Resource and Energy Collaborations

a Handbook

Why establish sharing collaborations?

Industries often have surplus energy or other resources that go unused. Business partnerships can prevent these resources from going to waste, improve their competitiveness and help Norwegian industry increase its energy efficiency and reduce its environmental impact. The purpose of this handbook is to inspire businesses and help them do just that. Surplus energy being the resource in focus, this handbook is written with the supplier side in mind.

What resources can be shared?*

- Excess heat
- Electricity
- Waste and byproducts
- Services
- Buildings, rooms, outdoor areas
- Labour
- Expert knowledge
- Financial resources

*see page 12 for more examples

This document is based on HighEFF deliverable number D5.3_2019.04a "Handbook: Energy Collaboration in Norwegian Industry".

HighEFF

About this handbook

This handbook focuses on guiding businesses into establishing collaborations when it is reasonably easy to do so: that is to say when it is technically feasible, when the different partners needs and values are compatible and when such a partnership is close to being profitable. It is the output of Shared Resources, a research project within the HighEFF research centre (Centre for an Energy Efficient and Competitive Industry for the Future) aiming to explore new possibilities and enablers for resource and energy collaborations in Norwegian industry.

The idea behind this handbook is to inspire partners both to seek such partnerships and broaden their horizon to what and who might be included in such collaborations. To do so, several tips, ideas and guiding questions are suggested throughout the handbook. The handbook also lists possible enablers to include in these energy and resource collaborations. These may increase the profitability for such energy collaborations, and the likeliness for establishment.

A Roadmap to energy collaboration

In this handbook, the process of establishing energy and resource collaborations is presented through a set of stages. Note that this is not a linear process, and that sometimes several stages need to be paid attention to simultaneously. Minor loops and returns to previous stages are necessary to reconsider work and decisions in light of new information or as a result of the negotiation process (Figure 1). An underlying task present throughout is *Building a foundation* (which could be thought of as Stage 0). It is important as a foundation for the rest of the stages and constitutes a continuous process for all parties who consider entering into this form of collaboration at one time or another.

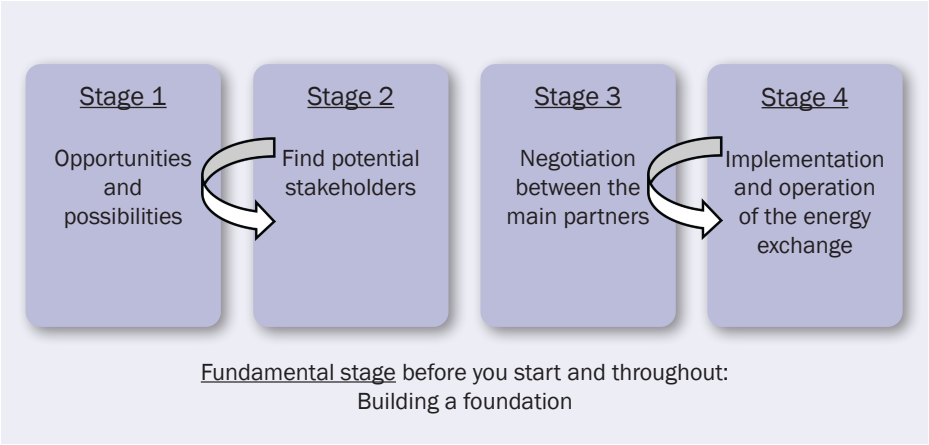


Figure 1: Important stages in energy collaboration processes

Building a foundation

Smart steps to go through regardless of any energy collaboration

Sharing collaborations are more likely to be successfully established if certain fundamental factors are in place. These can be grouped into three categories:

Culture and values

- Interest in energy efficiency at all levels of the company
- Pro-experimentation attitude
- Awareness of the company's role and position in the community
- Ability to appreciate and seek value beyond economic profit

