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Exploring interventions and tools used by REScoops to lower householders' energy consumption and stimulate investment in RES projects

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Abstract: REScoops are well positioned to spur energy savings among householders and generate investment in renewable energy projects. As compared to other agents in energy markets they have many benefits, particularly their embeddedness in local, social structures. In this paper we explore in which ways, and by using which tools and interventions REScoops exploit this assumed advantage. The main research question in this paper is: 'Which interventions and policies do REScoops use to persuade their members to lower energy consumption and invest in renewable energy? The question is answered by making an inventory and analysing practices of REScoop federations across six EU nation states. Next to providing information on the scope of the measures taken illustrative case studies are presented to provide in-depth insights into the ways REScoops use intervention strategies. Interventions and tools retrieved are clustered using psychological and policy oriented classifications. Data collection involved expert interviews, expert workshops, a survey, and collection of information on best practice instruments. Results of the analysis reveal that REScoops deploy a broad scope of tools and interventions, using both antecedent and consequence strategies. Consequence strategies (i.e. feedback) used typically rely on the use of technology, i.e. smart metering or an online platform. REScoops that just start off are keen to use antecedent strategies (i.e. awareness raising campaigns), whereas the more mature REScoops also use consequence strategies, but often in combination with the former. In using these interventions and tools the REScoops are well positioned locally to engage with householders, which helps to get more commitment and be supportive to the needs of the latter in learning how to use the tools. Results from trials organized by REScoops show promising signs in terms of householders actually lowering their energy consumption levels. Whether the interventions are really effective is still to be seen in future, more systematic, intervention research.

Key words: citizens' initiatives; societal self-governance; energy transition; interventions; REScoop; renewable energy; energy savings; households; community energy.

1. Introduction

In recent years energy markets have witnessed the rise of citizen-led low carbon energy initiatives (Arentsen & Bellekom, 2014; Hoffman, 2010; Oteman, Wiering, & Helderman, 2014; G. Seyfang & Haxeltine, 2012; G. Seyfang, Hielscher, S., Hargreaves, T., Martiskainen, M., & Smith, A. , 2014). They consist of citizens who jointly seek to produce and consume sustainable energy locally, and reject the use of centralized produced fossil and nuclear energy (T. Hoppe, A. Graf, B. Warbroek, I. Lammers, and I. Lepping., 2015; Oteman et al., 2014). Moreover, local production and provision of energy services should not conflict with local values, and generated income should contribute to local community goals (T. Hoppe, Arentsen, Sanders, Heldeweg, & Kroeze, 2014; REScoop.eu, 2014). Citizen-led initiatives organize themselves typically in 'renewable energy supplying cooperatives' (abbreviated to REScoops; (REScoop.eu, 2014)). As many REScoops have evolved in recent years they have become a new player of importance in energy markets and are in the process of earning a more prominent role (Arentsen & Bellekom, 2014; Bauwens, Gotchev, & Holstenkamp, 2016).

In the quest to lower energy demand and increase the use of renewable energy REScoops have a high potential. As compared to other agents they have many benefits, particularly their embeddedness in social structures (T. Hoppe et al., 2014; Oteman et al., 2014; G. Seyfang & Haxeltine, 2012). This gives them the opportunity to use social ties to persuade local householders to join their REScoop, and partake in their activities, and persuade their members (i.e. often householders at the local level) to either lower their energy consumption or adopt renewable energy (i.e. by having solar panels fitted on the rooftops of the dwellings they occupy) (REScoop.eu, 2014). Therefore, in this paper we claim that REScoops are in a relatively good position to take certain measures and succeed in persuading customers to lower their energy consumption level and promote the uptake of RES. However, under what conditions and how do they exploit this relative advantage? To address this issue one might want to look into strategies, tools, instruments and incentives REScoops deploy, and the experiences on implementing them.

In this paper, therefore, the research question is, 'Which interventions and policies do REScoops use to persuade their members to lower energy consumption and invest in renewable energy?' We will answer this question by making an inventory and analysing practices in REScoops across six EU nation states. Next to making a general inventory we will present illustrative case studies to provide a more genuine insights on the scope and practice of REScoop intervention strategies. This results of this study derive the EU-Horizon 2020 project "REScoop Plus" (REScoop.eu, 2016a). It is a follow-up project from the EU-FP7 "REScoop 20-20-20" project, in which capacities, organization, business cases and best practices were explored. "REScoop Plus" seeks to implement and measure best practice interventions from the "REScoop' project, and seek empirical evidence to support claims on the assumed advantages of these measures (REScoop.eu, 2015).

In the next section we will address, conceptualize and define REScoops and address their role viz. lowering energy consumption and targeting adoption of renewable energy among householders. In section 3 theoretical approaches on intervention strategies and (policy) instruments viz. energy consumption and investment in renewable energy among householders will be presented. In section 4 the research design and methodology of this study will be presented. Section 5 presents the results, addressing both an overview of incentives used by REScoops and illustrative cases on implementation practices, and to some extent effects. The paper ends with a conclusion and suggestions for a future research agenda.

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2. REScoops

REScoop.eu, the umbrella organization of European REScoops (https://rescoop.eu/) [REF], defines renewable energy cooperatives as groups of citizens who organize themselves to collectively take action to foster the use of renewable energy and increase energy efficiency standards. The International Cooperative Alliance (http://ica.coop/) defines a cooperative as an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise [REF]. Characteristic for cooperatives are seven principles that have been outlined by the International Cooperative Alliance (Alliance, 2016): (1) voluntary and open membership; (2) democratic member control; (3) economic participation through direct ownership; (4) autonomy and independence; (5) education, training and information; (6) cooperation among cooperatives; and (7) concern for the local community.

A cooperative is a legal entity owned and democratically controlled by its members. The legal entity is laid down in private law, and the exact form differs per country. REScoop.eu refers to REScoops as a business model in which citizens jointly own and participate in renewable energy or energy efficiency projects (REScoop.eu, 2016b). Alternative names are "community power" or "community energy initiatives". For REScoop.eu REScoops do not necessarily require the legal statute of a cooperative, but rather distinguish themselves by the ways in which they handle their business. This particular way of doing business refers to the seven principles of the International Cooperative Alliance

2.1. Arguments why REScoops are in a relatively good position to stimulate energy saving among householders

In drawing lessons from best practices (T. Hoppe, A. Graf, B. Warbroek, I. Lammers, and I. Lepping., 2015; Hufen & Koppenjan, 2015), REScoop policy documents (REScoop.eu, 2016b) and the academic and professional literature (Bauwens, 2016; Van Der Schoor & Scholtens, 2015; G. Walker, 2008; Gordon Walker & Devine-Wright, 2008; G. Walker, Devine-Wright, P., Hunter, S., High, H., & Evans, B. , 2010) nine arguments are formulated why the REScoop model in energy supply can be an important contributor to reduce energy use by their members (TUN, 2016a).

2.1.1. The scale level argument

A first argument would be that REScoops are in a good position to stimulate energy saving. This is related to the scale level of these activities, which is mostly on the local level, a level of operations close to citizens. Even if REScoops are national organizations they often work with locally organized groups. In the literature on local sustainability often the argument of proximity to citizens is used as an argument to take measures at a lower geographical level (Coenen, 2009). The REScoop model provides a good scale to run relevant local energy efficiency projects, such as investing in thermal insulation of dwellings, and that this would be a source of inspiration for others, including non-members (TUN, 2016a).

