NATO ENERGY SECURITY CENTRE OF EXCELLENCE

IESMA 2014

DELTA

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Editorial

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In November 2014, the NATO Energy Security Centre of Excellence and the State Military Scientific Technical Center „DELTA"of the Ministry of Economy and Sustainable Development of Georgia organized an international conference and industry exhibition "Innovative Energy Solutions for Military Applications" (IESMA 2014), which took place in Vilnius, Lithuania.

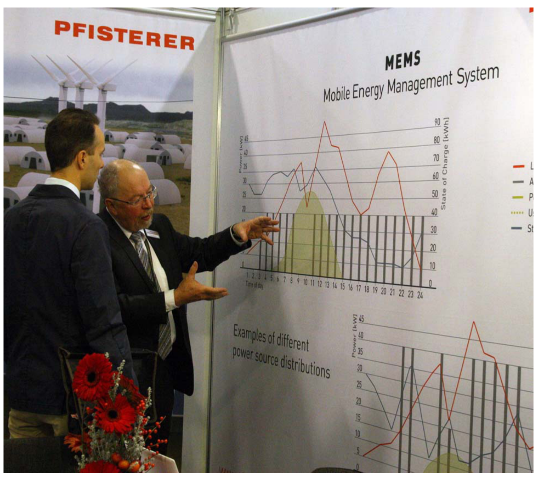
IESMA 2014 provided a unique opportunity to exchange information about best practices and technologies for advancing energy efficiency in the military. The conference brought together experts from academia, industry and the military that exchanged knowledge and discussed lessons learned, with a focus on standard, advanced and cutting-edge energy saving technologies. The industrial exhibition gave an opportunity for innovative energy technology and solution providers to display and explain their latest products that would improve energy efficiency during military activities.

The importance of energy efficiency in the military is growing rapidly. High capacity armed forces and their involvement in long distance missions, that most often require sustained presence, need large amounts of energy to be supplied and generated with no interruptions. However, even if supplied and produced smoothly, energy resources are limited and therefore they must be used wisely. Smart thinking and smart technologies are the right tools to address military energy efficiency. And if these tools are combined and applied wisely, the maximum result is guaranteed.

Collaboration between the public and private sector, including academia, is a paramount for fostering innovative energy solutions for the military. On the one hand, there are many revolutionary, as well as mature technologies already being avai-lable for the commercial use. Cooperation between the two sectors allows military to get acquainted with these technological availabilities. Application of commercial technologies also can save resources allocated for R&D projects.

On the other hand, commercial technologies and innovations, even if successfully used in the private sector, may not be fully applicable for the military use for various technical and security reasons. Public and private cooperation is vital for making this technologies military-proof.

As a result, NATO is looking to leverage the private sector knowledge and capital in the pursuit of these goals. The ability of PPPs to foster evolution and bring fresh perspective to old problems is well documented. From energy, to munitions and logistics, private companies are playing an increasingly important role in Western militaries. "We in the military encourage these partnerships, because they lead to innovation and creative thinking... and they allow both sides of the equation to share both risk and reward," the vice chairman of the Joint Chiefs of Staff, James. A. Winnefeld Jr., said in September, 2015.



IESMA 2014 emphasized public private partnerships. It not only demonstrated a variety of solutions developed on the basis of cooperation between public and private sectors, but also served as a kick-start for new cooperation initiatives. One of them was a genuine Smart Energy component during the multinational exercise Capable Logistician 2015, which took place in Hungary, 8-19 June. 14 companies, most of which participants of IESMA 2014, and two defence agencies contri-buted over 50 pieces of innovative energy equipment to be connected to the military power generation equipment in order to test interoperability and, most importantly, to raise awareness operational energy efficiency issues.

This special edition of NATO's 'Energy Security Forum' is dedicated to the role of Public Private Partnerships (PPP) in fostering evolution in the energy space. It also shows some of the fruitful coo-peration already underway in the United States and Europe. **Paul Roege** regards Public-Private Partnerships as a key to military community resilience given the recent deepening of stakeholder collaboration in the flexible framework of choice for risk management. **Ed Yarbrough and Alicia Collier** explain Honeywell's successfully deployed Energy Savings Performance Contracts and show how that private-sector led energy management systems are a viable option for military bases. **Vincent Toepoel** explains the cooperation between Dutch military and Toeps company that shows that public-private partnerships can help foster energy-related innovation.

This issue also contains the opening remarks by **Ambassador Sorin Ducaru**, NATO Assistant Secretary General for Emerging Security Challenges during IESMA 2014.

*Using this opportunity I would like to bring to your attention and to invite you to participate to the next **"Innovative Energy Solutions for Military Applications"** that will take place **in Vilnius, Lithuania, on 16-18 November 2016.***

Enhancing Energy Efficiency in the Military: **A NATO Priority**

Ambassador Ducaru's Introductory Remarks at IESMA, 12 November 2014

Ladies and Gentlemen,

In my long life as a diplomat I have developed a healthy scepticism towards solutions that are advertised as "perfect". My experience tells me that the perfect solution is a myth. For every solution that may appear "perfect" now, one will discover drawbacks later. It is our responsibility to be realistic about this, and not to oversell the solutions that we advocate.

But even if perfect solutions don't exist, we should constantly try to improve. To find ways of doing things better. More effective. And more efficient.

One area where this logic applies perfectly well is enhancing the energy efficiency in our armed forces. This is an area where new technologies and new thinking meet. And if we play our cards right, we stand to gain in more ways than one: Enhancing the energy efficiency of our armed forces means saving fuel – and this means spending less money on fuel. More energy-efficient equipment means having to transport less fuel over long and dangerous supply routes. And this, in turn, means saving lives of our soldiers. That's why the label "smart energy" is fully justified.

Why is energy efficiency in the military so important? And why is it "smart"? Let me give you a few examples that should speak for themselves.

You are all familiar with the amount of money we spend on fuel for our armed forces. The figures are staggering. It is known for example that for one gallon of fuel to be safely transported to an operational theatre like Afghanistan, we would need to spend the equivalent of 5 gallons. But it is not just the cost factor that should make us worry. Our energy posture is also limiting the effectiveness of our operations. In fact, our growing fuel requirements can compromise our operational capability and, ultimately, the very success of our missions.

Ambassador Sorin DUCARU, NATO Assistant Secretary General

Ambassador Sorin Ducaru took over the post of Assistant Secretary General for Emerging Security Challenges in September 2013. He is responsible for providing support to the North-Atlantic Council and for advising the Secretary General on the evolution of emerging security challenges and their potential impact on NATO's security. Prior to his appointment as ASG, Ambassador Ducaru served as Romania's Permanent Representative to the North Atlantic Council, from September 2006 to September 2013. From November 2011, Ambassador Ducaru was the Dean of the North Atlantic Council.

Why? Because our operations – whether led by NATO, the EU, the UN, or coalitions of the willing – involve long distances and often a sustained presence. So we need an ever larger support structure. And since our resources are limited, this growing support structure will at one point start eating away on our fighting forces.

So the questions we need to answer are clear: Can we reverse these unfavourable trends? Can we find ways to reduce our dependence on traditional fuels, shrink our logistics footprint, enhance the security of our troops, and even increase our fighting power? And can we perhaps even save money in the process?

The answer to all of these questions is a resounding "yes". New technologies will allow us to change the way we plan our missions, procure equipment, and conduct operations. And the good news: many of these technologies already exist.

For example, some of our Allies have been working on Forward Operating Bases that require much less fuel. Through better insulation, the use of solar power, and many other energy-efficiency measures, these military bases would produce most of the energy they consume. Far fewer soldiers would have to put their lives on the line to transport fuel to these compounds. And no expensive airdrop of fuel would be required.

A camp that produces most of the energy it needs is not just "smart" – it is a real force multiplier. Because it frees precious resources for other important tasks.

Another example is energy-efficient equipment for the individual soldier. Today, a soldier carries many kilograms of sophisticated electrical devices. This equipment is absolutely essential, but it limits his freedom of movement. The batteries that power his GPS, night vision goggles, and radio are heavy, and they don't last as long as one would like.

