An Empirico-Legal Analytical & Design Model for Local Smart-Grid Systems: Connecting the IAD-Framework to Institutional Legal Theory ('ILTIAD')

Prof.dr. Michiel A. Heldeweg LL.M.* and Imke Lammers MSc.**

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Abstract

This paper presents a new framework for analysis and design of legal-governance settings for common pool challenges, particularly of local smart-grid energy systems, with a focus on related local planning. The framework connects Ostrom's IAD-Framework with Institutional Legal Theory (ILT), to allow for a proper understanding of both empirical and legal-prescriptive elements, both as a matter of a state of affairs analysis and of design-oriented analysis towards institutional change of legal-settings for local smart-grid systems. The proposed framework connection (named 'ILTIAD') contributes to a proper empirico-legal understanding of existing and possible improvements in public-private arrangements relevant to bring about innovations of the said local energy systems.

A three-step approach is presented. The first step is about relating local smart-grid energy systems to the concept of a common pool resource and explaining the relevance of adding an ILT perspective to the AID-framework. The second step is to frame the connection between IAD and ILT (as ILTIAD) with a view on relevant Action Situations. To this end, Ostrom's 'rules-in-use' are connected to legal 'rules-in-form'. This institutional rule-perspective is then aligned with Action Situations at Ostrom's four analytical levels, considering that different legal institutions are relevant to the content of Action Situation rules. In the third step, the institutional rule-perspective is placed in the specific legal setting of an example in a Dutch municipality. We demonstrate how the abstract ILTIAD-framework provides a lens to identify legal aspects as constraints and opportunities (of the 'legal space' dimension of Action Situation), but also, from a dynamic/design perspective, as gaps and conflicts when establishing and maintaining particular local smart-grid energy systems – to provide insight for future design challenges. In conclusion the paper reflects inter alia on some analytical and methodological aspects of ILTIAD as compared to the IAD-framework.

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1. INTRODUCTION

"Without serious upgrading of existing grids and metering, renewable energy generation will be put on hold, security of the networks will be compromised, opportunities for energy saving and energy efficiency will be missed, and the internal energy market will develop at a much slower pace." (European Commission, 2011). Smart energy systems are considered a solution to overcoming the challenges that our current, aging energy infrastruture networks are facing (European Commission, 2011). But what are smart energy systems, and which institutional changes are needed to implement them? More specifically, in this paper we address the question '*how can institutional settings for smart energy systems be designed, and which consequences does this have in terms of renewable energy expansion and energy democracy*?'

Smart energy systems (also called smart grid systems) are needed, as the current electricity grid infrastructure was not designed for the local generation of electricity from intermittent renewable energy sources, as well as the increasing local demand. By adding digital communication technologies to the grid infrastructure, smart energy systems can balance supply and demand and thereby enable the efficient integration of renewable energy into the grid. This balancing of supply and demand happens through real-time remote control of smart appliances (e.g. smart washing machines[1]), heat-pumps or the batteries of electric cars (Hakvoort & Huygen, 2012). Ideally, in a smart energy system demand follows supply, which next to ICT calls for participation and behaviour change of consumers.

Due to the common pool character of energy inside a smart energy system, 'rules of the game (play)[2]' are needed on the design and functioning of these energy systems. This is especially the case for microgrids, which can run independently from the main power grid. Looking at the Dutch context, the Dutch 'IPIN smart grid pilots' the legal framework was listed as one of the main barriers inhibiting the roll out of smart energy systems (Ministerie van EZ, 2011). This barrier is related to the fixed tasks of current actors in the Dutch energy system: the Dutch Electricity Act states that distribution system operators (DSOs) are responsible for grid operation (Article 16, third paragraph), while energy suppliers need a specific supplier licence.

[1] These appliances become 'smart' when they are equipped with communication and steering interfaces, i.e. when chips are integrated into them (Wissner, 2011).
[2] See section 3 for details on this distinction

This current legal setting has two main consequences which both reflect a divide between rules-in-use and rules-in-form. On the one hand, no corresponding rules-in-form exist that allow newly emerging actors to play a role in smart energy systems (i.e. the rules-in-form currently only specify the involvement of DSOs and energy suppliers). On the other hand, DSOs who want to continue to play a central role in smart energy systems, e.g. by providing residents with smart appliances, are receiving warnings from the Dutch Authority for Consumers and Markets for doing so (ACM, 2015).

This current divide between rules-in-use and rules-in-form for the institutional setting of smart energy systems relates to the concept of 'regulatory disconnect' between regulation and innovation. This disconnect can "arise when innovation in the market develops in a faster tempo or differently than envisaged compared to respective regulation. The regulatory disconnection is not automatically problematic, but in certain cases it could lead to regulatory failure and should be eliminated. (Butenko, 2016)". To identify the core of the current divide between rules-in-use and rules-in-form, it is essential to understand the institutional setting and to be aware of a need for institutional change (Edomah, Foulds, & Jones, 2017; Wolsink, 2012).

To identify new governance arrangements for (smart) renewable energy systems, attempts have been undertaken in the Netherlands to achieve evidence-based institutional change through legally facilitated experimentation for smart energy systems. In section 2 we provide background information on the common pool resource character of these energy systems, and place the experiments in their institutional context. To analyse and design this legal experimentation, we see the need for adding a normative dimension to the institutional analysis and development (IAD) framework (Ostrom, 2005). We therefore draw on Institutional Legal Theory [ILT, (MacCormick, 2008; MacCormick & Weinberger, 1986; Ruiter, 1993, 2001)], and more specifically on the ILTIAD framework (Lammers & Heldeweg, 2016) in section 3. In the fourth section we analyse what has happened in terms of rules-in-use and rules-in-form in the experiments. This analysis is followed in section 5 with a discussion on avenues of experimental design towards new futures. The paper ends with a conclusion in section 6.

2. BACKGROUND

In order to obtain an understanding of the institutional setting two aspects have to be considered: the common good character of smart energy systems, and the multiplicity of institutional levels.

Microgrids as CPR systems

Firstly, for the establishment of projects, clear governance arrangements/ rules of the game are needed. This need derives especially from the fact that the energy inside a smart energy system (and specifically in a microgrid) can be defined as a common pool resource. A microgrid is a local energy system that consists of a variety of distributed energy sources. This microgrid can operate in an integrated way with the main electricity grid, or independently from it. "During disturbances, the generation and corresponding loads can separate from the distribution system to isolate the microgrid's load from the disturbance (and thereby maintaining high level of service) without harming the transmission grid's integrity" (Lasseter & Paigi, 2004, p. 4285). Microgrids thus have clearly defined boundaries. A prime example is the microgrid on the campus of the University of Princeton.

When hurricane Sandy caused a blackout in the New York area in 2012, the University of Princeton did not suffer from a power outage: the micro-grid on campus was separated from the main power grid and continued to operate independently based on its gas-turbine generator and solar PV panel park. In the words of the Princeton University (2014): "the University served as 'a place of refuge,' with police, fire-fighters, paramedics and other emergency-services workers from the area using Princeton as a staging ground and charging station for phones and equipment".

As Ostrom (2005, pp. 23-24) explains, common pool resources (CPR) are goods (or services) that "yield benefits where beneficiaries are hard to exclude [low excludability] but each person's use of a resource system subtracts units of that resource from a finite total amount available for harvesting [high subtractability]". Low excludability is the case for the energy (e.g. electrons) inside a microgrid, as entities connected to a microgrid can consume electricity available in the microgrid. Wolsink (2012) states that "once users are connected to the microgrid as coproducers they cannot be excluded from consumption" (p.831). At the same time, the resource units (kWhs) that one entity consumes prevent other entities in a microgrid from using the same resource units, as these units are subtracted from the finite total amount available at that moment (high subtractability).

Due to the common pool character of energy inside a microgrid, rules on the withdrawal of resource units are needed. Ostrom (2005, p. 220) states that "collective action is required to establish and enforce rules limiting the appropriation of [..] resource products". Hence, for establishing projects of smart energy system at the collective choice level, governance arrangements have to be identified that are in line with constitutional and operational level rules.

Institutional levels of analysis

Secondly, and consequently to the immediately above, it is important to consider all (analytical) levels of the institutional setting that Ostrom (2005, 2007) refers to in relation to the institutional analysis and development (IAD) framework: the constitutional choice level (establishing that projects may be established), collective choice level (establishing projects) and the operational level (projects/ experiments take place). In this article, we analyse the Dutch Crown decree for experiments with decentralized renewable electricity generation as an example of evidence-based institutional change through legally facilitated experimentation. For this analysis – and for the design of such settings – all three institutional levels have to be taken into account.