2.1.2. The capacity and critical mass argument

Implementing and using measures and equipment to save energy takes a lot of time and requires both technological expertise and bureaucratic competence (e.g., to grant legal permits or subsidies). Sharing experiences, not reinventing the wheel for oneself, and the advantages of participating in activities together (in terms of costs or time) add to the capacity for action. For REScoops it means that by

facilitating consumers with measures like technological advice, administrative support, or upfront investments, a larger group of consumers can be motivated to actually participate in energy saving activities. However, without these forms of support people would also be able to save energy by themselves, but in practice it would only be done by those who are already highly motivated, knowledgeable, administratively competent, having sufficient time available, and being prepared to take certain risks (Bauwens, 2016). Related to the argument of capacity is the argument of critical mass. REScoops are in a good position to contribute to energy savings because they have a certain critical mass to acquire the necessary expertise and motivate and assist citizens who are less motivated than those who are devoted to pursue sustainability goals (TUN, 2016a).

2.1.3. The social network argument

REScoops are in an excellent position to share and link their activities – including their energy saving actions - with other local actors like schools, sport clubs, local business firms and housing associations. These organizations also have a stake in the energy and low carbon debates and are willing to take their own responsibility (Gill Seyfang, Park, & Smith, 2013). REScoops do not pursue profit maximization and often have similar idealistic and collective, community goals. Moreover, given their expertise REScoops are often viewed by the other local organizations as good partners to cooperate with in energy and low carbon projects (TUN, 2016a).

2.1.4. The awareness raising and education argument

REScoops are in a good position to make consumers more aware of energy use. They can educate the larger community on the importance of energy efficiency by organizing and showing visible pilot projects in public buildings such as office buildings and schools, but also in individual consumer projects, and for instance the local community building (T. Hoppe, A. Graf, B. Warbroek, I. Lammers, and I. Lepping., 2015). Becoming a member of a REScoop makes consumers more aware of the importance of using energy than just being a passive consumer of a traditional energy supplier. One of the main hypotheses underlying the REScoop Plus project is that households that become members of REScoops will 'automatically' reduce their energy use, as they become more aware of the importance of energy (as communicated via the social network of the REScoop). Energy, then, becomes a more important issue to the consumer and his household, and as they become more conscious they are bound to waste less energy (TUN, 2016a).

2.1.5. The social norms argument

REScoops are not only in a good position to make consumers aware of energy use, but they - as active member organizations - also tend to set to energy saving as a social norm; viz. energy not only becomes a significant issue to the consumer and his/her household, but relative energy use and savings become less anonymous actions once users share their experiences with peers (W. Abrahamse, Steg, Vlek, & Rothengatter, 2007; W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005). In this sense, REScoop energy saving goals and average group energy saving behavior can become an element of goal steering, as a reference point for behavior (TUN, 2016a).

2.1.6. Trust

REScoops are in a good position to generate trust towards citizens for them to take measures themselves and invest in energy efficiency or RET appliances. This is especially important if these activities involve financial risks to be taken by the consumers in terms of making investments. Investments in thermal insulation, buying energy efficient appliances or putting solar panels on rooftops all involve risks in terms of return on investment for the consumer but might also involve radical change in the way of consumption. Dealing with REScoops, who are often viewed as a very trustworthiness partner (by local partners and citizens) to give advice, supply energy systems and

appliances, might make people more willing and able to take investment risks (TUN, 2016a; G. Walker, Devine-Wright, P., Hunter, S., High, H., & Evans, B. , 2010).

2.1.7. Tailoring energy saving to where it is needed.

REScoops are in a good position to target energy savings where it is most needed by the target groups or most efficient to work on because REScoops are in not-for profit organizations. Low income households (in particular social housing tenants) often live in poor thermally insulated dwellings and have to spend a considerable amount of their disposable income on energy expenditures. From a societal perspective it is worthwhile to foster energy savings in this target group (Boardman, 2013). It creates a win-win situation: it contributes to the solving or mitigating the issues of energy poverty and energy injustice, and offers a large potential in terms of energy savings, e.g. contributing to low carbon goals (TUN, 2016a).

2.1.8. The commons argument

In particular cases (like 'energy islands') the commons argument in sustainable energy production might occur. Commons are natural resources which are accessible to all members of a given community they are not privately owned and therefore can potentially be consumed by all of them, which presents the risk of over-exploitation and depletion of the natural resources pool (Hardin, 2009). Research shows that participating in decision-making related to sustainable consumption makes people more willing to cooperate in implementation actions and contribute to attaining energy efficiency goals (Coenen, 2009). But saving energy by individual consumers also makes it possible that more people can make use of the available renewable energy production (TUN, 2016a).

2.1.9. Balancing interests and social acceptance for renewable energy

REScoops are also in a good position when it comes to dealing with NIMBY problems, many of them having been limited in their actions by strong local NIMBY problems (Oteman et al., 2014). They can balance social, economic and environmental issues in particular situations very well because they are locally oriented and do not have profit goals, and can therefore integrate the environmental impact of the applied renewable energy production in their decision-making processes. As not-for profit organizations they can look differently to projects that might have good social and economic terms but may be harmful in social and environmental aspects (Bauwens et al., 2016). REScoop.eu also supports the REScoop model with direct citizen participation because they believe that it fosters social acceptance for renewable energy. Participation in decision-making leads to fewer NIMBY problems (Coenen, 2009).

3. Theory on intervention strategies and policy instruments

3.1. Factors influencing household energy consumption

Household energy consumption is determined by six factors: socio-demographics (e.g., income, age), climatic factors (e.g., temperature, wind power), economic factors (e.g., consumer pricing of energy, purchasing power), technology (e.g., energy efficiency of household appliances), the living condition (e.g., household size, dwelling type), and the energy supplier (e.g., the exergy content of the energy carrier) (Fuchs & Lorek, 2000). The determinants presented are influenced by both institutional factors (e.g. governmental policies) and cultural developments (e.g. emancipation, increasing the mobility of women). Demographic factors like attitudes, the living situation but also the use of technology and the kind of energy carriers and the distribution of wealth are all examples of the influence of cultural developments on the other determinants. Especially institutional factors influence the existing and magnitude of the determinants. For example, the government can influence spending patterns, set standards for energy efficiency of household appliances and dwellings, can stimulate innovations, etc.

REScoops cannot directly influence cultural developments, but can be viewed as part of a cultural development itself (e.g., citizen empowerment in energy issues). Institutional factors (e.g. law, governance, policy) can only be influenced by REScoops through lobbying, networking and by conducting research.

3.2. Interventions

A great number of interventions has been developed targeting behavioural determinants to lower household energy consumption. In the academic literature there are basically two traditions that cope with these interventions. First, there is a literature on behavioural intervention strategy. It has a background in environmental psychology (W. Abrahamse et al., 2007; W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Frederiks, Stenner, & Hobman, 2015; Gardner & Stern, 1996; McCalley & Midden, 2002). Second, there is a literature on policy instruments and strategies, having a disciplinary background in policy studies. One of the differences between the two traditions is that the psychological interventions in energy saving are often brought about by experimenters. Many of the behavioural interventions do not take place in a policy setting, but in an experimental setting were the experimenter tries to study the effect of an intervention to test a theoretical claim (while holding background conditions stable so that the relationship between two variables can be studied in near optimal conditions; i.e., without interference by other theoretically non-relevant variables). Although an experimenter can be a (local) government, an intervention in a policy setting means that the achievement of a policy goal in relation with an identified societal problem is targeted by the government.

To achieve a policy target certain activities are undertaken that are assumed to contribute to the achievement of the goal. Goals are intended policy effects that are considered desirable (from a societal perspective) to be achieved. Results are assessed in terms of policy effects, with the question whether the intended effect(s) have actually been achieved. Indicators are used to measure to what extent the desired effect took place. The relation between the policy instrument/incentive and the goal is also based on an assumption. Namely the assumption that a certain policy measure leads to a certain policy effect(s) (goal). In a policy evaluation the testing of this assumption (as part of the policy theory) will be part of the explanation to what extent goal achievement has been (not) achieved. In a policy setting experiments are also used, but it is much more difficult to withhold a certain benefit or positive effect from a target group on society than in an academic experiment (for ethical reasons). If the assumption of how a policy instrument works is based on behaviour there is a lot of resemblance between the two strands of literature. In both it is about people adjusting their energy consumption behaviour. The difference is who and how either in the decision context the payoff structure is changed or voluntary behaviour change is targeted.

