

GCF Proposal: Accelerating Deployment of Electric Mobility in Santiago de Chile's Public Transit System

Sebastián Galarza
Centro Mario Molina Chile



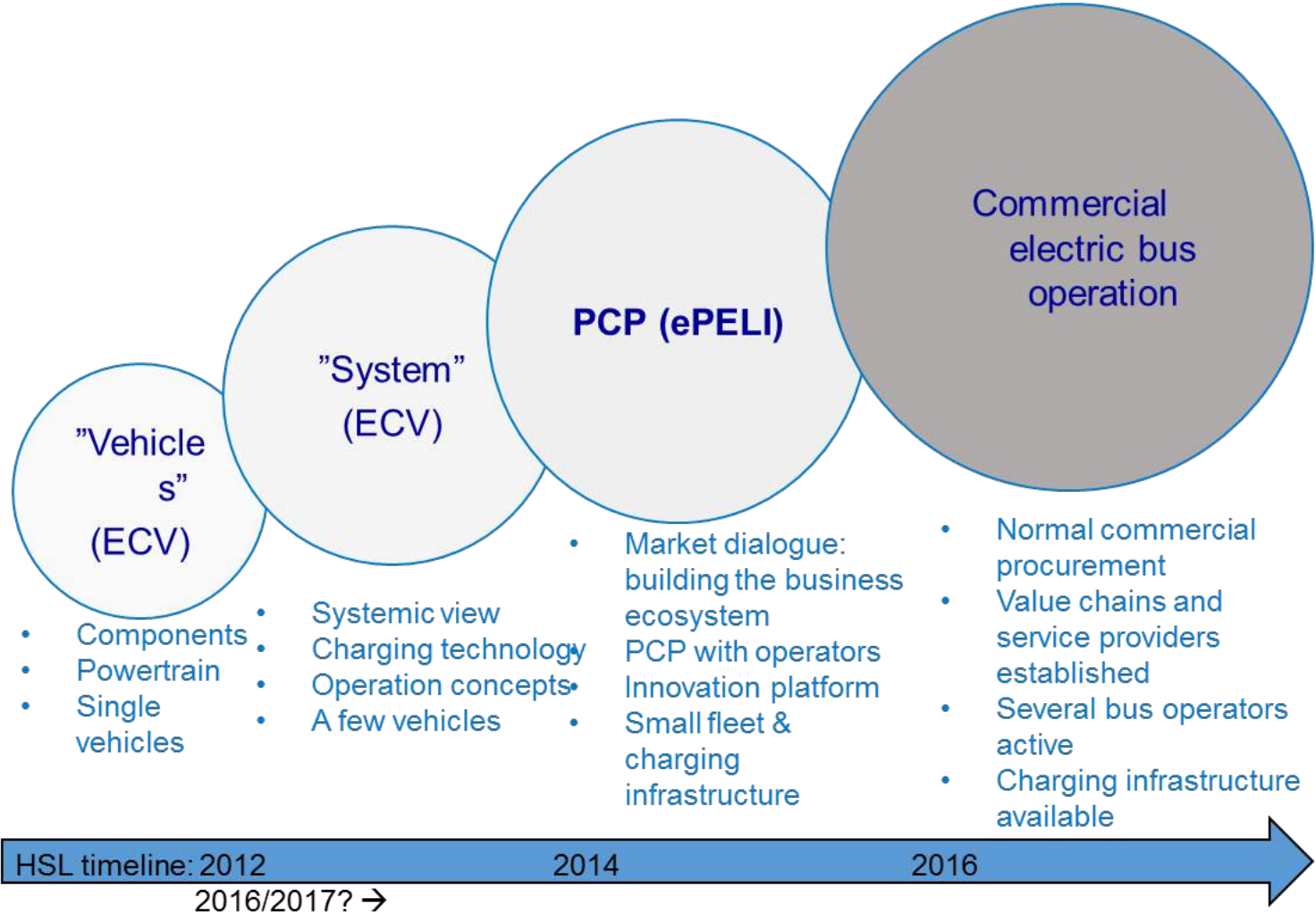
Centro Mario Molina Chile



CONSORCIO
MOVILIDAD
ELÉCTRICA



The Finnish Experience: Comprehensive steps to electrify the Helsinki Region bus system (2012 - 16)



Lessons Learned: Challenges to accelerating the adoption of electric buses in urban fleets

Financial

- The **higher upfront cost** of electric buses and their charging infrastructure **vis-à-vis diesel/CNG**

Competitiveness

- **Promote local industry** in the provision of services to the new business **ecosystem** centered around **e-mobility**

Operational

- The importance of identifying suitable **technology solutions** for **specific local operational contexts**

Regulatory

- The necessity to **review current procurement and contractual frameworks**

Infrastructure

- The requisite to **standardize charging interfaces** to ensure **interoperability of ebuses**, allowing multi-functional charging infrastructures

Cooperation

- The need to **develop trust and cooperation** between **private sector** service providers, operators and **public authorities/regulators**.

Bienes Públicos Estratégicos de Alto Impacto para la Competitividad de CORFO

Contexto: Bienes Públicos Estratégicos de Alto Impacto para la Competitividad de CORFO

- **Título:** Consorcio Tecnológico para definir e implementar una Estrategia que permita el despliegue de la movilidad eléctrica en Transantiago y sea habilitante para el desarrollo de Aplicaciones de Ciudad Inteligente (Smart City)
- **Objetivo:** Generar condiciones para la introducción de la electromovilidad en el país, con énfasis en el transporte público.
- **Mandantes:** Subsecretaría del MTT y SOFOFA
- **Co-Ejecutores:** ENEL y CMMCh
- **Organismos Internacionales Participantes:** Autoridad de Transportes de Helsinki (HSL/HKL), Centro de Desarrollo Tecnológico de Finlandia (VTT)
- **Financiamiento:** \$169.462.233 CLP x 16 meses

Bienes Públicos Estratégicos de Alto Impacto para la Competitividad de CORFO - Productos

Productos – Proyecto Bienes Públicos de CORFO

Diagnóstico de barreras y oportunidades, y de propuestas de solución

Opciones tecnológicas de buses y sistemas de recarga

Oportunidades de negocios que se pueden crear a partir del despliegue de la tecnología

Diseño técnico de un primer servicio eléctrico en Transantiago y en Metro

Propuesta de aspectos normativos a modificar por el MTT

Propuesta de incorporación de movilidad eléctrica en los recorridos de Transantiago

Grupo de trabajo público-privado

Definición de un consorcio tecnológico para el despliegue de la electro movilidad en el Transporte Publico

Estrategia para el despliegue de la electromovilidad en Transantiago

Oportunidades de financiamiento para apoyar el despliegue de la tecnología

Recomendaciones de financiamiento

Bienes Públicos Estratégicos de Alto Impacto para la Competitividad de CORFO - Productos

