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Smart design rules for smart grids: analysing local smart grid development through an empirico-legal institutional lens

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Abstract

Background: This article entails an innovative approach to smart grid technology implementation, as it connects governance research with legal analysis. We apply the empirico-legal 'ILTIAD framework', which combines Elinor Ostrom's Institutional Analysis and Development (IAD) framework with institutional legal theory (ILT), to an empirical case study of a local smart grid project.

Methods: Empirical data were collected in an exploratory, descriptive example study of a single case, focusing on the Action Situation and interactions towards establishing a local Smart Grid. The case was chosen because of its complexity, following the 'logic of intensity sampling'. Data triangulation took place combining participatory observation, semi-structured interviews, and document analysis.

Results: Through an exploratory case study, we showed how the ILTIAD framework can help reduce complexity in local decision-making processes on smart grid implementation, as it allows for analytical description and prescriptive design of local smart grid systems. In the analysis we addressed ownership arrangements and contracts and identified barriers and opportunities for realizing a local smart grid system. The design part includes a scenario which revealed the prescribed patterns of behaviour (liberties and abilities) and the consequential aspects that apply to each situation.

Conclusions: Analysing and designing normative alignment ex ante to the planning and implementation of a smart grid system provides clarity to stakeholders about their current opportunities. For this reason, the ILTIAD framework can be used as a design guideline for establishing new and integrated smart grid projects.

Keywords: Institutional Analysis and Development framework, Institutional legal theory, Empirical case study, Smart grid

Background

Introduction

In the future, distributed generation from intermittent sustainable energy sources coupled with rising local demand are expected to present a significant challenge to current electricity grids [1–3]. This challenge is aggravated as the timing of local energy demand does not match the timing of local production of energy from renewable resources, for example from solar PV panels. One option to meet peak demand is to reinforce the distribution grid with thicker cables and higher capacity transformers. Another, more sustainable solution is the implementation of smart grid technology to balance the energy supply and demand by increasing the flexibility of the electricity grid through the use of information and communication technology (ICT) and real-time remote control, e.g. with smart appliances and electric vehicles [4–8].

In a European Union (EU) member state such as the Netherlands, currently only smart grid pilot projects are being undertaken (which benefit from legal exemptions) and relying solely on the market is believed to offer insufficient incentives to implement smart grids on a larger scale [9]. Wolsink [10] states that 'there remains a complete lack of understanding of the need for institutional change required to establish them [i.e. smart grids]'. The decision-making process should facilitate the collective action of a wide range of actors to implement this technology, while at the same time ensuring an increase in community acceptance

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[10]. However, the changing institutional and technical environment, the need to coordinate energy, resource and spatial planning, as well as inconsistent and ambiguous smart grid terminology make the implementation of smart grid complex for local stakeholders [11, 12]. Most actors involved in local planning processes seem to struggle with the complexity of decision-making on smart grid implementation, which derives from the multiplicity of stakeholders involved in decision-making on renewable energy technologies, and from the redistribution of responsibilities and powers between them [13–17]. To summarize, 'the emergence of new actors and actor constellations in the dissemination of sustainable energy technologies has made local energy policy and planning more complex' [14]. Additional complexity is added by the existing legal framework and especially by the regulatory disconnect between emerging practices and this framework [18]. To decrease this complexity, both the governance of collective action and the related legal regimes have to be addressed.

In this article, we adopt an innovative approach to smart grid technology implementation, by combining governance research with legal analysis. This is present in the empirico-legal ILTIAD framework[1] [19], which combines Elinor Ostrom's Institutional Analysis and Development (IAD) framework with institutional legal theory (ILT). We address the research question 'how can the ILTIAD framework help to reduce complexity in local decision-making processes on smart grid implementation?' To answer this question and to demonstrate how the ILTIAD framework works, we apply the framework to an empirical case study of a local smart grid project.

We selected ILTIAD as it connects empirical institutional analysis of local decision-making processes (IAD) with the normative analysis of relevant legal aspects (ILT). To be more precise, the IAD framework is viewed as a 'conceptual tool for inquiry about how rules affect a given [empirical] situation' [20]. Especially as the renewable energy available in a smart grid can be defined as a common pool resource [10], such rules are needed for successfully addressing collective action challenges [21]. Institutional legal theory complements this as it allows for a 'realistic analysis, explanation, or description of the legal sphere and indeed of all those distinctively human and social institutions and phenomena which correlate with, depend upon, or presuppose legal or other rules or norms' [22]. The merger of both theoretical frameworks allows us to focus on rules reflecting descriptive patterns of behaviour, as well as to take into account their relevance to the legal environment in which smart grids are to be realized. By applying the ILTIAD framework to an empirical case study of Bothoven-Noord, a district in the city of Enschede, the Netherlands, we identify legal aspects that concern normative constraints and opportunities to establishing and maintaining particular local smart grid systems. The ILTIAD framework hereby serves as a heuristic tool for case analysis and for the formulation of prescriptive design guidelines for decision-makers; two aspects that can help reduce complexity in regard to complicated choices in decision-making processes.

The remainder of this section provides background information about the theoretical ITLIAD framework. In the 'Methods' section, the case study research is explained in detail. The 'Results' section combines the information of these previous two sections: the ILTIAD framework is applied to the case study of Bothoven-Noord. Our analysis provides a 'picture' of prescribed behaviour, including consequential aspects that may not yet have been considered by stakeholders, but may impact on their behaviour (whether in desirable ways or not). In the 'Discussion' section, we move beyond analysis, summarize the advantages of ILTIAD and debate how this framework can be used as a design tool. Our article ends with a conclusion in the last section.

The ILTIAD framework

As mentioned previously, the ILTIAD framework presented in this article combines the IAD framework with ILT. To understand why and how such a merger provides heuristic benefits to case analysis and to the formulation of prescriptive design guidelines (about the steps towards making consistent and necessary legal changes), a brief introduction into IAD is given, followed by a description of the related normative wisdom that ILT can add to IAD.

The Institutional Analysis and Development framework (IAD)[2]

The IAD framework (see Fig. 1) allows researchers to inquire how rules affect an action situation; in this research the local decision-making process on smart grid implementation. Through such an empirical focus on rules, it becomes possible to analyse the planning and implementation process of local smart grids (as a collective action challenge).

Rules are about shared understandings of regulated and sanctioned statements of ought, and build upon the conjunction of five '*ADICO*' components: an '*A*ttribute' (i.e. to whom the rule applies), a '*D*eontic' (i.e. the

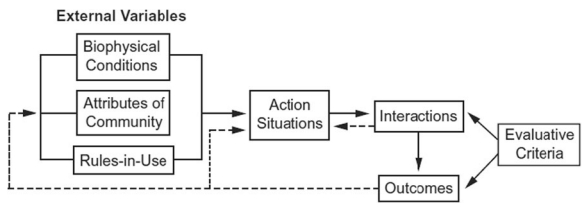

Fig. 1 The Institutional Analysis and Development framework. Source: [24]

direction of ought, such as shall or may), an 'a*I*m' (i.e. the action or outcome as object of the rule), '*C*onditions' (i.e. circumstances under which the rule applies to such actions/outcomes) and an '*O*r else' (i.e. the possibility of a sanction upon non-adherence) [23].[3] Ostrom distinguishes between two types of rules: rules-in-use[4] and rules-in-form. Rules-in-use are those rules to which participants would refer if they had to explain and justify their behaviour to other participants in the action situation[5] [24], while rules-in-form are always written statements, resulting from formal legal procedures. Seven different rules-in-use[6] influence (together with biophysical conditions and attributes of community) the action situation, as shown in Fig. 2.