3.3. Interventions in the psychological tradition

In psychology interventions are actions performed to bring about change in people. One type of intervention strategies exists that is directed towards activities to modify behaviour. Behavioural interventions may be aimed at (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005), viz. (i) voluntary behaviour change, by changing individual knowledge and/or perceptions; and (ii) changing the contextual factors (i.e. the pay-off structure) which may determine households' behavioural decisions. In this paper we focus on what can be called micro-level factors and not the macro-level or structural factors. These factors together with institutional factors and cultural developments influence the motivation, preferences, attitudes and opportunities and abilities of households to save energy. Behaviour related to household energy saving can be divided into two types of behavioural change

(Gardner & Stern, 1996): (i) efficiency behaviour as a one shot action or decision to save energy (for instance buying energy efficient equipment or the insulation of houses); and (ii) curtailment behavior with repetitive efforts to save energy (for instance lowering the temperature in a room by changing the thermostat).

Abrahamse et al. (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005) use a taxonomy for behaviour change interventions first issued by Geller et al. (Geller et al., 1990) which addresses antecedent and consequences strategies. Antecedent strategy tries to influence one or more behavioural determinants prior to the performance of energy saving behaviour. Examples are goal setting, commitment, information provision, and modelling. On the other hand, consequences strategy tries to influence behavioural determinants after the occurrence of the energy saving behaviour by providing a consequences feedback on outcome after the occurrence of the behaviour. Consequence strategies – i.e. offering rewards, or providing feedback - are based on the assumption that the presence of positive or negative consequences will influence behaviour, because it will make energy saving more attractive.

In inventory of literatures conveyed the use of the following interventions and strategies (sub-divided into antecedent and consequence strategies). Background information on the interventions mentioned can be found in Appendix A.

Antecedent strategies:

- Commitment (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Frederiks et al., 2015; Steg & Abrahamse, 2010);
- Goal setting (W. Abrahamse et al., 2007; W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Steg & Abrahamse, 2010);
- Information (W. Abrahamse et al., 2007; W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Brandon & Lewis, 1999; Frederiks et al., 2015; Leth-Petersen & Togeby, 2001; Gill Seyfang et al., 2013; Steg, 2008; Steg & Abrahamse, 2010);
- Media (W. Abrahamse & Steg, 2011; W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Burchell, Rettie, & Roberts, 2016; Frederiks et al., 2015; Gill Seyfang et al., 2013);
- Workshops (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Gill Seyfang et al., 2013);
- Combinations of incentives / 'REScoop membership packages' (Burchell et al., 2016; Steg & Abrahamse, 2010);
- Guidelines (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Burchell et al., 2016; De Almeida, Fonseca, Schlomann, & Feilberg, 2011; Frederiks et al., 2015; Gill Seyfang et al., 2013);
- Monetary rewards (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Steg & Abrahamse, 2010);
- Tariffs (Darby, 2006; Frederiks et al., 2015; Steg, 2008);

- Energy services offered (W. Abrahamse et al., 2007; Bauwens, 2016; Frederiks et al., 2015; Leth-Petersen & Togeby, 2001).

Consequence strategies:

- Direct feedback (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Brandon & Lewis, 1999; Burchell et al., 2016; Darby, 2006; Fischer, 2008; Hargreaves, Nye, & Burgess, 2010; Schultz, Estrada, Schmitt, Sokoloski, & Silva-Send, 2015; Gill Seyfang et al., 2013; Steg, 2008; Steg & Abrahamse, 2010);
- Indirect feedback (W. Abrahamse et al., 2007; W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005; Brandon & Lewis, 1999; Darby, 2006; Fischer, 2008; Leth-Petersen & Togeby, 2001; Gill Seyfang et al., 2013; Steg & Abrahamse, 2010).

Feedback appears to be an effective strategy for reducing household energy use (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005). The more frequent the feedback is given, the more effective it is. Combining comparative feedback with rewards in a contest is also considered effective. Combining feedback with goal setting resulted in reductions in energy consumption (McCalley & Midden, 2002), especially when combined with a setting a difficult goal it proved to be successful. Many studies have shown that a combination of strategies is generally more effective than applying one single strategy. However, confounding of effects makes it more difficult to determine which strategies actually contributed to the overall effect. More systematic research on the effectiveness of interventions under various circumstances would be advisable in this respect (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005).

Next to focusing on interventions themselves, attention is also needed to address situational factors like laws, regulations, neighbourhood factors, dwelling size, household size, household income, employment status of household occupants, ownership, stage of family life cycle, geographical locations, and personal comfort. Studies show that they all correlate significantly with household energy consumption (Frederiks et al., 2015).

3.4. Policy instruments and behavioural assumptions

Although REScoops are not governmental organizations there is an analogy between the activities of REScoops to let their members save energy and invest in RET, and the use of public policy tools. Public policy is made by governments and organizations which act on behalf of governments. Public policies are legitimized by elected politicians' decision making.

Governments use policy tools or instruments to influence citizen behavior and achieve policy goals (Dahl & Lindblom, 1953). Therefore government policies use implicit or explicit behavioral theories (i.e. to help them in making assumptions and scenarios on how a certain target group is likely to respond to the implementation of a certain policy incentive). How citizen behavior is influenced and in what way policy goals are achieved is based on assumptions. In their classic article on behavioral assumptions of policy tools Schneider and Ingram (Schneider & Ingram, 1990) state as a basic assumption that public policy almost always attempts to get people to do things that they might not otherwise do; or it enables people to do things that they might not have done otherwise. Policy goals are intended effects. For policies to have these intended impacts on society, a large number of people in different situations must make decisions and take actions in line with these intended impacts. The

intended impacts on society can be reached if people comply with set rules, behavior following given incentives or self-initiated actions that contribute to goal achievement. Therefore a framework for describing policy tools that emphasize behavioral characteristics must proceed from a theory of individual decision and action (Schneider & Ingram, 1990). The individual consumer level is a level that cannot be reached by policy tools like voluntary agreements and permit trading systems. These instruments ask for an organized target group that government can address, like companies organized in business organizations. Consumers are a target group that can be difficult to reach (Bressers & Ligteringen, 1997) by these type of collective agreements.

Schneider and Ingram (Schneider & Ingram, 1990) who distinguish five reasons why people are not taking actions and that can be addressed by policy: they may believe the law does not direct them or authorize them to take action; they may lack incentives or capacity to take the actions needed; they may disagree with the values implicit in the means or ends; or the situation may involve such high levels of uncertainty that the nature of the problem is not known; and it is unclear what people should do or how they might be motivated. Policy instruments address these problems by: (a) providing authority; (b) proving incentives or capacity; (c) by using symbolic and hortatory proclamations. Next, Scheider and Ingram (Schneider & Ingram, 1990) distinguish five types of policy instruments:

- *Authority tools*, which are statements backed by the legitimate authority of government that grant permission, prohibit, or require action under designated circumstances;
- *Incentive tools* are tools that rely on tangible payoffs, either positive or negative, to induce compliance or encourage utilization.
- *Capacity tools*, which are tools that provide information, training, education, and resources to enable individuals (or groups and agencies) to make decisions or carry out activities.
- *Symbolic and hortatory tools* motivate people to take policy-related actions on the basis of their beliefs and values. A hortatory is a person or thing that strongly requests someone else to take a particular action.
- And finally, *learning tools*, which promote learning about the problem and the knowledge and uncertainty about both the problem and the action to be undertaken.