Productos – Proyecto Bienes Públicos de CORFO

Diagnóstico de barreras y oportunidades, y de propuestas de solución

Opciones tecnológicas de buses y sistemas de recarga

Oportunidades de negocios que se pueden crear a partir del despliegue de la tecnología

Diseño técnico de un primer servicio eléctrico en Transantiago y en Metro

Propuesta de aspectos normativos a modificar por el MTT

Propuesta de incorporación de movilidad eléctrica en los recorridos de Transantiago

Grupo de trabajo público-privado

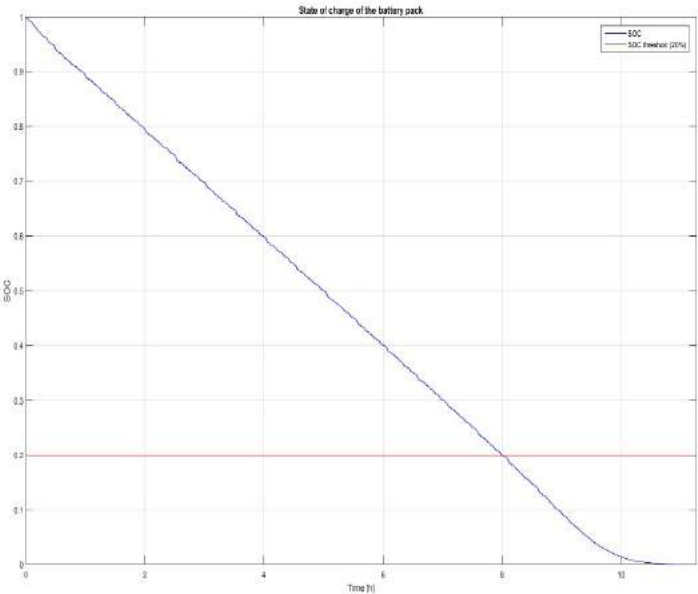
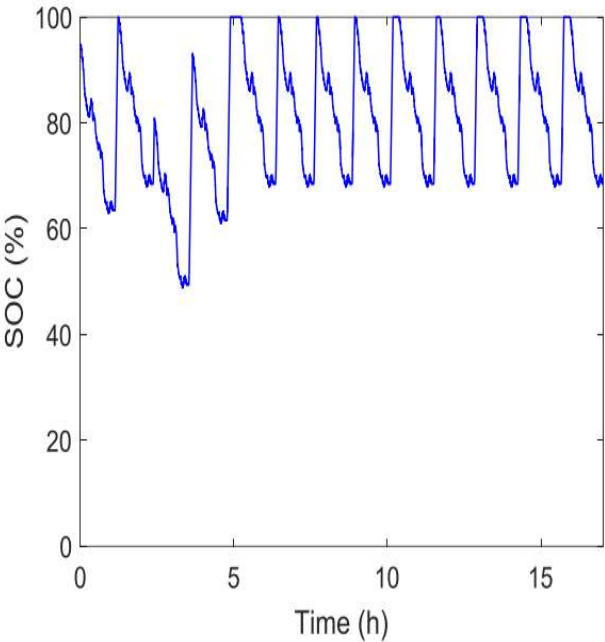
Definición de un consorcio tecnológico para el despliegue de la electro movilidad en el Transporte Publico

Estrategia para el despliegue de la electromovilidad en Transantiago

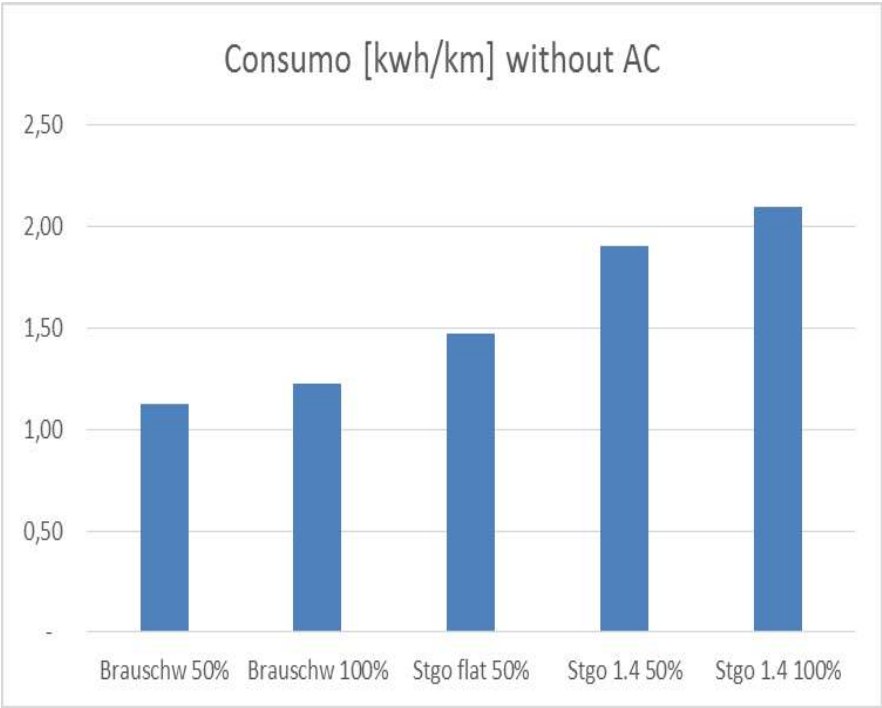
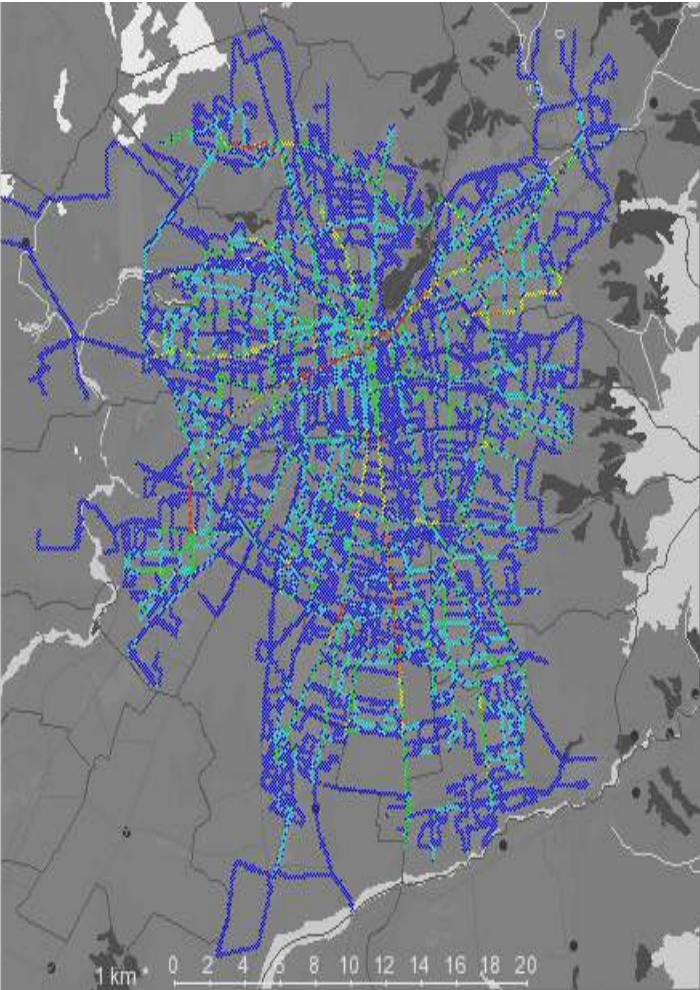
Oportunidades de financiamiento para apoyar el despliegue de la tecnología

