CASE STUDY

I4F-WP1-Task 3

Context/Intro:

In the framework of the ICaRE4Farms project, this document aims at reviewing the theoretical inner potential of Feng Tech STE system within the agricultural sector of Pig Farm.
The current field application example focus on a holding set in Brest (Brittany). It owns a herd of 190 sows giving birth to 4370 piglets/year for which it needs around 30 156 kWh of energy supply per year in order to clean its milking parlours and milk tanks. After enumerating the main characteristics of this typical and fictional dairy farm, a simulation with the Feng Tech STE system illustrating expected results will be tackled.
This file will be completed and crossed with a real-life case with similar attributes.

PART II: FIELD APPLICATION CASE

- *N°/Nickname:* N°4 French Pig Farm
- *Location (Country/Region):* Brittany
- *Type of holding: Maternity & Post-Weaning farms*
- *Date: Octobre 2020*

1 Initial characteristics of the installation: (Use Market Analysis + Technology Assessment)

- **Size of the surface/number of animals:** 44 places for maternity / 264 places for post-weaning
- **Water Use (heating/direct use):** Heating during the maternity (M) & post-weaning (PW) stages
  - **Frequency:** 1 month at high temperature + 1 month of post-weaning
  - **Timeframe:** all the time
  - **Quantity:** 729kWh (M) for each sow + 67kWh (PW) for each piglet
- **Version of FT STE system (***ETF 1 / ETF2): ETF 2 (with pressure)*
- **Temperature needed (in °):** 30° (average between Maternity & Post-Weaning)
- **Standard fossil energy used:** Electric Boiler
- **Price of fossil energy per kWh:** 0.15 €
- **Energy consumption for the activity (in kWh/year):** 78 215 kWh/year
  cf.with energy waste and differentiated needs depending on the period of the year, the energy need accounts for:
- **Expenditure of energy consumption (in EXCL TAX€/year):** 11 732 €/year
  cf. 0.15 EXCL.TAX/€/kWh x 78 215 kWh/year = 11 732 EXCL. TAX €/year
- **Available subsidies for STE:** fond chaleur (between 20 and 40% of investment)
- **Amount of CO2 emission:** 7822 kg *CO2/year*
  cf. given that 1kWh produces about 0.1 kg CO2(eq), 0.1 kg CO2/kWh x 78 215 kWh/year = 7822 kg CO2/year

Prerequisites of installation:

- Located on floor or roof
- Preference = South-West facing
- Not far from the holding to avoid additional energy needs for re-heating

Employed Version of the matrix = V9 Brest Study Case / V11 Lilles Irradiance & Cold Water

2 Simulation with a Feng Tech STE system:

- **Coverage Rate of the installation (Share of utilisation in %):** 50% at least - HERE = 50%
  cf. precising when the farmer wanted willingly a restricted share of power supply + Depending on location and weather + the value is imposed as it is the hypothetical reference we want to check after with the field application case

- **Number of STE units to reach the energy needs:** 10 units
  cf. potential energy savings = 39 457 kWh/year

- **Overall front surface of capture:** 40 m2
  cf.1 FT = 4m2 ; 4m2/unit x 10 units = 40 m2

- **Maximum attainable temperature with the current solution (in °):** 100°T (optimal conditions)

- **Power (kW/unit):** 2.5kW/unit

- **Number of sensors needed for remote surveillance and monitoring:**
  Commercial scope = 2 thermometers + 2 flowmeters

- **Surface requirement for the equipment:**
  cf. Length of concrete slab = size of panels (2x2m) + space between panels (1m x t panels) / Width = 3 m

valeurs d'irradiation (Calsol INES)	Brest	Albedo	0,8										
Unité (kWh / m² / jour)	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	Année
Irradiation Direct	0,97	1,1	2,22	2,49	2,63	2,4	2,44	2,16	1,66	1,89	1,14	0,77	1,82
Irradiation Diffus	0,56	0,87	1,37	1,91	2,29	2,49	2,4	2,08	1,56	1,05	0,65	0,47	1,48
Température eau froide °C	6,2	6,5	8,1	9,5	11	13	14	14	13	10	8,1	6,7	10

- **Solar energy contribution (in kWh/year)**: 39 457 kWh/year

  - Yearly Basis: 10 FT STE units' full potential = **39 457 kWh/year** *(relating to a specific simulation case)*
    cf. it corresponds to 25 645 kWh/year useful solar energy (depends on distance, insulation etc. / simulation from an average case)
  - Daily Basis: 39 457 kWh/year / 365 days = **108 kWh/day**