Ostrom [21, 25] speaks of multiple levels (situations) of analysis: operational, collective choice, constitutional and metaconstitutional. Rules are determined at each previous level: constitutional rules in Ostrom's model are defined at the metaconstitutional situation (making rule-making possible), collective choice rules are determined at the constitutional situation (making 'making grids' possible) and operational rules derive from the options and limits set out at the collective choice situation ('making grids'). These operational rules in turn influence the action situation at the operational situation ('operating grid'). All these rules are hence crafted at a deeper level and always exogenous to the higher level. Actors that are part of an action situation often have the ability to change at least some of the rules that affect their own (action) situation. To do so, actors have to 'move' to a deeper *analytical* level, e.g. from the operational situation to the collective choice situation, where they can decide to adopt new operational rules that (re)define their room to manoeuvre at the operational situation level. Often other actors are (also) involved in changing rules, such as when a regulator unilaterally determines the Operational Situation rules.

In the Bothoven-Noord case study, the action situation of interest is the decision-making process led by the smart grid project group (at the collective choice level) in which decisions about the implementation and maintenance of a local smart grid are taken (the operational situation level).

ILT—as applied to IAD

To add an institutional legal lens to the IAD framework follows from the assumption that participants in action situations (of setting up and operating a smart grid) intend to proceed in a lawful way, both as regards their actions as with respect to the outcomes, ultimately the smart grid system they aim to realize. Such lawfulness has two sides: firstly, the requirement of acts and outcomes which are in accordance with the law (i.e. compliant), and secondly, the possibility of making changes in the law, thus affecting the legal space within which acts and outcomes are in accordance with the law (e.g. signing a contract or issuing a permit).

Operating in accordance with the law is about actions and outcomes in conformity with the rules-in-form (henceforth legal rules). When the rules-in-use, as practiced in an action situation, are consistent with legal rules, their corresponding actions and outcomes are legally immune to criticism, such as by liability claims. As such they are positioned within a 'legal liberty space' [26] which may be understood as the realm of actions and outcomes that is legally available to participants in a particular action situation. This liberty space is determined by 'rules of conduct' which concern the lawfulness of performing factual actions or establishing certain factual outcomes. Such actions or outcomes may be either prohibited, commanded or permitted [23].

The possibility of making legal changes is about legal powers to make changes and legal immunities to not be

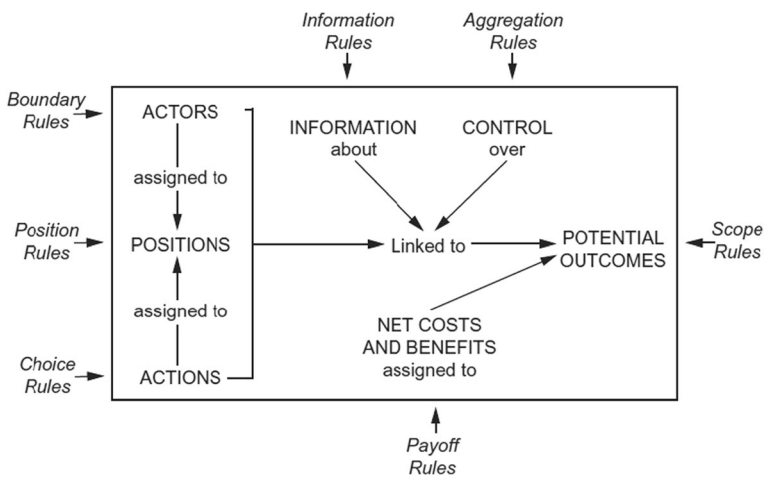

Fig. 2 Effect of rules-in-use on the internal structure of the action situation. Source: [24]

subject to such changes, which together make for a given 'legal ability space' [26]. Making legal changes is about the ability to intentionally introduce new, or alter or terminate existing legal rules. Taken from the IAD perspective, making such changes in rules-in-form will be the outcome of interactions within one 'law-making' Action Situation, with the intent to subsequently impact de facto rules-in-use of another (higher level) Action Situation. For example, by issuing a permit to establish an energy grid, as outcome of law-making, a previously prohibited action becomes a permitted action with the intent of allowing the particular grid to be realized, through (concerted) factual activity. The rules of power (and immunity) that determine the legal ability space applicable to participants in a given action situation are nowhere discussed by Ostrom and most likely seen as a matter of (prohibition or) permission to change legal rules. From the ILT perspective, the vital point is that only 'legal acts' performed upon the basis of a power-conferring legal rule—that is established at a deeper action situation level—can indeed cause legal effects (by introducing, changing or terminating legal rules) [27]. Thus, analytically, three levels of action situations are involved in legal change:

1. the level at which a legal power-conferring rule is made—creating a legal ability;
2. the level at which this rule (following 1.) is being applied by performing a legal act—use of legal ability to change legal liberties;
3. the level at which the scope of lawful factual actions is changed (by 2.)—use of legal liberty.

Following Ostrom, we name these levels constitutional, collective choice and operational level.

When we apply this basic understanding to action situations at different levels, we can distinguish interactions at these levels and the rules of conduct or of power that structure these interactions. As said, the latter rules have been determined at deeper levels, either by the actors themselves (first party regulation), or entirely or partly by other actors (second or third or hybrid regulation) [28], as deeper level participants—on the basis of power-conferring rules established at even deeper levels.

This leads to an improved understanding of a 'lawful' hierarchy of institutional levels that includes a proper understanding of legal liberty and ability space, based upon first-order rules of conduct and second-order rules of power—as presented in the below, Table 1.