Innovative environments

- An existing and proactive R&D environment
- Management style (supporting creativity and original thinking)
- Type of ownership (encourages and facilitates collaboration initiatives)

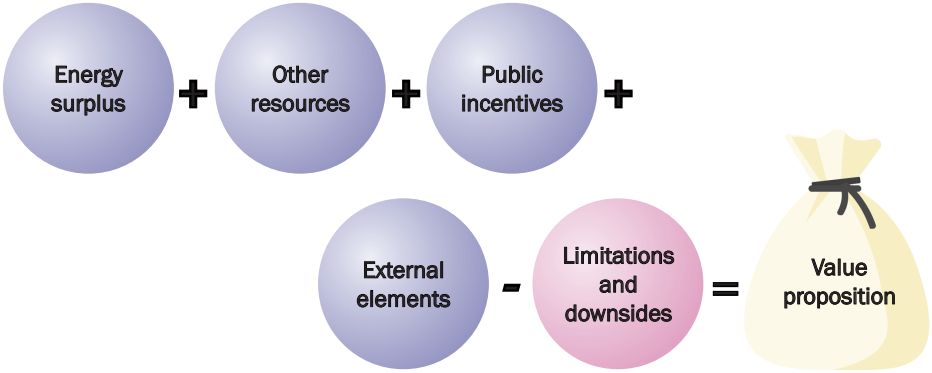
External relations

- Long-term relationship with different local actors in the community
- Reputation, goodwill, and local engagement
- Collaboration with universities and other R&D organizations
- Knowledge about trends in society, potential changes in regulations, plans for the local area
- Updated knowledge about environmental regulations
- Updated knowledge about public support schemes

Stage 1: Opportunities and possibilities

This important stage aims at establishing the benefits (and the potential downsides) of a collaboration. Five key issues need to be examined, as illustrated in the illustration below.

→ Find out how the use of surplus energy can be valuable (reduce cost and generate profit), and look for other elements that might contribute to make the agreement profitable for all parties.



1) Characteristics of the Energy surplus

- What is the type of heat surplus at hand? (steam, water, fluegas, low/high temperature, radiation)?
- What is the amount of surplus energy?
- What are the characteristics of the energy production (continued or discontinued stream, variations, stability and predictability)?

2) Other resources and services that can be shared

For example: expertise, services, manpower, bi-products – see our non-exhaustive list on page 12 of this handbook.

This kind of collaboration requires a flexible approach: be open minded and creative when it comes to deciding what might be included.

3) Public incentives

Existing incentives and public schemes might facilitate the establishment of a partnership. Find out which ones apply for your case (nationally and locally).

