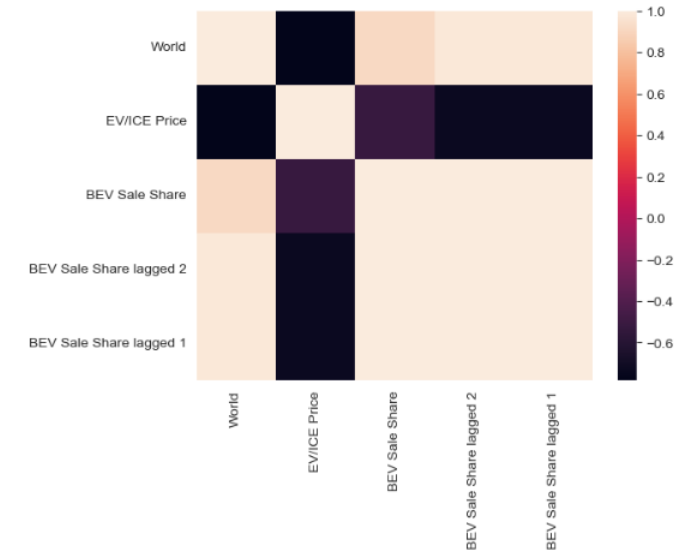


Ratio of Costs of EV engines and ICE

Ratio of Electric Engines to ICE costs



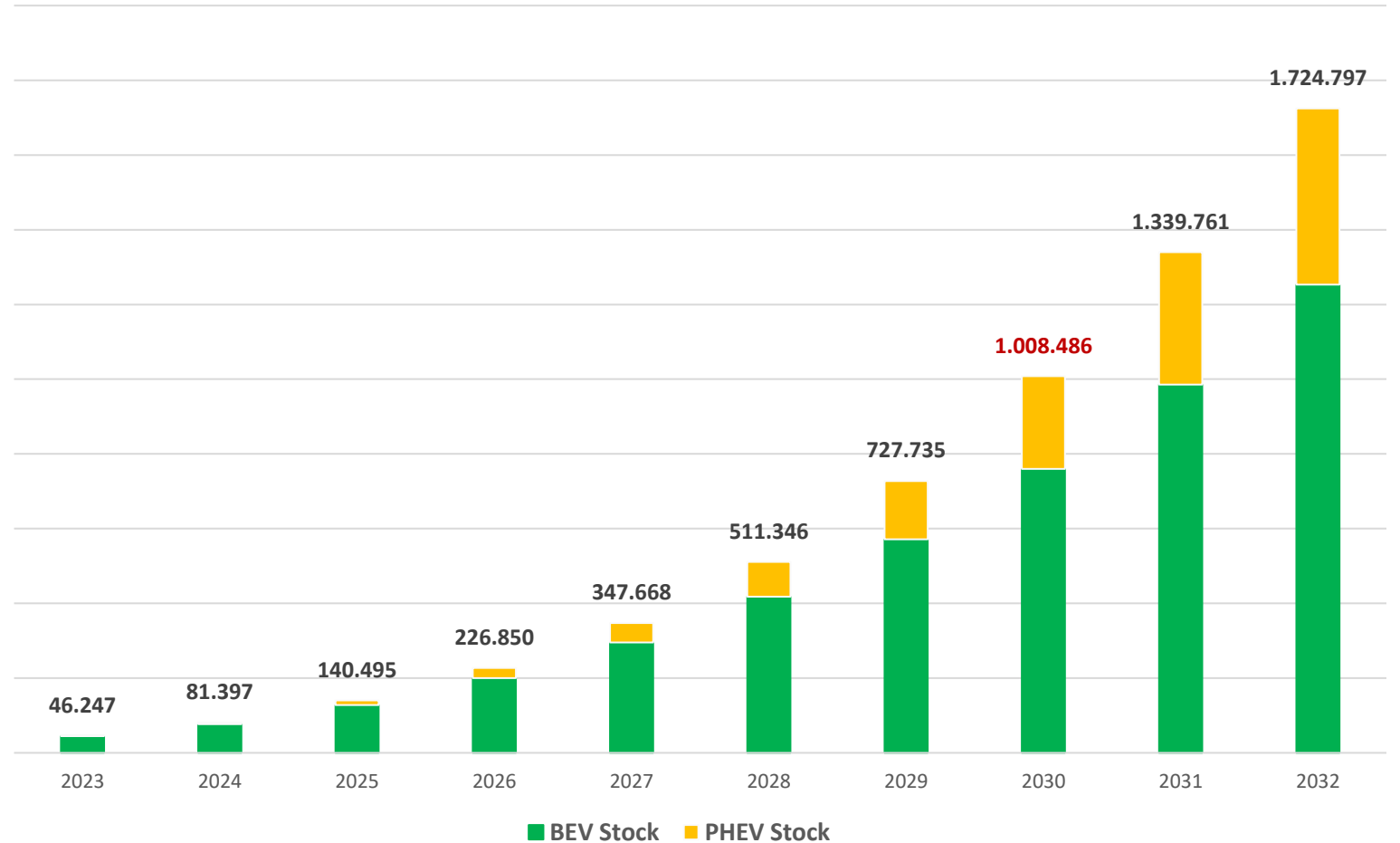
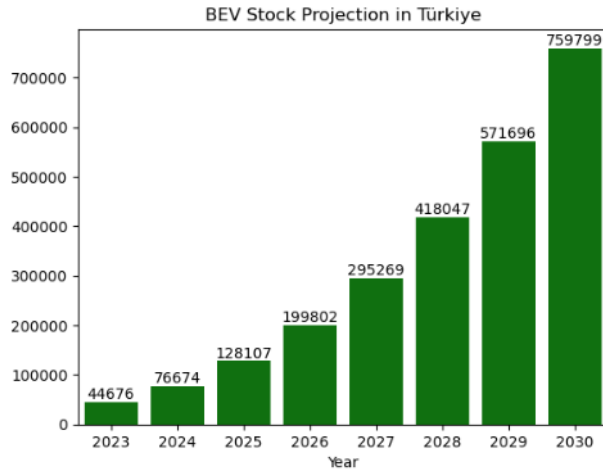
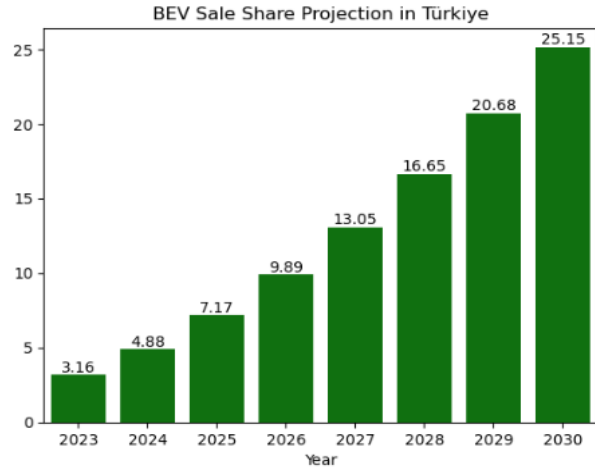
Heatmap of Correlation Matrix for Parameters



Parameter	Coefficient
World Projection	0.00124
EV/ICE Price Ratio	-0.00114
Sale Share Lagged 2	-0.97578
Sale Share Lagged 1	1.97373

EV AND CHARGING POINT PROJECTIONS

EV Sales Forecast – Statistical Model



EV AND CHARGING POINT PROJECTIONS

Charging Point Projection – Main Inputs

Housing Types in Türkiye

Region/City	Single storey houses in villages or suburb areas mostly for low-income families	Villa (Single storey houses mostly around cities for high-income families)	Houses in 2 storey buildings	Houses in 3 storey buildings	Houses in >=4 storey buildings	Total Number of Households (2021)
Türkiye	2,850,336	118,764	4,391,135	2,873,576	15,096,023	25,329,833
Istanbul	97,974	1,999	175,778	295,478	4,183,857	4,755,086
Ankara	56,673	1,753	74,753	63,653	1,677,262	1,874,093
İzmir	119,956	11,864	207,169	215,229	948,868	1,503,086
Turkey Housing Shares (%)	11.3%	0.5%	17.3%	11.3%	59.6%	