With the Experimentation Decree the Dutch Minister of Economic Affairs can allow experiments where associations take over the grid operation responsibilities of DSOs in local, small grid projects (Heldeweg, 2016; Lammers & Diestelmeier, 2017). In analytical terms, this governmental decree is located at the constitutional choice level,[3] and provides the possibility for smart energy system-projects to be established and take place (on the collective choice level and operational level respectively) outside of the current Dutch legal framework. This can be summarized as projects taking place on the collective choice level in 'standard' action situations[4] (under the current rule of law), and in 'experimental action situations' (AS – 1) that derive from the Experimentation Decree. The main

[3] We will point out in section 3 that there are some articles (five of seventeen) in the Decree, which hold rules of conduct that have a collective choice character (while the other twelve are rules of power).
[4] 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" (Ostrom, 2011).

goal of the experiments is to obtain information. This information might in the end be used to change the current legal framework at the constitutional choice level (AS – n, change?). As exemplified in the graphic (figure 1) below.

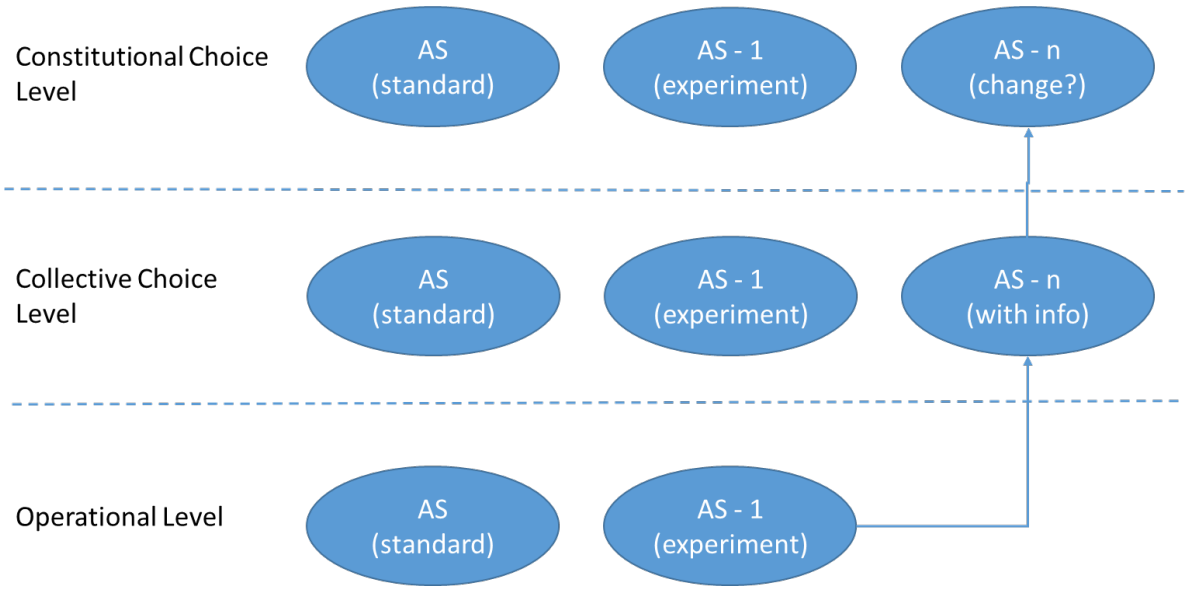

Figure 1: Institutional Levels and Experimentation

For the analysis, and especially for the design of (experimental) smart energy systems, the 'rules of the game' have to be aligned at all three analytical levels. Currently however, either no rules-in-form exist for actors who want to participate in smart energy systems at the collective choice or operational level (e.g. newly emerging actors like 'aggregators'), or the rules-in-use followed by certain actors are in conflict with the rules-in-form (e.g. DSOs), as shown in section 4.

To sum up, because of the common pool character of smart energy systems, institutional arrangements are needed for the design of these systems. The IAD Framework is therefore useful. Furthermore, as the design of legal experimentation involves as change of rules-in-form to accommodate (desired) and channel (undesired) rules-in-use, it is useful to add a normative dimension to the IAD perspective in form of institutional legal theory. We therefore chose for the ILTIAD Framework, as explained in the next section.

3. THEORY

So we see that the current divide between microgrid rules-in-use and rules-in-form may perhaps be bridged through legislative experimentation involving action situations at several levels to align towards institutional change. Proper understanding of the involved institutional mechanism is necessary to arrive at successful design of such institutional settings. We will look first look more closely at the relation between rules-in-use and rules-in-form, more particularly with legal rules-in-form. Next we will apply the institutional levels of analysis to relations between legal rules-in-form and to patterns of behaviour across these levels as legal institutions. Finally, we will specify how a design perspective rests upon various lines of normative consistency.

Relating rules-in-use to legal-rules-in-form

Together with biophysical conditions and attributes of the community, rules-in-use structure action situations as exogenous factors that enable and constrain interactions towards particular outcomes. The relation between the exogenous factors and the action situation is usually pictured as in figure 2.

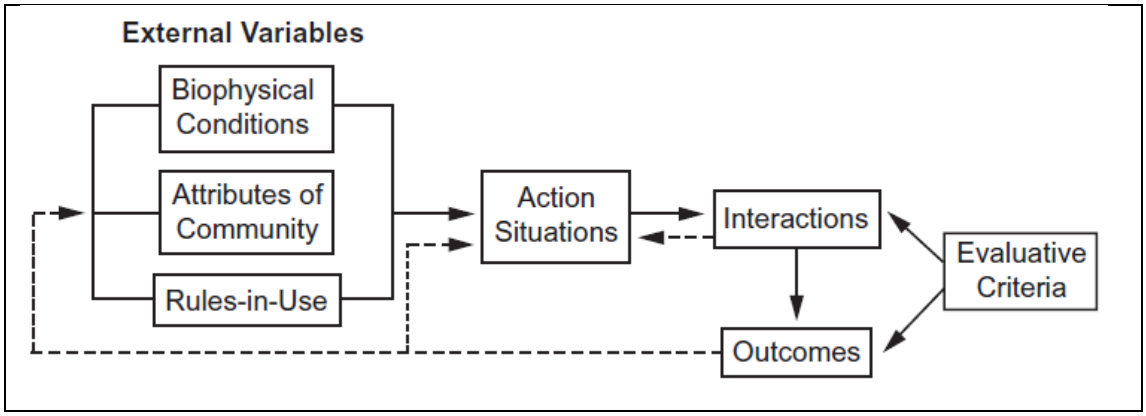

Figure 2: The IAD Framework

The way rules-in-use structure the action situation is usually pictured as follows, in figure no. 3, presenting seven types of such rules-in-use.

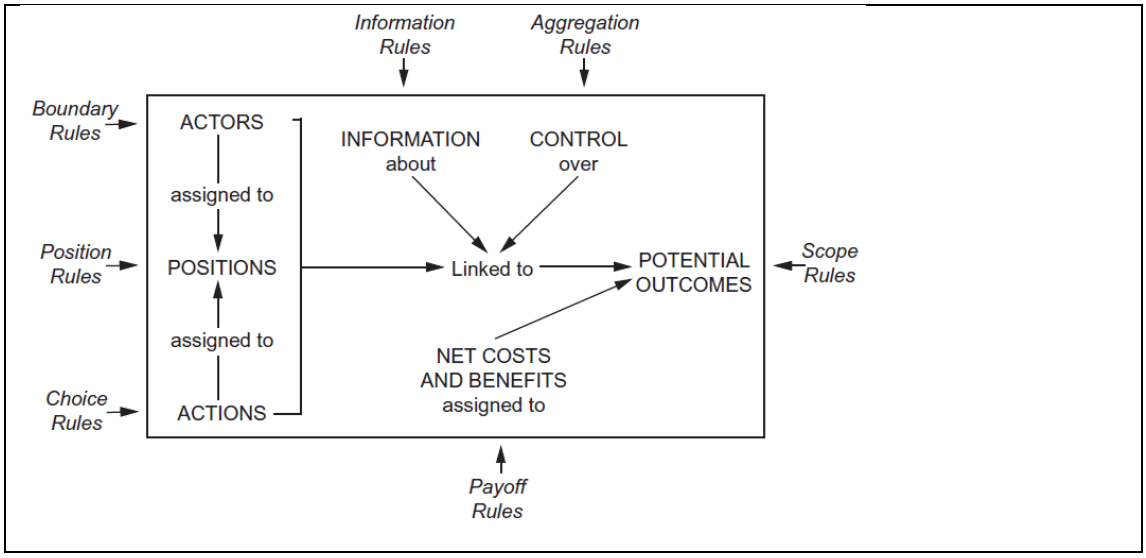

Figure 3: Rules-in-use and the action situation

Rules-in-use may, but need not only, follow from rules-in-form. Ostrom defines rules-in-form as written statements, resulting from formal legal procedures, and rules-in-use as rules to which participants would refer if they had to explain and justify their behaviour to other participants in the Action Situation (Ostrom, 2011). The latter justification may follow (desired) adherence to rules-in-form, but may also have a different origin, such as of informal actor interests. In turn the rules-in-form may have a legal character, but may also be about actor policies – as is pictured in the below figure

no. 4, with more discussion to follow in the further below.[5] To specify, some rules-in-use (RiUs) are rules-in-form (RiFs); all legal rules are RiFs, and some legal rules (L-RiFs) are RiUs.