4) External elements

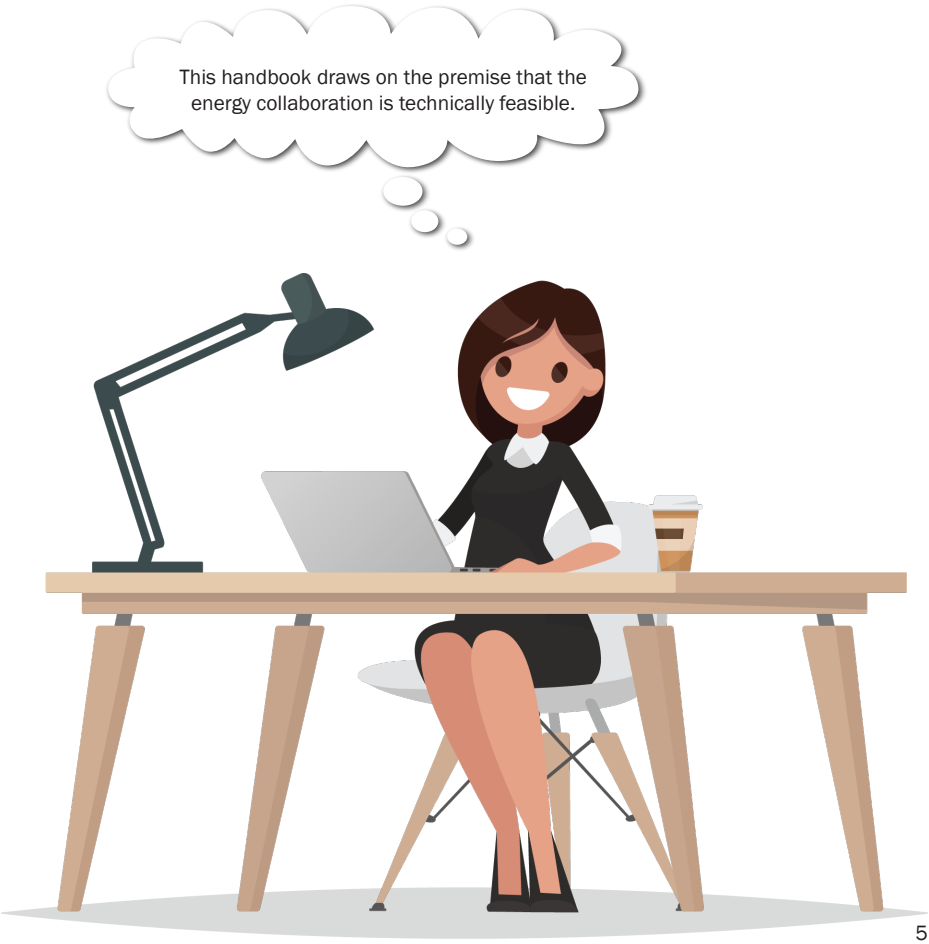
What are the external factors that could affect the process? The authorities changing the regulations and development plans is an example of such a factor.

5) Value proposition

What are the potential opportunities and downsides of an exchange? Value can be economic (savings or earnings), societal (creating jobs), environmental (increasing energy efficiency), or reputational.

Guiding questions:

- In which ways can this resource be valuable for others?
- What new infrastructure would be required and is there land available to build it?
- Are there regulated areas for new industry/activity close to the energy source?
- What is its potential monetary value?
- What else can bring value to the collaboration?
- What are the potential downsides and risks of the collaboration?



Stage 2: Find potential stakeholders

→ Find potential actors that would be interested in an energy and resource sharing partnership – both main partners and other relevant stakeholders.

The search criteria for partners are compatible cultures, shared values and common long-term interests. The parties being compatible reduces the risk of conflict down the road.

1) Main partners

- Typical surplus heat producers are:
  - Industry involving combustion or other energy-intensive production processes
  - Data centres
- Typical energy consumers are:
  - District heating companies
  - Owners of large buildings and infrastructure:
    - Public: schools, hospitals, offices, etc.
    - Private: residential areas, office buildings, shopping centres etc.
  - Other industry in need of energy (steam, hot water, etc.)
    - Horticulture
    - Aquaculture
    - Food transformation
    - Manufacturing

Research by HighEFF concluded that the industry sectors with the highest potential for energy surplus utilisation are food, beverages and tobacco.

2) Other relevant stakeholders

This category includes any other potential actors who might benefit from the establishment of the collaboration and want to contribute to its realisation. It also includes stakeholders who only have an interest in the collaboration being established. The following list is not exhaustive.

Local and regional authorities – They might offer help by reducing case processing time, guaranteeing a loan, or offering land to attract industry to their area.

R&D actors – Education institutions can help by designing programs and opportunities that respond to identified industrial needs.

Industrial parks organisations – These organisations can help finding potential partners, facilitate communication between parties, give advice on applications and provide support during the establishing phase.

Investors, champions, enthusiasts – Local groups or individuals can become supporters and help establishing trust in the area.

Trade unions – The unions can facilitate flexibility in terms of the organisation of the work. Their collaboration is also valuable if the partnership involves the sharing of personnel between partners.

Insurance companies – They can offer tailored and flexible products that fit energy collaboration arrangements.