3.5. Combining behavioural interventions and policy tools; an analysis framework

We suggest to combine insights from the behavioural and policy oriented literatures. We also combine the fundamental difference between antecedent and consequences strategies and the subcategories within these two behavioural strategies with the distinguished policy tools that affect these subcategories. The framework applies to REScoops. Hence, interventions and measures were selected and inserted, which we believe are relevant to REScoops. See Table 1 for an overview.

The framework takes into account that REScoops cannot use all types of policy tools (and neither in all circumstances). In the first place this depends on how a REScoop tries to influence the individual behavior of REScoop members. Directly through the use of incentives or indirectly by influencing the context which the behavior decision is taken. Sanctions are not relevant to REScoops. For direct influence they need rewards to motivate households with individual tangible payoffs, although withholding a payoff in the form of a reward can also be considered a sanction. Indirectly REScoops can influence the context in which the energy saving decision is taken by using capacity tools. Through information or knowledge tools REScoop members can be persuaded to alter their energy consumption behavior because they are confronted with new facts, information or knowledge. The situation in itself has not changed. Whatever kind of information (knowledge, arguments, and moral appeal) is transferred and through what mechanism (encouragement, persuasion, etc.) the behavior

change is still voluntary. This also means that the provision of information does not always lead to a change in energy use behavior, because it is up to the REScoops member to act on basis of the information.

Table 1. *Presentation of integrated intervention framework*

Antecedent strategies

Intervention	*Type of policy instrument*	*Goals and incentives*
Commitment	Symbolic and hortatory tools	Promotion as high priority issue
		Associated with positive symbols, labels, images, and events
Goal setting	Symbolic and hortatory tools	Consistent with own beliefs, values and preferences
Information	Capacity tools	Information to support decision-making
Modeling	Capacity tools	Information to support decision-making
Tariffs	Incentive tools	Inducements
Collective purchasing	Incentive tools	Inducements
Services	Incentive tools	Inducements

Consequence strategies

Intervention	*Type of policy instrument*	*Goals and incentives*
Feedback	Capacity tools	Information to support decision-making
	Leaning tools	Information to reconsider behavior
Rewards	Incentive tools	Inducements
		Charges

4. Methods

The research approach used in the study on which this paper is based combines different types of case study research designs. First, an inventory on interventions and strategies used by REScoop federations in six EU nation states was made. Second, in-depth illustrative case studies were conducted to shed light on the actual meaning, and experiences with implementation of particular (combinations of) interventions.

4.1. Case selection and research preparation

The inventory work presented in this report is based on desk research, a literature review, and on primary data collected among experts. The point of departure concerns the existing practice of REScoops in Europe on the basis of the activities of the participating REScoops federations or their representing organizations in the project consortium. They are: Coopernico (Portugal), Enostra (Italy) Ecopower (Belgium), Enercoop (France) EBO (Denmark), SEV (Italy) and SOMenergia (Spain). All federation are participating members in the EU-Horizon 2020 project 'REScoop PLUS'.

4.2. Data collection

Experts from these REScoops were contacted, completed a questionnaire, were interviewed (via Skype) and attended two expert workshops to discuss the (preliminary) results. After a selection process they contributed with factsheets which contain information on certain illustrative measures (some of these we present as illustrative case studies in this paper). Following collection of the factsheets interviews were conducted (via Skype) to gain more information on the experiences, background, context and use of the interventions. During the expert workshops the illustrative intervention case studies were also discussed in an interactive setting. Practitioners from other REScoops and academic experts were involved in both the inventory study and at the expert workshops.

4.3. Data analysis

Data analysis concerning the inventory study of interventions used the classification of the interventions and strategies that were retrieved during the data collection phase, using the interventions classification presented in sections 3.3 and 3.4. Empirical data are reflected upon using the conceptual classification. This allowed us to gain a better overview and scope of the interventions and strategies used by REScoops in six EU nation states. Data analysis on the illustrative case studies concerned reconstruction of the concept, use, target group, and working process (i.e., 'policy theory' of the instrument), next to presenting key experiences with them. In Appendix B a questionnaire is presented on the concepts used to get more detailed background information on the interventions used. Two illustrative case studies will be presented. Interventions and tools are presented to provide a broad overview using classification of intervention and tools. Measures implemented by French REScoop federation Enercoop were selected, because they cover the scope of the instruments' spectrum. In addition, an illustrative case study is presented of a REScoop presenting a wide set of interventions (LochemEnergie, from the Netherlands). In this case the focus is on experiences with combinations ('cocktails') of differents (types of) interventions (TUN, 2016b).

5. Results

5.1. Results of the inventory study on interventions used by REScoops

In this section we discuss which type of measures are actually used by the REScoops participating in the REScoop PLUS project, but we do not address the impact and effects of those measures. We define a "measure" as an action that can be taken to contribute to one or more (policy) objectives to overcome one or more identified problems. In the academic literature, "measures" are referred to as "policy instruments". These terms are interchangeable. Here the problem addressed by the measures is energy consumption by the members of the cooperatives or the investment of members of the cooperative in renewable energy production. Measures are related to attaining goals, although one measure can serve different goals. We distinguished the following goals:

1. Investing in RES (producing more renewable energy);
2. Saving energy;
3. Delivering (energy) services to REScoop members (for instance aimed at comfort, repairs, financial benefits, etc.);
4. Enlarging the size of total REScoop membership;
5. Stimulating the green energy transition and climate change awareness raising within and outside REScoop membership.

Strictly speaking we are looking for measures that address the first two goals. However, the other three goals are also important and are even expected to contribute to the attainment of the first two goals.

5.1.1. Antecedent strategies used by REScoops

Table 2 reveals a large variety of communicative antecedent strategies used by REScoops. More than 16 of these were identified. Most commonly used anatecent intervetions concerned awareness raising, education and behavioural change campaigns. Information (newsletters, social media, etc.), and (local) ambassadors were also used but more infrequently.

Table 2: *Overview of communicative antecedent strategies used.*

Social and communicative measures mentioned by the REScoops
•awareness raising, 6x
•behavioural change campaigns, 3x
•use of 'ambassadors', 2x
•use of process managers, 0x
•education, 5x
•tailor made advice, 2x
•fossil free project (with citizens), 1x
•'TupperWatt meetings', 1x
•coaching, 1x
•customers service provision evaluation, 1x
•newsletter, Facebook, website, adds, articles, 2x (but probably more...)
•conferences, 1x
•helpdesk with tutorials, 1x
•social networking platform, 1x
•participation in 'locale' (meeting by housing associations, etc.), 1x
•competitions (e.g., between kindergartens of schools), 1x

Table 3 reveals that eight different incentivized antecedent strategies were use. Most commonly used were the use of transparent and single pricing (of renewable energy sold to householders), the use of simple tariffs, and collective purchasing. Boni, giving out shares and lending of money were used only incidentally. The infrequent use of economic incentives might point to the fact that many of the REScoops observed were in the phase of starting off and experimenting with local projects and related business models. The latter would obtain one or more incentives. Finally, it is surprising that only one REScoop federation mentioned giving out shares as an incentive, since this principle basically forms a key part of the key principles of c-ooperatives.

Table 3: *Overview of incentive tools used by the REScoops.*

Economic incentives
•transparent and single prince, 3x
•simple tariffs, 3x
•bonus systems, 1x
•joint/collective purchasing, 2x
•differentiation between retailers, 1x
•give out shares in social capital RESCOOP, 1x
•lend money to members (to get distr. heat.), 1x
•agreements with RES/EV resellers to obtain specific offers, 1x

5.1.2. Consequence strategies

Eight different consequences strategies were deployed by REScoops, covering both direct and indirect feedback tools (see Table 4). At least half of the REScoop federations surveyed conveyed the use of consequence strategies, i.e. electronic billing, using online client accounts, smart metering, and organizing energy audits. As may be expected with consequence strategies all tools and interventions used were technical or technology supported, often using smart (ICT) technology. Feedback by humans (REScoop staff) appears to mostly happen indirectly, i.e. via billing, via online accounts of via a web-based platform. There was no mentioning of group-wise feedback or learning systems.