Table 1 Levels as action situations where legal acts are performed upon power-conferring-rules

Levels as action situations where legal acts are performed upon power-conferring-rules		
Level of action situation	Interaction	Rules structuring the AS (for interaction)
Operational situation (OS)	Performance of factual activities, e.g.:	OS-RiUs following RoCs with 'deeper origin' (CCS) involving prohibitions, commands, permissions and dispensations (and freedoms)
	• establish smart grid	
	• manage a neighbourhood cooperative	
Outcomes of CCS	⬆ CCS-made RoCs for OS use ⬆	
Collective choice situation (CCS)	Introducing, altering, terminating (*only*) RoCs, e.g.:	CCS-RiUs following CS-made RoPs (with positions and conditions) about:
	• contracting between OS participants (first party regulation)	• how to make/change RoCs at CCS, for OS-RiUs
	• permitting/subsidizing by non-OS-participants (second party)	
	• co-regulating formal or substantive standards for OS interactions	
Outcomes of CS	⬆ CS-made RoPs for CCS use ⬆	
Constitutional situations (CS)	Making, altering, terminating RiF, e.g.:	CS-RiUs following MS-made RoPs (with positions and conditions) about how to make/change RoPs at CS, for RiUs at CCS
	• (RoP for CCS) Civil Law Code; Electricity act;	
	• (RoP for CCS) as meta-regulation for private rules on products/services	
Outcomes of MS	⬆ MS-made CS-RoPs ⬆	
Metaconstitutional situations (MS)	Making, altering, terminating RiF, e.g.	MS-RiU following RoR when to make RiF
	• constitutions and bills of rights	
	• conventions, custom	

AS action situation, *RiU* rules-in-use, *RoC* rules of conduct, *RoP* rules of power, *RiF* rules-in-form (RoC and/or RoP), *RoR* rule of recognition

ILTIAD—bringing in legal institutions

Adding an ILT perspective to the IAD framework also enables an analytical focus on the patterns of empirically observable social practice, relating to collective action on common pool resources. Such collective action patterns usually concern a regime combining several rules of conduct (involving various, possibly related rights and obligations; legal liberties) or of rules of power (involving legal powers and immunities; legal abilities) [26, 29]. These regimes of rules intend to coherently describe types of realizable patterns of social behaviour (e.g. acting as firm, or parties agreeing on a contract), and at the same time prescribe lawful realization of incidents of such types of behaviour (e.g. how (not) to behave as firm X or how (not) to establish contract Y). Such regimes—combining the description of an existing or possible type of social institution (e.g. an organization or a contract) with the prescription of how incidents of such institutions can be instantiated—changed and terminated at will, while in existence, come with rules of conduct and/or of power. These regimes are known as 'legal institutions' [27, 30].

Most legal institutions are generally well known, such as the 'legal quality' of a licensor (e.g. public authority), the 'legal status' of public property (e.g. eminent domain), a 'personal legal relation' (person to person—P2P; e.g. of a contract), an 'objective legal relation' (person to object—P2O; e.g. of ownership of a property) and a 'legal configuration' (object to object—O2O; e.g. an easement) [27, 30]. We name these types *first*-order legal institutions of persons and objects, their attributes and their relations. *Second*-order types of legal institutions are 'legal persons', such as a cooperative and a firm, and 'legal objects' such as tradable permits [30]. Finally, *third*-order legal institutions are about institutional environments, such as public hierarchies, competitive markets and civil networks. Table 2 provides a schematic overview of all three orders of legal institutions.

ILTIAD—the heuristic approach

First of all, combining IAD with ILT, to make ILTIAD, has the heuristic advantage of transcending the doctrinal state of 'positive law' as it exists in a given legal system (e.g. a nation state) at a particular time. The ILTIAD approach is generally applicable, time and place independent. As such, it allows for making comparisons between action situations across different jurisdictions but also provides a general methodology by which to analyse different states of existing action situations and consider possibilities for (designed) change.

A second heuristic benefit of the ILTIAD framework lies in the fact that a legal institution approach provides an analytical focus on coherence within and between action situations, including action situations at different levels. As said, the collective action patterns that have our attention consist of combinations of seven IAD rules that need to direct action situation related behaviour in a consistent way [21]. This consistency applies to the empirico-causal process in terms of the proper combination of actions taken to achieve the desired outcome (i.e. establishing a smart grid); it also applies to doing so in terms of lawfulness (i.e. in accordance with the law and while applying suitable legal powers). The lens of legal institutions is useful to analysing and designing such lawful consistency within and between (given) action situations, within a given legal system (e.g. the Netherlands).

Against the backdrop of possible, suggested or given IAD rules-in-use the requirement of prescriptive legal consistency—to allow, enable and/or demand effective and legitimate collective action—comes with three challenges:

a. *Legal institution consistency:* to ensure consistency between rules to make for legal institutions that can be instantiated, and operate in a consistent way, within a particular action situation (at a particular level). IAD rules (of all seven types) need to be grouped consistently, within a given action situation, to make for proper particular legal institutions (e.g. a contract or cooperative) to exist and operate within that action situation. For example, together all seven IAD rules should group to make a consistent legal quality (e.g. of public authority regarding the fit between position and boundary rules),[7] legal personality (e.g. of a

Table 2 Three orders of legal institutions

Three orders of legal institutions					
Orders of institutions	Legal institutions (placing in this table does not mean to suggest relations across levels)[a]				
1st order	Legal Quality (e.g. public authority)	Legal Status (e.g. public good)	P2P-relation[a] (e.g. contract)	P2O-relation (e.g. ownership)	O2O-relation (e.g. easement)
2nd order	Legal Persons (e.g. associations, foundations, corporations) (public or private)			Legal Objects e.g. tradable private or public rights (following P2P/P2O/O2O) relations	
3rd order	Public Hierarchy (e.g. states, municipalities)		Civil Networks (e.g. NGOs, communities)		Competitive markets (e.g. commodity markets)

[a] 1st order is logically conditional to 2nd and 3rd orders; existence of 3rd order institutions influences scope for other institutions within

cooperative regarding position and aggregation rules) or a consistent institutional environment (e.g. of a regulated market regarding choice and payoff rules). When IAD rules cannot be consistently grouped to form a type or incident of a legal institution, for instance when there is no fitting information or aggregation rule for making an P2P-contractual arrangement, then collective action results cannot lawfully be achieved.

b. *Action situation consistency:* to ensure that properly formed legal institutions (consistent according to a.) allow for a consistent structure of a particular action situation, given its desired outcomes (at that particular level). This means that all IAD rules fit not only to form particular legal institutions (under a.), but also that together the thus formed legal institutions—particularly IAD rules of the same kind included in them—align within the action situation, so that legal institutions can functionally interlink properly. For example, missing links occur when a P2P cannot be agreed because of the absence of legal personality (i.e. lack of matching position rules as functional barrier). Collective action fails when the creation and/or use of various legal institutions do not lawfully add up to the desired outcomes.

c. *Level consistency:* to ensure that such a properly established action situation (consistent according to b.) aligns consistently with outputs at lower or inputs at higher levels of action situations (given that higher level actions and outcomes require a fit with lower level IAD rules concerning legal power or lawful conduct). As legal institutions are conceptualized at CS level, instantiated at CCS level and operated at OS level, the making of legal power rules (at CS), their use (at CCS) to make rules of conduct, and the adherence to the latter (at OS) need to properly relate in terms of IAD rules that are outcomes of a lower and input to a higher action situation. Otherwise, OS actions are unlawful, CCS actions are invalid and/or CS actions are not recognized as legitimate.

Heuristically, these three consistency challenges allow for an analysis that concerns prescribed patterns of interaction rather than focusing on mere individual rules. This is especially relevant in a dynamic perspective of actual changes taking place or of an intended (re-)design of an action situation. Both analysis and design allow for a legal mapping of the action situation as a legal (action) space, with multiple interrelated liberties and abilities. Such mapping will, for example, reveal if certain participants are redundantly included or have been inadvertently excluded.