Guiding questions:

- What kind of industry is a good match for a collaboration?
- What opportunities are offered to potential partners?
- What are the potential partners in the area?
- What are the consequences of a establishing a collaboration for each party?
- Are there other stakeholders that might have interest in this collaboration being realised?

Stage 3: Negotiation between the main partners

The negotiation of an energy collaboration contract between main partners should rest on an integrative approach – one that considers the interests of all parties and promotes alternative ways of solving problems. There are different aspects that must be taken into account by the contract form, namely: the type of ownership, the pricing model, potential spill over and added value effects, regulation, as well as risk, relational power, time and termination aspects.

→ Find a suitable contract form.

1) Type of ownership

Energy sharing will require infrastructure that must be built/owned by the partners. Here are the three most common types of ownership in an energy collaboration scenario.

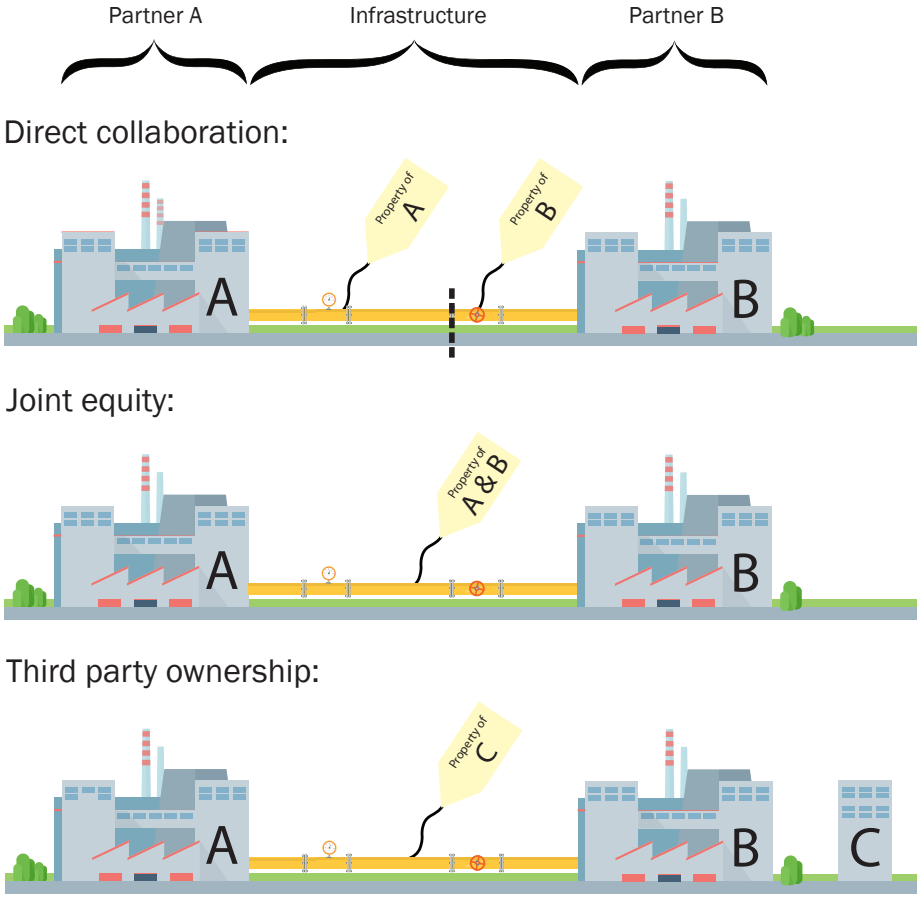


Figure 2: Examples of different contract models

Guiding questions:

- What type of ownership is suitable for the exchange?
- How do we regulate spillover effects of the collaboration?
- Are there any existing or expected regulations that will affect the collaboration?
- How do we ensure progress in the negotiation process?
- Are there critical deadlines or decision points for any of the partners that need to be taken into consideration?