Table 4: *Overview of (technicaI tools using consequences strategies used by REScoops).*

Technical measures:
•measuring devices, 2x
•energy audit, 3x
•electronic billing, 3x
•online client account, 4x
•smart metering, 3x
•apps providing feedback on energy consumption using smart phones, 1x
•web-based platform to manage smart grids, 1x
•installation of RES production devices, 1x

5.1.3. Motivational drivers REScoops have to intervene

Next to exploring the interventions and tools REScoop federations used we were interested in retrieving the motivations they have that legitimate the selection and implementation of these instruments. The motivational drivers mentioned most frequently (in five out of six observations) were

'contributing to a transition to a low carbon energy system' and 'to generate more energy efficiency (hence, energy savings) for householders'. Other motivations mentioned concerned 'regulation' (i.e. national regulation which was considered too restrictive by REScoop federations, and their actions can be viewed as a response to them), 'empowerment of REScoop members' and fair and accessible energy for everyone'. In sum, motivational drivers encompass pro-environmental arguments, equity arguments on energy availability and affordability, local community empowerment arguments, and a response to government regulations which are concerned too restrictive.

Table 5: *Overview of motivational drivers REScoops have.*

Motivational divers REScoops have
•transition to a low carbon energy system; 5x
•Regulation; 2x
•fair and accessable energy rates to all; 2x
•energy efficiency for members/households; 5x
•Communicate to members in an understandable way; 1x
•to make sure the members act (themselves; empowerment); 2x
•promote environmental awareness; 1x

5.1.4. Instruments used to influence the context of REScoops

Next to implementing tools and interventions to target their members REScoops also use and engage in instruments that target the institutional environment in which REScoops are operating. Results reveal that half of the REScoop federations engage in contracts or covenants with either public or private actors. Furthermore, two REScoop federations conveyed to be active in EU innovation projects (other than the REScoop PLUS project itself; see Table 6). Therefore, we can conclude that at least of the REScoop federations are actively engaging other stakeholders in either contracts, covenants, partnerships, alliances or innovation project collaboration in order to get a more favorable position in which they can operate.

Table 6: *Overview of bi- and multilateral agreements that REScoops have.*

Bi- and multilateral agreements:
•covenants/contracts with public and/or private actors, 3x
•collaboration with national Climate Alliance, 1x
•partnerships with ngo's or business firms, 1x
•protocols with Social Solidarity Private Institutions (IPSS), 1x
•Part of EU projects (e.g., MECISE European Project; PV Financing European Project; CitizEnergy European Project to promote crowdfunding platform; Empowering), 2x

5.2. Illustrative case studies

To get a better insights in the actual interventions and tools REScoops deploy an inventory was made of interventions and tools of REScoops deemed successful in stimulating energy savings among REScoop members and generating investments in RET projects (See Appendix C) (TUN, 2016a). The overview revealed that the majority of the measures (13 out of 15) at least contain elements of antecedent strategies. A lower number, but still the majority of measures implemented (8 out of 15) contain elements of consequence strategies (i.e. some form of feedback on householder's energy consumption). Roughly half of the measures implemented involved co-implementation by other ones as well. Hence, they were implemented in combination to each other, i.e. as 'cocktails' (using the REScoop.eu jargon). Outcome of the measures implemented concerned: awareness raising (7 out of 15 measures), energy savings (5 out of 15 measures), investment in RES project (5 out of 15 measures). Other desired outcomes concerned training in using equipments, professionalization, attracting new REScoop members, and increasing householder's experience with RE or energy efficient technology. Strikingly, few of the measures were systematically monitored and evaluated. Exemptions concerns the Isernia project (in Isernia and L'Aquila in Italy) in which smart metering led to a 7% reduction of energy consumption among householders being REScoop members (which was 4% more than the control group). Monitoring and evaluation, however, was revealed to be set up by more REScoop federations recently, and therefore did operate less systematically and infrequently. Some of these measures show promising signs, i.e. the Dr. Watt training package offered by French REScoop federation Enercoop revaled an average potential saving of 40% of all the electricity consumption of the devices measured householders (during the period in which the training was given).

To get more insight in the use of these interventions and tools two case studies are presented: (a) the interventions and tools used by the French REScoop federation *Enercoop*, and (b) the interventions and tools used by the Dutch REScoop *LochemEnergie*.

5.2.1. Enercoop

Launched in 2005 by French ecological and ethical business organizations, Enercoop is a 100% cooperative green energy supplier. In 2015, it had a total of 15,000 members, and 22,000 consumers. In addition to selling green electricity, one of the main objectives of Enercoop is to decentralize energy production so as to give every citizen the opportunity to get involved in the energy transition. By supporting the emergence of new local REScoops since 2009, Enercoop is fostering a network of cooperatives within which every citizen can invest and participate (TUN, 2016a). Enercoop started with the creation of one cooperative but has now become a network of 9 local cooperatives that allow citizens to reconnect with the challenges of the energy transition on a regional level. Enercoop can be viewed as one of the more experienced REScoops in Europe, alongside the likes of Ecopower and ODE. Enercoop has deployed a number of successful interventions and tools to spur energy savings among its members and spur investment in its RET projects, viz. 'TupperWatt' meetings, the 'Dr. Watt' self-diagnosis instrument, and the 'Energie Partagée' citizen investment fund. (Ibid.)

5.2.1.1. 'TupperWatt' meetings

Tupper Watt meeting are arranged and led by a member of the cooperative in a pleasant and friendly space (in his home or in a public space like a coffee shop) with their peers where they will introduce Enercoop, our values and more topics revolving around the energy transition. It is a good way to have a direct testimony by a member of the Rescoop. Inspired by the Tupperware company in the 50's who decide to start offering this products via mail order companies and direct selling. So called "tupperware meetings" were introduced, where small groups of people were given product

demonstrations and could place orders afterwards. Therefore the "tupperWatt meetings" are a tool for the members who want to be more involved in the Rescoop's activities and coincides with our will to put the citizen at the centre of energy issues (TUN, 2016a). This kind of meeting is perfect to be consistent with our communication strategy: not too much advertising, creating social links within a community, and experience sharing. The tool – like many antecedent strategies – targets awareness raising among REScoop members and persuading non-members to join in. Indirectly the tool serves to stimulate energy savings as well as investment in RES (Ibid.).

5.2.1.2. *The 'Dr. Watt' self-diagnosis instrument.*

Dr Watt is a training course to help consumers make a self-diagnosis of their specific electricity consumption. The aim is to help individual consumers to reduce their energy consumption by providing the tools to measure their consumption and understand it, and by reducing energy consumption while maintaining the same comfort level via tailor made advices offered through software (also entitled 'Dr. Watt'). Since 2013, Enercoop experiments the possibility for consumers to measure and save energy. The initiative came from the will to ensure energy efficiency on the long term by actually training individuals on how to measure and understand their energy consumption and by that, empower themselves (TUN, 2016a). Training sessions involve a three step approach: (a) training with an energy expert; (b) doing the self-diagnosis using a technical measurement tool (the 'Watt metre') for all in-door electrical appliances, and assisted by software; and (c) by organizing a 'feedback meeting' in which an experts analyses the collected data and addresses household consumption patterns individually, but in a group setting to allow for social dynamics, experience sharing and learning. In a later stage this is enabled online via the 'Dr. Watt' software platform. The approach encompasses the online training tool, advertisement and awareness raising media, group meetings, as well as technical measuring tools. Moreover, before each meeting participants are subjected to awareness raising by Enercoop (in which multiple media are used: e.g., newsletters, social media). 'Dr. Watt' can be seen as an approach using a broad scope of both antecedent and consequence strategies. Since 2013 experiments with the tool were organized in three local cooperatives of the Enercoop network. More than 20 training sessions were organized. According to participants potential energy saving run up to 40 % of all the electricity consumption by the households participating (Ibid.).