Again, a combination of existing technologies can change this: small portable fuel cells, nanotechnology and new textiles can provide our soldiers with equipment that is smaller, lighter and with a longer lasting energy supply. The fighting power of a soldier would increase, as he could operate for a longer period of time. At the same time, he will be more agile, and this means that he will be safer. Another "win-win" solution.

There are many more examples. Replacing traditional light bulbs with LEDs will pay off after just a few months. Coating the hull of a ship with special paint can significantly reduce its fuel consumption. Lightweight containers for military equipment can help reduce our logistics effort without sacrificing sturdiness.

Individually, these steps may seem small. Together, they can fundamentally change the way we conduct future military operations.

But let's be clear: technology alone will not do the trick. Like in our daily lives, saving energy also requires a change of behaviour – across and beyond our Alliance. We need to train our soldiers in how to best save and conserve energy. We need to adapt our operational procedures accordingly. And we need to integrate energy considerations into our defence planning process.

Above all, nations need to realise that simply buying more and more energy for our military is a dead end – financially, but also operationally.

Some of you might say: does all of this still matter once our Afghanistan mission ends? Will the end of ISAF not relieve us of our operational energy worries?

I believe that this would be short-sighted.

For one, we don't know what the future will bring. We didn't see "9/11" and Afghanistan coming, and we didn't see Libya coming, either. And, most recently, both the Ukraine crisis and ISIL caught us by surprise.

Like anyone else, I would like to see NATO having to carry fewer operational burdens. But I suspect that the world will not let us off the hook. In other words, we will remain very busy.

In fact, new developments are already on the way. As you all know, increasing the frequency of exercises in our easternmost member states is a key part of the Readiness Action Plan agreed at the Wales Summit. This means that even in peacetime we will be seeing more tanks, planes and ships moving – all of them consuming large amounts of fuel. The Readiness Action Plan is all about speed and mobility. We cannot afford energy requirements to slow us down.

In short, even if the number of NATO's operations may decrease, the challenge of energy efficiency must still be met.

NATO can help us achieve this goal. Some Allies have already made great strides in developing smart energy projects. However, they have done so on a purely national basis. Through NATO, we can pull these efforts together. NATO has over half a century of experience in standardisation – more than any other institution. And NATO enjoys strong links with our defence industries.

Two years ago, at their Chicago Summit, Allied Heads of State and Government added energy efficiency to NATO's energy security agenda. That same year, the NATO Energy Security Centre of Excellence was accredited here in Vilnius. And it was also two years ago that we set up a "Smart Energy Team" to look at available energy efficiency projects in our member nations and suggest those that are most promising for being pursued multinationally. Earlier this year, at the initiative of Lithuania and Denmark, NATO agreed the Green Defence Framework.

All this will help to bring "smart energy" into "Smart Defence" – because this is where it belongs.

At NATO, we already have agreed standards for fuel. Now is the time to start thinking about developing standards for energy efficiency. To start thinking about how to ensure the interoperability of energy-saving equipment. And to do so not just among Allies, but also together with our partner countries.

In short, now is the time to start thinking about multinational cooperation. "Smart Defence" shows us the way: by setting clear priorities; by bringing together groups of interested nations; and by achieving economies of scale through cooperation.

Ladies and Gentlemen,

I said at the outset that I do not believe in perfect solutions. But I firmly believe in "smart" solutions. Enhancing energy efficiency in our armed forces is a perfect example. It saves money. It enhances our military effectiveness. And, above all, it saves lives.

I congratulate Lithuania, Georgia and the NATO Energy Security Centre of Excellence for their leadership and determination. IESMA 2014, with its innovative blend of conference and exhibition, is a perfect example of how to effectively promote an important subject on NATO's agenda. I wish you a stimulating conference.

Thank you.

What are the obstacles to Public-Private Partnership (PPP) **in accelerating Energy Innovations for the military**

Vincent R. Toepoel

The cooperation between the Dutch military and Toeps dates back to 2010, when the Defense Innovation Competition (DIC) subject was energy and sustainability. The competition is open for companies to suggest ideas and technology that will improve military operations. Since Toeps develops and deploys clean technologies, the competition was a perfect fit. During the competition the military helped multiple participants better formulate their ideas to ensure the concepts would meet military requirements. From the start of this public-private partnership, several successes and obstacles were formulated which will be addressed here. The article is centered on the example of developing waste to energy for operations.

VISION AND TRUST BUILDING

The military described their operations and challenges at the outset of the DIC, providing inspiration for innovative solutions. Companies could visit specialists to consult with them and further refine their concepts.

For waste-to-energy (WER), base electrification proved more important than waste management. Gasifying waste and feeding the gas to diesel generators as a secondary fuel seemed to be the easiest way to convert waste to energy in the field, proving dual-fuel principles and preventing power failure. This proved a solution equally suitable for the military and for the private sector, as it became evident at the time of writing this article. The original graphical setup of Figure 1 still applies.

To provide some commercial context, electricity on small islands is often generated by diesel engines, while waste management is often lacking. Thus, successful waste-to-energy solutions can help private parties create commercial value.

Mr. Vincent R. Toepoel, civil project manager mandated by the Dutch MoD

Vincent's drive is to bring new clean technologies to reality in teams with optimum result for all stakeholders.
Vincent holds a Masters degree in mechanical engineering from the TU Delft with specialisation in energy technologies. Vincent has experience in deploying energy related technologies in several areas. From power plants, jet fuel, gas turbines, diesel engines, waste to energy, power supply up to materials. In 2010, Vincent expanded activities outside consulting and now develops and deploys innovations in international consortia. Vincent created Waste4ME BV, a joint venture with a Bulgarian entity to develop and deploy waste to energy technology for the Dutch Military, the WER. Aside from waste to energy does and did Vincent advise international players on technology deployment and Vincent setup several multi-stakeholder technology development projects in energy & biomass. Vincent cooperates close with partners from Bulgaria, Ukraine, United States, Netherlands and Belgium.

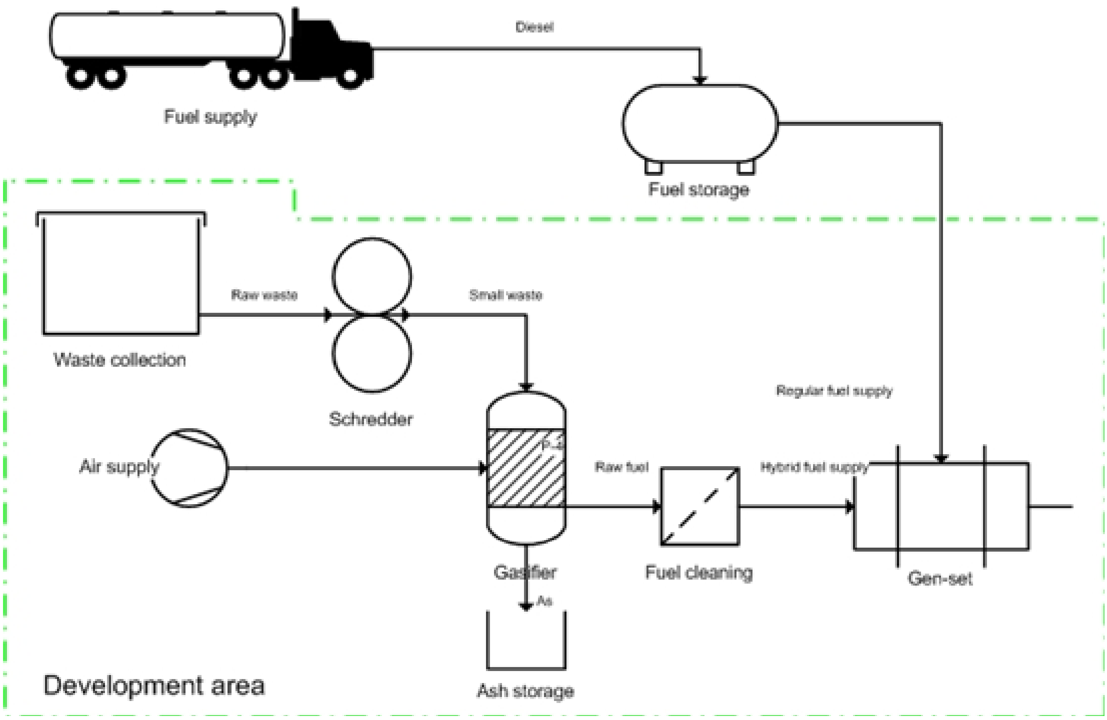


Figure 1 WER schematic setup

Consulting with the military not only refined the idea, but led to such significant insights that the basic business case could be formulated, which included a payback period of less than one year on energy alone. This meant additional savings in logistics and health, while lowering environmental impacts only improved the business case.

