

Renewable Energy and the Urban Challenge

Distributed Generation and Urban Sustainability in Buenos Aires

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Abstract

The powering of urban life is a widespread topic and the need for a shift away from environmentally harmful fossil energy sources is becoming ever more evident.

The Iresud project in Argentina aims to create such a transition through the employment of solar energy generation in urban settings. Solar power is a renewable energy source, a factor that has connected it to the fostering of sustainable development as well as a crucial part in powering cities without the use of finite fossil fuels. Therefore, the research discusses the socio-technical transition promoted by the Iresud project and does so in the setting of the Argentinian capital, Buenos Aires. The thesis asks if and how this transition can contribute to urban sustainable development. By analysing interviews carried out with representatives from the Iresud project the research discusses the perceptions and driving forces that motivate the actors responsible for this transition. The analysis suggests that the project is a response to the need for economic sustainability in Buenos Aires while omitting social and environmental concerns. However, by acknowledging profitability as a key incentive for a transition in the city, the project is reacting to contextual forces and thereby choosing a feasible route for a successful implementation. Existing political regulation as well as social interest have been recognised as hindering the project, as well as internal conflicts. However, although most participants have described the Iresud project as unsuccessful in many ways, the diffusion of the technology has been understood as a positive development and a way of creating social awareness in the society.

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1. Introduction

Sustainable Cities

Today 54 % of the world's population lives in cities and the number is expected to increase in the coming decades (UN 2014: 2). It would seem that cities make out the future for human populations, a point also recognised two decades ago by David Harvey in his book *Justice, Nature and the Geography of Difference* (1996: 403). However, due to the vast amount of people opting for urban life, these cities now represent three quarters of total global energy consumption and are responsible for over 70 % of global CO₂ emissions (World Bank 2014). The important role played by cities regarding sustainable development efforts as well as climate change mitigation has been recognised worldwide. One attempt to increase the sustainability of cities has been the introduction of renewable energies through distributed generation¹ which tends to be presented by fossil fuel adversaries as the rational way forward, away from the fossil fuel addiction that has been targeted as the main cause of global warming and climate change (IPCC 2012). In an attempt to decrease CO₂ emissions urban renewable energy projects have been launched in a wide array of places and contexts such as São Paulo, Barcelona, Freiburg and Dezhou. These projects have generally been facilitated through various incentives created by local and national governments that have allowed for a more attractive market of renewable energy technology and subsidies to increase investment (IRENA 2014).

Renewable Energy in Argentina

Energy consumption in Argentina has long been characterized by a dependency on the fossil fuels oil and natural gas, sources that in 2011 were reported to make up 87% of the country's total energy matrix. Regarding electricity, fossil fuels make up 66% of this generation. Furthermore, as demand for energy has been growing and the national reserves and extraction of fossil fuels finds itself in a steady decline, Argentina has been forced to increase its energy importation and especially natural gas from Bolivia. As of 2010 this trend has turned the country into a net importer of primary energy and created a national energy crisis as it keeps undermining the country's ability of self-sufficiency (Villalonga 2013: 6, 16). In Argentina

¹ Distributed generation refers to a decentralisation of the energy market meaning that generation and consumption occur in one and the same location (Ackermann, Andersson & Söder 2001: 195-6).

both provincial and national legislation is in place and goals call for a total of 8% of electricity generation in the country as a whole to be derived from renewable sources by 2016, a number that today rests on a steady 1,4% (Villalonga 2013: 6). The capital city Buenos Aires is participating in projects for local sustainability and clean energy such as Local Governments for Sustainability (ICLEI), the national programme for renewable energy (GENREN) as well as the Climate Leadership Group (C40). Furthermore, in November 2014 the city hosted the 5th International Solar Cities Congress, a congress that focuses on energy and climate change, sustainable construction, energy use and local generation. However, large-scale measures for the successful introduction of renewable energies in Buenos Aires still have a long way to go. According to the Carbon Disclosure Project (CDP), a UK based organisation providing emissions reports from cities worldwide, the autonomous city of Buenos Aires emitted 9,813,933 metric tonnes of CO₂ in 2013 mainly linked to urban features such as transportation and residential and commercial buildings. Simultaneously, risk assessments show that Buenos Aires is set to suffer an increase in climatic events such as heatwaves, longer summers, storms and heavy precipitation as well as a decrease in air quality due to the increased use of contaminating fuels. These prognostics will affect the future supply and demand of basic resources such as electricity in the city (CDP 2013).

The consequences of global greenhouse gas emissions have already been felt in the area. The region has often been observed to suffer inundations. One more recent example of this is the inundations in April 2013 when torrential rains affecting Buenos Aires and nearby La Plata resulted in floods leaving dozens dead and thousands displaced. Summer heatwaves are also occurring on a regular basis causing drought and power outages in the capital as electricity demand soars in an attempt to cool down the city (BBC 2013, La Nación 2014). This chain of events has led to the use of fossil fuel powered electricity generators popping up all over the city during the summer months. What is more, outages are so frequent that an interactive website called *Acá No Hay Luz* (Here There is No Light) has been created that allows citizens to report and get updates on current power cuts (Clarín 2015, *Acá No Hay Luz* 2015). The observed biophysical impacts are those of a warmer climate. However, human systems depend not only on the weather forecasts, but also the social, economic and political conditions in the affected regions. Due to the level of emissions stemming from cities worldwide, urban measures to decrease these are crucial.

Case Study – The Iresud Project

The previous discussion suggests that cities can play an important part in halting global CO₂ emissions and being the drivers of a sound global development through a shift to renewable energies. Drawing on this, the research intends to focus on one project that proposes precisely such a shift. The Iresud project in Argentina is the result of a public-private partnership created in 2011. It was initiated to facilitate the introduction of technologies related to solar power both connected to the grid and through distributed generation in Argentina. The consortium is made up of five private corporations and two public entities. The members are as follows:

Public: The National Atomic Energy Commission (CNEA) and the National University of San Martin (UNSAM)

Private: Aldar, Edenor, Eurotec, Q-Max and TE Connectivity

The goals of the Iresud project have been set to include the development and establishment of laws and regulations to facilitate the installation and use of solar panels in Argentina. Among the objectives there is also the focus on installing and operating solar panels for electricity generation in both public and private buildings, as well as in residential houses. Furthermore, from the beginning the project has been a driver of the issue of connecting solar panels to the electricity grid, meaning that any excess energy that the panels produce can be injected into the grid and sold elsewhere. Today, the Iresud project has fitted 40 solar panel installations all over Argentina, 3 of which are located in the city of Buenos Aires. They are all located in public buildings; the astronomic observatory, the energy department and the ministry of planning. The locations have been marked in red on the map below.



Figure: Red dots indicating installations carried out by the Iresud project in the city of Buenos Aires. (Source: Wikimedia Commons)

Due to the importance that solar energy is being attributed worldwide as a feasible way of reducing CO₂ emissions and the ecological footprints of cities, the focus of this thesis will be urban sustainable development through the adoption of renewable energies. By analysing the Iresud project in the setting of Buenos Aires I will have a platform for discussing local energy generation as a viable approach for agreeing with a multi-faceted urban sustainable development. These concepts will be discussed in depth in the theoretical section of the thesis.

From an ecological point of view, different cities face different geographical and climatic conditions that play an important role in the planning for urban sustainability. The same can be said about socio-political traits and traditions as well as economic considerations in a

specific area. Because of this, there is a vast array of definitions of what a sustainable city implies and how a process towards sustainability should be approached (Vojnovic 2013: 6-7). What this emphasizes is the inevitable importance of context specific approaches both in creating frameworks as well as in the execution of such processes. However, two themes will be playing a central part in this research. Firstly, the concept of sustainable development is recognised as a three-legged chair, taking into consideration the three aspects of environmental, economic and social development. Secondly, the study departs from the understanding of urban sustainable development as necessarily connected to a shift away from the use of fossil fuels toward the employment of renewable energy sources. These themes and the reason for applying them in the research will be presented in chapter 3.

Research Questions

By focusing on the Iresud project and the different challenges it is being subjected to in the specific context of Buenos Aires, the research sets out to discuss the connection between such an energy transition and its commitment to urban sustainability. This point has been translated into two research questions that the thesis seeks to answer:

1. In what way is the Iresud project a driving force of urban sustainable development?
2. How can local solar energy generation as such contribute to urban sustainability in Buenos Aires?

Structure

In chapter 2, the thesis starts by outlining the constructionist methodological framework that serves as a basis for understanding how the research has been approached. I then discuss the methods used for gathering data and the limitations that have been recognised in regards to these. In chapter 3 the thesis moves into the theoretical framework which includes an initial presentation of socio-technical transitions followed by a discussion of urban sustainable development through theories of urban environmental transitions and urban energy transitions. Additionally, a section focusing on equity will be tied to the key theoretical concepts. I then sum up the key concepts to be applied in the analysis in the section called *Operationalisation*. Following this, the thesis moves into chapter 4 which is the analysis where the data is presented and discussed. The data is then further analysed in the section

called *Discussion* which is followed by the conclusion where I also answer the research questions presented above.

2. Methodological framework & Methods

Constructionism

Drawing on the ideas of constructionist thought, the thesis departs from the point of view that urban traits are in fact the resulting constructs of human interaction. The social world has been described by Thomas Luckmann as the result of our history. That is, human activity that has shaped and reshaped the social world over generations. This in turn has led to the structures being perceived today which have been constructed through traditions and institutions that guide our lives on a daily basis. What this further indicates is that the social structures that dictate dynamics of social hierarchies, trade flows, consumption, international relations etc. are in fact created through ample accounts of human interaction (Luckmann 2008: 281). When looking at the quest for solar energy in Buenos Aires through this lens it is clear that the past constitutes the present, and any transition regarding energy generation must therefore take previous and current circumstances into consideration (Holland & Quinn 1987: 4). Therefore, in order to understand the energy transition in Buenos Aires it would seem highly necessary to bear in mind the social, political, and cultural models, as well as the perception of these, that are laying the ground for the city's future path of development. Furthermore, by applying this methodological framework to this particular research it must also be recognised that it is the inhabitants of the city who perceive any process of urban sustainable development through existing societal institutions, norms and relations. Therefore, urban sustainable development, or just sustainability, can in itself be approached as a social construct whose existence or non-existence is depending on different contextual factors across urban settlements. The main idea to be drawn from this discussion is that when we accept that societies are made up of social individuals it must also be taken into consideration that the perception of urban sustainable development in a defined setting may lead it to be prioritised in such a way that it is granted more or less attention (Klintman 2014). Consequently, holding that knowledge is a social construct and furthermore that this knowledge is context specific, it can also be argued that the inhabitants of a city are limited to perceiving only that which they find relevant to themselves. This is an interesting point that echoes in the works of Alfred Schütz as he states that “[r]elevance is not inherent in nature as such, it is the result of the

selective and interpretative activity of man within nature or observing nature” (1953: 3). What this implies is that when analysing whether a socio-technical transition can lead to urban sustainability or be part of urban sustainable development it is important to distinguish the causes or factors that drive the project. In other words, if the participants can be recognised to be striving for ecological, economic and social sustainability the project could potentially be moving towards that very end. However, if participants of the solar power project display motivations stemming from a limited part of the research’s understanding of the concept of urban sustainable development this would lay the ground for a different discussion. In that event it would be necessary to doubt the results of the project as part of a sustainable development. Consequently, by accepting past actions as the shaping power of the present day we can recognise the motivations of the Iresud project as the guiding force of the course it will take.

Methods

Personal experience

During 2014 and 2015 I spent 7 months in Buenos Aires as an intern working in the city legislature. On a daily basis I would come in contact with the local discourse on how to make the city ‘greener’. I was also introduced to projects that were being carried out by the local government, what actions were being taken from the civil society, and what should be done in a foreseeable future. What especially drew my attention was the push for solar energy, not just in Buenos Aires but in the country as a whole. Since 2011, Argentina has been facing the reality of being a net importer of fossil fuels, mainly natural gas from Bolivia. What this means is that as a whole, the country is spending more money on its imports of fuels than it gains from its exports. Simultaneously, the sheer geographical extension of Argentina gives it a vast array of opportunities for harvesting renewable energies such as wind in the southern parts and solar further north. During my time in Buenos Aires I read documents and articles, laws and regulations. I also attended several seminars and conferences where I had the chance to have personal conversations with presenters and other participants which has added to my understanding of the situation at hand. Two conferences on renewable energies open to the public were attended in Buenos Aires. The first occasion was a 2 day conference on the 23-24th of September 2014 organised by a local NGO and the faculty of engineering at the Catholic University of Argentina. The second event was the International Solar Cities

Congress that took place on the 17-18th of November 2014 organised by the city of Buenos Aires. This data has been useful for obtaining a clearer understanding of the context regarding the scope of renewable energies in Buenos Aires as well as the local way of addressing solar energy. By extension, this has provided me with a good idea of the setting in which a project like Iresud finds itself driving questions of distributed generation. Regarding the data, what it all had in common was a will to convey the grand possibilities of renewable energies and, more importantly, the necessity of transitioning to an environmentally benign way of generating energy. As a result of this I became very aware of the local and national discourse on renewables in Argentina. This experience has provided me with a basic understanding of existing motivations and barriers in the city of Buenos Aires and will be considered a source of knowledge in the thesis. Outside of these personal observations and experiences the research also gathers data from previous literature on socio-technical transitions and urban sustainable development. This literature will be presented in the theoretical framework in chapter 3.