A final remark on this conceptual aspect is that the above consistency challenges assume that indeed actors are out to secure coherence between rules-in-use and rules-in-form—if only to avoid legal consequences of invalidity or unlawfulness of their activities, which may well jeopardize their desired outcomes.

Methods

We collected empirical data to develop a future setting for an example case (Bothoven-Noord) on decision-making for smart grid implementation. Based on this, we applied the ILTIAD framework to demonstrate how to reduce complexity in decision-making by presenting the options that exist for arriving at this setting.

Case study research

The main interest of our research concerns the rules that structure an action situation—such as that for setting up a smart grid energy system. To get an in-depth view of the action situation and the interactions that take place in a local smart gird project, we conducted a case study of Bothoven-Noord. Ostrom [21] summarizes that case studies (and analytical narratives) are an important technique for analysing the structure of complex action situations and their linkages. We performed an in-depth exploratory, descriptive case study of a single case: Bothoven-Noord [31]. The case Bothoven-Noord was chosen because of its complexity, which is related to the 'logic of intensity sampling, [where] one seeks excellent or rich examples of the phenomenon of interest […]' [32]. The unit of analysis was the decision-making process (action situation) under existing general rules of law on the Bothoven-Noord smart grid project. The units of observation in our case study were the stakeholders involved in this local decision-making process, i.e. the smart grid project group members.

For the data collection, data triangulation took place. First, between January and June 2015, one of the researchers took part in six meetings of the smart grid project group, in form of moderate participant observation. Secondly, six semi-structured interviews were conducted with all six smart grid project group members between June 2015 and July 2015. Third, nine project documents were analysed. For the purpose of this exploratory research, the documents and interview transcripts were mainly used for obtaining insights as regards the envisioned smart grid design of the local project group, as well as regards the biophysical conditions and attributes of communities. The aim was not to solely analyse a current empirical situation, but, as stated in the introduction, to demonstrate how the ILTIAD framework can help reduce complexity in decision-making for arriving at an envisioned smart grid design.

This is similar to the backcasting method [33] but entails a design approach in form of legal prescription.

The ILTIAD framework was applied to show which options and barriers exist for stakeholders to arrive at their desired smart grid vision. Whilst such a descriptive legal state of affairs may be relevant as a matter of determining existing legal liberties and abilities, it also provides the point of departure for a prescriptive legal design analysis into which changes in these liberties and abilities are needed in order to secure the desired outcome. Our analysis focused on two specific first order legal institutions, ownership (P2Os) and contracts (P2Ps), and followed the three normative perspectives outlined at the end of the 'ILTIAD—the heuristic approach' section above. As we believe it helps in understanding the complexity of the case, we started with the 'bigger picture' through analysing firstly, level consistency (consistency of legal institutions across levels), secondly, action situation consistency (consistency of IAD rules for a particular legal institution), and thirdly, legal institution consistency (consistency across legal institutions for one rule-in-use type).

Results

For the demonstration of how the ILTIAD framework can help reduce complexity in local decision-making processes on smart grid implementation, the Bothoven-Noord smart grid project is an excellent example as it displays such complexity (also, see the 'Methods' section). The smart grid project was embedded in a larger project structure and involved several linkages to other projects. A wide range of stakeholders was involved in the decision-making process. While these stakeholders met on a regular basis, no far-reaching decisions have been taken and progress has stagnated in the project.

Before applying the ILTIAD framework, we will briefly introduce the case and its complexity, including our analysis of the biophysical conditions and the attributes of community that influence the action situation.

Context: biophysical conditions and attributes of community

As regards the biophysical conditions, the Bothoven-Noord district is located east of the city centre of Enschede, the Netherlands. It consists of about 1500 houses which are distributed over several areas: Tattersall (social housing owned by the DeWoonplaats housing association), Transburg (social housing owned by the Domijn housing association), an old factory terrain (owned by Domijn) and privately owned houses (see Fig. 3). Next to these four main areas, a neighbourhood park, including an old water tower, and an elementary school (Freinetschool) are located in Bothoven-Noord. About 570 houses (located both inside and outside the district) are connected to a local district heating grid that is supplied by a combined heat and power plant [34].

Regarding the attributes of community, Enschede is a rather poor municipality with a high rate of unemployment [35, 36]. According to the smart grid project group, many residents in Bothoven-Noord—and especially those renting social housing—are unemployed, have a low socio-economic status and are from diverse cultural backgrounds. The occupancy time of the social houses is said to be rather low (5 to 7 years according to the project group) and recently in particular families tend to move out of the district because they perceive the neighbourhood as unsafe. Currently, the tenants are mostly one-person households, students, starters on the labour market or one-parent families.

The smart grid project

In 2012, a public official from the municipality of Enschede, a director from the DeWoonplaats housing association and a director from the Domijn housing association realized that they had overlapping interests in Enschede's Bothoven-Noord district: (i) the creation of a neighbourhood park (the responsibility of the municipality), (ii) the renovation of houses (owned by DeWoonplaats) and (iii) the redevelopment of an old factory terrain (owned by Domijn). As a result, the three parties created a steering committee and wrote a joint vision document ('gebiedsvisie' in Dutch) that identified three integrated, core areas for collaboration: (i) social activation (participation), (ii) creating a 'heart' for the district and (iii) sustainability. One of the sub-objectives of sustainability was the creation of a smart grid in Bothoven-Noord. Although initially no progress was made, the situation started to change on 12 November 2013, when the municipality of Enschede signed the 'Green Deal Smart Energy Cities'[8] agreement, the objective of which is the implementation of smart grids (linked to innovation and distributed generation) so as to result in about 100,000 'energy-neutral' buildings by 2019. Following this agreement, in 2014, the municipality and the DeWoonplaats and Domijn housing associations found project partners for the realization of the Green Deal's goals: the Cogas and Enexis distribution system operators (DSOs), as well as the pioneering building association. In August 2014, these six organizations formed the smart grid Bothoven-Noord project group and defined seven project activities in a joint project plan:

1. Distributed generation from solar PV panels on the roof of the old factory terrain;
2. Installation of smart meters (electricity meters that remotely report data in intervals on electricity consumption and, if applicable, on production);