Recomendaciones de financiamiento

Different technologies available: opportunity charging and overnight charging

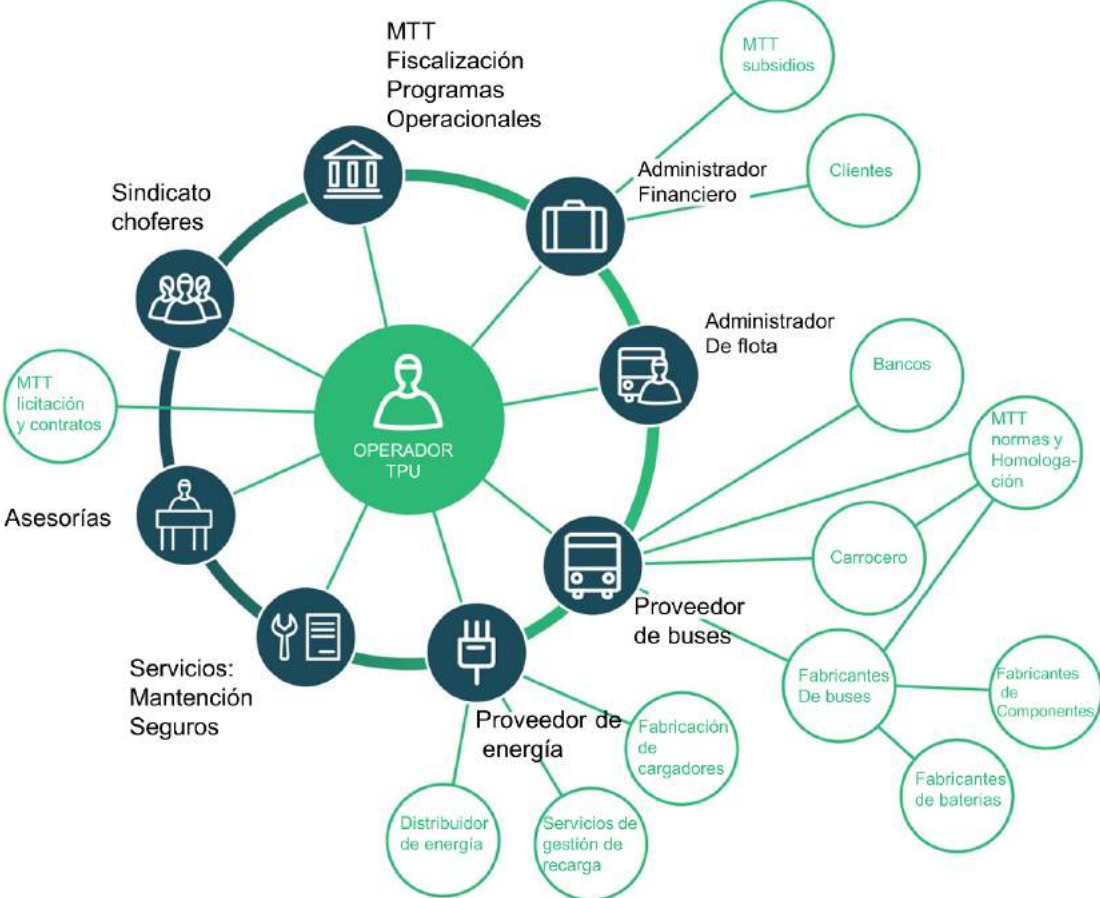


Different performances in complex public transport systems



Resultados preliminares de modelación y pruebas de laboratorio

Complex bussiness ecosystem for a PTO in Santiago



GCF Project Preparation Proposal

Background and Context

- Santiago RM (population 7.3M) with 1.2M private veh.
- 6,595 urban buses, more than 24k taxis and over 14k “colectivos” (shared fix route taxis)
- Over 60% of daily trips are made in motorized modes – each trip lasting around 30m and 6km
 - 29.1% are made in public transport & 28% in private car
 - 60% of all households do not count with a private cars
- Transport accounts for a third of energy emissions and almost half of of NOx emissions for Chile
- Transantiago alone emits more than 450k tonnes of CO₂ each year
- MTT has announced a move to Euro VI and 90 electric buses in its most recent tender (2018-2019)

Recent electric bus tenders around the world place Santiago's in perspective

Country	City	Year	# of ebuses
Thailand	Bangkok	2017 -	200
India	Bengaluru	2016 - 2020	150
USA	King County (WA)	2017 - 2020	120
Chile	Santiago	2018 - 2019	90
USA	Antelope Valley (CA)	2017 - 2020	85
Singapore	Singapore	2018	60
UK	London	2017	51(121)
Finland	Helsinki	2018	45-50
India	Delhi	2017	25
Korea	Jeju Island	2016	21
Italy	Turin	2016	16
South Africa	Cape Town	2017	13