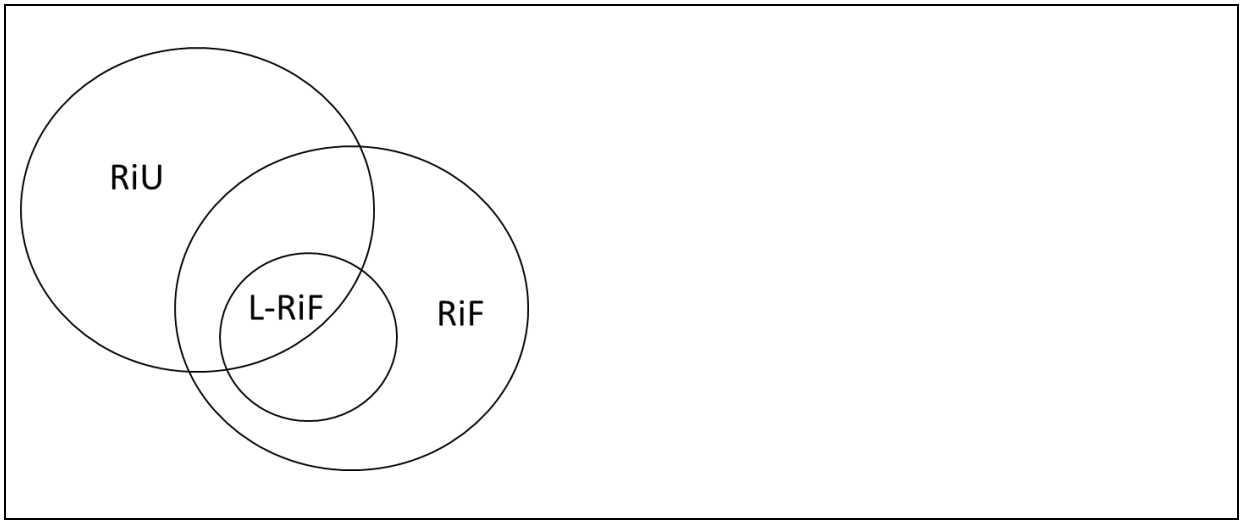

Figure 4: RiUs, RiF and L-RiF

When we apply Ostrom's definitions to our case and in the perspective of the above, it fits, for example, how a legal rule-in-form in the Electricity Act about who can(not) engage in operating a microgrid may be expected to lead to an equal rule-in-use, whereby it is determined, as a choice rule, which actions are available to actors in the action situations, as part of interactions between all actors towards certain outcomes.

In this viewpoint we regard legal rules-in-form[6] as prescriptive institutional statements/facts projecting a normative state of affairs, and rules-in-use as descriptive institutional statements/facts about an empirically observable state of affairs. Both rule-types cannot be reduced to one another (Ruiter, 1994, p. 100; 1997, pp. 361-363), given that:

- rules-in-use represent *ex post* (to some social practice) descriptions, with predictions about future practice, falsifiable by empirical observation (i.e. with a 'word-to-world direction of fit').
- legal rules-in-form represent *ex ante* (to some social practice) prescriptions, validated by the existence of a legal system (i.e. a legal validity generating framework that is socially accepted), which are not falsifiable upon empirical observation (i.e. presenting a 'world-to-word direction of fit').

While being irreducible to one another, both rule-types meet in action situations: the legal rules-in-form prescribe actions that can or may (not) be undertaken, while, as said, rules-in-use describe which rules the actors in the action situation may call upon in justification.[7] The justification may then

[5] Some nuances about legal rules being a subset to rules-in-form will be provided later.
[6] We do not describe these as legal rules-in-use as this excludes the category of legal rules that are not followed up in structuring the action situation – but if all is lawful, then indeed the legal rules-in-form will also function as legal rules-in-use.
[7] (Reference to Ostrom in the above.) A point for discussion is whether we should see this as 'how most actors behave most of the time' (with room for individual actors diverting – a matter for statistics about facts/social practice), or 'how most actors most of the time believe one should behave' (with room for many actors mostly behaving otherwise – a matter of statistics about opinions/social justification).

be sought and found in acting according to the prescriptive rules-in-form, which thus act as cause to act according to justification.[8] The below table 1 schematizes this relationship.[9]

Table 1: Connecting rules-in-form to rules-in-use		
Rule-in-form ➔ - result of legal procedure - written form	Operating in an Action Situation:	➔ Rule-in-use known to participants - affecting participants' behavior -
Rules with normative validity following a legal system	- as causal response (process) - as normative order (relation)	Empirically observable rules following interaction in practice

In the above the point was made that legal rules are a subcategory of rules-in-form. We do not address other types of rules-in-form, such as policies or advisory statements, which can indeed follow from formal procedures and have a written form, but may not count as law. At the same time, we should not exclude categories of valid legal rules that are generally accepted in (most) legal systems, but are not written or do not follow formalized procedure, such as legal principles, customary law and oral contracts.

Rules-in-use are regarded as a subcategory of institutional statements, aside strategies and norms. Rules, being shared understandings of regulated and sanctioned statements of ought, combine five so-called 'ADICO' components: an 'Attribute' (i.e. to whom the rule applies), a 'Deontic' (i.e. the direction of ought, such as shall or may), an 'aIm' (i.e. the action or outcome as object of the rule), 'Conditions' (i.e. circumstances under which the rule applies to such actions/outcomes), and an 'Or else' (i.e. the possibility of a sanction upon non-adherence) (Crawford & Ostrom, 1995). Norms and strategies belong to the domain of attributes of the community (Ostrom, 2005, p. 138). Norms, also have the element of ought, as they follow from shared perceptions between actors about proper and improper behaviour, but without sanctioning, and so they only combine the ADIC-components – without the O(r else). In turn, strategies are statements outside the realm of ought or sanctions, expressing institutional equilibriums, which rationally arise rationally arise form mutually understood actor preferences, which consist only of AIC-components (Ostrom, 2005, pp. 137-139).[10]

Legal academics will find the 'ADICO terminology' somewhat confusing. Following Von Wright (and others) they are accustomed to the following terms, in ADICO sequence: norm-subjects (i.e. who's addressed; 'Attribute'), norm-operators (i.e. modes of ought; 'Deontic'), norm-objects (i.e. regulated action; 'Aim'), norm-conditions (i.e. hypothetical norm applicability; 'Condition'), and norm-sanctions (i.e. corrective response to non adherence; 'Or else') (von Wright, 1963, p. 85). To regard the latter element of ADICO as making the decisive difference between norms of shared morality and rules of law is something some legal academics will take issue with, as with H.L.A. Hart (and others) they do not regard the 'Or else'/sanction component to be a necessary condition to the normative authority of a legal norm. Legal norms are intrinsically obligatory, due to the validity of a legal rule within its legal system, prior to perhaps a possibility of sanctioning (Hart, 1961).

[8] Whereby legal rules may seem to have some predictive nature, but that nature lies rather in the opinion of actors that these rules make sense or that most of the people think most of the time that they make sense – see previous footnote.
[9] This table is taken from par. 4.1.1 of our paper to the 2015 ECPR-conference in Montreal (Heldeweg & Lammers, 2015).
[10] Strategies can be upgraded to norms, and norm can of be upgraded to become rules.

As regards the norm-operator/Deontic, Ostrom makes a distinction between three modes of ought, expressed by three modal verbs: 'may' (i.e. permitted), 'must' (i.e. obliged) and 'must not' (i.e. forbidden) (Ostrom, 2005, p. 139). From a legal theory perspective it seems these modes are sometimes tying together a deontic/operator with an Aim/object, as in 'must not' (do), while in other cases ('may' and 'must') it seems to either only be intended to describe the deontic, but perhaps the aim/object ('do') is implicit.[11]

From a legal theory perspective, the distinctions relevant here are those between two types of norm-objects (i.e. 'do X' and 'not do X'/'refrain from X') and two types of norm-operators (i.e. 'may' and 'shall'). When we combine object and operator we yield four possible normative positions: command (i.e. 'shall do'), prohibition (i.e. 'shall not do/refrain'), permission (i.e. 'may do'), and dispensation (i.e. 'may not do/refrain').[12] Further we should be aware of the normative consequence from a factual state of affairs where no rule exists. Absence of legal rules is understood as a 'weak permission' (i.e. not addressed by any norm-authority), whereby actors are not under any obligation and thus 'free' to take and refrain from any action (von Wright, 1963). Table 2 pictures the relative positions that follow from this taxonomy.