5.2.1.3. The 'Energie Partagée' citizen investment fund

This tool is used by Enercoop to stimulate investment in RES project by REScoop members. *Energie Partagée* was created to promote the development of local renewable energy and energy efficiency projects, controlled and financed by citizens. It is organized in two complementary structures: an association of experts from different fields (technical, coordination, and financial) and a fund to invest in developed projects and more recently to partially finance development phase (2016)(TUN, 2016a). It was developed in response to legislation that did not allow Enercoop to raise capital from the public without a "regulatory visa" to invest in production units. Moreover, for a while Enercoop could not buy and sell electricity benefiting from the feed in tariff because it was a monopoly for the electricity supplier EDF. In 2010, *Energie partagée* was created by Enercoop and other partners, so as to raise awareness towards citizen energy and the fund was created to complete capital requirement of new renewable energy projects controlled by citizens. The main activities are: awareness raising towards citizen energy by promoting the concept of citizen energy and mobilization of citizen investment; to support citizen led projects with expertise and methodological support through each phase of the project; and to finance citizen-led projects (the projects are selected according to a local charter). Experiences thus far reveal that the approach met considerable success. As per 2016 there are 4312

subscribers, and more than 11 million euros investment fund was raised. Thus far, over 4 million euros have been invested in 23 projects (Ibid.).

5.2.2. LochemEnergie

LochemEnergie is a citizen-led energy cooperative in the Netherlands. It is one of the most well-developed and professional REScoops in the country, and has 725 members. All members pay annual membership fees. LochemEnergie produces and sells locally produced energy, more specifically electricity from four solar parks located at multiple sites within the Lochem municipality. LochemEnergie is also working on multiple RES projects including solar projects at schools, a local swimming pool, a wind energy project. Energy is sold to 320 clients. LochemEnergie has more than 45 volunteers that work on the RESoop's operations (TUN, 2016b).

LochemEnergie used a broad array of measures that can be viewed as interventions targeted at directly or indirectly persuading their members to lower energy consumption of invest/adopt RES. A list of all measures used by LochemEnergie is presented in Table 6. It reveals that LochemEnergie deploys a great amount of different interventions. However, they are mostly antecedent strategy interventions. The consequence strategy interventions (e.g. Smart Metres) were mostly planned but were hardly or not implemented yet. Many interventions were implemented in combination with others (TUN, 2016b).

Table 7: *Overview of interventions and measures used by LochemEnergie.*

Measure/service	**Type of measure/classification**	**Percentage of REScoop members participating in /using the measure**
(Renewable) Energy supply	Antecedent strategy	60%
Information provision via website REScoop	Antecedent strategy	86%
Information provision via newsletter	Antecedent strategy	91%
Smart metre installation	Antecedent strategy/with consequence strategy when smart metre is installed.	49%
Energy monitor installed in electricity box	Antecedent strategy	45%
Information offered regarding installation of solar panels on rooftop	Antecedent strategy	44%
Information offered regarding rental of solar panels	Antecedent strategy	23%
Neighbour bonus for energy savings	Reward system; Antecedent strategy	14%
Investment in solar panels for rental property	Antecedent strategy	17%
Promotion and tailored support regarding purchasing or renting of EVs	Antecedent strategy	5%
Investments in preparation trajectory of wind energy project	Antecedent strategy	20%
Neighborhood meetings	Antecedent strategy	42%

Workshops	Antecedent strategy	52%
Information meetings	Antecedent strategy	55%
General assembly	Antecedent strategy	62%
Excursions	Antecedent strategy	14%
Participation regional and national REScoop meetings	Antecedent strategy	13%
Participation in working groups	Antecedent strategy/Consequence strategy	49%

Results from a survey organized by LochemEnergie and TUN (N = 65) reveal that active REScoop members lowered energy consumption by more than 20% over a five year span (TUN, 2016b) (however, this is to some extent also positively related to climatic conditions; i.e., soft winters in the period under study). Savings were mostly achieved in consumption of natural gas. Energy savings in electricity consumption were lower. Saving energy on gas consumption (used for heating spaces, cooking, heating water, etc.) appears to be more easily done than to save energy in electricity consumption (used for electrical home appliances, domotica, etc.). Although energy savings realized cannot be attributed to the implementation of particular (combinations of) interventions. Although the questionnaire involved multiple items on investment in RES, only a few respondents mentioned actual investment (and related monetary values) (Ibid.).

LochemEnergie members state that the REScoop enables community building, strengthens social cohesion and supports the development of new collaboration modes. Half of the REScoop members conveyed to have undertaken actions in relation to (renewable) energy supply supported through promotion actions and with support of LochemEnergie. More than 30% of the REScoop members reported to be strongly involved in projects organized by LochemEnergie; e.g., solar panels installation, electric vehicle service provision, research or involvement with the energy savings project entitled 'Smart Grid Lochem'. Persons who participated in this particular (innovative) project turned out to also be involved in many other actions organized by LochemEnergie (Ibid.).

6. Conclusions and discussion

This paper started with research question: "Which interventions and policies do REScoops use to persuade their members to lower energy consumption and invest in renewable energy?" We answer the research question by differentiating measures between different types of intervention strategies.

Many antecedent strategies were used by REScoops. Many of the information tools used by REScoops were found to be rather similar to what other energy supplier or governments and NGOs use. The questions is whether REScoops might be better in communicating certain aspects because they might be seen as a trustworthy information source or might be more close to their members (than other suppliers are to their customers). In addition, one can state that a householder becoming a REScoop member can be viewed as a measure or intervention in itself, as coop memberships goes hand in hand with getting a REScoop's shares and sharing norms and commitment to contribute to attaining a given REScoop's goals; i.e., the 'awareness raising and education argument' presented in section 2 (p. 4).

Less consequence strategies were used than antecedent strategies. However, the consequence strategies used varied a lot, and included both direct and indirect feedback tools. Consequence strategies were found to be well supported by online platforms and smart technology (i.e., smart metering). However, many REScoops just on the verge of using feedback tools. REScoops were found to use a lot of technical equipment to provide feedback on energy consumtion to their customers. However this is not only technical equipment (but also uses other feedback mechanisms). The questions are whether REScoops are more progressive than other energy supplier and whether RE

Interventions and tools used by REScoops were found to target multiple goals, e.g., awareness raising, energy savings, investment in RES projects, training householders in using energy equipment, professionalization, attracting new REScoop members, and increasing householder's experience with RE or energy efficient technology. Scoop members are more willing to use this equipment.

Next to instruments directly targeting householders (in the form of REScoop members) REScoops were found to also implement instruments to alter their institutional environment. The study identified multiple of these instruments used; e.g., in contracts, covenants, partnerships, alliances or innovation project collaboration, involving many other public and private actors.

When concerning investment on REScoops' (own) RET projects many REScoops that organize and finance RET projects of their own do not do this only to generate more renewable energy, but also to be able to serve more (future) members with renewable energy, which is considered an important part of their business model. In that sense attracting more cooperative members is seen as an important source to finance and develop new RES projects.

We also found that little systematic monitoring and evaluation actions were organized thus far. The ones that were conducted, however, show promising signs: i.e. the Isernia project in Italy revealed a 7% reduction of energy reduction, participants in the Dr. Watt training program offered by French REScoop federation Enercoop realized up to 40% electricity reduction in the use of home appliances, and (active) members of Dutch REScoop LochemEnergie lowered primary energy consumption by 20% over a five year span after the REScoop started operations in 2010.