- **Savings on energy consumption (in €)**: 5919 *€ EXCL. TAX/year*
  cf. Given that, with energy waste, the energy saving accounts for 39 457 kWh/year x 0.15 €/kWh = 5919 €/year

- **Remaining share of the standard energy used (per year):** 5813.7 *€/year* (50 % ; 38 758 kWh/year)

  - In %: solar thermal energy represents 50% here so, remaining share of **50%**
  - In kWh: 78 215 - 39 457 = **38 758 kWh/year**
  - In €: 38 758 kWh/year x 0.15 €/kWh = **5813.7 €/year**

- **Remaining emission of CO2:** 3876 *kg CO2 (CO2 reduction up to 3946 kg CO2)*
  cf. 38 758 kwh/year x 0.1 kg CO2 = 3876 kg CO2

NO AID

- **Previsionnal Cost (total - subsidies):** 53 000 €

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 50 000€

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 10 units x 5000 €/unit = 50 000 €
  - **Cost of the site preparation:** 3 000€

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *0 €*

    cf. average grant = 35% *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 5 711 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **53 000 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

    => 53 000 € / 10 years = 5 300 €/year ; taking into account the loan rate: **5711 €/year** (in average)

- **Return on investment (global expense / annual savings):** 9 *years*
  - Global expense = **53 000 €**
  - Annual energy savings = **5919 € per year** during 30 years so in total : 5919 €/year x 30 years = **177 570 €**
  - ROI = 53 000 € / 5 919 € = **9 years (7.2 years** with the assumption of increasing energy price from 3 to 7%)
  - ROIC = 5 919 € / 53 000 € = **10.88 % (15.4%** with the assumption of increasing energy price from 3 to 7%)

- **Yearly Earnings (Annual savings and yearly loan payment):** 207 *€/year* (for 10 years, then 5919 €/year)

  cf. good if savings > loan
  - Annual savings = **5919 €**
  - Yearly loan payment = **5711 €**
  - Difference = 5919 - 5711 = **207 €/year of earnings during the 10 year-loan period / after = 5919 €/year**

	Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	**Charge sans solaire**	11732	12554	13432	14373	15379	16455	17607	18840	20158	21569	23079	24695	26423	28273	30252	32370	34636	37060	39654	42430
2	**Remboursement emprunt**	5711	5711	5711	5711	5711	5711	5711	5711	5711	5711	0	0	0	0	0	0	0	0	0	0
3	**Gaz restant à acheter**	5814	6221	6656	7122	7621	8154	8725	9336	9989	10688	11437	12237	13094	14010	14991	16041	17163	18365	19650	21026
4	**Entretien du système**	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
5	**Charge avec solaire (2+3+4)**	11525	11932	12367	12833	13331	14065	14642	15259	15919	16624	11669	12476	13340	14264	15252	16309	17440	18650	19944	21328
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	**Eco d'énergie (1-5) €HT/an**	208	622	1065	1540	2047	2390	2965	3581	4240	4945	11411	12219	13084	14009	15000	16060	17195	18410	19710	21102
7	**Eco d'énergie €HT /mois**	17	52	89	128	171	199	247	298	353	412	951	1018	1090	1167	1250	1338	1433	1534	1643	1758

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / INOVIA (Ancien du Groupe Terrena) / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)

CASE STUDY

I4F-WP1-Task 3

WITH AIDS

- **Previsionnal Cost (total - subsidies):** 35 500 €

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 50 000€

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 5 units x 3800 €/unit = 17 500 €
  - **Cost of the site preparation:** 3 000€

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** 17 500 €

    cf. average grant = 35% % ; 50 000 x 0.35 = 17 500 € *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 3825 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **35 500 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

    => 35 500 € / 10 years = 3 550 €/year ; taking into account the loan rate: **3825 €/year** (in average)

- **Return on investment (global expense / annual savings):** 6 *years*
  - Global expense = **35 500 €**
  - Annual energy savings = **5919 € per year** during 30 years so in total : 5919 €/year x 30 years = **177 570 €**
  - ROI = 35 500 € / 5919 € = **6 years (5.2 years** with the assumption of increasing energy price from 3 to 7%)
  - ROIC = 5919 € / 35 500 € = **15.2 % (23%** with the assumption of increasing energy price from 3 to 7%)

