



Project Idea Outline

1 PROJECT ESSENTIALS

Full title of the project idea	Zero Emission Bus Transportation; Delft, London, Valencia
Acronym:	ZEB
Relevant Challenge Platform (if applicable)	To be established
Type of project (Innovation / Pathfinder)	Pathfinder
Lead institution(s)	TU Delft - ZEB Foundation
Total Grant request from Climate KIC (k€)	200 k€. To be established more precisely
Expected duration (months):	18 months
Contact person: name and email address	Michiel Ytsma, m.m.ytsma@tudelft.nl and Tineke de Vries tdv@tg.nl

IMPORTANT: Please do not keep below instructions in the document. The max. page number is 4!

2 TEASER (5-10 LINES)

The European Climate goal is to significantly reduce CO2 emission caused by transportation. The specific focus of this proposal is on a transition to a zero-emission public bus transportation system in a cost effective way. This requires an economic analysis of the existing value chain of public bus transportation and to remodel it into a new value chain using a total cost of ownership model (TCO). Designing and using a customized TCO model for this transition will deliver insight in the variables and rationales underlying this fundamental shift in system and how to make necessary changes. We propose to further develop a draft TCO model that has been designed under the Zero Emission Foundation umbrella; to fill the model with data from pilots in the Netherlands, Spain and the UK and to develop country specific versions of the model. The objective is to gain insight in what variables can or must be changed in order to make the transition happen and dissolve the deadlock that prevents innovations and new companies to start launching their new services and products related to this new public bus transportation system.

3 CONVINCING PRESENTATION OF THE PROJECT (MAX.2 PAGES)

1. Strategic fit:

The highest density of exhaust gasses and most important related health problems is measured – of course – in urban areas, especially in city centers. Public busses fueled with fossil fuels are one of the main sources of CO2 and small particle emissions causing major health problems in urban areas. Transition to zero-emission public bus transportation systems will address this issue and contribute to sustainable city systems where transportation and mobility are no longer a source of problems but a sustainable solution for cities.

The partners collaborating in this project believe that transition to an electric public bus transportation system is possible in an economic viable way. Partners are committed to facilitate this transition and make the necessary system changes with an innovation partnership formed by public parties and transportation and technology companies. The lessons learned in the different countries under this project will be a source of knowledge for each other and other KIC locations.

The technology for zero emission busses is available and ready to market but nevertheless implementation on a large scale is not taking place. The complicated structure of the underlying public transportation economic model that is subject to large amounts of public funds is not financially sustainable and is not providing the incentives facilitating implementation of new technologies and infrastructure. For the transition to an electric public bus transportation system a re-structuring of the value chain of public bus transportation is needed to produce a new business model that is economically viable to all players in the value chain. In order to do this we need to know what variables are driving the current business model and how we can change them to transition into a new business model making the transition to a zero emission bus transportation system possible.

The objective of this project is to design customized country specific TCO models, to fill the models with data specific to the countries projects and to research which variables can be changed to make a successful transition in a cost effective way. The TCO model will vary in the different countries and cases, but many of the variables are the same. So we will learn which ones are always important to analyze in different situations. The assumption is that the re-organizing the value chain could lead to the transition without extra total cost of ownership.

The results are twofold:

- The outcome of this project can be used in and compared with in other segments of the transportation sector (taxis, ferries, cars);
- The insight in different total cost of ownership models makes the transition possible opening up opportunities for new products and service providers related to the new transportation system and new energy infrastructure.

Route to market / Exploitation plan:

Barriers to Zero Emission Public Transportation

Large scale investment in electrification of transportation are not made, at the same time the current business model of the old system of public bus transportation is economically not sustainable; public resources for funding are declining and the existing concession model is not providing any incentive for investments in new (zero emission) technology and infrastructure. These two main barriers need to be addressed before a transition to a more sustainable (economically and environmentally) public transportation system can be made. For the private investment community realistic models for total cost of ownership of zero emission transportation are needed as a base for solid and objective investment decisions related to the new system. Currently there is not a model supporting decisions on transitioning from old bus transportation to the new zero emission system.

Route to solution

As a starting point we will use the conceptual framework TCO table (figure 1) and start filling it with data of the projects in the participating countries, the variables will be researched and new variables will be added based upon the results of the pilot. For example we will research the effect of the opportunity to commercially exploit the new energy infrastructure on new businesses and innovation. The economic value of these new products and services may be added as a new variable under 'socio-economic costs and benefits'.

Who will benefit from the TCO model and the transition? Companies involved in the electric engine technology, bus-design and material supply and electric charging infrastructure will directly benefit from the transition to zero-emission bus transportation but also financial companies involved in leasing fleets of busses and transportation companies will benefit from the new business model. New businesses related to zero emission bus transportation are enabled to seize the opportunity and launch their new products and services to market. The TU Delft for instants is working on the following ideas:

- developing / connecting to a (larger) car park power plant (consisting of hybrid cars in a parking garage) and business / service concepts around the energy interchange
- developing business ideas and hardware solutions for charging buses with renewable energy (to be generated through the energy wall and the iconic wind turbine 'The Harp')
- connecting the zero emission bus with a planned monorail or individual automated transport system (a connection between the campus and railway station Delft Zuid)
- Direct Current infrastructural 'smart' solutions, instead of alternating current.

Besides these new ideas this transition could also have spin-offs in other transportation sectors like taxi, ferries etc.