Road Network

Avg. Monthly Income

Region	2021 Monthly Income (Euro)		
	Male	Female	Total
Turkey	403	319	380
Istanbul	658	520	621
Ankara	546	433	516
İzmir	490	388	463

Road Type	Length (km, 2023)
Autobahn (Motorway)	3,633
State Highways	
Divided Road	21,467
Other Roads	9,473
Provincial Roads	
Divided Road	2,258
Other Roads	31,858
Village Roads	
Asphalt Road	99,279
Stabilized Road	91,103

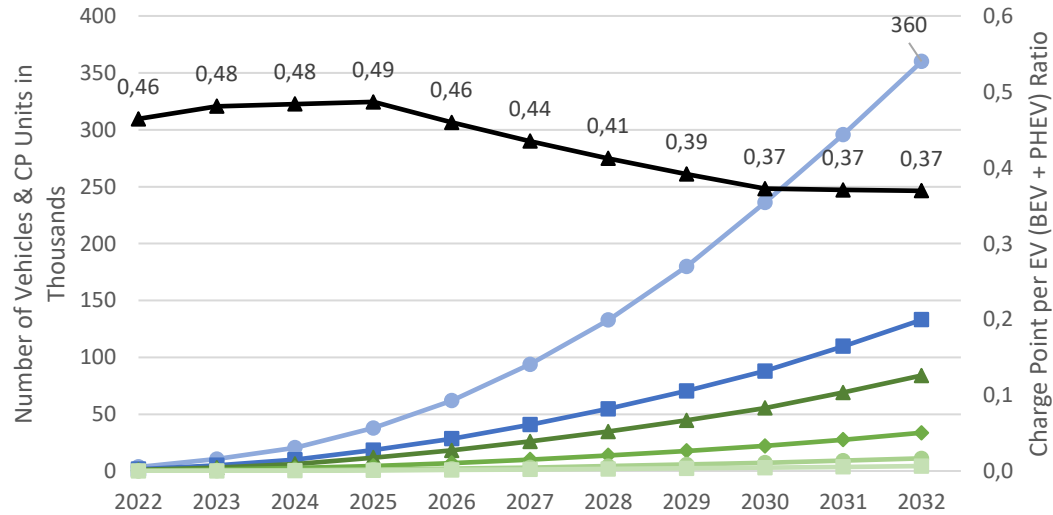
Energy Consumption per EV

Parameter	Unit	Value
Total annual EV Mileage (in km)	km / year	13,325
Unit energy consumption EV	kWh/100 km	20