Although both theory and the actual interventions, tools and strategies used by the REScoops analysed in this study give promising signs it is too premature to state that those used REScoops are effective in in generating energy savings among householders, and spurring investment in RES project undertaken by REScoops. More systematic (quasi-)experimental interventionist research is required to test claims on these matters. A limited set of carefully selected trials among REScoops should be undertaken. In following Steg (Steg, 2008) and Abrahamse et al. (W. Abrahamse, Steg, L., Vlek, G., Rothengatter, T., , 2005) we have to that previous (queasy-) experimental studies were not always systematically evaluated, and consequently no firm conclusions were drawn on how successful they were. In addition one has to be aware on the confounding of effects: due to the use of combinations of interventions, previous studies met considerable difficulty to establish the contribution of each intervention separately (Ibid.). Therefore, a study on REScoop's interventions should focus on single interventions, or focus (more pragmatically) on the implementation of 'cocktail' interventions, encompassing multiple interventions, typically including both antecedent and consequence strategies.

Finally, comparative studies are advised to test the nine claims on whether REScoops are better positioned than other energy (service) suppliers in providing energy services to local householders. In these studies service provision (and their effects) of REScoops can be compared with the likes of the traditional energy supplying companies, public energy suppliers and that of energy traders.

Appendices

Appendix A: Background information of conceptualization interventions and strategies

Antecedent strategies

- Commitment: In terms of large scale implementation, commitments do not necessarily have to cost a lot of money (in contrast to for instance financial incentives), but they may be difficult to implement when they rely on personal contact. Various studies have found commitment to be effective in encouraging energy conservation. Especially in view of the long-term effects found in several studies commitment may be a successful strategy for reducing household energy use (Steg and Abrahamse, 2010).

- Goal setting: in order for a (difficult) goal to work, households need feedback on how they are performing in relation to the goal. Also, eliciting implementation intentions, in which people are not only asked whether they intend to change their behaviour, but also to indicate how they plan to do so (i.e. reach that goal), appeared to be effective (Steg and Abrahamse, 2010).

- Information: Information tends to result in higher knowledge levels, but not necessarily in behavioural changes or energy savings (Abrahamse et al., 2005). Information is a widely used intervention to encourage household energy savings – its success, however, is rather debatable. It appears that information provision about energy conservation or environmental issues does indeed generally lead to an increase in knowledge, or awareness, but it does not necessarily translate into behaviour changes (Steg and Abrahamse, 2010). The provision of personalised, tailored, information tends to be more effective. An advantage of this approach is that households receive relevant information only. Information provision can also be more effective when it is given in a certain social context. Neighbourhood interactions may be important in this respect, as this may lead to the diffusion of information, and it may help people to develop and establish social norms (see Weenig & Midden, 1991). Sometimes it is more about the community than the energy. However, there are limits to how much civil society-led groups can achieve on their own. In this sense, consistent policy support is essential (Seyfang et al., 2013).

- Media/Mass media campaigns: campaigns analysed by Abrahamse et al. (2005) revealed a slight increase in knowledge, but levels of awareness of the problem remained unchanged. Willingness to behave pro-environmentally increased, but only among those who had already been behaving pro-environmentally before the campaigns. Results in terms of energy saving vary, however when realized they are small. Frequent provision of information after the campaign has ended is necessary to keep householders aware.

- Workshops: Geller (1981) measured the effectiveness of a workshop, in which information about energy-saving measures was given. In addition, each participant received a shower-flow restrictor and a booklet with information about energy conservation. The workshop led to higher levels of concern about the energy crisis, to an increase in knowledge about energy conservation, and stronger intentions to adopt energy-saving measures. Although information did influence underlying determinants of energy use, it did not result in behavioural changes (Abrahamse et al., 2005).

- Combinations of incentives: Combinations of interventions are generally more effective than single interventions. This makes sense to the extent that different people may have different

barriers to change (Gardner & Stern, 2002). A combination of antecedent (e.g., information) and consequence strategies (e.g., feedback) is generally more effective than the individual interventions. Moreover, informational and structural strategies could complement one another (Steg and Abrahamse, 2010). Abrahamse et al. (2007) conducted a study in which a combination of goal-setting, tailored information and tailored feedback were used. After 5 months, households exposed to the combination of interventions saved 5.1%, while households in the control group used 0.7% more energy. However, no difference in indirect energy savings emerged. Households exposed to the interventions also had significantly higher knowledge levels of energy conservation than the control group.

- Guidelines, education, training: Education tends to be associated with increased knowledge, awareness and concern regarding environmental issues (such as energy efficiency), however, higher levels of education generally do not lead certainly and directly to pro-environmental behaviour (e.g., saving energy) (Frederiks et al., 2015).

- Monetary rewards: Monetary rewards may serve as an extrinsic motivator to conserve energy. Rewards can either be contingent on the amount of energy saved, or a fixed amount (e.g. when a certain percentage is attained). Overall, rewards have effectively encouraged energy conservation, but with rather short-lived effects (Abrahamse et al., 2005). Rewards can either be contingent on the amount of energy saved, or a fixed amount (e.g., when a certain percentage is attained). Overall, rewards seem to have a positive effect on energy savings. Results of several studies (e.g. Slavin, Wodarski, & Blackburn, 1981) do however suggest that the effect of rewards is rather short-lived (Abrahamse and Steg, 2010). Effects appeared to be strongest immediately following implementation of the intervention (Slavin et al., 1981). Often rewards are implemented in combination with other incentives like information, reminders, and frequent feedback (Abrahamse et al., 2005). All studies reviewed report significant differences between households who had received a reward and those who had not (Ibid.).

- Tariffs: Studies which examined the effect of giving feedback about the price difference between on- and off-peak hours found this to result in shifts in consumption to off-peak hours, but no difference in overall consumption was found or reported (Heberlein & Warriner, 1983; Sexton et al., 1987; Abrahamse et al., 2005).

Consequence strategies

- Direct feedback: Relevant features of feedback that may determine its effectiveness are: frequency, duration, content, breakdown, medium and way of presentation, comparisons, and combination with other instruments (Fischer, 2008). Most research on direct feedback addresses the engagement of householders with in-home displays (IHDs) on which they can view their energy consumption and can get direct feedback. Ideally, feedback is given immediately after the behaviour occurs, because households need to understand the relationship between the feedback and their behaviour (Geller, 2002). IHDs can support energy consumption reduction, but engagement with IHDs can be limited to men and is often short-term. However results show that community action support and long-term engagement with energy consumption feedback, including by women, and can support behaviour change (Burchell et al., 2016). Feedback appears to be an effective strategy for reducing household energy use (e.g., Seligman & Darley, 1977), although some exceptions exist. Results of studies using feedback seem to suggest that the more frequent the feedback is given, the more

effective it is (Abrahamse and Steg, 2010). Regarding IHS: in-home displays offer promise for encouraging energy conservation, but careful consideration should be given to the way the feedback is framed (Wesley-Schultz et al., 2015). Households receiving simple feedback, and feedback framed as cost did not differ significantly from the randomized control at either the 1-week or the 3-month time points. Similarly, results showed that educational materials alone did not reduce electricity consumption. However, significant effects were found for households receiving the normative frame (Ibid.). When concerning direct feedback from smart energy monitors context factors are fundamental to understanding the extent to which change effects will be negotiated and realised (Hargreaves et al., 2010). Moreover, the monitors need to look good to fit in with the wider household, that the information they provide needs to be clear, transparent and flexible (i.e. present able in a variety of formats and perhaps custom is able in order that it can be easily related to everyday practices and contextualised, that efforts should be made to address whole households rather than simply individual householders, and that the wider policy and business context should be seen as supportive of householders efforts (Ibid.). When concerning feedback via metering and direct displays energy savings are in the range of 5%-15% (Darby, 2006).