PROJECT EXECUTION AND PRESERVATION OF TRUST

Toeps reached the finals of the DIC competition but did not win. In spite of this, the military secured alternative financing to proceed with the project, building upon the shared vision and trust developed during earlier stages.

The process of filing, re-filing, approving and signing took nine months. All specia-lists and operational professionals were up to date, but the bureaucratic process was not. Two hurdles were identified during this period: unclear bureaucratic procedures and timelines, in addition to the late inclusion of tertiary stakeholders involved in the bureaucratic process.

The lesson to be learned from this is that one should identify as many technical, economic and social effects on development as pos-

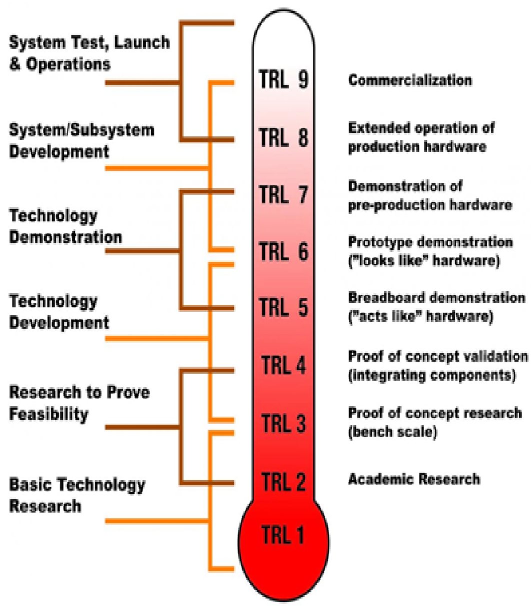


Figure 2 Technology Readiness Levels (TRL)

sible. The political and bureaucratic process is important and not necessarily a limitation. Usually, the negative impacts arise from lack of information.

Vision aside, waste management and energy recovery focused on economical design and reliable operation with some simple maintenance. While these aspects may have efficiency costs, an inoperable but efficient solution would have proved worthless.

The first tests were to prove the initial business case and models to reach technology readiness level (TRL) 4/5 – where components are validated in a laboratory or relevant environment (see figure 2).

Meeting the milestone and calculating the effect on the business case moved the focus forward to integrate the two tested steps (pyrolysis and gasification) and to include gas treatment. In a five month period a complete demonstrator was built (see Figure 3). It fitted the purpose, turned the waste into gas, cleaned it and revealed new challenges.

Figure 3 WER demonstrator

This demonstrator proved meeting TRL 6 by operating in a relevant environment. The military was present for each milestone to both inspect the results and align on the direction of the project. Without this frequent feedback and interaction, staying on track would have proved impossible.

The project was executed by payment on result (upon reaching a milestone). This way the private parties assumed project risks while retaining the motivation to succeed. The military's exposure to risk was limited by the ability to check whether milestones were reached and whether milestones were in line to achieve the goal. Mutual trust prevented unrealistic expectations while lessening the impact of mistakes.

There was a six-month gap between the feasibility and the prototype phases due to financing issues and bureaucracy. Financing in the second phase was anticipated as a 50/50 split between military and private partners.

The procedures in receiving the contract for the second phase financing were still unclear, but major delays were prevented by meeting with the contract manager and reading the template contract in an early stage. This short meeting solved three contractual differences of vision immediately.

With funding secured, the private parties began ambitiously producing the prototype. Several parallel development stages were executed, as project timing demanded it and vision allowed it. At the moment of writing, the prototype operates in relevant environments proving TRL 7. Certification necessary to work towards TRL 8 has already begun. The prototype operating with a generator consuming the gas is shown in Figure 4.

Figure 4 Testing WER with diesel generator

The informing sharing process has improved and there are now frequent updates between private and public supervisors. The public supervisors supply short updates on what is reached within their group of stakeholders.

FOLLOW-UP

The follow-up phase of the current WER prototype construction and certification is the implementation in a real-life operating environment, e.g. the peacekeeping operation in Mali. Implementation in Mali requires advance informing and planning regarding possibilities and current setup. The on-site diesel generators can be modified to consume the gas, online plan and finance conversion. Several operational officers are aware of the possibilities and are kept informed of progress.

Since the UN pays for diesel while the participating countries pay for the equipment, there could be a risk in meeting TRL 9, whereby the concept is proven in the operation.

These insights and experiences were used to shape the vision for the PPP in three general areas: Technical, Economic and Social vision.

Technical

Any innovation should both define and exceed the initial requirements of the participants (see Figure 1). Once found, a consortium of parties able to deliver the solution should be established. In this case, the military provides valuable knowledge and experience to guide development towards operational use. The choice to develop the WER in such a way that a car mechanic can perform basic maintenance, for example, is a military suggestion.
Innovation requires risk-taking, and technological development is never a clear path. To incorporate effective risk management, end solutions must be reachable in stages via clear milestones. Each milestone will answer key questions and generate knowledge for further steps, thereby reducing uncertainties in meeting goals. This maintains flexibility and direction as long as goals e-

xist. It is advisable to outline project stages following known technology readiness levels (TRLs) through the final level (9). Even though certain aspects cannot be predetermined, it guides vision and raises important unknowns.

Any approach to setting targets introduces risks – setting targets too low will reduce technical risks, but increase duration and reduce economic viability. When aiming for a 5% improvement, tweaking parameters suffices; over 30% improvement requires innovation.

From an economic standpoint, the ability to calculate lifecycle costs and link the business to the investment case also impacts the technical area. Low investment is today's priority, while fuel consumption is painted as tomorrow's problem. If lifecycle costs are not accepted, however, energy innovation will never move beyond addressing current problems and known solutions.

Economic

Innovation must provide economic or tactical benefit to all the parties involved. Further strategic capabilities, cost savings or profits do not matter – the business case must be sound up front.

In setting up the business case, it is important to calculate impacts separately and to be satisfied when meeting certain boundaries. These should be determined at the beginning of the project, with the first unit's envisioned client payback period not exceeding 2 years (1 year commercially advisable) with a minimum five-fold return over its total lifetime.

Applying this boundary to the WER, the payback period regarding energy savings is one year. This is already acceptable, but the payback period is further solidified by additional benefits. As logistical reductions alone will reduce this period by a factor greater than 2, calculating additional benefits (e.g. WER health and emissions) is not necessary – the one-year payback threshold is already met.

Other, non-threshold effects are primarily social effects. Using milestones to stage development aids risk impact reduction and reduces potential loss of reputation. Although the original business case is always based on assumptions, it will solidify as it is updated throughout the project. Staged development also reduces financial failure risks, as the project can be stopped after each completed stage if economic or technical viability falters.

Social

All participants should strive towards mutual benefit and be willing to commit despite the challenges ahead. Socially speaking, there are many stakeholders alongside an idea's creators. Promptly including crucial stakeholders in the process will grant them time to consider the idea. Free cross-departmental communication is crucial to make innovation viable and is encouraged.

Carefulness to avoid over-involvement while setting up the business case and according project plan is advised. Waste to energy provides four areas of improvement, but only the primary and secondary stakeholders need to be involved at this point in the start-up. The final user group is the most important factor in reaching TRL 9 (operational use) and should therefore be involved constantly. The secondary group directly impacts the business case and may offer practical advice, which warrants their inclusion (e.g. for the WER, medical staff and emission specialists). Meanwhile, the tertiary stakeholders are derived from spin-off economic development (e.g. policy makers, accountants) and should only be involved after the project setup is complete. This allows the primary and the secondary stakeholders to establish the vision for organizational result securely.