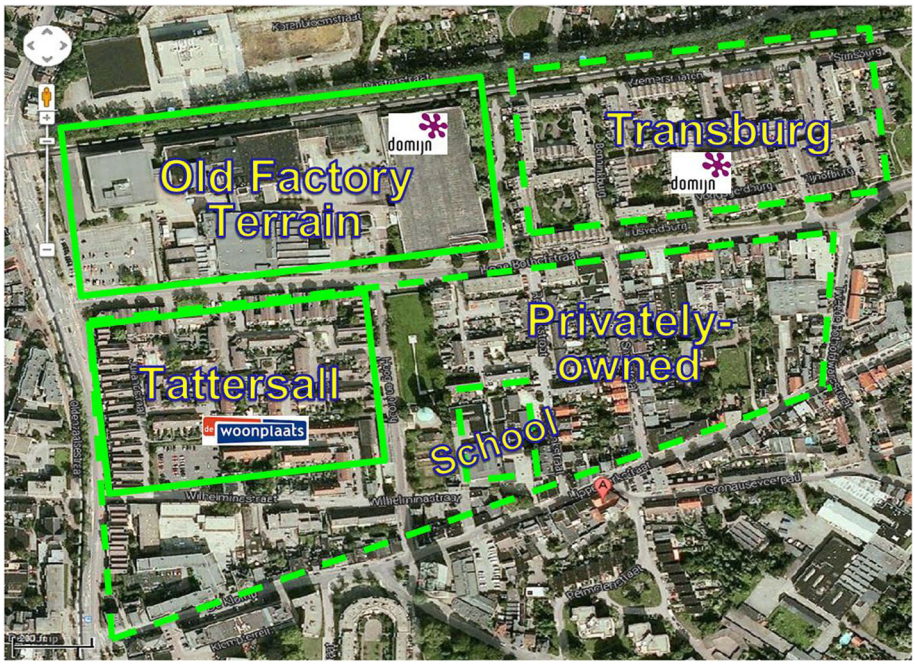

Fig. 3 Map of Bothoven-Noord

3. Development of a smart meter app (for electricity and heat);
4. Initiatives to help residents to save energy;
5. An educational program for the elementary school in Bothoven-Noord;
6. Monitoring the effects of the changes made;
7. Research into the feasibility of additional innovations (e.g. smart appliances).

All smart grid project group members had a general understanding of what a smart grid entails: 'renewable energy technologies connected via an ICT layer'. However, the project group members had few concrete ideas about how to implement a smart grid [37]. During the period from August 2014 to July 2015, the project group decided to take a 'modular approach' to the implementation of a smart grid, meaning that firstly smart meters were to be installed in 1500 households in Bothoven-Noord (by the end of 2015), and secondly that an app (providing information about energy production and consumption) would be made available to all tenants of the housing associations. However, the project group did not discuss any further steps and seemed to be uncertain, both in terms of direction and of necessary project management knowledge, about how to proceed in the implementation process. The existing uncertainty among stakeholders is especially visible in the fact that they seem to be unaware of each other's abilities and liberties, which agreements they could or should make, and have never discussed how to distribute the costs and benefits.

Analysis with the ILTIAD framework

This section provides the results of applying the ILTIAD framework to the case study of the Bothoven-Noord project, particularly through the lens of the three consistency challenges explained above. Due to the existing uncertainty and the absence of specific plans, for the purpose of our analysis we projected a realistic smart grid design for Bothoven-Noord, which is based on the interviews and moderate participant observation. For this projected design, we determined which P2Os and P2Ps need to come into existence for the creation of such a smart grid. Through the application of the ILTIAD framework, we identified legal aspects related to establishing and maintaining this local smart grid system, followed by a description of the barriers and opportunities for realizing the desired smart grid system.

Smart grid design

The basis for a smart grid in Bothoven-Noord is the installation of smart meters in all households in the district. In addition, solar PV panels and wall displays will be offered to all tenants of the housing associations, as was briefly considered by the smart grids project group (residents of Bothoven-Noord which do not rent from the housing associations are excluded but can purchase solar PV panels themselves). The wall display is to show the electricity consumption as well as the production of electricity from solar PV panels, in order to increase the energy consciousness of consumers and ideally decrease their energy demand and thus costs. The electricity

consumption and production data needs to be retrieved from the households' smart meters by a company that is certified as an independent service provider. With the help of an ICT Central Energy Management System, this independent service provider compares the data of all households in Bothoven-Noord that participate in the project. Based on the demand, the supply from solar PV panels and the related price of electricity, the ideal moment of consumption is calculated (where 'ideal' depends on the consumers' preferences, e.g. being the lowest price or most sustainable supply). In order for tenants to have an incentive to time shift their energy consumption, the energy provider must be able to charge lower or higher energy tariffs depending on the time of day. This is termed dynamic pricing and mostly takes place in 15-min intervals [38].

The project group briefly envisioned that tenants of the housing associations can obtain solar PV panels and wall displays from an 'installation company' under the following arrangement: If tenants of DeWoonplaats and Domijn wish to have a wall display or solar PV panels installed, the installation company will provide this technology and DeWoonplaats and Domijn will pay for it. The housing associations in turn will increase the rent of those households where such a device is installed.[9] The project group members believed that tenants will eventually make a profit as a result of overall lower energy costs. For the establishment (and maintenance) of this basic smart grid design, several P2Os and P2Ps are needed.

The six objective legal relations (P2O) for the envisioned smart grid in Bothoven-Noord are the following:

a. DSO Enexis: ownership of electricity grid and smart meter;
b. Housing associations: ownership of houses (in Tattersall/Transburg);
c. Energy supplier: ownership of electricity being supplied;
d. Installation company: ownership of wall display and/or solar PV panels;
e. Tenants: privacy rights concerning 'smart meter data'. [10]

To achieve the projected smart grid in Bothoven-Noord, the following six P2Ps (contracts) are needed:

a. *Contract between the housing associations and their tenants in Bothoven-Noord*: rental contract and installation agreement linked to rent increase;
b. *Contract between the energy supplier and the tenants in Bothoven-Noord*: contract about the supply of electricity and dynamic electricity/network tariffs (priced at 15-min intervals);
c. *Implicit contract between the tenants and DSO Enexis*: when tenants contract with an energy supplier this implies the coming into existence of a contract with the DSO to which tenants have to pay a network tariff for electricity provision; Enexis charges a dynamic electricity/network tariff;
d. *Contract between the installation company and the housing associations:* If tenants of the housing associations wish to have a wall display or PV panels installed, the installation company will provide this technology and the housing association will pay for it (whilst increasing the tenants' rent);
e. *Contract between the Independent Service Provider and the tenants:* tenants give permission to the Independent Service Provider to read their smart meter, and in turn receive the data about their daily consumption.

The projected smart grid design shows which P2Os and P2Ps are necessary, which is an initial step in reducing the complexity that the project group perceives. For example, the P2Os and P2Ps show that certain actors have been inadvertently excluded from the smart grid project group (tenants, energy supplier, installation company, Independent Service Provider), whereas other participants who are currently involved are actually, at least legally speaking, redundant (Cogas, Pioneering, and the municipality of Enschede). However, the question remains: can this smart grid design come into existence under the existing general rules of law?

Results of status quo analysis

We applied the ILTIAD framework to undertake a *status quo* analysis that focussed on all three normative consistency requirements, as summarized in the 'ILTIAD—the heuristic approach' section above. We conducted this analysis to show which barriers and opportunities currently exist for the smart grid project group Bothoven-Noord to implement the projected smart grid design.