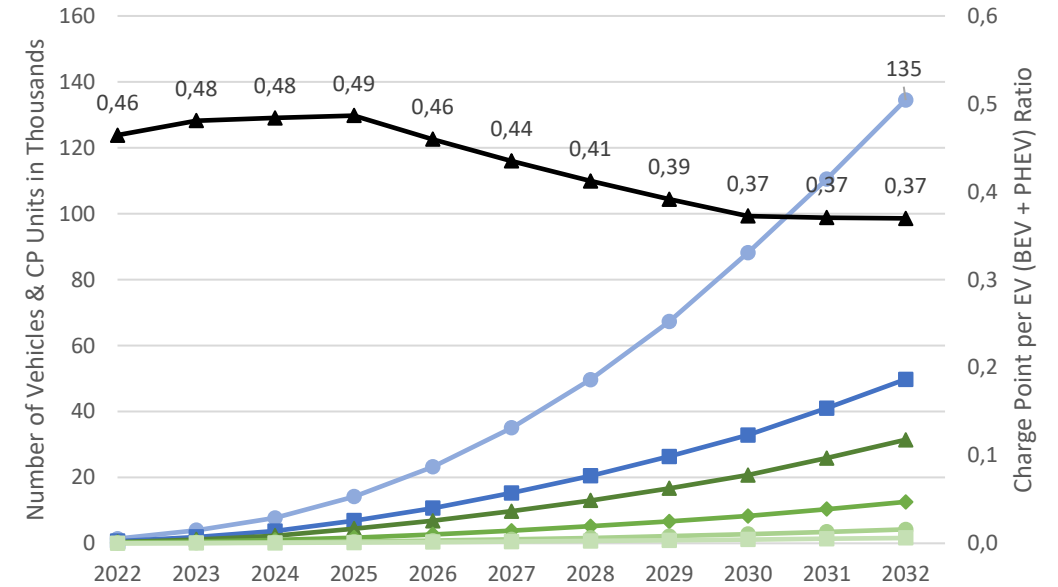
EV AND CHARGING POINT PROJECTIONS

Charging Point Projection – Outputs

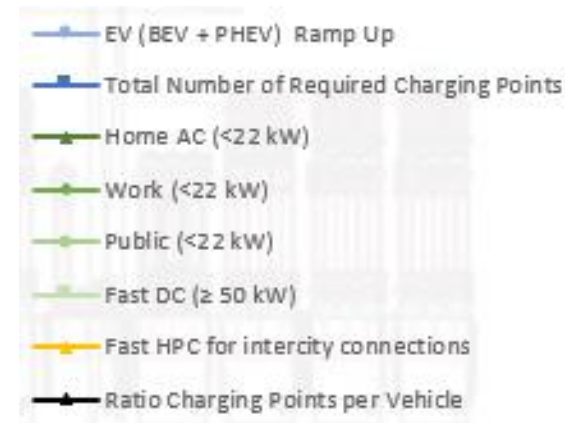
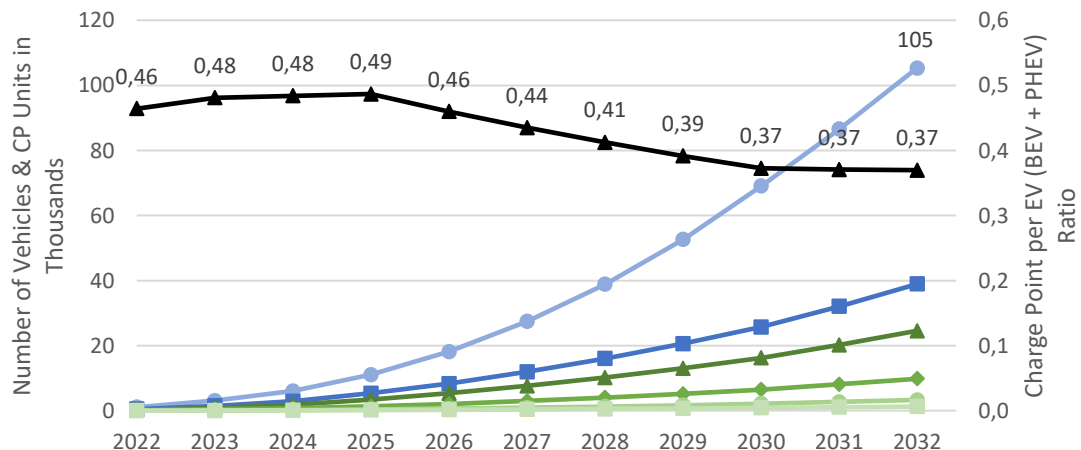
Charging Infrastructure Ramp up in **Istanbul** 2022 - 2032