Figure 1 Conceptual TCO Framework

TCO – Framework for economic analysis ZEB

TCO Bus		TCO Energy and Emission			TCO-concession		TCO-socio-economic cost/benefit	
Basis bus	Mechanical engineering	Energy Infrastructure	Fuel Cell change		Concession terms	Business model	Airquality	
	Chassis		Induction fueling					
	Driver positioning		Battery change					
	Wheel axes	Infrastructure (Grid Connection)	Pantograaf		Public Transportation Authority	Business model	Noise	
	Energy Management System		Slow fueling	Super-capacitors				
	Auxiliaries		Other options		Public Transportation Organization			
	System Requirements PTA		Local Renewables					Infrastructure
	System Requirements PTO	Procurement kWh	Existing Grid		Finance of investment		Healthcare	
	Maintenance						Consumer Behavior	
				- Price - Sustainability - Quantity - Other options				
		Asset management and Maintenance						

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Route to market

The project will focus on implementing a customized tco model to facilitate the introduction of an electric bus transportation system servicing the pilot areas (Delft including a pilot of 28 busses in the city of Amersfoort, Valencia en London.) **and** to create opportunities for companies to commercially exploit the new energy infrastructure. The TCO model helps to align the economic drivers of all the stakeholders involved in the transition and will help to provide for an objective tool for investment decisions and will give insight in possibilities for changing the value chain.

The prospect clients are the Local Public Transportation Authority and the local bus concession owner (privately held transportation company). They already have shown their interest in the total cost of ownership concept and see this as an opportunity to make the transition possible without the need to allocate extra budget or investments. The first analyses have for instance shown that organizing the concessions in a different way could help changing the value chain in such a way that electrical busses are a preferred option to conventionally fueled busses.

As mentioned before the first outline of the model is designed under the umbrella of Zero Emission Bus transport Foundation. The member organizations of this foundation represent the car, rail and bus industry and are all interested in the outcome of the models and pilots. We would like to emphasize that this is not a publicly funded national program seeking extra funding, but an initiative funded by the member organization and industry. There is no budget for this project yet and the organizations are part of the foundation because they share the ambition for zero emission bus transport and zero emission transport in general because of the prospect of new business it will bring.

With knowledge about the TCO-models and the success of the pilot we can engage the wider KIC community and sell this as a model to more clients in the KIC Community as an economic viable solution for transitions to an electric public transportation system.

2. Novelty of approach / Innovativeness:

The uniqueness of this project lays in the fact that a new economic model will be introduced that will help to make the transition to a new zero emission bus transportation system possible and creates economic opportunity at the same time.

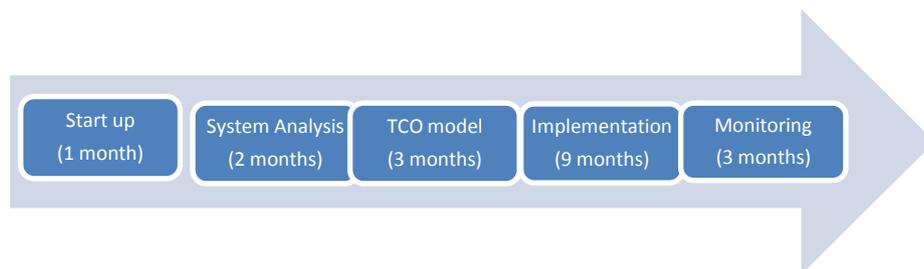
Partnership (max.0.5 page)

For all the different aspects of the tco model this project will search for the best expertise within the institutions of the consortium. A full proposal is going to be more specific on who is going to do what in developing the different aspects of the models.

Partner (Institution, contact, mail)	Contribution to project (capability, existing projects/products, role)
ZEB Foundation (NL) A Public Private partnership	Concept TCO Model; engagement of Prospect Clients
TU Delft	Research and development of the TCO model, comparing data and variables, consumer behavioral aspects. Analyses of the Dutch pilots. Creating a portfolio of new services and products resulting from changes in the total cost of ownership
Institute for Sustainability (UK)	Analyses of the energy mix. Input for the TCO model by comparing these cases with other sectors like ferries and taxis
Instituto Tecnológico de la Energía (ES)	Analyses of the Valencia pilot.

4 TIMELINE (MAX. 0.25 PAGE)

We will start up the pilot immediately after the formal approval of the project proposal and expect to complete the pilot within 18 months.



5 RESOURCES (MAX. 0.75 PAGE) TO BE DETERMINED IN A FULL PROPOSAL

Please give an indication of the required KIC funds and co-funding for the proposed project (see Annex I of guidance). While ideally the following tables should be filled in the minimum requirement is to present the KIC funding request over time for the entire project. It would be also of interest to:

- Have a tentative list of complementary activities (see table below) contributing to the project
- Understand how the team aims at leveraging additional financial resources in the future
- Whether/how many PhD students will be working on the activity

Distribution of project costs across partners.

	Total KIC added value cost	Climate-KIC funding	Eligible co-funding
ZEB Foundation			
TU Delft			
Institute for Sustainability			
Instituto Tecnológico de la Energía			
Taskforce Innovatie			
Total			

Distribution of eligible project costs across Business Plan years

	Total KIC added value cost	Climate-KIC funding	Eligible co-funding
2013			
2014			
2015			
Total			

Tentative list of activities per pilot

Name of activity (and Partner)	Short description (1 line)	Tentative amount
Draft TCO models	Analysis of the current variables and customize to country project	
Collect project data	Fill the model with project data	
Design TCO model	Custom made TCO model in co-creation with public and private partners	
Implement in project	Use the TCO model in implementing the new zeb transportation system	
Evaluation	Key Success and Fail factors will be evaluated	

Tentative list of complementary activities

Name of partner	Short description (1 line)	Tentative amount
Institute for sustainability	Low Carbon London. Smart grids programme linked to EVs	360k€
Institute for sustainability	Last mile logistics	900k€
TU Delft	Many KIC complementary activities which can be specified later on.	