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Summary

This paper examines the possibility of establishing an electric car-sharing program in New York, of the type that the French firm Bolloré articulated in France (*Autolib*) and in Indianapolis (*Blue-Indy*). It examines the current role of electric vehicles (EVs) in the global automobile industry. It explores how New York State and City policies could work in favor or against the establishment of a car-sharing program. It presents the opinions of energy and sustainability experts on electricity supply. Finally, this paper considers how an electric car-sharing system could fit into the ongoing reconfiguration of New York City's Metropolitan Transit Authority.

Keywords: battery, car-sharing, EV (electric vehicle), public transport, energy

Electric Car-Sharing: Is it Possible in New York City?

1.Background: Green Cars Today

Green cars were prominent on the brand banners of the 2016 New York International Auto Show at the Jacob K. Javits Convention Center's entrance galleries. The opening remarks of the 2016 Car of the Year Award ceremony underscored that what now matters the most for the new vehicles is, in order of importance: connectivity, fuel efficiency/ clean energy and shared mobility.[1] Connectivity refers not only to wireless communication technology, but also to sensors that allow for self-driving, maintenance efficacy and vehicular reaction to driving environment elements such as cyclists, pedestrians, animals and, naturally, other vehicles. Clean energy refers to non-fossil fueled vehicles: electric, hybrid and hydrogen-powered; and shared mobility to car-sharing services like Uber, ZipCar, and Bolloré's Autolib (Paris) and Blue Car (Indianapolis).

Indeed, the first award announced was the World Green Car Award, earned by the hydrogen-powered Toyota Mirai. The opening remarks underscored that in 2015 the amount of electric cars on the road reached one million. This number was below the industry's expectations.[2] However, electric vehicle sales growth is directly proportional to infrastructural development (visibility and availability of charging stations) and supporting policy (tax and investment incentives). This growth would have been higher had these two strategies fueled it, as it has been the case in Norway, the world's primary electric vehicle (EV) market and France, where there is currently a growth surge, and the province of Québec, where one of Hydro Québec's strategies aimed at turning Montreal into the electric car capital of the world.

Nationwide in the U.S. there are charging infrastructure initiatives that increased the number of electric vehicles. Nissan's "no charge to charge" program provides in 22 cities, two years of free charging to Nissan Leaf owners. The end of the fiscal year registered 20,000 charging stations. Thanks to an agreement with BMW, 520 quick charging stations had been added.[3]

Virtually every brand that exhibited at the 2016 New York International Auto Show featured clean energy vehicles in their line. Every single Volvo model will either be a green car or offer non-fossil fuel options. Kia, which is becoming the fastest growing brand under the helm of Frankfurt-based Chief Designer Officer Peter Schreyer, is investing $10 billion in its "green car road map," for which Kia would by 2020 have at least eleven models in its green vehicle lineup, in its goal to engineer an additional 25% in fuel economy.[4]

2. New York City and (individual) public transportation

For all its trendiness, economic might attention-getting New York is not, as a city, what the "diffusion of innovation theory" considers an *innovator*[5] or pioneer when it comes to individual public mobility infrastructure such as car-sharing and bike-sharing. It falls somewhere in-between an *early adopter* or part or an *early majority*. New York was cautious in setting up Citibike, its bicycle rental scheme. Citibike began to operate in 2013, five years after Paris launched Vélib and four years after Montreal launched Bixi. New York wished not to be a public bicycle system pioneer given the economic and regulatory complexity of its urban fabric, the challenges that the pioneering cities were experiencing, and the uncertainties in creating an indigenous business model. The bicycle rental schemes' experienced growing pains due to their disruptive nature. They were popular but unprofitable and complicated to manage… particularly Vélib, which was the world's largest.[6]

2.1 Current Environmental Policy at the City Level: From Sustainability to Resiliency

Two storms changed the course of this development in New York, one was climatic and the other electoral. Hurricane Sandy brought, in October of

2012, unprecedented physical destruction to the city and, consequently, a reformulation of the established public administration paradigms. On the other hand, Major Bill De Blasio's administration, which took office in January of 2014, implements a political and economic philosophy that seems significantly different from that of its preceding incumbent.