Operator ↓ / Object →	Do	Not do/refrain
Shall	Command (shall do)	Prohibition (shall refrain)
May	(may do) Permission	(may refrain) Dispensation
Absent norm →	Freedom (i.e. Permission & Dispensation)	

On the basis of these normative positions we may next define actor relations in terms of rights and duties that follow as legal relations (Hohfeld, 1964): permission grants a privilege to do X versus no-claim to stop from doing X; dispensation grants a privilege to refrain from X versus no-claim to require doing X; command creates a duty to do X versus a claim to see X done; prohibition creates a duty to refrain from X versus a claim to not do X. Absence of a norm grants no privileges (with corresponding no-claims), nor poses any duty (with corresponding claims), so there is no legal relation, only freedom. Existing legal relations (claim v. duty and privilege v. no-claim) may be elaborated in terms of available 'liberty space' for transactions between right-holders (of a claim or privilege) and their counter-parties (under duty or no-claim) (Lindahl, 1972). These are the types of distinctions that we will apply to our understanding of legal-rules-in-form, related to Ostrom's three 'deontic' modes of ought.[13]

[11] Perhaps this is due to Ostrom applying a substantive 'Aim', rather than the abstract object 'do X' versus 'not do/refrain from X'.

[12] We will not discuss but merely mention here how normative positions relate – as demonstrated in table 2: prohibition and command are contrary norms (i.e. cannot exist simultaneously, both may not be the case); prohibition and permission are contradictory norms (i.e. cannot exist simultaneously, one of both must be the case), as are command and dispensation (ditto); prohibition and command are subaltern norms (i.e. one implicates the other but not vv), and so are prohibition and dispensation (ditto); permission and dispensation are subcontrary norms (i.e. both may be the case simultaneously, one must be the case).

[13] Ostrom (2005, 145-146) does not seem to have picked up on the notion of privilege versus no-claim and instead reasons in terms of some rights not having a correlative duty.

From the same legal theory position, considering also the prescriptive nature of legal rules and the need for a normative underpinning,[14] it is important to see that the above taxonomy is descriptive only of one particular type of legal rules: rules of conduct. As rules of conduct they construe normative positions as regards factual behaviour. These are what Hart has named 1st order rules (Hart, 1961, pp. 91-99). He emphasized the need for 2nd order legal rules to have 1st order rules, and indeed the whole legal system, operate with a greater degree of sophistication. Firstly, because 2nd order rules of power are relevant to normative change: to make it possible to create new, or to alter or terminate existing rules of conduct – and to introduce new or alter and terminate existing rules of power to that end. Secondly, because 2nd order rules of adjudication enable enforcement of rules of conduct (and power) against transgression. Thirdly, because 2nd order rules of recognition specify on what grounds the former rules count as valid/legal rules within a generally accepted legal system.

In relation to rules of power (and rules of recognition) Ruiter (1994, p. 106) has explained that legal systems – being generally accepted upon some rule of recognition; such as a constitution - generate validity through combination of 'rule-establishing decisions' (henceforth 'legal acts') and 'decision-constituting-rules' (henceforth 'rules of power'). In the legal system rules of power confer power to certain norm-subjects, to enable them, as norm-authorities, to perform valid legal acts which come with intended legal effects which change legal positions, in terms of normative positions following from a new, altered or terminated rule of conduct or from a new, altered or terminated rule of power. To determine the validity of (a normative position towards factual acts upon) a rule of conduct, or to validly bring about or alter or terminate such a rule, we always have to look 'behind' the 1st order state of (desired) normative facts, to the 2nd order rules of power, to see: 1. if there is one such relevant and valid rule of power; 2. if a legal act has been performed or is performable upon this rule of power to (have) validly introduce(d), alter(ed) or terminate(d) the given or desired rule of conduct.

In terms of normative positions, rules of power have a more simple taxonomy, the only relevant deontic/operator being 'can' – as a legal can (not a factual): the ability to perform valid legal acts. The relevant position that follows is one of 'can perform', which we may pair with a counter-position of a legal cannot. A normative position of 'can(not) *refrain* from performing a legal act' is not a relevant category to the ability to change the law.[15] Absence of a rule of power or a mere existence of rules of conduct does not create a 'freedom to perform legal acts'. From a doctrinal viewpoint, this would render legal certainty meaningless, as there would be no limits to changes in the law and hence no legal stability. From the analytical standpoint of rules operating within legal systems, rules of conduct cannot replace rules of power, as commands and permissions to perform factual acts do not validate such acts to count as legal acts, to change the law – and similarly the mere freedom to act factually would also be without legal avail. Table 3 pictures the relative positions that follow from this taxonomy of power.

Operator ↓	Object →	Do/perform legal act

[14] Consider earlier remarks about legal rules being ex ante prescriptive and rules-in-use being ex post descriptive. The latter follow from empirically observable fact, and as statements ('word-to-world') are either true or false. The former follow from a normative state of institutional facts ('world-to-word') and are either valid or invalid.

[15] In some legal systems performance of a legal act is possible by not acting (before a certain deadline), e.g. 'lex silentio positivo'. Such non-action counts as fictitious legal act, in which the intent to bring about a change in the law. Is assumed present by default.

Can (change legal positions)	Legal power (can perform legal act)
Cannot (change legal positions)	(cannot perform legal act) No legal power
Absent norm ➔	No legal power

Similar to rules of conduct we see that normative positions regarding legal power lead to actor relations in terms of rights and duties that follow as legal relations (Hohfeld, 1964): attributing the capacity of performing legal acts grants a legal power to alter legal position X versus liability to have legal positions changed, furthermore dismissing the capacity of performing legal acts creates an immunity against alter legal position X versus a no-power position to have this legal position changed. Existing legal relations (power v. liability and immunity v. no-power) may be elaborated in terms of available 'ability space' for transactions between right-holders (of a power or immunity) and their counter-parties (under liability or no-power) (Lindahl, 1972). Transactions are also possible between liberty and ability space, such as when a power (e.g. following ownership) is transferred (e.g. through a sale), but a privilege (e.g. of use) is established (e.g. as easement); together liberty and ability space make for legal space.[16]

The distinction between primary and secondary rules, or the need, particularly, for rules of power is not present in the work by Ostrom.[17] Nonetheless, we believe it can and should be integrated in the IAD Framework. This would be necessary as regards the understanding of legal-rules-in-form, but we believe that in as much as rules-in-use remain within boundaries of lawfulness, the distinction is also relevant to them, particularly when we want to understand relations between action situations at various levels (see 3.2). Finally, of course we need to keep in mind that although the ADICO logic also applies to rules of power, its deontic is distinctively different from that of rules of conduct.

The above assumption, of rules-in-use remaining within the boundaries of legal-rules-in-form is a point of departure in this paper, and indeed the reason behind looking how legally arranged experimentation can be a lawful means of avoiding, evaluating or repairing a regulatory disconnect – suggesting that there maybe unlawful practices or a desire to move in a direction that is currently unlawful). Under our key lawfulness assumption, rules-in-use are not in conflict with legal-rules-in-form. This amounts to a proper match between a relevant legal space (prescribed by primary and secondary legal-rules-in-form) (Lindahl, 1972) available to interactions within a given (type of) action situation, and rules-in-use that structure that same (type of) action situation as a 'social space' (Ostrom, 2005, p. 14). Analytically this means that, given a corresponding AIC (described by a given combination of a norm-subject, -object and –condition), we can assess lawfulness of rules-in-use by varying along the Deontic/norm-operator (related to a given positive or negative Aim/norm-object; i.e. do or refrain).[18] In the addendum we name all possible permutations, for both rules of conduct and rules of power. With rules of conduct we have 5 possible normative positions (legal-rules-in-form)

[16] There is an element of overlap, as legal acts require performance of a factual act (including not acting). The legal reality of this is that factual act A, counts as legal act L in context C (of proper performance upon and in accordance with a rule of power). We will not elaborate here.

[17] In her 2005 book, there is a suggestion (on p.144-146) that permission is understood to also include the option to 'add new action options to the action situation' and 'attributing a right to take an action', but nowhere does the elaboration fully express what is at stake in rules of power.