Interviews

Apart from the aforementioned gathering of knowledge, the main body of primary data has been obtained through semi-structured interviews with 8 representatives from the Iresud project. The interviewees were chosen due to their direct involvement with the project and because they were oftentimes the only representatives with a connection to Iresud. Among the interviewed are engineers, market managers and Iresud project directors. The title of each interviewee will be presented in the analysis. The representatives have all agreed to the use of their full names in the thesis. Furthermore, the interviews were conducted in Spanish and have been translated by me. The quotes used in the data analysis have been marked with footnotes and can be found in the Appendix in their original Spanish form. The questions used in the interviews were quite open, thereby allowing for the interviewees' own perceptions to come through without me steering them in any direction other than the focus of the research. All of the interviewees have had long experience with electrical energy generation in Argentina. However, the amount of experience with solar energy generation specifically was more varying. The interviews were conducted via Skype and recorded directly by the computer with consent from the interviewees. Initially this approach brought about some concern. The fact that I did not meet the subjects in person can be criticized as it can be argued that by not appearing in the same room as the interviewee one may miss out on information expressed

through body language and other non-verbal communication. Furthermore, it can be argued that by not having a physical meeting but instead sitting down in front of a computer the subject may not be as engaged in the conversation, thereby affecting the information given. However, for each interview an appointment was scheduled in advance and during the sessions the interviewees made it clear they were under no time constraints and were happy to talk about the project. Two additional interviews were conducted with subjects not connected to the Iresud project but familiar with the solar energy discourse in Buenos Aires. One of the interviewees, who wished to remain anonymous, was chosen due to being involved in a local organization working with renewable energy. The other interviewee is Gastón Fenés, content director at Energía Estratégica, a well-known Argentinian news portal that specializes in renewable energies.

The data from the interviews will be presented and discussed in the analysis. The intention is to determine the perceptions of each representative in order to conclude how they approach the socio-technical transition and the concept of urban sustainable development in Buenos Aires. The data has been separated into sections where each project member is being discussed individually and key concepts are being highlighted. However, this will be followed by a joint discussion on the main findings from all of the interviews. The decision to present the data by member arose as a way to highlight differing approaches and motivations from the members. Furthermore, it allows for a clearer view of forces and relations internal to the Iresud project.

Limitations

At the start of each interview I introduced myself and gave a brief summary of the research topic. I was careful in positioning myself and not expressing my own thoughts about the project. This emerged as a result of a discussion I had to have on how to approach the participants. After the first couple of interviews it started to become clear that ambitions and motivations among the participating companies and institutions varied. There were also some tangible disagreements between project members. Through this realisation it became successively more important for me to adopt a standpoint that was as neutral as possible in order to minimize my own effect on the information given. This could possibly be seen to have had an impact on the answers I acquired later on in the interviewing process. Furthermore, at times I had to deal with the feeling of being given socially and politically

correct answers from the interviewees. This aspect will be further dealt with in the analysis section.

In addition, another limitation can be recognised in the number of participants interviewed. The amount of interviewees can always be up for scrutiny in qualitative research. However, in order to address this issue it is central to point out the approach utilized when selecting subjects. By focusing on including voices from each one of the seven participating companies and institutions measures have been taken to improve the scope and validity of the total data collected. Furthermore, it is worth pointing out that attempts were made to expand the number of interviews focusing on subjects from the project members. However, when discussing these possibilities with already interviewed subjects only CNEA and Aldar could give me the names of one more representative each. These two could however not be successfully reached. Regarding the other participants I was informed that they were the only ones engaged in the project. For this reason, the amount of interviews could not be expanded to include further accounts.

Although Iresud is a national project that includes 40 installations in different provinces across the country I have chosen to focus on the work that is being done in the city of Buenos Aires. This geographical limitation emerged primarily out of my own connection to the location. However, taking the discussion on the importance of context into consideration as well as the time constraints present, it would be contradictory to include all cities under a general contextual framework. Argentina is a federal state which means that different socio-political powers are present in different provinces. Moreover, considering that the country counts with 2,780,400 square kilometres (UN Data 2015) of national territory the various environmental conditions would have to have been considered for each city. This would not have been feasible for the time frame at hand.

3. Theoretical Framework & Key Concepts

The Urban Mission

The urban setting as a feasible environment for sustainable development endeavours has been criticized by many by drawing on issues such as polluting transportation, energy use in

buildings and infrastructure, and simply the sheer size and intensity of social, cultural, and economic relations that go on both within the city limits as well as between urban areas in different locations. The nature of cities has a long history as topic of debate. In 1867 Karl Marx recognised that capitalist production had a predilection for gathering people in nodes of capital accumulation, cities. However, he also acknowledged that as nodes of capital accumulation they necessarily thrive on the influx of material and energy from their surroundings, a concept also referred to as the metabolic rift (1867/1982: 637-8). More recently, this view has been addressed by William E. Rees in his article *Is 'Sustainable City' an Oxymoron?* where he states that “the ecological locations of urban regions no longer coincide with their geographic locations” (1997: 307). In other words, there seems to be a general understanding of cities as somewhat opportunistic in their relationships with their hinterlands meaning that the ecological footprints of urban areas are vastly larger than the geographical space we normally refer to when we talk about cities. Drawing on this understanding of cities, is urban sustainability a feasible endeavour?

Marx’s idea of the metabolic rift between the city and its rural surroundings is visible in the workings of energy generation for use in Buenos Aires. Although referring more to 19th century depletion of soil fertility at the time of writing, the concept adapts neatly to modern urban energy consumption as the majority of the energy comes from locations outside of the city, stretching as far as to other countries. In other words, cities as we know them cannot sustain themselves without the importation of material and energy. Hence, cities are unsustainable. However, the functioning of urban areas could also allow for a radical change towards sustainability (Bauman 2003: 5). As stated by Rees: “...the sheer concentration of population and consumption gives cities considerable leverage in reducing the ecological footprints of their citizens” (1997: 309). Furthermore, local energy generation would in theory render imported primary energy from other countries as well as from other locations in the country itself obsolete.

Socio-Technical Transitions

The shift from non-renewable to renewable energy sources in Argentina suggests a shift in technology use. However, as these technologies will inherently be powering cities and their functions it cannot be seen as a purely technical transition but a socio-technical one. Related

to the topic of this research this refers to electricity generation and use in the city of Buenos Aires. This approach has been described by Frank Geels whose writings on socio-technical transitions will serve as a starting point for this paper. According to Geels societies are supported by socio-technical systems that are produced and reproduced through the interaction of different social agents such as companies, universities, public entities, consumers, NGOs etc. These systems would in other words not serve any societal purpose without the human feature. Furthermore, any transition from one system to another would also necessitate a paradigm shift in aspects of regulation, user and cultural practices, values, perceptions, and economic resources. Drawing on this, it is clear that socio-technical transitions are in fact processes that respond to multiple actors and power struggles and a vast array of stakeholder interests (2005: 445-6, Geels 2012: 471, Lawhon & Murphy 2012: 355-7, Praetorius, Bauknecht, Cames, Fischer, Pehnt, Schumacher & Voss 2009: 4). The quest for solar power in Buenos Aires can thereby be recognised as a socio-technical transition being driven by the motivations of the various private and public actors. Furthermore, in the context of Buenos Aires there are certain societal factors, such as the ones mentioned above, which the transition needs to take into consideration and respond to in order for a shift to be successful.

When addressing an existing system there are certain factors to consider. For example, an established system might be subject to forces of a political nature, meaning that laws and regulations inhibit any structural changes (Bulkeley, Castan-Broto & Maassen 2011: 38, 43). Furthermore, Geels proposes a certain societal ‘blindness’ to transitions as the routinisation of existing practices makes for any systemic development to look in certain directions while omitting others. This societal embeddedness of a socio-technical system is what then causes a so called ‘lock-in’, where practices, lifestyles and political engagement all favour the system at hand. From an economic point of view it must also be stated that existing systems usually carry with them large investments leading any changes to also imply a certain economic loss for some (Geels 2005: 447). As can be understood, the socio-technical systems literature incorporates a strong focus on context as this is what guides social actors’ inclinations but also how a transition can be understood. However, the issues of ‘lock-in’ and ‘blindness’ discussed above do make for a rather hostile environment in regards to system transitions. So how can these transitions be carried out?

One focus has been the necessity of niches (Praetorius et al. 2009: 38). Any innovation to a system must initially be quite low key as it would be challenging the already ruling system. Therefore, by creating a limited transition in a certain context with the help of public and private funding one can establish a new socio-technical framework from which a further development will be easier to achieve. In Buenos Aires, this niche is manifested by the Iresud project. Through these niches the actors driving the transition would have the possibility to try out various approaches as well as learning from their own and external responses. It has been suggested that such an approach to system transition can cause a trickle-down effect that allows for further technology adoption and cultural awareness. However, as is the case with Iresud, these niches are usually made up of heterogeneous groups of social actors, leading projects under this framework to be inherently scattered with stakeholders trying out different ways of achieving a transition. Therefore, such endeavours are usually quite diffuse in their progress as they tend to be treading brand new ground in their local contexts (Geels 2005: 450).

What is also proposed by socio-technical transitions is the need for a multi-level perspective that considers both struggles internal to the niche as well as external forces as playing an important part in shaping the shift. Due to the many interests exercising certain powers on a transition project, the dynamic of any such process cannot be expected to be consistent and linear. In fact, drawing on the above discussion of central factors in a socio-technical transition it can be assumed that these processes will be riddled with colliding approaches and interests and therefore suffer an irregular development. Especially in the case of socio-technical transitions regarding electricity one can assume that there will be a certain amount of resistance. Since the large infrastructural systems are generally based on a long history of technology investments e.g. power plants, power lines, cables etc. this would require a multi-level approach that takes external socioeconomic aspects into consideration (Geels 2005: 452-3, Verbong & Geels 2010: 1214, 1217). This is also tied to the aspect of economic resources put forward by Verbong and Geels. While obviously an important characteristic in socio-technical transitions they do believe that such processes cannot be fully understood without incorporating the social actors of the project. This would imply that the interactions between the project stakeholders will be conducive of the transition and determinant of its end point (Verbong & Geels 2010: 1215).

A common question that can be revealed in the theory of socio-technical transitions is *how* a shift can happen. However, in order to be able to properly approach the research questions in this paper, what will be further discussed in the following section is *where does it lead?* The thesis recognises the Iresud project as a socio-technical transition. However, since the research seeks to analyse the project through its connection to urban sustainable development it is essential to add such a focus to the framework. By applying theories of urban transitions and sustainable development, key concepts will be highlighted and allow for the introduction of certain ideas and phenomena that will be analysed in relation to the Iresud project in the discussion.

Urban Sustainable Development

Departing from the understanding of the city put forward by Henri Lefebvre and David Harvey regarding ‘the right to the city’ assumes that there is a collective power to shape and reshape the urban condition through social, environmental and economic relations as well as technological innovation (Lefebvre 2003, Harvey 2008). Assuming this position in regards to renewable energy technologies in urban areas will accept the city as an entity subjected to constant transformation where social ties and power relations will inevitably lead to processes of change. From a conceptual point of view, what is clear is that any action comprising an element of ‘development’ implies a transition to something else or a transformation of existing circumstances. A development is therefore not a fixed state but an ongoing process that necessitates constant activity that allows one to move beyond the starting point and into the process itself. This is an important point of the research as it draws on theoretical frameworks that take precisely such urban developments into consideration.

There is a wide body of literature to draw from when approaching the concept of urban sustainable development. Attempts have been made to create a framework for such developmental endeavours but have many times failed due to problems arising from efforts to create globally applicable development structures in an inherently diverse world. However, for the purpose of this research I have chosen the framework that has stood out as the dominant discourse in sustainable urban development literature. Departing from the concept of ‘sustainable development’, what was stated as a crucial approach already in the ‘87 Brundtland report was the importance of the integrated effort to achieve environmental, economic and social improvements in order for any development to be sustainable (Harlem Brundtland 1987). This three-tiered conceptualisation is a representation of sustainable

development literature and has been chosen as a base for the understanding of sustainability throughout the research. As we move our focus to the level of the city, the literature offers some interesting insights into what ought to be implied when discussing the 'urban'. The city as such tends to serve as a node for financial flows, social relations, political discourse and cultural manifestations. Though today's global nature of such activities suggests that the 'urban' is much more than just its geographical place. Taking the global activities of the 21st century into consideration it is clear that the 'urban' must also be recognised as containing the international relations through which the city is created as well as impacting other geographical locations and societies. Therefore, the urban is simultaneously local and global, and processes on either level can be assumed to have an effect on the other (Pugh 2000: 2-5). Although seemingly a rather imprecise framework, by adopting a quite open definition of sustainable development this will allow for local contexts to play an important role in the creation of strategies towards urban sustainability that are sensitive to differing environmental, political, social and economic circumstances.

The focus on urban sustainable development further allows for a discussion on the temporal aspect of such processes. Firstly, as discussed, sustainable development can never be a fixed state as the concept per se necessitates a constant transition towards just environmental, social and economic practices. Secondly, in order for a process to be sustainable it needs to be able to consider the necessities of future generations (Harlem Brundtland 1987). This discussion makes use of two key concepts: intra-generational equity and intergenerational equity. Though they may appear deceptively similar, their implications for processes of urban sustainable development are very different. What intra-generational equity refers to is the importance of the needs of all urban dwellers being met regardless of socioeconomic status, geographical location etc. These needs have been recognised to include a safe and healthy environment, access to basic needs such as clean water and electricity, and access to a safe infrastructure. Turning instead to intergenerational equity, the scope of the development process instead focuses its attention to the consideration of the use of resources and ecological systems so as to not compromise the needs of future generations (McGranahan & Satterthwaite 2000: 76, Vojnovic 2013: 23). This point of view will be further discussed by the theories presented below.