How does that affect the future of electric cars in New York? First, the priorities of sustainability in the City shifted, after Sandy, from long-term reduction of energy consumption while creating synergies and efficiencies, to resiliency: how to recover from natural disasters as rapidly and effectively as possible. Secondly, whereas Major Michael Bloomberg's administration (2002-2013) championed policies to promote the incorporation of electric vehicles into the transportation topography of the city, Mayor Bill De Blasio's administration (2014 to present) barely does.

2.2 Bloomberg: Sustainability

PlaNYC, the Bloomberg administration's comprehensive sustainability plan for the City, initiated a strategy to reduce the City's greenhouse gas emissions in 2030 by 30% from 2005 levels. As part of that overall goal, transportation emissions, which at the time accounted for 22% of New York City's total greenhouse gas emissions, would be reduced by 44% by 2030. *PlaNYC* also targeted a reduction in the city's levels of harmful particulate emissions and pollutants to improve New York City's air quality. Public transportation, bicycling, and walking were critical elements of the city's sustainable transportation system, as by using fewer automobiles and making existing vehicles more efficient, the city could also become more sustainable.

For those New Yorkers that would continue to rely on the automobile for their mobility needs, these electric vehicles could offer an improvement over gasoline vehicles in reducing both urban pollution and greenhouse gas emissions, helping to meet the City's *PlaNYC* targets. Mayor Bloomberg's office created a division: *Drive Electric*[7] for implementing policy fostering the use of electric vehicles, which is evidence that electric vehicles were pivotal to the Bloomberg administration's environmental policy unlike his successor's. It featured a website with New York City-specific consumer information such as "Owning: Does an electric car work for me?"[8]

2.3 De Blasio: Resiliency

Under the de Blasio, the Mayor's Office of Sustainability and the Mayor's Office of Recovery and Resiliency oversee and implement the sustainability and resiliency initiatives in *One New York: The Plan for a Strong and Just City*, a plan that is the new equivalent of Bloomberg's *PlaNYC*. *One New York* claims that the City has already achieved:

- The cleanest air in 50 years
- 950,000 trees and six million square feet of reflective rooftop added to our urban landscape
- Building codes upgraded to prepare for floods, wind, and extreme weather

- 19% reduction in carbon emissions since 2005, on track to reaching an 80% reduction by 2050

There are only two mentions of electric vehicles in *One New York*, which are essentially continuations of *PlaNYC*'s policy, which suggests that in the new administration's sustainability policy there is no focus on electric vehicles.[9]

3. Current Environmental/Transportation Policy at the State Level: Governor Andrew Cuomo and *Charge New York*

Two factors at the state level may boost the popularity of electric vehicle in the City. First, the State of New York is one of the larger new car markets in the U.S. However, the much smaller market of Washington State dwarfs NY total of 2,615 registered electric cars.[10] There were 12,351 electric cars registered in Washington as of December 31, 2014, according to the state Department of Transportation. Only about 200,000 new vehicles are sold in Washington per year, but aggressive policies, unlike in New York, begot a much higher percentage of electric cars, which suggests that policy could make a difference in New York too. The other factor is that, under Governor Andrew Cuomo, the New York Power Authority (NYPA) improves the infrastructure for electric vehicles. NYPA. Along with the New York State Energy Research and Development Authority (NYSERDA), the NYPA is spearheading Governor Andrew Cuomo's Charge New York Initiative, announced in 2013. The goal was to create a statewide network of up to 3,000 public and workplace charging stations over the next five years and to put up to 40,000 plug-in vehicles on the road during that period.[11]

4. Would a car-sharing program be established in New York City?

As previously indicated, New York was not pioneering in developing Citibike, its public bicycle scheme, even when Mayor Bloomberg's 'green arm," that is, Department of Transportation Commissioner Jeanette Sadik-Khan, was committed to convert New York into one of the bicycle capitals of the world. In Paris, an electric car share program (Autolib) branched out of Vélib, the paradigmatic bicycle rental system that ignited a flurry of similar operations all over the world. It does not seem likely that, for now, an electric car-share program like Paris' Autolib or Indianapolis' Blue Indy would automatically evolve from Citibike, on the one hand because New York tends not to trendily hop on the bandwagon, and on the other because electric cars are not a priority in the new mayor's sustainability plan. Nevertheless, this is a young administration and so are the best-known metropolitan electric car share programs.