Level consistency: P2P housing associations and tenants

The implementation of smart grids in the Netherlands takes place in the context of the third-order legal institution of a regulated market, whose conception, instantiation and operation occur at the constitutional situation. For the Bothoven-Noord smart grid project, this regulated market context is determined by the Dutch Housing Act 2015,[11] the Dutch Electricity Act 1998,[12] the EU's Electricity Directive (2009/72/EC)[13] and the Dutch Rental Subsidy Act 1997.[14] These Acts impact especially on the legal ability space of actors related to the seven rules at the collective choice situation.

In this section, we focus on the P2P between the housing associations and their tenants, for which the Housing Act and the Rental Subsidy Act are key. The reason for this focus is the fact that housing associations own one third of all houses in the Netherlands [39] and renting out these (social) houses creates more complexity for smart gird development than situations in which owners reside in their own properties.

The Dutch Housing Act determines that housing associations can only increase the rent for social housing once a year by a certain fixed percentage (2.5% in 2015, up to a maximum rent of €710.68 a month) and, linked to specific conditions, after measures have been taken to improve a dwelling, e.g. through the installation of solar PV panels. However, tenants have to agree on such measures (and in turn to an increase of their monthly rent) beforehand. In cases in which a housing association wants to apply such measures to a housing complex of more than ten housing units, at least 70% of all tenants have to agree [40]. The Dutch Housing Act hence unilaterally limits the legal ability space as regards choice, aggregation and payoff rules of the P2P between the housing associations and their tenants, as the former's freedom to contract is dependent on the tenants' agreement. This could present an insuperable barrier to the implementation of the envisioned smart grid.

On the other hand, in general tenants enjoy a large legal ability space when it comes to the aggregation and payoff rules about the installation of a wall display/solar PV panels, as they can decide whether or not to contract about such installations and negotiate the rent increase that is linked to it. However, indirectly the legal ability space to enter into a contract is limited for some tenants of social housing by the Dutch Rental Subsidy Act 1997: tenants whose income qualifies them for a monthly government rental subsidy (<€34,911 a year), can only receive this subsidy while they live in dwellings with a set maximum rent of €710.68 per month (in 2015). If this rent figure is exceeded, e.g. through contracting on the installation of a wall display or solar PV panels, these tenants will no longer receive the rental subsidy. Thus for tenants who receive a rental subsidy, the Dutch Rental Subsidy Act limits the choice rules (can or cannot contract) and the payoff rules (the extent of the rent increase), which constitutes another potential barrier to the envisioned smart grid design.[15]

To sum up, as regards the P2P between the housing associations and their tenants, the Dutch Housing Act and Dutch Rental Subsidy Act (third-order legal institution of a regulated market) present a barrier to the implementation of a smart grid, as neither housing associations nor tenants (who receive a subsidy, factually) have the legal ability space to contract for a rent of more than €710.68 a month (see Table 3 for a summary).

Action situation consistency: P2P energy supplier and tenants The second part of our analysis focussed on all rules-in-use concerning the specific legal institution of the P2P between the energy supplier and the tenants in Bothoven-Noord. The analysis revealed that while two rules-in-use (information and scope rules) are aligned with all other IAD rules for the P2P, position, boundary, choice, aggregation and payoff rules are partially conflicting with each other under the existing general rules of law.

The standard *position and boundary* rule applies that an energy supplier and tenants have the ability to contract. Without a contract about the supply of electricity—especially about dynamic pricing—the proposed smart grid cannot come into existence. However, even assuming more modest ambitions, currently

Table 3 Legal institutionalization across institutional levels

Across action situations at various levels (i.e. P2P housing associations and tenants)	
Level	Actions and outcomes concerning legal institutions (conception, instantiation, operation)
Collective choice situation (CCS)	Setting governance structures
	Second-order legal institutions: long-term relations (P2P and P2O)
Outcome of CS	Written institutive, consequential and terminative rules; occurrences of first-, second- and third-order legal institutions
	• Legal ability space (generally) for contracting between participants
	• Unilaterally limited legal ability space housing associations
	- annual rent increase of 2.5% or after improvement measures on the dwelling (prior agreement from tenants needed)
	- Maximum rent for social housing (€710.68, 2015)
	• Indirectly unilaterally limited legal ability space for tenants
	- Maximum income to qualify for rental subsidy of €34,611 (in 2015), maximum rent of €710.68 (in 2015)
	• 70% of tenants have to agree to measures in housing complexes
Constitutional situation (CS)	Setting institutional environments
	• Conception, instantiation and operation of third-order legal institution of a regulated market
	Introducing, altering, terminating RoPs:
	• Dutch Housing Act 2015
	• Dutch Rental Subsidy Act 1997

neither an energy supplier, nor any residents of Bothoven-Noord are members of the smart grid project group. The absence of these essential stakeholders for the supply and demand of electricity shows that the position/boundary rules are not aligned with the choice rule, as energy suppliers are not involved in the project, and thus also not able to contract on dynamic pricing. Hence, as a project group already exists, it is reasonable to suppose that the incumbent holders will invite future holders, i.e. energy suppliers and tenants who are able (and willing) to contract, based on their legal power and position (invitational boundary rule).

Although no constraints exist for contracting in general, the *choice rule* as regards contracting for electricity tariffs is limited, as the third-order legal institution in form of the Electricity Act 1998 demands that energy suppliers allow net metering for all their customers: energy suppliers have to purchase the electricity that households generate, i.e. to only bill consumers for their net purchase of energy. This leads to a limited liberty space for energy suppliers. Additionally, this choice rule is not only in conflict with the existing position/boundary rules, but also with aggregation rules because parties are limited in agreeing on all aspects of the P2P.

As regards *information*, the contractual parties have the obligation to make all information available to each other. The general *aggregation rule* is that in contracting, all parties need to agree; i.e. mutual consent and mutual expression (through offer and acceptance) of the willingness to contract are essential.

Given the regulatory market context, *payoff rules* are decided freely by the contracting parties. However, the price that an energy supplier charges consumers in the Netherlands consists of four parts: (1) a fixed charge, (2) energy tax, (3) a price per kWh energy consumed, (4) 21% VAT on all kWh charged for. An energy supplier only has the legal ability space to change payoff rules as regards the price of the kWh of energy consumed. This fits the limitations of the choice rules and is also conflicting with the aggregation rule due to the fact that energy suppliers cannot agree to contract on any electricity price.

The *scope rules* derive from the objective legal relations (P2O) of the contracting parties.

To conclude, the rules-in-use as regards the P2P between an energy supplier and the tenants in Bothoven-Noord (see Table 4) are partially in conflict, which creates two main barriers for the functioning of the envisioned smart grid. First, a barrier exists as it is not enough for two contractual parties to be able to contract, but parties also have to be invited to join the project. Secondly, due to the presence of net metering (linked to the limited flexibility as regards payoff rules), currently no meaningful incentives can be created for consumers to move their electricity usage to different points in time, i.e. away from peak hours (also no incentives exist for the storage of electricity).