Charging Infrastructure Ramp up in **Ankara** 2022 - 2032



Charging Infrastructure Ramp up in **Izmir** 2022 - 2032

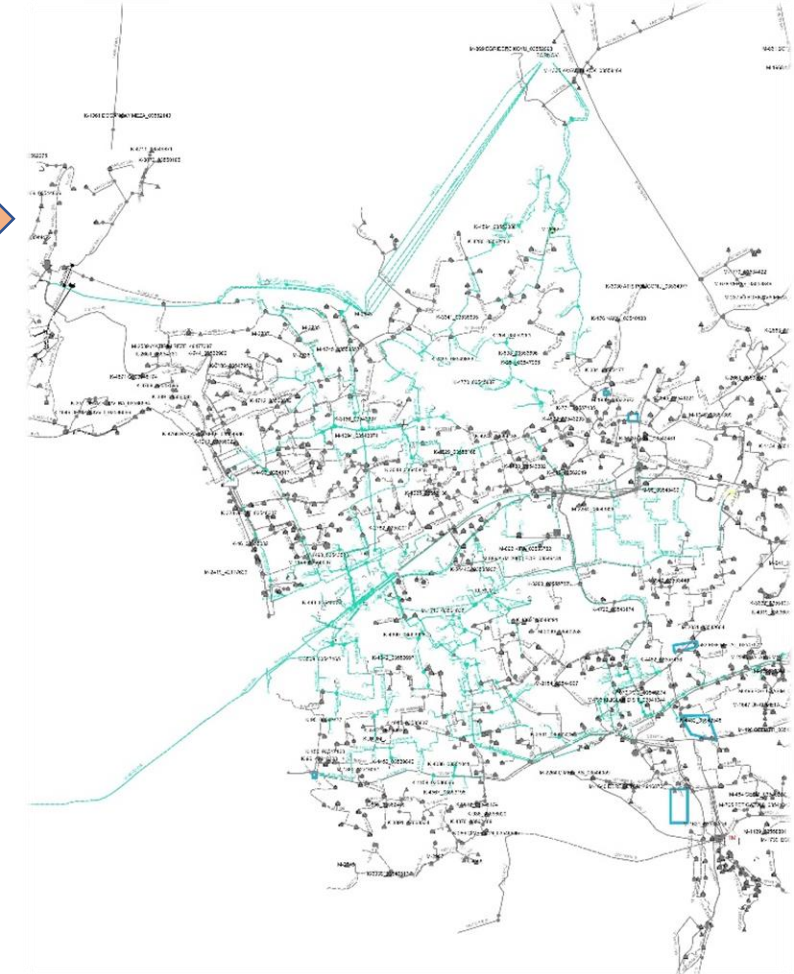


POWER SYSTEM STUDIES

MV Models

Region	Code	Name of TSO SS	Major Type of Customers
İzmir	---	Bostanlı GIS	Residential
	---	Bornova TM (Bülent Kuas)	Industrial
Ankara	BAA769	Balgat	Commercial/Governmental
	BAA801	Ümitköy	Residential
	BAC276	Ankara Sanayi	Industrial
İstanbul Anatolian Side	BCL58	Vaniköy	Residential
	BCL64	Beykoz	Residential
	BCL74	Küçükbakalköy	Commercial
	BCL75	Dudullu OSB	Industrial

Currently Selected TSO Ss



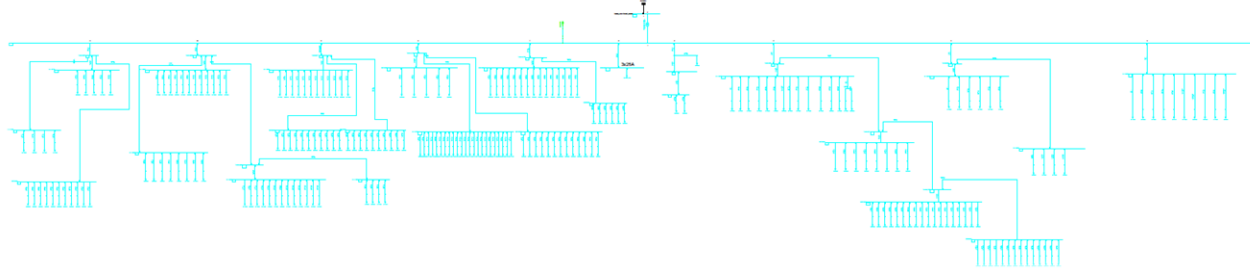
- MV GIS data of the İzmir metropolitan district has been modelled in the DigSILENT PowerFactory
- Selected TSO substation feeding area has been isolated via “normally open tie points”