So… would an electric car-sharing program be established in New York? The answer is yes. Such programs are, so to say, unavoidable for cities like New York. They are the wave of the future. Vehicle manufacturers continue to accelerate the development of EV technology (particularly the batteries,

which constitute 1/3 of the of each EV cost). As *Bloomberg* (Business Report's) Tom Randall indicated, in 2015 the batteries' price fell 35%, and are on a trajectory to make unsubsidized electric vehicles as affordable as their gasoline counterparts in the next six years.[12] Additionally climate change-led public policy create incentives for consumers and develop charging infrastructure in states and cities, while the political economy does not favor the fossil fuel's industry.[13] Infrastructural development and policy, rather than consumers (who tend to be cautious and conservative when it comes to this type of investment) drive the market forces, so today's regulatory environment is certainly paving the way. Specifically, New York City is, so to say, trying to reinvent itself energetically after the Hurricane Sandy disaster in a "resiliency" effort. The popularity of shared mobility, from bike-sharing to Uber and ZipCar further energize the possibility of a car sharing system in New York, similar to the ones available in Paris and Indianapolis.

4.1 The Role of Energy in a New York City Car-Sharing Program

I asked energy experts of the City University of New York (CUNY) if they thought that a program like this could be soon established in the City, and how to develop the charging network. They all thought that it was possible. Yehuda Klein,[14] Executive Officer of the Graduate Center Program in Earth and Environmental Sciences, sees good prospects given that so many people in the city have no cars. He indicated that the local (electricity) utility would have to price its supply for the public car-sharing operation by diversifying its load without stressing its service. For private EV owners, gas stations could be incorporated in a network of charging stations. New York, added Klein, does not have an energy producer-distributor like Hydro-Quebec, which facilitates policy implementation and infrastructural development. However, policy and entrepreneurial solutions could make this service viable, he added.

Hildegaard Link,[15] a Doctoral Candidate at the Graduate Center Program in Earth and Environmental Sciences, indicated that although the (energy) product sellers are rather diverse, Con Edison owns most of the distribution in the five boroughs and would probably like to maximize the use of their infrastructure. Additionally, the New York Power Authority, a not-for-profit energy company sells power to the New York and New Jersey Port Authorities. These two organizations, if engaged in the program, could probably convert airports and/or subway and/or train stations into distribution hubs, with solar paneled charging stations at airports. Link believes that car and bicycle sharing can help in peak shaving, that is, in strategically alleviating traffic congestion at peak hours. Fuel cell charging stations are another possibility to reduce environmental impact through clean energy diversification.

Robert Bell is a green energy authority and author of *The Green Bubble.*[16] He is active in the world climate summits.[17] He indicated that if Citibike develops an agreement with a vehicle manufacturer, like it was the case in Paris between Vélib and Bolloré when they created Autolib, it would be

possible to develop a program at New York. This entity could, for example, build parking facilities in in Brooklyn and New Jersey and grant the car-sharing vehicles toll-free access to and from Manhattan (as an alternative to congestion taxing), and shift the insurance liability from the service provider to the customer through the subscription or rental fee. The City would have to eliminate parking space on the streets as it did for Citibike in order to create additional lanes.

Bell, who knows well the city of Paris, indicated that EVs had a 58% growth in sales during 2015 because owners can charge in the same stations created for Autolib, which makes owning EVs desirable. As Carlos Ghosn, CEO of Nissan and Renault, indicated at this years Detroit auto show, for an EV environment to progress the infrastructure must be available and visible. However, according to Bell, focusing on EVs would transform, if not harm, the business model of car manufacturers, to the extent that 80% of their revenue does not come from selling cars, but from their maintenance. Electric vehicles are not only durable, but also less complicated mechanically than conventional fossil-fueled vehicles. Furthermore, as Bell stated in his article on Saudi Arabia and "the end of fossil fuel," an electric car boom is possible.[18]

Michael Menser,[19] a CUNY environmental ethics professor who advises the City in matters of resiliency, participatory budgeting and sustainability, is positive about the development of a car-sharing program in New York, in view of the City's plans regarding public transportation:

A-Although the priorities of the City changed from *sustainability* to *resiliency* after Sandy and under De Blasio, there is a residual commitment in the City for hybrid and electric vehicles, at least in the City fleets.

