North-West Europe ICARE4FARMS

CASE STUDY

I4F-WP1-Task 3



Context/Intro:

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

1

In the framework of the ICaRE4Farms project, this document aims at reviewing the real-life potential of Feng Tech STE system within the agricultural sector of pig farms.

The current real-life example focus on a holding set in Brittany (France). This farm currently owns a herd of 200 sows giving birth to 6000 piglets a year, for which it needs around 78215 kWh of energy supply per year in order to heat the buildings where the pigs are hosted.

After enumerating the main characteristics of this field application farm before installing STE plants, a review of functionning with the Feng Tech system illustrating expected results will be tackled. This file complements previous work on case studies and offer a more localised illustration.

FIELD APPLICATION CASE

- ► *N°/Nickname:* Bretagne Porcs
- Location (Country/Region): Brittany

Type of holding: Pig farm

• Date: 07/04/2022

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

- Size of the surface/number of animals: 200 sows / 6000 piglets per year
- Water Use (heating/direct use): Building Heating
 - Frequency: all the time
 - Timeframe: all the time
 - Quantity: Unknown
- Version of FT STE system (ETF 1 / ETF2) : ETF2
- Temperature needed (in °): 65°
- Standard fossil energy used: fioul
- Price of fossil energy per kWh: 0.101€/kWh
- 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 117 323 kWh/year cf. (7310 L fioul / 365 days) x 10.7 kWh(eq) = 214.kWh/day => 214 x 365 = 78 215 kWh/year
- Expenditure of energy consumption (in EXCL TAX€/year): 7 821 €/year cf. 0,101 EXCL.TAX/€/kWh x 78 215 kWh/year = 7 821 EXCL. TAX €/year
- Available subsidies for STE: fonds régionaux & fond chaleur / Plan Compétitivité & Adaptation des Exploitations agricoles (PCAE / 40%)
- Amount of CO2 emission: 23 464 kgCO2(eq)/year cf. given that 1kWh of fioul produces about 0,3 kg CO2(eq), 0,3 kg CO2/kWh x 78 215 kWh/year = 23 464 kg CO2/year

North-West Europe ICARE4FARMS

CASE STUDY

I4F-WP1-Task 3



12m

9m

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 = V10 Lille Study Case

2 <u>Simulation with a Feng Tech STE system:</u>

- Coverage Rate of the installation (Share of utilisation in %): 49% 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: 12 cf. potential energy savings = 37 209 kWh/year
- Overall front surface of capture: 48m2 cf.1 FT = 4m2; 4m2/unit x 12units = 48 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: Possibility for 2 thermometers + 2 flowmeters BUT not expressively mandatory
- Surface requirement for the equipment: $9m \ge 12m = 108 m^2$ cf. Length of concrete slab = size of panels (2x2m) + space between panels (1m x t panels) / Width = 3
- Irradiance & Cold Water Measurements:

valeurs d'irradiation (Calsol INES)	Brest 45°	Albedo	0,8										
Unité (kWh / m² / jour)	Janvier	Février	Mars	Avril	Mai	Juin	Juillet	Août	Septembre	Octobre	Novembre	Décembre	Année
Irradiation Direct	1,09	1,25	2,43	3,09	2,43	2,43	2,87	2,66	2,3	2,1	1,3	0,78	2,06
Irradiation Diffus	0,58	0,9	1,38	1,87	2,31	2,48	2,36	2,07	1,59	1,07	0,68	0,48	1,48
Température eau froide °C	7.5	7.8	9.4	11	12	14	15	15	14	11	9.3	7.8	11