Table 4 Rules-in-use across legal institutions

Across rules-in-use for one legal institution type (i.e. P2P energy supplier and tenants)	
Rules-in-use	P2P energy supplier and tenants Bothoven-Noord
Boundary rule	Ability to contract, plus invitation by incumbent holders
Position rule	Ability to contract
Choice rule	For energy suppliers no legal ability space for dynamic pricing, limited liberty space as regards net metering
Information rule	Information available to both contracting parties
Aggregation rule	Mutual consent and mutual expression of the willingness to contract
Payoff rule	Decided freely by contractual parties, however limited legal ability space for energy suppliers
Scope rule	Derive from legal ability space of contractual parties

Legal institution consistency: aggregation rule In the third part of the analysis, we considered all P2Ps and evaluated whether the aggregation rules for each of these legal institutions are consistent. The general aggregation rule is that in contracting all parties need to agree; i.e. mutual consent and mutual expression (through offer and acceptance) of the willingness to contract are necessary. This standard aggregation rule applies for the *P2P between the Independent Service Provider and the tenants*, as well as for the *energy supplier and the tenants*. As regards the *P2P between DSO Enexis and the tenants*, the aggregation rule is implied, as this P2P is automatically established when a contract with an energy supplier is entered into.

However, while the general aggregation rule also applies for the *P2P between the housing associations and the tenants* as regards the rental contract, contracting on the installation of solar PV panels (or a wall display) for housing complexes is subject to a different aggregation rule: only 70% of tenants have to agree (as stated in the Dutch Housing Act 2015). Mutual consent and expression of 30% of tenants is therefore not required. Yet tenants who receive a rental subsidy and have a rent that is close to the threshold for qualifying for this subsidy (€710.68 per month in 2015) do not have the legal ability space to agree on any rent increase (if they want to continue to receive the subsidy). This presents a conflict, which could arise in a district such as Bothoven-Noord, where various social housing complexes are located and several monthly rents are close to €710.68.

For the contract between the *installation company and the housing associations*, the standard aggregation

rule of mutual consent and mutual expression between these two parties is not sufficient for the creation of this P2P. Only if at least 70% of tenants agree on the installation of the wall displays/solar PV panels and the linked rent increase with DeWoonplaats/Domijn, can the housing associations and installation company contract (through offer and acceptance).

In conclusion, while the general aggregation rule is that in contracting all parties have to agree, this is not the case for housing complexes, since 70% of tenants have to agree (see Table 5). However, this is impossible for some tenants who receive a rental subsidy, and not sufficient for the P2P between the housing associations and the installation company (which depends on the prior agreement of tenants). Especially the high threshold of 70% for housing complexes could become a barrier to the implementation of a smart grid in Bothoven-Noord.

Discussion

The above analysis of the status quo demonstrated ILTIAD's heuristic use in a descriptive analysis of a given state of affairs. In this section, the heuristic advantages of ILTIAD are summarized and emphasized in context of the current academic debate on energy transition as well as vis-à-vis other frameworks. An additional heuristic value of ILTIAD—prescriptive design analysis—is illustrated with an example.

In general, the ILTIAD framework makes it possible to identify ex ante to the start of the planning and implementation of a smart grid which barriers or opportunities exist for actors in a specific action situation and how these interrelate. This aspect is similar to the merits of other frameworks which have been applied in the field of environmental policy and other research areas, e.g. the actor-centered institutionalism framework [41], actor-system-dynamics [42], the advocacy coalition framework [43], the policy arrangements approach [44] or constructive technology assessment [45]. While these frameworks focus on analysing structure and agency, the ILTIAD framework not only allows for analytical description but also for prescriptive design of local smart grid systems.

Table 5 Aggregation rules for all P2Ps

Across a legal institution type for one rule-in-use type (i.e. aggregation rule)	
P2Ps	Aggregation rules
Independent Service Provider and tenants	Standard: mutual consent and mutual expression of the willingness to contract.
Energy supplier and tenants	Standard: mutual consent and mutual expression of the willingness to contract.
DSO Enexis and tenants	Implicated aggregation when P2P between energy supplier and tenants comes into existence.
Housing associations and tenants (on energy saving measure)	For housing complexes only 70% of tenants have to agree; tenants with rental subsidy and rent close to €710.68 do not have legal ability space to agree.
Installation company and Housing associations	Dependent on agreement of tenants and housing associations. Then standard aggregation rule.

To start with, the ILTIAD framework can already help decrease complexity and provide direction for stakeholders in envisioning a smart grid, for example by showing which contracts or participants are needed for the successful implementation of a specific smart grid. Once a smart grid has been designed, the ILTIAD framework can demonstrate how liberties and abilities are interrelated (both vertically and horizontally). In addition, the framework enables the identification and mapping of prescribed patterns of social interaction rather than merely of individual rules. All this makes it possible to analyse normative alignment and thereby contemplate and evaluate alternatives. Unlike other frameworks, the ILTIAD framework can also support in undertaking a *dynamic*, prescriptive design analysis. This design builds on the aspect of prescriptive consistency that is a key requirement of legal systems (as in essence these are about channelling types of human behaviour through normative positions that provide a clear direction of ought).[16] ILTIAD can help to identify and thereby design how rules and relations need to be consistently arranged between legal institutions across related action situations, but also within a given action situation (see the three results of our above 'status quo' analysis). Against a background of necessary prescriptive opportunities or, alternatively, of existing prescriptive constraints, ILTIAD facilitates on the one hand a systematic approach to the design of a functionally ideal type or (remedially) improved action situations, at any relevant level. At the same time, it allows for a dynamic perspective of (often sequential) changes at various levels—from deeper to higher action situations.

Design analysis: institutional change

Broadly speaking, with ILTIAD such dynamic, design-driven analysis can be undertaken in three ways, related to the three normative consistency challenges (legal institution, action situation and level consistency) and the above 'status quo' analysis. These three ways, or approaches, are presented here in order of increasing diagnostic and design complexity—as the second and third approaches broaden the scope of relevant IAD rules compared to the first and second approach respectively:

- by considering the design of IAD rules within one legal institution in a particular action situation (see legal institution consistency): to prepare the possible introduction or change of, for example, an aggregation rule that fits the position rule of equal party autonomy in contracting, and/or the termination of rules that hamper such fit.
- by considering the design of IAD rules within different legal institutions within a particular action situation (see action situation consistency): to prepare the possible introduction or change of, for example, a legal person to fit the position rule for making a P2P, and/or termination of position rules that hamper such fit.
- by considering the design of IAD rules within different legal institutions across different action situations at various levels (see level consistency): to at constitutional level prepare the possible introduction or change of, for example, a choice rule of a legal power within a regulated housing or electricity market, that fits a broader scope for instantiating P2Ps at collective choice level, and/or the termination of choice rules that hamper such fit.

All activities involving the introduction, change and termination of IAD rules and perhaps indeed of instances of legal institutions, involve actions at deeper (analytical) levels. Some designs concern (changes in) consequential rules of legal institutions; in other words, the IAD rules of conduct that apply in a given instantiation of an institution—e.g. payoff rules in a contract or boundary rules regarding positions within a legal person. Other designs concern institutive and terminative rules; IAD rules of power that enable introduction, change and termination of such an instantiation—e.g. scope rules concerning the extent of such powers or aggregation rules for terminating a legal person. In applying one or more of the above three approaches to designing institutional change, the (design) analysis has to be clear on this distinction as it shows how invariably various analytical levels (see Table 1) are interconnected, whereby changes at higher levels follow from operations at deeper levels.