Urban Environmental Transitions Theory

As urban areas develop they encounter various environmental challenges, concerns that the urban environmental transitions theory sets out to address. Gordon McGranahan, one of the adherents of the theory, makes a distinction between two different urban environmental agendas: the brown and the green. These aspects of urban environmental transitions will be useful for adequately describing the scope of urban sustainable development discussed further below in this chapter. Where the brown agenda focuses on direct problems experienced locally by the inhabitants such as air pollution, sanitation and clean water, the green equivalent refers to the natural system as a whole e.g. global resource depletion and climate change (McGranahan, Jacobi, Songsore, Surjadi & Kjellén 2001: 5). In other words, drawing on the previous discussion on urban sustainable development, the two perspectives complement each other and are essential for transitioning towards a sustainable end. When addressing transitions, any new activities, such as institutional change, shifting political power, environmental alterations, and social relations, can all be recognised as potential game-changers in the transition process. These are the forces that guide the transition in a certain direction and can be found in initiatives on the local as well as the global scale (Harvey 1996: 105).

Moreover, according to McGranahan, the different environmental problems affect the urban poor and the urban affluent in varying ways as environmentally prosperous cities and neighbourhoods tend to come with a certain price tag (McGranahan et al 2001: 10-2, Caprotti 2014: 4-5). The differing environmental issues, however, are also connected to urban energy consumption. As history shows, the increased use of fossil energy is what has allowed for the urban sprawl of the past century (Droege 2008: 7-10). Furthermore, it has been recognised that more affluence also tends to increase urban energy consumption, a consumption that today looks to fossil fuels as they continue to be the world's main source of energy. However, as affluence enhances cities' capabilities of responding to and addressing environmental challenges, this also implies that as cities develop they gain the means to eliminate any such issues from the local, or brown, level while dispersing them on the global level that is the green agenda (Hornborg 2011: 49-54). In other words, although poorer cities tend to suffer environmental problems that are physically felt on the local level, more affluent cities tend to generate environmental harms that are spatially extensive, have a slower rate of impact, and have damaging effects on the ecosystem as a whole (McGranahan et al 2001: 10-9). While

McGranahan departs from this general view of urban environmental transitions, other scholars have taken it further in order to apply the theory specifically to urban energy transitions.

Urban Energy Transitions

The focus on urban energy transitions points out cities' history of responding to environmental, economic and social challenges and making certain changes in their primary energy sources accordingly. One example of this is the dawn of the industrial revolution. As the industrial revolution started to lead people away from traditional energy sources such as water and wind, "[it] signed the start of a trend of sequential changes in primary energy supplies with increasingly higher energy densities; from coal to petroleum to natural gas and nuclear power" (Marcotullio & Schulz 2008: 58). As the sources of primary energy changed, so did the environmental, social and economic concerns that followed in their tracks (ibid.).

The urban energy transition framework further sets out to identify driving factors other than economic affluence, thereby focusing less on McGranahan's poor vs rich populations and what can be expected from their respective environmental contexts. Among the array of causes for energy transitions much focus tends to fall on aspects such as geographical location, historical context, and political structure and how these affect the transition. Therefore, as cities go through the process of an energy transition, and especially when addressing the question of sustainability, it is necessary to seek out the driving forces behind the transition at hand in order to discuss the direction and possible end point (Droege 2008: 13, Marcotullio & Schulz 2008: 58-60).

This brings us to the notion of environmental load displacement which was briefly touched upon by the brown and green agendas. What the concept suggests is that as countries develop they gain the ability to shift environmentally harmful practices to developing regions. Consequently, more developed regions have been seen to impose environmental degradation on others whilst constructing more favourable environmental conditions at home (Hornborg 2011: 54). Such concepts also embrace the notion of ecological footprints introduced by William Rees and Mathis Wackernagel and further the fact that cities draw on additional resources from land areas in other locations (1996: 9-12). Therefore, in cases where environmental load displacement can be recognised, processes of urban development cannot be said to be sustainable as the workings of the city in question would necessitate unsustainable practises elsewhere. This aspect will also be taken into consideration when analysing the Iresud project.

Drawing on the same argument as environmental load displacement, another aspect regarding the initial urban environmental transitions theory is the fair deal of attention being paid to scale and the relationship between different levels. As previously noted, there is a tendency towards affluence equalling the dispersal of environmental harms to greater scale. Important to point out, however, is that this is not always the case. What this implies is that the local and the global are interlinked and that the urban geographical location serves as a connecting node. Consequently, local level environmental changes can in fact have an impact on both local and global scales, so called inter-scale effects. Following this logic, by allowing for a transition of local energy use from fossil fuels to cleaner energies, one could expect positive results in pollution levels and greenhouse gas emissions in the local geographical space as well as the global level as a whole. Thereby, local generation of renewable energies could potentially combine the concerns of both brown and green agendas (McGranahan et al 2001: 40, Marcotullio & Schulz 2008: 58-60). This significance of city level action is also favoured by David Harvey as he similarly proposes that the locus of agency is in fact everywhere, thereby recognising the notion of local action as an important strategy for urban sustainable development efforts (1996: 105).

Social Justice

Another point of departure for the study is the focus on justice. As sustainable development seeks to create a decent standard of living regarding environmental, social and political aspects, endeavours towards urban sustainability must also comprise a strive for social equity and justice. Therefore, policies and projects must be wary of reproducing or increasing existing inequalities and not creating an urban environmental transition so pricey that only the affluent can benefit from it (Hornborg 2014: 2, While 2011: 50). In other words, by taking the argument to its peak, the end point that is sustainability cannot be reached without eradicating poverty and thereby equalizing the playing field for all. This can be tied to the push for solar power in Buenos Aires as distributed generation could prove to be a way of reducing the need for imported fossil fuels and instead turn to local scale energy production, all the while securing the city's basic energy supply and distribution to all citizens. Arguments such as these, in favour of poverty alleviation, further strengthen the concept of sustainable development as comprising of all three legs. Here I would like to point out that the research does not assume a direct relationship between poverty and environmentally harmful practices. Such a hypothesis would wrongfully place the blame of global pollution and climate change

on less affluent developing countries instead of the now post industrial economies. However, the research recognises that the social tier of sustainable development is directly tied to reassuring a certain standard of living for urban settlers, a goal that can only be reached by efforts striving for a certain level of social and economic stability.

Moreover, the framework of the urban energy transitions theory makes a similar distinction between the two kinds of equity that will be recognised when looking at the solar energy project in Buenos Aires: intergenerational and intra-generational. However, drawing on the discussion on environmental load displacement, a third one that focuses on trans-frontier equity will be added to this. This concept has also been recognised as unequal ecological exchange, which lends attention to the possible imbalance between local environments that are engaged in certain types of exchange with each other (Hornborg 2011: 14-20). In the case of energy consumption in urban areas the words of William Rees lend a helping hand in understanding the relation between the city and its external providers: “[Cities] can maintain themselves and grow by importing high-grade energy and material from their host environments and by exporting entropy (degraded energy and material) back into those environments” (1997: 305). He then concludes by adding: “This interpretation shows that in thermodynamic and spatial terms, cities are nodes of intense material consumption and waste discharge within a diffuse and increasingly global human ecosystem” (ibid). Therefore, in this research, ‘frontier’ will be understood both as the border between the city and its rural surroundings as well as the city and other globally dispersed locations. Together the three concepts of equity address the need for an urban sustainable development that does not negatively affect present-day or future populations or transfers environmental burdens to other regions (McGranahan & Satterthwaite 2000: 73-6).

Taking all three types of equity into consideration, the reliance on finite resources such as oil or natural gas for powering cities does not only have a polluting effect in the immediate sense, but it has also been shown to impede the sustainable development of future generations through global warming and the depletion of the very resource itself. What this suggests is that urban sustainable development cannot include the use of such fuels as it poses a fundamental contradiction to the endeavour at hand. Furthermore, as we accept urban sustainable development to embrace the environmental, economic, and social, we must also accept these three as interdependent aspects of the change we want to create. Therefore, when

nurturing urban sprawl through resource depletion one is setting oneself up for a very fragile future.

Operationalization

In order to analyse my data through this theoretical framework, in this section I will define the set of concepts I will be discussing in the following chapter. As previously discussed, socio-technical transitions have shown a tendency to be scattered processes that involve an array of stakeholders with sometimes competing interests. However, such transitions are furthermore defined by a common strive for a socio-technical paradigm shift through changes in aspects of political regulation, user practices, local perceptions, and economic resources. These aspects will be taken into consideration when analysing my data. Considering these factors from the point of view of the project members will allow me to distinguish driving forces, barriers and future outcomes of the Iresud project. Furthermore, the suggested multi-level approach necessitates an analytical discussion regarding the interactions and relations between the participants of the project.

In addition to this, the research seeks to understand whether such a socio-technical transition can be part of an urban sustainable development in Buenos Aires. The research departs from the understanding of urban sustainable development as encompassing social, environmental and economic aspects of development. Therefore, I intend to determine the project member's approaches to these ideas and whether they are present in the data in order to indicate whether the Iresud project can be seen as a driver of urban sustainable development. Additionally, following the presented theoretical framework, the discussion further intends to make use of the three concepts intergenerational, intra-generational, and trans-frontier equity introduced in the previous section. These three types of equity can be applied to all three tiers of sustainable development. Therefore they will serve as overarching concepts in the analysis as they highlight the strive for environmental, social and economic justice essential to the previously stated understanding of sustainable development. Furthermore, these three aspects adequately include the concepts put forward in the previous section and also allow for a discussion on the aforementioned scale of processes of urban sustainability. It should be noted that the key concepts are kept on a relatively theoretical level on purpose. Due to the research's recognition of urban sustainable development as being highly context specific and thereby problematic for creating a general framework of analysis, I believe it is advantageous to propose a broader conceptualization. As discussed in the section on socio-technical transitions theory, these processes are oftentimes diffuse in their progress and necessarily under the

influence of a certain amount of diverse stakeholders. Therefore, the decision not to narrow down this conceptual framework any further is a deliberate choice that is perceived as a way to avoid any excluding or suppressive assumptions regarding the specific context in which the Iresud project finds itself.

4. Analysis

Primary Data

In this chapter I will apply the concepts introduced in the theoretical framework. The data will be discussed by presenting each project member at a time starting with the two public entities and then continuing on with each of the five private companies. Following this I will also present and discuss the interviews carried out with the two people not connected to the project. My intention with presenting the data this way is twofold. Firstly, this will give a better overview of the differing motivations and approaches both regarding the project as well as the concept of urban sustainable development. Secondly, it will allow for a clearer view of the internal relationships between the consortium participants. At times the interviewees' names will be used interchangeably with the name of the public entity or company they are representing. It must be emphasized that these are still the opinions put forward by no more than one or two representatives. However, since they were in most cases the only representatives working with the Iresud project their opinions have been taken to comprise the position of the whole public entity or company in regards to the project.

The National Atomic Energy Commission (CNEA)

Interviewee: Julio Cesar Durán, Head of the Solar Energy Department at the CNEA

The CNEA, together with UNSAM, can be said to be the birthplace of Iresud and the majority of the execution of the project has gone through these entities. Within the commission there is a department for solar energy created in the 70s and it was here that the blueprints of the project were laid out initially. When asked about the main incentives for creating a project like Iresud the interviewee was very clear. According to Durán there is a need to diversify the energy matrix of the whole country and thereby create a paradigm shift for the future. By

instigating a pilot project like Iresud one would achieve a necessary diffusion of the technology in the country. However, solar energy should not be perceived as the single solution to all the issues connected to the use of fossil fuels, but be seen as one step in a new direction. It was also pointed out by Durán that he believes that it is essential to make a shift to a more sustainable energy matrix with regards to the use of natural resources which would include the shift to renewable sources such as solar energy. These statements point to an awareness of the environmental aspect of sustainable development by recognising the necessity of a shift to a more reasonable use of natural resources. Additionally, it highlights the long-term perspective discussed by the framework for urban sustainable development by focusing on future access to these resources. Thereby, this demonstrates a concern for the previously discussed intergenerational equity that establishes a need for actions that are not resource depleting in themselves. Furthermore, the diversification was also understood to imply diversification of ways of generating energy, not just focusing on centralized generation but also distributed and local. Following this, the interview focused on the perceived benefits of distributed generation in urban areas. The main reason for this was presented as the reduction of transmission losses inherent in centralized electricity generation that takes place far away from the point of consumption. Durán stated:

In Argentina, and in many countries of the world, electricity consumption is concentrated mainly to urban areas. It is very clear because even the industries are very close to large zones of urban areas. To cite just one example, what we call the metropolitan area of Buenos Aires and Greater Buenos Aires...has a third of the population and consumes 40% of electric energy in the country. That means that if you can generate directly in the area of Buenos Aires this would contribute a lot to lowering the losses.¹

When asked about the main barriers to the Iresud project two key elements were mentioned: the economic barrier and the lack of political interest. These two, however, seem to be inherently linked to each other. Initially, Durán expressed issues with finding private companies that wanted to cooperate in driving the project. He explained: “We actually had a hard time getting private companies to join the consortium because it was unclear what the benefits were. They had to contribute with something in return, not only human resources but also some kind of investment.”² Another factor that kept appearing throughout the interview was the aspect of the electricity tariffs. According to Durán “...residential rates do not even cover the cost of generating with the most economical variant that we have within the generation part which is natural gas of domestic origin that is becoming increasingly scarce, we keep importing more...”³ He then continued:

So it is absolutely impossible to make this grow, this market for renewables in general and solar in particular. Either there is a change of tariffs, that they really reflect the true cost of generation, or it is imperative to have a subsidy at least equivalent to that of conventional sources. So this is the main barrier. Then there are other non-technical barriers but... I don't know if they are cultural, the [electricity] distributors don't like the idea of distributed generation very much.⁴

From this discussion it is clear that Durán considers the existing political regulations a main barrier, especially in creating the economic incentive which seems to be a big stumbling block in this case. Furthermore, the mentioning of the unwillingness of electricity distributors in the area draws attention to one of the consortium members from the private sphere, Edenor. Following this comment, Durán expressed an even clearer standpoint regarding these companies by adding: “It is not the distributor that should decide whether this is done or not. It has to be the executive power or the national congress. In other words, there must be laws and regulations requiring distributors to accept this source of generation.”⁵

Regarding the political aspect of solar energy in Buenos Aires I was told that there was no clear political support for such projects and the proposition to introduce beneficial tariffs for renewable energy had received little interest. This, however, was regarding the distributed generation as there is a political regulation for centralized generation of renewable energy. He stated that “there is a resolution from the secretariat of energy that enables the presentation of projects for renewable generation...”⁶ However, he then continued:

There seems to be a political decision. I say 'seems' because there are many more proposals than signed contracts. For solar energy, as far as I know, there is one signed contract and I don't know if there was a second. That contract is signed for a very small plant, one megawatt, and we have information, or know, that there are about 300 megawatts presented. But the contracts are not being signed. (...) That is, it is difficult to understand if there really is a strong political decision or if the resolution was issued because it was politically correct and then they didn't do anything else.⁷

What this suggests is that there is a noticeable lack of political motivation from the local as well as national government and that any renewable energy project is bound to find itself struggling against empty regulation that does in no way further a venture such as Iresud. According to Durán these are the main barriers to a successful implementation of solar energy generation in Buenos Aires. From a social and cultural perspective some doubts were emphasized regarding electricity consumption and awareness in Buenos Aires, especially

regarding the use of air conditioners for cooling houses and buildings. However, this was toned down by comparing it to the successful implementation of solar energy in California in the 80s and stating that “they are used at times when there is a lot of solar radiation. So there is a good correlation between generation and consumption.”⁸ Furthermore, the question of sustainability was declared as being under constant discussion. In fact, depending on the actor, what is implied by ‘sustainable development’ varies.