B-The City is in the process of developing a coastal tramcar on the west side of Brooklyn and Queens

C-Ferry services will be added from the Rockaways up and down the East River

The City is about to phase out its Metrocard system, added Menser. These developments seem to signal a reconfiguration of the Metropolitan Transit Authority to articulate intermodal transportation, in which a car-sharing service could be a component.

5. Conclusion

At the global, national, state and city level, technological advances along with public policy and cultural changes in matters of personal mobility are paving the ground for a car-sharing service in the City of New York. The year 2020 promises to be a decisive year in the transformation of the available automotive technology and environmental policy and, concomitantly, in the City's transportation landscape.

During a taxi ride across Manhattan I asked Emanuel Sofiev,[20] a Russian Prius driver who is interested in engineering, if he thought that a car-sharing program would soon be operating in New York City. "Definitely," he said… "It is the wave of the future… we have no other choice… it's coming… they'll build designated parking for that." "Do you like your Prius?," I asked. "Best car I've ever had," he said. Perhaps this is one reason why envisioning an electric car-sharing system in New York is, not to him, a foreign idea.

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[1] New York International Auto Show, Car of the Year Award ceremony, Thursday, March 24, 2016.
[2] Tom Randall: "Here is How Electric Cars Will Cause the Next Oil Crisis," *Bloomberg*, February 25, 2016, http://www.bloomberg.com/features/2016-ev-oil-crisis/, accessed on 2016-03-25
[3] This is according to José Muñoz, Executive Vice President of Nissan North America, in: *Carlos Ghosn's Media Q&A at the January 11-24, 2016 Detroit Motor Show* (https://www.youtube.com/watch?v=eQeLW0y5bkA) accessed 25on 2016-03-25
[4] Conversations with Kia's Candelaria Powell, Multicultural Marketing Manager, and James Hope, Manager, Product Communications (March 24, 2016); Scott McKee, Director, Corporate Communications, and Steve Kosowski, Long Range Strategy Manager (March 25, 2016) at the New York International Auto Show.
[5] Everett P. Rogers, *Diffusion of Innovations*,New York: Free Press, 2003

[6] Tironi, Martín (2011). Building infrastructure for mobility: the case of self-service bicycle programs in Paris. *Athenea Digital*, 11(1), 41-62.
[7] *Drive Electric NYC* from:http://www.nyc.gov/html/ev/html/home/home.shtml, accessed 2015-11-20
[8] **Owning: Does an electric car work for me?** accessed 2015-11-20
Owning a car in New York City is different than anywhere else on the planet: challenges like parking and congestion and alternatives like bicycling and public transportation mean that New Yorkers use their cars for unique patterns of travel. Some New Yorkers will be a better match for electric cars than others. The sections below can help you evaluate whether your home is a good candidate for adopting an electric car.
Will an electric car go everywhere I need it to go?
Despite its population, New York covers a relatively small area – an electric car could travel the 45 miles across the five boroughs and back again within a single charge. While extended range and plug-in hybrid electric cars can travel farther by refueling with gasoline, they provide the most benefits when operating gasoline-free.
When you get to where you're going you can either plug-in using a normal outlet or find a nearby fast charger. A fast charger takes half as long as using a wall outlet. Electric cars are designed to recharge every night at home rather than needing to travel to a gas station. Because of this, most drivers will start each day with a full charge. Electric cars also provide plenty of warning before their batteries are fully depleted.
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Electric cars are designed to recharge every night at home rather than needing to travel to a gas station. Because of this, most drivers will start each day with a full charge. Electric cars also provide plenty of warning before their batteries are fully depleted. When the battery is nearly empty, many electric cars feature a "low power mode" that allows you to travel at a reduced speed to get to a safe place. To help you understand whether an electric car would match your lifestyle, we asked real New Yorkers how an electric car would work for how they travel:
Only short trips
Lisa lives in Flushing and uses her car almost every day**.** She drives to shop for groceries, visit friends, and babysit her grandchildren. All of these trips are less than thirty miles' roundtrip.