- Solar energy contribution (energy savings in kWh/year): 42 563 kWh/year
 - Yearly Basis: 12 FT STE units' full potential = 42 563 kWh/year (relating to a specific simulation case)
 cf. it corresponds to 37 209 kWh/year useful solar energy (depends on distance, insulation etc. / simulation from an average case)
 Daily energy consumption saying : 42563 kWh/year (365 days = 116 kWh/day)
 - \circ Daily energy consumption saving : 42563 kWh/year / 365 days = **116 kWh/day**
- Savings on energy consumption (in €): 4 299 € EXCL. TAX/year cf. the energy saving accounts for42563 kWh/year x 0,101€/kWh = 4 299 €/year
- Remaining share of the standard energy used (per year): 3 601€/year (46% ; 35 652 kWh/year)
 - \circ In %: solar thermal energy represents 54% here so, remaining share of 46%
 - In kWh: X1 X2 =78215 42 563 = **35 652 kWh/year**
 - In €: 35 652 kWh/year x 0,101 €/kWh = 3 601 €/year
- Remaining emission of CO2: 10 696 kg CO2 (CO2 reduction up to 12 768 kg CO2) cf. 35 652 kWh/year x 0,3 kg CO2 = 10 696 kg CO2

North-West Europe ICARE4FARMS	CASE	STU WP1-Task 3	J D Y	North-West Europe ICARE4FARMS
Hyp = No AIDS / PRICING AT T				
Previsionnal Cost (total	- subsidies): 65 00)0€		
cf. cost of equipment & installation +	site preparation - potentia	l aids = previsional cost		
 Cost of the equipmen <u>Notes:</u> 3829€ for one stainless st Cost of the site prepa cf. in average if not done personal Aids and subsidies av cf. average grant = XXX % ; X1 x <u>OPTIONAL COST:</u> monitoring = 1200 Financial Package : 7 004 cf. Total - subsidies ; cash + financial I o Previsionnal cost = financial Ic 	at & installation: 6 ceel unit + installation expen- aration: 5 000€ <i>illy by the holder</i> vailable: 0€ $(X2 = XXX \in in the event of a (equipment) + 1200 \in (installat)4 €/year for 10 yearoan (= duration + annuity)ban = 65 000€$	50 000€ nses = 5000€/unit / <u>approval by regulating aut</u> tion)+ 38 €/year (RESOL subscr rs (in average)	12 units x 5000€/uni <u>horities</u> ^{iption)}	t = 60 000 €
• Duration: 10 years / l	_oan rate = 1,5% (with y	early increase) /	STE Durability =	+30 years
=> 65 000€ / 10 years = 6 500	te/year ; taking into acc	ount the loan rate: 7	004€/year (in avei	rage)
 Return on investment (g Global expense = 65 000£ 	lobal expense / ar	nnual savings): 1	5 .1 <i>years</i>	
 Annual energy savings = 4 299) € per year during 30 y	ears so in total : 4 299	9 €/year x 30 years	s = 128 965 €
• ROI = 65 000 / 4 299 = 15.1 ye	ars			
0 KUIC = 42997 05 000 = 6.6%				

Yearly Earnings (Annual savings and yearly loan payment): 394 €/year (for 10 years, then 5 781 €/year)

cf. good if savings > loan

- Annual savings = 4 299 €
- Yearly loan payment = 7004 €
- Difference = 4 299- 7 004 = 2705 €/year of earnings during the 10 year-loan period / after = 7004 €/year

-											_				_							
	A	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	7900	8453	9044	9678	10355	11080	11855	12685	13573	14523	15540	16628	17792	19037	20370	21796	23321	24954	26701	28570
2	Rembourse	ment emprunt	7004	7004	7004	7004	7004	7004	7004	7004	7004	7004	0	0	0	0	0	0	0	0	0	0
3	Gaz restant	à acheter	3601	3853	4123	4411	4720	5050	5404	5782	6187	6620	7084	7579	8110	8678	9285	9935	10631	11375	12171	13023
4	Entretien du	u système	0	0	0	0	0	200	206	212	219	225	232	239	246	253	261	269	277	285	294	303
	1	-																				
5	Charge avec	c solaire (2+3+4)	10605	10857	11126	11415	11724	12254	12614	12998	13409	13849	7315	7818	8356	8931	9546	10204	10907	11660	12465	13325
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Eco d'énergi	ie (1-5) €HT/an	-2705	-2404	-2082	-1737	-1369	-1174	-758	-313	164	674	8225	8810	9436	10106	10824	11592	12414	13294	14236	15244
7	Eco d'énergi	ie €HT /mois	-225	-200	-174	-145	-114	-98	-63	-26	14	56	685	734	786	842	902	966	1035	1108	1186	1270