Direct collaboration

Partners A and B each own part of the infrastructure, separately.

- Low start-up costs
- Lower management costs
- No sharing of equity
- Easier to terminate
- More adaptive to outside changes

Joint equity between the main partners

Partners A and B own the infrastructure together.

- Greater inter-dependency among parties
- Suitable for long-term partnerships
- Higher start-up costs
- Higher management costs
- More difficult to terminate

Third party ownership

A third party C owns and runs the infrastructure.

- Reduced risk for the main parties
- Third party takes care of the start-up costs
- Third party takes care of the management costs
- Higher energy/resource price because of the involvement of the third party
- Risk of being overcharged by a third party on which one is highly dependent

2) Pricing model

Different pricing schemes can be used for energy trading, separately or in combinations. As a rule, the price must cover at least generation and distribution costs. The price should also not go beyond the cost of alternative sources of energy (for example electricity prices) unless the contract includes other elements that add value beyond only the energy exchanged.

Consider competition regulations to ensure legal pricing models, and also be aware of potential reactions (both positive and negative) in market surroundings if the pricing is set low compared to alternative energy sources.

	Description	Metering required	Cost coverage	Suitable when...
Fixed energy price	Fixed price per kWh	Energy metering w/o time stamp	Generation and distribution	Energy production and consumption are constant
Time-varying energy price	Time dependent price per kWh	Energy metering w/ time stamp	Generation and distribution	Energy production and consumption do not match in time
Power price	Price per kWh dependent on the energy extraction rate at any given time	Energy metering w/ time stamp	Distribution	Distribution network dimensions are over/ underused at certain times
Volume price	Price per m^3 dependent on the total volume of distribution medium used (for example hot water)	Volumetric metering of distribution medium	Distribution	Return temperatures are too high, meaning there is unnecessary distribution medium being used

Table 1: Summary of characteristics of different pricing schemes for energy trading

3) Potential added value and spill over effects

Seeking a profitable and viable solution for all parties is an important task. Be creative, look for solutions and opportunities! What might be considered attractive elements will vary for each potential partner. Take the partners' needs and offers into consideration and find the ones that are relevant for your case.

Added value

As mentioned on page 1, the collaboration can include non-energy related resources – the sharing of expertise, services, manpower, bi-products, buildings etc.

Spillover

The contract should deal with spillover effects – intended or anticipated positive and negative outcomes of the collaboration. This can include guidelines for dealing with unforeseen events, policies and procedures for communication and resolving conflicts that will arise, a plan for managing intellectual property rights created as a result of the collaboration.

Be open-minded and creative towards what might be included in the agreement and the contract.

4) Regulation

The contract should consider any existing regulation that might affect the energy collaboration – for example regulation on matters such as confidentiality and nondisclosure agreements, ownership and licensing of intellectual property rights, and indemnity provisions. Another example is how to deal with adverse actions by regulatory authorities.

What resources can be shared?

- ✓ Excess heat
- ✓ Energy/electricity back-up solutions
- ✓ Waste/by-products
- ✓ Expert knowledge
- ✓ Competence
- ✓ Manpower pool
- ✓ Hire of external services
- ✓ Administration and HR services
- ✓ Marketing services
- ✓ Canteen services
- ✓ Fire brigade
- ✓ Security services
- ✓ Second-call night duty services
- ✓ IT services
- ✓ Purchase and accounting services
- ✓ Lobbying
- ✓ Control room operators
- ✓ Control room facilities
- ✓ Business equipment/inventory
- ✓ Storage units
- ✓ Laboratories
- ✓ Special equipment
- ✓ Offices and other buildings
- ✓ Transportation
- ✓ Harbour infrastructure
- ✓ Outdoor areas like parking
- ✓ Other type of infrastructure

NB: This is an inspirational rather than exhaustive list

5) Risk, relational power, time, and termination

These elements affect each of the previously discussed contractual elements.

Risk is the effect of uncertainties in every realm of the collaboration – technical, financial, etc.