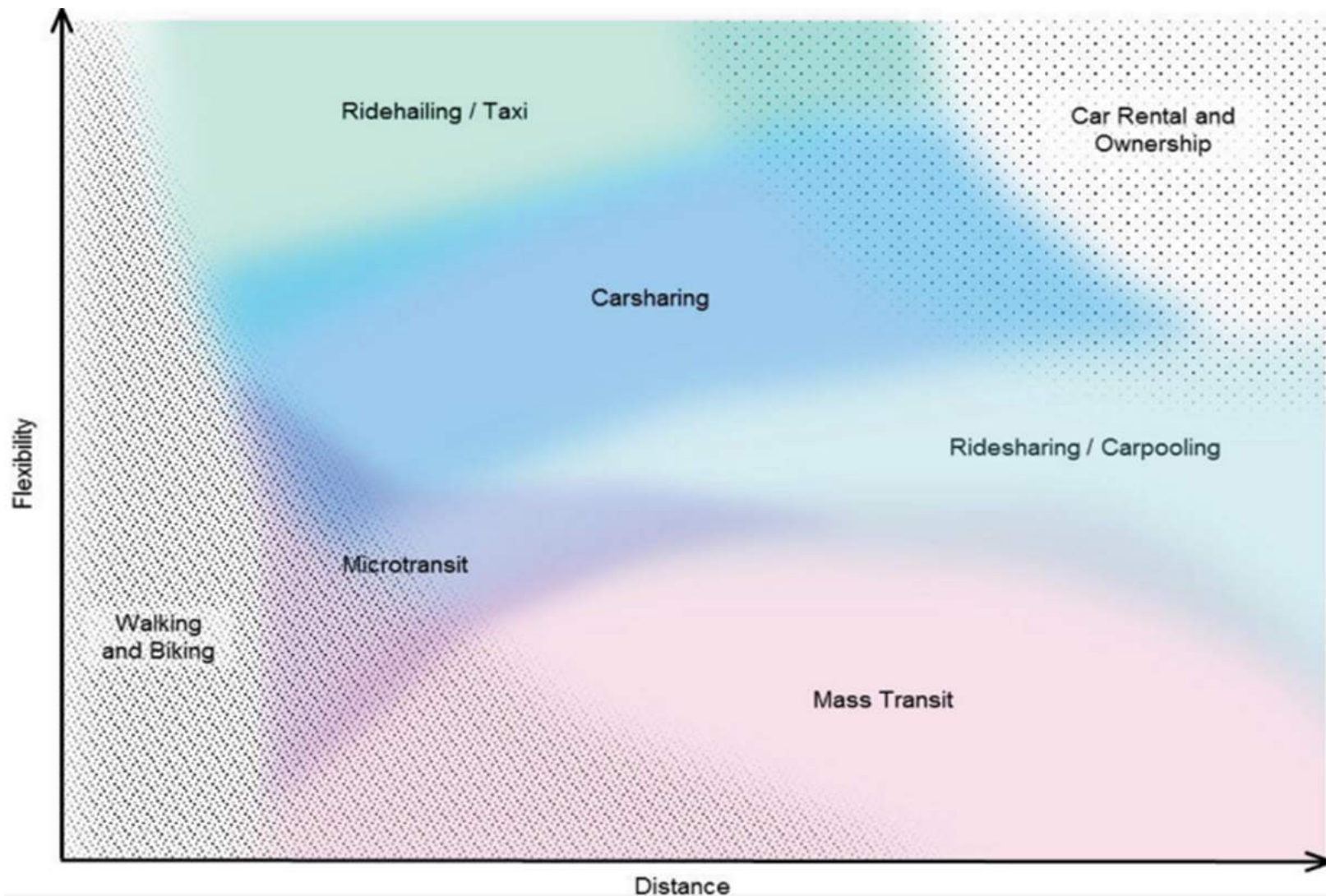
Recent electric bus tenders around the world place Santiago's in perspective

Country	City	Year	# of ebuses
Thailand	Bangkok	2017 -	200
India	Bengaluru	2016 - 2020	150
USA	King County (WA)	2017 - 2020	120
Chile	Santiago	2018 - 2019	90
USA	Antelope Valley (CA)	2017 - 2020	85
Singapore	Singapore	2018	60
UK	London	2017	51(121)
Finland	Helsinki	2018	45-50
India	Delhi	2017	25
Korea	Jeju Island	2016	21
Italy	Turin	2016	16
South Africa	Cape Town	2017	13

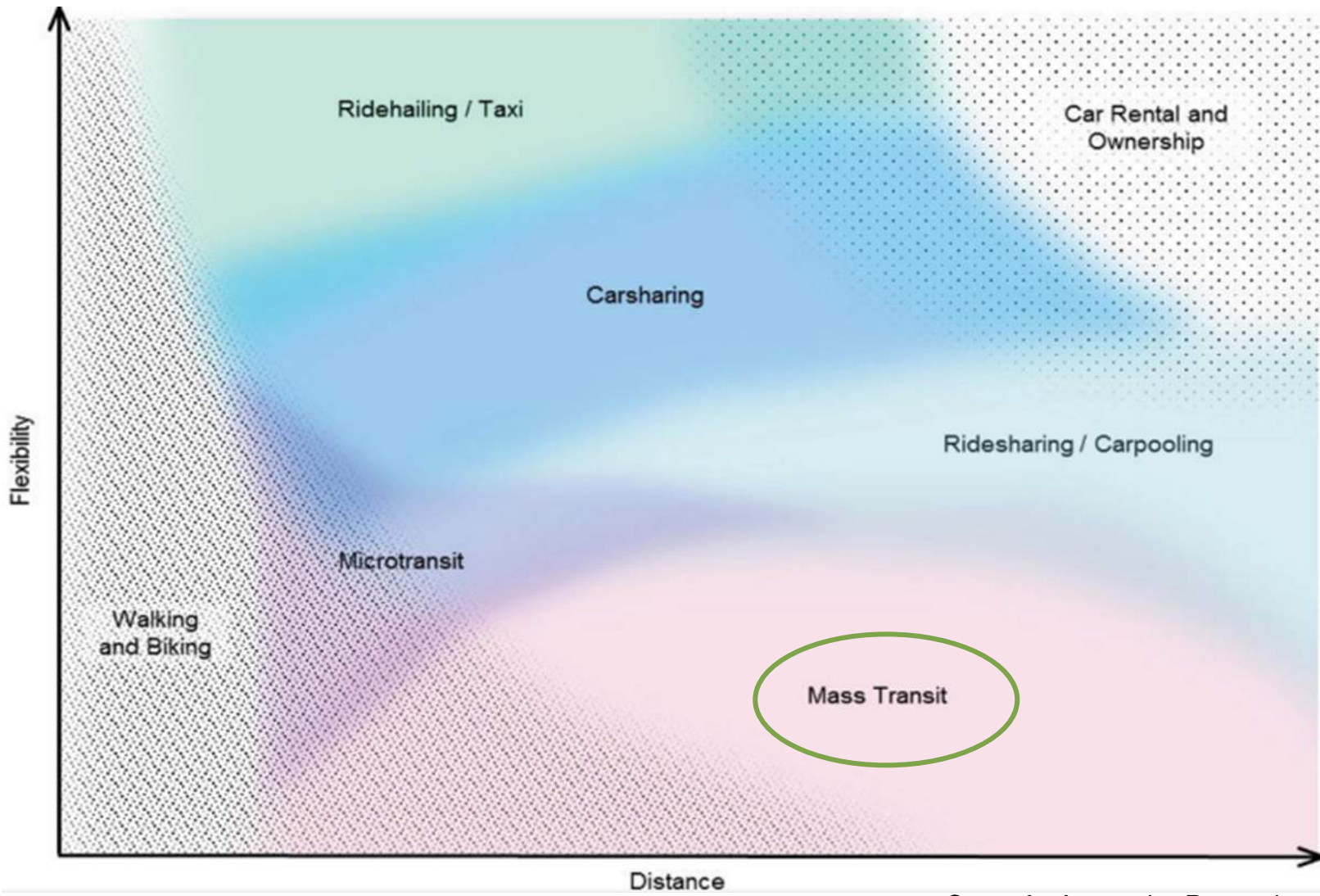
GCF Project Objectives

- The project aims at reinforcing the commitments expressed by the MTT in accelerating the adoption of zero emission urban buses in Santiago
- The focus of the project is on public transportation as a driving force for electric mobility in Chile
 - This is framed within a broader strategy to enable the electric mobility ecosystem nationwide
- The project aims to have 25% of the Transantiago fleet as BEBs by 2025
 - The scope of intervention will be refined in the full project
 - Including planning/developing the required charging network