- **Yearly Earnings (Annual savings and yearly loan payment):** 681.4 *€/year* (for 10 years, then 2338.42 €/year)

  cf. good if savings > loan
  - Annual savings = **5919 €**
  - Yearly loan payment = **3825 €**
  - Difference = 5919 - 3825 = **2093 €/year of earnings during the 10 year-loan period / after = 5919 €/year**

	Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	**Charge sans solaire**	11732	12554	13432	14373	15379	16455	17607	18840	20158	21569	23079	24695	26423	28273	30252	32370	34636	37060	39654	42430
2	**Remboursement emprunt**	3825	3825	3825	3825	3825	3825	3825	3825	3825	3825	0	0	0	0	0	0	0	0	0	0
3	**Gaz restant à acheter**	5814	6221	6656	7122	7621	8154	8725	9336	9989	10688	11437	12237	13094	14010	14991	16041	17163	18365	19650	21026
4	**Entretien du système**	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
5	**Charge avec solaire (2+3+4)**	9639	10046	10481	10947	11446	12179	12756	13373	14033	14739	11669	12476	13340	14264	15252	16309	17440	18650	19944	21328
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	**Eco d'énergie (1-5) €HT/an**	2093	2508	2951	3425	3933	4276	4851	5466	6125	6831	11411	12219	13084	14009	15000	16060	17195	18410	19710	21102
7	**Eco d'énergie €HT /mois**	174	209	246	285	328	356	404	456	510	569	951	1018	1090	1167	1250	1338	1433	1534	1643	1758

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / INOVIA (Ancien du Groupe Terrena) / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)

CASE STUDY

I4F-WP1-Task 3

Context/Intro:

In the framework of the ICaRE4Farms project, this document aims at reviewing the theoretical inner potential of Feng Tech STE system within the agricultural sector of Pig Farm.
The current academic example focus on a holding without on-farm processing and set in Pays de la Loire. The assumptions are that it owns a herd of 190 sows giving birth to 4370 piglets/year for which it needs around 30 156 kWh of energy supply per year in order to clean its milking parlours and milk tanks. After enumerating the main characteristics of this typical and fictional dairy farm, a simulation with the Feng Tech STE system illustrating expected results will be tackled.
This file will be completed and crossed with a real-life case with similar attributes.

!!!!invent for academic/anonymise for field application case!!!!!

PART I: ACADEMIC CASE

- *N°/Nickname:* N°4 French Pig Farm
- *Location (Country/Region):* Pays de la Loire
- *Type of holding: Maternity farms*
- *Date: 14/10/2021*

1 Initial characteristics of the installation: (Use Market Analysis + Technology Assessment)

- **Size of the surface/number of animals:** 190 sows for 4370 piglets (in average per year; 23 babies/1 sow) cf. 276 places/month with the assumption that 4370 piglets / 12 months
- **Water Use (heating/direct use):** Heating during the maternity (M) & post-weaning (PW) stages
  - **Frequency:** 1 month at high temperature + 1 month of post-weaning
  - **Timeframe:** all the time
  - **Quantity:** 729kWh (M) for each sow + 67kWh (PW) for each piglet
- **Version of FT STE system (***ETF 1 / ETF2): ETF 2 (with pressure)*
- **Temperature needed (in °):** 35° (M) / 24° (PW)
- **Standard fossil energy used:** Electric Boiler
- **Price of fossil energy per kWh:** 0.14 €
- **Energy consumption for the activity (in kWh/year):** 30 156 kWh/year
  cf.with energy waste and differentiated needs depending on the period of the year, the energy need accounts for: 729kWh/place/year (M) x 16 places/month (sow) + 67kWh/place/year (PW) x 276 places/month (piglet) = 30 156 kWh/year
- **Expenditure of energy consumption (in EXCL TAX€/year):** 4221.84 €/year
  cf. 0.14 EXCL.TAX/€/kWh x 30 156 kWh/year = 4221.84 EXCL. TAX €/year
- **Available subsidies for STE:** fond chaleur (between 20 and 40% of investment)
- **Amount of CO2 emission:** 3016 kg *CO2/year*
  cf. given that 1kWh produces about 0.1 kg CO2(eq), 0.1 kg CO2/kWh x 30 156 kWh/year = 3016 kg CO2/year

Prerequisites of installation:

- Located on floor or roof
- Preference = South-West facing
- Not far from the holding to avoid additional energy needs for re-heating

Employed Version of the matrix = V9 Brest Study Case / V11 Lilles Irradiance & Cold Water

2 Simulation with a Feng Tech STE system:

- **Coverage Rate of the installation (Share of utilisation in %):** 50% at least - HERE = 55%
  cf. precising when the farmer wanted willingly a restricted share of power supply + Depending on location and weather + the value is imposed as it is the hypothetical reference we want to check after with the field application case