The economic aspect of renewable energies received a lot of attention during the interview with Durán and at one point he gave an account on what he explained was the national energy debate:

I have been into the topic of solar energy for many years and for decades I have been hearing that we will be running out of oil in 30 to 40 years. That is, there’s always the same amount of time left before we run out of oil. As the horizon is not clear for the depletion of oil, I think the environmental element remains key, because a lot of people and many politicians are still betting on oil as the energy solution of the future in the medium or long term. As indeed in Argentina when the issue of the important new oil field Vaca Muerta² in Neuquén appeared and the energy discussion turned its focus to how we can exploit it and turn Argentina into a fossil fuel exporting country again.⁹

The strongest focus on the environmental aspects of an energy transition in Buenos Aires was put forward by Julio Durán and the CNEA through comments such as the above. Although the Iresud project could not be said to be finding strong support from regulatory tools, political will or economic investments it is clear that the key actor of the project did indeed initiate it with a certain degree of ecological interest in mind.

The National University of San Martín (UNSAM)

Interviewee: Hernán Socolovsky, electrical engineer at CNEA and PhD student at UNSAM

For the interview with the representative from the University of San Martín I was introduced to Hernán Socolovsky, an engineer working both with the university and with the solar energy department within the CNEA. From UNSAM the concept of urban sustainability was touched upon as incorporating a strong environmental, political and economic focus. However, it was also mentioned that practices related to this have been only timidly introduced in Argentina

² ‘Vaca Muerta’, or ‘Dead Cow’, is the name of Argentina’s biggest shale deposit in the Neuquén province (YPF 2013).

lately. Talking about the Iresud project and solar energy in this setting he pointed out that “...it is commonplace in most European countries, standing out among them Germany, Italy, Spain, etc. And it is practically unknown here in Argentina.”¹⁰

However, in the name of Iresud, the members had managed to achieve “...40 test installations in different provinces of the country, in order to spread the existence of such technology, show their reliability, performance and service life in society.”¹¹ Socolovsky also emphasized how the project had facilitated the start of a development of locally based human resources “...since the first specialists in photovoltaic systems connected to the grid were generated from the electrical, electronic, mechanical and architectural point of view.”¹² These comments clearly point to the positive results regarding geographical as well as social diffusion of the project. According to Socolovsky, the project has enabled a certain trickle-down effect in terms of societal implications which was mentioned in the socio-technical transition aspect of the theoretical framework. By creating the abovementioned job opportunities and additionally responding to this with a national workforce it is suggested that the project has been able to benefit the local society as well as the economy. However, such a statement alone cannot adequately ascertain that such a benefit would be equally distributed throughout the society thereby positively affecting intra-generational equity. Nonetheless, what can be detected is the creation of a new market that was previously non-existing.

Regarding the main barriers to the project, UNSAM agreed with CNEA and stated two main issues:

First, the electrical energy is subsidized by the state, so the cost of it is very low for the user. This means that the economic amortization of the system occupies almost the entire life of the product. Secondly, since there is no established mass market, the prices of solar panels and solar inverters are well above international prices and are subject somehow to the profit margin that the importer will agree with.¹³

The economic hurdle is obviously prevalent in most of the discussions. Additionally, the fact that this stems from a connection between the political regulations and the economic resources was further emphasized through the focus on electricity tariffs as “no government wants to pay the political cost of withdrawing the subsidy.”¹⁴

Aldar

Interviewee: Alejandro Zitzer, electrical engineer and commercial manager at Aldar

Aldar is one of the longest existing companies in Argentina that is working with solar energy. Their main function in the project is to carry out installations. However, according to the representative the company also provides support in all other aspects through the amount of experience they have regarding the subject matter. When initially asked about their incentive for wanting to partake in the project it was stated that Aldar was one of the initial members of the consortium and that they felt there was a need in Argentina for a regulatory framework regarding renewable energies. It was further noted that "...we carry the renewables in our souls. It is sort of our calling, and that goes beyond the economic aspect. We are convinced that this idea is related to the environment, the sustainability, the ecological. We do not merely do it just for the money."¹⁵ This comment again points out the economic aspect of the project as crucial and a factor that will make or break any transition progress. However, according to Zitzer, Aldar is motivated by a strive for an environmental wellbeing which demonstrated through his comment is a development inherent in the use of renewable energy.

Zitzer was further asked about the advantages of generating solar energy in the urban area whereby I was introduced to several aspects:

When you can generate in situ, you avoid losses by major transmission lines, avoid losses by diffusion, unzip nodes during peak hours, and if you lived in Argentina you have experienced some power cuts. This has nothing to do with lack of generation but lack of maintenance in the distribution. The grid is old, the transformers cannot cope, the cables are old and cannot cope... If you can implement an external source in the city to unzip these nodes, that would alleviate a lot and avoid the power cuts.¹⁶

He then continued by incorporating a more social aspect of the project:

One can live without electric supply for illumination but not without water. Then one could implement it for example in buildings, because there are people living in tall buildings, to operate the pumps. That would not be very expensive for a consortium and would be a solution at least so people continue to have water. That is, the Iresud project can do a lot of things, and now the possibility of developing photovoltaic in the city can be very important if it is done with a regulatory framework.¹⁷

As this quote shows, Aldar additionally demonstrates a concern for the citizens' access to electricity and why this is of importance to a decent urban life. This section therefore exhibits an inclination towards intra-generational equity regarding the access to basic human needs. However, the social aspect was then further described as an area in need of much attention.

Most people don't know about this yet. Therefore, we must do a lot of informing. That is, you have to work a lot, not just say: We have a law and we have regulated

it and we don't have to work hard in the context of what may be a regulatory framework. In schools, in society, organizing meetings to let people know what it is, the reasons, the public discussion. Socially we have to work a lot. It is not simply to launch a law and everyone tries to do what they can. So you have to plan.¹⁸

By this comment, Zitzer demonstrates an awareness of the importance of the local perceptions of renewable energies in Buenos Aires and how this furthermore must be approached as a way of changing user practices regarding electricity. The great diffusion of the new technologies in the country had been a positive achievement, but the lack of political interest and regulations is, according to Zitzer, continually a burning issue. However, in order to achieve this he again stressed the importance of the social sphere in efforts to power Buenos Aires through renewable energies:

This will involve the social question; it will be achieved through making people aware of what kind of city we want in the future. At least start thinking in that direction, because as time passes it's not that these renewables are going to be the only solution, certainly there will be new things, new developments. But at some point you have to start thinking in that direction, that has to be the aim. (...) We must also encourage users to begin to incorporate them into their homes, because it is the only way. The user will not do because he is a bohemian or because he has a love for ecology. He will do because it is convenient.¹⁹

Drawing on the issues with the political sphere in Argentina and in Buenos Aires mentioned by Julio Durán I asked Zitzer about his perception of the political commitment regarding solar energy in the country. He explained:

At the national level, when we speak of the national government, the answer is no. There is simply commitment for the sake of commitment, because the world is going in that direction. And then suddenly we see the president inaugurating 5 megawatts, the last 5 megawatts installed in San Juan in 2014. But that's nothing but a purely political act of commitment and does not show anything. The commitment, as far as we know, at the national level is zero; there is no major interest in this.²⁰

He then continued:

At the provincial level we are only now beginning to see that there is interest in some places... And I am convinced that eventually all provinces are going to have a regulation or some law that allows them to incorporate renewable energy into their provincial matrix. And then the nation will not have another choice but to understand that we must go in that direction.²¹

According to Zitzer there is a slow socio-technical development taking place in the country as a whole as well as an expectation that projects like Iresud can be a driving force in continuing such a transition. Beyond the pure recognition of an actual socio-technical shift, when asked about the Iresud project's possible connection to urban sustainable development Zitzer gave a similar account to that of CNEA and the University of San Martín. Like the two public entities he focused this part of the interview on the general engagement that the process had generated. Regarding the private sector's commitment to the project he described:

They are required to put in an investment that sometimes has to do with the supporting structures of the installation. So, it is not just that they contribute with the physical installation. They work together there, and they monitor it together as far as possible. (...) And this is still a pilot project that serves as a demonstration to society as a whole and in each of the provinces. Therefore, this really begins to be related to the responsibility for sustainability and the profit it can bring, because they start to actually see the benefits. However small the system, you start seeing the benefits they bring. Well, practically in all provinces, or in most of them, there is an Iresud pilot project. So the commitment to sustainability from the point of view of the project through, in this case the photovoltaic solar energy, is very clear.²²

According to Zitzer, the project had been successful in its way of illuminating a connection between economic profitability and the shift to solar energy. Furthermore, the above comment suggests that urban sustainability must be achieved through maintaining such a connection to economic benefits if the private sphere is going to accept the transition. Zitzer then emphasized the equally important political interest in order for the project to be successful. This was explained by focusing on the need for the transition to be accepted by the authorities in order for the society to be able to adopt it. Furthermore, according to Zitzer, a pilot project like Iresud is seen as a good way of introducing solar energy and creating a new market for this in the country. However, regarding the production of the technology he could not specifically state where it come from, but it was clear that the panels were always imported from other countries and had been attained through public tenders. It was also added that there are certain standards and quality norms that need to be fulfilled before a company could take part in the public tenders. The lack of immediate insight into the origin and production of the solar panels used in the project was demonstrated by all the interviewees. This would suggest that this aspect may not have been given equal attention during the process making a discussion on trans-frontier equity complicated.

Edenor

Interviewees: Mauricio Briaturi, chemical engineer & Juan Carlos Tripaldi, Assistant Manager of Department of Energy Efficiency.

Edenor is one of the main distributors of electrical energy in Buenos Aires. I was able to interview two people from this company at two separate occasions. The role of Edenor in the project was stated to be the securing of safety regarding the installations, both in terms of the user as well as operators maintaining the service. They also mentioned assuring the quality of the grid as one of their main incentives for wanting to participate. According to Edenor the application of distributed generation had been shown to be a good way of reducing electricity transmission losses. I then asked them about their opinion on whether this distributed generation could not be similarly achieved through the use of fossil fuel based electricity generators in Buenos Aires in the summer. They explained to me that this way of generating energy was very costly compared to other electricity prices in the city and was therefore not a profitable solution. Once again the issue of profitability regarding solar power had been brought up. As the interview continued on, I found their participation curious as local generation as such would appear to reduce their importance on the electricity market. When I shared my concerns with Briaturi he described: “Initially Edenor will not be affected. Of course, it means a disadvantage to Edenor. The only advantage would be if the user put the panels inside the house. So for Edenor this would imply lower consumption and we would be distributing less energy. But at the rate values today nobody will do it.”²³ According to Tripaldi, even if distributed generation was not so much a concern for the company today, there would be certain issues connected to it regarding the difficulties with assuring customers an energy supply and the lack of possibilities to store the energy. He explained:

Since you cannot control the solar energy generation, the distribution company has to plan its entire network as if this kind of energy did not exist. At night when there is peak demand, and the sun is not out, and the network has to provide 100% of the customer consumption... this basically means that there is no distributed generation. So the distributor should design the entire network and the whole operation as if there was no distributed generation.²⁴

Furthermore, it was mentioned that it could imply a change of business for the company towards being more focused on enabling installations. According to the interviewees however, the topic of distributed generation is not one of high visibility in the daily workings of Edenor and it is only rarely discussed. Consequently, according to the interviewees the main barrier to

the Iresud project had been the economic aspects. Solar power is still not a profitable business in Argentina as a whole. On this note, Briaturi brought up the general political interest and the lack of implemented renewable energy projects over all. He stated: “They are good projects because they correspond to something international...but I think that from the political side it is greenwashing.”²⁵ He then continued:

Approximately 40% of Argentina’s population lives in Greater Buenos Aires and the city of Buenos Aires. These are 40% of the voters of Argentina. Therefore, and this is the truth, I am ashamed to say it but this is how it is. It is a political issue. It is a political situation where 40% of the voters are being subsidized. And the government believes that by increasing the tariffs and removing the subsidies here that would imply a loss of image and a loss of votes.²⁶

However, referring to Buenos Aires as the biggest city in Argentina with a large consumption of electricity Tripaldi added: “This obliges us to seek out other ways of generating energy, because in 10 years from now it seems like we will not even have enough for turning on a small lamp.”²⁷

After a while the conversation turned towards the concept of sustainability. According to Tripaldi, “...the company has had environmental policies in place for almost 15 years. In fact, we have our own inventory of our carbon footprint.”²⁸ However, the main part of this discussion focused on the economic sustainability of a transition to solar power. Briaturi explained: “It must be business for someone, not necessarily for the state but for the private sector that will start to put in money. Having an economic benefit, that, for the state, represents sustainability regarding the energy generation.”²⁹

As suggested by similar comments from both of the interviewees, Edenor’s main interest lies in sustaining the profitability of energy generation, a corporate standpoint that fails to surprise. The company’s commitment to environmental sustainability was stated very briefly and the comment on company policies was not further elaborated. However, the focus on economic sustainability kept appearing as a main incentive for the company’s willingness to partake in the Iresud project. Nonetheless, turning to the societal aspect of solar energy implementation, I was curious to find out what Edenor, being one of the main electricity distributors in Buenos Aires, had to say regarding energy efficiency and consumer awareness. Could any kind of energy generation be sustainable if the users were not in fact familiar or concerned with the rational use of electricity? Briaturi explained:

Well, [electricity] doesn't have any value here so it's difficult to talk about energy efficiency since there is no economic benefit. Yes, from the company, Edenor, we give advice on efficient use. But these guidelines are pretty classic; where to put energy-saving lamps, where not to. What to do to consume less with the air conditioner, put in on 24 degrees. I think that it has to do with education and it has to do with the long term. And it is very difficult to educate people in general.³⁰

He then finished, with a slight laugh: "And here, long-term plans are usually not very fixed, not very widespread."³¹ Tripaldi concurred with this stance and stated: "There is no incentive for the people to use energy efficiently, and this is a cultural barrier that we have to surpass."³²

These comments suggest that any change in the inhabitants' energy use must go via their pockets. That is, as soon as it has a negative economic effect on someone this person will be inclined to take action in order to achieve a more favourable economic situation. However, what is omitted from this type of understanding of the social is the basic access to electricity. Making inhabitants pay a higher price for the energy that they consume may appear to be a way of assuring that demand is met. It does not, however, demonstrate a consideration of the effect this might have on the urban poor and whether a price increase would impede their access to energy stated as a necessity for example in the Brundtland report. Consequently, from the point of view of Edenor it is not suggested that a project like Iresud would have an effect on intra-generational equity in Buenos Aires. Tripaldi furthered this conclusion when discussing who would be able to generate solar energy in Buenos Aires:

Here, unfortunately, as a society we have some social issues that are more important that we have to solve before we can talk about taking care of the environment. We have problems with social inclusion, problems with living conditions. The upper classes can make an installation. A client from the middle or lower classes does not have the capacity to install renewable energy in his house. So, whoever wants to install it will basically be doing it for an ecological interest rather than an economic benefit.³³

Regarding the success of the Iresud project I was again told that the nationwide diffusion of the installations should be considered a very positive step in introducing solar energy in Argentina. Not only regarding technological experience but also through learning in the context, because "if something works in Germany it does not necessarily mean it will work here."³⁴ The objective to be able to generate regulations or laws to support an energy

transition through the project has yet to be achieved and regarding this it was suggested that perhaps it was too ambitious a goal to strive for at such an early stage of solar power in Argentina. Briaturi further elaborated on the topic of state regulations:

The only thing you can do is promote and try... A policy always ends up being something from the state and it implies a long delay. Policies here are always far behind that which is going on. It is very rare that there is a new policy that foresees something. It does not happen here. In general, suddenly something starts to happen and then the policy follows. But I do not consider it a failure. To me it seems like we did a lot of work and perhaps it is just going to take some time before this policy is in place.³⁵

Eurotec

Interviewee: Cirilo Espain, Mechanical engineer.

Eurotec is one of the smallest companies in the consortium. Previously an actor in the animal feed industry, 2 years ago the company expanded its work into the area of renewable energies. According to Espain, Eurotec's main incentive for participating in the Iresud project was to create a way for the company to generate and partake in the market of renewables in Argentina. However, although this was the official interest from the point of view of the company, Espain, the only representative from Eurotec, did not hesitate to give a more personal account on his own environmental concerns and how renewable energies would have to replace finite energy sources for ecological reasons.

Eurotec's principle function as member of the Iresud project is to carry out the installations of the technology. That is, a function similar to that of Aldar. Espain gave one of the more ecologically oriented accounts of urban sustainable development. However, following an initial presentation of the role of renewable energies in achieving urban sustainability, his focus swiftly returned to the economic and political issues seemingly inherent in the discussion:

The issue is that if there is no regulatory framework to help you it is very difficult. You end up talking to people who are into the same thing as you. They like it, it interests them, it helps the planet, but if you don't go via the economic aspect, which is a very big part here, you will not arrive at anything. And from the point of view of the company, for now we will continue doing the installations we can, waiting for the day when the government allows connection to the grid, which is prohibited today. Or they change the energy tariffs so that people actually pay the real worth of the energy production.³⁶

Regarding the political aspects of the project, he mentioned that they had met with the government on several occasions and presented all the benefits of solar energy versus fossil fuels. This, however, had not been successful. In fact, the government had responded by declaring that they were well aware of the positive aspects, but due to the way in which the energy sphere is already implemented in the society there was no incentive to change it at the moment. This point of view is directly connected to the 'lock-in' scenario proposed by the socio-technical transitions theory. Moreover, regarding the law 26.190 from 2006 that seeks to promote the use of renewables so that by 2016 8% of the country's energy matrix will consist of these sources, Espain stated:

The only thing the law says is that you have to reach 8% of the total energy mix from renewable sources. And the law promotes that CAMMESA³ must sign a contract and pay you for the energy that you inject. The issue is that you present the project, and you do the whole economic part, and CAMMESA doesn't pay. That is, they give you a much lower price. So, when they really do not sign a contract with any price...then you can't do any work, because it was CAMMESA that had to sign the contract. So on one hand you are being encouraged and on the other hand you are being held back.³⁷

The insincere political interest from local as well as national governments is a recurring perception from all of the members of the consortium. This would appear to be quite worrying when taking into consideration the fact that one of the main goals expressed by the project is to create political regulation that enables the use of solar energy in Argentinian cities. What it further suggests is the need for an approach that creates incentives through the economic and social spheres, an approach that seems to be recognised by the members.

Changing ones focus from the topic of external barriers, Espain then furthered the discussion to include competing forces within the Iresud consortium itself. When I asked him about his perception of the success of the project he stated:

We committed to doing 60 kilowatts of installations connected to the grid. Until now we could not carry it out, mainly because of the regulations in the country. I already presented four companies to help us do the grid installation, but because of the refusal from Edenor, which is the public distributor who is also part of the project, we were not allowed to connect them. So there is that problem. That is, on the one hand they put pressure on me because I haven't met with the project objective, but on the other hand I have the defence that I did present various options on how to do it, but Edenor prevented me from doing it.³⁸

³CAMMESA is the administrative company of the wholesale electricity market in Argentina (Cammesa 2011).

He then added a final remark regarding the accomplishments of Iresud: “The project was a success in terms of the number of installations that were achieved. Regarding regulations it was a failure because we couldn’t move forward at all. So the project has a very positive part but also a very large debt. Anyway, we kept colliding against the government or against the large distributors such as Edenor who are hindering us with the connection.”³⁹

The internal conflicts perceived by the representative from Eurotec are central to exploring the success of the project as well as the feasible directions it could take. According to Espain, Edenor is not facilitating the progress towards the goals of Iresud and thereby serves as an internal barrier to the successful implementation of solar energy in Buenos Aires.

Consequently, the inclusion of a consortium member that does not recognise a clear incentive nor perceives any future benefit from such a process, would suggest that such a conflicting motivation is indeed hindering the development. Furthermore, it also appears that these differing motivations are perceived by Eurotec as hindering attempts of urban sustainability.

QMax

Interviewee: Juan Corica, Manager at QMax

QMax is an Argentinian manufacturer of technology related to renewable energies such as inverters and chargers. According to Corica the company’s main incentive for wanting to participate in the Iresud project was to support with technological equipment for the installations and drive the development of a market for renewable energies in Argentina. The approach to generate electricity in the urban setting was considered a good way of alleviating the existing pressures on the current electricity grid. Corica also suggested that this type of generation would be suitable in Argentinian cities as any large scale solar plant installations would necessitate big investments and an extension of infrastructure to transmit the electricity into the cities. According to Corica, local generation would therefore allow for more but smaller projects. These initial comments during the interview with QMax show a similar standpoint to that of the other project members. Considering the currently low interest in solar energy in Buenos Aires as well as the lack of grand economic incentives it would seem that this approach would be a good starting point for moving a transition out of its initial niche state towards a more widespread societal shift.

Regarding social and cultural barriers to solar energy Corica supported the understanding put forward by many of the interviewees, namely that on the social level there was no widespread

awareness regarding efficiency or energy saving measures. Corica explained that once the electricity subsidies are removed and prices go up, people will have to become more aware of their energy consumption and the use of local generation will be a welcome complement in order to mitigate electricity demand in the city. However, it was not explained how or when these subsidies would be removed. However, the topic of urban access to energy was discussed. According to Corica the issue of power cuts and varying access to electricity in Buenos Aires is not just simply about a lack of generation:

Due to the issue of tariffs not being the correct ones, and because the companies are not being controlled the way they should be, the electrical grid, for example in Buenos Aires, is a very old one. So, even if you could install solar panels in your house that would not mean that the grid becomes any better. (...) So when the electricity companies start charging what they should be charging, and when they are controlled the way they should be controlled, they could slowly start to upgrade the grids.⁴⁰

The interview then moved further into the topic of urban sustainable development and how this concept was perceived at Qmax. According to Corica the quest for sustainability was their whole reason for partaking in the project and the business of solar energy as such. However, what kind of sustainability that was being referred to was not clear. I then asked about the technological components used in the project and if these could be considered sustainable. The immediate response from Corica was that this was not the case and he stated: "I believe that everything that is starting to develop is unsustainable in the beginning. That is, until there starts to be some kind of volume in the production."⁴¹ When asked if he was referring to the purely economic aspect of the technology he agreed and then continued:

I think that when one perceives the value of the energy and the energy source through its cost, and start using renewable energy, you begin to generate a link between the ecology and the energy, because there is a very direct impact. When you see a solar panel installed in your home, the impact with regard to ecology is very direct. I mean, I sometimes comment that it is like some kind of magic, in quotation marks. Because suddenly you put ten panels on the roof and you can supply your entire house. So it's something like, wow, you know. The sun comes up and generates energy for you. You become directly connected to it.⁴¹

At first glance, these two quotes seem to have an inclination towards the environmental aspect of urban sustainability. However, it is also clear that the use of 'sustainability' is typically connected to economic growth and, more specifically, the immediate economic benefit that

the consumer would be able to perceive through a shift to renewable energies.

TE Connectivity

Interviewee: Dario Savastano, Distribution Market Manager

The final interview was conducted with a representative from TE Connectivity. From the beginning it was stated that the company's main incentive was the economic benefits of joining the consortium, distributing their products and marketing. According to the interviewee one of the issues why the company was interested in this type of technology that has to do with the environment is that it is becoming increasingly popular, and that there is a business behind it. He then explained: "It generates many benefits for the company because it acts as a view into the basics of the exploitation of solar energy in Argentina."⁴³

The company was described as contributing with technological equipment such as terminals, connectors and cabling. On the topic of distributed generation, Savastano stated two benefits. Firstly, it served as a good way of generating energy without having to do any large-scale investments. Secondly, it would supposedly heighten the ecological awareness in the city. The first comment strengthens what has previously been stated by other participants. That in order for solar energy to have a place in Buenos Aires there has to be an economic gain for someone. But it also acknowledges a problematic economic context and the impact it is having on the approach the Iresud project can take. Furthermore, it corresponds to the topic of trans-frontier relations as it reduces the need for importing energy from other locations, be they external to the urban area or other countries. The second comment was not elaborated further.