Once the setup is complete, social risks become the most important factors to address. The natural human willingness to help is the starting point for social risk management.

Simply asking for assistance will open minds and foster new solutions.

Several powerful social barriers to innovation exist, and almost all stem from risk aversion. 'Not invented here' syndrome, fears of losing reputation or power, and fear of failure are known social innovation killers. These occur when there is insufficient vision towards development, or when stakeholders are overwhelmed by information.

Connecting the final results to the stakeholders' agendas is the first step in overcoming these issues – when benefits become universal, willingness to cooperate follows.

Setting up a staged development path manages most of the mentioned risks as the impact of failure is limited by the (social) investment per stage and the awareness that a stage can fail. The hurdle here is to allow failure with limited impact.

'Not invented here' syndrome is the most challenging to overcome. It is partly managed via shared vision, as the result becomes more important than creating the idea. NIH syndrome can be reduced by informing stakeholders up front about potential successes, goals and timelines. Note that covering NIH is not a transparent process.

Setting challenging targets and according milestones for economic viability can increase the risk of social failure. Ambitious goals are less likely to be understood as quickly as low-risk targets, as they require more outside-the-box thinking. Whenever doubts regarding feasibility arise, the understanding and the awareness of the business case should be increased. On the positive side, challenging milestones make stage progress more enjoyable while also reducing room for bureaucracy.

When the technical, economic and social fields are set up, trust is created. If these fields are not set up, it is possible that there is no trust.

The risk of losing trust is higher when the project boundaries in time, budget and quality are too tight. In this process it is crucial to calculate the business case with lower numbers than maximum feasibility to reduce the risk that stakeholders get the wrong expectations.

RESULTS AND DISCUSSION

Retrospectively evaluating experiences in various PPPs resulted in key factors for successful cooperation:

1. Share energy-related challenges with private parties;
2. Foster public-private vision towards operational use by informing secondary stakeholders;
3. Operational result oriented staged development;
4. Optimize milestones for high added value;
5. Keep boundaries wide enough in technical possibilities, added value and social satisfaction;
6. Inform primary stakeholders (project supervisors) about successes and issues regularly during development. Trust them to inform the remaining stakeholders accordingly;
7. Develop and continuously update the business case. If the business case is not viable anymore, take action to increase viability or stop;
8. Compare the progress in the project to set milestones and to reach operation, TRL 9.

The following hurdles remain in PPPs:

1. Clear focus on lifecycle cost calculation;
2. Willingness to take risks and set 1-3 year targets;
3. Opaque bureaucratic processes;
4. Ability to discover unknowns.

Permitting risk-taking with limited impact and rewarding results will help increase willingness to take risks. Creating an organization capable of this will be challenging.

Solving the opaque bureaucracy is a topic for debate. In a question session at the Dutch House of Representatives, the participating companies and representatives concluded that a project puller should pull projects through the required offices and commissions. The persons behind the processes are not unwilling - they merely need to know that something needs to be done. The reason for our delay came up in the conversation with the acquiring department at a reception. High risk of failure will remain if current bureaucracy stakeholders do not proactively address this issue.

How to increase the ability to discover unknown areas for military specialists and to engage in non-departmental controlled cooperation remains an open question. Regular alignment via informal interdepartmental energy knowledge groups may provide a solution.

CONCLUSIONS

Successful public-private partnerships are viable for energy-related innovation. The military is well equipped to supervise innovation direction due to their operational requirements and their specialists in various fields, e.g. from operation to engineering.

Just as energy is linked to capabilities, innovations in energy require cooperation between specialized fields. These collaborations should begin by creating a common vision through which all public and private stakeholders can benefit. A result-oriented approach to execution based on achie-ving goals will reduce the impact of risks and maintain flexibility to address errors.

Risk aversion and bureaucracy remain the highest hurdles to overcome. They actually decrease the competitive advantage, since time is everything during development.

ACKNOWLEDGEMENTS

For their assistance in innovating, I would like to thank all the involved personnel of the Dutch military, the supervisors captain Ben Reulink, ing. Wim Vroom and LTZT2OC Floris van de Herik, my partners Stefan Vassilev, Norbert van Twist and Slavcho Georgiev, and my partners' personnel for their trust and commitment to our vision. The process wasn't and isn't easy yet, but it is very rewarding and can improve all our lives.

Public-Private Partnerships
Key to Military Community Resilience

Paul Roege

Military forces exist to support national security needs beyond the capabilities of civilian entities. In the United States, military functions and authorities are carefully delineated and subject to civilian government control. Role separation and authority limitations, such as domestic law enforcement and intelligence collection, have long restrained military participation in civilian activities as commanders meanwhile are proactive in tending to military-specific matters. In recent decades, however, military and civilian concerns have been growing more interdependent, with overlapping concerns ranging from domestic security to international and transnational dynamics.

Contemporary factors of globalization and the proliferation of information and technology facilitate asymmetric terrorist and cyber threats; other social, political, and environmental issues, from energy choices to religious conflict interact in the national security equation, adding complexity. Some argue that wars are being fought over oil; meanwhile, multinational corporations, governments and Muslim extremists all derive substantial resources from fossil fuel revenues. Today's national security decision-makers can face intimidating permutations of military and civilian options, which become particularly difficult to reconcile in light of growing uncertainty.

Figure 1 - World Trade Center, September 11, 2001

Today's operating environment demands new paradigms that enable us consistently to organize requirements, anticipate system sen-

Mr. Paul Roege, Independent Engineer, USA

Paul Roege is a lifelong energy aficionado who is focusing on the role of energy in growing resilience from the community and regional levels. He recently spent four years on active military duty to establish the Army's concepts and strategies, seeking to use energy most effectively toward operational outcomes. He substantially influenced the Army's and other military strategies, including adoption of a concept for "Energy-Informed Operations" - weaving appropriate energy considerations into system design, operational and business processes. He also guided Army energy research and development thrusts toward more integrated, network foci, and advocated for the emergent (DoD) corporate shift toward resilience as an overarching concept for energy security. Paul has over 34 years of international experience in both civilian and military capacities, including nuclear operations and safety, energy system engineering, and facility construction and operations. He is a registered professional engineer, a West Point graduate and alumnus of Boston University (MBA) and MIT (Nuclear Engineer).

sitivities, support decisions, and coordinate action among the respective military and civilian stakeholder communities. Resilience is emerging as the flexible framework of choice for risk management in the face of complexity and uncertainty; it thrives on diversity and demands stakeholder participation. Because of this nature, resilience inevitably will lead military communities to deepen stakeholder collaboration through public-private partnerships.

MILITARY COMMUNITY INTERACTIONS

Military installations provide training and logistic infrastructure and projection platforms for armed forces, but they share important interdependencies with surrounding communities. The emergent concept of "Globally-Integrated Operations" (US Department of Defense 2012) inherently implicates installations even more directly into such operational activities as surveillance, analysis, cyber, and even remote piloting of unmanned systems, which increasingly are being relocated to domestic installations for flexibility and security. Meanwhile, surrounding communities increasingly expect military protection and

Figure 2 - Armed Unmanned Aerial System

support in the face of asymmetric threats and natural disasters. In essence, military communities are becoming partnerships that support the range of military operations.

These interdependencies have come at a price. A well-publicized Defense Science Board Report on energy (2008) brought substantial attention to the challenges of energy logistics in expeditionary operations; it also highlighted the perils of domestic installation dependencies upon a fragile domestic electrical power grid. The report triggered numerous calls and initiatives to enable installations to "island" their electrical power systems - supposing that this would assure essential functions in case of emergency. In fact, isolation is the hallmark of existing protective strategies embodied, for example, in physical and cyber security guidance – as is readily apparent to those who visit a US military installation. The underlying presumption is that military organizations are self-sufficient, and that external contacts inevitably weaken our readiness.