Electrification potential for different transport modes - based on distance traveled and flexibility of route



Electrification potential for different transport modes - based on distance traveled and flexibility of route



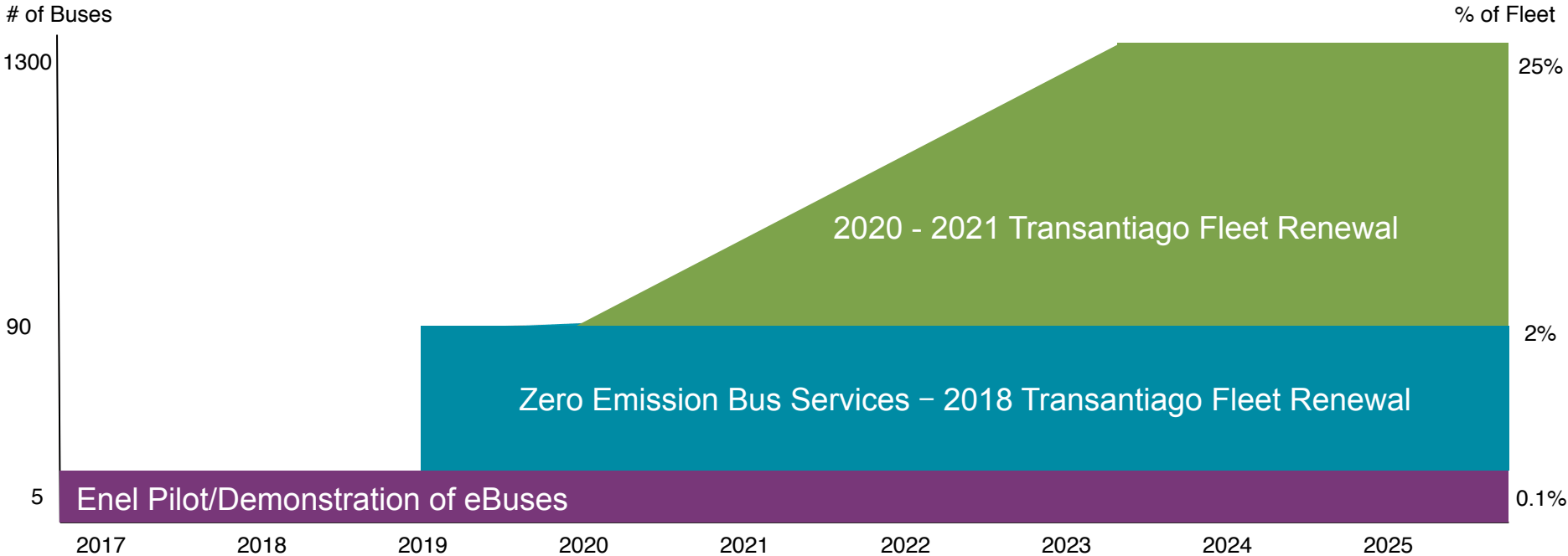
Urban buses represent the ideal case (in terms of operation planning and co-benefits) for e-mobility

- Energy efficient (low energy costs)
- High utilization rates enable faster pay-back
- Critical operation parameters are known:
 - Route length
 - Schedule/Frequency
 - Operating range and time
- Quiet
- Passenger comfort and service innovation
- Zero local emissions
- Multimodal potential of charging infrastructure (refuse, rail, tram, etc.)

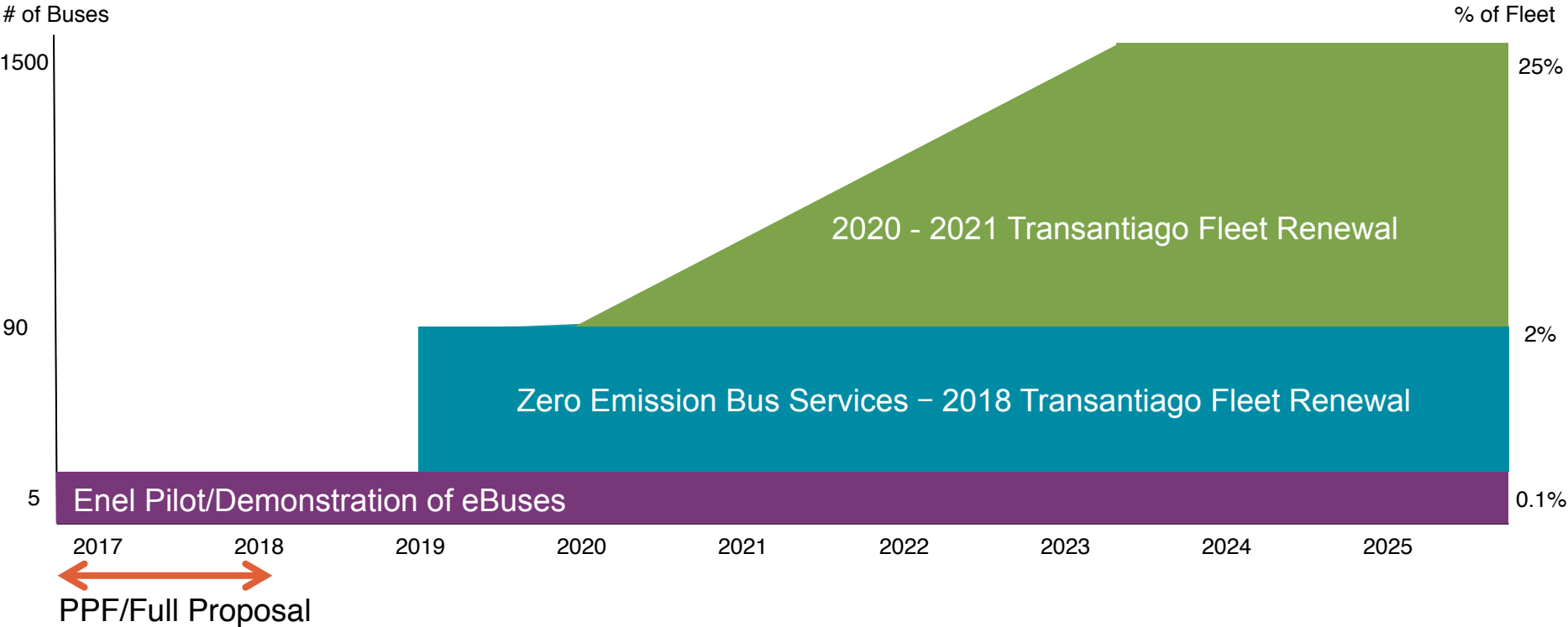
Aside from operational challenges, financing remains a key barrier to accelerated deployment