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 / M. ENERGIES Thermiques / Boissinot Elevage / Animat53 / Sarl Evident / AB Energies / MODEMA Agri / ALDS Duval Services / Méheust / Bretagne Sud Elevage (BSE) / Roudaut-Foricher / Sotec

 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



CASE STUDY

I4F-WP1-Task 3



Hyp - 40% AIDS - REAL LIFE CIRCOMSTANCES													
 Previsionnal Cost (total - subsidies): 39 000€ 													
cf. cost of equipment & installation + site preparation - potential aids = previsional cost													
 cf. cost of equipment & installation + site preparation - potential aids = previsional cost Cost of the equipment & installation: 60 000€ Notes: 3829€ for one stainless steel unit + installation expenses = 4000€/unit / 12 units x 5000€/unit = 60 000 € Cost of the site preparation: 5000€ cf. in average if not done personally by the holder Aids and subsidies available: 26 000€ cf. granted subsidy = 40%; 48 000 x 0.40 = 19 200 € in the event of approval by regulating authorities oPTIONAL COST: monitoring = 1200€ (equipment) + 1200€ (installation) + 38 €/year (RESOL subscription) Financial Package : 4 202 €/year for 10 years (in average) cf. Total - subsidies; cash + financial loan (= duration + annuity) Previsionnal cost = financial loan = 39 000 € Duration: 10 years / Loan rate = 1,5% (with yearly increase) / STE Durability = +30 years => 39 000€ / 10 years = 3 900 €/year; taking into account the loan rate: 4 202 €/year (in average) Return on investment (global expense / annual savings): 5.3 years Global expense = 39 000 € Annual energy savings = 4 299 € per year during 30 years so in total : 5 781, 745 €/year x 30 years = 128 965 € 													
• ROIC = 4299 / 39 000 = 11%													
 Yearly Earnings (Annual savings and yearly loan payment): XXX €/year (for 10 years, then XXX €/year) cf. good if savings > loan Annual savings = 4299 € Yearly loan payment = 4 202 € Difference = 4 299 - 4 202 = 97 €/year of earnings during the 10 year-loan period / after = 4 202 €/year 													
Année 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 2	0												
1 Charge sans solaire 7900 8453 9044 9678 10355 11080 11855 12685 13573 14523 15540 16628 17792 19037 20370 21796 23321 24954 26701 2857	0												
2 Remboursement emprunt 4202 4202 4202 4202 4202 4202 4202 420	3												
4 Entretien du système 0 0 0 0 0 200 200 212 219 225 232 239 246 253 261 269 277 285 294 300	3												
5 Charge avec solaire (2e3+4) 7803 8055 8325 8614 8922 9453 9812 10197 10608 11047 7315 7818 8356 8931 9546 10204 10907 11660 12465 1333	5												
	0												
6 Eco d'énergie (1-5) €HT/an 97 398 719 1064 1433 1627 2043 2489 2965 3476 8225 8810 9436 10106 10824 11592 12414 13294 14236 1524	4												

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 / M. ENERGIES Thermiques / Boissinot Elevage / Animat53 / Sarl Evident / AB Energies / MODEMA Agri / ALDS Duval Services / Méheust / Bretagne Sud Elevage (BSE) / Roudaut-Foricher / Sotec

• 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

#1 : hypothèse subvention montée à 40 au lieu de 30% car dans la réalité c'est le montant obtenu par l'exploitant

#2 : a priori pas de problème concernant l'estimation car avant/après correspondent relativement