In fact, most US installations have developed strong relationships with adjacent civilian support structures. Essential civilian and military functions have become inextricably linked, especially through services such as energy, water, transportation, and communication networks. Expanding participation in mutual support agreements for medical care, law enforcement and emergency response has been cultivating still deeper interdependencies and in communities, military personnel live alongside their civilian neighbors. Meanwhile, storm-induced outages simultaneously affect activities on both sides of the fence; emergency services such as search and rescue, water distribution and power generation support both civilian and military essential needs. While American military leaders carefully respect the delineation of defense authorities from civilian activities, they can and must participate aggressively

Figure 3 - Mississippi National Guard Soldiers Respond

in public-private partnerships for mutual benefit.

RESILIENCE AS A RISK FRAMEWORK

Compounding today's complexity of capabilities, threats and effects, current US military doctrine identifies increasing change and uncertainty as fundamental considerations (Joint Operating Environment 2010). Established strategies involving linear thinking, systems analysis and actuarial methods are proving inadequate – not only because of unpleasant surprises, but also in terms of decision-maker frustration, as they struggle to reconcile so many disparate considerations. Moreover, no closed-form analysis could prepare us for climate change, pandemic or other such open-ended possibilities. How, then, can a military force or community hope to posture itself for future contingencies if stakeholders have lost confidence in their planning basis?

American leaders are turning to resilience for answers. Presidential Policy Directive 21 defines resilience as "the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents" (2013). With respect to social structures, a National Academy of Science (NAS) report identifies four basic components: plan/prepare, absorb, recover, and adapt to anticipated and unanticipated conditions (2012). A fundamental shift from current practice, resilient design does not revolve around protection of highly-optimized systems, but on outcomes of importance (Hay 2013). Systems rarely operate at "design condition," so resilience practitioners build in change tolerance and flexibility. Design standards still apply; it would be foolish not to anticipate wind loads on a building or the need for fences to keep curious interlopers at bay. However, as Taleb (2012) points out, every new "worst" we experience – whether storm, earthquake or epidemic - exceeds previous expectations. Furthermore, increasingly complex modern systems create opportunities to discover surprisingly new failure modes, especially where human behaviors come into play (Lawson 2004). Resilience does not fail if the lights go out; we should have a candle and matches in the drawer.

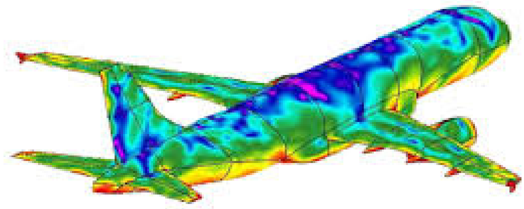


Figure 4 – Optimization using finite element analysis

ANALYTICAL TAXONOMY

Analysis of complex systems demands an organizing taxonomy. The NAS resilience definition identifies four temporal components, effectively casting resilience as a cycle. Recognizing the importance of management functions in addition to physical systems, Linkov (2013) provides an additional dimension by distinguishing domains of significance:

- Physical: sensors, facilities, equipment system states and capabilities;
- Information: creation, manipulation, and storage of data;
- Cognitive: understanding, mental models, preconceptions, biases, and values;
- Social: interaction, collaboration and self-synchronization between individuals and entities.

Superimposing this domain view on the resilience "cycle" produces a matrix that can be useful for resilience analysis. Let us explore the demands of military communities using this taxonomy, paying particular attention to the contributions that public-private partnerships bring to the table.

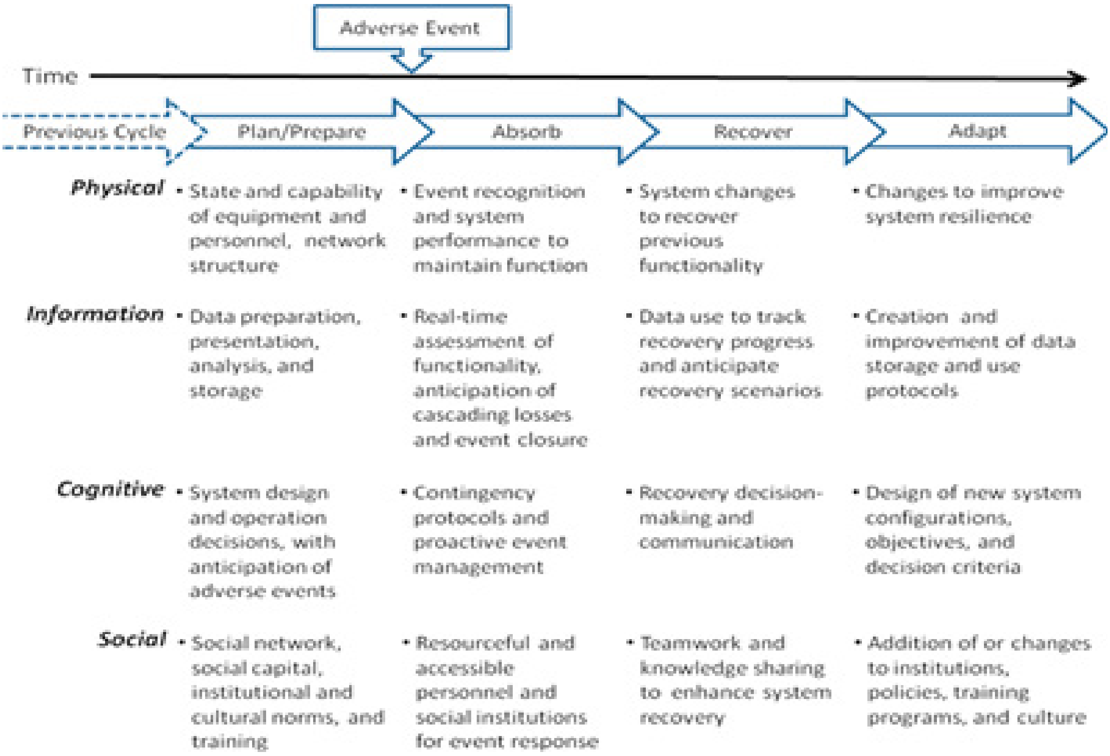


Figure 5 - Resilience Matrix (from Linkov 2013)

CREATIVITY IN PREPARATION

The preparation phase offers communities an opportunity to be creative as they set the stage for success in unknown future situations. This is not a call for "imagineering" and story-telling; rather, an imperative for experienced experts to draw upon their collective experiences and knowledge, and synthesize seasoned insights and observations about the community, its inherent interdependencies and dynamics. Where conventional risk analysis techniques use history and statistics to predict the future and guide investments, resilience demands that we understand what is important, and that we develop a collective understanding of how important conditions can be achieved. While no standard has been established yet for community resilience analysis a generic template has been developed to accommodate and guide collaborative analysis in the planning stage (Roege, Hope and Delaney 2014). Five basic steps include:

- Establishing a collaborative world view;
- Examining system response to perturbations;
- Structuring these observations into logical relationships;
- Assessing potential solution space;
- Resolving and implementing solutions.

This generic process accommodates input from specialized, quantitative analyses of component systems such as energy and transportation to inform discussion among community stakeholders, with the goal to cultivate richer, more useful system insights. The underlying premise is that community experts hold nuanced insights about complex system interactions and responses than reasonably could be exposed through quantitative techniques. Moreover, collaboration in a structured setting allows the group to elicit and mature insights which in turn enable collective identification and evaluation of portfolio solutions. Ultimately, these solution sets are likely to include actions to be taken by various community entities; participation in the decision process builds ownership and

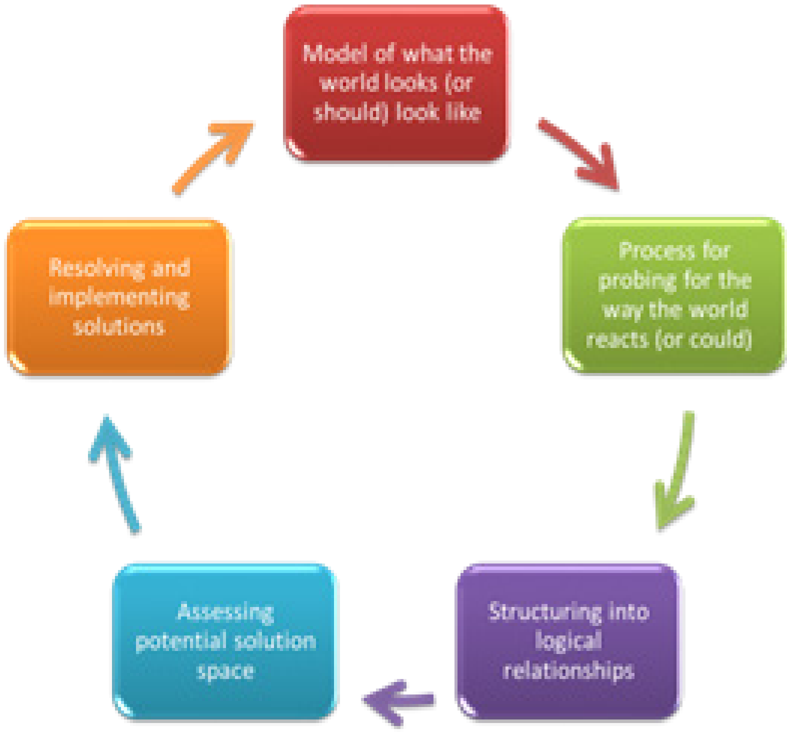


Figure 6 - Generic Resilience Analysis Process

commitment in implementation. Creative, inductive thinking and team solutions provide the basis for a resilient community posture.