This is not the place to theoretically elaborate on the heuristic value of ILTIAD as regards a prescriptive design analysis following the above approaches. Against the backdrop of the descriptive analysis in the 'Results' section, it is however possible to demonstrate the third above approach (consistent design of various legal institutions across different action situations) by looking into a scenario towards (enhancing) smartness of the existing grid. This scenario was chosen because our descriptive analysis has demonstrated the pivotal role of constitutional level institutional choices for collective choice level decisions on establishing and implementing smart grids.

In the scenario, at the constitutional level, the legal ability space is created for energy suppliers and DSOs to charge dynamic electricity/network tariffs (based on 15-min intervals), as well as that net metering ends (which is likely to happen after 2020).[17] This leads to several design opportunities for the smart grid's implementation and functioning as regards the P2P between the energy supplier and the tenants in Bothoven-Noord. First, the choice rules for the energy suppliers and DSOs will allow more discretion as limitations on their legal ability space would disappear due to the opportunity for dynamic pricing and the end of net metering. For tenants, the choice rules will also change as they do not have to perform net metering but can sell (and buy) their electricity for varying prices at their preferred points in time. Secondly, for the energy suppliers and DSOs, the payoff rules will change as they now have the ability to freely decide on these rules, instead of being bound to fixed tariffs. Third, while the standard aggregation rule of mutual consent and mutual expression of the willingness to contract remains, the fact that tenants are now able to potentially save money by shifting their energy demand and supply can incentivize them to install solar PV panels, wall displays and storage capacity. As a result, tenants will be more likely to agree to an increase in their rent, and based on this, a contract between a housing association and an installation company is more likely to come into existence.

This design-driven analysis is in line with, and adds to the contributions in this special issue. Oteman, Wiering, and Helderman [46] for example conclude that institutional conditions—including formal legislation and (informal) procedures for collective decision-making—can constrain or enable community energy projects. Our research precisely focused on normative consistency and showed which prescribed patterns of social interaction exist for local energy projects. This is in line with one of the aspects of the research agenda that Hoppe and Van Bueren [47] propose: 'addressing institutional conditions in multi-stakeholder configurations, looking into positions, ownership, institutional rules and policies'.

Conclusions

This article has shown that the ILTIAD framework can help reduce complexity in local decision-making processes on smart grid implementation, which makes it a useful heuristic tool for analytical description and prescriptive design in collective action challenges that involve a close relation between law and governance. We have addressed the research question ('How can the ILTIAD framework help to reduce complexity in local decision-making processes on smart grid

implementation?') by reasoning and demonstrating how ILTIAD provides normative 'heuristic concepts' (such as that of legal institutions) to adequately identify and understand prescriptive patterns of social interaction, relevant to the lawful design and making of smart grids. As a result, stakeholders involved in local planning are able to use the ILTIAD framework as a design support tool for establishing new or improved, integrated smart grid projects. Meanwhile, it should be recognized that the ILTIAD model is still in its infancy and can benefit from further elaboration and sophistication. Continued simultaneous research on empirical smart grid planning and on improving the ILTIAD model has the potential of being reciprocally beneficial. Thus, a promise lies ahead that should appeal to the research agenda of those interested in the heuristics of understanding and improving collective action in the energy transition.

Endnotes

[1]Heldeweg and Lammers (2015) refer to this framework as IAD-ILT framework. In this article, the same two authors decided to rename their framework into ILTIAD.

[2]This brief introduction of the IAD framework is a slightly amended version of the conference paper by [19].

[3]Ostrom (2005, 137–139) distinguishes three types of institutional statements: strategies (which only hold the AIC components—so without 'ought' and without sanction), norms (which only hold the ADIC components—so still without sanctions, but with an 'ought') and rules (as in the main text).

[4]Rules-in-use are also called working rules by Ostrom.

[5]An action situation is 'an analytic concept that enables an analyst to isolate the immediate structure affecting a process of interest to the analyst for the purpose of explaining regularities in human actions and results, and potentially to reform them' [24].

[6]Boundary rules are by Ostrom also referred to as entry and exit rules, and choice rules are also called authority rules in her work.

[7]We assume here that also first-order legal institutions of legal quality and legal status either require action situations for interactions towards their instantiation or their instantiation brings about an action situation towards their implementation—and so related IAD rules are either institutive (about instantiation) or consequential (implementing/operating of an instance).

[8]The Green Deal Smart Energy Cities was signed by the Minister of Economic Affairs, the municipalities of Enschede, Amsterdam, Arnhem, Eindhoven and Groningen, Netbeheer Nederland and five Dutch Top Sector programs (TKI's). The Dutch Top Sector program is a policy initiated by the First Rutte cabinet to (financially) support and strengthen nine important sectors of the Dutch economy. The five Top Consortia that signed the Green Deal Smart Energy Cities are Stichting TKI Switch2SmartGrids, Stichting TKI EnerGo, Stichting TKI Solar Energy, Stichting TKI Power2Gas and Stichting TKI ClickNL.

[9]As regards the installation of solar PV panels, this agreement was already executed by housing association Domijn in Enschede.

[10]Privacy as regards particular information may be perceived as a P2O 'right in rem' (held exclusively by one person, against all others). It may not pertain to an object in the sense of a good but does concern data that can be delineated and individualized as personal asset or interest.

[11]Herzieningswet toegelaten instellingen volkshuisvesting & Novelle Herzieningswet toegelaten instellingen volkshuisvesting.

[12]Wet van 2 juli 1998, houdende regels met betrekking tot de productie, het transport en de levering van elektriciteit.

[13]Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, published in OJ L 211, 14.8.2009, p. 55–93.

[14]Wet van 24 april 1997, houdende nieuwe regels over het verstrekken van huursubsidies.

[15]This 'indirect' limit of the ability space to contract is a factual limitation to use an existing ability space caused by either the discontinuation of a claim to subsidy (within the liberty space of an existing subsidy relationship) or the inability of government to establish a new or renew an existing subsidy relation (by legal act). While one could argue that this only impacts as a (non-legal) matter of willingness to contract, we prefer to focus here on the intended impact of constitutional situation settings on contracting behaviour of (potential) tenants on the basis of their factual capacity to contract.

[16]For example, the normative positions that shape liberty space, prohibition, command, permission and dispensation should not conflict, such as when some behaviour is commanded and prohibited at the same time, or permitted and prohibited or commanded and dispensed at the same time. Likewise, within ability space, power and immunity cannot exist at the same time with regard to one another and the possibility of legal change.

[17]Minister Kamp said this in a general consultation of the Dutch Second Chamber on 10 September 2014 ('We gaan in 2017 weliswaar evalueren, maar zoals ik in de Eerste Kamer heb gezegd, vind ik dat we in ieder geval tot 2020 de salderingsregeling overeind moeten houden' [48].

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