- Indirect feedback: Clear feedback is a necessary element in learning how to control fuel use more effectively over a long period of time and that instantaneous direct feedback in combination with frequent, accurate billing (a form of indirect feedback) is needed as a basis for sustained demand reduction (Darby, 2006). Feedback about individual performance relative to the performance of others may be helpful in encouraging energy conservation. By providing people with feedback on how they are doing as a group, social norms in favour of a certain pro-environmental behaviour may become salient. Similarly, by giving comparative feedback about how a group of individuals is doing relative to other groups may evoke feelings of social comparison (Steg and Abrahamse, 2010). Savings from indirect feedback (e.g., billing) range between 0%-10% (Darby, 2006). Petersen and Togeby (2001) analysed the effects of energy tests and heat audits among householders. They found that energy tests had a significant impact on household energy consumption (whereas heat audits had not).

Feedback appears to be an effective strategy for reducing household energy use (Abrahamse et al., 2005). The more frequent the feedback is given, the more effective it is. Combining comparative feedback with rewards in a contest is also considered effective. For example, EcoTeams, who receive both individual and comparative feedback, were successful in reducing energy use, also in the long run. Combining feedback with goal setting resulted in reductions in energy consumption (McCalley & Midden, 2002), especially when combined with a setting a difficult goal it proved to be successful.

Contextual factors

Contextual factors (policy, laws, regulations, neighbourhood factors, household size, household income, etc.):

- Situational predictors are very important, viz. laws, regulations, neighbourhood factors, dwelling size, household size, household income, employment status of household occupants, ownership, stage of family life cycle, geographical locations, personal comfort all tend to correlate significantly with household energy consumption (Frederiks, 2015: 580-590).

- On policy interventions: Most studies examined individual factors related to perceived effectiveness or acceptability judgements. These studies revealed, among other things, that

policies are more acceptable when they are believed to be more fair, when they are effective in reducing relevant problems, and when they do not seriously affect individual freedom. Moreover, policies are more acceptable to people who have strong environmental values, who are highly aware of the problem, and who feel a strong moral obligation to reduce the problems. Thus, normative and environmental concerns are important for the acceptability of policies. Moreover, acceptability may increase after policies have been implemented. Moreover, people prefer policies aimed at promoting the adoption of energy-efficient equipment above policies aimed at reducing the use of existing equipment (Poortinga et al., 2003; Steg et al., 2006), and energy savings in home above energy savings in transport (Poortinga et al., 2003).

- On contextual factors: human behaviour does not depend on motivations alone. Many contextual factors may facilitate or constrain energy conservation and influence individual motivations (Abrahamse and Steg, 2010). Multiple authors mention building regulations and certificates to lower energy consumption in residential sectors (Petersen and Togeby, 2001; De Almeida et al., 2011).

- Householder motivations should be addressed before targeting certain incentives at them. Attention should be paid to the social motivations that go beyond energy, generating income for community, and energy poverty (Seyfang et al., 2013).

- Another important factors concern cultural factors and lifestyles (Lutzenhiser, 1992).

Appendix B: Questionnaire to collect basic information on energy saving measures that energy cooperatives implement.

This questionnaire consists of four parts: questions on measures implemented by RESCOOPs, questions on the country context that influence these measures, questions on success and failure of these measures, and more general questions.

Inventory of measures

1. What measures (for instance incentives, communication strategies, energy use information provision, technical measures) are implemented by your RESCOOP to persuade members to save energy or to invest in RET? We give some examples of measures in different categories in the Excel sheet in a separate attachment.

2. What are the motivational drivers behind these measures? And why did your RESCOOP decide to specifically implement these particular measures?

3. Can you provide us with relevant documents on these particular measures?

And in which language are these documents available?

Country context

4. How does the institutional landscape (policy, regulations, energy pricing, feed-in-tariffs) look like in your country, in particular in relation to:

a) government support of RESCOOPs;

b) the possibility for RESCOOPs to design and implement measures themselves;

c) energy saving measures that local, regional and national government already implement t;

d) Institutions barriers that seriously impede operations of RESCOOPs.

Success and failures of measures

5. Does your RESCOOP evaluate the measures it implements?
6. Can you give examples of incentives/measures that work really well? If yes, please explain why?
7. Which barriers does your RESCOOP encounter in relation to the measures it implements? And which of those are the most problematic ones?
8. What are in your opinion the most important success and failure factors for energy saving measures within cooperatives? Please list them in descending order from most important to less important factor for success and failure.

General information

9. Are there particular experts we should interview (via Skype)?
10. Are there best practices that inspired your RESCOOP, or do that you consider relevant to the RESCOOP PLUS project?
11. Do you have further suggestions to the WP3 research team on topics or issues that need special attention in our research agenda?

After this first exchange of information we will organise a Skype-interview with you for follow up questions. The information will also be the input to the expert meeting in May. After the expert meeting we will ask you to prepare a short fact sheet on measures in your RESCOOP that are particular interesting for the project.

Thanks in advance!

Appendix C: Overview of best practice tools REScoops reviewed.

Measure	REScoop	Antecedent strategy	Concequense strategy	Outcome	Remarks
District heating package (Pakkeløsning)	EBO (DK)	x		Investment in RET. Adoption of district heating package.	A conversion package for the home owner: (1) a home visit; (2) establishment of heat service line; (3) removal of existing heating source; (4) installment of new district heating unit.
FJR-ordningen	EBO (DK)	x	X	(Non-)adjustment of district heating unit.	A check of the consumers heating installations every second year
The Customer journey project	EBO (DK)	x	X	To optimize the customer experience of district heating units.	A process-oriented method used to evaluate our district heating projects. An energy service to go with district heating use.
Dr Watt self-diagnosis instrument	Enercoop (FR)	x	X	Awareness raising, energy savings	A training course to help consumers make a self-diagnosis of their specific electricity consumption. Experiment by Enercoop since 2013: alleged 40% energy savings realized.
Tupper Watt meetings	Enercoop (FR)	x		Awareness raising, getting more REScoop members	Introduction of REScoop, values, topics, actions in friendly space. Inspired by the 1950s Tupperware parties.
Energie Partagée citizen investment fund	Enercoop (FR)	x		Awareness raising and fund raising for RES and EE projects, controlled and financed by citizens (i.e. crowd funding platform).	An association of experts from different fields (technical, coordination, financial...) and a fund to invest in developed projects
Member expectation survey	Cooperni co (PO)	x		Awareness raising	To understand how and why citizens choose to become Coopérnico members and their expectations about the Portuguese RESCOOP.
Communication tools	Cooperni co (PO)	x		Awareness raising	Newsletters, Facebook page, events and conferences (typisch voor REScoop die opstart)..
Electricity counter	Ecopower (BE)	x	X	Coop members using RES-E.	Offering shares; no fixed costs for clients; alternative invoicing manner.
EnergieID	Ecopower (BE)	x	X	Energiebesparing via feedback Energie-ID-pltaform	Platform voor gebruikers Energie-ID
ENEL Smart Info	E-distribuzi one (IT)		X	Energy consumption reduction; more awareness to habits and efficient behaviour.	Type of smart metre
Isernia Project	E-distribuzi one (IT)		X	7% energy reduction; 4% more than control group.	Adoption of smart metres (with kit).
Generation kWh	SOM Energeia (SP)	x		To promote new RES projects	Members loan money to REScoop to invest in RES-E production parks.
Infoenergia	SOM Energeia (SP)	x	X	Energy savings.	A personalized energy awareness service; via: monthly benchmark (to go with billing), smart metering, customer portal and personalized recommendations (with results from EU project survey).
Local group meetings	SOM Energeia (SP)	x		Awareness raising, professionalization and capacity building.	Organized as group of cooperative members from specific region or city, with online group support (platform).
Various (see Table 6)	LochemE nergie (NL)	x	X	Awareness raising, energy savings, investment in RES.	

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