AGILITY IN RESPONSE

Responding to change requires collective agility in order to mitigate effects as they unfold. This need applies equally to long-term change as to urgent events. Families and neighbors must act quickly, and emergency resources must respond in the right locations with appropriate assets in order to save lives and homes during a severe storm. Likewise, coastal Alaskan villagers must work together and with enabling entities to embody agility as they respond to albeit longer-term climate change in order to preserve their culture, livelihood, and economic future.

In a military community, public-private partnerships are especially important to agility. As a simple illustration, installation commanders impose access controls at the gate in the interest of physical security. And, while they subscribe to civilian-source energy, water, supply, and information services, military "networthiness" standards substantially block external information sharing about real-time conditions and needs. Undoubtedly, these security measures have prevented incidents that could have impacted military readiness. But, how would these barriers impact response to an urgent that requires civilian resources to respond? Imagine a medical emergency or natural gas leak on the installation. Without an established process to credential off-site responders, military readiness could suffer the effects of a lack of agility. Similarly, civilian utilities are beginning to install state-of-the-art electrical "smart grid" capabilities. Without trusted collaboration, the operator would lack information to provide situational awareness and therefore would be powerless to respond quickly to military needs. Public-private partnerships can help military communities achieve the agility needed to respond.

FLEXIBILITY IN RECOVERY

When recovering from a damaging event, few question the need to act. Compared to the response phase, recovery time frames accommodate more careful analysis and deliberate mobilization to action. Nevertheless, communities need flexibility in this phase because natural disasters have a habit of damaging property without regard to ownership. Worse yet, hostile actors are deliberately inconvenient. Effective recovery processes therefore demand the ability to work around physical obstacles, geographic factors, and various constraints imposed by ownership, authorities, business processes and information availability. The equipment and supplies that survive the storm probably include some combination of public and private resources. How will those capabilities be identified and applied to areas of greatest need? Strategically located shelters and supply points depend upon sharing of information, flexible logistics, and the wherewithal to overcome barriers of ownership or authorities. Public-private partnerships can help meet these challenges, providing the basis for greater flexibility.

Figure 7 - Military Installation Entrance

On the heels of the January 2010 Haiti earthquake, Robert Munro, an American private citizen, organized an international process that coordinated capabilities of text messaging, social media, translators, and the Ushadi web application to provide critical information to response workers on the ground, enabling them to prioritize and direct recovery efforts in a seemingly hopeless situation. Within four days of the earthquake, Haitians could send an SMS message to 4636 to report needs. Reports were translated by a network of volunteer Creole linguists, and information was forwarded with embedded location information to emergency response networks. This highly effective initiative highlighted not only the value of partnerships in providing flexibility, but also the fundamental importance of individual willingness to act as a fundamental tenet of resilience.

ADAPTATION

As the resilience "feedback loop," the adaptation phase demands adaptability. Once again, public-private collaboration provides an essential element, in this case to provide unity of effort. Consider the essential role that Homestead Air Force Base played during Hurricane Andrew (1992), and how the community has adapted. Despite being heavily damaged by the storm, the installation served as a staging area for important support during the community's response and recovery efforts. The Air Force invested $100M recovering from the event. However, adaptation took a different direction when, in 1995, Congress redesignated Homestead as a reserve installation and relocated active missions elsewhere. The community, meanwhile, has chosen a different adaptation pathway as it continues to rebuild. Fortunately, adaptation has not been entirely uncoordinated. Continuing public-private coordination has enabled substantial success as the reserve installation supported subsequent operations in Haiti, Iraq and Afghanistan. In this instance, while military and civilian adaptation paths have diverged, continuing partnerships continue to support some level of community resilience.

In another useful, albeit non-military example, coastal Alaskan villages are adapting in the face of existential threats due to multiple factors including climate change. Although native traditions included nomadic tendencies, permanent infrastructures established during the 20th Century now are being threatened by rising sea levels. Federal and state agencies are providing limited support, but individual villages have taken more or less proactive postures to chart their own futures. Many are cultivating partnerships with educational and nonprofit institutions, and even crowdsourcing ideas through social media. The villagers do not expect the government to build a dike to protect them. They are seizing the initiative and collaborating to identify and implement solutions that consider survival – of their families and culture – over future generations. This case study vividly illustrates the value of collaboration in community adaptation.

CONCLUSION

Modern pressures of globalization, information and technology availability are driving us to shift from traditional risk management and protection strategies to the more holistic concept of resilience. In the context of military communities, resilience demands collaborative engagement between military and civilian entities at each phase of change. Emerging analytical frameworks can leverage traditional quantitative tools to inform more qualitative collaborative exercises, steering the progression from analysis to solutions. Ultimately, public-private partnerships can help foster creativity in preparation; agility in response; flexibility in recovery; and adaptability as we posture for the future.

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Energy Savings Performance Contracts: **Innovation in Energy Savings Solutions and Financing for the Energy Challenges of the 21st Century**

Ed Yarbrough and Alicia Collier, Honeywell

This article highlights how Energy Savings Performance Contracts (ESPCs) enable energy demand reduction and management in an environment with rising energy costs, reduced budgets and aging infrastructure with or without very little direct capital costs. Since ESPCs are among the Public and Private Partnership opportunities and have been successfully implemented in the U.S., they are recognized in some EU nations. As NATO allies operate in a different legislative and regulatory environment providing a unique set of challenges, NATO and its member nations could well benefit from ESPC. They should consider ways to promote policies to support such win-win P3 opportunities which have been proven to lower energy consumption by 25 percent.

DEFINING ENERGY SAVINGS PERFORMANCE CONTRACTS

Energy Savings Performance Contracts (ESPCs), also known as Energy Performance Contracts, are an alternative financing mechanism authorized by the United States Congress and designed to accelerate investment in cost effective energy conservation measures in existing Federal buildings. ESPCs allow Federal agencies to accomplish energy savings projects without up-front capital costs and without special Con-

Honeywell

Honeywell is a US - based company with a global footprint that includes personnel and facilities in every part of the world. The company has extensive experience in providing energy efficiency and greenhouse gas reduction solutions across a broad range of technologies. These include: management of environmentally friendly and energy efficient buildings and large installations, energy control systems for smart grids, fuel-efficient turbine engines and turbochargers, drop-in biofuels and energy efficient avionics and subsystems that enable aircraft flight path management and taxi control. Honeywell has extensive experience in and familiarity with a wide range of Public-Private Partnership (P3) opportunities, including Energy Savings Performance Contracts (ESPCs), Utility Energy Service Contracts (UESCs), Utility Management Control Systems (UMCS), and Power Purchase Agreements (PPAs). Among the third party arrangements listed, Energy Savings Performance Contracts (ESPCs) offer the most flexible contracting vehicle for P3 energy savings solutions in Europe.
Across the United States, Honeywell's portfolio of energy efficiency solutions is over $2 billion, with over half of Honeywell's business comprising approximately 250 contracts with government agencies and military facilities and installations. Honeywell has also completed a number of ESPCs in Europe, many of which in support to the U.S. Army including 13 in Germany alone.