- **Number of STE units to reach the energy needs:** 5 units
  cf. potential energy savings = 16 703 kWh/year

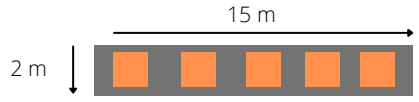
- **Overall front surface of capture:** 20 m2
  cf.1 FT = 4m2 ; 4m2/unit x 5 units = 20 m2

- **Maximum attainable temperature with the current solution (in °):** 100°T (optimal conditions)

- **Power (kW/unit):** 2.5kW/unit

- **Number of sensors needed for remote surveillance and monitoring:**
  Commercial scope = 2 thermometers + 2 flowmeters

- **Surface requirement for the equipment:**
  cf. Length of concrete slab = size of panels (2x2m) + space between panels (1m x t panels) / Width = 3 m



Solar irradiance value (Calsol INES)	Lille 45°	Albedo	0,8										
Unit (kWh / m² / day)	January	February	March	April	May	June	July	August	September	October	November	Décember	Year
Direct irradiance	0,57	0,96	1,61	2,11	2,21	2,36	2,13	2,11	2,05	1,43	0,72	0,45	1,56
Diffus irradiance	0,45	0,79	1,29	1,87	2,29	2,49	2,4	2,05	1,53	0,97	0,54	0,36	1,42
Cold water temperature (°C)	6,2	6,5	8,1	9,5	11	13	14	14	13	10	8,1	6,7	10

- **Solar energy contribution (in kWh/year)**: 16 703 kWh/year

  - Yearly Basis: 5 FT STE units' full potential = **16 703 kWh/year** *(relating to a specific simulation case)*
    cf. it corresponds to 10 857 kWh/year useful solar energy (depends on distance, insulation etc. / simulation from an average case)
  - Daily Basis: 16 703 kWh/year / 365 days = **45.76 kWh/day**

- **Savings on energy consumption (in €)**: 2338.42€ *EXCL. TAX/year*
  cf. Given that, with energy waste, the energy saving accounts for 16 703 kWh/year x 0.14 €/kWh = 2338.42 €/year

- **Remaining share of the standard energy used (per year):** 1883.42 *€/year* (45 % ; 13 453 kWh/year)

  - In %: solar thermal energy represents 55% here so, remaining share of **45%**
  - In kWh: 30 156 - 16 703 = **13 453 kWh/year**
  - In €: 13 453 kWh/year x 0.14 €/kWh = **1883.42 €/year**

- **Remaining emission of CO2:** 1345 *kg CO2 (CO2 reduction up to 1671 kg CO2)*
  cf. 13 453 kwh/year x 0.1 kg CO2 = 1345 kg CO2

WITH AIDS

- **Previsionnal Cost (total - subsidies):** 15 375 €

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 17 500€

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 5 units x 3800 €/unit = 17 500 €
  - **Cost of the site preparation:** 4 000€

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *6 125 €*

    cf. average grant = 35% % ; 17 500 x 0.35 = 6125 € *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 1657 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **15 375 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

    => 15 375 € / 10 years = 1537 €/year ; taking into account the loan rate: **1657 €/year** (in average)

- **Return on investment (global expense / annual savings):** 6 *years & 7 Months*
  - Global expense = **15 375 €**
  - Annual energy savings = **2338.42 € per year** during 30 years so in total : **2338.42** €/year x 30 years = **70 152.6 €**
  - ROI = 15 375 € / 2338.42 € = **6 years & 7 Months**
  - ROIC = 2338.42 € / 15 375 € = **15.2 %**

- **Yearly Earnings (Annual savings and yearly loan payment):** 681.4 *€/year*
  (for 10 years, then 2338.42 €/year)

  cf. good if savings > loan
  - Annual savings = **2338.42 €**
  - Yearly loan payment = **1657 €**
  - Difference = 2338.42 - 1657 = **681.4 €/year of earnings during the 10 year-loan period / after = 2338.42 €/year**

Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Charge sans solaire	4222	4517	4834	5172	5534	5921	6336	6779	7254	7762	8305	8886	9508	10174	10886	11648	12463	13336	14269	15268
Remboursement emprunt	1657	1657	1657	1657	1657	1657	1657	1657	1657	1657	0	0	0	0	0	0	0	0	0	0
Gaz restant à acheter	1883	2015	2156	2307	2469	2642	2827	3024	3236	3463	3705	3964	4242	4539	4857	5196	5560	5949	6366	6812
Entretien du système	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
Charge avec solaire (2+3+4)	3540	3672	3813	3964	4125	4498	4689	4893	5111	5344	3937	4203	4488	4792	5117	5465	5837	6235	6660	7114
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eco d'énergie (1-5) €HT/an	682	845	1021	1208	1408	1423	1647	1886	2143	2417	4368	4683	5020	5382	5769	6183	6626	7101	7610	8154
Eco d'énergie €HT /mois	57	70	85	101	117	119	137	157	179	201	364	390	418	448	481	515	552	592	634	680

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / INOVIA (Ancien du Groupe Terrena) / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)

NO AID

- **Previsionnal Cost (total - subsidies):** 21 500 €

  cf. cost of equipment & installation + site preparation - potential aids = previsional cost

  - **Cost of the equipment & installation:** 17 500€

    Notes: 3829€ for one stainless steel unit & 3480€ for one basic unit + installation expenses = 4000€/unit / 5 units x 3800€/unit = 17 500 €
  - **Cost of the site preparation:** 4000€

    cf. *in average if not done personally by the holder*
  - **Aids and subsidies available:** *0 €*

    cf. average grant = 35% % *in the event of approval by regulating authorities*

    OPTIONAL COST: *monitoring = 1200€ (equipment) + 1200€ (installation)+ 38 €/year (RESOL subscription)*

- **Financial Package :** 2317 *€/year for 10 years* (in average)

  cf. Total - subsidies ; cash + financial loan (= duration + annuity)
  - Previsionnal cost = financial loan = **21 500 €**
  - Duration: **10 years** / Loan rate = **1.50%** (with yearly increase) / STE Durability = **+30 years**

  => 21 500 € / 10 years = 2150 €/year ; taking into account the loan rate: **2317 €/year** (in average)

- **Return on investment (global expense / annual savings):** 9 *years & 2 months*
  - Global expense = **21 500 €**
  - Annual energy savings = **2338.42 € per year** during 30 years so in total : 2338.42 €/year x 30 years = **70 152.6 €**
  - ROI = 21 500 € / 2338.42 € = **9 years & 2 months**
  - ROIC = 2338.42 € / 21 500 € = **10.88 %**

- **Yearly Earnings (Annual savings and yearly loan payment):** 738 *€/year* (for 10 years, then 2118.2 €/year)

  cf. good if savings > loan
  - Annual savings = **2338.42 €**
  - Yearly loan payment = **2317 €**
  - Difference = 2338.42 - 2317 = **21.42 €/year of earnings during the 10 year-loan period / after = 2338.42 €/year**

Année	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Charge sans solaire	4222	4517	4834	5172	5534	5921	6336	6779	7254	7762	8305	8886	9508	10174	10886	11648	12463	13336	14269	15268
Remboursement emprunt	2317	2317	2317	2317	2317	2317	2317	2317	2317	2317	0	0	0	0	0	0	0	0	0	0
Gaz restant à acheter	1883	2015	2156	2307	2469	2642	2827	3024	3236	3463	3705	3964	4242	4539	4857	5196	5560	5949	6366	6812
Entretien du système	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
Charge avec solaire (2+3+4)	4200	4332	4473	4624	4785	5158	5349	5553	5771	6004	3937	4203	4488	4792	5117	5465	5837	6235	6660	7114
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eco d'énergie (1-5) €HT/an	22	185	361	548	749	763	987	1226	1483	1757	4368	4683	5020	5382	5769	6183	6626	7101	7610	8154
Eco d'énergie €HT /mois	2	15	30	46	62	64	82	102	124	146	364	390	418	448	481	515	552	592	634	680

- **Network of installers:** Ets LEFORT / Solair3Tech / Elevance (groupe Agriale) / Pineau Thermic System / MAES Ets / Lacta Services / INOVIA (Ancien du Groupe Terrena) / SARL TESSIER / Comptoir machine à traire (CMT) / CES Tardy - EMERAUDE ELEVAGE EQUIPEMENT / Energies libres

- **Legislation for installation/Procedures and precautions:** rural environnment so few restrictions ; when roof, request for work to municipality / when on the floor, nothing needed as long as within property

RELEVANT REMARKS & COMMENTS

NB 1: what about simulating another model where only the service of energy is sold, not the device?

NB 2: is Liqun a subcontractor of the installers or reverse?

NB 3: for each set of case study (academic + field application), making a review of conclusions (approximatively 1p)