[18] We ignore 'Or else'/norm-sanction differences as these are not expressive of the lawfulness itself.

to match with 5 possible normative practices (rules-in-form), to make 25 situations, of which 6 are unlawful, 3 irrelevant (no matching AIC rules) and 16 lawful. With rules of power we have 3 normative positions (legal-rules-in-form) to match with 3 possible normative practices (rules-in-form), to make 9 situations, of which 3 are unlawful (leading to invalid acts), 3 are irrelevant (no matching AIC rules) and 3 are lawful (as valid acts). We will not elaborate further, but want to be clear on the fact that our 'lawfulness assumption' covers many situations.[19]

Relating rules of power and rules of conduct across institutional levels

Because of the relationship between rules of power and rules of conduct, there is also a normative side to there being and having to be institutional levels at which action situations exist: meta-constitutional, constitutional, collective choice and operational action situations. The basic logic of this is that first there needs to be a foundation for a legal order at metaconstitutional level; often involving a constitution or conventions as a rule of recognition. This then makes it possible to make rules of power at constitutional level, conferring power to actors at collective choice level (as a legal ability space).[20] Thus, the latter actors can, at collective choice level, introduce rules of conduct (as legal liberty space) for factual activity at operational level.

In the above, at the end of section 2, we already apply the logic of rules of power and rules of conduct to the institutional levels. The next table (no. 5) offers a more detailed picture of how levels relate on the basis of legal-rules-in-form.[21]

Table 5: Levels as Action Arenas where rule-establishing-decisions (legal acts) are taken upon decision-constituting-rules

Level of Action Arena	Interaction	Rules structuring the AS (for Interaction)
Operational Situation (OS)	Performance of factual activities, e.g.: • establish smart grid • manage a neighbourhood cooperative	OS-RiUs following RoCs with 'deeper origin' (CCS) about: • prohibitions, commands, permissions & dispensations
	↑ CCS-made OS-RoCs ↑	
Collective Choice Situation (CCS)	Introducing, altering, terminating (*only*) RoCs, e.g.: • contracting between OS-participants • permitting/subsidizing by non-OS-participants • co-regulating formal or substantive standards for OS interactions	CCS-RiUs following CS-made RoPs (with positions and conditions) about: • how to make/change RoCs at CCS, for OS-RiUs
	↑ CS-made CCS-RoPs and OS-RoCs ↑	
Constitutional Situations (CS)	Making, altering, terminating RiF, e.g.: • (RoP for CCS) Civil Law Code; Electricity act • (RoC for OS) Competition Law Act; meta-regulation for products/services	CS-RiUs following MCS-made RoPs (with positions and conditions) about: - how to make/change RoPs at CS, for RiUs at CCS - how to make/change RoCs as CS, for RiUs at OS
	↑ MS-made CS-RoPs and OS-RoCs ↑	
Metaconstitutional Situations (MCS)	Making, altering, terminating RiF, e.g.	MS-RiU following RoR when to make RiF

[19] See our ECPR-paper (Heldeweg & Lammers, 2015) for an alternative and more elaborate analysis. We will also not further discuss the distinction between generative rules (creating institutional (legal) facts; 'let there be a…') and regulative rules (the discussed primary and secondary rules) (Ostrom, 2005, 138), nor will we elaborate on the rules of adjudication and the rules of recognition (Hart, 1961).
[20] Or to other actors at constitutional level to make rules of power.. etc.
[21] This Table can also be found in Lammers and Heldeweg, (2016) and Heldeweg and Lammers (2015).

	• constitutions & 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		

The table clearly expresses, on the basis of the normative logic of legal systems, that what happens at higher levels shall not conflict with deeper levels and, from constitutional to collective choice level, requires the underpinning by legal power, to produce the rules of conduct that can structure factual action at operational level.

This table also clarifies that one and the same piece of legislation or regulation[22] can hold rules that can be placed at various levels. Aside from rules of recognition that follow from metaconstitutional interactions, rules of power result from constitutional level interaction and rules of conduct resulting from interaction at collective choice level. In as much as a piece of legislation or regulation holds both latter types of rules, it functions across two levels; and in fact three if we consider consequences in operational action.[23]

This means that while according to Ostrom, in similarity to Williamson's levels of social analysis (Williamson, 2000), action situations at different levels have, on average, a different life-span – longer towards the metaconstitutional level and shorter towards the operational level – this may on average hold true, but will come with exceptions particularly when rules of power and of conduct are part of one and the same piece of legislation/regulation.[24]
In the next subsection this ordering will again be discussed (briefly) in relation to the phenomenon of legal institutions.

Relating patterns of behaviour across levels: legal institutions

When in section 2 a statute (Electricity Act), a Crown decree (about experimental dispensation) and licences (for experimental microgrid projects) were discussed, most readers will have had some (basic) understanding of patterns of behaviour involved in the making, in the operations and in the termination of these legal phenomena. There is a type understanding of such phenomena that

[22] Legislation is often divided into primary and secondary legislation – being introduced either by the highest/primary legislator (immediately below the constitutional legislator) and lower legislators (often from the executive branch of government). Regulation is generally understood to encompass secondary legislations as well as non-legislative legal acts (e.g. non-general & abstract acts; orders for individual cases and/or persons).
[23] Keep in mind that when rules of power and rules of conduct are part of the same piece of legislation or regulation, the former cannot underpin the latter, as both are part of the same legal act, or, phrased alternatively: a rule-establishing decision (i.e. a legal act) requires a separate decision-constituting-rule (i.e. rule of power) – there is no Baron Von Munchhausen lifting himself (plus his horse) out of the quicksand.
[24] It is important to well keep apart rules of conduct, and conditions to rules of powers prescribing under which circumstances which rules of conduct may be introduced by legal act, but do require such separate act to be performed before rules of conduct enter into force; the Crown decree discussed in section 2 offers a good example where 12 out of 17 articles are (about) rules of power and 5 are (also) about rules of conduct.

informs about how the involved actors ought to behave to properly execute such actions; a normative understanding that ties together various rules – of power and/or of conduct – and that can be applied whenever an instance of the relevant occurs (e.g. another state, crown decree or licence), albeit each time with some particularities (e.g. of an licence to experiment in microgrids or a regular environmental permit). In each of these examples we are concerned with rule-guided *social* institutions as we can see them being executed following a standard pattern of behaviour that makes functional sense and is empirically observable – suitable for description and to predict behaviour whenever an instance of such a social institution is being instantiated, has consequences while in existence and is terminated. To adhere to some time-zone or to drive either on the right or on the left side of the road will, at some time in the past, have merely been a matter of such social institutions, based only upon a practice which Ostrom would probably relate to strategies. In most modern societies, however, we find that such social institutions have been recognized by law (e.g. formal time-zones, traffic law), and that law has added new institutions to them (e.g. tradable rights) – much of which happened because with societal complexity and economic need strategies and norms where failing in providing the necessary trust and certainty in their workings. Thus, to prevent or overcome their failure *legal* institutions where introduced, as legal regimes that bring together institutive rules (to introduce a legal institution), consequential or regulative rules (on the do's and don'ts once a legal institution was instantiated) and terminative rules (on how to conclude an instance) – and possibly constitutive rules (that broadly define the institution). By virtue of how these legal institutions are configurations or regimes of rules (of power and conduct) that are valid within a given legal order, they have a prescriptive (world-to-word) relevance to interactions in society, which presumes that their functional concept fits (word-to-world) to a desired, existing or possible social praxis, and so they can and should be adhered to as if they portray a factual state of affairs that comes with certain opportunities and constraints to human behaviour. Thus, to say one has a licence to experiment creates an institutional fact that ought be treated as a real fact.[25]

The Dutch Electricity Act, its related Crown decree and the related licences to experiment with microgrids are examples of instances of types of legal institutions, but there are many such types, that group together various rules as prescriptive recipe to the making of (possibly many) instances of their kind: adulthood, public authority, contracts, marriage, property, legal personality, tradable public rights. Following Ruiter (1997), three orders of legal institutions may be distinguished (Lammers & Heldeweg, 2016). The types within are in Table 6, with some examples with each.[26]

[25] Take the real fact of a building's architecture that 'allows' certain ways (by hallways, stairs and doors) of getting from one side to the other side of the building, while excluding others (by walls, windows and ceilings).
[26] This table was also used in Lammers and Heldeweg (2016).

Table 6: Three Orders of Legal Institutions					
Orders of institutions	Legal institutions (placing in this table does not mean to suggest relations across order levels)*				
1st order	Legal Quality (e.g. public authority)	Legal Status (e.g. public good)	P2P-relation (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)		
* 1st order is logically conditional to 2nd and 3rd orders; existence of 3rd order institutions influences scope for other institutions within.					
P2P=person to person; P2O= person to object; O2O-person to object					

First order legal institutions are prescriptive of patterns of behaviour regarding the legal quality of persons, the status of objects and the nature of relations between persons, between objects and between persons and objects. Second order legal institutions are personifications and reifications of first order legal relations. Third order legal institutions are contextualisation's, as environments of typical-of-type legal relations. The second and third order legal institutions in the table are not exhaustive, but do relate to types with a strong societal relevance: where would we be without legal regimes for making, operating and dissolving firms and associations, or without legal regimes for states, markets and civil society networks?