The authors of this article Ed Yarbrough and Alicia Collier work for the aforementioned company.

gressional appropriations. The Energy Policy Act of 1992 (EPACT 1992) authorized Federal agencies to use private sector financing to implement energy conservation methods and energy efficiency technologies.

ESPCs allow building owners to complete energy-saving projects with little or no up-front capital costs. An ESPC is a partnership between a client and an energy service company (ESCO). The ESCO designs and constructs a project that meets the client's needs and arranges the financing of the project, if necessary. The ESCO guarantees that the improvements will generate energy cost savings to pay for the project over the term of the contract.

ESPCs provide an excellent contracting arrangement that will help NATO countries to achieve their goals of energy cost reduction, positive environmental impact and sustained energy security.

Specifically, performance contracting is a wide-ranging implementation of energy management measures to reduce waste, demand and loads in peak periods. This typically includes a broad range of interventions such as capital equipment replacement and upgrades with more energy-efficient machinery, energy loads measuring and monitoring systems, repair of inefficient plant processes and functions, training of managers, users and occupants along with preventative and maintenance services aimed at reducing energy and operating costs and improving infrastructure with little or no upfront investment by the client. The Energy Performance is guaranteed by the contractor - if not achieved, penalties are paid; if it is exceeded, the client reaps the rewards. The guaranteed energy performance financial savings are used to pay off the amortized costs of the upfront investment of the plant, of the equipment and of the installations. This is what makes the win-win possible.

At its core, the energy savings over the contract period will justify the investment of the financed capital equipment. ESPCs are normally accompanied by customized financing arrangements that facilitate the endeavor.

There are three primary benefits deriving from the energy savings of the public-private technology partnerships:

- cost-saving efficiencies through lower energy usage as well as lower energy usage at times of peak demand;
- positive environmental impact through greater integration of low carbon energy;
- increased economic security (reducing the need to import energy resources).

The typical technical solutions for maximum operational savings include heating ventilation and air conditioning control retrofit; lighting system improvements; ventilation and air quality improvements; infrastructure improvements such as insulation, doors and windows; "free" cooling on chilled water system; heat recovery system; energy management system; complex boiler plant optimization; demand-side management, focus on renewables; and cogeneration or Combined Heat and Power (CHP) use of a heat engine or power station to simultaneously generate electricity and useful heat.

CASE STUDY IN ESPC: THE UNITED STATES

Fort Bragg is a major United States Army installation, located in the state of North Carolina, covering more than 650 square kilometers (251 square miles) and spanning over four counties.

Working with Honeywell, the overall goal of the team is to minimize the energy costs within Fort Bragg's aging infrastructure. The expansive facility was comprised of hundreds of buildings of various ages and conditions. The specific objective was to optimally manage on-site energy equipment including turbines, chillers, and boilers and demand through "peak shaving," "load shedding," and "load shifting."
After careful study and extensive dialogue

with all stakeholders, an ambitious and innovative ESPC program emerged in the partnership with Fort Bragg, Honeywell, and the U.S. Army Corps of Engineers - an ideal public-private partnership. This partnership epitomized the P3 power that can be harnessed to derive ESPC savings.

Figure 1 Ft. Bragg Energy Information Centre

In June 2005, the Oak Ridge National Lab (ORNL), which is the U.S. Department of Energy's largest energy laboratory, joined the team and a CHP system was installed in the central heating plant of the legendary 82nd Airborne Division. Major subcomponents of this upgrade included a five megawatt gas turbine generator, a 1000-ton exhaust-driven absorption chiller, heat recovery steam generator, auxiliary gas-fired duct burner, auxiliary gas/oil-fired steam boiler and auxiliary electric centrifugal chiller.

In addition, an innovative Honeywell "active demand" energy management system was installed to allow peak shaving (reducing the amount of energy purchased from the utility company during peak hours when the charges are the highest), load shedding (an intentionally engineered electrical power shutdown where electricity delivery is stopped for non-overlapping periods of time over different parts of the distribution region), and load shifting (moving mass electrical charge from one part of the grid to another, especially during peak demand).

Using techniques for optimization based on many years of experience, recommended set points for the turbine generator and other major equipment and variables such as electric load, heating and cooling loads, grid electricity prices, fuel prices, equipment characteristics and weather data were all considered and adjusted continually.

The CHP project was one of the many projects that were incorporated in the Fort Bragg under the ESPC program with Honeywell. As a result of this comprehensive effort, Fort Bragg combined P3 team reduced the installation's energy usage by 25 percent, representing $57 million in savings against a $11 million investment.

Perhaps just as important as the energy savings that resulted from the Fort Bragg, the ESPC was the enhanced robustness of its energy network that provided adaptive energy management solutions and redundancy. These latter reduced the exclusive reliance on the grid, thereby increasing the security of this critical U.S. military installation. In recognition of the effort, the partnership was awarded the Department of Energy's National Energy Award.

ESPC DEVELOPMENTS IN EUROPE

ESPC partnerships with public entities in Europe are still in their infancy when compared to the U.S. market level of maturity. However, a recent example is the Blue Sky Peterborough (BSP) framework agreement that was signed last year between Honeywell and BSP in the U.K. (100 percent owned by Peterborough City Council). BSP is an iconic project that addresses the current political dilemma of both rising energy prices while providing access to regeneration and growth for the local economy through energy-led funding solutions. This groundbreaking project will define the blueprint for sustainable energy management in a smart city environment.

The framework consists of an eight-year agreement to develop energy performance-based contracts with the Peterborough City Council and potentially other U.K. councils that adhere to this initiative.

CREATIVE ENERGY MANAGEMENT "CURES" FOR HOSPITALS

The Atrium Hospital in Heerlen, the Netherlands, built a state-of-the-art "trigeneration" utility in the late 1990s to produce a 24-hour supply of steam, electricity and cooling to the 750-bed hospital. At the time, gas prices were low and electricity prices were high.

Figure 2 EU Building Automation Controls

However, the original design philosophy, based on a 1990s energy equation, made optimum economic operation a difficult if not impossible task as conditions changed. Liberalization and liquidity of the gas and electricity market, eco-taxes, and CHP subsidies, coupled with a steady increase in utility costs, compelled hospital management to take actions in order to be able to manage and control their energy costs.

In 2001, the hospital management decided to perform a detailed energy survey to enable them to make the right decisions regar-ding the future operation and optimization of a flexible utility. The investigations led to the design, installation, and operation of several demand-side and generation-side energy optimization measures which fitted with the hospital's financial constraints.

Teaming closely with Honeywell energy efficiency experts, a new strategy was drafted aiming at managing the hospitals energy consumption to both reduce usage and cost while maintaining the hospitals' ability to perform its critical mission. The resulting P3 ESPC included several key constraints:

- positive contribution to the internal rate of return (IRR);
- No compromise to the safety and the security of the hospital;
- sustainable for at least 10 years;
- easy to quantify and justify financial savings;
- Adaptable to the rapidly changing environment and infrastructure;
- operational within one year;
- being within the limits of the hospital's financial budget.

Following this energy evaluation, the solution was implemented successfully, leading to annual savings of €90,000 in 2004 alone.

The used details on specific energy conservation measures can be found in the journal Euro Heat & Power, 11/2005 or by contacting the author of this paper.

Among other best practices cited in a European Union Building Automation Controls (EU.BAC) white paper, "Energy Performance Contracting in the European Union," there is the case study of Lievensberg Hospitals, Netherlands.

With an annual turnover of more than 160,000 patients, Lievensberg Hospitals were looking for a solution that would enable them to streamline costs and enhance facility management at the same time. However, they were constrained by lack of resources and budget needed for necessary improvements. Honeywell initially focused on reducing the bottom-line impact associated with energy consumption, costs and improving the energy efficiency of Lievensberg's facilities through our design, implementation and financing capabilities.

Phase 1 included: the installation of a heat pump that provided cooling in summer and simultaneously heating to the Air Handling Units (AHU) in winter; a CHP unit to help recovering waste heat for electricity generation; and the implementation of Honeywell Energy Manager, an advanced energy information application that integrates with other building applications.