The interview then turned to the topic of urban sustainability and the interplay of ecological, social and economic aspects of the project. According to Savastano the ecological awareness in the societal sphere should be crucial. He mentioned a concern regarding the consumer's search for the next way of saving money. According to Savastano's perception, any new source of energy that was more economical than existing ones would gain societal support due to its inexpensive nature from the point of view of the consumer. This would be the case no matter how contaminating or clean the source of energy. Therefore, through the Iresud project, "seeing them operate, people become even more aware that you can. You can make a change. That is, in the way of living and seeing that they will not complicate life, just a

paradigm shift.”⁴⁴ He then continued: “So you cannot ignore the social awareness and a type of policy that allows for the inclusion of a lot of people without affecting the rest. The project has to do with that. Not only with the application of an idea or an invention but carrying it out consciously.”⁴⁵

Savastano’s comments suggest that there is a certain concern for the social applicability of renewable energies. Local perceptions and user practices are perceived as crucial for the project but also in the way that they correspond to the economic means of the consumer. The connection between economic incentive and user practices is a recurring theme in all of the interviews. Savastano furthered this understanding by commenting:

In Buenos Aires you know it is enough to have the air conditioner on 24 degrees but people set it at 20 all day. And that selfishness can render these projects unsuccessful. Therefore we must raise awareness among people. Often that goes hand in hand with, what we say here in Argentina, that it hits you in the pocketbook. So, if I increase the cost of your electricity, and on the other hand promote solar energy, and I tell you: look, you save a lot of money but these are the conditions. Well, I think people are going to start adopting these conditions.⁴⁶

However, according to Savastano it is not just an issue of making consumers interested in the renewable energy. It was just as much about perceptions from corporate actors:

It also has to do with the socioeconomic context we are living in at the moment; I do not think it is very beneficial for big investments. The situation is very unstable. So if we today have to donate a certain amount of terminals and connectors for a future project in a context that is so volatile we will prefer not to do it. That makes it a bit more difficult.⁴⁷

Regarding the various barriers to the project, Savastano further agreed with the other interviewees in that there were mainly economic and political obstacles for a successful implementation. He stated:

Well, what we are working on in this project is to generate and be able to inject into the grid, and that is the hardest part because there are companies that are not benefited by these things, they are economically affected. Now, on the economic level, in a society where everyone can collect solar energy and that which you don’t need you inject into the grid, there everyone is benefiting. And you also avoid having to import energy from other places.⁴⁸

His comment had me wonder if there were any particular companies that he had in mind. He then elaborated: “Nobody will openly say ‘I am against the project’. But obviously they are going to put up some kind of barriers because it is not something that is convenient for them. They don’t benefit from solar energy being exploited.”⁴⁹ As stated in the interview with Edenor, distributed generation in Buenos Aires would not be economically favourable for them. Due to this it is reasonable to believe that the companies Savastano is referring to include electricity distributors such as Edenor.

On the topic of the geographical viability of turning Buenos Aires into a solar powered city, Savastano expressed concerns regarding certain complications in the built environment. He noted: “Buenos Aires is not New York, but it has its buildings and its zones where there is little direct sunlight during long time periods.”⁵⁰ He then added: “I think that it will be difficult in Buenos Aires. It is definitely more expensive than in the interior of the country.”⁵¹

As the interview was coming to an end, the representative wanted to make one last comment on Argentina and renewable energies as such. During a talk he had had with a colleague from the US they had come to the conclusion that “...Argentina could be the Saudi Arabia of the future, because it has everything. It is so extensive from north to south that it has all the alternatives to be a great project for generating renewable electric energy.”⁵²

This perspective was conveyed by all of the interviewees in one way or another. It would therefore seem that the remaining socioeconomic and political aspects are in fact the key barriers keeping the implementation of solar energy, and renewables in general, at bay in Buenos Aires and in Argentina as a whole.

Data external to Iresud

Two interviews were conducted with subjects unrelated to the Iresud project in order to get a clearer understanding of the context in which a project for solar energy is situated in Buenos Aires. The first interviewee is Gastón Fenés, content director at *Energía Estratégica*, an Argentinian magazine focusing on renewable energy. The second one is working with renewable energy in Buenos Aires but wished to remain anonymous. This person will be referred to as interviewee B. In this section I will also present data gathered by attending two conferences on renewable energies in Buenos Aires in 2014 as stated in chapter 2.

According to accounts from both conferences regarding the position of solar energy in Buenos Aires neither politicians nor public society is focusing a lot of attention on it. According to Fenés the government has started to develop some projects related to urban sustainability such as recycling waste and promoting urban bicycle use. However, he also made it clear that the concept of sustainable development is something that is still very much in its initial phases in Buenos Aires. When asked about the political motivation for carrying out such projects in the city he stated: “It is also marketing. I mean, there is a lot of marketing that is ‘cool’. Talking about green cities and the environment. It seems very sustainable, but in practice there is a long way to go. It is just starting. It is a concept that is just starting.”⁵³ Furthermore, when commenting on the importance given to the three tiers of urban sustainable development, interviewee B mentioned that although the three should be given equal consideration this was not the case in Buenos Aires. The person stated: “In practice economic sustainability seems to be more important, then the social, and lastly the environmental since that is the one that is not experienced as much and takes longer to affect us.”⁵⁴ It was then further elaborated: “In Buenos Aires this type of technology is not profitable, so it is not seen, it is not known, and nobody really knows what it is about.”⁵⁵

Additionally, according to Fenés, due to the fact that Argentina is still a third world country there are more urgent issues taking up the societal spheres making long-term policies less of a pressing aspect, a comment also made by Juan Carlos Tripaldi. Environmental protection and corporate social responsibility were stated as examples of such long-term projects. These comments indicate that sustainability’s inherent connection to long-term developments is not a factor in the political context of Argentina. Furthermore, the topic of the electricity subsidies in Buenos Aires and the country as a whole was brought up at both conferences as well as by the two interviewees. Fenés mentioned that it was an action taken by the government in 2003 in order to secure people’s access to electricity, an approach that led to fewer resources for the distributing companies and a neglect of electricity infrastructure. According to interviewee B “...if we had to pay the true cost of energy from one day to the next, Argentina would explode as a lot of people would not be able to afford the energy and that would generate a crisis that no politician is willing to risk.”⁵⁶ However, this view was not completely shared at the conferences or by Gastón Fenés. Instead it was stated that the next government, whoever assumes power, will have to change the system of subsidies gradually. According to Fenés this would not stem from the concern for the environment but rather be a financial necessity

since the government can't keep paying for such a large amount of subsidies. He also mentioned the discursive split regarding exploitation of fossil fuels in Vaca Muerta in the country as constraining any renewable energy project. This issue was also discussed at the two conferences but was further elaborated on during a presentation by Juan Carlos Villalonga, president of the Argentinian Environmental Protection Agency (APrA). Referring to the energy deficit in the country and the economic problems related to this Villalonga stated:

Nobody is thinking that the non-conventional energy sources are going to be available before 2020. In other words, beyond the environmental discussion, whatever happens with the [exploitation of the] non-conventionals, they will not be available anytime soon. The only way to reduce the drain of foreign currency is through renewables. There is no other option. That is why I say to you that we are facing a unique opportunity. That is, we have a huge availability of natural resources...⁵⁷

He then concluded referring to the aforementioned law 26.190: "Therefore we say that it is necessary to reach 8% in 2016. Not only because it is good, not only because it is cleaner, not just because it is more sustainable, but also because, economically, here, I would say, it is the only rational alternative ahead."⁵⁸

Discussion

In this section I will discuss the data presented above and apply the analytical framework introduced in previous chapters. I will analyse the perceptions, motivations and project barriers as stated by the interviewees. In order to do so, I will structure the analysis by discussing the three aspects of social, environmental and economic sustainability separately and consider the three concepts of intergenerational, intra-generational and trans-frontier equity in relation to each of them. However, due to the nature of the data obtained through the interviews I will also be adding a fourth aspect, the political one.

Social Aspects

Departing from the social aspects of sustainable development, what can be understood from the data is that there is a lack of knowledge regarding solar energy technology in the society. Furthermore, consumer awareness of energy generation and use in Buenos Aires is perceived by the project members to be very low. This was considered a problem for the successful implementation of the project as the consumers are the ones choosing the energy and paying

for the access to it. Since electricity stemming from the use of fossil fuel is the most economical option for the consumer in Buenos Aires they are still not sufficiently motivated to turn to another source of energy or to alter their levels of consumption. The social aspect was thereby perceived as an important part of the development. In fact, the positive views expressed regarding the diffusion of the technology as a way of creating social awareness and interest is a clear indicator of this.

Although focusing a lot on these aspects of the social sphere, the project members over all paid less attention to the final distribution of the solar energy generated through the installations. This is an important point prominent in urban environmental transitions theory as well as in the Brundtland report arguing for intra-generational equity on the local scale. At the moment, the installations are limited to three public buildings and remain absent from the rest of society. Furthermore, the fact that all representatives have expressed a concern for the high price of solar energy generation in the city today suggests that these technologies are not accessible to all inhabitants without regard of their resources. What is more, the representatives did not discuss access to electricity for those inhabitants who are possibly already lacking such a service. Thereby, the project cannot be said to have had any effect on intra-generational aspects of social sustainability.

Regarding intergenerational social aspects, a project striving for the use of a renewable energy source is certainly focused on attaining a sustained future access to energy by omitting finite sources from the energy matrix. Therefore the Iresud project also carries with it a certain inclination towards intergenerational equity. However, this aspect still does not imply that the energy would be equally distributed in the city in the future. Furthermore, the data suggests that project members have little or no interest in the origins of the technology. However, their lack of comments on this cannot be seen to refer to the actual social conditions produced outside of Buenos Aires through the distributed generation. Therefore it cannot be argued that this practice is having neither a positive nor a negative impact on other locations. Consequently, based on the comments from the project participants trans-frontier social equity cannot be further discussed.

Environmental Aspects

The environmental sustainability of the Iresud project was the aspect least commented on during the interviews. Although, there seems to be a certain discrepancy among the project

members regarding what should be incorporated into urban sustainable development. The four members CNEA, UNSAM, Aldar and Eurotec demonstrated the most ecologically oriented perceptions whereas the remaining three only briefly referred to it. Instead, what was discussed abundantly from all representatives was the connection between locally generated solar energy and self-sufficiency for Argentina as a whole. Since Argentina and Buenos Aires depend on the generation from fossil sources and is a net importer of such fuels, the lack of such an overarching environmental discourse from the project members cannot be taken to imply a lacking environmental impact. As solar energy is considered a renewable resource, a project that intends to create a transition from finite fossil fuels to this type of energy would be considered a driving force of intergenerational equity. This aspect is the most visible one when discussing the interview data. That is, even though the aspect of a positive environmental development is not actively addressed by the representatives, their expressed goals and motivations carry with them an environmentally benign way of generating energy leading the transition to focus on environmental sustainability by default. This would furthermore have an effect on environments outside of the geographical space of Buenos Aires through the reduction of Marx's metabolic rift. This, however, can only be said about the importation of primary energy.

Since the origin and production were topics only briefly discussed by the interviewees it cannot be stated whether this socio-technical shift is ultimately leading to positive environmental developments on the global scale or if it is simply transitioning to another type of energy generation that necessitates harmful practices somewhere else along the chain of production. This is due to the lack of production of solar technology in Argentina as a whole. What this suggests is the need to recognise the possible existence of an environmental load displacement, a concept discussed in chapter 3. However, the lack of focus on this aspect from the interviewees renders the discussion of such a question too intangible. Certainly, emissions stemming from urban energy use would be reduced on local as well as global levels. However, this does not take into consideration the actual production of the technology. Thereby, trans-frontier significance was not apparent in the interviews nor could it be assumed a probable result of the project. Similarly, intergenerational environmental aspects would go through a positive transition on the local scale, but through the data obtained it cannot be said whether this would also be the effect in other locations. Though having said this, the successful implementation of the Iresud project would, according to the interviews, probably lead to a bettering of the immediate local environment, or McGranahan's brown

agenda, for example by reducing the need for emergency generators. However, the main benefits would probably be perceived on a national scale since most of the electricity generated for use in Buenos Aires today is not in fact produced in the city itself. Furthermore, any changes in the local environment might initially be too humble to be perceived by the inhabitants. Additionally, similar to the social sphere, there is no clear focus on the resulting distribution of environmental goods within the city through the realisation of the project.

Economic Aspects

The focus on economic sustainable development is dominating the discourse put forward by all the representatives of the project. The economic aspect was approached from two angles: the economic tier as a barrier to the implementation of solar energy projects in Buenos Aires and the economic tier as a driving force. These angles were prevalent between the project and its external forces but also internally between the members themselves. What is clear through the perceptions of the interviewees is that the installation and use of solar energy in general comes with a certain price tag. Not only regarding the implementation of projects and the transition from one technology to another, but for establishing the incentives that will create a necessary interest from society as a whole. However, by acknowledging this the members also note that, at least initially, solar energy is not a technology available to everyone. This point can be directly tied to the discussion put forth by McGranahan, Hornborg and While in chapter 3 on renewable technologies as being somewhat of a luxury. As stated by several interviewees, the use of solar energy technology must initially be presented as a way of reducing the electricity price paid by consumers today or it will not be adopted. Thereby they are acknowledging that a change in consumer behaviour in Buenos Aires must affect the economic resources of citizens in order to be a feasible endeavour. However, such comments tend to focus on the future benefits of the distributed generation. But what this also implies is a certain initial purchasing power from the consumer, a fact that makes such technologies available only to the more affluent parts of the population and omitting those with fewer resources. Taking into consideration today's already low price of electricity in Buenos Aires, making the tariffs more true to the cost of generation and thereby possibly affecting citizens' access to electricity would imply a lack of intra-generational equity. However environmentally beneficial, such a development would necessarily have a certain effect on the social and economic aspects of sustainable development. Nevertheless, through the implementation of solar energy in Buenos Aires and Argentina as a whole the participants

brought up the topic of self-sufficiency. By finding new ways of exploiting energy sources within the country it was understood that they would be able to put an end to the period of acting as a net importer on the energy market and thereby stopping the drain of money. This aspect could be perceived as a possible creator of inter- as well as intra-generational equity by increasing Argentina's financial resources. However, as previously highlighted in the social and environmental discussions, no focus was put on the equal distribution of such resources. Furthermore, the representatives did not comment on any consequences with regards to economic development in other locations thereby demonstrating a shortcoming concerning the idea of trans-frontier equity from the point of view of the Iresud project.

The economic aspect was further perceived as the main driver of motivational discrepancies between the members of the consortium. The main focus on profitability through distributed generation was, not surprisingly, presented by the private companies. This was also perceived as the main barrier in obtaining members and funding to support the project as well as creating an interest. The problematic surrounding the participation of Edenor was brought up by several of the other members and even by the company itself through comments regarding profitability in the case that a project like Iresud was successfully carried out. Such competing interests must be identified as a reason as to why the project has not been perceived a success by the members. Thereby, this participation could also be perceived to be hindering urban sustainable development through solar energy in the city. However, as mentioned by several representatives, the project has been an enabler of the advancement of a previously non-existing market in Argentina. Through developing a professional and technological base that can further the work of Iresud, this creation of a domestic industry and new employment opportunities suggest that the Iresud project, and solar power in general, can have a positive effect on the economic sphere.