Relational power is crucial to the negotiation between parties. It can be defined as the probability that one actor in a relationship will be able to carry out their own will despite resistance. This must be considered before establishing a collaboration.

Time comes into play during the negotiation process (compatible timelines and decision points), and in both the pricing model (which can be divided into time segments, for example) and the contract (which must last long enough to cover the initial costs and risks).

Termination – The collaboration might come to an end, due to a breakdown in the relationship, a failure to meet objectives, adverse action by regulatory authorities, or a change in the partners' strategies. Parties have to consider their exit strategies from the very beginning by specifying in the initial agreement what happens to assets, customers and existing contracts upon termination of the collaboration.

Risk can be best handled when values and culture are shared and, therefore, values and culture are critical as selection criteria for any collaboration partners.

Time is important during the negotiation process. Be aware of your partners decision points and deadlines and seek to establish compatible timelines where interdependencies are coordinated.

Preliminary discussions should explain in detail each partner's commitment in terms of resources, time and efforts.

Stage 4: Implementation and operation of the energy exchange

→ Find out what is important for the partners to achieve a successful implementation and operation of the energy and resource collaboration. This task must be considered throughout the entire process – particularly during Stage 3.

The organisation studies' literature points to three elements as keys in the successful implementation and operation of new projects in an organisation (such as establishing an energy collaboration between two or more parties).

Understanding

The parties collaborating must have a common understanding of goals roles and responsibilities. Central employees of every party, at every level, must have a common understanding of the situation and of their contribution to the collaboration.

The contract has to be detailed enough to be put into practice, yet flexible enough to allow for adaptation to unexpected events.

Anchoring

The overall goal of the collaboration must be understood and accepted by everyone involved. There has to be a consensus regarding the need to enter an energy collaboration. Good anchoring requires that employees have confidence in the organisation and in their leaders (in terms of both competence and intentions).

Commitment

Good cooperation requires that each person feels that they have a personal responsibility and role in the implementation of the plan. Both parties should have procedures for follow-up and feedback. Key roles, responsibilities and tasks must be well described and understood.

Guiding questions:

- What is important for the partners to achieve a successful implementation and operation of the energy and resource collaboration?
- How can employees be involved to facilitate and secure successful operation?

A Summary of Enablers

Throughout the handbook, several tips and ideas are suggested to increase the profitability of energy collaborations. Here we summarize and list these enablers according to the stages of the process in which they are of most importance.

TIMELINE	ENABLERS
Before establishing collaboration	► Develop a common understanding of different parties' needs, aims, possibilities, visions, timeframes ► Work towards a shared project ► Stimulate ownership and anchorage in every level of the organisations ► Gather knowledge about the industry, the market, and regulatory frameworks ► Assess location/ industry ► Conduct risk assessment
During the establishment	► Find suitable price and risk management model ► Agree on legal and financial liability issues ► Consider competition regulations (distortion of competition) ► Gather knowledge about the industry, the market, and regulatory frameworks ► Create third parties when beneficial ► Be aware of the timing and interdependency of different parties' decision points and deadlines
After the establishment	► Promote operators' communication and collaboration ► Stimulate dialogue with R&D environments to find solutions to possible challenges and problems ► Develop understanding, commitment, and anchorage at every level of the organisation
Throughout the whole process	► Engage in a dialogue with municipality and other relevant actors (regional and national authorities, business organisations, investors, etc.) ► Stimulate a sense of ownership and anchorage in the organisations ► Promote a creative environment to develop new ideas to optimise existing collaboration (involve employees from every level of the chain/organisation, not only leaders) ► Have a dialogue with universities and R&D environments ► Assess location/ industry ► Invest in R&D activities

Table 2: Summary of enablers


CENTRE FOR
ENVIRONMENT-
FRIENDLY ENERGY
RESEARCH
The Research Council of Norway


HighEFF


NTNU
Samfunnsforskning