Phase 2 included the renovation and optimization of the AHU. The flexible finance option offered by Honeywell enabled Lievensberg to transfer the savings made from Phase 1 to be invested in Phase 2.

A third party financing through Honeywell provided a cash flow-neutral solution without the need for upfront capital. There was no budget needed for modernization of the technical installation.

Other recent European healthcare customers cited in the paper include St. Elisabeth-Hospital, Herten, Germany and Klinikum Landshut, Landshut, Germany.

TRANSPORTATION INDUSTRY PUTS ENERGY EFFICIENCY IN MOTION

Perhaps no other city is as defined by its transport system as London, with its red buses, black cabs and tube trains. Transport for London (TFL), United Kingdom - responsible for the day-to-day operation of the capital's public transport network, managing London's main roads, planning and building new infrastructure - set a 25 percent carbon reduction target for their complex and fragmented building mix across 22 buildings.

In May 2009, a partnership with Honeywell enabled them to replace lighting and controls, to upgrade TFL's Building Energy Management controls, to improve TFL's building fabrics, to install an on-site CHP integrated energy system and to fit a solar thermal hot water system.

The result was the following: TFL's gas consumption was reduced by 20 percent and the electricity use by 25 percent. Additionally, they harvested a guaranteed energy savings of £770,000 per annum while witnessing a carbon dioxide reduction of 3,650 tonnes per annum.

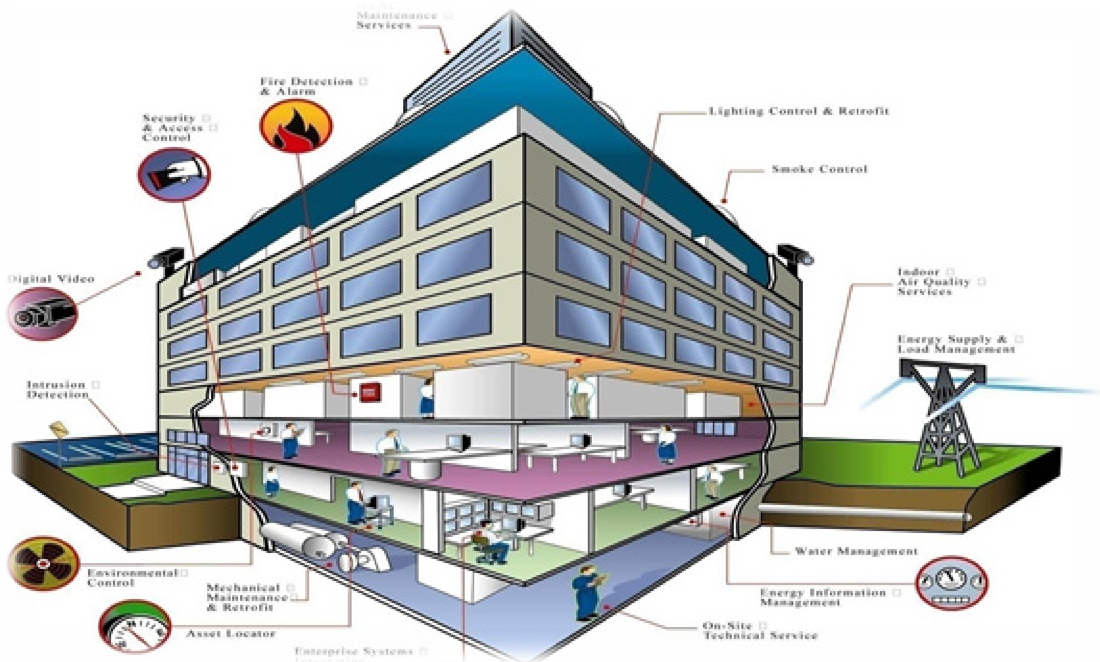

Figure 3 Building Management System

THE CASE FOR SMART GRIDS AS PART OF A HOLISTIC SOLUTION

While energy savings performance contracts create the fertile soil for public-private partnerships, taking a holistic approach is critical to achieve the three desired elements, namely cost-saving efficiencies, positive environmental impact and energy security.

As was highlighted in the Fort Bragg example, a key foundational element of such approach can be seen in the emerging concept of the "smart electricity grid" - interconnected local generation and distribution for intelligent management of local (electric) power generation supplying local (electric) loads.

The characteristics of a smart grid include local power generation co-existing with the utility but able to operate totally independently of the utility grid ("islanding") and offering the ability to manage and control local load.

Figure 4 Smart Micro-grid, Wheeler Army Airfield, Honolulu, Hawaii

Smart grids can also form the basis of effective P3s. Examples of such smart grid-based P3s, also known as a Smart Charging Micro-Grid, can be seen in the implementations at Wheeler Army Airfield in Honolulu, Hawaii, which became operational in 2012, and in the 55- megawatt Central Utility Plant Microgrid at the Federal Research Center at White Oak, Maryland.

The benefits of a smart grid are the ideal fit between the objectives of security, environment and cost-savings on the one hand, and renewable generation sources, storage technologies and demand management to integrate intermittent renewables (such as solar and wind), increased reliability, the ability to disconnect from the utility grid (islanding) to avoid blackout (uninterrupted power), improved efficiency, waste heat recycled for heating/cooling of buildings and reduced transmission and distribution losses on the other one.

Figure 5 Central Utility Plant Micro-grid, Federal Research Centre, White Oak, Maryland

WHAT MAKES A GOOD CANDIDATE?

The tripartite need for energy reliability, security and economy applies to a wide variety of public and private sector scenarios. However, the strongest cases can be made for customers who primarily need to interface with a utility grid and have islanding capability to support critical functions when necessary.

Prime candidates include:

- Fixed military installations and bases;
- University and college campuses;
- Commercial building complexes (e.g., industrial parks, corporate headquarters);
- Data centers;
- Hospitals;

• Communities with a utility infrastructure that experience power shortages.

COORDINATION IS KEY TO PUBLIC-PRIVATE COOPERATION BETWEEN THE U.S. AND THE EU

Inside the European Union, motivations and priorities can differ greatly, with some of the member states caring more about the environment and less about the costs, while for other countries the environment can be just one of many arguments. This can create conditions hindering the flowering of Public-Private Partnerships and holding back the proven benefits of energy security and efficiency savings.

As Dr. Arunas Molis, former Head of Strategic Analysis and Research Division at the NATO Energy Security Centre of Excellence, said, the EU faces problems that do not exist in the United States:

Things which would not be understandable in the U. S. are the specific national characteristics which hinder certain agreements and certain problems. For example each EU member state has its national champions. Of course, we can discuss the energy dependence problem or the diversification issues which are relevant on both sides, but the solutions are more effective in the United States I would say. This is actually the reality we face in Europe today – the issue of coordination.

CONCLUSION

The overall goal of this paper was to show that ESPCs enable energy demand reduction and management in an environment with rising energy costs, reduced budgets and aging infrastructure, and that the savings will pay for the initial investment over time.

It is clear that a country, especially but not limited to its military installations, can readily reduce its energy consumption, decrease pollution arising from lower energy usage, and enhance national economic security by implementing policies that support the implementation of ESPCs. Indeed, in the U.S., where the Obama administration has implemented such policies, energy usage on many of its largest federal facilities has dropped considerably resulting in a wide range of benefits.

Energy demand at peak times can be reduced to improve the security of supply and the stability of the grid. The low carbon energy generated locally can be given priority use to reduce carbon emissions. Budgeting for energy cost is made easier during the contract period, after which the full cost savings are passed along to the client.

In addition to cost savings, the reduced energy consumption directly reduces dependence on fuel imports.

Recognizing that NATO Allies operate in a different legislative and regulatory environment that provides a unique set of challenges, NATO and its member nations could well benefit from ESPC and should consider ways to promote policies supporting such win-win P3 opportunities which have been proven to lower energy consumption by 25 percent.

In summary, the P3 concept offers a huge opportunity for NATO countries to satisfy their political objectives of reducing energy consumption, carbon emissions, energy spending, energy imports and improving their grid stability and local economy.

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