In addition to the three aspects presented above, a large portion of the data included comments on the political sphere in Buenos Aires. Although not present in the operationalization it is an aspect discussed in the theoretical framework. I therefore find it crucial to add a discussion on the political characteristics featured in this study. According to the interviewees, political interest and will in Buenos Aires is very low. In fact, as stated by some of the interviewees, projects concerning renewable energies that had been carried out were merely attempts to appear fashionable on the energy market and therefore resulting in greenwashing and lack of further interest. As mentioned in chapter 2, the representatives'

understanding of the political interest caused for some concern as there is no saying that some of their comments were not themselves reflections of such an approach. However impossible to verify, this concern should still be noted. The political context as experienced by the representatives is worrisome to the development that the project seeks to carry out. All of the interviewees stated the same main goal of the project, namely to create laws and regulations that allow for the use of solar energy technology connected to the grid. However, so far this has not been achieved. The reason for this was perceived as a mix of socio-political and economic barriers where the technological shift would necessitate funding as well as unfavourable political changes whose consequences no politician would be ready to face. Furthermore, as discussed in the theoretical section, a commitment to sustainable development must also be a commitment to long-term plans. This was perceived by the representatives to be lacking in the political sphere. However, it is no more evident in the Iresud project that was initiated in 2011 and is in its final stages at the time of writing this analysis. By not extending this reach of the transition, this aspect suggests that the very time frame of the project inhibits its possibility of driving a long-term urban sustainable development in Buenos Aires.

What the discussion shows is that the socio-technical transition proposed by the Iresud project is not entirely in line with the framework for urban sustainable development presented in chapter 3. The considerations of the social and environmental tiers related to the transition have consistently received less attention throughout the interviews. Instead, the economic aspect has been approached as a key element in creating a shift in electricity generation in Buenos Aires. Comments regarding the need for profitability in order for it to become reality as well as a way of incentivising consumers, politicians and corporations demonstrate such a perception from the consortium. However, as noted in the discussion, the lack of attention regarding social and environmental factors does not necessarily imply that these are not affected by project processes. On a societal level, the project was recognised by the representatives as a driving force of social awareness concerning solar energy, a factor that was also stated as an important part of further implementation of this type of technology or socio-technical transitions as such. The environmental focus had a tendency to vary among the participants, an aspect that, as noted, does not imply that any environmental consequences of the project are absent. However, what is notably absent from the perspectives of the Iresud members is the concern for an equal distribution of the social, environmental and economic benefits. What this proposes is that the Iresud project can in fact be considered a driving force

of urban sustainable development in Buenos Aires, but that its effect must be considered a modest one. Furthermore, the focus on economic sustainable development can be understood as a response to the prevailing economic context in which the project is attempting to drive a transition. Therefore, by approaching the socio-technical transition through the economic sphere that has been proven to be of great importance in Buenos Aires, the project is attempting to create an incentive in a sphere where stakeholder focus has already been established. In paying more attention to economic benefits related to the project, the members might therefore be said to have found the most suitable way of achieving a certain amount of success.

The paper initially presented two research questions. In response to the second one it can be stated that a successful implementation of local solar energy generation could be part of urban sustainability in the sense that it would decrease the need for fossil fuels such as natural gas. Thereby, by shifting to solar power one could assume that this would have a positive effect on local as well as global emission levels. However, these environmental improvements must be understood in comparison to the energy and effects implicit in the production of the solar power technology, a factor that did not manifest itself in the data. Therefore, in order to ascertain an urban development that is not built on notions of unequal ecological exchange or environmental load displacement, such a practice must demonstrate a concern with the entire process from the creation of the technology to its final use. Having said this, by acknowledging this as a factor, local solar power generation could indeed be seen as contributing to urban sustainability in Buenos Aires from the environmental aspect. Regarding the social and economic spheres, the research has shown that these would need to demonstrate an interest in the equal distribution of such developments across society and thereby overcoming critique against sustainability as a luxury only accessible to those citizens with certain economic or socio-political powers. However, the successful diffusion of the technology can be seen as enabling of social awareness. This awareness can then lead to more voices being able to influence the existing discourse on renewable energy in Buenos Aires and Argentina. Therefore, by distributing this social contact with the technology one could arguably be affecting society's will and power to influence the current energy situation. Also tying in Geels' understanding of socio-technical transitions as inherently scattered and irregular processes it would be unfair to argue that the Iresud project is not a driver of urban sustainability, although the results have so far been quite modest. Consequently, although not an all-encompassing sustainable development, what the above arguments indicate is a trend

towards the inclusion of a more sustainable way of thinking and a progress towards renewable energies.

5. Conclusion

This thesis set out to discuss cities as settings for socio-technical transitions and the oftentimes proposed link between sustainable development and the use of renewable energies. By focusing on the progress of the solar power project Iresud and its work in Buenos Aires the research has been able to take context specific challenges as well as enabling forces into consideration. By analysing interviews carried out with representatives from the Iresud project the thesis has been able to define certain perceptions and motivations that drive the socio-technical transition in Buenos Aires. Chapter 3 presented the theoretical framework that includes social, environmental and economic development as interactive aspects of urban sustainability. Following this, in chapter 4 the research discussed if and how the Iresud project is contributing to such a development. By separating the three aspects of social, environmental and economic sustainable development I have been able to define certain trends in favour of or against such a development. As has been shown, the Iresud project is mainly a response to economic factors and has thereby set out to focus on a single tier of sustainable development. However, the analysis has suggested that this will still have an impact on the social and environmental spheres. Though as shown in the discussion, while not incorporating all the aspects presented in the theoretical framework, the transition can still be argued to be a positive driver of urban sustainability in Buenos Aires. Furthermore, the discussion presented certain concerns regarding the equal distribution of any beneficial development brought about through the project. However, as the research has shown the diffusion of the solar energy technology can be understood as a way of raising consciousness regarding issues related to this technology and thereby creating an awareness of urban sustainable development discourse in society.

Recommendations for Further Research

The topic of urban sustainable development is a widely debated issue. As the research has suggested it is a highly context specific endeavour but nonetheless connected to both local and global forces. This thesis has focused on the representatives from within the project and relied on their perceptions of the proposed transition. However, what this overlooks is the

response from the societal sphere. Socio-technical transitions are not about creating new technology and installing it in society. It is equally important to create awareness on multiple levels for the transition to be a feasible long-term scenario. Therefore, further research should take into consideration the perceptions of those subjected to the shift. Furthermore, the diversity regarding stakeholder interest would suggest a need for further case studies incorporating both local and global forces, thereby broadening the assessment of the dynamics present in urban energy transitions. Additionally, there is a need for research on the equal distribution of benefits connected to such socio-technical shifts. This would also include studies on trans-frontier equity that take into consideration the full life-cycle and social, environmental and economic effects produced by this technology.

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Appendix

¹ “En Argentina, y en muchos países del mundo, los consumos eléctricos están centralizados esencialmente en las áreas urbanas. Está muy claro porque incluso las industrias están muy cerca de las áreas grandes de las áreas urbanas. Por citar solo un ejemplo, lo que llamamos el área metropolitana de Buenos Aires o gran Buenos Aires...tiene un tercio de la población y consumen un 40% de la energía eléctrica en el país. Eso quiere decir que si uno puede generarla directamente en el área de Buenos Aires se contribuiría bastante a bajar las pérdidas.”

² “En realidad nos costó mucho trabajo conseguir sumar empresas privadas al consorcio porque no estaba claro cuál era el beneficio, porque para sumarse tenían que contribuir con algo de contraparte. No solo recursos humanos sino también algún tipo de inversión.”

³ “...las tarifas residenciales ni siquiera llegan a cubrir el costo de generación con la variante más económica que tenemos dentro de la parte de generación que es con gas natural de origen nacional que escasea, cada vez importamos más...”

⁴ “Entonces es absolutamente imposible lograr que esto crezca, este mercado de las renovables en general y del solar en particular. O sino hay un sinceramiento de las tarifas, que las tarifas realmente reflejen el costo de generación...o sino es imprescindible un subsidio como mínimo equivalente al de las convencionales. O sea la principal traba es esto, después aparecen algunas trabas no técnicas pero...no se si llaman los culturales, las distribuidoras mucho no les gusta la idea de la generación distribuida.”

⁵ “No es la distribuidora la que tiene que decidir si esto se hace o no. Lo tiene que ser el poder ejecutivo o congreso nacional. O sea tiene que haber leyes y regulaciones que obligan a las distribuidoras a aceptar esta fuente de generación.”

⁶ “... hay una resolución de la secretaría de energía que habilita la presentación de proyectos de generación con energías renovables...”

⁷ Ahí parece haber una decisión política. Digo ‘parece’ porque hay mucho más propuestas que contratos firmados. Solar, hasta donde conozco, hay un contrato firmado y no sé si había un segundo, ese contrato viene firmado por una central muy chica, un MW un MW y pico, y tenemos información, o sabemos, que hay como 300 MW presentados. (...) O sea, es difícil entender si realmente hay una decisión política fuerte o se sacó esa resolución porque políticamente era lo correcto y después no hicimos más nada.”

⁸ “Se usan en los momentos cuando más radiación solar hay. O sea que hay una buena correlación entre la generación y el consumo.”

⁹ “Hace muchos años que estoy en el tema de solar y hace décadas que oigo decir que el petróleo se acaba en 30 o 40 años. O sea, siempre falta lo mismo para que se acabe el petróleo. Como no está claro el horizonte del agotamiento del petróleo, yo pienso que el elemento ambiental sigue siendo clave, porque mucha gente y muchos políticos siguen apostando el petróleo como la solución energética del futuro en el mediano o largo plazo. Como de hecho en Argentina cuando apareció el tema del yacimiento tan importante en Neuquén en Vaca Muerta, caso como toda la discusión energética pasó a ver como se hace para explotar eso y que Argentina vuelva a ser un país exportador de combustibles fósiles.”

¹⁰ “...es algo corriente en casi todos los países europeos, sobresaliendo entre ellos Alemania, Italia, España, etc. Y es algo prácticamente desconocido aquí en la Argentina.”

¹¹ “...40 instalaciones de prueba en distintas provincias (estados) del país, con la finalidad de difundir en la sociedad la existencia de dicha tecnología, mostrar su confiabilidad, rendimiento y vida útil.”

¹² “...ya que se generaron los primeros especialistas en sistemas fotovoltaicos conectados a la red, tanto desde el punto de vista eléctrico, electrónico, mecánico y arquitectónico.”

¹³ “Primero, la energía eléctrica está subsidiada por el estado, por lo que el costo de la misma es muy bajo para el usuario. Esto hace que la amortización económica del sistema ocupe casi toda la vida útil del mismo. Segundo, al no haber un mercado establecido, los precios de los paneles solares y el inversor solar están muy por encima de los valores internacionales, quedando sujetos de alguna manera al margen de ganancia que al importador se le ocurra dar.”

¹⁴ “...ningún gobierno quiere pagar el costo político de retirar dicho subsidio.”

¹⁵ “...llevamos las renovables un poco en el alma, no. Es un poco nuestra vocación, y esto va más allá de lo económico. Estamos convencidos de que esta idea está relacionada con el medioambiente, con la sustentabilidad, con lo ecológico. No es que lo hacemos meramente solo por dinero.”

¹⁶ “Cuando vos puedes generar in situ, evitar pérdidas por grandes líneas de transmisión, evitar pérdidas por difusión, descomprimir los nodos en las horas pico, y si tu viviste en Argentina has experimentado algunos

cortes de suministro, esto no tiene que ver con que falta generación sino con que falta mantenimiento en la distribución. Entonces, las redes son viejas, los transformadores no dan abasto, los cables son antiguos y no dan abasto...Si uno puede implementar en el ámbito urbano en la ciudad una fuente externa que descomprima esos nodos, eso aliviaría mucho y evitaría los cortes del suministro.”

¹⁷ “Uno puede vivir sin suministro eléctrica para iluminarse pero no sin agua. Entonces uno podría implementar por ejemplo en los edificios, porque hay personas que viven en edificios altos, para que funcionen las bombas. Eso no sería muy costoso para un consorcio y sería una solución por lo menos para que la gente siga teniendo agua. Es decir, el proyecto Iresud puede marcar un montón de cosas, y, hoy la posibilidad de desarrollar las fotovoltaicas en la ciudad puede ser muy importante si se hace con un marco regulatorio.”

¹⁸ “La mayoría de la gente todavía no conoce de esto. Por lo tanto hay que hacer muchas tareas de información... Es decir, hay que trabajar mucho, no solo decir: tenemos la ley y la reglamentamos y no hay que trabajar mucho en el contexto de lo que puede ser un marco regulatorio. Desde las escuelas, desde la sociedad, haciendo convocatorias para que sepan de que se trata, los porqués, la discusión pública. Socialmente hay que trabajar mucho. No es simplemente lanzar una ley y tratar de hacer cada uno lo que se puede. Por eso hay que planificar, no.”

¹⁹ “Esto pasa por la cuestión social, pasa por una toma de conciencia, de qué tipo de ciudad en el futuro queremos. Por lo menos empezar a pensar en esa dirección, porque en la medida que el tiempo pase no es que estas renovables son las que van a ser la solución, seguramente habrán cosas nuevas, desarrollos nuevos, pero en algún momento hay que empezar a pensar en esa dirección, ese tiene que ser el objetivo. (...) También hay que incentivar a los usuarios para que empiecen a incorporarlas en sus viviendas, porque es la única forma. El usuario no lo va a hacer porque es un bohemio o porque tiene amor a la ecología. Lo va a hacer porque le conviene.”