Car	**Cost**	**Cost/Mile**
Conventional Compact Car (Honda Fit, Nissan Versa, etc.)	~$20,000 w/ similar specs	$.14 (based on 27 mpg)
Electric Vehicle (Nissan Leaf)	$25,000 w/ federal incentive	$.09

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[9] *One New York: The Plan for a Strong and Just City*-NYC.gov http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf accessed 2015-11-20
[10] Edelstein, Stephen, "Which Electric Car Dominates Sales in New York State?" *Green Car Reports*, May 9, 2015. http://www.greencarreports.com/news/1098201_which-electric-car-dominates-sales-in-new-york-state accessed 2015-11-20

[11] New York Power Authority. "Electric-Drive Vehicles: Moving into the Future: http://www.nypa.gov/ev/ accessed 2015-11-20
[12] Tom Randall: "Here is How Electric Cars Will Cause the Next Oil Crisis," *Bloomberg*, February 25, 2016, http://www.bloomberg.com/features/2016-ev-oil-crisis/ accessed: 2016-3-25

A year before Randall's article, the review of two recent on electric cars read, in regards to batteries: "As both Levi Tillemann's "The Great Race" and Steve LeVine's "The Powerhouse" highlight, the central problem is the nearly miraculous energy density of gasoline. Just one kilogram of the stuff, or about one-third of a gallon, LeVine notes, contains 1,600 watt-hours of stored energy. A car can easily carry many gallons of that powerful liquid and cover hundreds of miles before needing a refill. Developing batteries that can hold even half as much energy, making them continually rechargeable and light enough to be carried around on two axles, and installing a nationwide charging infrastructure as ubiquitous as gasoline filling stations — all this has proved elusive…. Better batteries would give electric and hybrid cars even better performance and increased range, which would improve their appeal. But the batteries also need to be cheaper for the mass market. These batteries would have other uses, such as storing energy on the grid. As the sun does not always shine nor the wind always blow, better batteries could squirrel away surplus energy produced by renewable sources for when demand peaks." Tom Zeller Jr., "Two books ask: will the electric car ever be the car of the present?" *The Washington Post*, February 27, 2015 https://www.washingtonpost.com/opinions/the-long-pitted-road-toward-large-scale-production-of-electric-cars/2015/02/27/09230816-a584-11e4-a7c2-03d37af98440_story.html accessed 2015-11-20
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[13] Robert I. Bell, "Quand les Saoudiens parient sur la fin du pétrole," *Les Echos*, February 25, 2016, http://www.lesechos.fr/idees-debats/editos-analyses/021670920561-quand-les-saoudiens-parient-sur-la-fin-du-petrole-1202707.php accessed 2016-3-25
[14] Yehuda Klein, Chair, Department of Economics, Brooklyn College Murray Koppelman School of Business, *Interview*, March 21, 2016.
[15] Hildegaard Link: Doctoral Dissertation project: *The Water - Energy Nexus: Water & Energy Interdependencies in Regional and Local Scale Consumption*, Earth and Environmental Sciences Program, City University of New York (CUNY) Graduate Center, *Interview*, CUNY Graduate Center, March 17, 2016.
[16] Robert I. Bell, *The Green Bubble* (See: http://robertibell.com/?p=83) accessed: 2016-3-25
[17] Robert I Bell, Professor, Brooklyn College, Department of Business Management, Murray Koppelman School of Business, Telephone Interview, Paris, March 25, 2016.
[18] Robert I. Bell, "Quand les Saoudiens parient sur la fin du pétrole," *Les Echos*, February 25, 2016http://www.lesechos.fr/idees-debats/editos-analyses/021670920561-quand-les-saoudiens-parient-sur-la-fin-du-petrole-1202707.php accessed 2016-3-25
[19] Michael Menser, CUNY Graduate Center Program: Earth and Environmental Sciences, *Interview,* Brooklyn College (City University of New York) Philosophy Department, March 21, 2016.
[20] Emanuel Sofiev, *Interview*, (Manhattan taxi ride from West 76 Street to East 58 Street, 9:30 AM), March 18, 2016.

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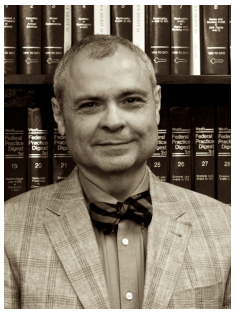
and the University of Valencia, Spain. He is known internationally for his work on television and the Internet. His research focuses on the economic connections between the Province of Quebec and New York State and, more recently, on electric vehicles (EVs). He was granted sabbatical leaves (2016-2017) to develop his Department's courses on Sustainable Business and Environmental Ethics.