- In the USA, \$275 million in funding for zero-emission buses is available from 2016 - 2020
 - California, Chicago and New York, have voucher programs, ranging from \$95,000 to \$150,000 per vehicle, to purchase electric buses
 - Every state is eligible to receive funding from \$15 billion settlement from Volkswagen dieselgate
 - \$2.7 billion will go towards helping fund NOx mitigation projects
- China provides of incentives for up to \$81,600 per vehicle for the purchase of electric buses in 2016
- EU incentives vary by type and by country:
 - UK has set up several funds, such as: Air Quality Grant, Green Bus Fund, Clean Bus Technology Fund
 - In Spain, provides €15-30k per bus through MOVELE and MOVEA schemes to promote electric mobility

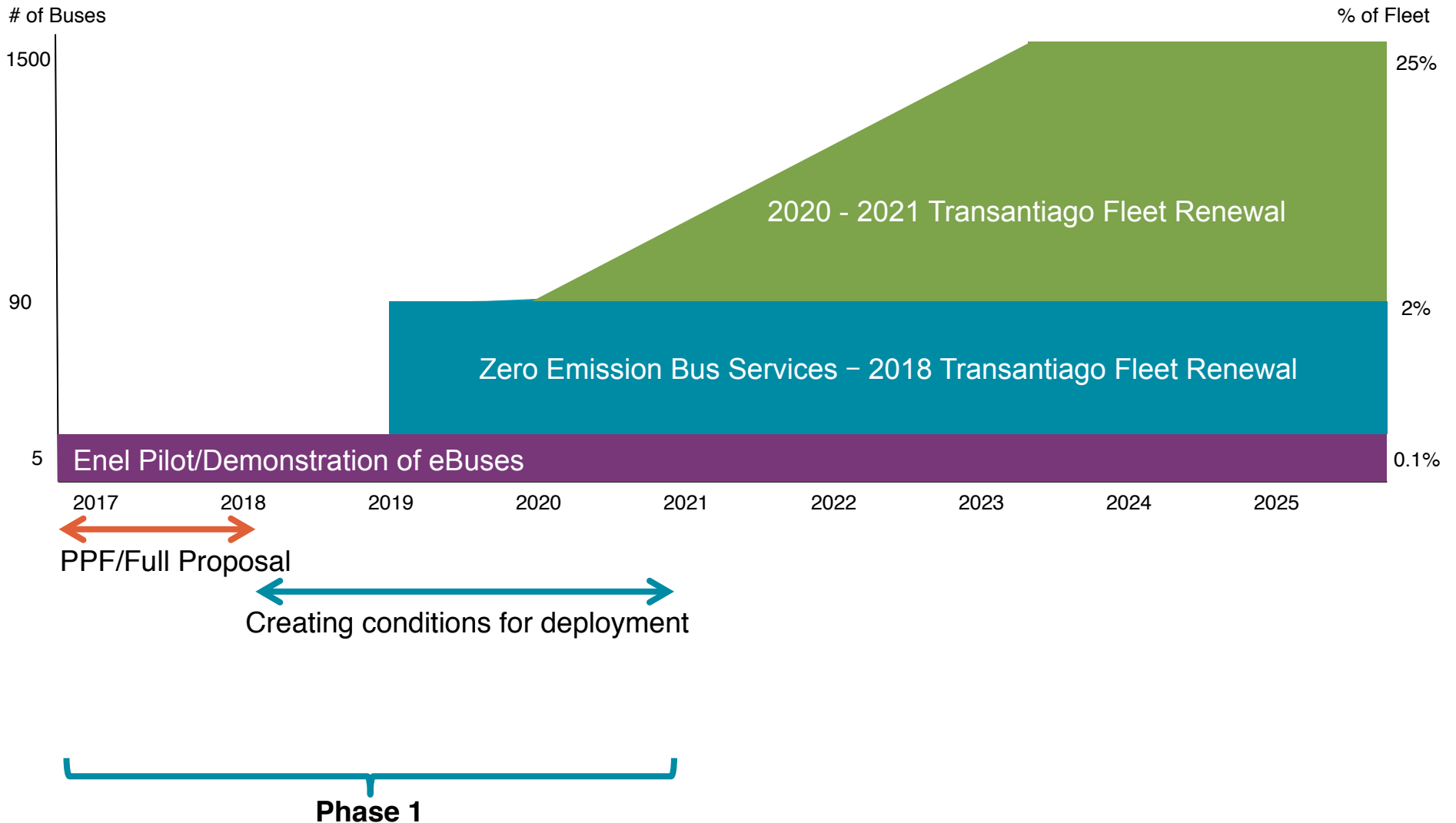
GCF Project Timeline: Deployment of Electric Mobility in Santiago's Public Transit System



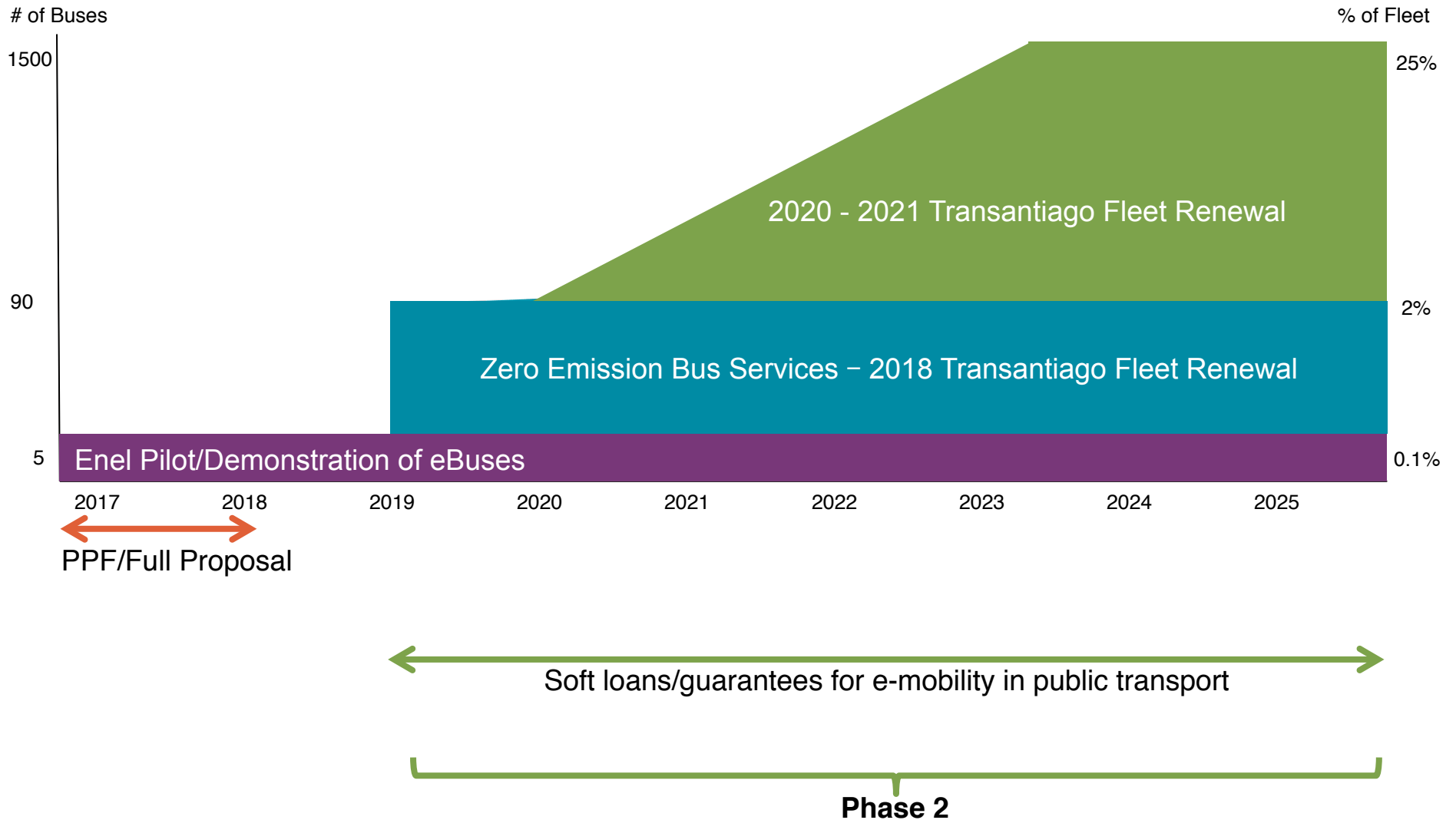
GCF Project Timeline: Deployment of Electric Mobility in Santiago's Public Transit System