The relevance of legal institutions to our subject will be clear at face value when we look at the different orders. In 1st order, the public authority of a minister to grant a licence or of the legislator to introduce the Electricity Act and of the Crown/government to introduce the Crown Decree, and the fact that all of these legal acts purport different subtypes of person-to-person legal relations. In 2nd order, the existence of associations engaged in experimenting with a microgrid is an example of a subtype of legal personality; it is not likely, though in theory possible, that the licence to experiment is a transferrable public right, but this would provide the example of a legal object. In 3rd order, the EU regulation to liberalize the former public hierarchy order of (state owned and operated) energy production and distribution, to become, not a competitive market order, but a hybrid regulated market, in-between public hierarchy and Competitive market, presents major examples of institutional environments as legal institutions.

The significance of legal institutional environments is that, once instantiated, such as in the form of the EU or an EU member state regulated energy market, they define a pattern of rules that prescribe which actors can be engaged in energy production, distribution and provision, and which freedoms there are in terms of engaging in relations between them. The playing field for energy actors is thus regulated in a way that is believed to strike the presently best possible balance in the energy trilemma – between (affordable) access, reliability and sustainability. It is under this state of affairs that the restrictions are posed as mentioned in the Introduction, of both newly emerging (community) actors and DSOs not being able to engage in microgrids, and to which legally arranged experimentation may present an exemption, also to evaluate if perhaps the rules of the game should be changed to facilitate microgrid expansion and ultimately accommodate their place in energy governance.

In action situations legal institutions can be relevant in various ways. Firstly, to understand the existence of legal institutions as normative patterns of behaviour makes actors aware (or should do so) that certain rules are part of sets that make an institutional regime. Consequently, changing rules of the game (at constitutional level for collective choice action situations) or rules of game-play (at collective choice level for operational level action situations) needs to be done carefully, and with concern for the functioning of the whole regime – e.g. introducing unilateral decision-making does not easily fit with a contractual setting. To change the IAD rules-in-use on information or payoff has to fit the legal institution to which they may be relevant. Secondly, legal institutions may prescribe rule-in-use in terms of how the interaction within the action situation needs to take place: in instantiating a legal institution (such as by offer and acceptance in a contract), in operating according to consequential rules (such as transparency of information in public authority decision-making) and in termination (such as in how to dissolve a firm). All of these rules prescribe and thereby also causally impact rules-in-use that structure the action situation to, by actor interaction, successfully lead to desired outcomes. Thirdly, an action situation may itself be an instance of a legal institution, such as that of an energy company in the regulated energy market, with immediate consequence in terms of how the action situation of company decision-making is structured, given, for example, prescribed positions, boundary rules, scope rules etc.

Finally, the way legal institutions relate to the institutional levels may be pictured as follows, in table no 7.

Institutional levels	Action situation relevance to Legal institutions
Operational level (OL)	Lawful operation (Factual acts within consequential rules)

Collective choice level (CCL)	Instantiate Legal institutions (Establish instances of a type of legal institution)
Constitutional level (CL)	Design Legal institutions (Introduce Institutive, Consequential and Terminative rules)
Metaconstitutional level (MCL)	Conceptualize Legal institutions (Authoritative recognition or original inception)

Clearly, legal institutions always work across institutional levels as, firstly, there needs to be metaconstitutional 'support' for their existence, even if indirect when they follow from basic legal principles (e.g. private individual autonomy and the fundamental right of assembly underpinning the existence of legal personality). Secondly, their basic workings need to be designed, primarily at constitutional level, through the characteristic three types of rules (institutive, consequential and terminative). Thirdly and fourthly, they are meant to be instantiated, ultimately at collective choice level, and then operate at, indeed, operational level. So from inception to factual operation, they link together action situations at different levels, as taking place consecutively over time – as first there needs to be the support, then the type, next the instantiation(s) and finally the factual being put into practice of the instantiation(s).

In as much as making institutive, consequential and terminative rules involves the making of rules of power (to instantiate or terminate, or as power of an actor within a legal institution once instantiated) and of rules of conduct (to instantiate or terminate by factual acts, or factual acts allowed once a legal institution is instantiated), the making and use of these rules will not take place at the same institutional level. As explained in the above, rules of power are constitutional level outcomes and rules of conduct are collective choice level outcomes. Hence, particularly between the constitutional and the collective choice levels there will be an iteration of interactions – as we already pointed out with respect to the Electricity Act and Crown decree in our 'case'. When performed by the same actor configuration, such as by a prime legislator (involving various actors within, such as chambers of parliament, the executive government), this iteration will not necessarily be noticeable, particularly when the making of rules of power and of rules of conduct happens simultaneously as it originates in the same broad power, such as to make primary legislation.[27] If not, then legal requirements may differ and iteration will come with a move between (analytical) levels with possibly different actor configurations and other rules of the game.

[27] For example, Article 81 of the Dutch Constitution holds a general power of making primary legislation, without specification of content to subject or to nature of the rule-types. Effectively one could assume that there is very little difference between action situation rules at the highest constitutional sublevel and rules to an action situation at the lowest collective choice level.

Instantiation can be a joined-up situation, such as of agreeing on a contract to have a legal person established, actually establishing this person and then having this person be granted an experimental licence for operating a microgrid. Of course, if pictured as consecutive action situations all of this makes more sense, or if regarded as one action situation with interactions over time – although the fact that there is a moment before and after inception of the legal person does amount to at least a legal rules-in-form change of position, boundary, scope, aggregation, information and scope rules, which would make it hard to still regard this as one action situation.

Conclusion: how ILTIAD may support analysis and design

In above we already pointed at the heuristic relevance of understanding legal institutions. Firstly, this is relevant to interactions in action situations with intended rule changes, because single rule changes may affect the functioning of a whole legal institution, given that these are instances that build on coherent legal regimes. Secondly, the action situation may itself be structured as a legal institution, so that existing rules-in-use have a coherent basis in a regime of legal-rules-in-form; or interactions within an action situation may have to, at least legally speaking, proceed according to institutive, consequential or terminative rules of a legal institution. Thirdly, relationships between institutional levels may result from legal institutions being conceptualized at one level, instantiated at another, and operated upon at yet another level. The latter came out already in section 2 of this paper where it was shown how legally accommodated experimentation, particularly with regard to microgrids, is a process across all (or at least the top 3) institutional levels.

Taken purely from an analytical and design perspective, the advantage of combining a legal institutions approach to IAD – by linking Institutional Legal Theory (ILT) to combine with IAD as 'ILTIAD' – brings several benefits. Firstly, because of the abstract character of ILTIAD, the analysis or design is not expressed in mere doctrinal/positive law terms, but in a way that allows transcending local/national jurisdictions and is particularly helpful to (develop a methodology for) comparative evaluation and design. Secondly, the ILTIAD-approach focuses attention to the need for coherence within and between action situations at a given institutional level, and of action situations between various institutional levels, which altogether works through into the fabric of interrelated rules of power and rules of conduct, as related in institutive, consequential and terminative rules, and to the seven types of IAD rules-in-use (as shown in graphic no. 3), all of which to be both effective (achieving outcomes – also efficiently) and lawful (making sure both interactions and outcomes can stand a test

of legal criticism).[28] To be more precise, consistency has to be ensured (and can be lacking – at the risk of ineffectiveness and/or unlawfulness) in three ways (Lammers & Heldeweg, 2016):

1. 'legal institution consistency' through consistency of rules-in-use in a given action situation as regards one legal institution, to properly instantiate, change, operate and terminate such institution – such as to have the right position, choice and aggregation rules in place to conclude a contract.
2. 'action situation consistency' through consistency of rules-in-use in a given action situation as regards relating legal institutions, to properly make various legal institutions to co-operate – such as to ensure a functional legal person, with public authority to issue a permit.
3. 'institutional level consistency' through consistency of rules-in-use to across various action situations as regards the proper functioning of legal institutions from their conceptualization, instantiation and operation – such as of the institutional environment of a regulated energy market across constitutional, collective choice and operational levels.

Table 8 summarizes these consistency requirements.

Consistency or rules-in-use as regards….		
Proper instantiation or operation of a legal institution within an action situation	Proper linking of various legal institutions within an action situation	Proper linking legal institutions' span across action situations on various levels
Legal institution consistency	Action situation consistency	Institutional level consistency

The issue of consistency, in all three respects, may be demonstrated by the importance of the determination of an institutional environment, such as that of a regulated energy market. This requires proper conceptualization, instantiation and adherence in factual operation. As said in the above, the choice of institutional environment as third order legal institution affects the legal space available for the use of 1st and 2nd order legal institutions. An important example is that of whether DSOs can be involved in microgrid initiatives and whether communities involved in such microgrids could operate as energy company, selling their surplus to third parties in the energy market.