²⁰ “A nivel política nacional, cuando hablamos del gobierno nacional, la respuesta es no. Simplemente hay compromisos de compromiso, porque el mundo va en esa dirección y entonces de repente vemos a la presidenta inaugurando los 5 MW de... los últimos 5 MW que se instalaron en San Juan en el año 2014, pero eso no es otra cosa que un acto meramente político de compromiso y no muestra absolutamente nada. El compromiso, por los conocimientos que tenemos nosotros, a nivel nacional es nulo, no tienen mayor interés en esto.”

²¹ “A nivel provincial podemos empezar a ver recién ahora que hay interés de algunos lugares... Y yo estoy convencido de que a la larga todas las provincias van a tener alguna reglamentación o alguna ley que les permite incorporar las renovables en su matriz energética provincial. Y entonces a la nación no va a quedar otra que entender que hay que ir en esa dirección. “

²² “Ellos tienen que poner una contraparte que a veces tiene que ver con las estructuras de soporte de la instalación. Entonces, no es que simplemente ponen el medio sino que trabajan en forma conjunta allí, y se monitorea en lo posible en forma conjunta. (...) Y después esto es, siendo un proyecto piloto sirve para demostrar a la sociedad en su conjunto y en cada una de las provincias. Por lo tanto, esto sí está, empieza a estar relacionado con la responsabilidad en cuanto a la sustentabilidad y al beneficio que puede traer, porque efectivamente empiezan a ver los beneficios, por más pequeño que sea el sistema, se empiezan a ver los beneficios que traen. Y bueno, prácticamente en todas las provincias o en la mayoría de ellas hay un proyecto piloto del consorcio Iresud. Así que el compromiso con la sustentabilidad desde el punto de vista del proyecto a través de, en este caso la energía solar fotovoltaica, es clarísimo, no.”

²³ “Al principio, Edenor no se ve afectada. Tiene, por supuesto una desventaja para Edenor. La única ventaja sería que el usuario ponga los paneles adentro de la casa. Entonces, para Edenor eso implicaría un menor consumo. Entonces, ahí sí estaría distribuyendo menor energía. Pero a los valores de tarifas nadie lo va a hacer.”

²⁴ “Entonces, como no se puede controlar la energía, la empresa distribuidora lo que tiene que hacer es dimensionar toda su red por acaso no tuviese. Porque yo, a la noche cuando hay el pico de consumo, y el sol no está, y la red tiene que aportar el 100% del consumo del cliente... Que básicamente pensar de que no existe la generación distribuida. Entonces para la empresa distribuidora toda la red debería estar dimensionada como si no existiera, y toda la operación tiene que estar pensada como si no existiera.”

²⁵ “Son buenos proyectos porque corresponden a algo internacional... pero me parece que desde el lado político es más...greenwashing.”

²⁶ “El 40% aproximadamente de la población de Argentina vive en esta zona del conurbano de gran Buenos Aires y Buenos Aires. Ese 40 son los votantes de la población de Argentina. Entonces, y esto de verdad, me da

vergüenza decirlo pero es así, es un tema político, es una situación política en donde el 40% de los votantes están subsidiados. Y el gobierno cree que aumentar las tarifas y quitar los subsidios aquí implicaría una pérdida de la imagen y una pérdida de votos.”

²⁷ “Esto también nos obliga a buscar otras maneras de generar energía, porque de acá a 10 años más ya me parece que no vamos a tener energía para encender una lamparita.”

²⁸ “La empresa hace prácticamente 15 años que tiene políticas de medio ambiente. De hecho, tenemos nuestra huella de carbono, nuestro inventario de huella de carbono.”

²⁹ “Que sea negocio para alguien, no necesariamente para el estado sino para los privados que van a empezar a poner plata. Teniendo un beneficio económico, eso, para el estado, representa una sustentabilidad en cuanto a la generación de energía.”

³⁰ “Bueno, acá que no tiene ningún valor, es difícil hablar de eficiencia energética porque no tiene ningún beneficio económico. Sí, desde la distribuidora, Edenor, damos consejos de uso eficiente. Pero son los consejos bastante clásicos, donde poner lámparas de bajo consumo, donde no. Qué hacer para consumir menos con el AC, ponerlo en 24 grados. Eso creo que tiene que ver con la educación y es del largo plazo. Y es muy difícil educar a la gente en general, digamos.”

³¹ “Y acá, los planes de largo plazo no suelen ser algo muy fijo, muy difundido.”

³² “No hay un incentivo para la gente que use de forma eficiente la energía. Y es una barrera cultural que hay que romper.”

³³ “Acá, lamentablemente que lo diga, como sociedad tenemos algunos puntos sociales más conflictivos que son más importantes que tenemos que resolver antes de empezar a hablar en forma general del cuidado del medio ambiente. Tenemos problemas de inclusión social, problemas de habitabilidad. La instalación la hacen las clases altas. Un cliente de una clase social media o baja no tiene capacidad de hacer una instalación de una energía renovable en su domicilio. Así que el que quiere instalarlo, que va a instalarlo básicamente lo va a hacer por un interés ecológico más que por un beneficio económico.”

³⁴ “...que algo funcione en Alemania no significa que funcione acá necesariamente.”

³⁵ “Lo único que se puede hacer es fomentar y intentar... Un normativo siempre termina siendo algo estatal, que cabe un retraso bastante largo. Las normativas acá siempre están bastante atrás de lo que pasa. Es muy raro que haya una normativa que prevee algo nuevo. *skratt* No sucede. En general, de repente se empieza a hacer y se hace una normativa atrás. Pero no lo veo como un fracaso. Me parece que se hizo mucho y tal vez simplemente falte tiempo para que esa normativa esté.”

³⁶ “El tema es que si no hay un marco regulatorio que ayude es muy difícil. Terminas chocando o hablando con gente que está en la misma que vos que le gusta, que le interesa, que le parece lindo, que ayuda el planeta, pero si no vas por la parte económica, acá es mucho y no llegas. Y desde el punto de vista de la empresa, por ahora es seguir haciendo las instalaciones que podemos, esperando el día en el que el gobierno libere la posibilidad de conexión a red, que hoy está prohibida. O se sinceren las tarifas energéticas, que realmente la gente pague lo que realmente vale la producción de energía.”

³⁷ “Lo único que dice la ley es que tenes que llegar al 8% de la matriz energética total, de fuentes renovables. Y la ley promueve que CAMMESA tiene que firmar un contrato y pagarte la energía que vos inyectas. El tema es que vos presentas con CAMMESA el proyecto, y vas a hacer toda la parte económica y CammESA no te paga, te cierra a un precio mucho menor. Cuando realmente no te firman un contrato con ningún precio...entonces vos no podés hacer ninguna obra, porque CAMMESA era la que tenía que firmar el contrato. Entonces por un lado te fomenta y por otro lado te frena.”

³⁸ “Nosotros nos comprometimos a hacer 60 kW de instalaciones conectadas a red las cuales hasta ahora no pudimos cumplir más que nada por las reglamentaciones que hay en el país. Yo ya presenté aproximadamente 4 empresas para poder hacer la instalación a red, y por la negativa de Edenor, que es la distribuidora pública, que también forma parte del proyecto, no nos dejó conectarlas. O sea, estamos con ese problema, entonces por un lado me presionan a mí de que yo no he cumplido con un objetivo del proyecto, pero por otro lado yo tengo el resguardo de que presenté opciones para hacerlo, y Edenor fue lo que no me permitió a hacerlo.”

³⁹ “El proyecto fue un éxito en cuanto a la cantidad de instalaciones que se lograron. Desde la parte de la reglamentación fue un fracaso porque no se pudo avanzar en nada. Entonces el proyecto tiene una parte muy positiva y una deuda muy grande. Pero bueno, volvimos a chocar contra el gobierno o contra las grandes distribuidoras como Edenor y Edesur, que son las que nos frenan con la conexión.”

⁴⁰ “Por este tema de que las tarifas no son las correctas, y las empresas no están siendo controladas de manera que deberían, la red eléctrica, por ejemplo en la ciudad de Buenos Aires, es una red eléctrica muy antigua. Entonces, a pesar de que uno pudiese colocar en su vivienda energía fotovoltaica, eso no quita que la red sea

de mala calidad. (...) Y las empresas electricas, cobrando lo que deberían cobrar, y siendo controladas como deberían ser controladas, deberían empezar de a poco a actualizar sus redes.”

⁴¹ “Yo creo que lo que se empieza a desarrollar, al principio no es sustentable, hasta que la producción empiece a tener volumen.”

⁴² “Yo creo que cuando uno percibe el valor de energía, y de donde viene la fuente energetica por el costo, y empieza a utilizar las energías renovables, se empieza a generar un vinculo entre la ecología y la energía, porque hay un impacto muy directo. Cuando uno ve un panel fotovoltaico instalado, en su vivienda, el impacto con respecto a ecología, es muy directo. O sea, yo a veces comento que es como una especie de magia, entre comillas, no. Porque de repente pones diez paneles en tu techo y abasteces toda tu vivienda. Entonces es algo como, wow, viste. Sale el sol y te genera energía. Te conectas muy directamente.”

⁴³ “A la empresa le genera muchas ventajas porque oficia de lo visto dentro de lo que son las bases de la explotación de la energía solar en Argentina.”

⁴⁴ “...al verlas funcionar, la gente toma más conciencia aún de que se puede. Se puede hacer un cambio, no. Este, en la forma de vivir y no les va a complicar la vida, solamente un cambio de paradigmas.

⁴⁵ “Entonces, no se puede dejar de lado la consciencia social y un tipo de politica que permita incluir mucha gente sin afectar al resto. Tiene que ver con eso no, el proyecto, no solamente con la aplicación de un idea o un invento sino llevarlo a cabo de manera consciente.”

⁴⁶ “En Buenos Aires uno sabe que conviene tener el aire acondicionado en 24 grados y la gente lo pone en 20 todo el día. Y ese egoísmo puede llegar a llevar a que no sean viables estos proyectos, entonces hay que conscientizar a la gente. Muchas veces eso va de la mano de, como decimos acá en Argentina, que te toquen el bolsillo. Entonces, si yo te aumento los costos de la energía electrica, y por otro lado fomento la energía solar, y te digo, mirá, te ahorrarás un montón de dinero, pero las condiciones son éstas, y bueno yo creo que la gente se va a empezar a adoptar estas condiciones.”

⁴⁷ “También tiene que ver con el contexto socioeconomico que estamos viviendo que hoy en día, no sé si da para grandes inversiones. Está muy inestable la situación. Si hoy tenemos que donar una x cantidad de terminales y conectores para un proyecto futuro en un contexto que es tan volatil preferimos no hacerlo. Eso lo dificulte un poco.

⁴⁸ “Bueno, lo que se está trabajando en este proyecto es generar para también inyectar y esa es la parte más complicada porque hay empresas a las que no sirven mucho este tipo de cosas porque se ven afectadas, no, economicamente. Ahora, a nivel economico, una sociedad donde todos puedan recabar energía solar y la que no necesita inyectarla a la red, y bueno ahí se ven beneficiados todos, y evitás tener que importar energía de otros lugares.”

⁴⁹ “Abiertamente nadie te va a decir que ‘estoy en contra del proyecto’. Pero sí que, obviamente van a poner este, algun tipo de trabas porque no es algo que les convengan. No les conviene que se explote la energía solar.”

⁵⁰ “Buenos Aires no es Nueva York pero tiene sus edificios, y tiene zonas donde no hay luz solar en forma constante durante un buen tiempo.

⁵¹ “Yo creo que en la ciudad de Buenos Aires se va a dificultar, es seguramente muchisimo más costoso hacerlo que en el interior del país.”

⁵² “...Argentina podría ser la Arabia Saudita del futuro, porque lo tiene todo. Es tan extensa de norte a sur que tiene todas las variantes para ser un gran proyecto para generar energía electrica renovable. “

⁵³ “Es marketing tambien. Ojo, no....no hay...hay mucho marketing que queda “cool” entre comillas, no. Hablar de ciudad verde y medio ambiente. Parece como muy sustentable, pero en la practica despues falta mucho para recorrer. Esta empezando. Es un concepto que recién está arrancando.”

⁵⁴ “En la práctica se percibe de mayor importancia la sustentabilidad económica, luego la social en en último lugar la ambiental ya que es la que menos se ve y la que mas tiempo tardará en afectarnos.”

⁵⁵ “En buenos aires no resulta rentable este tipo de tecnología, por lo que no se ve, no se conoce y nadie sabe realmente de que se trata.”

⁵⁶ “La realidad es que si la energía tuvieramos que pagarla por el verdadero costo de un dia para el otro, la argentina explotaría ya que mucha gente no podría pagar la energía y eso generaría una gran crisis que ningún político está dispuesto a afrontar.”

⁵⁷ “Nadie está pensando que los no convencionales vayan a estar disponibles antes del 2020. O sea, que la demanda energética aquí, al año 2020, más alla de lo que pensemos de los no convencionales, mas alla de la

discusion ambiental, suceda lo que suceda con los no convencionales, no van a estar disponibles en el corto plazo. Por eso yo les digo estamos ante una oportunidad unica. Es decir, tenemos una disponibilidad de recursos naturales enorme...”

⁵⁸ “Por eso decimos, por qué es necesario el 8% en el año 2016, no solo porque es bueno, no solo porque es mas limpio, no solo porque es mas sustentable, sino porque ademas, economicamente, es aca yo diría, la unica alternativa racional que tenemos por delante.”