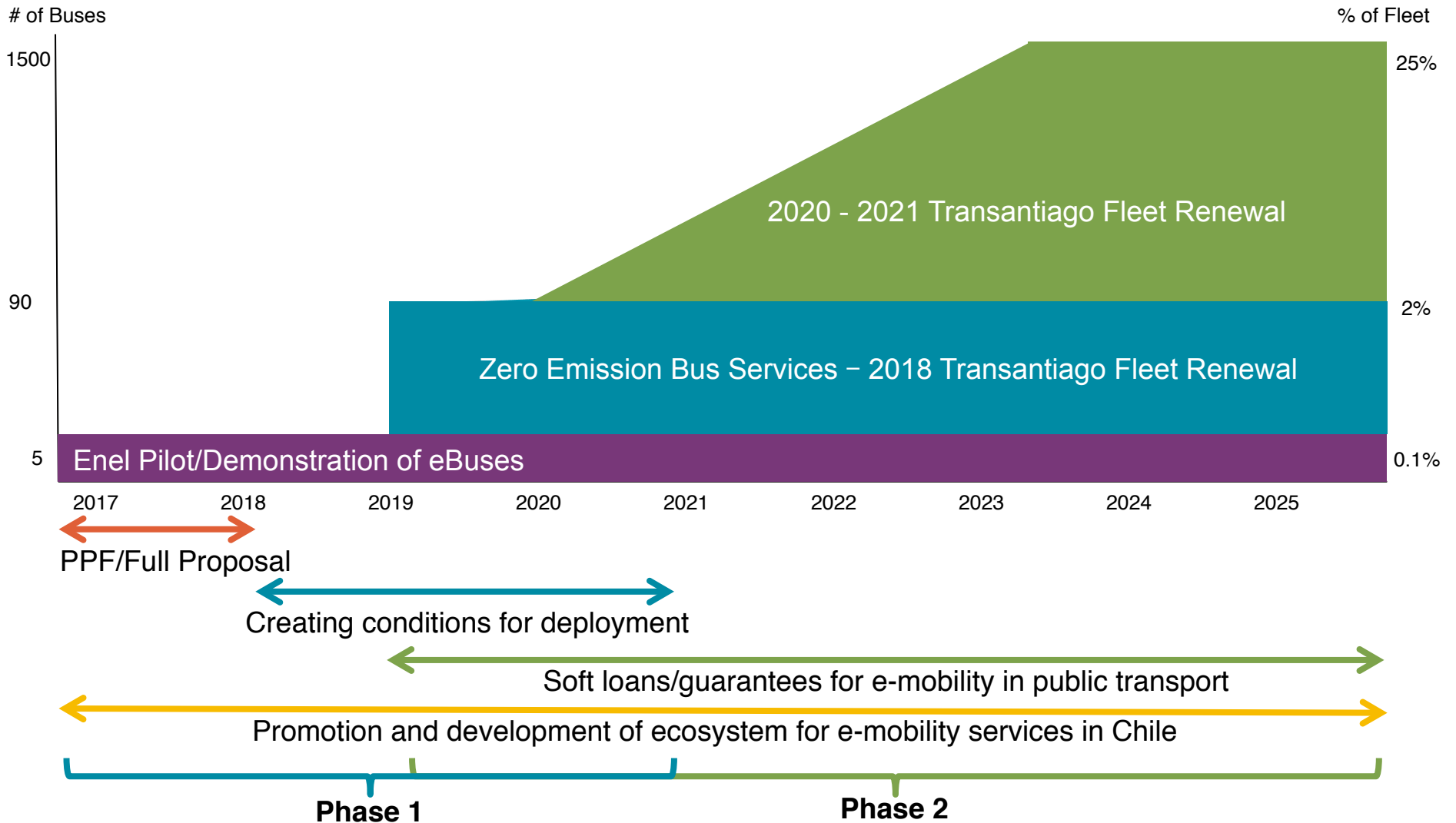
GCF Project Timeline: Deployment of Electric Mobility in Santiago's Public Transit System



GCF Project Timeline: Deployment of Electric Mobility in Santiago's Public Transit System



GCF Project Timeline: Deployment of Electric Mobility in Santiago's Public Transit System



Activities for GCF Project Preparation

Activity	Description
Analyze and mitigate barriers for ebus deployment	Identify and analyze the regulatory, commercial, financial and operational barriers for ebus deployment and activities to mitigate and overcome corresponding risks and barriers.
Evaluation of operating conditions for ebuses in Santiago	Monitor and evaluate pilot and demonstration projects in order to determine ebus performance under Santiago conditions.
BEB route planning for ebuses and charging infrastructure	Identifying routes with highest potential for ebuses in the medium term and the corresponding charging infrastructure.
Capacity building for Transantiago operators	Create capacity building workshops with bus operators and service providers for ebuses and charging systems.
Innovation platform	Empowerment of innovation platform created by CORFOs public goods initiative for the creation of an enabling ecosystem for electric mobility in Chile.
Economic, environmental and social impact assessment	Determine the economic, environmental and social impacts of the deployment of different levels and rates of ebuses in Santiago. This includes assessment as to job creation and gender considerations of the project.
Define financial instruments and structure for assistance programme	Define the financial instruments to be used to provide soft financing for the purchase of ebuses by operators.