The key issue here is that the basic forms of institutional environments do, especially through their consequential rules, carry a particular normative orientation. This can be concisely demonstrated by

[28] To be clear, the legal insistence on consistency and coherence related in part to the requirement of validity (is there a rule of power underpinning existing rules of conduct?) and for another part in ensuring lawfulness, to avoid contrary or contradictory requirements (e.g. something being both prohibited and commanded).

comparing three pure and generally accepted modes of governance as institutional environments: public hierarchy, competitive market and civil networks (Powell, 1990; Rhodes, 2007; Thompson, Frances, Levačić, & Mitchell, 1991). In doing so we can place unilateral public interest interventions next to private interest exchanges and community interest cooperation. On the basis of such orientations legal opportunities and constraints evolved, such as requirements of legitimacy, such as of democratic government (voice), competitive exchange (exit), voluntarism (loyalty), aside from specific legal requirements, such as of administrative law, competition law and law of social enterprise and free association. This also brings that governments should respect human rights, that companies in a market may not form cartels and community networks shall put stakeholder interests first. By way of a very concise summary, Table 9 presents the three basic types of legal institutions.

Public hierarchy	Competitive market	Civil networks
Command	Exchange	Cooperation
Public interest	Private interest	Community interest
Voice	Exit	Loyalty
Constitutional & administrative law	Competition law	Law of association & societal enterprise

The earlier mentioned regulated energy market is a hybrid that seeks to best combine command (e.g. regulations and licences) and exchange (buying and selling of energy), and thus serving both public and private interests (of reliable, affordable and sustainable energy provision, and of a proper price-service quality balance). Liberation of energy provision, as a move away from public energy hierarchy towards competitive energy market, was not fulfilled as public hierarchy safeguards where deemed necessary to avoid the private interest to (short term) neglect of the (long term) interest of, particularly, universal access and reliability. While hierarchical public control of the functioning of the competitive energy market is seen as providing the necessary safeguards, the desire to introduce microgrids as a means to enhance sustainability as element of the energy trilemma, now challenges the balance. This challenge pertains to the issue of whether we regard microgrids as intrinsically a community undertaking, fitting with the basic rules of civil networks – such as involving a coming together of the roles of producer and consumer (as prosumers) and of cooperative action. These basic rules are at odds with the separation of the roles of producers and consumers in energy provision and their competitive exchange mode of allocating energy services. The question related to this is if we regard microgrid energy provision as one that is guided by 'democratization', based upon procedural justice (of a key cooperative mode of decision-making) and substantive justice (of the community as key beneficiary) that empower and benefit communities, or as guided by 'expansion',

merely to create as many microgrids as possible while retaining competitive exchange, such as by microgrids as commercial undertakings, perhaps as 'micro energy markets' (of a limited set of households), fitting the model, perhaps with some modifications, of a regulated energy market (Hoffman & High-Pippert, 2015; Simcock, 2016; Sovacool, Burke, Baker, Kotikalapudi, & Wlokas, 2017). The below graphic, figure no. 5, pictures the question that is at stake here.

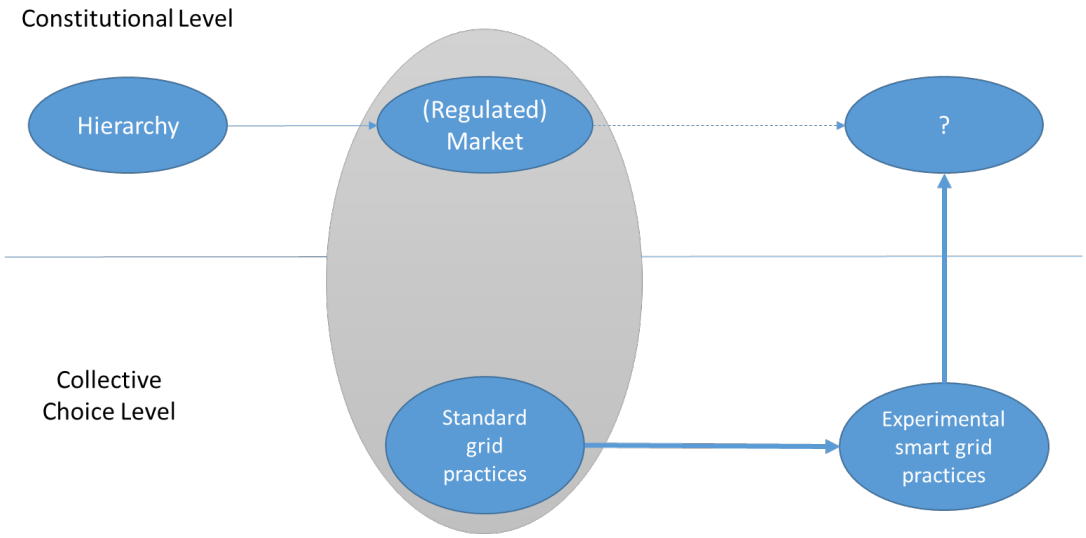

Figure 5: Institutional choice

It is this choice that is making it interesting to see, through the lens of ILTIAD, what is happening in the way of experimentation with microgrids. What is experimentation trying to prove? Is it about the future of community microgrids as one of civil energy networks, or is it about a possible modification of the regulated energy market, or perhaps a hybridization in between the former and the latter? The institutional legal framing of the experimentation, across various institutional levels, is vital to what evidence-based future may ensue. Therefore we will next look into the Dutch example of such experimentation.

4. RESULTS

Experimentation in practice

The Dutch Experimentation Decree entered into force on 1 April 2015, as part of the ongoing legislative process 'wetgevingsagenda STROOM', which attempts to change and combine the Dutch Electricity Act and the Dutch Gas Act. The Decree grants exemptions to article 16, third paragraph of the Electricity Act, which states that no one can take over the tasks of distribution system operators. This happens on individual project basis, via a tender procedure, whereby the Dutch Minister of Economic affairs can allow associations to experiment with the local generation, distribution and sale of renewable energy. The overall aim of these experiments to investigate their contribution to the

goals of a.) contributing to developments in the area of distributed generation of renewable electricity (or electricity generated via CHP), b.) decreasing the load on the electricity grid through demand side management and c.) increasing consumer involvement.

As explained in section 2, the Experimentation Decree constitutes a change at the constitutional level, that provides the legal power to allow associations to experiment with new institutional settings at the collective choice and operational level.

We can actually speak of various constitutional levels, such as when an Electricity act grants the power to the making of a Crown decree that will (inter alia) hold conditions regarding the power to grant the afore licences – which implies that there is a second constitutional level to accommodate the making of this Crown decree. Similarly there may be different sublevels at Collective choice level in setting rules of conduct for the electricity sector, one for the Electricity Act, one for the Crown decree and one for the ministerial licence.

For the changes that occurred at the constitutional level(s), please see the below table (no. 10).

Electricity Act (constit. level)	Experimentation Decree (constit. level)
DSOs responsible for grid operation (regulated task)	Associations responsible for grid operation in small grid projects
Energy generation and supply are market activities, a supplier permit is mandatory	Associations responsible for generation and supply
No rules	Association has to finance the entire project
Technical standards apply to DSOs	Associations have to prove that they can ensure reliability, safety, consumer, and environmental protection, and comply with the technical standards that apply to DSOs
Strict division of market and grid activities	No longer a strict division of market and grid activities compared to Electricity Act

A total of nine projects was granted experimental status in 2015 and 2016. Lammers and Diestelmeier (2017) summarize the main changes that these projects (experimental action situations) entail. We analyse these changes in terms of the divide between rules-in-form and rules-in-use: presented in Table 11.

Experimentation Decree (constit. level RiF)	Rules-in-use in experiments (collective choice level)	Lawfulness of RiU[29]
Associations responsible for generation, supply and grid operation.	Two projects are led by a professional project developer, and one project each is led by a company specialized in solar PV panels, a research centre, and a real estate company.	contradictory
DSOs cannot exercise control in projects	DSOs and energy suppliers still seem to exercise control in decision-making	contradictory
Associations must be entirely controlled by their members	DSOs and energy suppliers still seem to exercise control	contrary
Projects shall increase consumer involvement	Limited consumer involvement in decision-making	implicated/subaltern superficially adhered to ?
Associations have to prove that they can ensure reliability, safety, consumer, and environmental protection, and comply with the technical standards that apply to DSOs	Associations fill out project application form	consistent
No rules	Energy management with batteries as storage units (RiU 'sine lege')	Weak permission
No rules	Interest of aggregators to play a role, e.g. in energy balancing	Weak permission

5. DISCUSSION

From this state of experimental affairs, when comparing experimental rules-in-use with legal-rules-in-form to experiment, our ILTIAD-approach reveals that experimental practice seems to build on the regulated energy market type of energy provision, rather than to move towards a civil energy

[29] See section 3 and especially addendum 1 for details.

networks mode. The latter seems to be the objective of the experimentation, as the way actors are positioned, particularly the associations, emphasizes the democratization objective, driven by both procedural justice (of having the key say in the project) and substantive justice (of sharing the benefits of the project). Practice, however paints a picture in which the position of associations is rather 'superficial', while commercial interest driven actors are in charge. The graphic of figure no. 6 pictures this state of affairs.