POWER SYSTEM STUDIES

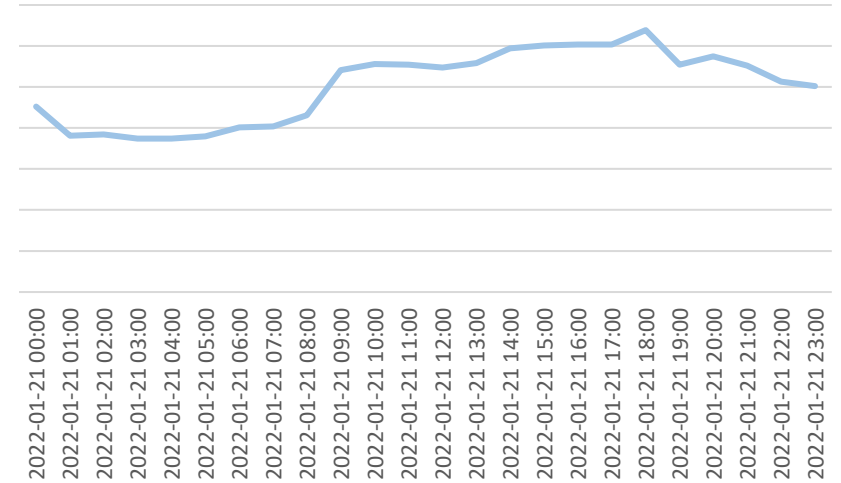
LV Models

● EnerjiSA – Ankara

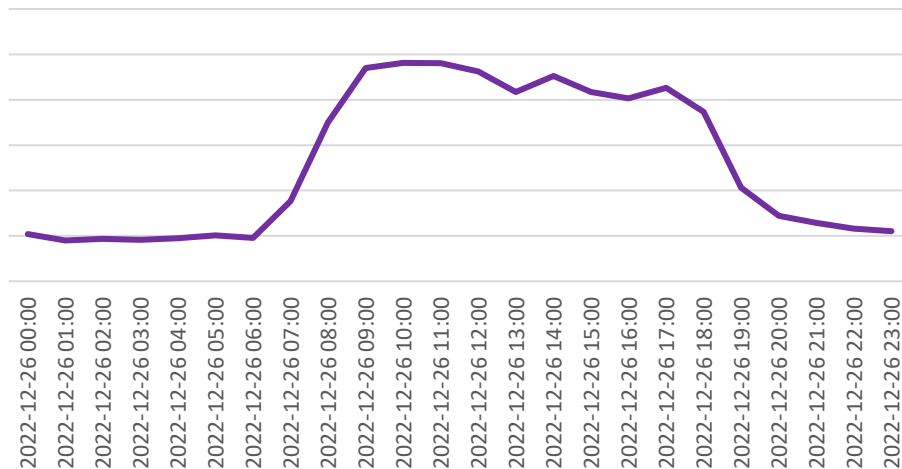
Ümitköy (Residential/Villa) – TAC563



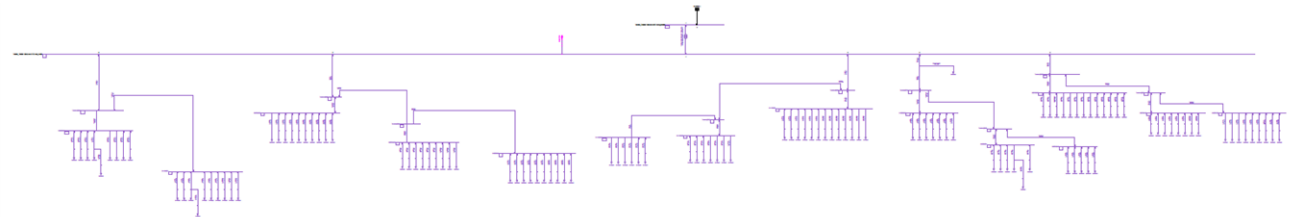
Load Profile - TAC563



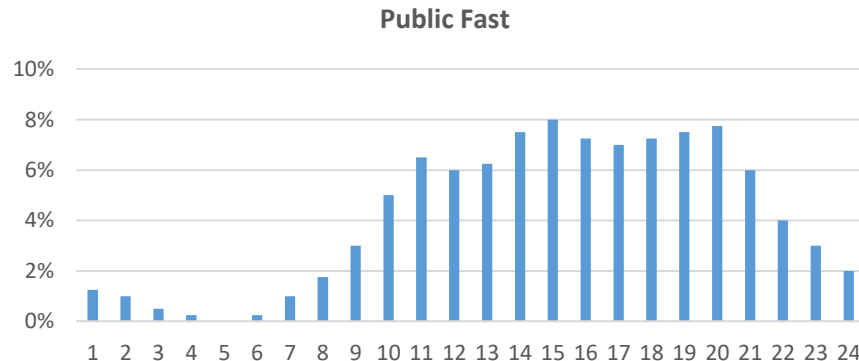
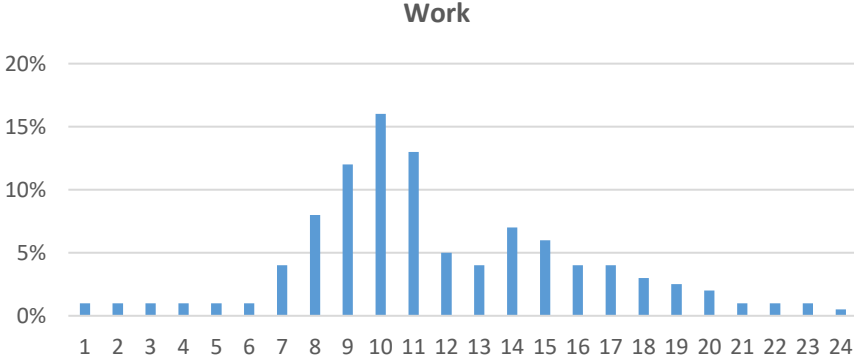
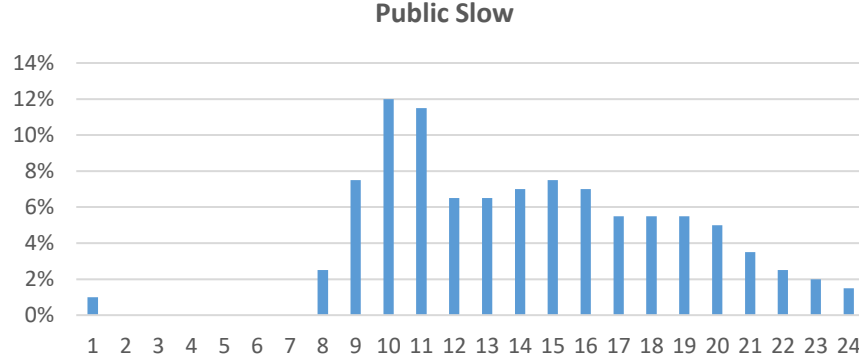
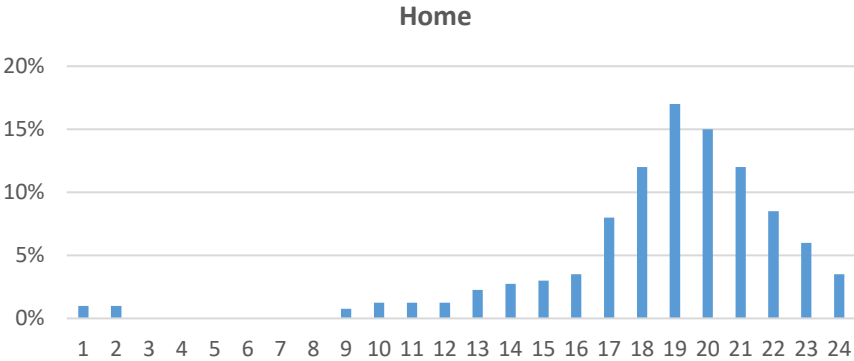
Load Profile - TAE409



Ankara Sanayi (Industrial) – TAE409



IDENTIFICATION OF EXISTING CHARGING POINTS AND THEIR LOADS



Typical "per unit" load profiles for different EV charging points identified for the project

NEXT STEPS

- Development of Spatial EV Demand Forecast for selected distribution system regions
- Identify the impact of the EV charging to the MV and LV distribution grid
- Application of Smart Charging ToU Tariffs
- Opportunities for coordinated deployment of rooftop PV and EV charging infrastructure

THANK YOU