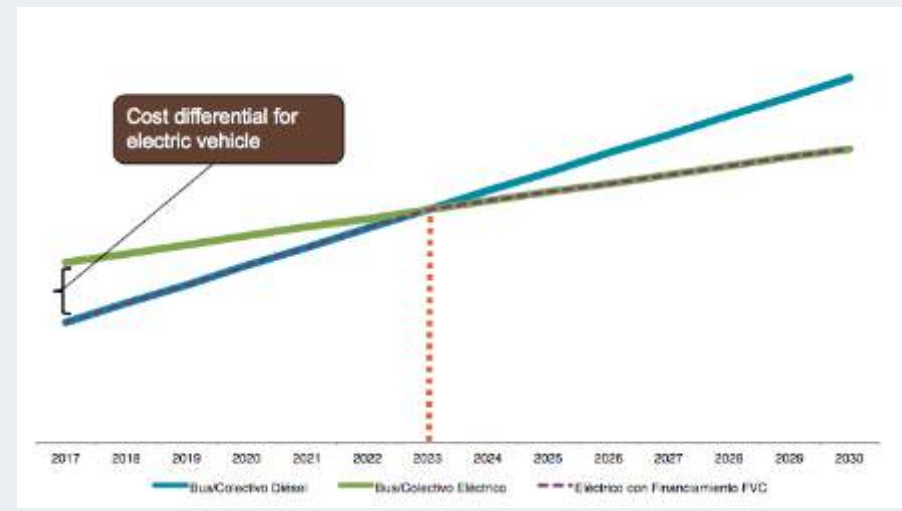
GCF Project Structure: Phased Approach

Phase 1: Enabling Environment for Deployment of Electric Mobility

- Pilot and demonstration projects
- BEB route planning for public transit
- Charging network planning and pilot projects
- Building capacity for transit operators and maintenance providers
- Adapting operator cost structure for electric buses
- Adapting tariff and subsidy structure for electric buses
- Developing market ecosystem for transport service providers

Phase 2: Financing for ZEVs for Santiago's Public Transit System

- Breaking commercial and financial barriers for ZEVs in public transit
- Soft, long-term, loans to Transantiago operators to cover incremental cost of buying an ebus



Preparatory Funding for GCF Project

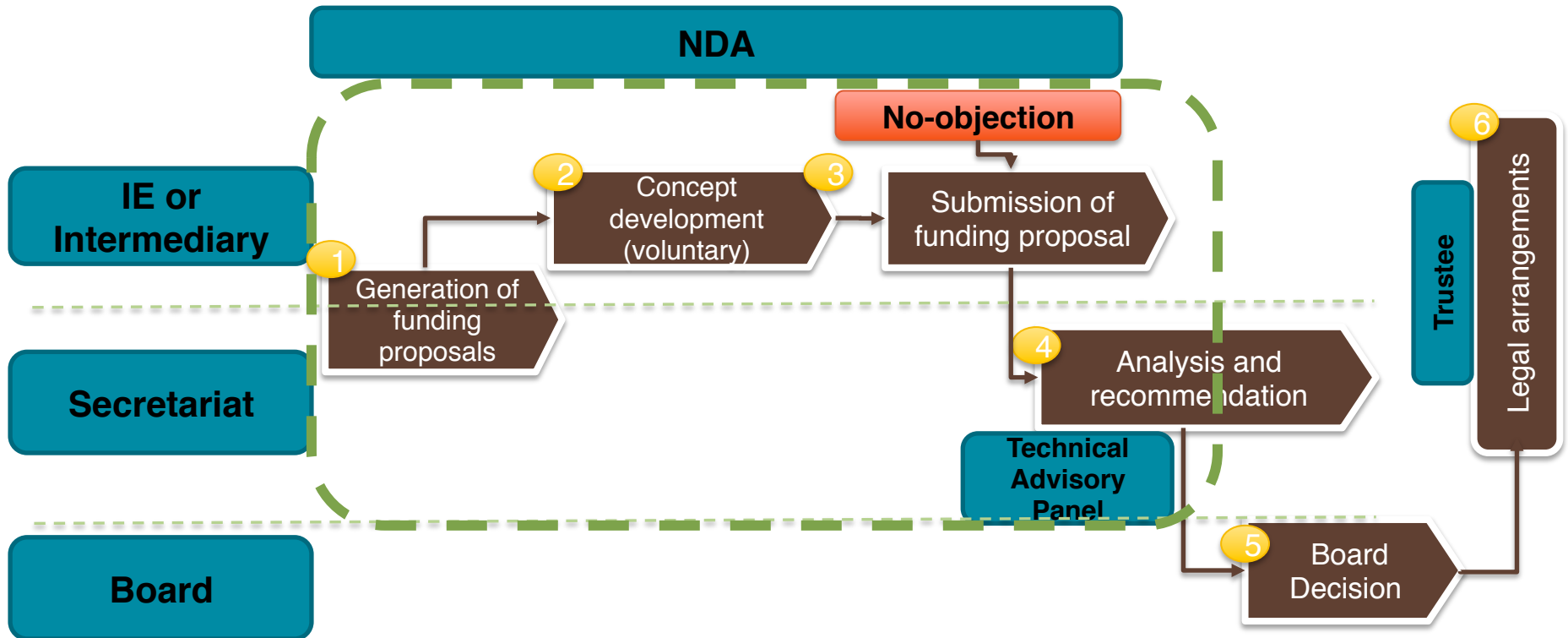
Agency/Partner	Financing (USD)	Months
GCF Preparatory funding	\$1.275.000	12-14 months
UN Environment Co-Financing	\$200.000	12-14 months
CAF Co-Financing	TBC	TBC
Private Sector Co-Financing (ENEL, VTT, CMMCh)	\$3.100.000 (additional funding TBC)	24-36 months

- Private sector co-financing includes acquisition and testing of different ebus technologies and charging systems
- Further co-financing is to be confirmed, expected to be an additional \$1-1.5 million USD

Institutional Partners, Executing Agencies and Local Partners

Level	Partner
Government Institutions	Ministry of Transport, Ministry of Energy, Ministry of Finance, CORFO
Executing Agencies	UN Environment and Andean Development Corporation (CAF)
Public-Private Partnerships	Consortio Tecnológico Movilidad Eléctrica
Local Technical Agencies	Centro Mario Molina Chile
International Technical Partners	Technical Research Center of Finland (VTT)
Private sector actors	SOFOFA, ENEL

GCF Next Steps: Initial Proposal Approval Process



- PPF Submission – End of April 2017
- Letters of No Objection from NDA and other involved parties – End of April 2017
- Timeline for Full Project (Concept Note) submission – End of July 2018

Gracias!

www.electromovilidad.org

sgalarza@cmmolina.cl