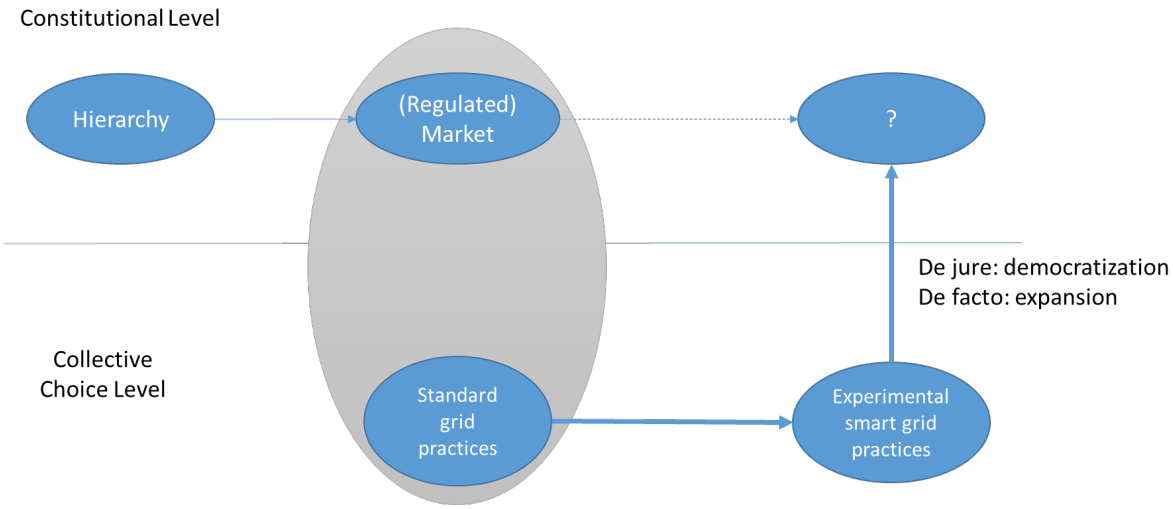

Figure 6: Institutional choice – de jure & de facto

With respect to the facts of the matter, this state of affairs raises the question how to move forward with experimentation. Should the legislator 'get real', place expansion of renewable energy upfront and regard experimentation as one that should be about how microgrids can be best reconciled with the institutional environment of the regulated energy market, whereby participation of associations is rather more about reducing NIMBY-ism than about having a key 'say' (Devine-Wright, 2012). Or do the experiments require stronger institutional support to indeed strengthen (support for) the role of associations and find a pathway towards 'true' energy democratization, with an accompanying institutional legal framework?

With respect to the use of ILTIAD the above question brings to the fore that ILTIAD offers an analytical lens to evaluate collective action in the energy sector, particularly as regards microgrids as CPRs and to find out if there is a consistent framework of legal rules that ensures proper – i.e. effective and legitimate/lawful – functioning of interaction in action situations at different levels. At the point where we find that experimentation paints a diffuse picture, ILTIAD can assist in arriving at a proper design of the experimentation rules. In practical terms this is to say that the legislator has to consider

objectives, particularly as regards the choice between democratization and expansion. As table 12 suggests there are basically three options.

Expansion*	Hybrid	Democratization*
Participation and sharing only in as much as efficient towards expansion**	Only input or only output legitimacy (as value in itself)	Input & output legitimacy (as value in itself): procedural and substantive justice is key
* of renewable energy use ** involve communities only to reduce NIMBY-ism		

Clearly, 'democratization' would be a course where experimentation would need to be channelled to enable an evidence-based legislative decision on the desirability of establishing a community energy network – aside the regulated energy market – with consequences for the use of 1st and 2nd order legal institutions (contracting, permitting, ownership, legal personality, transferable legal objects/rights) within. All of these would have to bring input legitimacy as procedural justice to the involved associations, and output legitimacy as substantive justice to the associations – as said: having both the 'key say' about and the main benefits from the projects.

Should 'expansion' be the key objective than the existing regulated energy market could be the governance point of departure, and experimentation should be channelled towards evidence about the need for minor rather than major legal modifications. Clearly the position of associations would not be one of being the key or prime stakeholder in terms of procedural and substantive justice, but rather one that merely ensures reducing NIMBY-ism to enable an effective and efficient roll-out of microgrids. The in-between hybrid governance position would only bring input legitimacy as procedural justice to associations (without a major stake in benefits), or only output legitimacy/substantive justice (without the key say in the project undertaking). This may be the 'best of both worlds', but the hybrid character brings an intrinsic complexity, of reconciling private interest driven behaviour of commercial actors and community interest driven behaviour by associations – with a complex detailing on fitting 1st and 2nd order legal institutions in its instrumentation. Again, the legal arrangement for experimentation would have to reflect to include this option if it is to yield useful information to consider this mode of governance as a viable future option.

6. CONCLUSION

The leading question to this paper reads: 'how can institutional settings for smart energy systems be designed, and which consequences does this have in terms of renewable energy expansion and energy democracy"? To this end this paper as presented the background of an energy transition that includes a strong increase in the number (and perhaps scale) of smart energy systems in the form of microgrids and how such increase may be at odds with existing energy legislation – as is the case in the Netherlands. Experimentation may be a means to bridge/remedy the regulatory disconnect that stands in the way of the aspired increase. To understand what is involved in proper legal arrangements towards such experimentation, and demonstrate the use of the ILTIAD-approach, a theoretical expose was presented to clarify the empirico-legal lens that may improve our understanding of how rules-in-use and legal rules-in-form interact and what this means in terms of the institutional modes of (experimental) governance, including relevant legal institutions.

By applying this lens to the first findings of Dutch experimental microgrid projects, it is hoped that this paper clarifies that a choice in policy objectives – on the spectrum from renewable energy expansion to energy democratization – requires thorough institutional consideration, first and foremost in the design of the legal arrangements for the relevant experimentation. The answer to the leading question would thus be to apply 'ILTIAD', with particular concern for the consequences of choice as regards the institutional environment (as third order legal institution).

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Addendum

Relating RiUs (rules-in-use) to legal RiFs (rules-in-form)

1st order (4 types of channelling behaviour)

RiF 1st	RiU 1st	Lawful RiU?
Prohibition	Prohibition	+ (consistent)
	Command	- (contrary)
	Permission	- (contradictory)
	Dispensation	+ (implicated/subaltern)
	- (no instit. practice)	+/- (irrelevant)
Command	Prohibition	- (contrary)
	Command	+ (consistent)
	Permission	+ (implicated/subaltern)
	Dispensation	- (contradictory)
	- (no instit. practice)	- (contrary)
Permission	Prohibition	- (contradictory)
	Command	+ (implicated/subaltern)
	Permission	+ (consistent)
	Dispensation	+ (consistent/subcontrary)
	- (no instit. practice)	+/- (irrelevant)
Dispensation	Prohibition	+ (implicated/subaltern)
	Command	- (contradictory)
	Permission	+ (consistent/subcontrary)
	Dispensation	+ (consistent)
	- (no instit. practice)	+/- (irrelevant)
	Prohibition	- (sine lege; invalid)

No RiF	Command	- (sine lege; invalid)
	Permission	+ (sine lege; freedom)
	Dispensation	+ (fine lege; freedom)
	- (no instit. practice)	+/- (irrelevant)
NB in practice arrangements may be 'layered': as a rule prohibited/commanded/permitted/dispensated but in particular cases 'not' (i.e. permitted/dispensated/prohibited/commanded -		

2nd order (1 type of empowerment 'can'; 1 possible exclusion 'cannot'; 1 absent RiF)

RiF 2nd	RiU 2nd	Lawful RiU? (as validity!)
Can	Can	+ (consistent)
	Cannot	- (contradictory – non usus)*
	- (no instit. practice)	+/- (irrelevant)*
Cannot (Immunity)	Can	- (contradictory – invalid)
	Cannot	+ (consistent)
	- (no instit. practice)	+/- (irrelevant)
No RiF (=cannot)	Can	- (sine lege; invalid)
	Cannot	+ (consistent)
	- (no instit. practice)	+/- (irrelevant)
*unless Can is commanded (non-discretionary): unlawful		